Supporting Waipapa Growth: Detailed Business Case

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August 2018

VERSION - Final

Detailed Business Case

NZ TRANSPORT AGENCY
WAKA KOTAHI

New Zealand Government

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EXECUTIVE SUMMARY

This Supporting Waipapa Growth Detailed Business Case (DBC) follows work completed to date, including the Strategic Case, and is a Single Stage Business Case combining both the Indicative and Detailed Business Case phases.

Background

The Waipapa Township is located on SH10, 5km northwest of Kerikeri. Along with Kerikeri, it is the most significant growth area in the Far North District and, over time, has developed to act as a service centre for Kerikeri and the wider East Coast and central areas of the District.

SH10 runs through Waipapa from north to south and acts as the spine for the road network. The busy commercial and industrial areas are located mainly to the west of SH10, with some direct access to and from SH10 and alternative access off Kahikatearoa Lane and Pataka Lane. A local road connection between Waipapa and Kerikeri is provided via Waipapa Road.

The Waipapa commercial area is a significant area of employment. Many of the people who work in this area travel by car as there is limited public transport and a lack of walking and cycling infrastructure.

Waipapa has been highlighted for strong future growth and development, with the Kerikeri Waipapa Structure Plan (2007) being the guiding document. The structure plan includes household and population predictions between 2001 and 2026, which indicates that the population is predicted to more than double over this timeframe. This predicted population growth will increase the demand for residential dwellings in the surrounding area. It will also increase the demand for land for commercial, industrial and retail development in the area with significant focus on Waipapa.

Problems and Opportunities

Problems for the Waipapa study area have evolved and been agreed to through the business case process based on stakeholder feedback and supporting evidence. These problems are:

- **Problem One: Lack of long term integrated planning and robust zoning controls has resulted in sub-optimal land use patterns and a deficient transport system (10%).**

  This problem statement relates to historic growth and development occurring in an ad hoc manner, with multiple direct accesses on the State Highway, and the existing roading network not being able to support further growth.

- **Problem Two: Disjointed and insufficient transport infrastructure is a major barrier to safe, efficient and reliable multi-modal passage, including visitor journeys, and realising community outcomes in Waipapa (45%).**

  This problem statement relates to the capacity of the existing SH10 / Waipapa Road intersection, the barrier of the State Highway to pedestrians and cyclists, and the proximity of the Skippers Lane intersection to the State Highway.

- **PROBLEM THREE: LAND USE DEVELOPMENT PRESSURE AND NETWORK CHANGES HAVE SIGNIFICANTLY ALTERED VEHICLE MIX AND JOURNEY PATTERNS ON THE STATE HIGHWAY AND ADJOINING LOCAL ROADS. THIS HAS LED TO INCREASED PRESSURE AT KEY POINTS ON THE NETWORK AND CHANGES TO CRASH PATTERNS (45%).**

  This problem statement relates to the increased traffic on Waipapa Road, which is also the Twin Coast Discovery Highway, and the over-representation of right-turn traffic into Kahikatearoa Lane and other business accesses.

Based on the problems and opportunities identified within the Waipapa study area, the following investment benefits were identified:

- **Benefit 1:** Improved Economic Growth for Waipapa and Kerikeri (10%)
- **Benefit 2:** Improved Network Efficiency (45%)
- **Benefit 3:** Increased Safety (15%)
- **Benefit 4:** Increased multi-modal travel (30%)

Option Development

Options were initially developed considering a range of alternatives based on addressing the above benefits. The identified “long-list” options were initially assessed using a multi-criteria analysis (MCA) framework which assessed option alignment with investment objectives and key project risks. The process allowed “long-list” options to be rationalised to a “short-list” of options to be assessed in further detail. Identified short-list options are listed below:

- **Right Turn Bay**
- **Roundabout**
- **Traffic Signals**
- **Head to Head Right Turn Bays**
- **Close Waipapa Loop Road South**

The short-list options were then assessed in further detail, including an assessment against anticipated environmental and social impacts, and high-level cost estimates.

Based on the findings of the MCA, supporting information, stakeholder and community feedback, the ***Roundabout*** was identified as the recommended option.

The extension of Klinac Lane to its north is an important new connection for unlocking the development potential of Waipapa. The extension provides an additional, more direct access into the commercial and industrial area of Waipapa. While the extension is seen as important to the growth and development of the area, it would also put additional pressure on the SH10 / Waipapa Rd intersection. Because of this, it is sensible to develop the intersection improvement at the same time as the new link road. Accordingly, the NZ Transport Agency and the Far North District Council developed the Business Case collaboratively.

The Far North District Council have programmed the design and construction of the Klinac Lane extension into their Long Term Plan - the intention being for this new link to enable growth. For the benefits of the new link to be realised, safe and efficient access from the State Highway is a pre-requisite and is enabled by addressing the safety and efficiency issues at the current intersection. Because of this, and because that extension is practically essential for any outcome that tries to properly balance traffic on the local road approaches to the main intersection, the economic analysis was carried out on the intersection improvement with the link road considered in the base case or ‘do minimum’ scenario.

Why This Option is Recommended

The Roundabout is identified as the recommended option for further progression, as it:

- Provides the best overall efficiency benefits, in particular for Twin Coast Discovery Highway movements.
- Provides a gateway treatment to the Waipapa area and allows ease of movement for all users.
- Significantly reduces the number of conflict points at the intersection.
- Provides opportunity for uncontrolled crossing points on all roads.
- Received the most favourable feedback from the public.

Recommended Option

The recommended option includes the following treatments:

- Roundabout at the intersection of SH10 / Waipapa Road / Waipapa Loop Road.
- Providing a link from Waipapa Loop Road to Klinac Lane (Klinac Lane Extension).
- Closing the northern end of Skippers Lane and introducing a turning head.
- Closing the Waipapa Loop Road North intersection.
- Implementing corridor improvements to SH10 that include:
  - A shared footpath from Waipapa Road to the Kerikeri River.
  - Widening to provide a flush median and right turn bays.
  - Streetlighting for amenity.

To maximise the benefits of investing on the corridor and ensure desired project outcomes are fully realised in the short-term, it is proposed that the recommended improvements are implemented as a single package.

Achieving the Outcomes

The recommended option’s outcomes are:

- Improve access opportunities without detrimental effects on the SH10 corridor.
- Decrease average delay at the SH10 / Waipapa Road intersection to under 10sec in opening year with no movement having more than 20sec delay.
- Provision of walking and cycling connectivity across SH10.
- 25% reduction in annual social crash cost.

Costs, BCR and Profile

The project Expected Estimate for the recommended option is **$7.1M**.

This is made up of the following components, excluding the cost of the Klinac Lane Extension, which has been considered in the base case or “Do Minimum” scenario.

COMPONENT	SUMMARY OF PROJECT COSTS
Roundabout	$6,074,516
Waipapa Corridor Treatment	$994,749
OPTION TOTAL	**$7,069,265**
Klinac Lane Extension	$494,429
TOTAL	**$7,563,694**

The BCR is **3.1** and the Assessment Profile is a **MHM.**

Next Steps

It is recommended that the option be advanced through pre-implementation, detailed design and implementation through traditional delivery methods in line with the NZ Transport Agency's standard procurement approach. We recommend that the construction be completed in the 2018/19 financial year.

THE CASE FOR CHANGE

1. INTRODUCTION

This document is a Single Stage Business Case for the State Highway 10 (SH10) / Waipapa Road intersection and includes both the indicative and detailed business case phases, referred to as a Detail Business Case (DBC) in this report.

This DBC outlines the investment story being promoted for SH10 corridor through Waipapa, building on the previous Strategic Business Case (Refer **Section 1.1**). Along with corridor improvements, the primary purpose of this DBC is to provide investors with an early opportunity to choose a SH10 / Waipapa Road Intersection layout option for further investment. The DBC outlines the ongoing engagement process for the recognition of problems and potential benefits, and the development of ideas into a long list of options. It goes on to identify and evaluate the risks and effects associated with each option; then determine a preferred option with target outcomes.

1.1 Work Completed to Date

SH10 / Waipapa Intersection Improvements, Scheme Assessment Report (Aecom, 2010)

This 2010 scheme assessment report by Aecom considered one and two lane options for a roundabout at the intersection; concluding that the former option should be adequate for 23 years.

Supporting Waipapa Growth – Strategic Business Case (NZTA, 2016)

A Strategic Business Case was developed by the NZ Transport Agency in Feb 2016 in partnership with the Far North District Council Transport and Planning teams.

The strategic case identified the problems and benefits presented in Table 1.

Table 1: Identified problems and benefits

THE PROBLEM	WEIGHTING	BENEFITS
Lack of long term integrated planning and robust zoning controls has resulted in suboptimal land use patterns and a deficient transport system	20%	Realised planned economic and targeted urban growth
Disjointed and outdated Waipapa corridor transport infrastructure is a major barrier to safe and efficient multi-modal passage and realising community outcomes	45%	An efficient and accessible Waipapa service centre and community hub
Land use and network changes have significantly altered vehicle mix, journey patterns and crash profile on the State Highway and adjoining intersections	35%	A fit for purpose and safe multi-modal transport network

The strategic case concluded that there is a good opportunity to enhance the economic prospects of Waipapa and the Far North District through investment in the transport network, including the SH10 corridor.

A recommendation of the strategic business case was to proceed with the project to a single stage business case to confirm the preferred network option(s) and corridor improvements on SH10 in Waipapa. This recommendation was endorsed by NZTA's Auckland / Northland Business Unit Decision Making Team.

Waipapa Road / SH10 Intersection Traffic Study (Opus, 2016)

The Waipapa Road / SH10 Intersection Traffic Study was completed in August 2016 by Opus for Far North District Council **(Appendix A)**. The study considered various forms of intersection control, together with various growth rate scenarios to provide an indication of possible intersection upgrades. Future road network changes were also considered to assess the change in traffic flows and any impact on the operation of the intersection.

It included an origin-destination survey to provide a better understanding of drivers' travel behaviours during different times of the day, as well as obtaining traffic movement data at the SH10 / Waipapa Road Intersection. The traffic study concluded that the existing SH10 / Waipapa Road / Waipapa Loop Road intersection experiences efficiency problems for the two minor approaches, especially of concern in the peak period, which is likely to limit future commercial and industrial growth in the area.

A single lane roundabout was identified as the favourable intersection layout with a significant improvement in intersection capacity. This increase in capacity would encourage commercial growth, and better accommodate State Highway and Local Road traffic growth. Importantly, a roundabout option would also be more resilient to changes in traffic flows in comparisons with the existing intersection layout.

2. CONTEXT

The Waipapa Township is located on SH10, 5km northwest of Kerikeri. Along with Kerikeri, it is the most significant growth area in the Far North District and, over time, has developed to act as a service centre for Kerikeri and the wider East Coast and central areas of the District.

SH10 runs through Waipapa from north to south and acts as the spine for the road network, as shown below. The busy commercial and industrial areas are located mainly to the west of SH10, with some direct access to and from SH10 and alternative access off Kahikatearoa Lane and Pataka Lane. A local road connection between Waipapa and Kerikeri is provided via Waipapa Road.

The Study Area covered in this Business Case is the length of SH10 from the bridge just north of Puketotara Road to Pungaere Road. This incorporates the major intersection with Waipapa Road/Waipapa Loop Road and with Kahikatearoa Lane.

Figure 1 below shows the location of the Study Area.

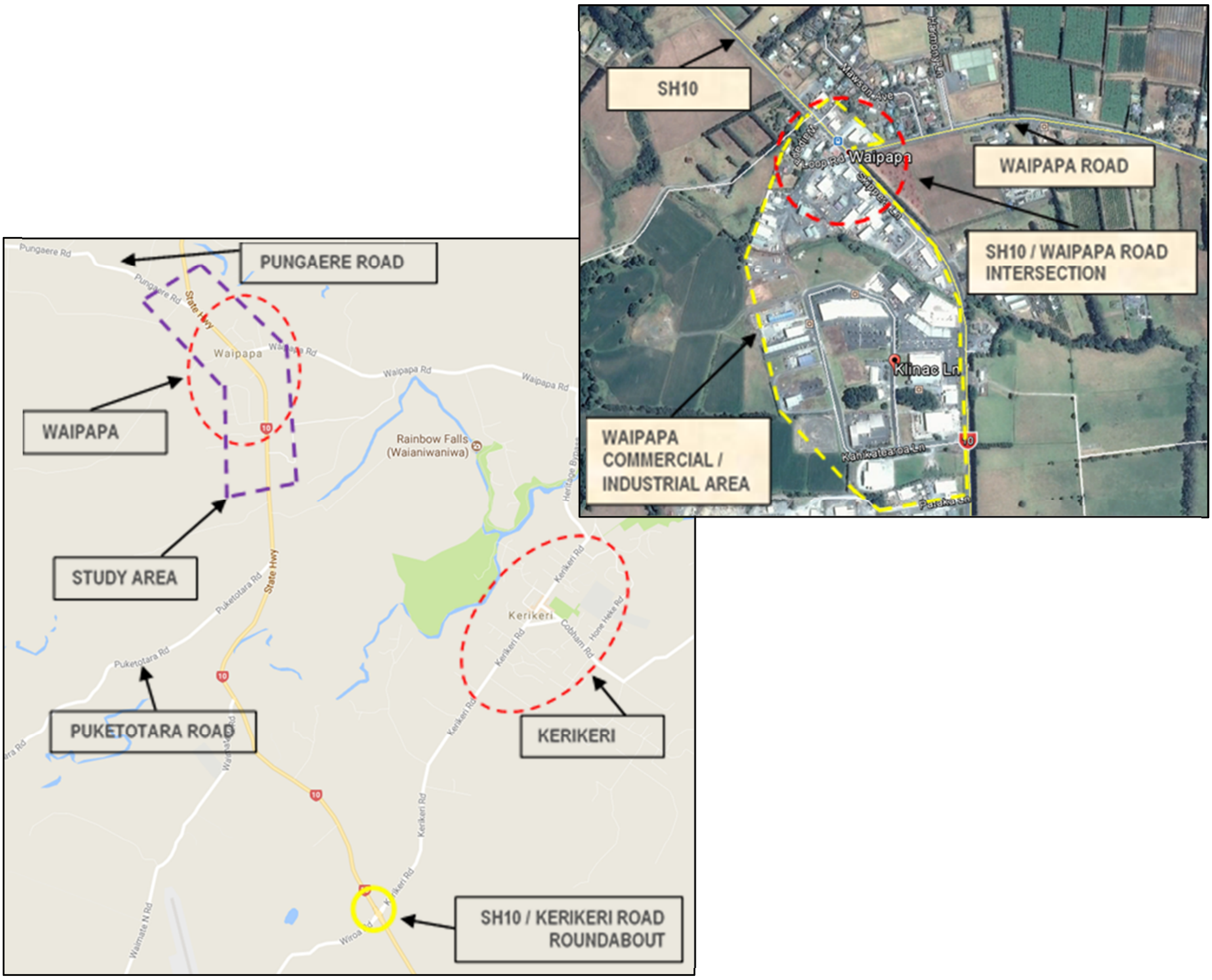


Figure 1: Study Area, showing Waipapa and Kerikeri area geographic proximity

2.1 Users

In addition to proving local connections, SH10 is classified as a ‘Primary Collector’ classification of road and plays an important role in connecting significant areas of forestry and tourism destinations with SH1.

The section of SH10 in the study area is also important for local trips carrying a mix of traffic including:

- Freight – both through traffic and servicing Waipapa
- Tourism – through traffic and the Twin Coast Discovery Highway (Waipapa Road and north on SH10)
- Local – particularly between Kerikeri and Waipapa commercial area (via Waipapa Road and Kahikatearoa Lane).

The Waipapa commercial area is a significant area of employment. Many of the people who work in this area travel by car as there is limited public transport and a lack of walking and cycling infrastructure. The following table provides an indication of a higher proportion of travel to work by car in the Far North District compared to Northland in general and to New Zealand as a whole.

Table 2: Transport to work

AREA	TRANSPORT TO WORK – PRIVATE OR COMPANY CAR* (%)
Far North District	82.5
Northland	73
New Zealand	70

**Car includes trucks and vans.*

2.2 Local Road Environment and Features

SH10 runs from south to north, before turning to the north-west through a moderate left-hand bend prior to the intersection with Waipapa Road and Waipapa Loop Road. The intersection is a priority crossroads, with both minor road approaches on a skew angle to the main highway. Both minor roads are stop controlled, single lane approaches.

Within the study area, heading north on the State Highway, the posted speed limit is 100km/hr with a shelter belt on the west side of the road and commercial/industrial properties on the east. After 500m, the speed limit drops to 70km/hr, just prior to the intersection with Pataka Lane. This is a relatively small priority controlled intersection providing access to several commercial and light industrial properties. 100m north of this is the larger intersection with Kahikatearoa Lane. This is the only road into the main commercial centre. There is a left turn slip lane and a right turn bay on the State Highway and the side road is give way controlled with a two-lane approach and traffic islands.

North of Kahikatearoa Lane, there are some commercial properties on both sides of the road, with access directly from the State Highway. Immediately after the left-hand bend there is access to Skippers Lane, which runs parallel to the State highway for approximately 250m, separated by a grass verge, providing access and parking for the adjacent shops and businesses.

Skippers Lane exits onto Waipapa Loop Road at the southwest corner of the main intersection of SH10/Waipapa Road/Waipapa Loop Road (referred to as SH10/Waipapa Road intersection from here on). This is a priority controlled crossroads junction, with the side roads meeting the State Highway at a skewed angle. There is a dairy shop on the north-west corner and a service station on the north-east corner. On the south-east corner, currently is a vacant land with a shelter belt of trees.

Immediately north of the intersection is a narrow painted median treatment, approximately 200m long. There are various shops and food outlets on the east side and the northern end of Waipapa Loop Road intersects with the State Highway 100m north of the cross roads. Waipapa Loop Road provides access to commercial and light industrial properties, an electrical substation, dairy farm and the community hall. This will also provide the connection to the Klinac Lane extension, which will become an alternative route to the main commercial centre. *FNDC remains committed to developing the extension of Klinac Lane northwards to link with Waipapa Loop Road. FNDC and NZTA agree that this local road work would need to be integrated with the main State Highway intersection upgrade (in whatever form agreed), as extension of Klinac Lane on its own would likely make matters even worse.*

The northernmost 400m of the study area to Pungaere Rd is rural on both sides of the road and the speed limit increases to 100km/hr approximately 200m prior to the Pungaere Rd intersection.

The key connecting roads can be seen in Figure 2 below:

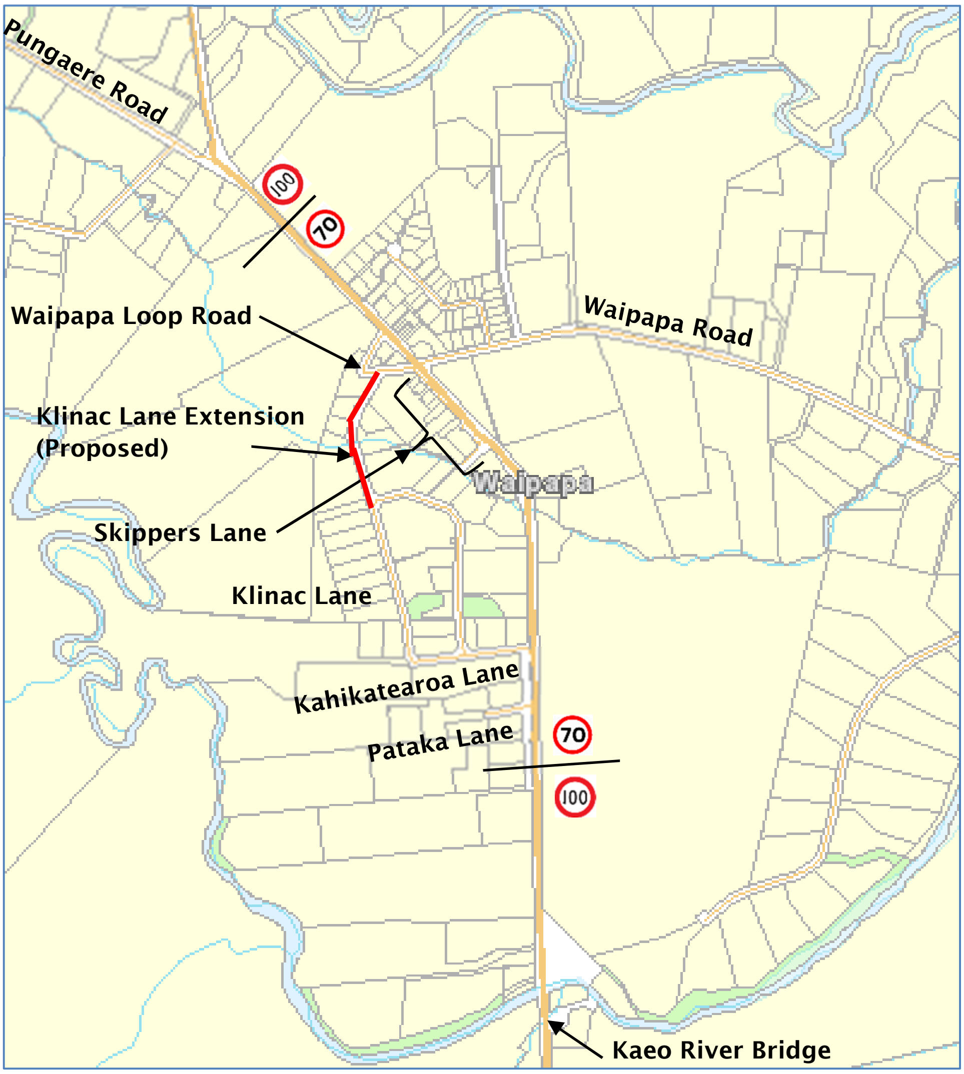


Figure 2: Waipapa Road Network

2.3 Surrounding Land Use

The following extract from the Far North District Plan shows the zoning in the study area which features a mix of residential, commercial and recreational and rural production zone.

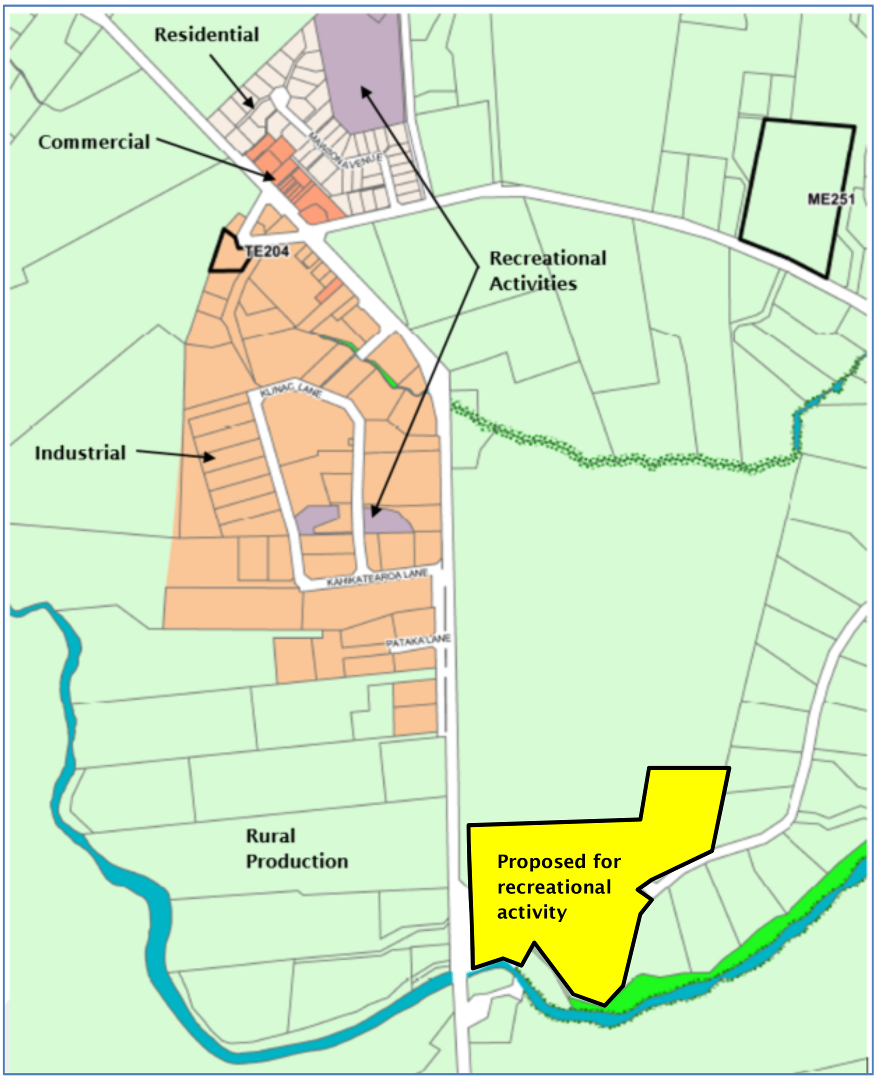


Figure 3: Zoning from FNDC District Plan

It should be noted, that the industrial zoned land is a mix of commercial and industrial, and that industrial developments have been permitted in the rural production zones.

The large parcel of land to the east of the State Highway is currently being considered as a location for a sports complex with access provided via SH10 and Waitotaria Drive.

2.4 Traffic and Other Growth

Waipapa has been highlighted for strong future growth and development, with the Kerikeri Waipapa Structure Plan (2007) being the guiding document. The structure plan includes household and population predictions between 2001 and 2026, which indicates that the population is predicted to more than double over this timeframe. This predicted population growth will increase the demand for residential dwellings in the surrounding area. It will also increase the demand for land for commercial, industrial and retail development in the area with significant focus on Waipapa.

Historic traffic growth on SH1 over the last 10 years has been approximately 2% per year based on the NZ Transport Agency's traffic count station at Springbank Road, located 4km south of the site. The count station at Takou Bay Road, located 8km north of the study area, shows a higher historic growth of 3% based on the last 28 years of traffic counts. It should be noted that both of these count stations are located outside of the study area and likely to predominantly measure State Highway through traffic. Both Kerikeri and Waipapa have important local function with local traffic travelling between these two centres. Any increase in this local traffic may not be captured in these count locations. Hence, the historic growth stated above may be lower than reality but still provide some indication of the traffic growth in the area.

A review of the traffic count data in the FNDC RAMM database indicates that the annual growth on Waipapa Road is over 5% since 2010. With both Waipapa and Kerikeri being identified for future growth, traffic volumes are expected to continue to grow.

3. GOVERNANCE AND ENGAGEMENT

3.1 Project Governance

The project responsibility will lie with the NZ Transport Agency, in partnership with the Far North District Council. Both these organisations have concerns about the current transport infrastructure and the need for further investment. Figure 4 shows the NZ Transport Agency's Project Governance structure which aims to deliver the Waipapa Business Case as per the national business case approach.

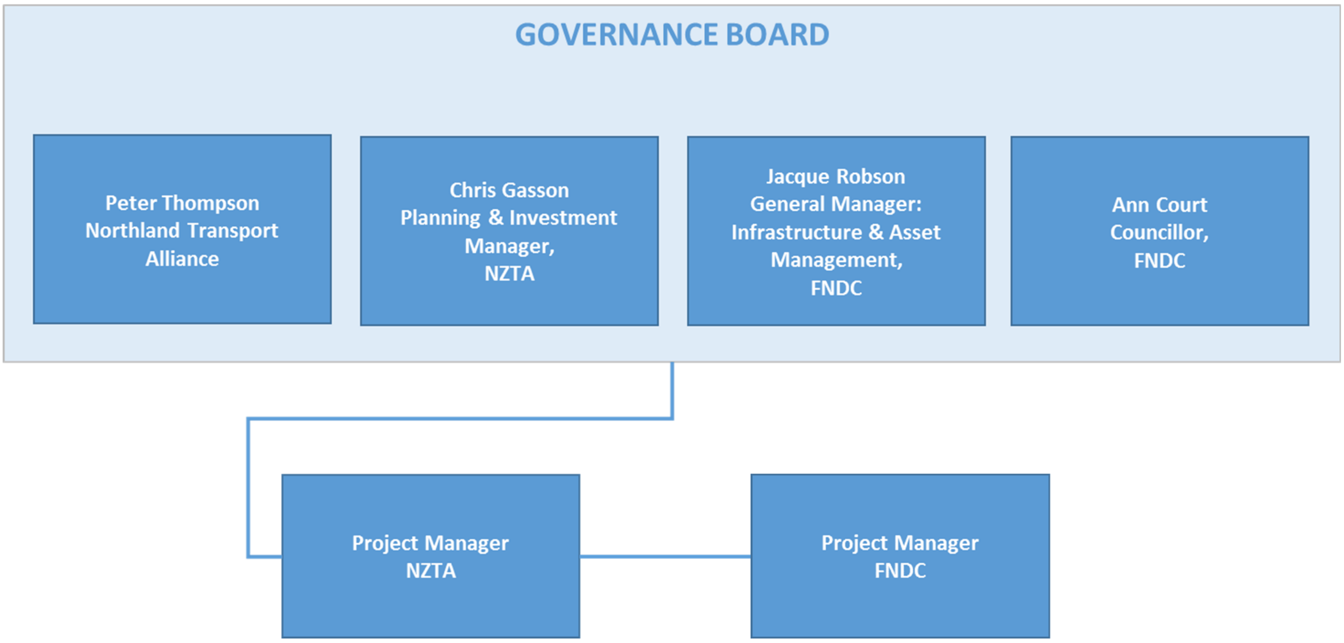


Figure 4: Project Governance Structure – Business Case

3.2 Engagement Approach

As part of the Strategic Case activities of the previous study phase, Investment Logic Mapping (ILM) workshops were organised by the NZ Transport Agency. Engagement was undertaken with the Far North District Council and the Waipapa Business Association to ensure the breadth of issues were well understood. The ILM diagram is included with the Strategic Case appended. It was then always expected that the subsequent Business Case stage would expand to a wider group of interested parties, which has duly occurred.

This stage of the business case was guided by the NZ Transport Agency State Highway Public Engagement Guidelines (then Draft, and which have since been finalised). Engagement partners were identified and grouped, and assigned appropriate levels of engagement, as follows:

- **Project Partners** – 'collaborate' and 'involve'
- **Stakeholders** – 'consult' and 'involve'
- **Community** – 'inform' and 'consult'

The engagement partners and knowledge areas are set out in Tables 3 and 4 respectively.

Table 3: Project Partners

PROJECT PARTNER	KNOWLEDGE AREAS
NZ Transport Agency (HNO + P&I) **(Project Manager)**	State Highway 10: traffic operation, safety, investment and planning.
Far North District Council	Local growth plans, community concerns, operation of the local roads, local travel demand and customer feedback concerns; also aware of State Highway influences.

Table 4: Project Stakeholders

PROJECT STAKEHOLDERS	KNOWLEDGE AREAS
Waipapa Business Association.	Local business needs / concerns.
Iwi	Cultural significance and ecologically important sites in the area.
Northland Regional Council	Flood management, Environment.
Ministry of Education	Future plans for schooling needs in Waipapa.
Ministry of Business, Innovation and Employment	Regional Economic Action Plan
Northland Inc	Regional Economic Development Agency encompassing the Regional Tourism Organisation (RTO)

3.3 Engagement Principles

A Communications Plan was developed by the NZ Transport Agency as part of the Detailed Business Case approach, attached as **Appendix B**.

The Communications Plan summarises the history of the SH10/Waipapa Road intersection, identifies the purpose and goals for the SBC engagement and specifies the level of influence that stakeholder and public participation would have on the SBC.

The consultation and communications approach in the Communications Plan was designed to deliver the following engagement objectives for both FNDC and the NZ Transport Agency:

- Gain stakeholder support by communicating the preferred option for improving the intersection to key stakeholders, iwi and road users;
- Inform affected parties and communities in order to achieve understanding of the proposed works and their effects;
- Minimise the number of public queries by being proactive in our approach and concise in our publications;
- Gather knowledge from the community and understand others viewpoints; and
- Fulfil the requirements of the Resource Management Act 1991, Land Transport Management Act 2003 and Local Government Act 2002.

To achieve these objectives, a structured sequence of events was implemented to ensure that key stakeholders were consulted on changes, landowners were informed of the preferred option before it became public knowledge and enabling the community to participate in consultation in an accessible manner.

The following provides further information on the delivery of the Communications Plan.

3.4 Key Stakeholders Involved

In partnership with FNDC, the NZ Transport Agency directly engaged with the Ministry of Education, the Local Business Association, the Bay of Islands-Whangaroa Community Board, Iwi and members of the Northland Transport Alliance; discussing the strategic case to improve the intersection. Recognising the need to narrow the focus of the transport needs of the community in relation to the SH10/Waipapa Road intersection, a Waipapa Project Steering Group was set up consisting of representatives from NZTA, Northland Transport Alliance, FNDC's infrastructure and assets group, and local community board member, Ann Court.

The Ministry of Education (MoE) administers a number of established educational facilities in the area that utilise the intersection. Through early engagement with MoE, it was identified that development of a vacant lot along Waipapa Road is planned. An improvement to the intersection would not only be beneficial for an education facility at this site in particular; but also for the other education centres around the township. MoE did not raise any concerns as part of this initial consultation.

The Local Business Association have been lobbying for a number of years for improvement to be made to the SH10 Waipapa Road intersection, so they were broadly very supportive. Their only concern was that improvements being investigated might not continue through to realisation.

The Bay of Islands (BOI)-Whangaroa Community Board were presented with the preferred option on 22 May 2017 at a closed meeting. Numerous questions were asked by the Board at the time of the meeting and these questions were answered satisfactorily by the Project team members. The Board had similar sentiment as the Local Business Association, in that it would be a disappointment for the community if the options for improvement did not continue to the next stages.

Waipapa is within the rohe of Ngâpuhi iwi with Ngâti Rêhia holding mana whenua of this area. Sebastian Reed, Keith Kent and Rewi Spraggon (NZTA Maori Liaison Co-ordinator) met with kuia Nora Tawhi Rameka to inform them of the progress with the business case, discuss project development and approach to delivering this information back to mana whenua. Neither Iwi nor the hâpu raised any particular concerns with the decision to proceed with an engineering solution to the traffic issues at the intersection. However, it is their aspiration to be involved in the planning and construction phases, particularly to manage any accidental discoveries of heritage or waahi tapu or taonga artefacts. A cultural value assessment has been requested by NZTA.

3.5 Public Participation

The NZ Transport Agency in partnership with the FNDC held a Public Open Day on 1 June 2017 at the local Waipapa Community Hall. Over 100 people came along to the Open Day, and gave the NZ Transport Agency and FNDC valuable feedback. It was confirmed that there is a high level of community support for a roundabout at this intersection, and also support for the extension of Klinac Lane; both helping to provide a simpler, safer and more effective connection between the eastern and western extents of the town.

4. PROBLEMS AND EVIDENCE

A facilitated workshop was held in November 2015 with key stakeholders from the NZ Transport Agency and FNDC exploring the issues being experienced in Waipapa during the Strategic business case stage. The stakeholder group developed and agreed on three problem statements.

The Detailed Business Case team revisited these at another workshop in November 2016. This involved a group of representatives from FNDC, NZTA and Opus. A 'Constraints & Opportunities' drawing was developed to capture a number of the main issues raised, which is presented in **Appendix C** of this report.

4.1 The Problems

The revisited problem statements below better reflect the issues faced within the SH10 study area.

Problem one: *Lack of long term integrated planning and robust zoning controls has resulted in sub-optimal land use patterns and a deficient transport system (10%)*

Problem two: *Disjointed and insufficient transport infrastructure is a major barrier to safe, efficient and reliable multi-modal passage, including visitor journeys, and realising community outcomes in Waipapa (45%)*

Problem three: *Land use development pressure and network changes have significantly altered vehicle mix and journey patterns on the State Highway and adjoining local roads. This has led to increased pressure at key points on the network and changes to crash patterns (45%)*

A broader overview of each of these problem statements is presented below.

PROBLEM ONE: LACK OF LONG TERM INTEGRATED PLANNING AND ROBUST ZONING CONTROLS HAS RESULTED IN SUB-OPTIMAL LAND USE PATTERNS AND A DEFICIENT TRANSPORT SYSTEM (10%)

This problem has arisen due to the permissive nature of planning controls in the FNDC District Plan, which provides little differentiation between zones, and as such growth and development have occurred in an ad hoc manner. Development occurring in such a way can make it difficult (and sometimes expensive) for infrastructure to be effectively planned and delivered. This is especially true in Waipapa where light industrial and commercial development has spread into the *Rural Production* zone.

Without strategic direction, development has tended to occur by piecemeal, with each site seeking access directly from SH10, undermining the safety and efficiency of the major road corridor, including through a proliferation of conflict points.

Waipapa has had available land for development and, along with Kerikeri, has seen significant growth in population and employment in recent years. Development without sufficient planning controls and direction has largely followed market forces, and this has resulted in the situation of different and sometimes incompatible land uses adjoining each other. Although a key concern for both the FNDC and NZ Transport Agency, it is not within the scope of improvements recommended in this business case to try to address these planning problems. It is understood that this is a separate matter and should continue to receive attention in parallel in terms of Council-led improvements.

FNDC is undertaking a consolidated review of its District Plan. The process is tracking towards producing a draft review document for public feedback by the end of June 2018. The appropriateness of zoning land in Waipapa to accommodate some or all of the industrial and commercial demand will be tested through the District Plan review process. Council has endorsed a hybrid approach to the style of future District Plans, enabling an 'activities approach' to the control of land use. This is a move away from the more permissive effects-based District Plan currently in place. This change is expected to lead to better coordinated associations between land use and zoning.

Problem 2: Disjointed and insufficient transport infrastructure is a major barrier to safe, efficient and reliable multi-modal passage, including visitor journeys, and realising community outcomes in Waipapa (45%).

The problem identifies that the existing transport network is deficient. The intersection is already at capacity with ineffective local road access, which means that any additional traffic will result in further delays, queues and safety problems. There are a number of issues which contribute to this:

- Lack of facilities for turning traffic, so vehicles slowing or stopping to turn impede the through-traffic; this results in unnecessary delay to the traffic that is travelling straight-on through the intersection.
- The layout of the intersection confuses motorists on Waipapa Road and Waipapa Loop Road creating uncertainly regarding priority, resulting in additional delay and risk;
- The speed of vehicles makes it more difficult to find appropriate gaps in the traffic. This reduces the capacity of the intersection as motorists are unsure whether or not it is safe to make their turning manoeuvre.
- The number of other traffic movements around the intersection – into the shops, service station, parking manoeuvres, etc. This adds confusion and motorists wait for bigger gaps in the traffic before making their turning manoeuvre, reducing the capacity of the intersection.
- Skippers lane access from Waipapa Loop Road does not meet intersection separation requirements (NZTA, FNDC and Austroads).

Problem 3: Land use development pressure and network changes have significantly altered vehicle mix and journey patterns on the State Highway and adjoining local roads. This has led to increased pressure at key points on the network and changes to crash patterns (45%)

In 2009 the FNDC opened the Kerikeri Heritage Bypass as a local road link, which significantly shortened (time and distance) the road connection between Kerikeri and Waipapa and resulted in this becoming the preferred route from Kerikeri for trips to the north. In addition to this new roading link; in recent years, new sports fields and residential developments on the eastern side of Kerikeri, and additional light industrial developments along Waipapa Road have also sprung up. As a result of the associated and general traffic growth, delays and congestion at the Waipapa Road and SH10 intersection have notably increased.

Traffic travelling to the commercial centre of Waipapa from Kerikeri not only needs to navigate the difficult Waipapa Road intersection, but also turn right into Kaihikatearoa Lane. This movement has resulted in three injury crashes in the past five years.

High operating speeds on SH10 also pose a safety risk and act as a deterrent to active travel modes that the NZ Transport Agency would like to encourage.

Table 5: Comparison of journeys between Waipapa and Kerikeri

CONNECTION BETWEEN WAIPAPA AND KERIKERI	TIME	DISTANCE	WALKING AND CYCLING FACILITIES
via Waipapa Road + Heritage Bypass	7min	5.6km	Yes
via SH10 + Kerikeri Road	10min	9.3km	No

The Problem Statements drafted at the earlier stage (Strategic Case) were then refined to better capture the situation, including a change in their percentage weighting.

Table 6: Refined Problem Statements

STRATEGIC BUSINESS CASE	DETAILED BUSINESS CASE	COMMENT/JUSTIFICATION
Lack of long term integrated planning and robust zoning controls has resulted in suboptimal land use patterns and a deficient transport system (20%)	**Lack of long term integrated planning and robust zoning controls has resulted in sub-optimal land use patterns and a deficient transport system (20%)**	*No change in wording. Weighting amended for relevance to the SH10 corridor*
Disjointed and outdated Waipapa corridor transport infrastructure is a major barrier to safe and efficient multi-modal passage and realising community outcomes (45%)	**Disjointed and insufficient transport infrastructure is a major barrier to safe, efficient and reliable multi-modal passage, including visitor journeys, and realising community outcomes in Waipapa (45%)**	*Minor changes to capture tourist trips*
Landuse and network changes have significantly altered vehicle mix, journey patterns and crash profile on the State Highway and adjoining intersections (35%)	**Land use development pressure and network changes have significantly altered vehicle mix and journey patterns on the State Highway and adjoining local roads. This has led to increased pressure at key points on the network and changes to crash patterns (35%)**	*Recognising recent growth within Waipapa*

4.2 Status of Evidence Base

This section sets out the status of the evidence that supports the identification and assessment of the key problems and potential benefits, and identifies any gaps in the evidence base as may be required to further support the investment story. In line with the problems and potential benefits defined above, the evidence base primarily covers:

- SH10 / Waipapa Road / Waipapa Loop Road Intersection Modelling
- Travel behaviour / Journey patterns
- Local growth
- Land use
- Safety record
- Vehicle Speed through the Waipapa Township

4.2.1 SH10 / Waipapa Road / Waipapa Loop Road Intersection Modelling

KEY ISSUE	PROBLEM ALIGNMENT		
	Problem 1	**Problem 2**	**Problem 3**
Site observations and traffic modelling at the SH10 / Waipapa Road indicate that the intersection has capacity constraints for local traffic entering onto the SH10 corridor, especially of concern in the PM Peak period. Average delay in the intersection is nearly 60 seconds in the PM peak period. Right turning traffic from Waipapa Road has been recorded to reach delays over 300 seconds in some situations. These delays are considered unacceptable for both local traffic and for State Highway through traffic as they do not meet the NZ Transport Agency Level of Service requirements.		●	

The SH10 / Waipapa Road intersection (shown in Figure 5) is the main intersection in Waipapa and provides a vital connection between Waipapa and Kerikeri. The existing intersection has two key problems that contribute strongly to the delays:

- Insufficient lane width on SH10 south approach prevents SH10 northbound through traffic to pass a slow moving or stationary vehicle waiting for a gap in the traffic to turn right from SH10 into Waipapa Road.
- Steady SH10 through movement from both the southern and northern approaches, limits gaps in the traffic stream thereby causing delays to right turns from both Waipapa Road and Waipapa Loop Road into SH10. It is reported that risky manoeuvres often eventuate.

Figure 5: SH10 / Waipapa Road / Waipapa Loop Road Intersection (Source: Far North Maps)

The diagram in Figure 6 shows average delay for right turn and straight-ahead movements from Waipapa Road to be nearly 5 minutes for the PM peak (16:00-17:00). The figure also shows that right turn and straight-ahead movements from Waipapa Loop Road face delays of approximately 25 seconds. The delays on this approach are less because there are fewer vehicles using this approach in comparison with the Waipapa Road approach. Long delays result in lower levels of services (LOS) as shown in the figure below.

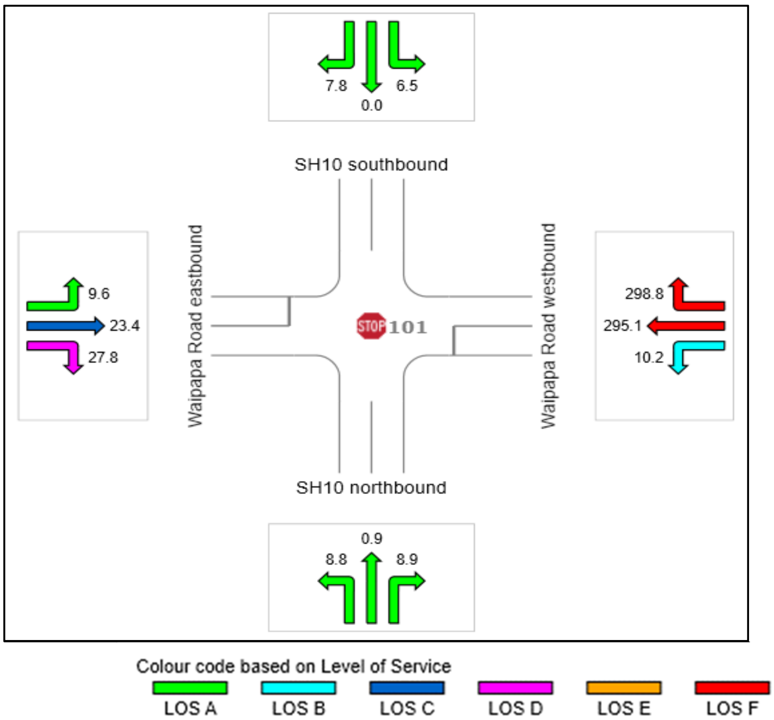


Figure 6: Average delays (seconds), Sidra modelling results for the SH10/Waipapa Road intersection (2016, 60 min peak period 16:00-17:00)

Figure 7 shows the posted and operating speeds on SH10 through Waipapa Township. Both southbound and northbound traffic speeds are higher than the posted speed limit with the exception of the SH10 stretch around the Waipapa Road. This reduction in speed limit observed is once again evidence that the turning traffic impedes proper through-traffic movement on SH10.

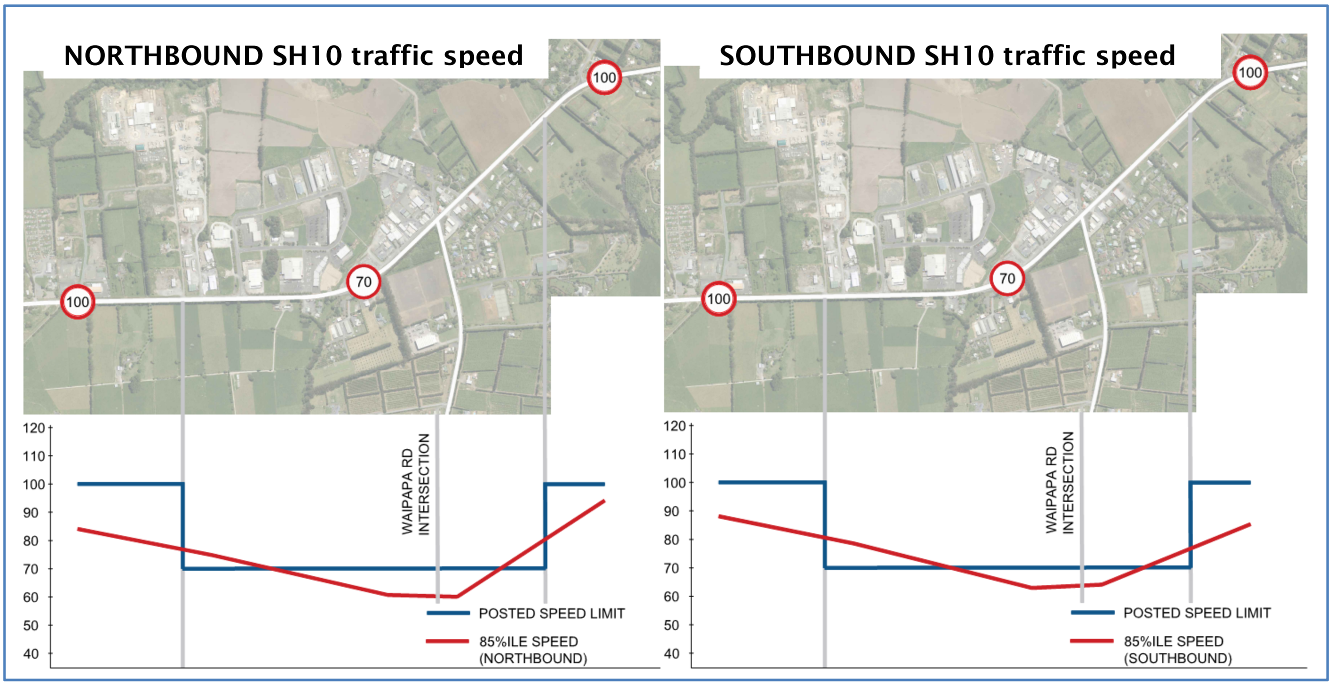


Figure 7: Recorded speed on SH10 Waipapa – Posted vs Operating (Km/hr) (Northbound and Southbound)

The project team recognises that a reduction in speed through the Waipapa Town centre has benefits for vulnerable road users and for creating a cohesive town centre.

There is an opportunity to purposely reduce the speed of operation by designed traffic engineering solutions, to alleviate the current situation where the speed reduction is happening as a result of caution around a suite of problems, including vehicle conflicts between local turning traffic and through traffic.

4.2.2 Travel Behaviour/Journey Patterns

Key Issue	Problem Alignment		
Blip track surveys clearly show that drivers change their travel behaviour in the busy PM peak period. The likely explanations for this change in travel behaviour include that drivers avoid being delayed when trying to turn right out from Waipapa Road, by instead diverting via Kerikeri Road.	**Problem 1**	**Problem 2**	**Problem 3** ●

Vehicles currently travelling from Kerikeri to north of the SH10/Waipapa Road intersection have two routes to choose from as illustrated in Figure 8. The northern route via Waipapa Road (shown in red) is approximately 5.5km long and the southern route via Kerikeri Road (shown in green) is approximately 9.5km long.

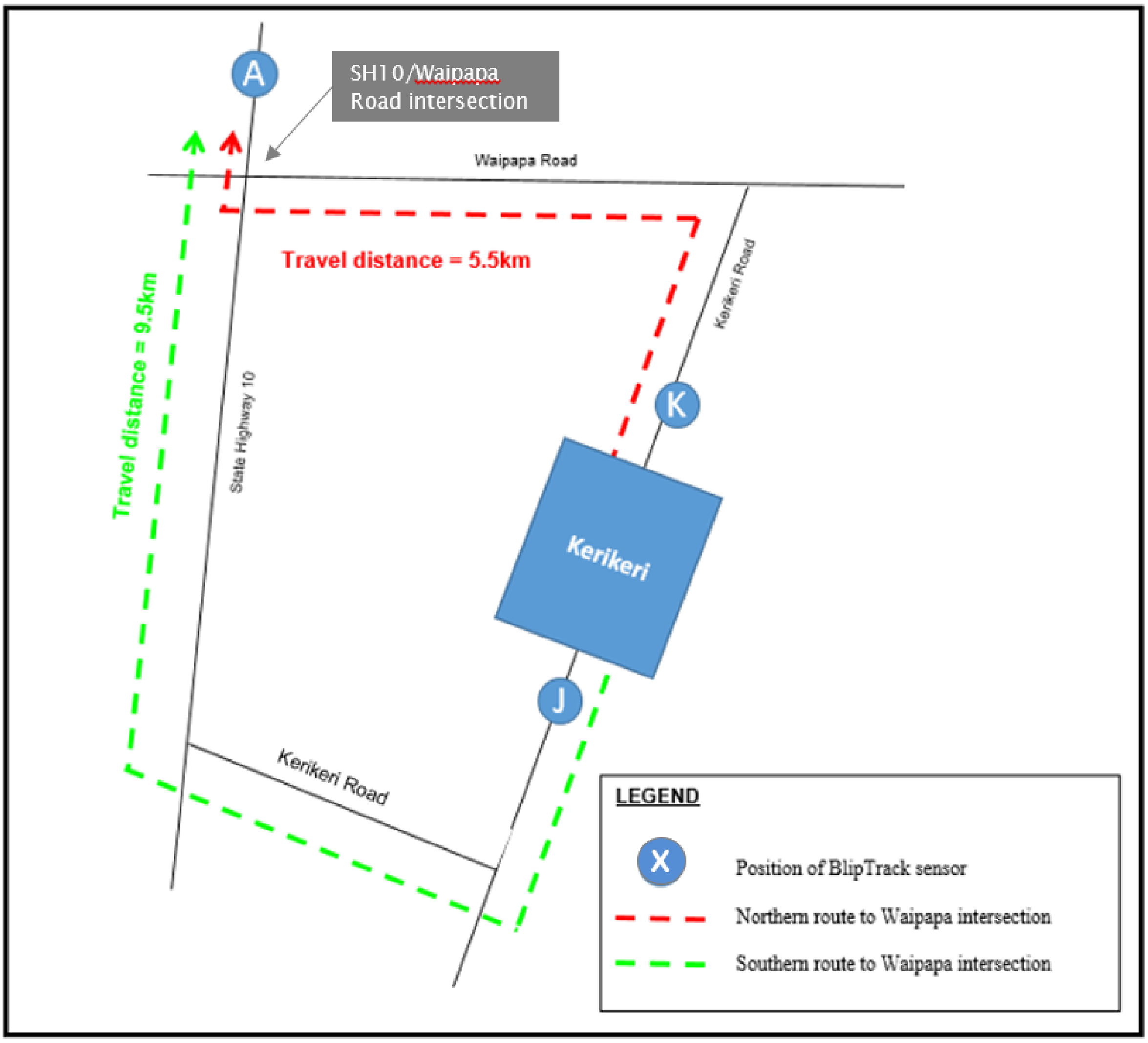


Figure 8: Journey choice from Kerikeri to North of SH10/Waipapa Road Intersection

Blip track survey was used to locate the origin-destination of vehicles and to record travel time for vehicles using the two routes. The travel distances and travel times in the PM peak hour for each of the routes is given in Table 7. This shows that even though the southern route has almost double the length of travel distance, the travel time is only 1.5minutes longer in the weekday PM peak.

Table 7: Travel distances and speeds

DESCRIPTION	TRAVEL DISTANCE (KILOMETRES)	TRAVEL TIME - PM PEAK (MINUTES)
Northern route (K to A)	5.5km	06:00
Southern route (J to A)	9.5km	07:28

The blip survey was also used to analyse travel behaviour and driver choice of route at different time periods. Figure 9 provides a comparison between journey choice in the AM and PM peak periods. It shows fewer trips being made between Kerikeri and Waipapa (southern route) in the weekday morning peak compared to weekday evening peak. A likely explanation for this change in behaviour is that drivers avoid Waipapa Road in the PM peak when the delays at the SH10/Waipapa Road intersection are expected to be longer.

This is a telling behaviour that the drivers choose a longer, and overall slower route to avoid the frustration of queues, and potentially unsafe situations, at the Waipapa intersection.

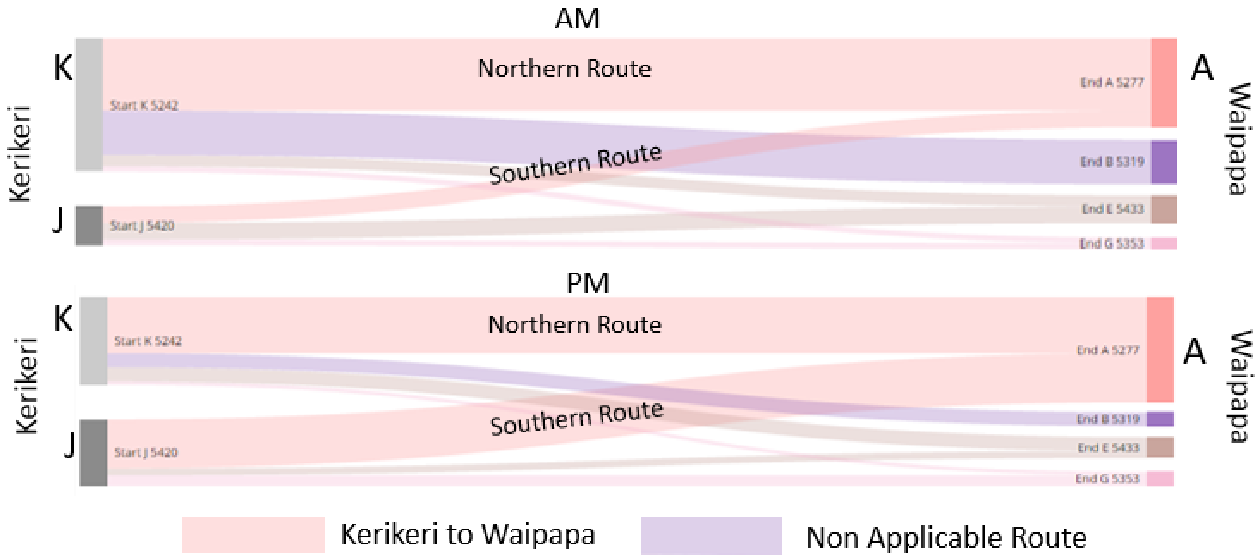


Figure 9: Journey choice weekday AM and PM peak

This change in travel behaviour supports the Problem 3 statement in that some people markedly change their journey behaviour because of pressure points in the network. Improvements to the SH10/Waipapa Road Intersection will release a dominant pressure point in this part of the road network.

4.2.3 SH10 and Local Traffic Growth

Key Issue	Problem Alignment		
The Kerikeri-Waipapa area is the fastest growing area in the Far North District in relation to population and associated commercial and industrial developments. Tourism activities in the north have also increased greatly over the last decade. The population and other development growth is directly related to traffic growth. With the existing SH10/Waipapa Road intersection already being at capacity, any increase in traffic driving through this intersection will exacerbate the existing intersection problem.	**Problem 1** ●	**Problem 2** ●	**Problem 3** ●

As per the evidence in the preceding discussion, SH10/Waipapa Road intersection is already at capacity, causing long delays for side road traffic turning into SH10. Further traffic growth on SH10 and/or the two side roads will worsen the intersection delays if no significant improvements are made.

Figure 10 and Figure 11 below show the traffic growth at the two NZ Transport Agency SH10 count stations located 8km north and 4 km south of the study area respectively.

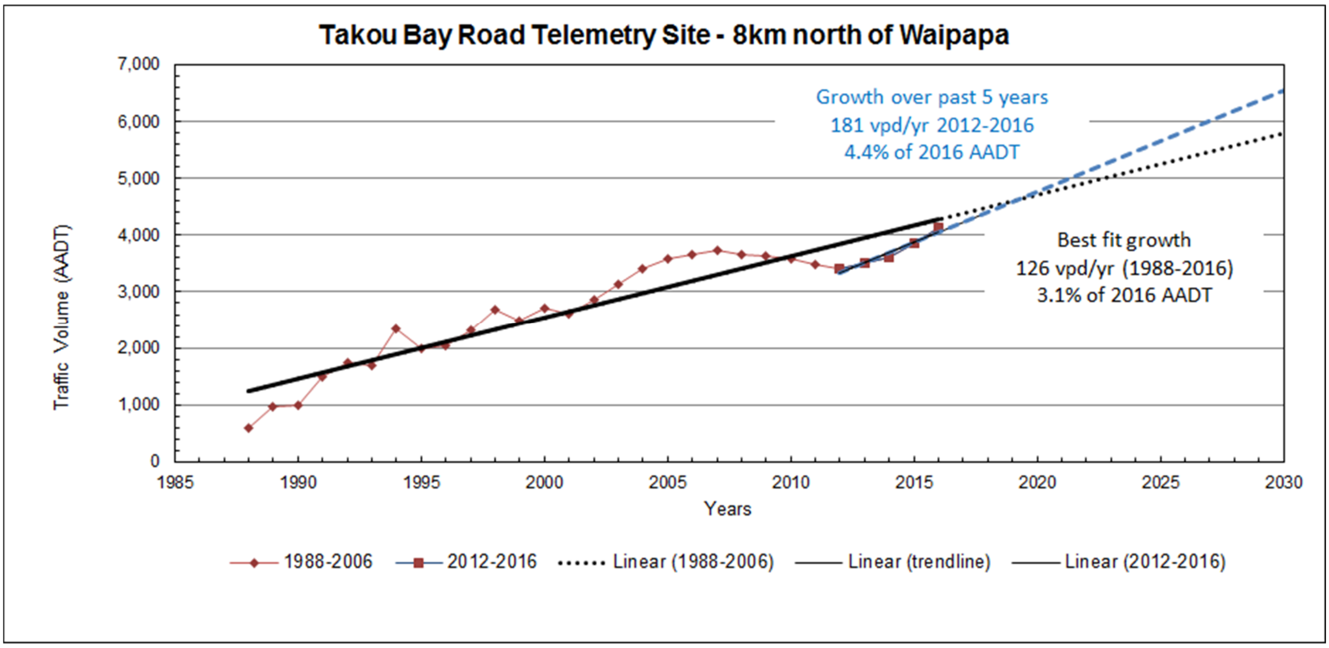


Figure 10: Recorded AADT and Trendlines for SH10 Telemetry Site at Takou Bay Road

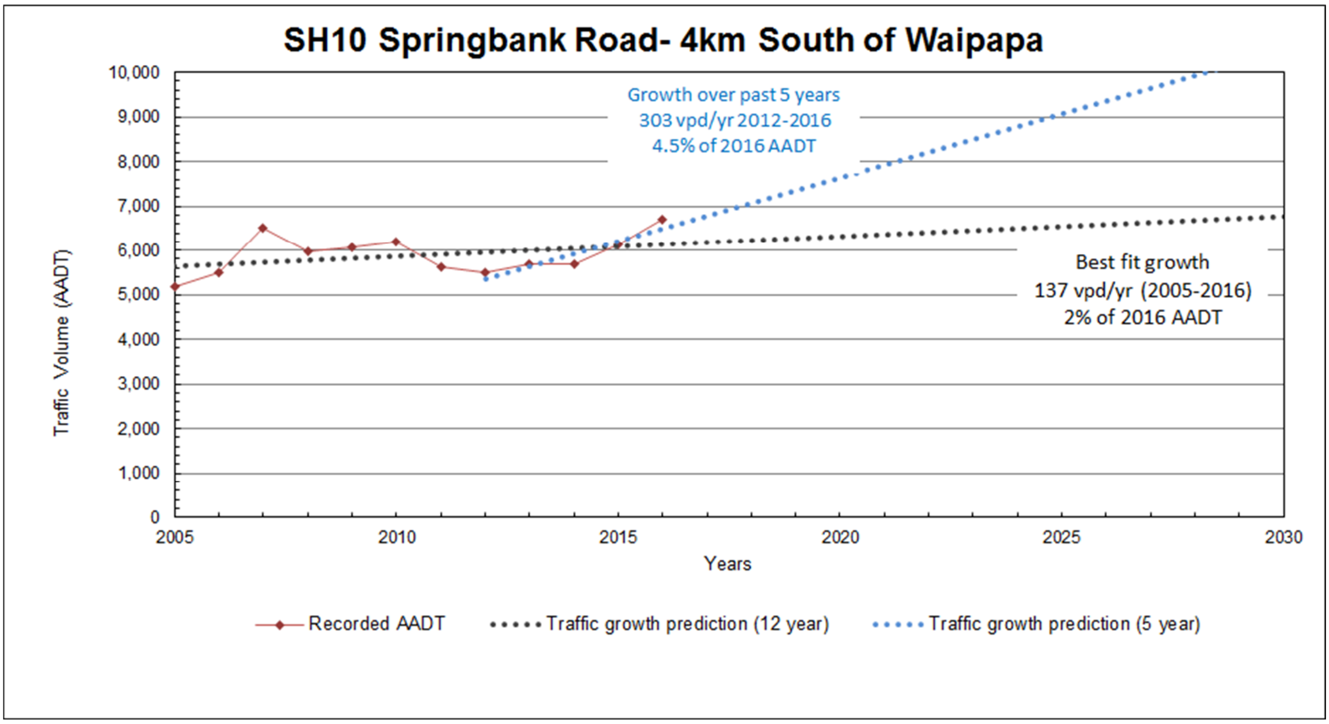


Figure 11: Recorded AADT and Trendlines for SH10 Count Site at Springbank Road

As shown in Figure 10, growth at the Takou Bay Road Telemetry sites indicates a historic growth of 3.1% over the last 28 years and 4.4% growth over the last 5 years. Figure 11 indicates higher growth scenario at the southern telemetry site on Springbank road in comparison with a historic growth of 2% over the last 10 years and a 4.5% growth over the last 5 years.

Taking the most conservative approach between the two sites (long term best fit growth scenario for Springbank Road), traffic would continue to grow with around 130 vpd per year for the foreseeable future. Even in this scenario, given that the intersection is already at capacity, any additional vehicles through the existing will increase the delays and exacerbate the issues at the existing intersection.

However, it is justifiably the more likely scenario that the marked increase in investment in Northland seen in recent years will run for many more years, driven in no small part by the Tai Tokerau Economic Action Plan, and sustained growth will continue to push traffic growth on a sustained steeper trajectory. The increasing demands of Northland freight and tourism, as well as those arising from the Kerikeri-Waipapa area being a recognised as a Northland growth ‘hotspot’, will more seriously expose the shortcomings of the SH10/Waipapa intersection if major improvements are not put into effect in the near future.

4.2.4 Land Use Population Growth

Key Issue	Problem Alignment		
	Problem 1	**Problem 2**	**Problem 3**
Waipapa is a key industrial and commercial hub within the Far North District. Currently approximately 75% of this area is occupied. The structure plan identifies the Waipapa area to intensify industrial, commercial and retail land uses. At present, intensifying this area is restricted because of the poor internal road network within the industrial zoned area and the reliance on access on and off SH10.	●		●

The Waipapa Kerikeri Structure Plan prediction is that both population and the number of households will double between 2001 and 2026 within the Waipapa Kerikeri area. The population growth according to census data shows growth tracking towards this prediction with significant population growth in the last two census periods (2006 and 2013, Statistics New Zealand). This growth in population increases the pressure for residential development but also supporting commercial, industrial and retail developments, all of which generates traffic.

As shown in Figure 12, there are five district landuse zones in Waipapa:

- Commercial
- Industrial
- Residential
- Recreational
- Rural Production

The industrial zone is the largest, and is located on the west side of SH10. This industrial zone includes a mix of traditional heavy industrial activities at the southern extent, large retail stores at the centre, and mixed industrial and retail activities at the northern extent of the study area.

Based on the large car parking space provided, this retail area in the centre of the industrial area is the largest trip generator, and access is provided via Kahikatearoa Lane and Klinac Lane.

The northern part of the industrial zone is a mix of industrial and retail, with access provided via Waipapa Loop Road and Skippers Lane.

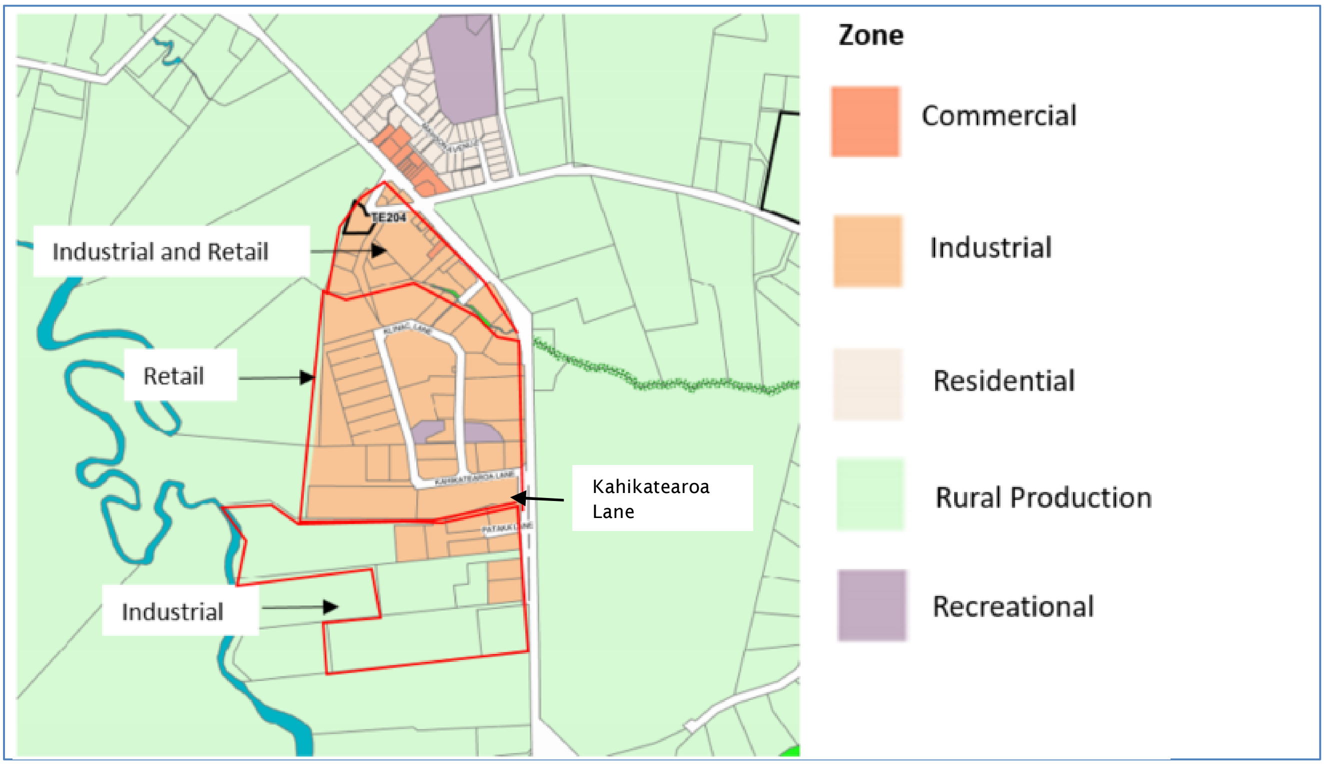


Figure 12: Existing District Landuse Zones (Source: Far North District Plan – Zone Map)

Currently there is no local road link between the three different parts of the industrial area, and any internal trip between any of these parts needs to use SH10. The largest trip generator is the central part of the industrial zone with access provided via Kahikatearoa Lane. There is an opportunity to connect the central and northern part of the Industrial zone with a road which is now referred to as the Klinac Lane Extension.

The Klinac Lane Extension would provide better internal connectivity between the different parts of the industrial zone, and should also reduce pressure at the Kahikatearoa Lane/SH10 Intersection. For example, trips to and from the north into the central part of the Industrial zone will be able to use the Klinac Lane Extension and Waipapa Loop Road to access SH10 instead of using the longer route via Kahikatearoa Lane.

Whilst the Klinac Lane Extension would put more pressure on the SH10/Waipapa Road intersection, if constructed in isolation, FNDC and the NZ Transport Agency have agreed that this new link road should be considered integral to the major intersection upgrade, to achieve a harmonious outcome.

4.2.5 Safety

KEY ISSUE	PROBLEM ALIGNMENT		
Analysis of crash data provided by NZTA's Crash Analysis System (CAS) database indicates that "rear end" and "crossing/turning" crashes are clearly over-represented on SH10 here in comparison with other State Highways, both regionally and nationally.	Problem 1	Problem 2	Problem 3 ●

Since 2006, a total of 59 crashes were recorded on SH10 between the Kerikeri River and 300 metres north of Waipapa Road. Of these crashes, 12 were minor injury crashes, 1 serious crash and 1 fatal crash. The remaining 45 crashes were non-injury or property damage only crashes.

The crash record over the last 5 years (2011-2016) shows a total of 28 crashes. Of these crashes, 7 were recorded as minor injury crashes and 21 non-injury or property damage only crashes, with none serious or fatal.

The crash record indicates that the two main crash types are “rear end/obstruction” crashes and “crossing/turning” crashes. As Table 8, below illustrates these two crash types are over represented when compared to regionally and nationally state highways.

Table 8: Crash record

CRASH TYPE	SH10 WAIPAPA CORRIDOR (%)		ALL NORTHLAND SH (%)	ALL NZ SH (%)
	10 years 2007-2016	5 Years 2011-2016	10 years 2007-2016	5 Years 2011-2016
Rear end / Obstruction	36	50	22	34
Crossing / Turning	39	29	11	13

An over-representation of “rear-end” and “crossing/turning” movement crashes indicates that SH10 at this location has an intersection/access problem. We believe the explanation includes that there are a number of direct property access points off SH10, and that there is a lack of safe/effective right turning facilities at intersections and at property accesses on SH10.

Figure 13 shows the time distribution of the “rear end” and “crossing/turning crashes”.

Apart from 3 crashes, all recorded crashes occurred during the day. Interestingly, 50% of the recorded “rear end” and crossing/turning” crashes occurred between 14:00 and 18:00hrs. There is also a cluster of crashes that occurred between 9:00 and 13:00hrs.

The day time carries the most traffic with highest peak in traffic flows being between 15:00 and 18:00hrs. During these peaks, there are only small gaps in the traffic to undertake turning movements to and from the side roads, which may contribute to the high number of “rear end” and “crossing/turning crashes”.

Any increase in traffic would result in even smaller gaps and can be expected to increase the risk of these crash types.

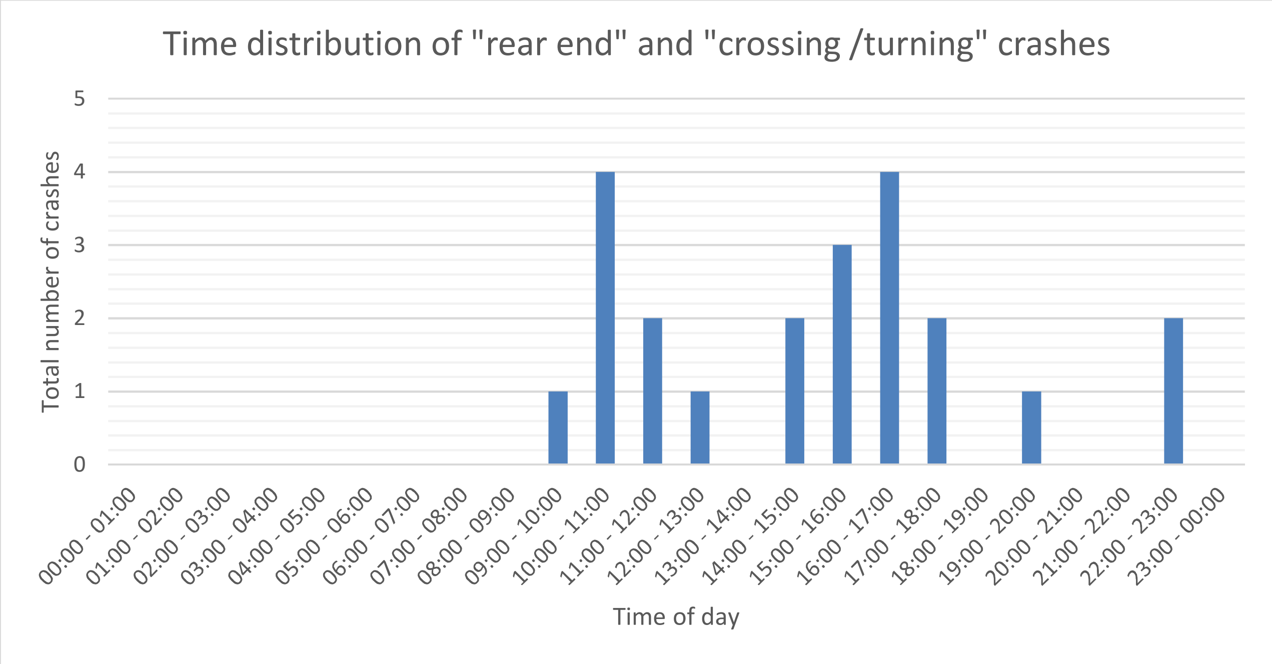


Figure 13: Time distribution of "rear end" and "crossing/turning" crashes

Analysing the data for seasonal variation in crashes, shows that there are no significant seasonal patterns, with both non-injury and injury crashes being randomly distributed over the year.

Skippers Lane acts as service lane on the western side of SH10 that usefully reduces the number of direct property accesses from/to SH10. However, this lane in turn is currently accessed off Waipapa Loop Road, which is awkwardly positioned in very close proximity to the SH10/Waipapa Road. The position of the Waipapa Loop Road and Skippers Lane intersection does not comply with minimum access requirements and adversely influences the safety of the adjacent SH10/Waipapa Road as shown in Figure 14 below*. The corridor and intersection upgrade provides an excellent opportunity to address this safety issue.*

Figure 14: Existing intersection separation deficiencies

4.2.6 Walking/Cycling Facilities

Key Issue	Problem Alignment		
SH10 acts as a barrier to pedestrians and cyclists, with the absence of links to connect the facilities in the Waipapa commercial area with those on Waipapa Road and Kerikeri Road.	**Problem 1**	**Problem 2** ●	**Problem 3**

Although some footpaths are provided in the commercial centre and for short sections in the town centre to the north of Waipapa Road, no facilities are provided to assist in crossing the State Highway, nor are existing facilities connected. Pedestrians currently use the painted median as a ‘hopefully safe’ island when crossing the road. Quite high traffic speed on SH10 is also an impediment to pedestrian movement across SH10.

The FNDC have invested in quality pedestrian and cyclist facilities on Waipapa Road and Kerikeri Road, encouraging active mode trips between Kerikeri and Waipapa (and beyond). However, the footpaths and cycle lanes on Waipapa Road are curtailed approximately 100m before the intersection with SH10, limiting the benefits of these facilities.

This project provides the ideal opportunity to improve pedestrian and cycling opportunities within the study area, and compliment a more coherent overall provision for active modes by the two main agencies responsible, the NZ Transport Agency and FNDC.

A good example would be improved connection across the State Highway linking up existing walking and cycling facilities and an improved walking and cycling connection to the Te Araroa trail that crosses the State Highway at the Kerikeri River bridge (at the south end of the study area).

5. OUTCOMES

5.1 Strategic Context

The followings documents are some of the most important among a number of references that strongly endorse the strategic alignment of NZTA's and FNDC's joint intention to soon implement major road intersection upgrade works at Waipapa.

Table 9: Strategic Alignment

STRATEGIC DOCUMENT OR CONTEXT		PROJECT ALIGNMENT	COMMENTARY
NATIONAL	Government Policy Statement (2015/16-2024/25)	✓	Project outcomes are well aligned to the following objectives identified in the GPS: • A land transport system that addresses current and future demand for access to economic and social opportunities • A land transport system that provides appropriate transport choices • A land transport system that is a safe system, increasingly free of death and serious injury • A land transport system that delivers the right infrastructure and services to the right level at the best cost. It also specifically states: "New Zealand is still in the process of addressing some critical constraints on the network, particularly, but not exclusively, in the upper North Island." – this reinforces the focus on supporting Northland that is referenced in other initiatives supported by government, such as relate to Tourism.
	'Draft' Government Policy Statement 2018/19 – 2027/28 (GPS 2018)	✓	• Whilst this next GPS is Draft, and will not be instituted until next year, importance is placed on factors directly relevant to Waipapa (and Kerikeri): o "needing local economies to thrive" o "support regional freight and tourism" o "high quality resilient connections"
REGIONAL	Tai Tokerau Northland Economic Action Plan	✓	• In February 2015, The Ministers for Economic Development, Primary Industries and Maori Development launched the Northland Growth Study, Opportunities Report, confirming part of the Government's gaze was firmly on the Northland economy. • The underpinning of economic development by associated transport development is recognised, including statements like - "Further investment is required in much needed road enhancements to ensure that the network will be able to cater for forecast growth in freight and visitors and provide for the dual needs of tourism and primary industries for transport and safety."

STRATEGIC DOCUMENT OR CONTEXT		PROJECT ALIGNMENT	COMMENTARY
REGIONAL			• That study led to a targeted plan called the Tai Tokerau Northland Economic Action Plan, which made a headline statement that the first of four “Game Changers” is transport, with the summary comment: “better connectivity with Auckland, within the region and with export markets. Northland is a place-based economy. Roading in particular is critical for Northland to develop and affects virtually every part of the economy” • Another principal goal is “Twin Coast Discovery Route Revitalisation”. The Twin Coast Discovery Highway passes through the Waipapa Intersection which, until it is substantially upgraded, represents an increasingly significant constraint to visitor movements.
	Regional Land Transport Plan (RLTP)	✓	• This Regional plan echoes Central Government’s drivers of economic growth and productivity, road safety and value-for-money. • In covering Integrated Transport Planning, this plan makes particular reference to Waipapa in the context of the following roading priority: - “The ‘Triangle in the North’ – the road system linking Waipapa, Kerikeri and Paihia. These areas have been identified as priority growth areas by Far North District Council, and as such there is significant value in upgrading this link to allow efficient traffic flow, particularly in regard to tourism. - The RLTP also highlights the Twin Coast Discovery route as showcasing “the best the region has to offer”. - Again, with congestion and safety issues highlighted at the current Waipapa Intersection layout, roading improvements are needed to help show the region at its best. - The Heritage Bypass in the Kerikeri-Waipapa area was a huge roading investment in recent times that specifically recognised the high profile of the area’s attractions, with particular relevance to the Old Stone Store and other historic buildings alongside. - That investment is somewhat muted in value for money if access from the State Highway is left seriously deficient.
LOCAL	Kerikeri-Waipapa Structure Plan	✓	The local area structure plan sets out some key elements at a high level: • Address lack of direction for growth • Protect village character through preservation of amenity and good urban design • Clustering of growth around existing settlements • Promote sustainable development and responsive design, particularly for infrastructure.

STRATEGIC DOCUMENT OR CONTEXT		PROJECT ALIGNMENT	COMMENTARY
LOCAL	Long Term Council Community Plan 2006-2016	✓	Looking closer at the specific objectives endorsed in the district's long term planning (LTCCP), the following statements are selected as wholly aligned to this Business Case: • Continuing to work with NZTA towards upgrading the intersection of State Highway (SH) 10 Waipapa Road / Waipapa Loop Road "to a roundabout" • Continuing to purchase land for a new link road between Kahikatearoa Road and Waipapa Loop Road • Continuing to widen and improve walking and cycling facilities on Waipapa Road.

5.2 Project Outcomes

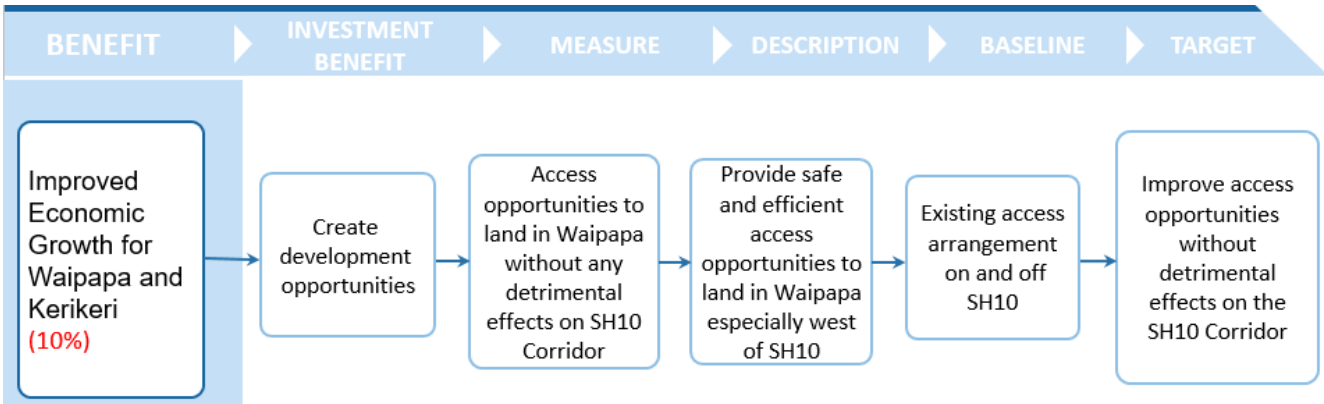
The benefits of successfully investing to address these problems were identified as part of the Investment Logic Mapping process at the second Strategic Case stage workshop in December 2015. At that time, three benefits were identified for the corridor if the problems are addressed.

The Single Stage Business case team has also revisited the description of benefits being pursued, and built on the benefits from the Strategic Business Case:

- **Benefit One:** Improved Economic Growth for Waipapa and Kerikeri (10%)
- **Benefit Two:** Improved Network Efficiency (45%)
- **Benefit Three:** Increased Safety (15%)
- **Benefit Four:** Increased multi-modal travel (30%)

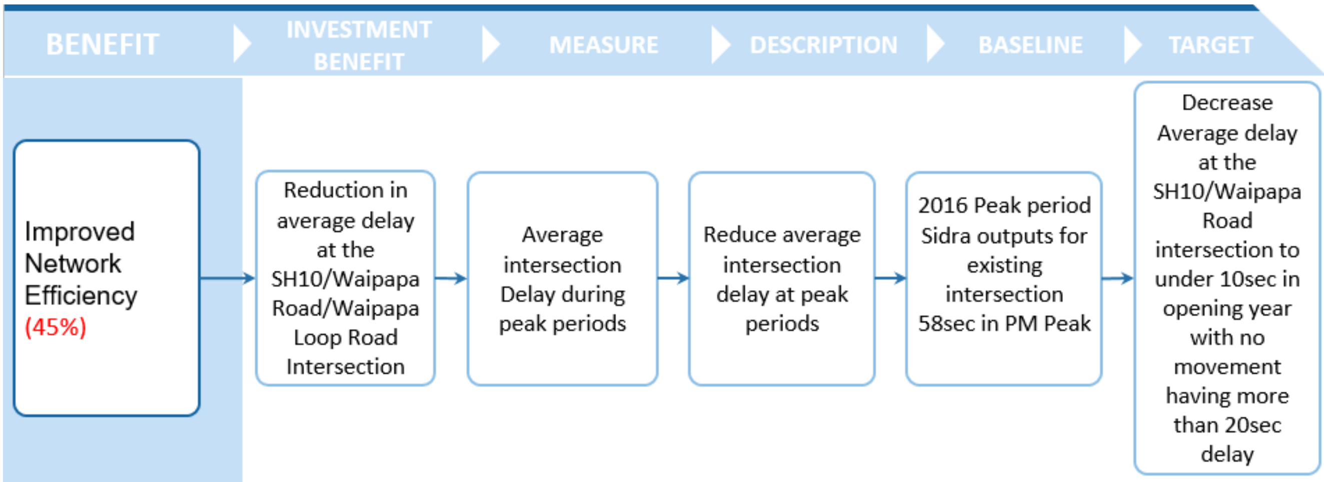
The discussion below provides a summary of the narrative around the expected benefits.

