



TE TUPU NGĀTAHI
SUPPORTING GROWTH

North West Detailed Business Case

November 2021

Version 1.1 FINAL

Document Status

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1.1	1 November 2021	FINAL DBC

Disclaimer

This is a draft document for review by specified persons at Auckland Transport and the New Zealand Transport Agency. This draft will subsequently be updated following consideration of the comments from the persons at Auckland Transport and the New Zealand Transport Agency. This document is therefore still in a draft form and is subject to change. The document should not be disclosed in response to requests under the Official Information Act 1982 or Local Government Official Information and Meetings Act 1987 without seeking legal advice.

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Appendix A: North West Strategic Case

Appendix B: Options Assessment Report

Appendix C: Transport Outcomes Report

Appendix D: Cost Report

Appendix E: Urban Design Evaluation

Appendix F: Design Report

Appendix G: Engagement Summary

Appendix H: Economics Assessment

Appendix I: Property Overview

Appendix J: Route Protection Strategy

Appendix K: Risk Register

Appendix L: Staging Considerations

Acronym/Term	Description
ADT	Average Daily Traffic
AFC	Auckland Forecasting Centre
AT	Auckland Transport
ATAP	Auckland Transport Alignment Plan
ASH	Alternative State Highway
AUPOIP	Auckland Unitary Plan - Operative in Part
BAU	Business as usual
BCR	Benefit Cost Ratio
CFAF	Corridor Form and Function
CO2	Carbon Dioxide
Council	Auckland Council
CRV	Increment for traffic congestion
DA	Developer Agreement
DBC	Detailed Business Case
Development ready	Bulk infrastructure is in place to service development, including three waters, transport, and social infrastructure
DoC	Department of Conservation
DSIs	Deaths and serious injuries
FAR	Funding Assistance Rate
FENZ	Fire and Emergency New Zealand
FTN	Frequent Transit Network
FULSS	Future Urban Land Supply Strategy
FUZ	Future Urban Zone
GHG	Greenhouse gases
GPS 2018	Government Policy Statement on Land Transport 2018/19 – 2027/28
GPS 2021	Draft Government Policy Statement on Land Transport 2021/22 – 2030/31
ha	hectare
HIF	Housing Infrastructure Fund
IBC	Indicative Business Case

Acronym/Term	Description
IOs	Investment Objectives
IQA	Investment Quality Assurance
ITA	Integrated Transport Assessment
KPIs	Key Performance Indicators
LOS	Level of Service
LOV	Low occupancy vehicle
MCA	Multi Criteria Analysis
MHS	Mixed Housing Suburban
MHU	Mixed Housing Urban
MoE	Ministry of Education
MSM	Auckland Regional Transport Model (Macro Strategic Model)
MSQA	Management, Surveillance, and Quality Assurance
NIMT	North Island Main Trunk Line
NLTF	National Land Transport Fund
NLTP	National Land Transport Programme
No2	Nitrogen Dioxide
NoR	Notice of Requirement
N-S	North-South
NZUP	New Zealand Upgrade Programme
OIM	Owner Interface Manager
Partners	Collectively refers to Auckland Transport, Waka Kotahi NZ Transport Agency, manawhenua, Auckland Council
PBC	Programme Business Case
PBIOs	Problems, benefits and investment objectives
PM10	Air quality – Particulate matter
PT	Public transport
P50	Project cost with sufficient funding to provide a 50% level of confidence
P95	Project cost with sufficient funding to provide a 95% level of confidence
RASF	Roads and Streets Framework

Acronym/Term	Description
RLTP	Regional Land Transport Plan
RMA	Resource Management Act 1991
RTC	Rapid Transit Corridor. Forms part of the overall Auckland Rapid Transit Network (RTN).
RTN	Rapid Transit Network which is comprised of multiple Rapid Transit Corridors (RTC's) around Auckland.
RPTP	Regional Public Transport Plan
SEA	Significant Ecological Area
SGA	Supporting Growth Alliance (referred to as Te Tupu Ngātahi)
SH16	State Highway 16
SH18	State Highway 18
SHA	Special Housing Area
SiDRA	Intersection modelling software
SSBC	Single Stage Business Case
TCE	Target Cost Estimate
TDM	Travel Demand Management
Te Tupu Ngātahi	Supporting Growth Alliance
TFUG	Transport for Future Urban Growth
THAB	Terraced Houses and Apartment Buildings
The Council	Auckland Council
The Programme	The Supporting Growth Programme
TOD	Transit Oriented Development
UDF	Te Tupu Ngātahi Urban Design Framework
Waka Kotahi	Waka Kotahi New Zealand Transport Agency
WEB	Wider Economic Benefits
VEPM	Vehicle Emissions Prediction Model (Waka Kotahi)
VKT	Vehicle Kilometres Travelled
vpd	Vehicles per day
VOC	Vehicle Operating Costs

1 Executive Summary

1.1 North West Growth

The purpose of the Te Tupu Ngātahi Programme (the Programme) is to recommend a sustainable transport network for route protection to support Auckland's planned greenfield growth over the next 30 years. The support of urban growth through access to high quality public transport and safe walking and cycling options will avoid or minimise new transport emissions as growth occurs.

The projected North West growth is based on the Auckland Council's (Council) Future Urban Land Supply Strategy (FULSS) and at full build out this growth is anticipated to reach¹:

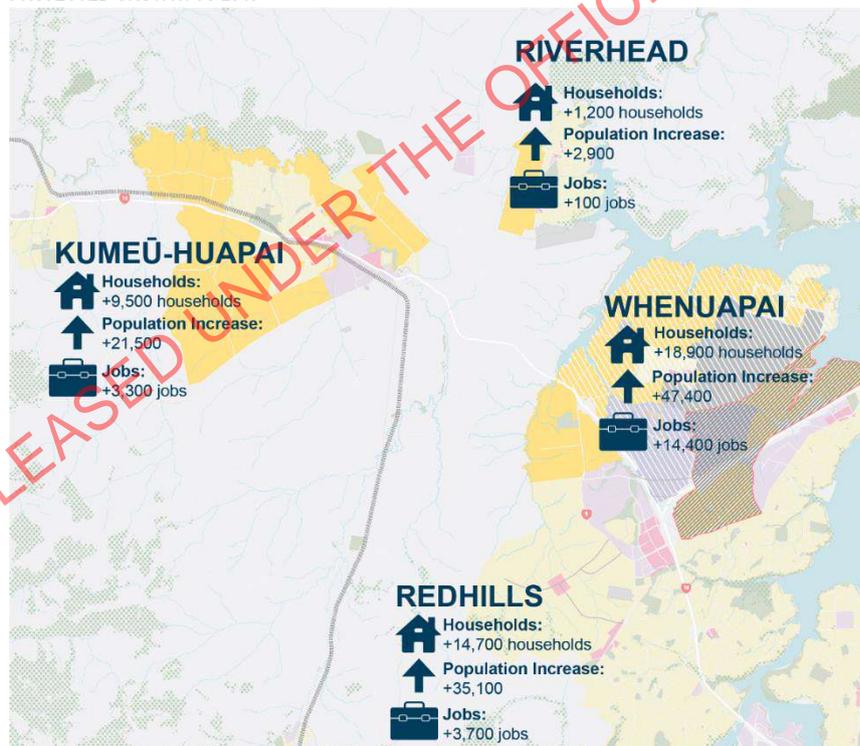
- 107,000 additional people - which is equivalent to adding a community the size of Dunedin.
- 44,300 new houses.
- 21,600 new jobs.

The full North West growth area has been identified in the FULSS to be development ready by 2032. 'Development ready' is defined by the FULSS as having bulk infrastructure in place ready for development of the site. Growth areas like Redhills and select Special Housing Areas are already live zoned. The projected North West growth is shown in Figure 1-1 below.

Figure 1-1 North West Growth Area

NORTH WEST LAND-USE CERTAINTY

PROJECTED GROWTH TO 2048+



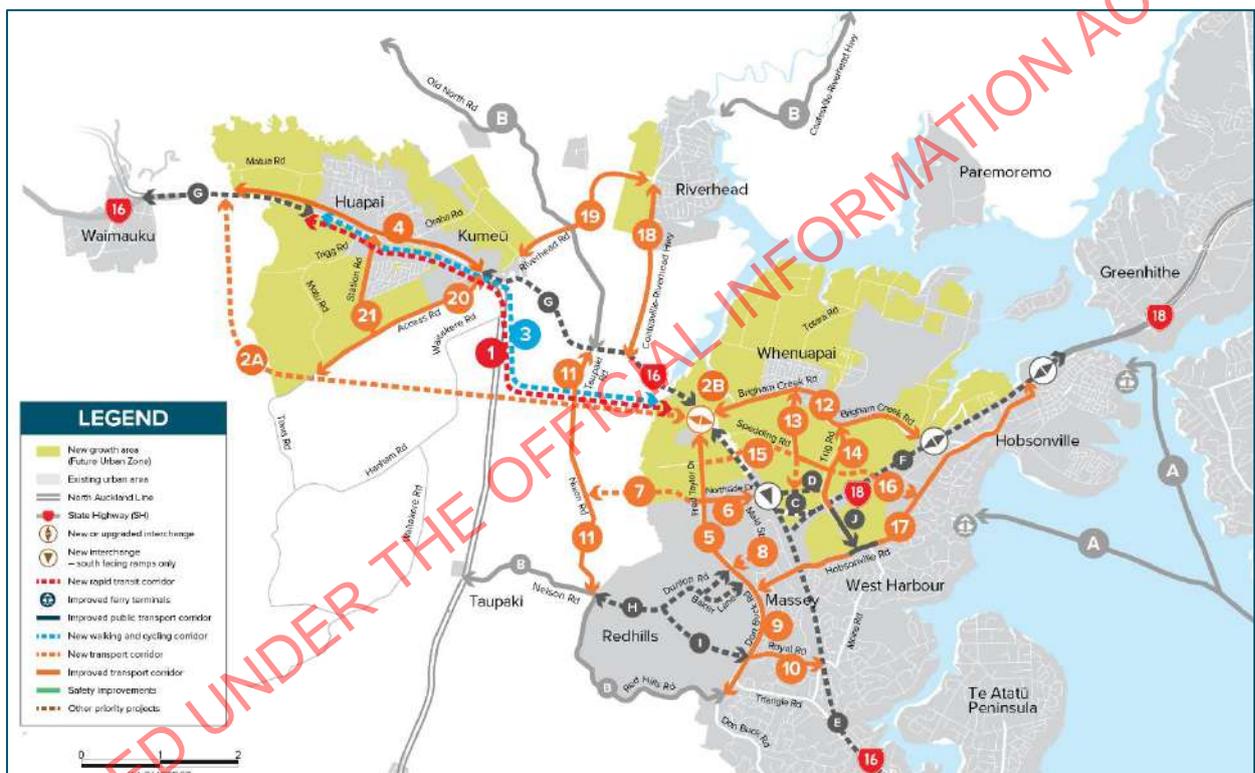
¹ This full build out is based on the Future Urban Land Supply Strategy modelled as per the 2048+ modelling scenario which uses Land use scenario i11.5. changes in timing indicate potentially a 5 year delay to full growth realisation in the North West Growth area.

1.2 Scope of project

The North West Detailed Business Case (DBC) follows on from the outcomes identified at both the Programme Business Case (PBC) and Indicative Business Case (IBC) stages and further investigates and confirms a fit-for-purpose transport network for route protection in the North West.

The North West DBC has a large scope with 21 corridors from the North West IBC Indicative Transport Network under investigation as shown in Figure 1-2. Together these projects form a cohesive transport response for the North West. The projects incorporate a wide range of transport investment including major strategic connections, intensified urban corridors and rural road upgrades. In addition, the timing for implementation will vary and will be dependent on the surrounding land use being realised.

Figure 1-2 North West DBC Scope



This document focuses on providing the overall North West DBC investment case for route protection and details the recommended route protection strategy. The preparation of the Notice of Requirement (NoR) packages will follow the completion of this DBC.

1.3 Why is investment needed?

The North West is uniquely located with geographical proximity to Auckland's city centre as well as two metropolitan centres (locally at Westgate and sub regionally at Albany). However, despite proximity to both SH16 and SH18 for these regional connections, it currently has limited transport choice and transport connections to these key employment locations.

The Future Urban Zoned (FUZ) land in the North West is currently served by a transport network that consists of existing rural and urban corridors. However, the current form is not capable of supporting the significant growth and will be unable to support the overall climate change goals of shifting future growth trips to lower emission travel options including public transport and active transport. It is critical that the transport system supports and shapes the scale of growth proposed.

Without significant transport investment the North West will experience:

- **Poorly integrated land use** which will result in reduced access to social and economic opportunities, compromised liveability, reduced opportunities to maximise transport catchments to increase mode share for public transport, walking and cycling and not support transit oriented developments.
- **Reduced climate change outcomes** resulting in an inability to shift to low emission transport modes with a continual reliance on private, low occupancy vehicles. The network will remain susceptible to climate change risks such as flooding.
- **Decreased safety** including additional conflict with active modes and increased risks on rural roads from high speeds and rat running by vehicles seeking to avoid congestion.
- **Limited transport choice** which will compromise transformational mode shift targets.
- **Unmanaged growth in demand for private vehicle travel** which will cause severe congestion on both local and strategic roads and further increase severance in Kumeū.
- **Reduced reliability** for bus networks which will be delayed in the congestion. Network resilience will be further exacerbated for the single access to Kumeū-Huapai and limited accesses to Whenuapai.

Therefore, it is critical that the transport requirements for the North West are planned for to match the intended growth. Route protection is the first and critical step for ensuring the transport enhancements needed can be provided. The intent of route protection is to identify and appropriately protect the land corridor necessary to enable the future construction, operation and maintenance of the recommended network options.

Route protection provides the mechanism to protect the network in advance as opposed to retrospectively making the transport interventions fit the existing urban form. The key benefits of route protections are that it:

- **Provides certainty and direction for future land use.** This supports key land use integration measures such as future structure planning processes and intensification around stations and public transport routes.
- **Provides a mechanism for AT and Waka Kotahi to plan for future financial investment while retaining flexibility** on the detailed development of the recommended future network, enabling it to respond to the pace, scale, and exact location of future urban growth.
- **Allows for major infrastructure to be implemented at the right time**, integrated with the urban development driving the desired transport and urban outcomes.

- **Reduces future cost risk.** If the corridor is protected by either early acquisition or notices of requirement, then there is an opportunity to reduce some land costs.
- **Protects project feasibility.** Route protection prevents the land from being developed in a manner which makes projects more expensive, has compromised outcomes or in the worst case the project is no longer feasible.

1.4 Problems and benefits of investment

Five investment areas have been reconfirmed for the North West as shown in Figure 1-3. Investment in these elements was determined to maximise land use and transport integration and align with the Ministry of Transport (MoT) Transport Outcomes Framework and GPS 2021.

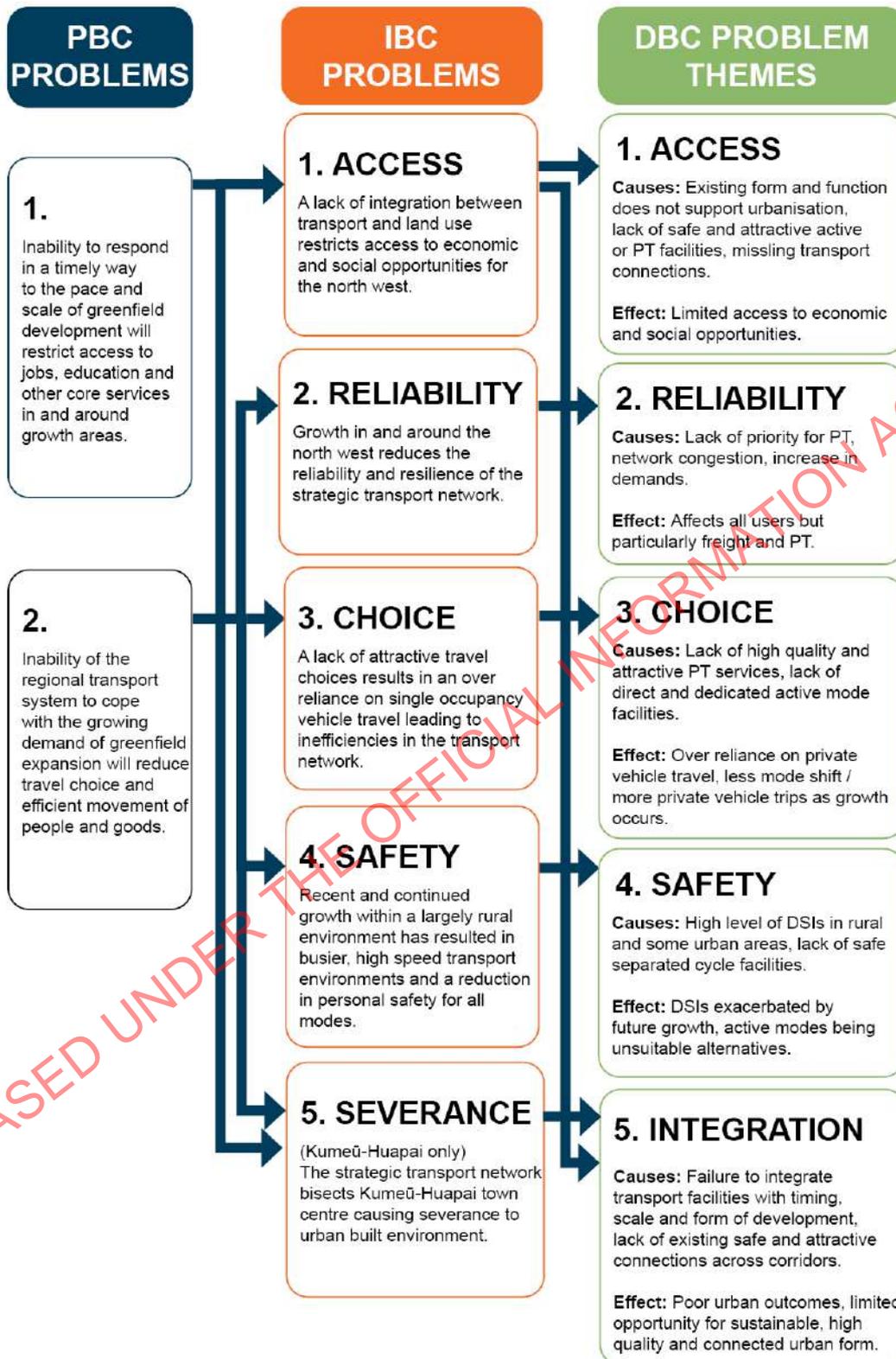
Figure 1-3 Problem areas in the North West for investment



The underlying causes of all these problems can be attributed to the planned urbanisation in the North West and the resulting increased transport demands.

A summary of the problems and how they map across the previous business cases is shown in Figure 1-4.

Figure 1-4 North West Problems



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1.5 Recommended network for route protection

The recommended North West transport package for route protection is shown in Figure 1-5 Figure 10-1. This is a comprehensive transport solution that provides:

- A safe, reliable transport system that supports North West growth and urbanisation.
- A transport network that supports the long term development of a low carbon transport system to support future growth and facilitates mode shift from private vehicles to public transport and active modes to reduce greenhouse gas emissions.
- Improved access to employment and social amenities.
- Support for intensification of adjacent land uses, particularly transit oriented developments and high density housing. Transport corridors maximise opportunities for walk up catchments to future rapid transit stations.
- Separation of the strategic trips from the local trips to support better placemaking in urbanised centres, provide direct freight connections and get the “right trips using the right corridors”.
- Increased reliability for public transport and resilience through urbanised alternative routes to improve safety on the North West rural roads.
- An areawide focus on safety through a holistic set of measures including Road to Zero safety principles, fully separated cycling facilities, well designed intersections and sufficient space for all modes to interact safely.

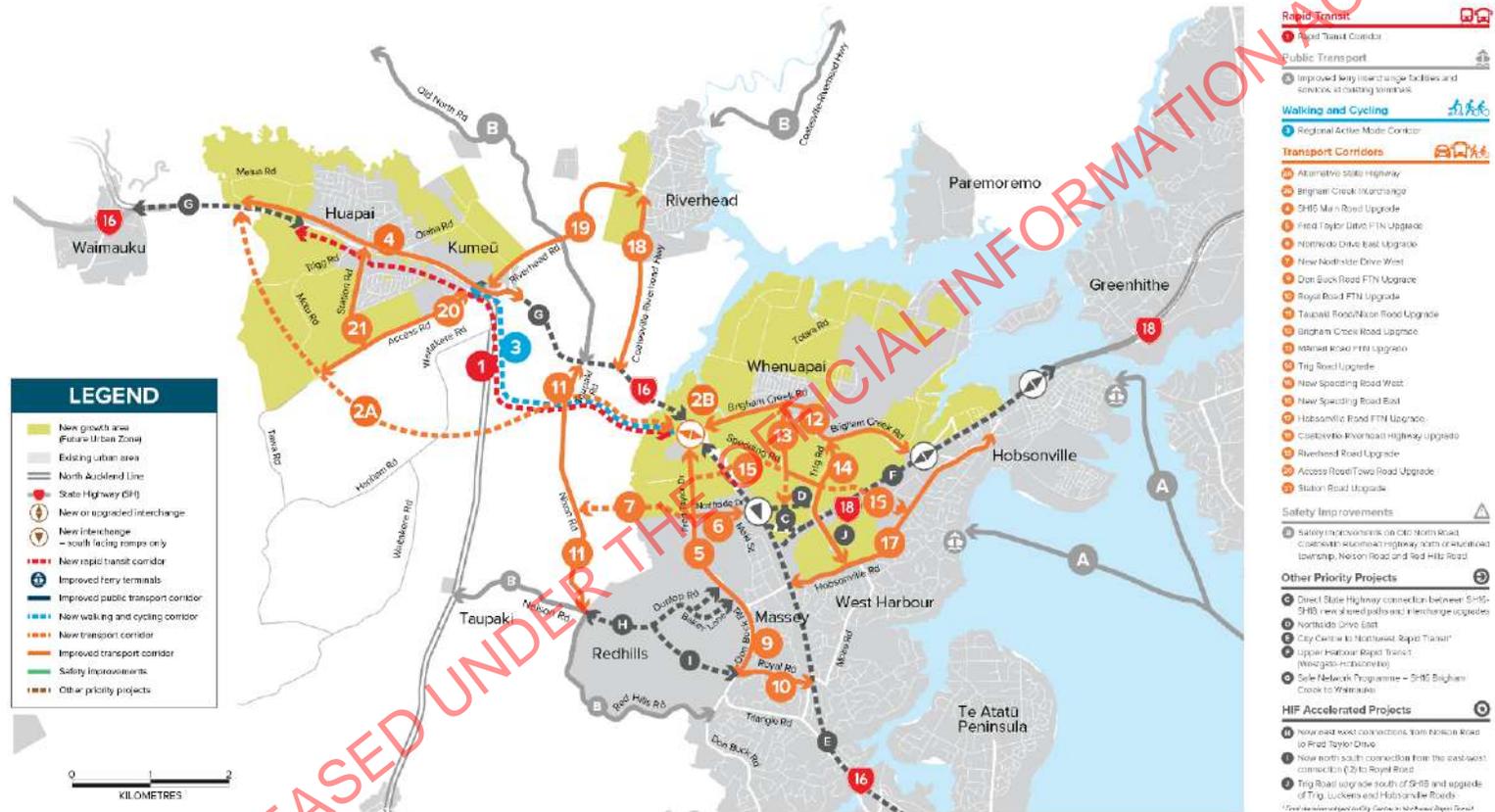
The outcomes will be achieved by targeted investment in:

- A high quality, fast and reliable Rapid Transit Corridor (RTC) to connect Kumeū-Huapai to Westgate and city centre.
- A new Alternative State Highway (ASH) that will remove strategic trips from within Kumeū-Huapai. This will improve amenity and access to the Kumeū town centre, support the implementation of the RTC and provide direct heavy vehicle access from the State highway to the future industrial area.
- A reliable bus infrastructure network that connects both existing and new land uses to key destinations and RTC stations. It will support both FTN and local bus services and includes measures such as 17.5km of new bus lanes and provision for intersection bus priority at key locations in the network.
- 21 corridors that include upgraded walking and cycling facilities to improve safety, attractiveness and connectivity within and between areas. This corresponds to 67km of new and improved cycle network. The suite of cycling measures include:
 - Strategic facilities adjacent the RTC and ASH which support separated, uninterrupted and higher speed cycling.
 - Separated cycle lanes on urban corridors and shared paths on rural corridors.
- Two new corridors (Spedding Road East and West) that provide additional crossings of SH18 and SH16 respectively to provide for local movements between Whenuapai and either Hobsonville or Redhills.

Figure 1-5 Recommended North West Transport Package



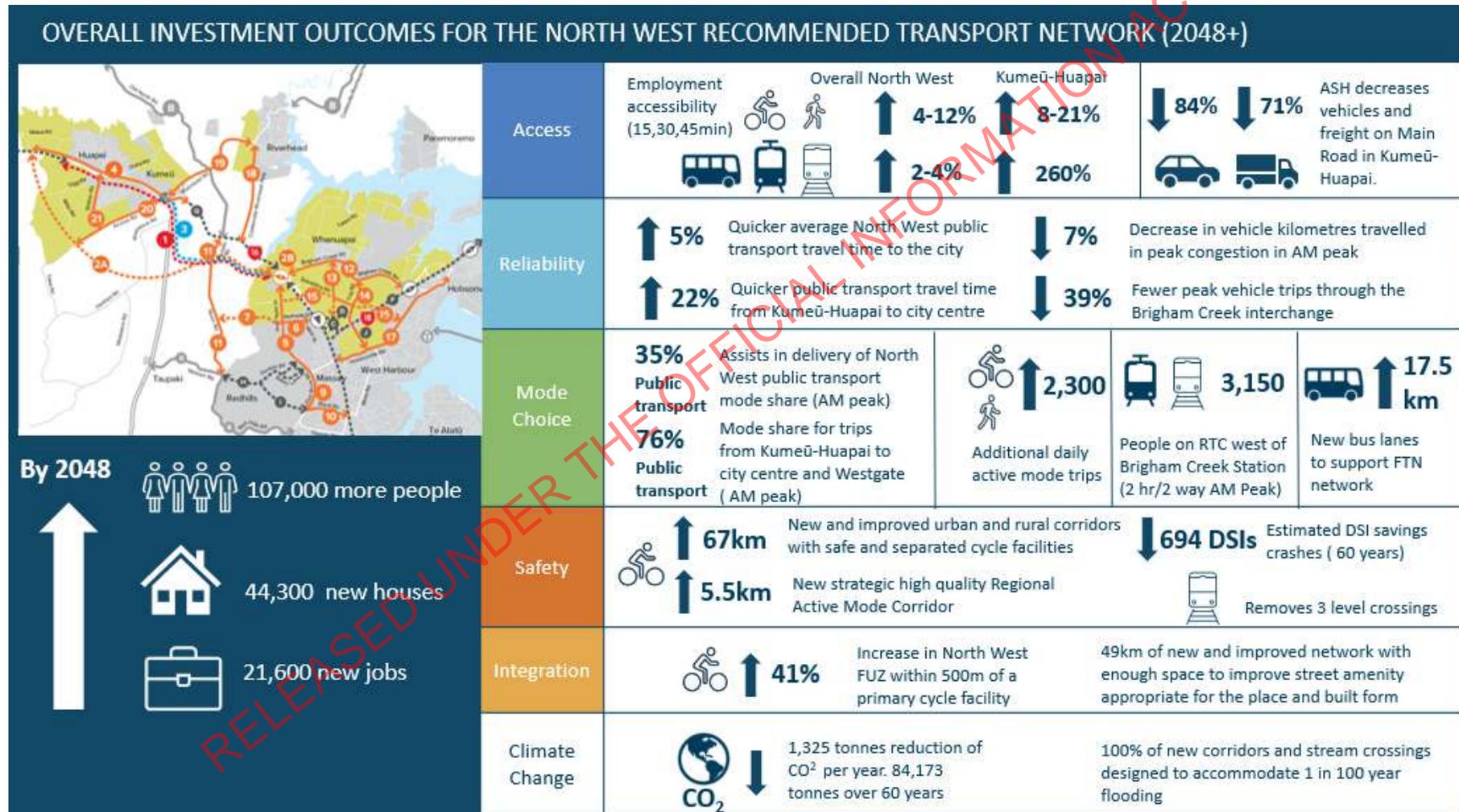
North West Preferred Transport Network



1.6 Outcomes achieved

The key outcomes for this recommended network are shown in Figure 1-6.

Figure 1-6 North West Recommended Transport Network for route protection



1.7 Costs and benefits

The overall estimated cost (P50 undiscounted) for the full North West programme is **\$4.8bn** of which [REDACTED] is associated with property purchase.

The Base Estimate Benefit Cost Ratio (BCR) for the package is shown in Table 1-1. The BCR for the full North West programme is **0.7** excluding Wider Economic Benefits (WEBs). When WEBs are considered this increases to 0.9.

Table 1-1 National and Government BCRs for North West DBC

Projects	National BCR (Excluding WEBs)	National BCR (including WEBs)
North West DBC programme wide	0.7	0.9
Rapid Transit Corridor/Regional Active Mode Corridor (60 years)	1.0	1.3
Alternative State Highway (60 years) includes Brigham Creek Interchange	0.9	1.1
Kumeū-Huapai/Riverhead (40 years) includes SH16 Main Road upgrade	0.2	0.2
Whenuapai (40 years)	0.7	0.8
Redhills (40 years)	0.4	0.5

The North West recommended transport programme underpins the whole premise for growth in the North West and without it growth would be constrained. The evaluation is based on the standard evaluation methods for transport infrastructure, which is typically dominated by travel time savings. The purpose of many of the identified schemes are primarily about providing the basic infrastructure to make growth happen such as urbanising existing rural roads or providing new connections to enable the land use to develop. Therefore, although travel times may improve for those living in the area this is a secondary consideration to the fundamental requirement to provide access.

1.8 Property and route protection

There is a potential property cost implication once the North West NoRs are lodged. [REDACTED]

Route protection costs consist of three components:

- Post lodgement funding for the NoR.
- Early property acquisition - property costs that could be anticipated during the route protection process.

- Property costs

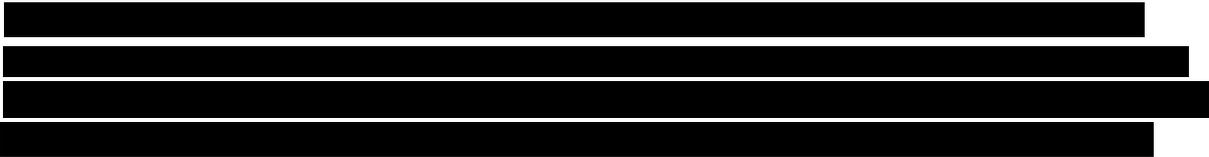
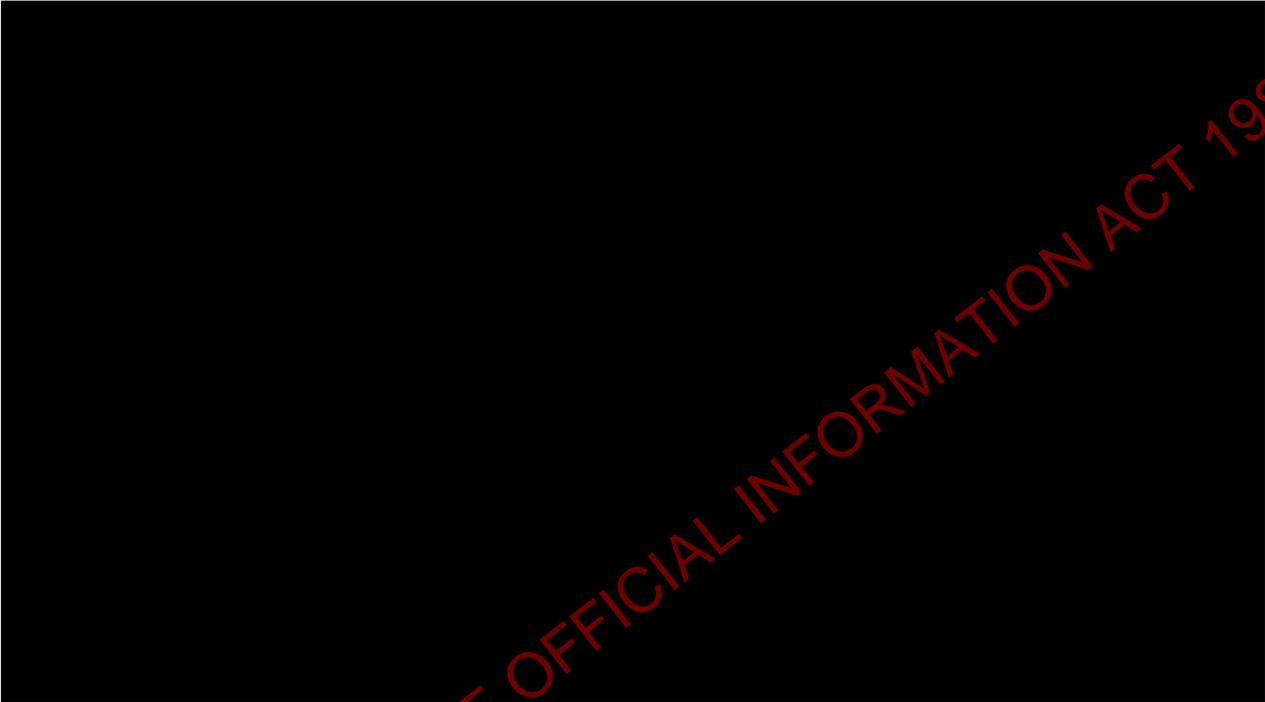


Figure 1-7 Cashflow for cost of route protection – NoR Post Lodgement Costs, Early Property Acquisition, Property Implementation [redacted]



The first decade cashflow for the **route protection only** part of the property costs is [redacted]
[redacted] The total first
decade early property acquisition costs [redacted]
[redacted]
[redacted]
[redacted]

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Figure 1-8 First decade cashflow for cost of route protection – NoR Post Lodgement Costs, Early Property Acquisition



1.9 Funding share

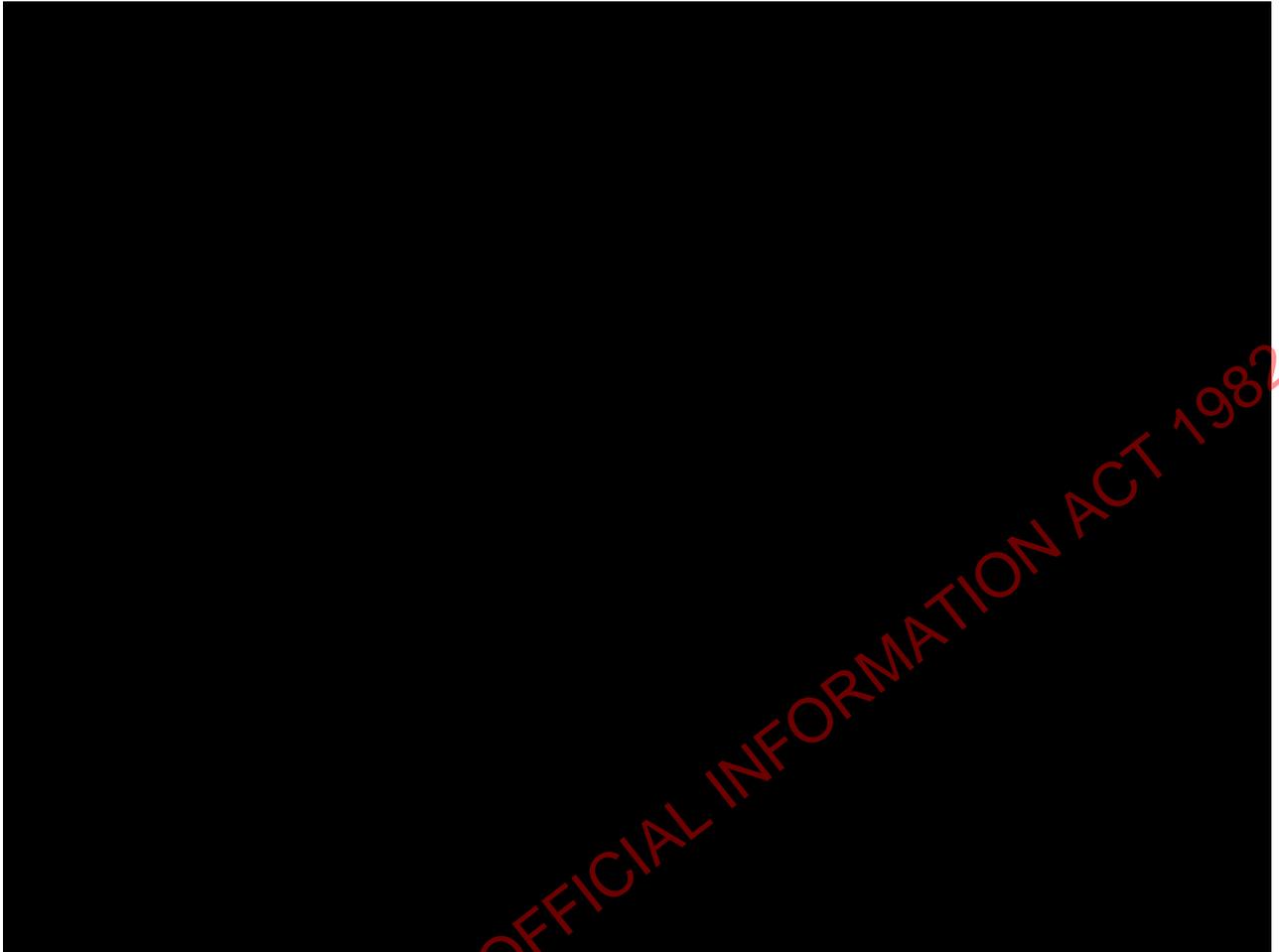


Figure 1-9 Funding Split for North West Projects (P50 Costs)



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Figure 1-10 Funding Split for North West Projects by Project Area (P50 Costs)²



This is a substantial transport investment programme to support the planned North West growth. The current staging is based on the FULSS land use which assumes the majority of growth land will be released in Decade 2 [REDACTED] and concentrates implementation around 2028-2032.

[REDACTED]

It is acknowledged that there is a cost to flexibility and route protection and the work undertaken to date for the North West has concentrated on balancing the future needs of the corridors and desired design flexibility against the property requirements to facilitate the infrastructure.

1.10 Key risks and opportunities

A Risk and Opportunity Management Plan has been developed and endorsed by the Te Tupu Ngātahi governance team. The risk management process is consistent with AS/NZS ISO 31000:2009 and is

[REDACTED]

consistent with typical risk management processes undertaken by AT and the Waka Kotahi. Key overarching risks and opportunities at a programme-wide level include:

- Affordability and availability of funding.
- Property impacts of route protection as a result of longer lapse times sought on designations.
- Lack of certainty around growth pace, growth form, zoning and timing.
- Impact of climate change policies on project development.
- Ongoing and consistent messaging to stakeholders and property owners to avoid local opposition to proposals.
- Development proceeding without protection of the recommended network, resulting in increased land values, potentially adversarial NoR processes and sub-optimal outcomes in terms of transport and land use integration.
- Political perspective change staging and or priorities.
- Property development pressure prior to route protection or implementation.

Specific additional North West DBC risks and opportunities include:

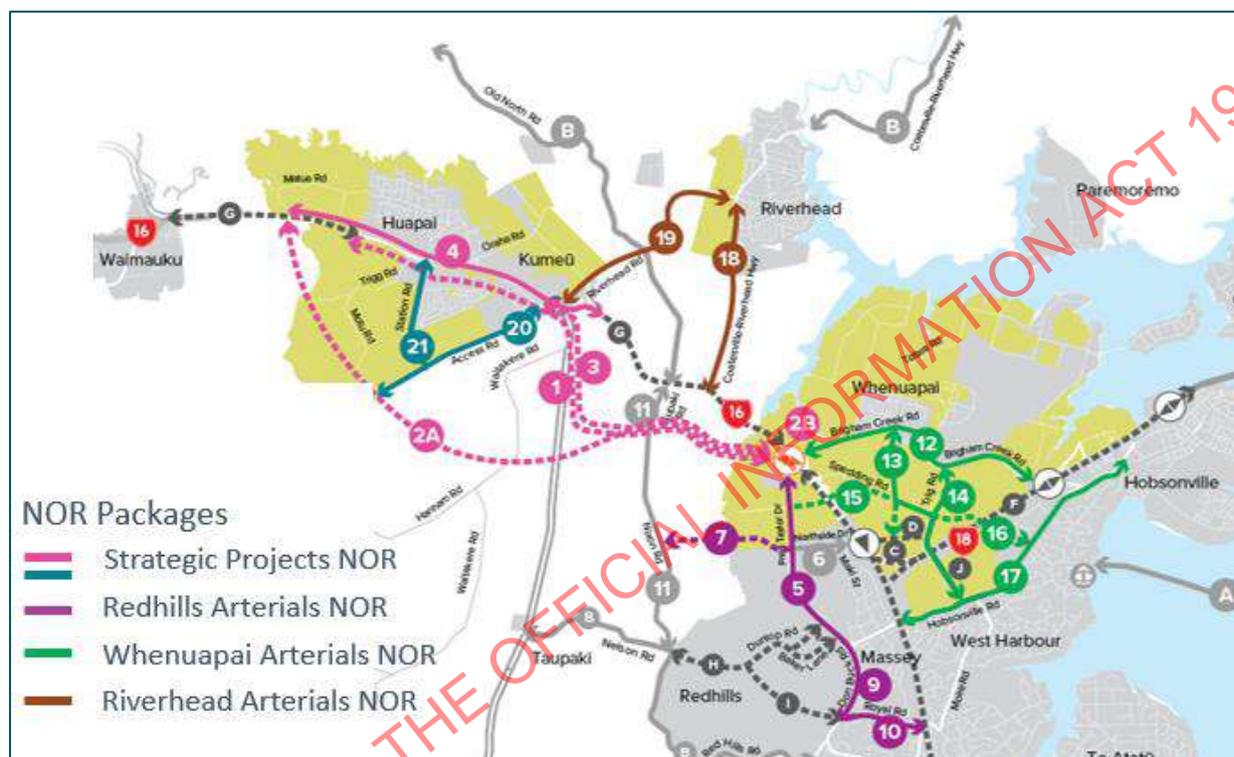
- Uncertainty of the RTC mode requiring additional design flexibility for the RTC. Resulting opportunity is potential additional future land acquisition savings.
- Opportunity to change the elevation of the RTC and SH16 at the Brigham Creek Interchange to facilitate better land use outcomes for residual land.
- Opportunity to work with Auckland Council to shape the land use around the proposed future RTC stations.

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1.11 Next steps for route protection

A North West Route Protection Strategy has been developed to support the North West DBC and makes recommendations on the prioritisation, packaging and preferred planning mechanism to secure route protection for the North West recommended network. A separate consent strategy will be prepared as part of the NoR process which will confirm consenting pathways, required technical assessments and NoR staging. The proposed NoR packages are shown in Figure 1-11.

Figure 1-11 Proposed NoR packages



The prioritisation and urgency for the route protection is shown in Table 1-2.

Table 1-2 Urgency of route protection

Area	Project Corridor	Urgency
Strategic Projects	<ul style="list-style-type: none"> ASH and BCI 	High
	<ul style="list-style-type: none"> RTC RAMC 	High
	<ul style="list-style-type: none"> SH16 Main Road 	High
	<ul style="list-style-type: none"> Access Road Station Road 	Medium
Redhills	<ul style="list-style-type: none"> Northside Drive West Don Buck Road 	Medium
	<ul style="list-style-type: none"> Fred Taylor Drive 	Medium

[REDACTED]

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2 Introduction

The purpose of the Te Tupu Ngātahi Programme (the Programme) is to recommend a sustainable transport network for route protection to support Auckland's planned greenfield growth over the next 30 years. The support of urban growth through access to high quality public transport and safe walking and cycling options will avoid or minimise new transport emissions as growth occurs.

The North West Detailed Business Case (DBC) follows on from the outcomes identified at both the Programme Business Case (PBC) and Indicative Business Case (IBC) stages and further investigates and confirms a fit-for-purpose transport network for the North West. This North West DBC:

- Identifies changes since the development of the IBC.
- Reviews the IBC assumptions, evidence and main findings.
- Develops and assesses options and confirms the preferred option for each corridor.
- Develops the economic case and measures expected benefits and outcomes.
- Identifies the arrangements needed for delivery and route protection.

It is important to note that the purview of this DBC is limited to outlining the case for **route protection** only of the projects within it. As projects progress for funding consideration and construction, separate implementation business cases will need to be prepared.

2.1 The North West growth area

The North West growth area is located approximately 20km to the west of Auckland's central city and includes the live zoned growth area of Redhills as well as the future growth areas of Whenuapai, Riverhead and Kumeū-Huapai. The projected growth is based on the Auckland Council's (council) Future Urban Land Supply Strategy (FULSS) and at full build out this growth is anticipated to reach³:

- 107,000 additional people - which is equivalent to adding a community the size of Dunedin.
- 44,300 new houses.
- 21,600 new jobs in the North West.

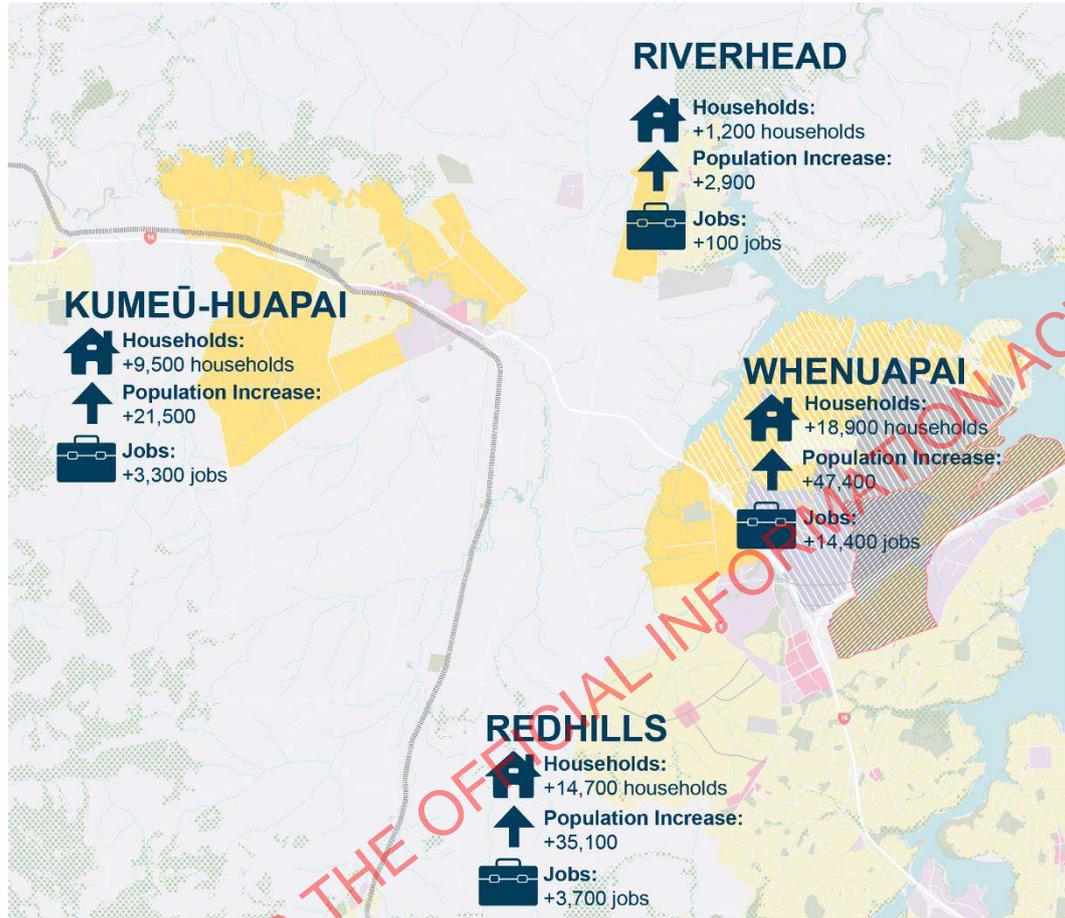
The full North West growth area has been identified in the FULSS to be development ready by 2032. 'Development ready' is defined by the FULSS as having bulk infrastructure in place ready for development of the site. Growth areas like Redhills and select Special Housing Areas are already live zoned. The projected North West growth is shown in Figure 2-1 below.

³ This full build out is based on the Future Urban Land Supply Strategy modelled as per the 2048+ modelling scenario which uses Land use scenario i11.5. changes in timing indicate potentially a 5 year delay to full growth realisation in the North West Growth area.

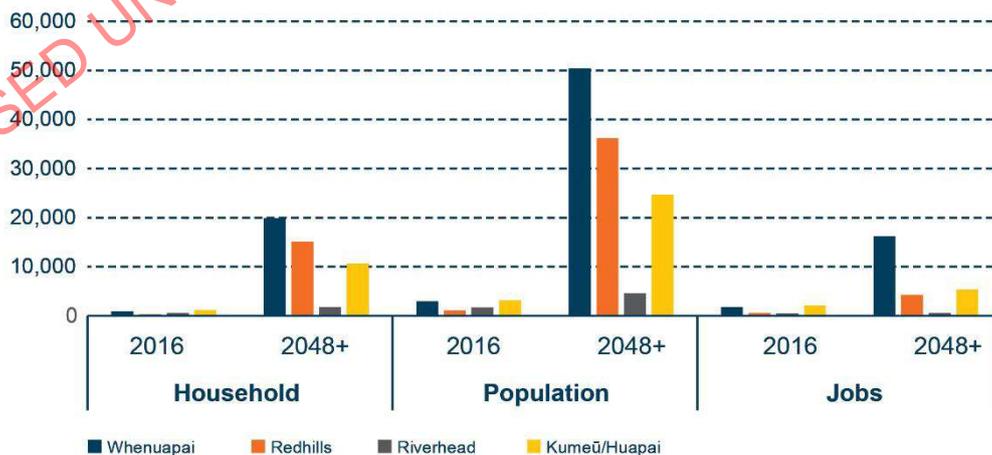
Figure 2-1 North West FULSS Land Release Stages

NORTH WEST LAND-USE CERTAINTY

PROJECTED GROWTH TO 2048+

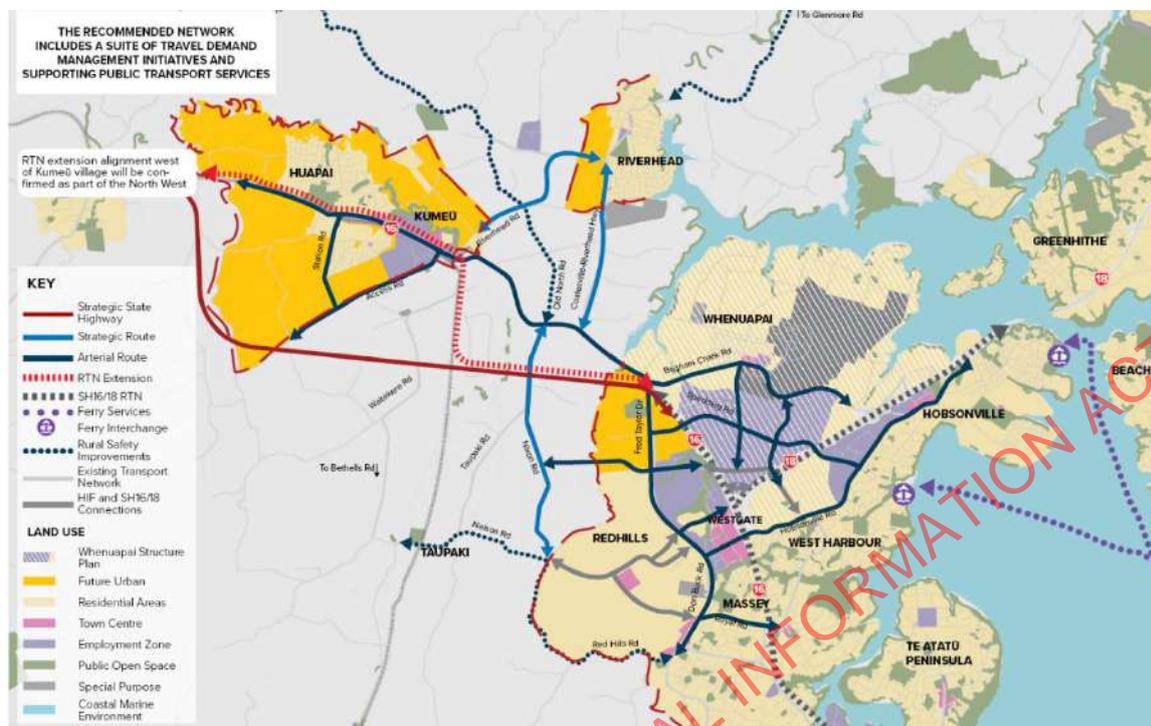


GROWTH IN KEY AREAS OF NORTH WEST AUCKLAND



The infrastructure to support the North West growth area was identified in the North West IBC and is shown in Figure 2-2.

Figure 2-2 North West indicative transport network (Source: North West IBC)



2.2 North West DBC Scope

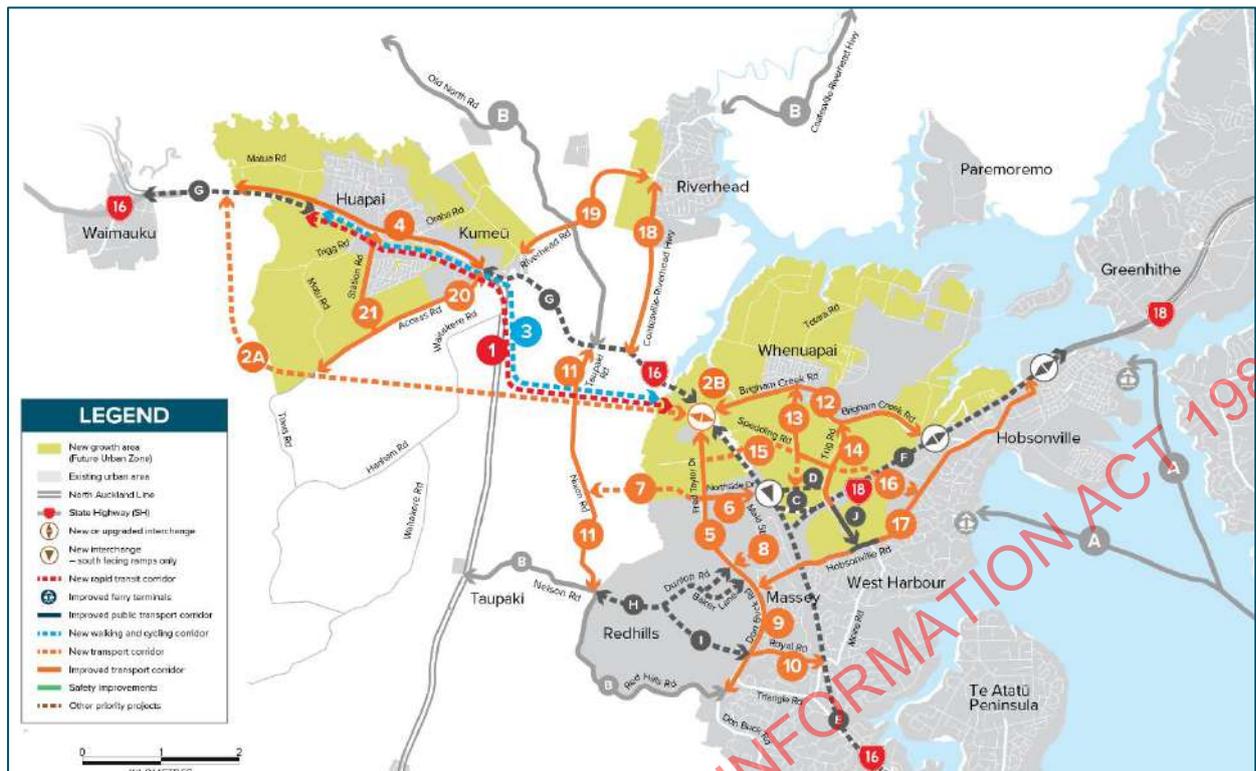
The investment decisions sought at this stage are:

1. **Approval of the North West recommended transport network.**
2. **Approval of lodgement and route protection for the North West.**
3. **Approval for funding release for the North West post lodgement activities.**
4. **Acknowledgement of the potential early property acquisition and associated risk arising from route protection of the recommended North West Package**

This document focuses on providing the overall North West DBC investment case for route protection and details the recommended route protection strategy. The preparation of the Notice of Requirement (NoR) packages will follow the completion of this DBC.

The North West DBC has a large scope with 21 corridors from the North West IBC Indicative Transport Network under investigation as shown in Figure 2-3. Together these projects form a cohesive transport response for the North West. The projects incorporate a wide range of transport investment including major strategic connections, intensified urban corridors and rural road upgrades. In addition, the timing for implementation will vary and will be dependent on the surrounding land use being realised.

Figure 2-3 North West DBC Scope

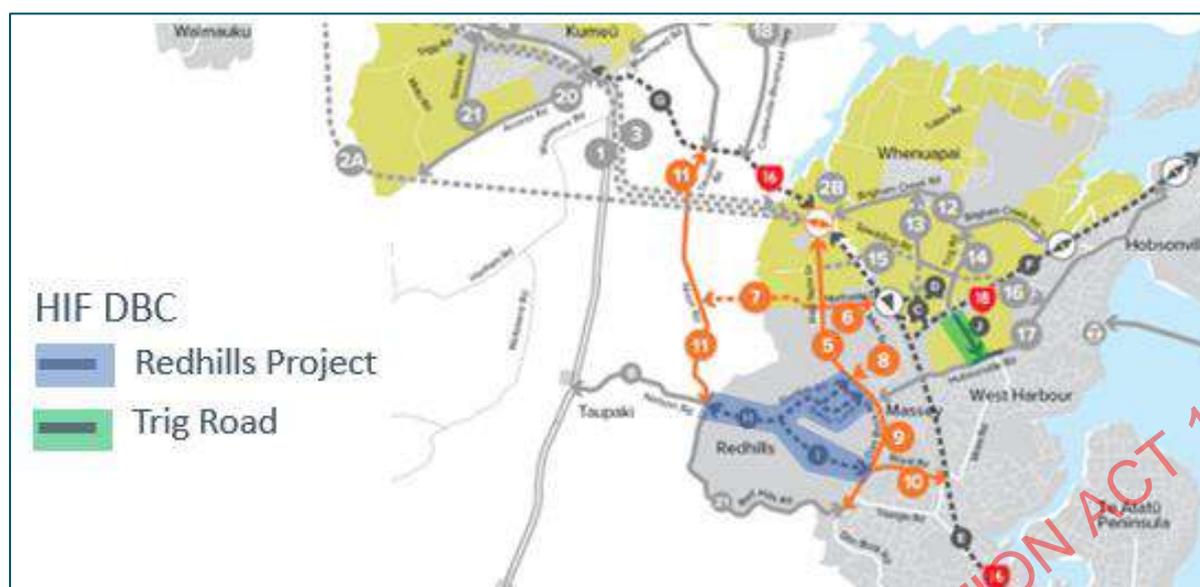


The North West DBC is designed to interface with corridors selected to be progressed as part of the Housing Infrastructure Fund (HIF) DBC. The HIF DBC corridors are shown in Figure 2-4 below. The HIF corridors included:

- Dunlop Road (west of Fred Taylor Drive).
- Baker Lane (west of Fred Taylor Drive).
- North-South Arterial to Royal Road.
- East-West Arterial to Nixon Road.
- Trig Road (south of SH18).