BENEFIT ONE: IMPROVED ECONOMIC GROWTH FOR WAIPAPA AND KERIKERI



By improving access to the State Highway network, the current constraints on development due to traffic will be lifted. As such, transportation improvements will act as an enabler for development especially west of SH 10 and support the growth in the region.

Benefit Two: Improved Network Efficiency

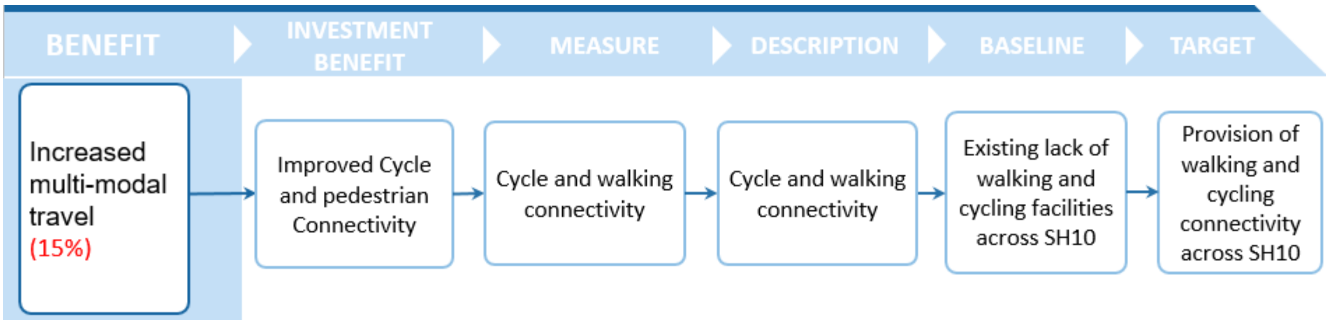


Improved network efficiency is a key aim of the project. Currently, the SH10 / Waipapa Road intersection is one of the pressure points in the network and reducing the delays at this intersection is an essential outcome for the success of this project. The reason for this is:

- Local traffic will no longer be faced with an intersection that delays their journey and presents serious difficulties in turning.
- Increase in capacity at this intersection creates the opportunity for an increase in traffic to be accommodated from Waipapa Loop road providing alternative access to and from Waipapa commercial centre towards the north; in turn, this will reduce traffic on SH10 corridor.
- Through traffic, including regional freight and tourists, will not be impeded by turning traffic.

Other corridor-wide improvements and/or network improvements may also bring improved network efficiency, which will help meeting the reduced intersection delay targets.

Benefit Three: Increased Safety



Addressing the efficiency of the network will also result in an improvement in road safety.

By providing a design that follows the Safe System approach, the number and severity of crashes should be reduced and motorists will find using the corridor to be more intuitive. When considered alongside other measures planned, this will increase the attractiveness of Waipapa and improve the experience for the local community and all users.

Benefit Four: Increased multi-modal travel

BENEFIT	INVESTMENT BENEFIT	MEASURE	DESCRIPTION	BASELINE	TARGET
Increased Safety (30%)	Improve safety	Decrease in social crash cost	Lower severity crashes will result in lower social crash cost	Weighted crash method using CAS data (2006-2015) $125k/year	25% reduction in annual social crash cost

A project solution that increases multi-modal travel is also important, and interlinks with the other benefits targeted. There are already shared paths on Waipapa Road and part of Kerikeri Road, with the last section of Kerikeri Road designed and ready to be constructed. Providing a link between these facilities as part of this project would promote the route as an attraction in itself, as well as encouraging sustainable journeys to destinations such as the shops, sporting facilities and the Te Araroa trail.

There are also wider cyclist benefits that could be accessed. SH10 is currently a barrier to walking and cycling trips between Kerikeri and the Waipapa commercial area, due to the speed and volume of traffic using the main road. This currently discourages active modes and encourages people to travel by car, thus exacerbating delays and increasing the risk of accidents.

By implementing new provisions for cyclists, and linking them with existing infrastructure, this will enhance this function of the Twin Coast Discovery Route, which already attracts cycle tourists.

By implementing new and better pedestrian access around the intersection will encourage the residents to opt for walking instead of driving.

5.3 Key Performance Indicators / Targets

The diagram below provides a summary of the Problems, Objectives and Key Performance Indicators / Targets identified for this project.

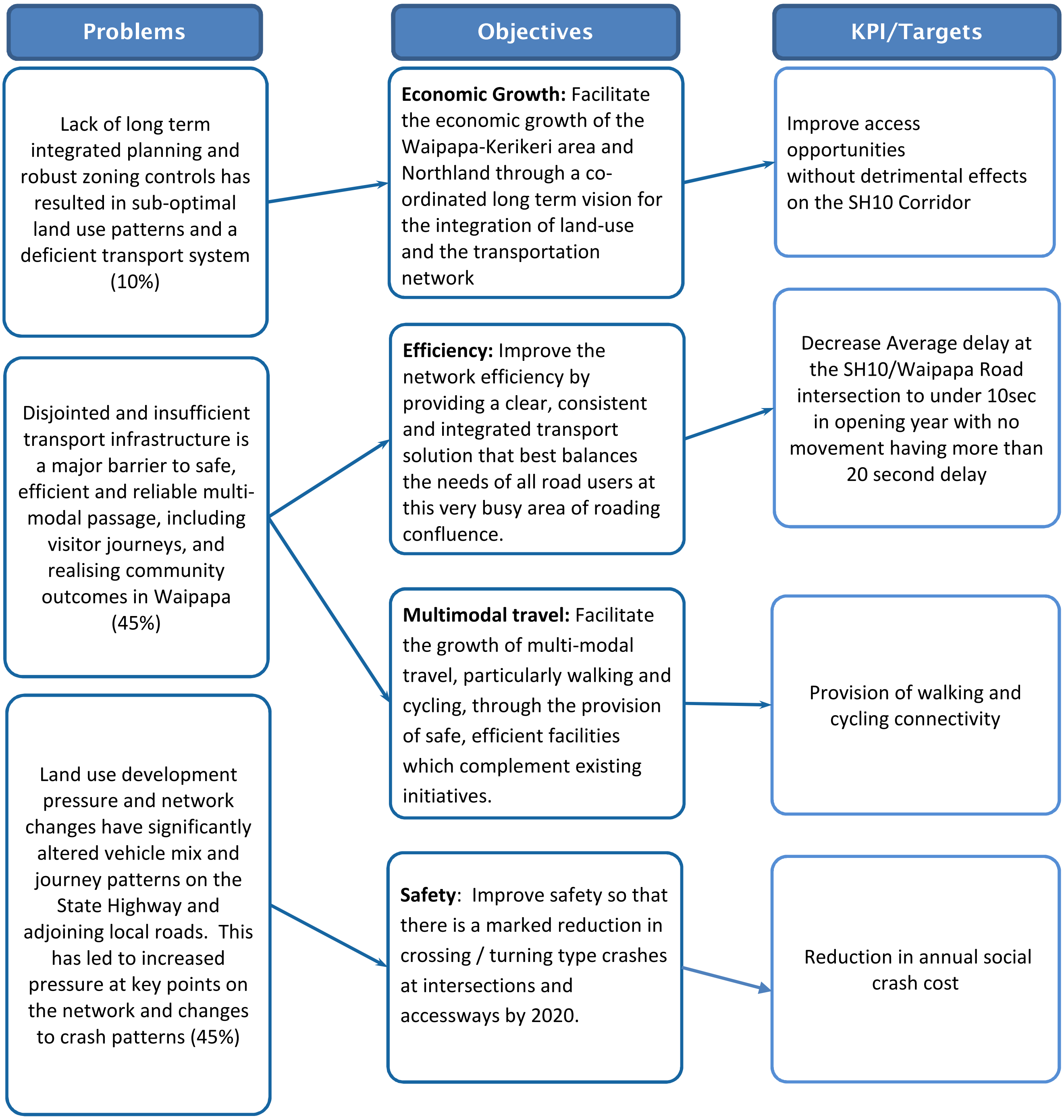


Figure 15: Key performance indicators

OPTION DEVELOPMENT

6. OPTIONS DEVELOPMENT

6.1 Option Development and Evaluation Framework

The alternatives and long list option assessment is based on the NZ Transport Agency's Business Case Process. In summary, the option identification and evaluation process was undertaken as follows:

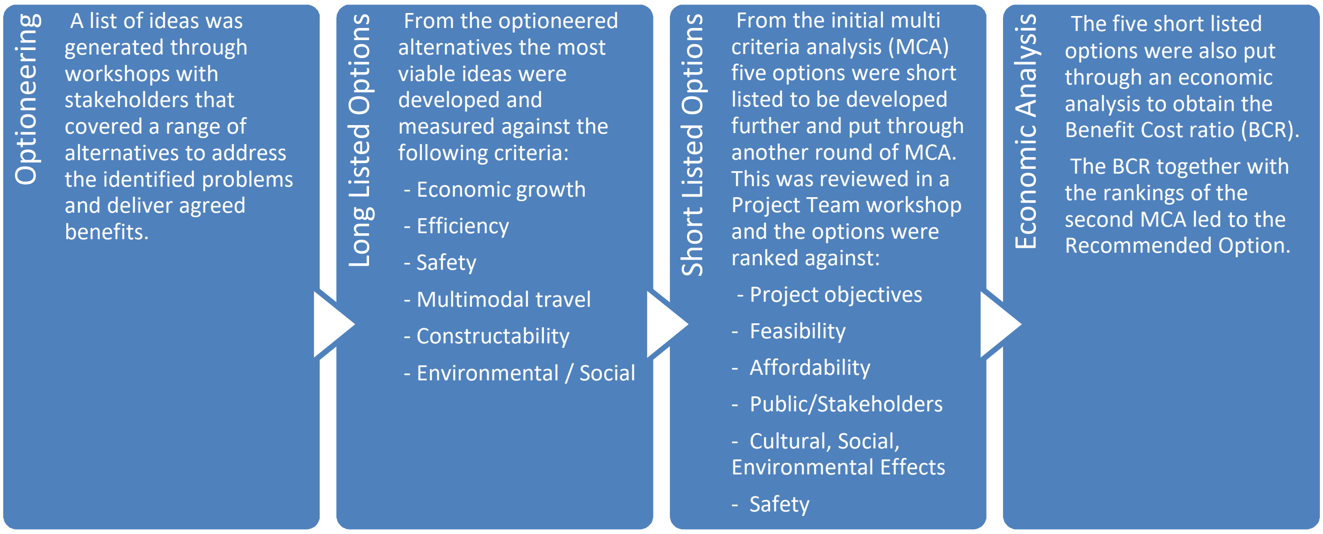


Figure 16: Option development process diagram

6.2 Alternatives and Interventions (Long List)

A workshop was held on 17th November 2016, where a broad range of improvement options were developed, setting aside any preconceived ideas of what solutions might be 'best', or limitations of cost.

Based on the multitude of ideas that were identified in the Stakeholder Workshop, the project team produced the following list of options which then informed the long list of options.

Table 10: Long list of options

OPTION	DESCRIPTION
Do Minimum	This assumes that the Klinac Lane extension has been constructed without any improvements to the State Highway.
Grade Separation	SH 10 is raised to allow Waipapa Rd and Waipapa Loop Rd to connect underneath. On and off ramps would be required to connect local traffic with the State Highway.
Roundabout	Roundabout at intersection of SH 10 / Waipapa Rd / Waipapa Loop Road
Traffic Signals	Signalise the intersection of SH 10 / Waipapa Rd / Waipapa Loop Road

OPTION	DESCRIPTION
Left Turn Slip Lane from Waipapa Road into SH10	Provide additional widening to the Waipapa Rd approach to allow left turning vehicles to bypass the queue of vehicles waiting to turn right.
Right Turn Bay into Waipapa Road	Provide a right turn bay on SH 10 for vehicles turning right into Waipapa Rd.
Re-align Waipapa Road	Relocate the intersection of SH 10 with Waipapa Rd further south to create a staggered T-intersection arrangement with Waipapa Loop Road.
Left In / Left Out Waipapa Loop Road	Provide concrete islands to prevent vehicles turning right into, and right out of, Waipapa Loop Road and from going straight across from Waipapa Loop Rd to Waipapa Rd.
Bypass	Provide a new highway to the west of the commercial area so that through traffic can completely bypass the intersection.
Close Waipapa Loop Road South	Close off the south end of Waipapa Loop Road so that all traffic must use the north end.
Speed reduction	Reduce the speed through the Township from 70 to 60 or even 50.

6.3 Option Development

The long list of options was further developed, refer **Appendix D**. The narrative below more describes each option.

6.3.1 Do Minimum Option

FNDC is committed to installing the Klinac Lane Extension to its north once the NZ Transport Agency upgrades the main intersection. Because of this, and because that extension is practically essential for any outcome that tries to properly balance traffic on the local road approaches to the main intersection, it was decided to include the Klinac Lane Extension in the base case.

While it is recognised that the Klinac Lane Extension will assist with the current land use and enable the intensification of both industrial and retail activities within the Waipapa area, earlier studies have confirmed that the link should not be constructed until the necessary improvements have been made on the State Highway connections.

6.3.2 Grade Separation

This would involve raising the State Highway so that local traffic could drive between Waipapa Road and Waipapa Loop Road directly. This would remove all conflicting vehicle movements and would remove the “barrier” to pedestrians and cyclists.

However, in order to maintain access to and from the State Highway, on and off ramps would be necessary, which would require significant land acquisition on all four quadrants, affecting the majority of the surrounding businesses. This would have a detrimental social and environmental impact, and to all intents and purposes is not practical.

Grade separation is usually associated with motorways and expressways where there are much higher volumes of traffic, and the potential for large areas of land-take is more in proportion with the scale of such projects. This option was rejected early, as the traffic volumes at this location would not justify the cost and adverse social impacts.

There are currently no grade separated intersections in Northland.

6.3.3 Roundabout

Constructing a roundabout at the intersection of SH10, Waipapa Road and Waipapa Loop Road would make it safer and easier for vehicles to turn right from SH10 and right out of the side roads. Urban roundabouts typically have a 55% effectiveness in crash reduction (Austroads Road Safety Engineering Toolkit), when constructed at existing priority crossroads. Facilities for pedestrians and cyclists will need to be a key consideration in the design.

Disbenefits of the roundabout option include the relatively large amount of land required compared to simpler intersection controls, and the slowing down of all State Highway traffic (although traffic already has to slow down when someone is waiting to turn right). Some slowing down of State Highway traffic is considered inevitable with any solution that gives reasonable weight to alleviating the delays and difficulties here with State Highway access/egress from the main side roads.

6.3.4 Traffic Signals

Installing traffic signals at the intersection of SH10, Waipapa Road and Waipapa Loop Road would remove the conflict for turning vehicles, making it easier for all right turning movements. It would also provide a safe crossing place for pedestrians and off-road cyclists. Traffic Signals typically have a 30% - 35% effectiveness in crash reduction (Austroads Road Safety Engineering Toolkit) when constructed at existing priority crossroads, depending on whether or not the right turn phases are fully controlled.

Disbenefits include significant delays to through traffic, compared to the existing arrangement, particularly during the inter-peak periods. Being the only signalised intersection north of Whangarei, it could lead to problems with compliance as motorists may not be expecting to have to stop, resulting in increased rear-end crashes. It may also lead to deliberate non-compliance at off-peak periods if motorists are kept waiting for a green light. The consequence of any non-compliance would be significant as there is a greater risk of a high speed, high severity collision as traffic with the green light will not be expecting anyone to run a red light.

6.3.5 Left Turn Slip Lane from Waipapa Road into SH10

Motorists turning left onto the State Highway from Waipapa Road experience delays due to the queue of right turning traffic. A left turn slip lane would involve widening the approach to the State Highway to allow enough room for two lanes of traffic, allowing left turning vehicles to exit much more readily, needing only the near lane of the State Highway to be clear.

The option does not address the main cause of the problem – delays caused by right turning traffic. There is anecdotal evidence that vehicles turn left here and do a U-turn on the State Highway, rather than queuing to turn right. The option makes this manoeuvre an even more attractive option.

Also, the number of left-turning vehicles is relatively low based on current evidence and the creation of a new connection to Klinac Lane will reduce it further so the benefit of investment in this option is not expected to be great.

6.3.6 Right Turn Bay into Waipapa Road

Due to the existing width of the road, vehicles waiting to turn right into Waipapa Road block the through traffic causing unnecessary delay. Providing a Right Turn Bay would allow the through traffic to continue unimpeded, and provide right turning traffic with a safe place to wait.

The disbenefit of this option is that the speed of through traffic will likely increase and add to the difficulty of exiting the side roads.

6.3.7 Re-align Waipapa Road

This would involve shifting the intersection of Waipapa Road further south on the State Highway, away from Waipapa Loop Road, in order to create a staggered pair of T-intersections. Separating these two local roads should remove some of the uncertainty associated with vehicles turning right from opposing side roads.

The right-left stagger requires drivers to initially turn right into the major road, then left into the opposite minor road leg. This treatment is only for low volume situations, but is often more cost-effective than a left-right stagger if converting a four-way cross intersection into a staggered T-intersection. Austroads recommends a stagger of only 15 to 30m. Crash reduction effectiveness is in the order of 25% to 35%, but design life is short (Austroads Road Safety Engineering Toolkit).

This option alone is unlikely to provide the benefits that are required, but could be incorporated into some of the other Options, such as the Right Turn Bay into Waipapa Road or the Left In / Left Out at Waipapa Loop Road.

6.3.8 Left In/Left Out at Waipapa Loop Road

This option involves constructing a traffic island at the southern intersection of Waipapa Loop Road, which would prevent right turns in and out. Motorists who wish to turn right could use the northern intersection of Waipapa Loop Road. This intersection may need some safety improvements if there were significant increases in traffic.

While the majority of motorists will be guided by signs and islands to prevent them from turning right, it is very difficult to stop drivers who are determined to ignore the banned movements. This can create additional safety hazards. This option was therefore rejected early.

6.3.9 Bypass

Bypassing the Waipapa commercial centre does not meet the objective of improving the economic growth of the area, as this would remove the majority of passing trade. It would improve the overall safety and efficiency of the network, but would have a significant social and environmental impact on the area. The construction would require considerable land acquisition and would be prohibitively expensive.

6.3.10 Close Waipapa Loop Road South

This is similar to the Left In / Left Out option, but would completely close the intersection and divert all traffic to Waipapa Loop Road North. This intersection would need additional safety improvements incorporated into the design.

This option has the benefit over the Left In / Left Out option in that there is no risk of motorists carrying out any banned manoeuvres, instead would force all traffic through the WL(N) intersection is undesirable due to a crest in SH10 limiting sight line restrictions to the north.

6.3.11 Speed Reduction

Reducing the 70km/hr speed limit to 60km/hr or even 50km/hr would have the benefits of increasing the opportunity for motorists to pull out of side roads, as they would accept smaller gaps in the traffic. It would also reduce the severity of any crashes that did occur.

However, a reduction in speed alone will not be enough to address the main issues.

The new Speed Management Guide, which came into effect this year, aims to ensure a consistent sector-wide approach is adopted to manage speeds. One of the results of the document is that the 70km/hr speed limit will no longer be an option. While there is no immediate requirement to replace existing 70km/hr speed limits with either 60km/hr or 80km/hr, this will be the eventual outcome, so could be incorporated into this project.

6.3.12 Corridor Improvements

While all of the above options address issues at the intersection with Waipapa Road to some degree, there are improvements that could be made to the whole State Highway corridor within the study area.

The improvements may include road widening with right turn bays and flush median, proper cycleway/footpath provision, improved lighting and speed-related provisions such as threshold treatments.

6.4 Long-List Options Assessment (Initial Multi-Criteria Analysis)

A workshop forum was used for a qualitative assessment of the Long List options, comparing how they measure up against each other in an initial Multi-Criteria Analysis (MCA).

This initial high-level MCA used the four stated project Objectives as core criteria:

1. **Economic Growth** – does the option support the growth of Waipapa and Northland
2. **Efficiency** – does the option improve efficiency for through traffic and/or local traffic
3. **Safety** – does the option improve safety for motorists, pedestrians, cyclists or other users
4. **Multi Modal Travel** – pedestrians and cyclists.

In addition, the team felt that two new criteria would be valuable to include at this stage:

- **Constructability** – how easy the option would be to implement
- **Environmental / Social** – high level assessment of the effects on the environment and community.

As discussions evolved, it was recognised that a few of the wider treatments that could be complimentary to any of the main options should be considered in their own right as sub-options, and separately scored in the MCA. Thus, ‘speed limit reduction’, ‘walking/cycling facilities’ and ‘corridor treatment’ were included so their attributes could be understood against the same criteria, although they may not ultimately be used as stand-alone treatments.

The team debated the issues and, by consensus, came up with the scoring summarised below:

OBJECTIVES / CRITERIA	MAIN OPTIONS					SUB-OPTIONS				
	Grade Separation	Roundabout	Traffic Signals	Left Turn Slip Lane / Right Turn Bay / Left In/Left Out	Re-align Waipapa Road	Bypass	Close Waipapa Loop Road South	Speed Limit Reduction	Walking / Cycling Facilities	Corridor Treatment
Improved Economic Growth	2	1	2	3	3	5	3	3	3	3
Improved Network Efficiency	1	2	4	2	2	1	3	4	3	3
Increased Safety	1	1	2	2	2	2	2	2	2	2
Increased Multi-Modal Travel	3	2	1	2	2	3	2	2	1	1
Constructability	5	3	2	2	3	5	3	1	2	1
Environmental / Social	5	2	2	3	3	5	3	3	2	2
MCA SCORE	**17**	**11**	**13**	**14**	**15**	**21**	**16**	**15**	**13**	**12**

Figure 17: Initial Multi-Criteria Analysis (High Level)

6.5 Short-Listed Options

From the initial MCA; two options (Grade Separation and Bypass) were discarded, and five options (see below) were shortlisted as meriting closer examination.

Grade Separation, which is not a solution that is normally associated with low traffic volumes, was also discarded due to the massive impact it would have on the surrounding business properties. It was also deemed to have a detrimental social and environmental impact.

The Bypass was discarded because it goes directly against the objective of supporting economic growth by removing the passing trade that many of the local businesses rely upon.

The following options were shortlisted:

- **Right Turn Bay**
- **Roundabout**
- **Traffic Signals**
- **Head to Head Right Turn Bays**
- **Close Waipapa Loop Road South**

The five shortlisted options have been drawn to a reasonable first order accuracy on a series of plans that are included in **Appendix E.** These plans illustrate the main features of each option.

Reduced-size versions of these drawings are provided below for ease of reference.

Please note that all options are deemed to be accompanied by the Klinac Lane Extension (as the Do Minimum).

Also, for options that show Waipapa Loop Road (North) closed, that closure is only one of a series of feasible sub-options and that element is therefore only indicative at this stage. Other sub-options for Waipapa Loop Road (North) could for example include 'Left Turn In & Left Turn Out'. It was decided to defer closer examination until a preferred option was identified, and then canvas opinion during upcoming public consultation to help inform any decision.

6.6 Option Assessment

6.6.1 Methodology

The project team met again, in a workshop, to carry out a more detailed analysis of the shortlisted options in a final MCA to determine the preferred option.

The criteria the options were weighed against included:

1. **Objectives**
2. **Feasibility / Constructability** – Property risks, consenting risks, Whole of Life operation / maintenance costs
3. **Affordability** – Funding risks, operating cost risks
4. **Public/Stakeholders** – public expectations
5. **Cultural, Social, Environmental Effects** – Community cohesion, connectivity
6. **Economy** – based on traffic modelling outputs
7. **Customers** – local users, freight users visiting users.

The team composition spanned a good range of skills, with both local and regional knowledge. They readily arrived at agreement on scores for many criteria, while for others they arrived at consensus scores following a healthy debate. A final review was undertaken and some small adjustments made to ensure overall balance.

Planning issues were considered neutral at this stage for the options analysed.

The team was comfortable that the final ranking of options was arrived at, through fair consideration, with the outcome of the process detailed in Section 6.6.2.

6.6.2 Key Findings

Summary and Comparison of the Short-listed options follows.

Option 1: Right Turn Bay

Description:

Minor intersection improvements with the implementation of a right turn bay for vehicles turning from SH10 into Waipapa Road. Option also includes a splitter island on Waipapa Loop Road that restrict movements from this approach to a left out only. The northern access to Waipapa Road remains open and option design encourages vehicles to use this intersection for the right turn from SH10 to Waipapa Loop Road, right turn from Waipapa Loop Road to SH10 and movements from Waipapa Loop Road to Waipapa Road.

Access between Skippers Lane and Waipapa Loop Road remains unchanged.

KEY POINTS OF DIFFERENCE:

Alignment to investment objectives: Low alignment to investment objectives.

Risks: Option is considered to have negligible construction risk as proposed improvements are minor in comparison with the other options.

Effects: Option is considered to have low effects as proposed improvements are minor in comparison with other options. Potential social effects with confusing road network with banned movements from Waipapa Loop Road that can also be somewhat disruptive to the businesses particularly on the eastern side of Waipapa Loop Road.

Outcome: Option only provides some efficiency improvements for SH10 northbound traffic with minimal improvements right turning traffic from the side roads. It is therefore considered that this option does not address the main objectives. Other similar cost options have better alignment to investment objectives and are therefore favoured in comparison with this option.

Cost: $5.75M

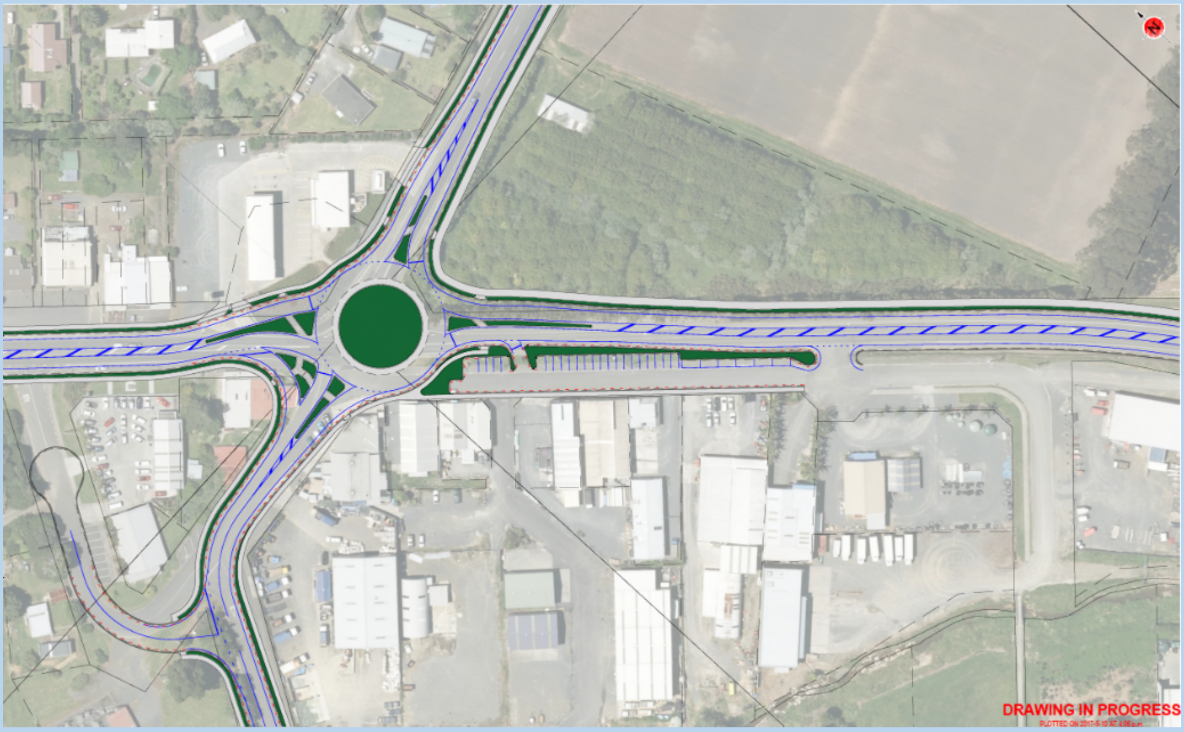
BCR: 2.9

Funding Profile: LLM

Option 2: Roundabout

Description:

This option includes the conversion of the existing crossroads to a single lane roundabout. This option also includes intersection rationalisation with both the northern Waipapa Loop Road access to SH10 and Skipper Lane access onto Waipapa Loop Road being closed.



Key points of difference:

Alignment to investment objectives: This option has the highest alignment to investment objectives of all considered options. The option alignment is also improved if this option is implemented at the same time as Klinac Lane extension.

Risks: The option is considered to have low overall risk, however, the risk are slightly higher in comparison with other options as the footprint of the intersection is higher. Important that the roundabout is designed according to design standards and deflections through the roundabout are considered.

Effects: The overall effect of this option is considered to be low and business as usual. Some social effects through property acquisition and the closure of two intersections.

Outcome: The roundabout option has very good alignment to the investment objectives. It addresses the current issue of intersection delays for side road traffic at the same time as providing opportunity for more development within the Waipapa area. It is recognised that there will be some increase in delay for SH10 through traffic but these disbenefits are outweighed by improved access for the side roads. Option also has manageable risks and effects.

Cost: $7.1M

BCR: 3.1

Funding Profile: MHM

Option 3: Traffic Signals

Description:

SH 10, Waipapa Road and Waipapa Loop Road are all signalised with two lane approaches on each leg. This option also includes intersection rationalisation with both the northern Waipapa Loop Road access to SH10 and Skipper Lane access onto Waipapa Loop Road being closed.

Pedestrian crossing facilities are incorporated into each leg.

Key points of difference:

Alignment to investment objectives: Mixed alignment to investment objectives, but low on average.

Risks: Option is considered to have some construction risk as proposed footprint is relatively high. It also poses a serious safety risk for motorists who are not expecting to have to stop.

Effects: The overall effect of this option is considered to be high as average travel times will increase. Some social effects through property acquisition and the closure of two intersections. Potential social effects with there being no signalised intersections in the Far North.

Outcome: Option provides good connectivity for pedestrians and full access into the Waipapa area. However, delays to all traffic movements, particularly during the inter-peak mean that his option is not viable.

Cost: $6.6M

BCR: N/A

Funding Profile: LLL

Option 4: Head-to-Head Right Turn Bays
Description: This option involves shifting the Waipapa Road approach further south creating a staggered T-intersection arrangement with Waipapa Loop Road, with right turn bays into both. This option also includes intersection rationalisation with both the northern Waipapa Loop Road access to SH10 and Skipper Lane access onto Waipapa Loop Road being closed. Pedestrian links, including central refuges on the State Highway, would also be provided.

Key points of difference: **Alignment to investment objectives**: Low alignment to investment objectives **Risks:** Option is considered to have minimal construction risk as proposed improvements are minor in comparison with the other options. **Effects:** Option is considered to have low effects as proposed improvements are minor in comparison with other options. **Outcome:** Option only provides some efficiency improvements for SH10 northbound traffic with minimal improvements right turning traffic from the side roads. It is therefore considered that this option does not address the main objectives. Other similar cost options have better alignment to investment objectives and are therefore favoured in comparison with this option.
Cost: $6.2M
BCR: 2.7
Funding Profile: LLL

Option 5: Close Waipapa Loop Road South

Description:

This option would completely close the intersection at the south intersection of Waipapa Loop Road, diverting all traffic through the north intersection and Skippers Lane. Access to Skippers Lane from the State Highway would only be from the south end.

Pedestrian links, including central refuges on the State Highway, would also be provided.

Key points of difference:

Alignment to investment objectives: Does not align well with investment objectives.

Risks: Option is considered to have negligible construction risk as proposed improvements are minor in comparison with the other options.

Effects: Option is considered to have low effects as proposed improvements are minor in comparison with other options. Potential social effects with confusing road network with circuitous route to access commercial area.

Outcome: Option only provides some efficiency improvements for SH10 northbound traffic with minimal improvements right turning traffic from the side roads. It is therefore considered that this option does not address the main objectives. Other similar cost options have better alignment to investment objectives and are therefore favoured in comparison with this option.

Cost: $5.7M

BCR: 2.8

Funding Profile: LLL

6.6.3 Assessment of Effects

The traffic signals option is the most favourable in terms of avoiding environmental, health, heritage and social impact overall.

The Roundabout is the second most favourable in terms of avoiding overall environmental, health, heritage and social impact – however, this is the case provided that adequate community consultation and temporary traffic management occurs to mitigate any concerns.

The remaining options are relatively equal in terms of avoiding environmental, health, heritage and social impact.

The following narrative provides a brief description of the Environmental and Social Responsibility Screens (ESRs).

The detailed ESRs are presented in **Appendix F**.

6.6.4 Natural Environment

All options are relatively equal in this regard. The road reserve and surrounds are all previously disturbed areas and contain no significant ecological, flora/fauna values. Important to note is that all options will involve alteration of the SH10 and Maritime Road[1] crossings over Whiriwhiritoa Stream. Details of these crossings are yet to be developed. Design must ensure that alterations do not worsen the 100 year ARI upstream flood level, and do not worsen fish passage provision up to the 1 year ARI.

6.6.5 Heritage/Archaeology

All options are relatively equal in this regard. The road reserve and surrounds are all previously disturbed and contain no significant Heritage/Archaeology values.

6.6.6 Land Acquisition

All options require some acquisition of surrounding land. All options require acquisition of land from the substation lot (corner of Loop Rd and Maritime Road). The traffic light option requires the least amount of land from the SH10 intersection, the remaining options all require similar amounts of land – therefore they are relatively equal in this respect.

6.6.7 Contaminated Land

One of the major constraints for the project is that the road is surrounded by land that is likely to be classified under the Hazardous Activities and Industries List (HAIL). As a result, if land needs to be acquired from these properties, or work needs to occur on these properties, then the National Environmental Standard Contaminated Land (NES Contam) needs to be considered. This essentially means that the presence of potentially contaminated land needs to be investigated and managed accordingly. Therefore, reducing the extent to which an option encroaches outside of the existing road reserve may assist in reducing the degree of this risk or the scale of its impact.

For all options, it is recommended that a Stage 2 contaminated land investigation is undertaken on land which may be acquired (this involves sampling and laboratory analysis of soil samples). If any site

[1] Note: The part of Maritime Road that crosses the Whiriwhiritoa Stream and joins with Klinac Lane is not yet formed road. FNDC currently refer to this as “The Klinac Lane Extension”.

is found to be heavily contaminated (which is probably unlikely), then the costs & practicalities of managing or remediating the land may weigh into final options assessment.

6.6.8 Social Impact

Social impact varies between the options according to how much change each option would have to people's way of life and the nature of that change, i.e., positive or negative. These impacts are assessed in two phases, identifying that impacts will differ between the actual permanency of the infrastructure and the temporary construction activities.

Impacts Resulting from Permanent Works

- The traffic signals option has least social impact as it retains the familiarity that the community has with the current intersection layout. However, this option does not improve the traffic congestion issue at the intersection with delays modelled in all traffic movements. The desire of the community is to have a safer and more efficient intersection layout which this option does not achieve. Traffic signals can be more costly in terms of maintenance and the potential for failure is also cause for concern in terms of a secure permanent intersection improvement solution.
- The Roundabout option achieves greater connectivity and movement from and to local roads in a reasonably efficient manner than the current intersection layout and the traffic signals option. The layout would be similar to the roundabout at SH10 and Kerikeri Road, which the community are familiar with. This option is also low maintenance and has low to nil risk of infrastructure failure meaning the community is well supported to continue with their way of life once installed.
- The right turn bay and head to head right turn bays options will be somewhat disruptive to local businesses and therefore social connectedness of the town, particularly on the eastern side of loop road as there would be minimal improvement to right-turning traffic from local roads. The roading layout in this option is more complex than the Traffic Signals and Roundabout options and would be unfamiliar to local road users. Both of these options would be low maintenance with low to nil risk of infrastructure failure providing stability to the community to be able to utilise the road network in an ongoing capacity.
- The closing of Waipapa Loop Road South would likely be highly disruptive to the businesses in its proximity, and make southbound entry onto SH10 difficult. The reduction of connectedness does not achieve the community's desires of being able to utilise and to promote their town as one whole service centre rather than two split communities. The roading layout for this option is deemed much more complex than any of the other options and would be unfamiliar to local road users. However, this option would be low maintenance with low to nil risk of infrastructure failure providing stability to the community to be able to utilise the road network in an ongoing capacity.

Impacts During Physical Works

1. The traffic signals option likely has the least impact on the community and environment as minimal alteration to the SH10 intersection is required resulting in less disruption to the way in which the community utilise the facilities in the town. Day-to-day operations of local businesses will be least affected under this scenario. Traffic flow will be manageable but would still have some disruption to an already congested intersection.
2. The right turn bay option would also have low social impact during construction with minimal alteration to the environment occurring resulting in less disruption to the way in which the community utilise the facilities in the town. Day-to-day operations of local businesses will be least affected under this scenario. Traffic flow will be disrupted to a greater extent than the

traffic signals option but this disruption would be minor in comparison to the remainder of the options.

3. The closing of Waipapa Loop Road South would likely be the next least disruptive option to the community, with greater alteration required to the existing environment than the traffic signals and right turn bay options. The scale of alteration would likely result in minor disruption to the community's experiences and use of their town. Businesses along Skippers Lane would also be immediately affected with closure to the Lane implemented early on in the works. Traffic flow can be managed during work with minor interruption through the use of existing roading infrastructure as detour routes.
4. The Roundabout option has a similar social impact footprint to that of closing of Waipapa Loop Road South. The option does not require much physical work outside of existing road areas therefore reducing the potential for environmental alteration, however, the overall scale of this work would impact on the community's sense of place and current rural feel of the township. Businesses along Skippers Lane would also be immediately affected with closure to the Lane implemented early on in the works. This option will also require a higher level of temporary traffic management to maintain highway flow which has the potential to cause the feeling of severance to the community and road-users if not managed well.
5. The head to head right turn bays option will be most disruptive to the community, road users and local businesses as the alteration in existing road alignments would require large-scale environmental alteration. The scale of environmental alteration will affect the way in which the community access facilities and utilise the transport networks as they will likely try to avoid the disruption. This in turn has the effect of a downturn in local business and trade, ultimately causing disruption to the community's way of life that cannot be easily managed.

6.6.9 Summary

A Summary of the MCA analysis is presented below. Refer to **Appendix G** for the detailed analysis of each option.

Table 11: Multi-criteria analysis results for each option

SUMMARY	DO MINIMUM – KLINAC LANE	RIGHT TURN BAY	ROUNDABOUT	TRAFFIC SIGNALS	HEAD TO HEAD RIGHT TURN BAYS	CLOSE WAIPAPA LOOP ROAD SOUTH
Objective 1 - Economic growth through integrated land-use	0	+	+++	+++	+	-
Objective 2 - Improve network efficiency	--	0	++	--	+	-
Objective 3 - Improve safety by reducing crossing/turning crashes	--	--	++	---	--	--
Objective 4 - Facilitate growth of multi-modal travel	0	++	+	++	+	+
Feasibility / Constructability	0	-	--	---	-	-
Affordability	0	0	0	0	0	0
Public / Stakeholders	---	--	++	---	--	--
Cultural, Social and Environmental Effects	0	++	+	+	+	+
Safety	--	--	++	---	--	--
Economy	0	+	++	+	+	-
Customers	-	++	++	0	+	0
Ranking	**6**	**2**	**1**	**4**	**3**	**5**

Planning issues were considered largely neutral to all options analysed.

The Roundabout Option ranked the highest, with positives in all the categories except Feasibility / Constructability and 'facilitate growth of multi-modal travel' due to the level of land-take required for this option and the perception of ease of use of a roundabout by cyclists respectively.

The short-listed options were also weighed in an economic analysis and again the **Roundabout Option** gave the best **BCR of 3.1**.

Therefore, the Roundabout Option emerged as the Preferred Option via this Business Case, and as such follows with a recommendation that the NZ Transport Agency proceed to the next phases of the project, i.e. Detailed Design and Implementation.

6.7 Recommended Option

The Recommended Option is the Roundabout, which scored well to very well on almost all main criteria.

It did score low on two criteria, ‘*feasibility/constructability*’ and ‘*facilitate growth of multi-modal travel*’ but this is only relative to the other options, and it remains perfectly feasible. The score simply recognises that this option has the largest physical ‘footprint’ and is likely to have higher ongoing maintenance costs than other options due to factors like seal stress and landscaping upkeep.

Importantly, the Roundabout is clearly the stand-out option in terms of meeting the main project Objectives. Some salient observations are noted as follows:

Objective 1 - Economic growth through integrated land-use

This option provides a significantly better situation than the Do Minimum in terms of ease of movement in all directions. This also provides a gateway treatment to the Waipapa area. For Tourism, this option is considered optimum, especially for Twin Coast Discovery Highway movements.

Objective 2 - Improve network efficiency

This option provides the best overall efficiency benefits. Pedestrian crossing points are necessarily some distance from the desire lines for crossing, but careful design can still accommodate suitable facility.

Objective 3 - Improve safety by reducing crossing / turning crashes

Roundabouts significantly reduce the number of conflict points and, for most users, will represent a safe and easy option. Even though they can have a higher number of crashes compared to some other intersection treatments, incidents tend to be of a lesser severity due to lower speeds. It is reasonably assumed that safe cycling provision can be addressed satisfactorily by careful design.

Objective 4 - Facilitate growth of multi-modal travel

Pedestrian movements are well provided-for with uncontrolled crossing points, but some of the designed walking routes across the intersection will unavoidably be at some distance from the ‘desire lines’ due to practical constraints.

Cycling provision can be carefully designed for but less confident cyclists may find roundabouts less desirable.

As noted earlier, all options were normalised to be treated as if including the Klinac Lane extension; and also to include some prudent level of complimentary corridor treatment (regardless of whether such corridor treatment would be implemented concurrently or phased in later).

Following the Road Safety Audit and feedback from the public consultation, some minor changes were made to the design. Full area drawings of the Recommended Option, covering the Klinac Lane link and the probable corridor treatment are included in **Appendix H**. The following drawing shows the general arrangement plan outlining the proposed treatment.

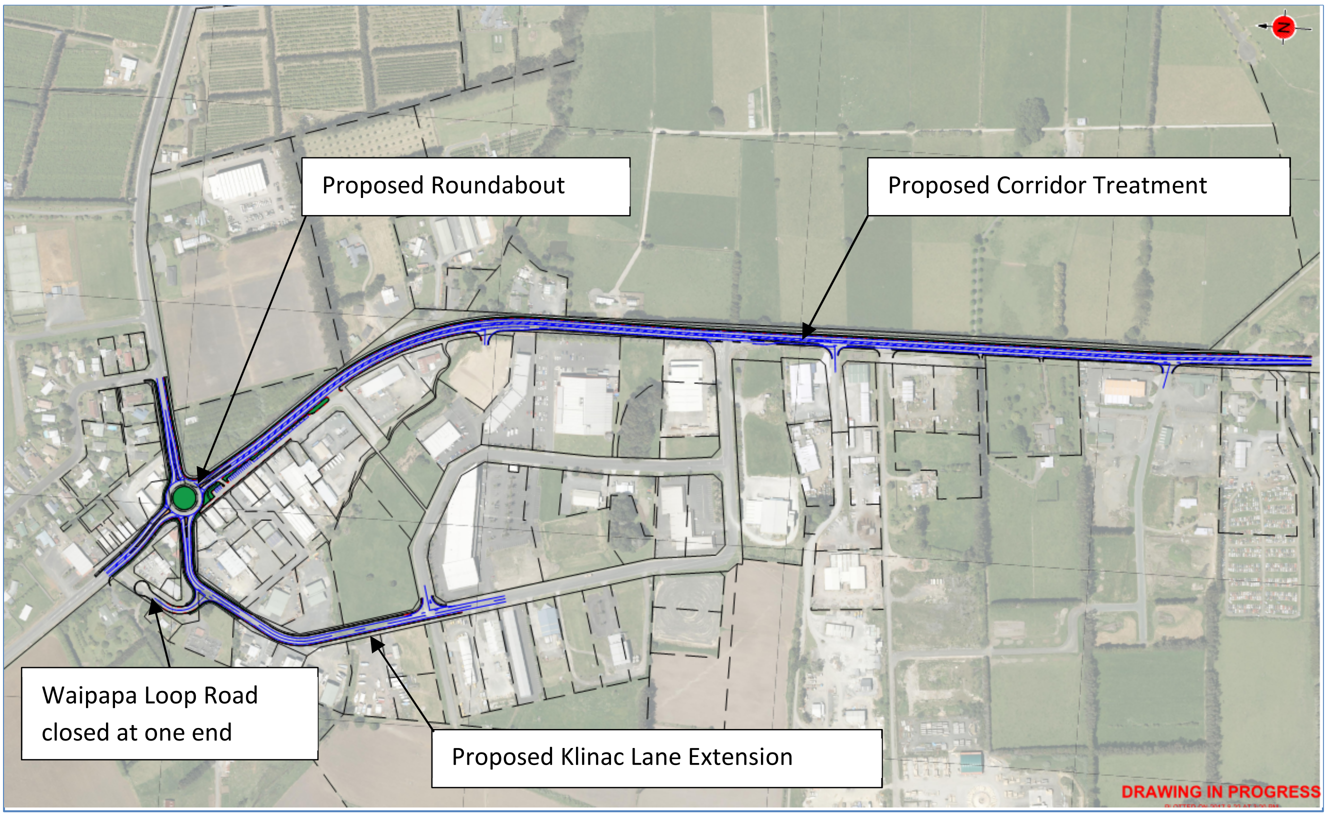


Figure 18: Recommended option – general arrangement

6.8 Engagement

The focus of engagement has largely been focused on the SH10 / Waipapa road intersection which is the centre of community concern. Ongoing stakeholder consultation and community engagement has been undertaken as part of this business case to understand affected parties' needs, behaviours and attitudes to the SH10 Waipapa Road intersection, and the preferred option.

The outcomes of the consultation and engagement on the preferred option demonstrated that the community and key stakeholders believe that investment is needed to improve the SH10 Waipapa Road intersection and that they are supportive of improving safety, efficiency and network resilience.

6.8.1 Affected Parties

Figure 19 depicts the landowners identified as being directly affected by the preferred intersection layout, and/or the extension to Klinac Lane, either as adjacent landowners or as owners where land is to be acquired. They were identified with the assistance of FNDC.

Figure 19: Property acquisition for preferred option

Landowners whose property may need to be acquired for the preferred roundabout design have been generally receptive of acquisition by agreement. However, tenants of two properties have not been as receptive as their landlords to the change that the roundabout option would represent for them, although at the same time not necessarily being against the idea altogether. Their concerns are outlined as follows:

- The Pioneer Bar resides on Lot 5 DP 429319 on the south-west corner of the intersection (owned by Wiroa Properties) and, while the preferred option is to avoid the land and the building, parking on the roadside in front of The Pioneer will be removed to accommodate a roundabout option. The owner and operator of The Pioneer is concerned about the impact the loss of car parks would have on the business. They are awaiting the outcome of this business case, and would like to be involved in the ensuing project phase, detailed design.

- The Price-cutter shop, on the north-west corner of the intersection (Lot 2 DP 72659), is in a state of conditional purchase by the shop owner, and acquisition discussions have been transferred to the new owners (Mr and Mrs Patel). They anticipate being able to continue to operate a smaller-scale Price-cutter under the preferred roundabout option, although this may not be the case, so discussions are continuing between Mr Patel, the NZ Transport Agency project manager and Crown Properties. On-street parking in the immediate vicinity of the property is critical to the viability of business, given its 'convenience store' function. However, parking on SH10 in front the shop is very likely to be lost to ensure the safe and efficient operation of the intersection.

- Portions of properties on both corners of Waipapa Road will need to be acquired. Both property owners have been consulted and are not opposed to negotiating an agreement.
- The Waipapa Garage operation, on the north-east corner of the intersection, is not affected as the land portion required is not used by the business. When the garage was redeveloped a number of years ago, it was set back from the State Highway to avoid being impacted by any future improvements at the intersection.
- On the south-east corner of the intersection, the land is currently vacant. Although the owner has development aspirations, he is willing to work with the NZ Transport Agency and FNDC to accommodate the intersection upgrade, which he views as a likely benefit to any on-site business, provided his access needs, etc. are accommodated.
- A partial realignment of Waipapa Loop Road would impact on a portion of a property owned by Top Energy. Top Energy has indicated that no essential services are located on the subject portion and they are happy, in principle, to negotiate land purchase.

To summarise, property effects are considered to be manageable. Compulsory land acquisitions are not expected to be necessary due to the constructive relationships that have been developed through early conversations with the potentially affected land owners. However, effects on tenant businesses have been identified as a concern, potentially alleviated to some extent by inviting these parties to be involved during detailed design.

7. ECONOMIC ANALYSIS

7.1 Methodology

7.1.1 Outline Economic Approach

A Benefit Cost Ratio (BCR) calculation was undertaken for the five shortlisted options, using the NZ Transport Agency Economic Evaluation Manual (EEM), January 2016 process. The travel time, vehicle operation cost and CO_2 were all based on SIDRA traffic modelling (**Appendix I**) outputs.

The existing crash cost was derived from weighted crash procedures, based on crash prediction models and the past five full calendar year (1 January 2011 – 31 December 2015) crash history from the NZ Transport Agency Crash Analysis System (CAS). Future accident cost has been estimated according to the EEM and the Crash Estimation Compendium effective from 1 January 2016.

7.1.2 Assumptions

General assumptions made for this Single Stage Business Case economic analysis include:

- *Base date* – 2016
- *Time Zero* – 2017
- *Start of Construction* – 1 Oct 2018
- *Discount Factor* 6% over a 40 year project period (Sensitivity on 4% and 8% discount rates)
- *Excludes* any maintenance, noise and road roughness costs
- *Trip reliability* benefits have been ignored
- *All options have a construction period of 6 months*
- *Traffic flows* based on BLIP survey in 2016 adjusted for seasonal variations
- Annual linear growth of 2.2% on SH10 through movement and on Waipapa Road turning movements. This growth is based on last five-year (2011-2015) data on SH10 approximately 4.5km south of the site. Sensitivity test on 1% and 3% annual growth.
- Growth between 2036 and 2056 based on 0.5% growth on SH10 through movement and on Waipapa Road turning movements.
- All movements are capped at 300s delay (conservative assessment as existing intersection creates considerably longer delays than assessed options)
- Growth on Waipapa Loop Road derived from development west of SH10. Assumed 50% of land developed by 2026 and 100% developed by 2036.
- AM (245hr/year), IP (1960hr/year), PM (490hr/year), Sat (312hr/year) and Sun (408hr/year). Evening period of 5345/year has been included for the roundabout to take into consideration any geometric delay.
- Urban Arterial Road
- TT, VOC, CO_2 for intersections based on Sidra default outputs except for a 100% peak flow factor
- Crash cost estimated based on Crash Estimation Compendium.

7.1.3 Reference Case

The 'Do Minimum' option has been assumed to retain the existing intersection configuration. However, the economic evaluation assumes that the Klinac Lane link has been built as part of the Do Minimum network. Accordingly, the Do Minimum network has some change in trip distribution in the network, with more traffic using Waipapa Loop Road.

A sensitivity test has been carried out that excludes the Klinac Lane link in the Do Minimum network.

For all options (including the Do Minimum) and sensitivity tests only the benefits from the SH10/Waipapa Road intersection have been considered. Hence, any cost and benefits from the Klinac Lane extension has been ignored. The reason for is to simplify the economic evaluation and capture the main benefits which are associated with the SH10/Waipapa Road intersection.

7.2 Economic Summary: Assessed Options

Table 12 provides a summary of the assessed options for the SH10/Waipapa Intersection. The values in the table all reflect the net cost or benefit for the Preferred Option in comparison with the Do Minimum option. All values are the net present values over the 40-year analysis period using a discount factor of 6%.

Table 12: NPV net cost and benefits for Preferred Option in comparison with the Do Minimum

SHORTLISTED SCHEME OPTIONS	OPTION 1 RIGHT TURN BAY	OPTION 2 ROUND-ABOUT	OPTION 3 TRAFFIC SIGNALS	OPTION 4 HEAD TO HEAD RIGHT TURN BAYS	OPTION 5 CLOSE WAIPAPA LOOP ROAD
NPV Option Cost (k)	$5,061	$6,260	$5,837	$5,434	$4,998
BENEFITS					
NPV Travel Time Savings (k)	$11,199	$14,572	-$8,840	$11,200	$10,834
NPV Vehicle Operating Costs (k)	$3,180	$4,086	$2,826	$3,181	$2,897
NPV CO2 Emissions (k)	$195	$273	$180	$195	$181
NPV Accidents (k)	$320	$452	$23	$320	$320
NPV Total (k)	$14,895	$19,384	-$5,810	$14,896	$14,232
BCR	**2.9**	**3.1**	**N/A**	**2.7**	**2.8**

As the table above illustrates, all assessed options have a BCR between 2.7 and 3.1, with the exception of the signalised option that has negative benefits and hence a BCR on this option was not considered further. The Roundabout option has the highest benefits in comparison with the Do Minimum option but also has slightly higher costs.

The economics assessment worksheets are presented in **Appendix J**.

The Roundabout is the preferred option in this analysis because it is the only option that increases the capacity in the intersection. This means that the initial investment for the roundabout will provide benefits for a longer period of time, will best manage high traffic growth and will not be as sensitive to change in traffic turning patterns. The roundabout also caters well for all traffic movements in the intersection, whilst most other options except traffic lights prioritise SH10 movements at the expense of, a still quite poor level of service for, side traffic.

7.3 Economic Summary: Recommended Project Option

Table 13 provides a summary of the recommended option for the SH10 / Waipapa Intersection. The values in the table all reflect the net cost or benefit for the preferred option in comparison with the Do Minimum option. All values are the net present values over the 40-year analysis period using a discount factor of 6%.

Table 13: NPV net cost and benefits for Preferred Option in comparison with the Do Minimum

PREFERRED OPTION	ROUNDABOUT
NPV Cost (k)	$6,260
BENEFITS	
NPV Travel Time Savings (k)	$14,572
NPV Vehicle Operating Costs (k)	$4,086
NPV CO2 Emissions (k)	$273
NPV Accidents (k)	$452
NPV Total (k)	**$19,384,597**
BCR	**3.1**

7.4 Comparison with Earlier Stages

This project is a Single Stage Business Case and no previous economics were undertaken for this project.

7.5 Sensitivity Analysis

Table 14 outlines the results of sensitivity testing undertaken on the SH10 / Waipapa Intersection economic outputs. The results of the sensitivity analysis indicate BCR's of ***between 1.9 and 3.7***. As with most economics, the intersection BCR is the most sensitive towards changes in the assumed traffic growth. The base case has assumed an annual growth of 2.2% growth up to 2036, which is not unreasonable as growth over the last 5 years has been in the range of 4% per annum.

In all scenarios, the Roundabout option has the highest BCR of the tested intersection layouts. The reason for this is that the roundabout layout has the longest intersection life expectancy for good capacity in relation to traffic growth, and is not sensitive to changes in traffic flows or travel patterns.

Table 14: Benefit Cost Ratio – Sensitivity Test

TEST PARAMETER	VALUE	BCR
Without Klinac lane Link	Remove the Klinac Lane from the Do Minimum (Reducing vehicles on Waipapa Loop Road)	1.8
Growth Rate	1%	1.4
	3%	4.3
Discount Rate	4%	4.6
	8%	2.1
Construction Cost	+20%	2.5
	-20%	3.8

7.6 Incremental Analysis

An incremental benefit analysis has been undertaken to illustrate the economic return for the additional investment between each of the options. However, it should be noted that the variation in construction cost estimates between the different options is relatively small, and there is little scope to implement this project in stages. As Figure 20 illustrates the construction cost for all options range from approximately $5M to $6.1M. It also shows that the Roundabout option provides the most benefits. In relation to the BCR, the incremental BCR for the Roundabout is 3.1 in comparison with Option 1: Right Turn Bay.

In other words, for the additional $1.4M invested in the Roundabout the economic return is around $5M. In addition, the capacity life of the roundabout is superior in comparison with all of the other options, which makes it the favoured option.

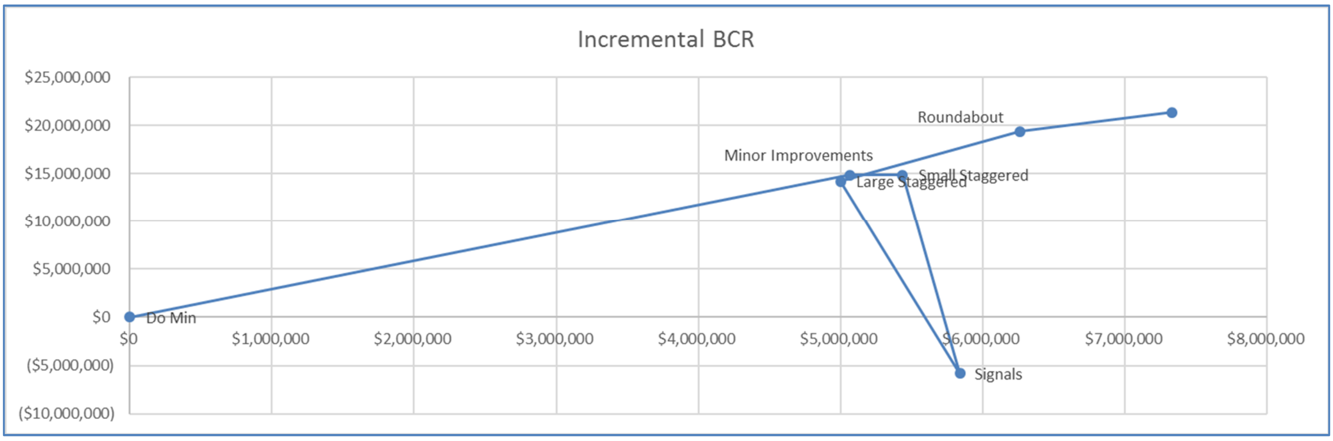


Figure 20: Incremental analysis

7.7 Assessment Profile

An assessment profile of **MHM** has been determined for the Preferred Option of the Roundabout and Corridor Treatment. The derivation of the assessment profile is discussed below.

7.7.1 Strategic Fit Rating

Assessing the project from both a national and local context, the project has been rated as a **Medium** strategic fit.

National Context

SH10 is part of Twin Coast Discovery Highway that was created in 1999, and is considered nationally significant. In 2016, the NZ Transport Agency, along with a number of local and regional councils, proposed to investigate future investment opportunities on the Twin Coast Discovery Route and developed the Twin Coast Discovery 'Corridor Plan'.

The Programme Business Case is currently under internal review. The aim of this Corridor Plan is to make the route safer and more reliable, as well as providing better accessibility to main centres for tourists, local communities and freight operators.

Regional Context

The project fits well with the Tai Tokerau Northland Economic Action Plan. Whilst that plan has an obvious economic focus, it also recognises the importance of a 'safe and efficient' road network to support the growth in freight and visitors, particularly through the revitalisation of the Twin Coast Discovery Route.

Furthermore, the Regional Land Transport Plan places considerable importance on the upgrade of the road network linking Waipapa, Kerikeri and Paihia, recognised as dominant centres of activity.

Waipapa has been identified as one of the key areas to support economic growth and opportunities to intensify industrial, commercial and retail development in the Waipapa-Kerikeri area. The Preferred Option in this DBC is an essential part of the plan to support this strategically important growth.

7.7.2 Effectiveness Rating

The preferred intersection upgrade option and attendant corridor improvement, in combination with the council-driven Klinac Lane Extension, has been rated **High** as a network improvement in relation to **Effectiveness**.

The preferred network, corridor and intersection option provides an effective solution to address the identified problems and achieve the project objectives. The proposed roundabout is the superior intersection layout to reduce the existing delays experienced by local traffic without significant effects on the SH10 through-traffic. A roundabout at this location also improves access to and from Waipapa Loop Road and therefore encourages further development opportunities with the Waipapa industrial/commercial zone. The proposed corridor improvement is a cost-effective solution to address a number of current safety problems and provide a more integrated road network. The proposed roundabout will provide safer local access and will also reduce speed through Waipapa on the State Highway, which will have safety benefits for both motor vehicles and vulnerable road users.

7.7.3 Efficiency Rating

The economic assessment undertaken for the SH10 / Waipapa Road intersection indicates the project would result in a **BCR of 3.1** and therefore the project has been ranked as **Medium** in relation to **Efficiency**.

The economic benefits outlined in the assessment are primarily from travel time benefits within the intersection. This ignores any wider benefits from the project such as inward economic investment into the Waipapa area. The project will enable growth within the area which is considered to be a positive, generating its own benefits. These latter factors suggest the Efficiency benefit is actually higher.

PROCESS FOR IMPLEMENTATION

8. FINANCIAL CASE

8.1 Summary

The Financial Case concentrates on the affordability of the proposal, its funding arrangements and technical accounting issues.

The total project 'Expected Cost' for the Preferred Option and Waipapa Corridor Treatment is $7,069,265 including property, pre-implementation and contingency, assuming commencement of pre-implementation in 2017 and implementation in 2018.

Ongoing periodic maintenance and renewal costs are estimated at $60,000 per year.

Methodology

The methodology for the cost estimation carried out for this report was as follows:

- Elemental breakdown cost estimation was completed for the Do Minimum and the Short List Options[2].
- Base Estimate is based on the elemental cost estimation.
- Expected Estimate is based on a percentage increase to the base estimate due to the level of uncertainty, either in terms of the design stage or the variability in the rates. This, in most cases, means a 10% addition for variation in the quantities/rates. For items with greater level of uncertainty including property, pre-implementation fees, and service relocations; a 20% contingency has been added.
- 95th Percentile Estimate is based on taking into account funding risk contingency and semi-quantitative risk analysis. This has resulted in the addition of 10% to the property cost, and 10% to the pre-implementation. Risk Cost (Item 13 of the Physical Works) has been worked out from the project risks identified in the Risk Register (**Appendix K**), weighed against the likelihood of the risk occurring.

8.2 Project Delivery Costs

The costs estimates have taken into consideration the following:

- Nett property costs
- Design costs
- Construction costs (including Preliminary & General (P&G))
- Risk Analysis: General Approach (semi-quantitative)
- 'State of market' premium

The Elemental Costs and Detailed Business Case Estimates (DBE) for each option are presented in **Appendix K.** The Expected Costs for the Preferred Option and associated works are presented in Table 15.

[2] The methodology is written for how the cost estimates were arrived at for all the Options, however only the Preferred Options costings are detailed in this section. The elemental cost and detailed business case estimates are presented in Appendix J.

Table 15: Summary of Detailed Business Case Cost Estimate for Preferred Option and associated works

CRITERIA	SUMMARY OF PROJECT COSTS	ASSUMPTIONS
Roundabout	$7,069,265	
Klinac Lane Extension[3]	$494,429	Part funding from Far North District Council.
Waipapa Corridor Treatment[4]	$891,580 (*base cost only*)	Waipapa Corridor Treatment cost is included in the option cost.
TOTAL	**$7,563,694**	

Pre-Implementation

The following table outlines the key project delivery cost assumptions for the Preferred Option during the pre-implementation phase.

Table 16: Pre-implementation project delivery key costs and assumptions

CRITERIA	KEY COSTS AT PRE-IMPLEMENTATION – KLINAC LANE	KEY COSTS AT PRE-IMPLEMENTATION – PREFERRED OPTION (ROUNDABOUT)[4]	ASSUMPTIONS
Property Purchase, Management and Disposal Costs	$0	$1,198,500	Property purchase to forward as voluntary with no significant compensation costs.
Design & Procurement Costs	$43,752	$508,089	13%[5] of base physical works estimate. Klinac Lane Extension and Preferred Option to be procured as a package.
TOTAL	**$43,752**	**$1,706,589**	

[3] Klinac Lane Extension works are expected to form part of the solution alongside the Preferred Option to gain the full benefits of the scheme. FNDC are the partners to NZTA in this scheme and will provide part funding for the Klinac Lane Extension works.
[4] The costs for the Preferred Option: Roundabout include the costs for the Waipapa Corridor Treatment.
[5] The percentage assumption is used to derive the fees that forms the **Base Estimate.**

Implementation

Table 17 outlines the key project delivery cost assumptions for the Preferred Option during the implementation phase.

Table 17: Implementation project delivery key costs and assumptions

CRITERIA	KEY COSTS AT IMPLEMENTATION – KLINAC LANE	KEY COSTS AT IMPLEMENTATION – PREFERRED OPTION (ROUNDABOUT)[6]	ASSUMPTIONS
Implementation Fees	$36,715	$426,369	10% of base physical works estimate.
Statutory application costs	$0	$55,000	
Construction Costs	$413,962	$4,881,307	• Timing assumptions – x1 construction season in 2018. • Earliest implementation date – it is assumed that the project will commence in 2018. • Expected duration of implementation – it is assumed that the expected duration of implementation will be 6 – 9 months. • Supplier Market – it is assumed that there may be an increase in construction project costs as a result of market forces due to higher levels of construction activity, and that this will be reflected in increases in the cost of labour/materials and fees. • 15% accounted for Supplier market premium costs. Service relocation costs are estimated. P&G estimated at 8% of the physical works.
TOTAL	**$450,677**	**$5,362,676**	

The cost estimate in this report has been carried out based on the NZ Transport Agency's Cost Estimation Manual (SM014).

[6] The costs for the Preferred Option: Roundabout include the costs for the Waipapa Corridor Treatment.

DBE Notes:

These costs will require further refinement at preliminary design stage. The order of cost will be sensitive to further information and market forces. The costs for service relocation are estimates only.

It is understood that a cost estimate has not been previously produced for this project. It is the aim of this cost estimate to be as comprehensive as appropriate at this early stage of the project lifecycle, and reflects the cost risk analysis to provide some contingency and project costs (actual and forecast).

Property

Land Requirement Plans were drafted for the short-listed options to establish the extents of the property that would have to be acquired for each. Table 18 summaries the land requirements with rough order magnitude (ROM) cost estimates.

The Land Requirement Plans are presented in **Appendix L**.

Table 18: Property affected in the project site from the Preferred Option

SHORTLISTED OPTIONS	PROPERTY REQUIREMENTS	ESTIMATED AREA TO BE ACQUIRED	NETT PROPERTY PURCHASE COSTS
Do Minimum – Klinac Lane Extension		0	$ 0
Roundabout	Lot 2 DP 22952, Lot 2 DP 72659, Lot 1 DP 153739, Lot 1 DP95010, Lot 2 DP 153648	1504m^2 *(add the area for the dairy)*	$ 998,750
Waipapa Corridor Treatment*	Lot 1 DP 153739, Lot 4 DP 98489, Lot 3 DP 98489, Lot 4 DP 102236, Lot 5 DP 102236, Lot 3 DP 99619	491m^2	46,750*
**Waipapa Corridor Treatment nett property purchase cost is included in each of the option costs.*			

Services

A desktop study of the services in the project site identified energy, potable water, storm water, and telecommunications services. The various service authorities were contacted for their initial relocation estimates based on the requirements of the Preferred Option. The Expected Estimate includes services relocation costs of **$1,548,000**.

These estimates are detailed in **Appendix J**.

The Concept Plans with the services overlain for the Preferred Option 1-11751.00 X02, X20-25 Revision C are presented in **Appendix H**.

Ongoing Maintenance and Operation Costs

The ongoing maintenance cost would involve the roundabout landscaping maintenance and the pavement maintenance including the corridor and the intersection. Table 19 gives an outline of the key ongoing expenditure assumptions for the recommended option.

Table 19: Ongoing operation and maintenance costs for the Preferred Option

CRITERIA	KEY COSTS	ASSUMPTIONS
Operating Costs	NA	NA
Maintenance Costs – short term	$60k Annually	Maintenance includes general maintenance and repairs (road signs, lighting, etc.), and roundabout landscaping, roadside landscaping (to maintain safety) and weed control.
Maintenance Costs – long term	$600k in 20 years' time	Maintenance includes road maintenance and repairs (pavement rehabilitation, etc.)
Other Costs (Insurances, etc.)	N/A	None

8.3 Option Cost Risk Analysis

The risk analysis was carried out in accordance with the NZ Transport Agency's Minimum Standard Z/44 – Risk Management Version 4, Apr 2015. As the estimated project cost is <$20M; the General Approach (i.e. interpretation of semi-quantitative data) to risk analysis has been undertaken.

17 risks have been identified so far including risk costs and time risk costs, of which 16 are threats and 1 is an opportunity. 5 threats have been identified as extreme risk and 8 as high risk.

The extreme risks (prior to any mitigation measures being implemented) are related to:

- consenting conditions that may be placed in reference to the flooding issues in the area.
- the potential requirement for the relocation of power poles at the north end of Loop Road and the western end of Skippers Lane (*Roundabout option only*).
- the lack of clarity around the funding for the treatment of Klinac Lane.
- the former orchard site, a portion of which will be required for the preferred option, and
- the petrol filling station, a portion of which will be required for the preferred option.

The Risk Register that details the identified risks with their owners and suggested mitigation measures is presented in **Appendix K**.

8.4 Project Revenues

No project revenues are forecast for this project.

8.5 Funding Options

Subject to meeting overall thresholds for investment, it is anticipated that the activity can be funded in the main from the National Land Transport Fund (NLTF) and Road Improvement Activity Class. There is some additional funding that can be obtained from the Far North District Council towards the Klinac Lane Extension.

8.6 Funding Risk

There are no funding risks foreseen at this stage.

9. COMMERCIAL CASE

This chapter provides evidence on the commercial viability for this DBC and the procurement strategy that will be used to engage the market.

9.1 Contract Form

It is proposed that the project is delivered using a traditional design approach considering the scale of the project, the anticipated timeline for delivery and the flexibility this provides the NZ Transport Agency.

A Measure and Value contract form is therefore anticipated, which will require a full detailed design with technical specification and a detailed schedule of quantities for pricing. There are no unusual processes identified at this time that could complicate the construction process.

Tenderers will need to be pre-qualified for construction level 4B with the required management, quality, safety and technical support systems.

9.2 Implementation Strategy

The implementation strategy has been developed consistent with the NZ Transport Agency's Procurement Manual, 1st Edition, Nov 2009.

The proposed implementation strategy is aimed at a mid-2018 contract award, assuming property acquisition proceeds by agreement. Table 20 outlines the proposed implementation programme, the indicative programme is presented in **Appendix M**.

Table 20: Proposed implementation programme

PROJECT IMPLEMENTATION MILESTONE	APPROXIMATE COMPLETION DATE
Approval of Business Case	20 October 2017
Appointment of Professional Services Supplier	27 October 2017
Stakeholder Engagement / Statutory Consenting – initial	20 October 2017
Stakeholder Engagement / Statutory Consenting	9 April 2018
Detailed Design and Specification for Request for Proposal (RFP)	25 June 2018
RFP to market (competitive tender – price quality)	9 July 2018
Close of RFP	10 August 2018
Preferred Respondent announced	7 September 2018
Contract Award	7 September 2018
Physical Works Commencement	10 September 2018
Handover of Capital Project	1 April 2019
Post-Project Evaluation	19 April 2019

NB. Fitting the whole of the Works into a single construction season may be tight, so the implementation strategy should look for opportunities during the detailed design phase to separate our early procurement of some advance works (e.g. services relocations).

9.3 Consenting Strategy

Most NZ Transport Agency projects require statutory authorisations ranging from a relatively simple outline plan of works for projects which can be constructed under the authority of an existing designation, to obtaining multiple resource consents, statutory authorisations and designations.

The Preferred Option, the Roundabout, was the second most favourable in terms of consenting and is not anticipated to be too difficult in its implement ability. The designation will only need to be extended by a small amount; towards the corner of the petrol station and orchard. It is expected that there will be sufficient detail available to provide to the territorial authority such that the works could be authorised through an alteration to the designation.

Activities regulated under other statutory instruments other than the District Plan will be assessed for compliance and applications lodged for consent where permitted activity provisions are unable to be met. This can include any breaches of Regional Plan rules or a National Environmental Standard.

The information supplied for statutory approvals should achieve the following objectives:

- To lodge applications with sufficient detail to avoid ongoing requests for further information.
- To obtain statutory authorisations with reasonable/practical conditions, which still allow for helpful innovation on site.

The Planning and Environment Assessment Report presented in **Appendix N** outlines the means of achieving this outcome.

9.4 Property Acquisition Strategy

Land acquisition will be required for this project and will be achieved by constructive agreement as best practical, which seems likely in most cases, but also in accordance with the Public Works Act 1981 where necessary. The NZ Transport Agency engage Crown Property Services Ltd[7] (CPS) to manage their land acquisition requirements.

A CPS Representative, the NZ Transport Agency Business Case Project Manager, and the FNDC Project Manager have been in initial conversations with all the landowners principally affected by the proposed Waipapa Intersection Improvement works. These initial conversations have involved familiarising the landowners with the project aims and scope, and listening to the landowners respective views. The Stakeholder Consultation and Engagement Report, presented in **Appendix O**, presents more detail regarding the parties affected and their reaction to the proposed works.

9.5 Procurement/Delivery Model

Table 21 discusses the criteria considered for selecting the procurement/delivery model as best suits the preferred option and its context (*as per Appendix B of the Procurement Manual*).

[7] CPS are a Land Information New Zealand (LINZ) accredited specialist.

Table 21: Delivery Model selection

CRITERIA	DEFINITION	PREFERRED OPTION ASSESSMENT	INFRASTRUCTURE: STAGED	INFRASTRUCTURE: DESIGN & BUILD	INFRASTRUCTURE: SHARED RISK (ADVANCED)	INFRASTRUCTURE: SUPPLIER PANEL (ADVANCED)
Complexity	Levels of complexity including: Structural complexity is the number of varied components and the interdependence of these components.	The Preferred Option: Does not comprise particularly varied components but a single roading component with enabling and associated works well within the remit of a roading contractor.	✓			
	Technical complexity is the extent to which untested or new technical issues need to be addressed in delivering the activity.	Is not envisioned to encounter any untested or new technical issues.	✓			
Uncertainty	Is there uncertainty existing in the methodology and expected outcomes?	No	✓			
	How many separate components exist in the activity?	The preferred option only has one component, namely the roading works including the widening of the Waipapa Corridor treatment, Intersection treatment in terms of a roundabout, and associated works (shared cycle, walkway, Klinac Lane extension).	✓			
	Are these components interdependent?	N/A	✓			
Scale	Scale of the contract including: Will more than contractor be required for the project implementation?	No	✓			

CRITERIA	DEFINITION	PREFERRED OPTION ASSESSMENT	INFRASTRUCTURE: STAGED	INFRASTRUCTURE: DESIGN & BUILD	INFRASTRUCTURE: SHARED RISK (ADVANCED)	INFRASTRUCTURE: SUPPLIER PANEL (ADVANCED)
Timing and urgency	What is the expected delivery date for this project?	2018-2019	✓			
	Which delivery model is likely to optimise activity delivery time?	It is recommended that the model likely to optimise delivery time is the Staged Delivery Model with Direct Appointment.	✓			
Innovation potential	Would the introduction of incentives encourage innovation such that: - project quality and efficiency are increased? - delays and risks are minimised?	There is scope for improvement in efficiency with incentives. There is scope for minimising delays and risks with incentives.	✓			
Supplier Market	Will the project attract a highly competitive market of potential suppliers? or is the activity profile likely to attract a supplier market that will be lacking in competition?	It is likely that due to the scale of the project and the current market activity the project may be more attractive to the suppliers if the turn-around from procurement to project delivery was short.	✓			
Risk management: What is the status of the following risks for the Preferred Option? *(The risks mentioned here are from the Risk Register (Appendix J) and comprise semi-quantitative*	Cost and time risks	The cost and time risks for this project are envisioned to be low with the exception of: 1) Property acquisition 2) Services relocation 3) Contaminated land (former orchard and petrol filling station)	✓			
	Quality risks	The quality risks for this project are envisioned to be low.	✓			
	Technical risks	The technical risks for this project are envisioned to be low.	✓			
	Scope risks	The scope risks for this project are envisioned to be low.	✓			

CRITERIA	DEFINITION	PREFERRED OPTION ASSESSMENT	INFRASTRUCTURE: STAGED	INFRASTRUCTURE: DESIGN & BUILD	INFRASTRUCTURE: SHARED RISK (ADVANCED)	INFRASTRUCTURE: SUPPLIER PANEL (ADVANCED)
assessment prior any treatment strategy.)	Third party risks	The third-party risks for this project are envisioned to be low - medium.	✓			

9.6 Implementation Trigger

The main trigger for implementing this project is that the intersection of SH 10 / Waipapa Road has already reached capacity, which means that any growth in traffic will result in longer queues and longer delays. As this Business Case more fully covers, there are various other shortcomings also supporting that trigger, such as increasing safety problems.

9.7 Risk Allocation and Transfer

Risk will be allocated in accordance with a traditional Client/Consultant/Contractor model and apportioned in accordance with the relevant standard conditions of contract (typically NZ3910:2013).

Start and end of phase risk assessments will be completed for design, tendering and construction.

9.8 Pricing Framework and Special Payment Mechanisms

The pricing framework will be based on similar works and traditional procurement. Given the relatively routine nature of the physical works envisaged, no financial performance based incentives will be made available to the Contractor.

9.9 Works Contract Length

It is expected that the bulk of the physical works will be completed within 6 months, although this may be quite tight so needs closer consideration in due course. It is recommended that during the pre-implementation phase, a procurement strategy is developed, which should consider to potentially split off packages of work to optimise the timing of the physical works.

9.10 Contract Management

The Professional Services provider will have end-to-end accountability for the works contract. The assigned Project Manager will manage the project through all phases, with active scheduling and management techniques expected to be employed. Support for in-service management should be sourced from the Professional Services provider's wider resources as appropriate for the task complexity.

The pre-implementation phase is likely to take six to nine months from approval, dependant on stakeholder consultation outcomes, and statutory requirements.

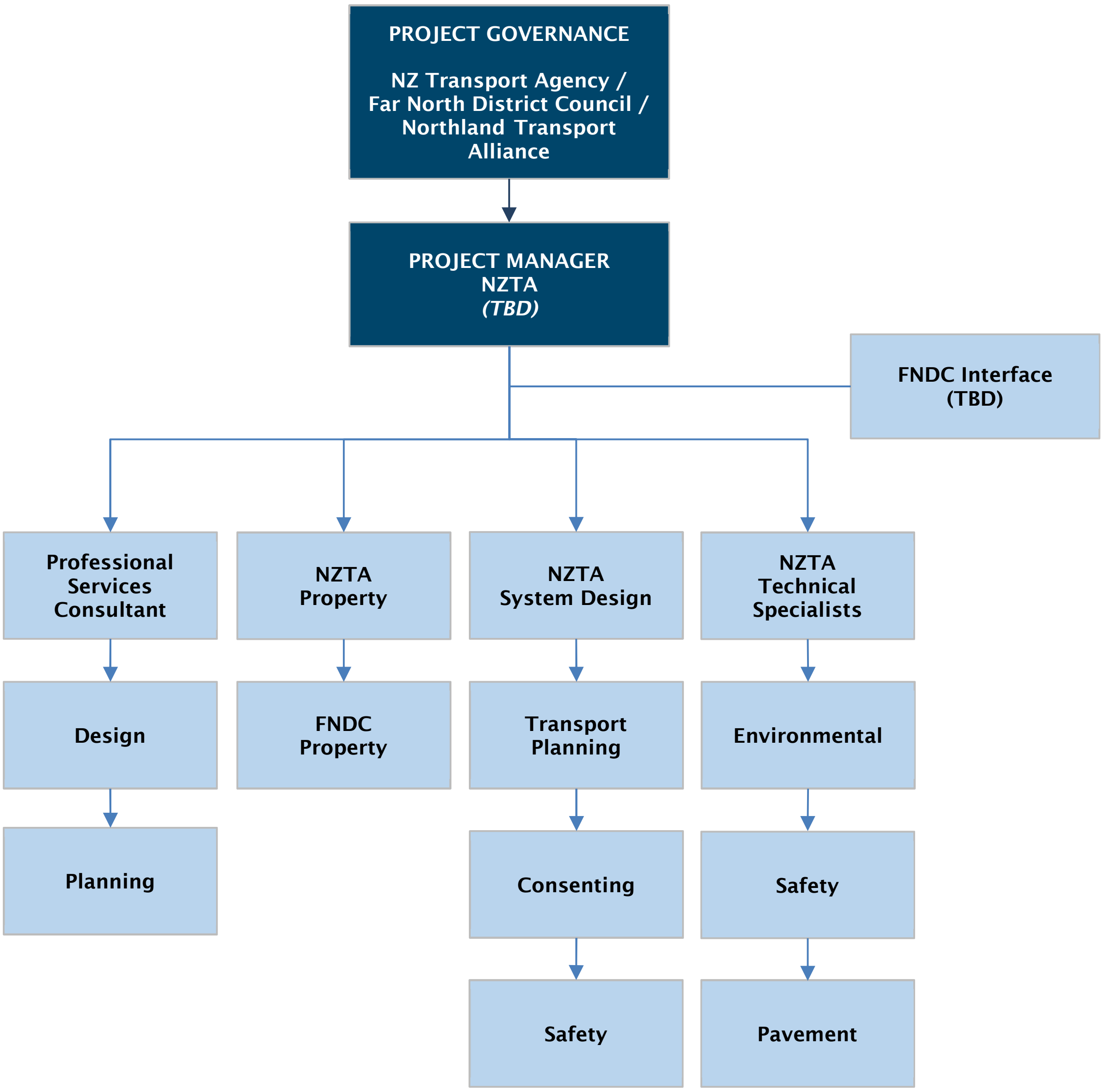
10. MANAGEMENT CASE

10.1 Governance Structure and Project Roles

This project will be delivered by the NZ Transport Agency working with their appointed consultants and contractor. The Regional DMT will be responsible for committing funds and accepting risk allocation.

The governance structure is established by the NZ Transport Agency, and includes stakeholders who will variously influence of the development and finalisation of the contractual, financial, and other arrangements. It is presented as Figure 21 below.

Figure 21: Project Governance Structure



10.2 Project Roles

The project team and roles will be confirmed by the NZ Transport Agency on business case approval and the subsequent project phases of pre-implementation and implementation.

10.3 Project Metrics

The project metrics include the following:

Business Case Approval

This Business Case will be put forward to the NZ Transport Agency's Investment Finance Team (IFT) seeking approval for the project. The Business Case will also be put forward to Dougal List, Manager Regional Development.

Project Assurance

The NZ Transport Agency HNO's acceptance criteria will be met by following the key project assurance protocols for the project pre-implementation and implementation phases, including IFT approvals for Funding and Implementation Phase, Detailed Design, Project reviews, and Procurement phases.

Detailed Design

The Detailed Design will be carried out by the nominated Professional Services Consultant who will develop the Preferred Option for the implementation phase. This design will be cognisant of and compliant with the NZ Transport Agency and Austroads Standards.

Reviews and Audit

The Detailed Design will be peer-reviewed at 90% completion by a suitably qualified and experienced person independent of the design team, and nominated by the NZ Transport Agency.

A Safety in Design (SiD) Review will be carried out at the following stages of the project prior to proceeding to the next stage:

- Scheme/Preliminary Design Stage
- Detailed Design Stage

The Safety Audit is similarly an independent review, and aims to identify any deficiencies potentially remaining in the design that could affect the safety of road users. The objective of a road safety audit is to help ensure a project achieves an outcome that is consistent with the "Safer Journeys" strategy and the "Safe System" approach, which of course seek to avoid occurrences of serious injury or death. As such specific safety audits will be undertaken at the following stages:

- Detailed Design
- Post-Construction

Consistent with these aims, a Safety Audit has been conducted at the current stage (Scheme/Preliminary Design) and is presented in **Appendix O**.

Any design departures that are approved by the NZ Transport Agency during the tender stage will be fed into the safety audit process for assessment.

Procurement and Contract Award

The procurement will be carried out as per the procurement procedure set out in the NZ Transport Agency's Procurement Manual, 1st Edition, Nov 2009. The procurement procedure to be followed for this project is Staged Delivery model, Professional Services supplier – Direct Appointment, and Physical Works supplier – Price Quality.

Post Project Evaluation Planning

The post project evaluation will be carried out as detailed in Section 10.8 of this report.

10.4 Change Control

An approval process to track change/s whether they receive approval or not is proposed. The Project Manager will brief anyone who is involved in completing a task as part of the Project on the Change Process.

Levels of change authorisation should be established at the outset of each phase. Any Change Request must include a detailed description of the proposed change and its impact on the Project as a whole, in respect to time, cost and quality.

Some changes could have significant impact and these would require PCG/Project Sponsor approval. It is for the Project Manager to determine the level of authorisation required. Once approved, the tasks will be updated and reissued.

10.5 Stakeholder Management

The stakeholder management process is set out in the Waipapa Intersections Upgrade, Stakeholder Consultation and Engagement, September 2017 presented in **Appendix P**. It discusses the consultation approach following the NZ transport Agency's guidance and indicates how this translates into an engagement process.

Consultation and engagement to date has been targeted at the strategic end of the Project profile and this has resulted in the Preferred Option: Roundabout receiving a high-level of support from the Waipapa community during a well-attended Open Day.

Continued engagement and consultation will be necessary during detailed design, particularly with key stakeholders, affected landowners and businesses. The purpose of consultation and engagement during this phase will need to be clear, particularly where decisions have already been made.

Consultation programmes therefore should be developed around the Project phases of procurement and construction to identify timelines, objectives of engagement, risks, purpose of engagement, methods, measurables and evaluative actions/feedback loops.

As such going forward, the project team will have a dedicated Stakeholder Manager responsible for involving and leading the key stakeholders through successive project phases.

10.6 Cost Management

The cost management will be carried out based on the *Scope and Cost Control Process* guidelines set out in the NZ Transport Agency's Cost Estimate Manual, SM014, Amendment 1, Oct 2015. The following statements are highlighted:

> "To ensure scope changes are identified, scrutinised, agreed and costed at the appropriate time;
>
> To ensure that there is a robust updated project cost estimate available at all times."

The project scope will be defined at the start of each phase. A cost control schedule will be set up for each phase of the project and will record scope changes (if any) and updated cost estimates. The cost control record form will be used to record in detail each individual scope change that may arise.

10.7 Risk Management

The risks identified thus far have been assessed in accordance to the NZ Transport Agency's Minimum Standard Z/44 – Risk Management (General Approach) Version 4, Apr 2015 and discussed in Section 8.3 and Appendix J: Risk Register. The Client may elect to conduct a review of the risk documents and satisfy itself of the risk management dimension of the project.

A risk management plan, including an activity risk file, and a risk adjusted programme, will be produced for the project at the Pre-Implementation stage. The risk owner(s) will be clearly defined in the risk management plan, with the process for risk identification, treatment, monitoring, and review set out along with the reporting procedures.