The HIF assessment included the intersections on the connecting arterials of Fred Taylor Drive, Royal Road and Hobsonville Road. This North West DBC does not duplicate this work and instead interfaces with these endorsed designs.

Figure 2-4 North West Housing Infrastructure Fund DBC corridors



Given the number and range of projects across the entire Te Tupu Ngātahi Programme and the difference in likely timing of implementation (between 10-30+ years), three broad DBC types have been identified:

- **Type A: Detailed Business Case for corridor confirmation** – identification of a preferred corridor; however, no further work required as no investment being sought.
- **Type B: Detailed Business Case for route protection** – identification of a preferred corridor with sufficient design to inform the assessment of effects and lodge a NoR. Investment in pre-implementation and resultant property costs sought.
- **Type C: Detailed Business Case for implementation** – a typical DBC assessment suitable for selection of a preferred option with sufficient detail to progress to pre-implementation, and implementation funding is sought.

The projects within this North West DBC are **Type B** business cases with the following exceptions:

- Taupaki-Nixon is a **Type A** DBC as no route protection mechanism will be progressed at this stage. Project details for this corridor have been developed to an IBC level of detail. No further investment is being sought for this corridor.
- Northside Drive East is a **Type A** DBC as no route protection mechanism will be progressed at this stage. Auckland Transport (AT) may wish to reallocate road space in the future if required and a costing has been provided in this DBC for this reallocation project. No further investment is being sought for this corridor.
- Dunlop Road east of Fred Taylor Drive is considered **fit for purpose** with the consented cross section providing suitable active mode facilities and sufficient traffic capacity. The available road reserve provides for some flexibility in the future if any improvement was desired for the type of cycle facilities. The intersection with Dunlop Road/ Fred Taylor Drive is included as part of the route protection project detailed in the HIF DBC and the design included the provision of bus priority. **Therefore, the corridor is not recommended to be progressed further in this DBC.**

This DBC has undertaken sufficient design detail and assessment to confirm the footprint required to provide for future infrastructure. This footprint strikes a balance of minimising land requirement whilst maintaining flexibility for future decisions over the next 10-30 years. Examples of how flexibility has been managed is shown in Table 2-1.

Table 2-1 Management of flexibility in the North West DBC

Item	How flexibility has been managed
Road space allocation	The cross sections provide sufficient space to provide for the individual modal elements – but how this road space might ultimately be allocated will be confirmed during the implementation DBC and reflect the design standards at that time. This includes final decisions on intersection form.
Stormwater treatment	Each corridor has had stormwater analysis undertaken to understand the stormwater treatment and attenuation requirements. This has informed the footprint including identification of wetlands where appropriate. For rural corridors, this has included the protection for provision of green infrastructure options as per Policy 6 of the AT Business Plan for 2020/2021. The Waka Kotahi standard is NZTA P46 Stormwater Specification. It is noted that this assumption may be revisited during the NoR process for affected roads.
North West DBC Rapid Transit Corridor	<p>This project is a planned extension to the fully implemented North West Rapid Transit Network (NWR TN) City Centre to Westgate (CC2W) rapid transit corridor which is being progressed on a different timeline. The CC2W DBC does not have a confirmed start date but current estimates are late 2021/ early 2022. The scope for the CC2W project includes from the city centre to the new Brigham Creek Station. The CC2W will define the mode for North West rapid transit system and as such there is currently no mode confirmed for this North West DBC's rapid transit network. The rapid transit project proposed in this North West DBC is a critical piece of infrastructure and has a pivotal role in enabling a transformational change for public transport in Kumeū-Huapai, hence despite modal uncertainty it has still been included as part of this North West DBC and the overall transport story. It is acknowledged that the modal uncertainties result in this corridor being unable to deliver the same level of certainty and detail as other corridors in the DBC. This is managed in this DBC by:</p> <ul style="list-style-type: none"> • Provision of a mode neutral alignment that can provide for bus, light rail or light metro rolling stock. • Inclusion of a station strategy which indicates number and type of stations and indicative locations. • It is expected that additional design work around specific station locations and any final alignment refinements would occur once the mode has been confirmed and prior to completion of Notice of Requirement documents.
Management of greenhouse gas (GHG) emissions.	<p>A number of factors will encourage mode shift in time with development to support the management of GHG emissions associated with future growth:</p> <ul style="list-style-type: none"> • Flexibility in road space allocation and longevity of the programme provides sufficient opportunities to realise future design changes or use of materials to best support low carbon infrastructure throughout the lifecycle of the project. • Flexibility for programme staging to allow re-prioritisation of elements to best respond to mode shift targets as interdependent factors such as funding and changing land use occurs.

2.3 Structure of North West DBC

This DBC document provides a summary of the North West Business Case and more detailed information for each corridor is included in the specific appendices referenced throughout the DBC.

All appendices have been written to allow individual corridor information to be easily decoupled from this overarching DBC for use in future individual corridor business case processes or preparation of NoR workstreams. Details of the appendices' purpose are shown in Table 2-2.

All appendices are formatted similarly with reporting ordered as follows:

- Generic or process orientated information.
- Strategic project information.
- Local projects ordered by Redhills, Whenuapai, Riverhead then Kumeū-Huapai.

The economic case has been prepared for the overall North West with an additional assessment lens by development area e.g Redhills, Whenuapai, Riverhead and Kumeū-Huapai. In addition, there are assessments for two groupings of the strategic projects:

- Alternative State Highway (ASH) and Brigham Creek Interchange (BCI).
- Rapid Transit Corridor (RTC), SH16 Main Road Upgrade and Regional Active Mode Corridor (RAMC) projects which would be expected to be delivered together.

The programme outcomes have been reported in a similar geographic way to support staged delivery by area should it be desired. Where possible outcomes have also been reported per corridor.

Table 2-2 North West DBC appendices

Appendix	Summary of purpose
A: North West Strategic Case	Strategic Case for the North West DBC including specific evidence for each project corridor. Identifies any changes to the policy and strategic direction since the completion of the North West IBC.
B: Options Assessment Report	Summary of option assessment process for North West. Includes detailed documentation for each corridor individually.
C: Transport Assessment	Specific information on transport aspects including form and function assessments, modelling and transport outcomes.
D: Cost Report	Assumptions and methodology for costing. Costs prepared for each project.
E: Urban Design Evaluation	Urban design evaluation for all projects in the North West using the Te Tupu Ngātahi Design Framework principles.

Appendix	Summary of purpose
F: Design Report	Engineering report that documents assumptions and decisions for the recommended network for each project.
G: Engagement Summary	Summary of results from the 2020/2021 North West engagement.
H: Economics Assessment	Economic assessment for the North West. Includes assumptions and outcomes.
I: Property Acquisition Strategy	Assumptions and methodology for the calculation of property costs.
J: Route Protection Strategy	Strategy to route protect for the North West.
K: Risk Register	Key overall North West and individual project risks.
L: Staging Assessment	Potential staging for the North West network. Includes qualitative commentary of both land use and transport factors for staging and commentary on triggers.

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Strategic Case

2.4 Business Case change history

A snapshot of the North West Business Case history is shown in Figure 2-5. It summarises the recommended network for each Business Case stage, the urbanisation growth assumptions and the applicable regulatory and planning policies influencing decisions made. It is noted that the drivers for transport intervention have not changed throughout this process with continuity of:

- **Growth in the North West:** Dwellings, jobs and population assumptions have continued to increase throughout the business case stages demonstrating further urban intensification.
- **Regulatory and planning policies:** These policies support the mode neutral approach to transport interventions.

Figure 2-5 History of the North West Business Case

Stage	Detail	Growth	Policy
Programme Business Case (2016-2017)	<p>TFUG considered a programme of intervention for the North, North West and South growth areas. The possible North West interventions included:</p> <ul style="list-style-type: none"> • New Rapid Transit Corridor. • New Alternative SH16 Corridor. • New and improved public transport and cycle facilities. • Safety improvements. • Upgraded local road corridors. 	<ul style="list-style-type: none"> • Responds to the pace, scale and staging of growth identified in the AUPOIP and FULSS 2015. • FULSS 2015 greenfield growth assumptions: Dwellings 24,540 - 29,700, Jobs 13,360. 	<ul style="list-style-type: none"> • FULSS (2015). • AUPOIP (2015). • I9 Land Use Scenario. • ATAP first revision. • GPS on Land Transport (2015-2018)
Indicative Business Case (2018-2019)	<p>IBC focused on North West area only:</p> <ul style="list-style-type: none"> • Confirmed need for Rapid Transit Corridor and Alternative SH16 corridor • Development of Frequent Transit Networks in Redhills and Whenuapai. • New and upgraded multimodal road corridors • Connected cycle network • Safety improvements 	<ul style="list-style-type: none"> • Response to the pace of the updated FULSS 2017. • FULSS 2017 greenfield growth assumptions: <ul style="list-style-type: none"> • Dwellings 42,355 • Jobs 13,000 • Modelled growth assumptions* – <ul style="list-style-type: none"> • Dwellings 46,900 • Jobs 22,100 • Total Population 114,100. 	<ul style="list-style-type: none"> • Updated FULSS (2017). • I11.4 Land Use Scenario. • Updated ATAP. • New GPS (2018-2021). • New Auckland Plan 2050. • Whenuapai Plan Change 5 in progress • Outcome: new GPS and Auckland Plan reinforces a balanced, mode neutral response in the North West. Focusing on greater mode choice and consideration of modal priorities.

Stage	Detail	Growth	Policy
Detailed Business Case (2020-2021)	<ul style="list-style-type: none"> • DBC investigated interventions identified during the IBC: • New Rapid Transit Corridor • New Alternative SH16 • Frequent Transit Networks on Fred Taylor Dr/Don Buck/ Hobsonville/Māmari Road/Royal Road • Cycle hierarchy including a regional connection between Kumeū and Westgate. • Arterial upgrades to 13 local roads. • Removes Dunlop Rd from Programme 	<ul style="list-style-type: none"> • Whenuapai Plan Change 5 still in progress • Response to the pace of the updated FULSS 2017. • Similar modelled growth to IBC numbers so ultimate transport response is commensurate. • Modelled growth assumptions* – Dwellings 47,500 • Jobs 26,600 • Total Population 115,900 • Additional 5 years for full build out. Could affect timing of infrastructure. Using 2048+ scenario for modelling. 	<ul style="list-style-type: none"> • I11.5 Land Use Scenario • New GPS (2021-2024) • Spatial Land Use Strategy for North West. • Vision Zero 2019. • Climate Change Response (Zero Carbon) Amendment Act 2019 • NPS Urban development (NPS-UD). • NPS Freshwater Management (NPS-FM). • Outcome: Continued focus on mode shift and choice. Increased focus on achieving climate change response and intensification of development at transport nodes.

*Modelled growth numbers are generally reported in this North West IBC and DC documentation. The modelled growth assumptions include the full potential of zoning in North West i.e., both Future Urban Zoning as well as subdivisional capability under the Unitary Plan.

3 Why is investment needed?

Auckland is New Zealand's largest city and the economic heart of the nation. The current transport network with its high reliance on private vehicle use does not support the aspirations of New Zealand to address climate change with a move to a low carbon economy.

Over the next 30 or more years, the North West growth areas are expected to accommodate:

- Increase from 3,200 to 44,300 dwellings.
- Increase from 5,000 to 21,600 employment opportunities.
- Tenfold increase of population from 9,000 to 107,000 people which is equivalent to adding the population of Dunedin into the North West.

This is a significant increase from the existing population and employment in areas that are presently predominantly rural in character. The existing transport system is not appropriate and this growth will exacerbate existing transport problems resulting in the current network being unsuitable to support this planned future growth. Without investment, urban growth will continue to contribute to transport emissions rather than supporting the government policy to avoid emissions when growth occurs.

The North West is uniquely located with geographical proximity to Auckland's city centre as well as two metropolitan centres (locally at Westgate and sub regionally at Albany). However, despite proximity to both SH16 and SH18 for these regional connections, it currently has limited transport choice and limited transport connections to these key employment locations.

The Future Urban Zoned (FUZ) land in the North West is currently served by a transport network that has existing rural and urban transport corridors. A snapshot of the existing North West network performance is:

- 93% of North West commute mode share is made by private vehicle, 2% by public transport, 3% by foot and 1% by bicycle⁴.
- Existing cycleway provision is localised and does not create a connected network to key destinations.
- Low existing bus frequencies and limited route choice in the North West, particularly for Kumeū-Huapai. With limited bus priority, the public transport that is currently provided is subject to reliability issues from background congestion.
- Significant congestion on sections of the North West network, especially on SH16 in the vicinity of Brigham Creek and the key arterials of Fred Taylor Drive, Don Buck Road and Hobsonville Road.
- Many sections of the rural network have safety issues and these roads are routinely used for rat running as other vehicles try and avoid congestion.
- Connectivity between areas in the North West is limited with only a single urban corridor to access Kumeū-Huapai and Riverhead. Whenuapai is severed by both SH16 and SH18 and has only three current access points and no direct connection between SH16 and SH18.

The current form of the transport network is not capable of supporting the significant growth and will be unable to support the overall climate change goals of shifting trips to lower emission travel options including public transport and active transport. It is critical that the transport system supports and

⁴ 2018 census data excluding the influence of the RNZAF air base and personnel living adjacent the Air Force Base. Refer to Strategic Case for more information.

shapes the scale of growth proposed. Table 3-1 shows the most likely issues to develop in the North West if investment does not occur.

Table 3-1 North West without transport investment

Issue	Outcomes
Poorly integrated land use	<p>Substantial growth has been identified in the North West, ranging from Redhills which is live zoned to areas that are yet to be structure planned. A planned approach to growth and investment is essential to ensure land use is well integrated with the transport network to enhance liveability, sustainability, and improved choice for customers. Without land use integration the North West could expect:</p> <ul style="list-style-type: none"> • Reduced ability to improve access to social and economic opportunities through poor connectivity between land uses and geographical areas. This could include insufficient or unsuitable transport links to support employment zones. • Poor correlation between local jobs and population increasing demand for commuter travel outside of North West, further exacerbating transport demands. • Reduced opportunities to increase mode share for public transport, walking and cycling as transport catchments will not be optimised if land use is in a suboptimal location or at an insufficient density. This will reinforce private car use to continue at existing levels and not support GHG reductions. • Inability to realise opportunities to create transit-oriented developments that are supportive of intensification in town centres like rapid transit networks (RTN) or frequent transit networks (FTN). Without investment, there is the risk of sub-optimal or less efficient urban land development. • Liveability outcomes are compromised, limiting North West Auckland’s growth potential. • Growth aspirations will not be met possibly placing increasing pressure on other areas of Auckland city.
Reduced climate change outcomes	<ul style="list-style-type: none"> • Without the infrastructure to support substantial mode shift such as rapid transit, improved bus networks and cycle facilities the North West will not have the ability to facilitate the shift to low emission transport modes. It is likely that transportation will remain reliant on private low occupancy vehicles. • Lack of investment will leave the existing network more exposed to increasing climate change related risk
Decreased safety	<ul style="list-style-type: none"> • Decreased safety on key corridors such as SH16 and Coatesville-Riverhead Highway as traffic volumes increase with limited investment in safe solutions. • Increased safety risks on rural roads from high speeds and rat running by vehicles seeking to avoid significant congestion. • The land use change from rural to urbanised area and increased traffic volumes will increase safety risks for active mode conflict with

Issue	Outcomes
	vehicles. Lack of cycle facilities will also result in people utilising inappropriate cycling routes reducing safety outcomes.
Transformational mode shift is compromised	<ul style="list-style-type: none"> Under investment in public transport, walking and cycling will reduce the ability to contribute to transformational mode shift which facilitates reduction in vehicular greenhouse gas emissions. Limited transport choice therefore reducing access to key social and economic opportunity centres.
Unmanaged growth in demand for private vehicle travel	<ul style="list-style-type: none"> Severe congestion on both local and strategic roads. Increased severance through Kumeū from heavier traffic volumes, further reducing the amenity and access to the town centre.
Reduced reliability	<ul style="list-style-type: none"> Strategic network resilience risk associated with only a single access to Kumeū-Huapai and limited access to Whenuapai. Over-reliance of these connections for both strategic and local activities compromises both functions. Reduced reliability for bus networks decreasing attractiveness of mode choice.
Inability to urbanise the rural road network	<ul style="list-style-type: none"> Limited urbanisation of the currently rural road network, which will have negative outcomes for safety, urban form, and active travel.

3.1 Why route protect?

The North West transport network will require substantial investment to support this planned growth. Route protection is the first and critical step for ensuring the transport enhancements needed can be provided. The intent of route protection is to identify and appropriately protect the land corridor necessary to enable the future construction, operation and maintenance of the recommended network options.

Route protection provides the mechanism to protect the network in advance as opposed to retrospectively making the transport interventions fit the existing urban form. The key benefits of route protections are that it:

- **Provides certainty and direction for future land use.** This supports key land use integration measures such as future structure planning processes and intensification around stations and public transport routes.
- **Provides a mechanism for AT and Waka Kotahi to plan for future financial investment while retaining flexibility** on the detailed development of the recommended future network, enabling it to respond to the pace, scale, and exact location of future urban growth.
- **Allows for major infrastructure to be implemented at the right time**, integrated with the urban development driving the desired transport and urban outcomes. This means that projects can be delivered to meet project objectives, with the transport network in mind and gives certainty that the transport system can be operated.

- **Reduces future cost risk.**

[REDACTED]

- **Protects project feasibility.**

[REDACTED]

The North West is seeing increased development pressure which further supports the need for timely route protection as detailed in the North West IBC. This development pressure is demonstrated by increases in building consents of 50% in Rodney and 100% in Henderson Massey⁵ in the two years since the North West IBC was developed. The project team is also aware of the following significant land developments:

- Areas of Whenuapai where developers are working towards Private Plan Changes to rezone land currently zoned future urban and forecast for release in 2028 – 2032 (In addition Council's Proposed Plan Change 5)
- Purchase of land in Riverhead by Fletcher Residential Ltd – with the intention of working towards Private Plan Changes to rezone land currently zoned future urban and forecast for release in 2028 – 2032⁶.
- Purchase of rural land in Taupaki by Fletcher Residential Ltd to be rezoned in the longer term (by 2045) into an urban village.⁷

⁵ Refer to Appendix A: Strategic Case , Section 3

⁶ <https://www.linz.govt.nz/overseas-investment/decision-summaries-statistics/2020-12/202000481>

⁷ <https://www.linz.govt.nz/overseas-investment/decision-summaries-statistics/2020-09/201900654>

4 What has changed since the IBC?

There has been a wide array of changes to policy, land use and transport assumptions between the endorsement of the North West IBC and the preparation of this North West DBC. Table 4-1 summarises the key changes and the impacts for this North West DBC. For more detail refer to Section 3 of **Appendix A: North West Strategic Case**.

Land use and transport project assumptions are in constant evolution. This North West DBC is focused on using the new information to:

- Identify and where possible mitigate or reduce project risks.
- Better understand the flexibility that will be required during option development for route protection.
- Test the resilience of the proposed programme to changing land use.
- Align with other endorsed projects technical requirements and where necessary identify opportunities for improved outcomes.

Table 4-1 Summary of Key Changes since the North West IBC

Change Since North West IBC		DBC Response
Growth Assumptions	<ul style="list-style-type: none"> • Overall growth projections in the North West remain generally consistent in terms of full build out quantum. • Growth projections are expected to slightly slow in terms of full build realisation, which is expected to take approximately 5 years longer. 	Given the overall quantum of growth remains largely the same, and this was the basis on which the transport network was developed, the conclusions of the North West IBC remain valid. The change in timing could potentially affect the timing of implementation of transport projects in the North West DBC.
Land Use Assumptions	<ul style="list-style-type: none"> • The Auckland Council North West Spatial Land Use Strategy has been developed as a starting point to ensure the future land use and transport networks work together to support growth. • Whenuapai Proposed Plan Change 5 hearing was adjourned and Council is now preparing a variation. • Increasing development pressure has been identified in the North West, including proposals to bring forward development faster than current FULSS sequencing, proposals to urbanise areas currently not urban, and increasing rates of building consents in the North West. This increases the risk of strategic transport corridors being compromised where private plan changes and live zoning result in development occurring ahead of route protection. • 	<p>The North West DBC is cognisant of any changes in the land use assumptions and utilises the most current land use assumptions available.</p> <p>Of those identified to date, there are no significant changes to land use assumptions from the North West IBC. This will need to be monitored and is identified within the Management Case at Section 14 of this DBC.</p>

<p>Policy and Strategic Alignment</p>	<ul style="list-style-type: none"> • Ministry of Transport Outcomes Framework. • An updated GPS 2021 on Land Transport has been released, which places increased focus on climate change objectives and freight connections rather than broader environmental outcomes and value for money. • NPS on Urban Development. • NPS on Freshwater Management. • Proposed NPS for Highly Productive Land. 	<p>Overall, there have been some changes to the policy and strategic direction since the North West IBC. These changes are however still consistent with the overarching outcomes sought from the North West IBC. These include access, mode shift, environmental sustainability, safety.</p> <p>With these continuing objectives it is considered that the North West IBC conclusions are well aligned with the current strategic and policy directions.</p> <p>The problems and assessment in the North West DBC have been refined to accommodate these changes. Details on how the network will support addressing climate change will be included.</p>
<p>Climate Change</p>	<ul style="list-style-type: none"> • The Climate Change Response (Zero Carbon) Amendment Act 2019. • Amendments support contribution to the global effort under the Paris Agreement to limit the global average temperature increase to 1.5° Celsius above pre-industrial levels. • Allow New Zealand to prepare for, and adapt to, the effects of climate change. • AT has internal target to reduce 50% of its operation emissions by 2030. This will require future facilities to be highly efficient and emit less emissions. 	<p>The North West IBC was built on the premise of:</p> <ul style="list-style-type: none"> • Transport and land use integration – a guiding principle to provide a transport network that supports land use development and good urban form. • Prioritising mode choice – specifically focusing on rapid transit, improved public transport reliability and services and creation of a well-connected walking and cycling network. <p>The result is a recommended transport system which actively reduces the reliance on private vehicles and shifts trips to low carbon alternatives. This is one of the key levers identified to mitigate transport based emissions.</p> <p>The North West DBC also continues to build on demand management principles adopted in the North West IBC and does not provide for unconstrained demand but rather seeks opportunities to influence and reduce demand alongside the recommended infrastructure.</p>

		As such, the North West DBC is well positioned to respond to climate change outcomes. The DBC looks at climate change from both a Te Tupu Ngātahi programme level as well as at the project level and is focussed on fine tuning the system response to maximise climate change mitigation.
Transport Projects	<ul style="list-style-type: none"> • Heavy rail. • SH16/18 Connections project (SSBC). • North West Rapid Transit Network (including City Centre to Westgate RTC and SH18 RTC). • SH16 Brigham Creek to Waimauku. • Housing Infrastructure Fund. • Interim Public Transport measures. 	<p>From the North West IBC there has been little change that would have demonstrable effect on the conclusions in the North West IBC.</p> <p>There has been no additional funding identified since the North West IBC that would change the indicative staging of these investments. It is noted that the short term North West Rapid Transit Improvements have been identified and funded since the IBC, in order to initiate the North West rapid transit system.</p> <p>Options interdependent with heavy rail will be considered during the development of key projects (Alternative State Highway, Rapid Transit Corridor and SH16 Main Road upgrade). The optioneering process will be cognisant of possible long-term potential for the NAL so as not to inadvertently preclude opportunities. It is noted that impacts associated with port relocation opportunities or external freight policy decisions are not considered in the scope of the North West DBC</p>
Development pressures	<p>Evidence of following significant land developments:</p> <ul style="list-style-type: none"> • Areas of Whenuapai where developers are working towards Private Plan Changes to rezone land currently zoned future urban and forecast for release in 2028 – 2032 (In addition Council's Proposed Plan Change 5). • Purchase of land in Riverhead by Fletcher Residential Ltd – with the intention of working towards Private Plan Changes to rezone land currently zoned future urban and forecast for release in 2028 – 2032. • Purchase of rural land in Taupaki by Fletcher Residential Ltd to be rezoned in the longer term (by 2045) into an urban village. 	<p>Generally, the North West DBC responds to growth as currently identified in the FULSS. However, there is evidence of ongoing development pressure in the North West.</p> <p>These will have varying degrees of impact and where the proposed plan changes are within the existing future urban zoned land – these impacts would largely be focused on the staging and sequencing impacts and the resulting pressure on strategic transport infrastructure. Development</p>

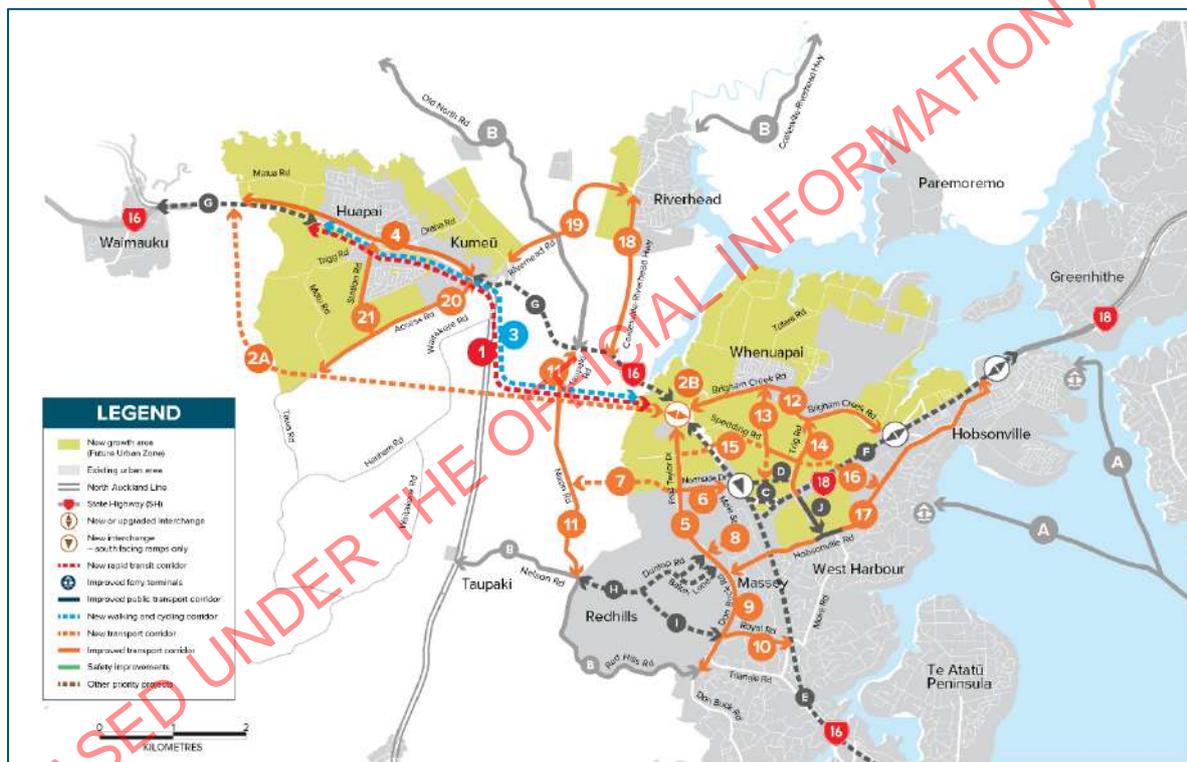
	<ul style="list-style-type: none"> Oyster Capital Plan Change in structure planned Whenuapai. 	<p>proposals such as that identified in Taupaki would have a wider implication on the proposed network as it generates additional demand where previously there were none.</p> <p>Issuing of consents has generally doubled in the two years since the completion of the IBC.</p> <p>Where some certainty of information is available e.g., for Plan Change 5 and the Oyster Development, the DBC has considered the proposed land use changes to understand how this might impact the proposed transport network. Where possible the team has spoken with developers directly e.g., multiple conversations with Oyster Development. Where there are no details available this DBC has not formally or informally assessed the impacts.</p>
COVID19	<p>The impact of COVID19 on the transport system has three key impacts:</p> <ul style="list-style-type: none"> Resilience of public transport operations. Change in funding levels and type. A kick start for working from home. 	<p>While the response to COVID19 has had a direct and immediate impact on public transport and transport demand, it is expected in the longer-term horizon, such as that assessed in the North West DBC that transport demands will return to projected levels.</p> <p>In addition to this, the realisation of work from home opportunities will have an impact consistent with longer term aspirations for reduced travel demand.</p> <p>Given the long-term nature of the North West DBC no specific changes to land use and travel demand assumptions are considered necessary.</p>

5 North West projects

This North West DBC proposes an integrated transport network to support the expected future growth in the North West. The network includes provision for rapid and frequent public transport, improved walking and cycling, and general traffic connections. Overall, the North West package seeks to improve connectivity for the North West and support transformational mode shift by providing high quality, safe and attractive transport environments.

Following the development of the North West IBC, 21 corridors from this recommended programme were initially considered as part of this North West DBC as shown in Figure 5-1 below. Other projects identified in the IBC such as rural safety improvements, ferry services and infrastructure and Housing Infrastructure Fund (HIF) corridors have been incorporated into alternative or parallel programmes and are shown in grey or black on the map below.

Figure 5-1 North West DBC projects



The next sections provide a summary of the projects assessed in this document. Full project descriptions are included in the corridor assessments in **Appendix A: North West Strategic Case**.

5.1 Strategic network projects

There are four projects which form part of the strategic network as shown in Figure 5-2.

Figure 5-2 Strategic network projects



Table 5-1 describes the extent and intent of each project as well as the desired outcomes for the North West package. Whilst assessed as separate projects there is a strong interdependency between all four elements to collectively provide the new strategic links for the North West. Note that Project 2 is made up of two components: Alternative State Highway and the Brigham Creek Interchange.

Table 5-1 Strategic projects assessed in North West DBC

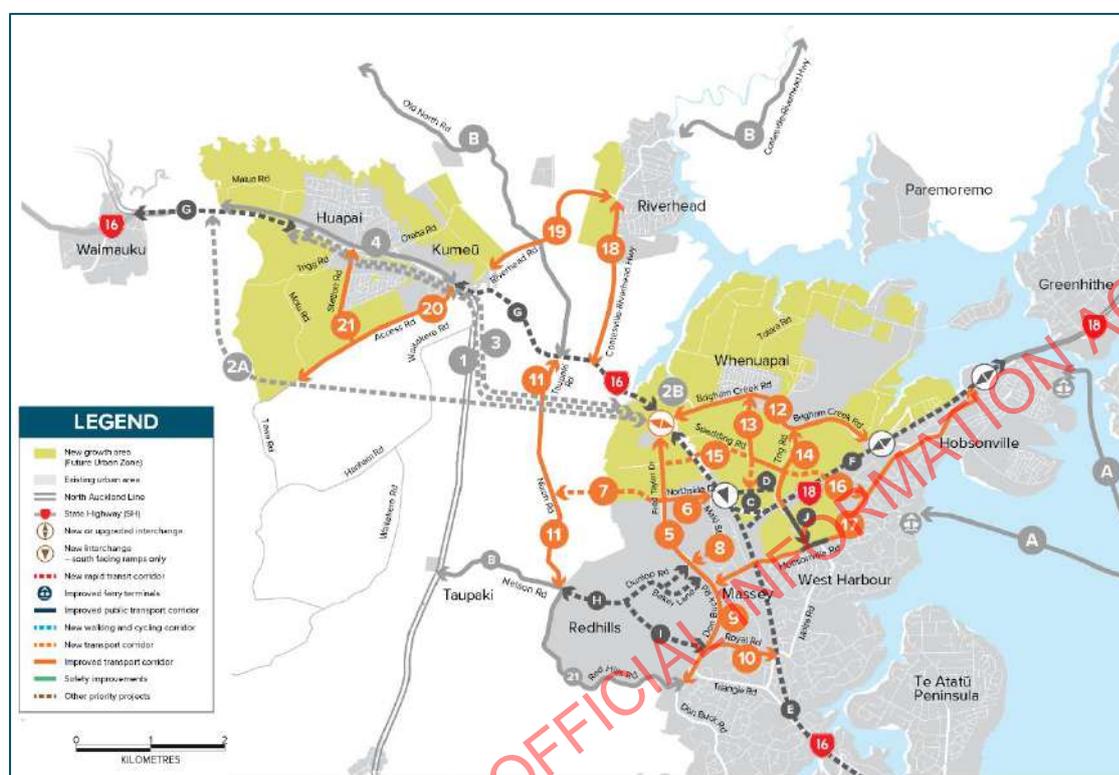
Project	Project Description and desired outcomes	DBC Interdependencies
<p>1</p> <p>Rapid Transit Corridor (RTC)</p> <p>From Brigham Creek Interchange to Kumeū-Huapai</p>	<ul style="list-style-type: none"> Support transformational mode shift in Kumeū-Huapai through the provision of a safe, high-quality, frequent, and reliable public transport system that connects Kumeū-Huapai with Westgate, Auckland city centre and North shore. Balance the transport and urban development potential of the system to support land and transport integration. Respond to climate change through driving a shift to low carbon alternatives. Support a key transport interchange at Westgate as well as unlocking access to economic and social opportunities in the North West. 	<ul style="list-style-type: none"> SH16 Main Road Upgrade Regional Active Mode Corridor Brigham Creek Interchange <p>External to the DBC:</p> <ul style="list-style-type: none"> North West Rapid Transit Network (NWRTN) - City

Project	Project Description and desired outcomes	DBC Interdependencies
	<ul style="list-style-type: none"> Support transit-oriented development around the RTC stations and will be integrated with bus, walking, and cycling networks to promote travel choice. 	Centre to Westgate RTC.
2A Alternative State Highway (ASH) From Brigham Creek Interchange to SH16	<ul style="list-style-type: none"> Relocate the existing longer distance regional and sub-regional connections from existing SH16 to a new state highway. Reduce traffic on SH16 Main Road to enable transport and land use integration of Kumeū-Huapai growth and support mode shift through provision of rapid transit and associated walk up catchment facilities to stations. Improve freight reliability with direct access to planned future industrial land use. Improve resilience of the network by providing a quality alternative to access Kumeū-Huapai. This will result in a reduction in vehicles utilising the surrounding rural road network to avoid congestion and improve rural road safety. Enable better safety outcomes for active modes on SH16 Main Road as well as supporting mode choice through the provision of active mode facilities along the alignment. 	<ul style="list-style-type: none"> Brigham Creek Interchange
2B Brigham Creek Interchange SH16 end of Brigham Creek Road	<ul style="list-style-type: none"> Intersection of Brigham Creek Road, Fred Taylor Drive and SH16. To provide for RTC, ASH and RAMC connections in the future. Deliver a critical component of the ASH that will provide reliable access for both the strategic transport network and linking local road network. Improved access for active modes through the interchange. 	<ul style="list-style-type: none"> Alternative State Highway Rapid Transit Corridor Brigham Creek Road Upgrade Fred Taylor Drive RTN Upgrade
3 Regional Active Mode Corridor (RAMC)	<ul style="list-style-type: none"> Key strategic corridor for walking and cycling that connects Westgate to Kumeū- Huapai. Segregated facility that maximises safety for active modes and provides a direct link with limited vehicle conflicts. The facility will link to the North Western cycleway and ultimately the Auckland CBD. It will provide a strong north- south spine that is also connected to rapid transit stations located along the corridor. 	<ul style="list-style-type: none"> Alternative State Highway Rapid Transit Corridor
4 SH16 Main Road Upgrade From Old Railway Road to Foster Road	<ul style="list-style-type: none"> Upgrades to this corridor are to support the revocation from a state highway to an arterial corridor. Note improvements to this corridor are interdependent with the development of the Rapid Transit Corridor and the Alternative State Highway. Provision of improved active mode facilities and realisation of improved amenity for the town centre. 	<ul style="list-style-type: none"> Rapid Transit Corridor Alternative State Highway

5.2 Local network projects

In total there are 17 projects which form part of the local network as shown in Figure 5-3. These are split into the geographical areas of Redhills, Whenuapai, Riverhead and Kumeū-Huapai.

Figure 5-3 Local network projects



The local road projects include urbanisation of rural corridors, upgrades of existing urban corridors and the creation of new transport connections.

Collectively the local projects provide a transport network that:

- Supports the transition between rural and urban land uses.
- Maximises connectivity between North West areas.
- Shifts trips to lower emission travel options by supporting improved bus services and bus priority.
- Shifts trips to lower emission travel options by completing or enhancing networks for walking and cycling infrastructure.

Redhills

There are seven local roads projects in Redhills as shown in Figure 5-4 and a description of their functional intents is included in Table 5-2.

Figure 5-4 Redhills local projects

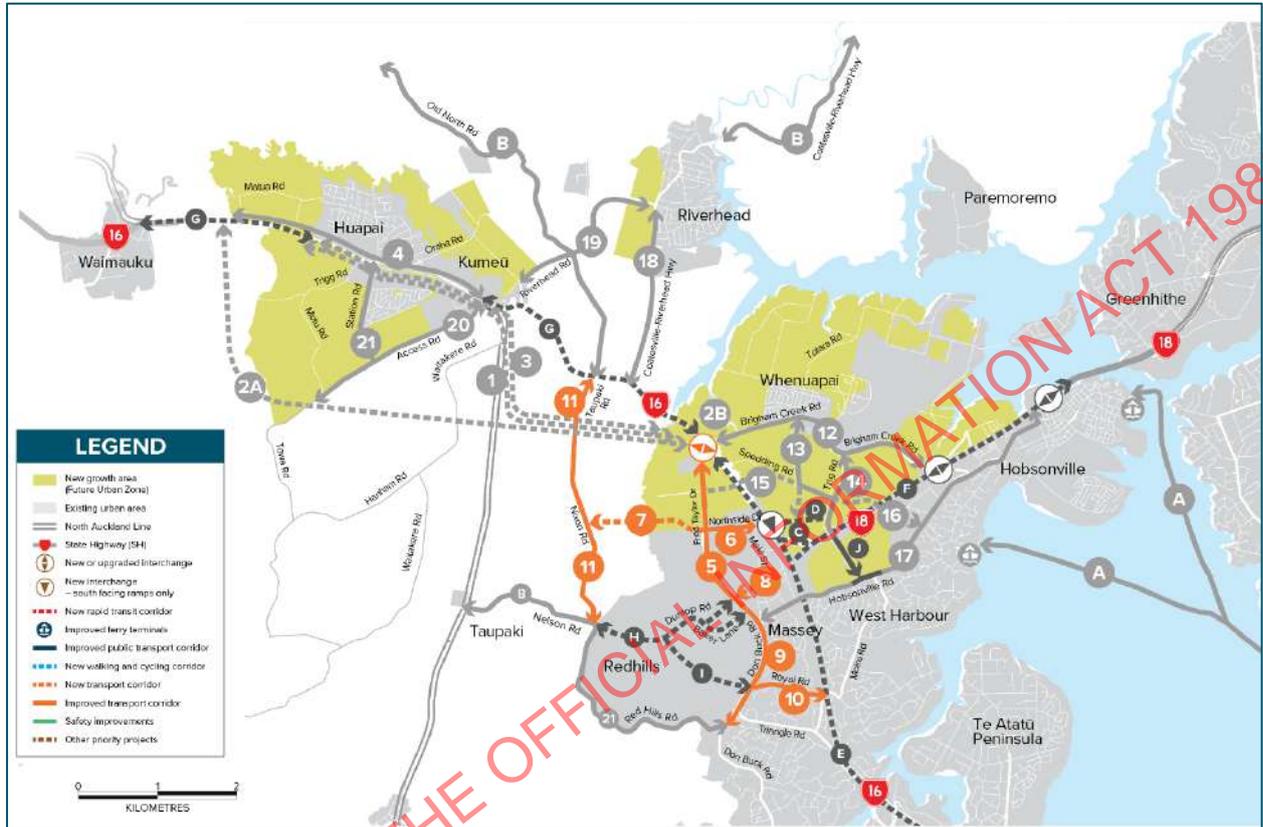


Table 5-2 Redhills projects assessed in North West DBC

Project	Project Description and desired outcomes	DBC Interdependencies
5 Fred Taylor Drive FTN Upgrade	<ul style="list-style-type: none"> Existing road that will provide a north-south spine running parallel to SH16 that distributes future Redhills growth and connects people to rapid transit stations, regional active mode corridors and the SH16 motorway interchanges. The corridor will support active modes, freight, and public transport priority for the significant number of future local bus services. Will remain a strategic Level 1B freight route. 	<ul style="list-style-type: none"> Brigham Creek Interchange Northside Drive East Upgrade New Northside Drive West Don Buck Road FTN Upgrade New Spedding Road East
6 Northside Drive East Upgrade	<ul style="list-style-type: none"> Existing corridor that currently provides access from Fred Taylor Drive to the Westgate centre. Has been recently developed as part of the town centre development. Supports active modes and public transport. 	<ul style="list-style-type: none"> Fred Taylor Drive FTN Upgrade <p>External to the DBC:</p> <ul style="list-style-type: none"> SH16/18 Connections Project (Northside Dr

Project	Project Description and desired outcomes	DBC Interdependencies
From Fred Taylor Drive to SH16	<ul style="list-style-type: none"> Will integrate with the new Northside Drive city facing ramps as part of the SH16/18 Connection's project. Does not include the bridge over the motorway. 	bridge plus Northside Drive east to Trig Road)
7 New Northside Drive West From Fred Taylor Drive to Nixon Road	<ul style="list-style-type: none"> Provide a new alternative east-west connection between Whenuapai and the proposed Redhills north-south arterial (Taupaki Road / Nixon Road) and Kumeu-Huapai thus increasing resilience for SH16 within the network. Support an improvement in active mode share and contribute to a safer active mode network in Redhills and the wider North West transport network. The proposed alignment supports the long term Rodney Greenways plan which identifies this route as a key cycle connection. Connects Fred Taylor Drive to Taupaki Road and ultimately the ASH. 	<ul style="list-style-type: none"> Fred Taylor Drive FTN Upgrade Taupaki Road/Nixon Road Upgrade
8 Dunlop Road Upgrade	<ul style="list-style-type: none"> Existing corridor that provides a link between Westgate and Redhills linking to the existing Dunlop Road local road in Redhills. Will provide connectivity for buses and active modes to Westgate station. Integrates with the planned Fred Taylor Drive/Dunlop Road intersection upgrade as part of the Housing Infrastructure Fund DBC. 	<ul style="list-style-type: none"> Fred Taylor Drive FTN Upgrade <p>External to the DBC:</p> <ul style="list-style-type: none"> Housing Infrastructure DBC
9 Don Buck Road FTN Upgrade Fred Taylor Drive to Redhills Road	<ul style="list-style-type: none"> Existing road that will provide a north-south spine running parallel to SH16 that distributes future Redhills growth and connects people to rapid transit stations, regional active mode corridors and the SH16 motorway interchanges. The corridor will support active modes, freight, and public transport priority for the future Frequent Transit Network. Will remain an overweight and over dimension freight route. 	<ul style="list-style-type: none"> Fred Taylor Drive FTN Upgrade Royal Road FTN Upgrade <p>External to the DBC:</p> <ul style="list-style-type: none"> Housing Infrastructure DBC
10 Royal Road FTN Upgrade	<ul style="list-style-type: none"> Existing road that will provide a critical east west link from Redhills to a future rapid transit station and the State highway network. Provides a local link between Massey and Hobsonville. Will support active modes and public transport priority for the future Frequent Transit Network. 	<ul style="list-style-type: none"> Don Buck Road FTN Upgrade <p>External to the DBC:</p> <ul style="list-style-type: none"> Housing Infrastructure DBC
11 Taupaki Road/ Nixon Road Upgrade	<ul style="list-style-type: none"> Existing rural road that will continue to provide access between the Redhills, Kumeū-Huapai and Riverhead growth areas, and for the onward strategic connections with Helensville and Dairy Flat. Improve safety along the corridor. Provide further resilience to SH16 in the case of unplanned closure. The proposed alignment supports the long term Rodney Greenways plan which identifies this route as a key cycle connection. 	<ul style="list-style-type: none"> New Northside Drive West Alternative State Highway

Whenuapai

There are six local roads projects in Whenuapai as shown in Figure 5-5 and a description of their functional intents is included in Table 5-3.

Figure 5-5 Whenuapai local projects

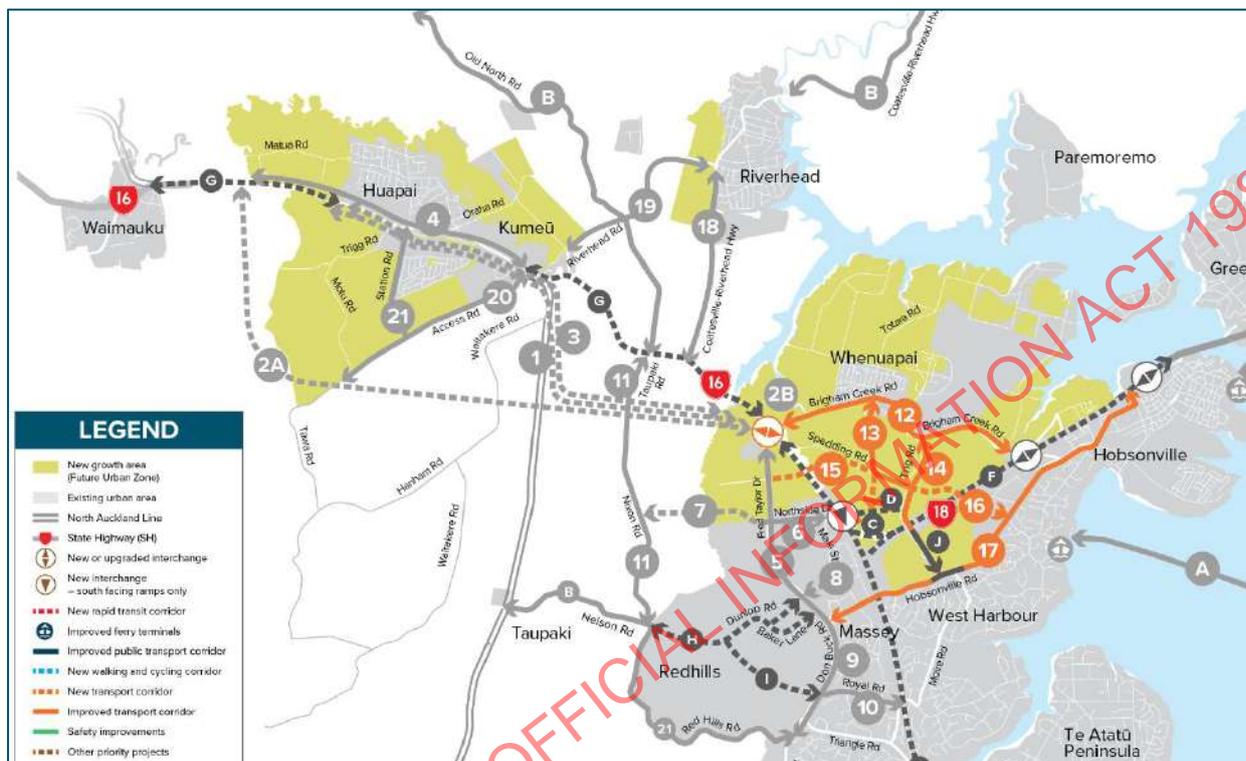


Table 5-3 Whenuapai projects assessed in North West DBC

Project	Project Description and desired outcomes	DBC Interdependencies
12 Brigham Creek Road Upgrade	<ul style="list-style-type: none"> Existing road that will provide an east west connection for all modes through Whenuapai to SH16 and SH18 as well as local destinations such as Hobsonville and Kumeū-Huapai. Supports access to the local centre. Will support active modes and future local bus services. Will provide continued access to industrial zoning and likely to remain a key link in the North West freight network. Currently a level 1B freight and overweight route. Expected to maintain this status in the future. 	<ul style="list-style-type: none"> Brigham Creek Interchange <p>External to the DBC:</p> <ul style="list-style-type: none"> SH16/18 Connections Project
13 Māhari Road FTN Upgrade	<ul style="list-style-type: none"> Multimodal connection that will provide a north-south connection for public transport, active modes and private vehicles between northern parts of Whenuapai and the employment/industrial zoned land in the south. Links via Northside Drive to both SH16 and SH18 strategic transport networks through the SH16/18 connections project. 	<ul style="list-style-type: none"> Brigham Creek Road <p>External to the DBC:</p> <ul style="list-style-type: none"> SH16/18 Connections Project

Project	Project Description and desired outcomes	DBC Interdependencies
	<ul style="list-style-type: none"> Links to a proposed bus link for the Frequent Transit Network that will connect commuters from Northside Drive directly to the station at Westgate. 	
14	<p>Trig Road Upgrade</p> <p>SH18 to Brigham Creek Road</p> <ul style="list-style-type: none"> Existing road which will provide a north-south connection in Whenuapai and will connect employment/industrial zoned land to SH16 and SH18. Provides a local connection to West Harbour and ferry services. Support for active modes. Will remain an overweight freight route. 	<ul style="list-style-type: none"> Brigham Creek Road New Spedding Road East <p>External to the DBC:</p> <ul style="list-style-type: none"> Housing Infrastructure DBC
15	<p>New Spedding Road West</p> <p>Māmari Road to SH16</p> <ul style="list-style-type: none"> New east-west connection that will support active mode and public transport connectivity between Whenuapai and Redhills. Reduction of severance for Whenuapai created by the State highway network by providing a non-interchange SH16 crossing location to support local movements for all modes. Provide increased reliability and resilience for access to and from Whenuapai. Support all mode access to the proposed City Centre to Westgate Brigham Creek Rapid Transit station. 	<ul style="list-style-type: none"> Fred Taylor Drive Upgrade Māmari Road FTN Upgrade
16	<p>New Spedding Road East</p> <p>Māmari Road to SH18</p> <ul style="list-style-type: none"> New east-west connection that will support active mode and public transport connectivity between Whenuapai and Hobsonville. Reduction of severance for Whenuapai created by the State Highway network by providing a non-interchange SH18 crossing location to support local movements for all modes. Provide increased reliability and resilience for access to and from Whenuapai. Support all mode access to the proposed Waka Kotahi SH18 Rawiri rapid transit station. 	<ul style="list-style-type: none"> Trig Road Upgrade Hobsonville Road FTN Upgrade
17	<p>Hobsonville Road FTN Upgrade</p> <ul style="list-style-type: none"> Existing east-west corridor that connects SH16 to SH18 and provides a local spine road for West Harbour and Hobsonville. Upgrades will support active modes and bus priority. Will remain an overweight and over dimension freight route. 	<ul style="list-style-type: none"> New Spedding Road East

Riverhead

There are two local roads projects in Riverhead as shown in Figure 5-6 and a description of their functional intents is included in Table 5-4.

Figure 5-6 Riverhead local projects

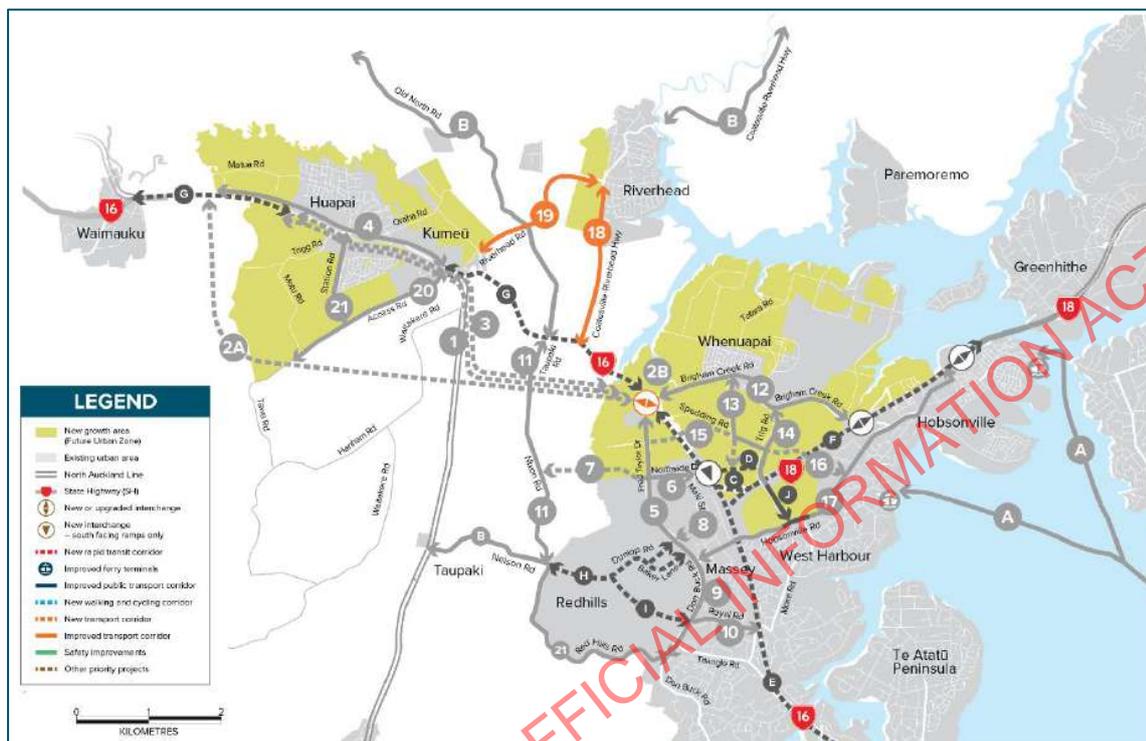


Table 5-4 Riverhead projects assessed in North West DBC

Project	Project Description and desired outcomes	DBC Interdependencies
18 Coatesville-Riverhead Highway Upgrade SH16 to Riverhead Road	<ul style="list-style-type: none"> Existing rural road which will provide a key north-south connection for Riverhead to the strategic road network and rapid transit services at Brigham Creek Interchange or Westgate. Will support active modes and reduce safety risk on the corridor. Will remain an over dimension freight route. 	External to the DBC <ul style="list-style-type: none"> SH16 Brigham Creek to Waimauku Project
19 Riverhead Road Upgrade	<ul style="list-style-type: none"> Existing rural road which will form the strategic connection between Riverhead and Kumeū-Huapai, providing strong links to Kumeū-Huapai social and business infrastructure. The proposed alignment supports the long term Rodney Greenways plan which identifies this route as a key cycle connection. 	<ul style="list-style-type: none"> SH16 Main Road Upgrade

Kumeū-Huapai

There are two local roads projects in Kumeū-Huapai as shown in Figure 5-7 and a description of their functional intents is included in Table 5-5.

Figure 5-7 Kumeū-Huapai local projects

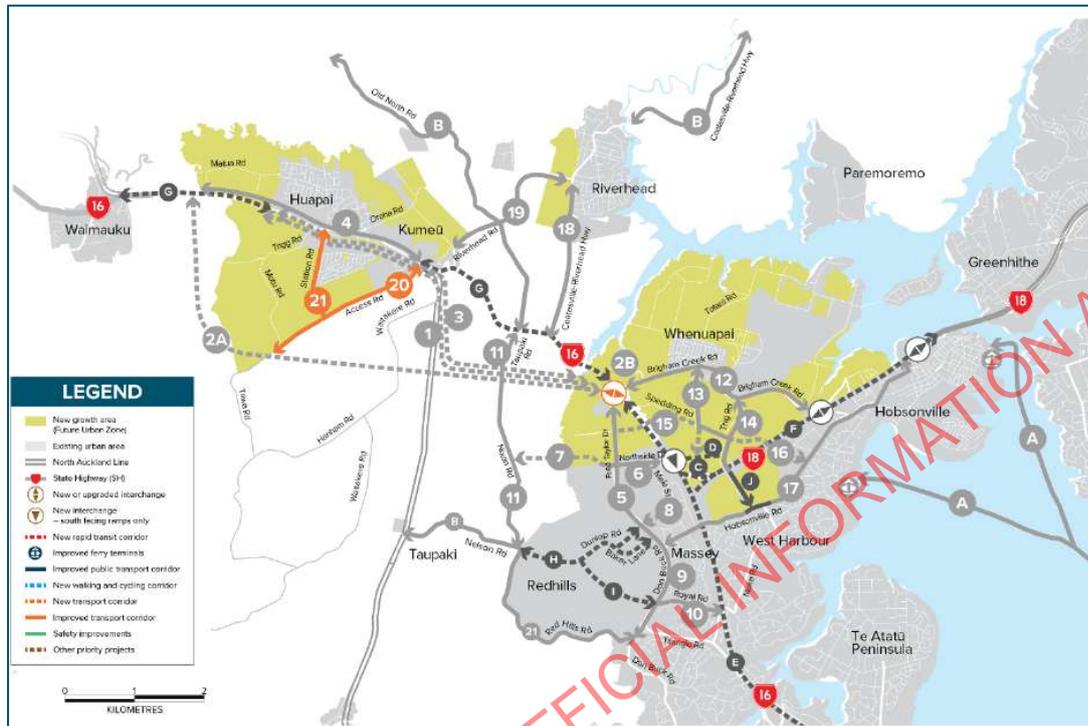


Table 5-5 Kumeū-Huapai projects assessed in North West DBC

Project	Project Description and desired outcomes	DBC Interdependencies
20 Access Road/Tawa Road Upgrade	<ul style="list-style-type: none"> Existing corridor that will provide a key strategic link to the Alternative State Highway. Will support freight by connecting industrial zoned land directly to the strategic network. Will provide active mode access to the future primary active mode facilities on the Alternative State Highway. Supports local bus service of around 8 bus per hour in the future. The proposed alignment supports the long term Rodney Greenways plan which identifies this route as a key cycle connection. 	<ul style="list-style-type: none"> Alternative State Highway Rapid Transit Corridor Station Road Upgrade
21 Station Road Upgrade	<ul style="list-style-type: none"> Existing local road that will connect SH16 Main Road with Access Road providing a north south connection through the FUZ land. Important link for active modes and future local bus services to connect to future rapid transit facilities in Kumeū-Huapai. The proposed alignment supports the long term Rodney Greenways plan which identifies this route as a key cycle connection. 	<ul style="list-style-type: none"> Rapid Transit Corridor Access Road/Tawa Road Upgrade

5.3 Complementary Projects

There are several projects being developed separately in the North West which are complementary to the Te Tupu Ngātahi transport network. These projects combined with the Te Tupu Ngātahi network form the complete transport response for the North West. Table 5-6 summarises these additional projects and demonstrate how they integrate with the additional investment recommended in the North West DBC.