This plan will be managed by the Project Manager, and will remain a live document, as such will be reviewed and updated periodically.

10.8 Post-Project Evaluation Planning

The safety outcome of the project will be measured based on the number of deaths and serious injuries that are reduced. Crash records will be reviewed each year following implementation, although meaningful trends cannot be established until at least 3 years have passed since implementation so a full measure will evolve over time.

Lesson Learned

It is recommended that a *Lessons Learned* register be maintained throughout the project phases. This register is to be managed by the Project Manager and will be communicated within the team at reasonable intervals. Following project completion these lessons learnt will be fed back to the NZ Transport Agency, and any helpful follow-up action duly considered.

APPENDIX A
Waipapa Road / State Highway 10 Intersection Traffic Study

Waipapa Road / State Highway 10 Intersection Traffic Study

Waipapa Road / State Highway 10 Intersection

Traffic Study

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Date: 4 October 2016
Reference: 1-13046.00
Status: Final

Contents

Appendices

1 Background & Scope

1.1 Introduction

This traffic study has been produced for the Far North District Council (FNDC) to assess various forms of intersection control for the Waipapa Road and State Highway 10 (SH10) Intersection. The existing Waipapa Road/SH10 Intersection is designed as cross priority controlled intersection, which experiences efficiency and capacity issues for the two minor approaches especially in the peak periods.

Land use in the vicinity of the intersection is mainly commercial and the existing constraints within the intersection currently limit future commercial and industrial growth in the area.

The study aims to consider various forms of intersection control, together with various growth rate scenarios in order to provide an indication of possible intersection upgrades. Future road network changes are also considered to assess the change in traffic flows and any impact on the operation of the intersection.

An optimal form of intersection control is recommended together with the useful life (i.e. how long the recommended intersection control will operate in future years if implemented).

The location of the intersection is shown on Figure 1-1 below.

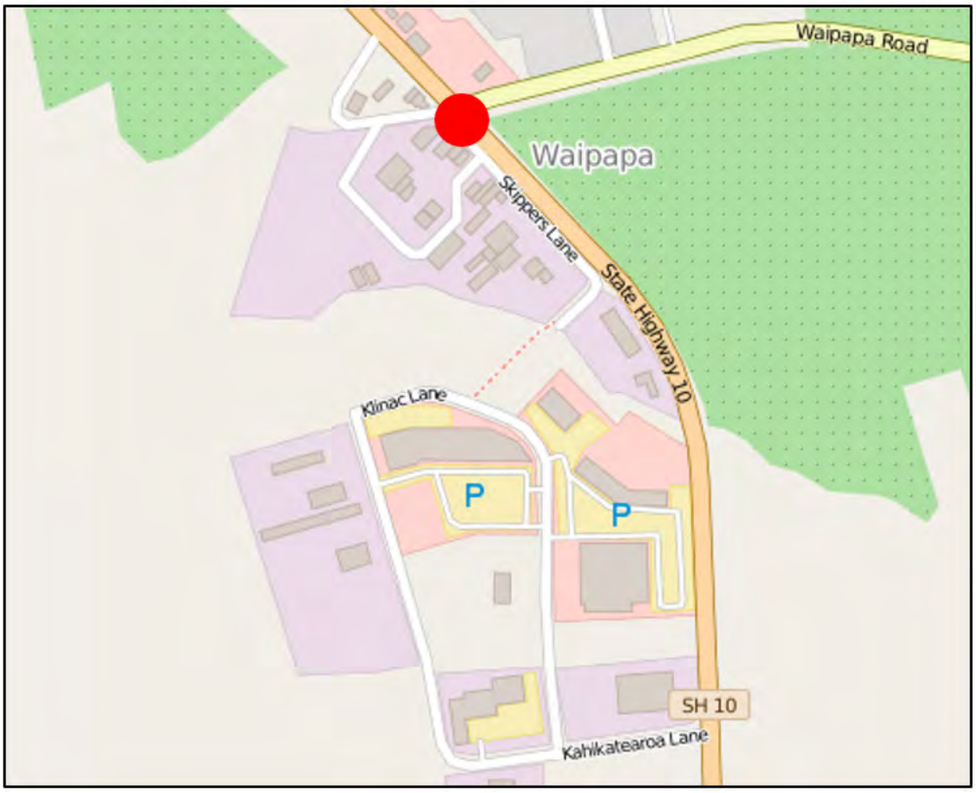


Figure 1-1 Locality Plan

The intersection is located in the Kerikeri District as shown on Figure 1-2.

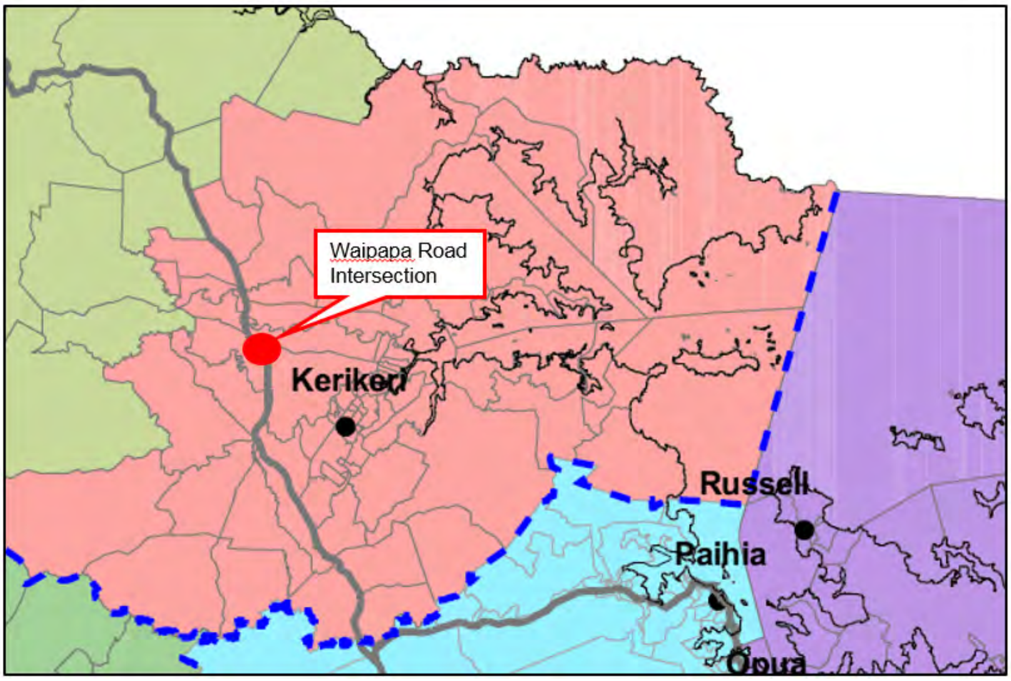


Figure 1-2 Kerikeri District

The existing intersection layout for the Waipapa Road and SH10 Intersection is shown on Figure 1-3 below.

Figure 1-3 Waipapa Road and SH10 Intersection

1.2 Objectives

The objectives of the study are to :

1. Undertake an efficiency and capacity assessment of different intersection layouts for the Waipapa/SH10 Intersection including the existing intersection layout.

2. Determine the expected life of an intersection upgrade using different growth and road network changes.

1.3 Intersection control considered

The aim of the assessment is to consider the following forms of intersection control at the Waipapa Road and SH10 Intersection:

- A priority controlled intersection (existing situation)

- An improved priority layout (left slip lane from Waipapa Road onto State Highway 10 southbound)

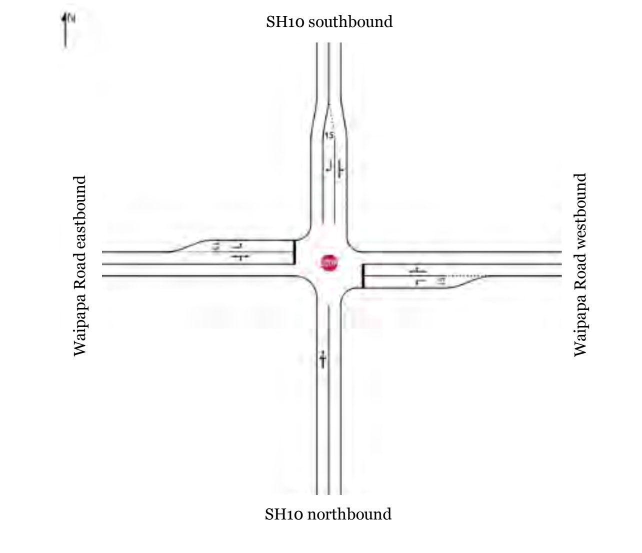
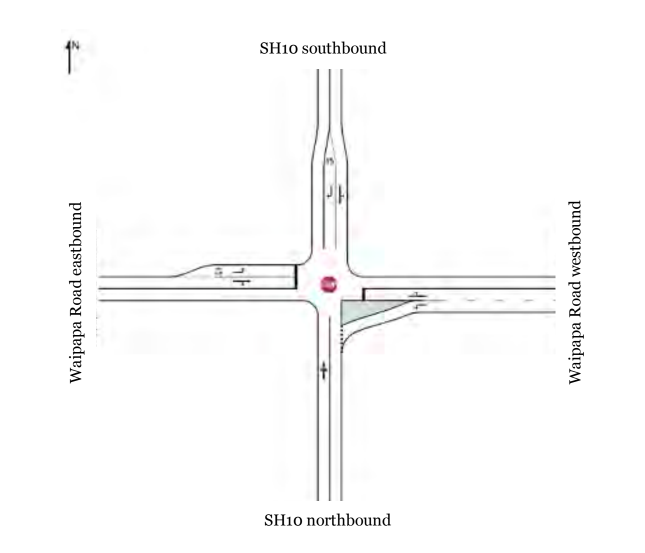
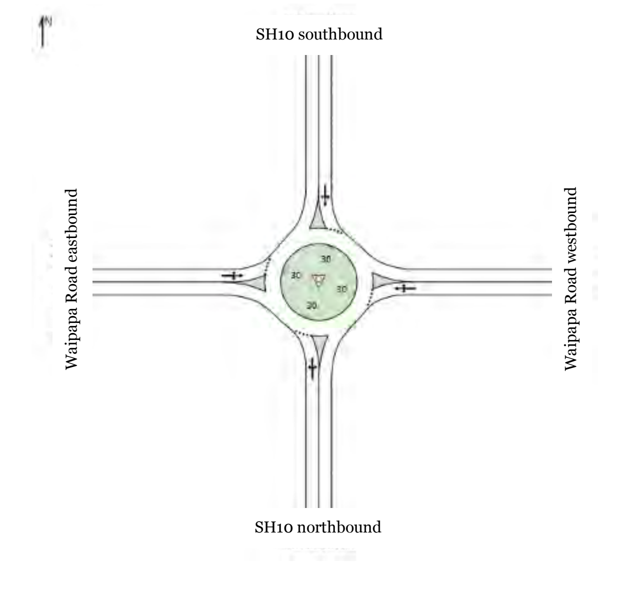
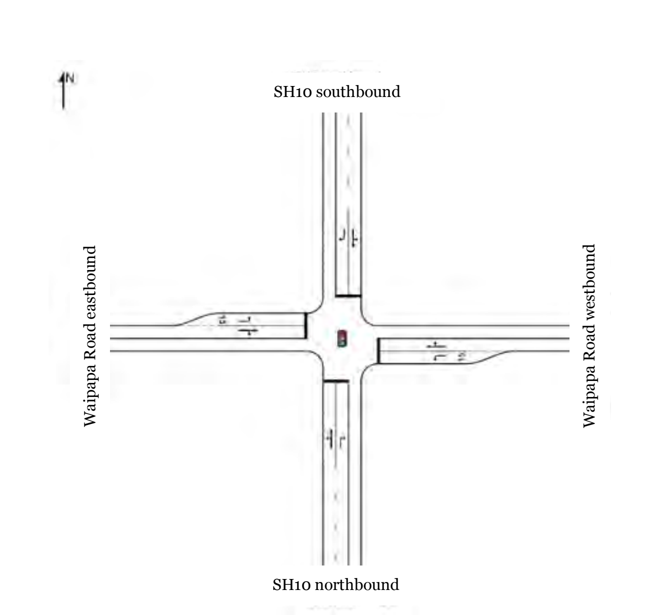
- A signalised intersection

- A roundabout

These layouts have been modelled in SIDRA Intersection version 7. SIDRA reports the performance of an intersection in terms of Level of Service (LOS) and Volume to Capacity (V/C) ratio. Level of service range from LOS A to LOS F with LOS A being free flow with no or very small delays and LOS F reflecting a congested environment with an average delay of over 60 seconds. In this location a LOS D and better during the peak periods would be considered acceptable. The V/C ratio is a function of the volume divided by the capacity. The volume for any approach can be defined as the actual number of vehicles passing a point of a road. The capacity can be defined as the maximum vehicles per hour that can pass a certain point or section of a road in a given time under ideal conditions. Any V/C ratio higher than 1 indicates unacceptable operation.

The intersection layouts considered in the study are shown in Table 1-1 below.

Table 1-1 Intersection layouts

Existing	Left Slip Lane
	
Roundabout	**Traffic Signal**
	

1.3.1 Existing layout

This is the existing operational layout at the Waipapa Road and SH10 Intersection as modelled using SIDRA Intersection 7. Short lanes for left turn movements have been provided on the western and eastern approaches and for the right turn movement on the northern approach. The existing line marking does not show these short lanes but the modelling recognises that the current approaches are wide enough to allow two turning vehicles to queue while still allowing other vehicles to pass.

1.3.2 Left slip lane

A left turn slip lane from Waipapa Road onto SH10 southbound (for which funding has been allocated in the Long Term Plan) has been considered. Short lanes were provided for turning vehicles as discussed for the existing layout above. The left slip lane was modelled with infinite lane length in order to determine required length from the queues. Using the output queue lengths from SIDRA we determined that a nominal length will be required (i.e. SIDRA showed that storage required will be less than 3 metres or 1 vehicle).

1.3.3 Roundabout layout

In 2010, AECOM undertook a scheme assessment report[1] for the Waipapa Road and SH10 Intersection. Two options were considered for the intersection :

- A single lane roundabout, with a 30m diameter central circular island
- A two lane roundabout

A single lane roundabout was recommended as the preferred improvement treatment (see Appendix A). This layout was analysed for the roundabout option in this study.

1.3.4 Signalised intersection

A signal controlled intersection with a three phase cycle was modelled. Northern and southern right turn lanes were considered on SH10.

1.4 Additional considerations

1.4.1 Klinac Lane Extensions

In addition to the above intersection options, two extensions of Klinac Lane were considered. These potential extensions will redistribute traffic using the Waipapa Road and SH10 intersection. The Klinac Lane extensions are shown on Figure 1-4.

[1] SH10 Waipapa Road Intersection Improvements, Scheme Assessment Report, AECOM New Zealand Limited, 6 September 2010.

Figure 1-4 Klinac Link Extensions

1.4.2 Pungaere Road Extension

The consequence that the southern extension of Pungaere Road will have on the Waipapa Road and SH10 intersection was considered (see Figure 1-5). If Pungaere Road is extended southwards, the existing intersection of Pungaere Road and SH10 will be closed. The redistribution of traffic due to the southern extension will mean that there is a reduction in the flows on the northern leg and an increase of flow on the eastern, western and southern leg at the Waipapa Road and SH10 intersection. The SIDRA analysis showed that for the roundabout there is a negligible increase in delay (less than 1 second) at the Waipapa Road and SH10 intersection if the link is included together with the closure. The Pungaere road extension was not considered further as there is a negligible difference in delay at the Waipapa Road and SH10 intersection.

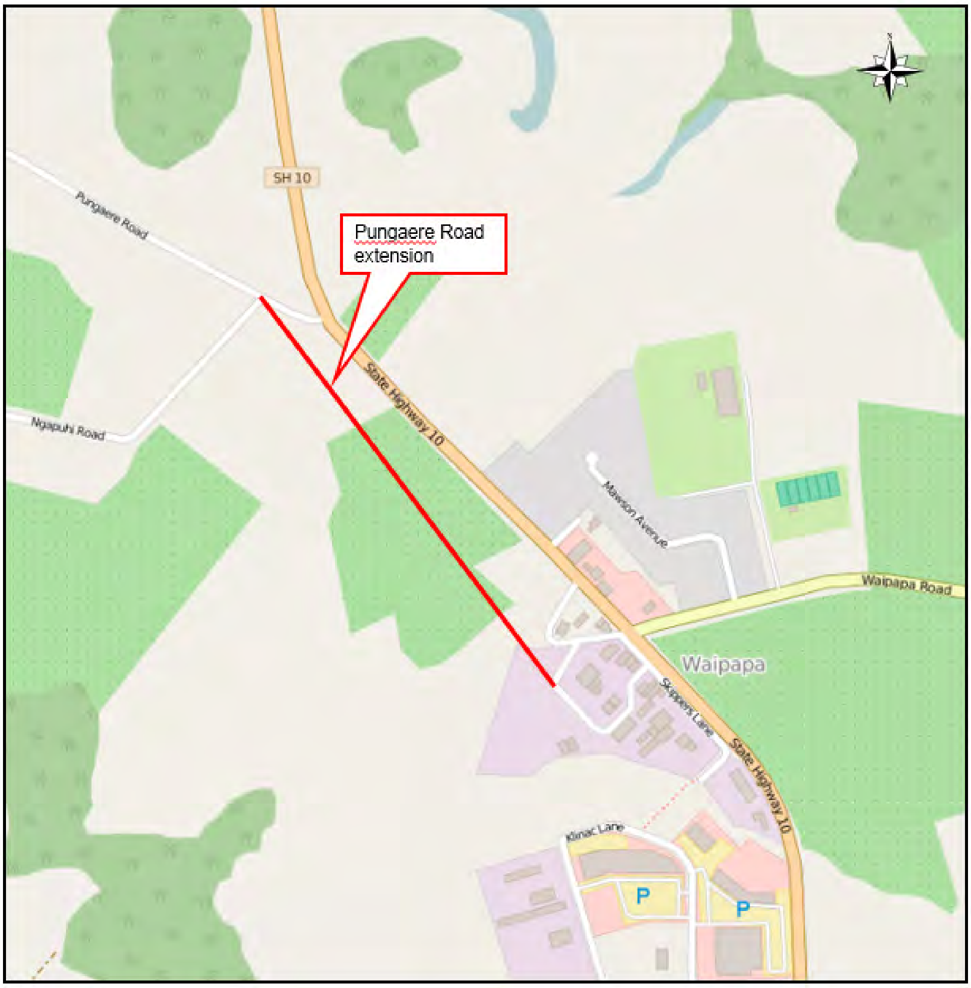


Figure 1-5 Pungaere Road Extension

1.4.3 Waipapa Recreation Ground

The District Council plans to develop an additional mixed sport and recreation facility to serve the Kerikeri area and is currently investigating potential sites. One of these sites sits to the east of SH10 and is considered sufficiently close to the study area to require consideration. The development will gain access from SH10 as shown on Figure 1-6. Only traffic on SH10 to and from the north will travel through the Waipapa Road and SH10 intersection. It is expected that the trips during the critical weekday peak periods will be low to the recreational ground development as the land uses proposed are not peak hour traffic generators. Sufficient provision for future recreation development traffic has been made in the overall background traffic growth on SH10.

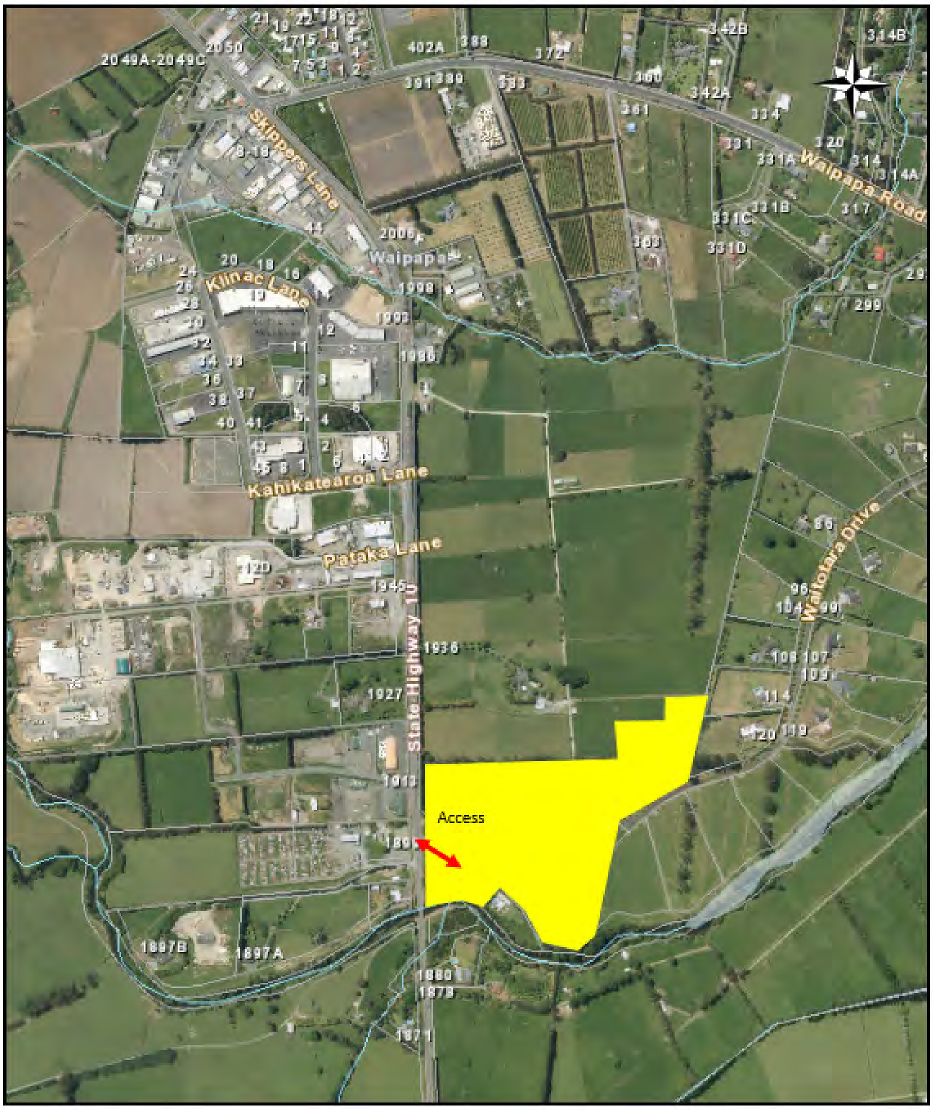


Figure 1-6 Waipapa Recreation Ground

1.4.4 Journey choice from Kerikeri

Vehicles currently travelling from Kerikeri to the north of the Waipapa Road and SH10 intersection have two routes to choose from (see Figure 1-7 below), the northern route (shown in red) and the southern route (shown in green).

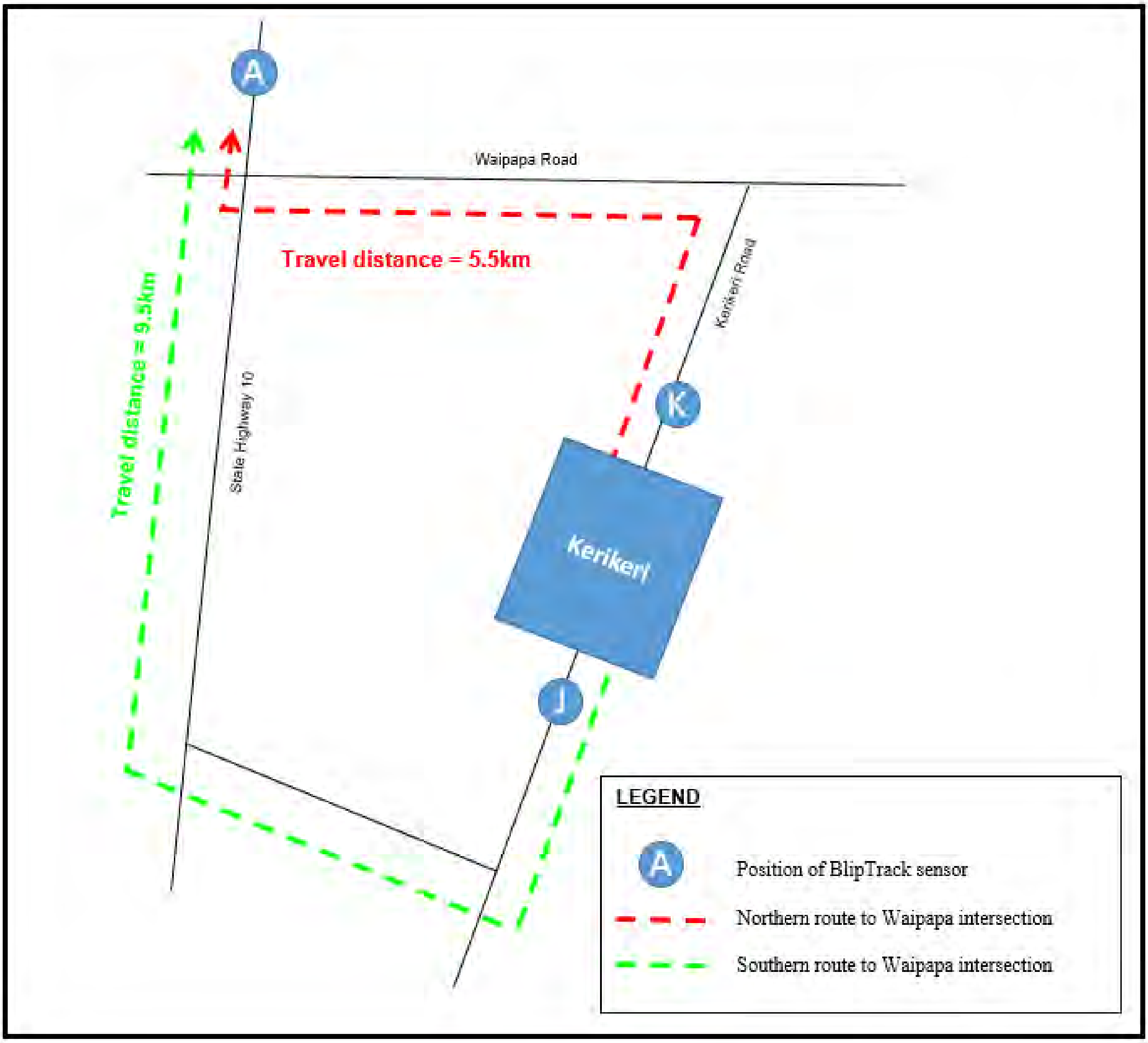


Figure 1-7 Journey choice from Kerikeri

The travel distances and travel times for each of the routes is given in Table 1-2 below. The travel times were extracted for the critical weekday PM peak from the BlipTrack data.

Table 1-2 Travel distances and Speeds

Description	Travel distance (kilometres)	Travel time - PM peak (minutes)
Northern route (K to A)	5.5km	06:00
Southern route (J to A)	9.5km	07:28

Table 1-2 shows that even though the southern route has almost double the length travel distance the travel time is only 1.5minutes longer in the weekday PM peak.

In order to determine the changes in route choice due to the long delays experienced at the Waipapa Road and SH10 intersection the BlipTrack data was further analysed. Figure 1-8 shows that fewer trips are made between J and A (southern route) in the weekday morning peak and Figure 1-9 shows that a higher proportion of trips are made between J and A in the weekday evening peak. This is due to the high delays experienced in the PM peak by right turn vehicles on the eastern approach of the Waipapa Road and SH10 intersection.

Figure 1-8 Journey choice weekday AM peak

Figure 1-9 Journey choice weekday PM peak

It is expected that if the Waipapa Road and SH10 intersection is upgraded that there will be a shift in journey choice to the northern route for trips from Kerikeri.

2 Traffic Data

2.1 General

Traffic surveys were undertaken to obtain traffic volumes, vehicle classification, origin and destination patterns and speed profiles. BlipTrack Sensors and Loop counts were used to obtain this data. The BlipTrack data was used to determine the turning volume splits and the origin destination patterns. The Loop data was used to determine the absolute traffic numbers, the vehicle classification and speed profiles. Results and findings for each of the surveys are discussed in detail below. From the BlipTrack and loop data the following peak periods were identified :

- Weekday AM peak 08:00 – 09:00
- Weekday PM peak 16:00 – 17:00
- Saturday Midday peak 11:00 – 12:00

2.2 BlipTrack sensor surveys

The BlipTrack Sensor surveys were conducted by Beca between 22 June 2016 and 29 June 2016. The mobile BlipTrack sensors record vehicles containing Bluetooth devices. Although a full week's data was obtained only specific data was used :

- For the AM and PM weekday the Tuesday and Thursday data was used. The Wednesday was discarded as it was not surveyed for a full day. The Monday and Friday data was discarded as these two days were not seen to be normal days from a traffic flow viewpoint.
- The Saturday midday was considered for the busiest weekend period.

Beca reports that usually about 15% of vehicles have Bluetooth devices. Opus can confirm that for the Waipapa Road surveys the Blip interception rate was between 7% and 12%. The positions where the BlipTrack surveys were undertaken is shown Appendix B.

2.3 Loop surveys

2.3.1 Count data

The Loop surveys were conducted between 23 June 2016 and 01 July 2016. The Loop data was used to normalise the BlipTrack turning data at the Waipapa Road and SH10 Intersection. The Loop counts were conducted in June which can historically be considered one of the quieter months of the year in terms of traffic flow. The volumes were factored to an equivalent Annual Daily Traffic using the New Zealand Transport Agency (NZTA), State Highway Traffic Monitoring System (TMS) data. A site was found near Kerikeri just south of the Waipapa Road and State Highway 10 Intersection. The NZTA State Highway Reference Station is shown in Appendix C. The site number is 17 near Kerikeri (Site ref : 01000029). The following seasonal adjustment factors were used :

- 1.16 for the weekday AM and PM peak
- 1.22 for the Saturday midday peak

The adjusted 2016 base traffic volumes are shown below on Figures 2-1 to 2-3.

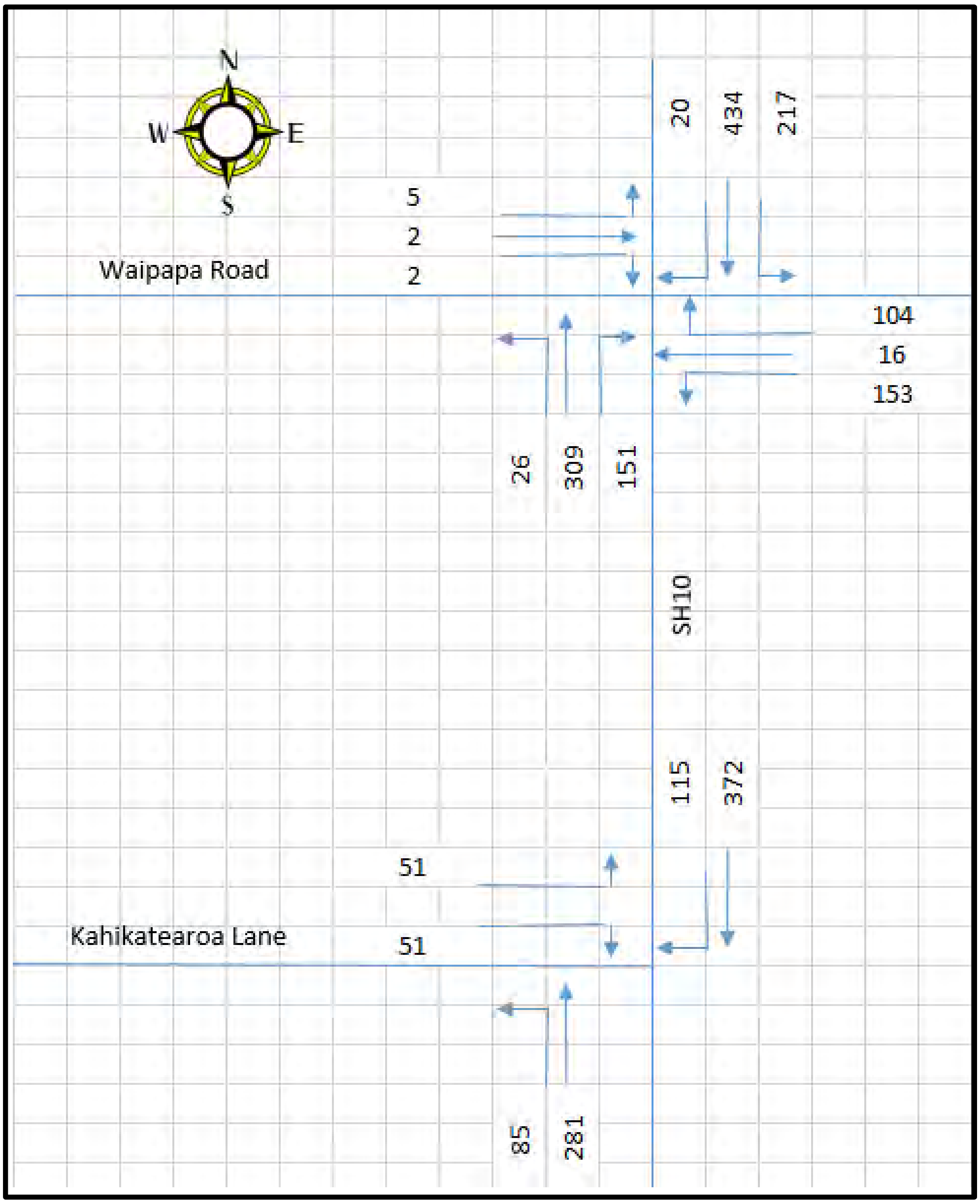


Figure 2-1 : 2016 adjusted weekday AM peak hour (08:00 – 09:00)

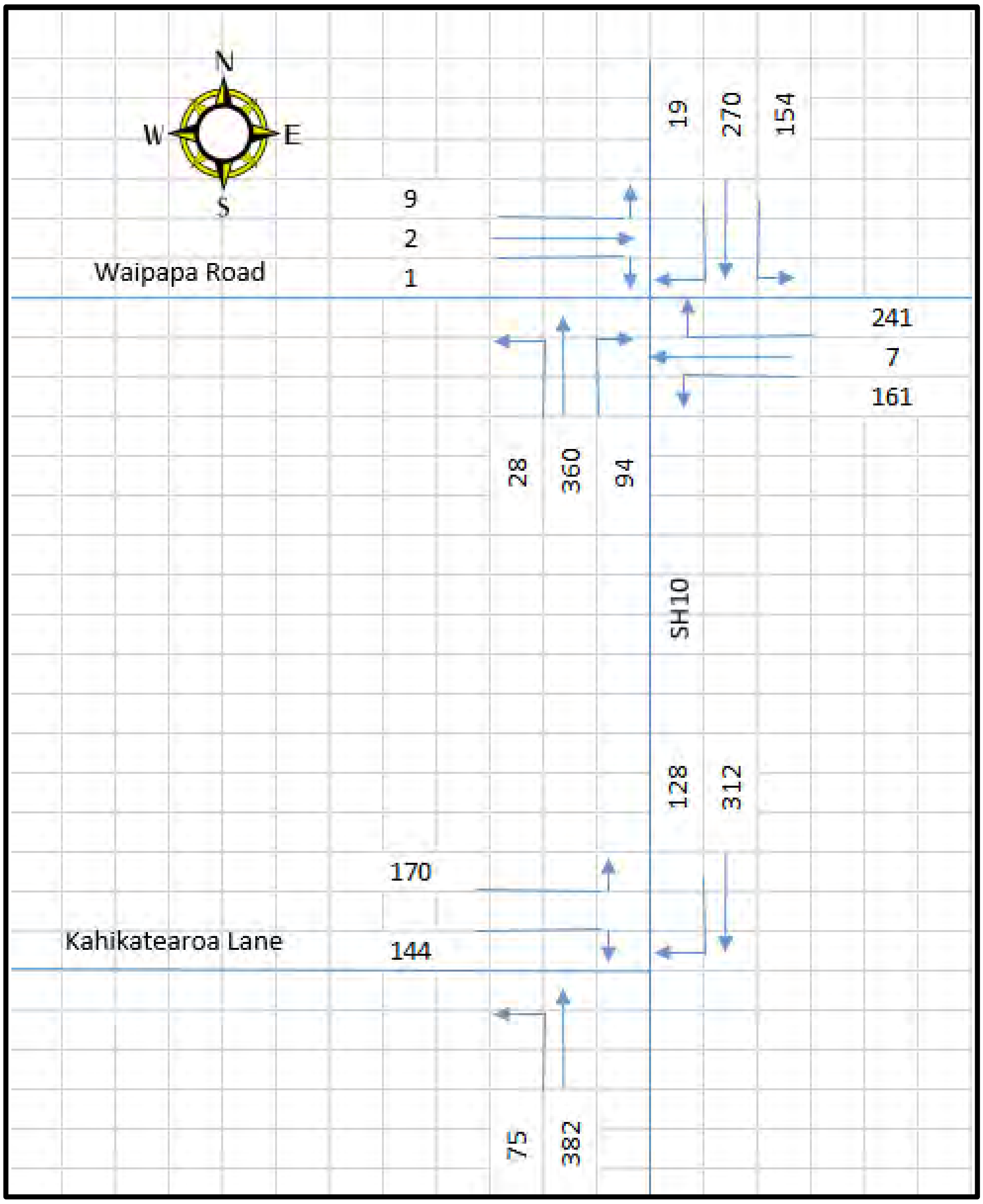


Figure 2-2 : 2016 adjusted weekday PM peak hour (16:00 – 17:00)

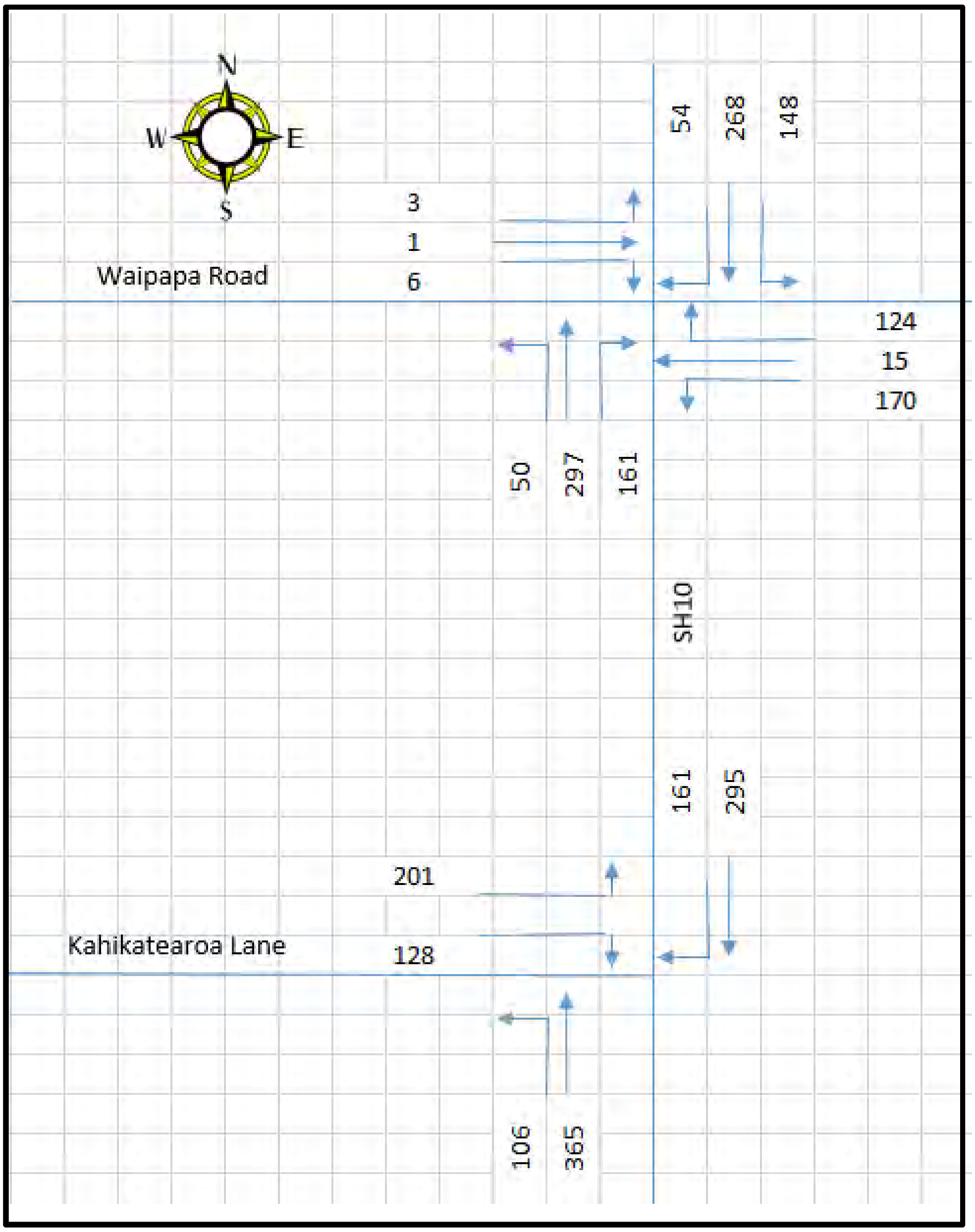


Figure 2-3 : 2016 adjusted weekend Saturday peak hour (11:00 – 12:00)

2.3.2 Speed data

The Loop data, shows all the 85th percentile speeds were under the speed limit, except at site E, where the 85th percentile speed was higher than the posted speed limit. The 85th percentile speeds are shown in Table 2-1.

Table 2-1 Measured speeds

Site ID	Description	Posted speed limit	85th percentile measured speed
A	SH10 – north of Waipapa Road / SH10 intersection	70 km/h	62 km/h
B	Waipapa Road – east of Waipapa Road / SH10 intersection	80 km/h	73 km/h
C	SH10 – south of Waipapa Road / SH10 intersection	70 km/h	62 km/h
D	Waipapa Road – west of Waipapa Road / SH10 intersection	50 km/h	31 km/h
E	SH10 – south of Kahikatearoa Lane / SH10 intersection	70 km/h	78 km/h
F	Kahikatearoa Lane – west of Kahikatearoa Lane / SH10 intersection	50 km/h	45 km/h

2.3.3 Vehicle classification

The vehicle classification used in the loop data is the Vehicle classification - TNZ 1999. TNZ 1999 is a scheme developed by Transit New Zealand and it has 14 classes[2]. There are three classes of vehicles :

- Light Commercial Vehicle (LCV)
- Medium Commercial Vehicle (MCV)
- Heavy Commercial Vehicle (HCV)

All LCV vehicles were classified as light vehicles while the MCV and HCV vehicles were classified as heavy vehicles as shown in Table 2-2.

[2] TNZ 1999, MTE User Manual – Classification Schemes, Version 3.18, MetroCount – Traffic Data Specialists, November 2007.

Table 2-2 Vehicle classification

Site ID	Description	Vehicle Type	
		Light	Heavy
A	SH10 – north of Waipapa Road / SH10 intersection	94.9%	5.1%
B	Waipapa Road – east of Waipapa Road / SH10 intersection	94.2%	5.8%
C	SH10 – south of Waipapa Road / SH10 intersection	95.1%	4.9%
D	Waipapa Road – west of Waipapa Road / SH10 intersection	90.7%	9.3%
E	SH10 – south of Kahikatearoa Lane / SH10 intersection	94.2%	5.8%
F	Kahikatearoa Lane – west of Kahikatearoa Lane / SH10 intersection	95.0%	5.0%
Average		94.0%	6.0%

Heavy vehicles make up 5% to 10% of the total traffic volumes. The average shown in the table above is a numeric average and not a weighted average.

2.4 Traffic growth data

2.4.1 Historic count data

To obtain the growth on SH10, historical data from State Highway AADT Data Booklet (2011-2015)[3] was obtained. Data from station 17 at Kerikeri on SH10 south of Waipapa Road was used. The growth rate calculations on SH10 between 2011 and 2015 are shown in Appendix E. The annualised compound growth of SH10 between 2011 and 2015 is 2.6% per annum. This growth rate was used to grow the through movement traffic on SH10 for the 2021 and 2026 scenarios.

2.4.2 Latent growth

The land use planning around the Waipapa Road and SH10 Intersection is shown on the Far North District Plan – Zone Map in Appendix E. The plan shows intended commercial intensification on the western side of SH10. To date a large portion of the potential commercial development has not occurred as shown on Figure 2-4.

[3] State Highway AADT Data Booklet 2011-2015, NZ Transport Agency, April 2016.

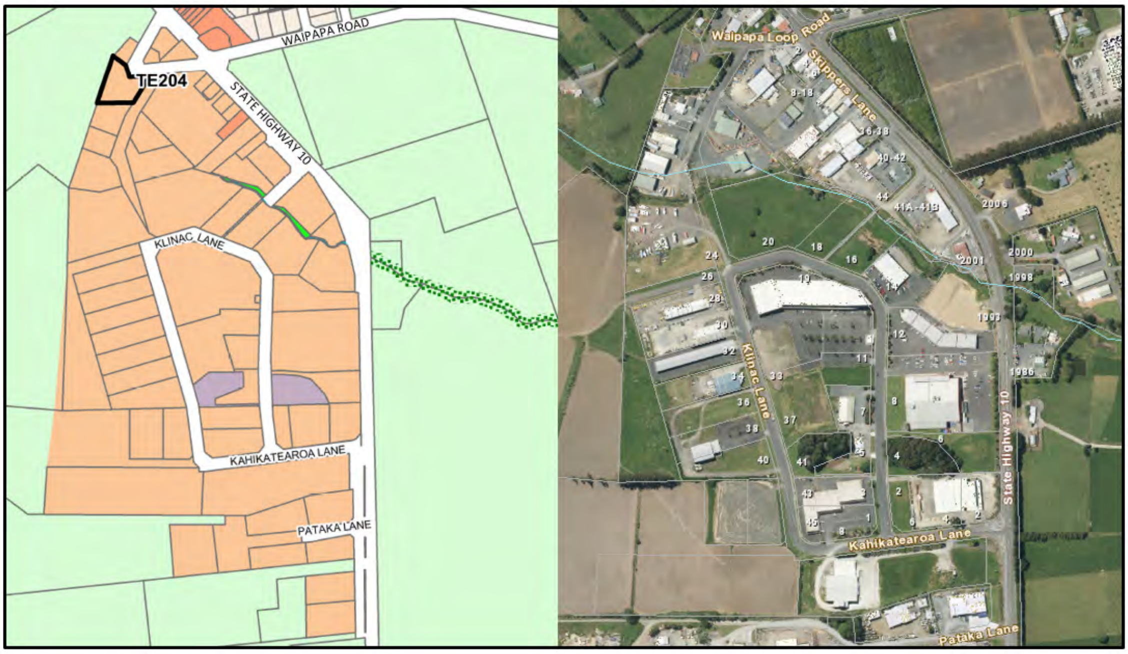


Figure 2-4 Latent Development

It was determined that about 55% of the potential commercial development has occurred. The trip generation for the additional 45% potential commercial development was calculated based on the existing trips currently entering the commercial area. For the purposes of this study it was assumed that 50% of the 45% potential commercial development will be realised by 2021 and 100% of the 45% potential commercial development will be realised by 2026.

3 Scenarios assessed

3.1 Future Years

As stated in section 2.4 of this report, two future years were considered, 2021 and 2026. The results focus on year 2026, which is the worst-case scenario with assumed SH10 growth of 2.6% per year 100% development of the commercial zoned land west of SH10.

3.2 Klinac Lane extensions

As stated in section 1.4 of this report, two Klinac Lane extensions have been considered. Diversions were calculated for each of the extensions and it was determined that only the northern extension is likely to have an effect on traffic volumes at the Waipapa Road / SH10 intersection. The Kahikatearoa Lane/ SH10 intersection will benefit from the southern extension as there will be a reduction of flows at this intersection due to the diversions.

4 Intersection Capacity Assessment

4.1 Traffic volumes used

The traffic volumes used for the SIDRA analysis for the critical PM peak hour are shown on Figure 4-1 below.

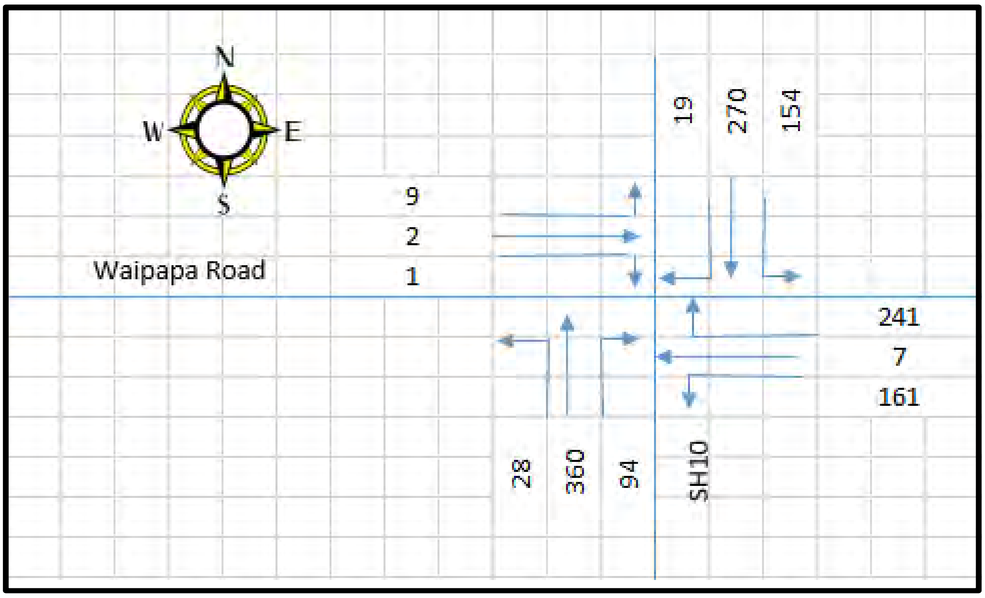


Figure 4-1 : 2016 adjusted weekday PM peak hour (16:00 – 17:00)

4.2 SIDRA base model calibration

From the Blip data, travel times could be estimated for each of the movements for the Waipapa Road and SH10 intersection. The Blip data showed lower delays than the SIDRA output, which is expected as Sidra outputs reflect stopline delay where blip data will record travel time upstream and downstream of the intersection. SIDRA queue outputs for the critical eastern approach showed similar queue lengths as were observed on site. There is reasonable confidence that the SIDRA output is calibrated for actual operating conditions at the Waipapa Road and SH10 intersection.

4.3 Base Year (2016) results

4.3.1 Existing layout and left slip

The priority control and left slip lane performance were assessed with existing (2016) typical weekday traffic. Table 4-1 shows the results of the SIDRA analysis for the weekday PM peak, which is the worst performing period.

Table 4-1 : Scenario 1 – 2016 Weekday PM peak hour

Priority Intersection (Existing control)						Priority Intersection with left slip					
Approach	Movement	Volume (veh / hour)	V/C ratio	Average Delay (s/veh)	LOS	Approach	Movement	Volume (veh / hour)	V/C ratio	Average Delay (s/veh)	LOS
North	L	154	0.24	6.5	N/A*	North	L	154	0.24	6.5	N/A*
	T	270	0.24	0.0	N/A*		T	270	0.24	0.0	N/A*
	R	19	0.02	7.8	N/A*		R	19	0.02	7.8	N/A*
East	L	161	0.16	10.2	B	East	L	161	0.14	7.8	B
	T	**7**	**1.27**	**295.1**	**F**		T	**7**	**1.27**	**295.1**	**F**
	R	**241**	**1.27**	**298.8**	**F**		R	**241**	**1.27**	**298.8**	**F**
South	L	28	0.31	8.8	N/A*	South	L	28	0.31	8.8	N/A*
	T	360	0.31	0.9	N/A*		T	360	0.31	0.9	N/A*
	R	94	0.31	8.9	N/A*		R	94	0.31	8.9	N/A*
West	L	9	0.01	9.6	A	West	L	9	0.01	9.6	A
	T	2	0.02	23.4	C		T	2	0.01	23.4	C
	R	1	0.02	27.8	D		R	1	0.01	21.3	D
Total		**1345**	**1.27**	**58.3**	**F**	Total		**1345**	**1.27**	**58.0**	**F**

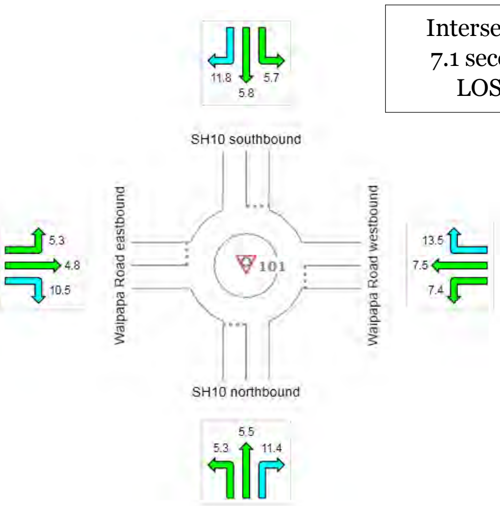
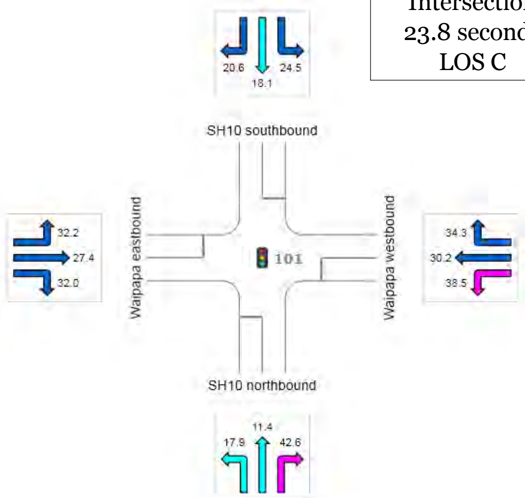
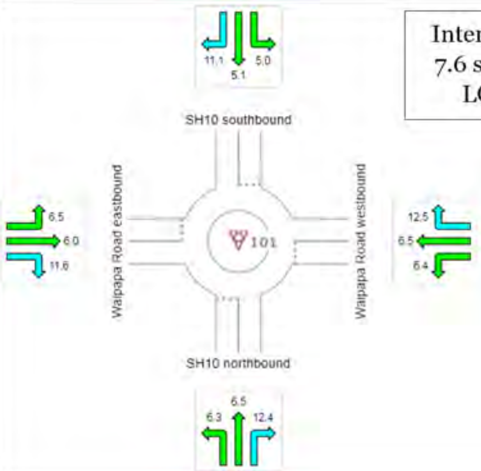
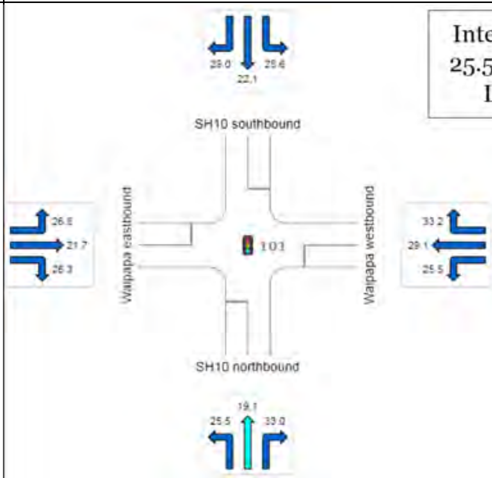
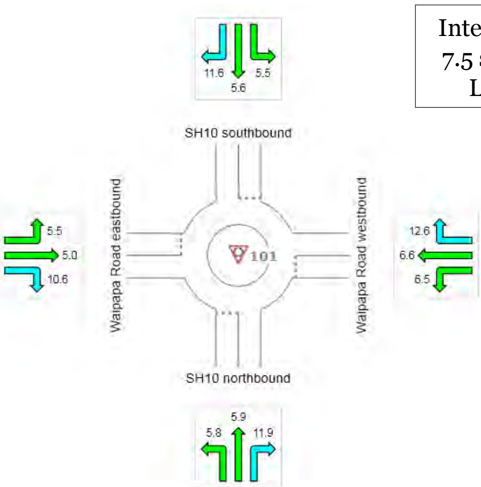
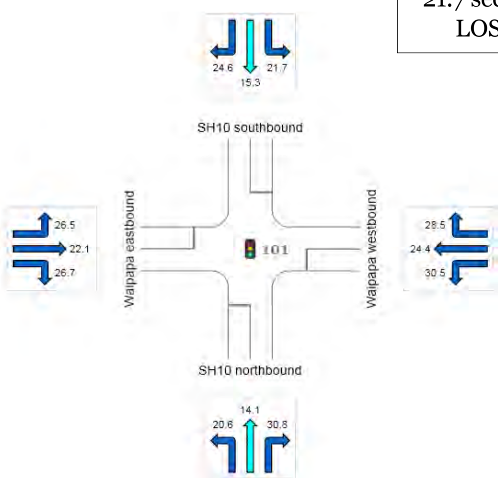
Note : * - Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delay associated with major road movements.

Table 4-1 shows the SIDRA results for 2016 Base year analysis and the results suggest that the priority and the left slip lane intersection control cannot accommodate the existing demand. Table 4-1 shows the eastern approach is operating unacceptably with existing traffic flow conditions. Therefore further analysis on the priority and left slip options was not undertaken.

4.3.2 Signal and roundabout

Table 4-2 shows the delays for 2016 Base year for the roundabout and signalised intersection. Both forms of intersection control operate acceptably; however, the roundabout operates much better. Therefore only the roundabout was considered for future year analysis.

Table 4-2 Base Year delays (s) for Signals and Roundabout

	Roundabout Delays (s)	Signal Delays (s)
AM peak	 Intersection 7.1 seconds LOS A	 Intersection 23.8 seconds LOS C
PM peak	 Intersection 7.6 seconds LOS A	 Intersection 25.5 seconds LOS C
Midday Saturday peak	 Intersection 7.5 seconds LOS A	 Intersection 21.7 seconds LOS C

Some additional reasons why a roundabout is preferred to a signal are[4] :

- The severity of accidents are lower at a roundabout than at a signalised intersection due to the lower speed and speed differential
- The number of potential conflict points at a roundabout is 8 as compared to 32 for a signalised intersection
- There are more delays to all vehicles at a signal as compared to a roundabout
- Roundabout operation is more efficient during quieter periods of day where vehicles experience little or no delay whilst at signals delays can be long when there is very little traffic.

4.4 Year 2026 results for Roundabout

The 2026 analysis year represents the worst case scenario in terms of traffic flow. The existing layout capacity analysis results are included in the tables below for comparative purposes.

Based on the results shown in Table 4-2 above, it can be seen that the weekday PM peak performs the worst. Therefore, the PM peak was analysed as the critical peak.

4.4.1 No Klinac Lane Extensions

Table 4.3 shows the capacity analysis results for 2026 with no Klinac extension.

[4] Comparison of Traffic Signal vs. Roundabout, Wisconsin Department of Transport

Table 4-3 : 2026 Weekday PM peak hour – no Klinac Lane extension

Priority Intersection (Existing control)						Roundabout Intersection					
Approach	Movement	Volume (veh / hour)	V/C ratio	Average Delay (s/veh)	LOS	Approach	Movement	Volume (veh / hour)	V/C ratio	Average Delay (s/veh)	LOS
North	L	154	0.32	6.5	A	North	L	154	0.49	5.6	A
	T	413	0.32	0.0	A		T	413	0.49	5.7	A
	R	19	0.02	9.2	A		R	19	0.49	11.7	B
East	L	203	0.25	11.5	N/A*	East	L	203	0.51	8.4	A
	T	**7**	**3.56**	**2370**	**N/A***		T	7	0.51	8.5	A
	R	**241**	**3.56**	**2380**	**N/A***		R	241	0.51	14.5	B
South	L	42	0.51	11.7	B	South	L	42	0.69	8.1	A
	T	547	0.51	2.6	A		T	547	0.69	8.2	A
	R	148	0.51	12.0	B		R	148	0.69	14.2	B
West	L	9	0.01	11.3	N/A*	West	L	9	0.05	9.8	A
	T	**2**	**0.29**	**66.3**	**N/A***		T	2	0.05	9.3	A
	R	**12**	**0.29**	**90.3**	**N/A***		R	12	0.05	15.0	B
Total		**1797**	**3.56**	**333**	**N/A***	Total		1797	0.69	8.9	A

Note : * - Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delay associated with major road movements.

Table 4-3 shows the existing priority intersection operates very poorly for 2026 Weekday PM peak hour with no Klinac Lane extension. The roundabout intersection operates at an average delay 8.9 seconds, which means there is ample capacity available.

4.4.2 With northern Klinac Lane Extension

Table 4.4 shows the capacity analysis results for the priority and roundabout layouts with the northern Klinac Lane extension in place.

Table 4-4 : 2026 Weekday PM peak hour – with Klinac Lane extension

Priority Intersection (Existing control)						Roundabout Intersection					
Approach	Movement	Volume (veh / hour)	V/C ratio	Average Delay (s/veh)	LOS	Approach	Movement	Volume (veh / hour)	V/C ratio	Average Delay (s/veh)	LOS
North	L	154	0.25	6.5	A	North	L	154	0.49	5.6	A
	T	283	0.25	0.0	A		T	283	0.49	5.7	A
	R	149	0.14	8.2	A		R	149	0.49	11.7	B
East	L	122	0.13	10.3	N/A*	East	L	122	0.51	8.4	A
	T	**88**	**3.47**	**2263**	**N/A***		T	88	0.51	8.5	A
	R	**241**	**3.47**	**2290**	**N/A***		R	241	0.51	14.4	B
South	L	42	0.31	8.6	A	South	L	42	0.58	9.7	A
	T	374	0.31	0.8	A		T	374	0.58	9.8	A
	R	76	0.31	9.1	A		R	76	0.58	15.7	B
West	L	182	0.22	10.2	N/A*	West	L	182	0.41	7.9	A
	T	**74**	**0.61**	**47.4**	**N/A***		T	74	0.41	7.5	A
	R	**12**	**0.61**	**61.8**	**N/A***		R	12	0.41	13.1	B
Total		**1797**	**3.47**	**423**	**N/A***	Total		1797	0.58	9.4	A

Note : * - Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delay associated with major road movements.

Table 4-4 shows that existing priority intersection operates very poorly for 2026 Weekday PM peak hour with the northern Klinac Lane extension. The roundabout intersection operates at an average delay 9.4 seconds, which means there is ample capacity available. The inclusion of the northern Klinac Lane extension helps balance the approach volumes by increasing the volume of traffic approaching from the west. This results in a slight increase in the overall delay of the roundabout intersection (from 8.9 seconds to 9.4 seconds). Balanced approach volumes is especially positive for roundabout layouts, as it provides equal opportunity for traffic to enter the intersection.

5 Useful life of a Roundabout

A sensitivity test was conducted to see how much growth can occur on SH10 per year before capacity is reached for the roundabout (i.e. what is the useful life of the roundabout). Reaching useful life means that one or more movements has reached capacity for a short time during the peak period. This will be when the intersection operates at a LOS E or higher. The traffic volumes on SH10 were compounded by 2.6% per annum in 5 year increments in the PM peak. Table 5-1 shows a summary of capacity analysis results with and without the northern Klinac Lane extension.

Table 5-1 Useful life of Roundabout

Design Year	Without Klinac Lane extension		With Klinac Lane extension	
	Delay	LOS	Delay	LOS
2026 (10 years from base year)	8.9	A	9.4	A
2051 (35 years from base year)	**51.7**	**E**	**46.7**	**D**

Table 5-1 shows the roundabout will operate acceptably until 2051 if an annual growth rate of 2.6% transpires on SH10.

6 Safety and economic evaluation

As part of this study a crash analysis or economic evaluation has not been undertaken. It is recommended that these two components will be assessed as part of the business case process for the project.

7 Conclusion/Recommendations

To conclude the existing Waipapa Road/SH10 Intersection is designed as cross priority controlled intersection, which experience efficiency and capacity issues for the two minor approaches especially in the peak periods. This current intersection constraints are considered likely to limit future commercial and industrial growth in the area.

Various forms of intersection control were considered namely, a priority controlled intersection (existing situation), an improved priority, a signalised intersection and a roundabout. The analysis undertaken shows that a single lane roundabout provides the best operation in terms of capacity. This roundabout also has spare capacity and is more resilient to changes in traffic flows due to planned road network changes.

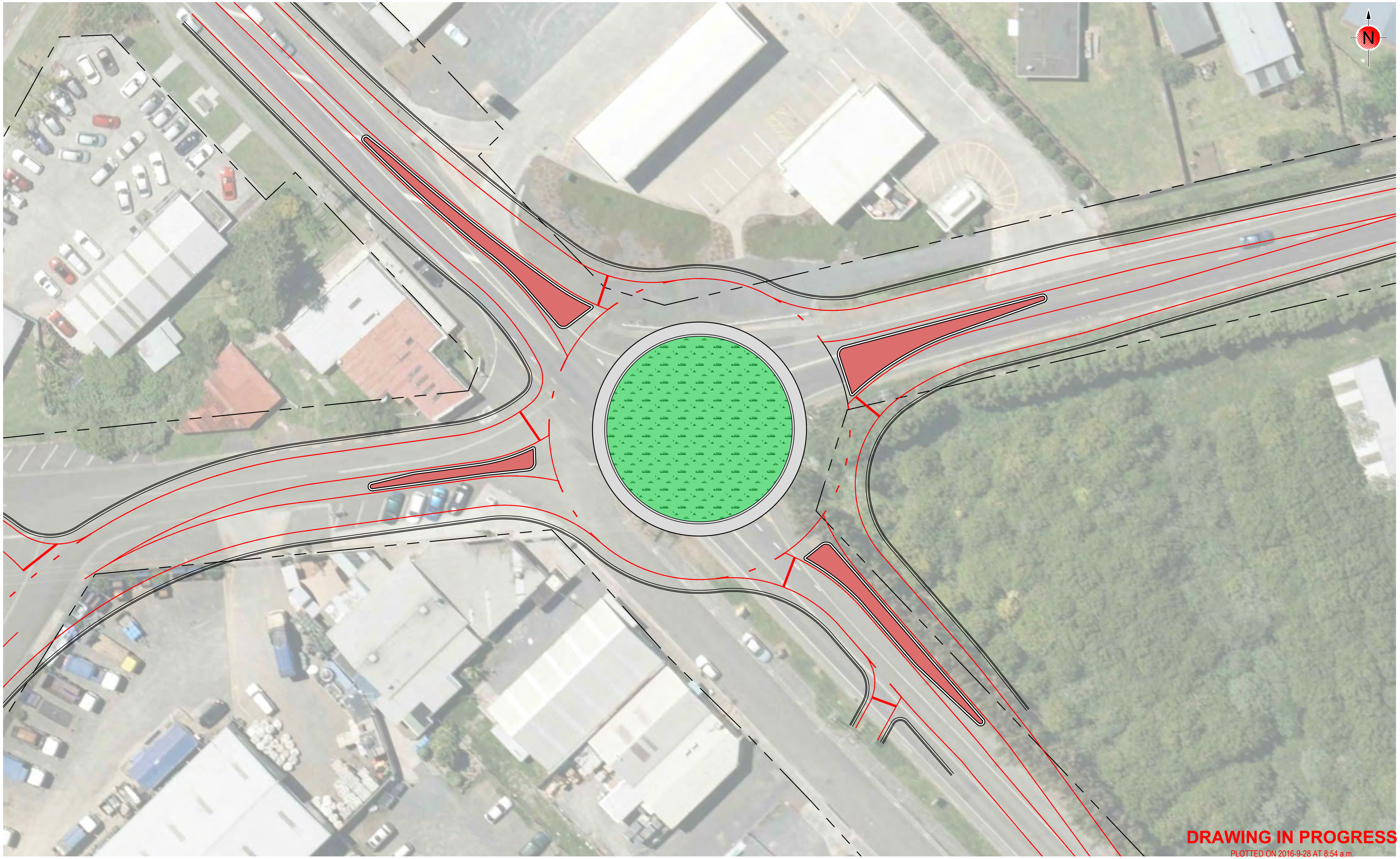
The assessment shows that the roundabout will operate acceptably until 2051 if an annual growth rate of 2.6% transpires on SH10.

It is recommended that :

- The left turn slip lane from Waipapa Road onto SH10 southbound (for which funding has been allocated in the Long Term Plan) not be implemented as this does not pose a viable long-term solution.
- From an efficiency and capacity perspective a single lane roundabout at the Waipapa Road and SH10 intersection is the preferred choice for intersection control.
- That further investigation in relation to safety and economic evaluation is considered as part of the business case process for the project.

Appendix A :

Single Lane Roundabout Layout



CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	CONCEPT ISSUED FOR INFORMATION		

Far North District Council
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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:250 AT A1

Project
FAR NORTH DISTRICT COUNCIL
WAIPAPA TRAFFIC STUDY

Sheet
ROUNDABOUT OPTION
PLAN

Project No.	Sheet. No.	Revision
1-13046.00	C01	A

1:250 @ A1
1:500 @ A3
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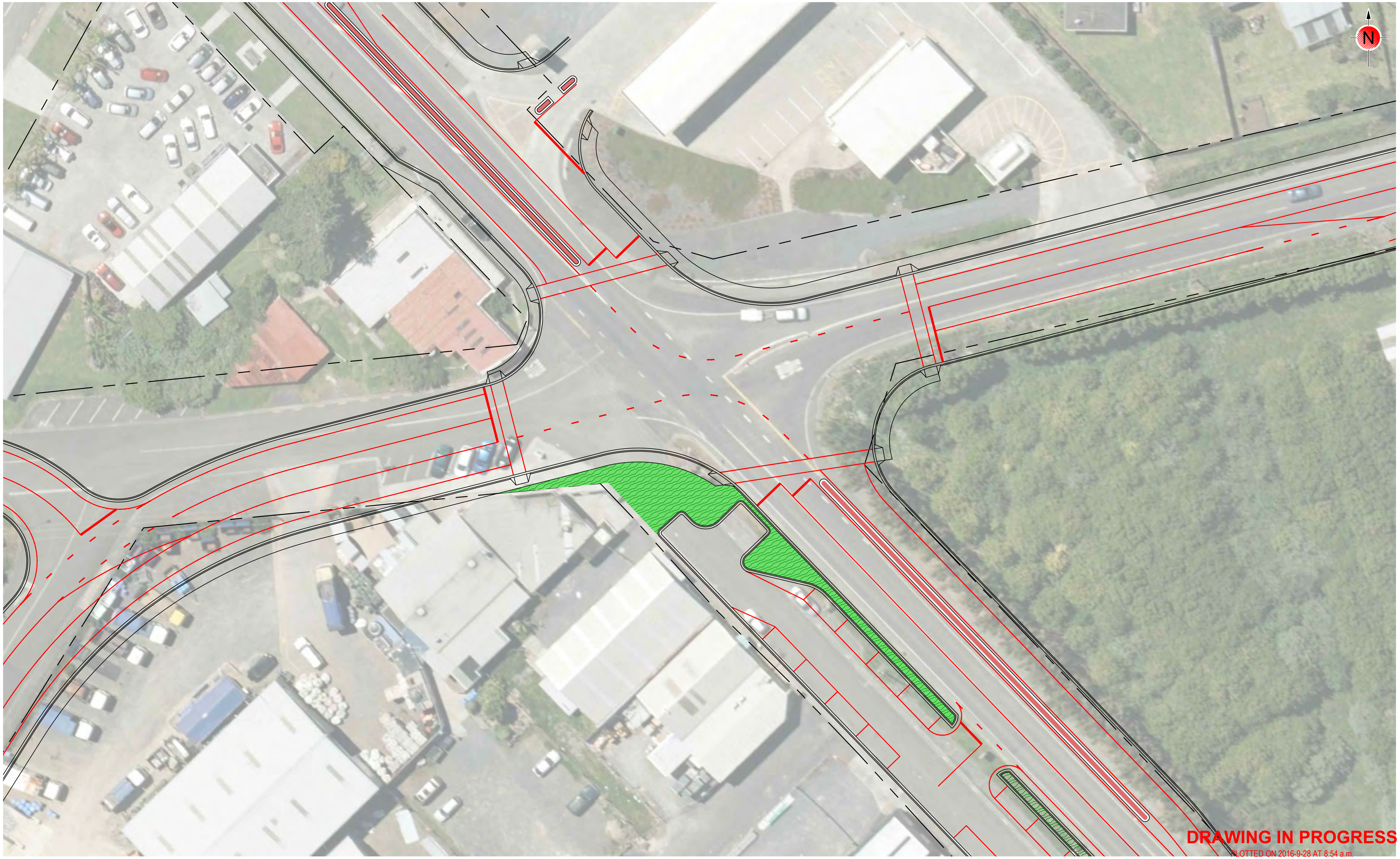

CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	CONCEPT ISSUED FOR INFORMATION		

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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:250 AT A1

Project
FAR NORTH DISTRICT COUNCIL
WAIPAPA TRAFFIC STUDY

Sheet
SIGNALISED OPTION
PLAN

Project No.	Sheet. No.	Revision
1-13046.00	C01	A

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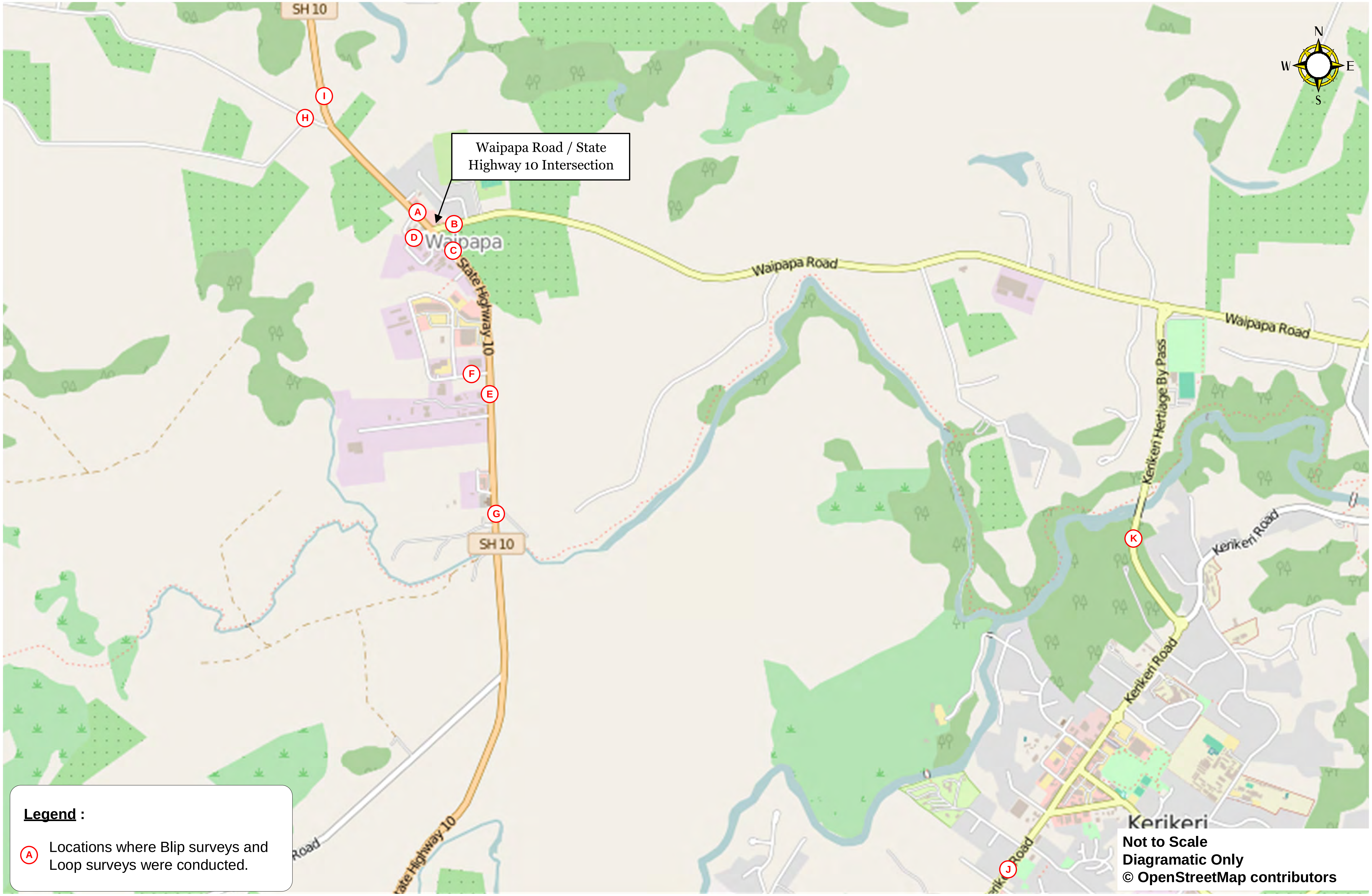
Appendix B :

Location of Traffic Surveys



No	Ammendment	Drawn	Checked	Approved	Date
5					
4					
3					
2					
1	First Draft	AK			08/16

Far North District Council
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Drafting Check: Kris Hansson	Design Check: Kris Hansson
Approved:	
Date:	
Scale: NOT TO SCALE	

Project: Waipapa Traffic study
Title: Location of Traffic Surveys
Sheet: Location Plan

Original Size: A3 | Drawing No: 1-13046-1 | Rev: 1

Appendix C :

NZTA State Highway Reference Stations

NZ TRANSPORT AGENCY
WAKA KOTAHI

State Highway Reference Stations
Northland

0 10 20 km

15/04/2016

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Appendix D :

Growth Rate Calculations

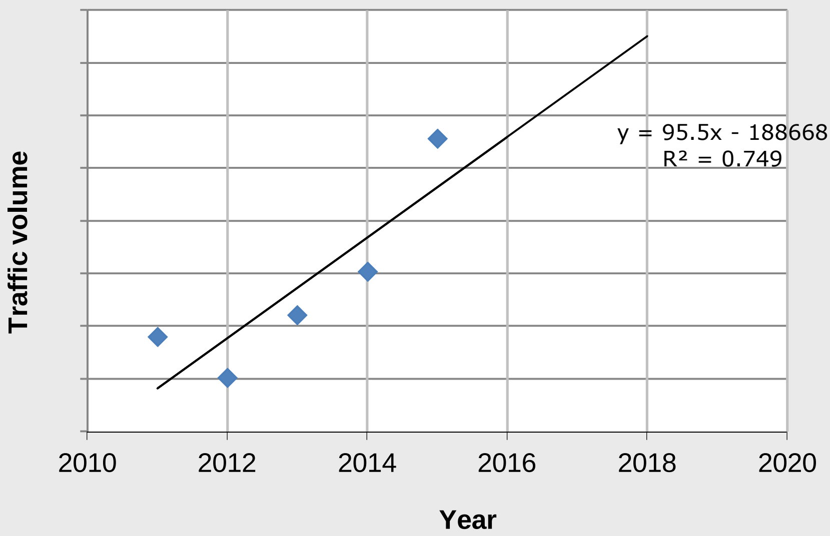
Worksheet A2 – Traffic data continued

Worksheet A2.4 – Time zero traffic volume and growth rates

1	Activity option	
2	Road/section/movement	SH10 at Waipapa Road intersection
3	Time period	AADT

Year (4)	AADT or average volume (5)
2007	
2008	
2009	
2010	
2011	3,480
2012	3,403
2013	3,522
2014	3,604
2015	3,857
2016	

	Regression output	
6	Constant	-188,668
7	X coefficient	95.5
8	R square	0.749



9	Time zero	**1 July 2015**
10	Time zero traffic volume	**3,764**
11	Growth rate at time zero	**2.54%**

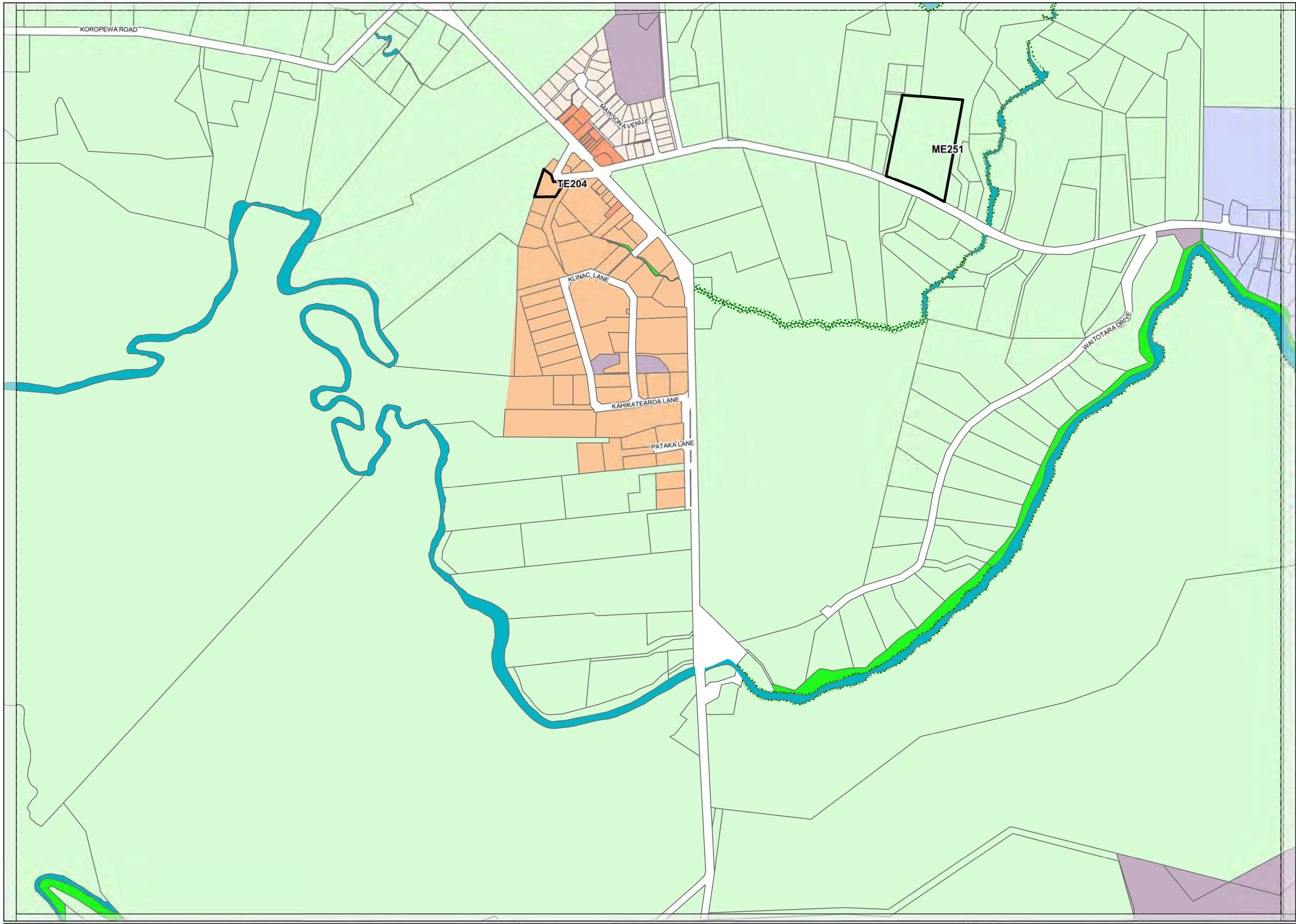
Appendix E :

Far North District Plan – Zone Map

Waipapa

82

Scale 1:10000
2-12-2013



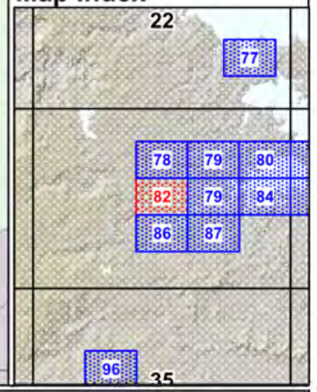
Legend

- Cemetery
- Historic Site
- Notable Tree
- Heritage Area
- Heritage Precinct
- Kerikeri Visual Buffer
- Russell Township Basin and Gateway Area
- Designations
- Coopers Beachfront Estate
- Esplanade Priority
- Pedestrian Frontage
- Maritime Exemption Area
- HV Powerline
- Railway

Zone

- Carrington Estate
- Coastal Living
- Coastal Residential
- Commercial
- Conservation
- General Coastal
- Horticultural Processing
- Industrial
- Kauri Cliffs
- Lakes & Rivers
- Minerals
- Motoroa Island
- Orongo Bay Special Purpose
- Point Veronica
- Quail Ridge Country Club
- Recreational Activities
- Residential
- Rural Living
- Rural Production
- Russell Township
- South Kerikeri Inlet Zone
- Waimate North Sensitive Area

Map Index



Far North District Plan - Zone Map

N

0 200 400
metres

Note:

Roads carry the same zoning as the adjoining land.
If a boundary between zones follows a road,
the zone boundary is located on the centerline
of the formed road, or where unformed,
the centerline of the legal road.

DISCLAIMER

Considerable care has been taken to avoid errors and omissions, and the latest information has been included in these District Plan maps. However, even with the greatest care inaccuracies may occur and therefore the Far North District Council cannot accept any responsibility for such errors and omissions.