Table 5-6 Complementary North West Projects

Project	Integration with North West DBC
<p>North West Rapid Transit Network (NWRTN):</p> <ul style="list-style-type: none"> City Centre to Westgate RTC (Northwestern Bus Improvements and long term rapid transit). SH18 RTC stations. <p>Expected outcomes:</p> <ul style="list-style-type: none"> Transformational mode shift to connect North West to the City Centre and North Shore through provision of rapid transit. 	<ul style="list-style-type: none"> North West Busway improvements has an interim solution which includes bus stations as Lincoln Road, Te Atatu and Westgate using shoulders on SH16. DBC extends the NWRTN rapid transit infrastructure to directly connect the additional growth in Kumeū-Huapai to the rapid transit corridor. This will maximise the population who are connected to the RTC. DBC provides the critical supporting transport network for public transport and active modes to reach all planned RTN stations in the North West. Mode shift cannot be fully realised unless people can access these stations. DBC recommends the form of this supporting transport network to best support the desired land use intensification near stations.
<p>SH16 Safety Improvement Programme.</p> <p>Expected outcomes:</p> <ul style="list-style-type: none"> Additional capacity between Taupaki Road and Brigham Creek Road. New shared path and safety improvements 	<ul style="list-style-type: none"> The additional capacity as part of the SH16 Brigham Creek to Waimauku project provides an interim solution on SH16 and the North West DBC provides the long term solution with the provision of the Alternative State Highway, Brigham Creek Interchange and RTC extension. The DBC proposes upgrades to Coatesville Riverhead Highway which in the future will allow buses to use the four laned SH16 infrastructure to access the Westgate RTN station. DBC provides cycle infrastructure on SH16 Main Road, Fred Taylor Drive and Brigham Creek Road to connect the SH16 Safety Improvement shared path to the wider North West local network. This will maximise the realisation of cyclists on the shared path.
<p>SH16/18 Connections project.</p> <p>Expected outcomes:</p> <ul style="list-style-type: none"> Direct connections from SH16 to SH18 to remove strategic trips from Brigham Creek Road and increase access for Whenuapai. New Northside Drive city facing ramps to provide a new SH16 connection for Redhills North and Whenuapai. 	<ul style="list-style-type: none"> DBC assumes the SH16/18 Connections project infrastructure is implemented in the network by 2038 and is considered critical to remove strategic trips out of Whenuapai. The North West DBC then focuses on urbanising the key arterials in Whenuapai and Redhills to support the future intensified residential and employment land uses. DBC provides long term improvements for the Brigham Creek interchange to provide reliable movement through the interchange for all modes and connect the ASH and RTC.

Project	Integration with North West DBC
<ul style="list-style-type: none"> Interim improvements to Brigham Creek Interchange. 	

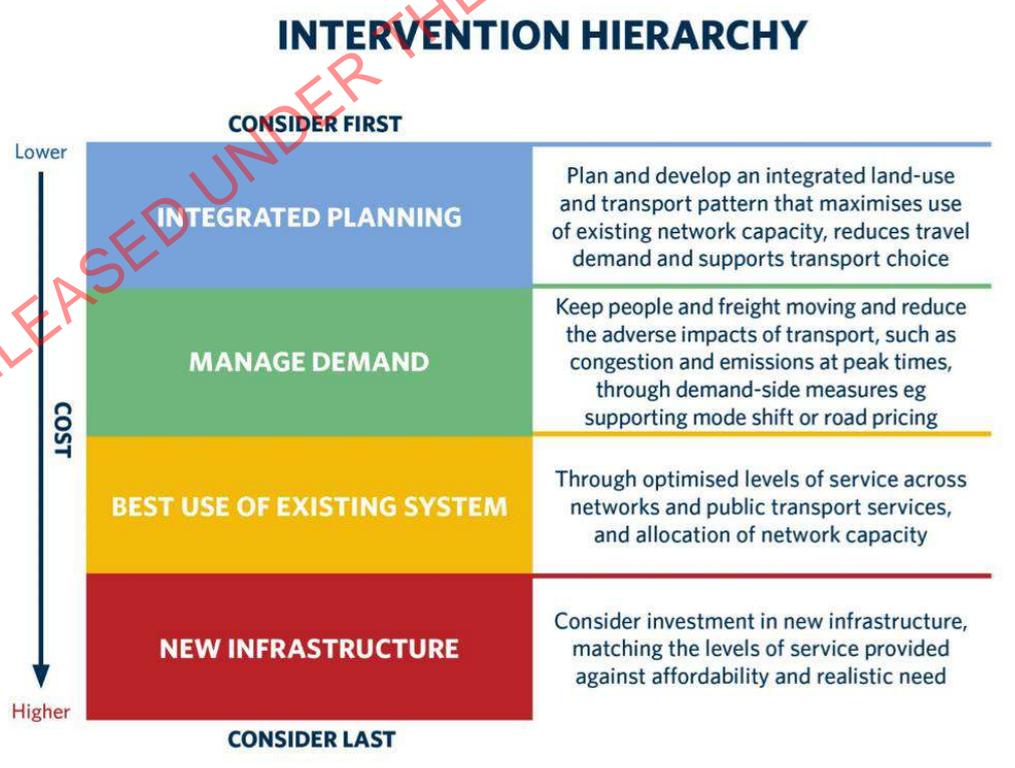
6 Guiding Principles for the North West

The North West DBC has been shaped by a number of key principles and these have been applied throughout the identification and development of corridors to confirm the future recommended transport network.

The North West IBC followed the intervention hierarchy as shown in Figure 6-1 when developing the North West Indicative Transport Network. This focused on integrating transport and land use first followed by managing demand and making best use of the existing system. Lowest in the hierarchy was the consideration of new infrastructure. These intervention principles have been continued and built upon in the development of the North West DBC.

For existing roads identified for upgrade in the North West DBC, detail was developed around supporting the adjacent future land use, managing demand through supporting road space to maximise people throughput (e.g on buses) and reallocation of road space to provide for corridor specific modal priorities. The transport network does identify new pieces of infrastructure such as a Rapid Transit Corridor and a new Alternative State Highway alignment. These have been recommended to provide a step change in transport choice and in the instance of the ASH, to remove strategic trips from the existing SH16 Main Road to enable integrated planning and better management of transport demand through the town centre.

Figure 6-1 Transport intervention hierarchy (source Waka Kotahi)



The GPS 2018 which was used to develop the North West IBC has developed into the GPS 2021 which, as previously discussed in Section 4, now has a clear strategic priority on Climate Change and the role of transport in developing a low carbon transport system that supports emission reductions while improving safety and inclusive access. The North West DBC has assessed how the transport system will contribute to these strategic policies.

6.1 Te Tupu Ngātahi Urban Design Framework

The development of the North West DBC development has relied strongly on the principles of the Te Tupu Ngātahi Urban Design Framework (UDF). This document provides measurable guidance for land use and transport integration throughout each phase of the programme delivery. The UDF takes a systems approach to how urban areas are organised and understood and pulls these apart in layers spanning history, the natural environment and the built form. The North West DBC has used the design principles for each of these system layers to understand how the transport networks contribute to the urban system as a whole. Each of the principles describe what ‘good looks like’ and what to aim for in the design of transport networks that contribute positively to new or planned communities, environments, corridors and the social and economic vitality of Auckland. This framework has also provided spatial definition to some of the themes such as sustainability and integration which are discussed further in the following sections.

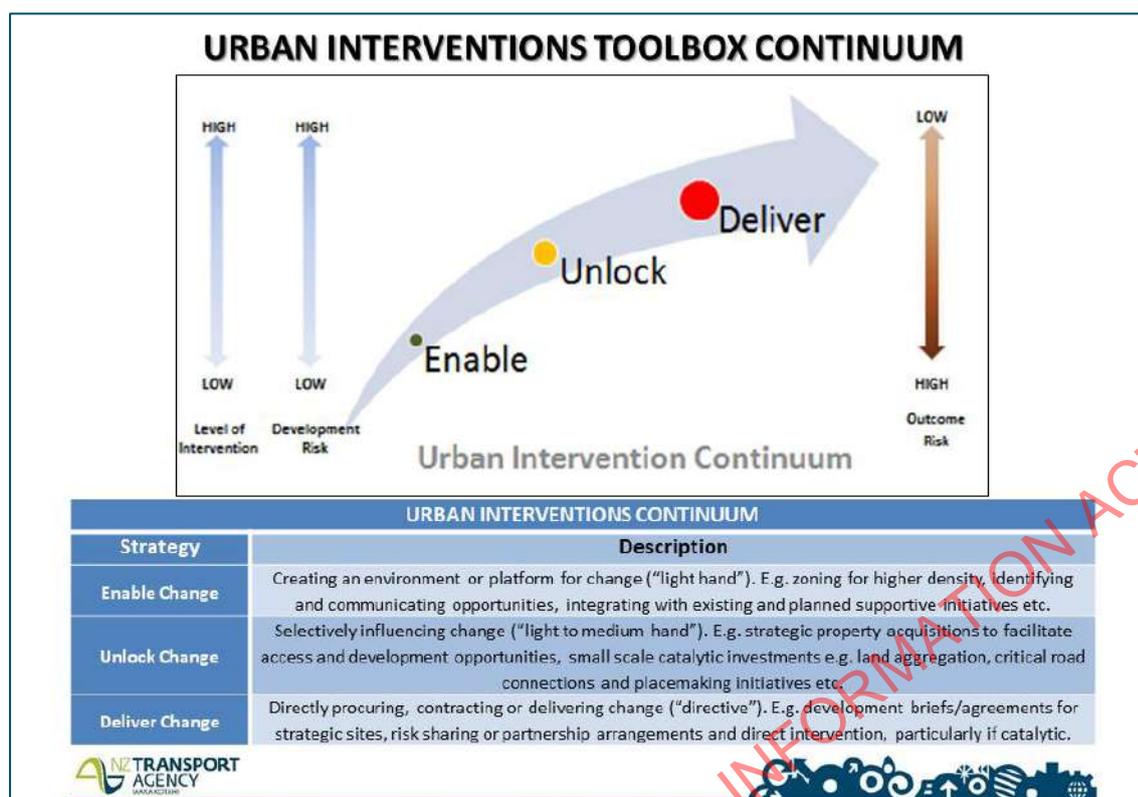
6.2 Land use integration

Integration between land use and transport is a critical factor in maximising future transport and community outcomes in the North West. The transport network supports the land use through:

- Improving accessibility.
- Strengthening the physical character of urban environments to impact customer journey experience.
- Providing infrastructure to move people and goods efficiently between desired destinations.

The step change for transport integration is to consider how infrastructure can also be used to support and drive better placemaking in the North West. This “unlocking” is a key part of the urban interventions continuum as shown in Figure 6-2 and is where significant opportunities can be realised in the North West.

Figure 6-2 Urban intervention principles



Examples that will enable and unlock change in the North West include:

- Provision of multimodal access to rapid transit networks to support densification close to planned stations.
- Design of transport infrastructure with regard to identifying opportunities for future development of residual land packages.
- Location of stations on the Rapid Transit Corridor to maximise future catchment and serve key destinations such as employment nodes and future town and local centres.
- Use of the road hierarchy of State highways and local roads to better manage freight movements to industrial land uses.
- Understanding future social infrastructure requirements such as schools, parks, town centres and the transport connections required to serve these customers. Conversely, using the proposed transport infrastructure to inform future land purchases for new social infrastructure to maximise outcomes.
- Use of form and function to balance placemaking and modal needs on the corridors.

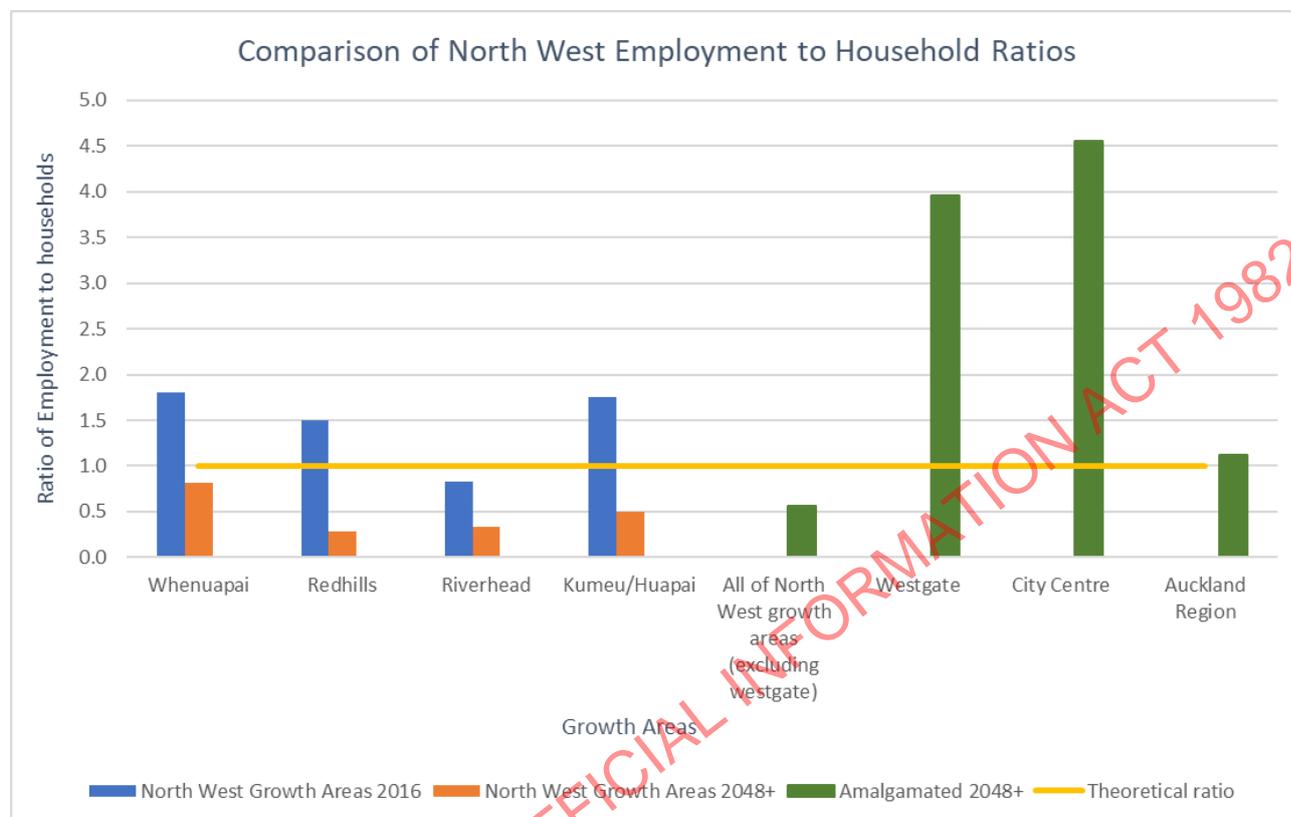
6.2.1 North West Employment to Households Ratio

In the future, travel demand is expected to increase further because of urbanisation. With a full build out scenario, transport demand across all modes on key arterial corridors is expected to increase significantly. To lessen the overall demand for travel on key corridors an urban area should seek to provide a balance between the number of jobs and the number of households in an area.

The ratio of employment to households is therefore one land use measure used to understand the ability of an area to increase place quality and reduce travel demand as more people can live and work in the same geographical area.

The employment to household ratios for the North West growth areas are compared with metropolitan and city centres as well as the Auckland region as shown in Figure 6-3.

Figure 6-3 Comparison of Employment to Households ratio in Auckland



This graph shows us how the employment to household ratios are expected to change as growth is introduced. It demonstrates a shift from local area based employment in 2016 (which is currently predominantly rural and has more jobs than houses) to a more urbanised growth model in 2048 where there is some local employment but the main employment centres are concentrated elsewhere in areas such as the Westgate metropolitan centre or city centre. As people need to travel further from their houses to reach employment it emphasises the importance of accessibility. In the first instance this is reflected in the need to make Westgate more accessible to the wider North West area – especially for low carbon transport modes such as walking cycling and public transport. People living in the North West are also expected to want to access jobs in other locations like the City Centre and Albany so improving non-vehicular access to wider employment destinations through modes like rapid transit becomes equally important.

The provision of reliable and attractive connections to these key employment centres are critical for managing future North West transport demand. This principle has underpinned the development of the IBC North West recommended network and continues in this DBC with additional development of the corridors form and function and modal priorities.

6.2.2 Land use integration in the North West

The consideration of land use integration in the North West started during the development of the North West PBC and IBC and has continued as an iterative process throughout this DBC. This will continue as the corridors move from route protection to implementation in the future.

Table 6-1 provides an overview of the type of collaboration that has taken place at each stage of the North West DBC development. Land use planners from Waka Kotahi and Auckland Transport have been involved in specific Te Tupu Ngātahi North West land use integration sessions as well as participating in many of these Partner discussions outlined below.

Table 6-1 Land Use integration in the North West

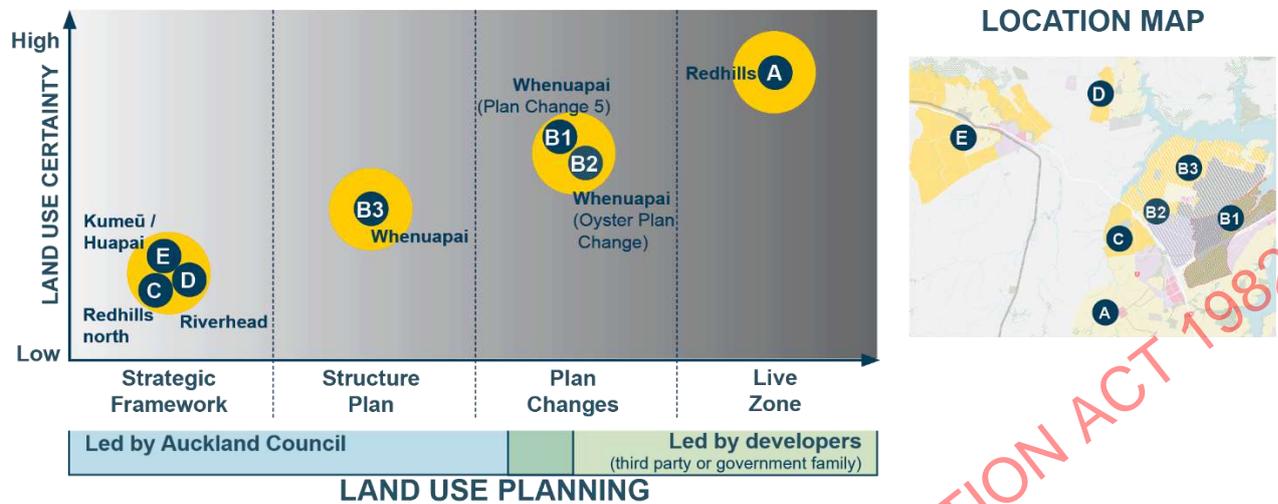
Stage of analysis	Auckland Council	Government Partners ⁸	Private Developers
Preliminary assessment <ul style="list-style-type: none"> Gap analysis. Constraint mapping. Form and Function. 	<ul style="list-style-type: none"> Understanding existing land use. Potential impacts of the National Policy Statement: Urban Development and future areas of densification. Strategic Framework development for non- structure planned areas. Land use implications for strategic infrastructure (RTC and ASH) form and function. 	<ul style="list-style-type: none"> Strategic planning of key social assets. Planned upgrades to existing assets. 	<ul style="list-style-type: none"> Consented developments. Future plans of large landowners particularly those that might require plan change i.e., new town centre zoning,
Option development and assessment	<ul style="list-style-type: none"> Protection of the rural edge. Land use interface with proposed RTC stations. Opportunities and challenges with residual land. Connectivity and access to future land uses. Discussion on trade-offs for competing land uses on existing constrained corridors. 	<ul style="list-style-type: none"> Understanding potential impacts on existing facilities or assets. Preferences for corridor widening. 	<ul style="list-style-type: none"> Understanding potential impacts on existing and future developments. Opportunities for staging or collective delivery.

Land use developments in the North West are in different stages of maturity and therefore different stages of certainty as shown in Figure 6-4.

⁸ Government partners include Ministry of Education, New Zealand Defence Force

Figure 6-4 North West land use certainty

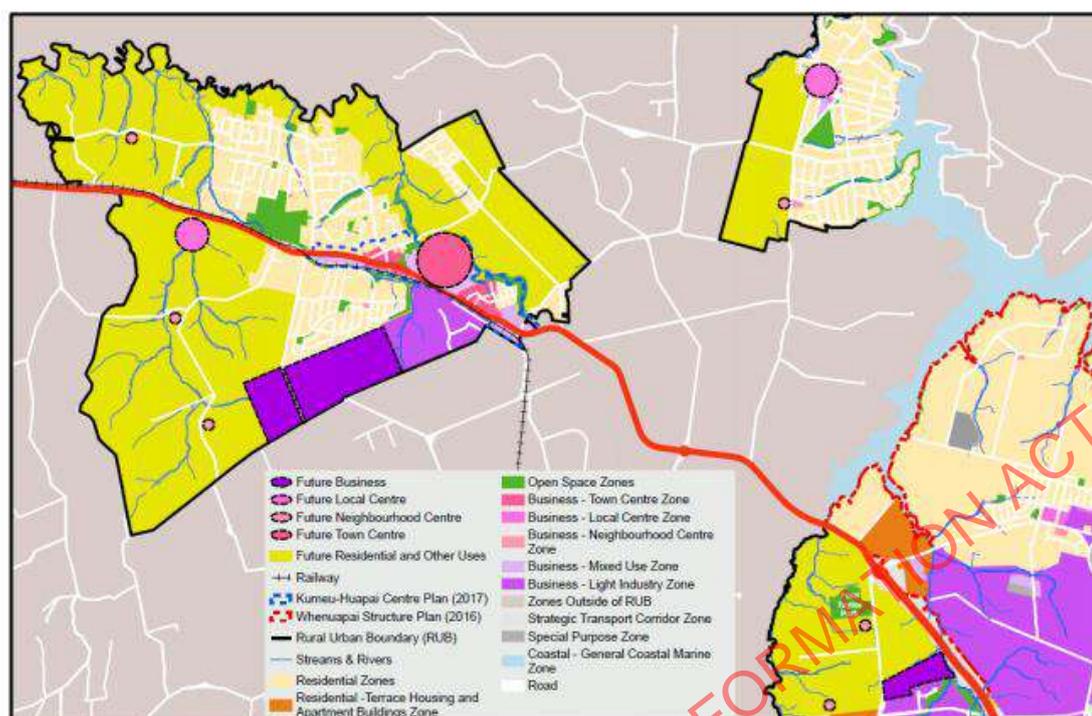
NORTH WEST LAND-USE CERTAINTY



For areas with higher land use certainty (Redhills and Whenuapai) the land use issues have been focused on rapidly changing land uses and high development activity. Land use integration discussions with Auckland Council informed Te Tupu Ngātahi on existing land uses and how these land uses might be expected to change, including potential intensification in response to the new National Policy Statement on Urban Development. Additional discussions have also been held with a range of active developers to better understand how new developments are progressing and types of densities that can be expected. As part of the iterative nature of land use, key route refinement decisions such as which side to widen on existing corridors and impacts on competing land uses were discussed with Auckland Council. This has allowed the impacts of transport infrastructure on the existing land uses to be carefully balanced.

Structure planning is not yet complete in Riverhead, Kumeū-Huapai and Redhills North and is expected to start from around 2025 before land release potentially from 2028. This results in less land use certainty for these areas but also provides significant opportunities to use transport to shape placemaking. In the absence of Structure Plans and to ensure the future land use and transport networks work together to support growth, Auckland Council prepared a Spatial Land Use Strategy in 2020 which was adopted in May 2021. The Strategy is a starting point for future structure plans and identifies potential locations for future centres and business land on FUZ land in Kumeū-Huapai, Riverhead and Redhills North and is shown in Figure 6-5. This is an iterative process and is expected to be revisited as strategy, policy and infrastructure planning progresses.

Figure 6-5 Auckland Council North West Spatial Land Use Strategy (May 2021)



Following the high-level guidance received through the strategic framework, conversations with Auckland Council were broadened to consider the role of transport in protecting the rural edge, land use interfaces with public transport and land use implications for strategic transport infrastructure form and function e.g., location of Alternative State Highway interchanges. During option development and assessment careful consideration was given to the opportunities and challenges associated with residual land packages as well as land use trade-offs for corridor widening and upgrades.

The cumulative effect of these myriad discussions is a recommended transport network which achieves the desired transport outcomes, supports land use integration and, importantly, recognises the additional placemaking opportunities associated with key transport infrastructure.

Specific land use integration outcomes and opportunities are detailed throughout the DBC and supporting appendices, in particular, **Appendix B: Option Assessment** and **Appendix E: Urban Design Evaluation**.

The Management Case in Section 14 of this DBC includes more detail about next steps for projects with identified land use opportunities.

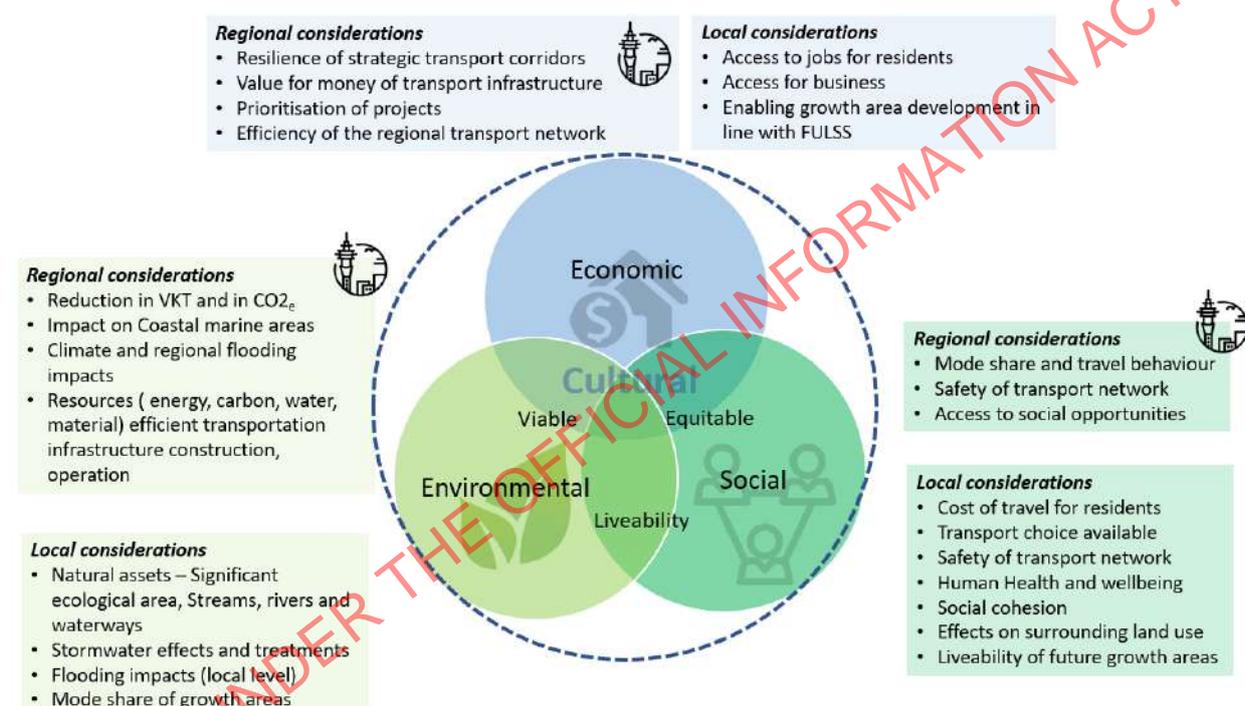
6.3 Sustainable outcomes

Sustainability is an overarching principle of this DBC and reflects the core principles of the GPS 2021 to ensure the land transport system is both economically and environmentally sustainable.

The Te Tupu Ngātahi Programme has identified four factors that work in partnership to achieve sustainable outcomes as shown in Figure 6-6. These pillars of sustainability include:

- **Natural Environment:** Conserve and enhance the natural environment.
- **Social:** Meet the social and health needs of Aucklanders.
- **Economic:** Foster jobs, growth and economic productivity.
- **Cultural:** Celebrate Auckland’s unique cultural identity.

Figure 6-6 Sustainability principles



A combination of these factors provides the pathway to achieving thriving, equitable and restorative outcomes. The Te Tupu Ngātahi UDF supports the application and measurement of these concepts.

The outcomes can be achieved at both the local and regional level and the application to the North West transport network is shown in Table 6-2.

Table 6-2 Sustainability applications in the North West

Sustainability factor	Measures	Applied in the North West DBC
Cultural	Extent and effects on sites and places of cultural heritage value to manawhenua and built heritage.	<ul style="list-style-type: none"> • Regular manawhenua engagement and feedback, particularly in the development and assessment of options. • Heritage specialist to review option alignments.

Sustainability factor	Measures	Applied in the North West DBC
Environmental 	Responding to climate change by providing a transport system that supports a reduction in emissions, is responsive to flooding impacts and limits impacts on our key natural assets such as wetlands and ecological habitats.	<ul style="list-style-type: none"> • Appropriate stormwater treatment including provision for green infrastructure in rural areas (e.g., swales) and suitable treatment and attenuation. Full details of stormwater infrastructure are included in Appendix F: Design Report. • Priority focus on completing a core cycling network. • Public transport priority facilities to improve the reliability and quality of services. PT facilities to be planned, designed, constructed and operated to significantly reduce not only operational but also whole of life emissions. • Identification of location and quality of wetlands, streams and ecological areas during constraint mapping to inform option selection. • Flood mapping to inform option selection and assess potential impacts of new corridors on the landscape. • Assessment of reduction of emissions on whole of life basis in the economic analysis for the recommended programme. • Protect and restore the environment across the construction, operation and maintenance of the transport network.
Social 	Transport has key role to improve people's wellbeing and liveability of places.	<ul style="list-style-type: none"> • DBC focuses on safety improvements, particularly for existing corridors. • DBC priority is improving transport choice and is reflected in modal priority assessments, rapid transit, walking and cycling network. • Liveability addressed primarily through our urban design specialists who input at all stages of the corridor development. • Social cohesion and human health are specific MCA assessment criteria so impacts considered in detail for all corridors.
Economic 	Access to jobs and businesses and enabling growth. At the regional level this includes resilience of the network, value for money and prioritisation	<ul style="list-style-type: none"> • North West investment objective and associated KPIs specifically measure improvements in access. • Land use assessment for all corridors includes consideration of trip destinations as well as an understanding of future land uses and impacts of intensification. • Specific analysis to better understand the outcomes of each corridor and to inform prioritisation for implementation. • Through option development the future cross section has been challenged from an efficiency perspective to: <ul style="list-style-type: none"> - Balance flexibility – e.g., retention of ability to provide for green infrastructure on rural roads or flexibility of mode for the RTC. - Maintain transport outcomes – seeking to balance land requirements with outcomes achieved e.g., does the additional land provide step change in outcomes or can the outcomes be maintained with a reduction in cross section which minimises property impacts. - These decision points have been tested with stakeholders and trade-offs clearly discussed to achieve a balanced network.

Many of the specific considerations are included as part of the investment case suite of KPI's and measures such as access to jobs, measures of resilience and emission modelling. However other aspects have been considered more broadly as part of a project option assessment process such as during multicriteria analysis (MCA), constraint mapping and option development. Cultural aspects have been considered for all three factors and regular dialogue has been undertaken with manawhenua throughout the option development process.

Therefore, the principles of sustainable development have been captured through seeking to achieve a balanced decision-making process which:

- Reviews a holistic and broad suite of sustainability aspects during option development.
- Identifies the biggest risks and opportunities.
- Prioritises those identified aspects for focus.
- Strives to enhance those sustainability aspects (not just mitigate).

6.4 Climate change response

Climate change is one aspect of the overall sustainable response and links closely with the sustainable outcomes discussed in the previous section. Whilst climate change is not a new consideration for the development of transport infrastructure, recent changes in policy such as the Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan and He Pou a Rangi the Climate Change Commission have reconfirmed the importance of systems change and diverse action to affect significant and timely reductions to emissions. Fundamentally the goal is to limit global temperature increases by reducing greenhouse gas emissions by 50 per cent by 2030 and achieve net zero emissions by 2050.

Reducing transport emissions is an important contributor to meeting New Zealand's emissions targets. It is recognised that transport plays a key role and the Climate Change Commission reflects *"We need to change the way we build and plan our towns and cities and the way people and products move around. This includes making walking and cycling easier with good cycleways and footpaths. It means moving freight off the road and onto rail and shipping. It means reliable and affordable public and shared transport systems. And it means an electric or low emissions transport fleet."*⁹ This aligns well with the GPS 2021 and by extension, to the development of this North West DBC which itself aligns closely to the goals of the GPS 2021. The North West DBC is built on:

- **Transport and land use integration** – a guiding principle as described in Section 6.1 and providing a transport network to support land use development and good urban form.
- **Prioritising mode choice** – specifically focusing on rapid transit, improved public transport reliability and services and creation of a well-connected walking and cycling network.

The result is a recommended transport system which has the capability to actively reduce the future growth area's reliance on private vehicles by providing accessible active mode routes and public transport options that connect people to where they need to go.

It is noted that the climate change response of this DBC is part of a wider Aotearoa transport response which includes complementary initiatives such as increasing the adoption of electric vehicles and use of low carbon fuels. A change to an electric or low emissions fleet will not however address congestion and integrated land use planning retains an ongoing role, particularly as areas in the North West are structure planned in the future. The importance of the supporting local roading

⁹ He Pou a Rangi the Climate Change Commission, 31 January 2021 Draft Advice to Government

network also cannot be overlooked. The Te Tupu Ngātahi North West network will provide the key connections and initial driver for mode shift but to maximise mode shift outcomes the local roads have a parallel role to further connect local cycling, support walk up catchments to public transport and provide efficient local bus networks.

The climate change strategies can be split into two types:

- **Mitigation** - aimed at addressing the causes and minimising the possible impacts of climate change.
- **Adaptation** – focused on reducing the negative effects and identifying opportunities that arise from climate change.

As a route protection business case, the North West DBC is primarily focused on mitigation strategies. Decisions for the corridors have been focused on providing lower-emission travel options, including public transport and active transport that will contribute to emission reduction by replacing passenger trips by private vehicle. It is expected that adaptation measures will be considered in more detail as the projects progress through future design and implementation processes.

The North West DBC addresses enabled carbon emissions (greenhouse gas emissions associated with infrastructure end use e.g., vehicles) through its influence on how the infrastructure is used. Examples of climate mitigation strategies in North West include:

- Assessment of modal priorities for each project to understand the corridors road function. This has then informed the allocation of road space to best support sustainable mobility modes such as bus, walking and cycling. By way of example, 100% of corridors provide new or improved active facilities.
- Using route protection to provide a suitable footprint to allow future flexibility in design to best accommodate climate mitigation.
- Focus on proximity of rapid transit and public transport to population centres and social infrastructure. This is particularly relevant for the identification of rapid transit stations.
- Restriction of the provision of additional vehicle capacity. Generally, additional capacity is reserved for projects that serve an integration role between local and strategic transport functions e.g for local roads supporting motorway interchanges. In the case of the ASH project, this piece of infrastructure is focused on providing new vehicle capacity but targets specific trip types and has a broader role as one part of an integrated transport response in Kumeū-Huapai. This project supports heavy vehicle access to future industrial land zoning on Access Road and removes strategic through trips from the Kumeū town centre to improve the ability of SH16 Main Road to focus on rapid transit and both regional and local walking and cycling. The ASH therefore supports the overall reduction in low occupancy vehicles in Kumeū-Huapai.
- Development of a connected cycle network that provides both regional and local cycle links and maximises the ability of people to access public transport or key destinations.

6.4.1 Demand management

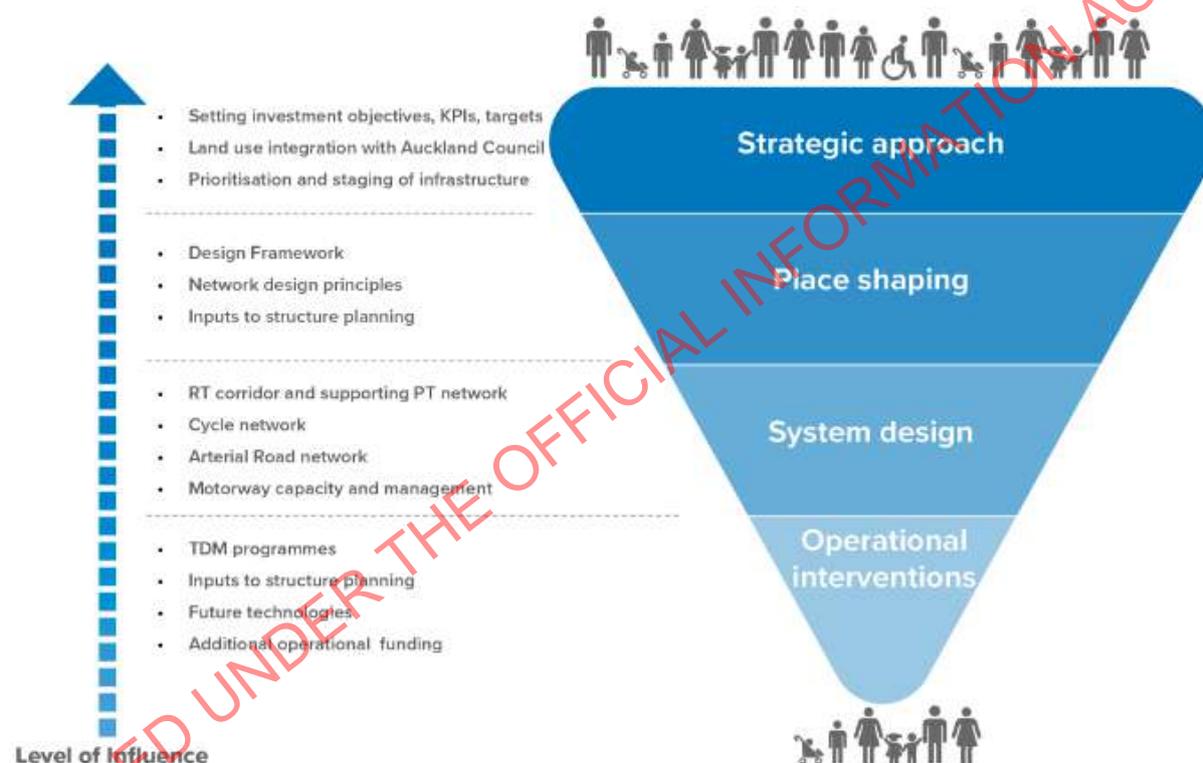
As previously mentioned, a guiding principle of this DBC is sustainable urban mobility, which seeks to develop an urban transport system that fosters a balanced development of all relevant transport modes and encourages a shift to more sustainable modes. The other aspect within this climate change response is to improve the performance of the land transport system by changing transport

demand and travel behaviour. Demand management activities influence how, when and where people and freight travel and has the following objectives:

- Shaping transport demand to better balance with supply.
- Shaping travel behaviour to ease pressure on the transport network and environment.
- Delivering economic benefits to businesses, communities or Aotearoa as a whole.¹⁰

Therefore, the North West DBC continues to build on demand management principles adopted in the North West IBC and does not provide for unconstrained demand but rather seeks opportunities to influence and reduce demand alongside the recommended infrastructure. A four-step approach to Travel Demand Management (TDM) and influencing travel behaviour has been used, as shown in Figure 6-7. This includes consideration of an integrated set of policy-based, soft measures to achieve the desired goal.

Figure 6-7 Te Tupu Ngātahi Demand management influence



Specific applications of the TDM approach within the North West DBC are detailed in Table 6-3. Commensurate with the purpose of this DBC, a significant focus of the TDM tasks has been in maximising outcomes within the system design part of the hierarchy. However, there have still been significant strategic and place shaping opportunities that have been realised throughout the overall development of the recommended programme and these have typically been associated with the larger strategic pieces of transport infrastructure such as the Rapid Transit Corridor and Alternative State Highway.

¹⁰ <https://www.nzta.govt.nz/planning-and-investment/planning-and-investment-knowledge-base/activity-classes-and-work-categories/road-safety-promotion/wc-421-travel-demand-management>.

Table 6-3 Demand management applications

Demand management influence	North West DBC Response
<p>Strategic approach</p> <p>Decisions have a broader effect and have the potential to significantly alter transport demand at a regional level</p>	<ul style="list-style-type: none"> Confirmed investment objectives and KPIs which are consistent with TDM principles focusing on safety, access, mode shift (particularly reducing single occupancy vehicles), reliability and land use integration. These investment objectives align with the Ministry for Environment climate change goals to develop a low carbon transport network. Also align with the MoT Transport Outcomes Framework that includes environmental sustainability. Collaboration with Auckland Council to establish land use principles for non-structure planned areas. Discussions about land use impacts arising from planned upgrades including residual land. Consideration of staging and interdependencies in the North West DBC.
<p>Place shaping</p> <p>Developing good urban form to influence travel behaviour e.g provision of good quality, frequent public transport service to key destinations</p>	<ul style="list-style-type: none"> The North West DBC has built on North West IBC recommended key connections and corridors. Place shaping has been further developed for key infrastructure such as the Rapid Transit Corridor and the SH16 Main Road Upgrade, including assessment of station locations and north-south connectivity. Consideration of how changes in intensification will happen for land use near proposed frequent transit networks and changing needs of corridors. Impacts on social infrastructure such as Fred Taylor Park as part of the Brigham Creek Interchange design. Consideration of heavy rail severance in Kumeū-Huapai.
<p>System design</p> <p>Areas of focus for infrastructure design</p>	<ul style="list-style-type: none"> Rigorous application of Corridor Form and Function process to balance place and movement functions on corridor. Focusing on public transport priority, connected cycle networks, minimising capacity for private vehicles. Enhancement of key corridors connecting to public transport interchange locations e.g Royal Road and Māmari Road. Investigation of park and ride site in Kumeū-Huapai to support RTC operations.
<p>Operational interventions</p> <p>Operational measures to support targeted mode shifts</p>	<ul style="list-style-type: none"> Restricted parking on arterial corridors. Potential pricing of the park and ride site. Assessment of complementary operational design measures for the recommended programme e.g., increased public transport, end of trip facilities, travel behaviour change schemes, promotions and monitoring. These types of opportunities have been identified where applicable during this DBC, but more detail is expected to be developed as corridors progress from route protection to funding and implementation. Although out of scope for this DBC, it is acknowledged that investment in public transport infrastructure alone will not influence demand. Instead, additional funding will be required for more public transport services to put buses and rapid transit vehicles onto the network to achieve better frequency and longer hours of operation.

7 North West investment case

The North West IBC demonstrated a strong case for investment and was focused around five key problem areas: Access, Reliability, Choice, Safety and Severance. Investment in these elements was determined to maximise land use and transport integration and align with the Ministry of Transport (MoT) Transport Outcomes Framework and GPS 2021.

At the commencement of this DBC, these five investment areas were carefully reconsidered with respect to changes since the IBC (including strategic context) and discussions with Auckland Transport and Waka Kotahi. As a result of this process, the key problem areas for investment in the North West were reconfirmed as shown in Figure 7-1.

Figure 7-1 Problem areas in the North West for investment

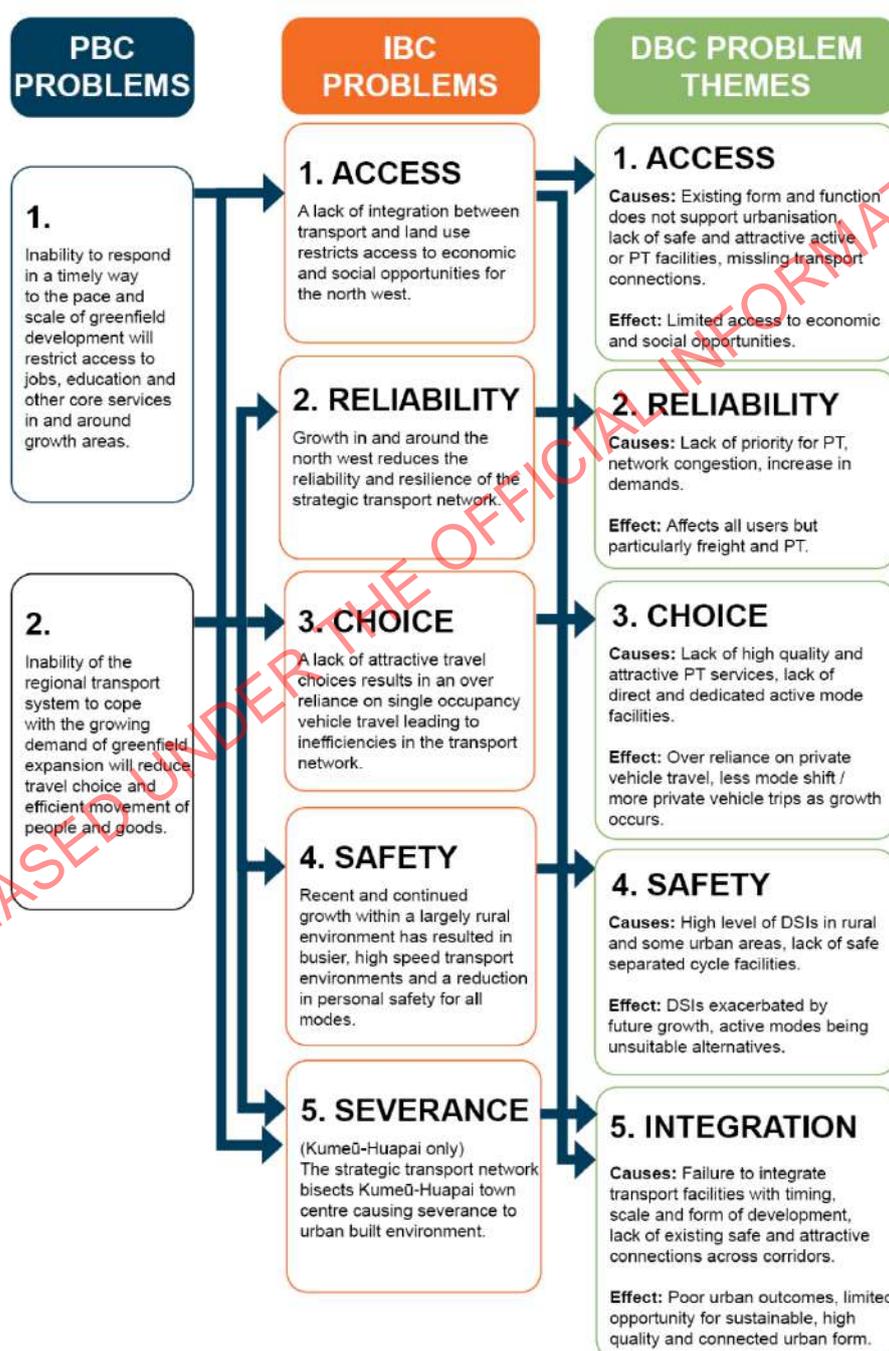


The problem area of 'Severance' from the IBC has been replaced with 'Integration' in the North West DBC. Integration is a broader concept which includes severance as well as aspects of land use and transport integration. Examples of severance include hard infrastructure severances such as the North Auckland Rail line in Kumeū-Huapai as well as people severance through reduced permeability by insufficient active mode crossings and highly volume corridors. The land use and transport integration referenced in this investment area relates to how the corridors physically integrate with adjacent corridors and land uses (including driveways) as well as other pieces of transport infrastructure such as stations, interchanges and wider active mode infrastructure such as the Northwestern Cycleway.

A specific climate change investment objective was considered; however, it was felt that the intentions of this objective to develop a low carbon transport system that supports emission reductions while improving safety and inclusive access was already collectively achieved by the other investment areas and would be essentially double counting. Whilst climate change is therefore not an additional investment objective, this DBC does provide specific commentary on how the North West as well as individual projects themselves contribute to achieving climate change initiatives. Climate change outcomes are therefore reported for each corridor in the option development (Chapter 9) and for the recommended programme (chapter 10).

The process of identifying problems and investment areas from the North West PBC to IBC to the current DBC is shown in Figure 7-2 and illustrates a clear linkage between Business Cases. As mentioned above the only problem to further develop from the IBC is the expansion of the severance category to become an integration category that considers severance, land use and transport integration for all the North West. The DBC remit is to consider each corridor in more detail than the IBC and it was considered that severance is in fact a general issue for people movement on most urbanising corridors. In addition, the design to inform the route protection of these corridors requires decisions to be made on how the corridor interacts with existing infrastructure. As such it was considered important to ensure this physical integration was adequately considered and assessed during corridor development.

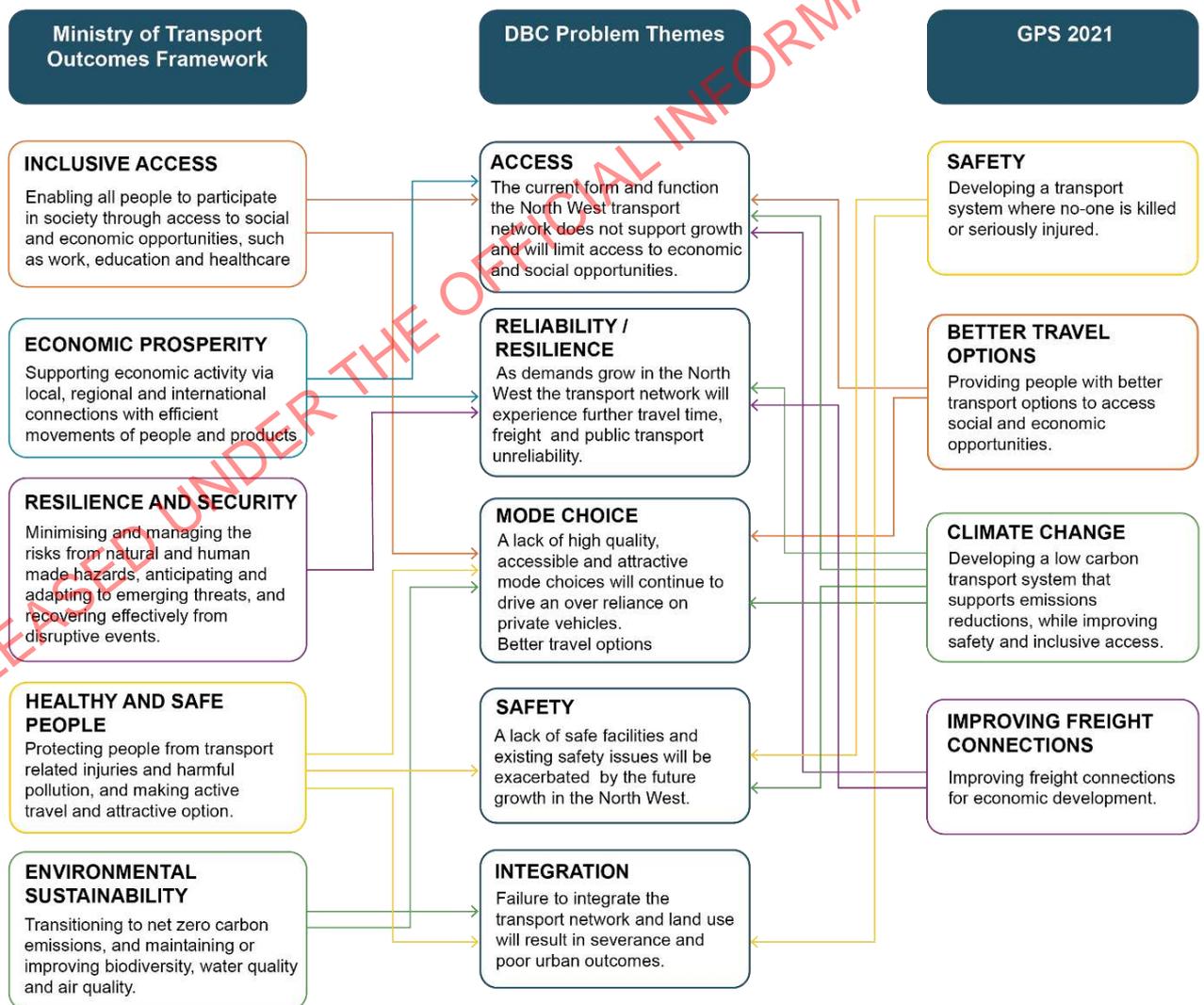
Figure 7-2 Business case mapping for investment



The five North West DBC problem themes and investment areas have also been mapped to the current national government strategic policy direction and show that investment in addressing these problem statements will maximise land use and transport integration and align with the GPS 2021 and MoT Transport Outcomes Framework. The result of this mapping is shown in Figure 7-3 below with the following key outcomes:

- Mapping to the MoT Transport Outcomes Framework shows clear alignment confirming the recommended transport network remains aligned with the five outcome areas of inclusive access, healthy and safe people, economic prosperity, environmental sustainability, and resilience and security.
- Mapping to the GPS 2021 shows clear alignment confirming the recommended networks remain aligned for future investment. Safety and Better Travel Options remain cornerstones of the North West network. The renewed emphasis on improving freight connections is particularly relevant for the improvements planned for SH16. The North West focus on mode neutrality and mode choice supports the climate change initiatives to develop a low carbon economy – this is manifested through the investment in active modes, bus reliability and rapid transit connections.

Figure 7-3 Mapping of DBC Problems to Current Strategic Policy Direction



7.1 North West problem themes

This section provides more details on the five problem themes for the North West DBC at an area wide level. **Appendix A: North West Strategic Case** provides more specificity and details the problem themes and investment corridors for each individual corridor. This demonstrates how each of the corridors is expected to contribute to addressing the overall North West problem themes.

7.1.1 Access

The current form and function of the North West transport network does not support growth and will limit access to economic and social opportunities.

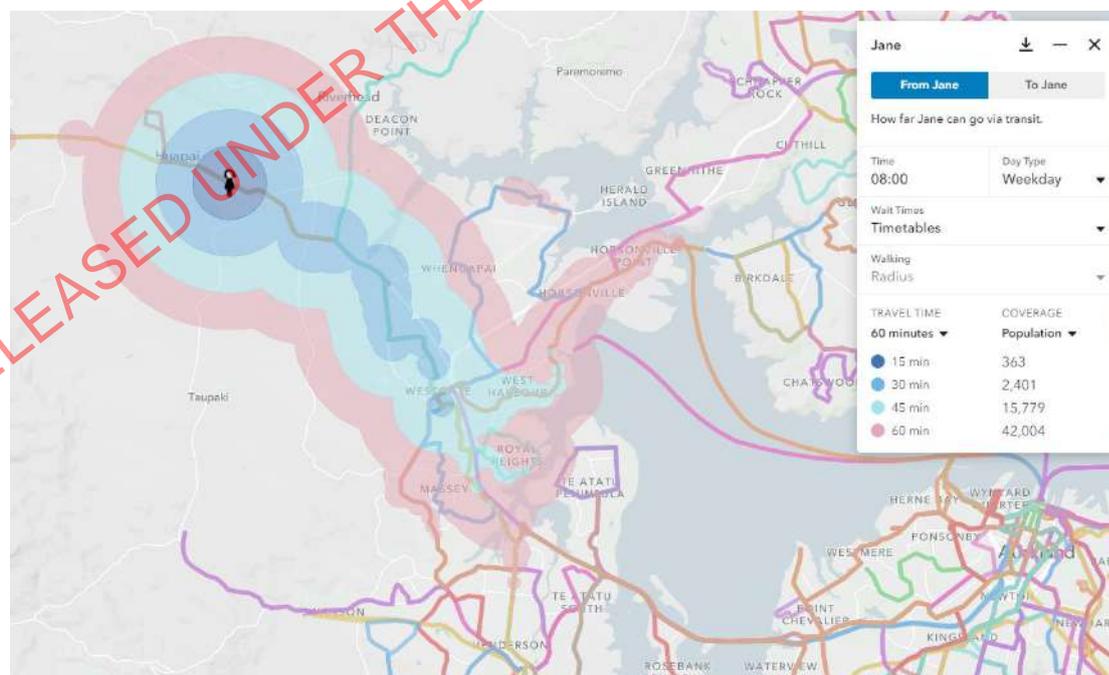
The Access problem theme primarily focuses on limited access to economic and social opportunities in the North West. There are a variety of causes for this problem including:

- The existing form and function of corridors do not support the planned urbanisation.
- Missing transport connections between key destinations.
- Lack of safe and attractive active mode facilities.
- Existing public transport provision is insufficient to accommodate future growth expectations.

Part of addressing this Access problem includes the consideration of the integration between land use and transportation. It also needs to consider all modal users including freight vehicles. Ultimately the provision of better access will support the broader goals of growth in the North West.

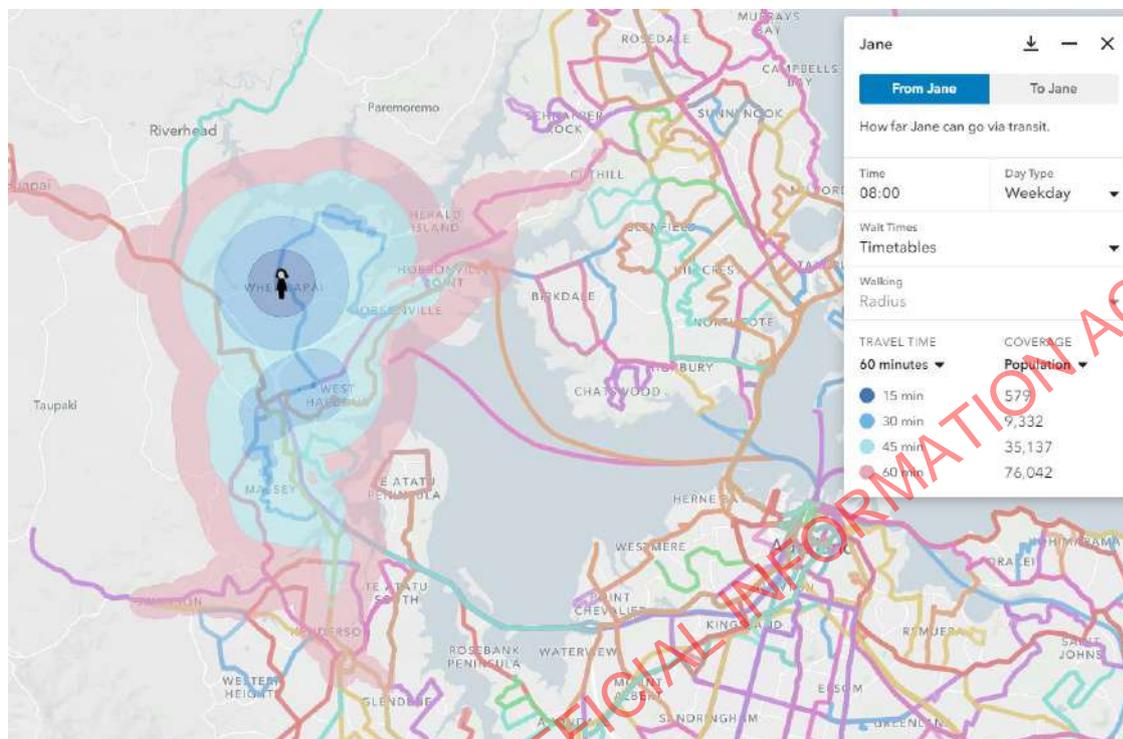
As shown in Figure 7-4 below, current access to employment from Kumeū within 45mins by public transport during the morning peak period is relatively poor, with access to Westgate and a small part of Whenuapai and West Harbour being the only viable employment locations within this time frame.

Figure 7-4: Public Transport Accessibility in 45mins in the morning peak period from Kumeū



As shown in Figure 7-5 below, current access to employment within 45mins from Whenuapai by public transport in the morning peak period is also relatively poor, with access within Whenuapai and Hobsonville being the only viable employment locations. It is also noteworthy that the metropolitan centre at Westgate is outside of a 45min Public Transport travel time.

Figure 7-5: Public Transport Accessibility in 45mins in the morning peak period from Whenuapai



The above figures, demonstrate accessibility by public transport in the peak commuter period where frequency and number of services tend to be higher. It can therefore be assumed that access to social opportunities outside of these periods would be further limited.

Overall, the current level of Access in the North West growth areas by public transport is poor. With the population in the North West projected to increase by 107,000, the transport network will need to be significantly improved to address the ability of people to access employment, education, and social activities by public transport in a manner that is reliable, efficient, and safe.

7.1.2 Reliability/Resilience

As demands grow in the North West the transport network will experience further travel time, freight and public transport unreliability.

Growth in and around the North West will increase demand for all modes of travel. Vehicles and buses will experience congestion in the network, particularly in peak periods. Combined with a lack of priority for public transport and missing travel links this will result in travel time unreliability, lack of resilience and susceptibility to network incidents. This problem affects all users however the most critical are those related to freight and public transport users.

Figure 7-6 and Figure 7-7 below show the expected congestion on the network in the morning and evening peak periods based on 2048+ growth, but without the proposed transport network interventions in the SGA North West programme (the 'Do Minimum' scenario for assessment purposes).

It is important to note that whilst, the 2048+ Do Minimum scenario has the same growth assumptions, it includes assumptions relating to planned transport network improvements that have been identified through other business cases. This is discussed further in the Transport Outcomes Report (Appendix C of the DBC), but in terms of strategic projects includes the North West Rapid Transit corridor from the City Centre to a Brigham Creek station, the SH18 Westgate to Albany RTN and the SH16 to SH18 Connections projects. Without these projects, the 2048+ congestion in the North West, around Westgate, Whenuapai and Hobsonville would be significantly worse than illustrated below.

As can be seen in both periods there are areas in the North West that will experience high levels of congestion (black and red). These tend to be corridors that form the arterial network in the North West – moving significant numbers of people and goods and services.

The figures below show the vehicle to capacity ratios expected on the network in the North West in the Do Minimum scenario as explained above. A vehicle to capacity ratio measures the level of congestion on a road by dividing the volume (VPD) of traffic by the theoretical capacity of the road. At over 100% capacity this would indicate significant queuing and congestion. At 80 or 90% capacity the network would be impacted significantly by incidents such as breakdowns or accidents. Any public transport within these corridors would also be susceptible to poor travel time reliability. There is need for balance in the network, as a network with too much capacity could indicate an over provision for vehicles, which would undermine objective to encourage mode shift.

It should be noted that within the Do Minimum congestion plot there are some improvements that have been assumed. This includes the SH16/18 Connection project which relieves a significant amount congestion from both the Brigham Creek Road interchange with SH16 and Brigham Creek Road within the midblock. Without these projects, congestion would be expected to be considerably worse.

Figure 7-6: Do Minimum Congestion Plot (2048+) Morning Peak Period

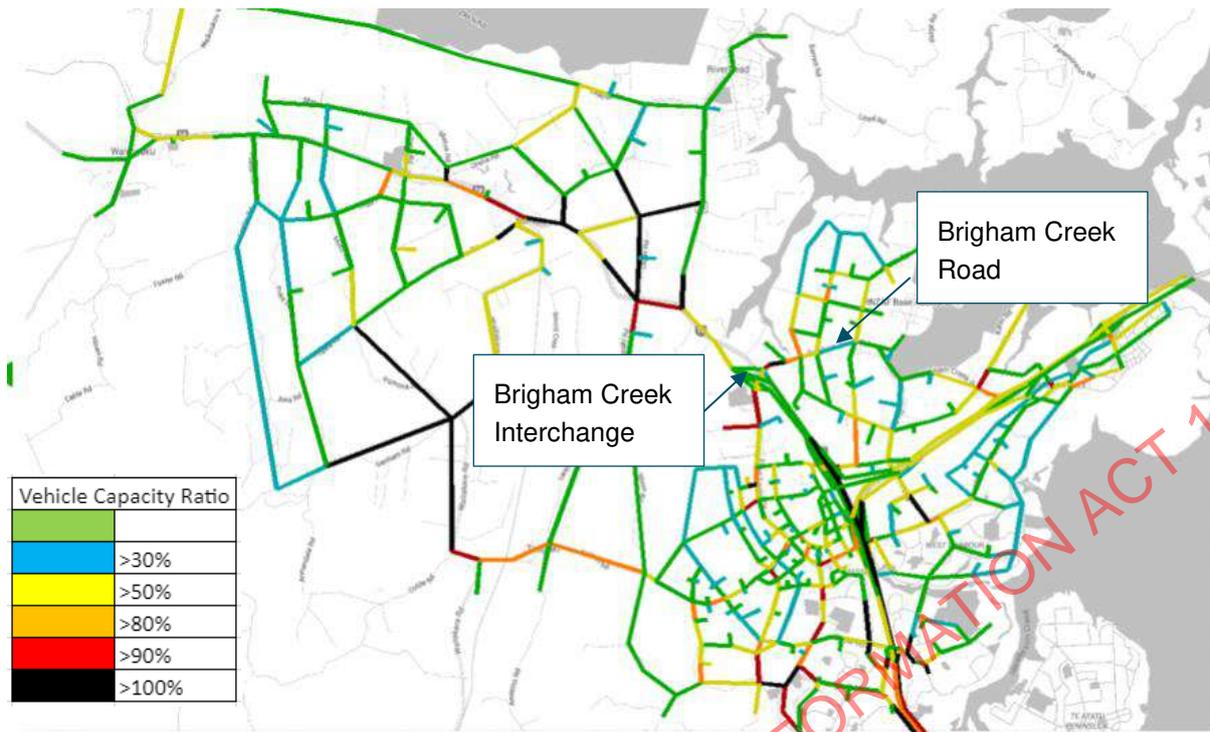
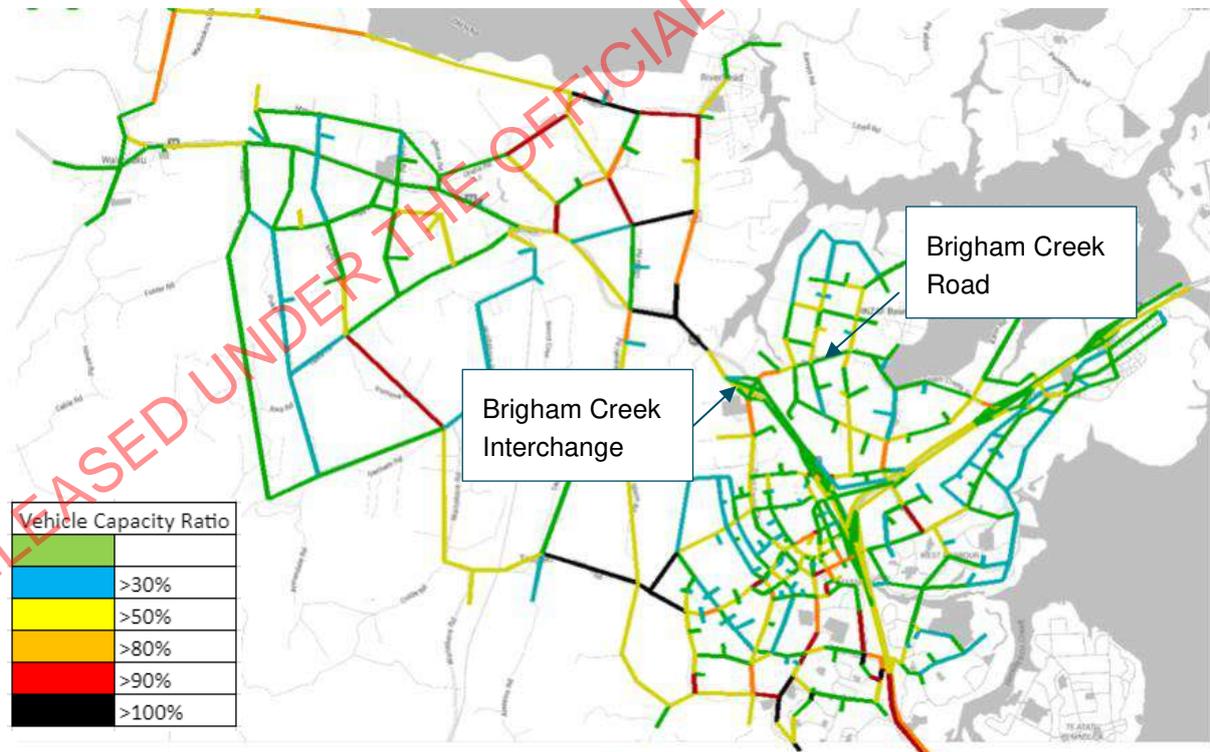


Figure 7-7: Do Minimum Congestion Plot (2048+) Evening Peak Period

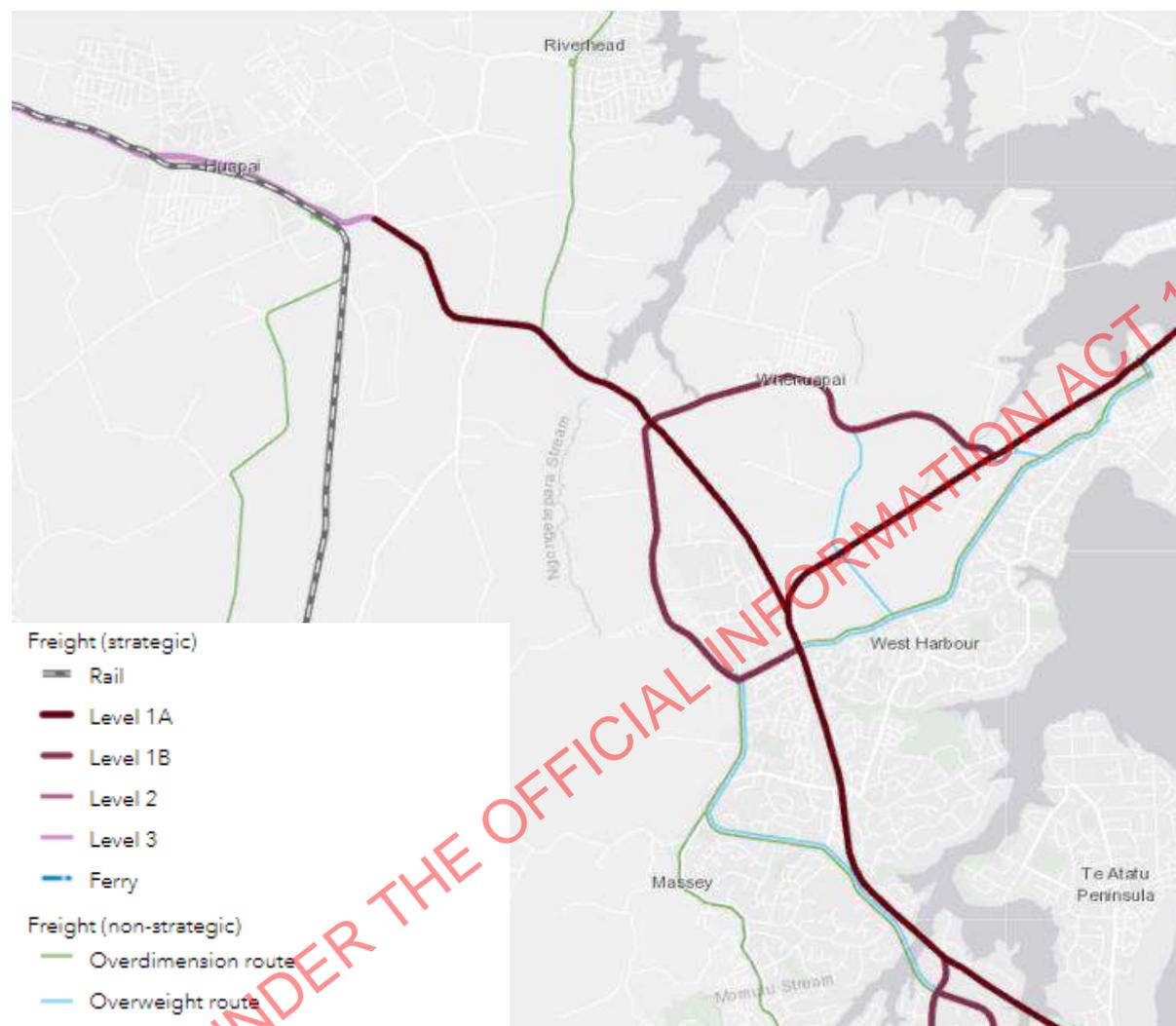


In terms of freight networks, the North West has several key arterials that play an important role within the freight network.

As shown in Figure 7-8, Brigham Creek Road and Fred Taylor Drive are part of the Strategic Freight network, with Don Buck Road, Hobsonville Road, Trig Road and Coatesville – Riverhead Highway

having supplementary roles for over dimension and overweight freight. It is assumed that these roads will continue to perform these functions.

Figure 7-8 Existing freight network



Overall, without investment in infrastructure to support the anticipated growth in the North West there is expected to be a decreasing level of reliability on the network.

Congestion levels that impact on the movements of goods and services are expected to worsen, impacting on the efficiency of freight and economic activities.

In terms of the movement of people, the increasing congestion levels will impact on public transport offerings. Without dedicated facilities to move people directly and quickly, options for public transport will experience unreliable travel times – reducing the attractiveness of public transport as a viable mode choice.

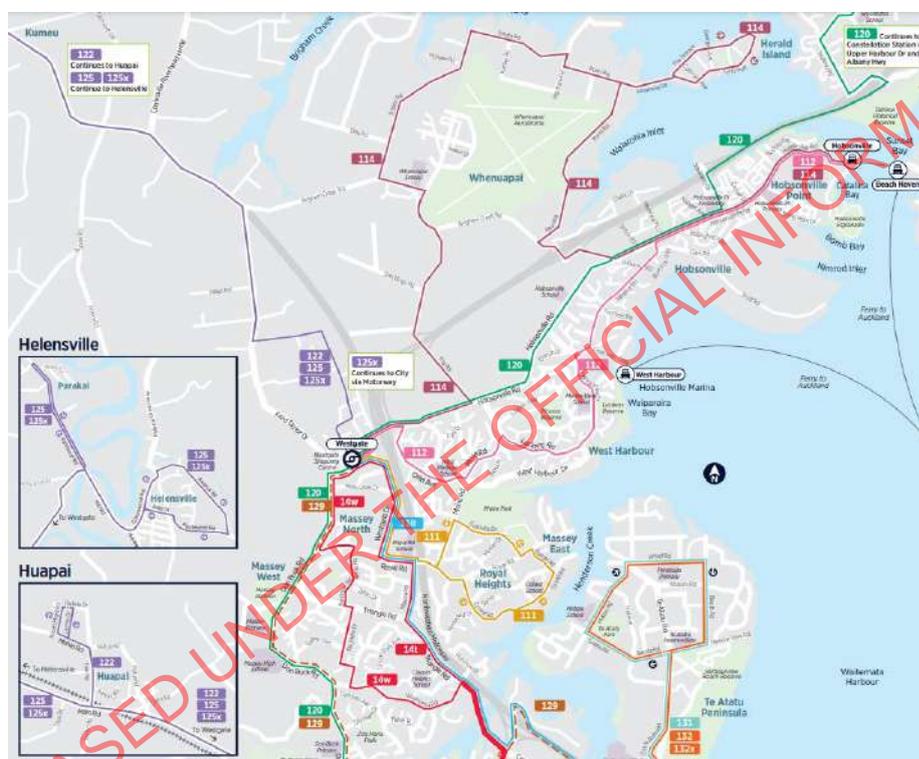
7.1.3 Mode Choice

A lack of high quality, accessible and attractive mode choices will continue to drive an over reliance on private vehicles.

The lack of high quality and attractive public transport services and direct and dedicated active mode facilities combined with increased growth in the North West will exacerbate the existing over reliance on private vehicle travel for the North West and contribute to a lower mode shift. Mode shift includes moving people from private vehicles to public transport, active mode, and high occupancy vehicle use.

The current North West public transport network is shown below in Figure 7-9. As shown the network is understandably focused on existing urban areas with limited services in Whenuapai and Kumeū and no services in areas currently rural such as Redhills.

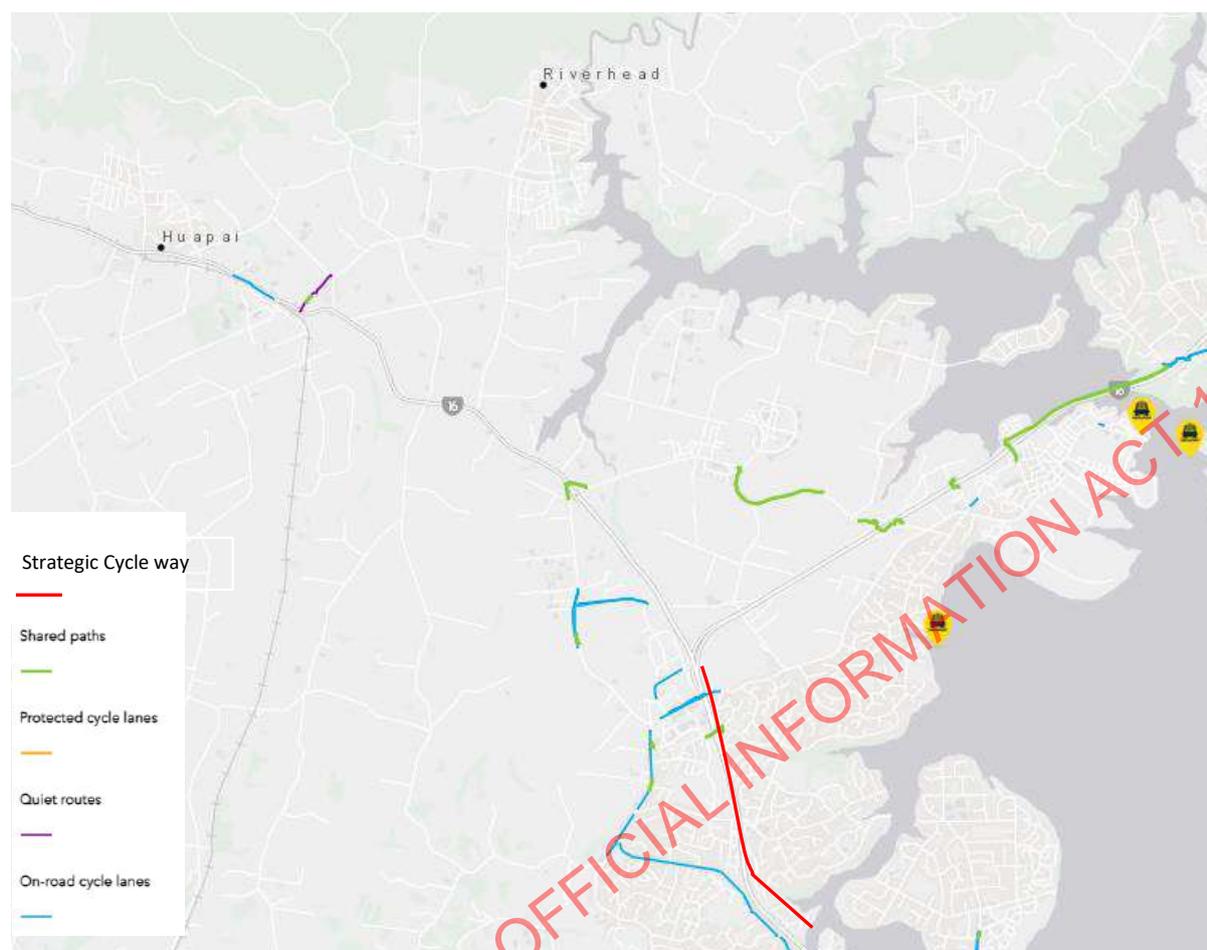
Figure 7-9: Existing Public Transport Network



In terms of cycling, the current cycling network, as shown in the Auckland Cycleway Map and Figure 7-10 below¹¹, is extremely limited, and with the anticipated future growth in the North West this level of service does not provide any incentive for future residents to choose to cycle to work, education or social events.

¹¹ Auckland Cycleway Map, Auckland Transport
<https://maps.at.govt.nz/arcgis/apps/webappviewer/index.html?id=88a582e934f6473dba32cb3ab909890a>

Figure 7-10: Existing Cycle Network in the North West



Overall, options for mode choice in the North West are extremely limited. With the population in the North West projected to increase by 107,000, the transport network in the North West will need to be broadened to provide viable mode choice for residents. By providing a range of transport choices this will enable people to travel by modes that provide safe and efficient travel while supporting wider sustainability outcomes.

7.1.4 Safety

A lack of safe facilities and existing safety issues will be exacerbated by the future growth in the North West.

At a micro level in the North West, high death and serious injury crashes (DSIs) in rural and some urban areas and lack of safe and separated active mode facilities will be exacerbated by future growth and could result in active modes using unsuitable alternatives such as walking and cycling on corridors with limited sealed shoulders or in live traffic lanes.

Further to high-risk safety locations, there is a broader safety problem which is to be considered in the development of the North West DBC. The Road to Zero strategy from Ministry of Transport and the adoption of Vision Zero by Auckland Transport focuses on a safe system approach which acknowledges that people make mistakes, so we need to build a more forgiving road system that protects people from death and serious injuries when they crash.

Our existing networks are not always meeting Vision Zero standards, so the projects in the North West DBC are an opportunity to create a safer way of addressing transport needs in the North West. This might mean that we need more space to achieve the broader vision, or the infrastructure design needs to consider a wider transport outcome. The land uses will be heavily urbanising in the North West and existing safety problems may not exist in the future, but the transport networks need to be cognisant of not creating new safety problems as an unintended consequence.

Therefore, this DBC generally applies a safety lens to each corridor. There might not be a specific safety problem to solve but the corridor will have a role in the broader safety vision for the North West.

Most corridors in the North West adjacent to areas planned for urbanisation are rural in nature, with no active mode facilities. Those that are not rural suffer from low quality active mode provision and in most cases provide only minimal footpath facilities. To support a shift to walking and cycling, these corridors need to have safe walking and cycling facilities that are attractive to users.

Safety outcomes will be integrated into the proposed solutions for all corridors in the North West. The transport system, where possible, will also respond to existing known safety issues e.g speed and geometric deficiencies.

7.1.5 Integration

Failure to integrate the transport network and land use will result in severance and poor urban outcomes.

Land use and transport integration is an important component to achieving good access, mode shift and ultimately supporting growth. Integration for the North West includes a range of factors such as:

- Integration between the transport infrastructure and the adjacent land use including consideration of zoning and density.
- Severance effects from transport infrastructure.
- Poor urban outcomes such as lack of connections or high-density developments in sub optimal locations.
- Integration of the proposed transport corridor with the timing and location of other key transport infrastructure in the North West.
- Integration to support the development of the low carbon transport network.

Predominant causes for this problem are the failure to integrate transport facilities with the timing, scale and form of future development and the lack of existing safe and attractive connections across corridors.

For some corridors e.g., rural, or new urban greenfield, integration can sufficiently be addressed as part of the Access problem. However, for standalone transport infrastructure such as the RTC or ASH or for arterials that either pass through or directly connect centres there is a larger opportunity to address integration. For these corridors, a specific integration problem is considered.

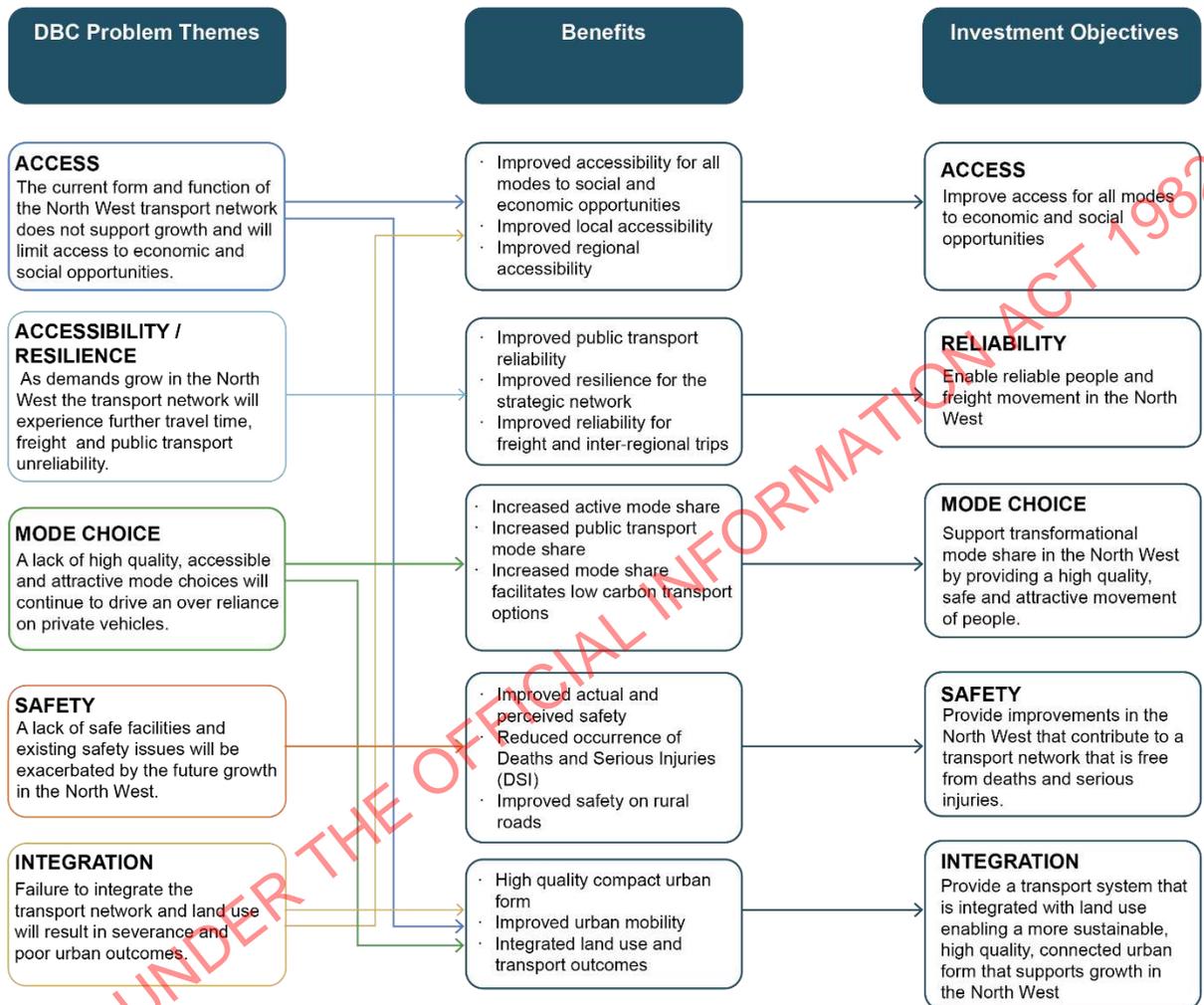
While land use and transport corridors can be integrated as new areas in the North-West are urbanised, there are several existing urban areas that will be impacted where the corridors are widened.

Integration of land use and transport for these corridors can address resulting severance, level change issues and the interface of infrastructure with existing or future land use.

7.2 Investment Logic Map

The North West problems have been mapped and the following overall investment objectives and benefits have been identified.

Figure 7-11 Overall North West Investment Logic Map



Each corridor has localised investment objectives and benefits identified and details are included in **Appendix A: Strategic Case.**

8 Partner and stakeholder engagement

This section summarises engagement undertaken with Partners, key stakeholders, and the community by Te Tupu Ngātahi for the North West DBC.

The team utilised a wide variety of methods to engage at an appropriate level for each stakeholder group. For the purposes of guiding levels of engagement appropriately, stakeholders were defined by the following stakeholder groups:

- Owners
- Partners.
- Elected Members.
- Key Stakeholders (*government stakeholders, network utilities and interest groups*).
- Developers.
- Landowners.
- Wider Community.

The information gathered through engagement has been used to inform route refinement and selection of an emerging preferred option and subsequent option refinement. A detailed engagement summary is included in **Appendix G**.

8.1 Engagement History

The engagement undertaken to support the DBC is a continuation of previous engagement that took place during the PBC and IBC phases. This progression is illustrated in Figure 8-1 below:

Figure 8-1 North West engagement process



8.2 Owner Engagement Summary

Te Tupu Ngātahi has had ongoing engagement with Waka Kotahi and Auckland Transport throughout the development of this DBC. Led by Owner Interface Managers, the project team has collaborated regularly with a team of key technical representatives from the organisations to ensure technical and strategic alignment of the DBC. Forums have included:

- Regular technical sessions to discuss emerging preferred options.
- Specific sessions to discuss design assumptions, key principles or locational design issues.

- Technical review at 30%, 50% and 70% design stages to identify emerging issues.
- Regular briefings on complementary projects to ensure alignment between workstreams.

8.3 Partner Engagement Summary

Te Tupu Ngātahi worked closely with our partners manawhenua, Kiwirail, and Auckland Council throughout the development of the DBC.

8.3.1 Manawhenua

Te Tupu Ngātahi recognises the responsibilities and commitments of engagement with manawhenua as a Treaty Partner. We maintain a manawhenua forum (for operational and kaitiaki level interaction) and enable linkages with the wider governance level relationships of Waka Kotahi and AT via the Tāmaki Transport Table and Auckland Council Kaitiaki Governance Table. The focus of this group is Programme-wide delivery, particularly seeking consistency across projects.

Between March 2020 and February 2021, Te Tupu Ngātahi attended five manawhenua hui, two Technical Strategy Team (TST) presentations and a site visit. These provided insights on the aspirations and issues of manawhenua. The key topics of discussion included:

- Overview and updates on the North West projects.
- Opportunities to provide input on the Options Assessment process and constraint mapping exercise.
- Importance of productive soils and lower quality ecological areas and vegetation.
- Opportunities to minimise impacts or enhance quality of several significant streams.
- Stormwater treatment design.

Feedback obtained from manawhenua was incorporated in the development of options and to confirm the emerging preferred options.

8.3.2 KiwiRail

Te Tupu Ngātahi has engaged regularly with KiwiRail throughout the development of the DBC. This included alignment meetings to share and discuss information, as well as meetings for specific issues on the Alternative State Highway and RTC projects. KiwiRail was also invited to all technical stakeholder workshops.

There was a total of seven meetings held between Te Tupu Ngātahi and KiwiRail between March and December 2020. The key topics covered during these meetings included:

- Understanding the strategic direction of KiwiRail in North West.
- Exploring possibilities of shared designations which has been discounted due to health and safety and maintenance issues.
- Liaison around KiwiRail infrastructure such as substation locations and level crossings.
- KiwiRail high-level assessment of feasibility for relocating rail to co-locate with the proposed Alternative State Highway.
- General agreement with how options were progressing and assumptions being made by Te Tupu Ngātahi on corridors adjacent the North Auckland Line.

8.3.3 Auckland Council

There were regular and ongoing engagement between Te Tupu Ngātahi and Auckland Council (council) which supports the programme's desired outcome of integrated land use and transport planning. Te Tupu Ngātahi facilitated seven council Integration meetings between April and September 2020 prior to the engagement period with discussions continuing in 2021 as necessary on specific projects. Council was also invited to all technical stakeholder sessions to comment on the emerging preferred design. These technical stakeholder sessions were convened regularly throughout the DBC to provide the opportunity for key specialists from Waka Kotahi, AT and partner organisations to discuss technical issues with the project team and provide feedback on specific planning and design parameters.

Topics included:

- Future zoning in the North West, in particular integration with the adopted Spatial Land Use Strategy to understand desired land use prior to formal structure planning.
- Land use considerations and principles for use in the development of the emerging preferred options.
- Potential treatment of residual land from specific projects.

The positive engagement with council has primarily been with the Plans and Places group with secondary conversations with the Parks team regarding the Brigham Creek interchange project. Council has worked iteratively with the Te Tupu Ngātahi team to integrate land use and transport assumptions in the Spatial Land Use strategy.

8.4 Elected Members

Engagement with elected members provided Te Tupu Ngātahi with feedback on our engagement approach and methods, as well as better our understanding of the community. We provided FAQs prior to and throughout the formal engagement period to local MPs, Ward Councillors, the Auckland Planning Committee and Local Boards (Rodney, Upper Harbour and Henderson-Massey).

Briefing notes were sent to the Local Boards in November 2020, including an offer for us to further engage with them. Various presentations and forums were held upon request, and the outcomes of these are summarised in Table 8-1. In addition, Te Tupu Ngātahi provided a project briefing to various Members of Parliament in April 2021.

Table 8-1 Summary of Local Board discussions

Stakeholder	Feedback/Input
Upper Harbour Local Board	<ul style="list-style-type: none"> • Supportive of the North West projects, specifically the separated cycleways proposed along Hobsonville Road. • Noted fast-paced development along Hobsonville Road and uncertain timing of North West projects. • Noted current safety issues at existing Brigham Creek Interchange.
Rodney Local Board	<ul style="list-style-type: none"> • Provided insights into the community to shape our engagement approach, such as recommending us to use the New World supermarket in Kumeū on a Saturday for one of our community drop-in sessions.

Stakeholder	Feedback/Input
	<ul style="list-style-type: none"> Shared information about our formal engagement period of Facebook. Noted community's concerns about timing and property impacts for the Alternative State Highway project.
Henderson and Massey Local Board	<ul style="list-style-type: none"> Henderson-Massey Local Board has not provided any feedback to Te Tupu Ngātahi.

8.5 Key Stakeholders

Key stakeholders, such as government agencies, utility networks and interest groups were engaged with throughout the engagement period, as well as prior as part of ongoing programme wide engagement.

A number of these stakeholders have been engaged with in the North West through the life of the Te Tupu Ngātahi Programme. Key stakeholders were sent an email in December 2020, updating them on the DBC and inviting them to provide feedback. Following the opening of the public consultation, presentations and one-to-one meetings were held with stakeholders as requested. Engagement with government agencies and utility networks is summarised in

Table 8-2 below.

Table 8-2 Summary of Key Stakeholder engagement

	Key Stakeholder	Feedback
Government agencies	Ministry of Education (MoE)	<ul style="list-style-type: none"> Discussed locations of proposed future school sites in relation to projects in the North West. Agreed to continue to work collaboratively.
	New Zealand Defence Force (NZDF)	<ul style="list-style-type: none"> Discussed potential interface between Brigham Creek Road project and NZDF base in Whenuapai. Discussed design requirements to meet NZDF's base constraints.
	Kainga Ora	<ul style="list-style-type: none"> Supported North West projects, particularly the walking and cycling aspects.
[Redacted]	[Redacted]	[Redacted]
	[Redacted]	[Redacted]

	Key Stakeholder	Feedback
	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]

Te Tupu Ngātahi also received feedback from various interest groups, including:

[REDACTED]

More detailed feedback from these groups is included in **Appendix G: Engagement Summary**.

8.5.1 Developer Summary

Te Tupu Ngātahi engaged with a range of developers in the North West throughout the engagement period. Developers were sent bespoke emails in November 2020 from a developer relationship owner which were tailored to each developer group, inviting them to provide feedback. Developers provided feedback via face-to-face meetings and email submissions. Developers that provided feedback included:

[REDACTED]

Discussions with developers generally related to interfaces between how their land is potentially impacted by the proposed projects. Feedback was generally supportive of the North West projects. Te Tupu Ngātahi will continue to engage with developers as the projects progress.

8.6 Public engagement

The engagement period to support the DBC was undertaken between late 2020 and early 2021. During this time, the engagement team actively carried out engagement activities and analysed feedback, working closely with members of the project team.

Te Tupu Ngātahi received approximately **650** pieces of feedback across all channels. People provided feedback in a range of ways, including:

- **153** social pinpoint comments.
- **163** online surveys completed.
- **98** posted feedback forms.
- **57** landowner meetings.
- **91** emails in and **40** phone calls (includes transactional emails and calls).
- **12** additional feedback received via email.
- **32** subscriptions to North West online newsletter.
- Approximately **20** information requests (OIA requests, Ministerial queries, customer queries and an MP information request).

8.6.1 Landowner Engagement Summary

Landowners received letter packs in November 2020, inviting them to attend drop-in sessions and provide feedback. Following the drop-in sessions, it became evident many landowners wanted to understand more about their property impacts, potential acquisition, and timeframes. Hence, the Te Tupu Ngātahi team, supported by the Waka Kotahi property team conducted a total of **57** meetings with landowners.

The most common themes from the landowner meetings included:

- **Property** – property acquisition process, preference for full and early acquisition and loss of property value.
- **Alignment** – alternative alignment suggestions including north of SH16 along Old North Road, further south than the proposed alignment and an extension further north towards Waimauku/Helensville.
- **Project timing** – need certainty around project timeframes.

8.6.2 Community Engagement Summary

Feedback from the community was important for developing knowledge used in decision making processes. Over the engagement period, a range of methods were used to engage with the community, including:

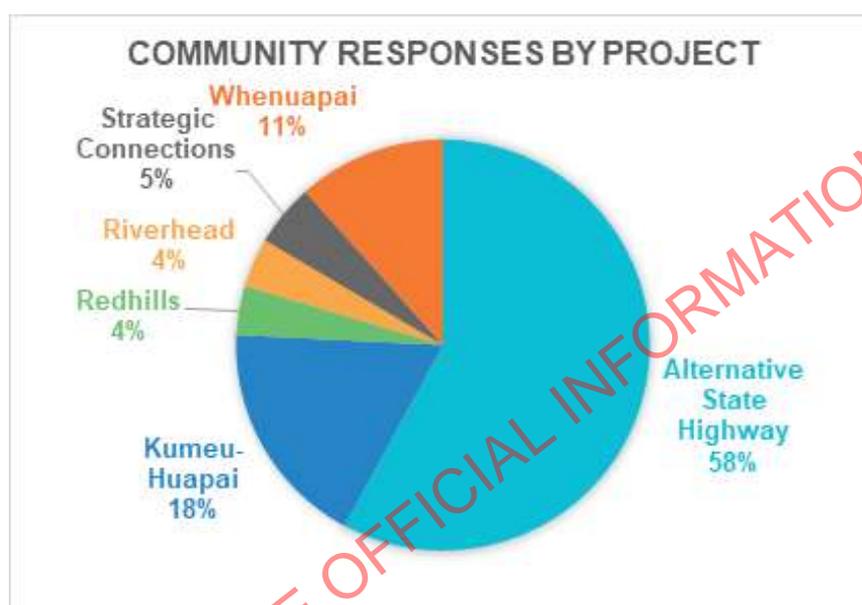
- Social and digital media.
- A2 flyer.
- Website.
- Social Pinpoint and online surveys.
- Email updates.
- Community drop-in sessions.
- Feedback forms and information sheets.

The most comments were received about the Alternative State Highway project, which accounted for **58%** of all community responses. Of these respondents:

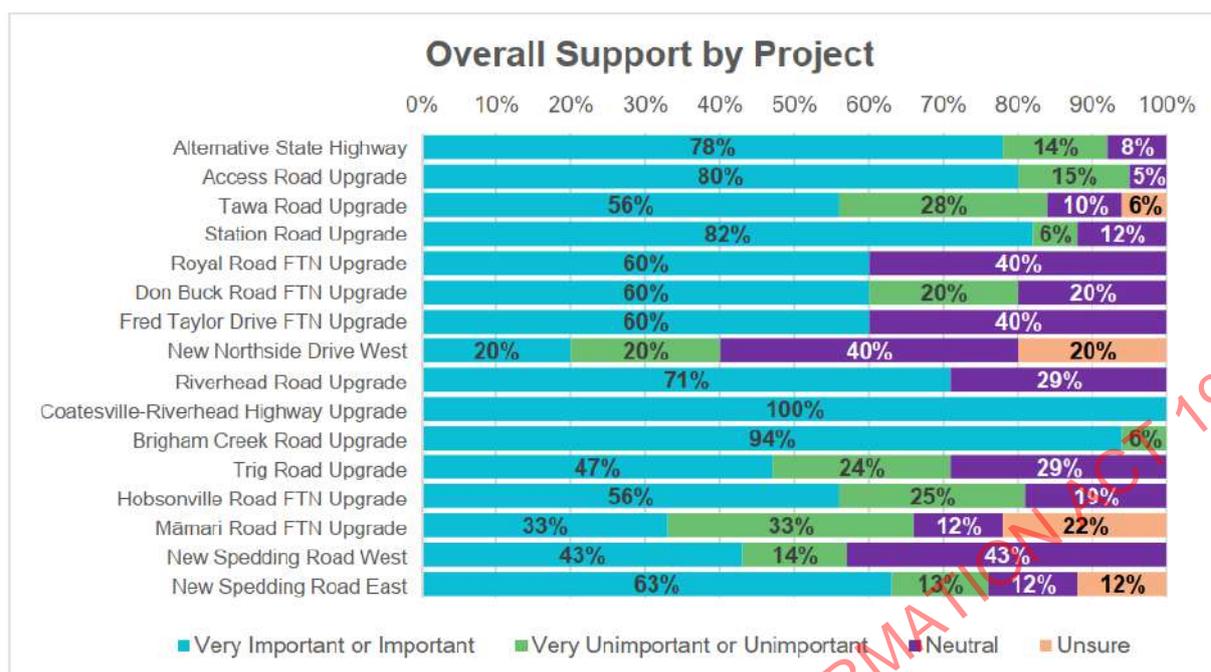
- 78% supported the project to move the State highway out of Kumeū-Huapai confirming the high level of public interest for this project.
- 55% rated the proposed Alternative State Highway alignment as good or very good and **28%** rated it poor or very poor. Reduction of traffic through Kumeū-Huapai was the most common reason respondents rated the project good or very good.

The community responses by project are shown in Figure 8-2 below.

Figure 8-2 North West responses by project



Specific questions such as how important each project is to the community were also asked to gauge levels of community support. A summary of the support by project is shown in Figure 8-3 below.

Figure 8-3 North West support by project¹²

The highest level of support for projects in the North West included the Alternative State Highway, Coatesville-Riverhead Highway, Brigham Creek Road, Station Road and Access Road. All other projects received over 50% support except for Trig Road, Māmari Road and Spedding Road West. Note several projects identified in the IBC were engaged on a higher level. This included the RTC, Brigham Creek Interchange, SH16 Main Road and the Regional Active Mode Corridor which has been incorporated into the RTC design. Dunlop Road was not engaged on as it was determined to be fit for purpose. Northside Drive East Upgrade was also not engaged as no additional road reserve is required.

8.6.3 Next Steps

Following the engagement period, the feedback was carefully analysed and used by the project team to either confirm the emerging preferred option for each corridor or, where appropriate, consider additional alignments or refinements to further inform option selection. Examples where additional testing occurred include the alignments of greenfield corridors on Māmari Road and the central section of the Alternative State Highway.

¹² Note Access Road and Tawa Road are grouped together in the collateral, however separate questions were asked in the feedback forms and survey questions.



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Economic Case

9 Economic case

This section describes the development of the recommended North West transport network and includes:

- Establishment of the Do Minimum.
- Option development process.
- Assessment undertaken to identify the recommended network.
- Overall outcomes of the recommended network.

A summary of the recommended option for each of the 22 elements in the 21 projects is included in this section including a high-level assessment of how the projects will operate as a key part of the transport system. More detailed option assessment is contained in **Appendix B: Option Assessment Report**.

9.1 Do Minimum option

The North West has followed the principles of the Te Tupu Ngātahi programme wide approach for the definition of the Do Minimum.¹³ The Do Minimum is defined as the least effort to maintain the existing system, including maintenance and operation of the existing system.

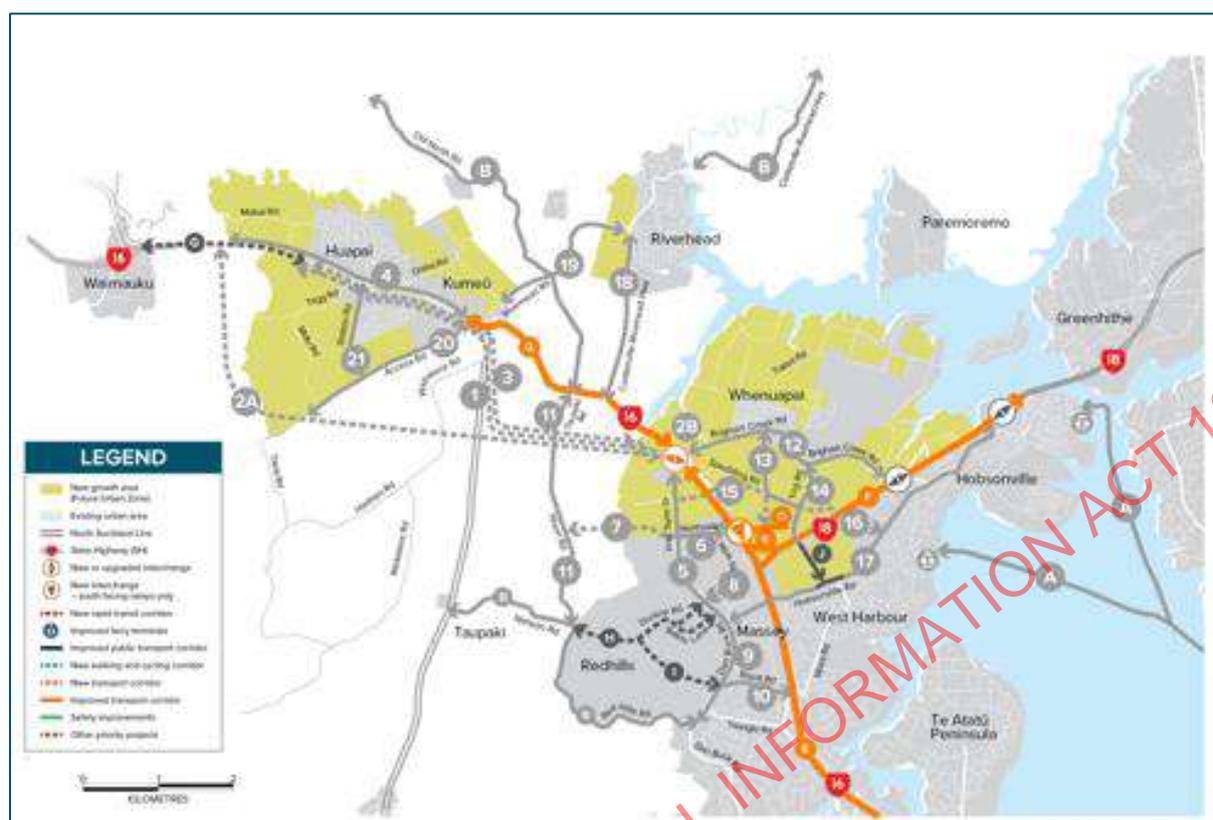
The assumption includes the same quantum of land use development between all scenarios. Within the study area it has been assumed that urban road speeds will be applied, enhanced bus services will be provided on the existing network, intersection upgrades will be provided to support development from a safety perspective and all development areas have access to the existing arterial networks. It is noted that the bus service assumptions are commensurate with the shifting priorities for transport in Auckland where mode shift to public transport and urban accessibility to support intensification is being prioritised in the future. An example of this public transport commitment is shown in the latest ATAP which increases the funding for buses and ferries to boost public transport trips by 91% from \$800M to \$1.3 billion.

Following discussions with Waka Kotahi and Auckland Transport, the following strategic interventions have been included in the North West Do Minimum as shown in Figure 9-1:

- SH16 Brigham Creek to Waimauku Project currently being delivered by Waka Kotahi.
- Full implementation of the NWRN from the City Centre to a Brigham Creek station (City Centre to Westgate (CC2W) project). It was agreed with the owners to use the station locations identified in the North West Rapid Transit IBC.
- SH18 Rapid transit corridor between Westgate and Constellation.
- SH16 to SH18 Connections improvements.

¹³ SGA Approach to Do Minimum Development_V1

Figure 9-1 Map showing Do Minimum projects for the North West DBC



The inclusion of these key inter-dependent strategic projects in the Do-minimum network is to account for the fact that those projects are being developed separately by Waka Kotahi/Auckland Transport, so are not included as part of the Te Tupu Ngātahi improvements package. They are however a key part of the future transport network for the North West so are part of the overall North West response. It is noted that the SH16 Brigham Creek to Waimauku project has funding and potential seed funding for the CC2W project has been included in the RLTP as part of the 10 year capital expenditure. All projects are subject to stand alone business case processes. To understand the overall North West response, it is therefore considered appropriate to include these projects in the modelling assessment.

It is the combination of the proposed projects in this North West DBC, which have been developed to integrate with the key inter-dependent projects identified above, that will enable and maximise the full transport and land use integration outcomes for the North West community. Collectively these projects will establish a properly connected transport system which efficiently moves people from the growth areas to key destinations and transport nodes.

From an assessment perspective, the North West DBC is therefore building on the already assumed strategic components. However, it is noted that the strategic projects included in the Do Minimum are in themselves of a transformative nature so do absorb a substantial amount of transport benefits.

The Do Minimum projects above have been assumed to be in place for technical assessments, however the potential impact of the project not being in place as assumed has still been considered in terms of option selection and outcomes. For example, the SH16 to SH18 Connections project includes a direct connection between SH16 and SH18 which is expected to relieve Brigham Creek Road of its current strategic function. During option assessment and form and function development

consideration has been given to how Brigham Creek Road might be impacted should the SH16 to SH18 Connections project not proceed.

More information on the development of the Do Minimum is included in **Appendix C: Transport Outcomes Report**.

9.2 Option development and assessment methodology

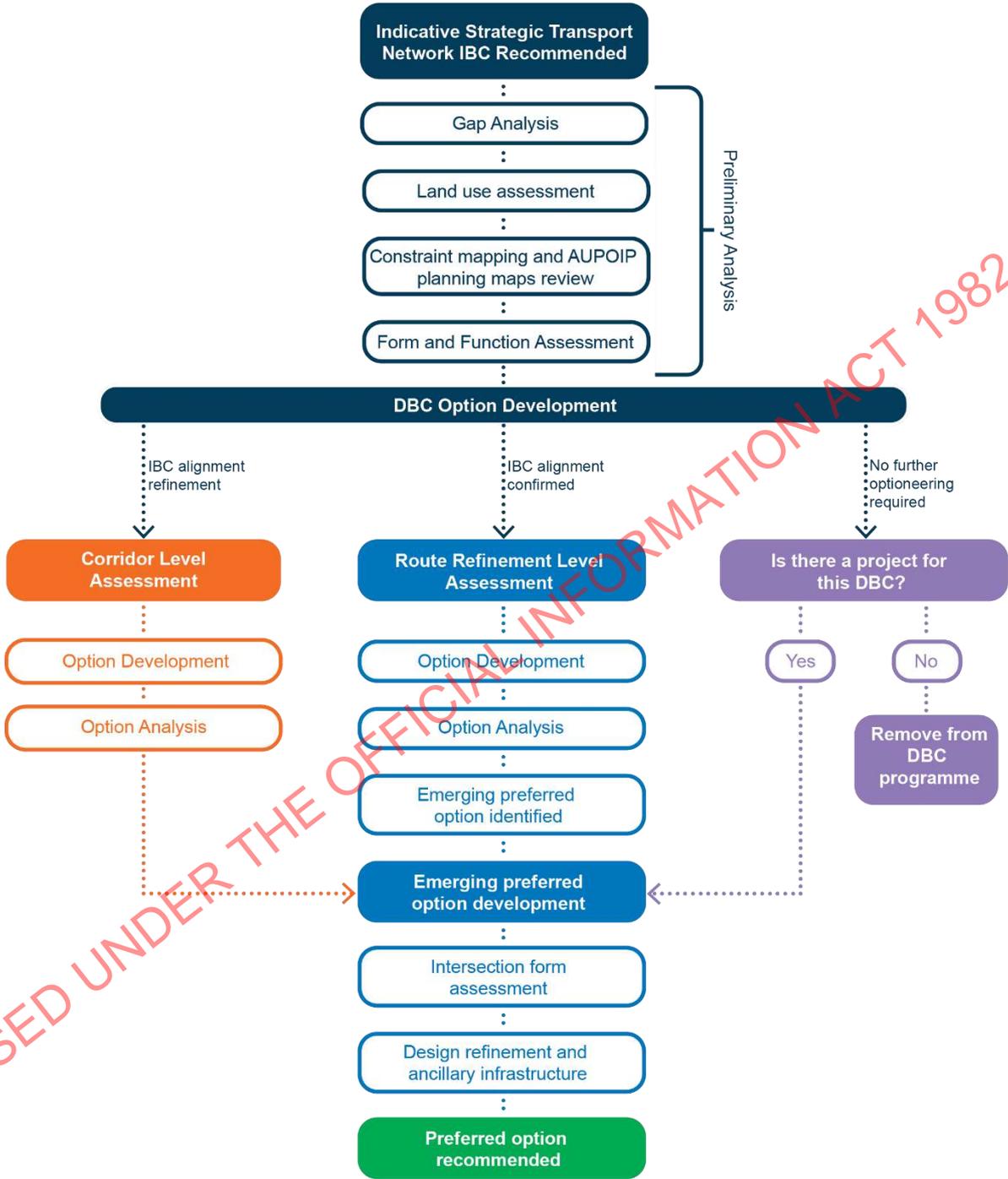
The optioneering process is summarised in Figure 9-2. The process adopted was developed to be fit-for-purpose for each corridor within the North West and is informed by the previous stage of assessment (i.e., the PBC informed the options for the IBC and the IBC informed the options for the DBC). The result of the optioneering process was to confirm an emerging preferred option to be developed into the recommended option for route protection.

The option assessment methodology is summarised in the following sections. For a full description of the process refer to **Appendix B: Options Assessment Report**.

Note the following definitions used in this section:

- **Corridor assessment** – this is referring to the location of the infrastructure within a study area. For a corridor assessment a number of different locations or connection points may be tested. Generally, applies to greenfield routes.
- **Route refinement** – assumes the specific corridor has been confirmed. Optioneering is then refined to localised widening options or minor alignment variations to avoid identified constraints. Generally, applies to upgrades on existing routes.
- **Alignment** – this is used to describe how one particular option connects two points in the corridor. There may be several different alignments in a single corridor.

Figure 9-2: Option assessment process



9.2.1 Preliminary Analysis

There were four key steps in this preliminary analysis as summarised in Table 9-1.

Table 9-1 Preliminary analysis

Step	Description
Gap analysis	<p>The gap analysis and background reviews were undertaken to ensure an understanding of how the Indicative Strategic Transport Network was identified, to check if anything had changed since the IBC including policy direction and statutory documents (for example, plan changes or National Policy Statements), and to identify gaps or issues that require further consideration during the DBC phase.</p> <p>The gap analysis included the following:</p> <ul style="list-style-type: none"> • Review of previous Supporting Growth PBC and IBC documents including option assessments, recommendations and identified opportunities. • Alignment of the recommended options with relevant policy documents (for example, Government Policy Statement on Land Transport 2021, AUPOIP) with a focus to confirm if anything has changed since the North West IBC recommendations. • Alignment with strategic plans, other statutory documents and developer aspirations that may have progressed since the IBC. For example, structure plans, plan changes (or appeals), recent Notices of Requirement and developer plans. • Interaction with other projects in the area.
Land use assessment	<p>The future land use adjacent to each corridor was individually assessed to understand the transport requirements to best service the intended land use as well as the identification of opportunities to enhance land use and transport integration. This was done by:</p> <ul style="list-style-type: none"> • For Redhills and Whenuapai, using the Unitary Plan (AUPOIP), Whenuapai Structure Plan and information known from third party developers. • For Kumeū-Huapai, Riverhead and Redhills North Future Urban Zone (FUZ) land, which is yet to be structure planned, using the Unitary Plan (AUPOIP) and the Auckland Council North West Spatial Land Use Strategy which was developed in parallel to this North West DBC. The parallel development allowed multiple discussions to be held over a period of time to inform an integrated transport and land use plan. <p>Land use assessment was then used an input into the general constraint mapping process.</p>
Constraint mapping	<p>Corridor mapping was undertaken by manawhenua and Subject Matter Experts to understand potential constraints to inform the refinement of the DBC options. Areas of assessment included:</p>

Step	Description
	<div data-bbox="443 315 1326 860" data-label="Diagram"> </div> <p data-bbox="375 965 1385 1099">These constraints were then used as direct inputs into the option development process. Local arterial projects were assessed on a study area of 100m wide. This area was increased for the Alternative State Highway, Brigham Creek Interchange, part of Spedding Road West and part of the RTC to respond to known constraints.</p> <p data-bbox="375 1122 1385 1218">Constraints were mapped on GIS and their significance recorded. The constraints and their significance were reviewed and discussed at a workshop attended by manawhenua, Subject Matter Experts (both owner and independent specialists) and the Project team.</p>
<p data-bbox="204 1263 347 1397">Corridor Form and Function Assessment</p>	<p data-bbox="375 1263 1385 1429">The Corridor Form and Function (CFAF) process was used primarily for the purpose of assessing multi-modal corridors in the North West. The CFAF framework is a tool which formalises the optioneering process and provides consistent decision-making across the wider Te Tupu Ngātahi programme. It is based on the Auckland Transport Roads and Streets Framework (RASf) guidance.</p> <p data-bbox="375 1462 1385 1597">The iterative nature of the process allowed for high stakeholder and owner engagement and an efficient design process. Note that during the development of this DBC, the CFAF assessment was revisited as necessary to address identified constraints and design considerations. Any modifications were taken back through the endorsement process.</p> <p data-bbox="375 1630 1385 1796">In the North West, the CFAF was applied to all local road corridors but was not immediately applicable to the ASH and RTC projects which are a different typology of corridors. It is noted however that the principles for modal space allocation were used in the development of cross sections for these two bespoke corridors. The key principles are related to place and movement as shown below.</p>

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Step	Description
	<div data-bbox="367 302 1284 795" style="text-align: center;"> <p>A. Place & corridor function</p> <ul style="list-style-type: none"> Place Corridor purpose Related projects <p>B. Movement needs (mid-block)</p> <ul style="list-style-type: none"> Public transport Walking and cycling General traffic Freight <p>C. Longitudinal form</p> <ul style="list-style-type: none"> Intersections Accesses <p>D. Uncertainty & future requirements</p> <ul style="list-style-type: none"> Dealing with uncertainty Route protection requirements </div> <p>In addition to the CFAF assessments a fit for purpose assessment was completed for recently delivered (or approved to be delivered) corridors in the North West. The purpose of this assessment was to compare the facilities along the corridor against that recommended as part of the CFAF assessment to identify if further upgrades are required to achieve the intended outcomes sought by this DBC.</p> <p>This assessment considered:</p> <ul style="list-style-type: none"> Land use adjacent to the corridor and the degree of land use certainty. Facilities currently (or proposed) to be provided on the corridor compared to those that are recommended by the CFAF process. Consideration of corridor width and the ability to implement a reallocation of space to achieve the Te Tupu Ngātahi outcomes or cross sections. <p>This assessment was completed for the following corridors:</p> <ul style="list-style-type: none"> Northside Drive (Fred Taylor Drive to Maki Street). Dunlop Road (Fred Taylor Drive to Maki Street). Fred Taylor Drive (Don Buck Road to SH16). Hobsonville Road (Buckley Avenue to Squadron Drive). <p>Full details of the North West CFAF can be found in Appendix C: Transport Outcomes Report.</p>

9.2.2 DBC Option development and assessment

The preliminary analysis identified whether the IBC recommended option for each project required additional reconsideration in light of any new information relating to that project. The analysis also identified whether the IBC options assessment had sufficiently considered alternatives proportional to the scale of potential effects of each project. Further consideration was then given to the nature and significance of identified constraints and the land use context at the option development and option

assessment phase. The choice of pathway depended on the individual needs of the corridor and the North West decisions are summarised in Table 9-2.