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Appendix B Communications Plan

Communications Plan SH10 Waipapa

Kelli Sullivan

20 April 2017

VERSION 1

SH10 Waipapa project. Communications and engagement plan for preferred option – May 2017

Engagement Plan

Introduction	Public engagement is proposed for late May to communicate the preferred option for the SH10 / Waipapa Road intersection and associated transport improvements as part of the Waipapa Single Stage Business Case. The Transport Agency, in partnership with the Far North District Council (FNDC), has considered a range of option to improve transport connections, safety and efficiency of the transport network in Waipapa. Public engagement on the preferred solution (a roundabout and associated improvements) will begin once local iw, directly affected land owners and key stakeholders have been consulted.
Engagement objectives	• Gain stakeholder support by communicating the preferred option for improving the intersection to key stakeholders, iwi and road users • Inform affected parties and communities in order to achieve understanding of the proposed works and their effects • Minimise the number of public queries by being proactive in our approach and concise in our publications • Gather knowledge from the community and understand others viewpoints • Fulfil the requirements of the Resource Management Act 1991, Land Transport Management Act 2003 and Local Government Act 2002
Background	Waipapa is an important regional centre in Northland, serving Kerikeri and the wider east coast of the Far North. There is no current investment strategy to address the strategic needs of the Waipapa township. There are existing problems with the operation and quality of the transport network in Waipapa. These problems not only limit the economic opportunities in Waipapa but also lead to sub optimal growth patterns in the wider area. In collaboration with FNDC, the Strategic Business Case (2016) outlined the problems and potential benefits in this corridor and sought approval to develop a Single Stage Business Case to develop options and approaches to maximise the opportunities available. One option under development is an upgrade of the SH10/Waipapa Road intersection.
Objectives and benefits	**Single Stage Business Case - Investment Objectives:** **Economic growth** - Facilitate the economic growth of the Waipapa-Kerikeri

	area and Northland through a co-ordinated long term vision for the integration of land-use and the transportation network. **Efficiency** - Improve the network efficiency by providing a clear, consistent and integrated transport solution that best balances the needs of all road users at this very busy area of roading confluence. **Safety** - Improve safety so that there is a marked reduction in crossing / turning type crashes at intersections and access ways by 2020. **Multi-modal travel** - Facilitate the growth of multi-modal travel, particularly walking and cycling, through the provision of safe, efficient facilities which complement existing initiatives. **Benefits:** **The SH10/Waipapa Intersection Improvements project will improve:** - Economic growth for Waipapa and Kerikeri - Network efficiency - Safety - Multi-modal travel
Inter-relationships	**Northland Economic Action Plan (2016) –** The SH10 corridor carries regional freight and is part of the Twin Coast Discovery tourism route. The Twin Coast Discovery Route is identified in the Tai Tokerau Northland Economic Action Plan as a key component in expanding Northlands economy through tourism. **Twin Coast Discovery Programme Business Case (late-2017)–** the outcome of the Waipapa Business Case are likely to support what the Twin Coast Discovery Route is trying to achieve
Stakeholders	Internal: • NZTA- Journey Manager, SHMTA, EUD • FNDC – Mayor, Councillors, Community Board, officers External: • Directly affected property owners/businesses • Local road users – Kerikeri and Waipapa • Relevant Iwi/Hapu • Ministry of Education • Waipapa businesses • Emergency services – NZ Police, NZ Fire and St John Ambulance • Media
Key messages	Key messages include: • The proposed roundabout at the SH10/Waipapa Road intersection will provide for safer turning movements across the state highway, reducing the number of vehicle crashes at this location • The project will reduce peak time congestion and vehicle queuing on SH10 by providing for safe and efficient turning movements via a roundabout design. • The proposed roundabout design will assist in slowing state highway traffic through the Waipapa town centre, making it more appealing and

	safer for pedestrians and cyclists • Improvements to cycling and pedestrian facilities are proposed to promote active modes of transport and improve connectivity between Waipapa businesses and community on either side of SH10
Risks/issues and mitigation	**Risk:** Property impacts and/or land acquisition **Mitigation**: Early engagement with potentially affected stakeholders and open communication as the preferred option develops **Risk**: Preferred option is not supported by local road users and businesses **Mitigation**: Communications to support the preferred option will be developed and delivered collaboratively by NZTA and FNDC. Collateral for engagement to explain the process to date in assessing the five options to identify the preferred option **Risk**: Key stakeholder confusion with Twin Coast Discovery PBC outcomes in relation to Waipapa Growth project **Mitigation:** Key messaging developed collaboratively with FNDC to support Transport Agency Twin Coast PBC communications programmed for late-2017
Key milestones	• Confirmation of public information day date by W/C 24 April • Briefing roles and responsibilities (as outlined below) W/C 24 April • XX May – key stakeholder briefing • XX May – affected property/business owner briefing • XX May – public information day • XX June – consultation summary and next steps
Evaluation measures	• Volume, tone and nature of any queries received by NZTA or FNDC relating to the preferred option • Stakeholder feedback received by NZTA and FNDC • Submissions from stakeholders during consenting phase • Volume, tone and nature of media coverage

COMMUNICATIONS AND ENGAGEMENT ACTIVITIES					
TASKS	**ACTION/CHANNELS**	**TARGET AUDIENCE**	**LEAD RESPONSIBILITY**	**TIMING**	**STATUS**
Liaising with FNDC	Confirming date for briefing Community Board Confirming date for public information day event	Project partner	Sebastian Reed / Keith Kent	**Ongoing**	Once event date confirmed *(this plan works to a Thursday 25th May event date)*
Book community venue	FNDC venue options- Waipapa Hall ph Judy Remnant 09 407 5447 The Centre (Kerikeri) ph Kerikeri Community Trust 09 407 0260	Community venue	Kelli Sullivan	**To do**	Once event date confirmed
NZTA Internal Communications	Advise Brett Gliddon/SHMTA of engagement programme Seek direction on whether briefing to Minister's office is require pre-engagement	Brett, Tommy, Ernst, Minister's office?	Sebastian Reed	**To do**	Once event date confirmed
Collateral creation	Draft poster content with inputs from project team and Opus Poster content to include:	Key stakeholders, community, iwi, road users	Martell (Opus) develop with Kelli Sullivan guidance	**To do**	Draft for NZTA approvals W/C 8 May Collateral print date

	- Project overview incl. objectives/benefits -Urban design and Environment - Preferred option/Indicative design - Project timeline - Twin Coast Discovery PBC - Cultural values (TBC with hapu) To support engagement: -Information brochure with feedback form		FNDC/NZTA joint review/approval		18 May
Print advertising to promote public engagement	Book quarter page in Northern News, Bay Chronicle Brief PORT into creating print ad Supply advert to media Circulate PDF of advert to key stakeholders for distribution (incl. FNDC channels and NZTA social media	Wider communities of Waipapa, Kerikeri, Bay of Islands	Kelli Sullivan	**To do**	Advertising to commence W/C 15 May
Key Stakeholder/partner	Briefing sessions with key stakeholders/partners week	Key stakeholders and project partners	Sebastian Reed/Kelli Sullivan/Rewi	**To do**	Meetings to be set up for W/C 15 May

briefings	prior to public event. To include: - FNDC - Community Board - Waipapa Business Assoc. - Hapu/Iwi		Spraggon (iwi)		
One on one meetings with affected business/landowners	Meetings with Waipapa businesses and residences in proximity to intersection		Kelli Sullivan/Sebastian Reed / Keith Kent / Stu Graham (Crown Property)		Meetings to be set up for W/C 15 May
Online engagement	Update on Connecting Northland/Waipapa webpage promoting open day Open day collateral uploaded onto page	Customers	Kelli Sullivan	**To do**	Information 'live' by 23 May
Media/Social	Media release promoting open day Transport Agency Twitter/Facebook	Communities Customers	Sarah Azam FNDC (TBC) Kelli Sullivan	**To do** **To do**	W/C 15 May
Event resourcing	Confirm staffing of event (incl. FNDC team attending) Connecting Northland	Project team	Kelli Sullivan	**To do**	W/C 15 May

	branded banners Transport coreflute posters, display easels, feedback forms, furniture (if req) Liaison with venue for access on day Set up/pack down Take photos of event				
Feedback collation	Circulate hard copies of feedback form to community venues in Waipapa area after event Summarize into consultation report.	Internal approvers, key stakeholders on request	Kelli Sullivan	**Complete- Draft consultation report in InfoHub**	June.

APPENDIX C
Drawing: Constraints and Opportunities

OTHER COMMENTS:

1. NO KNOWN IWI OR CULTURAL ISSUES
2. HIGH % FREIGHT MOVEMENTS

PLANNING:

1. INDUSTRIAL ZONING HAS AN ENABLING TRAFFIC INTENSIFICATION FACTOR
2. RURAL PRODUCTION ZONING HAS A 60vpd THRESHOLD
3. NO PUBLIC WATER OR WASTEWATER SCHEME

SPEED:

1. INCONSISTENT SPEEDS THROUGH WAIPAPA
2. 70km/h FEELS UNSAFE
3. APPLICAITON OF NEW SPEED MANAGEMENT GUIDELINES

FOR INFORMATION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION	-	-

NZ TRANSPORT AGENCY
WAKA KOTAHI

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Approved:
Approved Date:
Drawn: K. MEIN
Scales: NOT TO SCALE

Project: WAIPAPA IMPROVEMENTS

Sheet: CONSTRAINTS AND OPPORTUNITES

Project No.: 1-11751.00
Sheet No.: C01
Revision: A

Survey - -
Drawing - -
Design - -
Checked
Date

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APPENDIX D
Drawing: Long List Options

GENERAL TRAFFIC:

1. IMPROVED PEDESTRIAN FACILITIES INCLUDING PEDESTRIAN CROSSINGS
2. IMPROVED CYCLING FACILITIES
3. REMOVE/BETTER DEFINE PARKING

PLANNING:

1. UPDATED STRUCTURE PLAN
2. MIXED USE ZONING AROUND WAIPAPA ROAD INTERSECTION

FOR INFORMATION

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Whangarei 0110

Designed	C. PARKER
Approved	
Approved Date	
Drawn	K. MEIN
Scales	NOT TO SCALE
Project	WAIPAPA IMPROVEMENTS
Sheet	LONG LIST OF OPTIONS
Project No.	1-11751.00
Sheet No.	C02
Revision	A

Survey	Drawing	Design	Checked	Date
-	-	-		

Original Sheet Size A1 [841x594]   Plot Date 2016-11-23 at 2:42:17 p.m.   Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(C)Civil+AutoCAD\1-11751.00(C01).dwg C02

APPENDIX E
Drawings: Short List Options

CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-08
B	CONCEPT IMPROVED		2017-02-11
C	CONCEPT IMPROVED		2017-02-22

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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
RIGHT TURN BAY OPTION
PLAN

Project No.	Sheet. No.	Revision
1-11751.00	X01	C

1:500 @ A1
1:1000 @ A3
0 5 10 15 20 25 30 35 40 45 50 m

Original Sheet Size A1 [841x594] Plot Date 2017-02-23 at 3:30:38 p.m. Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(X) Other Category\+AutoCAD\1-11751.00_X01-05.dwg - X01

CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-08
B	CONCEPT IMPROVED		2017-02-11
C	ROUNDABOUT ELLONGATED AND MOVED		2017-02-15

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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
ROUNDABOUT OPTION
PLAN

Project No.	Sheet. No.	Revision
1-11751.00	X02	C

1:500 @ A1
1:1000 @ A3
0 5 10 15 20 25 30 35 40 45 50 m

Original Sheet Size A1 [841x594] Plot Date 2017-02-23 at 3:30:45 p.m. Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(X) Other Category\+AutoCAD\1-11751.00_X01-05.dwg - X02

DRAWING IN PROGRESS

PLOTTED ON 2017-2-23 AT 3:30 p.m.

CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-08
B	CONCEPT IMPROVED		2017-02-11
C	CONCEPT IMPROVED		2017-02-22

NZ TRANSPORT AGENCY
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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
TRAFFIC SIGNALS OPTION
PLAN

Project No.	Sheet. No.	Revision
1-11751.00	X03	C

1:500 @ A1
1:1000 @ A3
0 5 10 15 20 25 30 35 40 45 50 m

Original Sheet Size A1 [841x594] Plot Date 2017-02-23 at 3:30:50 p.m. Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(X) Other Category\+AutoCAD\1-11751.00_X01-05.dwg - X03

DRAWING IN PROGRESS

PLOTTED ON 2017-2-23 AT 3:30 p.m.

CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-11
B	CONCEPT IMPROVED		2017-02-22

NZ TRANSPORT AGENCY
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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

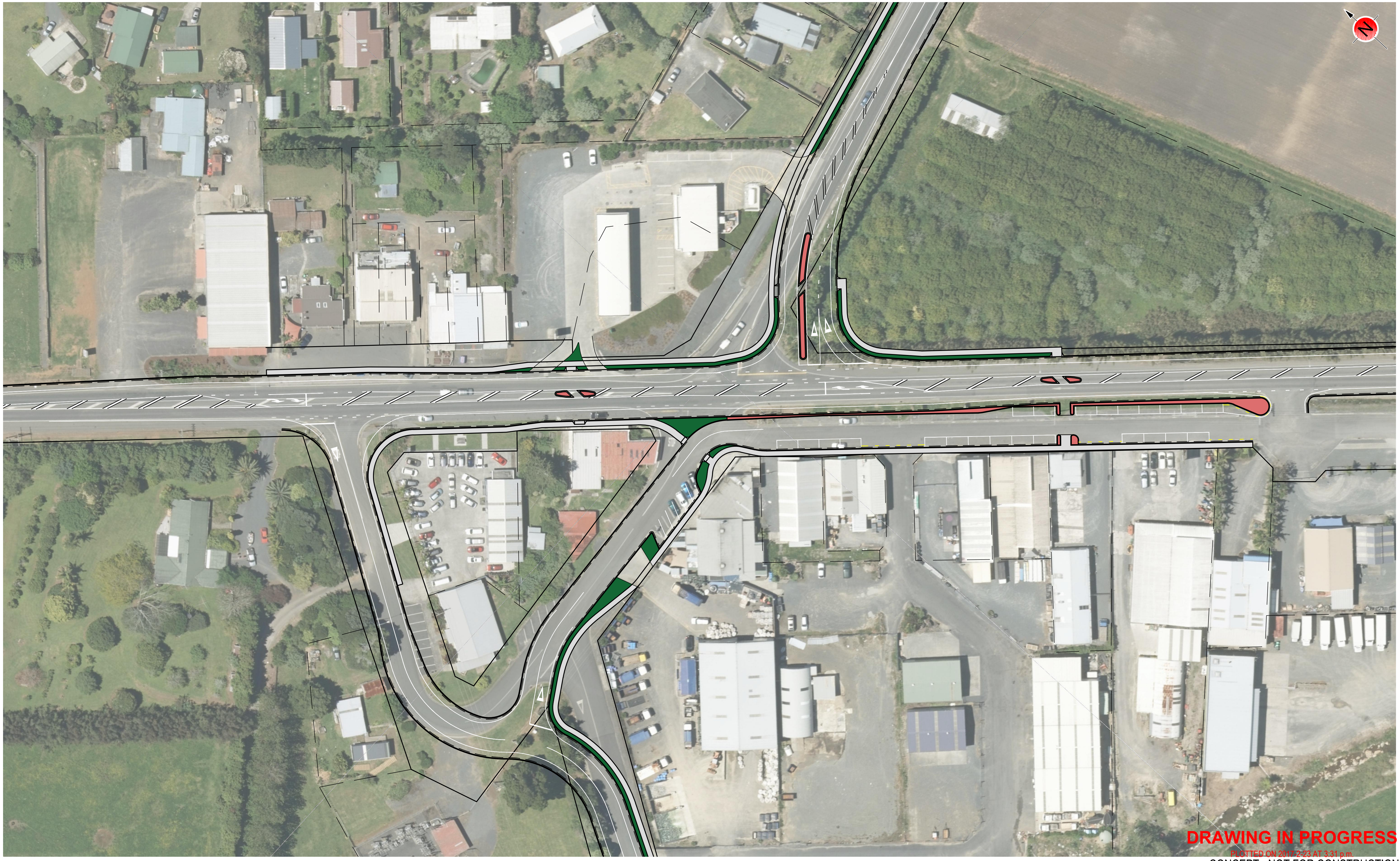
Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
HEAD TO HEAD RIGHT TURN BAYS OPTION
PLAN

Project No.	Sheet. No.	Revision
1-11751.00	X04	B

1:500 @ A1
1:1000 @ A3
0 5 10 15 20 25 30 35 40 45 50 m

Original Sheet Size A1 [841x594] Plot Date 2017-02-23 at 3:30:55 p.m. Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(X) Other Category\+AutoCAD\1-11751.00_X01-05.dwg - X04



CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-22

NZ TRANSPORT AGENCY
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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
CLOSE WAIPAPA LOOP ROAD SOUTH OPTION
PLAN

Project No.	Sheet. No.	Revision
1-11751.00	X05	A

1:500 @ A1
1:1000 @ A3
0 5 10 15 20 25 30 35 40 45 50 m

Original Sheet Size A1 [841x594] Plot Date 2017-02-23 at 3:31:00 p.m. Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(X) Other Category\+AutoCAD\1-11751.00_X01-05.dwg - X05

APPENDIX F
Environmental Social Responsibility Screens (ESRs)

ENVIRONMENTAL AND SOCIAL RESPONSIBILITY SCREEN V2.FEBRUARY 2016

NZ TRANSPORT AGENCY
WAKA KOTAHI

Use to assess options in the Indicative Business Case

Use this screen to identify opportunities and risks and assess options for state highway projects. Complete the screen for each option to distinguish them from one another or bundle options where appropriate. Screen results will signal where technical assessments are required and provide a written record to support the alternatives assessment required for statutory applications. For further assistance contact the EUD Team.

Additional instructions and content, including information sources, to help complete the screen can be found on the Highways Information Portal Screen pages here

Decide how many times screen should be filled out (Group Options) ▶ Answer screen questions using project information and suggested information sources ▶ Refer to screen questions explanation, particularly if you answered yes to any of the questions ▶ Complete page 2 of screen ▶ Incorporate page 2 text in IBC assessment of options table (Background and MCA)

PROJECT LOCATION:	PROJECT PURPOSE:	DATE:	OPTION DESCRIPTION:
Waipapa State Highway 10	Intersection Upgrade	25/05/2017	Close Loop South Option

CATEGORY		QUESTION	ANSWER		USEFUL INFORMATION SOURCES
GENERAL	G1	What is the zoning of adjacent land? Are there any encumbrances on the land? e.g. Maori Reserve or other reserve/covenants	Rural [ ] Industrial [x] High density residential [ ]	Commercial [x] Residential [ ] Parks/open space [ ]	District/Unitary Plan Zoning Maps
	G2	Does the option disturb previously undisturbed land?	Y [ ]	N [x]	
	G3	What is the construction timeframe?	>18 months [ ]	<18 months [x]	
NATURAL ENVIRONMENT	NE1	Are there any outstanding/significant natural features (e.g. geological or geothermal)/landscapes?	Y [ ]	N [x]	NZTA MapHub Environmental and Social Risk Map- Natural Environment
	NE2	Will the option affect the coastal marine area, wetlands, lakes, rivers, streams or their margins?	Y [x]	N [ ]	Regional Plan Maps and Schedules
	NE3	Will the option affect areas of the conservation estate, or areas of known significance for biodiversity or known habitats of uncommon or threatened species?	Y [ ]	N [x]	District Plan Maps and Schedules
	NE4	Is the option in an area of potential hazard risk e.g. fault lines, significant erosion, flooding, sea level rise etc?	Y [x]	N [ ]	Department of Conservation
	NE5	Will more than 0.5 hectares of vegetation be removed?	Y [ ]	N [x]	
		What type?			
CULTURAL AND HISTORIC HERITAGE	CH1	Are there sites/areas of significance to Maori within 200m of the area of interest?	Y [ ]	N [x]	Iwi NZTA MapHub Environmental and Social Risk Map- Culture and Heritage Heritage New Zealand List NZ Archaeological Association District Plan Maps and Schedules Regional Plan Maps and Schedules IPENZ Heritage List NZTA GIS predictive models
	CH2	Are any recorded, scheduled or listed archaeological sites within 200m of the area of interest?	Y [ ]	N [x]	
	CH3	Are any scheduled, listed or other important heritage buildings/structures within 200m of the area of interest?	Y [ ]	N [x]	
	CH4	Will the option affect the setting of any historic building/structure or archaeological site?	Y [ ]	N [x]	
	CH5	Is a group of archaeological sites or an area of historic built environment (even partially) within 200m of the area of interest?	Y [ ]	N [x]	
HUMAN HEALTH	HH1	What is the One Network Road Classification?	National [ ] Arterial [ ]	Regional [x] Collector [ ]	NZTA MapHub Environmental and Social Risk Maps- Human Health and Community which includes: - Designated airsheds (including one network classification) - Highly sensitive receivers Regional Council Contaminated sites Team
	HH2	Is the area of interest designated as a non-compliant airshed?	Y [ ]	N [x]	
	HH3	Are there medical sites, rest homes, schools, child care sites, residential properties, maraes or other sensitive receivers located within 200m of the area of interest?	Y [ ]	N [x]	
	HH4	Does land use within 200m of the area of interest include industrial sites, chemical manufacturing or storage, petrol stations, vehicle maintenance, timber processing/treatment, substations, rail yards, landfills or involve other activities that may result in ground contamination?	Y [x]	N [ ]	
		OR Are there HAIL or SLUR (contaminated) sites within 200m of the area of interest?	Y [x]	N [ ]	
SOCIAL	S1	Does the option affect access to community facilities i.e. libraries, open space etc (either temporarily or permanently)?	Y [ ] Which?	N [x]	NZTA MapHub Project Team District Plan Maps Council and Community Strategy Documents
	S2	Does the option affect community cohesion and accessibility including vehicular connectivity on the local road network?	Y [x]	N [ ]	
URBAN AND LANDSCAPE DESIGN	ULD 1	Are there opportunities to enhance infrastructure for, and/or improve access to, public transport and/or active modes of travel such as as walking and cycling?	Y [x]	N [ ]	NZTA MapHub Environmental and Social Risk Map- Natural Environment (Scenic Routes) Regional Land Transport Plan Project Team Strategies and District Plan
	ULD2	Does the option enhance the development potential of adjacent land where appropriate?	Y [x]	N [ ]	
	ULD3	Is the option located on a themed highway? Is the option part of or near a national cycle or walking route?	Y [x]	N [ ]	
	ULD4	Are there opportunities to enhance the urban character, landscape character and visual amenity?	Y [x]	N [ ]	

Answers and Comments	Refer to screen questions explanation to help complete this part.

1. **Summarize the potential environmental and social risks/impacts associated with this option. Consider short and long term risks and impacts.**

NATURAL ENVIRONMENT:	Works footprint is pre-disturbed, contains no significant ecological/flora/fauna values. SH10 and Maritime Road both cross a stream. Any crossings of the stream must not worsen upstream flooding up to 100 year ARI, and must not worsen fish passage up to 1 year ARI.
CULTURAL AND HISTORIC HERITAGE:	Works footprint is pre-disturbed, contains no significant archaeology/heritage values.
HUMAN HEALTH:	Portion of land needs to be taken from orchard on corner of SH 10 and Waipapa Road. Portion of land needs to be taken from electrical substation on corner of Maritime Rd and Loop Road. Both sites are HAIL activities. Potential for contaminated land.
SOCIAL:	Business/properties on eastern side of Loop road likely to be impacted at least during works period. Appears businesses utilise road reserve for car parking. On a permanent basis, their access to SH 10 will be significantly altered (making entry southbound onto SH10 difficult). Petrol station on SH 10 and Waipapa Road intersection likely to be impacted at least during works - vehicle entry/exit from the service station may be impacted.

The responses above will be used in the IBC assessment of options summary table: MCA of the Option.

URBAN AND LANDSCAPE DESIGN:	Some opportunity to provide landscaping improvement on corner of Maritime Road and Loop Road - portion of road designation on northern and eastern side of intersection will remain unutilised. Some opportunity to provide landscaping improvement on corner of Petrol Station - portion of road designation will remain unutilised.

Incorporate the relevant comments from above into the economy, social and geography sections of the IBC assessment of options summary table.

2. **What are the environmental, social integration, landscape design or urban design benefits or opportunities presented by this option? Particularly record opportunities that could be lost if not considered early in the design process.**

Ensure businesses on eastern side of loop road are not heavily impacted during works. Major vehicle entry/exit point from business here + business utilises road reserve for parking. Ensure alternate route's for southbound entry onto SH 10 are provided. Ensure entry/exit from Petrol Station is not heavily disturbed during works.

3. **Are there any impacts, risks or opportunities which require preliminary technical assessments to help understand risks or opportunities? Is further information required to support the development of the detailed business case or can it be left until the detailed business case/pre-implementation?**

Potential flooding risks/fish passage risks from SH 10 and Martime Road Creek Crossings need to be addressed. Also considered important to address contaminated land. Suggest progressing straight to Stage 2 investigation - get soil samples from orchard and substation sites.

Completed by	Mark Farrey	
Reviewed by NZTA Project Manager		
Incorporated results into IBC assessment of options summary table?	Yes ●	No ☐

ENVIRONMENTAL AND SOCIAL RESPONSIBILITY SCREEN V2.FEBRUARY 2016

NZ TRANSPORT AGENCY WAKA KOTAHI

Use to assess options in the Indicative Business Case

Use this screen to identify opportunities and risks and assess options for state highway projects. Complete the screen for each option to distinguish them from one another or bundle options where appropriate. Screen results will signal where technical assessments are required and provide a written record to support the alternatives assessment required for statutory applications. For further assistance contact the EUD Team.

Additional instructions and content, including information sources, to help complete the screen can be found on the Highways Information Portal Screen pages here

Decide how many times screen should be filled out (Group Options) ▶ Answer screen questions using project information and suggested information sources ▶ Refer to screen questions explanation, particularly if you answered yes to any of the questions ▶ Complete page 2 of screen ▶ Incorporate page 2 text in IBC assessment of options table (Background and MCA)

PROJECT LOCATION:	PROJECT PURPOSE:	DATE:	OPTION DESCRIPTION:
Waipapa State Highway 10	Intersection Upgrade	25/05/2017	Head to Head Right Turn Bays

CATEGORY		QUESTION	ANSWER		USEFUL INFORMATION SOURCES
GENERAL	G1	What is the zoning of adjacent land? Are there any encumbrances on the land? e.g. Maori Reserve or other reserve/covenants	Rural [ ] / Industrial [x] / High density residential [ ]	Commercial [x] / Residential [ ] / Parks/open space [ ]	District/Unitary Plan Zoning Maps
	G2	Does the option disturb previously undisturbed land?	Y [ ]	N [x]	
	G3	What is the construction timeframe?	>18 months [ ]	<18 months [x]	
NATURAL ENVIRONMENT	NE1	Are there any outstanding/significant natural features (e.g. geological or geothermal)/landscapes?	Y [ ]	N [x]	NZTA MapHub Environmental and Social Risk Map- Natural Environment Regional Plan Maps and Schedules District Plan Maps and Schedules Department of Conservation
	NE2	Will the option affect the coastal marine area, wetlands, lakes, rivers, streams or their margins?	Y [x]	N [ ]	
	NE3	Will the option affect areas of the conservation estate, or areas of known significance for biodiversity or known habitats of uncommon or threatened species?	Y [ ]	N [x]	
	NE4	Is the option in an area of potential hazard risk e.g. fault lines, significant erosion, flooding, sea level rise etc?	Y [x]	N [ ]	
	NE5	Will more than 0.5 hectares of vegetation be removed?	Y [ ]	N [x]	
		What type?			
CULTURAL AND HISTORIC HERITAGE	CH1	Are there sites/areas of significance to Maori within 200m of the area of interest?	Y [ ]	N [x]	Iwi NZTA MapHub Environmental and Social Risk Map- Culture and Heritage Heritage New Zealand List NZ Archaeological Association District Plan Maps and Schedules Regional Plan Maps and Schedules IPENZ Heritage List NZTA GIS predictive models
	CH2	Are any recorded, scheduled or listed archaeological sites within 200m of the area of interest?	Y [ ]	N [x]	
	CH3	Are any scheduled, listed or other important heritage buildings/structures within 200m of the area of interest?	Y [ ]	N [x]	
	CH4	Will the option affect the setting of any historic building/structure or archaeological site?	Y [ ]	N [x]	
	CH5	Is a group of archaeological sites or an area of historic built environment (even partially) within 200m of the area of interest?	Y [ ]	N [x]	
HUMAN HEALTH	HH1	What is the One Network Road Classification?	National [ ] / Arterial [ ]	Regional [x] / Collector [ ]	NZTA MapHub Environmental and Social Risk Maps- Human Health and Community which includes: - Designated airsheds (including one network classification) - Highly sensitive receivers Regional Council Contaminated sites Team
	HH2	Is the area of interest designated as a non-compliant airshed?	Y [ ]	N [x]	
	HH3	Are there medical sites, rest homes, schools, child care sites, residential properties, maraes or other sensitive receivers located within 200m of the area of interest?	Y [ ]	N [x]	
	HH4	Does land use within 200m of the area of interest include industrial sites, chemical manufacturing or storage, petrol stations, vehicle maintenance, timber processing/treatment, substations, rail yards, landfills or involve other activities that may result in ground contamination?	Y [x]	N [ ]	
		OR Are there HAIL or SLUR (contaminated) sites within 200m of the area of interest?	Y [x]	N [ ]	
SOCIAL	S1	Does the option affect access to community facilities i.e. libraries, open space etc (either temporarily or permanently)?	Y [ ] Which?	N [x]	NZTA MapHub Project Team District Plan Maps Council and Community Strategy Documents
	S2	Does the option affect community cohesion and accessibility including vehicular connectivity on the local road network?	Y [x]	N [ ]	
URBAN AND LANDSCAPE DESIGN	ULD 1	Are there opportunities to enhance infrastructure for, and/or improve access to, public transport and/or active modes of travel such as as walking and cycling?	Y [x]	N [ ]	NZTA MapHub Environmental and Social Risk Map- Natural Environment (Scenic Routes) Regional Land Transport Plan Project Team Strategies and District Plan
	ULD2	Does the option enhance the development potential of adjacent land where appropriate?	Y [x]	N [ ]	
	ULD3	Is the option located on a themed highway? Is the option part of or near a national cycle or walking route?	Y [x]	N [ ]	
	ULD4	Are there opportunities to enhance the urban character, landscape character and visual amenity?	Y [x]	N [ ]	

Answers and Comments	Refer to screen questions explanation to help complete this part.

1. **Summarize the potential environmental and social risks/impacts associated with this option. Consider short and long term risks and impacts.**

NATURAL ENVIRONMENT:	Works footprint is pre-disturbed, contains no significant ecological/flora/fauna values. SH10 and Maritime Road both cross a stream. Any crossings of the stream must not worsen upstream flooding up to 100 year ARI, and must not worsen fish passage up to 1 year ARI.
CULTURAL AND HISTORIC HERITAGE:	Works footprint is pre-disturbed, contains no significant archaeology/heritage values.
HUMAN HEALTH:	Portion of land needs to be taken from orchard on corner of SH 10 and Waipapa Road. Portion of land needs to be taken from electrical substation on corner of Maritime Rd and Loop Road. Both sites are HAIL activities. Potential for contaminated land.
SOCIAL:	Business/properties on eastern side of Loop road likely to be impacted at least during works period. Appears businesses utilise road reserve for car parking. Petrol station on SH 10 and Waipapa Road intersection likely to be impacted at least during works - vehicle entry/exit from the service station may be impacted.

The responses above will be used in the IBC assessment of options summary table: MCA of the Option.

URBAN AND LANDSCAPE DESIGN:	Some opportunity to provide landscaping improvement on corner of Maritime Road and Loop Road - portion of road designation on northern side of intersection will remain unutilised. Some opportunity to provide landscaping improvement on corner of Petrol Station - portion of road designation will remain unutilised.

Incorporate the relevant comments from above into the economy, social and geography sections of the IBC assessment of options summary table.

2. **What are the environmental, social integration, landscape design or urban design benefits or opportunities presented by this option? Particularly record opportunities that could be lost if not considered early in the design process.**

Ensure businesses on eastern side of loop road are not heavily impacted during works. Major vehicle entry/exit point from business here + business utilises road reserve for parking. Ensure entry/exit from Petrol Station is not heavily disturbed during works.

3. **Are there any impacts, risks or opportunities which require preliminary technical assessments to help understand risks or opportunities? Is further information required to support the development of the detailed business case or can it be left until the detailed business case/pre-implementation?**

Potential flooding risks/fish passage risks from SH 10 and Martime Road Creek Crossings need to be addressed. Also considered important to address contaminated land. Suggest progressing straight to Stage 2 investigation - get soil samples from orchard and substation sites.

Completed by	Mark Farrey	
Reviewed by NZTA Project Manager		
Incorporated results into IBC assessment of options summary table?	Yes ●	No ☐

ENVIRONMENTAL AND SOCIAL RESPONSIBILITY SCREEN V2.FEBRUARY 2016

NZ TRANSPORT AGENCY
WAKA KOTAHI

Use to assess options in the Indicative Business Case

Use this screen to identify opportunities and risks and assess options for state highway projects. Complete the screen for each option to distinguish them from one another or bundle options where appropriate. Screen results will signal where technical assessments are required and provide a written record to support the alternatives assessment required for statutory applications. For further assistance contact the EUD Team.

Additional instructions and content, including information sources, to help complete the screen can be found on the Highways Information Portal Screen pages here

Decide how many times screen should be filled out (Group Options) ▶ Answer screen questions using project information and suggested information sources ▶ Refer to screen questions explanation, particularly if you answered yes to any of the questions ▶ Complete page 2 of screen ▶ Incorporate page 2 text in IBC assessment of options table (Background and MCA)

PROJECT LOCATION:	PROJECT PURPOSE:	DATE:	OPTION DESCRIPTION:
Waipapa State Highway 10	Intersection Upgrade	25/05/2017	Right Turn Bay Option

CATEGORY		QUESTION	ANSWER		USEFUL INFORMATION SOURCES
GENERAL	G1	What is the zoning of adjacent land? Are there any encumbrances on the land? e.g. Maori Reserve or other reserve/covenants	Rural ☐	Commercial ☒	District/Unitary Plan Zoning Maps
			Industrial ☒	Residential ☐	
			High density residential ☐	Parks/open space ☐	
	G2	Does the option disturb previously undisturbed land?	Y ☐	N ☒	
	G3	What is the construction timeframe?	>18 months ☐	<18 months ☒	
NATURAL ENVIRONMENT	NE1	Are there any outstanding/significant natural features (e.g. geological or geothermal)/landscapes?	Y ☐	N ☒	NZTA MapHub Environmental and Social Risk Map- Natural Environment
	NE2	Will the option affect the coastal marine area, wetlands, lakes, rivers, streams or their margins?	Y ☒	N ☐	Regional Plan Maps and Schedules
	NE3	Will the option affect areas of the conservation estate, or areas of known significance for biodiversity or known habitats of uncommon or threatened species?	Y ☐	N ☒	District Plan Maps and Schedules
	NE4	Is the option in an area of potential hazard risk e.g. fault lines, significant erosion, flooding, sea level rise etc?	Y ☒	N ☐	Department of Conservation
	NE5	Will more than 0.5 hectares of vegetation be removed?	Y ☐	N ☒	
		What type?			
CULTURAL AND HISTORIC HERITAGE	CH1	Are there sites/areas of significance to Maori within 200m of the area of interest?	Y ☐	N ☒	Iwi NZTA MapHub Environmental and Social Risk Map- Culture and Heritage Heritage New Zealand List NZ Archaeological Association District Plan Maps and Schedules Regional Plan Maps and Schedules IPENZ Heritage List NZTA GIS predictive models
	CH2	Are any recorded, scheduled or listed archaeological sites within 200m of the area of interest?	Y ☐	N ☒	
	CH3	Are any scheduled, listed or other important heritage buildings/ structures within 200m of the area of interest?	Y ☐	N ☒	
	CH4	Will the option affect the setting of any historic building/structure or archaeological site?	Y ☐	N ☒	
	CH5	Is a group of archaeological sites or an area of historic built environment (even partially) within 200m of the area of interest?	Y ☐	N ☒	
HUMAN HEALTH	HH1	What is the One Network Road Classification?	National ☐	Regional ☒	NZTA MapHub Environmental and Social Risk Maps- Human Health and Community which includes: - Designated airsheds (including one network classification) - Highly sensitive receivers Regional Council Contaminated sites Team
			Arterial ☐	Collector ☐	
	HH2	Is the area of interest designated as a non-compliant airshed?	Y ☐	N ☒	
	HH3	Are there medical sites, rest homes, schools, child care sites, residential properties, maraes or other sensitive receivers located within 200m of the area of interest?	Y ☐	N ☒	
	HH4	Does land use within 200m of the area of interest include industrial sites, chemical manufacturing or storage, petrol stations, vehicle maintenance, timber processing/treatment, substations, rail yards, landfills or involve other activities that may result in ground contamination?	Y ☒	N ☐	
		OR Are there HAIL or SLUR (contaminated) sites within 200m of the area of interest?	Y ☒	N ☐	
SOCIAL	S1	Does the option affect access to community facilities i.e. libraries, open space etc (either temporarily or permanently)?	Y ☐	N ☒	NZTA MapHub Project Team District Plan Maps Council and Community Strategy Documents
			Which?		
	S2	Does the option affect community cohesion and accessibility including vehicular connectivity on the local road network?	Y ☒	N ☐	
URBAN AND LANDSCAPE DESIGN	ULD 1	Are there opportunities to enhance infrastructure for, and/or improve access to, public transport and/or active modes of travel such as as walking and cycling?	Y ☒	N ☐	NZTA MapHub Environmental and Social Risk Map- Natural Environment (Scenic Routes) Regional Land Transport Plan Project Team Strategies and District Plan
	ULD2	Does the option enhance the development potential of adjacent land where appropriate?	Y ☒	N ☐	
	ULD3	Is the option located on a themed highway? Is the option part of or near a national cycle or walking route?	Y ☒	N ☐	
	ULD4	Are there opportunities to enhance the urban character, landscape character and visual amenity?	Y ☒	N ☐	

Answers and Comments	Refer to screen questions explanation to help complete this part.

1. **Summarize the potential environmental and social risks/impacts associated with this option. Consider short and long term risks and impacts.**

NATURAL ENVIRONMENT:	Works footprint is pre-disturbed, contains no significant ecological/flora/fauna values. SH10 and Maritime Road both cross a stream. Any crossings of the stream must not worsen upstream flooding up to 100 year ARI, and must not worsen fish passage up to 1 year ARI.
CULTURAL AND HISTORIC HERITAGE:	Works footprint is pre-disturbed, contains no significant archaeology/heritage values.
HUMAN HEALTH:	Portion of land needs to be taken from electrical substation on corner of Maritime Rd and Loop Road, likely a HAIL activity. Potential for contaminated land.
SOCIAL:	Business/properties on eastern side of Loop road likely to be impacted at least during works period. Appears businesses utilise road reserve for car parking. Option has benefit that no change to northern connection Loop Road/SH10 will occur - no major change.

The responses above will be used in the IBC assessment of options summary table: MCA of the Option.

URBAN AND LANDSCAPE DESIGN:	Some opportunity to provide landscaping improvement on corner of Maritime Road and Loop Road - portion of road designation on northern side of intersection will remain unutilised.

Incorporate the relevant comments from above into the economy, social and geography sections of the IBC assessment of options summary table.

2. **What are the environmental, social integration, landscape design or urban design benefits or opportunities presented by this option? Particularly record opportunities that could be lost if not considered early in the design process.**

Ensure businesses on eastern side of loop road are not heavily impacted during works. Major vehicle entry/exit point from business here + business utilises road reserve for parking

3. **Are there any impacts, risks or opportunities which require preliminary technical assessments to help understand risks or opportunities? Is further information required to support the development of the detailed business case or can it be left until the detailed business case/pre-implementation?**

Potential flooding risks/fish passage risks from SH 10 and Martime Road Creek Crossings need to be addressed. Also considered important to address contaminated land (stage 2 inv)

Completed by	Mark Farrey	
Reviewed by NZTA Project Manager		
Incorporated results into IBC assessment of options summary table?	Yes ☑	No ☐

ENVIRONMENTAL AND SOCIAL RESPONSIBILITY SCREEN V2.FEBRUARY 2016

NZ TRANSPORT AGENCY
WAKA KOTAHI

Use to assess options in the Indicative Business Case

Use this screen to identify opportunities and risks and assess options for state highway projects. Complete the screen for each option to distinguish them from one another or bundle options where appropriate. Screen results will signal where technical assessments are required and provide a written record to support the alternatives assessment required for statutory applications. For further assistance contact the EUD Team.

Additional instructions and content, including information sources, to help complete the screen can be found on the Highways Information Portal Screen pages here

Decide how many times screen should be filled out (Group Options) ▶ Answer screen questions using project information and suggested information sources ▶ Refer to screen questions explanation, particularly if you answered yes to any of the questions ▶ Complete page 2 of screen ▶ Incorporate page 2 text in IBC assessment of options table (Background and MCA)

PROJECT LOCATION:	PROJECT PURPOSE:	DATE:	OPTION DESCRIPTION:
Waipapa State Highway 10	Intersection Upgrade	25/05/2017	Roundabout

CATEGORY		QUESTION	ANSWER		USEFUL INFORMATION SOURCES
GENERAL	G1	What is the zoning of adjacent land? Are there any encumbrances on the land? e.g. Maori Reserve or other reserve/covenants	Rural ☐ Industrial ☒ High density residential ☐	Commercial ☒ Residential ☐ Parks/open space ☐	District/Unitary Plan Zoning Maps
	G2	Does the option disturb previously undisturbed land?	Y ☐	N ☒	
	G3	What is the construction timeframe?	>18 months ☐	<18 months ☒	
NATURAL ENVIRONMENT	NE1	Are there any outstanding/significant natural features (e.g. geological or geothermal)/landscapes?	Y ☐	N ☒	NZTA MapHub Environmental and Social Risk Map- Natural Environment
	NE2	Will the option affect the coastal marine area, wetlands, lakes, rivers, streams or their margins?	Y ☒	N ☐	Regional Plan Maps and Schedules
	NE3	Will the option affect areas of the conservation estate, or areas of known significance for biodiversity or known habitats of uncommon or threatened species?	Y ☐	N ☒	District Plan Maps and Schedules
	NE4	Is the option in an area of potential hazard risk e.g. fault lines, significant erosion, flooding, sea level rise etc?	Y ☒	N ☐	Department of Conservation
	NE5	Will more than 0.5 hectares of vegetation be removed?	Y ☐	N ☒	
		What type?			
CULTURAL AND HISTORIC HERITAGE	CH1	Are there sites/areas of significance to Maori within 200m of the area of interest?	Y ☐	N ☒	Iwi NZTA MapHub Environmental and Social Risk Map- Culture and Heritage
	CH2	Are any recorded, scheduled or listed archaeological sites within 200m of the area of interest?	Y ☐	N ☒	Heritage New Zealand List NZ Archaeological Association
	CH3	Are any scheduled, listed or other important heritage buildings/ structures within 200m of the area of interest?	Y ☐	N ☒	District Plan Maps and Schedules
	CH4	Will the option affect the setting of any historic building/structure or archaeological site?	Y ☐	N ☒	Regional Plan Maps and Schedules IPENZ Heritage List
	CH5	Is a group of archaeological sites or an area of historic built environment (even partially) within 200m of the area of interest?	Y ☐	N ☒	NZTA GIS predictive models
HUMAN HEALTH	HH1	What is the One Network Road Classification?	National ☐ Arterial ☐	Regional ☒ Collector ☐	NZTA MapHub Environmental and Social Risk Maps- Human Health and Community which includes:
	HH2	Is the area of interest designated as a non-compliant airshed?	Y ☐	N ☒	- Designated airsheds (including one network classification)
	HH3	Are there medical sites, rest homes, schools, child care sites, residential properties, maraes or other sensitive receivers located within 200m of the area of interest?	Y ☐	N ☒	- Highly sensitive receivers Regional Council Contaminated sites Team
	HH4	Does land use within 200m of the area of interest include industrial sites, chemical manufacturing or storage, petrol stations, vehicle maintenance, timber processing/treatment, substations, rail yards, landfills or involve other activities that may result in ground contamination?	Y ☒	N ☐	
		OR Are there HAIL or SLUR (contaminated) sites within 200m of the area of interest?	Y ☒	N ☐	
SOCIAL	S1	Does the option affect access to community facilities i.e. libraries, open space etc (either temporarily or permanently)?	Y ☐ Which?	N ☒	NZTA MapHub Project Team District Plan Maps
	S2	Does the option affect community cohesion and accessibility including vehicular connectivity on the local road network?	Y ☒	N ☐	Council and Community Strategy Documents
URBAN AND LANDSCAPE DESIGN	ULD 1	Are there opportunities to enhance infrastructure for, and/or improve access to, public transport and/or active modes of travel such as as walking and cycling?	Y ☒	N ☐	NZTA MapHub Environmental and Social Risk Map- Natural Environment (Scenic Routes)
	ULD2	Does the option enhance the development potential of adjacent land where appropriate?	Y ☒	N ☐	Regional Land Transport Plan Project Team
	ULD3	Is the option located on a themed highway? Is the option part of or near a national cycle or walking route?	Y ☒	N ☐	Strategies and District Plan
	ULD4	Are there opportunities to enhance the urban character, landscape character and visual amenity?	Y ☒	N ☐	

Answers and Comments	Refer to screen questions explanation to help complete this part.

1. **Summarize the potential environmental and social risks/impacts associated with this option. Consider short and long term risks and impacts.**

NATURAL ENVIRONMENT:	Works footprint is pre-disturbed, contains no significant ecological/flora/fauna values. SH10 and Maritime Road both cross a stream. Any crossings of the stream must not worsen upstream flooding up to 100 year ARI, and must not worsen fish passage up to 1 year ARI.
CULTURAL AND HISTORIC HERITAGE:	Works footprint is pre-disturbed, contains no significant archaeology/heritage values.
HUMAN HEALTH:	Minor portion of land needs to be taken from orchard on corner of SH 10 and Waipapa Road. Minor portion of land needs to be taken from petrol station on corner of SH 10 and Waipapa Road. Portion of land needs to be taken from commercial business on south east corner of SH 10 and Waipapa Road. Portion of land needs to be taken from electrical substation on corner of Maritime Rd and Loop Road. Each of these sites are likely HAIL sites Potential for contaminated land.
SOCIAL:	Commercial business on south east corner of SH 10 and Loop Road will be impacted as their building/shop is located within the land required. Business/properties on eastern side of Loop road likely to be impacted at least during works period. Appears businesses utilise road reserve for car parking. Petrol Station on SH 10 and Waipapa Road intersection likely to be impacted at least during works - vehicle entry/exit from the service station may be impacted. This option is likely to have a longer temporary impact on general users of SH10. The other options have similar lower construction timeframe estimates, the roundabout stands out with a slightly higher construction timeframe - therefore it has the highest potential for nuisance to SH 10 users.

The responses above will be used in the IBC assessment of options summary table: MCA of the Option.

URBAN AND LANDSCAPE DESIGN:	Some opportunity to provide landscaping improvement on corner of Maritime Road and Loop Road - portion of road designation on northern side of intersection will remain unutilised. Some opportunity to provide landscaping in centre of roundabout.

Incorporate the relevant comments from above into the economy, social and geography sections of the IBC assessment of options summary table.

2. **What are the environmental, social integration, landscape design or urban design benefits or opportunities presented by this option? Particularly record opportunities that could be lost if not considered early in the design process.**

Ensure commercial business owner on corner of SH10 and Loop Road is catered for.

Ensure businesses on eastern side of loop road are not heavily impacted during works. Major vehicle entry/exit point from business here + business utilises road reserve for parking. Ensure entry/exit from Petrol Station is not heavily disturbed during works.

3. **Are there any impacts, risks or opportunities which require preliminary technical assessments to help understand risks or opportunities? Is further information required to support the development of the detailed business case or can it be left until the detailed business case/pre-implementation?**

Potential flooding risks/fish passage risks from SH 10 and Martime Road Creek Crossings need to be addressed. Also considered important to address contaminated land. Suggest progressing straight to Stage 2 investigation - get soil samples from orchard, substation, and petrol station sites. Traffic management important for temporary works.

Completed by	Mark Farrey	
Reviewed by NZTA Project Manager		
Incorporated results into IBC assessment of options summary table?	Yes ●	No ☐

ENVIRONMENTAL AND SOCIAL RESPONSIBILITY SCREEN V2.FEBRUARY 2016

NZ TRANSPORT AGENCY
WAKA KOTAHI

Use to assess options in the Indicative Business Case

Use this screen to identify opportunities and risks and assess options for state highway projects. Complete the screen for each option to distinguish them from one another or bundle options where appropriate. Screen results will signal where technical assessments are required and provide a written record to support the alternatives assessment required for statutory applications. For further assistance contact the EUD Team.

Additional instructions and content, including information sources, to help complete the screen can be found on the Highways Information Portal Screen pages here

Decide how many times screen should be filled out (Group Options) ▶ Answer screen questions using project information and suggested information sources ▶ Refer to screen questions explanation, particularly if you answered yes to any of the questions ▶ Complete page 2 of screen ▶ Incorporate page 2 text in IBC assessment of options table (Background and MCA)

PROJECT LOCATION:	PROJECT PURPOSE:	DATE:	OPTION DESCRIPTION:
Waipapa State Highway 10	Intersection Upgrade	25/05/2017	Traffic Signals

CATEGORY		QUESTION	ANSWER	USEFUL INFORMATION SOURCES
GENERAL	G1	What is the zoning of adjacent land? Are there any encumbrances on the land? e.g. Maori Reserve or other reserve/covenants	Rural [ ] Commercial [x] Industrial [x] Residential [ ] High density residential [ ] Parks/open space [ ]	District/Unitary Plan Zoning Maps
	G2	Does the option disturb previously undisturbed land?	Y [ ] N [x]	
	G3	What is the construction timeframe?	>18 months [ ] <18 months [x]	
NATURAL ENVIRONMENT	NE1	Are there any outstanding/significant natural features (e.g. geological or geothermal)/landscapes?	Y [ ] N [x]	NZTA MapHub Environmental and Social Risk Map- Natural Environment Regional Plan Maps and Schedules District Plan Maps and Schedules Department of Conservation
	NE2	Will the option affect the coastal marine area, wetlands, lakes, rivers, streams or their margins?	Y [x] N [ ]	
	NE3	Will the option affect areas of the conservation estate, or areas of known significance for biodiversity or known habitats of uncommon or threatened species?	Y [ ] N [x]	
	NE4	Is the option in an area of potential hazard risk e.g. fault lines, significant erosion, flooding, sea level rise etc?	Y [x] N [ ]	
	NE5	Will more than 0.5 hectares of vegetation be removed? What type?	Y [ ] N [x]	
CULTURAL AND HISTORIC HERITAGE	CH1	Are there sites/areas of significance to Maori within 200m of the area of interest?	Y [ ] N [x]	Iwi NZTA MapHub Environmental and Social Risk Map- Culture and Heritage Heritage New Zealand List NZ Archaeological Association District Plan Maps and Schedules Regional Plan Maps and Schedules IPENZ Heritage List NZTA GIS predictive models
	CH2	Are any recorded, scheduled or listed archaeological sites within 200m of the area of interest?	Y [ ] N [x]	
	CH3	Are any scheduled, listed or other important heritage buildings/ structures within 200m of the area of interest?	Y [ ] N [x]	
	CH4	Will the option affect the setting of any historic building/structure or archaeological site?	Y [ ] N [x]	
	CH5	Is a group of archaeological sites or an area of historic built environment (even partially) within 200m of the area of interest?	Y [ ] N [x]	
HUMAN HEALTH	HH1	What is the One Network Road Classification?	National [ ] Regional [x] Arterial [ ] Collector [ ]	NZTA MapHub Environmental and Social Risk Maps- Human Health and Community which includes: - Designated airsheds (including one network classification) - Highly sensitive receivers Regional Council Contaminated sites Team
	HH2	Is the area of interest designated as a non-compliant airshed?	Y [ ] N [x]	
	HH3	Are there medical sites, rest homes, schools, child care sites, residential properties, maraes or other sensitive receivers located within 200m of the area of interest?	Y [ ] N [x]	
	HH4	Does land use within 200m of the area of interest include industrial sites, chemical manufacturing or storage, petrol stations, vehicle maintenance, timber processing/treatment, substations, rail yards, landfills or involve other activities that may result in ground contamination?	Y [x] N [ ]	
		OR Are there HAIL or SLUR (contaminated) sites within 200m of the area of interest?	Y [x] N [ ]	
SOCIAL	S1	Does the option affect access to community facilities i.e. libraries, open space etc (either temporarily or permanently)?	Y [ ] N [x] Which?	NZTA MapHub Project Team District Plan Maps Council and Community Strategy Documents
	S2	Does the option affect community cohesion and accessibility including vehicular connectivity on the local road network?	Y [x] N [ ]	
URBAN AND LANDSCAPE DESIGN	ULD 1	Are there opportunities to enhance infrastructure for, and/or improve access to, public transport and/or active modes of travel such as as walking and cycling?	Y [x] N [ ]	NZTA MapHub Environmental and Social Risk Map- Natural Environment (Scenic Routes) Regional Land Transport Plan Project Team Strategies and District Plan
	ULD2	Does the option enhance the development potential of adjacent land where appropriate?	Y [x] N [ ]	
	ULD3	Is the option located on a themed highway? Is the option part of or near a national cycle or walking route?	Y [x] N [ ]	
	ULD4	Are there opportunities to enhance the urban character, landscape character and visual amenity?	Y [x] N [ ]	

Answers and Comments	Refer to screen questions explanation to help complete this part.

1. **Summarize the potential environmental and social risks/impacts associated with this option. Consider short and long term risks and impacts.**

NATURAL ENVIRONMENT:	Works footprint is pre-disturbed, contains no significant ecological/flora/fauna values. SH10 and Maritime Road both cross a stream. Any crossings of the stream must not worsen upstream flooding up to 100 year ARI, and must not worsen fish passage up to 1 year ARI.
CULTURAL AND HISTORIC HERITAGE:	Works footprint is pre-disturbed, contains no significant archaeology/heritage values.
HUMAN HEALTH:	Portion of land needs to be taken from electrical substation on corner of Maritime Rd and Loop Road, likely a HAIL activity. Potential for contaminated land.
SOCIAL:	Business/properties on eastern side of Loop road likely to be impacted at least during works period. Appears businesses utilise road reserve for car parking.

The responses above will be used in the IBC assessment of options summary table: MCA of the Option.

URBAN AND LANDSCAPE DESIGN:	No changes will occur to the road alignment and set out

Incorporate the relevant comments from above into the economy, social and geography sections of the IBC assessment of options summary table.

2. **What are the environmental, social integration, landscape design or urban design benefits or opportunities presented by this option? Particularly record opportunities that could be lost if not considered early in the design process.**

Ensure businesses on eastern side of loop road are not heavily impacted during works. Major vehicle entry/exit point from business here + business utilises road reserve for parking

3. **Are there any impacts, risks or opportunities which require preliminary technical assessments to help understand risks or opportunities? Is further information required to support the development of the detailed business case or can it be left until the detailed business case/pre-implementation?**

Potential flooding risks/fish passage risks from SH 10 and Maritime Road Creek Crossings need to be addressed. Also considered important to address contaminated land - suggest progressing straight to stage 2 investigation at substation.

Completed by	Mark Farrey	
Reviewed by NZTA Project Manager		
Incorporated results into IBC assessment of options summary table?	Yes ☒	No ☐

APPENDIX G
Final Multi Criteria Analysis

ASSESSMENT SUMMARY TABLE – DO MINIMUM: KLINAC LANE EXTENSION

Business case name	SH10 Waipapa Road Intersection Improvements		Name of Project Manager & Region		Sebastian Reed, Auckland / Northland	
Business case purpose	To upgrade the SH10 Waipapa Road Intersection to improve the economic growth, efficiency, safety, and to promote of multi-modal travel in the Northland region.					
Option description	**Description:** The Klinac Lane Extension will be installed to the north following the intersection at SH10, Waipapa Road and Waipapa Loop Road. This extension is practically essential for any outcome that tries to properly balance traffic on the local road approaches to the main intersection.  **Dependencies:** None					
Estimated total public sector funding requirement			**Lower**		**Upper**	
	Capital cost ($m):		$361,031		$400,194	
	Net property cost ($m):		-		-	
	Opex ($m/30yr):					
	Maintenance ($m/30yr):					
	Present value of cost to govt. ($m):					
Estimated BCR range						
Timing of need:	***Optimal programme***:		***Likely***:			
IAF profile	***Strategic fit***	H/M/L	***Effectiveness***	H/M/L	***Efficiency***	H/M/L

ASSESSMENT SUMMARY TABLE – DO MINIMUM: KLINAC LANE EXTENSION

Criterion	Score	Discussion
Objective 1: Economic Growth through integrated land-use	*0*	This option scored neutral for the first objective of *Economic Growth* as it is likely to make no effect to the economics of the area in terms of either aiding or restricting it.
Objective 2: Improve network efficiency	--	This option increases traffic at the intersection of SH10, Waipapa Road and Waipapa Loop Road. This traffic increase will saturate the intersection and adversely affect the SH10 traffic.
Objective 3: Improve safety by reducing crossing/turning crashes	--	This option increases the traffic at the intersection of SH10, Waipapa Road and Waipapa Loop Road, thereby increasing the risk of crossing/turning crashes.
Objective 4: Facilitate growth of multi-modal travel	*0*	This option has scored neutral for facilitating multi-modal travel as it is likely to make no effect to facilitate multi-modal travel in the area in terms of either aiding or restricting it.
Feasibility	*0*	As this option has already been decided to go ahead by FNDC, it is considered feasible and scored neutral in comparison to the other options.
Affordability	*0*	This option scored neutral for affordability as this project is most likely to go ahead regardless of the Waipapa Road Intersection Improvements and will be funded in part by FNDC.
Public/Stake-holders	---	As the public/stakeholders consider the intersection at SH10, Waipapa Road and Waipapa Loop Road to be a bad and unsafe intersection. '*Do Nothing*' will not be an acceptable option at this site.
Environmental and social	*0*	Although this option will not fix the issues with the intersection at SH10, Waipapa Road and Waipapa Loop Road; it will however, aid in dealing with the traffic in its proximity and offering better solutions to the businesses in and around it.
Safety	--	This option increases the traffic at the intersection of SH10, Waipapa Road and Waipapa Loop Road, thereby increasing the risk of crossing/turning crashes. This option does not address the needs of pedestrians and cyclists.
Economy	*0*	This option scored neutral for economy as this option as it is likely to make no effect to the economics of the area in terms of either aiding or restricting it.
Environmental opportunities	There is some opportunity to improve the stormwater capacity on Klinac Lane, which will improve the overflow during flood events.	
Social opportunities	There may be some social opportunities based on the needs of the local businesses.	
Rationale for selection or rejection of alternative	This option ranked 6th of those assessed. It was believed that a Do-Minimum approach will not be met favourably by the public and stakeholders as they have been expecting improvements to the intersection. This option would also not be beneficial in terms of improvements to safety and efficiency, which will degrade further with increase in traffic over time.	

ASSESSMENT SUMMARY TABLE – RIGHT TURN BAY

Business case name	SH10 Waipapa Road Intersection Improvements	Name of Project Manager & Region	Sebastian Reed, Auckland / Northland
Business case purpose	To upgrade the SH10 Waipapa Road Intersection to improve the economic growth, efficiency, safety, and to promote of multi-modal travel in the Northland region.		
Option description	**Description:** This option will involve providing a Right Turn Bay (RTB) for which there is room due to the existing width of the road. This will allow the through traffic to continue unimpeded, and provide right turning traffic with a safe place to wait. The dis-benefit of this option will be that the speed of through traffic will likely increase and add to the difficulty of exiting the side roads.  **Dependencies:** None		

Estimated total public sector funding requirement		**Lower**	**Upper**
	Capital cost ($m):	$5,030,208	$5,722,276
	Net property cost ($m):	$274,750	$329,700
	Opex ($m/30yr):		
	Maintenance ($m/30yr):		
	Present value of cost to govt. ($m):		
Estimated BCR range			
Timing of need:	**Optimal programme**:	**Likely**:	

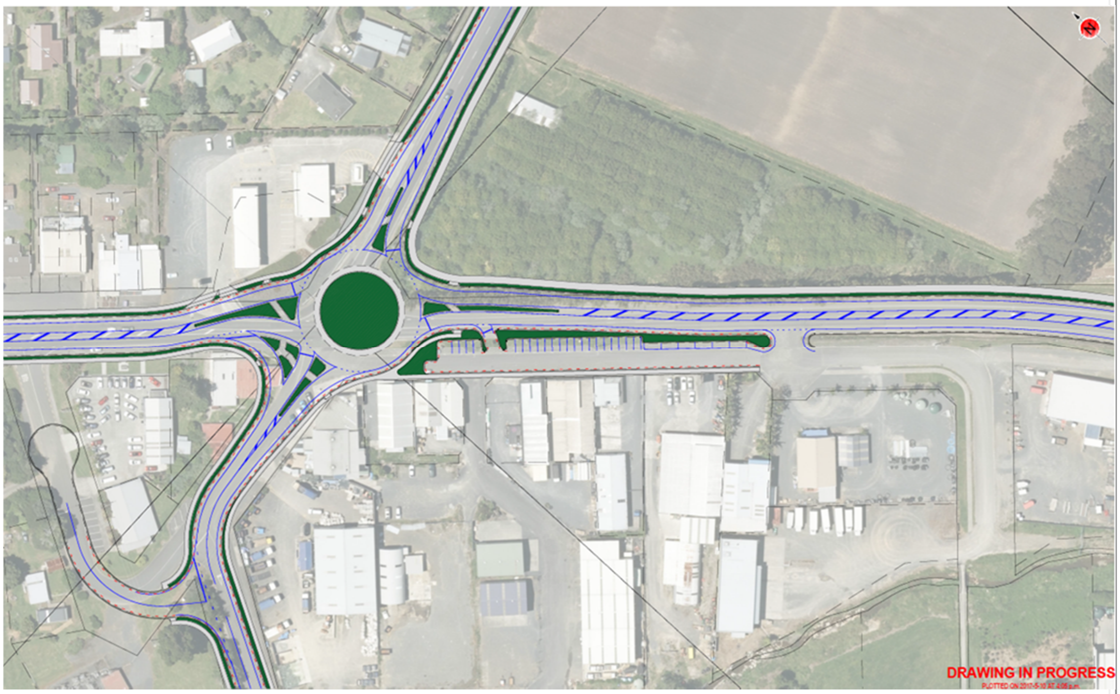
[IAF profile]()	[Strategic fit]()	L	[Effectiveness]()	L	[Efficiency]()	M

ASSESSMENT SUMMARY TABLE – RIGHT TURN BAY

Criterion	Score	Discussion
Objective 1: Economic Growth through integrated land-use	+	This option provides a slightly better situation than *Do Minimum* in terms of improved local business access. However, this option still poses some level of impediment to local traffic from Waipapa Road crossing the SH10.
Objective 2: Improve network efficiency	0	The benefit to SH10 through-traffic from separating the *right* turning traffic is offset by the longer and less straight-forward route for the cross-traffic. Therefore, the net effect remains neutral.
Objective 3: Improve safety by reducing crossing/turning crashes	--	Whilst some safety benefit is delivered to right turners exiting Waipapa Road, the northbound through-traffic may travel at faster speeds, no longer impeded by traffic turning right from SH10. Additionally, the increased traffic movements at Waipapa Loop Road North will create more conflict with SH10 traffic and the shops opposite.
Objective 4: Facilitate growth of multimodal travel	++	This option will mean that pedestrian movements are well provided for, with uncontrolled crossing points as this option offers some of the shortest walking routes across the intersection. Cycling is also reasonably well-catered for in this option.
Feasibility	-	N.E. and S.W. corners will remain unaffected and with least impact on the S.E. corner. On the N.W. corner major land take is required. Some property access in industrial area will be slightly affected by change to one way in Skippers lane. In terms of consenting, this option is neutral relative to the other options, as at this early stage, it is considered that the each of the options is equally consentable. For this option the whole of life/maintenance costs will be minimal.
Affordability	0	Whilst costs vary somewhat between options, the affordability of whatever become the preferred option will be considered to be "affordable" if economically viable overall.
Public/Stake-holders	--	Whilst the public may recognise some benefit, any non-roundabout option is likely to be seen as nett dis-benefit as such. This is due to the fact that the other options really do not address the full extent of the problems in the area of the intersection at SH10, Waipapa Road and Waipapa Loop Road.
Environmental and social	++	Good pedestrian connectivity to all amenities. Slight dis-benefit for motorists as straight through movement from Waipapa Loop Road is no longer possible. Full access to existing walking and cycling facilities. Least land take.
Safety	--	Whilst some safety benefit is delivered to right turners exiting Waipapa Road, the northbound through-traffic may travel at faster speeds, no longer impeded by traffic turning right from SH10. Additionally, the increased traffic movements at Waipapa Loop Road North will create more conflict.
Economy	+	Refer to the Traffic Modelling Report, Opus June 2017 which details that this option will make slight benefits when compared to the other options including *Do Nothing*.
Environmental opportunities	There are no identified environmental opportunities connected with this option.	
Social opportunities	There are no identified social opportunities connected with this option.	
Rationale for selection or rejection of alternative	Ranked 2nd of those assessed as it does not meet the safety, environmental and/or social benefits as some of the other options.	

ASSESSMENT SUMMARY TABLE – ROUNDABOUT

Business case name	SH10 Waipapa Road Intersection Improvements	Name of Project Manager & Region	Sebastian Reed, Auckland / Northland
Business case purpose	To upgrade the SH10 Waipapa Road Intersection to improve the economic growth, efficiency, safety, and to promote of multi-modal travel in the Northland region.		
Option description	**Description:** This option consist of having a roundabout at the intersection of SH10, Waipapa Road and Waipapa Loop Road. It is understood that urban roundabouts typically have a 55% effectiveness in crash reduction (Austroads Road Safety Engineering Toolkit). However, facilities for pedestrians and cyclists would have to be incorporated into the design.		



Dependencies: None

Estimated total public sector funding requirement		Lower	Upper
	Capital cost ($m):	$6,186,236	$7,069,265
	Net property cost ($m):	$998,750	$1,198,500
	Opex ($m/30yr):		
	Maintenance ($m/30yr):		
	Present value of cost to govt. ($m):		
Estimated BCR range			
Timing of need:	***Optimal programme***:	***Likely***:	

IAF profile	***Strategic fit***	M	***Effectiveness***	H	***Efficiency***	M

ASSESSMENT SUMMARY TABLE – ROUNDABOUT

Criterion	Score	Discussion
Objective 1: Economic Growth through integrated land-use	+++	This option provides a significantly better situation than *Do Minimum* in terms of ease of movement in all directions and provides a gateway treatment to the Waipapa area. It also provides the optimum economic growth and integrated land-use solutions in terms of tourism, i.e. for Twin Coast Discovery Highway movements.
Objective 2: Improve network efficiency	++	This option provides the best overall efficiency benefits but the pedestrian crossing points are necessarily some distance from the desire lines for crossing. It also provides the optimum solutions for network efficiency in terms of tourism, i.e. for Twin Coast Discovery Highway movements.
Objective 3: Improve safety by reducing crossing/turning crashes	++	This option will significantly reduce the number of conflict points and, for most users, will represent a safe and easy option. Even though roundabouts can have a higher number of crashes, compared to other intersection treatments, but these tend to be of a lesser severity due to lower speeds. It is assumed cycling provision can be carefully designed for.
Objective 4: Facilitate growth of multimodal travel	+	This option can provide well thought out pedestrian movements, with uncontrolled crossing points. But some of the walking routes across the intersection are at some distance from the desire lines. Cycling provision can be carefully designed for but less confident cyclists may find roundabouts less desirable.
Feasibility	--	This option will require land in-take from all four corners, and will have the largest overall footprint of all the considered options. Access within industrial area will largely remain unaffected. In terms of consenting, this option is neutral relative to the other options, as at this early stage, it is considered that the each of the options is equally consentable. In terms of whole of life operation/maintenance this option will pose greater stress on seal, so will require higher maintenance and/or earlier reseal. Landscaping maintenance also a factor for this option.
Affordability	*0*	Whilst costs vary somewhat between options, the affordability of whatever become the preferred option will be considered to be "affordable" if economically viable overall.
Public/Stake-holders	++	The community are all very much expecting the solution to be a roundabout, based on various prior forms of awareness of a potential project at this intersection. The community is also expecting this option to be selected due to the success of the nearby SH10 / Kerikeri Rd Roundabout. In the eyes of the community, this option will be the best solution.
Environmental and social	+	The pedestrian connectivity to all amenities will have to be considered carefully but is achievable as it will be potentially affected by free-flowing traffic. This option will provide easier access for motorists for all movements. Full access to existing walking and cycling facilities can also be accommodated. This option will require the largest amount of land in-take, with a significant effect on the dairy.
Safety	++	This option will significantly reduce the number of conflict points and, for most users, will represent a safe and easy option. Even though roundabouts can have a higher number of crashes, compared to other intersection treatments, but these tend to be of a lesser severity due to lower speeds. It is assumed cycling provision can be carefully designed for.
Economy	++	A Traffic Modelling Study was conducted and found that that this option is preferred between all the options considered.
Environmental opportunities	There is some opportunity to clean up any potential contamination from the land in-take from the orchard. Also, for some landscaping on the actual roundabout.	
Social opportunities	There are no social opportunities associated with this option.	
Rationale for selection or rejection of alternative	This option ranked **1**st of the options considered as it provides the best safety benefits with good efficiency and economic benefits. The dis-benefit being that this option is the most expensive of the options considered.	

ASSESSMENT SUMMARY TABLE – TRAFFIC SIGNALS

Business case name	SH10 Waipapa Road Intersection Improvements	Name of Project Manager & Region	Sebastian Reed, Auckland / Northland
Business case purpose	To upgrade the SH10 Waipapa Road Intersection to improve the economic growth, efficiency, safety, and to promote of multi-modal travel in the Northland region.		

Option description

Description: This option involves traffic signals at the intersection of SH10, Waipapa Road and Waipapa Loop Road. It is understood that installing traffic signals will remove the conflict for turning vehicles, making it easier for all right turning movements, pedestrians and off-road cyclists. Traffic Signals typically have a 30-35% effectiveness in crash reduction (Austroads Road Safety Engineering Toolkit), depending on whether or not the right turn phases are fully controlled.

Disbenefits of this option include significant delays to through traffic, particularly during the inter-peak periods, and potential issues related to this then being the only set of traffic signals north of Whangarei, which would generate problems not common to most signals elsewhere.

Dependencies: None

Estimated total public sector funding requirement		Lower	Upper
	Capital cost ($m):	$5,809,633	$6,597,650
	Net property cost ($m):	$410,750	$429,900
	Opex ($m/30yr):		
	Maintenance ($m/30yr):		
	Present value of cost to govt. ($m):		
Estimated BCR range			
Timing of need:	***Optimal programme***:	***Likely***:	

IAF profile	***Strategic fit***	L	***Effectiveness***	L	***Efficiency***	L

ASSESSMENT SUMMARY TABLE – TRAFFIC SIGNALS

Criterion	Score	Discussion
Objective 1: Economic Growth through integrated land-use	+++	This option will provide a significantly better situation than *Do Minimum* in terms of ease of movement in all directions and provides a gateway treatment to the Waipapa area. It will also provide the optimum economic growth and integrated land-use solutions in terms of tourism, i.e. for Twin Coast Discovery Highway movements.
Objective 2: Improve network efficiency	--	This option will provide a detrimental effect on journey times for all movements particularly during off-peak periods. It is noted that this option is optimum for pedestrians. It also provides the optimum economic growth and integrated land-use solutions in terms of tourism, i.e. for Twin Coast Discovery Highway movements.
Objective 3: Improve safety by reducing crossing/turning crashes	---	SH traffic will not expect traffic signals this far north and so the instances of red light running are likely to be high. This could result in high-speed, high-severity crashes (for example "T-boning").
Objective 4: Facilitate growth of multimodal travel	++	Pedestrians will have controlled crossing points close to the desire lines. These can also be used by less confident cyclists.
Feasibility	---	N.E. and S.W. corners will be unaffected. This option's greatest impact will be on the S.E. On N.W. corner, the land in-take will be minimal but building modification may be required. Access within industrial area will be largely unaffected. At this stage of project, all options are considered generally neutral relative to each other in terms of planning. Traffic signals represent the greatest ongoing care obligation and operational cost scenario i.e. signals infrastructure, heightened seal maintenance, etc.
Affordability	0	Whilst costs vary somewhat between options, the affordability of whatever become the preferred option will be considered to be "affordable" if economically viable overall.
Public/Stake-holders	---	The Far North might be regarded as 'proud' of the fact that there are no traffic signals in the region, so signals would be strongly disliked. Neither would they be considered the best solution because of the inevitable waiting times.
Environmental and social	+	Pedestrian connectivity to all amenities will be available and controlled by signals. There will be easier access for motorists for all movements, but with some inherent delays. Full access to existing walking and cycling facilities can be provided in this option. This option will require a Medium level of land take overall.
Safety	---	SH traffic will not expect traffic signals this far north and so the instances of red light running are likely to be high. This could result in high-speed, high-severity crashes (for example "T-boning").
Economy	+	Refer to the Traffic Modelling Report, Opus June 2017 which details that this option will make slight benefits when compared to the other options including *Do Nothing*.
Environmental opportunities	There are no direct environmental opportunities associated with this option.	
Social opportunities	There are no social opportunities associated with this option.	
Rationale for selection or rejection of alternative	This option ranked **4th** of the options considered as it provides significant benefits in economic growth with additional benefits in multi-modal travel but is also vastly worse off in terms of safety, feasibility and public expectations.	

ASSESSMENT SUMMARY TABLE – HEAD TO HEAD RIGHT TURN BAYS

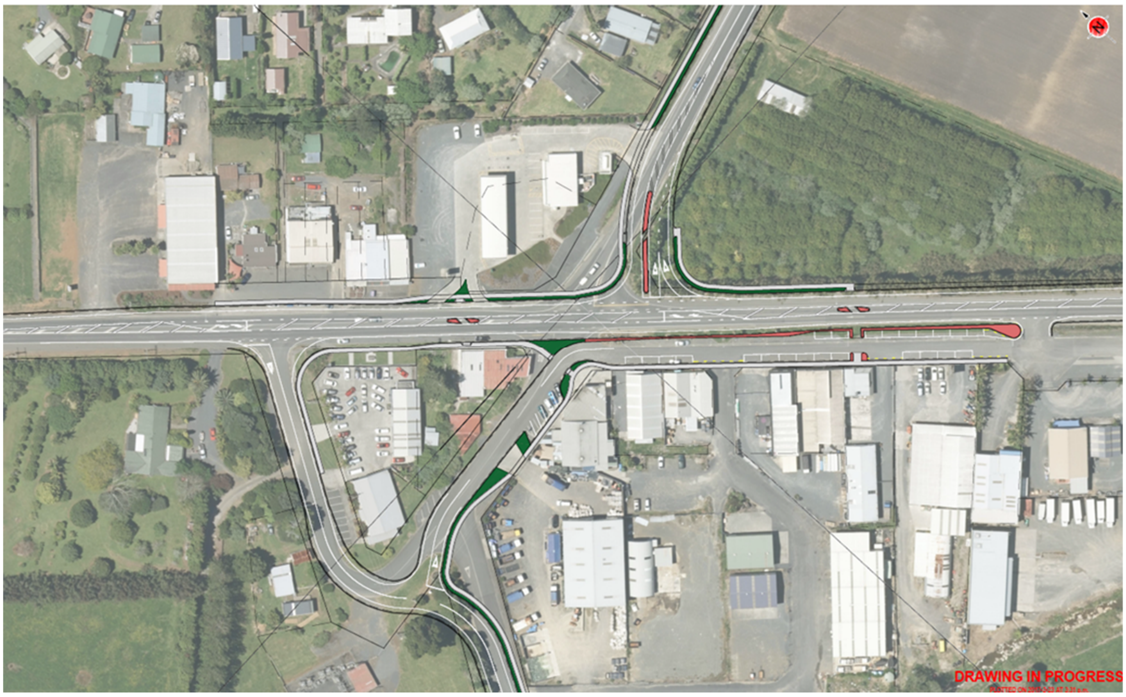
<table>
<tr><td>Business case name</td><td colspan="2">SH10 Waipapa Road Intersection Improvements</td><td colspan="2">Name of Project Manager & Region</td><td colspan="2">Sebastian Reed, Auckland / Northland</td></tr>
<tr><td>Business case purpose</td><td colspan="6">To upgrade the SH10 Waipapa Road Intersection to improve the economic growth, efficiency, safety, and to promote of multi-modal travel in the Northland region.</td></tr>
<tr><td>Option description</td><td colspan="6">Description: This option would involve shifting the intersection of SH10, Waipapa Road, and Waipapa Loop Road further south on the State Highway, away from Waipapa Loop Road, in order to create a staggered pair of T-intersections. Separating these two local roads is likely to remove some of the uncertainty associated with vehicles turning right from the opposite side road.


Dependencies: None</td></tr>
<tr><td rowspan="6">Estimated total public sector funding requirement</td><td colspan="2"></td><td colspan="2">Lower</td><td colspan="2">Upper</td></tr>
<tr><td colspan="2">Capital cost ($m):</td><td colspan="2">$5,395,801</td><td colspan="2">$6,141,090</td></tr>
<tr><td colspan="2">Net property cost ($m):</td><td colspan="2">$426,750</td><td colspan="2">$512,100</td></tr>
<tr><td colspan="2">Opex ($m/30yr):</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="2">Maintenance ($m/30yr):</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="2">Present value of cost to govt. ($m):</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="3">Estimated BCR range</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>Timing of need:</td><td colspan="2">Optimal programme:</td><td colspan="2">Likely:</td><td colspan="2"></td></tr>
<tr><td>IAF profile</td><td>Strategic fit</td><td>L</td><td>Effectiveness</td><td>L</td><td>Efficiency</td><td>L</td></tr>
</table>

ASSESSMENT SUMMARY TABLE – HEAD TO HEAD RIGHT TURN BAYS

Criterion	Score	Discussion
Objective 1: Economic Growth through integrated land-use	+	This option will provide a slightly better situation than Do Minimum in terms of improved local business access. However, it will still pose some level of impediment to local traffic from Waipapa Road crossing the State Highway.
Objective 2: Improve network efficiency	+	This option will provide a small benefit to SH through-traffic from separating the Right turning traffic. There will also be a slight benefit from vehicles turning right out of Waipapa Road due to the increased separation from Waipapa Loop Road.
Objective 3: Improve safety by reducing crossing/turning crashes	--	Whilst some safety benefit is delivered to right turning traffic exiting Waipapa Road, the northbound through-traffic may travel faster (speed) as they are no longer impeded by traffic turning right from the SH. Traffic turning right out of Waipapa Loop Road South will still have conflicts to manage.
Objective 4: Facilitate growth of multimodal travel	+	Pedestrian movements will be well provided for by this option, with uncontrolled crossing points, but some of the walking routes across the intersection will be at some distance from the desire lines. Cycling will also be reasonably well-catered for.
Feasibility	-	N.E. and S.W. corners will be unaffected. This option will have some impact the S.E. corner. On the N.W. corner, the land in-take will be minimal but modification may be required. Access within Skippers Lane will be slightly restricted. At this stage of the project, all options considered are generally neutral relative to each other in terms of planning. This option will have minimal effect on whole of life/maintenance.
Affordability	*0*	Whilst costs vary somewhat between options, the affordability of whatever become the preferred option will be considered to be "affordable" if economically viable overall.
Public/Stake-holders	--	Whilst the public may recognise some benefit, any non-roundabout option is likely to be seen as nett dis-benefit.
Environmental and social	+	Pedestrian connectivity overall will be improved, but there will be some separation of crossing points from desire lines in places. No improvement for motorists via this option. Full access to existing walking and cycling facilities will also be provided, but not optimal.
Safety	--	Whilst some safety benefit is delivered to right turning traffic exiting Waipapa Road, the northbound through-traffic may travel faster (speed) as they are no longer impeded by traffic turning right from the SH. Traffic turning right out of Waipapa Loop Road South will still have conflicts to manage.
Economy	+	Refer to the Traffic Modelling Report, Opus June 2017 which details that this option will make slight benefits when compared to the other options including *Do Nothing*.
Environmental opportunities	There are no direct environmental opportunities associated with this option.	
Social opportunities	There are no social opportunities associated with this option.	
Rationale for selection or rejection of alternative	This option ranked 3rd in all the options considered as it only provides minimal benefits in economic growth, efficiency and multi-modal travel but will be worse off in terms of safety.	

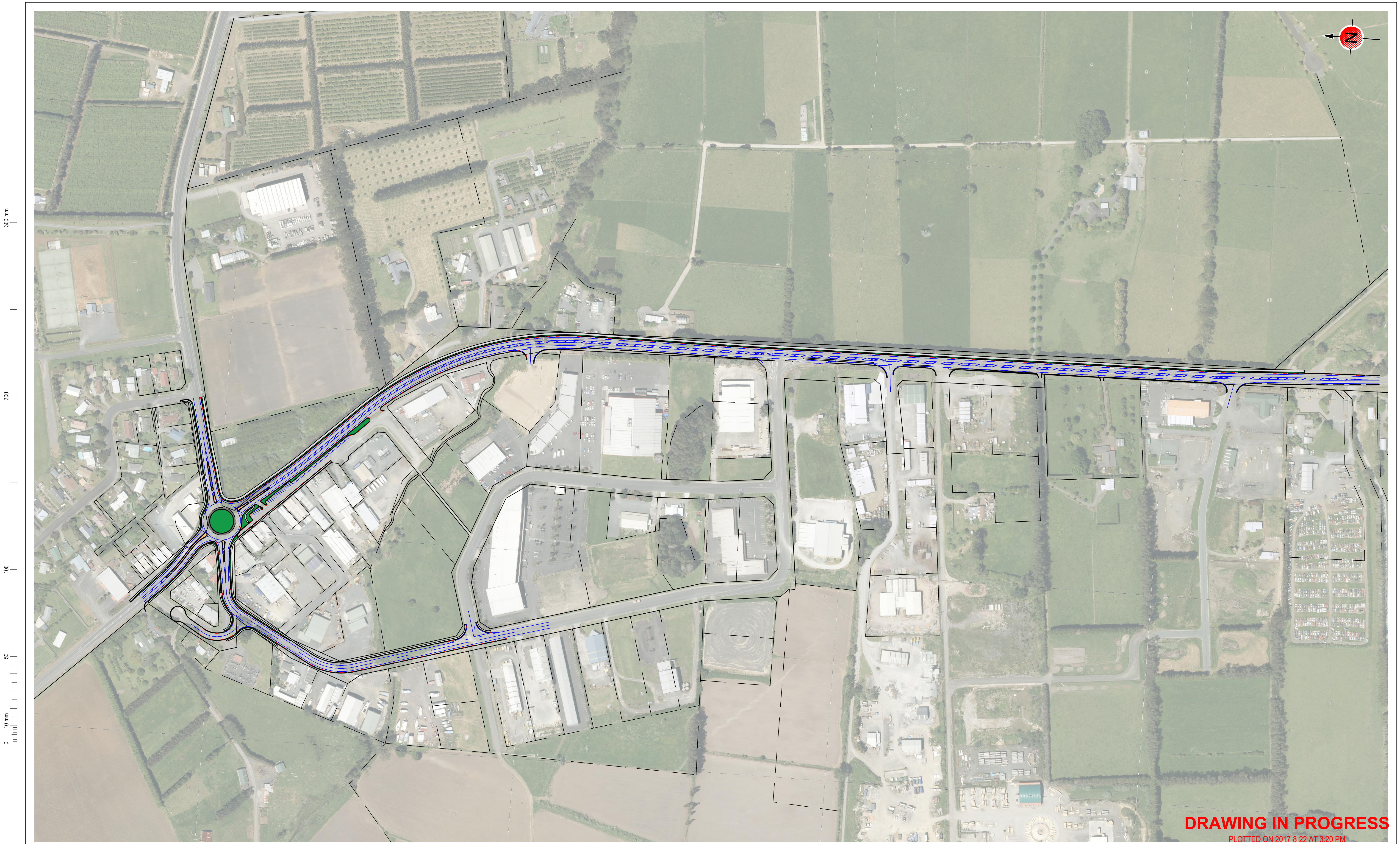
ASSESSMENT SUMMARY TABLE – CLOSE WAIPAPA LOOP ROAD SOUTH

<table>
<tr><td>Business case name</td><td colspan="2">SH10 Waipapa Road Intersection Improvements</td><td colspan="2">Name of Project Manager & Region:</td><td colspan="2">Sebastian Reed, Auckland / Northland</td></tr>
<tr><td>Business case purpose</td><td colspan="6">To upgrade the SH10 Waipapa Road Intersection to improve the economic growth, efficiency, safety, and to promote of multi-modal travel in the Northland region.</td></tr>
<tr><td>Option description</td><td colspan="6">Description: This option would completely close the intersection at Waipapa Loop Road South and divert all traffic to Waipapa Loop Road North. This intersection would need additional safety improvements incorporated into the design.

Dependencies: None</td></tr>
<tr><td rowspan="6">Estimated total public sector funding requirement</td><td colspan="2"></td><td colspan="2">Lower</td><td colspan="2">Upper</td></tr>
<tr><td colspan="2">Capital cost ($m):</td><td colspan="2">$4,982,356</td><td colspan="2">$5,042,174</td></tr>
<tr><td colspan="2">Net property cost ($m):</td><td colspan="2">$93,750</td><td colspan="2">$112,500</td></tr>
<tr><td colspan="2">Opex ($m/30yr):</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="2">Maintenance ($m/30yr):</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="2">Present value of cost to govt. ($m):</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="3">Estimated BCR range</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>Timing of need:</td><td colspan="2">Optimal programme:</td><td colspan="2">Likely:</td><td colspan="2"></td></tr>
<tr><td><u>IAF profile</u></td><td><u>Strategic fit</u></td><td>L</td><td><u>Effectiveness</u></td><td>L</td><td><u>Efficiency</u></td><td>L</td></tr>
</table>

ASSESSMENT SUMMARY TABLE – CLOSE WAIPAPA LOOP ROAD – SOUTH

Criterion	Score	Discussion
Objective 1: Economic Growth through integrated land-use	-	This option is considered a net dis-benefit overall due to access to the business park being less straight-forward.
Objective 2: Improve network efficiency	-	This option is less beneficial as local road users will have to travel slightly further due to the closing of the Waipapa Loop Road South. Those movements are less intuitive and are likely to result in motorists using alternative access further to the South.
Objective 3: Improve safety by reducing crossing/turning crashes	--	Whilst some safety benefit will be delivered to right turning traffic exiting Waipapa Road, the northbound through-traffic may travel faster (speed) as they are no longer impeded by traffic turning right from the SH. Traffic turning right out of Waipapa Loop Road North will still have conflicts to manage.
Objective 4: Facilitate growth of multimodal travel	+	Pedestrian movements will be well provided for, with uncontrolled crossing points, but some of the walking routes across the intersection will be at some distance from the desire lines. Cycling will also be reasonably well-catered for.
Feasibility	-	Land in-take will be essentially focussed on the S.E. corner. No direct access will be provided from Skippers Lane into the main intersection. At this stage of the project, all options considered are generally neutral relative to each other in terms of planning. This option will have minimal costs for Whole of Life Operation / Maintenance.
Affordability	*0*	Whilst costs vary somewhat between options, the affordability of whatever become the preferred option will be considered to be "affordable" if economically viable overall.
Public/Stake-holders	--	Whilst the public may recognise some benefit, any non-roundabout option is likely to be seen as nett dis-benefit, and as such options felt to be not really addressing the full extent of problems in the area of the intersection.
Environmental and social	+	Pedestrian connectivity overall will be improved, but there will be some separation of crossing points from desire lines in places. There will be no improvement for motorists. Full access will be provided to the existing walking and cycling facilities, but not optimal. Some land take will be required.
Safety	--	Whilst some safety benefit is delivered to right turners exiting Waipapa Road, the northbound through-traffic may travel faster (speed) as they are no longer impeded by traffic turning right from the SH. Traffic turning right out of Waipapa Loop Road North still has conflicts to manage.
Economy	-	Refer to the Traffic Modelling Report, Opus June 2017 which details that this option will make slight benefits when compared to the other options including *Do Nothing*.
Environmental opportunities	There are no direct environmental opportunities associated with this option.	
Social opportunities	There are no social opportunities associated with this option.	
Rationale for selection or rejection of alternative	This option ranked **5th** out of the options considered as it provides no real benefits apart from slightly better connectivity for pedestrians and cyclists. In all other aspects considered, it will only provide dis-benefits.	

APPENDIX H Recommended Option – Area Drawings



DRAWING IN PROGRESS

PLOTTED ON 2017-8-22 AT 3:20 PM

CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-04-12
B	ROUNDABOUT SHAPE CHANGED		2017-05-10
C	ROUNDABOUT MOVED		2017-08-19

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OPUS
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Whangarei 0110

Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:2000 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
GENERAL ARRANGEMENT (OPTION 2 SHOWN)
PLAN

Project No.	Sheet. No.	Revision
1-11751.00	X01	C

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1:4000 @ A3
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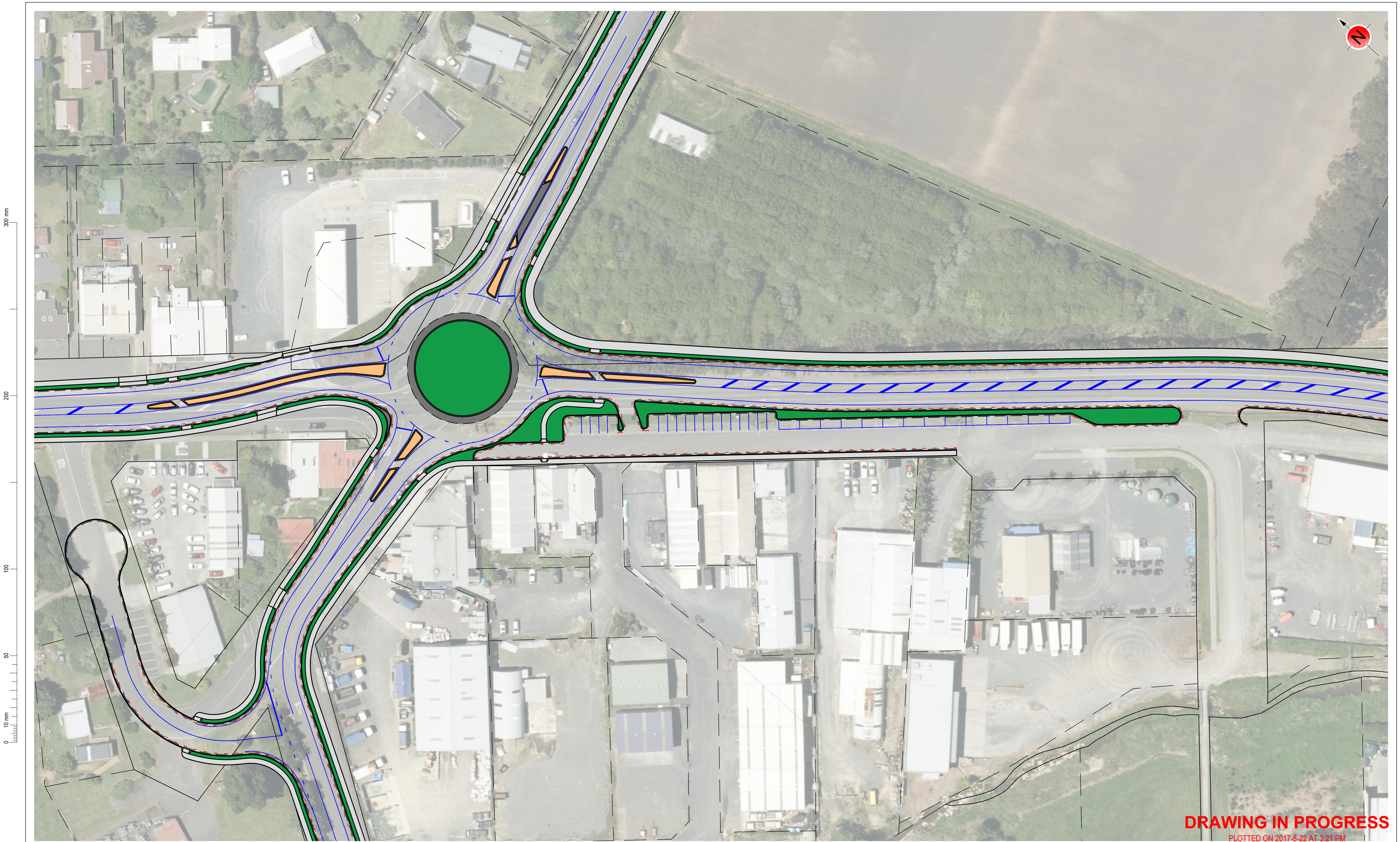

DRAWING IN PROGRESS

PLOTTED ON 2017-8-22 AT 3:21 PM

CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-08
B	CONCEPT IMPROVED		2017-02-11
C	ROUNDABOUT ELLONGATED AND MOVED		2017-02-15
D	AMENDMENTS TO CONCEPT		2017-04-12
E	ROUNDABOUT SHAPE CHANGED		2017-05-10

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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
OPTION 2: ROUNDABOUT
PLAN

Project No.	Sheet. No.	Revision
1-11751.00	X03	E

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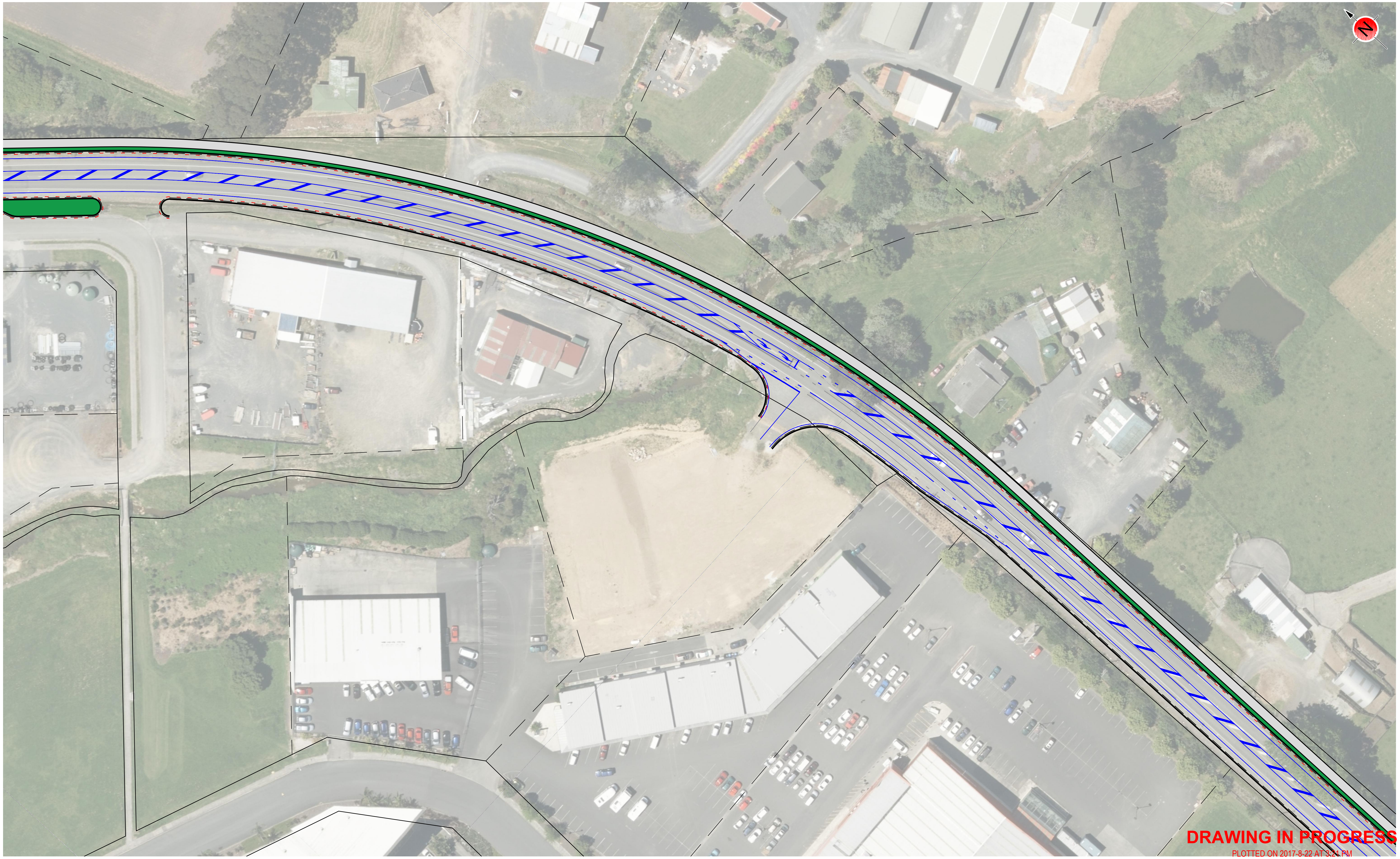

CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-22
B	ISSUED FOR INFORMATION		2017-03-13
C	AMENDMENTS TO CONCEPT		2017-04-12
D	ROUNDABOUT MOVED		2017-08-19

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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
WAIPAPA CORRIDOR TREATMENT
PLAN (SHEET 1 OF 2)

Project No.	Sheet. No.	Revision
1-11751.00	X20	D

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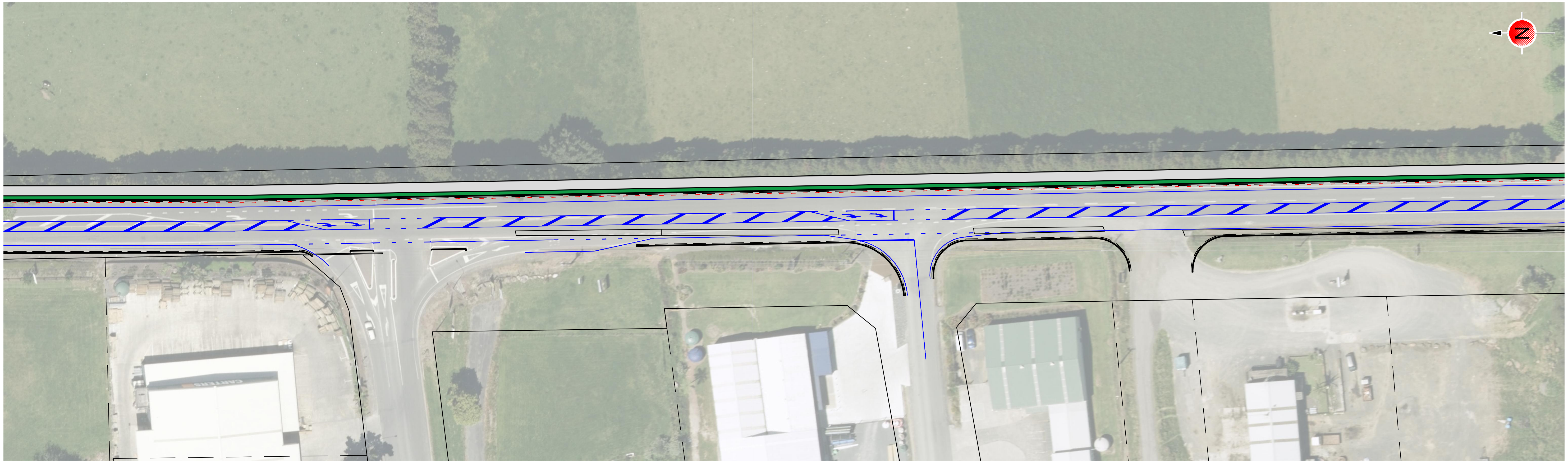

300 mm
200
100
50
10 mm
0

DRAWING IN PROGRESS

PLOTTED ON 2017-8-22 AT 3:21 PM

CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-22
B	ISSUED FOR INFORMATION		2017-03-13
C	AMENDMENTS TO CONCEPT		2017-04-12

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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
WAIPAPA CORRIDOR TREATMENT
PLAN (SHEET 2 OF 2)

Project No.	Sheet. No.	Revision
1-11751.00	X21	C

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DRAWING IN PROGRESS

PLOTTED ON 2017-8-22 AT 3:21 PM

CONCEPT - NOT FOR CONSTRUCTION

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-02-22
B	ISSUED FOR INFORMATION		2017-03-13
C	AMENDMENTS TO CONCEPT		2017-04-12
D	ROUNDABOUT MOVED		2017-08-19

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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
 LINAC LANE LIN
PLAN

Project No.	Sheet. No.	Revision
1-11751.00	X25	D

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APPENDIX I
Traffic Modelling

Waipapa Road/SH10 Intersection
Economic Analysis Inputs - using SIDRA model outputs

Assumptions and input data **Worksheets A2.1 to A2.8**

Evaluation carried out in accordance with

Manual:	NZTA's EEM (volume 1)
Revision:	First Edition, Amendment 0
Date:	Effective from 1 July 2013

Project Timing:

Date of Evaluation:	31-Mar-17				
Base date is 1 July	2016				
Time Zero is 1 July	2017				
Discount Factor	6.00%				
Earliest Start of Construction is	1-Oct-18		ie at Time =	1.25	
Construction Period is	6.0	months			
Construction Period ends	1-Apr-19		ie at Time =	1.75	2016

Analysis period extends to 40 years after the start of construction, to Time= 41.25 2041

Construction Cost of Options (+MSQA)

Expected Construction Costs - 1 July	**1st period**		Total Expected Estimate
Time Period			
Discount period - midpoint	1.50		
Do Min			
Option 1 (Right Turn Bay))	$4,926,802		$5,722,276
Option 2 (4 Leg Roundabout)	$5,362,676		$7,069,265
Option 3 (Signals)	$5,575,956		$6,597,650
Option 4 (Head to Head Right turn Bays)	$5,142,295		$6,141,090
Option 5 (Close Waipapa Loop)	$5,058,386		$5,652,450

Expected Land Cost of Options	**1st period**
Time Period	Oct-18
Discount period	1.25
Do Min	$0.0
Option 1 (Right Turn Bay))	$329,700.0
Option 2 (4 Leg Roundabout)	$1,198,500.0
Option 3 (Signals)	$492,900.0
Option 4 (Head to Head Right turn Bays)	$512,100.0
Option 5 (Close Waipapa Loop)	$112,500.0

Expected Fees -	**1st period**	**2nd period**
Time Period	I/R	Specimen Design And Project Documentation
Discount period - midpoint	0.25	0.75
Do Min		
Option 1 (Right Turn Bay))	$232,887.0	$232,887.0
Option 2 (4 Leg Roundabout)	$254,044.5	$254,044.5
Option 3 (Signals)	$264,397.0	$264,397.0
Option 4 (Head to Head Right turn Bays)	$243,347.5	$243,347.5
Option 5 (Close Waipapa Loop)	$239,408.0	$242,156.0

Accident Savings are based on:

			Action				
Step 1	More than 1500vpd	Yes	Five year accident data	AADT	3,857	source:	NZTA Count Site Data - Station 17 at Kerikeri
Step 2	Crash history adequate	Yes	Go to step 3	Traffic growth rate	2.20%	source:	Based on 5 year count site data - annualised compound growth of SH10 between 2011-2015
Step 3	Significant change in last three years	No	Go to step 4	Growth rate ajustment for use in crash cost =	-2.00%		
Step 4	Minimum of crashes ≥ 5 injury or ≥ 2 serious and fatal	No	Go to step 5	Accident growth rate =	0.20%		
Step 5	Are Crash Prediction Models or crash rates available for the do minimum and project option(s)?	Yes	Go to Step 7				
Step 7	Fundamental Change	Yes	Method C for do min and Method B for Project Option		Table A6.1(a)		
	Fundamental Change	No	Method C for do minimum and project Option	Accident Trend Adjustment	0.965		
Conclusion	Do Min	Method C					
	Option 1 (Right Turn Bay))	Method B					
	Option 2 (4 Leg Roundabout)	Method B					
	Option 3 (Signals)	Method B					
	Option 4 (Head to Head Right turn Bays)	Method B					
	Option 5 (Close Waipapa Loop)	Method B					

Traffic Volume Inputs & Model Assumptions

SIDRA 7.0.5.6563 software used to determine the annual operating costs

Project Operating Costs

Operating costs are based on SIDRA outputs
Vehicle Operating costs are determined from fuel usage outputs
Travel time costs are based on average sidra delays
CO2 is calculated from Sidra CO2 outputs
Benefits begin after construction (all benefits prior to construction are assummed to be equal)

Annualisation Factors

TIME PERIOD DATA						
PERIOD	**DESCRIPTION**	**hr/day**	**days/year**	***hrs/year***		
1	AM Peak (1hr)	1	245	*245*		
2	PM Peak (1hr)	2	245	*490*		
3	IP Peak (1hr)	8	245	*1960*		
4	Saturday (1hr)	6	52	*312*		
5 Sunday	Sunday (1hr)	6	68	*408*		
5 off peak	Off peak			*5345*	8760.00	8760.00

TT and VOC Cost Values used in economics

TT & CRV COST/HR	**Tab A4.3**	**RS**
Period	**TT**	**CRV**
1	15.13	3.88
2	14.96	3.79
3	17.95	3.60
4	14.09	4.26
5	14.09	4.26

VOC based on total fuel used and an equivalent resource cost
other VOC components considered to be the same

VOC costs (BASED ON $1.49/LITRE * 1 (factor to get total VOC))	
Period	$/litre
all periods	1.49

UPDATE FACTORS 2002 TO	2016
OPERATING COSTS	
TT	1.45
VOC	0.98
ACC	1.03
CONSTRUCTION COSTS	
Estimate at year	2017
Base date =	2016
Factor for base date =	0.96

YEARLY OPERATING COST WORKSHEET

1 hour modelled period

Roundabout (Option 2)

				Travel Time Cost			VOC		CO2			Yearly Cost		
Year	Time Period	Total Travel Time	Number of Vehicles (veh/hr)	Travel Time Cost	V/C	CRV Additional Congestion Cost	Fuel use litres/period	Cost/litre	CO2 Tonnes	Cost/Tonne	Periods/Yr	TT	VOC	CO2
2016	AM Peak (1hr)	3.23	1435.00	$49	0.54	$0	187.4	1.49	0.448	40	245	$11,968	$68,410	$4,391
	PM Peak (1hr)	3.09	1339.00	$46	0.41	$0	175	1.49	0.418	40	490	$22,630	$127,768	$8,201
	IP Peak (1hr)	2.25	1054.00	$40	0.31	$0	134.2	1.49	0.321	40	1960	$79,314	$391,918	$25,159
	Saturday (1hr)	2.25	1054.00	$32	0.31	$0	134.2	1.49	0.321	40	312	$9,910	$62,387	$4,005
	Sunday	1.77	860.00	$25	0.25	$0	108.9	1.49	0.2604	40	408	$10,162	$66,202	$4,250
	Night											$6,223	$11,690	
											TOTAL	$140,208	$728,375	$46,005
2026	AM Peak (1hr)	5.07	1,845	$77	0.73	$2	245.7	1.49	0.587	40	245	$19,354	$89,693	$5,756
	PM Peak (1hr)	4.99	1,780	$75	0.58	$0	236.9	1.49	0.566	40	490	$36,607	$172,961	$11,099
	IP Peak (1hr)	3.34	1,415	$60	0.43	$0	182.7	1.49	0.437	40	1960	$117,542	$533,557	$34,253
	Saturday (1hr)	3.34	1415.00	$47	0.43	$0	182.7	1.49	0.437	40	312	$14,687	$84,934	$5,453
	Sunday	2.57	1155.00	$36	0.34	$0	147.9	1.49	0.3536	40	408	$14,755	$89,911	$5,771
	Night											$7,592	$14,262	
											TOTAL	$210,538	$985,317	$62,331
2036	AM Peak (1hr)	18.81	2,335	$285	1.00	$72	342	1.49	0.817	40	245	$87,307	$124,847	$8,007
	PM Peak (1hr)	12.02	2,289	$180	0.87	$26	320.2	1.49	0.765	40	490	$101,035	$233,778	$14,998
	IP Peak (1hr)	5.23	1,829	$94	0.59	$0	240.8	1.49	0.576	40	1960	$184,106	$703,232	$45,143
	Saturday (1hr)	5.23	1829.00	$74	0.59	$0	240.8	1.49	0.576	40	312	$23,005	$111,943	$7,186
	Sunday	3.61	1492.00	$51	0.46	$0	193.6	1.49	0.463	40	408	$20,728	$117,693	$7,556
	Night											$8,961	$16,833	
											TOTAL	$425,142	$1,308,327	$82,889
2056	AM Peak (1hr)	41.84	2,517	$633	1.00	$162	414.7	1.49	0.990	40	245	$194,858	$151,386	$9,701
	PM Peak (1hr)	26.87	2,474	$402	1.00	$102	372.9	1.49	0.890	40	490	$246,872	$272,254	$17,452
	IP Peak (1hr)	6.33	1,964	$114	0.65	$0	261.4	1.49	0.625	40	1960	$222,647	$763,393	$49,000
	Saturday (1hr)	6.33	1964.00	$89	0.65	$0	261.4	1.49	0.625	40	312	$27,820	$121,520	$7,800
	Sunday	4.01	1602.00	$56	0.50	$0	209	1.49	0.4997	40	408	$23,024	$127,055	$8,155
	Night											$8,961	$16,833	
											TOTAL	$724,182	$1,452,441	$92,108

YEARLY OPERATING COST WORKSHEET

1 hour modelled period

Traffic signals (Option 3)

Year	Time Period	Total Travel Time	Number of Vehicles (veh/hr)	Travel Time Cost			VOC		CO2		Periods/Yr	Yearly Cost		
				Travel Time Cost	V/C	CRV Additional Congestion Cost	Fuel use litres/period	Cost/litre	CO2 Tonnes	Cost/Tonne		TT	VOC	CO2
2016	AM Peak (1hr)	12.28	1435.00	$186	0.79	$14	193.4	1.49	0.462	40	245	$48,972	$70,601	$4,531
	PM Peak (1hr)	11.34	1339.00	$170	0.86	$23	186.7	1.49	0.446	40	490	$94,254	$136,310	$8,744
	IP Peak (1hr)	7.79	1054.00	$140	0.68	$0	141.7	1.49	0.339	40	1960	$273,994	$413,821	$26,554
	Saturday (1hr)	7.79	1054.00	$110	0.68	$0	141.7	1.49	0.339	40	312	$34,236	$65,873	$4,227
	Sunday	6.12	860.00	$86	0.75	$4	115.80	1.49	0.28	40	408	$36,964	$70,397	$4,519
											TOTAL	$488,419	$757,002	$48,574
2026	AM Peak (1hr)	22.31	1846.00	$337	0.88	$52	257.3	1.49	0.615	40	245	$95,477	$93,927	$6,026
	PM Peak (1hr)	20.17	1,780	$302	0.92	$55	255.4	1.49	0.610	40	490	$174,853	$186,468	$11,958
	IP Peak (1hr)	11.79	1,415	$212	0.79	$13	193.5	1.49	0.463	40	1960	$439,815	$565,097	$36,268
	Saturday (1hr)	11.79	1415.00	$166	0.79	$15	193.5	1.49	0.463	40	312	$56,539	$89,954	$5,773
	Sunday	8.66	1155.00	$122	0.72	$3	156.1	1.49	0.373	40	408	$51,003	$94,896	$6,091
											TOTAL	$817,687	$1,030,343	$66,116
2036	AM Peak (1hr)	75.11	2,335	$1,136	1.00	$291	403.5	1.49	0.963	40	245	$349,817	$147,298	$9,437
	PM Peak (1hr)	53.86	2,289	$806	1.00	$204	371.6	1.49	0.887	40	490	$494,794	$271,305	$17,387
	IP Peak (1hr)	23.27	1,829	$418	0.94	$68	263	1.49	0.628	40	1960	$951,091	$768,065	$49,259
	Saturday (1hr)	23.27	1829.00	$328	0.94	$80	263	1.49	0.628	40	312	$127,240	$122,263	$7,841
	Sunday	12.60	1492.00	$178	0.89	$33	206.1	1.49	0.493	40	408	$86,079	$125,292	$8,038
											TOTAL	$2,009,021	$1,434,224	$91,962
2056	AM Peak (1hr)	116.34	2,517	$1,760	1.00	$451	487.9	1.49	1.164	40	245	$541,854	$178,108	$11,403
	PM Peak (1hr)	95.46	2,474	$1,428	1.00	$362	454.8	1.49	1.085	40	490	$876,994	$332,049	$21,266
	IP Peak (1hr)	52.32	1,964	$939	1.00	$188	319.4	1.49	0.763	40	1960	$2,209,841	$932,776	$59,788
	Saturday (1hr)	52.32	1964.00	$737	1.00	$223	319.4	1.49	0.763	40	312	$299,535	$148,483	$9,517
	Sunday	15.66	1602.00	$221	0.87	$38	223	1.49	0.533	40	408	$105,476	$135,566	$8,697
											TOTAL	$4,033,700	$1,726,982	$110,671

YEARLY OPERATING COST WORKSHEET

1 hour modelled period

Option 5 Staggered T

				Travel Time Cost			VOC		CO_2			Yearly Cost		
Year	Time Period	Total Travel Time	Number of Vehicles (veh/hr)	Travel Time Cost	V/C	CRV Additional Congestion Cost	Fuel use litres/period	Cost/litre	CO_2 Tonnes	Cost/Tonne	Periods/Yr	TT	VOC	CO_2
2016	AM Peak (1hr)	2.43	1,521	$37	0.43	$0	159.2	1.49	0.382	40	245	$8,991	$58,116	$3,741
	PM Peak (1hr)	2.85	1,449	$43	0.60	$0	161.1	1.49	0.386	40	490	$20,885	$117,619	$7,556
	IP Peak (1hr)	1.96	1,203	$35	0.27	$0	133.3	1.49	0.319	40	1960	$69,096	$389,289	$25,025
	Saturday (1hr)	1.96	1203.00	$28	0.27	$0	133.3	1.49	0.319	40	312	$8,634	$61,969	$3,984
	Sunday	1.51	981	$21	0.19	$0	108.6	1.49	0.260	40	408	$8,700	$66,020	$4,243
											TOTAL	$116,306	$693,013	$44,549
2026	AM Peak (1hr)	5.03	1,965	$76	0.87	$11	208.8	1.49	0.500	40	245	$21,322	$76,222	$4,902
	PM Peak (1hr)	9.65	1,942	$144	1.00	$37	260.3	1.49	0.623	40	490	$88,675	$190,045	$12,215
	IP Peak (1hr)	2.99	1,620	$54	0.44	$0	179.9	1.49	0.430	40	1960	$105,318	$525,380	$33,743
	Saturday (1hr)	2.99	1620.00	$42	0.44	$0	179.9	1.49	0.430	40	312	$13,160	$83,632	$5,371
	Sunday	2.21	1,322	$31	0.30	$0	146.3	1.49	0.350	40	408	$12,683	$88,939	$5,715
											TOTAL	$241,158	$964,218	$61,947
2036	AM Peak (1hr)	24.27	2,488	$367	1.00	$94	349.9	1.49	0.836	40	245	$113,018	$127,731	$8,196
	PM Peak (1hr)	48.06	2,504	$719	1.00	$182	579.9	1.49	1.382	40	490	$441,573	$423,385	$27,083
Sunday+102:105	IP Peak (1hr)	5.14	2,088	$92	0.77	$4	233.4	1.49	0.559	40	1960	$189,524	$681,621	$43,794
	Saturday (1hr)	5.14	2088.00	$72	0.77	$5	233.4	1.49	0.559	40	312	$24,233	$108,503	$6,971
	Sunday	3.26	1,703	$46	0.49	$0	188.8	1.49	0.520	40	408	$18,713	$114,775	$8,490
											TOTAL	$787,062	$1,456,016	$94,534
2056	AM Peak (1hr)	28.07	2,700	$425	1.00	$109	476.5	1.49	1.137	40	245	$130,749	$173,946	$11,145
	PM Peak (1hr)	66.92	2,700	$1,001	1.00	$254	850.7	1.49	2.025	40	490	$614,872	$621,096	$39,686
Sunday+102:105	IP Peak (1hr)	8.69	2,238	$156	0.98	$29	254.9	1.49	0.610	40	1960	$363,226	$744,410	$47,840
	Saturday (1hr)	8.69	2238.00	$122	0.98	$35	254.9	1.49	0.610	40	312	$49,040	$118,498	$7,615
	Sunday	3.76	1,826	$53	0.60	$0	202.6	1.49	0.560	40	408	$21,591	$123,165	$9,141
											TOTAL	$1,179,478	$1,781,115	$115,426

YEARLY OPERATING COST WORKSHEET

1 hour modelled period

DO MINIMUM

				Travel Time Cost			VOC		CO2			Yearly Cost		
Year	Time Period	Total Travel Time	Number of Vehicles (veh/hr)	Travel Time Cost	V/C	CRV Additional Congestion Cost	Fuel use litres/period	Cost/litre	CO2 Tonnes	Cost/Tonne	Periods/Yr	TT	VOC	CO2
2016	AM Peak (1hr)	3.55	1435	$54	0.72	$1	160.10	1.49	0.38	40	245	$13,364	$58,445	$3,757
	PM Peak (1hr)	5.73	1339	$86	0.94	$17	157.80	1.49	0.38	40	490	$50,463	$115,210	$7,401
	IP Peak (1hr)	2.23	1054	$40	0.41	$0	120.30	1.49	0.29	40	1960	$78,284	$351,324	$22,571
	Saturday (1hr)	2.23	1054	$31	0.41	$0	120.3	1.49	0.288	40	312	$9,782	$55,925	$3,593
	Sunday	1.62	860	$23	0.27	$0	97.6	1.49	0.2336	40	408	$9,338	$59,333	$3,812
											TOTAL	$161,231	$640,236	$41,135
2026	AM Peak (1hr)	19.17	1846	$290	1.00	$74	258.9	1.49	0.619	40	245	$89,285	$94,511	$6,065
	PM Peak (1hr)	32.88	1780	$492	1.00	$125	334.6	1.49	0.798	40	490	$302,065	$244,291	$15,641
	IP Peak (1hr)	4.36	1415	$78	0.79	$5	164.3	1.49	0.393	40	1960	$162,937	$479,822	$30,827
	Saturday (1hr)	4.36	1415	$61	0.79	$6	164.3	1.49	0.393	40	312	$20,958	$76,380	$4,907
	Sunday	2.60	1155	$37	0.48	$0	132	1.49	0.3161	40	408	$14,939	$80,245	$5,159
											TOTAL	$590,184	$975,250	$62,599
2036	AM Peak (1hr)	29.05	2335	$440	1.00	$113	621.6	1.49	1.481	40	245	$135,298	$226,915	$14,509
	PM Peak (1hr)	43.94	2289	$657	1.00	$167	889	1.49	2.115	40	490	$403,680	$649,059	$41,450
	IP Peak (1hr)	25.34	1829	$455	1.00	$91	278.5	1.49	0.665	40	1960	$1,070,283	$813,331	$52,144
	Saturday (1hr)	25.34	1829	$357	1.00	$108	278.5	1.49	0.665	40	312	$145,073	$129,469	$8,300
	Sunday	5.80	1492	$82	0.91	$17	175	1.49	0.4188	40	408	$40,314	$106,386	$6,835
											TOTAL	$1,794,648	$1,925,160	$123,238
2036	AM Peak (1hr)	34.06	2517	$515	1.00	$132	959.4	1.49	2.282	40	245	$158,617	$350,229	$22,368
	PM Peak (1hr)	52.17	2474	$781	1.00	$198	1341.2	1.49	3.188	40	490	$479,355	$979,210	$62,485
	IP Peak (1hr)	28.64	1964	$514	1.00	$103	353.8	1.49	0.845	40	1960	$1,209,627	$1,033,238	$66,217
	Saturday (1hr)	28.64	1964	$404	1.00	$122	353.8	1.49	0.845	40	312	$163,960	$164,475	$10,541
	Sunday	14.82	1602	$209	1.00	$63	200.5	1.49	0.4796	40	408	$110,943	$121,888	$7,827
											TOTAL	$2,122,503	$2,649,039	$169,437

ACCIDENT BY ACCIDENT ANALYSIS - DO MINIMUM

WORKSHEET A6.2

Project Name:	Waipapa Road/SH10 Intersection	**Posted Speed Limit:**	70 km/h
Vehicle Involvement:	All	**Mean Speed:**	100 km/h
		Road Category:	70
		Traffic growth rate	2.20% %

Crash Type	Crash Cost (per Year)
Lost Control off Road	2,303
Head On	5,613
Crossing, Direct	0
Crossing Turning	9,211
Rear End, Crossing	8,635
	25,762

Lost Control off Road	**Injury Severity**			**Non-Injury**	**Total Cost**
	Fatal	**Serious**	**Minor**		
1. No. of Years of typical accident rate records	5	5	5	5	
2. No. of Reported Accidents over Period	0	0	0	1	
3. Proportion of Fatal to Serious (Table A6.19 (a) to (c))	0.2	0.8			
4. No. of Reported Accidents Adjusted by severity **(2) x (3)**	0	0	0	1	
5.Accidents per year **(4)/(1)**	0	0	0	0.2	
6. Adjustment Factor (table A6.1(a))	1.028	1.028	1.028	1.028	
7. Adjusted Accidents per Year **(5) x (6)**	0.000	0.000	0.000	0.206	
8. Under-Reporting Factors (table A6.20(a)&(b))	1.0	1.5	4.5	7	
9. Total Estimated Accidents/Year **(7) x (8)**	0.000	0.000	0.000	1.439	
10. Accident Cost, 50 km/h Speed Limit (Table A6.21(a)-(d))	5,000,000	505,000	27,000	1,800	
11. Accident Cost, 100 km/h Speed Limit (Table A6.21(e)-(h))	4,600,000	505,000	28,000	1,600	
12. Mean Speed Adjustment = ***(Do Min Mean Speed - 50) / 50***	1	1	1	1	
13. Cost per Accident = **(11) + (12) x [(10) - (11)]**	4,600,000	505,000	28,000	1,600	
14. Total Accident Cost per Year **(9) x (13)**	0	0	0	2,303	**2,303**

Head On	**Injury Severity**			**Non-Injury**	**Total Cost**
	Fatal	**Serious**	**Minor**		
1. No. of Years of typical accident rate records	5	5	5	5	
2. No. of Reported Accidents over Period	0	0	0	1	
3. Proportion of Fatal to Serious (Table A6.19 (a) to (c))	0.12	0.88			
4. No. of Reported Accidents Adjusted by severity **(2) x (3)**	0	0	0	1	
5.Accidents per year **(4)/(1)**	0	0	0	0.2	
6. Adjustment Factor (table A6.1(a))	1.028	1.028	1.028	1.028	
7. Adjusted Accidents per Year **(5) x (6)**	0.000	0.000	0.000	0.206	
8. Under-Reporting Factors (table A6.20(a)&(b))	1.0	1.5	4.5	7.0	
9. Total Estimated Accidents/Year **(7) x (8)**	0.000	0.000	0.000	1.439	
10. Accident Cost, 50 km/h Speed Limit (Table A6.21(a)-(d))	4,550,000	585,000	32,000	3,200	
11. Accident Cost, 100 km/h Speed Limit (Table A6.21(e)-(h))	5,400,000	610,000	36,000	3,900	
12. Mean Speed Adjustment = ***(Do Min Mean Speed - 50) / 50***	1	1	1	1	
13. Cost per Accident = **(11) + (12) x [(10) - (11)]**	5,400,000	610,000	36,000	3,900	
14. Total Accident Cost per Year **(9) x (13)**	0	0	0	5,613	**5,613**

Crossing, Direct	**Injury Severity**			**Non-Injury**	**Total Cost**
	Fatal	**Serious**	**Minor**		
1. No. of Years of typical accident rate records	5	5	5	5	
2. No. of Reported Accidents over Period	0	0	0	0	
3. Proportion of Fatal to Serious (Table A6.19 (a) to (c))	0.21	0.79			
4. No. of Reported Accidents Adjusted by severity **(2) x (3)**	0	0	0	0	
5.Accidents per year **(4)/(1)**	0	0	0	0	
6. Adjustment Factor (table A6.1(a))	1.028	1.028	1.028	1.028	
7. Adjusted Accidents per Year **(5) x (6)**	0.000	0.000	0.000	0.000	
8. Under-Reporting Factors (table A6.20(a)&(b))	1.0	1.5	4.5	7.0	
9. Total Estimated Accidents/Year **(7) x (8)**	0.000	0.000	0.000	0.000	
10. Accident Cost, 50 km/h Speed Limit (Table A6.21(a)-(d))	4,600,000	490,000	31,000	2,800	
11. Accident Cost, 100 km/h Speed Limit (Table A6.21(e)-(h))	4,650,000	525,000	35,000	3,200	
12. Mean Speed Adjustment = ***(Do Min Mean Speed - 50) / 50***	1	1	1	1	
13. Cost per Accident = **(11) + (12) x [(10) - (11)]**	4,650,000	525,000	35,000	3,200	
14. Total Accident Cost per Year **(9) x (13)**	0	0	0	0	**0**

ACCIDENT BY ACCIDENT ANALYSIS - DO MINIMUM **WORKSHEET A6.2**

Project Name:	Waipapa Road/SH10 Intersection	**Posted Speed Limit:**	70 km/h
Vehicle Involvement:	All	**Mean Speed:**	100 km/h
		Road Category:	70
		Traffic growth rate	2.20% %

Crossing Turning	Injury Severity				
	Fatal	**Serious**	**Minor**	**Non-Injury**	**Total Cost**
1. No. of Years of typical accident rate records	5	5	5	5	
2. No. of Reported Accidents over Period	0	0	0	2	
3. Proportion of Fatal to Serious (Table A6.19 (a) to (c))	0.09	0.91			
4. No. of Reported Accidents Adjusted by severity **(2) x (3)**	0	0	0	2	
5.Accidents per year **(4)/(1)**	0	0	0	0.4	
6. Adjustment Factor (table A6.1(a))	1.028	1.028	1.028	1.028	
7. Adjusted Accidents per Year **(5) x (6)**	0.000	0.000	0.000	0.411	
8. Under-Reporting Factors (table A6.20(a)&(b))	1.0	1.5	4.5	7.0	
9. Total Estimated Accidents/Year **(7) x (8)**	0.000	0.000	0.000	2.878	
10. Accident Cost, 50 km/h Speed Limit (Table A6.21(a)-(d))	4,500,000	475,000	31,000	2,900	
11. Accident Cost, 100 km/h Speed Limit (Table A6.21(e)-(h))	4,650,000	525,000	35,000	3,200	
12. Mean Speed Adjustment = ***(Do Min Mean Speed - 50) / 50***	1	1	1	1	
13. Cost per Accident = **(11) + (12) x [(10) - (11)]**	4,650,000	525,000	35,000	3,200	
14. Total Accident Cost per Year **(9) x (13)**		0	0	9,211	**9,211**

Rear End, Crossing	Injury Severity				
	Fatal	**Serious**	**Minor**	**Non-Injury**	**Total Cost**
1. No. of Years of typical accident rate records	5	5	5	5	
2. No. of Reported Accidents over Period	0	0	0	2	
3. Proportion of Fatal to Serious (Table A6.19 (a) to (c))	0.16	0.84			
4. No. of Reported Accidents Adjusted by severity **(2) x (3)**	0	0	0	2	
5.Accidents per year **(4)/(1)**	0	0	0	0.4	
6. Adjustment Factor (table A6.1(a))	1.028	1.028	1.028	1.028	
7. Adjusted Accidents per Year **(5) x (6)**	0.000	0.000	0.000	0.411	
8. Under-Reporting Factors (table A6.20(a)&(b))	1.0	1.5	4.5	7.0	
9. Total Estimated Accidents/Year **(7) x (8)**	0.000	0.000	0.000	2.878	
10. Accident Cost, 50 km/h Speed Limit (Table A6.21(a)-(d))	4,600,000	450,000	30,000	2,900	
11. Accident Cost, 100 km/h Speed Limit (Table A6.21(e)-(h))	4,250,000	525,000	34,000	3,000	
12. Mean Speed Adjustment = ***(Do Min Mean Speed - 50) / 50***	1	1	1	1	
13. Cost per Accident = **(11) + (12) x [(10) - (11)]**	4,250,000	525,000	34,000	3,000	
14. Total Accident Cost per Year **(9) x (13)**	0	0	0	8,635	**8,635**

Worksheets A6: Accident cost savings

Weighted accident procedure – do minimum

Worksheet A6.5

Project option	Do minimum		
Posted speed limit	70	Traffic growth rate	2.20%
Road category	RS	Time zero	2017

#	Site specific accident rate	
1	Number of years of accident records	5
2	Number of reported injury accidents over period	0
3	Number of accidents per year **(2)**/**(1)**	0
4	Trend adjustment factor (table A6.1(a))	1.028
5	Site-specific accident rate (accidents per year), A_S **(3)** x **(4)**	0
#	**Accident prediction model**	
6	Table used	6.1
7	Parameter b_0	0.00108
8	Parameter b_1	0.51
9	Parameter b_2	0.21
10	Lowest or sideroad AADT, Q_{minor}	6050
11	Highest or primary AADT, Q_{major}	8581
12	Typical accident rate (accidents per year), $A_{T,dm}$ (formula from appendix A6.5)	0.681862355

Go to step 13

#	Exposure based accident prediction equation	
6a	Table used	
7a	Coefficient b_0 (/10^8 veh-km or /10^8 vehicles)	
8a	Cross-section adjustment factor from table A6.13 (1.0 for no adjustment)	
9a	Adjusted coefficient **(7a)** x **(8a)**	
10a	Exposure at time zero (10^8 veh-km or 10^8 vehicles)	
12	Typical accident rate (accidents per year), $A_{T,dm}$ **(9a)** x **(10a)**	0.681862355
13	Accident trend factor for adjusting typical accident rate, f_t (appendix A6.4 method B).	-0.02
14	Adjustment factor for accident trend (1 + **(8)** x (time zero year - 2006) (appendix A6.4 method B).	0.98
15	Typical accident rate per year adjusted for accident trends, $A_{T,dm}$ **(12)** x **(14)***	0.668225108
#	**Weighting factor**	
16	k value (appendix A6.5)	2.3
17	Reliability of accident history, α_X (default is 1.0)	1
18	Reliability of accident prediction model or equation, α_M (default is 1.0)	1
19	Weighting factor, w, **(17)**^{2} x **(16)** / (**(17)**^{2} x **(16)** + **(18)**^{2} x **(15)**))	0.771330037
20	Do minimum weighted accident rate, $A_{W,dm}$ [**(19)** x **(15)**] + [**(1)** – **(19)**] x **(5)**	0.515422097
21	Cost per reported injury accident (table A6.22)	295000
22	Total do minimum accident cost per year **(20)** x **(21)**	**152050**

** For all mid-block analyses, the typical accident rate **(15)** must be divided by the mid-block length (in km).*

ACCIDENT RATE ANALYSIS - Option **WORKSHEET A6.5**

Project:	Waipapa Road/SH10 Intersection		
Project Option :			
Option Posted Speed Limit :	70	**Traffic Growth :**	2.20%
Road Category:	RS	**Time Zero :**	2017

ACCIDENT PREDICTION MODEL			
1	Model used	Accident prediction model 7	
2	Qmajor	8581	
3	Qminor	6050	
4	bo	2.81E-03	
5	b1	0.14	
6	b2	0.46	
7	Typical Accident Rate (Accidents per Year), At (formula from Section A6.5)	0.548	
		Proceed to Step 8	
EXPOSURE BASED ACCIDENT PREDICTION EQUATION			
1a	Method / Table Used:		
2a	Coefficient b0 (/10^8 veh-kms or /10^8 vehicles)		
3a	Cross-section adjustment factor from table A6.13 (1.0 no adjustment)		
4a	Adjusted coefficient **(2a)** x **(3a)**		
5a	Exposure at Time Zero (10^8 veh-kms or 10^8 vehicles)		
7	Typical Accident Rate (Accidents per Year), Atdm **(4a)** x **(5a)**		
8	Accident trend factor for adjusting Typical Accident rate, ft (appendix A6.4 method B)	-0.02	
9	Adjustment factor (1 + **(8)** x (time zero year - 2006)) (appendix A6.4 method B)	0.980	
10	Typical Accident Rate per year adjusted for accident trends At **(7)** x **(9)****	0.537	No cost for signal in 70 and 100km area so Priority T costs has been used
ACCIDENT COSTS			70
11	Cost per Reported Injury Accident (Table A6.22)	$ 280,000.00	$ 280,000
12	Total Accident Cost per Year **(10)** x **(11)**	$ 150,450	
	No years	0	
	MID POINTYear	2017	
	Traffic Growth at year Zero With adjustment	0.20%	
	Total Accident Cost/Year	**$ 150,450**	
	Growth		

(14)** For midblock analysis, the typical ax rate **(15)** must be divided by the length in km

Traffic Flows obatined from Tubecounts that have both directions

ACCIDENT RATE ANALYSIS - Option **WORKSHEET A6.5**

Project:	Waipapa Road/SH10 Intersection		
Project Option :			
Option Posted Speed Limit :	70	**Traffic Growth :**	2.20%
Road Category:	RS	**Time Zero :**	2017

ACCIDENT PREDICTION MODEL				
1	Model used			
2	Qmajor	8581	8581	
3	Qminor	6050	4093	
4	bo	5.65E-05	5.65E-05	
5	b1	0.2	0.2	
6	b2	0.76	0.76	
7	Typical Accident Rate (Accidents per Year), At (formula from Section A6.5)	0.259	0.192	
		Proceed to Step 8		
EXPOSURE BASED ACCIDENT PREDICTION EQUATION				
1a	Method / Table Used:			
2a	Coefficient b0 (/10^8 veh-kms or /10^8 vehicles)			
3a	Cross-section adjustment factor from table A6.13 (1.0 no adjustment)			
4a	Adjusted coefficient **(2a)** x **(3a)**			
5a	Exposure at Time Zero (10^8 veh-kms or 10^8 vehicles)			
7	Typical Accident Rate (Accidents per Year), Atdm **(4a)** x **(5a)**			
8	Accident trend factor for adjusting Typical Accident rate, ft (appendix A6.4 method B)	-0.02		
9	Adjustment factor (1 + **(8)** x (time zero year - 2006)) (appendix A6.4 method B)	0.980		
10	Typical Accident Rate per year adjusted for accident trends At **(7)** x **(9)****	0.442		No cost for signal in 70 and 100km area so Priority T costs has been used
ACCIDENT COSTS			70	
11	Cost per Reported Injury Accident (Table A6.22)	$ 295,000.00	$ 295,000	
12	Total Accident Cost per Year **(10)** x **(11)**	$ 130,391		
	No years	0		
	MID POINTYear	2017		
	Traffic Growth at year Zero With adjustment	0.20%		
	Total Accident Cost/Year	**$ 130,391**		
	Growth			

(14)** For midblock analysis, the typical ax rate **(15)** must be divided by the length in km

Traffic Flows obatined from Tubecounts that have both directions

2016

	SH10 Northbound	SH10 Southbound
0700-1900	3821	3679
0000-0000	4237	4055
Difference	416	376
Geomeric delay (s)	5.5	5.5
Total TT	2288	2068
Additional TT Cost	3268.566889	2954.281611
Total TT	**6222.8485**	

	SH10 Northl	SH10 Southbound
0700-1900	3821	3679
0000-0000	4237	4055
Difference	416	376
Curve Speed	20	20
Initial Speed	70	70
Additional VC	4.1	4.1
Total VOC	6140.16	5549.76
Total VOC	**11689.92**	

2026

	SH10 Nor	SH10 Southbound
0700-1900		
0000-0000		
Growth	507.52	458.72
Geomeric	5.5	5.5
Total TT	2791.36	2522.96
Additional	3987.652	3604.224
Total TT	**7591.875**	

	SH10 Nor	SH10 Southbound
0700-1900		
0000-0000		
Difference	507.52	458.72
Curve Spe	20	20
Initial Spee	70	70
Additional	4.1	4.1
Total VOC	7490.995	6770.707
Total VOC	**14261.7**	

2036

	SH10 Nor	SH10 Southbound
0700-1900		
0000-0000		
Difference	599.04	541.44
Geomeric	5.5	5.5
Total TT	3294.72	2977.92
Additional	4706.736	4254.166
Total TT	**8960.902**	

	SH10 Nor	SH10 Southbound
0700-1900		
0000-0000		
Difference	599.04	541.44
Curve Spe	20	20
Initial Spee	70	70
Additional	4.1	4.1
Total VOC	8841.83	7991.654
Total VOC	**16833.48**	

Growth 2.20%

EEM Table A5.41 Additional VOC due to Speed Change Cycle (cents/Speed cycle)

Initial speed(km/h)	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115
5	0.1																							
10	0.2	0.1																						
15	0.3	0.2	0.1																					
20	0.5	0.4	0.2	0.1																				
25	0.7	0.6	0.5	0.3	0.2																			
30	1	0.9	0.7	0.6	0.4	0.2																		
35	1.3	1.2	1.1	0.9	0.7	0.4	0.2																	
40	1.7	1.6	1.4	1.2	1	0.7	0.5	0.2																
45	2.1	2	1.8	1.6	1.4	1.1	0.8	0.5	0.3															
50	2.5	2.4	2.3	2.1	1.8	1.5	1.2	0.9	0.6	0.3														
55	3	2.9	2.8	2.6	2.3	2	1.7	1.3	1	0.6	0.3													
60	3.6	3.5	3.3	3.1	2.9	2.5	2.2	1.8	1.4	1	0.7	0.3												
65	4.2	4.1	3.9	3.7	3.5	3.1	2.8	2.4	2	1.6	1.1	0.7	0.3											
70	4.9	4.7	4.6	4.4	4.1	3.8	3.4	3	2.6	2.1	1.7	1.2	0.7	0.3										
75	5.6	5.4	5.3	5	4.8	4.4	4.1	3.7	3.2	2.8	2.3	1.8	1.3	0.8	0.4									
80	6.3	6.2	6	5.8	5.5	5.1	4.8	4.4	3.9	3.5	3	2.5	1.9	1.4	0.8	0.4								
85	7.1	7	6.8	6.5	6.3	5.9	5.5	5.1	4.7	4.2	3.7	3.2	2.6	2.1	1.5	0.9	0.4							
90	8	7.8	7.6	7.4	7.1	6.7	6.3	5.9	5.4	5	4.5	3.9	3.4	2.8	2.2	1.6	0.9	0.4						
95	8.9	8.7	8.5	8.2	7.9	7.5	7.1	6.7	6.3	5.8	5.3	4.7	4.2	3.6	2.9	2.3	1.7	1	0.4					
100	9.8	9.6	9.4	9.1	8.8	8.4	8	7.6	7.1	6.6	6.1	5.6	5	4.4	3.8	3.1	2.4	1.7	1	0.4				
105	10.8	10.6	10.4	10.1	9.8	9.4	8.9	8.5	8	7.5	7	6.4	5.8	5.2	4.6	3.9	3.3	2.5	1.8	1.1	0.4			
110	11.9	11.6	11.4	11.1	10.8	10.3	9.9	9.4	9	8.4	7.9	7.3	6.7	6.1	5.5	4.8	4.1	3.4	2.7	1.9	1.1	0.4		
115	13	12.7	12.5	12.2	11.8	11.4	10.9	10.4	9.9	9.4	8.9	8.3	7.7	7.1	6.4	5.7	5	4.3	3.5	2.8	2	1.2	0.5	
120	14.1	13.9	13.6	13.2	12.9	12.4	11.9	11.5	10.9	10.4	9.8	9.3	8.6	8	7.4	6.7	6	5.2	4.5	3.7	2.9	2	1.2	0.5

Hourly Count Export

Site Ref: 01000015 (1km south of Waimate Nth Rd)
Start Date (dd-mon-yyyy): 01-Jan-2015
End Date (dd-mon-yyyy): 31-Dec-2015
Direction: Both
Data Type: ALL Vehicles

Day		00:00 - 01	01:00 - 02	02:00 - 03	03:00 - 04	04:00 - 05	05:00 - 06	06:00 - 07	07:00 - 08	08:00 - 09	09:00 - 10	10:00 - 11	11:00 - 12	12:00 - 13	13:00 - 14	14:00 - 15	15:00 - 16	16:00 - 17	17:00 - 18	18:00 - 19	19:00 - 20	20:00 - 21	21:00 - 22	22:00 - 23	23:00 - 00	Total
27-Feb	FRI	13	11	7	15	26	67	158	381	529	490	493	446	516	488	563	636	676	526	378	204	149	94	57	37	6960
6-Mar	FRI	16	13	10	16	28	85	132	379	545	458	495	550	508	507	577	624	645	539	339	240	162	106	78	37	7089
29-May	FRI	12	15	12	9	26	73	133	395	508	460	416	500	507	538	577	688	632	575	279	208	168	97	118	46	6992
7-Aug	FRI	11	7	11	12	23	61	155	365	484	445	431	436	470	440	481	561	605	471	259	149	98	75	60	35	6145
30-Oct	FRI	10	6	11	16	15	65	157	440	548	457	483	502	528	452	558	652	589	562	293	172	126	83	61	33	6819
6-Nov	FRI	19	14	16	11	19	67	150	395	549	474	480	518	529	507	554	667	607	584	337	208	140	116	90	27	7078
2-Mar	MON	15	16	9	24	27	70	176	456	536	435	423	509	455	398	419	570	566	503	251	164	77	60	35	31	6225
9-Mar	MON	15	8	12	18	37	67	149	406	509	419	421	432	414	387	479	477	530	546	249	122	88	53	18	20	5876
25-May	MON	7	9	7	16	31	77	162	388	519	421	396	423	430	426	438	522	528	498	172	116	54	40	40	11	5731
10-Aug	MON	12	7	14	16	25	62	142	397	468	373	338	394	422	384	468	455	535	420	196	117	67	45	27	12	5396
2-Nov	MON	15	13	10	13	26	90	165	448	537	452	458	427	475	463	480	547	591	532	294	149	78	48	41	16	6368
9-Nov	MON	14	9	14	19	25	71	185	426	577	441	453	495	484	438	493	549	591	550	280	156	114	59	36	15	6494
28-Feb	SAT	21	12	11	12	28	43	94	194	287	456	503	581	507	465	440	343	358	308	228	160	116	92	67	50	5376
7-Mar	SAT	26	13	12	10	13	40	88	171	271	416	533	560	527	496	464	379	316	304	212	139	94	99	66	31	5280
23-May	SAT	17	9	7	11	14	35	54	118	186	284	430	449	422	367	316	273	281	238	173	81	61	60	45	23	3954
8-Aug	SAT	17	10	9	8	26	30	54	144	250	410	512	521	499	397	377	343	271	242	180	106	87	61	44	24	4622
31-Oct	SAT	18	12	12	13	20	23	91	196	311	453	523	570	550	460	438	408	431	306	231	195	136	92	59	27	5575
7-Nov	SAT	17	12	11	7	16	40	86	193	332	475	571	549	504	424	399	354	363	314	354	315	232	290	195	30	6083
1-Mar	SUN	29	12	16	4	10	25	46	105	145	322	426	489	410	374	416	431	341	301	223	165	115	53	34	17	4509
8-Mar	SUN	17	14	9	5	10	18	48	81	148	286	425	468	420	405	409	374	354	335	228	158	120	60	30	18	4440
24-May	SUN	28	24	20	4	12	23	35	86	129	272	340	394	349	370	288	336	286	232	166	104	50	34	12	8	3602
9-Aug	SUN	22	11	6	4	9	14	34	71	126	226	311	309	391	320	340	289	284	248	156	104	69	44	20	13	3421
1-Nov	SUN	17	12	8	12	43	16	42	117	177	313	389	354	402	368	377	392	370	279	183	151	126	72	26	18	4264
8-Nov	SUN	19	14	7	6	11	20	55	129	202	305	422	433	414	352	347	448	321	313	230	151	117	55	25	22	4418
5-Mar	THU	12	8	9	19	15	72	141	393	592	469	484	479	481	510	530	594	590	579	325	193	126	87	46	35	6789
12-Mar	THU	7	3	13	21	24	77	149	397	551	439	460	502	469	481	478	540	596	590	313	187	136	91	55	30	6609
28-May	THU	9	9	15	13	18	77	172	394	553	484	426	474	472	444	504	582	604	552	248	146	101	62	59	21	6439
6-Aug	THU	19	8	13	8	20	50	139	384	499	442	459	404	425	439	494	515	530	487	217	120	88	61	46	22	5889
29-Oct	THU	7	8	15	14	21	69	158	402	547	469	493	482	512	457	489	572	562	563	255	167	84	68	37	24	6475
5-Nov	THU	8	7	12	9	24	77	160	421	536	544	478	531	549	503	556	566	604	614	294	196	118	87	57	22	6973
3-Mar	TUE	12	15	12	14	23	68	143	395	542	431	428	454	475	461	521	545	581	541	248	150	112	78	36	17	6302
10-Mar	TUE	4	7	11	13	25	55	143	384	528	470	456	439	486	445	447	546	581	524	260	175	107	74	36	20	6236
26-May	TUE	16	6	15	10	18	69	161	412	522	450	416	425	466	447	470	566	529	520	228	108	66	63	33	33	6049
11-Aug	TUE	12	6	7	13	18	49	152	369	477	429	417	432	455	384	412	487	563	471	205	104	60	49	22	18	5611
3-Nov	TUE	7	10	17	8	14	59	174	446	550	474	524	536	503	466	505	546	588	506	283	147	114	67	43	21	6608
10-Nov	TUE	9	9	14	15	25	83	187	396	605	481	475	437	491	459	540	589	574	518	303	179	110	73	50	16	6638
4-Mar	WED	7	7	14	14	19	81	139	432	536	449	464	528	480	405	471	563	572	601	293	176	103	82	42	19	6497
11-Mar	WED	8	17	9	13	22	63	164	419	554	465	489	523	478	484	460	545	580	568	286	169	118	78	40	20	6572
27-May	WED	10	11	11	11	23	66	171	402	515	461	422	440	467	416	474	529	539	504	233	127	80	87	28	17	6044
5-Aug	WED	8	9	7	14	13	60	142	364	482	398	407	423	432	454	460	525	528	422	198	108	74	73	35	17	5653
4-Nov	WED	10	11	11	16	16	77	159	387	538	500	489	494	547	467	534	536	585	562	302	173	103	87	44	20	6668
11-Nov	WED	10	5	10	10	29	74	173	441	572	517	461	484	537	494	505	549	600	603	311	200	124	108	53	30	6900
		00:00 - 01	01:00 - 02	02:00 - 03	03:00 - 04	04:00 - 05	05:00 - 06	06:00 - 07	07:00 - 08	08:00 - 09	09:00 - 10	10:00 - 11	11:00 - 12	12:00 - 13	13:00 - 14	14:00 - 15	15:00 - 16	16:00 - 17	17:00 - 18	18:00 - 19	19:00 - 20	20:00 - 21	21:00 - 22	22:00 - 23	23:00 - 00	Total
Weekday		11	9	12	14	23	69	156	404	534	457	451	471	482	455	498	561	580	534	271	161	105	75	47	24	
Sat		19	11	10	10	20	35	78	169	273	416	512	538	502	435	406	350	337	285	230	166	121	116	79	31	
Sun		22	15	11	6	16	19	43	98	155	287	386	408	398	365	363	378	326	285	198	139	100	53	25	16	

	PERIOD	Days/Yr	hrs/day	Hrs/Year	flow/hr			
weekday night		240	13	3120	75			
week day AM		240	1	240	534			
week day PM		240	2	480	571			
week day IP		240	8	1920	469	Same as Saturday pe	Counte	
Saturday		52	6	312	468	Count was 11-12	Sidra Volmes reduced by	0.87
Sunday		68	6	408	383	82% of IP	Sidra Volmes reduced by	0.71
Weekend offpeak/night		120	18	2160	115			

APPENDIX J
Economics

COST-BENEFIT ANALYSIS OF THE OPTIONS

WORKSHEET 4

Const Starts 1-Oct-18

Const Ends 1-Apr-19

Project :	Waipapa Road/SH10 Intersection	Time Zero:	1-Jul 2017
Calculated by :	Kristoffer Hansson	Base Date:	1-Jul 2016
Reviewed by:			

OPTION		**Option 2 (Roundabout)**	**Option 4 (Head to Head Right Turn Bays)**	**Option 5 (Close Waipapa Loop South)**	**Option 3 (Traffic Signals)**	**Option 1 (Right Turn Bay)**	**Do Min**	**Option 2 (Roundabout)**	**Option 4 (Head to Head Right Turn Bays)**	**Option 5 (Close Waipapa Loop South)**	**Option 3 (Traffic Signals)**	**Option 1 (Right Turn Bay)**
TANGIBLE BENEFITS CALCULATION:								NET BENEFITS OF THE OPTIONS				
1. Travel Time		$6,465,175	$9,838,281	$10,203,623	$29,877,354	$9,838,281	$21,037,803	$14,572,628	$11,199,523	$10,834,181	($8,839,551)	$11,199,523
2. Vehicle Oper.		$14,838,274	$15,743,905	$16,027,995	$16,098,854	$15,743,905	$18,924,446	$4,086,173	$3,180,541	$2,896,451	$2,825,592	$3,180,541
3. Accidents		$1,794,968	$1,927,424	$1,927,424	$2,223,937	$1,927,424	$2,247,576	$452,608	$320,152	$320,152	$23,639	$320,152
4.Carbon dixiode ($40/tonne)		$939,343	$1,017,102	$1,031,307	$1,032,524	$1,017,102	$1,212,531	$273,188	$195,429	$181,224	$180,007	$195,429
6. TOTAL (1+2+3+4)		$24,037,760	$28,526,712	$29,190,348	$49,232,670	$28,526,712	$43,422,356	$19,384,597	$14,895,645	$14,232,008	($5,810,313)	$14,895,645
COSTS CALCULATION:								NET COSTS OF THE PROJECT OPTIONS				
1. Fees		$473,810	$453,859	$449,037	$493,118	$434,350	$0	$473,810	$453,859	$449,037	$493,118	$434,350
2. Property		$1,069,609	$457,027	$100,401	$439,892	$294,243	$0	$1,069,609	$457,027	$100,401	$439,892	$294,243
3. Construction		$4,716,741	$4,522,905	$4,449,102	$4,904,331	$4,333,368	$0	$4,716,741	$4,522,905	$4,449,102	$4,904,331	$4,333,368
4. Maintenance							$0					
5. TOTAL (1+2+3+4)		$6,260,159	$5,433,791	$4,998,541	$5,837,341	$5,061,960	$0	$6,260,159	$5,433,791	$4,998,541	$5,837,341	$5,061,960
TANGIBLE BENEFIT TO COST RATIO								**3.1**	**2.7**	**2.8**	**N/A**	**2.9**

Ranking B/C Ratio

Intangible Benefits

INCREMENTAL COST-BENEFIT ANALYSIS OF PROJECT OPTIONS

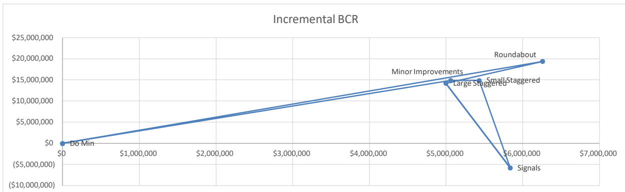
WORKSHEET 5

Incremental BCR in order of increasing cost:

Target BCR **3.0**

Ranked by increasing cost

Option	**Net Costs**	**Net Benefits**
Do Min	$0	$0
Minor Improvements	$5,061,960	$14,895,645
Small Staggered	$5,433,791	$14,895,645
Signals	$5,837,341	($5,810,313)
Large Staggered	$4,998,541	$14,232,008
Roundabout	$6,260,159	$19,384,597
PW Roundabout	#REF!	#REF!



Step	**Option** (Option A)	**Costs**	**Benefits**	**Option** (Option B)	**Costs**	**Benefits**	**Incremental Costs**	**Incremental Benefits**	**Incremental BCR**
1	Option 1 (Right Turn Bay)	$5,061,960	$14,895,645	Option 4 (Head to Head Right Turn Bays)	$5,433,791	$14,895,645	$371,830	$0	N/A
2	Option 1 (Right Turn Bay)	$5,061,960	$14,895,645	Option 3 (Traffic Signals)	$5,837,341	($5,810,313)	$775,380	($20,705,958)	N/A
3	Option 1 (Right Turn Bay)	$5,061,960	$14,895,645	Option 5 (Close Waipapa Loop South)	$4,998,541	$14,232,008	($63,419)	($663,636)	N/A
4	Option 1 (Right Turn Bay)	$5,061,960	$14,895,645	Roundabout	6260159.312	19384596.87	$1,198,199	$4,488,952	3.7
5	Roundabout	$6,260,159	$19,384,597	#REF!	#REF!	#REF!	#REF!	#REF!	**#REF!**

INPUT TABLE - read from "inputdata" worksheet	
year of EEM amendment	2016
Year of MAINTENANCE Costs	2017
YEAR OF CONSTRUCTION COSTS	2017
YEAR OF LAND COSTS	2017
Base Date:	2016
Time Zero:	2017
Discount factor	6.00%
UPDATE FACTORS USED	
TT & Reliability	1.45
VOC	0.98
ACC	1.03
MAINTENANCE COSTS	0.96
CONSTRUCTION COSTS & FEES	0.96
LAND COSTS	0.96

		CRITERIA RANGE						
TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE
C	M	T	V	A	F	L	CO2	R

TIME STREAMS AND DISCOUNTING

OPTION **Do Min**

WORKSHEET A1.1 and A1.2

BASE DATE 2016
TIME ZERO 2017

DESCRIPTION	PAYMENT TYPE T	START YEAR.	END YEAR	DURATION YEARS n	BASE YEAR COST/YR. $	BASE YEAR GROWTH. %	START YEAR COST/YR $	START YEAR GROWTH %	YEAR OF ESTIMATE	UPDATE FACTOR	PRESENT VALUE TIMEZERO $	DISCOUNTING SPPWF	DISCOUNTING UNSPWF	DISCOUNTING AGPWF
COSTS & MAINTENANCE														
Construction Cost	C	1.5	1.5	0.0					2017	0.96		0.916	0.000	0.000
Fees	F	0.3	0.3	0.0					2017	0.96		0.986	0.000	0.000
Fees	F	0.8	0.8	0.0					2017	0.96		0.957	0.000	0.000
Property	L	1.3	1.3	0.0					2017	0.96		0.930	0.000	0.000
Maintenance (ignored)	M													
OPERATING COSTS														
Travel Time 2016-2026	T	1.8	10.0	8.2	161,231	26.60%	236,386	18.15%	2002	1.45	$3,422,510	0.903	6.549	24.852
Travel Time 2026-2036	T	10.0	20.0	10.0			590,184	20.41%	2002	1.45	$6,960,151	0.558	7.579	34.234
Travel Time 2036-2056	T	20.0	41.3	21.3			1,794,648	0.91%	2002	1.45	$10,655,142	0.312	12.187	103.433
VOC 2016-2026	V	1.8	10.0	8.2	640,236	5.23%	698,933	4.79%	2008	0.98	$4,786,972	0.903	6.549	24.852
VOC 2026-2036	V	10.0	20.0	10.0			975,250	9.74%	2008	0.98	$5,824,205	0.558	7.579	34.234
VOC 2036-2056	V	20.0	41.3	21.3			1,925,160	1.88%	2008	0.98	$8,313,270	0.312	12.187	103.433
CO2 2016-2026	CO2	1.8	10.0	8.2	41,135	5.22%	44,896	4.78%	2008	0.98	$307,366	0.903	6.549	24.852
CO2 2026-2036	CO2	10.0	20.0	10.0			62,599	9.69%	2008	0.98	$373,217	0.558	7.579	34.234
CO2 2036-2056	CO2	20.0	41.3	21.3			123,238	1.87%	2008	0.98	$531,948	0.312	12.187	103.433
Crash Costs Period 1	A	1.8	41.3	39.5	152,050	0.20%	152,582	0.20%	2006	1.03	$2,247,576	0.903	15.444	197.192

TRANSFERED IN FROM OTHER WORKSHEETS	TT/yr	growth/yr	VOC/yr	growth/yr	C02	growth/yr	crashes	growth/yr
2016	$161,231		$640,236		$41,135		152050	304
2026	$590,184	$42,895	$975,250	$33,501	$62,599	$2,146		
2036	$1,794,648	$120,446	$1,925,160	$94,991	$123,238	$6,064		
2056	$ 2,122,503	$ 16,393	$ 2,649,039	$ 36,194	$ 169,437	$ 2,310		
							crash GROWTH adjustment =	0.20%

INPUT TABLE - read from "inputdata" worksheet	
year of EEM amendment	2016
Year of MAINTENANCE Costs	2017
YEAR OF CONSTRUCTION COSTS	2017
YEAR OF LAND COSTS	2017
Base Date:	2016
Time Zero:	2017
Discount factor	6.00%
UPDATE FACTORS USED	
TT & Reliability	1.45
VOC	0.98
ACC	1.03
MAINTENANCE COSTS	0.96
CONSTRUCTION COSTS & FEES	0.96
LAND COSTS	0.96

		CRITERIA RANGE						
TYPE	TYPE	**TYPE**	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE
C	M	T	V	A	F	L	CO2	R

TIME STREAMS AND DISCOUNTING

OPTION **Option 3 (Traffic Signals)**

WORKSHEET A1.1 and A1.2

BASE DATE 2016
TIME ZERO 2017

DESCRIPTION	PAYMENT TYPE T	START YEAR.	END YEAR	DURATION YEARS n	BASE YEAR COST/YR. $	BASE YEAR GROWTH. %	START YEAR COST/YR $	START YEAR GROWTH %	YEAR OF ESTIMATE	UPDATE FACTOR	PRESENT VALUE TIMEZERO $	DISCOUNTING SPPWF	DISCOUNTING UNSPWF	DISCOUNTING AGPWF
COSTS & MAINTENANCE														
Construction Cost	C	1.5	1.5	0.0	5,575,956		5,575,956		2017	0.96	$4,904,331	0.916	0.000	0.000
Fees	F	0.3	0.3	0.0	264,397		264,397		2017	0.96	$250,150	0.986	0.000	0.000
Fees	F	0.8	0.8	0.0	264,397		264,397		2017	0.96	$242,968	0.957	0.000	0.000
Property	L	1.3	1.3	0.0	492,900		492,900		2017	0.96	$439,892	0.930	0.000	0.000
Maintenance (ignored)	M													
OPERATING COSTS														
Travel Time 2016-2026	T	1.8	10.0	8.2	488,419	6.74%	546,109	6.03%	2002	1.45	$5,753,744	0.903	6.549	24.852
Travel Time 2026-2036	T	10.0	20.0	10.0			817,687	14.57%	2002	1.45	$8,319,783	0.558	7.579	34.234
Travel Time 2036-2056	T	20.0	41.3	21.3			2,009,021	5.04%	2002	1.45	$15,803,827	0.312	12.187	103.433
VOC 2016-2026	V	1.8	10.0	8.2	757,002	3.61%	804,893	3.40%	2008	0.98	$5,265,374	0.903	6.549	24.852
VOC 2026-2036	V	10.0	20.0	10.0			1,030,343	3.92%	2008	0.98	$5,029,763	0.558	7.579	34.234
VOC 2036-2056	V	20.0	41.3	21.3			1,434,224	1.02%	2008	0.98	$5,803,718	0.312	12.187	103.433
CO2 2016-2026	CO2	1.8	10.0	8.2	48,574	3.61%	51,648	3.40%	2008	0.98	$337,868	0.903	6.549	24.852
CO2 2026-2036	CO2	10.0	20.0	10.0			66,116	3.91%	2008	0.98	$322,622	0.558	7.579	34.234
CO2 2036-2056	CO2	20.0	41.3	21.3			91,962	1.02%	2008	0.98	$372,034	0.312	12.187	103.433
Crash Costs Period 1	A	1.8	41.3	39.5	150,450	0.20%	150,978	0.20%	2006	1.03	$2,223,937	0.903	15.444	197.192

TRANSFERED IN FROM OTHER WORKSHEETS	TT/yr	growth/yr	VOC/yr	growth/yr	C02	growth/yr	crashes	growth/yr
2016	$488,419		$757,002		$48,574		150450	301
2026	$817,687	$32,927	$1,030,343	$27,334	$66,116	$1,754		
2036	$2,009,021	$119,133	$1,434,224	$40,388	$91,962	$2,585		
2056	4,033,700	$101,234	1,726,982	$14,638	110,671	$935		
							crash GROWTH adjustment =	0.20%

INPUT TABLE - read from "inputdata" worksheet	
year of EEM amendment	2016
Year of MAINTENANCE Costs	2017
YEAR OF CONSTRUCTION COSTS	2017
YEAR OF LAND COSTS	2017
Base Date:	2016
Time Zero:	2017
Discount factor	6.00%
UPDATE FACTORS USED	
TT & Reliability	1.45
VOC	0.98
ACC	1.03
MAINTENANCE COSTS	0.96
CONSTRUCTION COSTS & FEES	0.96
LAND COSTS	0.96

		CRITERIA RANGE						
TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE
C	M	T	V	A	F	L	CO2	R

TIME STREAMS AND DISCOUNTING

OPTION Option 1 (Right Turn Bay)

WORKSHEET A1.1 and A1.2

BASE DATE 2016
TIME ZERO 2017

DESCRIPTION	PAYMENT TYPE T	START YEAR.	END YEAR	DURATION YEARS n	BASE YEAR COST/YR. $	BASE YEAR GROWTH. %	START YEAR COST/YR $	START YEAR GROWTH %	YEAR OF ESTIMATE	UPDATE FACTOR	PRESENT VALUE TIMEZERO $	DISCOUNTING SPPWF	DISCOUNTING UNSPWF	DISCOUNTING AGPWF
COSTS & MAINTENANCE														
Construction Cost	C	1.5	1.5	0.0	4,926,802		4,926,802		2017	0.96	$4,333,368	0.916	0.000	0.000
Fees	F	0.3	0.3	0.0	232,887		232,887		2017	0.96	$220,338	0.986	0.000	0.000
Fees	F	0.8	0.8	0.0	232,887		232,887		2017	0.96	$214,011	0.957	0.000	0.000
Property	L	1.3	1.3	0.0	329,700		329,700		2017	0.96	$294,243	0.930	0.000	0.000
Maintenance (ignored)	M													
OPERATING COSTS														
Travel Time 2016-2026	T	1.8	10.0	8.2	116,306	10.73%	138,181	9.04%	2002	1.45	$1,591,017	0.903	6.549	24.852
Travel Time 2026-2036	T	10.0	20.0	10.0			241,158	22.64%	2002	1.45	$2,992,990	0.558	7.579	34.234
Travel Time 2036-2056	T	20.0	41.3	21.3			787,062	2.49%	2002	1.45	$5,254,274	0.312	12.187	103.433
VOC 2016-2026	V	1.8	10.0	8.2	693,013	3.91%	740,530	3.66%	2008	0.98	$4,887,700	0.903	6.549	24.852
VOC 2026-2036	V	10.0	20.0	10.0			964,218	5.10%	2008	0.98	$4,920,226	0.558	7.579	34.234
VOC 2036-2056	V	20.0	41.3	21.3			1,456,016	1.12%	2008	0.98	$5,935,979	0.312	12.187	103.433
CO2 2016-2026	CO2	1.8	10.0	8.2	44,549	3.91%	47,597	3.66%	2008	0.98	$314,079	0.903	6.549	24.852
CO2 2026-2036	CO2	10.0	20.0	10.0			61,947	5.26%	2008	0.98	$317,960	0.558	7.579	34.234
CO2 2036-2056	CO2	20.0	41.3	21.3			94,534	1.11%	2008	0.98	$385,063	0.312	12.187	103.433
Crash Costs Period 1	A	1.8	41.3	39.5	130,391	0.20%	130,848	0.20%	2006	1.03	$1,927,424	0.903	15.444	197.192

TRANSFERED IN FROM OTHER WORKSHEETS	TT/yr	growth/yr	VOC/yr	growth/yr	C02	growth/yr	crashes	growth/yr
2016	$116,306		$693,013		$44,549		130391	261
2026	$241,158	$12,485	$964,218	$27,121	$61,947	$1,740		
2036	$787,062	$54,590	$1,456,016	$49,180	$94,534	$3,259		
2056	1,179,478	$19,621	1,781,115	$16,255	115,426	$1,045		
							crash GROWTH adjustment =	0.20%

INPUT TABLE - read from "inputdata" worksheet	
year of EEM amendment	2016
Year of MAINTENANCE Costs	2017
YEAR OF CONSTRUCTION COSTS	2017
YEAR OF LAND COSTS	2017
Base Date:	2016
Time Zero:	2017
Discount factor	6.00%
UPDATE FACTORS USED	
TT & Reliability	1.45
VOC	0.98
ACC	1.03
MAINTENANCE COSTS	0.96
CONSTRUCTION COSTS & FEES	0.96
LAND COSTS	0.96

		CRITERIA RANGE						
TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE
C	M	T	V	A	F	L	CO2	R

TIME STREAMS AND DISCOUNTING

OPTION Option 2 (Roundabout)

WORKSHEET A1.1 and A1.2

BASE DATE 2016
TIME ZERO 2017

DESCRIPTION	PAYMENT TYPE T	START YEAR.	END YEAR	DURATION YEARS n	BASE YEAR COST/YR. $	BASE YEAR GROWTH. %	START YEAR COST/YR $	START YEAR GROWTH %	YEAR OF ESTIMATE	UPDATE FACTOR	PRESENT VALUE TIMEZERO $	DISCOUNTING SPPWF	DISCOUNTING UNSPWF	DISCOUNTING AGPWF
COSTS & MAINTENANCE														
Construction Cost	C	1.5	1.5	0.0	5,362,676		5,362,676		2017	0.96	$4,716,741	0.916	0.000	0.000
Fees	F	0.3	0.3	0.0	254,045		254,045		2017	0.96	$240,356	0.986	0.000	0.000
Fees	F	0.8	0.8	0.0	254,045		254,045		2017	0.96	$233,454	0.957	0.000	0.000
Property	L	1.3	1.3	0.0	1,198,500		1,198,500		2017	0.96	$1,069,609	0.930	0.000	0.000
Maintenance (ignored)	M													
OPERATING COSTS														
Travel Time 2016-2026	T	1.8	10.0	8.2	140,208	5.02%	152,530	4.61%	2002	1.45	$1,536,643	0.903	6.549	24.852
Travel Time 2026-2036	T	10.0	20.0	10.0			210,538	10.19%	2002	1.45	$1,886,777	0.558	7.579	34.234
Travel Time 2036-2056	T	20.0	41.3	21.3			425,142	3.52%	2002	1.45	$3,041,755	0.312	12.187	103.433
VOC 2016-2026	V	1.8	10.0	8.2	728,375	3.53%	773,393	3.32%	2008	0.98	$5,046,772	0.903	6.549	24.852
VOC 2026-2036	V	10.0	20.0	10.0			985,317	3.28%	2008	0.98	$4,691,525	0.558	7.579	34.234
VOC 2036-2056	V	20.0	41.3	21.3			1,308,327	0.55%	2008	0.98	$5,099,976	0.312	12.187	103.433
CO2 2016-2026	CO2	1.8	10.0	8.2	46,005	3.55%	48,866	3.34%	2008	0.98	$319,074	0.903	6.549	24.852
CO2 2026-2036	CO2	10.0	20.0	10.0			62,331	3.30%	2008	0.98	$297,019	0.558	7.579	34.234
CO2 2036-2056	CO2	20.0	41.3	21.3			82,889	0.56%	2008	0.98	$323,250	0.312	12.187	103.433
Crash Costs Period 1	A	1.8	41.3	39.5	121,430	0.20%	121,856	0.20%	2006	1.03	$1,794,968	0.903	15.444	197.192

TRANSFERED IN FROM OTHER WORKSHEETS	TT/yr	growth/yr	VOC/yr	growth/yr	C02	growth/yr	crashes	growth/yr
2016	$140,208		$728,375		$46,005		$ 121,430.41	243
2026	$210,538	$7,033	$985,317	$25,694	$62,331	$1,633		
2036	$425,142	$21,460	$1,308,327	$32,301	$82,889	$2,056		
2056	724,182	$14,952	1,452,441	$7,206	92,108	$461		
							crash GROWTH adjustment =	0.20%

INPUT TABLE - read from "inputdata" worksheet	
year of EEM amendment	2016
Year of MAINTENANCE Costs	2017
YEAR OF CONSTRUCTION COSTS	2017
YEAR OF LAND COSTS	2017
Base Date:	2016
Time Zero:	2017
Discount factor	6.00%
UPDATE FACTORS USED	
TT & Reliability	1.45
VOC	0.98
ACC	1.03
MAINTENANCE COSTS	0.96
CONSTRUCTION COSTS & FEES	0.96
LAND COSTS	0.96

		CRITERIA RANGE						
TYPE	TYPE	**TYPE**	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE
C	M	T	V	A	F	L	CO2	R

TIME STREAMS AND DISCOUNTING

OPTION Option 4 (Head to Head Right Turn Bays)

WORKSHEET A1.1 and A1.2

BASE DATE 2016
TIME ZERO 2017

DESCRIPTION	PAYMENT TYPE T	START YEAR.	END YEAR	DURATION YEARS n	BASE YEAR COST/YR. $	BASE YEAR GROWTH. %	START YEAR COST/YR $	START YEAR GROWTH %	YEAR OF ESTIMATE	UPDATE FACTOR	PRESENT VALUE TIMEZERO $	DISCOUNTING SPPWF	DISCOUNTING UNSPWF	DISCOUNTING AGPWF
COSTS & MAINTENANCE														
Construction Cost	C	1.5	1.5	0.0	5,142,295		5,142,295		2017	0.96	$4,522,905	0.916	0.000	0.000
Fees	F	0.3	0.3	0.0	243,348		243,348		2017	0.96	$230,235	0.986	0.000	0.000
Fees	F	0.8	0.8	0.0	243,348		243,348		2017	0.96	$223,624	0.957	0.000	0.000
Property	L	1.3	1.3	0.0	512,100		512,100		2017	0.96	$457,027	0.930	0.000	0.000
Maintenance (ignored)	M													
OPERATING COSTS														
Travel Time 2016-2026	T	1.8	10.0	8.2	116,306	10.73%	138,181	9.04%	2002	1.45	$1,591,017	0.903	6.549	24.852
Travel Time 2026-2036	T	10.0	20.0	10.0			241,158	22.64%	2002	1.45	$2,992,990	0.558	7.579	34.234
Travel Time 2036-2056	T	20.0	41.3	21.3			787,062	2.49%	2002	1.45	$5,254,274	0.312	12.187	103.433
VOC 2016-2026	V	1.8	10.0	8.2	693,013	3.91%	740,530	3.66%	2008	0.98	$4,887,700	0.903	6.549	24.852
VOC 2026-2036	V	10.0	20.0	10.0			964,218	5.10%	2008	0.98	$4,920,226	0.558	7.579	34.234
VOC 2036-2056	V	20.0	41.3	21.3			1,456,016	1.12%	2008	0.98	$5,935,979	0.312	12.187	103.433
CO2 2016-2026	CO2	1.8	10.0	8.2	44,549	3.91%	47,597	3.66%	2008	0.98	$314,079	0.903	6.549	24.852
CO2 2026-2036	CO2	10.0	20.0	10.0			61,947	5.26%	2008	0.98	$317,960	0.558	7.579	34.234
CO2 2036-2056	CO2	20.0	41.3	21.3			94,534	1.11%	2008	0.98	$385,063	0.312	12.187	103.433
Crash Costs Period 1	A	1.8	41.3	39.5	130,391	0.20%	130,848	0.20%	2006	1.03	$1,927,424	0.903	15.444	197.192

TRANSFERED IN FROM OTHER WORKSHEETS	TT/yr	growth/yr	VOC/yr	growth/yr	C02	growth/yr	crashes	growth/yr
2016	$116,306		$693,013		$44,549		130391	261
2026	$241,158	$12,485	$964,218	$27,121	$61,947	$1,740		
2036	$787,062	$54,590	$1,456,016	$49,180	$94,534	$3,259		
2056	1,179,478	$19,621	1,781,115	$16,255	115,426	$1,045		
							crash GROWTH adjustment =	0.20%

INPUT TABLE - read from "inputdata" worksheet	
year of EEM amendment	2016
Year of MAINTENANCE Costs	2017
YEAR OF CONSTRUCTION COSTS	2017
YEAR OF LAND COSTS	2017
Base Date:	2016
Time Zero:	2017
Discount factor	6.00%
UPDATE FACTORS USED	
TT & Reliability	1.45
VOC	0.98
ACC	1.03
MAINTENANCE COSTS	0.96
CONSTRUCTION COSTS & FEES	0.96
LAND COSTS	0.96

		CRITERIA RANGE						
TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE	TYPE
C	M	T	V	A	F	L	CO2	R

TIME STREAMS AND DISCOUNTING

OPTION Option 5 (Close Waipapa Loop South)

WORKSHEET A1.1 and A1.2

BASE DATE 2016
TIME ZERO 2017

DESCRIPTION	PAYMENT TYPE T	START YEAR.	END YEAR	DURATION YEARS n	BASE YEAR COST/YR. $	BASE YEAR GROWTH. %	START YEAR COST/YR $	START YEAR GROWTH %	YEAR OF ESTIMATE	UPDATE FACTOR	PRESENT VALUE TIMEZERO $	DISCOUNTING SPPWF	DISCOUNTING UNSPWF	DISCOUNTING AGPWF
COSTS & MAINTENANCE														
Construction Cost	C	1.5	1.5	0.0	5,058,386		5,058,386		2017	0.96	$4,449,102	0.916	0.000	0.000
Fees	F	0.3	0.3	0.0	239,408		239,408		2017	0.96	$226,508	0.986	0.000	0.000
Fees	F	0.8	0.8	0.0	242,156		242,156		2017	0.96	$222,529	0.957	0.000	0.000
Property	L	1.3	1.3	0.0	112,500		112,500		2017	0.96	$100,401	0.930	0.000	0.000
Maintenance (ignored)	M													
OPERATING COSTS														
Travel Time 2016-2026	T	1.8	10.0	8.2	116,306	10.73%	138,181	9.04%	2002	1.45	$1,591,017	0.903	6.549	24.852
Travel Time 2026-2036	T	10.0	20.0	10.0			241,158	22.64%	2002	1.45	$2,992,990	0.558	7.579	34.234
Travel Time 2036-2056	T	20.0	41.3	21.3			787,062	2.49%	2002	1.45	$5,254,274	0.312	12.187	103.433
Additional Travel Time 2016-2026	T	1.8	10.0	8.2	12,275	3.90%	13,113	3.65%	2002	1.45	$128,012	0.903	6.549	24.852
Additional Travel Time 2026-2036	T	10.0	20.0	10.0			17,062	2.73%	2002	1.45	$117,623	0.558	7.579	34.234
Additional Travel Time 2036-2056	T	20.0	41.3	21.3			21,725	0.00%	2002	1.45	$119,707	0.312	12.187	103.433
VOC 2016-2026	V	1.8	10.0	8.2	693,013	3.91%	740,530	3.66%	2008	0.98	$4,887,700	0.903	6.549	24.852
VOC 2026-2036	V	10.0	20.0	10.0			964,218	5.10%	2008	0.98	$4,920,226	0.558	7.579	34.234
VOC 2036-2056	V	20.0	41.3	21.3			1,456,016	1.12%	2008	0.98	$5,935,979	0.312	12.187	103.433
Additional VOC 2016-2026	v	1.8	10.0	8.2	14,213	3.83%	15,167	3.59%	2002	0.98	$99,866	0.903	6.549	24.852
Additional VOC 2026-2036	v	10.0	20.0	10.0			19,659	2.68%	2002	0.98	$91,398	0.558	7.579	34.234
Additional VOC 2036-2056	v	20.0	41.3	21.3			24,926	0.00%	2002	0.98	$92,825	0.312	12.187	103.433
CO2 2016-2026	CO2	1.8	10.0	8.2	44,549	3.91%	47,597	3.66%	2008	0.98	$314,079	0.903	6.549	24.852
CO2 2026-2036	CO2	10.0	20.0	10.0			61,947	5.26%	2008	0.98	$317,960	0.558	7.579	34.234
CO2 2036-2056	CO2	20.0	41.3	21.3			94,534	1.11%	2008	0.98	$385,063	0.312	12.187	103.433
Additional CO2 2016-2026	CO2	1.8	10.0	8.2	711	3.83%	758	3.59%	2002	0.98	$4,993	0.903	6.549	24.852
Additional Co2 2026-2036	CO2	10.0	20.0	10.0			983	2.68%	2002	0.98	$4,570	0.558	7.579	34.234
Additional CO2 2036-2056	CO2	20.0	41.3	21.3			1,246	0.00%	2002	0.98	$4,641	0.312	12.187	103.433
Crash Costs Period 1	A	1.8	41.3	39.5	130,391	0.20%	130,848	0.20%	2006	1.03	$1,927,424	0.903	15.444	197.192

TRANSFERED IN FROM OTHER WORKSHEETS	TT/yr	growth/yr	VOC/yr	growth/yr	C02	growth/yr	crashes	growth/yr
2016	$116,306		$693,013		$44,549		130391	261
2026	$241,158	$12,485	$964,218	$27,121	$61,947	$1,740		
2036	$787,062	$54,590	$1,456,016	$49,180	$94,534	$3,259		
2056	1,179,478	$19,621	1,781,115	$16,255	115,426	$1,045		
							crash GROWTH adjustment =	0.20%

APPENDIX K
Cost Estimates and Risk Register

Project Estimate - Form C

DBE

PN4234 SH10 Waipapa Road Intersection Improvements

Detailed Business Case Estimate
Right Turn Bay

Item	Description	Base Estimate	Contingency	Funding Risk Contingency
A	**Nett Project Property Cost**	274,750	54,950	27,475
	Project Development Phase			
	- Consultancy Fees	Nil	Nil	Nil
	- NZTA Managed Costs	Nil	Nil	Nil
B	**Total Project Development**	Nil	Nil	Nil
	Pre-implementation Phase			
	- Consultancy Fees			
	- NZTA Managed Costs			
C	**Total Pre-implementation**	423,431	42,343	42,343
	Implementation Phase			
	Implementation Fees			
	- Consultancy Fees			
	- NZTA Managed Costs			
	- Construction Monitoring Fees			
	Sub Total Base Implementation Fees	325,716	65,143	
	Physical Works			
1	Environmental Compliance	50,000	5,000	
2	Earthworks	22,918	2,292	
3	Ground Improvements	0	0	
4	Drainage	634,384	63,438	
5	Pavement and Surfacing	462,499	46,250	
6	Bridges	0	0	
7	Retaining Walls	62,550	6,255	
8	Traffic Services	216,500	21,650	
9	Service Relocations	1,290,000	258,000	
10	Landscaping	143,312	14,331	
11	Traffic Management and Temporary Works	375,000	37,500	
12	Preliminary and General	260,573	26,057	
13	Extraordinary Construction Costs	488,574	48,857	
	Sub Total Base Physical works	4,006,311	529,631	
D	**Total for Implementation Phase**	4,332,027	594,774	950,000
E	**Project Base Estimate** (A+C+D)	5,030,208		
F	**Contingency** (Assessed/Analysed) (A+C+D)		692,067	
G	**Project Expected Estimate** (E+F)		5,722,276	
	Nett Project Property Cost Expected Estimate			
	Project Development Phase Expected Estimate		Nil	
	Pre-implementation Phase Expected Estimate			
	Implementation Phase Expected Estimate			
H	**Funding Risk Contingency** (Assessed/Analysed) (A+C+D)			1,019,818
I	**95th percentile Project Estimate** (G+H)			6,742,094
	Nett Project Property Cost 95th percentile Estimate			
	Project Development Phase 95th percentile Estimate			Nil
	Pre-implementation Phase 95th percentile Estimate			
	Implementation Phase 95th percentile Estimate			

Date of Estimate	29/09/17	**Cost Index (Qtr/Year)**	
Estimate prepared by		**Signed**	N Todd Jones
Estimate internal peer review by		**Signed**	[signature]
Estimate external peer review by		**Signed**	
Estimate accepted by NZTA		**Signed**	

Note: (1) These estimates are exclusive of escalation and GST.
(2) Project Development Phase Estimates are set to Nil as these are now sunk costs.