Options developed for both the Corridor Assessment and Route Refinement pathways were developed to the same design standard and sufficiently detailed to allow a comprehensive assessment. Note some project corridors were segmented to allow a more localised assessment. In some cases, different approaches to option development were adopted in different segments of the same project corridor. This allowed a fit for purpose assessment of the North West network.

The option assessment for each corridor was fit for purpose and included either a full MCA assessment with Subject Matter Expert input and/or a project team option assessment. Full details of this methodology are included in Appendix B : Options Assessment Report.

During development of the corridors, the principles from the Te Tupu Ngātahi UDF have been applied during the MCA and the subsequent design development stages. This has been particularly important for the corridors where space constraints have required trade-offs and the UDF has been used to help inform these decisions.

Table 9-2 Option development pathways

Pathway	Option development	Option Assessment
Corridor Level Assessment	<p>Undertaken if the gap analysis identified that the IBC recommended option for the corridor required additional reconsideration.</p> <p>This assessment:</p> <ul style="list-style-type: none"> • Impacted specific North West greenfield corridors. • Included development of additional options occupying different locations within a defined study area and potentially connecting to the transport network at different points. • Tested options at sufficient detail to develop an emerging preferred option, so no additional route refinement was required for these sections. 	MCA Assessment with Subject Matter Expert input
Route Refinement Assessment	<p>Undertaken for corridors that had the IBC alignment confirmed during preliminary analysis.</p> <p>This assessment:</p> <ul style="list-style-type: none"> • Focused on localised widening options of the IBC recommended option. • Involved widening on one side or both sides or a bespoke approach to avoid or mitigate identified constraints. 	MCA Assessment with Subject Matter Expert input and/or Project Team Option Assessment
No Options Developed	<p>No options identified during preliminary analysis.</p> <p>This assessment resulted in three possible project corridor outcomes:</p> <ul style="list-style-type: none"> • Corridor considered fit for purpose – no changes required and can be removed from the DBC programme. 	Project Team Option Assessment

Pathway	Option development	Option Assessment
	<ul style="list-style-type: none"> Existing designation sufficient however potential reallocation of road space could be considered at a future time. No need for route protection. Potential project identified but not being recommended for route protection in this DBC programme due to surrounding land use and future zoning considered low risk. 	

9.2.3 Emerging preferred option development

Following the option development process, the emerging preferred option was identified for each corridor and confirmed with stakeholders and owners. These options were also included as part of the wider public engagement period and feedback was collated and used by the project team in the next stage of design. The design included the consideration of:

- Vertical alignment.
- Horizontal alignment.
- Identification of future intersection form and function using the Te Tupu Ngātahi process.
- Property access – in particular driveway access for existing corridors.
- Stormwater requirements including location of future stormwater ponds.
- Further development of walking and cycling arrangements.

Designs were issued to a wider technical stakeholder group at 30%, 50% and 70% design levels to ensure early identification of issues and timely decision making for design choices such as intersection treatments, stormwater principles and constraints to the cross sections.

Full details of the design process for each corridor are detailed in **Appendix X: Design Report**

9.3 Summary of North West option development and assessment

A summary of the option development and assessment process as well as the preferred options for the full North West network is summarised in Table 9-3 below. A more detailed summary for each project is included in Sections 9.5 to 9.9.

Table 9-3 Summary of North West option assessment

Project	Purpose	Assessment type			Low carbon transport network Facilities			Preferred option	Objective alignment	Included in Recommended network
		Corridor Assessment	Route Refinement	No options developed	Bus Lanes	Bus Priority	Active modes (upgrade or new)			
1	Rapid Transit Corridor (RTC)	<ul style="list-style-type: none"> Support transformational mode shift and drive a shift to low carbon alternatives through provision of safe, high quality, frequent and reliable rapid transit system. 	✓					<ul style="list-style-type: none"> Grade separated, mode agnostic alignment running abutting the North Auckland Line corridor. RTC decoupled from SH16 Main Road (i.e., RTC not in the centre of the road). Shared corridor with the ASH between Brigham Creek Road and NAL. Includes design for Regional Active Mode Corridor (RAMC) and SH16 Main Road Upgrade. 	<ul style="list-style-type: none"> Reduced need to travel by single occupancy vehicles. Improved access to local employment and social/community facilities. Grade separation to maximise RTC efficiency and reliability. Forecast to carry from Kumeū 3,150 pax/2 hr AM period – much of which will be mode shift from private vehicles. Station strategy to support land use intensification. Cornerstone of network response to drive mode shift and support climate change goals to develop a low carbon future network. 	Yes
2	A. Alternative State Highway (ASH)	<ul style="list-style-type: none"> Relocate the existing longer distance regional and sub-regional connections from existing SH16 to a new state highway. Reduce traffic on SH16 Main Road to enable transport and land use integration of Kumeū-Huapai growth and support mode shift through provision of rapid transit and associated walk-up catchment facilities to stations. Improve freight reliability with direct access to planned future industrial land use. Improve resilience of the network by providing a quality alternative to access Kumeū-Huapai. This will result in a reduction in vehicles utilising the surrounding rural road network to avoid congestion and improve rural road safety. Enable better safety outcomes for active modes on SH16 Main Road as well as supporting mode choice through the provision of active mode facilities along the alignment. 	✓				<ul style="list-style-type: none"> Eastern connection at Brigham Creek. Western connections near Fosters Rd. Alignment is through southern end of Boord Crescent then south of Pomona Road to Tawa interchange. Western alignment along ridge and connects west of Fosters Road 	<ul style="list-style-type: none"> Relocation of strategic trips from the town centre and through Kumeū-Huapai, improving local access options and supporting implementation of RTC. Alignment will provide a second transport corridor into Kumeū-Huapai improving reliability. Freight to access future industrial zoning directly from the Tawa interchange without having to traverse urban areas. Alternative route to remove strategic trips from unsuitable parallel rural roads. Provision of active modes on the corridor to provide safe alternative strategic cycling access. Supports placemaking opportunities in Kumeū-Huapai townships by removing heavy vehicle and private carbon emitting vehicles from existing SH16 and enabling reallocation of space for more climate friendly modes such as rapid transit, walking and cycling. Part of collective strategic transport solution (including RTC and SH16 Main Road upgrade) which supports transformation to a low carbon transport system. The role of the ASH is to remove strategic trips from Kumeū-Huapai to allow existing SH16 to be downgraded to an arterial to better support the operation of the RTC and reduce reliance on carbon emitting private vehicle travel by encouraging walk-up and cycle-up catchment at stations. The State highway corridor itself will also have active mode facilities to support strategic cycling movements in the North West. The allocation of the proposed four lanes on ASH will be decided upon implementation 	Yes	

Project	Purpose	Assessment type			Low carbon transport network Facilities			Preferred option	Objective alignment	Included in Recommended network	
		Corridor Assessment	Route Refinement	No options developed	Bus Lanes	Bus Priority	Active modes (upgrade or new)				
									but the additional capacity could also be used for managed lanes or interim public transport facilities.		
	B. Brigham Creek Interchange	<ul style="list-style-type: none"> Provide reliable access and efficient interface between the strategic and local network Improved and safer access for active modes through the interchange 	✓					<ul style="list-style-type: none"> Split Fork arrangement Assumes ASH and RTC are at grade and local roads elevated. 	<ul style="list-style-type: none"> Grade separates local and strategic people movement on the local and strategic corridors enabling good quality people movement. Lower exposure/improved safety for active modes with fewer intersections and grade separation. Supports mode shift and reducing vehicle emissions for local trips between growth areas. 	Yes	
3	Regional Active Mode Corridor (RAMC)	<ul style="list-style-type: none"> Provision of a high quality segregated cycling facility that connects Westgate to Kumeū-Huapai. Note this facility will be provided as part of the RTC project and not pursued as a separate project. 	✓					<ul style="list-style-type: none"> Following alignment of the proposed RTC and ASH. Considered as part of RTC option development. 	<ul style="list-style-type: none"> Corridor connects with Northwestern cycleway and completes high quality (higher speed) connection between metropolitan centre of Westgate and the expanded Kumeū town centre. Connects with facility on ASH serving southern FUZ. Other local connection opportunities to maximise access to the facility in rural area. Safe, consistent, coherent, segregated facility. Provision of high quality active mode facilities will enable mode shift to active modes to support a low carbon transport system in growth areas. 	Yes	
4	SH16 Main Road Upgrade	<ul style="list-style-type: none"> Revocation of SH16 to an arterial (once ASH is in place) to remove strategic trips from Kumeū-Huapai, support walk up access to the RTC stations and better serve the surrounding urban land use including activation of the town centre. 			✓			<ul style="list-style-type: none"> Existing alignment. Bespoke widening to integrate with RTC. Focuses on improving active mode access and placemaking opportunities. Considered as part of RTC option development. 	<ul style="list-style-type: none"> Focused on connecting local land use to the transport network and distributing efficiently to the strategic network (RTC or ASH). High quality cycle facilities to provide the spine network to connect the residential catchments to key destinations and the RAMC. Reduced speed environment and space for midblock crossings. Reduction in road hierarchy to an arterial function to de-tune SH16 Main Road and support improved permeability (including north south connections over the rail line). Supports climate change through utilising existing corridor. Focuses on active modes to shift trips away from carbon generating private vehicle use and link land use to the RTC. Raises SH16 bridge to mitigate flooding risk. 	Yes	
5	Fred Taylor Drive FTN Upgrade	<ul style="list-style-type: none"> Distributes future Redhills growth and connects people to rapid transit stations, regional active modes and SH16. Needs to support reliable bus access to Westgate for local bus services and provide improved walking and cycling facilities. 			✓	✓	✓	✓	<ul style="list-style-type: none"> No options developed as existing designation in place. Designation used as much as practicable. Some localised widening of designation required. 	<ul style="list-style-type: none"> Provides multimodal corridor to connect Redhills to Westgate metropolitan centre. Improved reliability of public transport with dedicated bus lanes and bus priority. Provision of separated cycle facilities and improved intersection controls to support safety of turning traffic. Supports climate change by driving mode shift through increase of non-vehicular people movement capacity by provision of dedicated bus infrastructure and walking and cycling facilities. 	Yes

Project	Purpose	Assessment type			Low carbon transport network Facilities			Preferred option	Objective alignment	Included in Recommended network
		Corridor Assessment	Route Refinement	No options developed	Bus Lanes	Bus Priority	Active modes (upgrade or new)			
6	Northside Drive East Upgrade	<ul style="list-style-type: none"> Connect Fred Taylor Drive to Westgate. Improve active mode facilities along this existing corridor. 			✓			<ul style="list-style-type: none"> Sufficient existing road width to support road space reallocation to a 20m Te Tupu Ngātahi cross section. No additional route protection required. No further investment sought at this stage. 	<ul style="list-style-type: none"> Upgraded cycle and walking facilities will improve quality of service to achieve higher levels of active mode access on this part of the network. Provision of high quality active mode facilities will enable mode shift to active modes to support a low carbon transport system in growth areas. 	Yes (Type A)
7	New Northside Drive West	<ul style="list-style-type: none"> Alternative east west connection between Redhills and Kumeū to provide resilience to SH16. Connects cyclists from Fred Taylor Drive to future facilities on Taupaki Road which ultimately connect with the ASH 	✓					<ul style="list-style-type: none"> Follows structure plan alignment to the east and has a bespoke route to connect to Nixon Road to the west. New connection and cycle facilities. 	<ul style="list-style-type: none"> New multimodal corridor is provided to complete an alternative local east-west connection between Redhills North and Kumeū-Huapai. Provides a local alternative route to the strategic network (SH16). Could be used by strategic traffic during a SH16 incident. Provides a new local east west cycle connection to complete the wider Redhills cycling network. Dedicated facility improves the exposure risk for cyclists. Supporting climate change and transformation to a future low carbon transport system by creating a new east west walking and cycling connection to enable active mode shift. 	Yes
8	Dunlop Road Upgrade	<ul style="list-style-type: none"> Support mode shift through the provision of reliable bus and active mode access between Redhills and Westgate. 			✓			<ul style="list-style-type: none"> Project corridor is Fit for Purpose. 	<ul style="list-style-type: none"> Existing facilities provide key public transport connection from Redhills to Westgate. Supports climate change through facilitation of mode shift to increase in people movement capacity by bus, walking and cycling. 	No
9	Don Buck Road FTN Upgrade	<ul style="list-style-type: none"> Distributes future Redhills growth and connects people to rapid transit stations, regional active modes and the SH16 motorway interchange. Needs to support reliable FTN access to Westgate and provide improved walking and cycling facilities. 		✓		✓	✓	<ul style="list-style-type: none"> Corridor extent reduced. Section from Royal Road to Redhills Road excluded as significant constraints with limited transport benefits for associated impact. Remaining widening bespoke to avoid key constraints along the corridor. 	<ul style="list-style-type: none"> Provides multimodal corridor to connect Redhills to Westgate metropolitan centre, RTC and State highway. Improved reliability of public transport with dedicated bus lanes and bus priority. Provision of separated cycle facilities and improved intersection controls to support safety of turning traffic. Supports climate change by driving mode shift through increase of non-vehicular people movement capacity by provision of dedicated FTN bus infrastructure and walking and cycling facilities. 	Yes (Reduced extents)
10	Royal Road FTN Upgrade	<ul style="list-style-type: none"> Key corridor with multiple functional requirements. Distributes future Redhills growth and connects people to rapid transit stations, regional active modes and the SH16 motorway interchange. Needs to support reliable FTN access to RTC and provide improved walking and cycling facilities 		✓		✓	✓	<ul style="list-style-type: none"> Corridor widening on north side only. 	<ul style="list-style-type: none"> Provides key link between Redhills and future RTC station and strategic highway network. Improved reliability of public transport with dedicated bus lanes and bus priority. Provision of separated cycle facilities and improved intersection controls to support safety of turning traffic. Supports climate change by driving mode shift through increase of non-vehicular people movement capacity by provision of dedicated FTN bus infrastructure and walking and cycling facilities. Helps maximise RTC catchment through provision of direct, efficient and 	Yes

Project	Purpose	Assessment type			Low carbon transport network Facilities			Preferred option	Objective alignment	Included in Recommended network
		Corridor Assessment	Route Refinement	No options developed	Bus Lanes	Bus Priority	Active modes (upgrade or new)			
									well connection bus and walking and cycling connections to the station.	
11	Taupaki Road/ Nixon Road Upgrade	<ul style="list-style-type: none"> Local alternative access between Redhills and Kumeū and key cycle connection in Rodney Greenways plan. Needs safety improvements and active mode facilities. 	✓					<ul style="list-style-type: none"> Shared path on eastern side and upgrade to the Nixon/Taupaki Roundabout. Segment between ASH and SH16 to be included in the ASH project. South of ASH no route protection being progressed for this corridor. No further investment sought at this stage. 	<ul style="list-style-type: none"> Alternative active mode connection to facilitate trips between Redhills and Kumeū-Huapai that are not required to traverse the Brigham Creek Interchange. Provision of separated active mode facilities. Upgrade to the intersection at Taupaki Road and Nixon Road to improve safety. Provision of high quality rural active mode facilities will enable mode shift to active modes to support a low carbon transport system in growth areas. 	Yes (Type A)
12	Brigham Creek Road Upgrade	<ul style="list-style-type: none"> Distributes future Whenuapai growth and connects people to rapid transit stations and the SH16 and SH18 motorway interchanges. Will support local bus services and active modes as well as remain a key link in the North West freight network. Provides access to the local Whenuapai centre. 	✓				<ul style="list-style-type: none"> Bespoke corridor widening to avoid key constraints. Different cross section applied in the town centre. 	<ul style="list-style-type: none"> Upgraded access through Whenuapai which focuses on improving local access and connecting key land uses within Whenuapai. Multimodal corridor with separated cycle facilities on both sides as well as enhanced, reliable public transport facilities to support a frequent bus service. Specific town centre cross section in the centre section to support land use. Focuses on contiguous active mode facilities along the length of the corridor. Intersection upgrades to support active mode permeability across the corridor. Supporting transformation to a future low carbon transport system through the increase of people movement capacity by bus, walking and cycling. 	Yes	
13	Māmari Road FTN Upgrade	<ul style="list-style-type: none"> Distributes future Whenuapai growth and connects people to rapid transit stations, regional active modes and the SH16 motorway interchange. Needs to support reliable FTN access to Westgate and provide improved walking and cycling facilities. 	✓		✓	✓	<ul style="list-style-type: none"> Bespoke corridor widening to avoid key constraints on existing section. Southern connection reflects discussions with land owners. Supports connection for buses to Westgate. 	<ul style="list-style-type: none"> Multimodal corridor with dual purpose to provide access from Whenuapai to both a future RTC station and the strategic highway network. Provides alternative link from Whenuapai to both Northside Drive and Trig Road motorway interchanges which is beneficial for freight vehicles to access the industrial zoned land. Critical FTN bus link with improved reliability of public transport with dedicated bus lanes and bus priority. Provision of separated cycle facilities and improved intersection controls to support safety of turning traffic. Supporting transformation to a low carbon transport system through the increase of people movement capacity by bus, walking and cycling. FTN connection to Westgate maximises RTC catchment and mode shift. 	Yes	
14	Trig Road Upgrade	<ul style="list-style-type: none"> Key freight connection between Whenuapai employment area and SH16 and SH18. 	✓				<ul style="list-style-type: none"> Equitable widening on both sides. Provision of new cycling facilities. 	<ul style="list-style-type: none"> Connects Whenuapai employment area directly to the SH18 interchange which improves freight accessibility. 	Yes	

Project	Purpose	Assessment type			Low carbon transport network Facilities			Preferred option	Objective alignment	Included in Recommended network
		Corridor Assessment	Route Refinement	No options developed	Bus Lanes	Bus Priority	Active modes (upgrade or new)			
	<ul style="list-style-type: none"> Needs to support active modes and freight. 								<ul style="list-style-type: none"> Multimodal corridor with separated cycle facilities on both sides. Connects to active mode facilities proposed on Trig Road south of SH18 interchange and proposed facilities on SH18. Cross section provides future opportunity for mid-block crossings to improve corridor permeability and safety. Provision of high quality active mode facilities will enable mode shift to active modes to support a low carbon transport system in growth areas. 	
15	New Spedding Road West	<ul style="list-style-type: none"> New east-west connection that will support active mode and public transport connectivity between Whenuapai and Redhills and connect to the new RTC station at Brigham Creek. Increased resilience and reduction of severance for Whenuapai by providing a non-interchange SH16 crossing to support local movements for all modes. 	✓					<ul style="list-style-type: none"> Western connection at Hailes Road. Bridge at optimised location for ecological sensitivity and potential access to future RTC station. Equitable widening for existing section. 	<ul style="list-style-type: none"> New link for local trips between Whenuapai and Redhills and link RTC and future Whenuapai employment zones. Removes local trips from adjacent interchanges. Provision of separated cycle facilities and improved intersection controls to support safety of turning traffic. Cross section provides future opportunity for mid-block crossings to improve active mode permeability. Improved reliability for local bus services to access the Brigham Creek RTC station. Supports climate change through transformation to a low carbon transport system through the increase of people movement capacity by bus, walking and cycling. Spedding Road West provides new east west connectivity between Whenuapai and the Brigham Creek RTC station. A good quality bus service on this link will maximise the wider catchment for the RTC station which would have otherwise been severed by SH16 and further improve mode shift for Whenuapai. 	Yes
16	New Spedding Road East	<ul style="list-style-type: none"> New east-west connection that will support active mode and public transport connectivity between Whenuapai and Hobsonville and connect to proposed SH18 RTC. Increased resilience and reduction of severance for Whenuapai by providing a non-interchange SH18 crossing to support local movements for all modes. 	✓					<ul style="list-style-type: none"> Eastern connection ties into consented development plans. Bridge location optimised to minimise impacts on ecology. Western connection provides for future collectors and bus access to SH18. 	<ul style="list-style-type: none"> Improve access for all modes between Hobsonville and Whenuapai employment destinations. Removes local trips from adjacent interchanges. Improved reliability of public transport allowing access to the SH18 RTC station without needs to traverse an interchange. Additional link into Whenuapai improving resilience to access growth area. Multimodal corridor with separated cycle facilities on both sides. Supports access to a future SH18 RTC Station. Supporting transformation to a low carbon transport system through the increase of people movement capacity by bus, walking and cycling. Spedding Road East provides new east west connectivity between Whenuapai and the future SH18 RTC station. A good quality bus service on this link will maximise the wider catchment for the RTC station which would have otherwise been severed by SH18 and ultimately increase mode shift for Whenuapai. 	Yes

Project	Purpose	Assessment type			Low carbon transport network Facilities			Preferred option	Objective alignment	Included in Recommended network
		Corridor Assessment	Route Refinement	No options developed	Bus Lanes	Bus Priority	Active modes (upgrade or new)			
17 Hobsonville Road FTN Upgrade	<ul style="list-style-type: none"> Connects Hobsonville to Westgate. Upgrade supports active modes and bus priority measures. 		✓		✓	✓	✓	<ul style="list-style-type: none"> Extents reduced to between SH16 and Hobsonville Point Road as other parts considered fit for purpose. Three sections with bespoke widening arrangements and cross sections to minimise impacts on property. 	<ul style="list-style-type: none"> Corridor supports access to employment zoning as part of Whenuapai Plan Change 5 adjacent Hobsonville Road as well as to employment nodes in Whenuapai and Westgate. Corridor provides local access to both the proposed SH18 RTC as well as SH16 RTC at Westgate. Bus lanes and priority measures for public transport at key intersections and at congested sections of corridor will improve people movement reliability. Provision of separated, high quality cycle facilities, along both sides of Hobsonville Road. Supporting transformation to a low carbon transport system through mode shift and the increase of people movement capacity by bus, walking and cycling. Supports local bus network that will serve SH18 RTC bus stations and ferry terminal. 	Yes (reduced extents)
18 Coatesville-Riverhead Highway Upgrade	<ul style="list-style-type: none"> Connects Riverhead to strategic road network and rapid transit at Brigham Creek or Westgate. Will support active modes and reduce safety risk on the corridor. 		✓				✓	<ul style="list-style-type: none"> Shared path on the west and safety improvements. Bespoke widening on both sides. Provision for green stormwater infrastructure. 	<ul style="list-style-type: none"> Key corridor with dual purpose to provide access from Riverhead to both a future RTC and the strategic highway network. Multimodal corridor with separated cycle facilities on both sides in the urban area and a shared path in the rural corridor. Provision for bus priority measures to support a frequent bus service. Geometric deficiencies addressed to improve safety. Supporting climate change through transformation to a low carbon transport system by mode shift from the increase of people movement capacity by bus, walking and cycling. Provision of green infrastructure to manage stormwater future proofs for climate change adaptation. 	Yes
19 Riverhead Road Upgrade	<ul style="list-style-type: none"> Connects Riverhead to social and employment infrastructure in Kumeū-Huapai. Key cycle connection in the Rodney Greenways plan. 		✓				✓	<ul style="list-style-type: none"> Shared path to the north. Widening predominantly to the north side but some land required on the south for green infrastructure provision. 	<ul style="list-style-type: none"> Key corridor better connects active mode users between Riverhead and Kumeū-Huapai town centre. Route integrates with new FUZ and connects with existing recreational pathways adjacent Kumeū River. New active mode facilities to support increase in active mode share. Intersection improvements for all modes to address existing safety issues. New facilities decrease exposure risk for active mode users. Western connection utilises low volume roads and green space rather than a busy vehicular road. Supporting climate change through transformational mode shift to a low carbon transport system by the increase of people movement by provision of well-connected active mode facilities. Provision of green infrastructure to manage stormwater future proofs for climate change adaptation. 	Yes
20 Access Road/Tawa Road Upgrade	<ul style="list-style-type: none"> Provide key strategic link to the new ASH. Support freight by providing direct connection between SH16 and planned industrial land use. 		✓				✓	<ul style="list-style-type: none"> Widening to the south in the urban area and to the north in the rural area. Provision for green infrastructure for stormwater. 	<ul style="list-style-type: none"> Key link from southern growth area to the future RTC station in Kumeū and town centre. Direct access for heavy vehicles from the ASH to the future light industrial zoned land removing need to enter Kumeū and town centre improving amenity. Improved reliability for freight vehicles by direct access to ASH. 	Yes

Project	Purpose	Assessment type			Low carbon transport network Facilities			Preferred option	Objective alignment	Included in Recommended network
		Corridor Assessment	Route Refinement	No options developed	Bus Lanes	Bus Priority	Active modes (upgrade or new)			
	<ul style="list-style-type: none"> Supports local bus service and provides active mode link to future primary active mode facilities on the ASH. 								<ul style="list-style-type: none"> Multimodal corridor with active mode corridor on the future urban side only (to reinforce rural edge). Cross section provides space for bus lanes north of Station Road should they be required to support RTC access. Additional capacity south of Station Road predominately to support ASH and trips accessing the southern part of the growth area. Supporting climate change through transformational mode shift to a low carbon transport system through the increase of people movement capacity by bus, walking and cycling. Provision of green infrastructure to manage stormwater future proofs for climate change adaptation. 	
21	Station Road Upgrade	<ul style="list-style-type: none"> Connect SH6 Main Road to Access Road providing key north south link in the FUZ. Important link for active modes and future local bus services to connect to future rapid transit facilities in Kumeū-Huapai. 	✓				<ul style="list-style-type: none"> Bespoke widening to address constraints and existing consented developments. 	<ul style="list-style-type: none"> Central north south corridor that connects residential and educational land uses on Station Road to SH16 Main Road and it associated land uses of future RTC stations, town/local centres and open space. Provision of separated active mode facilities on both sides of Station Road to connect and complete part of network with future facilities on Access Road and SH16 Main Road. Provision of safe active mode provision supports mode shift for Huapai School pick up and drop off. Provision of high quality active mode facilities will enable mode shift to active modes to support a low carbon transport system in growth areas. 	Yes	

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9.4 Description of option development and assessment structure

The North West DBC is large and complex with 22 individual elements across 21 project corridors in the study area. This has presented challenges in creating accessible documentation. In order to streamline reporting, the option development and assessment section has been summarised for each corridor and presented as slides in the following sections.

Each individual summary follows the option development methodology process described as in Section 9.1 and provides an overview of the option development process, option assessment and resulting preferred option. Each of these steps are supported by comprehensive detail which is included in the appendices to this report. Note that all appendices are split by projects so the reader can access particular corridor information if desired.

A guide is shown in Table 9-4 for the readers that wish to access the next level of detail behind decisions and option development.

The projects are presented in numerical order and start with the strategic projects, followed by Redhills, Whenuapai, Riverhead and Kumeū-Huapai local projects. Geographical dividers have been inserted to further aid navigation.

Table 9-4 Guide to additional option assessment information

Step	Option Process	Associated appendices
1. Preliminary analysis	Gap Analysis Land Use Assessment Constraint Mapping/ AUPOIP Planning Maps Review	Appendix B: Options Assessment Report
	Form and Function Assessment	Appendix C: Transport Outcomes Report
2. Option refinement and assessment	Option development Option Assessment	Appendix B: Options Assessment Report
3. Emerging preferred option development	Design Refinement	Appendix F: Design Report
	Intersection Form Assessment	Appendix C: Transport Outcomes Report
4. Recommended Option	Outcome of option assessment	Appendix B: Options Assessment Report

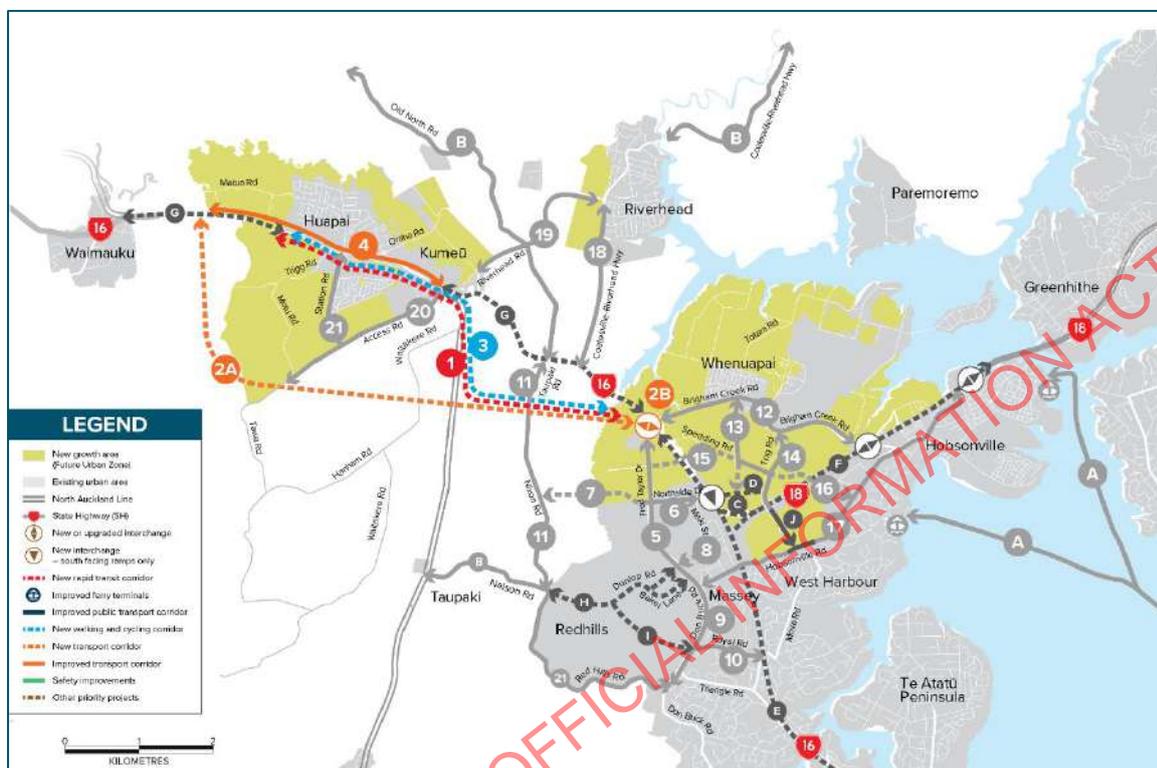
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Strategic Network Option Development

9.5 Strategic network options development and assessment

The strategic projects are shown in Figure 9-3 below. Note this is the starting point from the IBC network.

Figure 9-3 Strategic North West Projects



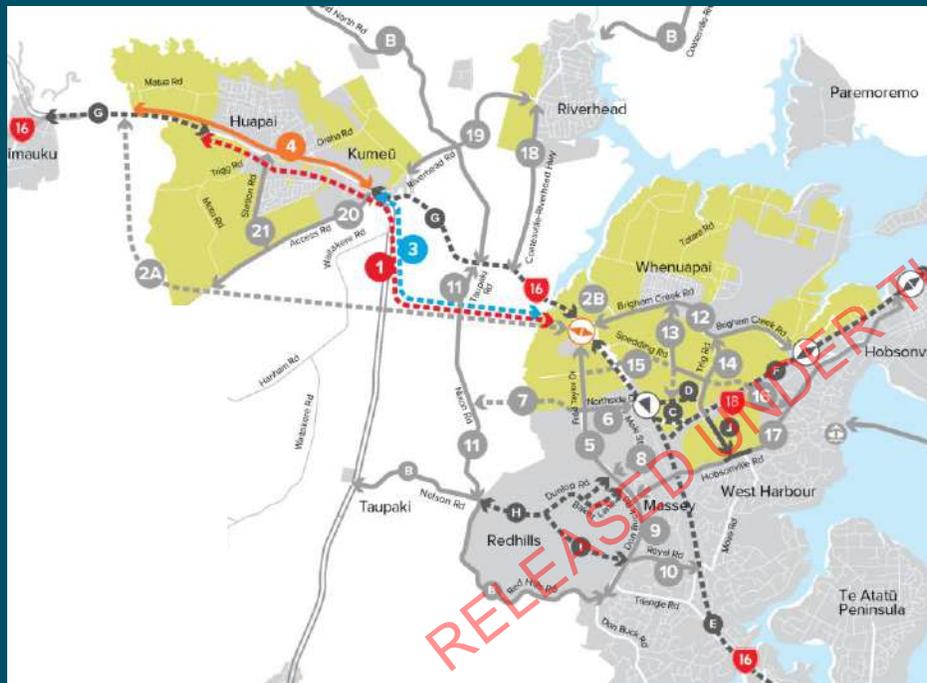
The strategic projects have been assessed for option development as described in Table 9-5.

Table 9-5 Option development for strategic projects

Project	Commentary
1,3 and 4	Rapid Transit Corridor and SH16 Main Road Upgrade. Regional Active Mode Corridor for option development.
2A	Assessed initially without Brigham Creek Interchange. Design to consider interface.
2B	Assessed separately due to complexity. To interface with both RTC (1) and Alternative State Highway (2A) projects.
3	Initial corridor assessment done independently to confirm need and route for this facility. Following recommendation to follow the RTC route subsequent option development has been incorporated into the RTC project.

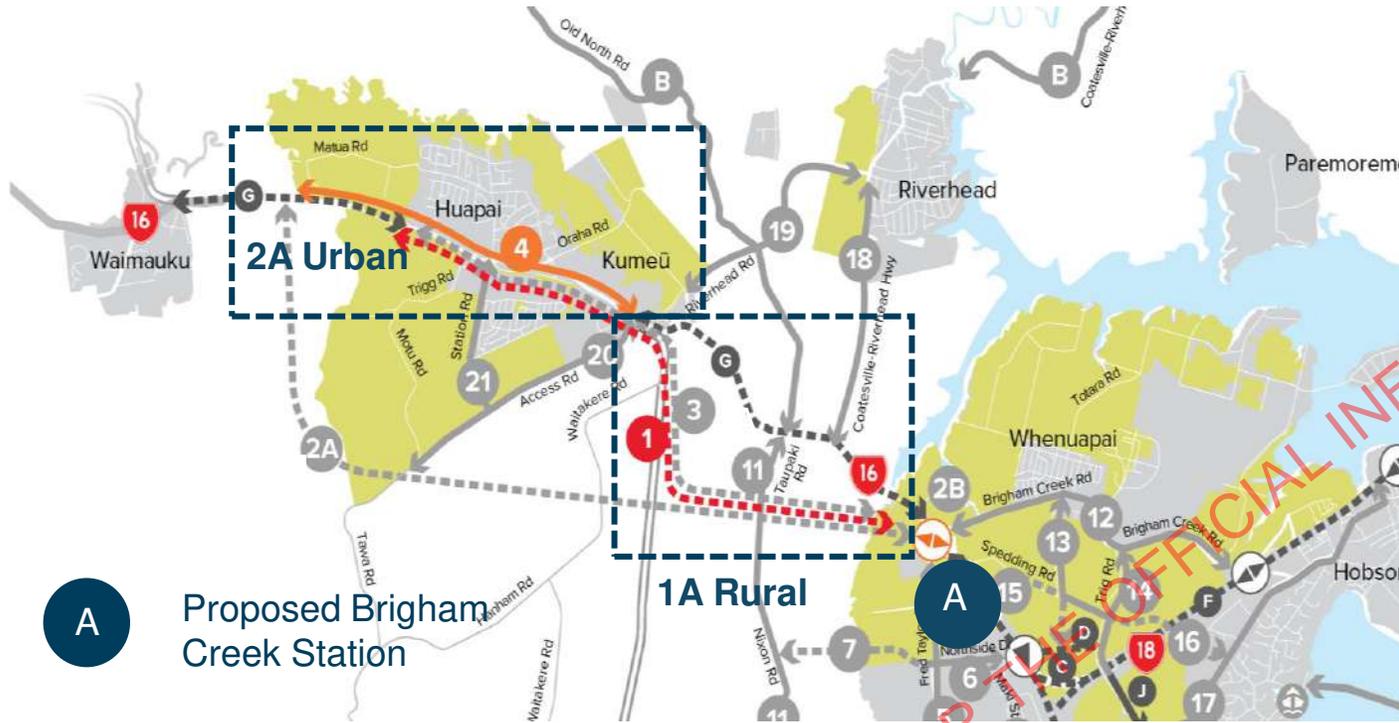
Rapid Transit Corridor (RTC) SH16 Main Road Upgrade Regional Active Mode Corridor (RAMC)

Projects 1,3 and 4



RTC / SH16 MAIN ROAD UPGRADE / RAMC – PRELIMINARY ASSESSMENT

PROJECTS #1, #3 and #4



EXTENTS

- RTC (Project #1) will be an extension to the City Centre to Westgate (CC2W) project (which is part of the overall NWRN project). RTC extent is from proposed Brigham Creek RTC Station (excluding the station which is part of CC2W) to the western edge of Kumeū-Huapai growth area.
- SH16 Main Road Upgrade (Project #4) extent is from Old North Road to Foster Road. It is fully interdependent with the Rapid Transit Corridor (RTC)
- Regional Active Mode Corridor (RAMC) (Project #3) is to be delivered adjacent the rural section of the RTC and has been included in the RTC Rural design.
- All projects would be delivered together so option assessment has been combined to consider corridor holistically.

PURPOSE

- Support transformational mode shift and drive a shift to low carbon alternatives through provision of safe, high quality, frequent and reliable rapid transit system.
- Provision of a high quality segregated cycling facility that connects Westgate to Kumeū-Huapai.
- Revocation of SH16 to an arterial (once ASH is in place) to remove strategic trips from Kumeū-Huapai, support walk up access to the RTC stations and better serve the surrounding urban land use including activation of the town centre.

POSSIBLE MODES

- Mode dependent on City Centre to Westgate Rapid Transit Corridor decision.
- North West DBC to be mode agnostic and consider a footprint to accommodate all three modes.

BUS



LIGHT RAIL



LIGHT METRO



RTC / SH16 MAIN ROAD UPGRADE / RAMC – FORM

ASSUMPTIONS

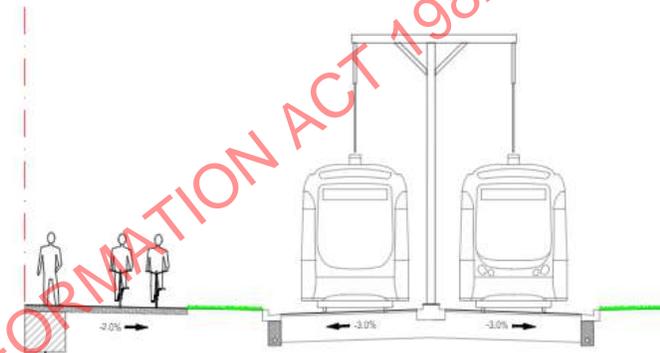
- RTC to be route protected for flexibility of mode including bus, light rail and light metro.
- RTC to be a bi-directional rapid transit facility with segregated facilities and grade separated at intersections.
- Note a central running RTC (suitable for bus and light rail) was initially investigated but was discounted due to being unsuitable for light metro and not being mode agnostic.
- RTC does not include the Brigham Creek Station which remains in the CC2W business case for a logical CC2W termination point and to provide operational aspects such as layover facilities and turnarounds. CC2W has provided this DBC with an indicative location for the Brigham Creek Station
- RTC (Rural) co-locates with the ASH between Brigham Creek Interchange and the North Auckland Line.
- RTC (Urban) has the opportunity to co-locate with the SH16 Main Road Upgrade.
- Station type and general station location and sizing to be investigated as part of this DBC. Exact station location to be finalised during the Notice of Requirement process or once rapid transit mode confirmed.
- SH16 Main Road Upgrade includes consideration of walking and cycling facilities and improved amenity for the town centre.
- RAMC form is a segregated, high speed cycle way with limited access.

DEFINITIONS

- A de-coupled cross section is where the RTC is in its own corridor adjacent the SH16 Main Road corridor.
- A “**fully decoupled**” cross section is if there is additional land or buildings between the RTC and SH16 Main Road.
- A “**combined decoupled**” cross section is if the RTC abuts the SH16 Main Road corridor. There are opportunities with this cross section to combine some facilities in constrained sections.

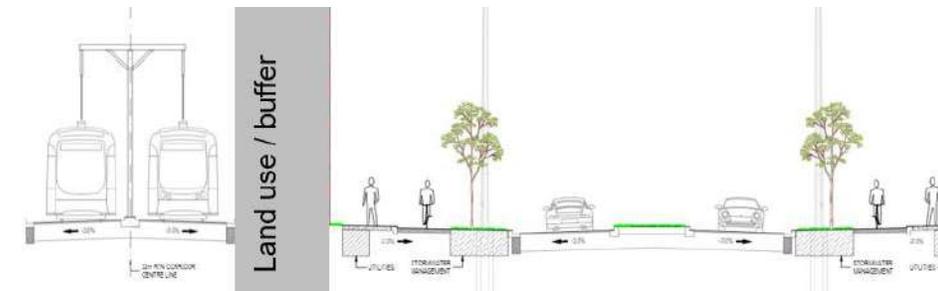
INDICATIVE CROSS SECTIONS CONSIDERED (MODE AGNOSTIC)

RURAL

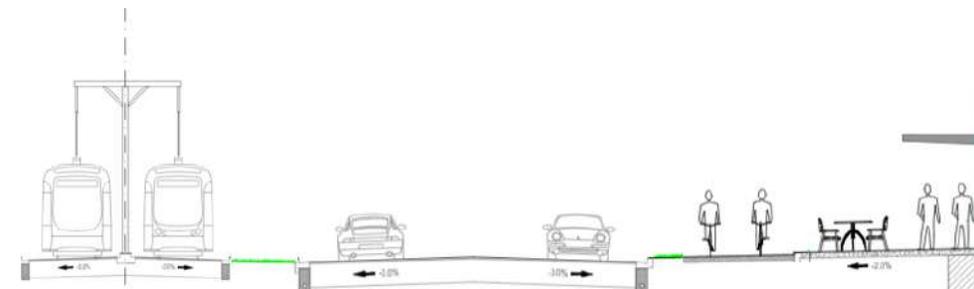


URBAN OPTIONS

Fully Decoupled

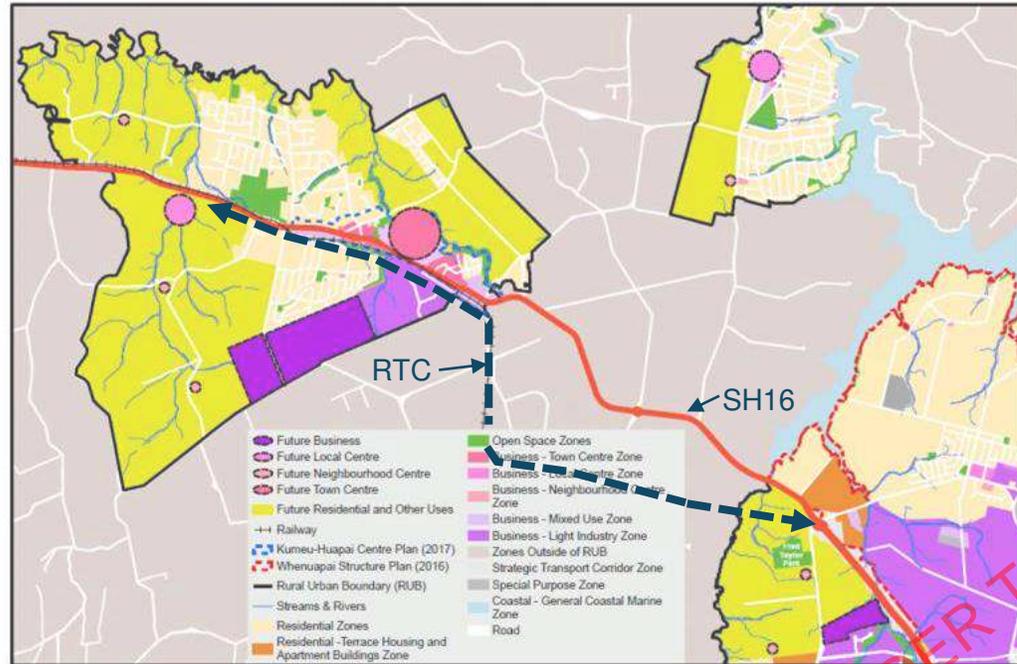


Combined Decoupled



PROPOSED FUTURE LAND USE AND TRANSPORT INTEGRATION

Auckland Council North West Spatial Land Use Strategy (May 2021)



LAND USE ASSESSMENT OF IBC ALIGNMENT

- IBC alignment crosses Rural-Countryside Living Zone between Brigham Creek and Kumeū. With limited catchment in this rural area this is an opportunity to improve travel times and support more stations within the FUZ catchment zones. Provision of a station at this location (near Taupaki Road) would potentially increase urbanisation pressures and not support the current outcomes of the Unitary Plan. Therefore a station at Taupaki has not been provided for in this DBC but note the design will not preclude a station should the area in fact urbanise in the future.
- IBC urban alignment along SH16 bisects the FUZ to maximise urban catchment from north and south of the North Auckland Line.

PROPOSED FUTURE LAND USE

- Auckland Council prepared a draft Spatial Land Use Strategy prior to formal structure planning to inform option development.
- Recommends a single expanded town centre retained in Kumeū-Huapai. This land use supports a key station at this location and is consistent with Te Tupu Ngātahi Design Framework.
- Plans for a local centre in Huapai and a number of neighbourhood centres in the FUZ area. Rapid transit would not be expected to directly serve a local centre, however proximity to rapid transit would be beneficial. The future land use and catchments support a proposed rapid transit central alignment along SH16.
- **It is expected that future structure planning will follow the intensification principles for rapid transit stations as outlined in the recent National Policy Statement for Urban Development, e.g. denser development closest to stations.**
- New north-south road connections will be critical to maximise station accessibility and access over the RTC and the North Auckland Line.
- Park and ride facilities at the western extent would further support access for Waimauku and the surrounding rural catchment to the RTC.

RTC / SH16 MAIN ROAD UPGRADE / RAMC – GAP ANALYSIS FOR RAPID TRANSIT SYSTEM

North West DBC reconfirms IBC recommendation of a new rapid transit system to connect the Kumeū-Huapai growth area instead of using existing North Auckland Line.

Consideration	Reason for review	Outcome /Action
Heavy rail as the rapid transit system	<ul style="list-style-type: none"> IBC decision reviewed due to infrastructure upgrades (particularly track and tunnel upgrades) and wider rail policy changes. 	<p>Rail confirmed to remain discounted in the long term because:</p> <ul style="list-style-type: none"> Does not service the wider growth area including Whenuapai and the metropolitan centre at Westgate. Lower predicted patronage than proposed rapid transit (indicated in the IBC), due to longer travel times and origin and destination demand patterns. IBC showed heavy rail is around 35% slower than the proposed rapid transit to a key destination of the City Centre (just over one hour compared with 45 minutes). The destinations of Henderson and New Lynn can be accessed from the proposed rapid transit via the FTN at Westgate and Lincoln Road stations.
Dual RTN system (Heavy Rail and proposed Rapid Transit Corridor alignments)	<ul style="list-style-type: none"> Revised land use models. 	<ul style="list-style-type: none"> The revised land use models used in the DBC have negligible difference to the IBC in the overall long term household and employment projections for Kumeū / Huapai. The IBC discounted dual rapid transit modes as in the long term projected public transport ridership associated with planned future growth does not support investment in both heavy rail and the proposed RTC. The IBC AM peak modelling showed approximately 2,000 passengers on passenger rail only compared with 3,300 passengers on the proposed rapid transit only for Kumeū / Huapai. Dual modes resulted in approximately 3,600 passengers, only slightly more than rapid transit alone with significant additional investment. Therefore, the combination of rapid transit modes splits demands, rather than significantly increasing mode share. Opportunity remains to use passenger rail in the interim.
Rapid transit sharing the NAL line	<ul style="list-style-type: none"> Rolling stock sharing NAL infrastructure. 	<ul style="list-style-type: none"> Discounted at this stage as the rapid transit mode has not been confirmed. This option would not be feasible for a bus based solution and is therefore not mode agnostic. To be retained as an opportunity for consideration once modes are confirmed. It is noted that the existing single track would not be suitable to meet the needs of a fast, frequent and reliable RTN service. Could be issues with freight and passenger rail sharing the same system with differing speeds etc, requiring additional lines.

RTC / SH16 MAIN ROAD UPGRADE / RAMC – GAP ANALYSIS FOR HEAVY RAIL

North West DBC reconfirmed relocation of the NAL is not a practicable option for the RTC in this North West DBC. DBC to retain working assumption to not preclude co-location of the rail with the ASH and consider impacts on rapid transit alignment should the relocation of rail be identified as feasible in the future.

Consideration	Reason for review	Outcome /Action
<ul style="list-style-type: none"> The relocation of the NAL was identified as an opportunity within the North West IBC. 	<ul style="list-style-type: none"> This opportunity would create the potential to use the existing NAL corridor for the rapid transit project. Assessment to consider if this relocation is a feasible option for consideration in this DBC. 	<ul style="list-style-type: none"> This opportunity has been discussed in detail with AT, Waka Kotahi and KiwiRail throughout the development of the DBC. It is collectively acknowledged that at a transport planning principle level it is not an optimal transport outcome to have rail in its current location due to factors such as severance and safety in Kumeū-Huapai. Putting rapid transit next to the heavy rail will exacerbate the severance. It is noted that mitigation to reduce severance effects can be investigated through better north south connections and crossing points to improve permeability across the corridor and removal of level crossings. The NAL currently operates at 2 trains a day, has no future passenger rail services planned and the asset is already located in an optimised rail corridor. Therefore, from a KiwiRail perspective there is limited justification to relocate the rail line under current conditions. KiwiRail have significant uncertainty about their future needs within their designation e.g. requirements for single, double or triple tracking. Future freight demands will be contingent on big strategic moves such as the relocation of Auckland Port to North Port or the establishment of a North West inland freight hub. Timeframes are unknown for understanding future freight demands and if there are any strategic drivers to support possible future relocation rail. Future relocation would require a business case by KiwiRail who would need to consider alternatives to meet their specific future rail objectives. One option may be to co-locate with the new ASH. A feasible outcome of a KiwiRail business case process could also be that the existing NAL designation is wide enough and suitable for future rail growth and no relocation is justified. This results in three strategic options to consider in this DBC: <ol style="list-style-type: none"> Relocating the NAL and using the NAL alignment for the RTC. Upgrading the current rail alignment for rapid transit and sharing with freight trains – note this would require confirmation of the RTC mode for further consideration. Building a new RTC next to the current rail alignment. Each option has advantages and disadvantages. Therefore, given the uncertainty about the future role of rail it is prudent to assume Option 3 as this does not preclude any of the options in the future and is the only option that is truly mode agnostic. It also allows for implementation of the RTC in a timely manner to support growth without the dependency on the relocation of another major piece of infrastructure. There should continue to be ongoing investigation for these strategic opportunities. This DBC recognises that whilst the NAL relocation opportunity cannot currently be confirmed as an option, in the future other strategic moves could be made that change operational decisions and allow the opportunity to be reconsidered. This scenario was considered during the development of an RTC alignment and consideration given to how the RTC alignment could be laterally moved should the opportunity be presented. This resulted in a principle being adopted for the RTC to abut the existing NAL designation where possible to retain flexibility for this future uncertainty. The principle has been adopted for the design of the ASH to not preclude NAL co-locating with the ASH.

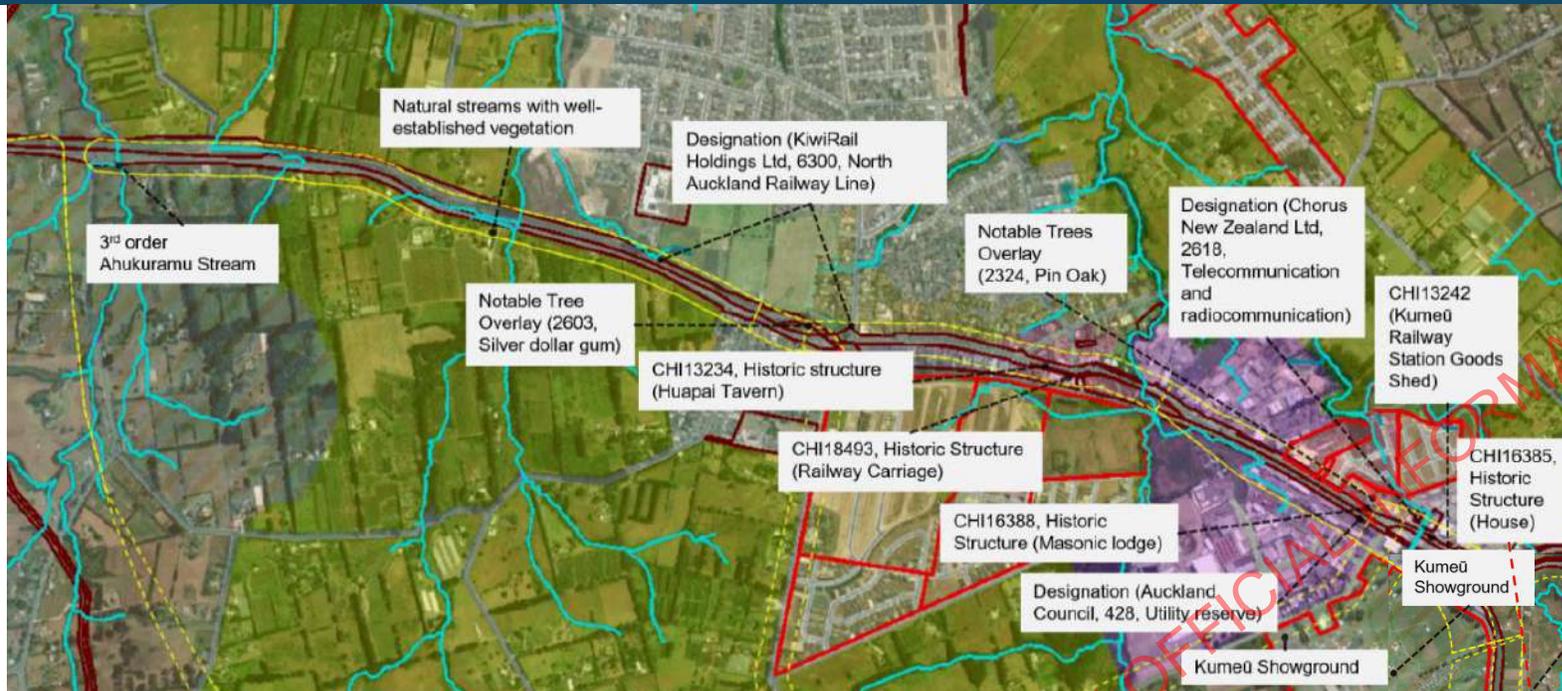
RTC / SH16 MAIN ROAD UPGRADE / RAMC – GAP ANALYSIS FOR RAPID TRANSIT ALIGNMENT

North West DBC reconfirmed the IBC rapid transit alignment where:

- Offline rural section co-located with the proposed ASH and adjacent to North Auckland Line (NAL) to minimise additional severance.
- Urban/future urban section located adjacent the North Auckland Line and central to the growth area to maximise catchment potential

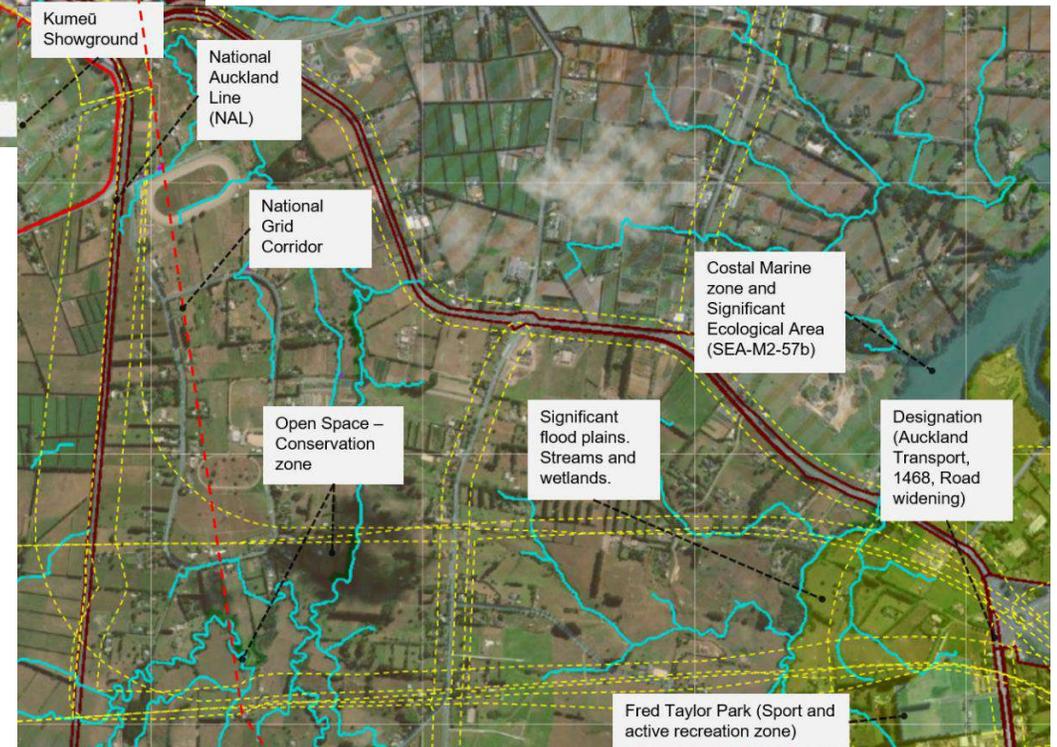
Assumption	Reason for review	Outcome /Action
Rapid transit alignment along existing SH16 rather than proposed offline route.	IBC decision reviewed considering investment being made by Waka Kotahi to widen to four lanes between Brigham Creek and Taupaki.	<p>Reconfirmed IBC preference for a rural offline alignment rather than using the existing SH16 because:</p> <ul style="list-style-type: none"> • Land use adjacent both sides of SH16 requires access which is challenging for a segregated rapid transit facility. If central running facilities are provided, then most likely outcome is banned right turns for all properties and reduced access. If side running facilities are provided, then property access is terminated to SH16 and alternative access is required, likely via service lanes. • Rapid Transit vehicles typically travel at the speed of the adjacent road corridor therefore the offline alignment provides the opportunity for the rapid transit service to achieve faster speeds (adjacent a motorway and rail line) and improve the overall efficiency of the system. • Aligning with the ASH and existing heavy rail through the rural alignment means the RT corridor is adjacent to other corridors without adjacent property access. • Forecasts show that four traffic lanes will be required between Taupaki Road and Brigham Creek to support both bus priority and private vehicle trips to and from Riverhead.
Moving urban alignment north or south of SH16	IBC recommendation for the rapid transit to be located adjacent SH16 was reviewed following new information regarding the location of the expanded town centre.	<p>Reconfirmed IBC preference for SH16 urban alignment because:</p> <ul style="list-style-type: none"> • Primary objectives for this RTC is to maximise patronage through the widest available catchment and provide direct connection to the expanded town centre. • Moving the rapid transit alignment north e.g through the expanded town centre of north of SH16 could potentially increase accessibility for the station to the town centre but it would also significantly decrease the catchment potential for the southern part of the growth area, particularly given the restricted opportunities to cross the North Auckland Line. FUZ land to the north of the town centre is also severed by the Kumeū River which could further impact catchment realisation for the town centre station. • Moving the rapid transit alignment south of SH16 to potentially service a central southern local centre would better maximise the southern catchment, but significantly reduce station access to the town centre and northern growth areas. Direct rapid transit connections to a local centre is not a key design principle. This connection can be achieved through local active modes and public transport access. • The alignment on SH16 remains the best potential alignment for future expansion to Waimauku should it be required.
Extension of RTC to Waimauku	Additional review to confirm western extents of RTC.	<p>Reconfirmed IBC preference to terminate rapid transit at Huapai because:</p> <ul style="list-style-type: none"> • Waimauku is currently not a growth area and demand is currently insufficient to support an RTC extension.