Project Estimate - Form C

DBE

PN4234 SH10 Waipapa Road Intersection Improvements

Detailed Business Case Estimate
Roundabout

Item	Description		Base Estimate	Contingency	Funding Risk Contingency
A	**Nett Project Property Cost**		998,750	199,750	99,875
	Project Development Phase				
		- Consultancy Fees	Nil	Nil	Nil
		- NZTA Managed Costs	Nil	Nil	Nil
B	**Total Project Development**		Nil	Nil	Nil
	Pre-implementation Phase				
		- Consultancy Fees			
		- NZTA Managed Costs			
C	**Total Pre-implementation**		461,899	46,190	46,190
	Implementation Phase				
	Implementation Fees				
	- Consultancy Fees				
	- NZTA Managed Costs				
	- Construction Monitoring Fees				
	Sub Total Base Implementation Fees		355,307	71,061	
	Physical Works				
1	Environmental Compliance		50,000	5,000	
2	Earthworks		28,256	2,826	
3	Ground Improvements		0	0	
4	Drainage		667,241	66,724	
5	Pavement and Surfacing		579,306	57,931	
6	Bridges		0	0	
7	Retaining Walls		62,550	6,255	
8	Traffic Services		226,550	22,655	
9	Service Relocations		1,290,000	258,000	
10	Landscaping		274,170	27,417	
11	Traffic Management and Temporary Works		375,000	37,500	
12	Preliminary and General		284,246	28,425	
13	Extraordinary Construction Costs		532,961	53,296	
	Sub Total Base Physical works		4,370,279	566,028	
D	**Total for Implementation Phase**		4,725,587	637,089	1,512,500
E	**Project Base Estimate**	(A+C+D)	6,186,236		
F	**Contingency** (Assessed/Analysed)	(A+C+D)		883,029	
G	**Project Expected Estimate**	(E+F)		7,069,265	
	Nett Project Property Cost Expected Estimate				
	Project Development Phase Expected Estimate			Nil	
	Pre-implementation Phase Expected Estimate				
	Implementation Phase Expected Estimate				
H	**Funding Risk Contingency** (Assessed/Analysed)	(A+C+D)			1,658,565
I	**95th percentile Project Estimate**	(G+H)			8,727,830
	Nett Project Property Cost 95th percentile Estimate				
	Project Development Phase 95th percentile Estimate				Nil
	Pre-implementation Phase 95th percentile Estimate				
	Implementation Phase 95th percentile Estimate				

Date of Estimate	29/09/17	Cost Index (Qtr/Year)	
Estimate prepared by		Signed	N.Todd [signature]
Estimate internal peer review by		Signed	[signature]
Estimate external peer review by		Signed	
Estimate accepted by NZTA		Signed	

Note: (1) These estimates are exclusive of escalation and GST.
(2) Project Development Phase Estimates are set to Nil as these are now sun

Project Estimate - Form C

PN4234 SH10 Waipapa Road Intersection Improvements

DBE

Detailed Business Case Estimate
Head to Head RTB

Item	Description		Base Estimate	Contingency	Funding Risk Contingency
A	**Nett Project Property Cost**		426,750	85,350	42,675
	Project Development Phase				
	- Consultancy Fees		Nil	Nil	Nil
	- NZTA Managed Costs		Nil	Nil	Nil
B	**Total Project Development**		**Nil**	**Nil**	**Nil**
	Pre-implementation Phase				
	- Consultancy Fees				
	- NZTA Managed Costs				
C	**Total Pre-implementation**		442,450	44,245	44,245
	Implementation Phase				
	Implementation Fees				
	- Consultancy Fees				
	- NZTA Managed Costs				
	- Construction Monitoring Fees				
	Sub Total Base Implementation Fees		340,346	68,069	
	Physical Works				
1	Environmental Compliance		50,000	5,000	
2	Earthworks		12,872	1,287	
3	Ground Improvements		0	0	
4	Drainage		651,124	65,112	
5	Pavement and Surfacing		589,172	58,917	
6	Bridges		0	0	
7	Retaining Walls		62,550	6,255	
8	Traffic Services		223,000	22,300	
9	Service Relocations		1,290,000	258,000	
10	Landscaping		149,742	14,974	
11	Traffic Management and Temporary Works		375,000	37,500	
12	Preliminary and General		272,277	27,228	
13	Extraordinary Construction Costs		510,519	51,052	
	Sub Total Base Physical works		4,186,255	547,625	
D	**Total for Implementation Phase**		**4,526,601**	**615,695**	**1,277,500**
E	**Project Base Estimate**	(A+C+D)	**5,395,801**		
F	**Contingency** (Assessed/Analysed)		(A+C+D)	745,290	
G	**Project Expected Estimate**		(E+F)	**6,141,090**	
	Nett Project Property Cost Expected Estimate				
	Project Development Phase Expected Estimate			Nil	
	Pre-implementation Phase Expected Estimate				
	Implementation Phase Expected Estimate				
H	**Funding Risk Contingency** (Assessed/Analysed)			(A+C+D)	1,364,420
I	**95th percentile Project Estimate**			(G+H)	**7,505,510**
	Nett Project Property Cost 95th percentile Estimate				
	Project Development Phase 95th percentile Estimate				Nil
	Pre-implementation Phase 95th percentile Estimate				
	Implementation Phase 95th percentile Estimate				

Date of Estimate	29/09/17	**Cost Index (Qtr/Year)**	
Estimate prepared by		**Signed**	N Todd Jones
Estimate internal peer review by		**Signed**	[illegible]
Estimate external peer review by		**Signed**	
Estimate accepted by NZTA		**Signed**	

Note: (1) These estimates are exclusive of escalation and GST.
(2) Project Development Phase Estimates are set to Nil as these are now sun

Project Estimate - Form C

DBE

PN4234 SH10 Waipapa Road Intersection Improvements

Detailed Business Case Estimate
Traffic Signals

Item	Description		Base Estimate	Contingency	Funding Risk Contingency
A	**Nett Project Property Cost**		410,750	82,150	41,075
	Project Development Phase				
		- Consultancy Fees	Nil	Nil	Nil
		- NZTA Managed Costs	Nil	Nil	Nil
B	**Total Project Development**		Nil	Nil	Nil
	Pre-implementation Phase				
		- Consultancy Fees			
		- NZTA Managed Costs			
C	**Total Pre-implementation**		480,722	48,072	48,072
	Implementation Phase				
	Implementation Fees				
	- Consultancy Fees				
	- NZTA Managed Costs				
	- Construction Monitoring Fees				
	Sub Total Base Implementation Fees		369,786	73,957	
	Physical Works				
1	Environmental Compliance		50,000	5,000	
2	Earthworks		12,872	1,287	
3	Ground Improvements		0	0	
4	Drainage		659,124	65,912	
5	Pavement and Surfacing		603,062	60,306	
6	Bridges		0	0	
7	Retaining Walls		56,250	5,625	
8	Traffic Services		515,500	51,550	
9	Service Relocations		1,290,000	258,000	
10	Landscaping		136,057	13,606	
11	Traffic Management and Temporary Works		375,000	37,500	
12	Preliminary and General		295,829	29,583	
13	Extraordinary Construction Costs		554,680	55,468	
	Sub Total Base Physical works		4,548,374	583,837	
D	**Total for Implementation Phase**		4,918,160	657,795	1,265,000
E	**Project Base Estimate**	(A+C+D)	5,809,633		
F	**Contingency** (Assessed/Analysed)		(A+C+D)	788,017	
G	**Project Expected Estimate**		(E+F)	6,597,650	
	Nett Project Property Cost Expected Estimate				
	Project Development Phase Expected Estimate			Nil	
	Pre-implementation Phase Expected Estimate				
	Implementation Phase Expected Estimate				
H	**Funding Risk Contingency** (Assessed/Analysed)			(A+C+D)	1,354,147
I	**95th percentile Project Estimate**			(G+H)	7,951,797
	Nett Project Property Cost 95th percentile Estimate				
	Project Development Phase 95th percentile Estimate				Nil
	Pre-implementation Phase 95th percentile Estimate				
	Implementation Phase 95th percentile Estimate				

Date of Estimate 29/9/17	**Cost Index (Qtr/Year)**
Estimate prepared by	**Signed** NTodd Jones
Estimate internal peer review by	**Signed**
Estimate external peer review by	**Signed**
Estimate accepted by NZTA	**Signed**

Note: (1) These estimates are exclusive of escalation and GST.

(2) Project Development Phase Estimates are set to Nil as these are now sun

Project Estimate - Form C

PN4234 SH10 Waipapa Road Intersection Improvements

DBE

Detailed Business Case Estimate
Close Waipapa Loop Road

Item	Description	Base Estimate	Contingency	Funding Risk Contingency
A	**Nett Project Property Cost**	93,750	18,750	9,375
	Project Development Phase			
	- Consultancy Fees	Nil	Nil	Nil
	- NZTA Managed Costs	Nil	Nil	Nil
B	**Total Project Development**	Nil	Nil	Nil
	Pre-implementation Phase			
	- Consultancy Fees			
	- NZTA Managed Costs			
C	**Total Pre-implementation**	435,287	43,529	43,529
	Implementation Phase			
	Implementation Fees			
	- Consultancy Fees			
	- NZTA Managed Costs			
	- Construction Monitoring Fees			
	Sub Total Base Implementation Fees	334,836	66,967	
	Physical Works			
1	Environmental Compliance	50,000	5,000	
2	Earthworks	12,872	1,287	
3	Ground Improvements	0	0	
4	Drainage	643,272	64,327	
5	Pavement and Surfacing	534,476	53,448	
6	Bridges	0	0	
7	Retaining Walls	62,550	6,255	
8	Traffic Services	220,500	22,050	
9	Service Relocations	1,290,000	258,000	
10	Landscaping	159,690	15,969	
11	Traffic Management and Temporary Works	375,000	37,500	
12	Preliminary and General	267,869	26,787	
13	Extraordinary Construction Costs	502,254	50,225	
	Sub Total Base Physical works	4,118,483	540,848	
D	**Total for Implementation Phase**	4,453,319	607,816	922,500
E	**Project Base Estimate** (A+C+D)	4,982,356		
F	**Contingency** (Assessed/Analysed)	(A+C+D)	670,094	
G	**Project Expected Estimate**	(E+F)	5,652,450	
	Nett Project Property Cost Expected Estimate			
	Project Development Phase Expected Estimate		Nil	
	Pre-implementation Phase Expected Estimate			
	Implementation Phase Expected Estimate			
H	**Funding Risk Contingency** (Assessed/Analysed)		(A+C+D)	975,404
I	**95th percentile Project Estimate**		(G+H)	6,627,854
	Nett Project Property Cost 95th percentile Estimate			
	Project Development Phase 95th percentile Estimate			Nil
	Pre-implementation Phase 95th percentile Estimate			
	Implementation Phase 95th percentile Estimate			

Date of Estimate	29/09/17	**Cost Index (Qtr/Year)**	
Estimate prepared by		**Signed**	NTodd Jones
Estimate internal peer review by		**Signed**	[signature]
Estimate external peer review by		**Signed**	
Estimate accepted by NZTA		**Signed**	

Note: (1) These estimates are exclusive of escalation and GST.
(2) Project Development Phase Estimates are set to Nil as these are now sun

Project Estimate - Form C

DBE

PN4234 SH10 Waipapa Road Intersection Improvements

Detailed Business Case Estimate
DO MINIMUM: Klinac Lane Extension

Item	Description	Base Estimate	Contingency	Funding Risk Contingency
A	**Nett Project Property Cost**	0	0	0
	Project Development Phase			
	- Consultancy Fees	Nil	Nil	Nil
	- NZTA Managed Costs	Nil	Nil	Nil
B	**Total Project Development**	Nil	Nil	Nil
	Pre-implementation Phase			
	- Consultancy Fees			
	- NZTA Managed Costs			
C	**Total Pre-implementation**	39,775	3,977	3,977
	Implementation Phase			
	Implementation Fees			
	- Consultancy Fees			
	- NZTA Managed Costs			
	- Construction Monitoring Fees			
	Sub Total Base Implementation Fees	30,596	6,119	
	Physical Works			
1	Environmental Compliance	0	0	
2	Earthworks	0	0	
3	Ground Improvements	0	0	
4	Drainage	0	0	
5	Pavement and Surfacing	0	0	
6	Bridges	0	0	
7	Retaining Walls	0	0	
8	Traffic Services	0	0	
9	Service Relocations	0	0	
10	Landscaping	0	0	
11	Traffic Management and Temporary Works	0	0	
12	Preliminary and General	0	0	
13	Extraordinary Construction Costs	0	0	
	Sub Total Base Physical works	376,329	37,633	
D	**Total for Implementation Phase**	406,925	43,752	387,500
E	**Project Base Estimate** (A+C+D)	446,700		
F	**Contingency** (Assessed/Analysed) (A+C+D)		47,730	
G	**Project Expected Estimate** (E+F)		494,429	
	Nett Project Property Cost Expected Estimate			
	Project Development Phase Expected Estimate		Nil	
	Pre-implementation Phase Expected Estimate			
	Implementation Phase Expected Estimate			
H	**Funding Risk Contingency** (Assessed/Analysed) (A+C+D)			391,477
I	**95th percentile Project Estimate** (G+H)			885,907
	Nett Project Property Cost 95th percentile Estimate			
	Project Development Phase 95th percentile Estimate			Nil
	Pre-implementation Phase 95th percentile Estimate			
	Implementation Phase 95th percentile Estimate			

Date of Estimate	29/09/17	**Cost Index (Qtr/Year)**	
Estimate prepared by		**Signed**	N Todd Jones
Estimate internal peer review by		**Signed**	[signature]
Estimate external peer review by		**Signed**	
Estimate accepted by NZTA		**Signed**	

Note: (1) These estimates are exclusive of escalation and GST.
(2) Project Development Phase Estimates are set to Nil as these are now sun

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Right Turn Bay		
Elemental Breakdown for Physical Works				
Item	Description	Unit	Sub-Element Totals	Element Totals
C	**Pre-implementation Phase Fees**			$ 423,431.20
D1	**Implementation Phase fees**			$ 325,716.31
D2	**Physical Works**			$ 4,006,310.61
1.00	**Environmental Compliance**			$ 50,000.00
2.00	**Earthworks**			$ 22,918.35
2.01	Site clearance - greenfield such as small trees, shrubs, hedging etc.		$ -	
2.02	Demolition - building demolition, structures, fences, retaining walls, utility services, stormwater pipe, manholes, cesspits, surfacing, kerbs, lights, signs, temporary works etc.		$ -	
2.03	Temporary fencing		$ -	
2.04	Topsoil stripping,		$ -	
2.05	Cut to fill,		$ -	
2.06	Cut to waste (Option)	m3	$ 10,046.40	
2.07	Cut to waste (Waipapa Corridor)	m3	$ 12,871.95	
2.08	Borrow to fill		$ -	
2.09	Imported fill		$ -	
2.10	Undercutting soft spots		$ -	
2.11	Excavation in rock (state types)		$ -	
2.12	Conditioning of cut and/or fill materials		$ -	
2.13	Preloading, additional preload materials, settlement monitoring and removal of preload materials		$ -	
2.14	Respreading topsoil		$ -	
2.15	Imported topsoil		$ -	
2.16	Reclamation works		$ -	
2.16	Foreshore works		$ -	
2.17	Temporary earthworks		$ -	
2.18	Temporary haul roads		$ -	
2.19	Construct, maintain & remove temporary sediment control measures, temporary sediment control ponds, including temporary hydroseeding, rock check dams, silt fencing		$ -	
2.20	Dust control		$ -	
2.21	Archaeological treatment/mitigation works		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Right Turn Bay		
Elemental Breakdown for Physical Works				
Item	Description	Unit	Sub-Element Totals	Element Totals
3.00	**Ground Improvements**			**$ -**
4.00	**Drainage**			**$ 634,384.05**
4.01	Stormwater drainage, temporary stream diversion and culverts including headwalls, chambers and rip-rap		$ -	
4.02	Subsoil and pavement drains		$ -	
4.03	**Kerb blocks (incl. subsoil) (Waipapa Corridor)**	m	$ 264,866.51	
4.04	**Kerb without Channel (Incl.subsoil) (Waipapa Corridor)**	m	$ 1,280.00	
4.05	**Kerb blocks (incl. subsoil) (Option)**	m	$ 139,894.29	
4.06	**Kerb without Channel (Incl.subsoil) (Option)**	m	$ 21,600.00	
4.07	Surface water channel		$ -	
4.08	Erosion control		$ -	
4.09	Flumes		$ -	
4.10	Rain gardens		$ -	
4.11	Permanent ponds		$ -	
4.12	Wetlands		$ -	
4.13	Grassed swales		$ -	
4.14	Treatment devices		$ -	
4.15	Manhole 1200mm	ea	$ 6,474.55	
4.16	RCRRJ Pipe - 300mm dia, Class 4 (Waipapa Corridor)	m	$ -	
4.17	RCRRJ Pipe - 375mm dia, Class 4	m	$ 4,791.60	
4.18	RCRRJ Pipe - 450mm dia, Class 4	m	$ 60,860.50	
4.19	RCRRJ Pipe - 600mm dia, Class 4	m	$ 110,716.67	
4.20	RCRRJ Pipe - 750mm dia, Class 4	m	$ -	
4.21	RCRRJ Pipe - 900mm dia, Class 4	m	$ -	
4.22	RCRRJ Pipe - 300mm dia, Class 4 (Option)	m	$ 15,806.75	
4.23	RCRRJ Pipe - 375mm dia, Class 4		$ -	
4.24	RCRRJ Pipe - 450mm dia, Class 4		$ -	
4.25	RCRRJ Pipe - 600mm dia, Class 4		$ -	
4.26	RCRRJ Pipe - 750mm dia, Class 4		$ -	
4.27	RCRRJ Pipe - 900mm dia, Class 4		$ -	
4.28	Single Sump Catchpit	ea.	$ 8,093.19	
4.29	Manhole 1200mm		$ -	
5.00	**Pavement and Surfacing**			**$ 462,498.70**
5.01	Subgrade stabilisation/improvement (aggregate, lime or cement)		$ -	
5.02	Subgrade preparation and testing		$ -	
5.03	Sub-basecourse (Waipapa Corridor)	m3	$ 48,934.87	
5.04	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m2	$ 8,159.00	
5.05	Base course	m3	$ 53,635.03	
5.06	Surfacing (chip seal)	m2	$ 12,228.25	
5.07	Surfacing (Stone Mastic Asphalt)		$ -	
5.08	Surfacing (second coat)	m2	$ 75,900.00	
5.09	Sub-basecourse (Option)	m3	$ 38,193.07	
5.10	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m2	$ 6,368.00	
5.11	Base course	m3	$ 41,861.49	
5.12	Surfacing (chip seal)	m2	$ 9,544.00	
5.13	Surfacing (Stone Mastic Asphalt)	m2	$ 121,200.00	
5.14	Surfacing (second coat)	m2	$ 46,475.00	
5.15	Upgrade existing carriageway(s).		$ -	
5.16	Sawcutting		$ -	
5.17	Joints		$ -	
5.18	Scarifying		$ -	
5.19	Ancillary roadworks		$ -	
6.00	**Bridges**			**$ -**

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Right Turn Bay		
Elemental Breakdown for Physical Works				
Item	Description	Unit	Sub-Element Totals	Element Totals
7.00	**Retaining Walls and Access Works**			**$ 62,550.00**
7.01	Timber-piled walling		$ -	
7.02	Concrete-piled walling including ground anchors		$ -	
7.03	Gabion walling		$ -	
7.04	Crib walling		$ -	
7.05	Mechanically stabilised earth (MSE) walling		$ -	
7.06	Backfill behind retaining walls where the estimator is to consider the provisions included in the earthworks element and allow extra for special materials and/or placement requirements behind retaining walls).		$ -	
7.07	Stone strong walling		$ -	
7.08	Diaphragm walling		$ -	
7.09	Precast concrete facing panels		$ -	
7.10	Drainage in association with retaining walls		$ -	
7.11	Temporary works associated with retaining walls.		$ -	
7.12	Residential Vehicle crossing (Waipapa Corridor)	Ea	$ 6,000.00	
7.13	Commercial Vehicle Crossing (Waipapa Corridor)	Ea	$ 18,900.00	
7.14	Residential Vehicle crossing (Option)	Ea	$ 3,000.00	
7.15	Commercial Vehicle Crossing (Option)	Ea	$ 34,650.00	
8.00	**Traffic Services**			**$ 216,500.00**
8.01	Barrier (wire/concrete median barrier and verge barrier)		$ -	
8.02	Pavement markings, pavement markers (Waipapa Corridor)	LS	$ 5,000.00	
8.03	Pavement markings, pavement markers (Option)	LS	$ 8,000.00	
8.04	Road signs, gantries (Waipapa Corridor)	LS	$ 500.00	
8.05	Road signs, gantries (Option)	LS	$ 3,000.00	
8.06	Traffic signals		$ -	
8.07	Marker posts		$ -	
8.08	Lighting (Waipapa Corridor)	Ea	$ 150,000.00	
8.09	Lighting (Option)	Ea	$ 50,000.00	
8.10	Emergency cross-overs and phones		$ -	
8.11	Variable Message Signs		$ -	
8.12	Intelligent Traffic Signals/ATMS.		$ -	
8.13	Bus/cycleway green paint marking		$ -	
8.14	Guardrails		$ -	
8.15	Leading and trailing end terminals		$ -	
8.16	Crash cushions		$ -	
9.00	**Service Relocations**	Estimated		**$ 1,290,000.00**
9.01	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **TOP ENERGY**		$ 550,000.00	
9.02	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **CHORUS**		$ 500,000.00	
9.03	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **FNDC**		$ 115,000.00	
9.04	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **KERIKERI IRRIGATION**		$ 10,000.00	
9.05	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **EDWARD LOCK**		$ 50,000.00	
9.06	Civil works associated with utility services such as trenching.		$ 50,000.00	
9.07	Temporary works associated with utility services		$ 15,000.00	
10.00	**Landscaping & Urban design**			**$ 143,312.00**
10.01	Landscaping (aesthetic and environmental)		$ -	
10.02	Grassing (Waipapa Corridor)	m2	$ 3,712.00	
10.03	Grassing (Option)	m2	$ 3,200.00	
10.04	Architecture		$ -	
10.05	Fencing		$ -	
10.06	Streetscaping		$ -	
10.07	Land accommodation costs (also refer to project property cost funding)		$ -	
10.08	Footpaths (1.5m) and cycleway	m2	$ 63,000.00	
10.09	Footpaths (2.5m) and cycleway	m2	$ 43,500.00	
10.10	Building relocations		$ -	
10.11	Traffic islands - splitter	m2	$ 24,000.00	
10.12	Traffic islands - pedestrian	m2	$ 3,400.00	
10.13	Pram crossings with kerb and tactile pavers	Ea	$ 2,500.00	
10.14	Urban design features to bridges, structures, barriers, retaining walls etc.		$ -	
10.15	Mountable Concrete Apron		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Right Turn Bay		
Elemental Breakdown for Physical Works				
Item	Description	Unit	Sub-Element Totals	Element Totals
11.00	**Traffic Management and Temporary Works**			$ 375,000.00
11.01	Temporary traffic diversions		$ -	
11.02	Traffic management physical works costs		$ -	
11.03	Temporary roads		$ -	
12.00	**Preliminary and General**			$ 260,573.05
12.01	Establishment, temporary accommodation, clean up, disestablishment and other site operating costs		$ 97,714.89	
12.02	Contractor's supervision, on site staffing, prescribed specialists and other time related costs.		$ -	
12.03	Insurances, bonds, warrantees/guarantees, as-built requirement plans and other non time-related costs.		$ -	
12.04	Temporary works design and traffic management planning		$ -	
12.05	Project plans, quality assurance, traffic management plans, environmental management plans, programming and reporting, consent fees, stakeholder management, health and safety, security management, contractor's escrow tender documents		$ -	
12.06	Network maintenance		$ -	
12.07	QA systems		$ -	
12.08	Testing		$ -	
13	**Extraordinary Construction Costs**			$ 488,574.46

Base Estimate	$ 4,755,458.12

Date of Estimate	29/09/2017
Estimate prepared by	NJodd-Jones
Estimate internal peer review by	[signature]
Estimate external peer review by	
Estimate accepted by NZTA project manager	

Note: These estimates are exclusive of Contingency, Funding Risk Contingency, Escalation and GST.

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Roundabout		
Elemental Breakdown for Physical Works				
Item	Description	Unit	Sub-Element Totals	Element Totals
C	**Pre-implementation Phase Fees**			**$ 461,899.44**
D1	**Implementation Phase fees**			**$ 355,307.26**
D2	**Physical Works**			**$ 4,370,279.34**
1.00	**Environmental Compliance**			**$ 50,000.00**
2.00	**Earthworks**			**$ 28,255.50**
2.01	Site clearance - greenfield such as small trees, shrubs, hedging etc.		$ -	
2.02	Demolition - building demolition, structures, fences, retaining walls, utility services, stormwater pipe, manholes, cesspits, surfacing, kerbs, lights, signs, temporary works etc.		$ -	
2.03	Temporary fencing		$ -	
2.04	Topsoil stripping,		$ -	
2.05	Cut to fill,		$ -	
2.06	Cut to waste (Option)	m3	$ 15,383.55	
2.07	Cut to waste (Waipapa Corridor)	m3	$ 12,871.95	
2.08	Borrow to fill		$ -	
2.09	Imported fill		$ -	
2.10	Undercutting soft spots		$ -	
2.11	Excavation in rock (state types)		$ -	
2.12	Conditioning of cut and/or fill materials		$ -	
2.13	Preloading, additional preload materials, settlement monitoring and removal of preload materials		$ -	
2.14	Respreading topsoil		$ -	
2.15	Imported topsoil		$ -	
2.16	Reclamation works		$ -	
2.16	Foreshore works		$ -	
2.17	Temporary earthworks		$ -	
2.18	Temporary haul roads		$ -	
2.19	Construct, maintain & remove temporary sediment control measures, temporary sediment control ponds, including temporary hydroseeding, rock check dams, silt fencing		$ -	
2.20	Dust control		$ -	
2.21	Archaeological treatment/mitigation works		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Roundabout		
Elemental Breakdown for Physical Works				
Item	Description	Unit	Sub-Element Totals	Element Totals
3.00	**Ground Improvements**			**$ -**
4.00	**Drainage**			**$ 667,241.31**
4.01	Stormwater drainage, temporary stream diversion and culverts including headwalls, chambers and rip-rap		$ -	
4.02	Subsoil and pavement drains		$ -	
4.03	**Kerb blocks (incl. subsoil) (Waipapa Corridor)**	m	$ 264,866.51	
4.04	**Kerb without Channel (Incl.subsoil) (Waipapa Corridor)**	m	$ 1,280.00	
4.05	**Kerb blocks (incl. subsoil) (Option)**	m	$ 135,231.14	
4.06	**Kerb without Channel (Incl.subsoil) (Option)**	m	$ 40,000.00	
4.07	Surface water channel		$ -	
4.08	Erosion control		$ -	
4.09	Flumes		$ -	
4.10	Rain gardens		$ -	
4.11	Permanent ponds		$ -	
4.12	Wetlands		$ -	
4.13	Grassed swales		$ -	
4.14	Treatment devices		$ -	
4.15	Manhole 1200mm	ea	$ 6,474.55	
4.16	RCRRJ Pipe - 300mm dia, Class 4 (Waipapa Corridor)	m	$ -	
4.17	RCRRJ Pipe - 375mm dia, Class 4	m	$ 4,791.60	
4.18	RCRRJ Pipe - 450mm dia, Class 4	m	$ 60,860.50	
4.19	RCRRJ Pipe - 600mm dia, Class 4	m	$ 110,716.67	
4.20	RCRRJ Pipe - 750mm dia, Class 4	m	$ -	
4.21	RCRRJ Pipe - 900mm dia, Class 4	m	$ -	
4.22	RCRRJ Pipe - 300mm dia, Class 4 (Option)	m	$ 28,452.60	
4.23	RCRRJ Pipe - 375mm dia, Class 4		$ -	
4.24	RCRRJ Pipe - 450mm dia, Class 4		$ -	
4.25	RCRRJ Pipe - 600mm dia, Class 4		$ -	
4.26	RCRRJ Pipe - 750mm dia, Class 4		$ -	
4.27	RCRRJ Pipe - 900mm dia, Class 4		$ -	
4.28	Single Sump Catchpit		$ 14,567.73	
4.29	Manhole 1200mm		$ -	
5.00	**Pavement and Surfacing**			**$ 579,305.93**
5.01	Subgrade stabilisation/improvement (aggregate, lime or cement)		$ -	
5.02	Subgrade preparation and testing		$ -	
5.03	Sub-basecourse (Waipapa Corridor)	m3	$ 48,934.87	
5.04	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m2	$ 8,159.00	
5.05	Base course	m3	$ 53,635.03	
5.06	Surfacing (chip seal)	m2	$ 12,228.25	
5.07	Surfacing (Stone Mastic Asphalt)		$ -	
5.08	Surfacing (second coat)	m2	$ 75,900.00	
5.09	Sub-basecourse (Option)	m3	$ 58,483.13	
5.10	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m2	$ 9,751.00	
5.11	Base course	m3	$ 64,100.40	
5.12	Surfacing (chip seal)	m2	$ 14,614.25	
5.13	Surfacing (Stone Mastic Asphalt)	m2	$ 195,000.00	
5.14	Surfacing (second coat)	m2	$ 38,500.00	
5.15	Upgrade existing carriageway(s).		$ -	
5.16	Sawcutting		$ -	
5.17	Joints		$ -	
5.18	Scarifying		$ -	
5.19	Ancillary roadworks		$ -	
6.00	**Bridges**			**$ -**

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Roundabout		
Elemental Breakdown for Physical Works				
Item	Description	Unit	Sub-Element Totals	Element Totals
7.00	**Retaining Walls and Access Works**			**$ 62,550.00**
7.01	Timber-piled walling		$ -	
7.02	Concrete-piled walling including ground anchors		$ -	
7.03	Gabion walling		$ -	
7.04	Crib walling		$ -	
7.05	Mechanically stabilised earth (MSE) walling		$ -	
7.06	Backfill behind retaining walls where the estimator is to consider the provisions included in the earthworks element and allow extra for special materials and/or placement requirements behind retaining walls).		$ -	
7.07	Stone strong walling		$ -	
7.08	Diaphragm walling		$ -	
7.09	Precast concrete facing panels		$ -	
7.10	Drainage in association with retaining walls		$ -	
7.11	Temporary works associated with retaining walls.		$ -	
7.12	Residential Vehicle crossing (Waipapa Corridor)	Ea	$ 6,000.00	
7.13	Commercial Vehicle Crossing (Waipapa Corridor)	Ea	$ 18,900.00	
7.14	Residential Vehicle crossing (Option)	Ea	$ 3,000.00	
7.15	Commercial Vehicle Crossing (Option)	Ea	$ 34,650.00	
8.00	**Traffic Services**			**$ 226,550.00**
8.01	Barrier (wire/concrete median barrier and verge barrier)		$ -	
8.02	Pavement markings, pavement markers (Waipapa Corridor)	LS	$ 5,000.00	
8.03	Pavement markings, pavement markers (Option)	LS	$ 15,550.00	
8.04	Road signs, gantries (Waipapa Corridor)	LS	$ 500.00	
8.05	Road signs, gantries (Option)	LS	$ 5,500.00	
8.06	Traffic signals		$ -	
8.07	Marker posts		$ -	
8.08	Lighting (Waipapa Corridor)	Ea	$ 150,000.00	
8.09	Lighting (Option)	Ea	$ 50,000.00	
8.10	Emergency cross-overs and phones		$ -	
8.11	Variable Message Signs		$ -	
8.12	Intelligent Traffic Signals/ATMS.		$ -	
8.13	Bus/cycleway green paint marking		$ -	
8.14	Guardrails		$ -	
8.15	Leading and trailing end terminals		$ -	
8.16	Crash cushions		$ -	
9.00	**Service Relocations**			**$ 1,290,000.00**
9.01	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **TOP ENERGY**		$ 550,000.00	
9.02	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **CHORUS**		$ 500,000.00	
9.03	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **FNDC**		$ 115,000.00	
9.04	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **KERIKERI IRRIGATION**		$ 10,000.00	
9.05	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **EDWARD LOCK**		$ 50,000.00	
9.06	Civil works associated with utility services such as trenching.		$ 50,000.00	
9.07	Temporary works associated with utility services		$ 15,000.00	
10.00	**Landscaping & Urban design**			**$ 274,169.90**
10.01	Landscaping (aesthetic and environmental)	m2	$ 34,000.00	
10.02	Grassing (Waipapa Corridor)	m2	$ 3,712.00	
10.03	Grassing (Option)	m2	$ 4,320.00	
10.04	Architecture		$ -	
10.05	Fencing		$ 2,187.90	
10.06	Streetscaping		$ -	
10.07	Land accommodation costs (also refer to project property cost funding)		$ -	
10.08	Footpaths (1.5m) and cycleway	m2	$ 81,000.00	
10.09	Footpaths (2.5m) and cycleway	m2	$ 39,000.00	
10.10	Building relocations		$ -	
10.11	Traffic islands - splitter	m2	$ 48,000.00	
10.12	Traffic islands - pedestrian	m2	$ 3,400.00	
10.13	Pram crossings with kerb and tactile pavers	Ea	$ 2,500.00	
10.14	Urban design features to bridges, structures, barriers, retaining walls etc.		$ -	
10.15	Mountable Concrete Apron	m2	$ 56,050.00	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Roundabout		
Elemental Breakdown for Physical Works				
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
11.00	Traffic Management and Temporary Works			$ 375,000.00
11.01	Temporary traffic diversions		$ -	
11.02	Traffic management physical works costs		$ -	
11.03	Temporary roads		$ -	
12.00	Preliminary and General			$ 284,245.81
12.01	Establishment, temporary accommodation, clean up, disestablishment and other site operating costs		$ 532,960.90	
12.02	Contractor's supervision, on site staffing, prescribed specialists and other time related costs.		$ -	
12.03	Insurances, bonds, warrantees/guarantees, as-built requirement plans and other non time-related costs.		$ -	
12.04	Temporary works design and traffic management planning		$ -	
12.05	Project plans, quality assurance, traffic management plans, environmental management plans, programming and reporting, consent fees, stakeholder management, health and safety, security management, contractor's escrow tender documents		$ -	
12.06	Network maintenance		$ -	
12.07	QA systems		$ -	
12.08	Testing		$ -	
13	Extraordinary Construction Costs			$ 532,960.90

Base Estimate	**$ 5,187,486.04**

Date of Estimate	29/09/2017
Estimate prepared by	N Todd Jones
Estimate internal peer review by	[signature]
Estimate external peer review by	
Estimate accepted by NZTA project manager	

Note: These estimates are exclusive of Contingency, Funding Risk Contingency, Escalation anc

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Traffic Signals		
Elemental Breakdown for Physical Works				
Item	Description	Unit	Sub-Element Totals	Element Totals
C	**Pre-implementation Phase Fees**			$ 480,722.44
D1	**Implementation Phase fees**			$ 369,786.50
D2	**Physical Works**			$ 4,548,373.92
1.00	**Environmental Compliance**			$ 50,000.00
2.00	**Earthworks**			$ 12,871.95
2.01	Site clearance - greenfield such as small trees, shrubs, hedging etc.		$ -	
2.02	Demolition - building demolition, structures, fences, retaining walls, utility services, stormwater pipe, manholes, cesspits, surfacing, kerbs, lights, signs, temporary works etc.		$ -	
2.03	Temporary fencing		$ -	
2.04	Topsoil stripping,		$ -	
2.05	Cut to fill,		$ -	
2.06	Cut to waste (Option)	m3	$ -	
2.07	Cut to waste (Waipapa Corridor)	m3	$ 12,871.95	
2.08	Borrow to fill		$ -	
2.09	Imported fill		$ -	
2.10	Undercutting soft spots		$ -	
2.11	Excavation in rock (state types)		$ -	
2.12	Conditioning of cut and/or fill materials		$ -	
2.13	Preloading, additional preload materials, settlement monitoring and removal of preload materials		$ -	
2.14	Respreading topsoil		$ -	
2.15	Imported topsoil		$ -	
2.16	Reclamation works		$ -	
2.16	Foreshore works		$ -	
2.17	Temporary earthworks		$ -	
2.18	Temporary haul roads		$ -	
2.19	Construct, maintain & remove temporary sediment control measures, temporary sediment control ponds, including temporary hydroseeding, rock check dams, silt fencing		$ -	
2.20	Dust control		$ -	
2.21	Archaeological treatment/mitigation works		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Traffic Signals		
Elemental Breakdown for Physical Works				
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
3.00	**Ground Improvements**		$ -	**$ -**
4.00	**Drainage**			**$ 659,124.01**
4.01	Stormwater drainage, temporary stream diversion and culverts including headwalls, chambers and rip-rap		$ -	
4.02	Subsoil and pavement drains		$ -	
4.03	**Kerb blocks (incl. subsoil) (Waipapa Corridor)**	m	$ 264,866.51	
4.04	**Kerb without Channel (Incl.subsoil) (Waipapa Corridor)**	m	$ 1,280.00	
4.05	**Kerb blocks (incl. subsoil) (Option)**	m	$ 139,894.29	
4.06	**Kerb without Channel (Incl.subsoil) (Option)**	m	$ 32,000.00	
4.07	Surface water channel		$ -	
4.08	Erosion control		$ -	
4.09	Flumes		$ -	
4.10	Rain gardens		$ -	
4.11	Permanent ponds		$ -	
4.12	Wetlands		$ -	
4.13	Grassed swales		$ -	
4.14	Treatment devices		$ -	
4.15	Manhole 1200mm	ea	$ 6,474.55	
4.16	RCRRJ Pipe - 300mm dia, Class 4 (Waipapa Corridor)	m	$ -	
4.17	RCRRJ Pipe - 375mm dia, Class 4	m	$ 4,791.60	
4.18	RCRRJ Pipe - 450mm dia, Class 4	m	$ 60,860.50	
4.19	RCRRJ Pipe - 600mm dia, Class 4	m	$ 110,716.67	
4.20	RCRRJ Pipe - 750mm dia, Class 4	m	$ -	
4.21	RCRRJ Pipe - 900mm dia, Class 4	m	$ -	
4.22	RCRRJ Pipe - 300mm dia, Class 4 (Option)	m	$ 25,290.80	
4.23	RCRRJ Pipe - 375mm dia, Class 4		$ -	
4.24	RCRRJ Pipe - 450mm dia, Class 4		$ -	
4.25	RCRRJ Pipe - 600mm dia, Class 4		$ -	
4.26	RCRRJ Pipe - 750mm dia, Class 4		$ -	
4.27	RCRRJ Pipe - 900mm dia, Class 4		$ -	
4.28	Single Sump Catchpit	ea.	$ 12,949.10	
4.29	Manhole 1200mm		$ -	
5.00	**Pavement and Surfacing**			**$ 603,062.11**
5.01	Subgrade stabilisation/improvement (aggregate, lime or cement)		$ -	
5.02	Subgrade preparation and testing		$ -	
5.03	Sub-basecourse (Waipapa Corridor)	m3	$ 48,934.87	
5.04	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m2	$ 8,159.00	
5.05	Base course	m3	$ 53,635.03	
5.06	Surfacing (chip seal)	m2	$ 12,228.25	
5.07	Surfacing (Stone Mastic Asphalt)		$ -	
5.08	Surfacing (second coat)	m2	$ 75,900.00	
5.09	Sub-basecourse (Option)	m3	$ 79,966.73	
5.10	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m3	$ 13,333.00	
5.11	Base course	m2	$ 87,647.49	
5.12	Surfacing (chip seal)	m2	$ 19,982.75	
5.13	Surfacing (Stone Mastic Asphalt)	m2	$ 159,000.00	
5.14	Surfacing (second coat)	m2	$ 44,275.00	
5.15	Upgrade existing carriageway(s).		$ -	
5.16	Sawcutting		$ -	
5.17	Joints		$ -	
5.18	Scarifying		$ -	
5.19	Ancillary roadworks		$ -	
6.00	**Bridges**			**$ -**

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Traffic Signals		
Elemental Breakdown for Physical Works				
Item	Description	Unit	Sub-Element Totals	Element Totals
7.00	**Retaining Walls and Access Works**			**$ 56,250.00**
7.01	Timber-piled walling		$ -	
7.02	Concrete-piled walling including ground anchors		$ -	
7.03	Gabion walling		$ -	
7.04	Crib walling		$ -	
7.05	Mechanically stabilised earth (MSE) walling		$ -	
7.06	Backfill behind retaining walls where the estimator is to consider the provisions included in the earthworks element and allow extra for special materials and/or placement requirements behind retaining walls).		$ -	
7.07	Stone strong walling		$ -	
7.08	Diaphragm walling		$ -	
7.09	Precast concrete facing panels		$ -	
7.10	Drainage in association with retaining walls		$ -	
7.11	Temporary works associated with retaining walls.		$ -	
7.12	Residential Vehicle crossing (Waipapa Corridor)	Ea	$ 6,000.00	
7.13	Commercial Vehicle Crossing (Waipapa Corridor)	Ea	$ 18,900.00	
7.14	Residential Vehicle crossing (Option)	Ea	$ 3,000.00	
7.15	Commercial Vehicle Crossing (Option)	Ea	$ 28,350.00	
8.00	**Traffic Services**			**$ 515,500.00**
8.01	Barrier (wire/concrete median barrier and verge barrier)		$ -	
8.02	Pavement markings, pavement markers (Waipapa Corridor)	LS	$ 5,000.00	
8.03	Pavement markings, pavement markers (Option)	LS	$ 12,000.00	
8.04	Road signs, gantries (Waipapa Corridor)	LS	$ 500.00	
8.05	Road signs, gantries (Option)	LS	$ 3,000.00	
8.06	Traffic signals	LS	$ 295,000.00	
8.07	Marker posts		$ -	
8.08	Lighting (Waipapa Corridor)	Ea	$ 150,000.00	
8.09	Lighting (Option)	Ea	$ 50,000.00	
8.10	Emergency cross-overs and phones		$ -	
8.11	Variable Message Signs		$ -	
8.12	Intelligent Traffic Signals/ATMS.		$ -	
8.13	Bus/cycleway green paint marking		$ -	
8.14	Guardrails		$ -	
8.15	Leading and trailing end terminals		$ -	
8.16	Crash cushions		$ -	
9.00	**Service Relocations**			**$ 1,290,000.00**
9.01	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **TOP ENERGY**		$ 550,000.00	
9.02	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **CHORUS**		$ 500,000.00	
9.03	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **FNDC**		$ 115,000.00	
9.04	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **KERIKERI IRRIGATION**		$ 10,000.00	
9.05	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **EDWARD LOCK**		$ 50,000.00	
9.06	Civil works associated with utility services such as trenching.		$ 50,000.00	
9.07	Temporary works associated with utility services		$ 15,000.00	
10.00	**Landscaping & Urban design**			**$ 136,056.90**
10.01	Landscaping (aesthetic and environmental)		$ -	
10.02	Grassing (Waipapa Corridor)	m2	$ 3,712.00	
10.03	Grassing (Option)	m2	$ 1,440.00	
10.04	Architecture		$ -	
10.05	Fencing	m2	$ 504.90	
10.06	Streetscaping		$ -	
10.07	Land accommodation costs (also refer to project property cost funding)		$ -	
10.08	Footpaths (1.5m) and cycleway	m2	$ 63,000.00	
10.09	Footpaths (2.5m) and cycleway	m2	$ 43,500.00	
10.10	Building relocations		$ -	
10.11	Traffic islands - splitter	m2	$ 18,000.00	
10.12	Traffic islands - pedestrian	m2	$ 3,400.00	
10.13	Pram crossings with kerb and tactile pavers	Ea	$ 2,500.00	
10.14	Urban design features to bridges, structures, barriers, retaining walls etc.		$ -	
10.15	Mountable Concrete Apron		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Traffic Signals		
Elemental Breakdown for Physical Works				
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
11.00	**Traffic Management and Temporary Works**			$ 375,000.00
11.01	Temporary traffic diversions		$ -	
11.02	Traffic management physical works costs		$ -	
11.03	Temporary roads		$ -	
12.00	**Preliminary and General**			$ 295,829.20
12.01	Establishment, temporary accommodation, clean up, disestablishment and other site operating costs		$ 110,935.95	
12.02	Contractor's supervision, on site staffing, prescribed specialists and other time related costs.		$ -	
12.03	Insurances, bonds, warrantees/guarantees, as-built requirement plans and other non time-related costs.		$ -	
12.04	Temporary works design and traffic management planning		$ -	
12.05	Project plans, quality assurance, traffic management plans, environmental management plans, programming and reporting, consent fees, stakeholder management, health and safety, security management, contractor's escrow tender documents		$ -	
12.06	Network maintenance		$ -	
12.07	QA systems		$ -	
12.08	Testing		$ -	
13	**Extraordinary Construction Costs**			$ 554,679.75

Base Estimate	$ 5,398,882.86

Date of Estimate	29/09/2017
Estimate prepared by	N Todd Jones
Estimate internal peer review by	[signature]
Estimate external peer review by	
Estimate accepted by NZTA project manager	

Note: These estimates are exclusive of Contingency, Funding Risk Contingency, Escalation anc

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Head to Head RTB		
Elemental Breakdown for Physical Works				
Item	Description	Unit	Sub-Element Totals	Element Totals
C	**Pre-implementation Phase Fees**			**$ 442,449.70**
D1	**Implementation Phase fees**			**$ 340,345.93**
D2	**Physical Works**			**$ 4,186,254.92**
1.00	**Environmental Compliance**			**$ 50,000.00**
2.00	**Earthworks**			**$ 12,871.95**
2.01	Site clearance - greenfield such as small trees, shrubs, hedging etc.		$ -	
2.02	Demolition - building demolition, structures, fences, retaining walls, utility services, stormwater pipe, manholes, cesspits, surfacing, kerbs, lights, signs, temporary works etc.		$ -	
2.03	Temporary fencing		$ -	
2.04	Topsoil stripping,		$ -	
2.05	Cut to fill,		$ -	
2.06	Cut to waste (Option)	m3	$ -	
2.07	Cut to waste (Waipapa Corridor)	m3	$ 12,871.95	
2.08	Borrow to fill		$ -	
2.09	Imported fill		$ -	
2.10	Undercutting soft spots		$ -	
2.11	Excavation in rock (state types)		$ -	
2.12	Conditioning of cut and/or fill materials		$ -	
2.13	Preloading, additional preload materials, settlement monitoring and removal of preload materials		$ -	
2.14	Respreading topsoil		$ -	
2.15	Imported topsoil		$ -	
2.16	Reclamation works		$ -	
2.16	Foreshore works		$ -	
2.17	Temporary earthworks		$ -	
2.18	Temporary haul roads		$ -	
2.19	Construct, maintain & remove temporary sediment control measures, temporary sediment control ponds, including temporary hydroseeding, rock check dams, silt fencing		$ -	
2.20	Dust control		$ -	
2.21	Archaeological treatment/mitigation works		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Head to Head RTB		
Elemental Breakdown for Physical Works				
Item	Description	Unit	Sub-Element Totals	Element Totals
3.00	**Ground Improvements**			**$ -**
4.00	**Drainage**			**$ 651,124.01**
4.01	Stormwater drainage, temporary stream diversion and culverts including headwalls, chambers and rip-rap		$ -	
4.02	Subsoil and pavement drains		$ -	
4.03	**Kerb blocks (incl. subsoil) (Waipapa Corridor)**	m	$ 264,866.51	
4.04	**Kerb without Channel (Incl.subsoil) (Waipapa Corridor)**	m	$ 1,280.00	
4.05	**Kerb blocks (incl. subsoil) (Option)**	m	$ 139,894.29	
4.06	**Kerb without Channel (Incl.subsoil) (Option)**	m	$ 24,000.00	
4.07	Surface water channel		$ -	
4.08	Erosion control		$ -	
4.09	Flumes		$ -	
4.10	Rain gardens		$ -	
4.11	Permanent ponds		$ -	
4.12	Wetlands		$ -	
4.13	Grassed swales		$ -	
4.14	Treatment devices		$ -	
4.15	Manhole 1200mm	ea	$ 6,474.55	
4.16	RCRRJ Pipe - 300mm dia, Class 4 (Waipapa Corridor)	m	$ -	
4.17	RCRRJ Pipe - 375mm dia, Class 4	m	$ 4,791.60	
4.18	RCRRJ Pipe - 450mm dia, Class 4	m	$ 60,860.50	
4.19	RCRRJ Pipe - 600mm dia, Class 4	m	$ 110,716.67	
4.20	RCRRJ Pipe - 750mm dia, Class 4	m	$ -	
4.21	RCRRJ Pipe - 900mm dia, Class 4	m	$ -	
4.22	RCRRJ Pipe - 300mm dia, Class 4 (Option)	m	$ 25,290.80	
4.23	RCRRJ Pipe - 375mm dia, Class 4		$ -	
4.24	RCRRJ Pipe - 450mm dia, Class 4		$ -	
4.25	RCRRJ Pipe - 600mm dia, Class 4		$ -	
4.26	RCRRJ Pipe - 750mm dia, Class 4		$ -	
4.27	RCRRJ Pipe - 900mm dia, Class 4		$ -	
4.28	Single Sump Catchpit	ea.	$ 12,949.10	
4.29	Manhole 1200mm		$ -	
5.00	**Pavement and Surfacing**			**$ 589,171.52**
5.01	Subgrade stabilisation/improvement (aggregate, lime or cement)		$ -	
5.02	Subgrade preparation and testing		$ -	
5.03	Sub-basecourse (Waipapa Corridor)	m3	$ 48,934.87	
5.04	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m2	$ 8,159.00	
5.05	Base course	m3	$ 53,635.03	
5.06	Surfacing (chip seal)	m2	$ 12,228.25	
5.07	Surfacing (Stone Mastic Asphalt)		$ -	
5.08	Surfacing (second coat)	m2	$ 75,900.00	
5.09	Sub-basecourse (Option)	m3	$ 69,224.93	
5.10	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m3	$ 11,542.00	
5.11	Base course	m2	$ 75,873.94	
5.12	Surfacing (chip seal)	m2	$ 17,298.50	
5.13	Surfacing (Stone Mastic Asphalt)	m2	$ 177,600.00	
5.14	Surfacing (second coat)	m2	$ 38,775.00	
5.15	Upgrade existing carriageway(s).		$ -	
5.16	Sawcutting		$ -	
5.17	Joints		$ -	
5.18	Scarifying		$ -	
5.19	Ancillary roadworks		$ -	
6.00	**Bridges**			**$ -**

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements			Head to Head RTB	
Elemental Breakdown for Physical Works				
Item	Description	Unit	Sub-Element Totals	Element Totals
7.00	**Retaining Walls and Access Works**			**$ 62,550.00**
7.01	Timber-piled walling		$ -	
7.02	Concrete-piled walling including ground anchors		$ -	
7.03	Gabion walling		$ -	
7.04	Crib walling		$ -	
7.05	Mechanically stabilised earth (MSE) walling		$ -	
7.06	Backfill behind retaining walls where the estimator is to consider the provisions included in the earthworks element and allow extra for special materials and/or placement requirements behind retaining walls).		$ -	
7.07	Stone strong walling		$ -	
7.08	Diaphragm walling		$ -	
7.09	Precast concrete facing panels		$ -	
7.10	Drainage in association with retaining walls		$ -	
7.11	Temporary works associated with retaining walls.		$ -	
7.12	Residential Vehicle crossing (Waipapa Corridor)	Ea	$ 6,000.00	
7.13	Commercial Vehicle Crossing (Waipapa Corridor)	Ea	$ 18,900.00	
7.14	Residential Vehicle crossing (Option)	Ea	$ 3,000.00	
7.15	Commercial Vehicle Crossing (Option)	Ea	$ 34,650.00	
8.00	**Traffic Services**			**$ 223,000.00**
8.01	Barrier (wire/concrete median barrier and verge barrier)		$ -	
8.02	Pavement markings, pavement markers (Waipapa Corridor)	LS	$ 5,000.00	
8.03	Pavement markings, pavement markers (Option)	LS	$ 12,000.00	
8.04	Road signs, gantries (Waipapa Corridor)	LS	$ 500.00	
8.05	Road signs, gantries (Option)	LS	$ 5,500.00	
8.06	Traffic signals		$ -	
8.07	Marker posts		$ -	
8.08	Lighting (Waipapa Corridor)	Ea	$ 150,000.00	
8.09	Lighting (Option)	Ea	$ 50,000.00	
8.10	Emergency cross-overs and phones		$ -	
8.11	Variable Message Signs		$ -	
8.12	Intelligent Traffic Signals/ATMS.		$ -	
8.13	Bus/cycleway green paint marking		$ -	
8.14	Guardrails		$ -	
8.15	Leading and trailing end terminals		$ -	
8.16	Crash cushions		$ -	
9.00	**Service Relocations**			**$ 1,290,000.00**
9.01	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **TOP ENERGY**		$ 550,000.00	
9.02	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **CHORUS**		$ 500,000.00	
9.03	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **FNDC**		$ 115,000.00	
9.04	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **KERIKERI IRRIGATION**		$ 10,000.00	
9.05	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **EDWARD LOCK**		$ 50,000.00	
9.06	Civil works associated with utility services such as trenching.		$ 50,000.00	
9.07	Temporary works associated with utility services		$ 15,000.00	
10.00	**Landscaping & Urban design**			**$ 149,741.80**
10.01	Landscaping (aesthetic and environmental)	m2	$ 12,800.00	
10.02	Grassing (Waipapa Corridor)	m2	$ 3,712.00	
10.03	Grassing (Option)	m2	$ 1,920.00	
10.04	Architecture		$ -	
10.05	Fencing	m	$ 1,009.80	
10.06	Streetscaping		$ -	
10.07	Land accommodation costs (also refer to project property cost funding)		$ -	
10.08	Footpaths (1.5m) and cycleway	m2	$ 68,400.00	
10.09	Footpaths (2.5m) and cycleway	m2	$ 42,000.00	
10.10	Building relocations		$ -	
10.11	Traffic islands - splitter	m2	$ 7,200.00	
10.12	Traffic islands - pedestrian	m2	$ 10,200.00	
10.13	Pram crossings with kerb and tactile pavers	Ea	$ 2,500.00	
10.14	Urban design features to bridges, structures, barriers, retaining walls etc.		$ -	
10.15	Mountable Concrete Apron		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements			Head to Head RTB	
Elemental Breakdown for Physical Works				
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
11.00	**Traffic Management and Temporary Works**			$ 375,000.00
11.01	Temporary traffic diversions		$ -	
11.02	Traffic management physical works costs		$ -	
11.03	Temporary roads		$ -	
12.00	**Preliminary and General**			$ 272,276.74
12.01	Establishment, temporary accommodation, clean up, disestablishment and other site operating costs		$ 102,103.78	
12.02	Contractor's supervision, on site staffing, prescribed specialists and other time related costs.		$ -	
12.03	Insurances, bonds, warrantees/guarantees, as-built requirement plans and other non time-related costs.		$ -	
12.04	Temporary works design and traffic management planning		$ -	
12.05	Project plans, quality assurance, traffic management plans, environmental management plans, programming and reporting, consent fees, stakeholder management, health and safety, security management, contractor's escrow tender documents		$ -	
12.06	Network maintenance		$ -	
12.07	QA systems		$ -	
12.08	Testing		$ -	
13	**Extraordinary Construction Costs**			$ 510,518.89

Base Estimate	$ 4,969,050.55

Date of Estimate	29/09/2017
Estimate prepared by	N Todd Jones
Estimate internal peer review by	
Estimate external peer review by	
Estimate accepted by NZTA project manager	

Note: These estimates are exclusive of Contingency, Funding Risk Contingency, Escalation an

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Close Waipapa Loop Road		
Elemental Breakdown for Physical Works				
Item	Description	Unit	Sub-Element Totals	Element Totals
C	**Pre-implementation Phase Fees**			$ 435,286.82
D1	**Implementation Phase fees**			$ 334,836.02
D2	**Physical Works**			$ 4,118,483.02
1.00	**Environmental Compliance**			$ 50,000.00
2.00	**Earthworks**			$ 12,871.95
2.01	Site clearance - greenfield such as small trees, shrubs, hedging etc.		$ -	
2.02	Demolition - building demolition, structures, fences, retaining walls, utility services, stormwater pipe, manholes, cesspits, surfacing, kerbs, lights, signs, temporary works etc.		$ -	
2.03	Temporary fencing		$ -	
2.04	Topsoil stripping,		$ -	
2.05	Cut to fill,		$ -	
2.06	Cut to waste (Option)	m3	$ -	
2.07	Cut to waste (Waipapa Corridor)	m3	$ 12,871.95	
2.08	Borrow to fill		$ -	
2.09	Imported fill		$ -	
2.10	Undercutting soft spots		$ -	
2.11	Excavation in rock (state types)		$ -	
2.12	Conditioning of cut and/or fill materials		$ -	
2.13	Preloading, additional preload materials, settlement monitoring and removal of preload materials		$ -	
2.14	Respreading topsoil		$ -	
2.15	Imported topsoil		$ -	
2.16	Reclamation works		$ -	
2.16	Foreshore works		$ -	
2.17	Temporary earthworks		$ -	
2.18	Temporary haul roads		$ -	
2.19	Construct, maintain & remove temporary sediment control measures, temporary sediment control ponds, including temporary hydroseeding, rock check dams, silt fencing		$ -	
2.20	Dust control		$ -	
2.21	Archaeological treatment/mitigation works		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements			**Close Waipapa Loop Road**	
Elemental Breakdown for Physical Works				
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
3.00	**Ground Improvements**			**$ -**
4.00	**Drainage**			**$ 643,272.43**
4.01	Stormwater drainage, temporary stream diversion and culverts including headwalls, chambers and rip-rap		$ -	
4.02	Subsoil and pavement drains		$ -	
4.03	**Kerb blocks (incl. subsoil) (Waipapa Corridor)**	m	$ 264,866.51	
4.04	**Kerb without Channel (Incl.subsoil) (Waipapa Corridor)**	m	$ 1,280.00	
4.05	**Kerb blocks (incl. subsoil) (Option)**	m	$ 146,422.69	
4.06	**Kerb without Channel (Incl.subsoil) (Option)**	m	$ 14,400.00	
4.07	Surface water channel		$ -	
4.08	Erosion control		$ -	
4.09	Flumes		$ -	
4.10	Rain gardens		$ -	
4.11	Permanent ponds		$ -	
4.12	Wetlands		$ -	
4.13	Grassed swales		$ -	
4.14	Treatment devices		$ -	
4.15	Manhole 1200mm	ea	$ 6,474.55	
4.16	RCRRJ Pipe - 300mm dia, Class 4 (Waipapa Corridor)	m	$ -	
4.17	RCRRJ Pipe - 375mm dia, Class 4	m	$ 4,791.60	
4.18	RCRRJ Pipe - 450mm dia, Class 4	m	$ 60,860.50	
4.19	RCRRJ Pipe - 600mm dia, Class 4	m	$ 110,716.67	
4.20	RCRRJ Pipe - 750mm dia, Class 4	m	$ -	
4.21	RCRRJ Pipe - 900mm dia, Class 4	m	$ -	
4.22	RCRRJ Pipe - 300mm dia, Class 4 (Option)	m	$ 22,129.45	
4.23	RCRRJ Pipe - 375mm dia, Class 4		$ -	
4.24	RCRRJ Pipe - 450mm dia, Class 4		$ -	
4.25	RCRRJ Pipe - 600mm dia, Class 4		$ -	
4.26	RCRRJ Pipe - 750mm dia, Class 4		$ -	
4.27	RCRRJ Pipe - 900mm dia, Class 4		$ -	
4.28	Single Sump Catchpit	ea.	$ 11,330.46	
4.29	Manhole 1200mm		$ -	
5.00	**Pavement and Surfacing**			**$ 534,475.70**
5.01	Subgrade stabilisation/improvement (aggregate, lime or cement)		$ -	
5.02	Subgrade preparation and testing		$ -	
5.03	Sub-basecourse (Waipapa Corridor)	m3	$ 48,934.87	
5.04	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m2	$ 8,159.00	
5.05	Base course	m3	$ 53,635.03	
5.06	Surfacing (chip seal)	m2	$ 12,228.25	
5.07	Surfacing (Stone Mastic Asphalt)		$ -	
5.08	Surfacing (second coat)	m2	$ 75,900.00	
5.09	Sub-basecourse (Option)	m3	$ 64,450.80	
5.10	Pavement Stabilisation (150mm, 4kg/m2, 1.5% Hydrated Lime)	m3	$ 10,746.00	
5.11	Base course	m2	$ 70,641.26	
5.12	Surfacing (chip seal)	m2	$ 16,105.50	
5.13	Surfacing (Stone Mastic Asphalt)	m2	$ 130,500.00	
5.14	Surfacing (second coat)	m2	$ 43,175.00	
5.15	Upgrade existing carriageway(s).		$ -	
5.16	Sawcutting		$ -	
5.17	Joints		$ -	
5.18	Scarifying		$ -	
5.19	Ancillary roadworks		$ -	
6.00	**Bridges**			**$ -**

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Close Waipapa Loop Road		
Elemental Breakdown for Physical Works				
Item	Description	Unit	Sub-Element Totals	Element Totals
7.00	**Retaining Walls and Access Works**			**$ 62,550.00**
7.01	Timber-piled walling		$ -	
7.02	Concrete-piled walling including ground anchors		$ -	
7.03	Gabion walling		$ -	
7.04	Crib walling		$ -	
7.05	Mechanically stabilised earth (MSE) walling		$ -	
7.06	Backfill behind retaining walls where the estimator is to consider the provisions included in the earthworks element and allow extra for special materials and/or placement requirements behind retaining walls).		$ -	
7.07	Stone strong walling		$ -	
7.08	Diaphragm walling		$ -	
7.09	Precast concrete facing panels		$ -	
7.10	Drainage in association with retaining walls		$ -	
7.11	Temporary works associated with retaining walls.		$ -	
7.12	Residential Vehicle crossing (Waipapa Corridor)	Ea	$ 6,000.00	
7.13	Commercial Vehicle Crossing (Waipapa Corridor)	Ea	$ 18,900.00	
7.14	Residential Vehicle crossing (Option)	Ea	$ 3,000.00	
7.15	Commercial Vehicle Crossing (Option)	Ea	$ 34,650.00	
8.00	**Traffic Services**			**$ 220,500.00**
8.01	Barrier (wire/concrete median barrier and verge barrier)		$ -	
8.02	Pavement markings, pavement markers (Waipapa Corridor)	LS	$ 5,000.00	
8.03	Pavement markings, pavement markers (Option)	LS	$ 12,000.00	
8.04	Road signs, gantries (Waipapa Corridor)	LS	$ 500.00	
8.05	Road signs, gantries (Option)	LS	$ 3,000.00	
8.06	Traffic signals		$ -	
8.07	Marker posts		$ -	
8.08	Lighting (Waipapa Corridor)	Ea	$ 150,000.00	
8.09	Lighting (Option)	Ea	$ 50,000.00	
8.10	Emergency cross-overs and phones		$ -	
8.11	Variable Message Signs		$ -	
8.12	Intelligent Traffic Signals/ATMS.		$ -	
8.13	Bus/cycleway green paint marking		$ -	
8.14	Guardrails		$ -	
8.15	Leading and trailing end terminals		$ -	
8.16	Crash cushions		$ -	
9.00	**Service Relocations**			**$ 1,290,000.00**
9.01	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **TOP ENERGY**		$ 550,000.00	
9.02	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **CHORUS**		$ 500,000.00	
9.03	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **FNDC**		$ 115,000.00	
9.04	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **KERIKERI IRRIGATION**		$ 10,000.00	
9.05	NZTA cost of local authority and utility companies (after cost share) and contractors on costs - **EDWARD LOCK**		$ 50,000.00	
9.06	Civil works associated with utility services such as trenching.		$ 50,000.00	
9.07	Temporary works associated with utility services		$ 15,000.00	
10.00	**Landscaping & Urban design**			**$ 159,690.10**
10.01	Landscaping (aesthetic and environmental)		$ -	
10.02	Grassing (Waipapa Corridor)	m2	$ 3,712.00	
10.03	Grassing (Option)	m2	$ 1,600.00	
10.04	Architecture		$ -	
10.05	Fencing	m	$ 1,178.10	
10.06	Streetscaping		$ -	
10.07	Land accommodation costs (also refer to project property cost funding)		$ -	
10.08	Footpaths (1.5m) and cycleway	m2	$ 63,000.00	
10.09	Footpaths (2.5m) and cycleway	m2	$ 43,500.00	
10.10	Building relocations		$ -	
10.11	Traffic islands - splitter	m2	$ 40,800.00	
10.12	Traffic islands - pedestrian	m2	$ 3,400.00	
10.13	Pram crossings with kerb and tactile pavers	Ea	$ 2,500.00	
10.14	Urban design features to bridges, structures, barriers, retaining walls etc.		$ -	
10.15	Mountable Concrete Apron		$ -	

Elemental Breakdown for Physical Works

PN4234 SH10 Waipapa Road Intersection Improvements		Close Waipapa Loop Road		
Elemental Breakdown for Physical Works				
Item	**Description**	**Unit**	**Sub-Element Totals**	**Element Totals**
11.00	**Traffic Management and Temporary Works**			$ 375,000.00
11.01	Temporary traffic diversions		$ -	
11.02	Traffic management physical works costs		$ -	
11.03	Temporary roads		$ -	
12.00	**Preliminary and General**			$ 267,868.81
12.01	Establishment, temporary accommodation, clean up, disestablishment and other site operating costs		$ 100,450.81	
12.02	Contractor's supervision, on site staffing, prescribed specialists and other time related costs.		$ -	
12.03	Insurances, bonds, warrantees/guarantees, as-built requirement plans and other non time-related costs.		$ -	
12.04	Temporary works design and traffic management planning		$ -	
12.05	Project plans, quality assurance, traffic management plans, environmental management plans, programming and reporting, consent fees, stakeholder management, health and safety, security management, contractor's escrow tender documents		$ -	
12.06	Network maintenance		$ -	
12.07	QA systems		$ -	
12.08	Testing		$ -	
13	**Extraordinary Construction Costs**			$ 502,254.03

Base Estimate	$ 4,888,605.86
Date of Estimate	29/09/2017
Estimate prepared by	NJTodd Jones
Estimate internal peer review by	[signature]
Estimate external peer review by	
Estimate accepted by NZTA project manager	

Note: These estimates are exclusive of Contingency, Funding Risk Contingency, Escalation anc

PN4234 SH10 Waipapa Road Intersection Improvements

Nett Property Costs

Property Acquisition Reference	Property Requirements	Purchased	Property Purchase Costs (A)	(Less) Disposal Value (B)	Nett Property Purchase Costs (A-B=C)					Property Compensation Costs (D)	Property owner Accommodation Works (E)	Nett Project Property Cost (C+D+E=F)
					Right Turn Bay	Round-about	Signals	Head to Head RTB	Cloase Waipapa Loop Road			
	Lot 2 DP 22952		0	0	12,000	12,000	12,000	12,000	12,000	0	0	0
	Lot 2 DP 72659		1,000,000	0	200,000	650,000	200,000	200,000	0	0	0	0
	Lot 1 DP 153739		0	0	16,000	40,000	40,000	30,000	35,000	0	0	0
	Lot 1 DP 95010		0	0	0	50,000	14,000	0	0	0	0	0
	Lot 2 DP 153648		0	0	0	200,000	95,000	135,000	0	0	0	0
	Lot 1 DP 164804		0	0	0	0	3,000	3,000	0	0	0	0
	Waipapa Corridor Treatment: Lot 1 DP 153739, Lot 4 DP 98489, Lot 3 DP 98489, Lot 4 DP 102236, Lot 5 DP 102236, Lot 3 DP 99619		0	0	46,750	46,750	46,750	46,750	46,750	0	0	0
			0	0						0	0	0
			0	0						0	0	0
			0	0						0	0	0
			0	0						0	0	0
Fees	**Property Acquisition Agents Fees**	-	-	-	-					-	-	0
Base Estimate			**0**	**0**	**274,750**	**998,750**	**410,750**	**426,750**	**93,750**	**0**	**0**	**0**

Contingency	0
Expected Estimate	**0**
Funding Risk Contingency	0
95th Percentile Estimate	**0**

Date of Estimate	**Cost Index**
Estimate prepared by	**Signed**
Estimate internal peer review by	**Signed**
Estimate external peer review by	**Signed**
Estimate accepted by NZTA project manager	**Signed**

Note: These estimates are exclusive of escalation and GST.

Ian Rich – HNO Risk Advisor (Tel: 04 894 6287)
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April 2015

Risk Register

Project/Contract:	SH10 Waipapa Road Intersection	**Document Date:**	21 June 2017
Project/Contract ID:	PN4234	**Supplier Lead:**	Chris Parker / Opus
NZTA Office:	Northland	**RM Specialist:**	Naushaba Todd-Jones / Opus
NZTA Lead:	Sebastian Reed	**Risk Tolerance Threshold:**	**Moderate**

										Current Exposure				Residual (Target) Exposure			
										Semi-Quantitative			Treatment Strategy	Semi-Quantitative			
?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Rank	**RID**	**Risk Title**	**Description/ Cause/ Consequence**	**Risk Owner**	**Risk Owning Org**	**Date Raised (xx/xx/xxxx)**	**Risk Status**	**Phase**	**Established Controls**	**Consq.**	**Likelihood**	**Risk Score**	**Individual actions to be recorded in the Actions Register (Tab 4)**	**Consq.**	**Likelihood**	**Risk Score**	**Commentary & Closure Statement**
5	1	Property acquisition required to widen the carriageway lanes and add the intersections	**Description:** There is a threat that compulsory acquisition will be required. **Cause:** The cause of the threat is that due to the design (carriageway widths and shared pathways) land in-take will be required and uncooperative owners may require statutory timeframes (18 months). **Consequence:** The consequence of the threat is that this will lead to delays in the project programme until compulsory acquisition has been completed.	Sebastian Reed / Stu Graham	NZTA	21/03/2017	Draft	Pre Implementation	Begin property acquisition liaison as early as possible in the project.	Very High	Low	20		High	Very Low	8	
1	2	Property disposal	**Description:** There is an opportunity to sell a portion of the Loop Road (north end) by moving the turnaround (closed end) treatment further into Loop Road. **Cause:** The cause of the opportunity is that Loop Road is to be closed off with a turnaround treatment in the current design. **Consequence:** The consequence of the opportunity is that the north end of Loop Road can be separated as a section and sold possibly to the neighbouring property as a store frontage.	Sebastian Reed / Stu Graham	NZTA	21/03/2017	Draft	Pre Implementation	This opportunity to be explored and implemented at the Detailed Design Stage.	High	High	21		Very High	Very High	25	
5	3	Treatment of Loop Road	**Description:** There is a threat that there may be public objections to the closing of the Loop Road, currently proposed in the Roundabout Option. **Cause:** The cause of the threat is that closing a road requires public notification, which may lead to objections and hearings. **Consequence:** The consequence of the threat is that Loop Road may have to be left open to the SH, which is not desirable for safety reasons.	Sebastian Reed / Keith Kent / Chris Parker	NZTA / FNDC / Opus	21/03/2017	Draft	Pre Implementation	Manage expectation early - prepare the arguments for closing Loop Road and demonstrate the benefits to the Public and Key Stakeholders on Open Days, meetings, etc. Include FNDC in presenting these arguments.	Very High	Low	20		Very High	Very Low	13	
1	4	Treatment of Loop Road	**Description:** There is a threat that for the Roundabout Option, the power poles on the top end (N) of Loop Road and the western end of Skippers lane will require relocating. **Cause:** The cause of the threat is the design requirement (closure of Loop Road, becoming a cul-de-sac and additional area requirement for the roundabout treatment at the intersection). **Consequence:** The consequence of the threat is that this involves major works and will affect both the cost and the programme of the project.	Sebastian Reed / Chris Parker	NZTA / Opus	21/03/2017	Draft	Pre Implementation	Establish from the design whether this relocation will be required and plan ahead, taking in account the cost and time requirements early in the project.	Very High	Medium	23		High	Low	16	

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Risk Register

Project/Contract:	SH10 Waipapa Road Intersection	Document Date:	21 June 2017	
Project/Contract ID:	PN4234	Supplier Lead:	Chris Parker	Opus
NZTA Office:	Northland	RM Specialist:	Naushaba Todd-Jones	Opus
NZTA Lead:	Sebastian Reed	Risk Tolerance Threshold:	**Moderate**	

										Current Exposure				Residual (Target) Exposure			
										Semi-Quantitative			Treatment Strategy	Semi-Quantitative			
?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Rank	**RID**	**Risk Title**	**Description/ Cause/ Consequence**	**Risk Owner**	**Risk Owning Org**	**Date Raised (xx/xx/xxxx)**	**Risk Status**	**Phase**	**Established Controls**	**Consq.**	**Likelihood**	**Risk Score**	**Individual actions to be recorded in the Actions Register (Tab 4)**	**Consq.**	**Likelihood**	**Risk Score**	**Commentary & Closure Statement**
1	5	Treatment of Klinac Lane	**Description:** There is a threat that there is lack of clarity as to the funding of the Klinac Lane Treatment. **Cause:** The cause of the threat is that the funding for the project from FNDC is as yet uncommitted. **Consequence:** The consequence of the threat is that the without the Klinac Lane treatment, the Waipapa Intersection treatment will have reduced economic benefits, and affect the viability of the project.	Sebastian Reed / Keith Kent	NZTA / FNDC	21/03/2017	Draft	Implementation	FNDC to commit their funding for this project at the Business Case stage so that NZTA can account for the 60% subsidy requirement for this part of the project in their funding request.	Very High	Medium	23		High	Low	16	
10	6	Services Relocation	**Description:** There is a threat that the project programme may be extended. **Cause:** The cause of the threat is the requirement for the services relocations to accommodate the new intersection & associated geometrics design, and the difficulty in the accurate planning and estimating of the services relocations based on conceptual design. **Consequence:** The consequence of the threat is adverse impact on the project programme.	Sebastian Reed	NZTA	21/03/2017	Draft	Implementation	The services relocation plan (including programming) to be revised at Detailed Design stage with the asset owners.	Medium	High	17		Low	Medium	10	
11	7	Services Relocation	**Description:** There is a threat that project costs may escalate from services relocation. **Cause:** The cause of the threat is the requirement for the services relocations to accommodate the new intersection & associated geometrics design, and the difficulty in the accurate planning and estimating of the services relocations based on conceptual design. **Consequence:** The consequence of the threat is that the cost of services relocation is much higher than anticipated and will have a major impact on the project costs.	Sebastian Reed	NZTA	21/03/2017	Draft	Implementation	The services relocation plan (including cost) to be revised at Detailed Design stage with the asset owners.	Medium	Medium	15		Low	Low	6	
1	8	Consents (NZTA)	**Description:** There is a threat that NRC may require treatment of the road to a 100year ARI through the consenting process. **Cause:** The cause of the threat is that the project site is on a floodplain / flood overland flowpath. **Consequence:** The consequence of the threat is that the design will have to incorporate 100year ARI (which is not economically feasible for the site) but may otherwise not be consented.	Sebastian Reed	NZTA	21/03/2017	Draft	Pre Implementation	Project Manager to engage NRC early on in the project to discuss the design requirements and criteria including the economic feasibility.	Very High	Medium	23		High	Very Low	8	

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Risk Register

Project/Contract:	SH10 Waipapa Road Intersection	**Document Date:**	21 June 2017
Project/Contract ID:	PN4234	**Supplier Lead:**	Chris Parker / Opus
NZTA Office:	Northland	**RM Specialist:**	Naushaba Todd-Jones / Opus
NZTA Lead:	Sebastian Reed	**Risk Tolerance Threshold:**	**Moderate**

										Current Exposure – Semi-Quantitative			Treatment Strategy	Residual (Target) Exposure – Semi-Quantitative			
?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Rank	**RID**	**Risk Title**	**Description/ Cause/ Consequence**	**Risk Owner**	**Risk Owning Org**	**Date Raised (xx/xx/xxxx)**	**Risk Status**	**Phase**	**Established Controls**	**Consq.**	**Likelihood**	**Risk Score**	**Individual actions to be recorded in the Actions Register (Tab 4)**	**Consq.**	**Likelihood**	**Risk Score**	**Commentary & Closure Statement**
5	9	Consents (FNDC)	**Description:** There is a threat that Klinac Lane upgrade project may not go ahead. **Cause:** The cause of the threat is that the project site is on a floodplain / flood overland flowpath. **Consequence:** The consequence of the threat is that the design will have to incorporate 100year ARI (which is not economically feasible for the site) and may not be consented.	Keith Kent	FNDC	21/03/2017	Draft	Pre Implementation	To assess the viability of the proposed options for Klinac Lane early in the Design process and incorporate flood solutions that are technically viable and economically feasible.	Very High	Low	20		Very High	Very Low	13	
4	10	Contaminated Land - Former Orchard	**Description:** There is a threat that the land intake from the former orchard will be contaminated. **Cause:** The cause of the threat is that additional land is required to be taken to the SE of the intersection to allow for the upgrade (roundabout or head to head right turn bays). **Consequence:** The consequence of the threat is that the land may require remediation and therefore impact on the project costs and programme.	Sebastian Reed	NZTA	21/03/2017	Draft	Pre Implementation	Conduct a Preliminary Site Investigation early in the project (Pre-Implementation).	High	High	21		Medium	Medium	15	
8	11	Contaminated Land - PFS	**Description:** There is a threat that the land intake from the Petrol Filling Station (PFS) will be contaminated. **Cause:** The cause of the threat is that additional land is required to be taken to the NE of the intersection to allow for the upgrade (roundabout). **Consequence:** The consequence of the threat is that the land may require remediation and therefore impact on the project costs and programme.	Sebastian Reed	NZTA	21/03/2017	Draft	Pre Implementation	Conduct a Preliminary Site Investigation early in the project (Pre-Implementation).	High	Medium	19		Medium	Low	11	
14	12	Geotechnical Issues	**Description:** There is a threat that there may be some geotechnical issues identified during the construction phase. **Cause:** The cause of the threat is that no geotechnical investigation (desktop and / or site investigation) has been conducted for the site. **Consequence:** The consequence of the threat is that if any geotechnical issues are identified they will have an impact on the cost and programme of the project.	Sebastian Reed	NZTA	21/03/2017	Draft	Pre Implementation	Conduct a Preliminary Geotechnical Investigation early in the project (Pre-Implementation).	Medium	Low	11		Low	Very Low	2	

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Project/Contract ID:	PN4234	**Supplier Lead:**	Chris Parker / Opus
NZTA Office:	Northland	**RM Specialist:**	Naushaba Todd-Jones / Opus
NZTA Lead:	Sebastian Reed	**Risk Tolerance Threshold:**	**Moderate**

										Current Exposure			Treatment Strategy	Residual (Target) Exposure			
										Semi-Quantitative				Semi-Quantitative			
?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Rank	RID	Risk Title	Description/ Cause/ Consequence	Risk Owner	Risk Owning Org	Date Raised (xx/xx/xxxx)	Risk Status	Phase	Established Controls	Consq.	Likelihood	Risk Score	Individual actions to be recorded in the Actions Register (Tab 4)	Consq.	Likelihood	Risk Score	Commentary & Closure Statement
14	13	Archaeological Issues	**Description:** There is a threat that there may be some archaeological issues identified during the construction phase. **Cause:** The cause of the threat is that only a very high level archaeological assessment has been conducted as part of the Planning and Environment Desktop Study. **Consequence:** The consequence of the threat is that if any archaeological issues are identified they will have an impact on the cost and programme of the project.	Sebastian Reed	NZTA	21/03/2017	Draft	Pre Implementation	Conduct a Preliminary Archaeological Investigation early in the project (Pre-Implementation).	Medium	Low	11		Low	Very Low	2	
14	14	Accommodating 24 hour Businesses during Construction	**Description:** There is a threat that the 24hour businesses on the project site may be uncooperative during the construction phase. **Cause:** The cause of the threat is the Waipapa intersection has a 24 hour Petrol Filling Station (PFS). **Consequence:** The consequence of the threat is this will impact the project programme in the form of extensions.	Sebastian Reed / Contractor	NZTA / TBC	21/03/2017	Draft	Operation	The Contractor to liaise with the business owners and other stakeholders early on in the programme and keep them abreast with the timeline of the construction phases. The Contractor to also find the business owners' requirements and, accommodate & account for these within their management plans.	Medium	Low	11		Medium	Very Low	4	
11	15	Parking Changes	**Description:** There is a threat that the local businesses may object to the design. **Cause:** The cause of the threat is the change in the intersection treatment that will change the parking situation (arrangement, number, etc.) **Consequence:** The consequence of the threat is that the design may have to be changed or additional intake of land may be required to provide additional parking.	Sebastian Reed	NZTA	21/03/2017	Draft	Pre Implementation	Involve the key stakeholders (business owners, residents, etc.) in the process early through Open days, etc. to get their buy-in into the design.	Medium	Medium	15		Medium	Low	11	
11	16	Water / Stormwater Culverts	**Description:** There is a threat that there may be previously unknown / unaccountable SW / mains water culverts in the project site. **Cause:** The cause of the threat is that there are water services of suppliers who have not been able to be contacted and there are no services plans available for these services. **Consequence:** The consequence of the threat is that it will have an adverse impact on the cost and time of the project.	Sebastian Reed / Chris Parker	NZTA / Opus	22/03/2017	Draft	Pre Implementation	To liaise with the service providers and asset owners in the locality of the project to assess impact and associated costs, etc. early on but also throughout the design development.	Medium	Medium	15		Medium	Low	11	

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Risk Register

Project/Contract:	SH10 Waipapa Road Intersection	**Document Date:**	21 June 2017	
Project/Contract ID:	PN4234	**Supplier Lead:**	Chris Parker	Opus
NZTA Office:	Northland	**RM Specialist:**	Naushaba Todd-Jones	Opus
NZTA Lead:	Sebastian Reed	**Risk Tolerance Threshold:**	**Moderate**	

										Current Exposure			Treatment Strategy	Residual (Target) Exposure			
										Semi-Quantitative				Semi-Quantitative			
?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Rank	**RID**	**Risk Title**	**Description/ Cause/ Consequence**	**Risk Owner**	**Risk Owning Org**	**Date Raised (xx/xx/xxxx)**	**Risk Status**	**Phase**	**Established Controls**	**Consq.**	**Likelihood**	**Risk Score**	**Individual actions to be recorded in the Actions Register (Tab 4)**	**Consq.**	**Likelihood**	**Risk Score**	**Commentary & Closure Statement**
8	17	Shared Footpath / Cycleway	**Description:** There is a threat that the Agency has not decided whether they would like to have the shared footpath / cycleway and consequently not agreed on its dimensions (meet/depart from the requirements?) **Cause:** The cause of the threat is the early stage of the design phase. **Consequence:** The consequence of the threat is that as this project is going through a Single Stage Business Case process, the design may change following the project funding having been approved.	Sebastian Reed / Chris Parker	NZTA / Opus	22/03/2017	Draft	Pre Implementation	Key design aspects to be decided upon as soon as possible.	High	Medium	19		Medium	Very Low	4	

Risk Status	
Draft	17
Live - Treat	0
Live - Parked	0
Impacted	0
Closed	0
Rejected	0
Blank	8
TOTAL	**25**

Current Risk Score	
Extreme	5
High	9
Moderate	3
Low	0
Zero	8
TOTAL	**25**

Residual Risk Score	
Extreme	1
High	5
Moderate	7
Low	4
Zero	8
TOTAL	**25**

APPENDIX L Indicative Land Requirement Plans

LAND REGISTRATION DISTRICT : NORTH AUCKLAND

LOCAL AUTHORITY : FAR NORTH DISTRICT

SCHEDULES

LAND REQUIRED FOR ROAD

SHOWN	DESCRIPTION	CT	AREA
A	Pt. LOT 2 DP 22952	NA6C/1449	167m²
B	LOT 2 DP 72659	NA28C/1053	19m²
C	LOT 1 DP 153739	NA91C/871	88m²
D	LOT 1 DP 153739	NA91C/871	71m²
TOTAL AREA			345m²

DRAWING IN PROGRESS

PLOTTED ON 2017-3-20 AT 12:05 p.m.

PRELIMINARY

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-03-20

NZ TRANSPORT AGENCY
WAKA KOTAHI

OPUS
Whangarei Office
+64 9 430 1700
125A Bank Street
PO Box 553
Whangarei 0110

Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
RIGHT TURN BAY OPTION
LAND REQUIREMENT PLAN

Project No.	Sheet No.	Revision
1-11751.00	V01	A

1:500@ A1
1:1000@ A3
0 5 10 15 20 25 30 35 40 45 50 m

Original Sheet Size A1 [841x594] Plot Date 2017-03-20 at 12:05:33 p.m. Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(V) Survey\+AutoCAD\1-11751.00_V01-05,20.dwg - V01

LAND REGISTRATION DISTRICT : NORTH AUCKLAND

LOCAL AUTHORITY : FAR NORTH DISTRICT

SCHEDULES

LAND REQUIRED FOR ROAD

SHOWN	DESCRIPTION	CT	AREA
A	Pt. LOT 2 DP 22952	NA6C/1449	167m²
B	LOT 1 DP 153648	NA91C/694	7m²
C	LOT 2 DP 153648	NA91C/695	460m²
D	LOT 1 DP 153739	NA91C/871	976m²
E	LOT 2 DP 72659	NA28C/1053	33m²
TOTAL AREA			1648m²

DRAWING IN PROGRESS

PLOTTED ON 2017-10-9 AT 4:17 PM

PRELIMINARY

1:500 @ A1
1:1000 @ A3
0 5 10 15 20 25 30 35 40 45 50 m

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-03-20
B	ROUNDABOUT DESIGN REVISED		2017-05-08
C	ROUNDABOUT DESIGN REVISED		2017-10-09

NZ TRANSPORT AGENCY
WAKA KOTAHI

OPUS
Whangarei Office
+64 9 430 1700
125A Bank Street
PO Box 553
Whangarei 0110

Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
ROUNDABOUT OPTION
LAND REQUIREMENT PLAN

Project No.	Sheet. No.	Revision
1-11751.00	V02	C

Original Sheet Size A1 [841x594] Plot Date 2017-10-09 at 4:17:19 PM Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(V) Survey\+AutoCAD\1-11751.00_V01-05,20.dwg - V02

LAND REGISTRATION DISTRICT : NORTH AUCKLAND

LOCAL AUTHORITY : FAR NORTH DISTRICT

SCHEDULES

LAND REQUIRED FOR ROAD

SHOWN	DESCRIPTION	CT	AREA
A	Pt. LOT 2 DP 22952	NA6C/1449	161m²
B	LOT 1 DP 95010	NA50C/862	45m²
C	LOT 2 DP 72659	NA28C/1053	21m²
D	LOT 2 DP 153648	NA91C/695	94m²
E	LOT 1 DP 153739	NA91C/871	1024m²
F	LOT 1 DP 164804	NA97B/374	48m²
TOTAL AREA			1393m²

DRAWING IN PROGRESS

PLOTTED ON 2017-3-20 AT 12:05 p.m.

PRELIMINARY

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-03-20

NZ TRANSPORT AGENCY
WAKA KOTAHI

OPUS
Whangarei Office
+64 9 430 1700
125A Bank Street
PO Box 553
Whangarei 0110

Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
SIGNALS OPTION
LAND REQUIREMENT PLAN

Project No.	Sheet No.	Revision
1-11751.00	V03	A

1:500 @ A1 / 1:1000 @ A3 — 0 5 10 15 20 25 30 35 40 45 50 m

LAND REGISTRATION DISTRICT : NORTH AUCKLAND

LOCAL AUTHORITY : FAR NORTH DISTRICT

SCHEDULES

LAND REQUIRED FOR ROAD

SHOWN	DESCRIPTION	CT	AREA
A	Pt. LOT 2 DP 22952	NA6C/1449	167m²
B	LOT 2 DP 72659	NA28C/1053	45m²
C	LOT 2 DP 153648	NA91C/695	17m²
D	LOT 1 DP 153739	NA91C/871	734m²
E	LOT 1 DP 164804	NA97B/374	37m²
TOTAL AREA			1000m²

DRAWING IN PROGRESS

PLOTTED ON 2017-3-20 AT 12:05 p.m.

PRELIMINARY

1:500 @ A1
1:1000 @ A3
0 5 10 15 20 25 30 35 40 45 50 m

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-03-20

NZ TRANSPORT AGENCY
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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
HEAD TO HEAD RIGHT TURN BAY OPTION
LAND REQUIREMENT PLAN

Project No.	Sheet. No.	Revision
1-11751.00	V04	A

Original Sheet Size A1 [841x594] Plot Date 2017-03-20 at 12:05:39 p.m. Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(V) Survey\+AutoCAD\1-11751.00_V01-05,20.dwg - V04

LAND REGISTRATION DISTRICT : NORTH AUCKLAND

LOCAL AUTHORITY : FAR NORTH DISTRICT

SCHEDULES

LAND REQUIRED FOR ROAD

SHOWN	DESCRIPTION	CT	AREA
A	Pt. LOT 2 DP 22952	NA6C/1449	187m²
B	LOT 1 DP 153739	NA91C/871	785m²
TOTAL AREA			972m²

DRAWING IN PROGRESS

PLOTTED ON 2017-3-20 AT 12:05 p.m.

PRELIMINARY

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-03-20

NZ TRANSPORT AGENCY
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125A Bank Street
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Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
CLOSE WAIPAPA LOOP ROAD NORTH OPTION
LAND REQUIREMENT PLAN

Project No.	Sheet. No.	Revision
1-11751.00	V05	A

1:500 @ A1
1:1000 @ A3
0 5 10 15 20 25 30 35 40 45 50 m

Original Sheet Size A1 [841x594] Plot Date 2017-03-20 at 12:05:41 p.m. Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(V) Survey\+AutoCAD\1-11751.00_V01-05,20.dwg - V05

LAND REGISTRATION DISTRICT : NORTH AUCKLAND

LOCAL AUTHORITY : FAR NORTH DISTRICT

SCHEDULES

LAND REQUIRED FOR ROAD

SHOWN	DESCRIPTION	CT	AREA
A	LOT 1 DP 153739	NA91C/871	177m²
B	LOT 4 DP 98489		4m²
C	LOT 3 DP 98489		49m²
D	LOT 4 DP 102236		64m²
E	LOT 5 DP 102236		42m²
F	LOT 3 DP 99619		155m²
TOTAL AREA			491m²

DRAWING IN PROGRESS

PLOTTED ON 2017-3-20 AT 12:05 p.m.

PRELIMINARY

Revision	Amendment	Approved	Revision Date
A	ISSUED FOR INFORMATION		2017-03-20

NZ TRANSPORT AGENCY
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125A Bank Street
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Whangarei 0110

Designed	Approved	Approved Date
C. NIXON	-	-

Drawn	Scales
C. NIXON	1:1500 AT A1

Project
NZ TRANSPORT AGENCY
STATE HIGHWAY 10 / WAIPAPA ROAD
INTERSECTION IMPROVEMENTS

Sheet
WAIPAPA CORRIDOR TREATMENT
LAND REQUIREMENT PLAN

Project No.	Sheet. No.	Revision
1-11751.00	V20	A

1:1500 @ A1
1:3000 @ A3
0 20 40 60 80 100 120 140 m

Original Sheet Size A1 [841x594] Plot Date 2017-03-20 at 12:05:44 p.m. Path G:\01 Clients\NZTA\1-11751.00 PN4234 SH10 Waipapa Road Intersection Improvements\200 Technical\210 Drawings\(V) Survey\+AutoCAD\1-11751.00_V01-05,20.dwg - V20

APPENDIX M
Preliminary Planning and Environmental Assessment

NZ Transport Agency

Waipapa Intersection Upgrade

Planning and Environment Desktop Review

March 2017

NZ Transport Agency

Waipapa Intersection Upgrade

Planning and Environment Desktop Review

March 2017

Prepared By	Jessica Moser Graduate Environmental Consultant	Opus International Consultants Ltd Whangarei Office Mansfield Terrace Service Lane, 125A Bank St PO Box 553, Whangarei 0140 New Zealand
Reviewed By	Mark Farrey Team Leader Planning	Telephone: +64 9 430 1700 Facsimile:
		Date: 07/03/2017 Reference: 1-11751.00 Status: Draft 1
Approved for Release By	Chris Parker Roading Team Leader	

Contents

1 Introduction

The New Zealand Transport Agency (NZTA) have an interest in upgrading the intersection between State Highway 10 and Waipapa Road. Opus has been requested to undertake an upgrade options assessment which is of sufficient detail to support the NZTA business case.

Possible upgrades for the intersection being considered include:

- A roundabout
- Traffic signals
- Head to head right turn bays
- Close Waipapa Loop Road South
- Add a right turn bay

The effectiveness and feasibility of each option can be impacted by planning and environment constraints. Accordingly, it is vital to identify such constraints and account for these up front during the concept design options assessment.

1.1 Scope and Objectives

The scope of this report is limited to a desktop planning assessment. The desktop assessment will aim to identify planning constraints that may be encountered during:

1. The engineering investigation stage- i.e. potential for disturbance and consents during the geotechnical investigation.

2. The design phase- i.e. the potential for different designs to have different effects on the environment and trigger different consents.

3. The construction phase- a rough forward estimate of differing construction methods (required for different designs) will be made. Different construction methods may again cause different impacts on the environment and trigger different consents.

The objective of this desktop assessment will be to identify where constraints can be avoided and how impact can be minimised. This work will identify the most favourable options (in terms of planning and environmental constraints).

1.2 Methodology

Opus Planners have assessed all proposed alignments, designs and potential investigation or construction methods against relevant District and Regional Planning Provisions and National Environmental Standards. These have included:

- Far North District Council, District Plan;
- Northland Regional Council, Regional Plans;
    - Regional Water and Soil Plan
    - Regional Air Quality Plan
    - Regional Policy Statement
- National Environmental Standards for Air Quality; and

- National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health.

The planning assessment is also supported by a desktop archaeological investigation, attached in **Appendix A**.

2 Engineering Investigations, Designs and Construction Requirements

2.1 Engineering Investigations

Before certain designs can be considered, a geotechnical investigation of the site needs to be undertaken. Geotechnical investigation typically involves a number of tests:

- Pavement Testing. A small section of road and underlying gravel is extracted and tested for integrity
- SCALA Testing. A solid small diameter probe (approximately 10mm diameter) is pushed into the ground to a depth of 4-5m. This probe is then hit with a weight to measure the amount of resistance the soil has. No extraction of soil is required
- Cone Penetration Testing. This is similar to SCALA testing, except to a deeper level of approximately 12m. No extraction of soil is required
- Hand Auger Testing. An auger (typically <100mm diameter) is hand driven down a few meters. The soil core is extracted and sent to a laboratory for testing.

2.2 Design and Alignment

The designs may vary during detailed design, however the likely options are as follows:

- Option 1A: Replace the existing intersection with a roundabout.
- Option 1B: Add traffic signals to the existing intersection.
- Option 1C: Remove the existing head to head turn bays by realigning Waipapa Road so that the eastern approach to State Highway 10 is moved further south.
- Option 1D: Close Waipapa Loop Road South.
- Option 1E: Add a right turn bay on State Highway 10 for traffic turning right onto Waipapa Road.

2.3 Possible Construction Requirements

The construction works with consenting significance could include:

- A small amount of vegetation clearance (for the road realignment required for Option 1C and Option 1D).
- Works associated with upgrades to intersection approaches – possible need for extension/upgrade of water course crossing to the south.
- Stormwater diversion and discharge
- Some excavation in potential HAIL sites.

3 Environmental, Heritage Constraints

3.1 Environmental Constraints

3.1.1 Ecosystems

Terrestrial Environment

The site is heavily disturbed, with the majority of the works envelope being previously cleared and disturbed during the development of the industrial area and the existing road. The only vegetation remaining acts as a buffer screen on the boundary of the Orchard Lot (on the South East of the intersection) **Figure 1**. The lot boundary on the State Highway contains a tall row of bamboo, the lot boundary on Waipapa Road consists of a tall row of what looks to be a mix of native/non-native species. Neither row of vegetation is considered sufficient enough to offer ecological or habitat values.

As the site does not provide any significant terrestrial habitat, there will be limited ecological constraints associated with the construction works and operation of the upgraded intersection. However the vegetation on the boundaries of the Orchard do have visual screening value, therefore it is ideal to avoid disturbing this vegetation, or replace the vegetation if it needs to be cleared.

Aquatic Environment

The only aquatic ecological values identified, exist to the south of the site where a tributary of the Kerikeri River is situated (Whiriwhiritoa Stream) (**Figure 2**). This tributary has been subjected to a significant amount of urban encroachment and disturbance, however it would still provide passage for aquatic species such as fish. Accordingly any work on the culvert over this tributary must account for fish passage. Overall when catering for fish passage the following principles are considered:

- Maintaining fish passage during low/base flow events.
- Maintaining fish passage during high flow events (at least up to the 1 year ARI event). This is measured by:
  - » No increase in flow velocity on the stream edges compared to existing; OR
  - » No increase in flow velocity on the stream edges above 0.3m/s.

In order to comply with the above guiding principles the following measures are recommended:

- Ensure culvert array spans the full width of the stream – this avoids narrowing flows.
- Avoid the use of base slabs on culverts – this maintains the natural “low flow” channel which fish can utilise for passage during base flow scenarios.
- If a base slab is required, bury it below the stream bed, otherwise:
  - » Ensure invert is installed on upstream/downstream gradient no steeper than natural existing gradient.
  - » Ensure invert meets apron and any upstream or downstream scour protection at the same height (no hydraulic jumps or “lips”) (**Figure 3**)
  - » Provide for low flow provision (usually achieved by installing the centre culvert cell slightly lower than the outside cells) (**Figure 4**)

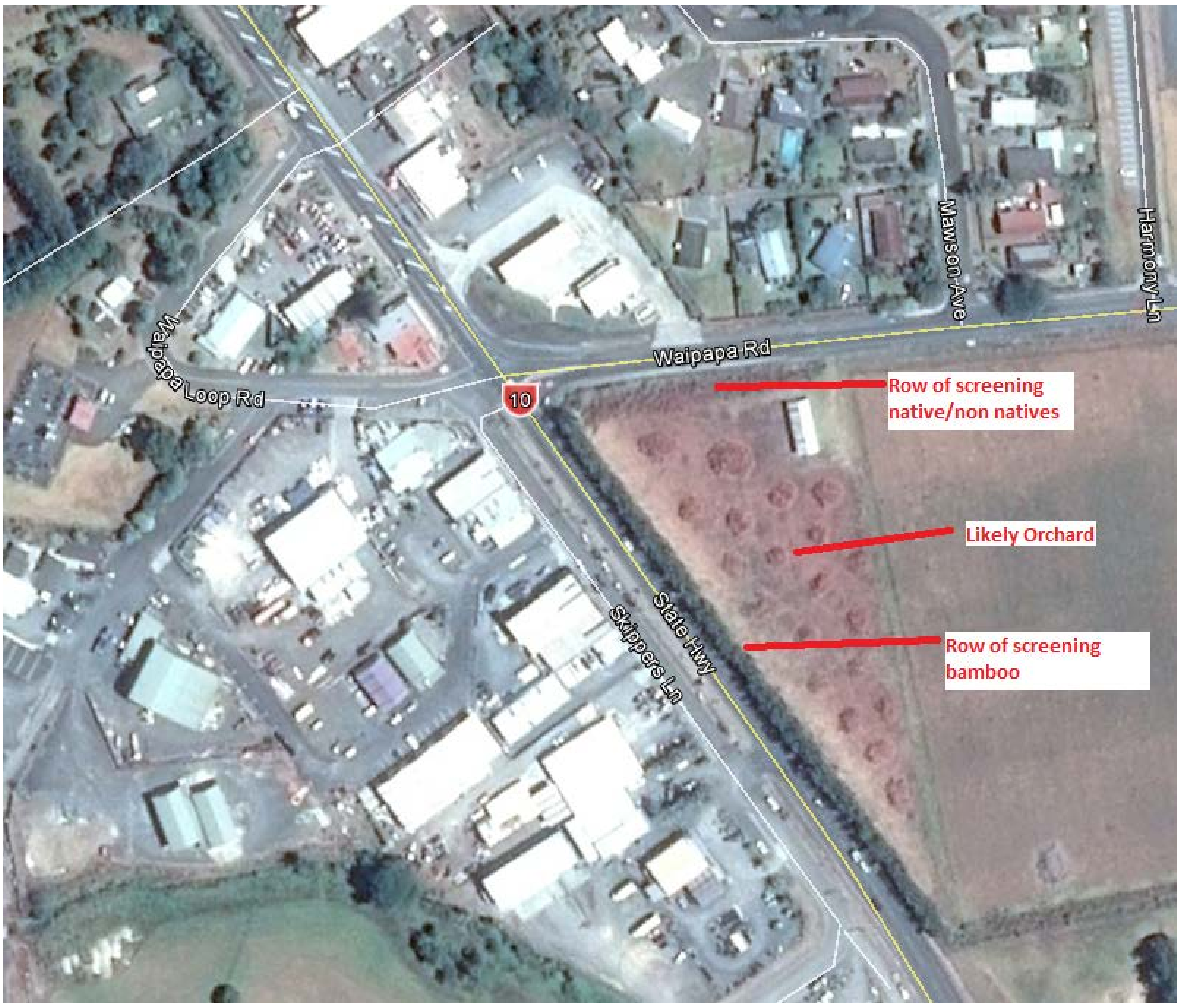

Figure 1: Vegetation within Project Site

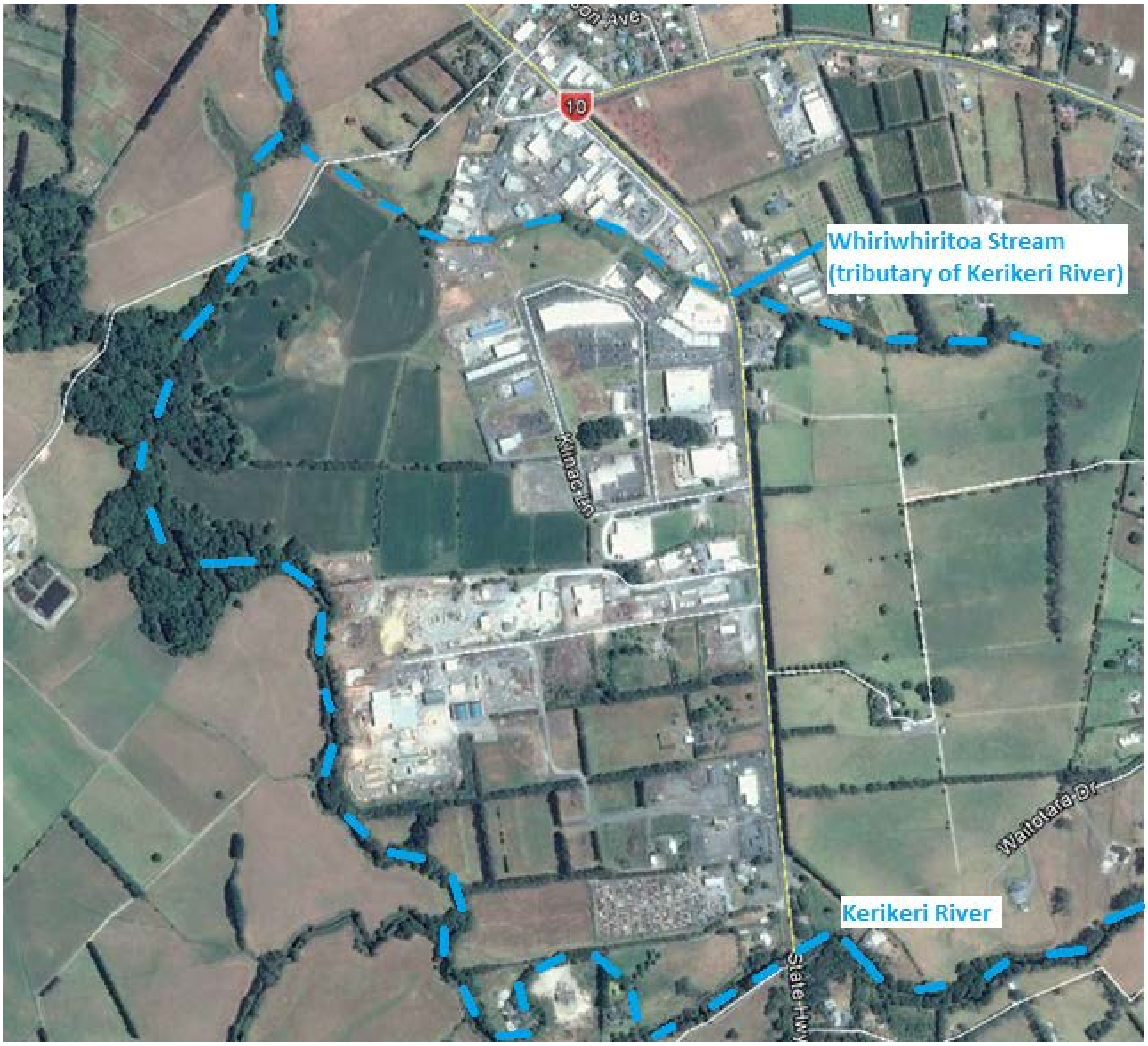

Figure 2: Local Drainage

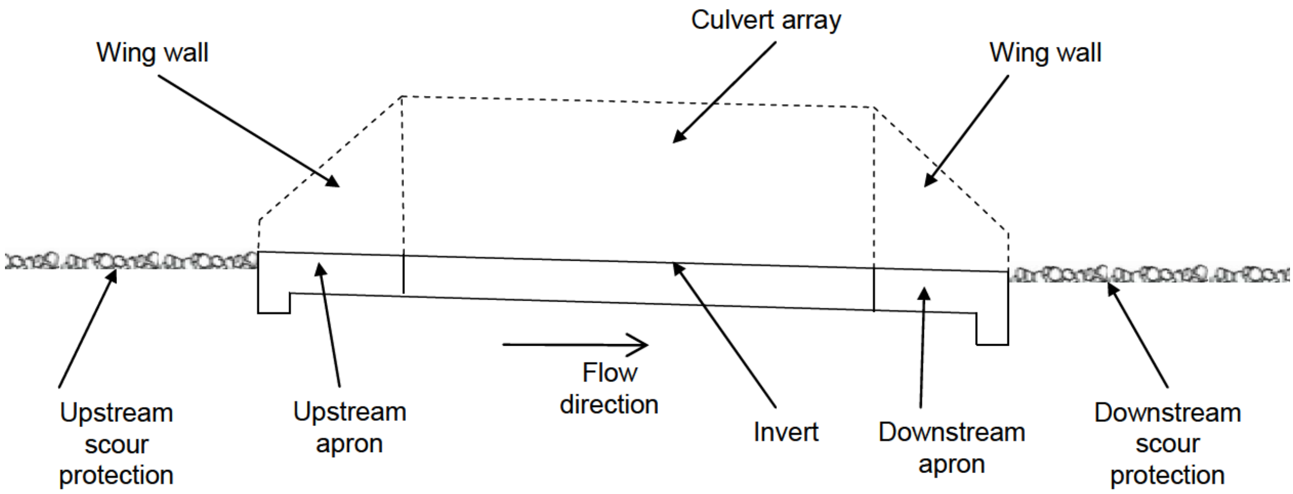

Figure 3: Connection of culvert inverts, aprons and scour protection

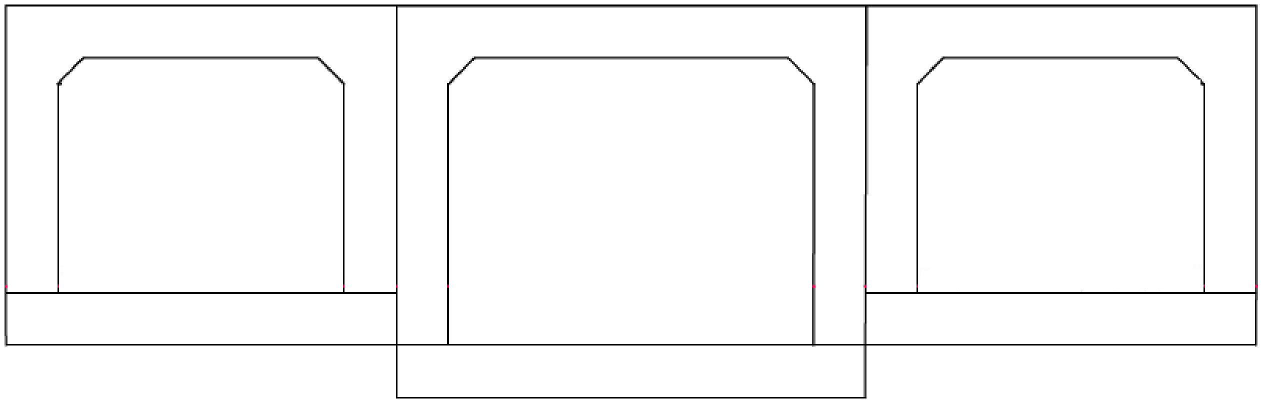

Figure 4: Lowering of a culvert cell for low flow fish passage provision

3.1.2 Geology and Soil

The *Department of Lands and Survey Soils Map Whangaroa – Kaikohe* provides the following soils information:

- Northern side of intersection: Okaihau gravelly friable clay
- Southern side of intersection: Waipapa Clay

The *Department of Lands and Survey Rock Types Map Whangaroa – Kaikohe* provides the following geological information:

- Northern side of intersection: Basalt flows and cones of very fine to medium grained crystalline basalt, dense and moderately fractured; hard to very hard. Weathered to soft red brown or dark grey brown clay to depths of 20m with many rounded corestones:
  - » A Bauxite outcrop is noted on land a few lots to the East on Waipapa Road

- South side of intersection: Alluvium; mud sand and gravel with minor peat, forming river bed and flood plain deposits up to 10m above stream. In places forming a thin (1-3m) veneer over rugged surfaces of lave flows; unconsolidated to very soft. Un-weathered.

Overall it can be seen that the geology/soils support a lot of clay, therefore the site is dominated by very fine sediment. Fine sediment must be managed carefully during construction as it is prone to erosion and is difficult to capture in sediment control devices.

Bauxite is an aluminium ore which can often be mixed with iron and titanium oxides, therefore it may be natural to encounter elevated concentrations of aluminium, iron and titanium in the soil at this site.

There are a number of listed HAIL sites and potential HAIL sites in the vicinity of the intersection (**Figure 5**):

- The BP Service Station directly north of the intersection which stores large quantities of fuel underground. There is potential for mismanagement of fuels and leaking of underground tanks at this site. If this has occurred, the typical contaminants released can include petroleum hydrocarbons, mono aromatic hydrocarbons and metals such as lead (previously used in leaded petrol).
- Two corners on the intersection cater for a range of industrial land uses which may undertake activities which could be considered potentially contaminating.
- There is also an orchard directly east of the intersection which may have been subject to chemicals in the form of fertilizers and pesticides. Therefore, the site has a risk of containing contaminated soil/groundwater and is therefore classified under the Ministry for the Environment, Hazardous Activities and Industries List (HAIL).

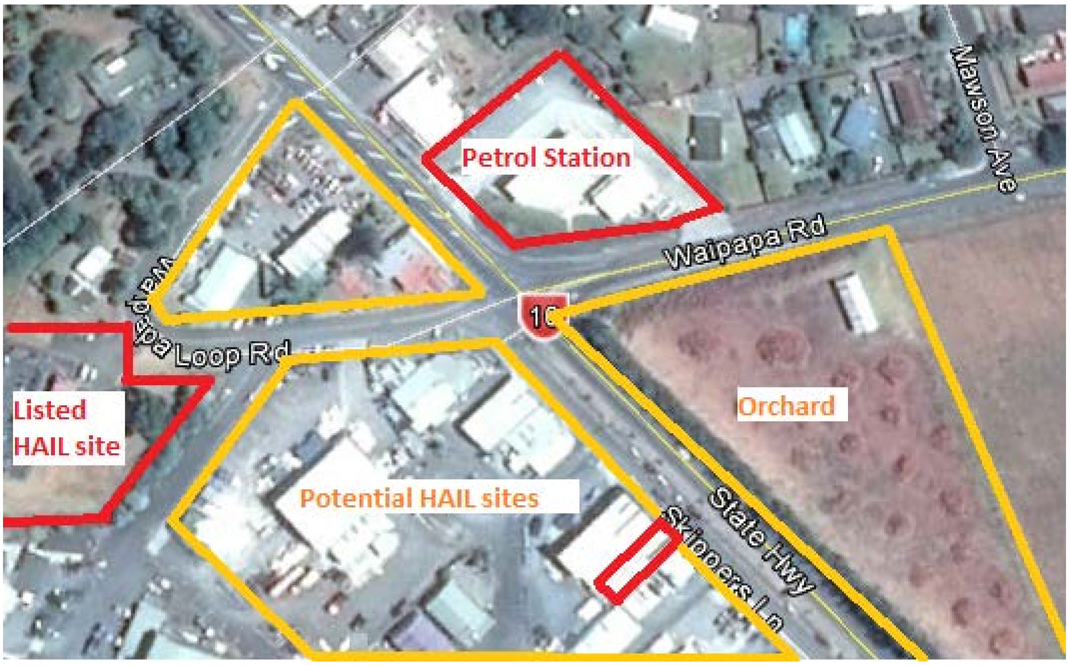

Figure 5: HAIL Sites Adjacent to the Existing Intersection

3.1.3 Topography and Drainage

The project site has an elevation of approximately 80 m above sea level. The land from the intersection to the south is flat in nature, it is considered an alluvial plan (as per the geology describes) associated with the Kerkikeri River 1.4km to the south of the intersection. To the north of the intersection the geology changes, and there is a gentle incline upwards.

All water from the site would eventually drain southwards towards the Kerikeri River tributary (Whiriwhiritoa Stream) which is situated ~400 m south of the intersection (**Figure 2)** This tributary will be sensitive to any erosion and sediment runoff from site works. However, one advantageous feature of the site, is its flat nature, this makes erosion prevention much less complex than a hilly site.

3.2 Heritage Constraints

The Archaeological Assessment in **Appendix A** identifies that the site has low archaeological value. A search of the Heritage New Zealand Pouhere Taonga register found that there are no known heritage sites in the vicinity of the project. In addition, the site has already been subject to significant disturbance associated with the existing intersection and surrounding industrial area. Therefore, it is unlikely that any undiscovered archaeology remains.

4 Planning Constraints

4.1 Far North District Council

The relevant District Council planning maps have been reproduced below. It can be seen in **Figure 6** that the current intersection is designated as road reserve. The adjoining land is made up of commercial, industrial and rural production zones.

Figure 6: FNDC Zoning Maps for Waipapa

The resource map for Waipapa (**Figure 7**) shows that there are no outstanding landscapes, features or sites of cultural significance and therefore no constraints are relevant to this site in regards to resources.

Figure 7: FNDC Resource Map

4.2 Northland Regional Council

The relevant Regional Council information maps have been reproduced below.

4.2.1 Flooding

Figure 8 shows the flood hazards for the 10 year and 100 year flood extent. The 100 year flood level is close to the site, therefore the impact on the overland flow paths will be taken into consideration in the design.

The intersection itself is not heavily constrained by flooding, the map simply shows that some backing up through the current stormwater system can occur in a 100 year event which isn't a major concern. However, flooding is a significant constraint towards the south of the intersection around the tributary of Kerikeri River (Whiriwhiritoa Stream). Any works over this tributary may have potential to alter the flooding regime.

- Any changes to the state highway culvert crossing, or adjacent council roads over this tributary will need to allow for the unimpeded passage of the 1 in 100 year event (i.e. not worsen the upstream flood level).

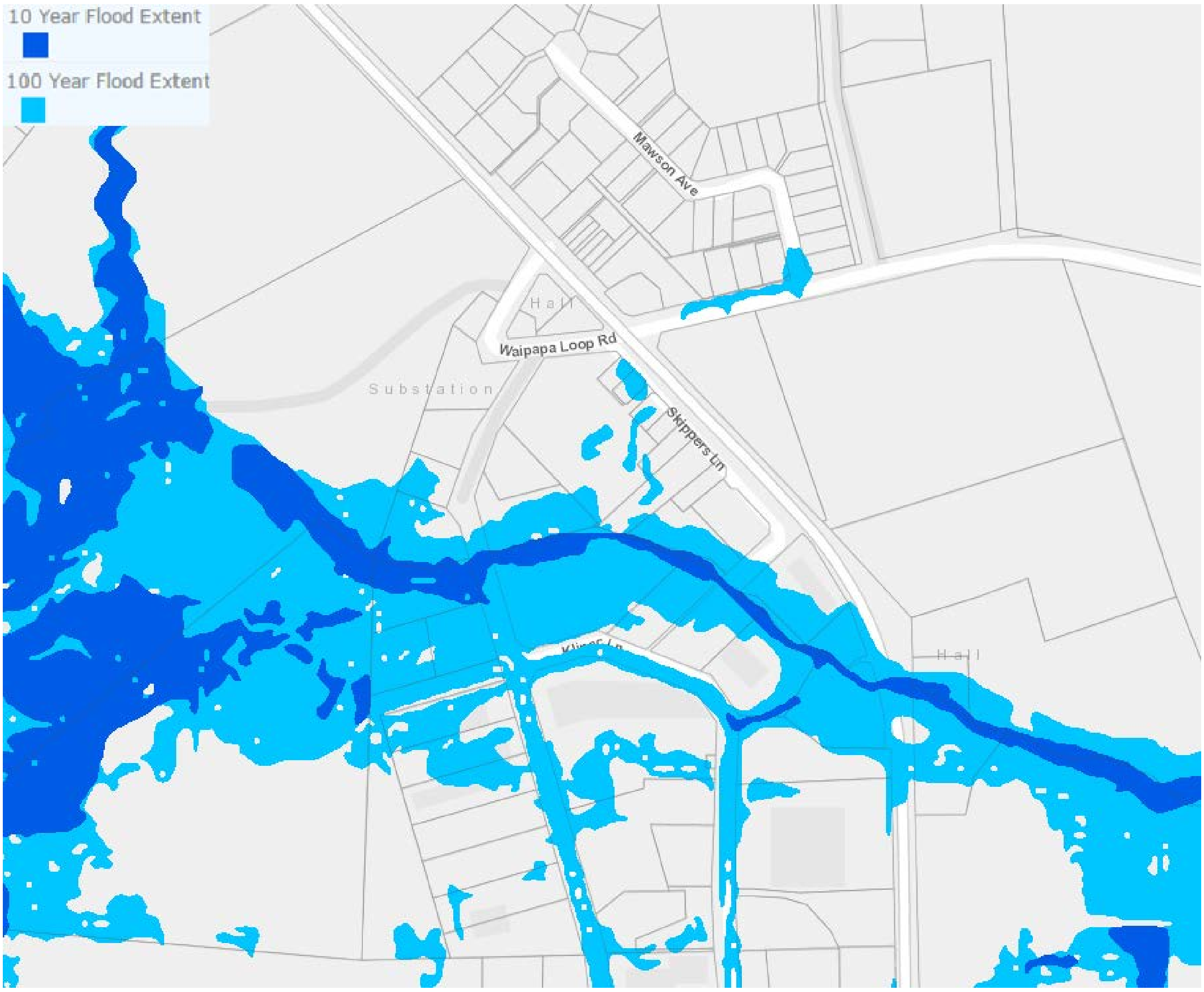

Figure 8: NRC Flood Hazards

4.2.2 Groundwater

It can be seen that the current intersection and surrounding area has low groundwater allocation (**Figure 9**) by catchment. **Figure 10** shows that the area is one of Northlands main aquifers and includes one active bore log directly south east of the intersection and several active and inactive bore logs further north. Together, these two images indicate that there is low groundwater allocation, however there are a number of bores in the local vicinity. Low groundwater allocation means that less than 25% of the groundwater table is assigned to a certain use.

Although the use of groundwater in the area is not high, there are still some local users. Therefore the project must ensure that the quality/quantity of groundwater for local users is not adversely impacted. This can primarily be ensured by appropriate management of any contamination at the site.

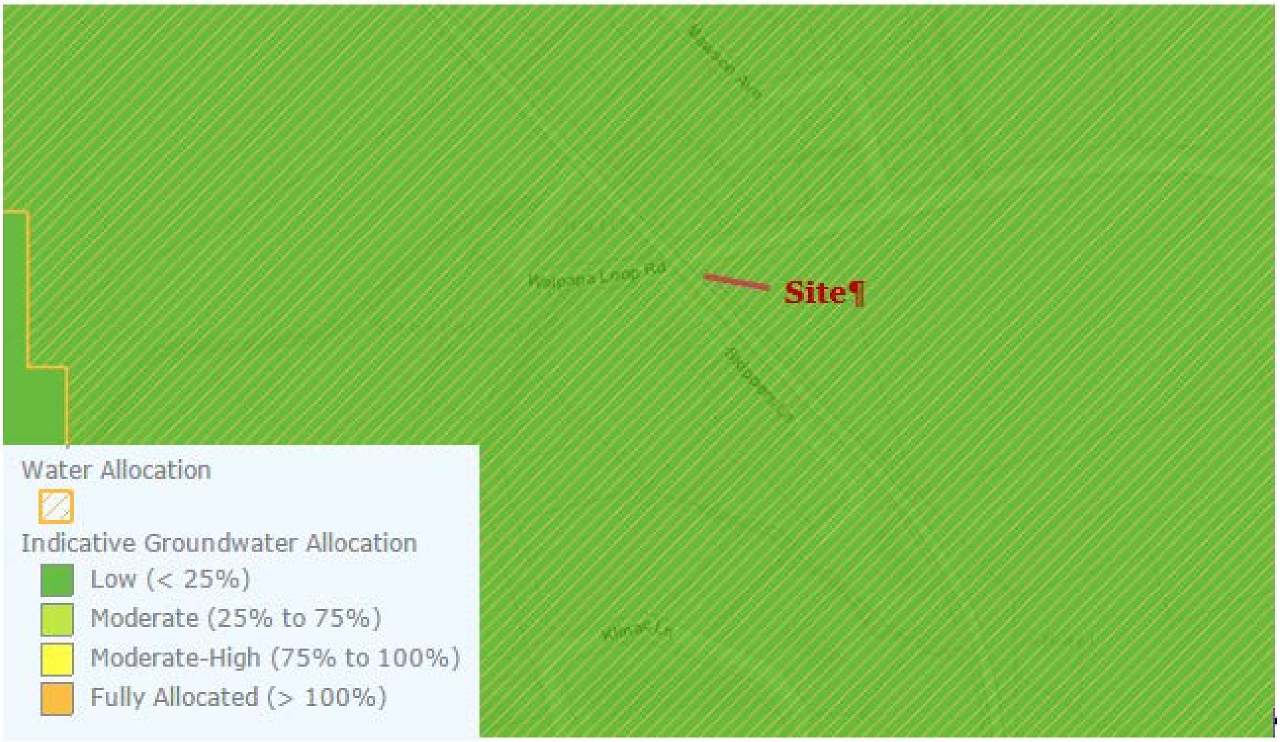

Figure 9: NRC Indicative Groundwater Allocation

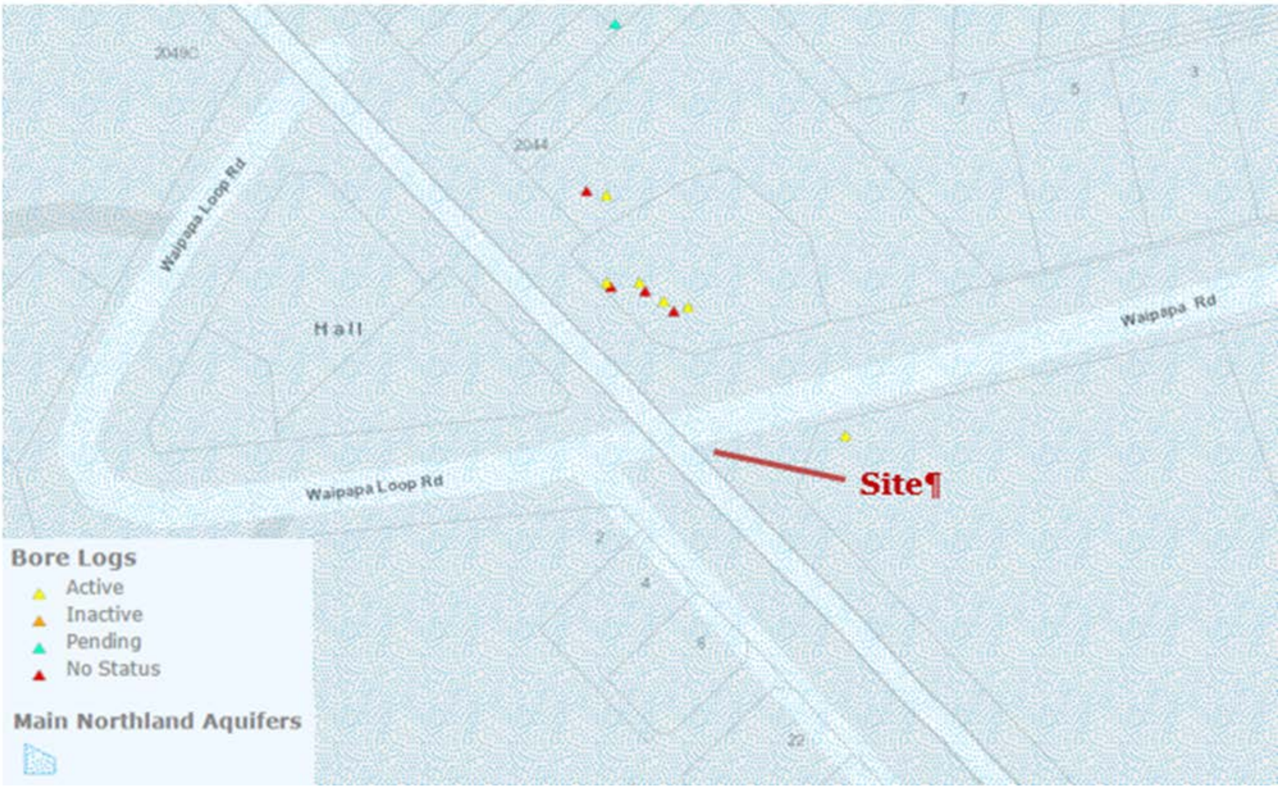

Figure 10: NRC Water Resources

4.2.3 Surface Water

It can be seen that the current intersection and surrounding area has fully allocated surface water (**Figure 11**) by catchment. This means that a high number of people are reliant on extracting water from the river and its tributaries. As a result, it is of up most importance that the quality of the surface water near the project site is not negatively impacted by sediment runoff or other contaminants.

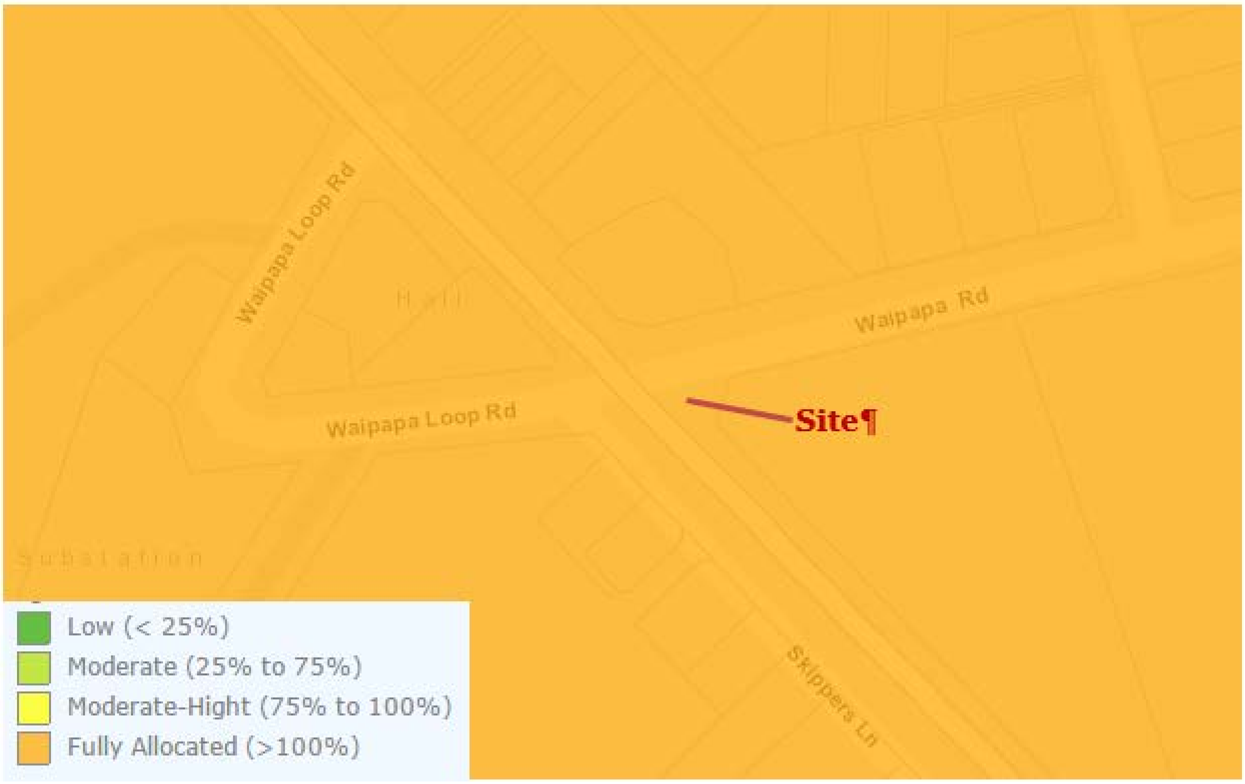

Figure 11: NRC Indicative Surface Water Allocation

4.2.4 Selected Land Use Sites

Figure 12 shows that there are two selected land use (SLU) sites in close proximity to the works envelope. These are HAIL sites which have been recorded by NRC. The SLU directly north of the intersection is a verified HAIL site due to the service station. The other SLU on State Highway 10 is further south from the site, it is a verified HAIL site due to a motor vehicle workshop and paint manufacturer or formulation.

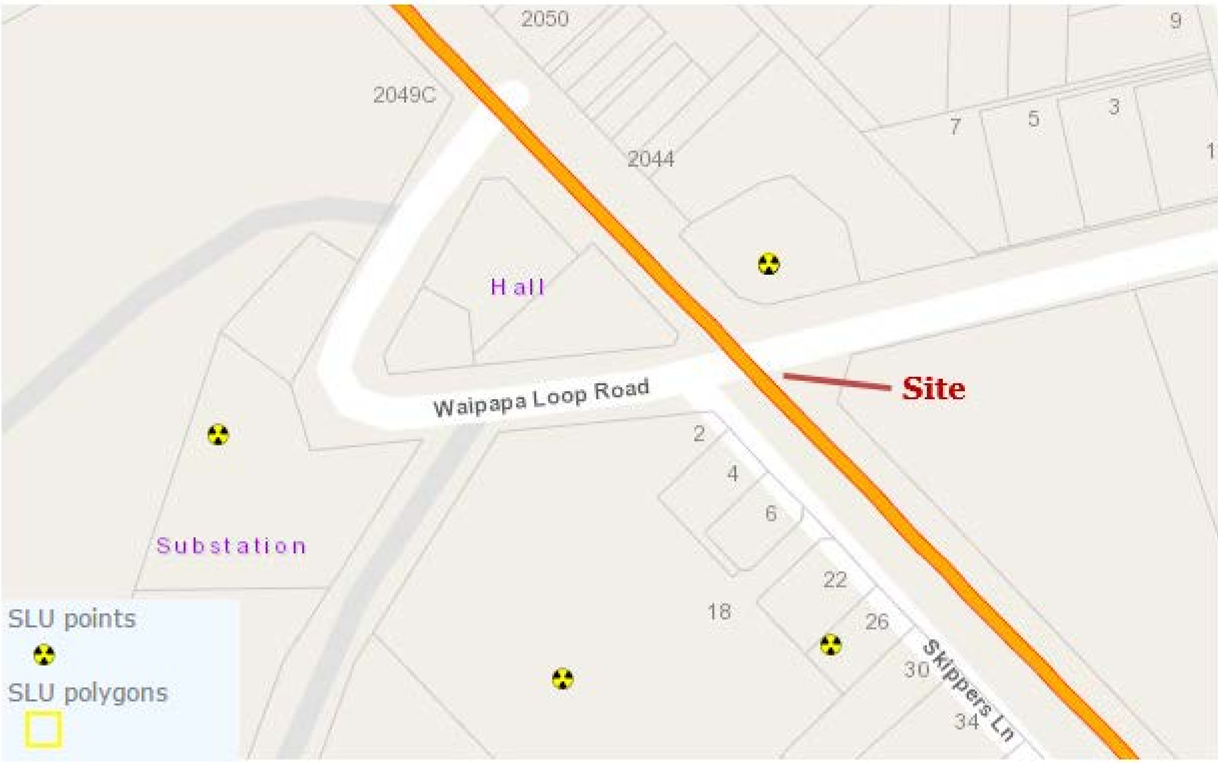

Figure 12: NRC Selected Landuse Sites

5 Consenting Considerations

5.1 Investigative Works

As described above in Section 2.1, some drilling and soil extraction will be required.

5.1.1 Terrestrial Investigations

Non HAIL Sites

Consent for geotechnical investigation will not be required. It is highly unlikely that 5000 m3 needs to be disturbed in a period of 12 months. Accordingly it is a **permitted activity**

HAIL Sites

Consent for geotechnical investigation will not be required for:

- Soil sampling
- Small – scale and temporary disturbance of soil (< 25 m^3 per 500 m^2, in < 2 months)

It is therefore likely that geotechnical investigation in HAIL sites can proceed as a **permitted activity**.

5.1.2 Riparian Zone

Provided that:

- The area of exposed soil is <200m^2 and <50m^3; AND
- The disturbed area is reinstated and revegetated a.s.a.p.

Then the geotechnical investigation can proceed as a **permitted activity**.

5.2 Design and Alignment

5.2.1 Far North District Council

Alteration to Designation

Provided that the works remain within the road designation, the NZTA avoids the requirements for a land use consent under the District Plan. Therefore, the most efficient and timely way to progress with a development is to utilise the existing designation as much as possible without encroaching on other land.

- The traffic signals is the most favourable option in this respect, as the designation will not need to be altered.
- The roundabout is the next most favourable option as the designation will only need to be extended a small amount; towards the corner of the petrol station and the orchard.
- The head to head right turn bays and loop road options are the least favourable equally. Both these options require alteration to the designation towards the orchard and from the industrial land on the west side of the state highway.

Outline Plan of Works

An outline plan is not always necessary for works within a designation. Under s176A(2) an outline plan is not necessary if:

- The proposed public work, project, or work has been otherwise approved under the RMA, or
- The details of the proposed public work, project or work, are already incorporated into the designation,
- The territorial authority waives the requirement for an outline plan. This is usually because adequate details sufficient to supply 176A (3) have already been provided in designation.

176A(3) of the RMA requires that an outline plan must show:

a. The height, shape, and bulk of the public work, project or work; and
b. The location on the site of the public work, project or work; and
c. The likely finished contour of the site; and
d. The vehicular access, circulation, and the provision for parking; and
e. The landscaping proposed; and
f. Any other matters to avoid, remedy, or mitigate any adverse effects on the environment.

In this case, sufficient detail of all of the above can likely be provided with the alteration to designation. Discussions will be required with Far North District Council Consents Manager to agree on this approach.

5.2.2 National Environmental Standard for Assessing and Managing Contaminants in Soil (NESCS)

As described above in **Section 3.1.2**, the petrol station is considered basically all land surrounding the intersection is either a formally listed HAIL site or potentially considered a HAIL site.

With the exception of the traffic signals, all options will require some encroachment on HAIL sites. Given that there is no doubt these sites are HAIL sites, the most efficient course of action would be to:

- Proceed with a Stage 2 investigation (sample the soil to determine if contamination is actually present)
- If contamination is present, produce a management plan which will identify how contamination will be managed during works to ensure it is not spread or worsened.
    - Remediation is unlikely to be necessary as the exposure risk to the end user will not raise (i.e. the land will continue to be used as a road, the land will not be used for residential purposes, childcare, food growing etc).

5.2.3 Northland Regional Council

The alignment is primarily on terrestrial land and therefore the design is not heavily constrained by regional rules. However, there is a tributary Tributary of the Kerikeri River (Whiriwhiritoa Stream) approximately 400 m to the south of the intersection.

The Regional Council requires **consent for any culvert longer than 25m**. And any works on the culvert need to consider Fish Passage provisions (as outlined in Section 3.1.1 of this report) and Flooding Provisions (as outlined in 4.2.1 of this report). The Environmental Standards for structures under the plan also apply.

- Environmental Standards are outlined in Section 29.1.11 of the Regional Water and Soil Plan:

    1. The structure does not prevent fish passage under any flow conditions.
    2. Any placement of a new structure from 27 October 2001 shall not take place within any indigenous wetland; and
    3. The repair, alteration, use or removal of an existing structure shall not take place within any indigenous wetland; and
    4. No activity or structure shall adversely affect any area of significant indigenous vegetation or significant habitats of indigenous fauna.
    5. The structure does not cause the diversion, damming or blockage of any river or stream.
    6. The short term visual clarity of any permanently flowing river or wetland shall not be reduced by more than 40% after reasonable mixing, due to sediment or sediment laden discharge originating from the site of the land disturbance activity.
    7. There is no damage to, or restriction of the use of, any existing river or lake protection works, or any other lawfully established structure as a result of this activity.
    8. There is no significant erosion of the bed of the river or lake as a result of the activity.
    9. Any associated embankments are maintained to prevent sediment entering the river or lake.
    10. No contaminants (including but not limited to oil, petrol, diesel, paint or solvent) are released into the water or to the bed of the river or lake from equipment being used for the activity, and no refuelling of equipment takes place on any area of the river or lake bed.
    11. All demolition debris from the river or lake bed structure is removed from the site.
    12. Existing lawful public access rights to and along rivers and lakes are not restricted.
    13. The activity shall not interfere with or destroy any waahi tapu, as defined in the definitions, urupa or any other sites known to the local iwi that are of spiritual or cultural significance to Maori which have been identified to the Council. Should archaeological remains or features be uncovered the activity shall cease and the Regional Council notified as soon as practicable. Also as soon as practicable the Regional Council will then notify the appropriate tangata whenua entity. The activity shall not be recommenced without the authority of the New Zealand Historic Places Trust.

    At this stage **sufficient information is not yet available to determine likelihood of meeting the above criteria**.

5.3 Possible Construction Requirements

Construction methods can only be assumed at this stage, however construction activities with consenting relevance have been assumed in the following sections.

5.3.1 Far North District Council

The district plan is considered by the regional council for noise/vibration limits set in the district plan.

Provided that the construction noise meets the limits specified in NZS 6803:1999 (**Table 1**) and the vibration meets the limits in ISO 4866 (**Table 2**), the activity is permitted.

The noise limits in the industrial and commercial areas are quite lenient as general activities at these locations are not highly noise sensitive (i.e. workers do not need silence to sleep). Therefore it is quite likely that these limits can be met.

Table 1: Recommended Upper Limits for Construction Noise Received in Industrial or Commercial Areas for all Days in the Year

Time Period	Duration of Work		
	Typical Duration L_{eq} (dBA)	Short-Term Duration L_{eq} (dBA)	Long-Term Duration L_{eq} (dBA)
0730 – 1800	75	80	70
1800 - 0730	80	85	75

The vibration limits associated with occupied dwellings do not apply as the site is surrounded by commercial/industrial activities. Therefore the lowest guideline limit applicable is 2 mm/s PPV which is not a complex target to achieve particularly in clay soils. It is likely this limit can be met, however it is standard practice to ensure pre and post work condition surveys are undertaken on adjacent structures and buildings.

Table 2: ISO 4866: 2010 Vibration Guidelines

Receiver	Details	Category A (Peak particle Velocity, PPV)	Category B (Peak particle Velocity, PPV)
Occupied dwellings	Night time (8pm to 6am)	0.3 mm/s PPV	1 mm/s PPV
	Daytime (6am to 8pm)	1 mm/s PPV	5 mm/s PPV
Other occupied buildings	Daytime 0630h - 2000h	2 mm/s PPV	10 mm/s PPV
All other buildings	Vibration - transient	5 mm/s PPV	BS 5228-2* Table B2
	Vibration - continuous		BS 5228-2*

			50% of table B2 values
Underground Services	Vibration – transient	20 mm/s PPV	30 mm/s PPV
	Vibration - continuous	10 mm/s PPV	15 mm/s PPV

5.3.2 Northland Regional Council

The following construction activities are subjected to rules under the Northland Regional Air Quality Plan and the Regional Water and Soil Plan:

- Generation of dust.
  - Rule 9.1.4.2: The discharge of dust into air arising from road construction and maintenance is a **permitted activity** provided that the discharge shall not result in any offensive or objectionable dust deposition, or any noxious or dangerous levels of airborne particulate matter, beyond the boundary of the subject property. Provided dust management measures are in place, these criteria can be complied with.
- A small amount of vegetation clearance (limited vegetation remaining within the envelope).
  - Rule 33.1.1: Any vegetation clearance that is not on erosion prone land, and is not in a Riparian Management Zone, is a **permitted activity**, provided that:
    a) The Environmental Standards in Section 32 are complied with; and
    b) Vegetation clearance by burning does not take place on peat soils, nor on any contiguous area in excess of 5 hectares on other soils.

    It is likely these criteria can be complied with, therefore permitted activity.
- Road construction/widening including excavation and filling.
  - Rule 33.1.3: Any earthworks that are not in a Riparian Management Zone, are a permitted activity, provided that:
    a) The volume moved or disturbed in less than 5,000 m^3 in any 12 month period where the activity is not undertaken on erosion prone land;
    b) The volume moved or distributed is less than 1,000 m^3 in any 12 month period and the surface area of the soil exposed is less than 1,000 m^2 where the activity is undertaken on erosion prone land;
    c) There are no more than minor adverse effects on soil conservation beyond the property boundary; and
    d) The Environmental Standards in Section 32 are complied with.

    It is likely that earthworks will exceed these limits, therefore a **resource consent may be required**.
- Taking, use, damming or diverting of surface water may be required during works:

» Rule 24.3.3: The taking, use, damming or diverting of surface water which does not meet the requirements of the permitted activity rules, or is not covered by the non-complying activity rules, and is not otherwise covered by a rule in any other section of this Plan, is a discretionary activity. It is likely **resource consent may be required for this activity**.

» Rule 34.1.2: Vegetation clearance within the Riparian Management Zone is a permitted activity, provided that:
  a) The Environmental Standards in Section 32 are complied with; and
  b) The vegetation;
    i. Impedes or is likely to impede flood flows; or
    ii. Causes or is likely to cause stream bank erosion; or
    iii. Is a plantation forest planted prior to this Plan becoming operative; or
    iv. Is a plantation forest planted after this Plan became operative and the clearance is outside a setback of 5 m from a water body; or
  c) The vegetation clearance;
    i. Is the minimum necessary to give effect to the permitted activity rules in this Plan; and
    ii. Does not exceed 200 m^2 in total; or
    iii. It is the minimum necessary for track and road maintenance.

  This activity it likely to meet criteria c, and therefore is likely to be **permitted activity**.

» Rule 34.1.3: Earthworks in the Riparian Management Zone are a permitted activity, provided that:
  a) The Environmental Standards in Section 32 are complied with;
  b) The earthworks are the minimum necessary;
    i. To give effect to the permitted activity rules in this Plan; and
    ii. The area of exposed soil is less than 200 m^2 and the volume of earth disturbed is less than 50 m^3; or
    iii. For track or road maintenance;
  c) Following the completion of any earthworks those parts of the Riparian Management Zone that are not required for the permitted activity are reinstated to a stable contour and revegetated as soon as practicable; and
  d) As a result of the earthworks in the Riparian Management Zone there are no adverse flooding or drainage effect on any property owned or occupied by another person.

- Alteration to stormwater; stormwater discharge points may be required.

  » Rule 21.1.1: The diversion and discharge of stormwater by way of an open constructed stormwater collection system or piped stormwater collection system into water or onto or into land where it may enter water, where the stormwater collection system is connected to, or part of, a stormwater system for which a resource consent exists is a permitted activity.

5.3.3 National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health

As described in **Section 4.2.4** the construction has the potential to take place within two HAIL sites and therefor the following constraints from the National Environmental Standards apply.

Rule 8.3: Disturbing the soil of the piece of land is a permitted activity while the following requirements are met:

a) Controls to minimise the exposure of humans to mobilised contaminants must:

   i. Be in place when the activity begins;

   ii. Be effective while the activity is done;

   iii. Be effective until the soil is reinstated to an erosion-resistant state;

b) The soil must be reinstated to an erosion-resistant state within 1 month after the end of the course of sampling for which the activity was done;

c) The volume of the disturbance of the soil of the piece of land must be no more than 25 m^3 per 500 m^2;

d) Soil must not be taken away in the course of the activity, except that:

   i. For the purpose of laboratory analysis, any amount of soil may be taken away as samples;

   ii. For all other purposes combined, a maximum of 5 m^3 per 500 m^2 of soil may be taken away per year;

e) Soil taken away in the course of the activity must be disposed of at a facility authorised to receive soil of that kind;

f) The duration of the activity must be no longer than 2 months;

g) The integrity of the structure designed to contain contaminated soil or other contaminated materials must not be compromised.

It is unlikely that the requirements for volume and timeframe will be met and therefore, the project will require investigation and consent for these activities.

5.4 Affected Parties

In respect to the natural environment, overall it is considered that the existing site is already significantly disturbed, design/construction, provided it occurs in accordance with all recommendations in this report, can likely occur with no more than minor effect on the environment.

- It is of course recommended that consultation occurs with the local tangata whenua

In respect to the built environment, the traffic detours/delays during works can have the potential to negatively impact on the businesses operating adjacent to the site.

- The adjacent business owners should be consulted with and informed of the potential for disruption to their customer base, and how this can be avoided and mitigated.

6 Summary Recommendations

The following key recommendations can be concluded from the above investigation:

6.1 Geotechnical Investigation

- Geotechnical Investigation Activities (provided they roughly align with the assumptions provided in Section 2.1) can proceed as a permitted activity.

6.2 Design and Alignment

- Given that there is no doubt the sites surrounding the intersection are HAIL sites, the most efficient course of action would be to:
  - Proceed with a Stage 2 investigation (sample the soil to determine if contamination is actually present)
  - If contamination is present, produce a management plan which will identify how contamination will be managed during works to ensure it is not spread or worsened.
    - Remediation is unlikely to be necessary as the exposure risk to the end user will not raise (i.e. the land will continue to be used as a road, the land will not be used for residential purposes).
- Pursue an option which requires the least amount of encroachment/disruption on land outside of the existing road designation. The signals or the roundabout option seem to require the least amount of land requirement.
  - This can also be favourable when dealing with HAIL sites, as the less disturbance required in these sites, the less complications arise.
- Works on/adjacent to the Kerikeri River Tributary (Whiriwhiritoa Stream) will need to consider fish passage impacts (recommendations have been provided in Section 3.1.1), and flooding impacts (recommendations have been provided in Section 4.2.1)
- Given that the site consists of fine clay soils focus should be placed on preventing erosion as sediment capture devices are almost ineffective against fine soil. Design and works should avoid large cuttings, steep slopes or steep/long drainage paths.
- Tangata Whenua should be consulted and involved in design, particularly regarding any works within watercourses.

6.3 Construction

- Given that the site is a state highway and is surrounded by commercial/industrial uses, noise/vibration management requirements will not be highly restrictive. The works would be likely to meet permitted criteria, however pre and post work condition surveys on surrounding buildings/structures are still recommended.

- The risk of encountering archaeology on this site is considered low, therefore works can proceed under an Accidental Discovery Protocol.
- The adjacent business owners should be consulted with and informed of the potential for disruption to their customer base, and how this can be avoided and mitigated.

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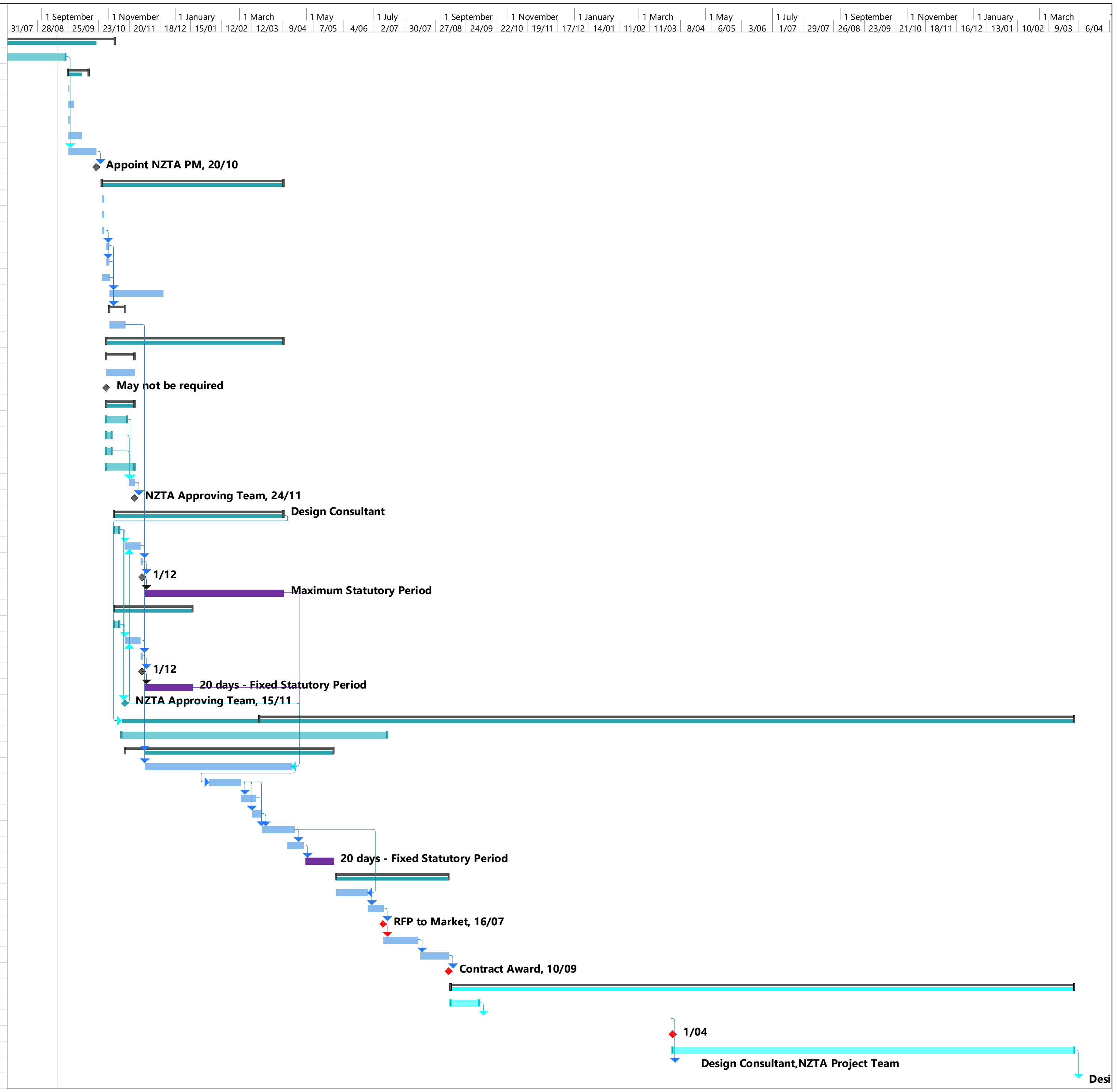
APPENDIX N
Indicative Programme

ID		Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1			**PROJECT DEVELOPMENT**	**416 days**	**Fri 1/04/16**	**Mon 6/11/17**		**NZTA Project Team**
2			Business Case Preparation	212 days	Thu 1/12/16	Fri 22/09/17		Design Consultant,NZTA
3			**Consenting _ Initial Liaison**	**15 days**	**Mon 25/09/17**	**Fri 13/10/17**		**Design Consultant**
4			Engage Design Consultant to commence initial liaison with	1 day	Mon 25/09/17	Mon 25/09/17		NZTA Project Team
5			FNDC - Confirm Statutory Application Required (NoR or	5 days	Mon 25/09/17	Fri 29/09/17		Design Consultant
6			Contaminated Land Follow up - Service Station	2 days	Mon 25/09/17	Tue 26/09/17		Design Consultant
7			FNDC / NRC - Contaminated Land Desktop Study (PCS)	10 days	Mon 25/09/17	Fri 6/10/17		Design Consultant
8			Business Case Approval	20 days	Mon 25/09/17	Fri 20/10/17	2	NZTA Approving Team
9			Appoint Project Manager (NZTA)	0 days	Fri 20/10/17	Fri 20/10/17	8	NZTA Project Team
10			**PRE-IMPLMENTATION**	**102 days**	**Thu 26/10/17**	**Mon 9/04/18**		
11			Engage P&I Representative (NZTA)	2 days	Thu 26/10/17	Fri 27/10/17		NZTA Project Manager
12			Engage Regional/National Office (NZTA)	2 days	Thu 26/10/17	Fri 27/10/17		NZTA Project Manager
13			Appoint Consultant: Design & Stakeholder Engagement	2 days	Thu 26/10/17	Fri 27/10/17		NZTA Project Manager
14			Project Charter preparation	3 days	Mon 30/10/17	Wed 1/11/17	13	Design Consultant,NZTA
15			Consultant's Project Quality Plan	3 days	Mon 30/10/17	Wed 1/11/17	13	Design Consultant
16			Update Risk Register	5 days	Thu 26/10/17	Wed 1/11/17		NZTA Project Team,Design
17			Property Acquisition	35 days	Thu 2/11/17	Wed 20/12/17	14	Property Consultant
18			**Preliminary Design**	**10 days**	**Thu 2/11/17**	**Wed 15/11/17**	**14,15,16**	
19			Design Development for applications (NOR, AtD, RC)	10 days	Thu 2/11/17	Wed 15/11/17		
20			**Consenting**	**100 days**	**Mon 30/10/17**	**Mon 9/04/18**		
21			**Contaminated Land Investigation - Orchard**	**20 days**	**Mon 30/10/17**	**Fri 24/11/17**		**Design Consultant**
22			Preliminary Site Investigation	20 days	Mon 30/10/17	Fri 24/11/17		
23			Detailed Site Investigation	0 days	Mon 30/10/17	Mon 30/10/17		
24			**Technical Assessments to Support Statutory Approvals**	**20 days**	**Mon 30/10/17**	**Fri 24/11/17**		
25			Prepare Draft Assessment of Environmental Effects (AEE)	15 days	Mon 30/10/17	Fri 17/11/17		Design Consultant
26			Prepare Draft Consent Conditions	5 days	Mon 30/10/17	Fri 3/11/17		Design Consultant
27			Prepare Draft Environmental and Social Management	5 days	Mon 30/10/17	Fri 3/11/17		Design Consultant
28			Prepare Draft Cultural Impact Assessment (CIA)	20 days	Mon 30/10/17	Fri 24/11/17		Iwi
29			Submit recommendation to Lodge Statutory Applications to	5 days	Mon 20/11/17	Fri 24/11/17	25,26,27	NZTA Project Manager
30			Approval to recommendation to Lodge Statutory	0 days	Fri 24/11/17	Fri 24/11/17	29	NZTA Approving Team
31			**NoR / Alteration to Designation - FNDC**	**95 days**	**Mon 6/11/17**	**Mon 9/04/18**		**Design Consultant**
32			Alteration to Designation - preparation	5 days	Mon 6/11/17	Fri 10/11/17		
33			Pre-Lodgement consultation (PEP)	10 days	Thu 16/11/17	Wed 29/11/17	32,43	
34			Submit and obtain approval to application	2 days	Thu 30/11/17	Fri 1/12/17	33	
35			Lodgement Application	0 days	Fri 1/12/17	Fri 1/12/17	34	
36			Statutory Timeframe for Approval	75 days	Mon 4/12/17	Mon 9/04/18	35	
37			**Resource Consent - NRC**	**40 days**	**Mon 6/11/17**	**Tue 16/01/18**		**Design Consultant**
38			Resource Consent application prep	5 days	Mon 6/11/17	Fri 10/11/17		
39			Pre-Lodgement consultation (PEP)	10 days	Thu 16/11/17	Wed 29/11/17	38,32,43	
40			Submit and obtain approval to application	2 days	Thu 30/11/17	Fri 1/12/17	39	
41			Lodgement - Resource Consent	0 days	Fri 1/12/17	Fri 1/12/17	40	
42			Statutory Timeframe for Approval (Limited Notified)	20 days	Mon 4/12/17	Tue 16/01/18	41	
43			NZTA Reviews / Approvals	3 days	Mon 13/11/17	Wed 15/11/17	32,38	NZTA Approving Team
44			**IMPLEMENTATION**	**517 days**	**Mon 19/03/18**	**Wed 1/04/20**	**31**	
45			Community & Stakeholder Engagement	157 days	Mon 13/11/17	Fri 13/07/18		Design Consultant,NZTA
46			**Detailed Design**	**120 days**	**Thu 16/11/17**	**Fri 25/05/18**	**19**	
47			Detailed Design	80 days	Mon 4/12/17	Mon 16/04/18	19,36FF+5 days,4	
48			Design Review	20 days	Thu 1/02/18	Thu 1/03/18	47FS-50 days	
49			Safety Audit	10 days	Fri 2/03/18	Thu 15/03/18	48	
50			Safety in Design Workshop	7 days	Mon 12/03/18	Tue 20/03/18	48FS+6 days	
51			Design Finalisation	20 days	Wed 21/03/18	Thu 19/04/18	48,49,50	
52			Outline Plan of Works Prep	10 days	Fri 13/04/18	Fri 27/04/18	51FS-5 days	Design Consultant
53			Outline Plan of Works - FNDC	20 days	Mon 30/04/18	Fri 25/05/18	52	
54			**Procurement**	**74 days**	**Mon 28/05/18**	**Fri 7/09/18**		
55			Detailed Design and Specification For Request for Quote (RFQ)	20 days	Mon 28/05/18	Mon 25/06/18	51FF+2 days	Design Consultant
56			RFQ Documents - NZTA Reviews / Approvals	10 days	Tue 26/06/18	Mon 9/07/18	55	
57			RFP to market (competitive tender - price quality)	0 days	Mon 9/07/18	Mon 9/07/18	56	
58			Close of RFP	24 days	Tue 10/07/18	Fri 10/08/18	57	
59			Preferred Respondent announced	20 days	Mon 13/08/18	Fri 7/09/18	58	
60			Contract Award	0 days	Fri 7/09/18	Fri 7/09/18	59	
61			**Physical Works**	**396 days**	**Mon 10/09/18**	**Wed 1/04/20**		**Contractor,Design**
62			Physical Works - enabling works	20 days	Mon 10/09/18	Fri 5/10/18		
63			Physical Works - intersection improvement, Klinac Lane	113 days	Mon 8/10/18	Fri 29/03/19	62	
64			Handover of Capital Project	0 days	Mon 1/04/19	Mon 1/04/19		
65			Defects Liability Period	263 days	Mon 1/04/19	Wed 1/04/20		
66			**POST-PROJECT EVALUATION**	**15 days**	**Mon 1/04/19**	**Fri 19/04/19**	**63**	**Design Consultant,NZTA**
67			**PROJECT CLOSE**	**5 days**	**Thu 2/04/20**	**Wed 8/04/20**	**65**	**Design Consultant,NZTA**



APPENDIX O
Road Safety Audit Report

NZ TRANSPORT AGENCY
WAKA KOTAHI

NCC consulting engineers

Robinson Transportation Consulting

SH10 / Waipapa Road Intersection Improvements

Road Safety Audit
Scheme/Preliminary Design

July 2017

NCC consulting engineers

Robinson Transportation Consulting

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	Mike Sullivan	Rae Sullivan	28/07/17	Mike Sullivan		20/07/17
B		Bruce Robinson				24/07/17
C						
D						

Contents

1. Introductory Statement

1.1 Introduction

This report presents the findings of a scheme/preliminary design stage safety audit for the proposed SH10 / Waipapa Road intersection improvements at Waipapa, Far North.

The project provides a new single lane roundabout in place of a priority cross-roads intersection of SH10, Waipapa Road and Waipapa Loop Road. Corridor improvements along SH10 are also proposed, comprising of widening and the marking of a central flush median and a shared path on the eastern side of SH10.

The primary purpose of the project is to improve the efficiency of the SH10 / Waipapa Road intersection.

The proposed preliminary design has been prepared by Opus International Consultants, Whangarei.

1.2 Audit team

The audit team comprised of:

Bruce Robinson (Team Leader)	Pr.Eng. (RSA), M.Eng., B.Sc.Eng. (Civil) Robinson Transportation Consulting, Tauranga
Mike Sullivan	CPEng, BE (Civil), MIPENZ Director NCC – Consulting Engineers, Whangarei.
David Spoonley	BEng, CEng, CIHT MICE Project Manager / Road Safety Engineer NCC – Consulting Engineers, Whangarei

1.3 Previous audits

Mike Sullivan carried out a scheme/preliminary design stage safety audit on a previous roundabout proposal at the site in February 2010. Bruce Robinson also carried out a design review on the 2010 proposal for NZ Transport Agency. The 2017 proposed design is a substantial change from the 2010 proposal and this audit is, therefore, the first audit for the current proposal.

1.4 Project description

The project is located on SH10, Waipapa, from the Kerikeri River Bridge (RP 17/2.02) to the northern urban limit of the township (RP 17/3.50).

The project comprises of:

- A 28 m inscribed diameter four-legged roundabout at the intersection of SH10, Waipapa Road and Waipapa Loop Road;
- Widening of a 1.5 km length of SH10 and the provision of a 2.5 m wide central flush median with right turn bays, 1.5 m wide shoulders and a 2.5 m wide shared path along the eastern side of the SH10 between the Kerikeri River Rest Area and Waipapa Road; and
- The closure of the northern intersection of Waipapa Loop Road with SH10, with a cul-de-sac treatment on the end of Waipapa Loop Road.

The Far North District Council is proposing a new link road (Maritime Way / Klinac Lane) from Waipapa Loop Road to the Waipapa commercial area west of SH10. This forms part of the wider road network plan, but is excluded from the scope of this audit.

1.5 Audit methodology

This audit has been carried out for Sebastian Reed, Transport Planner, NZ Transport Agency.

The audit follows the guidelines contained within the NZ Transport Agency document "Road Safety Audit Procedures for Projects, Guidelines, Interim Release, May 2013" and is complemented by the auditors' experience with other audits.

This audit should not be regarded as a complete "quality check" of the project. It focuses essentially on safety issues that are considered significant regarding the proposed design.

The auditors have identified road safety concerns and have made recommendations about corrective actions. Whilst these recommendations may indicate the nature or direction of a solution, they do not provide specific details of how to address or resolve that concern.

Responsibility for the solution of any safety issue identified in this audit remains with the designer.

1.6 Project documentation

The audit team was provided preliminary design plans that were prepared by Opus International Consultants, Whangarei, in May/June 2017 (drawing numbers 1-11751.00, sheets X01 (B), X03 (E), X20 (C), X21 (C), X25 (C), X30 (A), X31 (A), X33 (A) and X35 (A). Copies of these drawings are contained in Appendix A.

1.7 Briefing meeting

Mike Sullivan and Dave Spoonley held an entry meeting with the Opus Design Manager, Chris Parker, on 3rd July 2017. Opus raised the following issues relating to the status of the proposed design and the scope of the safety audit:

- The level of design is at the concept/preliminary design stage. The next stage of the project will be design and implementation;
- The roundabout is likely to proceed, however, the SH10 corridor improvements are not yet certain;
- The Klinac Lane / Maritime Way connection to the Waipapa commercial area is a Far North District Council project and is not included in the NZ Transport Agency project. It is shown on the plans for completeness of the overall road network, but excluded from the scope of the audit;
- The closure of the northern intersection of Waipapa Loop Road with SH10, with a cul-de-sac treatment on the end of Waipapa Loop Road is proposed. Opus would like the audit team to comment on an option for left turn treatments at this intersection, noting that dairy tankers access a farm on Waipapa Loop Road;
- Skippers Lane is one-way in the northbound direction, with a turnaround north of the northern access point;
- Route lighting is proposed with the corridor improvements;
- The project is not reviewing the existing speed limits, although NZ Transport Agency are proposing a 60 km/h limit through the township as a separate exercise;
- Vehicle turning paths are provided for an 18 m semi-rigid, except for Waipapa Loop Road that is designed for a large rigid truck;
- The project business case is due for completion in July 2017 with detailed design to follow, with construction due to start in October 2018.

1.8 Audit and site visit

The auditors carried out a desk-top audit and site visit on the 5th July. The weather was fine for the site visit.

1.9 Ranking system

The potential road safety problems identified have been ranked as follows:

The probable crash frequency is qualitatively assessed based on expected exposure (how many road users will be exposed to a safety issue) and the probability of a crash resulting from the presence of the issue. The likely severity of a crash outcome is qualitatively assessed based on factors such as expected speeds, type of collision, and type of users involved.

Reference to historic crash rates or other research for similar elements of projects, or projects as a whole; have been drawn on where appropriate to assist in understanding the likely crash types, frequency and likely severity that may result from a particular concern.

The frequency and severity ratings are used together to develop a combined qualitative ranking for each safety issue using the Concern Assessment Rating Matrix in **Table 1** below. The qualitative assessment requires professional judgement and a wide range of experience in projects of all sizes and locations.

Table 1: Assessment Matrix

Likelihood of Fatality or Serious Injury	Probability of a Crash Occurring			
	Frequent	Common	Occasional	Infrequent
Very Likely	Serious	Serious	Significant	Moderate
Likely	Serious	Significant	Moderate	Moderate
Unlikely	Significant	Moderate	Minor	Minor
Very Unlikely	Moderate	Minor	Minor	Minor

While all safety concerns should be considered for action, the client or nominated project manager will make the decision as to what course of action will be adopted based on the guidance given in this ranking process with consideration to factors other than safety alone. As a guide, a suggested action for each concern category is given in **Table 2** below.