RTC / SH16 MAIN ROAD UPGRADE / RAMC – CONSTRAINT MAPPING



SUMMARY OF KEY CONSTRAINTS

- Corridor crosses a range of topography.
- There are significant streams, natural wetlands and flooding present along the route.
- The North Auckland Line designation forms a hard constraint.
- Key utilities that need to be avoided are the National Grid transmission lines.
- Property consideration to be given to existing town centre, existing businesses and heritage buildings in urban section.



RAPID TRANSIT STATION PRINCIPLES

The RTC is an integral part of the future low carbon transport network and will transform travel behaviour for trips from Kumeū-Huapai to Westgate, City Centre, North Shore and beyond.

Stations are the cornerstones of the RTC and no matter what mode or how the RTC develops over time, the location of the stations will ultimately determine the success of the RTC.

As such stations need to be optimally located to maximise:

- **Land use integration opportunities** to unlock land use outcomes such as Transit Oriented Developments, intensified land use to support NPS-UD outcomes and access to social and economic infrastructure.
- **Ridership catchment.** The stations need to have strong walking, cycling and public transport connections and connect to suitable land uses e.g high density housing, town centre or employment areas.
- **RTC operational efficiency.** The number of stations needs to be balanced against the additional delays to the RTC service with stopping at stations.

Station locations for the North West DBC have been decided in parallel with the development of the Auckland Council's Spatial Land Use Strategy. An iterative process has been undertaken by Auckland Council and Te Tupu Ngātahi to understand how land use and the RTC can best deliver shared outcomes to support the growth. A summary of station principles include:

- The eastern station location will directly connect the RTC to the expanded town centre and employment areas.
- Western-most station(s) will need to include Park and Ride to capture the broader rural catchment of Waimauku, Helensville etc. Connection to the future local centre in Huapai is desirable.
- Stations will need to include north-south connections for as many modes as possible to reduce the severance effects of the NAL.

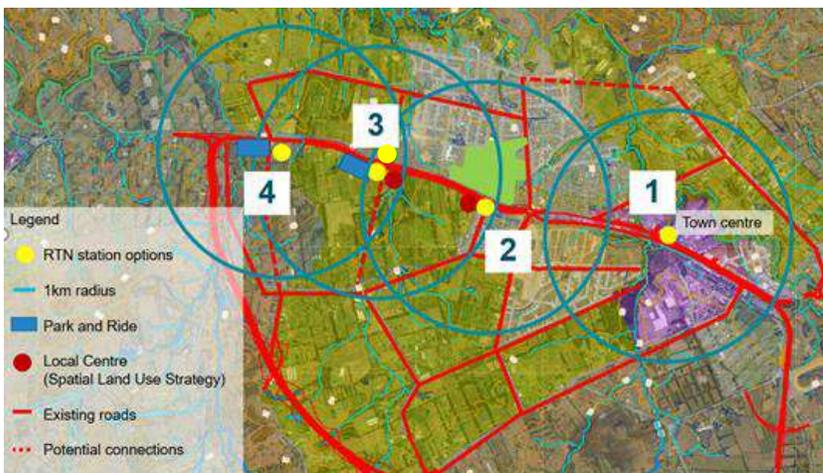
The station assessment approach has included the use of:

- Te Tupu Ngātahi Design Framework.
- Specific station design principles, subset of Design Framework.
- North West DBC Investment Objectives for RTC.

RAPID TRANSIT CORRIDOR – STATION STRATEGY ASSESSMENT

Options assessed

- Four options of station combinations were tested (A-D) to understand the station catchments, land use integration opportunities and optimal station locations.
- Town centre station (Station 1) is assumed to be provided in all station configurations.
- Assumed no stabling/depot facilities required at the Kumeū-Huapai stations.



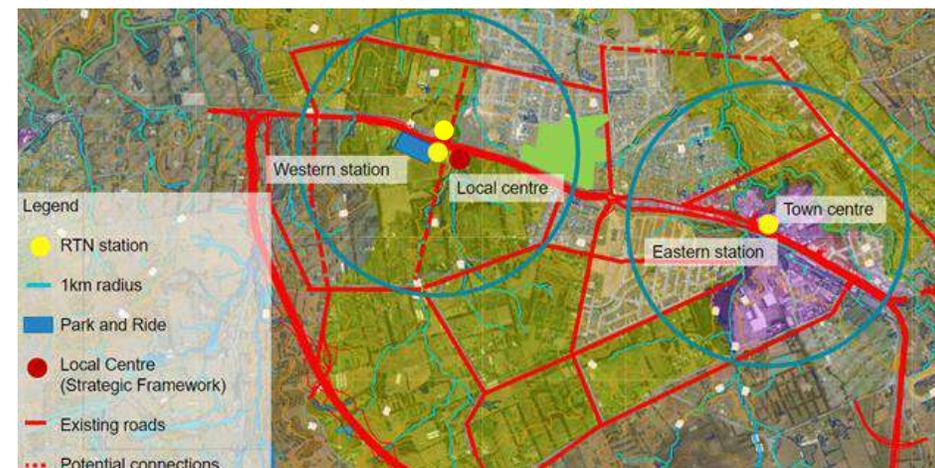
Station option	Stations			
	1	2	3	4
A	✓	✓	✓	
B	✓		✓	
C	✓	✓		✓
D	✓			✓

Key Differentiators:

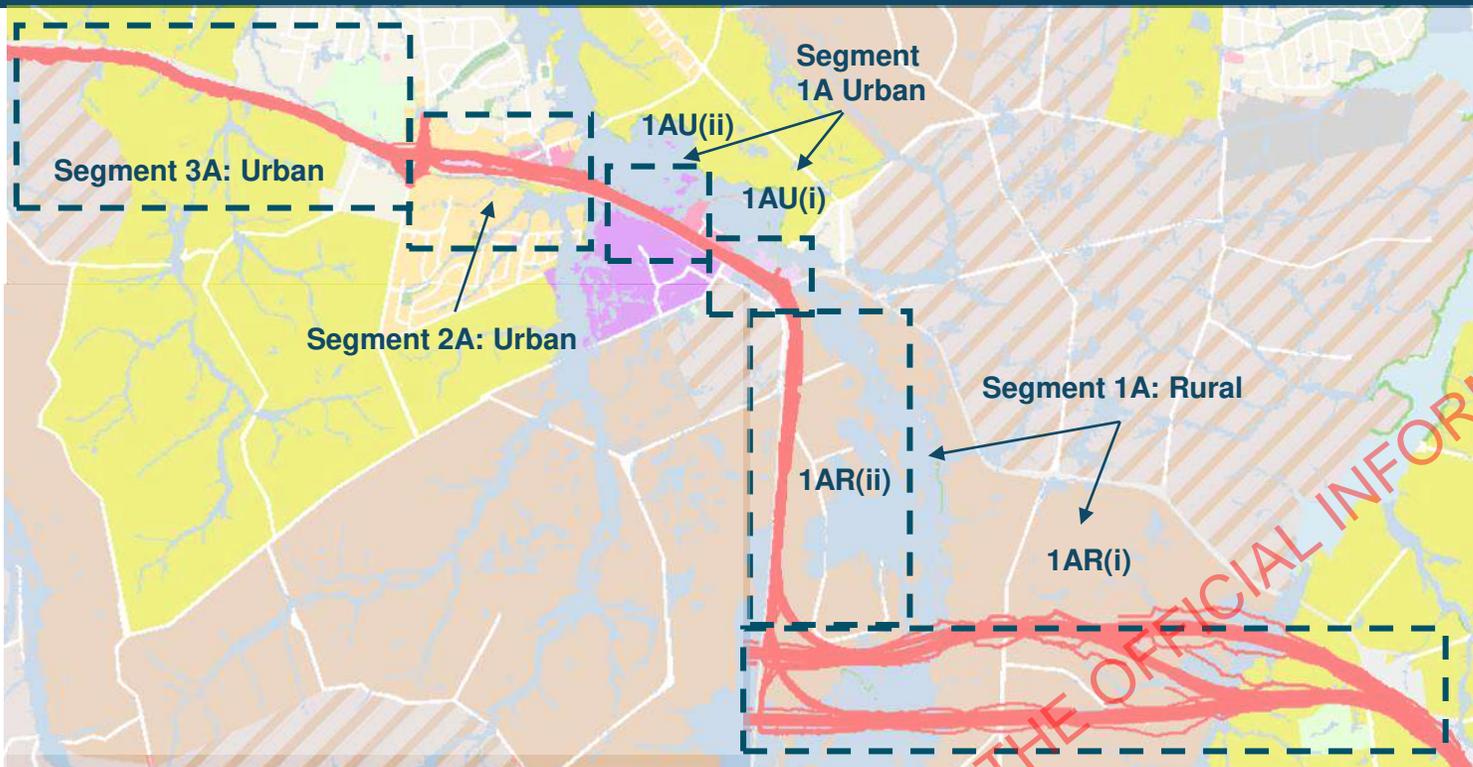
- Two stations predicted to achieve similar patronage to three stations but reduces journey time (one less stop).
- The three station strategy (Option C) has significant catchment overlap. Station 2 has limited additional catchment (mainly south of NAL), restricted by existing recreational reserve, school and residential areas, plus low opportunity for multi-modal connection north of NAL.
- Station 3 supports stronger 360-degree urban catchment than compared with Station 4 and reduces risk of urban edge extension. Could be on north or south of SH16 Main Road.
- Station 2 and 3 have opportunity to co-locate with future local centre and create stronger station identity.
- Park and Ride within urban area has impact on surrounding FUZ, potentially inconsistent with NPS:UD requiring careful management.

RECOMMENDED STATION CONFIGURATION

- Option B is the optimal station configuration for maximising both catchment and operational efficiency of the RTC.
- A north-south road connection will be required across SH16 Main Road / NAL at western station.
- RTC station can be on north or south side (but adjacent) to SH16 Main Road – will depend on RTC alignment outcomes.
- Manage the interface between the RTC station and the Local Centre including access considerations for all modes.
- Retain some flexibility for indicative RTC station and Park and Ride locations, as part of the DBC, whilst maintaining optimal station catchment. Specific site selection during NoR stage.
- Park and Ride final site selection to assess trade offs:
 - Co-located with the station which results in a consolidated and more flexible footprint to be route protected.
 - Separate site to allow land adjacent the station to be maximised for intensified development.



RTC / SH16 MAIN ROAD UPGRADE / RAMC – ALIGNMENT OPTION DEVELOPMENT



OPTION DEVELOPMENT

- Alignment split into segments to allow localised assessment and respond to considerations and constraints in each segment.
- Initially central running rapid transit cross sections were tested as per generic Te Tupu Ngātahi cross sections. The decision to adopt a mode agnostic approach resulted in a decoupled cross section being developed.
- The access trade offs, land use integration issues, complications for construction and ability to deliver the RTC without reliance on implementing the ASH first were considered during option development.

URBAN SEGMENTS

Segment 1AU(i) and Segment 2A

Total of 4 options each considering permutations of:

- Centrally running rapid transit at centreline, north and south widening (3 options).
- Decoupled rapid transit running adjacent to the North Auckland Line (1 option).

Segment 1AU(ii)

- No alignment options tested as NAL is a hard constraint and no feasible alternative alignment options available. Two cross section widths tested.

Segment 3A

- 4 options tested to accommodate grade separation at Station Road.

RURAL SEGMENTS

Segment 1AR (i)

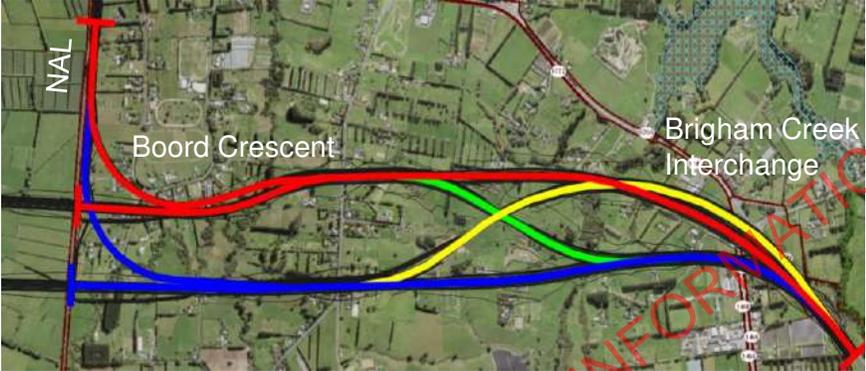
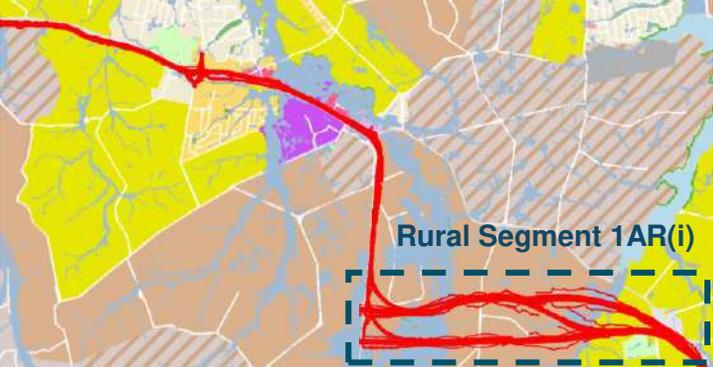
Total of 4 options considering permutations of:

- North and south connections at Brigham Creek testing resultant proximity to Ngongotepara Stream, Coastal Protection Area and residual FUZ land.
- North and south alignments adjacent Kumeū River testing impact on flood plains.

Segment 1AR (ii)

- Western side of NAL discounted due to requirement for rapid transit to cross the NAL twice and impacts on the Kumeū showgrounds. Therefore, only option considered for RTC is east of North Auckland Line.

MCA OPTION ASSESSMENT



Note this alignment is the same as the ASH alignment for this section

Option Description			Preferred
No.	Alignment	Brigham Creek Connection	
1	North	North	✗
3	South	North	✗
4	South	South	✗
6	North	South	✓

KEY DIFFERENTIATORS

Option differentiators include:

- Options score similarly positive across all investment objectives. Lower integration scores for Option 3 due to severance to local roads.
- Natural wetlands are located along the route. Highest ecological value wetlands found along southern options.
- Overall higher ecological impacts for southern options due to additional effects on rivers, streams and floodplains.
- More significant flooding and stormwater impacts south of the Kumeū River.
- Landscape impacts less for northern alignments.
- Southern connections at Brigham Creek are further away from the Ngongotepara Stream.
- Southern connections are not adjacent any known archaeological sites.

EMERGING PREFERRED OPTION 6

Reasons for selection:

- Lower ecological impacts. It crosses a greater extent of natural wetlands (south of Boord Crescent) however avoids the wetlands and ecological features with higher ecological value.
- Reduced impact on Ngongotepara Stream.
- Responds to the existing character of the area including the curvilinear alignment around Boord Crescent.
- Least impacts on potential archaeological sites.
- Least effects on the landscape and natural features compared to other options.
- Best alignment for preferred options for the Brigham Creek Interchange.

MCA OPTION ASSESSMENT



Option Description			Preferred
No.	Alignment	RTN assumption	
1	30m cross section Widen both sides	Central running	✗
2	30m cross section Widen to south	Central running	✗
3	30m cross section Widen to north	Central running	✗
5	38m cross section Abuts NAL	Side running	✓

KEY DIFFERENTIATORS

Option differentiators include:

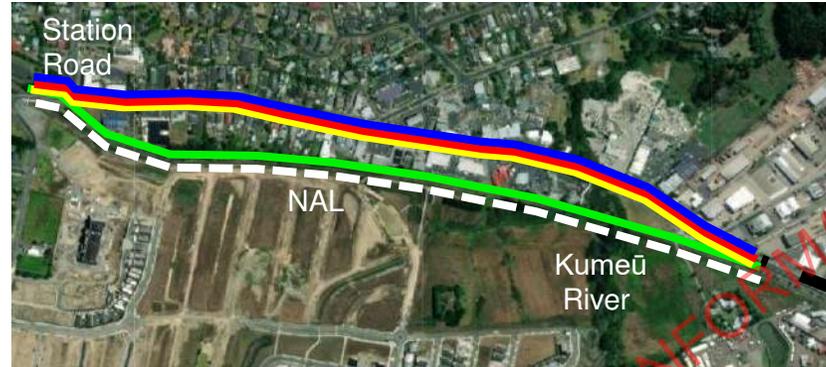
- Option 5 has greater reliability for public transport as less interaction with intersections. The decoupled alignment also maintains full access for land use adjacent SH16 Main Road on north side.
- Southern widening options have greater impact on heritage buildings, result in loss of land currently zoned Business Mixed Use and potentially impact KiwiRail designations (although not in operational use).
- Southern options have less scale and height issues and located away from development in the north.
- Southern options have higher property impact than northern options.
- Southern options proximity to NAL results in greater risk of flooding on the NAL and constrained options for providing stormwater infrastructure. Preferred for ecology as further from the Kumeū floodplain.
- Southern options can be largely constructed offline which results in less disruption.

EMERGING PREFERRED OPTION 5

Reasons for selection:

- Most flexibility for mode as provides for light metro as well as light rail and bus solutions.
- High land requirement; however, this facilitates better urban design and land use outcomes, including the creation of a gateway to enhance the entrance to Kumeū-Huapai.
- Best addresses the severance issues with the existing SH16 and will not restrict access for development land on the northern side of the corridor.
- The offline construction will minimise construction impacts and maintain accessibility for traffic using SH16.
- Potential stormwater and flooding impacts are acknowledged however feasible engineering solutions are available to provide appropriate stormwater infrastructure to avoid or mitigate flood risks .

MCA OPTION ASSESSMENT



Option Description			Preferred
Alignment		RTN assumption	
1	30m cross section Widen both sides	Central running	×
2	30m cross section Widen to south	Central running	×
3	30m cross section Widen to north	Central running	×
5	38m cross section RTN abuts NAL, SH16 Main Road existing location	Decoupled	✓

KEY DIFFERENTIATORS

Option differentiators include:

- Option 5 has greatest reliability with least interaction with intersections and is the only alignment that can provide flexibility for light metro as a potential mode.
- Option 5 has greatest impact on heritage requiring relocation or adaptation.
- The decoupling of the rapid transit resulting in infrastructure being positioned away from publicly visible areas may reduce impact on amenity and potentially provide better interface with SH16 and surrounding land uses.
- Lowest land use requirements for central and northern options.
- Least stormwater impacts with northern alignments.
- Less construction disruption and risk with the offline alignment of Option 5.

EMERGING PREFERRED OPTION 5

Reasons for selection :

- Best addresses the severance issues with the existing SH16 corridor and avoids exacerbating severance by decoupling the RTC from the SH16. North-south crossings cross adjacent rail and RT corridors.
- However, the option will have a higher land requirement and result in the loss of some developable land; residual land remains developable and accessible to the north side of SH16.
- Retains future flexibility for co-location of RTC with the NAL.
- Facilitation of better urban design outcomes, including the interface between an upgraded SH16 and surrounding urban areas. It avoids infrastructure which is out of scale and character being positioned on the existing SH16.
- Offline construction will minimise construction impacts and maintains accessibility for traffic using SH16.
- More reliable and higher user safety due to least interaction with intersections.

RTC / SH16 MAIN ROAD UPGRADE / RAMC – ROUTE REFINEMENT– SEGMENT 3A URBAN

OPTION ASSESSMENT



Identification of necessity for grade separation at Station Road has resulted in additional alignment options being considered for this segment.

		Option Description		Preferred
	Alignment (60km design speed)	Station Road		
1	Early emerging preferred alignment to south of NAL	No grade separation		x
2	Option 1 with grade separation	3 tiered grade separation		x
3	Under station road, crosses back over NAL	Grade separation		x
4	Option 2 with later crossing point	Grade separation		x
5	Alignment north of NAL	Grade separation		✓

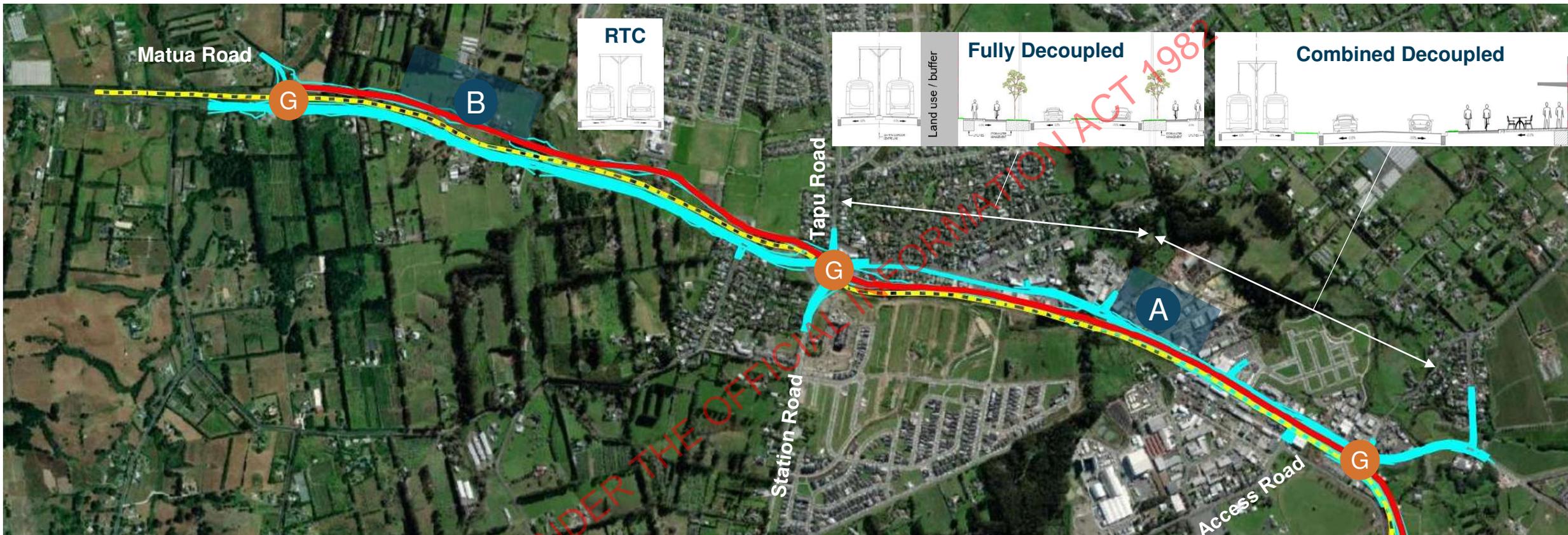
DISCOUNTED OPTIONS

- Option 1: No grade separation at Station Road so not mode neutral which is key criteria for the alignment.
- Option 2: Grade separation to make mode neutral would result in a three tiered transport interchange which has a scale out of keeping with the existing environment and urban design outcomes desired for the future. It would not support land use integration within the surrounding areas.
- Option 3 & 4: Scale of infrastructure to cross to southern station out of scale. Larger impacts on Huapai Domain and surrounding land. Southern section of alignment effectively cuts off land use access to SH16 Main Road which does not support land use intensification.

EMERGING PREFERRED OPTION 5

- Reasons for selection:
- Provides for grade separation under Station Road parallel to the NAL.
 - Lesser extent of impacts on the Huapai Domain (Sport and Active Recreation Zone) and school.
 - Does not require large additional infrastructure to recross NAL and Main Road which would be out of scale for the urbanising area.
 - Removes access constraints to the land use south of SH16 Main Road to maximise intensification opportunities.
 - Will require consideration of ecological features on north side of NAL as part of design.
 - North based station will require strong north south access solution.
 - Continues principle of RTC abutting the NAL designation to retain opportunities for using rail corridor in the future. Note opportunities to further reduce the land required through discussions with KiwiRail.
 - Does not preclude longer term further extension to Waimauku should this be considered necessary.

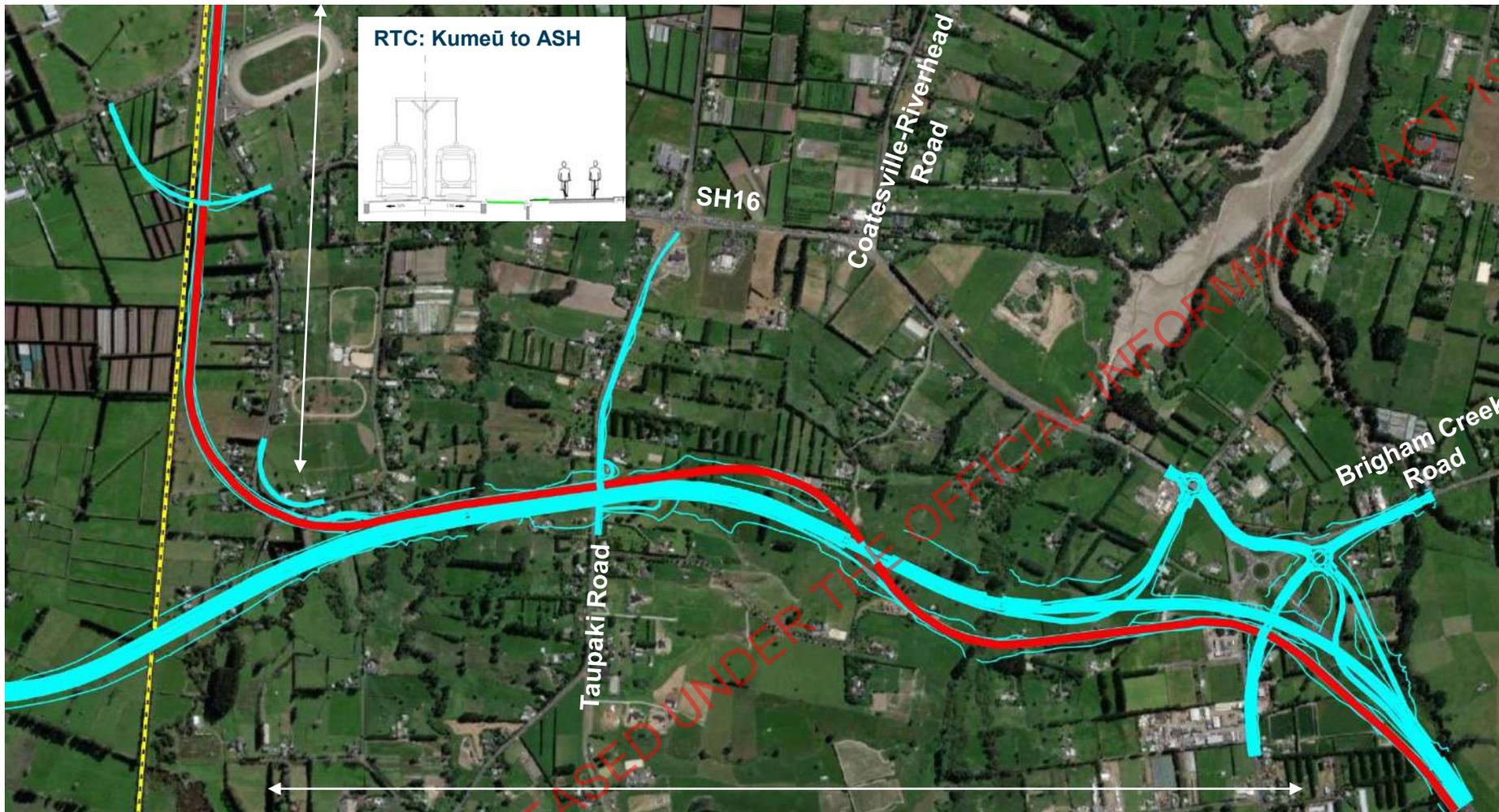
RTC / SH16 MAIN ROAD UPGRADE / RAMC – URBAN RECOMMENDED OPTION



The decoupled rapid transit alignment abuts the KiwiRail designation and runs parallel to the rail line along the urban section. Should the rail be relocated in the future the rapid transit alignment could be moved laterally into this vacated space. This would reduce the rapid transit designations required.

- RTC alignment
- SH16 Main Road alignment
- A B Indicative RTC station locations. Specific land acquisition and location of Park and Ride to be confirmed during NoR.
- G New grade separated intersections
- Existing North Auckland Line (NAL)

RTC / SH16 MAIN ROAD UPGRADE / RAMC – RURAL RECOMMENDED OPTION



- RTC alignment
- ASH alignment
- Existing North Auckland Line (NAL)

The decoupled rapid transit alignment abuts the KiwiRail designation and runs parallel to the NAL then is co-located with the ASH.

Should the rail be relocated in the future, the section of rapid transit alignment adjacent the rail could be moved laterally into the vacated NAL space. This would reduce the rapid transit designations required.



RTC / SH16 MAIN ROAD UPGRADE / RAMC – RECOMMENDED OPTION

DESIGN REFINEMENTS UNDERTAKEN

- Grade separation at Access Road, Station Road and Matua Road.
- Confirmation of western station being on north side of SH16 Main Road to better integrate with RTC alignment.
- Bespoke cross sections for constrained segments e.g. Section 1AU(ii).
- Identification of number of stations, sizing (for all RT modes) and indicative locations. With location to be further refined through Notice of Requirement phase, once RT mode confirmed.

ADDITIONAL WORK FOR NOTICE OF REQUIREMENT

- Stations – specific site selection, design / layout and sizing.
- Park and ride location to be balanced against adjacency to station footprint (resulting in a more flexible footprint) compared with in a different location so as to not restrict land use intensification around the station.
- Alignment modifications to refine land use requirements.

INTERDEPENDENCIES

- SH16 Main Road upgrade.
- Alternative State Highway.
- Brigham Creek Interchange.
- Regional Active Mode Corridor.
- NWRTN – City Centre to Westgate RTC

OPPORTUNITIES

- Finalisation of station location in NOR to allow structure planning and TOD planning to occur to maximise land use intensification and integration around the stations.
- The RTC is located abutting the NAL designation which provides opportunities:
 - During NOR: Further discussions with KiwiRail to understand if any of the anomalous pieces of KiwiRail designation can be used for the RTC alignment to reduce additional land designation.
 - During pre-implementation/implementation: consideration of co-location between NAL and RTC (rail-based solutions only).
 - At any stage: Consider lateral shift of the RTC alignment should the NAL be relocated as part of KiwiRail wider freight strategies, and the rail corridor becomes vacant.
- Refine cross sections once mode is confirmed to further reduce impact on property and improve land use opportunities, particularly between Access Road and the Kumeū River.
- Design opportunities:
 - Raised platforms at intersections and additional provision of midblock crossings.
 - Further reduce active mode facilities conflict with vehicle accesses.
 - Investigation of trenching of RTC – noted water table and potential flooding issues on the alignment.
 - Adjust vertical alignment to reduce cut and fill balance.
 - Additional flood modelling and rationalisation of stormwater treatment ponds
 - During implementation phase, implement behaviour change campaign and incentives to further support mode shift.

RTC / SH16 MAIN ROAD UPGRADE / RAMC – INVESTMENT OBJECTIVE ALIGNMENT

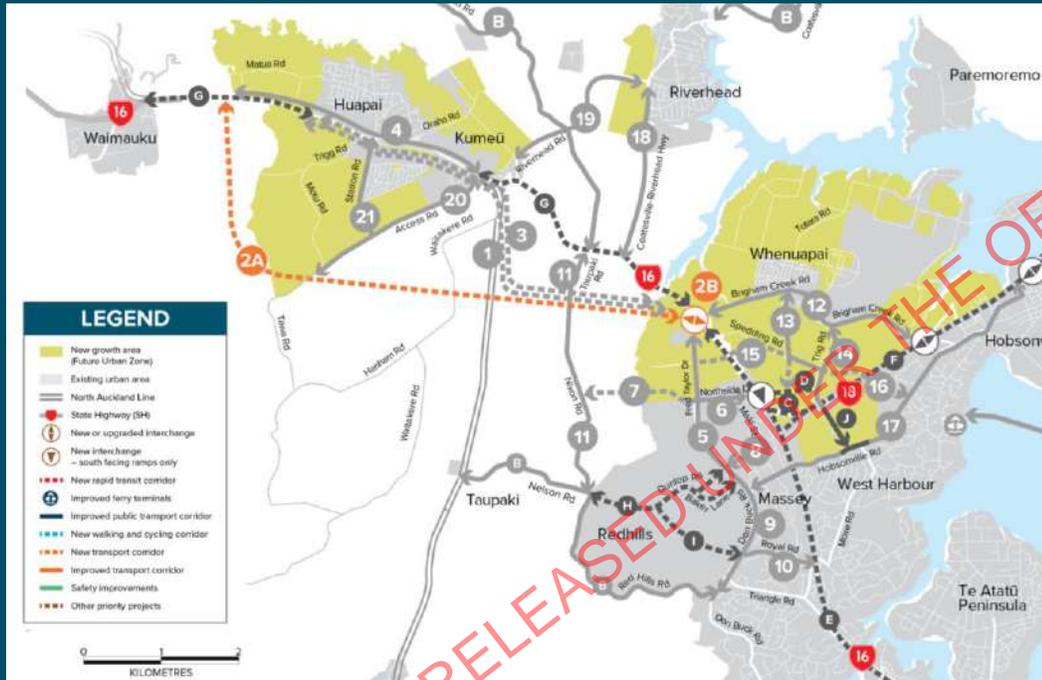
RAPID TRANSIT CORRIDOR ALIGNMENT

SH16 MAIN ROAD ALIGNMENT

Investment Objectives		Rapid Transit Alignment	Investment Objectives		SH16 Main Road Alignment
Access	Provide effective and attractive public transport access to economic and social opportunities for Kumeū-Huapai.	New high quality public transport that runs centrally through Kumeū-Huapai, maximising catchment and connecting Kumeū-Huapai to key North West centres (Westgate metropolitan centre) as well as to City Centre to improve access to local employment and social/community facilities. Reducing the need to travel by single occupancy carbon generating private vehicles.	Access	Improve access to social and economic opportunities for active modes, public transport and local trips within Kumeū-Huapai.	Focused on connecting local land use to the transport network and distributing efficiently to the strategic network (RTC or ASH). Cycle facilities provided the length of the corridor will connect to the RAMC.
Reliability	Enable reliable and resilient public transport trips between Kumeū-Huapai and the strategic network.	Rapid transit corridor is fully segregated and grade separated (where necessary) to ensure reliability. Operates on alternate corridor to key road connections of SH16 and new ASH. Stations provided in growth areas only to enable faster speeds through rural areas and maximise RTC efficiency.	Mode Choice	Support transformational mode share in Kumeū-Huapai by providing a high quality, safe and attractive active mode facility on the existing SH16 corridor between Matua Rd and Access Rd.	High quality active mode network to provide the spine network to connect the residential catchments to key destinations and the RAMC. Facilities provided on both sides. Connects to new proposed regional active mode corridor and shared path on existing SH16.
Mode Choice	Enable a transformational public transport mode share for trips between Kumeū- Huapai and key centres.	Forecast to carry from Kumeū 3,150 pax/2 hr AM period – much of which will be mode shift from private vehicles. Design enables high speed, efficient station locations. Provides for trips between North West destinations as well as further beyond. Mode agnostic to respond to future mode decisions, maximising opportunity for higher capacity RT modes, such as light metro. Mode change from vehicles to RT has associated positive safety outcomes.	Safety	Provide improvements to the existing SH16 corridor between Matua Rd and Access Rd that contribute to a transport network that is free from deaths and serious injuries.	Sufficient footprint provided to enable midblock pedestrian crossings or provide raised intersection platforms (to be considered during detailed design). Reduction in road hierarchy to an arterial function to de-tune SH16 Main Road will result in lower speed environment contributing to improved safety.
Integration	Provide a Rapid Transit corridor which supports high quality integrated communities.	Station strategy focused on access to future town centre and maximises active mode catchments in Kumeū-Huapai . Supports intensification near stations and maintains flexible access for existing land uses. Grade separation along the route improves safety and maximises north-south permeability. Leverages the existing severance from the NAL.	Integration	Provide a transport system that is integrated with land use enabling a more sustainable, high quality, connected urban form, and supports growth in Kumeū-Huapai.	Reduction in road hierarchy to an arterial function to de-tune SH16 Main Road and support improved permeability (including north south connections over the rail line). Improved street amenity with berm space and connected cycle facilities. Supports a potential north south boulevard approach for the expanded town centre (yet to be master planned). Decoupled RTC alignment preserves maximum accessibility for existing land uses on SH16 Main Road.
Climate Change	Provision of a high quality alternative to private vehicle supporting a step change mode shift and reduction in carbon emissions. Focused on inclusive access through maximising catchments and integration with local (and future) network. Station locations selected specifically to maximise walk-up and cycle-up catchments and encourage higher density development, reducing the need for carbon generating private vehicle use.		Climate Change	Utilisation of the existing corridor in preference to creating a new corridor and introducing more severance. Focus on active modes to shift trips away from carbon generating private vehicle use. Corridor improved to support connections to link the rapid transit system to the adjacent land use. Raising SH16 bridge to mitigate flooding.	

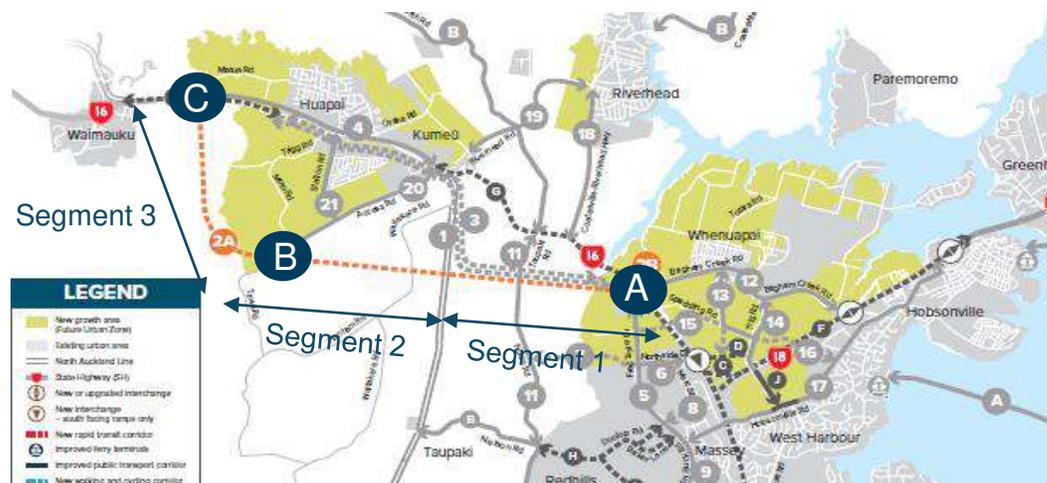
Alternative State Highway

Project 2A



ALTERNATIVE STATE HIGHWAY – PRELIMINARY ASSESSMENT

PROJECT #2A: ALTERNATIVE STATE HIGHWAY (ASH)



- A** Brigham Creek Interchange
- B** Tawa Road Interchange
- C** SH16 Roundabout

PURPOSE

- Relocate the existing longer distance regional and sub-regional connections from existing SH16 to a new state highway.
- Reduce traffic on SH16 Main Road to enable transport and land use integration of Kumeū-Huapai growth and support mode shift through provision of rapid transit and associated walk up catchment facilities to stations.
- Improve freight reliability with direct access to planned future industrial land use.
- Improve resilience of the network by providing a quality alternative to access Kumeū-Huapai. This will result in a reduction in vehicles utilising the surrounding rural road network to avoid congestion and improve rural road safety.
- Enable better safety outcomes for active modes on SH16 Main Road as well as supporting mode choice through the provision of active mode facilities along the alignment.

EXTENTS AND FORM

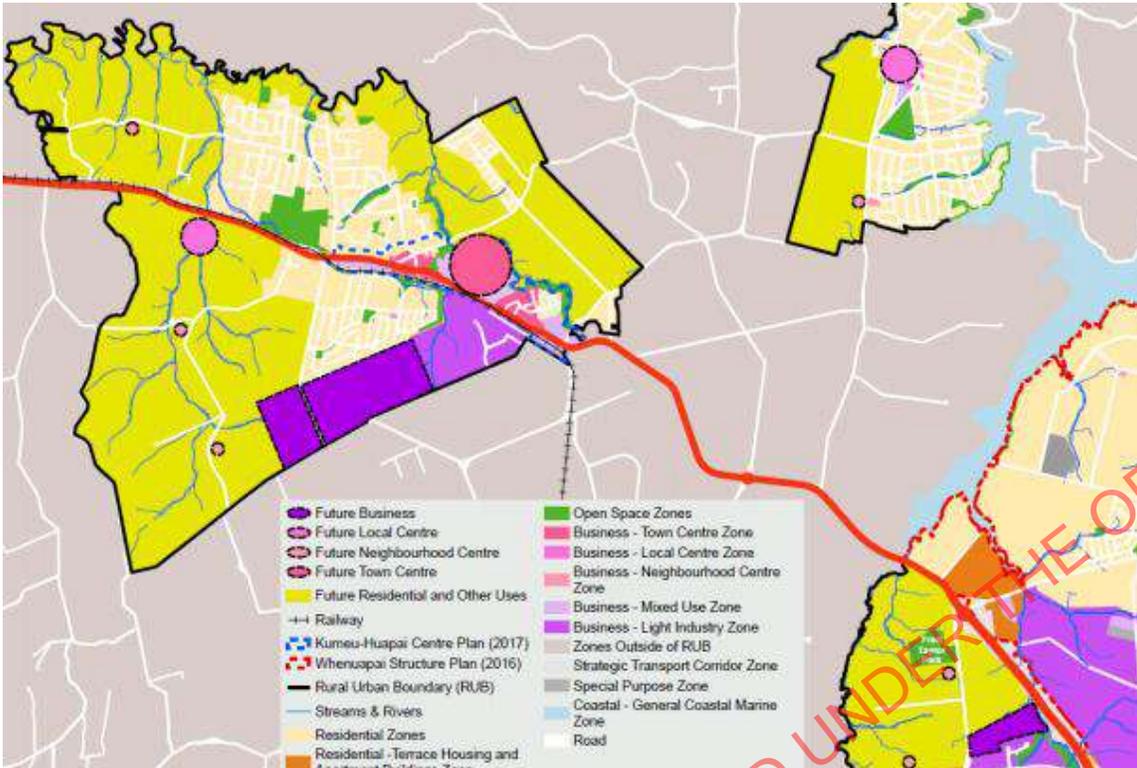
- Four lane (Dual Carriageway) with central and side barrier systems
- Interchanges at Brigham Creek and Tawa Road and roundabout connection with SH16
- Separated cycle facilities
- No direct local vehicle access & grade separation at local roads
- Safe and Appropriate Speed of up to 110km/hr
- Shared corridor with RTC and RAMC between Brigham Creek and North Auckland Line



ALTERNATIVE STATE HIGHWAY – LAND USE ASSESSMENT

PROPOSED FUTURE LAND USE

Auckland Council North West Spatial Land Use Strategy (May 2021)



LAND USE ASSESSMENT

- Route will cross predominately Rural-Countryside Living Zone and smaller areas of Future Urban Zone (FUZ). Near Rural – Production Zone.
- High quality soils throughout the study area.
- Topography steep (particularly to the west) and prevalence of wetlands and streams along the route.
- Auckland Council prepared a Draft Spatial Land Use Strategy prior to formal structure planning to inform option development.
- Future business zone planned to expand west of the existing business zone adjacent Access Road. Proposed Tawa/Access interchange with the ASH will support heavy vehicle access to the strategic transport network.
- Single expanded town centre retained in Kumeū-Huapai.
- New local centre in Huapai – location to integrate with RTC stations.
- Key land use integration issues include the location of interchanges, interaction with rural zoning and severance of FUZ land.

ALTERNATIVE STATE HIGHWAY – GAP ANALYSIS FOR STATE HIGHWAY ALIGNMENT

1. STATE HIGHWAY ALIGNMENT

North West DBC generally reconfirms IBC alignment. Anchor decisions identified along ASH alignment to inform option development.

Consideration	Outcome /Action	Anchor
ASH located north of SH16	<p>IBC decision reviewed and remains discounted because:</p> <ul style="list-style-type: none"> • Significant impacts on large stand of native vegetation in Riverhead hills and is within an area of Outstanding Natural Landscapes (ONL) • Would not efficiently serve the larger southern Kumeū-Huapai growth areas. • Would not support land use integration outcomes due to traffic continuing to use SH16/Main Road and connections to a northern corridor impacting the largely developed residential area on the north side of Kumeū. • Would not provide direct access to the planned industrial area. 	N/A
ASH alignment to the west of Waimauku	<p>IBC decision to connect to SH16 before Waimauku re-tested. Constraint mapping undertaken for a wider study area to understand topography.</p> <p>Alignment remains discounted because:</p> <ul style="list-style-type: none"> • There is no FUZ land in Waimauku. Insufficient demand to support the ASH being extended 4-5km from growth area in Kumeū-Huapai. Daily traffic demand can be accommodated on SH16 between Fosters Road and Waimauku. • Limits access from the Kumeū-Huapai growth area to the ASH. • Challenging topography with increased earthworks and potential environmental and landscape effects • Required to cross petroleum and gas pipeline, requiring engineering solutions to protect during construction and operation 	N/A
ASH central section alignment	Interaction of central section alignment (between NAL and Tawa Road) with rural and countryside living land uses to be considered in more detail during option development.	Yes
Interaction with the Kumeū-Huapai Future Urban Zone (FUZ)	Location of where the alignment will cross the southern part of the Kumeū-Huapai FUZ to be considered in more detail during option development. This will include an assessment on topography, land use and potential severance to the FUZ.	Yes

ALTERNATIVE STATE HIGHWAY – GAP ANALYSIS FOR STATE HIGHWAY CONNECTIONS

2. STATE HIGHWAY CONNECTIONS

- IBC connections generally confirmed
- East and west connections confirmed as anchor decisions for the alignment

Consideration	Outcome /Action	Anchor Decision
Eastern connection at SH16	<p>IBC decision reviewed due to the confirmation of four laning being implemented between Brigham Creek and Taupaki Road.</p> <ul style="list-style-type: none"> • Confirmed IBC decision to connect at Brigham Creek which makes best use of existing motorway infrastructure and allows a full motorway interchange. It increases resilience of the network through provision of two movement corridors to Kumeū-Huapai and avoids a wide corridor between Brigham Creek Road and Taupaki Road to accommodate multiple modes. Existing SH16 would have issues with local property access, which would also adversely impact on the resilience and reliability of that corridor, when compared with the equivalent section of ASH from Brigham Creek, which would have no local access. Efficiencies in the ASH being delivered as a multi-modal transport corridor with the RTC/RAMC. • Connection south of Brigham Creek was discounted due to impacts on planned interchange at Northside Drive and the proposed Spedding Road West corridor bridging over SH16. This would also have greater adverse impact on already developing and future urban areas in Whenuapai and Redhills. • Connection at Taupaki was discounted as it would create an undesirable 5 leg intersection with Taupaki Road, SH16, Old North Road, the new State Highway and RTC. It would be less resilient as would remain a single road into Kumeū until Taupaki Road. Grade separation requirements would result in a large and complex interchange in an otherwise rural area. 	Yes
Western connection at SH16 (West of Kumeū-Huapai)	<ul style="list-style-type: none"> • Identified that more detail required to confirm western connection location. • Three locations to be tested: Near Fosters Road, Midway between Huapai and Waimauku, East of Waimauku. 	Yes
Taupaki Interchange	<p>An additional interchange was discounted at this location because:</p> <ul style="list-style-type: none"> • An interchange at this location would not serve a growth area but rather Rural - Countryside Living Zone and would potentially create pressure to re-zone rural land. • Connections to Riverhead will be adequately serviced by the proposed Brigham Creek Interchange and the already planned upgrades to SH16 from Taupaki Road to Brigham Creek Road. 	No

ALTERNATIVE STATE HIGHWAY – GAP ANALYSIS FOR HEAVY RAIL (NORTH AUCKLAND LINE)

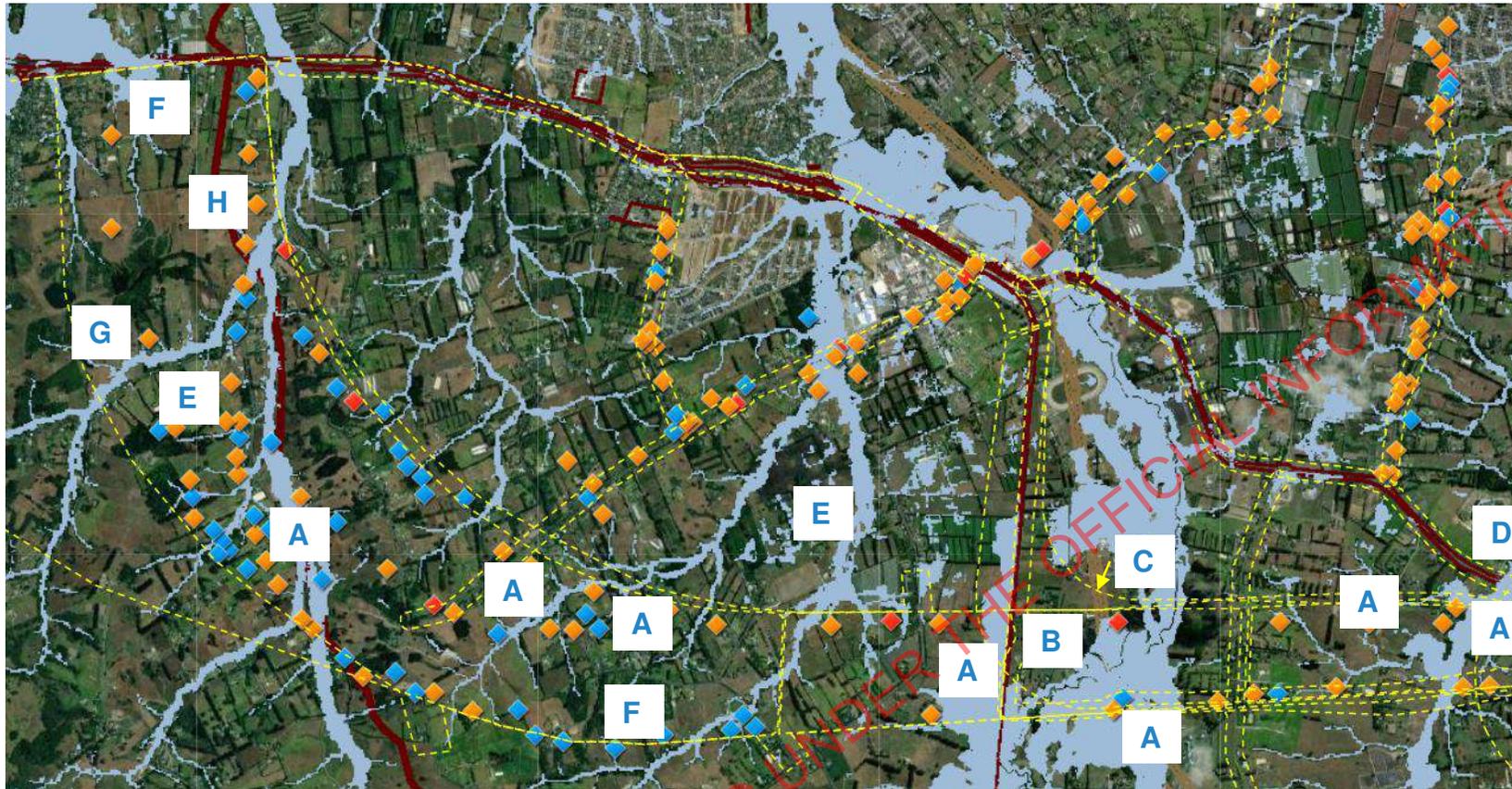
HEAVY RAIL (NORTH AUCKLAND LINE)

- **ASH alignment to not preclude co-location with heavy rail.**
- **Opportunity remains to consider use as an interim measure prior to the implementation of the core RTC network. This is outside of the Te Tupu Ngātahi longer term route protection remit.**

Consideration	Outcome /Action	Anchor Decision
Opportunity for North Auckland Line (NAL) and ASH to co-locate as multimodal corridor	<p>KiwiRail currently has no long term strategic plans to consider relocating the rail line. Dependencies for this decision include future policy for Marsden Port, provision of a North West inland freight hub and future freight traffic. There are aspirations to potentially double or triple track this part of the existing NAL corridor. These items are not included in the Rail Network Improvement Plan (RNIP) within the next 10 years and no funding has been allocated to these projects.</p> <p>Whilst this DBC cannot decide if or where the NAL could relocate to, it has considered how the ASH could be designed to not preclude the opportunity for future co-location with rail.</p> <p>The design process undertaken was:</p> <ul style="list-style-type: none">• ASH options were initially determined for the state highway alignment to meet the objectives of this DBC.• High level assessment of suitability of ASH options to be used as a future multimodal corridor prior to selection of the emerging preferred option.• Further investigation of the emerging preferred option to better understand its suitability for a potential future multi-modal corridor to include rail, so as not to preclude this co-location opportunity.	No

ALTERNATIVE STATE HIGHWAY – CONSTRAINT MAPPING

CONSTRAINTS



Key constraints

- A. Significant flood plains, streams, wetlands
- B. Open Space Conservation Zone
- C. National Grid Corridor – 220kv/110kv transmission lines
- D. Coastal Marine Zone and SEA
- E. Elite soils
- F. Rural production
- G. Steep topography
- H. High pressure Natural Gas and Fuel Pipeline

Corridor wide constraints

- Visual impacts to existing residential audiences
- Potential archaeological discovery along the route

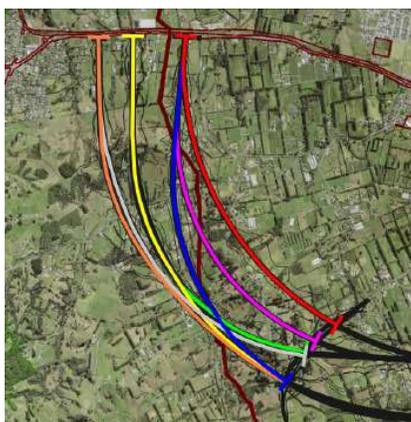
Corridor crosses a range of topography including undulating landscape and steep sections to the west. There are significant streams, natural wetlands and flooding present along the route. Key utilities that need to be avoided are high pressure gas and fuel lines and the National Grid transmission lines. Potential severance to local roads and individual property access to be considered along the route.

ALTERNATIVE STATE HIGHWAY – OPTION DEVELOPMENT

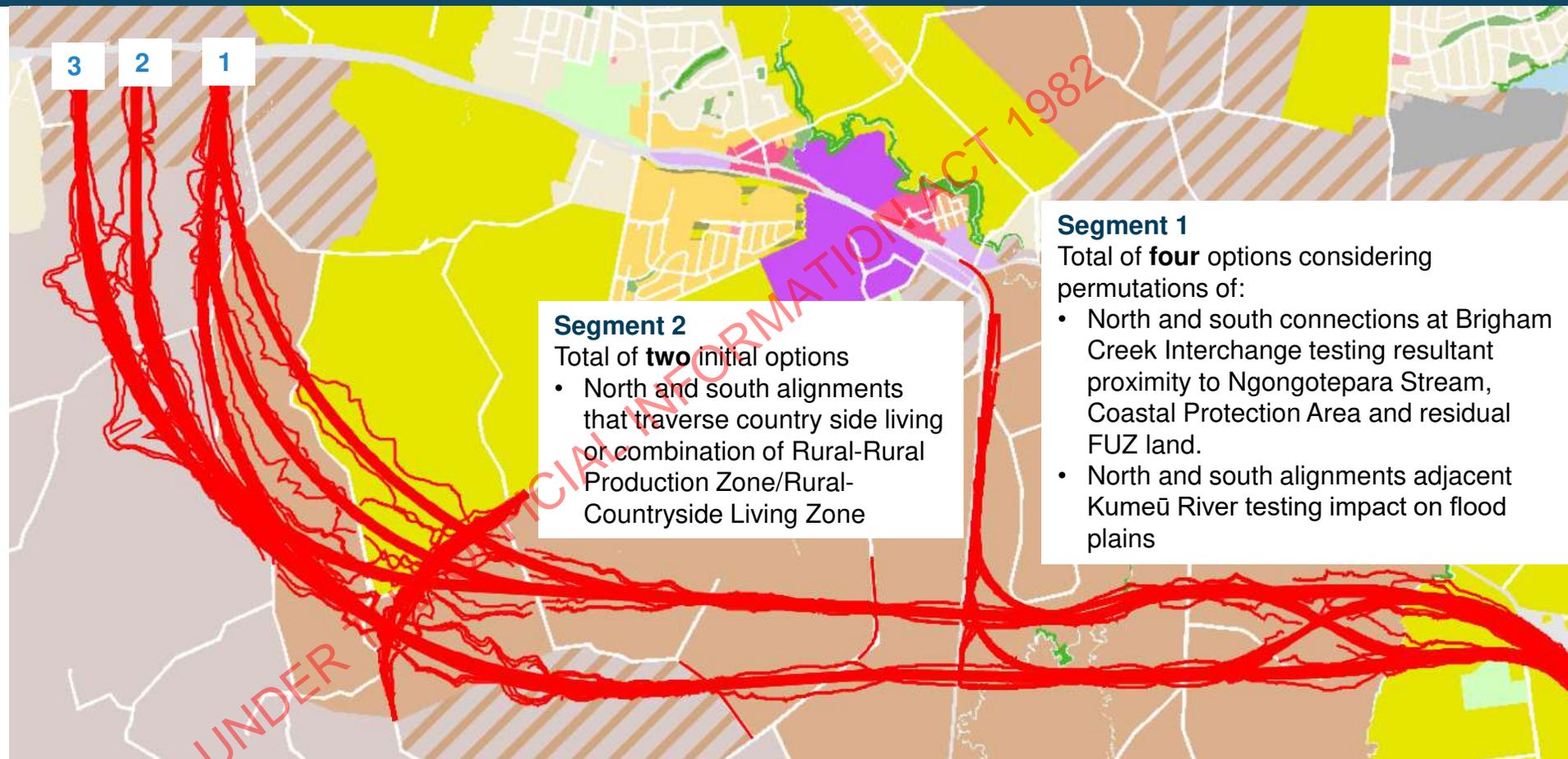
Segment 3

Total of **seven** alignments

- Three possible western connections at SH16 to test impacts of proximity to Waimauku and Huapai:
 1. West of Fosters Road
 2. Midsection between Fosters Road and Wintour Road
 3. East of Wintour Road
- Where alignment intersects with Kumeū-Huapai FUZ land and testing resulting impacts of severance of FUZ land.
 - Avoids the FUZ
 - Crosses through the FUZ – three possible crossing points



Segment 3 – seven options tested



Segment 2

Total of **two** initial options

- North and south alignments that traverse country side living or combination of Rural-Rural Production Zone/Rural-Countryside Living Zone

Segment 1

Total of **four** options considering permutations of:

- North and south connections at Brigham Creek Interchange testing resultant proximity to Ngongotepara Stream, Coastal Protection Area and residual FUZ land.
- North and south alignments adjacent Kumeū River testing impact on flood plains

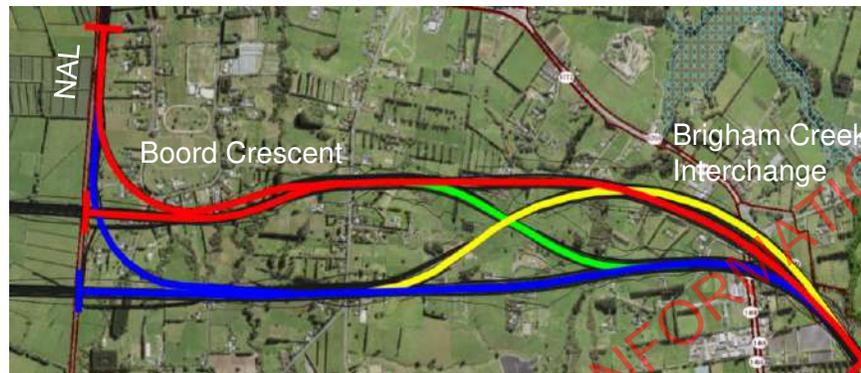
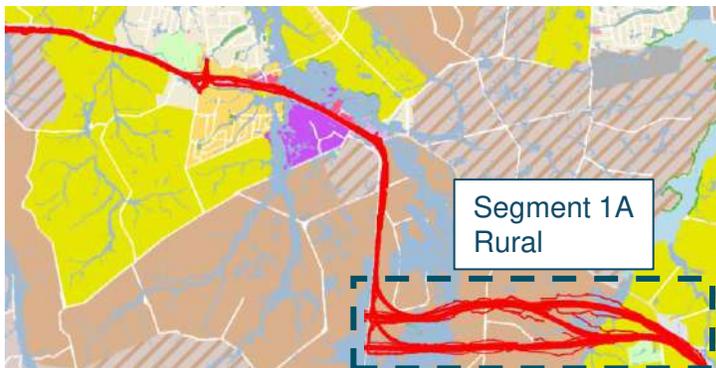


OPTION DEVELOPMENT

- Split into three segments to allow localised assessment and respond to considerations and constraints in each segment.
- Anchor points of corridor include the east and west connections to SH16 (with localised testing of these), location to cross the FUZ and land use implication (countryside vs rural production) in the central section.

ALTERNATIVE STATE HIGHWAY – ROUTE REFINEMENT– SEGMENT 1

MCA OPTION ASSESSMENT



Option Description			Preferred
No.	Alignment	Brigham Creek Connection	
1	North	North	✗
3	South	North	✗
4	South	South	✗
6	North	South	✓

KEY DIFFERENTIATORS

Option differentiators include:

- Options score similarly positive across all investment objectives. Lower integration scores for Option 3 due to likely severance to local roads.
- Natural wetlands are located along the route. Highest ecological value wetlands found along southern options
- Overall higher ecological impacts for southern options due to additional effects on rivers, streams and floodplains.
- More significant flooding and stormwater impacts south of the Kumeū River.
- Landscape impacts less for northern alignments.
- Southern connections at Brigham Creek are further away from the Ngongotepara Stream.
- Southern connections are not adjacent any known archaeological sites.

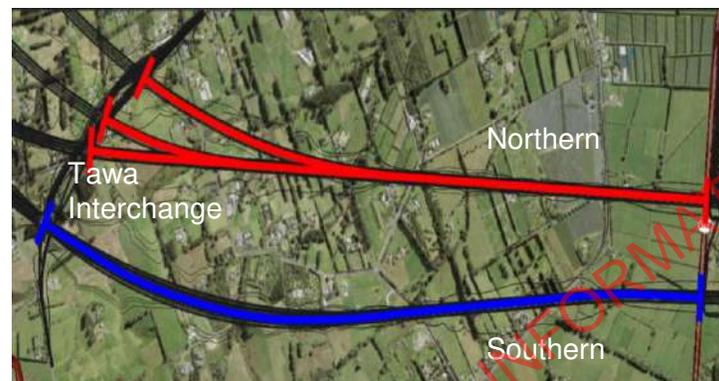
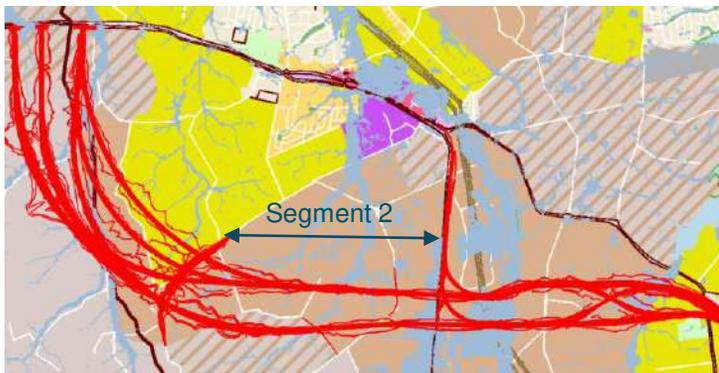
EMERGING PREFERRED OPTION 6

Reasons for selection:

- Lower ecological impacts. It crosses a greater extent of natural wetlands (south of Boord Crescent) however avoids the wetlands and ecological features with higher ecological value.
- Reduced impact on Ngongotepara Stream.
- Responds to the existing character of the area including the curvilinear alignment around Boord Crescent.
- Least impacts on potential archaeological sites.
- Least effects on the landscape and natural features compared to other options.
- Best alignment for preferred options for the Brigham Creek Interchange.

ALTERNATIVE STATE HIGHWAY– ROUTE REFINEMENT– SEGMENT 2

MCA OPTION ASSESSMENT



Option Description		Preferred
No.	Alignment	
1	North	✓
2	South	x

KEY DIFFERENTIATORS

Option differentiators include:

- Options score similarly positive across investment objectives. Northern option scores lower due to severance of Dysart Lane.
- Both options impact Rural-Countryside Living Zone but southern option also impacts Rural –Mixed use zone. Quality soils found in both locations but the southern option reduces land available for rural production.
- All options impact the existing rural character in the segment, however the northern option provides a more direct option for active mode users to access Tawa Road and future development.
- Northern option has less earthworks and will result in less significant landscape impacts
- Northern option has reduced upstream catchments and presents the best freeboard flood opportunity and reduced culvert/ bridge lengths. Crosses the North Auckland Line floodplain at shortest point.
- Northern option has least number of river and stream crossings, avoids large surface water bodies and lowest extent of impact on potential native trees and woody vegetation removal.

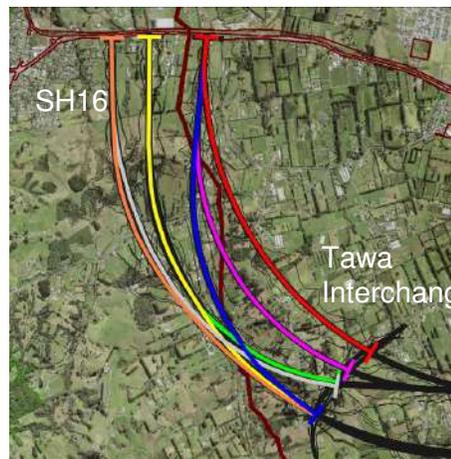
EMERGING PREFERRED NORTHERN

Reasons for selection:

- Least ecological impacts. Although the northern option crosses a greater extent of natural wetlands it avoids the wetlands and ecological features with higher ecological value.
- Avoids impact on Rural-Mixed Use Zone allowing lane to be retained for productive activities
- It has a reduced flood risk and impact on floodplains and waterbodies.
- More direct route for active mode users connecting to the Kumeū-Huapai FUZ
- Least Natural hazards and landscape impacts due to reduced earthworks and alignment passing through flat alluvial ground.

ALTERNATIVE STATE HIGHWAY– ROUTE REFINEMENT– SEGMENT 3

MCA OPTION ASSESSMENT



No.	Segment 2 Alignment	Option Description		Preferred
		Future Urban Zone	SH16 Connection	
1	North	Bisects	West Fosters Road	✓
2	North	Avoids	East Wintour Road	×
3	North	Avoids	Between Foster and Wintour	×
4	South	Avoids	West Fosters Road	×
5	South	Avoids	East Wintour Road	×
6	South	Avoids	Between Foster and Wintour	×
7	North	Bisects	West Fosters Road	×

KEY DIFFERENTIATORS

Option differentiators include:

- Foster Road connection preferred due to better access to growth area.
- Avoiding FUZ creates pressure for unplanned development in rural zones. Severing FUZ reduces land but topography in southern section is less attractive for dense development.
- Western Gateway opportunity for Foster Road connection to define rural edge. Options that cut through FUZ allows more direct access and amenity for cyclists.
- Options within FUZ preferred as can be incorporated into urbanisation of the FUZ.
- Northerly alignments preferred as reduced stream crossings and best freeboard flood opportunities.
- Northerly options least impact on the extent of floodplains, rivers and stream crossings. Avoids greatest number of large surface water bodies and least removal of native trees. Option 1 avoids two higher value wetlands west of Pomona Road.

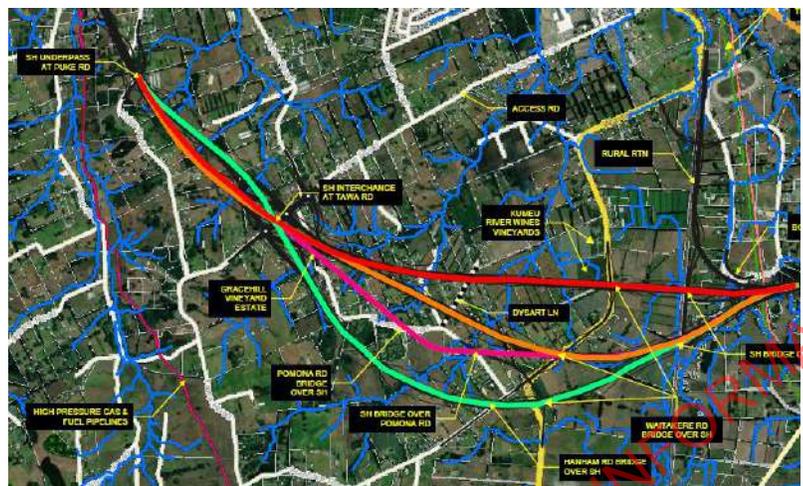
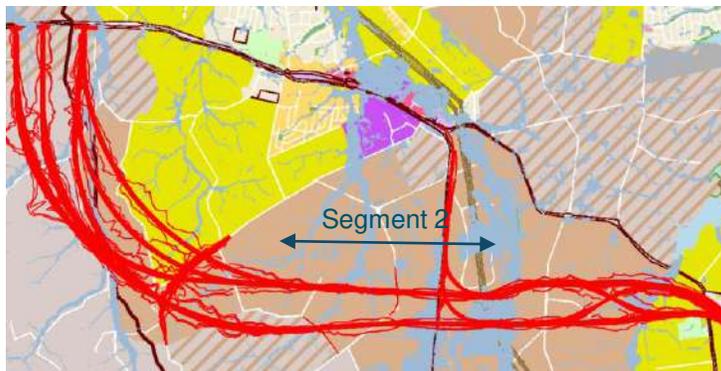
INITIAL EMERGING PREFERRED OPTION 1

Reasons for selection:

- Provide better access to growth areas and reduce need for “back tracking” onto SH16.
- Least impact on floodplains, waterways and native vegetation.
- Less significant landscape effects as viewed within the context of future development in the FUZ.
- Least impact on rural zones where development is not anticipated to occur. Residual land will be in the FUZ and have greater ability to integrate with future development. Terrain is steeper and not as suitable for intense development so impact is acceptable from a future urban land use development perspective.
- Severance issues for FUZ can be addressed via structure planning and Plan Changes
- Least impact on local road access, existing utilities and infrastructure and avoids the National Oil and Gas Pipeline.

ALTERNATIVE STATE HIGHWAY – ADDITIONAL CENTRAL SECTION ASSESSMENT

OPTION ASSESSMENT



Option Description		Preferred
No.	Alignment	
1	Initial emerging preferred alignment	✗
2	South of Boord Crescent then north of Pomona Road	✗
3	South of Pomona Road	✗
4	South of Pomona Road then crosses to north of Pomona Road after Dysart Lane	✓

KEY DIFFERENTIATORS

Option differentiators include:

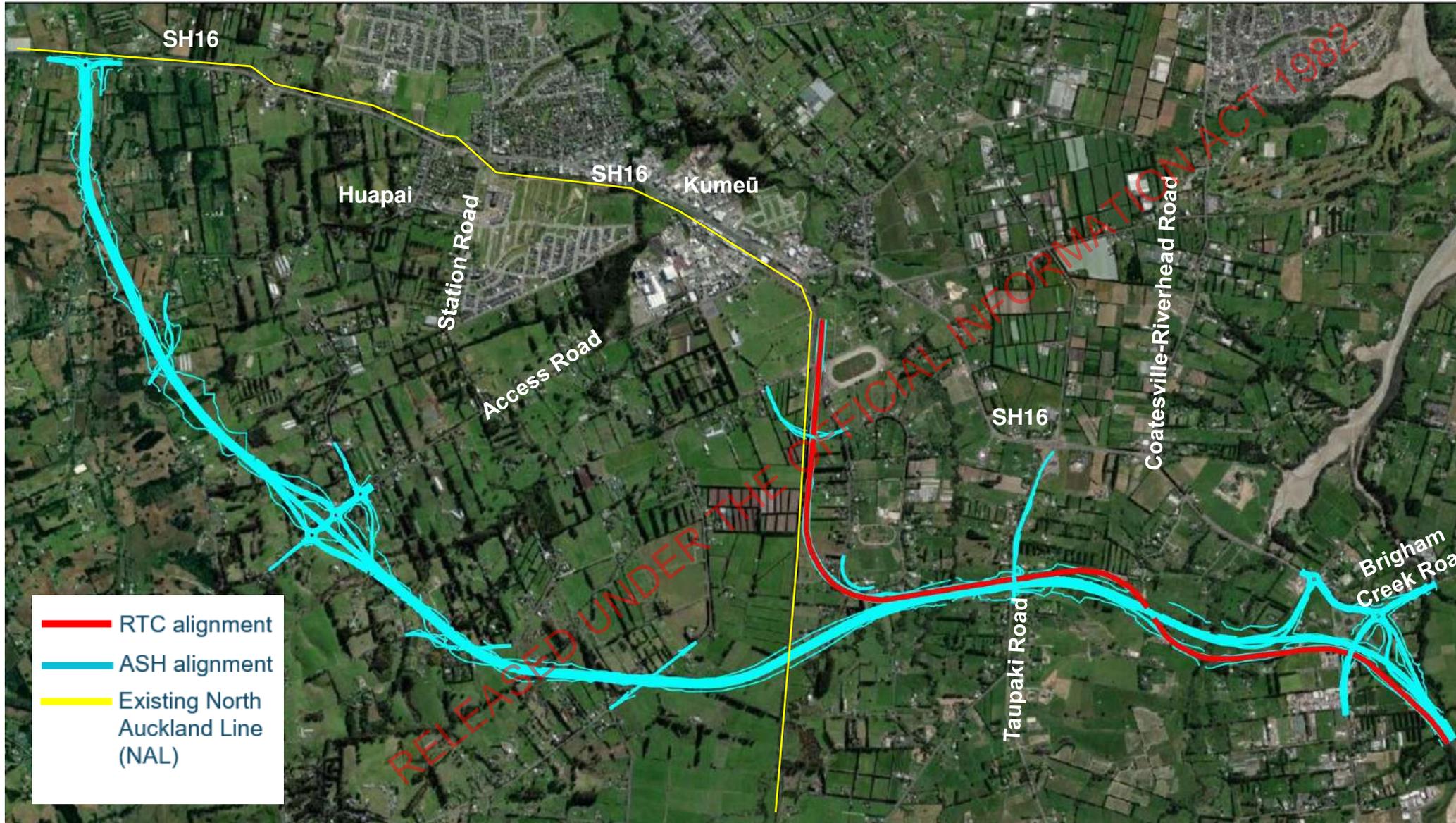
- Options score similarly positive across investment objectives. Options that avoid Dysart Lane score better for integration.
- Options north of Pomona Road have localised access issues at Dysart lane.
- Options south of Pomona Road impact the Rural-Mixed Zone and small pockets of Rural – Production Zone.
- Options 2,3,4 create land locked area to the south of Boord Crescent which may be difficult to develop.
- Option 3 is the least direct route for active mode users.
- Option 1 has significant impacts on Kumeū River Wines and Option 3 is the longest route with the overall largest land requirement.
- All options have ecological impacts. Options 2 and 3 in particular impacts the streams and wetlands around Pomona and Dysart Lane.
- Option 4 has the least earthwork requirements.

REFINED EMERGING PREFERRED OPTION 4

Reasons for selection:

- The impact on the Rural – Mixed Use Zone is limited to a fringe area with large area of the Zone remaining to the south.
- Option 4 has reduced property impacts / complexity and reduced socio-economic impacts by avoiding the Kumeū River Wines.
- Option 4 avoids local access and severance issues on Dysart Lane.
- An area of residual land is created between the Option 4 alignment and Pomona Road. which is suited for use as a stormwater pond.
- Opportunities to further manage flood risk and feasibly refine design to avoid or appropriately minimise effects on the higher value unchanneled wetland.

ALTERNATIVE STATE HIGHWAY – RECOMMENDED OPTION



- RTC alignment
- ASH alignment
- Existing North Auckland Line (NAL)

- RTC alignment
- ASH alignment
- Existing North Auckland Line (NAL)

ALTERNATIVE STATE HIGHWAY – RECOMMENDED OPTION

DESIGN REFINEMENTS UNDERTAKEN

- Refinement of cycle connections.
- Confirmation of alternative local property access arrangements.
- Minimise impact on flood plains south of Boord Crescent.
- Minimise impacts on streams/ecology south of Pomona Road.

MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN

- Integration with design of Brigham Creek Interchange.
- Potential for additional mitigation for wetlands and streams.
- Adjust vertical alignment to reduce cut and fill balance.
- Additional flood modelling.
- Design for local property access.
- Rationalise stormwater treatment ponds with the aim to reduce them.
- Undertake assessment to raise Transpower assets to achieve vertical clearance requirements.

OPPORTUNITIES

- Route protect for 4 lanes and grade separation but implement in stages (initially 2 lanes).
- Consider tolling or managed lanes.
- Deliver as an expressway rather than motorway and consideration of the form on cyclists.
- Additional cycle connections to local roads.

INTERDEPENDENCIES

- Brigham Creek Interchange.
- Rapid Transit Corridor.
- Regional Active Mode Corridor.

CONSIDERATION OF HEAVY RAIL

KiwiRail undertook a high-level review to assess suitability for co-location of road and rail along the initial seven State highway alignments. The subsequent central section refinement is not expected to change the overall outcomes of this assessment.

- **Horizontal curve:** This element of track geometry is critical as it affects the speed, noise, wagon and rail wear overtime. All options were found to be suitable for this criterion based on the high level of design provided.
- **Vertical geometry:** All proposed options have grades beyond the desirable maximum curve compensated grade for mainlines. Consequently, the integration of the rail at a same grade as the proposed roads will be challenging but could still be feasible.
- **Clearance:** All proposed options are suitable for the horizontal and vertical clearance requirements.
- The initial emerging preferred option taken to engagement was the preferred option with the least (but still significant) vertical geometry challenges.
- **The recommended ASH alignment therefore does not preclude future rail co-location.** For this DBC rail relocation remains an opportunity for KiwiRail who would independently need to establish whether a co-location of the ASH and the NAL was a realistic option as part of a separate business case and options assessment. This relocation opportunity remains dependent on major policy changes which would significantly alter the freight patterns such as the relocation of the Ports from Auckland to Northport and the development of an inland freight hub.

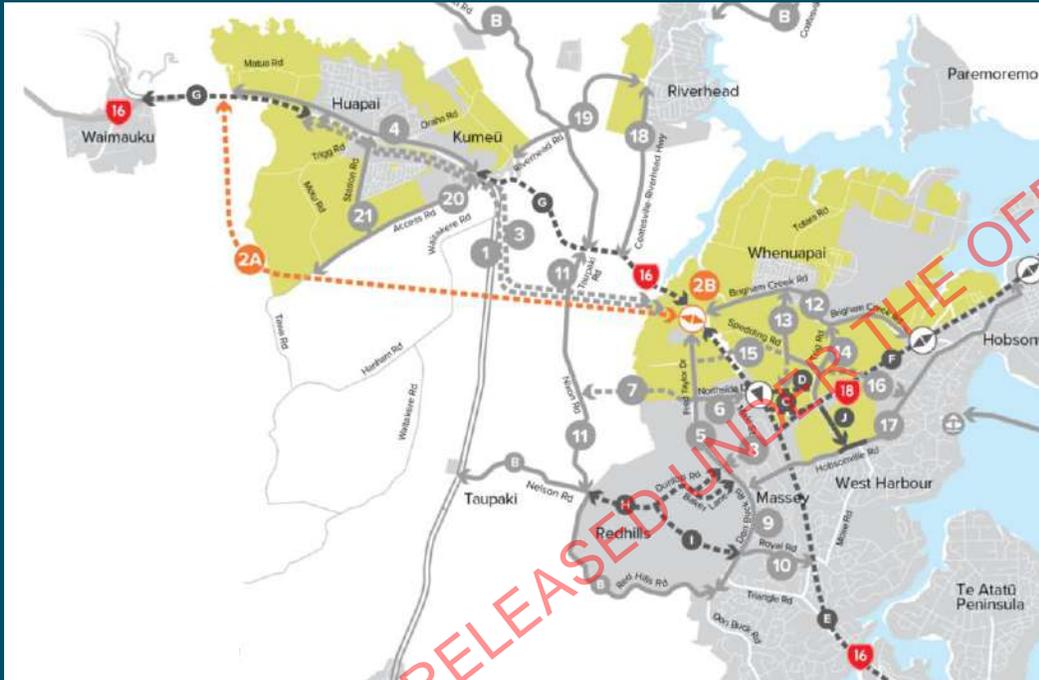
ALTERNATIVE STATE HIGHWAY– RECOMMENDED OPTION

ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives		Alignment
Access	Improve access to economic and social opportunities to, from and within Kumeū-Huapai by removing the strategic function from the existing state highway.	New strategic function providing a new alternate route, enabling a reduction in travel time between Waimauku and Brigham Creek, for FUZ and through trips. Strategic trips will be removed from the town centre and through Kumeū-Huapai, improving local access options.
Reliability	Improve reliability of inter-regional movements in Northwestern Growth area	Alignment will provide a second transport corridor into Kumeū-Huapai improving reliability. Freight to access future industrial zoning directly from the Tawa interchange without having to traverse urban areas. Identified 'motorway' standard with no direct access, except at interchanges, improves reliability, compared to existing SH16.
Safety	Contribute to a transport network between Brigham Creek and Waimauku that is free from DSIs	Alternative route to remove strategic trips from unsuitable parallel rural roads. Provision of active modes on the corridor to provide safe alternative strategic cycling access. New corridor will achieve appropriate risk rating. Tawa Interchange provides for safe active mode access outside the interchange footprint to Tawa Road/Access Road.
Integration	Provide a transport system that enables a more sustainable, high quality, connected urban form and supports growth in Kumeū-Huapai	Supports placemaking opportunities in Kumeū-Huapai townships by removing heavy vehicle and private carbon emitting vehicles from existing SH16 and enabling reallocation of space for more climate friendly modes such as rapid transit, walking and cycling. Grade separation at local roads to maintain local access. Alignment severs FUZ where lower density development is expected to be provided, minimises visual impact on western segment for adjacent rural land use.
Climate Change	Part of collective strategic transport solution (including RTC and SH16 Main Road upgrade) which supports transformation to a low carbon transport system. The role of the ASH is to remove strategic trips from Kumeū-Huapai to allow existing SH16 to be downgraded to an arterial to better support the operation of the RTC and reduce reliance on carbon emitting private vehicle travel by encouraging walk-up and cycle-up catchment at stations. The State highway corridor itself will also have active mode facilities to support strategic cycling movements in the North West. The allocation of the proposed four lanes on ASH will be decided upon implementation but the additional capacity could also be used for managed lanes or interim public transport facilities.	

Brigham Creek Interchange

Project 2B



BRIGHAM CREEK INTERCHANGE – PRELIMINARY ASSESSMENT

PROJECT #2B: BRIGHAM CREEK INTERCHANGE



PURPOSE

- Provide reliable access and efficient interface between the strategic and local network
- Improved and safer access for active modes through the interchange

GAP ANALYSIS

- North West DBC reconfirms IBC eastern connection for ASH and RTC at Brigham Creek.
- Given the size of the interchange and complexity of modal interaction a separate option assessment is warranted in this DBC.

EXTENTS AND FORM

- Interchange to facilitate and connect:
 - Strategic roads of SH16, ASH and RTC.
 - Local roads of Fred Taylor Dr and Brigham Creek Road.
- Provide efficient strategic people movement on the motorway and rapid transit system, whilst simultaneously providing for three key local access corridors between Redhills, Whenuapai, Riverhead and Kumeū-Huapai.
- Active modes need safe passage through the interchange with least conflict with vehicles as possible.

FUTURE LAND USE

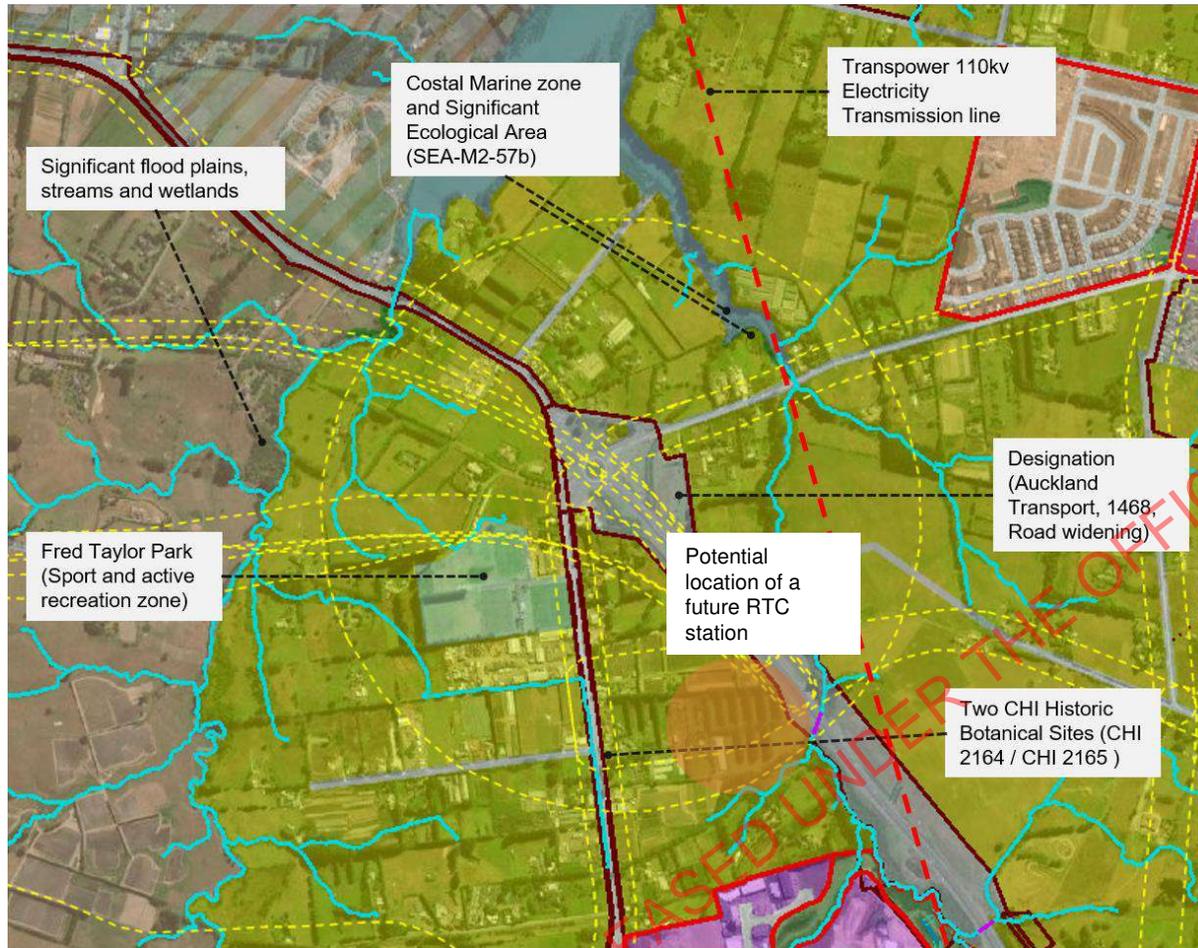


- Additional light industry zoning.
- New neighbourhood centres
- Residential - Terrace Housing & Apartment Buildings
- A Brigham Creek Interchange
- R Indicative Rapid Transit Station

- Interchange located in Future Urban Zone.
- Adjacent an existing open space of Fred Taylor Park.
- Auckland Council prepared a Draft Spatial Land Use Strategy prior to formal structure planning to inform option development. Only small amount of additional light industry zoning is expected adjacent existing zoning. Other social infrastructure likely to include neighbourhood centres.
- Whenuapai Structure Plan provides for residential intensification (Terraces Houses Apartment Buildings zone) north east of the interchange.
- North West Rapid Transit (NWRT) IBC defines an indicative station located south of the interchange. Preliminary discussions indicate that depot and stabling infrastructure may also be required near this station – not in scope for this DBC.
- This results in a confluence of transport and land use demands at this location which need to be balanced. Tensions could be expected between the space required for infrastructure (rapid transit and road) compared with the desire to intensify development near a rapid transit station. In addition there is designated ‘Terrace House & Apartment Buildings’ zoning which is severed from the station via SH16 and an existing open space adjacent the interchange.
- The new Spedding Road West connection provides an opportunity to connect Whenuapai to the RTC station.

BRIGHAM CREEK INTERCHANGE – ROUTE REFINEMENT AND ASSESSMENT

CONSTRAINT ANALYSIS



Brigham Creek Interchange is bounded by the Ngongotepara and Totara Streams and is proximate to a Coastal Marine zone and SEA. The design needs to consider the adjacency to Fred Taylor Park. There is also an existing road widening designation near the existing Brigham Creek roundabout.

ASSUMPTIONS

- To maintain the most flexibility for rapid transit modes it has been assumed that the rapid transit station at Brigham Creek is at-grade. This rules out above ground/elevated RTC or ASH and represents a conservative footprint. This does not preclude reversal of elevations during detailed design.
- Local roads are therefore elevated and pass over the RTC and ASH.
- Potential Watercare gravity sewer tunnel to the west of Brigham Creek will likely prevent trenching or undergrounding of RTC or ASH.
- Indicative Brigham Creek Rapid Transit station location was provided by the NWRTN IBC and is assumed to be located in the area of land bordered by the interchange, Fred Taylor Drive and Hailes Road.
- The Brigham Creek Interchange is being designed with the ASH project. However if the rapid transit project is implemented prior to the State highway project then the interchange may be partially or fully required ahead of the State highway.

BRIGHAM CREEK INTERCHANGE – EMERGING PREFERRED OPTION DEVELOPMENT

LONG LIST

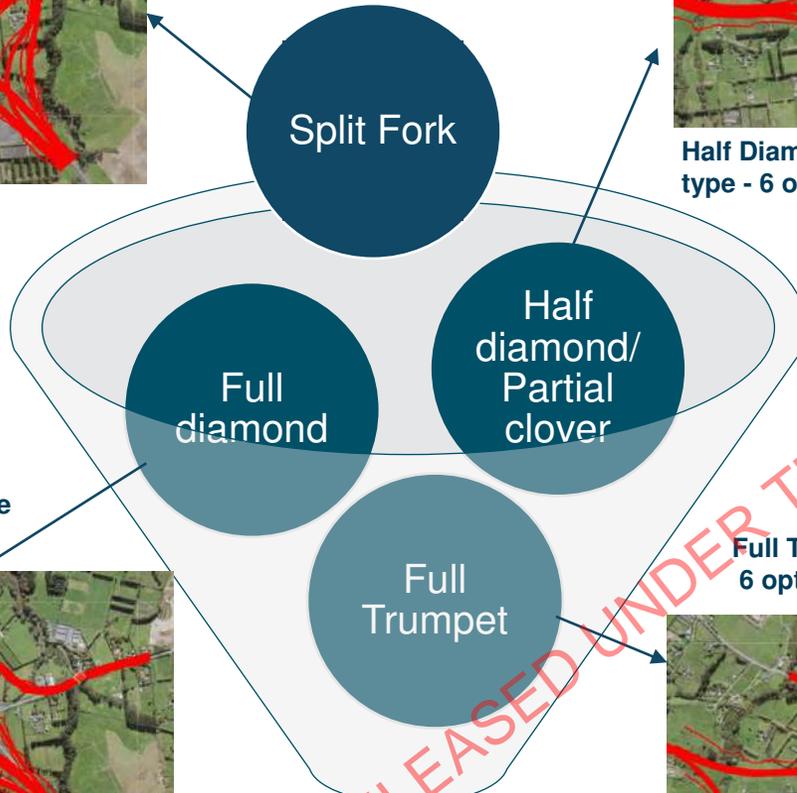
- Combinations of
- Interchange form and type
 - Local road priority
 - ASH connection



Split fork type
2 options tested



Half Diamond/ Partial Clover
type - 6 options tested



Full Diamond type
6 options tested



Full Trumpet type
6 options tested



Long list for assessment (20 Options)

SHORT LIST – FULL MCA (Reduced to 9 Options)

- 'Trumpet' discounted due to significant FUZ land use requirements.
- Half diamond / Partial clover discounted for northern ASH alignment options due to impact on Brigham Creek and Totara Creek bridges.
- Local Road priority of SH16 to Brigham Creek Road discounted due to compressed intersection spacing and performed least well for key Riverhead to Westgate movement.
- Early emerging preferred options: Diamond (land use) and Split Fork (operational efficiencies).

SHORT LIST REFINEMENT (Reduced to 2 Options)

- Refinements made to diamond and split fork arrangements including condensing land use footprints, removal of north east leg and assessing opportunity for grade separation for active modes. Initial SIDRA modelling undertaken to better understand operational capacities of the layouts.
- An additional northern ASH connection was discounted due to effects on residual land and proximity to streams.
- Two refined short list options, both with southern ASH connections were assessed against key differentiating criteria: investment objectives, land use, operations, urban design, ecology and construction.



Diamond



Split Fork

BRIGHAM CREEK INTERCHANGE – EMERGING PREFERRED OPTION ASSESSMENT

SHORT LIST REFINEMENT

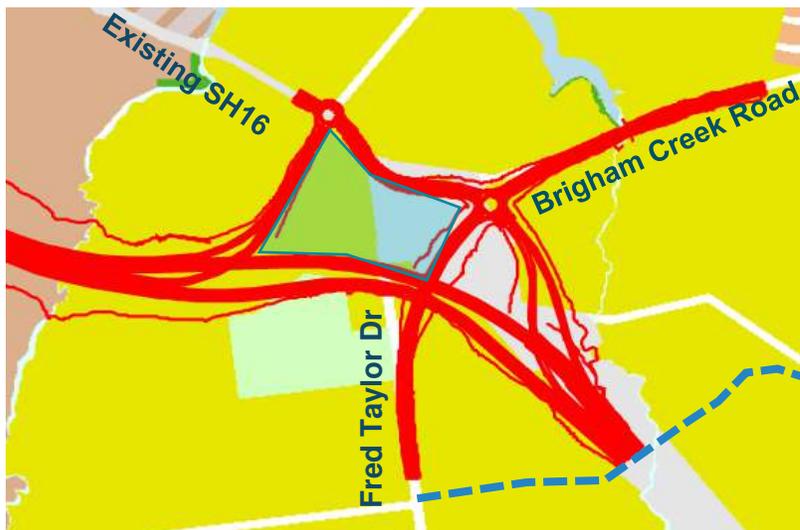
	IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	Land Use	Urban Design	Operational	Ecology	Construction Impacts		Preferred
Diamond 	✓	✓	✓	✓	Low impact	Low impact	High impact	Low impact	High impact	<ul style="list-style-type: none"> Better human scale and active frontage and permeability to the north/north east. Better access to central land use area of interchange (however only ~40% central land area available compared to Split fork). Additional land opportunities to east (potential partial release of WK designation) and in NW quadrant. 	x
Split Fork 	✓	✓	✓	✓	High impact	High impact	Low impact	Low impact	Low impact	<ul style="list-style-type: none"> Operationally more legible and direct for key connections (all modes). Active mode advantages: <ul style="list-style-type: none"> Lower exposure/improved safety with fewer intersections. More attractive with better separation between motorway and local arterials and better roadside amenity opportunities. Construction – less diversions, most flexibility. Interim staging advantages. Most available land use to south which is closer to RTC. Least effect on open space at Fred Taylor Park. Best utilises existing designations. 	✓

RECOMMENDED OPTION – SPLIT FORK

- Increased operational and safety benefits of a split fork interchange.
- Whilst not the preferred option in terms of Land Use and Urban Design criteria, impacted land remains developable and structure planning can guide appropriate development within these areas to optimise outcomes. Additional opportunities if ASH/ RTC can be swapped to be elevated over the local roads then residual land and human scale issues significantly reduce.
- Operational benefits and residual land use integration opportunities of the split fork interchange.

BRIGHAM CREEK INTERCHANGE – EMERGING PREFERRED OPTION DEVELOPMENT

EMERGING PREFERRED RECOMMENDED ALIGNMENT



- Proposed Spedding West connection
- Fred Taylor Park
- Existing Auckland Transport Road Widening designation
- Central residual land

DESIGN REFINEMENTS

- Provision of access to the central 6ha residual land.
- Additional separation between the rapid transit and Fred Taylor Park.
- Further opportunities for grade separation of active modes.
- Intersection layout informed by further modelling.

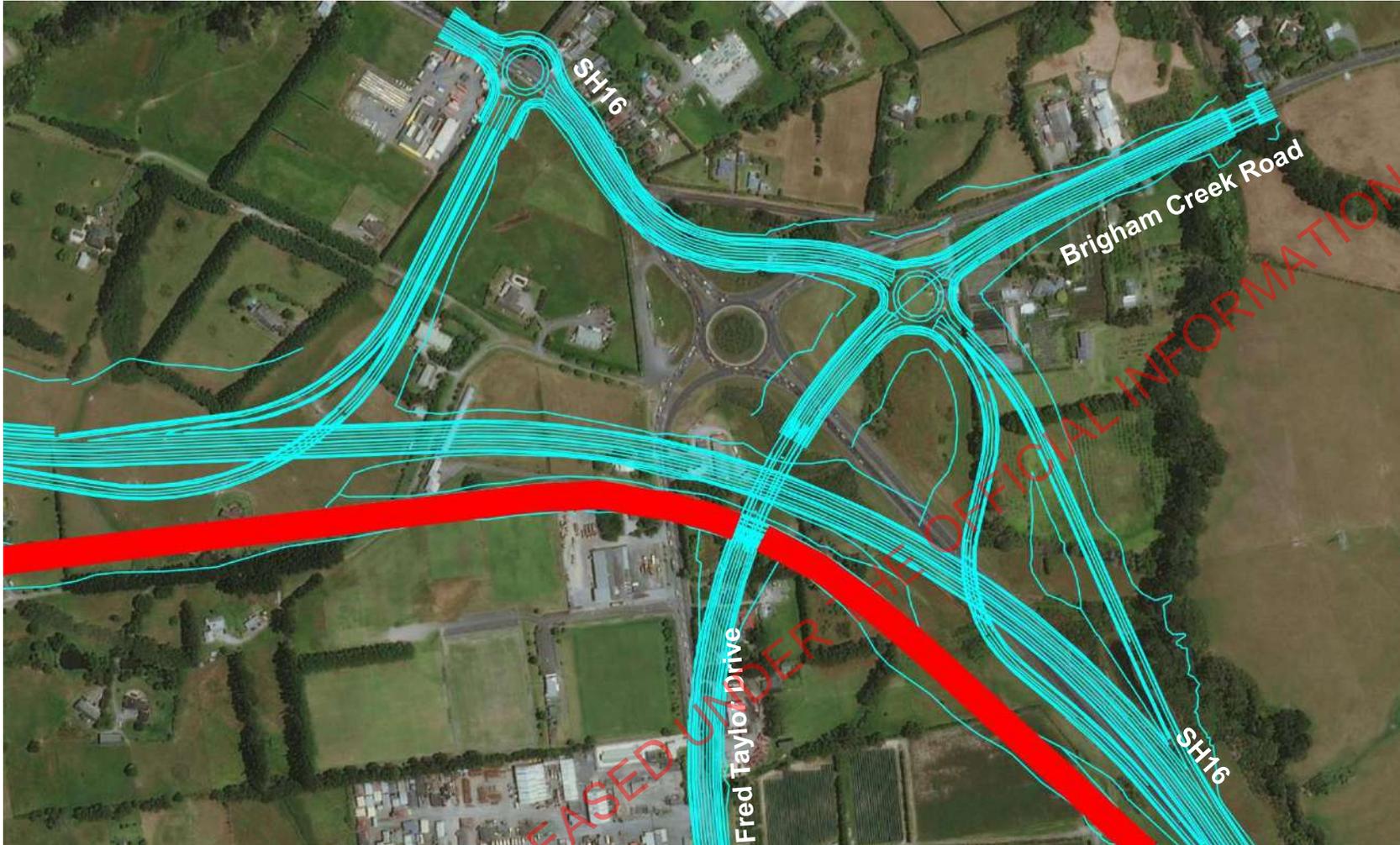
MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN

- Elevation of ASH and RTC over local roads (requires confirmation of rapid transit mode decision).
- Integration of City Centre to Westgate Rapid Transit Corridor elevation with the Spedding Road West bridge i.e. over or under this bridge.
- Provide additional permeability to the high density housing zoned in north east Whenuapai.
- Adjust vertical alignment to reduce cut and fill balance.
- Additional flood modelling.

CONSIDERATION OF RESIDUAL LAND

- Adoption of this interchange alignment results in a ~6ha piece of central residual land.
- Approximately 40% of this land area is already designated by Auckland Transport.
- In the absence of a confirmed rapid transit mode, the conservative assumption is to have the State highway and rapid transit modes (and stations) at grade and this results in this central area being compromised with permeability and human scale issues.
- Discussions with Waka Kotahi and Auckland Council confirmed that this area of land is **developable but potentially constrained**. Special purpose land use applications need to be explored - residential is not preferred. Mechanisms might include the future Redhills North structure planning or plan change process.
- Viewed as an opportunity to move the project from a solely infrastructure focussed project to one that has wider community benefit and land integration.
- Important that access is provided to this land area and this will be considered during design refinements.
- It is noted that if the elevation of roads swap then the urban form outcomes would be vastly improved and could even exceed the diamond interchange outcomes.
- Business case to focus on identifying a forward planning pathway to realise these opportunities in future stages of development.

BRIGHAM CREEK INTERCHANGE – RECOMMENDED OPTION



- RTC alignment
- ASH alignment

OPPORTUNITIES

- Confirm rapid transit mode and seek to realise opportunity to swap elevation and raise RTC and ASH alignments over the local roads to improve human scale and access to central land area.
- Additional grade separation for active modes.
- Can be partially built offline to allow current network to keep operating.

RISKS FOR NOTICE OF REQUIREMENT

- Flooding mitigation resulting in additional bridges and cost.
- Additional ecology mitigation required for wetlands and streams.
- Local property access.
- Stakeholder objections.

INTERDEPENDENCIES

- Alternative State Highway.
- Rapid Transit Corridor in this North West DBC
- City Centre to Westgate Rapid Transit Corridor including Brigham Creek Station and integration with the Spedding Road West overbridge.
- Local roads of Brigham Creek Road, Fred Taylor Drive and existing SH16.
- SH16/18 Connections project.

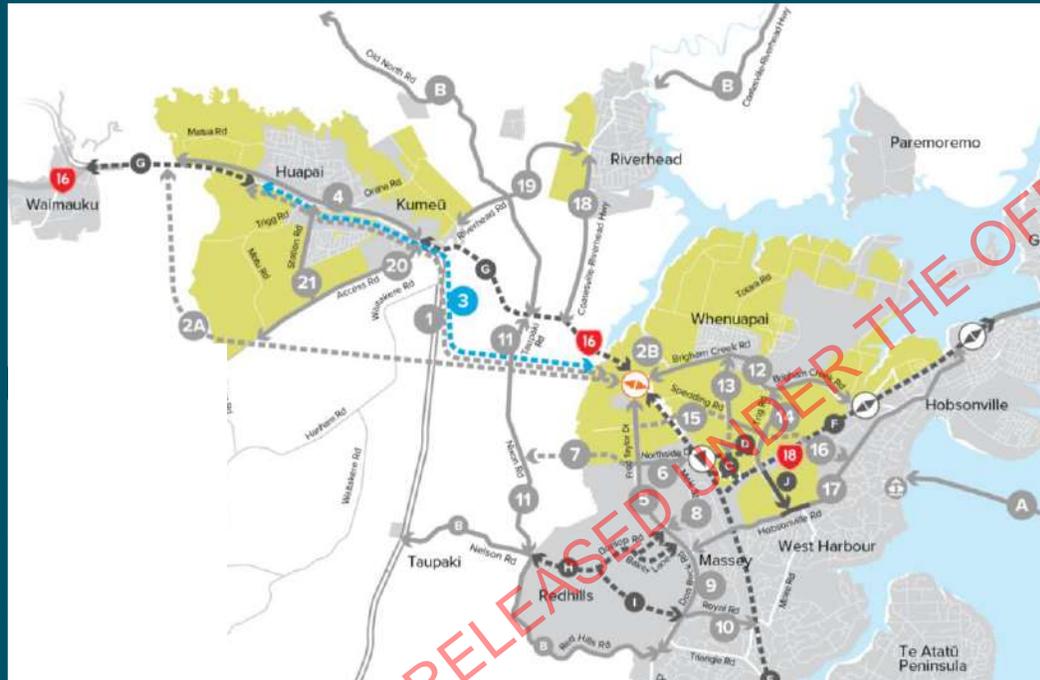
BRIGHAM CREEK INTERCHANGE– RECOMMENDED OPTION

ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives		Alignment
Access	Improve the access of people to economic and social opportunities for movements through the Brigham Creek Interchange	Provides west-facing ramps for ASH supporting access between Kumeū-Huapai and Whenuapai-Westgate, improving access to economic and social opportunities. The RTC and RAMC will be grade separated through the Interchange on southern/western side providing high quality / uninterrupted connections, improving access to economic and social opportunities. Provides for key strategic people movements between Riverhead / Whenuapai and SH16 to/from the City providing better access to strategic connections for economic and social opportunities.
Reliability	Improve the reliability of people movement through the Brigham Creek Interchange	Grade separates local and strategic people movement on the local and strategic corridors enabling good quality people movement. Enables the ASH and RTC corridors to be grade separated from local movements, benefiting people travelling on those corridors to/from the Kumeū-Huapai catchments. Provides a high degree of separation between ramp intersections and minimises delays to key PT services.
Mode Choice	Support transformational mode share in the area including the provision of a safe and attractive active mode facilities through the interchange	Supports transformational mode share for the Kumeū-Huapai catchment by enabling both RTC and RAMC to be grade separated from local movements at the Brigham Creek Interchange. More attractive with better separation between motorway and local arterials, more direct connections, and better roadside amenity opportunities.
Safety	Contribute to the operation of an interchange that is free from deaths and serious injuries	Grade separates local active mode connections from the higher speed state highway movements and manages interaction between local and strategic vehicle movements. RAMC will be a high quality and continuous facility in all options. Lower exposure/improved safety with fewer intersections.
Climate Change	Upgrades the at-grade roundabout for a grade separated facility that provides space for all modes including rapid transit and active modes. Connects future local active mode networks of Fred Taylor Dr, Brigham Creek Road and existing SH16 to ensure a connected active mode network not severed by the State highway system. Supports mode shift and reducing vehicle emissions for local trips between growth areas.	

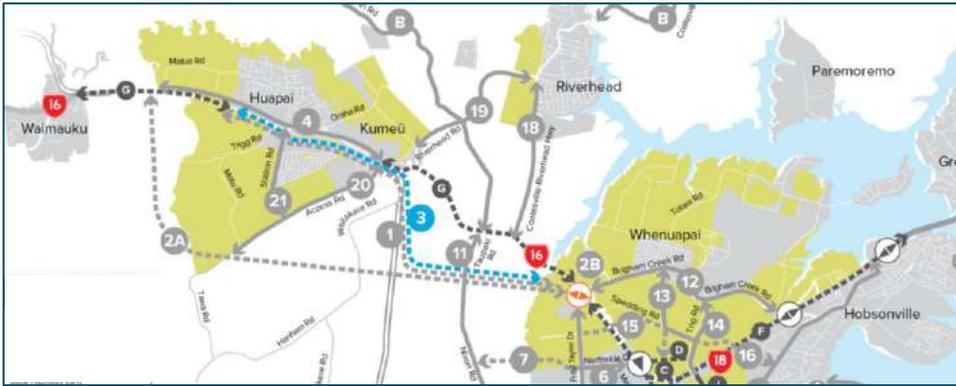
Regional Active Mode Corridor

Project 3



REGIONAL ACTIVE MODE CORRIDOR – PRELIMINARY ASSESSMENT

PROJECT #3 REGIONAL ACTIVE MODE CORRIDOR



PURPOSE

- Provision of a safe, segregated, high quality active mode access between Westgate and Kumeū.

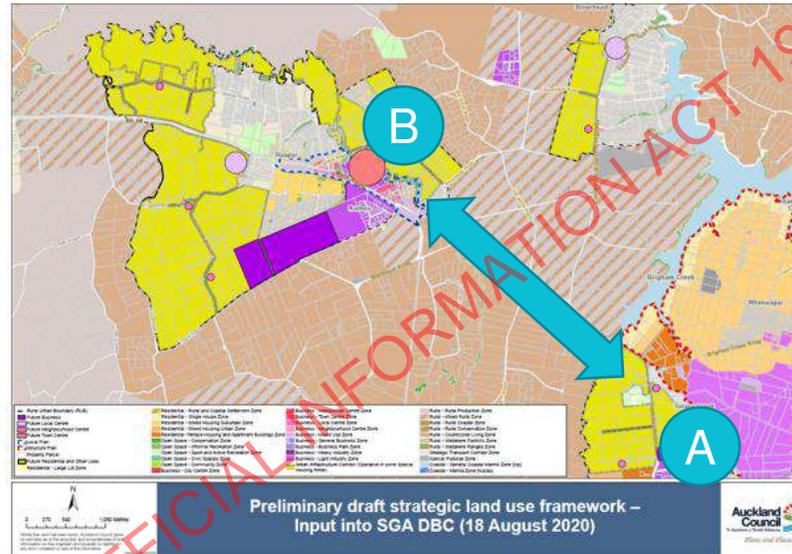
GAP ANALYSIS

- IBC identified opportunity for an active mode facility along the proposed rapid transit corridor.
- Following the IBC, the SH16 Safety Improvements project has proposed a shared path (3m) along the western side of SH16. This is funded and is in the final stages of preliminary design.
- DBC to reconfirm the strategic walking and cycling connection requirement and re-assess the previously identified alignment alongside the other options

EXTENTS AND FORM

- Defined in the Te Tupu Ngātahi Design Framework as a corridor that provides interregional connections and connects town and metropolitan centres or rapid transit services.
- Regional facility to support a high quality, direct and coherent facility that is separated, uninterrupted and supports higher cycle speeds.
- Facility to extend as far as Kumeū gateway, where it joins the local cycle network near Access Road.

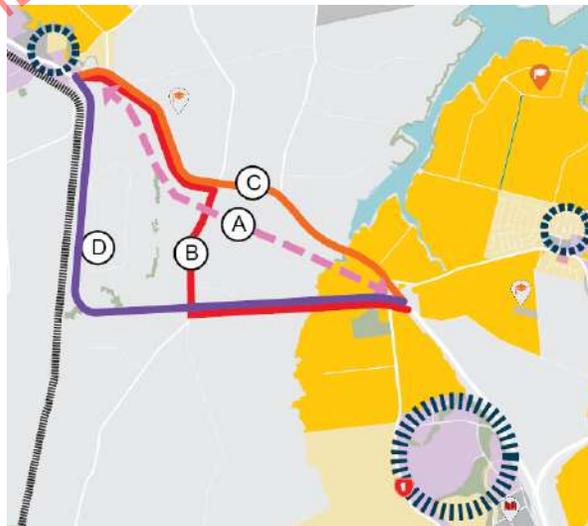
LAND USE



- Additional light industry zoning.
- Expanded town centre
- New local centre
- New neighbourhood centres
- A Westgate Metropolitan centre
- B Future Kumeū town centre
- ↔ Desired regional active mode connection

- Auckland Council Draft Spatial Plan confirms an expanded town centre in Kumeū.
- Facility is through Rural-Countryside Living Zone areas to connect Kumeū-Huapai and Redhills/Whenuapai growth areas.

OPTION DEVELOPMENT



Four options identified:

- Greenfields direct route
 - ASH/Taupaki Road/SH16
 - Existing SH16 shared path (assuming implemented)
 - ASH/RTC Corridor.
- Option A not shortlisted due to limited local access, less attractive, more suited to a recreational route and duplication of crossing infrastructure i.e. bridges
 - Option B not shortlisted due to less coherence from multiple facility types, multiple transition points, limited local access and not a direct route for commuters.

REGIONAL ACTIVE MODE CORRIDOR – ROUTE REFINEMENT AND ASSESSMENT

OPTION ASSESSMENT		IO1: Access	IO3: Mode	IO4: Safety	Directness	Speed	Topography	Quality of service	Safety		Preferred
C	Proposed SH16 Shared Path 	✓	✓	✓	Low impact	Low impact	High impact	High impact	High impact	<ul style="list-style-type: none"> • Direct and coherent facility, shortest route • Proximity to busy 4 lane arterial and multiple vehicle crossings resulting in lower speeds • Topography 8% through the Ngongotepara Stream section • 3m shared path less likely to meet long term quality of service • Several connections to other primary AMC routes (incl Riverhead) • Passive surveillance from the SH16 corridor • Lower safety due to proximity of SH16, driveways and intersections 	x
D	ASH/RTC alignment 	✓	✓	✓	High impact	Low impact	Low impact	Low impact	Low impact	<ul style="list-style-type: none"> • High quality facility and uninterrupted, Separated from ASH/RTC • Limited local access but, higher speed achieved along route • Average grade 3% • Consistent and coherent facility • Passive surveillance along ASH and RTC • Can provide access to Taupaki Rd shared path, connection to SH16/ Riverhead • Efficiency in land acquisition through a combined multi-modal corridor • Higher safety due to no driveway/intersection crossings 	✓

RECOMMENDED OPTION – OPTION D

- Higher quality of service providing a segregated facility with high speeds and a predominately flat route.
- Safer route as less side friction and conflict points. Avoids safety issues at key intersections.
- Better cycle connection for full Kumeū-Huapai growth. Complementary with proposed SH16 shared path which provides for existing Kumeū-Huapai population plus long term Riverhead demand. Opportunity for SH16 / RAMC connection via Taupaki Rd
- Opportunity to be a “Cycle Superhighway” and connect with Northwestern Cycleway. In combination with ASH shared path and future local networks provides access for majority of Kumeū-Huapai FUZ.
- Efficiency in land acquisition - not a standalone route so can be route protected with other facilities (RTC/ASH).
- Reduced reputational risk as no piecemeal land take required compared to Option C which might need re-litigation to accommodate a wider facility.

REGIONAL ACTIVE MODE CORRIDOR – RECOMMENDED OPTION

RECOMMENDED OPTION

- Facility to be co-located with the combined ASH/RTC between Brigham Creek Interchange and North Auckland Line.
- To co-locate with the RTC alignment between the North Auckland Line and Kumeū.
- Facility terminates at the entrance to Kumeū and joins local active modes network as part of SH16 Main Road, Access Road and Riverhead Road Upgrade projects.
- **Separate option development has not been undertaken. Refer to Rapid Transit Corridor alignments for details.**



RISKS

- Delay to facility implementation as dependent on delivery of large state highway and rapid transit infrastructure. However desired growth not likely to proceed without these key transport connections. Could result in piecemeal delivery of this connection. Would need to rely on SH16 shared path facility in the interim.

ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives		Alignment
Access	Improve access to economic and social opportunities through the provision of an integrated and attractive active mode facility between Kumeū-Huapai and Whenuapai/Westgate and the strategic network	Corridor connects with Northwestern cycleway and completes high quality (higher speed) connection between metropolitan centre of Westgate and the expanded Kumeū town centre. Connects with facility on ASH serving southern FUZ. Other local connection opportunities to maximise access to the facility in rural area.
Mode Choice	Provide a high quality, safe and attractive strategic active mode facility between Kumeū-Huapai and Whenuapai/Westgate.	Consistent and coherent facility. Segregated facility with no side friction, so achieves higher speeds along a relatively flat route improving attractiveness.
Safety	Provide a safe facility which separates vulnerable users from conflict with vehicles.	Separation achieved with no driveway or intersection access and better separation from road corridor. Passive surveillance from ASH and RTC.
Climate Change	Provision of high quality active mode facilities will enable mode shift to active modes to support a low carbon transport system in growth areas.	