Table 2: Categories of Concern

CONCERN	Suggested Action
Serious	Serious concern that must be addressed and requires changes to avoid serious safety consequences.
Significant	Significant concern that should be addressed and requires changes to avoid serious safety consequences.
Moderate	Moderate concern that should be addressed to improve safety
Minor	Minor concern that should be addressed where practical to improve safety.

In addition to the ranked safety issues it is appropriate for the safety audit team to provide additional comments with respect to items that may have a safety implication but lie outside the scope of the safety audit. A comment may include items where the safety implications are not yet clear due to insufficient detail for the stage of the project, items outside the scope of the audit such as existing issues not impacted by the project or an opportunity for improved safety but not necessarily linked to the project itself. While typically comments do not require a specific recommendation, in some instances the auditors may give suggestions.

1.10 Decision tracking process

Decision tracking is an important part of the road safety audit process. A decision tracking table is embedded into the report format at the end of each set of recommendations to be completed by the designer, safety engineer and client for each issue documenting the designer response, client decision (and asset manager's comments in the case where the client and asset manager are not one and the same) and action taken.

A copy of the report including the designer's response to the client and the client's decision on each recommendation shall be given to the road safety audit team leader as part of the important feedback loop. The road safety audit team leader will disseminate this to team members.

1.11 Disclaimer

The findings and recommendations in this report are based on an examination of available relevant plans, the specified road and its environs, and the opinions of the audit team. However, it must be recognised that eliminating safety concerns cannot be guaranteed since no road can be regarded as absolutely safe and no warranty is implied that all safety issues have been identified in this report. Safety audits do not constitute a design review or an assessment of standards with respect to engineering or planning documents. Readers are urged to seek specific technical advice on matters raised and not rely solely on the report.

While every effort has been made to ensure the accuracy of the report, it is made available on the basis that anyone relying on it does so at their own risk without any liability to the safety audit team or their organisations.

2 Safety Audit Findings and Recommendations

2.1 Speed management

Opus has advised that the project does not include reviewing the existing speed limits, although the NZ Transport Agency are proposing a 60 km/h limit through the township as a separate exercise. The site currently has a 70 km/h speed limit, which the auditors consider is too high for the urban area of Waipapa. Therefore, the auditors support a review of the speed limit and note the need to ensure that any changes to the limit are safe, appropriate and consistent for the road environment. This speed limit review would also help determine the appropriate design speed for the project.

Recommendation

Ensure that any speed limit changes result in a limit that is safe, appropriate and consistent for the road environment.

Overall Rating: **Minor**			
Frequency Rating:	**Occasional**	*Severity Rating:*	**Unlikely**
Designer Response: Agree.			
Safety Engineer: see client decision			
Client Decision: The current speed limit is 70km/hr. The Safe and appropriate speed is 50km/hr but although not a priority it will be considered under a 3 yr programme with other TLA roads in the area. It cannot be assumed that this section of highway will have priority, however it appears to be logical to rationalise the SH corridor at the same time the project gets underway			
Action Taken: The potential of an intersection improvement at the intersection has been provided to the NZTA team managing the speed management process, to ensure as much alignment as possible. Engagement with this team (speed management review process) will continue during the design phase.			

2.2 Intersection form

A 28 m inscribed diameter four-legged roundabout is proposed at the intersection of SH10, Waipapa Road and Waipapa Loop Road (refer to **Figure 1**). No details have been provided regarding other options that have been considered for the form of treatment for the intersection. Other treatments could include reconfiguration of a priority controlled intersection, signalisation, alternative roundabout configurations or an alternative location for the intersection. Therefore, the auditors are unable to comment on whether the form and location of the roundabout is the best solution in terms of a safe system design for this specific location.

The consideration of alternative roundabout configurations is desirable, as the skewed configuration results in faster left turn layouts on the obtuse angled exits. Faster exit speeds increase the likelihood of loss of control type crashes and the potential for higher speed crashes involving pedestrians crossing the road near the exits. An alternative configuration may also be useful in addressing specific safety concerns raised in this audit relating to the proposed design.

The auditors note that in general terms, a well-designed roundabout can provide an appropriate safe system design for intersection conflicts and that a roundabout at the site may improve safety by reducing driver frustration and poor gap decisions for drivers exiting Waipapa Road.

Figure 1: The proposed roundabout at the intersection of SH10, Waipapa Road and Waipapa Loop Road.

Recommendation

Consider alternative roundabout configurations and/or locations, to improve safety performance and to address other specific safety concerns raised in this audit. These alternatives could include increasing the roundabout inscribed diameter or making the roundabout elliptical.

Overall Rating: **Moderate**			
Frequency Rating:	**Occasional**	*Severity Rating:*	**Likely**
Designer Response: Alternative configurations have been considered, including an elliptical roundabout. While it is agreed that it may be possible to design out some of the issues by re-locating the intersection, it has been found that this will have other effects, such as impact on the community, businesses and/or additional cost.			
Safety Engineer: see client decision			
Client Decision: NZTA accepts the designer response (ADR) and confirms that alternative configurations have been considered and will be confirmed by NZTA before moving to design phase, where it is expected that some of these safety issues will be addressed			
Action Taken: Issue highlighted and to be addressed at detailed design phase.			

2.3 Corridor central flush median

The project includes the widening of a 1.5 km length of SH10 and the provision of a 2.5 m wide central flush median, 1.5 m wide shoulders and a 2.5 m wide shared path along the eastern side of the road between the Kerikeri River Rest Area and Waipapa Road (refer to **Figures 2 and 3**).

The auditors note that this section of SH10 is a monitored crash reduction study site (CRS Site 36: Kahikatearoa Lane). Crash commonality includes rear end and turning crash movements, attributable to the frequency of high use accesses and an inconsistent road cross section. The proposed widening and provision of a central flush median is an appropriate treatment to address the crash history. Opus has advised that the inclusion of the SH10 corridor improvements in the project are not yet certain. The auditors recommend that these improvements be included in the project to address the crash history and provide a safe and consistent road environment through this length of SH10. Should this work not be included, then the auditors recommend that the median be provided south of the roundabout to the existing right turn bay at the Gull Service Station as a minimum treatment (refer to **Figure 2**).

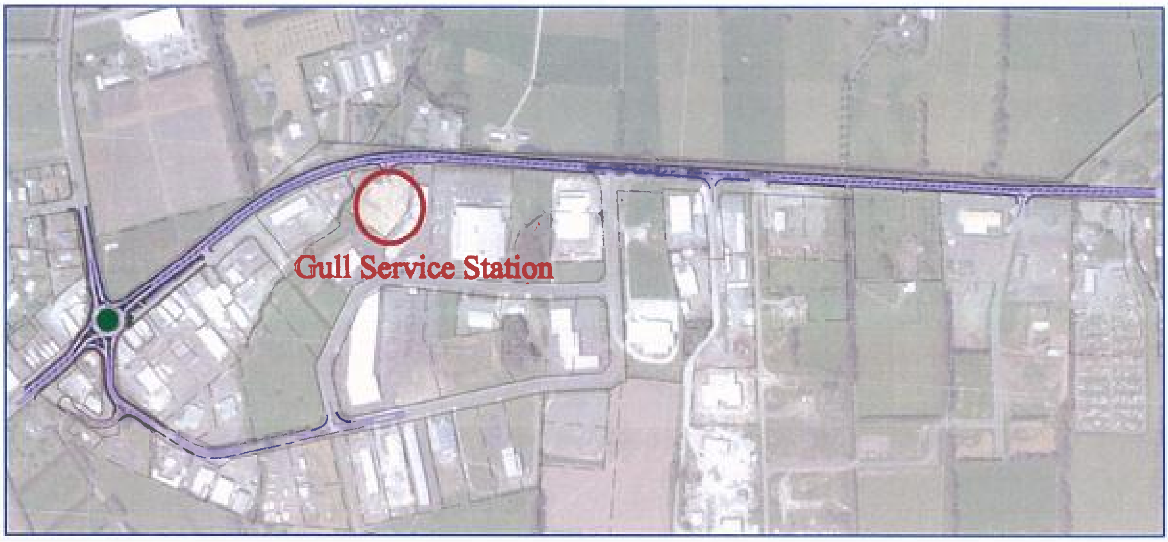

Figure 2: The proposed central flush median corridor treatment.

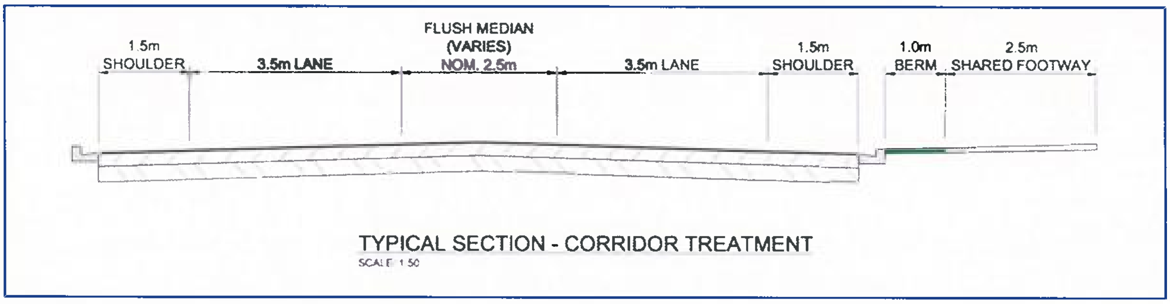

Figure 3: The typical cross section for the proposed central flush median corridor treatment.

Recommendation

Include the SH10 corridor improvements in the project implementation. Should this work not proceed, then provide a central flush median south of the roundabout to the existing right turn bay at the Gull Service Station.

Overall Rating: **Significant**			
Frequency Rating:	**Frequent**	*Severity Rating:*	**Unlikely**
Designer Response: Agree. The corridor improvements have been included in the Detailed Business Case, which will form the basis of the funding application.			
Safety Engineer: see client decision			
Client Decision: NZTA ADR but requests the designer to reconfirm a more accurate cost for extending the flush median.			
Action Taken: Issue highlighted and to be addressed at detailed design phase.			

2.4 Waipapa Loop Road left turn lane to SH10

There is an acute angle left turn free flow lane from Waipapa Loop Road to SH10 (refer to **Figure 4**). This creates an unorthodox layout for vehicles and pedestrians that introduces additional crossing points for pedestrians. This complicates pedestrian wayfinding, increases the number of vehicle versus pedestrian conflicts and increases difficulties for pedestrians to make safe decisions for crossing the road (on occasions the intended route of an approaching vehicle may be unclear until the last moment). These factors increase the likelihood of vehicle versus pedestrian crashes that result in high injury severity and is an unsafe configuration for pedestrians in an urban environment.

The auditors consider that the free flow left turn lane should be removed, with a design similar to the left turn from Waipapa Road to SH10 (south) provided as a safer alternative. This may be able to be achieved by increasing the inscribed diameter of the roundabout or by providing an elliptical central island.

Figure 4: The free flow left turn from Waipapa Loop Road to SH10.

Recommendation

Remove the free flow left turn from Waipapa Loop Road to SH10 and consider alternative geometric configurations for the roundabout to accommodate left turns within the roundabout circulatory roadway.

Overall Rating: **Significant**			
Frequency Rating:	**Common**	*Severity Rating:*	**Likely**
Designer Response: Agree. This will be confirmed during Detailed Design. A scheme has been prepared for this option			
Safety Engineer: see client decision			
Client Decision: Designer to discuss with NZTA PM and SE. Is the designer agreeing to remove the free left turn and for what reasons			
Action Taken: The new scheme, reflecting the concerns above has been developed and is considered the preferred option.			

2.5 Pedestrian crossing points at roundabout

There are pedestrian crossing points on the splitter islands into the roundabout. On Waipapa Loop Road and SH10 north these are located on the obtuse angled leg of the skewed roundabout (refer to **Figure 4**). The obtuse angle of the left turns could lead to higher vehicle speeds on the left turn and increase the crash severity for pedestrians crossing the road. The crossings are also very close to the departure point of the roundabout, particularly on the SH10 north leg. This could lead to confusion for pedestrians to determine the intended direction of an approaching vehicle or for drivers to not anticipate a pedestrian crossing at the exit of the roundabout. This issue needs to be assessed together with the issues raised in **Section 2.4** above.

For each leg of the roundabout the crossing points within the entry islands are not perpendicular to the opposite crossing point (refer to **Figure 5**). Visually impaired pedestrians will have difficulty in orientating themselves across the road to the kerb ramps and could instead be directed into conflicts with vehicles.

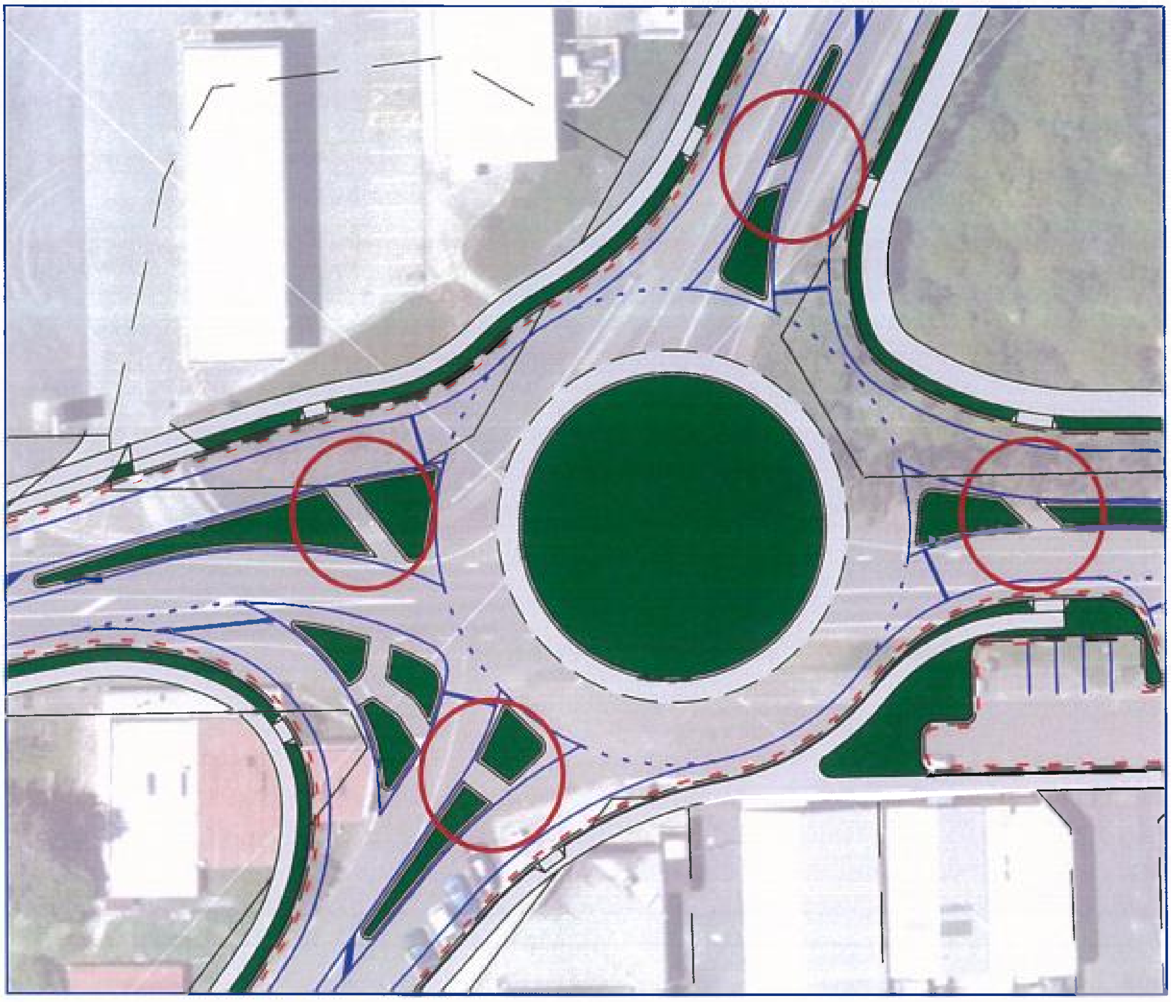

Figure 5: The crossing points within the entry islands are not perpendicular to the opposite crossing points.

Recommendations

a) *Move the pedestrian crossing points on the entry islands further back on the Waipapa Loop Road and SH10 north approaches.*

Overall Rating: **Significant**			
Frequency Rating:	**Common**	*Severity Rating*	**Likely**
Designer Response: Noted. The location of the pedestrian crossing points will need to balance the issues raised above with the pedestrian desire lines.			
Safety Engineer: see client decision			
Client Decision: Needs discussion. The recommended location of a pedestrian crossing point on a roundabout is one vehicle length behind the limit line. Discuss with NZTA PM and SE			
Action Taken: Noted, to be refined at detailed design.			

b) *Orientate the pedestrian crossing points on the entry islands perpendicular to the opposite crossing point.*

Overall Rating: **Significant**			
Frequency Rating:	**Common**	*Severity Rating:*	**Likely**
Designer Response: Pedestrian crossing points are angled to encourage pedestrians to face oncoming traffic. Visually impaired pedestrians will be guided by tactile paving, which will be aligned.			
Safety Engineer: see client decision			
Client Decision: NZTA ADR but considers that there is a compromise here The splays do look more angled than they may need to be. Scheme Dwg to be amended.			
Action Taken: Noted, approach to be confirmed at detailed design.			

2.6 Waipapa Loop Road north / SH10 intersection

The closure of the northern intersection of Waipapa Loop Road with SH10, with a cul-de-sac treatment on the end of Waipapa Loop Road is proposed (refer to **Figure 6**). Opus has asked the audit team to comment on an option for left in/left out treatments at this intersection, noting that dairy tankers access a farm on Waipapa Loop Road. The auditors favour a left in/left out only configuration for the intersection, as:

- This will be beneficial in addressing the safety concerns associated with the acute angle left turn free flow lane from Waipapa Loop Road to SH10, discussed in **Section 2.4** above; and
- Turning movements for dairy tankers will be more easily provided for at this location, rather than the acute angle at the roundabout.

The proposed configuration for the intersection of Waipapa Loop Road with Maritime Way will not provide for the tracking of a dairy tanker and will need to be revised if the proposed cul-de-sac is constructed. The intersection throat is relatively large. The provision of a throat island and pedestrian refuge would be beneficial to reduce vehicle speeds and walking distances through the intersection.

Figure 6: The proposed closure of the northern intersection of Waipapa Loop Road with SH10, with a cul-de-sac treatment.

Recommendations

a) *Provide a left in/left out configuration at the Waipapa Loop Road / SH10 intersection.*

Overall Rating: **Significant**			
Frequency Rating:	**Common**	*Severity Rating:*	**Likely**
Designer Response: Agree in part. May be left out only. To be determined through Detailed Design.			
Safety Engineer: see client decision			
Client Decision: NZTA concurs with the designer response, however providing a left turn out will encourage rat running and increase the number of conflicts and this needs to be avoided. To be discussed with NZTA			
Action Taken: Noted, public feedback on this issues was also mixed. Decision on treatment to made at detailed design.			

b) *Provide adequate tracking for dairy tankers to access the farm on Waipapa Loop Road.*

Overall Rating: **Moderate**			
Frequency Rating:	**Common**	*Severity Rating:*	**Unlikely**
Designer Response: Agree.			
Safety Engineer: see client decision			
Client Decision: NZTA ADR			
Action Taken: Noted, to be incorporated at detailed design.			

c) *Consider providing a throat island and pedestrian refuge at the intersection of Waipapa Loop Road and Maritime Way.*

Overall Rating: **Moderate**			
Frequency Rating:	**Common**	*Severity Rating:*	**Unlikely**
Designer Response: Agree. To be considered during Detailed Design.			
Safety Engineer: see client decision			
Client Decision: NZTA considers that the volume using the cul de sac will be low and a throat island is not required, however if there is a connection to the SH, concerns raised in 2.6a will occur, and a throat island (solid or painted) to provide turning discipline is required. In any event, NZTA to confirm decision with FNDC but ensure that dairy tanker tracking without encroachment over centrelines is proved.			
Action Taken: Noted, to be considered at detailed design.			

2.7 Speed management through the roundabout

The Waipapa Road and SH10 south entries into the roundabout have relatively low deflection (refer to **Figure** 7). Drivers will be able to enter the roundabout at higher speeds and be forced to slow quickly into the circulatory lane. This could increase the likelihood of loss of control. Best practice is to offset the approach entry paths to the left of the central island to manage entry speeds into the circularly path with the minimum vehicle speed being achieved at the roundabout limit line.

The skewed roundabout configuration results in faster left turn layouts on the obtuse angled exits. Faster exit speeds increase the likelihood of loss of control type crashes and the potential for higher speed crashes involving pedestrians crossing the road near the exits.

The design should include the consideration of the speed path profiles through the roundabout to demonstrate safe speeds, through both the circulatory path and on the higher speed left turns that are on the obtuse angles.

The roundabout central island also includes an apron, although the vehicle tracking plan indicates that the design vehicle does not track the apron (refer to **Figure 8**). A kerb is detailed between the circulatory lane and the apron (refer to **Figure 9**). Kerbs next to roundabout islands can be hazardous for motorcyclists, particularly if the entry path offsets, referred to above, have not been provided. The apron should either be removed if it is not required for vehicle tracking, or the kerb removed to improve safety for motorcyclists.

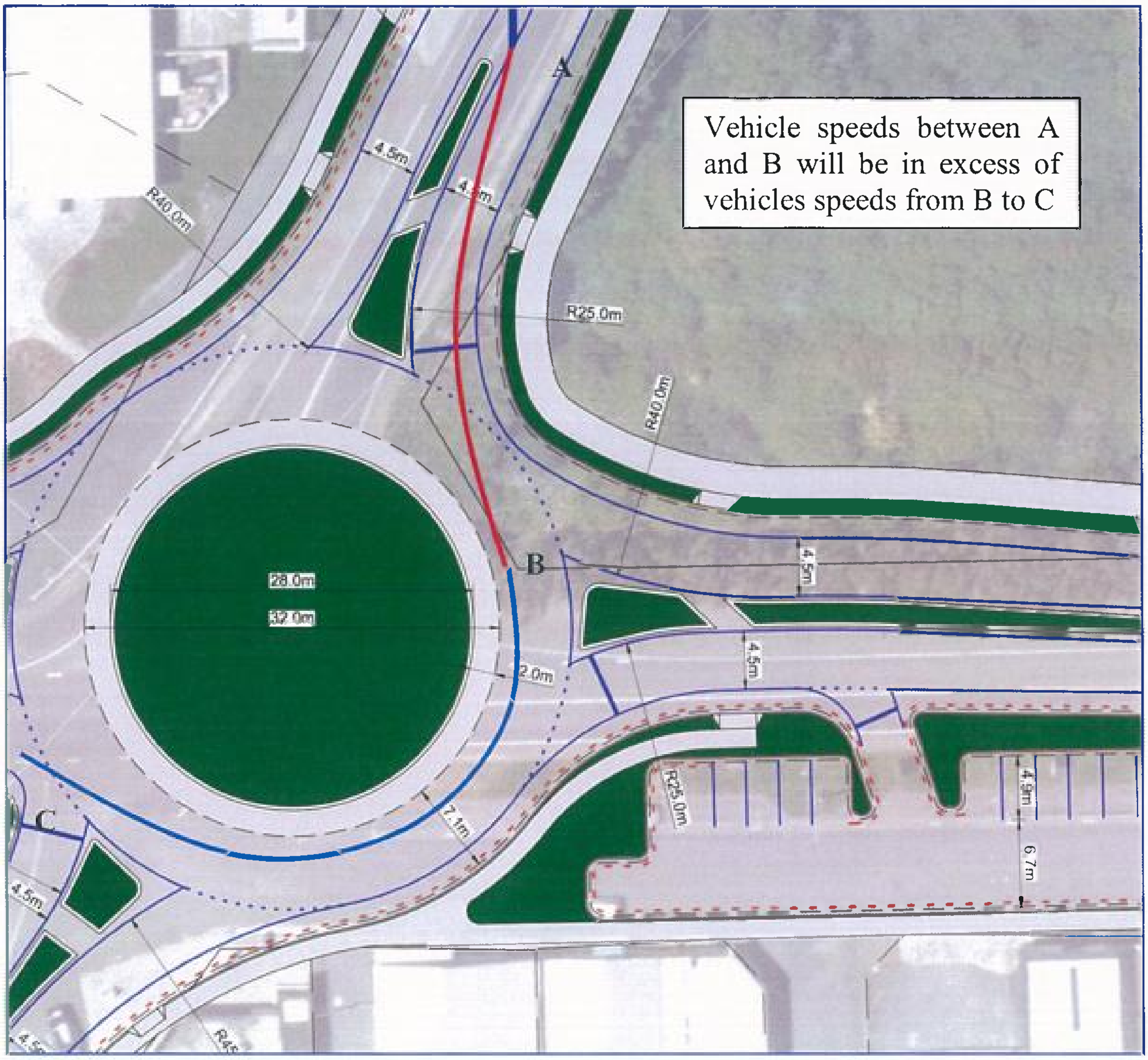

Figure 7: The Waipapa Road and SH10 south entries into the roundabout.

Figure 8: The roundabout vehicle tracking plan.

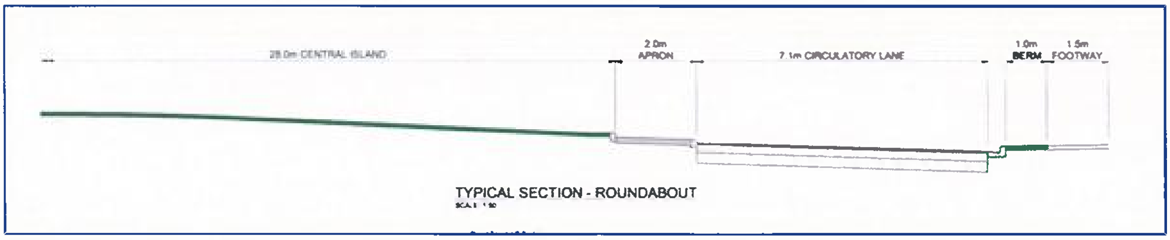

Figure 9: The typical section through the roundabout.

Recommendations

a) *Assess the speed path profiles through the roundabout and provide safe speeds, through both the entry-circulatory path, which should be sufficiently offset from the central island, and on the higher speed left turns that are on the obtuse angles.*

Overall Rating: **Significant**			
Frequency Rating:	**Common**	*Severity Rating:*	**Likely**
Designer Response: Agree. To be addressed at Detailed Design.			
Safety Engineer: see client decision			
Client Decision: NZTA ADR and to be discussed with the design team.			
Action Taken: Noted, to be refined at detailed design.			

b) *Review the need for an apron on the roundabout island. If it is retained, remove the kerb between the circulatory lane and the apron.*

Overall Rating: **Moderate**			
Frequency Rating:	**Occasional**	*Severity Rating:*	**Likely**
Designer Response: Agree. To be reviewed at Detailed Design.			
Safety Engineer: see client decision			
Client Decision: Apron to remain and kerb removal is required			
Action Taken: Noted, to be refined at detailed design.			

2.8 Pedestrian desire line SH10 east to Skippers Lane

There is a pedestrian desire line from SH10 east to Skippers Lane that is not provided for with a footpath link (refer to **Figure 10**). Consideration should be given to providing a footpath up to the Skippers Lane access and providing a raised platform across Skippers Lane to the existing footpath.

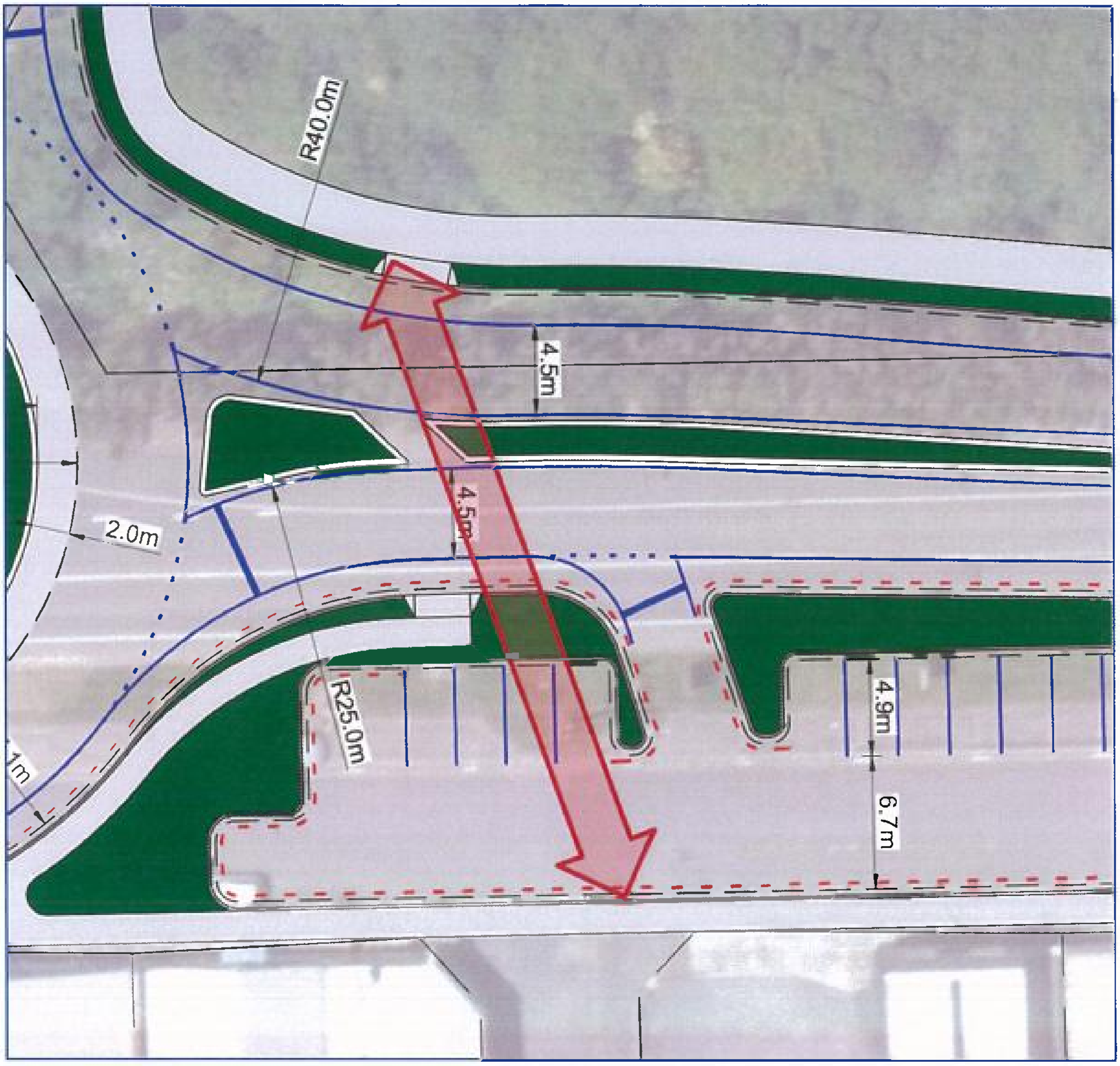

Figure 10: The pedestrian desire line from SH10 to Skippers Lane.

Recommendation

Provide a more direct footpath link from SH10 east to Skippers Lane, possibly with a raised platform across Skippers Lane. Ensure that the path is aligned with the pedestrian desire lane.

Overall Rating: **Moderate**			
Frequency Rating:	**Occasional**	*Severity Rating:*	**Likely**
Designer Response: Agree in part. Pedestrian facilities to be assessed as part of Detailed Design.			
Safety Engineer: see client decision			
Client Decision: NZTA ADR but amend plan now to show an extension of the footpath depth to the kerbline at the crossing shown above. It is understood that the			

roundabout may have been slightly moved to the south which has already change the footpath location. Designer to resolve before going to detailed design with PM and SE
Action Taken: Noted, to be refined at detailed design. Although a raised platform may limit parking which is already any issues for adjacent businesses.

2.9 Footpath proximity to the left turn from SH10 to Waipapa Loop Road

The footpath is directly next to the road through the left turn from SH10 into Waipapa Loop Road (refer to **Figure 11**). The obtuse angled exit from the roundabout is likely to increase vehicle speeds turning left and there is the potential for drivers to lose control, or cut the corner", mount the footpath and hit pedestrians. It is desirable to offset the footpath from the road with a grass berm serving as a buffer, as detailed on the other quadrants of the roundabout, to improve pedestrian safety.

Figure 11: The footpath is next to the road through the left turn from SH10 into Waipapa Loop Road.

Recommendation

Offset the footpath from the road on the left turn from SH10 into Waipapa Loop Road.

Overall Rating: **Moderate**			
Frequency Rating:	**Occasional**	*Severity Rating:*	**Likely**
Designer Response: Agree in part. Need to consider ongoing maintenance of a grass berm in terms of Safety in Design.			
Safety Engineer: see client decision			
Client Decision: NZTA concurs with the SAT. A grass berm does not need to be the outcome, but the concept is approved to separate the footpath from the kerb. Urban design may recommend smooth embedded rounded pebble stone (max exposure 25mm). Dwg to be amended.			
Action Taken: Noted, to be refined at detailed design.			

2.10 Kerb type

The typical details indicate the use of a vertical kerb profile near the footpath (refer to **Figure 12**). The footpath is next to the road on the left turn from SH10 into Waipapa Loop Road. Vertical kerbs can snag errant vehicles, causing them to mount a footpath and hit pedestrians. Semi-mountable kerbs enable drivers to more easily regain control and avoid mounting the footpath. Vertical kerbs also prevent cyclists mounting the kerb to avoid being hit by vehicles. Semi-mountable kerbs should therefore be use as the preferred safe system treatment.

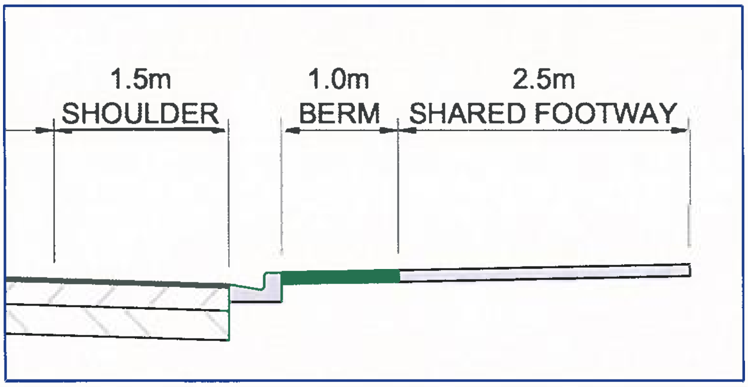

Figure 12: Typical kerb detail near footpath.

Recommendation

Provide semi-mountable kerbs in place of vertical kerbs.

Overall Rating: **Moderate**			
Frequency Rating:	**Occasional**	*Severity Rating:*	**Likely**
Designer Response: Disagree. In an urban environment, at lower speeds, the vertical kerb will redirect errant vehicles, whereas a semi-mountable kerb will make it easier for an errant vehicle to hit a pedestrian. It is also highly unlikely that a cyclist would be aware if they were about to be hit by a car, let alone have time to do anything about it. The use of semi-mountable kerbs also encourages driving over, or parking on, the berm/footpath. This is even more likely at this location where on-street parking is being removed. A possible compromise could be to consider providing semi-mountable kerbs at the pinch-points only, on the apexes of the entry and exit radii.			
Safety Engineer: see client decision			
Client Decision: Research has shown that semi – mountable kerb is a more safe system response and advises the designer that this issue has been debated at other recent roundabout sites in Whangarei and semi-mounted kerbs (preferably Australian roll over type) as being done in Whangarei is required. Dwg to be amended.			
Action Taken: Noted, design change to be carried out at detailed design.			

2.11 Pedestrian connectivity

The auditors support the provision of a 2.5 m shared path on the eastern side of SH10. However, there is no footpath provision on the western side of SH10 with pedestrian access from the northern end of Waipapa to the commercial and retail areas to the south via Skippers Lane and a footpath link to Klinac Lane. The development of the commercial and retail areas to south has been somewhat ad-hoc, and there does not appear to be a planned network of pedestrian connections throughout the area. The provision of additional footpath links as part of this project should be considered as part of a wider strategy for pedestrian connectivity throughout Waipapa. For example, there is a possible pedestrian desire line across SH10 from the southern end of Skippers Lane to the proposed shared path on the eastern side of SH10.

Recommendation

Consider the provision of additional footpath links as part of this project as part of a wider strategy for pedestrian connectivity throughout Waipapa.

Overall Rating: **Moderate**			
Frequency Rating:	**Occasional**	*Severity Rating:*	**Likely**
Designer Response: Agree. To be considered during Detailed Design.			
Safety Engineer: see client decision			

Client Decision: It was considered to be more practical to proceed with pedestrian facility on the western side only. The project is not to preclude a future option to provide a footpath on the eastern side associated with any pedestrian desire line as a result of the planned sports facility which will need to provide this infrastructure as part of that project. Meanwhile, designer to accurately cost up an Eastern footpath option which would include piping the drain.
Action Taken: **Noted, to be refined at detailed design.**

2.12 Left turn treatments at corridor intersections

The project includes the provision of a 2.5 m wide central flush median, 1.5 m wide shoulders and a 2.5 m wide shared path along the eastern side of the road between the Kerikeri River Rest Area and Waipapa Road (refer to **Figures 2 and 3**).

Several accesses and intersections on the western side of SH10 are significant traffic generators. Vehicles turning left will partially block the through lane. Following vehicles may either rear-end the turning vehicle or overtake into the flush median and conflict with opposing vehicles waiting to turn right. Consideration should be given to widening the shoulders to 2.5m for left turning vehicles at high use accesses and intersections.

Recommendation

Consider widening the shoulders to 2.5m for left turning vehicles at high use accesses and intersections.

Overall Rating: **Moderate**			
Frequency Rating:	**Occasional**	*Severity Rating:*	**Likely**
Designer Response: Agree in part. Recommend a detailed analysis is undertaken on the accessway use during Detailed Design.			
Safety Engineer: see client decision			
Client Decision: NZTA concurs with the SAT and comments that the safety issues relate more to rear ends than high risk type crashes, nevertheless we concur that it shall be included at design stage.			
Action Taken: Noted, to be considered further at detailed design.			

2.13 Open drains

There are open drains along the western side of SH10, south of Skippers Lane (refer to **Figure 13**). These are a hazard to errant vehicles. It is not clear if these will be replaced with piped drainage as part of the proposed widening.

The Whiriwhiritoa Stream Culvert No.730 is unprotected on the upstream (western) side (refer to **Figure 14**). This is a significant hazard for errant vehicles and should be protected with a roadside barrier.

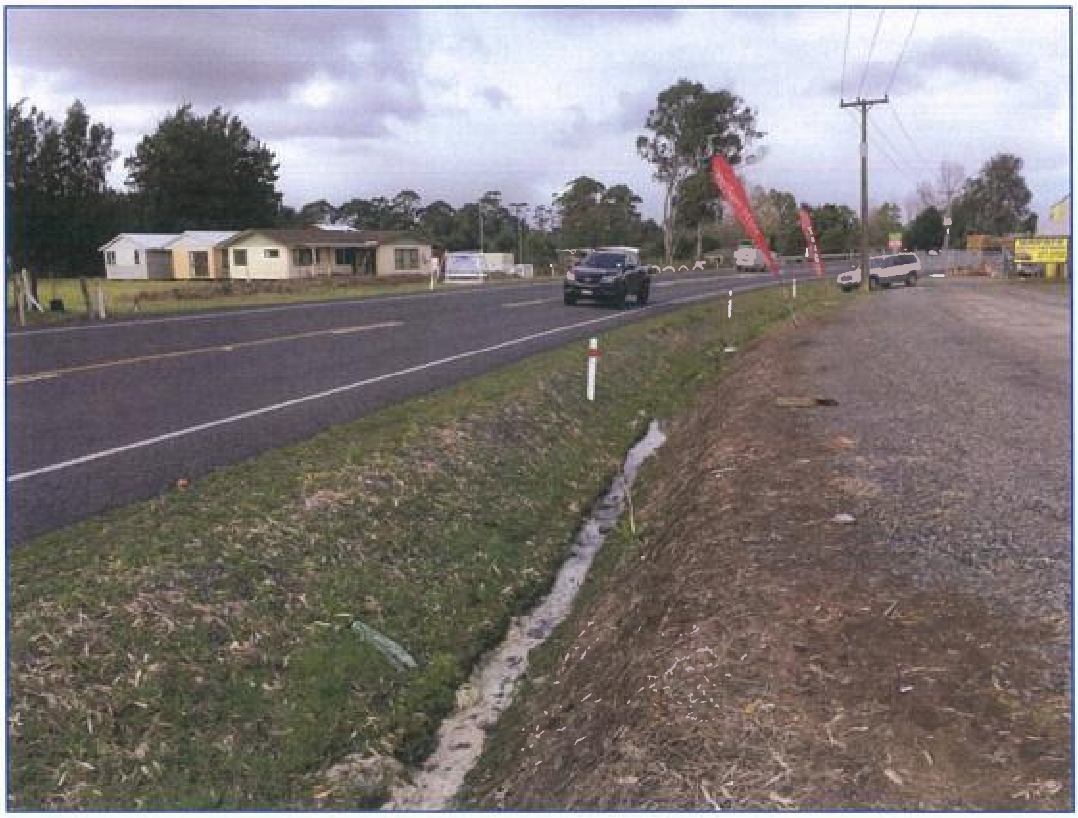

Figure 13: The open drains along the western side of SH10, south of Skippers Lane.

Figure 14: The Whiriwhiritoa Stream Culvert No.730 that is unprotected on the upstream (western) side.

Recommendations

a) *Replace the open drains along the western side of SH10 south of Skippers Lane with a piped drainage system.*

Overall Rating: **Moderate**			
Frequency Rating:	**Occasional**	*Severity Rating:*	**Likely**
Designer Response: Disagree. Hazard considered to be a low risk, particularly with reduced speed limit. No work is proposed on the western side of SH10, as all the widening will be on the eastern side.			
Safety Engineer: see client decision			
Client Decision: NZTA concurs with the SAT. It is not guaranteed that a reduced speed limit will be successful in the short to medium term. The replacement of open drains on the western side is not currently included in the scope but designer to cost this option now at scheme stage for determination at design stage to include this work. If the drains are within the CZ of the current operating speed, they must be addressed and the option would be to pipe the drain.			
Action Taken: Monitor the progress of the speed management review and consider what, if any, action is required at the detailed design phase.			

b) *Provide a roadside barrier on the upstream (western) side of the Whiriwhitirtoa Stream Culvert No.730.*

Overall Rating: **Moderate**			
Frequency Rating:	**Occasional**	*Severity Rating:*	**Likely**
Designer Response: Disagree. Hazard is considered to be a low risk, particularly with reduced speed limit. No work is proposed on the western side of SH10, as all the widening will be on the eastern side.			
Safety Engineer: see client decision			
Client Decision: see above. This culvert must be addressed. Unprotected culverts must be addressed as a minimum requirement. Designer to consider best option available given decision in 2.13a. Designer to discuss with PM and SE.			
Action Taken: **Consider appropriate action at detailed design.**			

2.14 Power poles

There are power poles along the western side of SH10 (refer to **Figure 15**). These are a hazard to errant vehicles. These will be closer to the edge of SH10 after the proposed widening and more likely to be hit by an errant vehicle, particularly if the drains are replaced with piped drainage, as recommended in **Section 2.13** above. It would be desirable to relocate the power underground through the urban area to remove this hazard.

Figure 15: The existing power poles on the western side of SH10 at the southern access to Skidders Lane.

Recommendation

Consider relocating power underground through the urban area.

Overall Rating: **Moderate**			
Frequency Rating:	**Occasional**	*Severity Rating:*	**Likely**
Designer Response: Disagree. Hazard is considered to be a low risk, particularly with reduced speed limit. No work is proposed on the western side of SH10, as all the widening will be on the eastern side.			
Safety Engineer: see client decision			
Client Decision: (Seb call) NZTA concurs with the SAT and advises that poles are one of the highest risks where objects hit usually results in high severity. The design team should investigate how the SAT recommendation can be achieved. Option to underground should be costed and discussed with NZTA/TLA and power company to determine their current underground priority and policy. It is understood the power company and NZTA/FNDC are already in discussion with another part of this project in the vicinity of the roundabout for undergrounding.			
Action Taken: Consider option for undergrounding at the pre-imp phase.			

2.15 Skippers Lane southern access

The southern access to Skippers Lane requires a difficult 180-degree left turn from SH10 south to the southern end of Skippers Lane (refer to **Figures 15 and 16**). These create conflicts with other vehicles accessing properties off Skippers Lane. Moving the access about 70 m southwards to align with the 90 degree turn on Skippers Lane would improve accessibility and safety.

Figure 16: The southern access to Skippers Lane.

Recommendation

Consider relocating the southern access to Skippers Lane southwards by around 70 m.

Overall Rating: **Minor**			
Frequency Rating:	**Occasional**	*Severity Rating:*	**Unlikely**
Designer Response: Agree. To be considered during Detailed Design.			
Safety Engineer: see client decision			
Client Decision: NZTA ADR and concurs that the 180 degree turn is problematic for HCV and unlikely to be achieved without impacting on the FM which would conflict with the right turn in and would be unacceptable to track over the median. however the relocation recommended by the SAT would need to be proved that a. Sight distance is met to the south b. Support from the business community that the SAT recommendation is acceptable and notes than flare/tapers to the access way need to be shown. Designer to cost up the option now showing a plan of the option with tracking (assuming a single unit truck unless semi-trailers are operating here.			
Action Taken: Noted, to be considered at detailed design.			

2.16 SH10 north approach to the roundabout

The SH10 north approach to the roundabout ties in to the existing central flush median treatment (refer to **Figures 17, 18 and 19**). Approach speeds in this direction are reasonably high due to rural speed limit and road environment to the north. Speed management measures should be considered to reduce speeds approaching the roundabout.

There are many vehicles turning to access retail and commercial activities in this area and on the approach to the proposed roundabout. There are also frequent pedestrian movements across the road between shops and parked vehicles. These factors result in many existing conflict points approaching the proposed roundabout that should be mitigated.

The auditors consider that the use of additional raised central islands on the north approach to the roundabout would be beneficial in:

- Creating additional side friction to reduce vehicle speeds;
- Providing better definition and control of access to and from SH10; and
- Enabling the provision of refuge areas for pedestrians crossing SH10.

Figure 17: The SH10 north approach to the roundabout tie-ins to the existing central flush median treatment.

Figure 18: The SH10 north approach, 150 m in advance of the roundabout.

Figure 19: The SH10 north approach, 70 m in advance of the roundabout.

3 Audit Statement

We certify that we have used the available plans, and have examined the specified roads and their environment, to identify features of the project we have been asked to look at that could be changed, removed or modified in order to improve safety. The problems identified have been noted in this report.

Signed:

Mike Sullivan, BE (Civil), MIPENZ
Director, NCC Consulting Engineers, Whangarei

Date: 20/07/2017

Signed:

David Spoonley BEng, CEng, CIHT MICE
Project Manager / Road Safety Engineer
NCC – Consulting Engineers, Whangarei

Date: 20/07/2017

Signed:..

Date: 26/07/2017

Bruce Robinson, Pr.Eng. (RSA), M.Eng., B.Sc.Eng. (Civil)
Robinson Transportation Consulting, Tauranga

Designer: Name.. Position:................

Signature.................................. Date:....................

Safety Engineer: Name. Brian Rainford Position: Principal T&S Engineer

Signature Date: 29/8/2017

Project Manager: Name....Sebastian Reed Position:..Transport Planner

Signature.................................. Date:...12/06/2018

Action Completed: Name....Sebastian Reed Position:..~~12/06/2018~~ Transport Planner

Signature.................................. Date:...12/06/2018

Project Manager to distribute audit report incorporating decision to designer, Safety Audit Team Leader, Safety Engineer and project file.

Recommendation

Provide additional raised central islands on the SH10 north approach to the roundabout.

Overall Rating: **Significant**			
Frequency Rating:	**Common**	*Severity Rating:*	**Likely**
Designer Response: Agree. To be assessed during Detailed Design.			
Safety Engineer: see client decision			
Client Decision: NZTA concurs with the SAT and ADR			
Action Taken: Noted, to be refined at detailed design.			

Date:..........................

Appendix A: Drawings

APPENDIX P
Stakeholder Consultation and Engagement

Stakeholder Consultation and Engagement

Alteration to the SH10 Waipapa Road intersection has been long in the community's sights to implement, primarily for reasons of safety and efficiency. Stakeholder consultation and community engagement was undertaken as part of the development of the business case to understand people's needs, behaviours and attitudes to the SH10 Waipapa Road intersection. This involved consultation and involvement of key stakeholders to identify a preferred treatment option followed by community engagement and consultation on the preferred design.

The outcomes of the consultation and engagement demonstrates that the community and key stakeholders believe that investment is needed to improve the SH10 Waipapa Road intersection and that they are for the most part committed to achieving the outcome of improving safety, efficiency and network resilience.

The following sections provide a detailed description of the consultation and engagement approach and the views expressed by those consulted.

1. CONSULTATION AND COMMUNICATION APPROACH

The following principles, developed by the Transport Agency, were implemented through the High-level Communications Plan (CP) attached as Appendix B of the Supporting Waipapa Growth: Detailed Business Case, October 2017.

- We know why we are engaging and we communicate this clearly.
- We know who to engage.
- We know the history and background.
- We begin early.
- We are genuine.
- We support and encourage best practice.

The CP summarises the history of the SH10 Waipapa Road intersection, identifies the purpose and goals for the SBC engagement and specifies the level of influence that stakeholder and public participation would have on the SBC. Collateral, Appendix A, was developed to tell the story and inform the public of key milestone information such as public open days, likely consenting phases and preferred construction start.

2. ENGAGEMENT PROCESS

The consultation and communications approach in the CP was designed to deliver the following engagement objectives for both FNDC and the Transport Agency;

- Gain stakeholder support by communicating the preferred option for improving the intersection to key stakeholders, iwi and road users;

- Inform affected parties and communities in order to achieve understanding of the proposed works and their effects;
- Minimise the number of public queries by being proactive in our approach and concise in our publications;
- Gather knowledge from the community and understand others viewpoints; and
- Fulfil the requirements of the Resource Management Act 1991, Land Transport Management Act 2003 and Local Government Act 2002.

To achieve these objectives, a structured sequence of events was implemented to ensure that key stakeholders were consulted on changes, landowners were informed of the preferred option before it became public knowledge and enabling the community to participate in consultation in an accessible manner.

The following provides further information on the delivery of the CP which was prepared and implemented for the purposes of the SBC.

2.1 Key Stakeholders Involved

In partnership with FNDC, NZTA directly engaged with the Ministry of Education, Local Business Association, Bay of Islands-Whangaroa Community Board, Iwi and members of the Northland Transport Alliance on the strategic case to improve the SH10 Waipapa Road intersection. Identifying the need to narrow the focus of the transport needs of the community in relation to the SH10 Waipapa Road intersection, a Waipapa Project Steering Group was set up consisting of representatives from NZTA, Northland Transport Alliance and FNDC's infrastructure and assets group and local community board member Ann Court.

The Ministry of Education (MoE) administers a number of established educational facilities in the area that utilise the intersection. Through early engagement with MoE it was identified that development of a vacant lot along Waipapa Road is planned and that an improvement to the intersection would be beneficial for an education facility at this site in particular but also for the other education centres around the township. MoE did not raise any concerns as part of this initial consultation.

The Local Business Association have been lobbying for a number of years for improvement to be made to the SH10 Waipapa Road intersection. Their only concern was that improvements being investigated would not continue through to the next stages.

The BOI-Whangaroa Community Board were presented with the preferred option on 22nd May 2017 at a closed meeting. Numerous questions were asked by the Board at the time of the meeting and these questions were answered satisfactorily by the Project team members. The Board had similar sentiment as the Local Business Association in that it would be a disappointment for the community if the options for improvement did not continue to the next stages.

Waipapa is within the rohe of Ngâpuhi iwi with Ngâti Rêhia holding mana whenua of this area. Sebastian Reed, Keith Kent and Rewi Spraggon, NZTA Maori Liaison Co-ordinator met with kuia Nora Tawhi Rameka to inform of progress with the business case, discuss project development and the approach to delivering this information back to mana whenua. Neither Iwi nor the hâpu raised any particular concerns with the decision to proceed with an engineering solution to the traffic issues at the intersection. However, it is their aspiration to be involved in the planning and construction phases, particularly to manage any accidental discoveries of heritage or waahi tapu or taonga artefacts. A cultural value assessment has been requested as part of the detailed design phase.

2.2 Affected Parties Informed

With the assistance of FNDC, the following landowners were identified as being directly affected by the preferred intersection alteration and/or the extension to Klinac Lane either as adjacent landowners or as owners where land is to be acquired.

Legal Description	Proprietors	Potential Acquisition Required? (☒)
Lot 1 DP 203534	Adrian Richard Manning, Richard Patrick Wallace	☐
Lot 1 DP 490482	Elsdon Properties Limited	☐
Lot 2 DP 490482	Waipapa Storage Limited	☐
Pt Lot 2 DP 22952	Top Energy Limited	☒
Lot 2 DP 153648	Waipapa Garage Northland Limited	☒
Lot 2 DP 208329	Jennifer Kathleen Mark, John Charles Mark	☐
Lots 1- 6 DP 429319	Wiroa Properties Limited	☒
Lot 1 DP 153739	Linita Holdings Limited	☒
Lot 2 DP 490482	Waipapa Storage Limited	☐
Sec 3 SO 438821	WBC Developers Ltd	☐
Sec 4 SO 438821	Ross Auld, Judith Auld, David Gibson	☐
Lot 1 DP 193119	Deborah Elaine Bartlett, Denise Raeleen Welsh, Gaeleen Muriel Turner, Keith Bryce Turner	☐
Lot 2 DP 72659	Edward Martin Wilberforce Lock, Robin Wilberforce Lock	☒

Landowners whose property may need to be acquired for the preferred roundabout design have been generally receptive of acquisition by agreement. However, tenants of two properties have not been as receptive as their landlords with the roundabout option, but not necessarily against the idea, their concerns are discussed as follows.

The Pioneer Bar resides on Lot 5 DP 429319 (owned by Wiroa Properties) and while the preferred option is to avoid the land and the building, parking on the roadside in front of The Pioneer will be removed to accommodate a roundabout option at the intersection. The owner and operator of The Pioneer is concerned about the impact the loss of car parks would have on the business.

They are awaiting the outcome of the business case and would like to be involved in detailed design.

Land where the Pricecutter is located (Lot 2 DP 72659) is in a state of conditional purchase by the shop owner and acquisition discussions have been transferred to the new owner (Mr and Mrs Patel). The new owners anticipate that they will be able to continue to operate a smaller Pricecutter under the preferred roundabout option however, this may not be the case and ongoing discussions are being had with Mr Patel, the NZTA project manager and Crown Properties. On street parking in the immediate vicinity of the property is understood to be critical to the viability of business, given its 'convenience store' function. However, parking on SH10 in front of the shop will very likely be lost to ensure the safe and efficient operation of the intersection.

On the opposite side of SH10, the land is vacant but the owner has development aspirations, he is willing to work with NZTA and FNDC to accommodate the intersection upgrade, which he views as a benefit to any onsite business.

A realignment of Waipapa Loop Road would impact a portion of a property owned by Top Energy. Top Energy has indicated no essential services are located on the subject portion and they are happy, in principle, to negotiate land purchase.

In concluding, compulsory land acquisitions are not expected due to the relationships that have been developed through early consultation with the potentially affected land owners. However, effects on tenant businesses have been identified as a concern, potentially requiring these parties to be involved more so during detailed design.

2.3 Public Participation

The Transport Agency in partnership with the FNDC held a Public Open Day on 1 June 2017. The Open Day gave the Transport Agency and FNDC valuable feedback that there is a high level of community support for a roundabout at the intersection of SH10 and Waipapa Road and for the extension of Klinac Lane to provide a simple connection between the eastern and western extents of the town. In total, over 100 people came along to the open day held at the local Waipapa Community Hall.

The feedback received from stakeholders and the community was consistently in favour of improving the intersection to enable safer and more efficient journeys. Appendix B provides a summary of the feedback received which has informed a number of elements in the SBC.

APPENDIX A: COLLATERAL

SH10 WAIPAPA IMPROVEMENTS

CONNECTING COMMUNITIES

TRANSPORT NETWORK

The SH10 Waipapa intersection is a key point for road transport connections for tourism, primary industries, local workforces and the community.

As a result of the development of the town around the old roading infrastructure, the town is split across both sides of SH10. Although provisions were made to connect the township via Waipapa Loop Road, the link has not been built. Subsequently, no direct connections exist between the east and west of the township.

Changes to the intersection will improve the transport network:

- Providing more direct links within the Waipapa township, reducing travel times and journey lengths;
- Creating resilience in the immediate and wider transport system in the area by providing additional route choices through the construction of the local road extension (Klinac Lane) and improving journey time reliability;
- Including options to take alternative modes of transport such as cycling or walking throughout the township through integrated design;
- Removing travel constraints on the Twin Coast Discovery route at this site;
- Providing a long-term transport solution for the future as the region's population grows and tourist numbers increase.

WAIPAPA

WALKING AND CYCLING

Although footpaths are provided for short sections in the town centre, no facilities are provided to assist in crossing SH10. Speed on SH10 is also a barrier to safe pedestrian movement across the state highway.

The existing intersection layout creates safety risks for cyclists due to on street parking, as well as the risk taking behaviours of queuing drivers.

The roundabout will assist in slowing State Highway traffic through the Waipapa township, making the road safer and more appealing for pedestrians and cyclists.

New footpaths and safer crossing points will promote and support active modes of transport around the township.

These improvements will add to the existing quality pedestrian and cyclist facilities on Waipapa Road, promoting active transport connections with Kerikeri.

The location of footpaths and crossing points will provide safer connections for Waipapa businesses and community on either side of SH10.

KERIKERI

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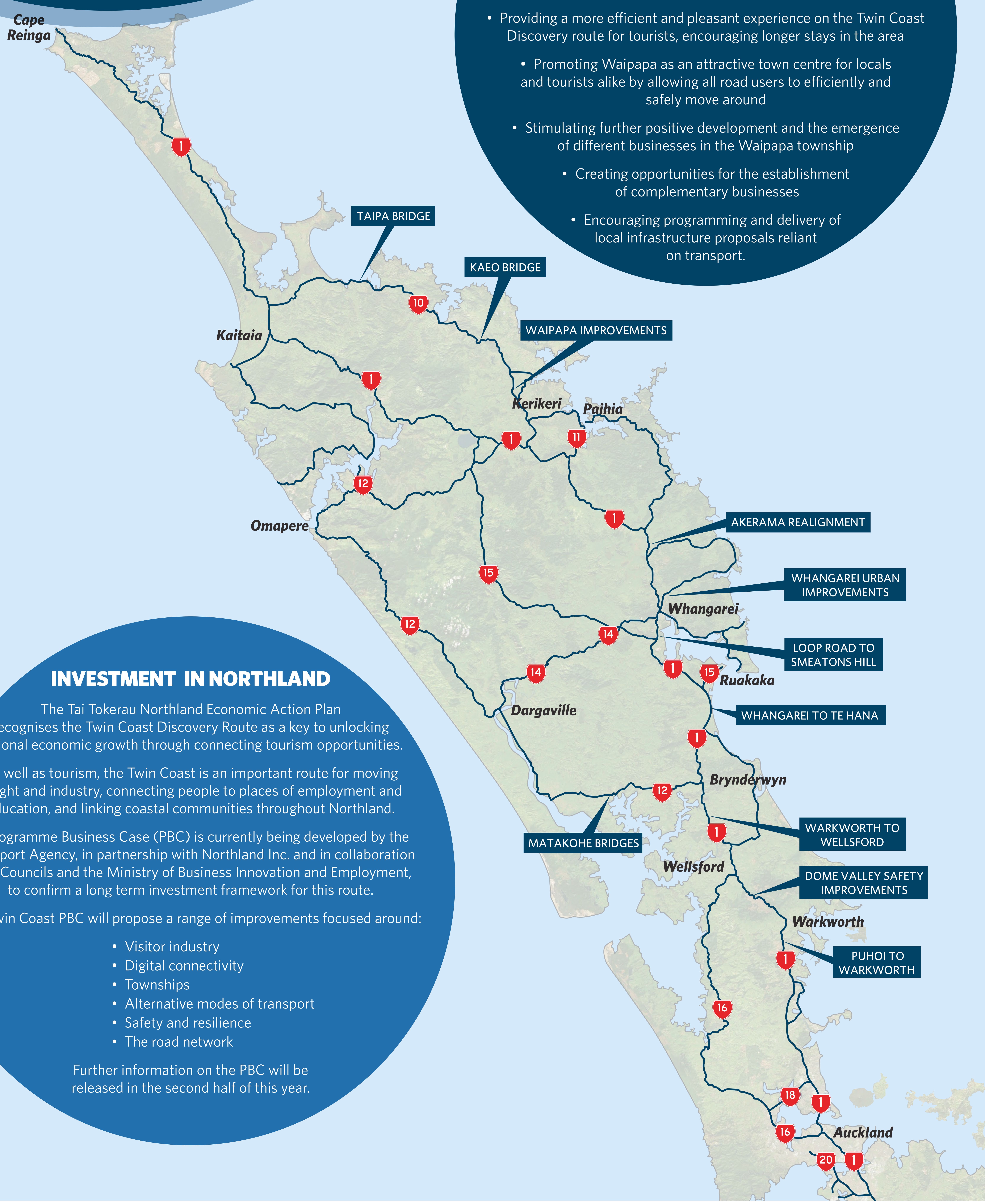
CONNECTING NORTHLAND

SH10 WAIPAPA IMPROVEMENTS

ECONOMIC GROWTH

Improvements to the SH10 Waipapa intersection in conjunction with the Far North District Plan review will enable economic opportunities for Waipapa, Kerikeri and the Far North, by:

- Creating a safe, simple gateway to Waipapa and Kerikeri townships and businesses along connected local roads, particularly the proposed extension of Klinac Lane
- Providing a more efficient and pleasant experience on the Twin Coast Discovery route for tourists, encouraging longer stays in the area
- Promoting Waipapa as an attractive town centre for locals and tourists alike by allowing all road users to efficiently and safely move around
- Stimulating further positive development and the emergence of different businesses in the Waipapa township
- Creating opportunities for the establishment of complementary businesses
- Encouraging programming and delivery of local infrastructure proposals reliant on transport.



INVESTMENT IN NORTHLAND

The Tai Tokerau Northland Economic Action Plan recognises the Twin Coast Discovery Route as a key to unlocking regional economic growth through connecting tourism opportunities.

As well as tourism, the Twin Coast is an important route for moving freight and industry, connecting people to places of employment and education, and linking coastal communities throughout Northland.

A Programme Business Case (PBC) is currently being developed by the Transport Agency, in partnership with Northland Inc. and in collaboration with Councils and the Ministry of Business Innovation and Employment, to confirm a long term investment framework for this route.

The Twin Coast PBC will propose a range of improvements focused around:

- Visitor industry
- Digital connectivity
- Townships
- Alternative modes of transport
- Safety and resilience
- The road network

Further information on the PBC will be released in the second half of this year.

SH10 WAIPAPA IMPROVEMENTS

SH10 is part of the Twin Coast Discovery Route providing access to significant tourist destinations including popular swimming beaches to the north, Kerikeri township to the east, Puketi Forest walks to the west and the Bay of Islands and Waitangi to the southeast.

The SH10 Waipapa intersection experiences an average of 13,000 vehicle movements per day and the intersection is a key transport connection for tourism, primary industries, local workforces and the communities of Waipapa and Kerikeri.

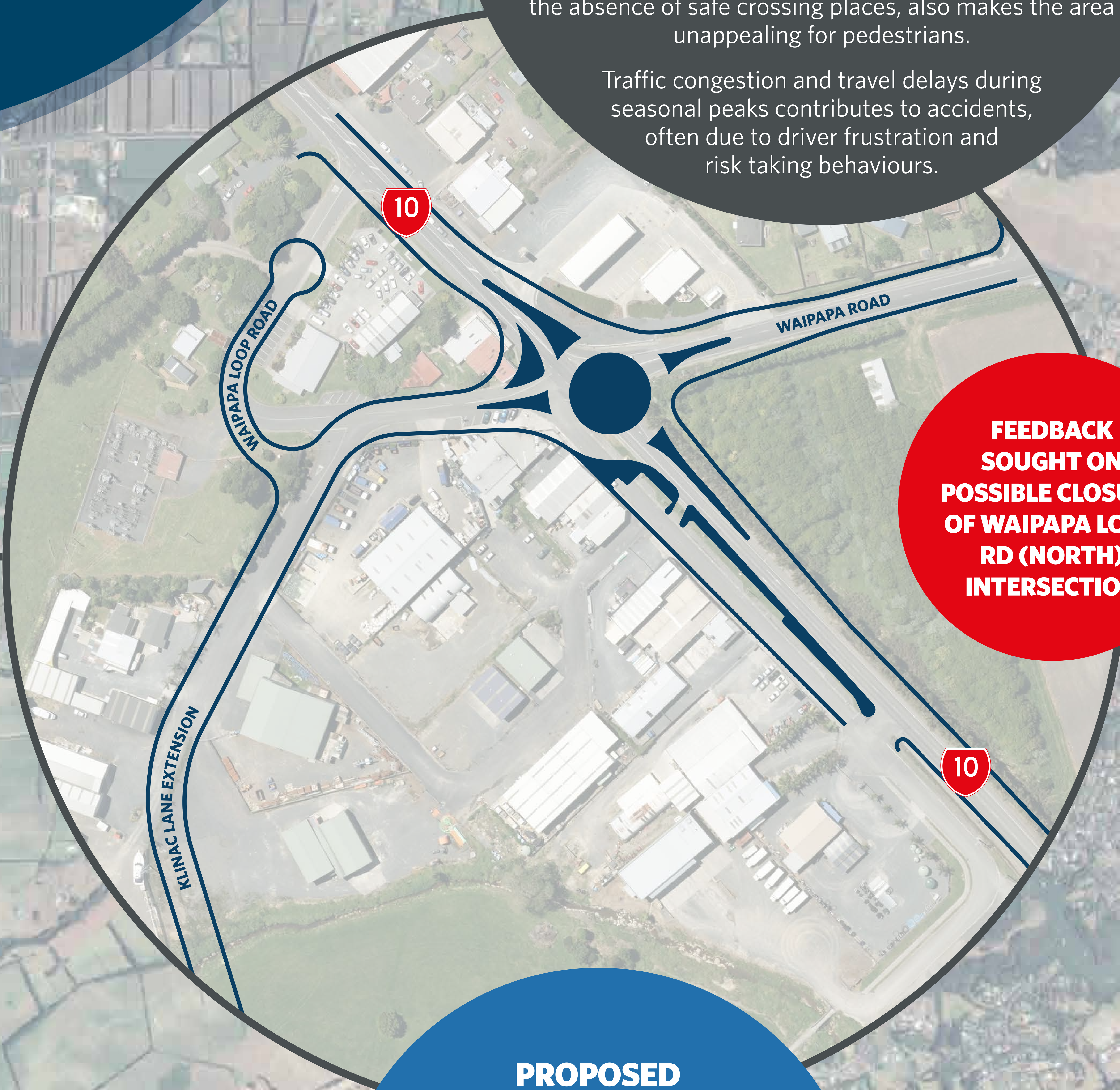
THE CASE FOR CHANGE

Growth in Waipapa and Kerikeri means improvements to the transport network at Waipapa are needed to improve safety, reduce congestion and support continued growth.

The current cross roads intersection is of substandard design, lacking road width to allow traffic to flow onto and off of the State Highway efficiently and safely, with right-turn movements particularly challenging at peak times. There have been seven reported crashes between 2011 and 2016 at or near the intersection.

There is a lack of space for cyclists to travel safely through the intersection. The posted speed limit of 70 km/hr and the absence of safe crossing places, also makes the area unappealing for pedestrians.

Traffic congestion and travel delays during seasonal peaks contributes to accidents, often due to driver frustration and risk taking behaviours.



FEEDBACK SOUGHT ON POSSIBLE CLOSURE OF WAIPAPA LOOP RD (NORTH) INTERSECTION

PROPOSED IMPROVEMENTS

A single lane roundabout is proposed at the intersection of SH1 and Waipapa Road. Improvements to the intersection include new footpaths and crossing points for pedestrians and traffic islands at the approaches to the intersection.

An extension of Klinac Lane is also proposed to provide additional route options in Waipapa.

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SH10 WAIPAPA IMPROVEMENTS

THE PREFERRED SOLUTION

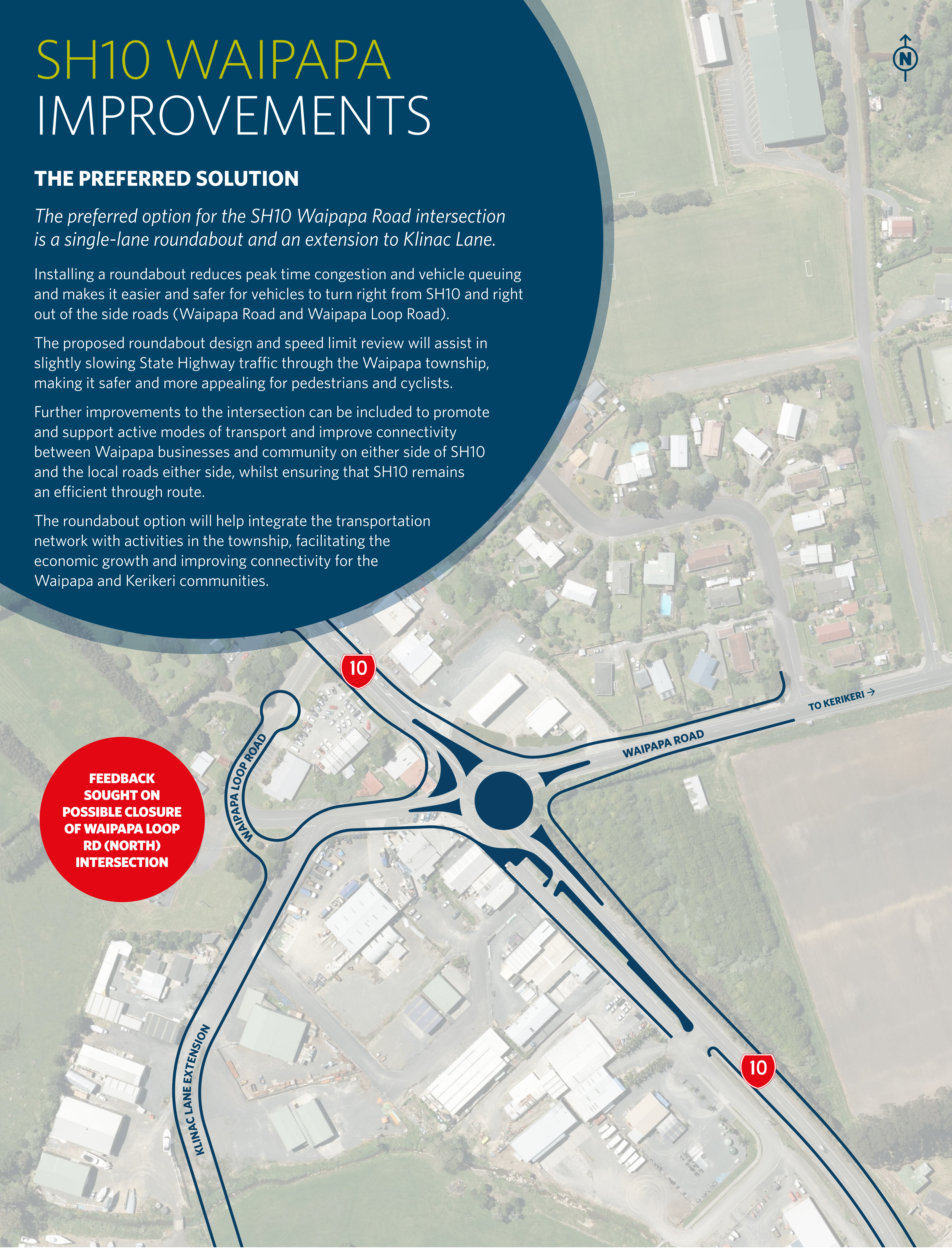
The preferred option for the SH10 Waipapa Road intersection is a single-lane roundabout and an extension to Klinac Lane.

Installing a roundabout reduces peak time congestion and vehicle queuing and makes it easier and safer for vehicles to turn right from SH10 and right out of the side roads (Waipapa Road and Waipapa Loop Road).

The proposed roundabout design and speed limit review will assist in slightly slowing State Highway traffic through the Waipapa township, making it safer and more appealing for pedestrians and cyclists.

Further improvements to the intersection can be included to promote and support active modes of transport and improve connectivity between Waipapa businesses and community on either side of SH10 and the local roads either side, whilst ensuring that SH10 remains an efficient through route.

The roundabout option will help integrate the transportation network with activities in the township, facilitating the economic growth and improving connectivity for the Waipapa and Kerikeri communities.



SH10 WAIPAPA INTERSECTION IMPROVEMENTS

The NZ Transport Agency, on behalf of the NZ Government, in partnership with the Far North District Council have developed a preferred solution to improve the transport network in Waipapa.

Come along to our public information day to see what changes are proposed to the intersection of SH10 and Waipapa Road, talk to the project team and have your questions answered.

Thursday 1 June
3pm - 6.30pm

Waipapa Hall
Loop Road, Waipapa

For more information please visit
https://www.nzta.govt.nz/twin-coast-discovery-route /waipapa-growth/
or email **connecting-northland@nzta.govt.nz**

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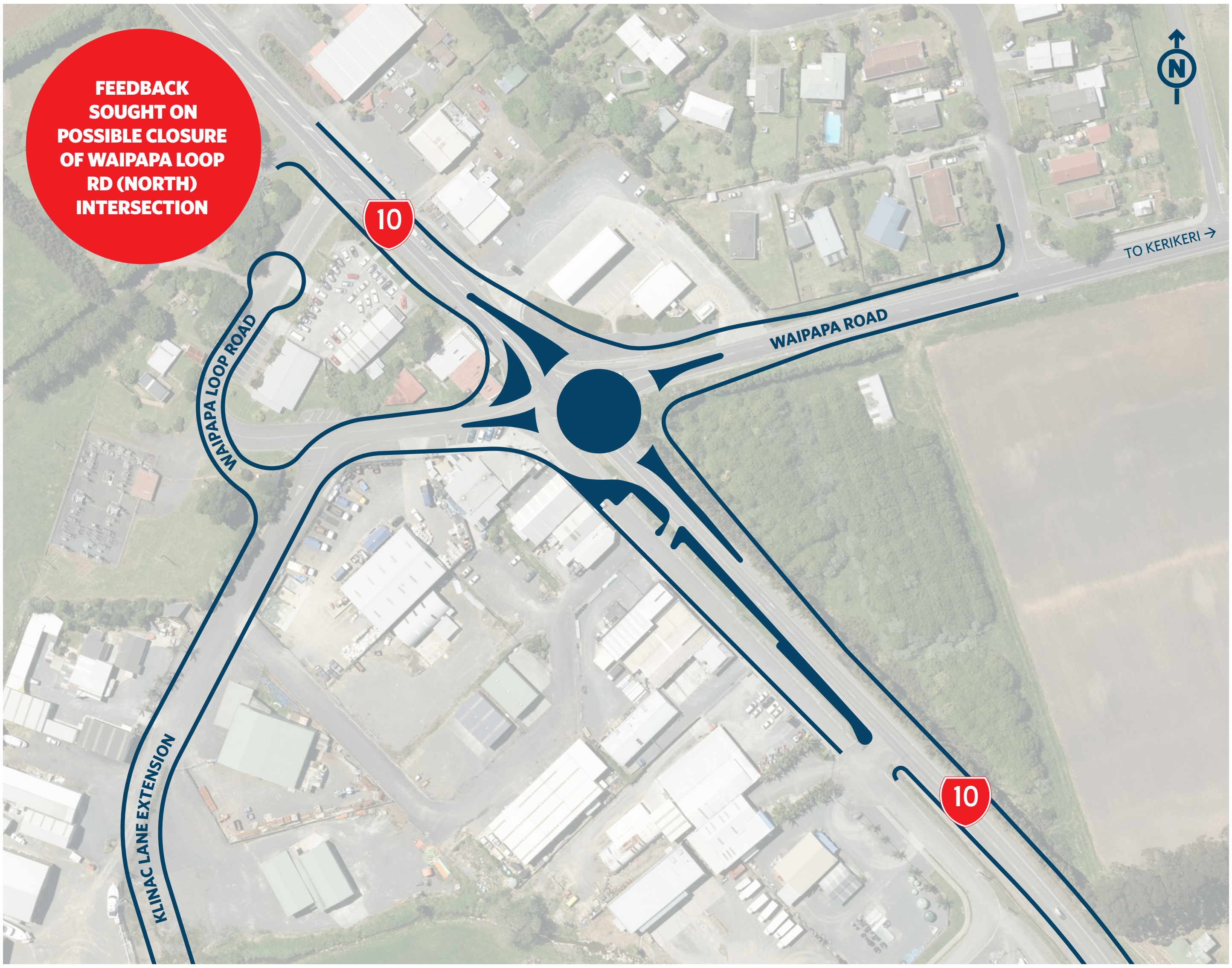
SH10 Waipapa Improvements
FACT SHEET JUNE 2017

The NZ Transport Agency, on behalf of the NZ Government and in partnership with the Far North District Council, is planning improvements to the transport network in Waipapa.



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Growth in Waipapa and Kerikeri means improvements to the transport network at Waipapa are needed to improve safety, reduce congestion and support continued growth.

Traffic congestion and travel delays during seasonal peaks contributes to accidents, often due to driver frustration and risk taking behaviours.

PROPOSED IMPROVEMENTS

A single-lane roundabout is proposed at the intersection of State Highway 10 and Waipapa Road. Installing a roundabout will reduce peak time congestion and make it easier and safer for vehicles to connect with businesses and community on either side of SH10.

The preferred roundabout design will improve safety by

- Slowing traffic
- Reducing the frequency of higher-speed crashes and this location by provide safer turning movements onto and off the State Highway
- Reducing peak time congestion and vehicle queuing

In conjunction with the intersection changes, the Far North District Council will be extending Klinac Lane, which will provide an alternate and route to and from the Waipapa township.

ECONOMIC GROWTH

Improvements to the SH10 Waipapa intersection in conjunction with the Far North District Plan review will enable economic opportunities for Waipapa, Kerikeri and the Far North, by

- Creating a safe, simple gateway to Waipapa and Kerikeri townships and businesses along connected local roads, particularly the proposed extension of Klinac Lane
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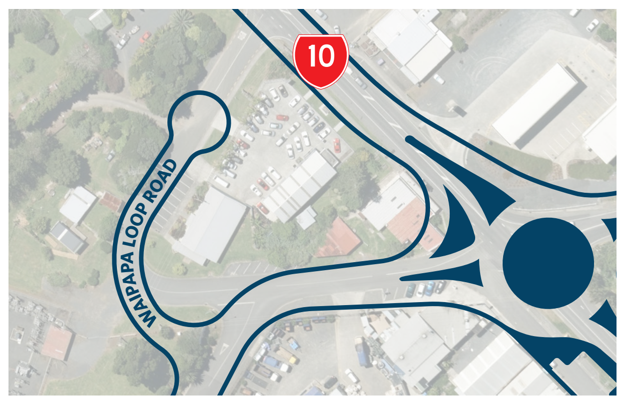

FEEDBACK SOUGHT

As part of the intersection improvements, stopping vehicle access to and from the State Highway at Waipapa Loop Road (north) is proposed. This will improve safety on SH10 by removing turning traffic in proximity to the roundabout which will also help the intersection function more efficiently. We invite feedback on this proposed closure via email to: northlandproject@nzta.govt.nz

CONTACT US

If you have any questions on the SH10 Waipapa Improvements, please contact:

Sebastian.reed@nzta.govt.nz or Keith.kent@fndc.govt.nz

NZ Transport Agency 0800 44 44 49

Far North District Council 0800 920 029

More information can be found at www.nzta.govt.nz/twin-coast-discovery-route/waipapa-growth

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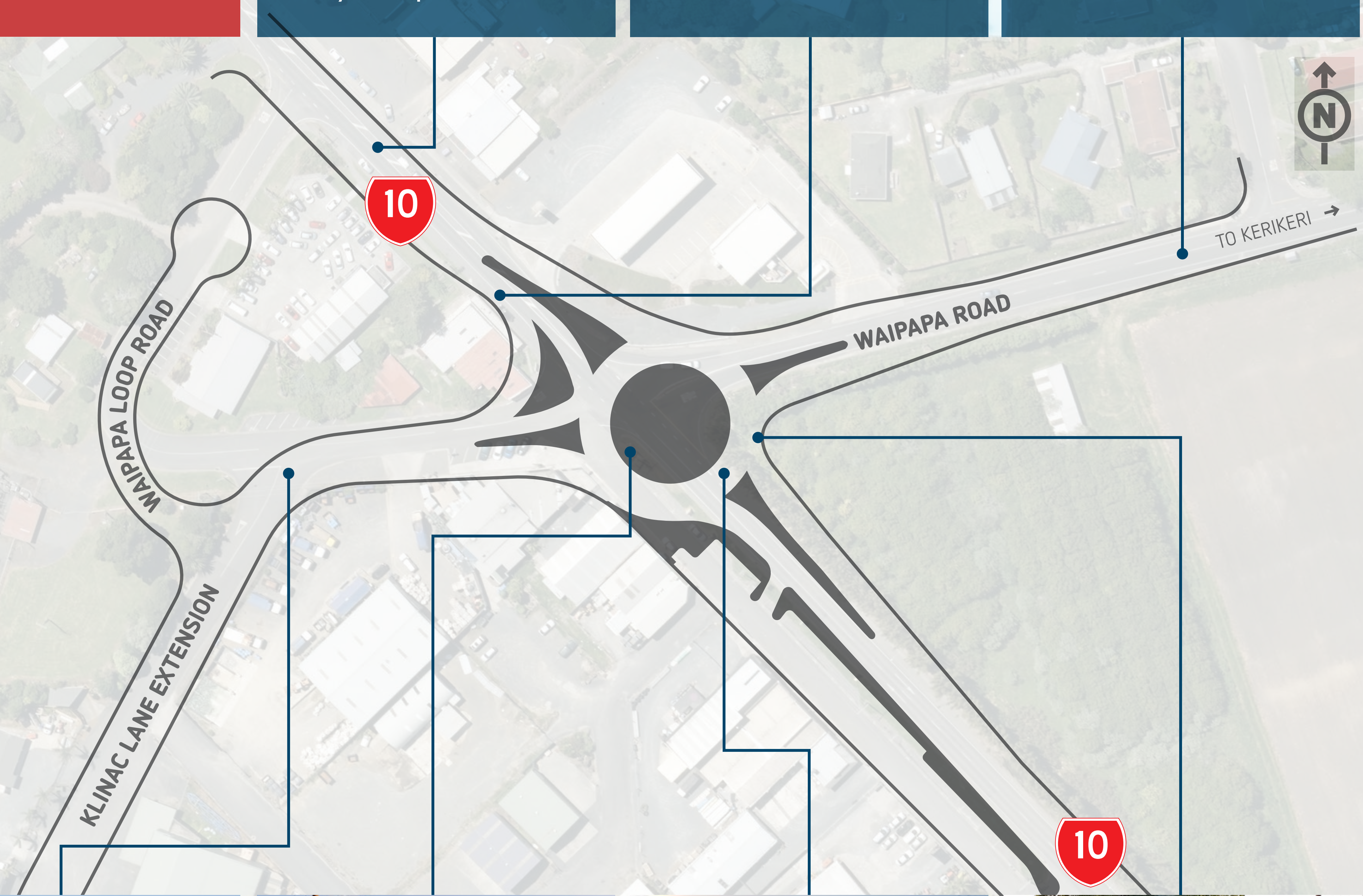
APPENDIX B: PUBLIC OPEN DAY FEEDBACK

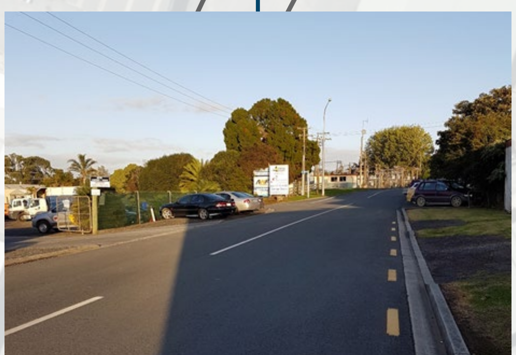
FEEDBACK RECEIVED ON ROUNDABOUT OPTION AT SH10 WAIPAPA ROAD INTERSECTION

- Access and parking are important to business and impact should be avoided or minimised.
- People described many ways that road users accessed local shops and cafes.
- The places where people park were not necessarily where you would think they would park.

- Footpaths could be improved.
- Pedestrian crossings would be good to have to cross safely.
- A cycleway which links up to the Heritage Bypass cycleway would be logical.

- The speed limit/operating speed is too high and has implications on safety and pedestrian access across the State Highway.
- People realised that actual speeds would naturally reduce as a result of a roundabout at this location.





- People currently used Waipapa Loop Road (North) as a way of avoiding the challenges of the Waipapa Road intersection with the State Highway.
- A high number of people supported full closure of Waipapa Loop Road (North).
- Closure of Waipapa Loop Road (North) should only take place if the roundabout is constructed.

- A roundabout would reduce peak time congestion and vehicle queuing.
- Safer turning movements onto and off of the State Highway.
- Concerned that exit/ entry point to the BP Petrol Station would be compromised on Waipapa Road.

- People were unsure whether a single-lane roundabout would have sufficient capacity, a left-turn slip lane was suggested by many.
- Closing off top of Skippers Lane was agreeable, so long as other accessways to these businesses were maintained.

- Unsafe vehicle manoeuvring under current road layout is very concerning to the community and road users.
- Signage to the commercial area on Klinac Lane should be integrated with existing signage.
- There are a high number of accidents (i.e., nose-to-tail) at this intersection.