DESIGN DETAILS

- Opportunities for additional local connections to the active mode facility.

INTERDEPENDENCIES

- Alternative State Highway.
- Rapid Transit Corridor.
- SH16/18 Connections Project.

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Local Network Option Development

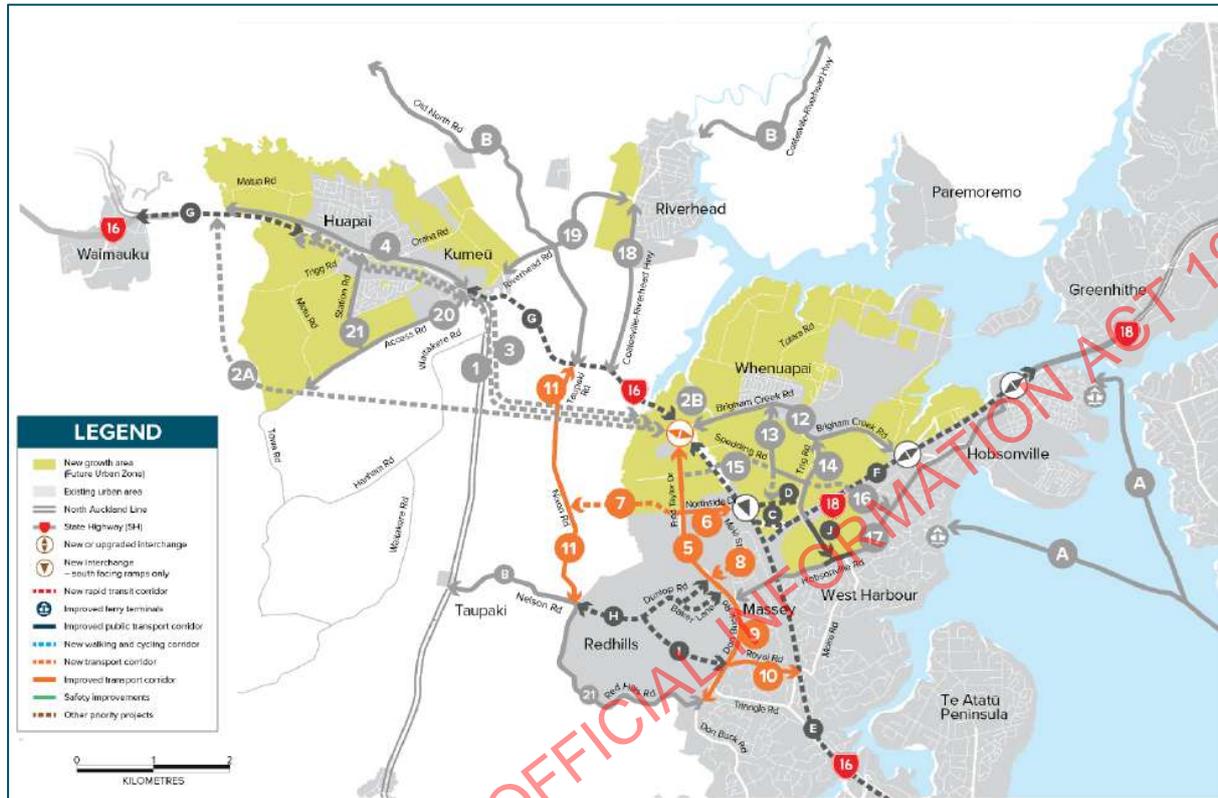
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Redhills Option Development

9.6 Redhills options development and assessment

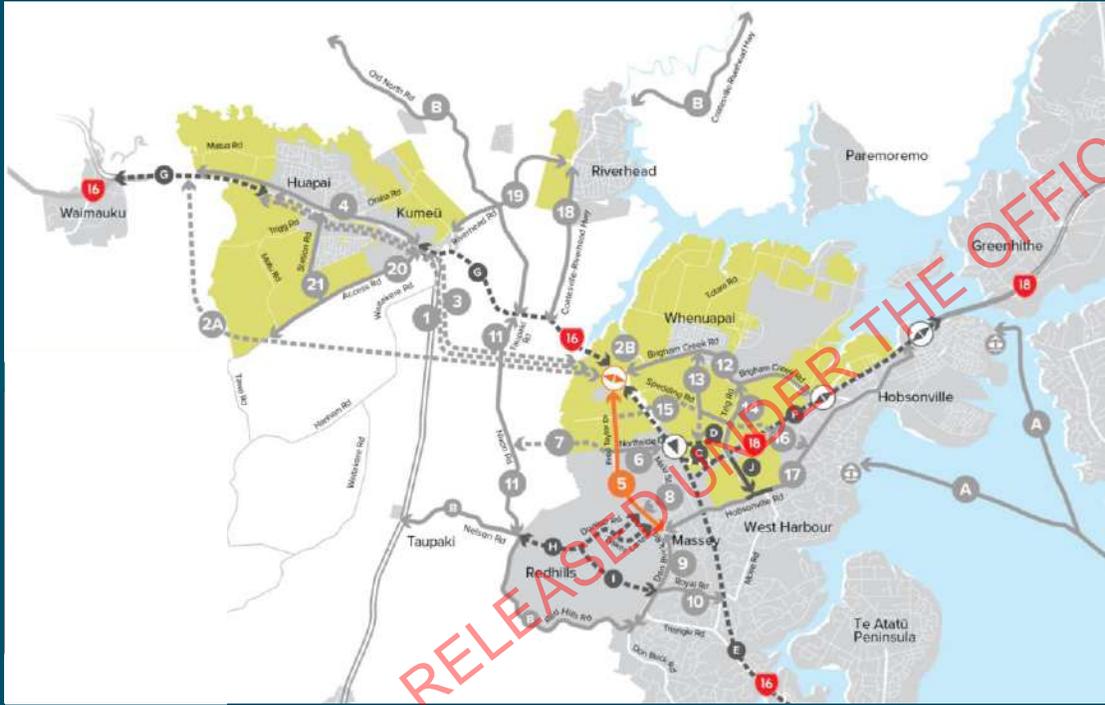
The Redhills projects are shown in Figure 9-4 below.

Figure 9-4 Redhills option assessment corridors



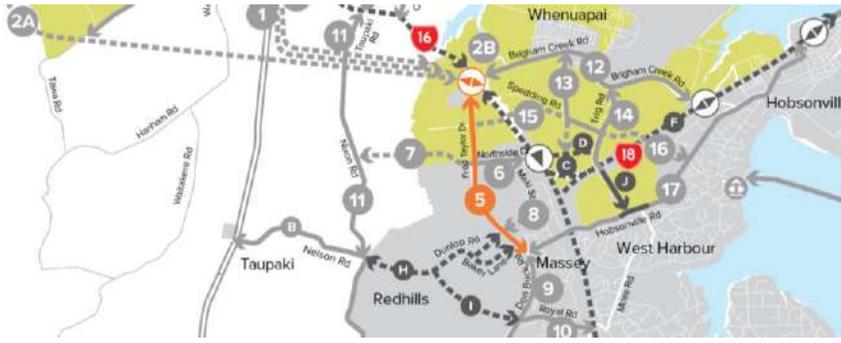
Fred Taylor Drive FTN Upgrade

Project 5



FRED TAYLOR DRIVE FTN UPGRADE – PRELIMINARY ASSESSMENT

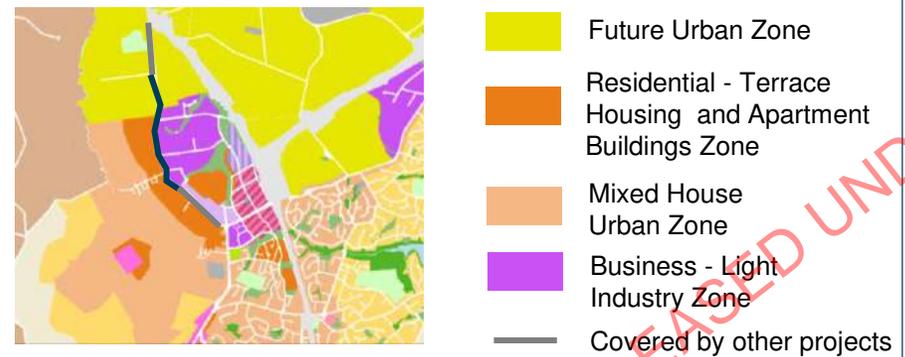
PROJECT #5 FRED TAYLOR DRIVE FTN UPGRADE



PURPOSE

- Distributes future Redhills growth and connects people to rapid transit stations, regional active modes and SH16.
- Needs to support reliable bus access to Westgate and provide improved walking and cycling facilities.

LAND USE

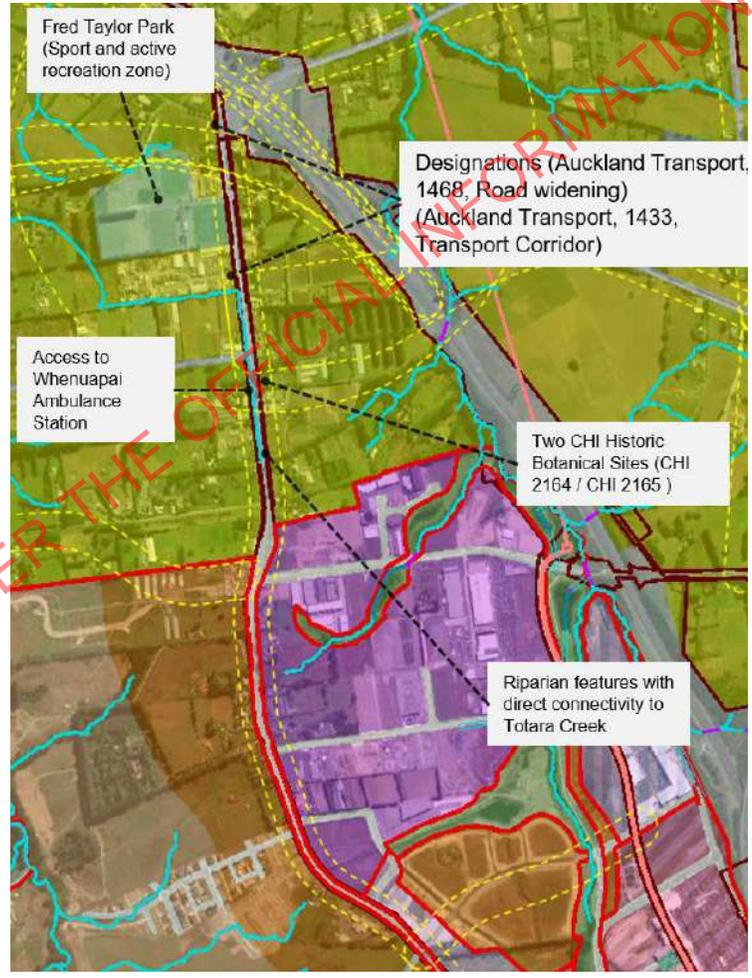


- Land use along the corridor includes a variety of different land uses including Terrace Housing and Apartment Buildings, Light Industry and Future Urban Zones.
- Development is already occurring along Fred Taylor Drive, particularly in the Redhills live zoned section which is putting pressure on additional designation opportunities.

GAP ANALYSIS

- North West DBC reconfirms IBC Indicative Transport Network alignment.

CONSTRAINTS



FORM AND FUNCTION ASSESSMENT

EXISTING CROSS SECTION



FUTURE CROSS SECTION



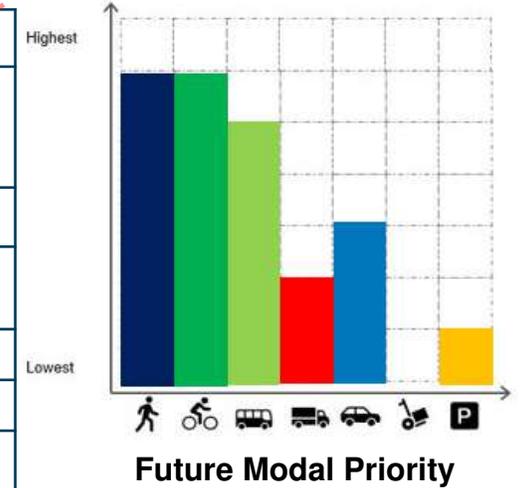
DBC OPTION DEVELOPMENT

- No options were developed as it was established that the road corridor and Auckland Transport designation generally provided sufficient width to upgrade Fred Taylor Drive.
- Option progressed straight through to development of the recommended option which considered any additional designation that may be required e.g. at intersections as well as requirements for construction.
- Due to adjacent projects (Brigham Creek Interchange and the Housing Infrastructure Fund) the extent of Fred Taylor Drive considered is from Hailes Road to Kedgley Road.

FRED TAYLOR DRIVE FTN UPGRADE – EMERGING PREFERRED OPTION DEVELOPMENT

INTERSECTION FORM ASSESSMENT

Intersection	Recommendation	Comment
Fred Taylor Drive/Don Buck Rd	Signals	Urban environment with significant traffic volumes. Close proximity to Town Centre. Redhills Precinct Plan identifies a signalised intersection as a development trigger. Currently a dual lane roundabout with poor walking and cycling facilities.
Fred Taylor Drive/Baker Lane	Signals	This intersection is being developed as part of the Housing Infrastructure workstream
Fred Taylor Drive/Dunlop Rd	Signals	This intersection is being developed as part of the Housing Infrastructure workstream. Provides public transport priority across Fred Taylor Drive through to Westgate
Fred Taylor Drive/Kakano Rd	Signals	Existing signalised intersection
Fred Taylor Drive/Northside Dr	Signals	Existing signalised intersection
Fred Taylor Drive/Hailes/Spedding Road	Dual lane roundabout	Opportunity for roundabout with future urban zoning and limited land development.



HOW SOLUTION MEETS FUTURE MODAL PRIORITY

- Provision of bus lanes and priority to support the corridors contribution to the wider North West FTN network. This link is an important feeder of buses to the Westgate metropolitan centre and a future RTC station. Whilst not an FTN route itself, Fred Taylor Drive is expected to collectively carry sufficient local buses to warrant bus lanes.
- Provision for separated cycle facilities and footpaths on both sides of the corridor.
- Retention of existing level of traffic capacity i.e. one lane in each direction.

DESIGN REFINEMENTS

- Vertical alignment raised near Hailes Road Intersection to provide for adequate freeboard above adjacent overland flow path.
- Retaining walls modelled where opportunity existed to reduce impacts on dwellings with alternative driveway access/regrading able to be provided.
- Proposed new wetland near Dunlop Road incorporated into existing wetland on eastern side.

MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN

Matters to Consider Further in Detailed Design	Complexity Rating
Existing intersection arrangements and existing development constraints	M
Public transport priority on Fred Taylor Drive connecting through to Westgate.	M
Protection of significant services (Watercare 470 CLS Transmission Main in middle of road, newly installed Vector infrastructure).	M
Assessment of existing drive-way accesses towards southern end.	M
Design requirements associated with upgrading existing stormwater wetlands	L
Proposed wetland discharge points considering extent of development at the time.	L
Appropriateness of diversion drains considering soon to be built up environment.	M

FRED TAYLOR DRIVE FTN UPGRADE – RECOMMENDED OPTION

RECOMMENDED OPTION FOR FRED TAYLOR DRIVE



OPTION

- Use existing designation.
- Localised widening of designation to allow for intersection upgrades and temporary construction space.

RISKS

- Significant development occurring along the corridor. Any changes to designation needs swift attention before opportunities are lost.
- Proposed locations for new stormwater wetlands may be opposed by landowners and may need relocation during Notice of Requirement stage.

INTERDEPENDENCIES

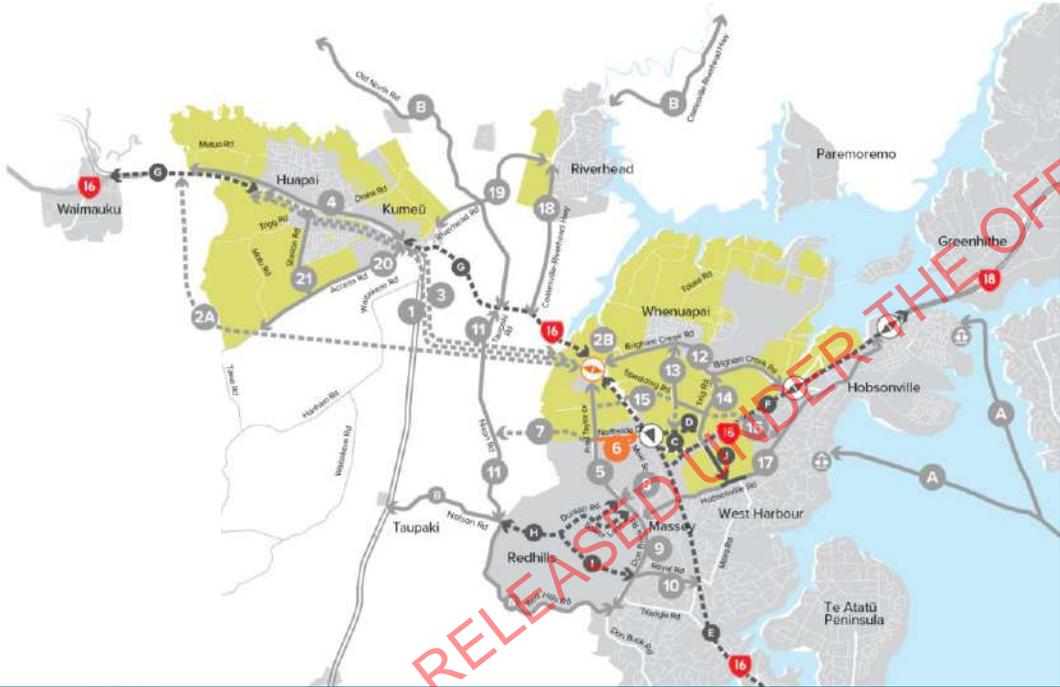
- Fred Taylor Drive/Baker Lane intersection upgrade as part of Housing Infrastructure Fund project.
- Fred Taylor Drive/Dunlop Road intersection upgrade as part of Housing Infrastructure Fund project.

ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives	Alignment
Access	<p>Improve access to economic and social opportunities along an integrated Fred Taylor Drive.</p> <p>Key corridor with dual purpose to provide access from Redhills to both a future rapid transit station and the strategic highway network. Bus lane facilities provides a multimodal corridor into Westgate metropolitan centre for local bus services.</p>
Reliability	<p>Enable reliable people movement between Redhills and SH16.</p> <p>Improved reliability of public transport with dedicated bus lanes and bus priority.</p>
Mode Choice	<p>Support transformational mode share in Redhills by providing a high quality, safe and attractive movement of people along Fred Taylor Drive.</p> <p>Multimodal corridor with separated cycle facilities on both sides as well as enhanced public transport facilities to support a frequent bus service to Westgate and beyond.</p>
Safety	<p>Provide improvements on Fred Taylor Drive that contribute to a transport network that is free from deaths and serious injuries.</p> <p>Provision of separated cycle facilities and improved intersection controls to support safety of turning traffic.</p>
Integration	<p>Provide a transport system that is integrated with land use enabling a more sustainable, high quality, connected urban form which supports growth in the North West.</p> <p>Access to the existing land use maintained along the length of the corridor. Sufficient width to provide future mid block pedestrian crossings to improve corridor permeability.</p>
Climate Change	<p>Supporting transformation to a low carbon transport system through the development of a multimodal corridor to increase non vehicular people movement capacity through the provision of dedicated bus infrastructure and walking and cycling facilities.</p>

Northside Drive East Upgrade

Project 6



NORTHSIDE DRIVE EAST UPGRADE – PRELIMINARY ASSESSMENT

PROJECT #6 NORTHSIDE DRIVE EAST UPGRADE



PURPOSE

- Connect Fred Taylor Drive to Westgate.
- Improve active mode facilities along this existing corridor.

GAP ANALYSIS

- North West DBC reconfirms IBC Indicative Transport Network alignment.

LAND USE



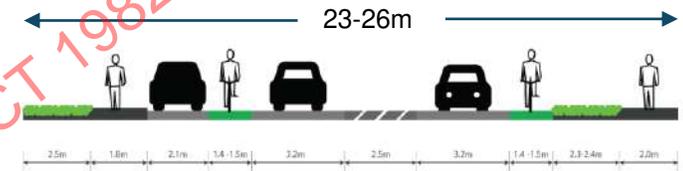
- Future Urban Zone
- Residential - Terrace Housing and Apartment Buildings Zone
- Residential - Mixed Housing Urban Zone
- Business - Light Industry Zone
- Business Zone

- Land use along the corridor is primarily Light Industry and Open Space – Informal Recreation zoning. Not in the Future Urban Zone.

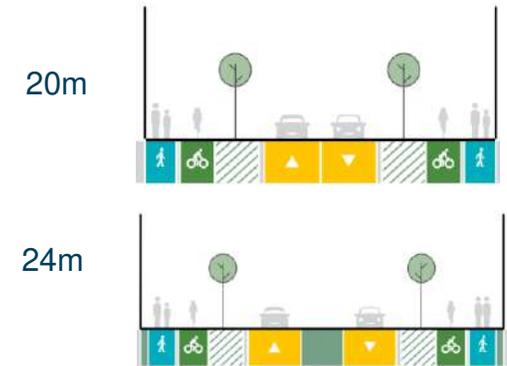
FORM AND FUNCTION ASSESSMENT

- Built as part of Plan Change 15, Northside Drive was upgraded to a two-lane urban arterial with pedestrian and cycling facilities.
- The existing road reserve varies between 23.5 and 26 metres in width with parking on one side and water sensitive design features. This road width is sufficient to achieve the Te Tupu Ngātahi form and function desired for this corridor.
- Buses per hour are expected to reduce from four to three due to improvements on adjacent corridors of Spedding Road and Dunlop Road. Therefore bus priority facilities are not required.
- No additional vehicle capacity is being provided.

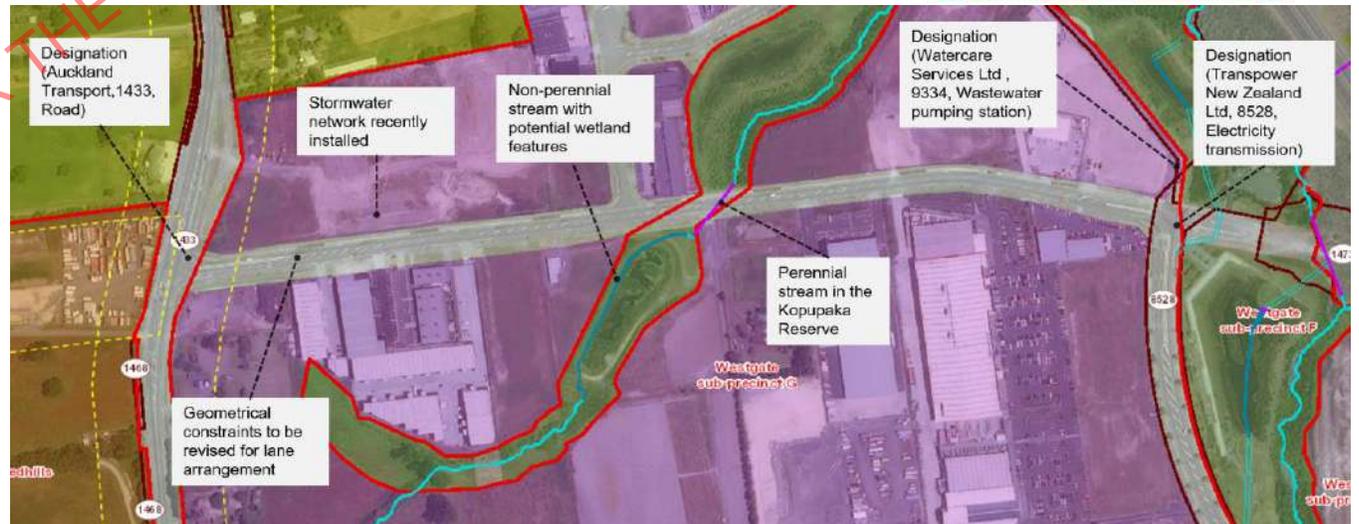
EXISTING CROSS SECTION



FUTURE CROSS SECTION



CONSTRAINTS



- Main constraints associated with stream and water management or existing utilities.

NORTHSIDE DRIVE EAST UPGRADE– EMERGING PREFERRED OPTION DEVELOPMENT

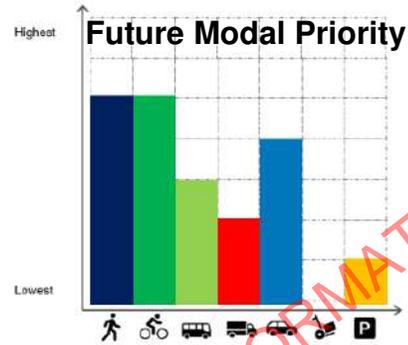
DBC OPTION DEVELOPMENT

- Northside Drive East corridor currently is a minimum of 23m and will remain a two lane road in the future.
- Should Auckland Transport desire to upgrade the on road cycle facilities to separated facilities, the road reserve can accommodate the 20m Te Tupu Ngātahi two lane ‘no access’ cross section (no flush median) as there is limited property access along this corridor. In addition, further road allocation flexibility could be provided through a locally constrained version of the 24m Te Tupu Ngātahi two lane cross section which does provide for a flush median. This DBC has chosen to cost the 20m cross section road space reallocation project.
- Stormwater improvements are based on upgrading existing facilities to respond to climate change.
- No road widening options were subsequently developed as part of this DBC.
- **Therefore the existing road reserve is considered sufficient for future road space allocation projects and no further route protection is required.**

INTERSECTION FORM ASSESSMENT

Intersection	Recommendation	Comment
Northside Drive/Fred Taylor Drive	Retain existing signals	Also assessed as part of Fred Taylor Drive.
Northside Drive/Maki Street	Retain existing signals	Possible consideration as part of SH16/18 connections.

HOW SOLUTION MEETS FUTURE MODAL PRIORITY



- Existing road reserve provides sufficient space for retrofitting of separated cycle facilities and footpaths on both sides of the corridor.
- Retention of existing level of traffic capacity i.e. one lane in each direction.

DESIGN REFINEMENTS

- Proposed cross-section was reduced to a 20m two-lane arterial.
- Cross-section further reduced locally near Maki Street by removing the front berm on the southern side.
- Proposed two new wetlands near Dunlop Road incorporated into existing wetlands on northern side.
- Extent of work revised to tie-in on eastern side of Maki Street before the intersection, with SH16/18 Connections Project proposing to tie-in on the western side.

MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN	Complexity Rating
Existing intersection arrangements and existing development constraints	M
Design requirements associated with upgrading existing stormwater wetlands	L
Rest areas for active mode users due to steeper grades experienced on the approach to Fred Taylor Drive. Note gradients meet current design standards.	M
Shift alignment north near Maki Street to avoid having to locally reduce the cross section.	L

NORTHSIDE DRIVE EAST UPGRADE – RECOMMENDED OPTION

ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives		Alignment
Access	Improve access to economic and social opportunities along an integrated Northside Drive.	Corridor remains a key link to provide access from Redhills to the strategic highway network. Will also provide access from Whenuapai to Westgate once SH16/18 Connections project completed.
Mode Choice	Support transformational mode share in Redhills and Whenuapai by providing a high quality, safe and attractive movement of people along Northside Drive.	Upgraded cycle and walking facilities will improve quality of service to achieve higher levels of active mode access on this part of the network.
Safety	Provide improvements on Northside Drive that contribute to a transport network that is free from deaths and serious injuries.	Upgraded cycle facilities reduce risk of exposure for cyclists.
Climate Change	Provision of high quality active mode facilities will enable mode shift to active modes to support a low carbon transport system in growth areas. Achieved through the provision of improved levels of service for the North West active mode network. Upgrade of existing wetlands to address climate change related stormwater management. No change to the capacity for private vehicles.	

RECOMMENDED OPTION

- Reallocate road space within the existing road reserve of to provide upgraded separated cycle facilities. Design utilises the 20m Te Tupu Ngātahi cross section. A locally constrained 24m could be investigated during future detailed design if a flush median is desired.
- Vehicle capacity remains at two lanes.

RISKS

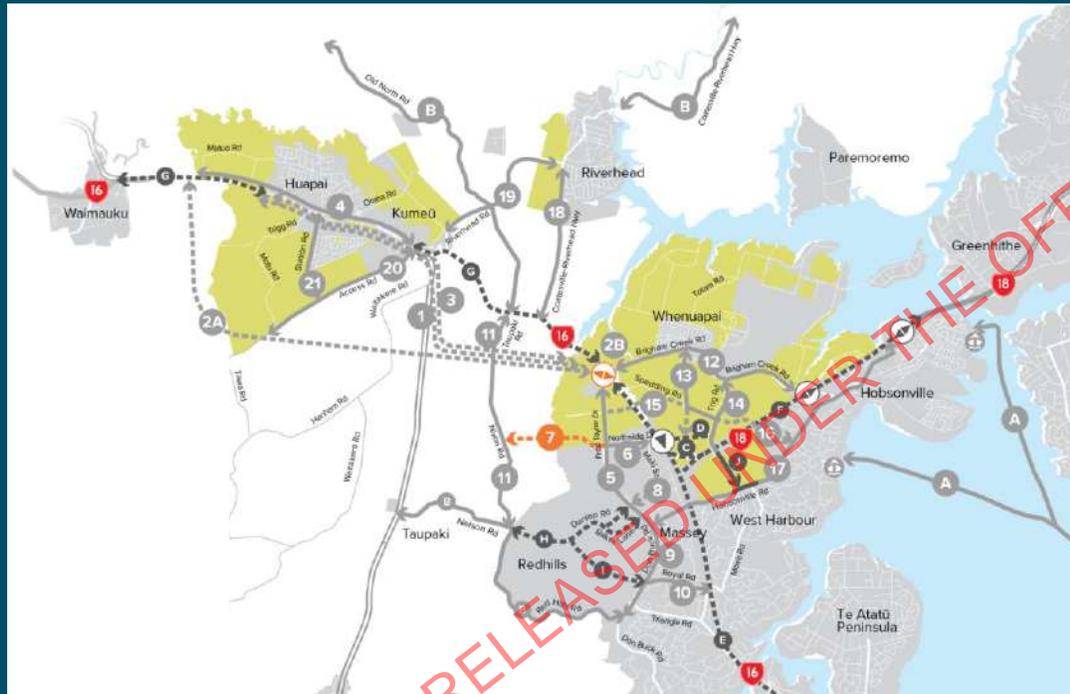
- Proposed upgrade of existing wetlands to address climate change not feasible during detailed design and new locations required to be identified. This could have an impact on land requirement.

INTERDEPENDENCIES

- Northside Drive Extension over SH16 as part of Waka Kotahi's SH16/18 Connections Project.
- New Northside Drive West corridor extension to Taupaki Road.
- Intersection with Fred Taylor Drive FTN upgrade project.

New Northside Drive West

Project 7



NEW NORTHSIDE DRIVE WEST – PRELIMINARY ASSESSMENT AND OPTION DEVELOPMENT

PROJECT #7 NEW NORTHSIDE DRIVE WEST



PURPOSE

- Alternative east west connection between Redhills and Kumeū to provide resilience to SH16. Connects cyclists from Fred Taylor Drive to future facilities on Taupaki Road which ultimately connect with the ASH.

GAP ANALYSIS

- North West DBC reconfirms IBC Indicative Transport Network alignment.

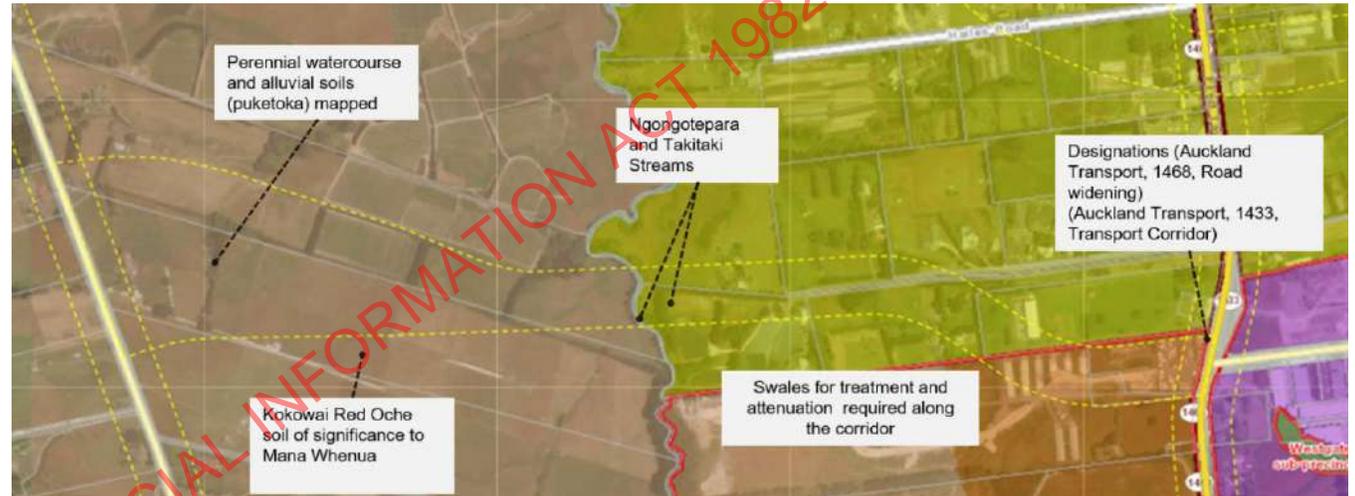
LAND USE



- Future Urban Zone
- Residential - Terrace Housing and Apartment Buildings Zone
- Residential - Mixed Housing Urban Zone
- Business - Light Industry Zone
- Business - General Business Zone
- Rural Countryside Living Zone

- Land use along the corridor is a mix of terrace housing, apartment buildings, mixed housing urban, future urban and Rural-Countryside Living zoning.

CONSTRAINTS



- Constraints focused on streams, water management and significant soils.

FORM AND FUNCTION ASSESSMENT

FUTURE CROSS SECTION (Rural section)



FUTURE CROSS SECTION (Urban section)



DBC OPTION DEVELOPMENT

- No option developed for the east side of the Ngongotepara Stream as corridor is through an urban area that has been structure planned and partially consented. No rationale to change these assumptions.
- Two western corridor refinement options:
- Option 1** – a 24m cross section with a ‘straight’ alignment between Ngongotepara Stream and Nixon Road.
- Option 2** - a 24m cross section with a ‘north west’ alignment between Ngongotepara Stream and Nixon Road.

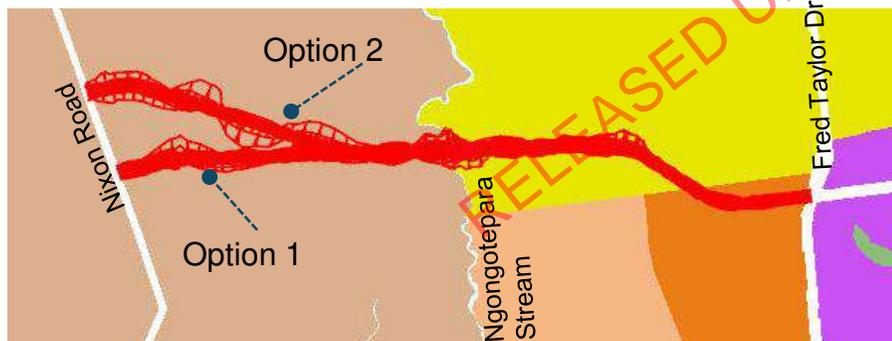
NEW NORTHSIDE DRIVE WEST – ROUTE REFINEMENT AND ASSESSMENT

OPTION ASSESSMENT

KEY IMPACTS

High impact
 Medium impact
 Low impact

		IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	Heritage	Land	Stormwater/ Ecology	Transport	Construction	SUMMARY OF ASSESSMENT	Preferred
1	SGA 24m rural cross section Southern option west of Ngongotepara	✓	✓	✓	✓						Option 1 low point is offset from the Ngongotepara stream and has less flood risk. Least impact on wetlands, floodplain and woody vegetation of local ecological importance. Lower earthworks volumes and located further away from Aronui Stream. One property severed reducing development potential.	✓
2	SGA 24m rural cross section Northern option west of Ngongotepara	✓	✓	✓	✓						Responds better to existing lot patterns which is reflective of rural land use. Located on a property boundary so no residual land issues. Increased flood risk due to low point adjacent Ngongotepara Stream. More extensive impact on ecological features such as wetlands, streams and woody vegetation. Higher earthworks than Option 1.	x



EMERGING PREFERRED OPTION – OPTION 1 SOUTHERN ALIGNMENT

- Less ecological effects on existing habitats and vegetation and less stream fragmentation.
- Less flood risk and difficulties to treat stormwater due to being positioned away from low points adjacent to the Ngongotepara Stream. This also led to a preference in terms of construction costs and risks.
- Less prominent in the landscape due to lower earthwork volumes and less vegetation removal.
- Greater land requirement and land use impacts compared to Option 2, but potential for alternative access arrangements or lot amalgamations.

NEW NORTHSIDE DRIVE WEST – EMERGING PREFERRED OPTION DEVELOPMENT

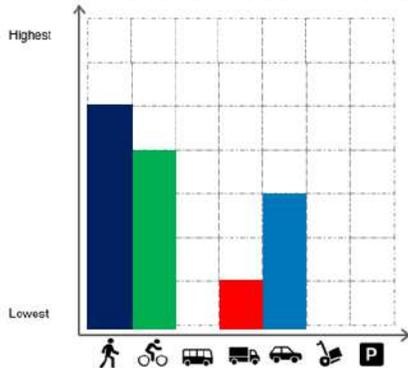
INTERSECTION FORM ASSESSMENT

Intersection	Recommendation	Comment
Northside Drive Extension and Fred Taylor Drive	Signals	Existing signalised intersection. Additional PT priority to be provided. Recently constructed as part of Westgate development. Designation utilised to full extent to future proof.
Northside Drive Extension and Nixon Road	Single Lane Roundabout	Rural adjacent land use. Speed management opportunity.

HOW SOLUTION MEETS FUTURE MODAL PRIORITY

- Provision for separated cycle facilities and footpaths on both sides of the corridor.
- Retention of existing level of traffic capacity i.e. one lane in each direction.

Future Modal Priority



DESIGN REFINEMENTS

- Horizontal alignment revised to match existing consented development at 132-136 Fred Taylor Drive.
- Vertical alignment revised to ensure low point is off the bridge structure.
- Vertical alignment raised where necessary to provide for adequate freeboard requirements above Ngongetepara Stream and adjacent overland flow paths.

MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN

Issues	Complexity Rating
Existing intersection arrangements and existing development constraints	M
Orientation and placement of bridge piers to better align with Ngongetepara Stream and its banks.	L
Shape of proposed wetlands to be refined to complement the landscape.	L
Discharge points from wetlands into Ngongetepara Stream to be reviewed.	L
Slope of large cut embankment to be investigated if it can be steepened	L
Inclusion of retaining walls at bridge abutments could reduce impacts on adjacent land and Ngongetepara Stream and its tributaries.	M
Structural and geotechnical design of bridge over Ngongetepara Stream.	M

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NEW NORTHSIDE DRIVE WEST – RECOMMENDED OPTION

RECOMMENDED OPTION FOR NORTHSIDE DRIVE WEST



- Eastern section as per existing structure plan. Crosses Ngongotepara Stream at narrowest point.
- Western section a direct connection between Ngongotepara Stream and Nixon Road.

RISKS

- Geometry proposed by developer of 132-136 Fred Taylor Drive may not be suitable and require reconstruction of this portion of the road.
- Steep grades (8%) on approaches to bridge crossing, however these do meet AT Transport Design Manual standards. If standards change and other measures are required such as lifting the road, this might have an impact on land required.
- Construction of bridge crossing and erosion and sediment control measures may require more space than allowed for in the designation.

INTERDEPENDICES

- Taupaki Road/Nixon Road Upgrade Project.
- Intersection with Fred Taylor Drive FTN Upgrade.

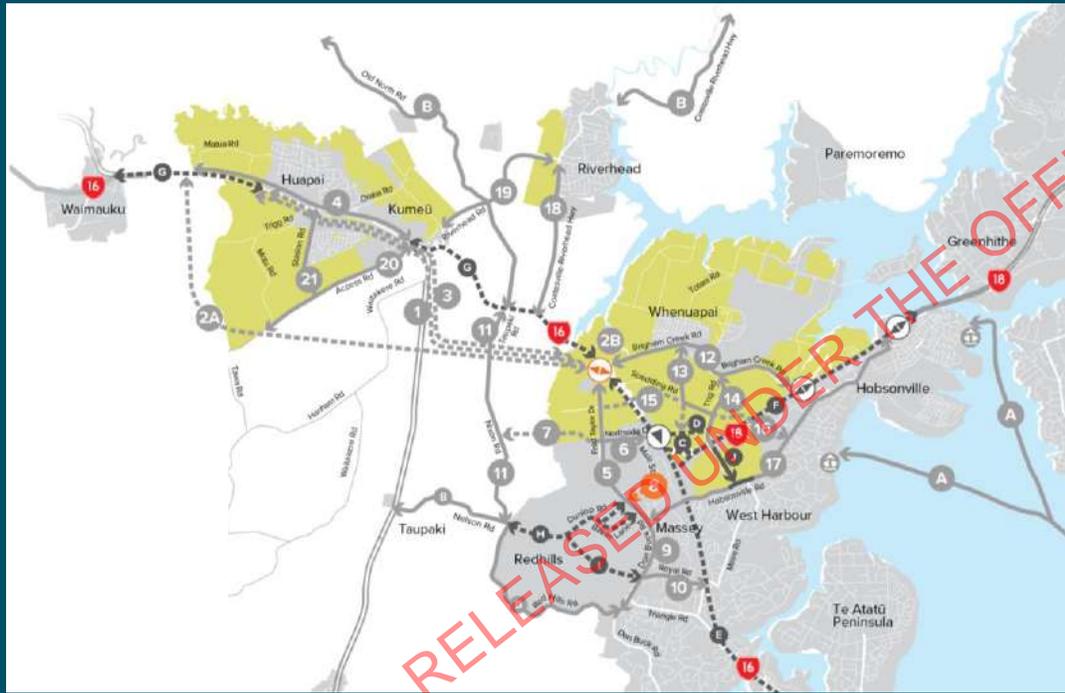
ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives		Alignment
Access	Enable access to economic and social opportunities by providing a new integrated multi-modal corridor between Redhills and Kumeū-Huapai.	New multimodal corridor is provided to complete an alternative local east-west connection between Redhills North and Kumeū-Huapai.
Reliability	Enable reliable and resilient people movement between Redhills and Kumeū-Huapai.	Provides a local alternative route to the strategic network (SH16). Could be used by strategic traffic during a SH16 incident.
Mode Choice	Support transformational mode share in Redhills by providing a high quality, safe and attractive movement of people between Redhills and Kumeū-Huapai.	Expands the east west connectivity of the active mode network. Connects with proposed facilities on Taupaki Road and Nixon Road and ultimately to regional cycle facilities as part of the ASH and RTC projects.
Safety	Contribute to a transport network between Redhills and Kumeū-Huapai that is free from deaths and serious injuries.	Provides a new local east west cycle connection to complete the wider Redhills cycling network. Dedicated facility improves the exposure risk for cyclists.
Climate Change	Supporting transformation to a low carbon transport system by creating a new east west walking and cycling connection to enable active mode shift.	

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Dunlop Road Upgrade

Project 8



DUNLOP ROAD UPGRADE – PRELIMINARY ASSESSMENT

PROJECT #8 DUNLOP ROAD UPGRADE



PURPOSE

- Support mode shift through the provision of reliable bus and active mode access between Redhills and Westgate.

GAP ANALYSIS

- North West DBC reconfirms IBC Indicative Transport Network alignment.

LAND USE

- Land use along the corridor is primarily Terrace Housing, Apartment Building and Business zoning.
- Current consents include the upgrade of Dunlop Road.

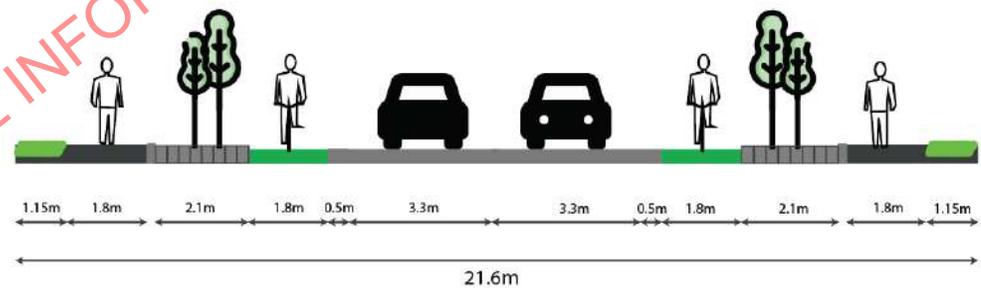


- Future Urban Zone
- Residential - Terrace Housing and Apartment Buildings Zone
- Residential - Mixed Housing Urban Zone
- Business - Light Industry Zone
- Business - General Business Zone

FORM AND FUNCTION ASSESSMENT

- Currently, there is progressive urban development occurring along Dunlop Road. The existing road reserve varies between 21.5 and 25.5 metres in width.
- Consented cross section provides for buffered cycle lanes. This upgrade achieves Te Tupu Ngātahi form and function desired for this corridor.

CONSENTED CROSS SECTION



CONSTRAINTS

- A constraint mapping exercise was undertaken by specialists for Dunlop Road extension. No key constraints were identified for the proposed Dunlop Road Extension corridor that would prevent the upgrade of the road within the existing corridor.

DBC OPTION DEVELOPMENT

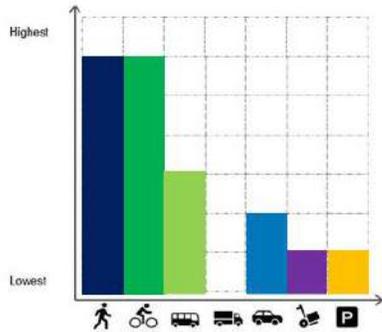
- Dunlop Road corridor is considered **fit for purpose** and no options were subsequently developed as part of this DBC. The current cross section for this corridor is suitable and the additional available space would provide for some flexibility in the future if any improvement was desired for the cycle facilities.

DUNLOP ROAD UPGRADE – RECOMMENDED OPTION

INTERSECTION FORM ASSESSMENT

Intersection	Recommendation	Comment
Dunlop Road/Fred Taylor Drive	Signals	Assessed as part of Housing Infrastructure Fund
Dunlop Road/Maki Street	Signals	Existing intersection outside of SG Scope

HOW SOLUTION MEETS FUTURE MODAL PRIORITY



- Corridor links to future Westgate bus station and the future RTC station. Critical final link to connect Redhills directly to Westgate Station.
- Provision for separated cycle facilities and footpaths on both sides of the corridor.
- Retention of existing level of traffic capacity i.e. one lane in each direction

RISKS

- Delay to or non delivery of the Fred Taylor/Dunlop Road intersection upgrades will reduce the efficacy of the corridor to provide bus reliability on this key public transport connection to Westgate.

INTERDEPENDENCIES

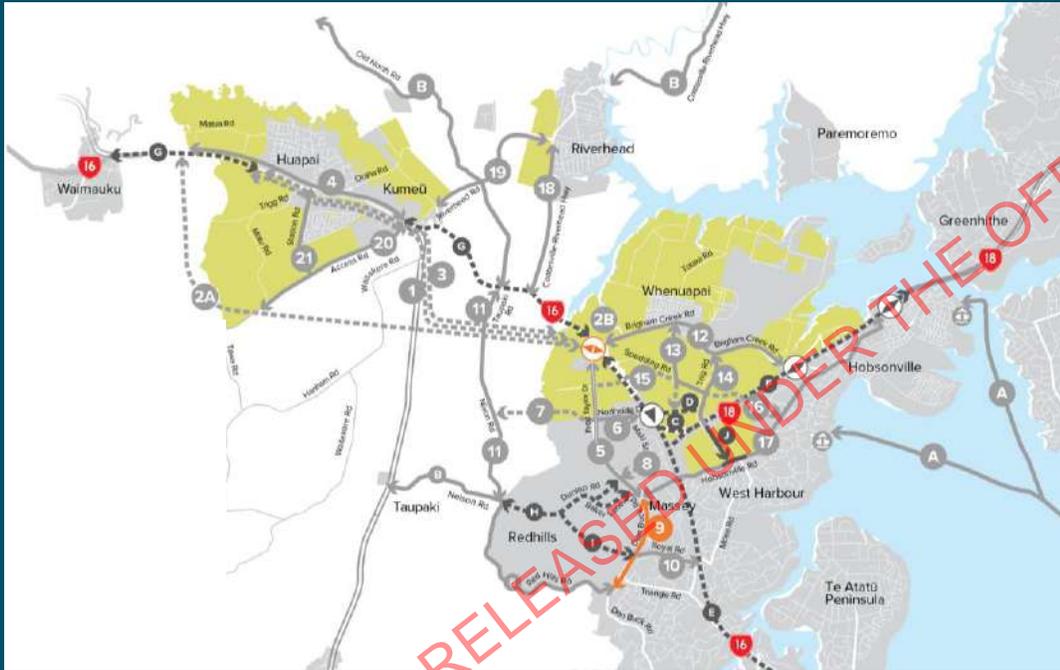
- Fred Taylor Drive/Dunlop Road intersection upgrade as part of Housing Infrastructure Fund project.
- Westgate Bus Station and future RTC station.

ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives		Alignment
Access	Improve access to economic and social opportunities along an integrated Dunlop Road	Key corridor to connect the public transport corridor from Redhills to Westgate rapid transit and bus connections.
Reliability	Enable reliable people movement between Redhills and SH16	Extension completes the prioritised bus link through to Westgate. Note traffic volumes low enough to not require bus lanes. Priority facilities are however provided at the intersection.
Mode Choice	Support transformation mode share in Redhills by providing a high quality, safe and attractive movement of people along Dunlop Road	Multimodal corridor with buffered cycle facilities on both sides as well as enhanced public transport facilities to support a frequent bus service to connect Redhills to Westgate station.
Safety	Provide improvements on Dunlop Road that contribute to a transport network that is free from DSIs	Provision of separated cycle facilities and improved intersection controls to reduce cyclist exposure.
Climate Change	Supporting transformation to a low carbon transport system through the increase of people movement capacity by bus, walking and cycling. It is the critical final link between Redhills and Westgate station to support bus mode shift. No additional provision for private vehicle capacity.	

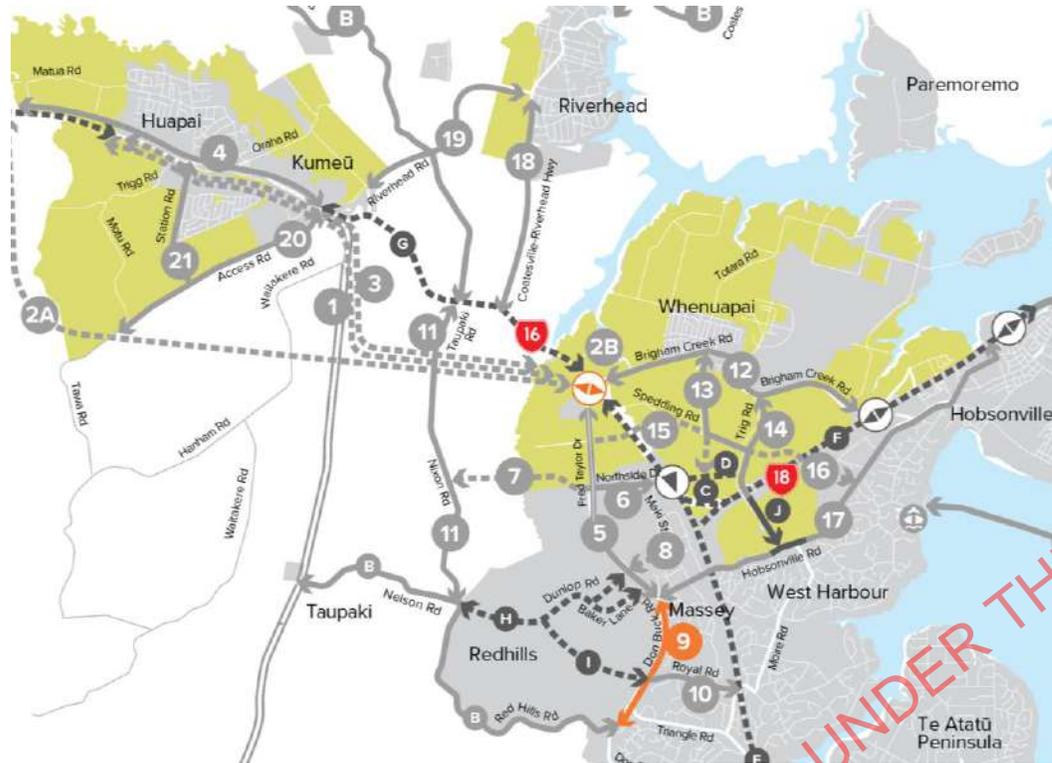
Don Buck Road FTN Upgrade

Project 9



DON BUCK ROAD FTN UPGRADE – PRELIMINARY ASSESSMENT

PROJECT #9 DON BUCK ROAD FTN UPGRADE



PURPOSE

- Distributes future Redhills growth and connects people to rapid transit stations, regional active modes and the SH16 motorway interchange.
- Needs to support reliable FTN access to Westgate and provide improved walking and cycling facilities.

GAP ANALYSIS

- North West DBC reconfirms IBC Indicative Transport Network alignment.
- Analysis to be considered in two segments due to different land use and impacts:
 - Segment 1: Between Fred Taylor Drive and Royal Road.
 - Segment 2: Between Royal Road and Redhills Road.

FORM AND FUNCTION ASSESSMENT

EXISTING CROSS SECTION



FUTURE CROSS SECTION



LAND USE



- Future Urban Zone
- Residential - Terrace Housing and Apartment Buildings Zone
- Residential - Mixed House Urban Zone
- Business - Light Industry Zone
- Business - General Business Zone

- Land use along the corridor includes a variety of different land uses including Terrace Housing, Apartment Buildings, Light Industry and Mixed Urban Zoning
- South of Royal road is a local town centre on the western side and a community centre on the eastern side.

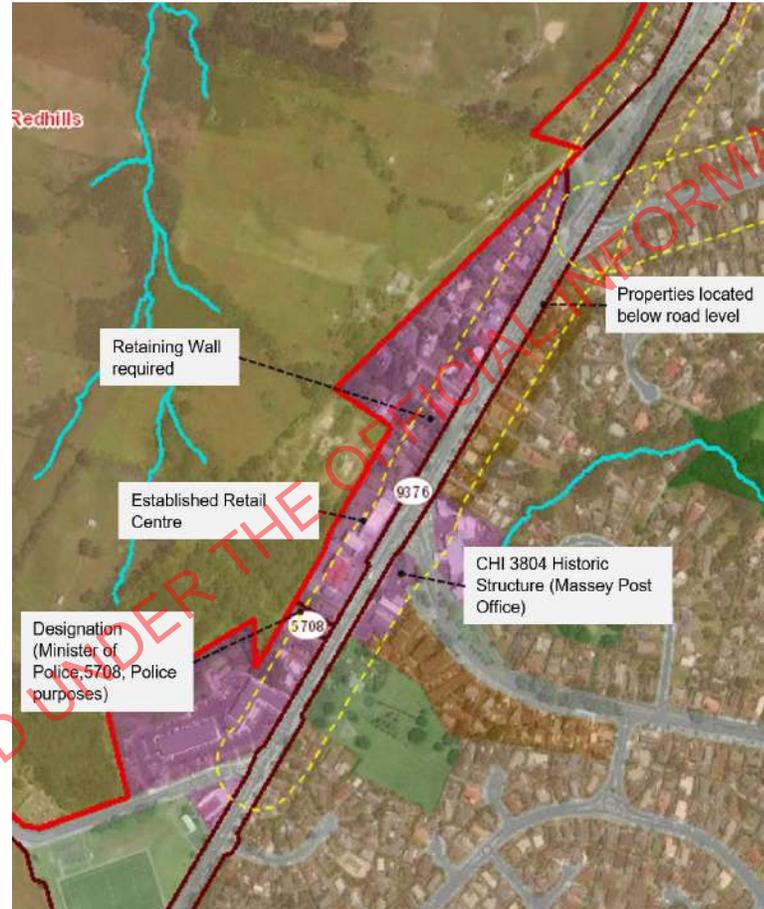
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DON BUCK ROAD FTN UPGRADE – CONSTRAINTS AND OPTION DEVELOPMENT

CONSTRAINTS – SEGMENT 1 FRED TAYLOR DRIVE TO ROYAL ROAD



CONSTRAINTS – SEGMENT 2 ROYAL ROAD TO REDHILLS ROAD



DBC OPTION DEVELOPMENT

Five options were assessed in detail for each of the segments.

- 30m cross section with widening from either the centre, to the north or to the south.
- Reduced cross section with flush median.
- Reduced cross section without flush median.

DON BUCK ROAD FTN UPGRADE – SEGMENT 1 ROUTE REFINEMENT AND ASSESSMENT

OPTIONS	IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	KEY IMPACTS						SUMMARY OF ASSESSMENT	Preferred	
					Heritage	Land Requirement	Stormwater	Social cohesion	Transport	Construction			
1	SGA 30m cross section Holding the existing centreline	✓	✓	✓	✓	High impact	Low impact	High impact	Low impact	High impact	High impact	In the mid-section of the corridor, Option 1 has a more equitable and more limited impact on the land within the Residential – Mixed Housing Zone by widening on both sides of the road corridor.	✓ Hybrid
2	SGA 24.6m constrained No flush median, holding the existing centreline	✓	✓	✓	✓	High impact	High impact	High impact	High impact	High impact	High impact	Reduced transport and urban design outcomes as the absence of a flush median reduces access for vehicles and connectivity for pedestrians to cross the road.	✗
3	SGA 27.1m constrained With flush median, holding the existing centreline	✓	✓	✓	✓	High impact	High impact	High impact	High impact	High impact	High impact	Does not tie into the intersection works proposed as part of the Housing Infrastructure Fund project. And would increase the extent of property impacts across both projects.	✗
6	SGA 30m cross section Holding the eastern boundary and widening west	✓	✓	✓	✓	High impact	High impact	High impact	High impact	High impact	High impact	By widening to the west impact to key facilities along the corridor (i.e. Massey Leisure Centre, Jehovah's Witness Hall and Haumaru Housing) is minimised.	✓ Hybrid
7	SGA 30m cross section Holding the western boundary and widening east	✓	✓	✓	✓	High impact	High impact	High impact	High impact	High impact	High impact	Option 7 will tie in with the North West HIF project and will minimise the area of land impacted across both projects.	✓ Hybrid

EMERGING PREFERRED OPTION – HYBRID OF OPTIONS 1,6 AND 7

Reasons for selection

- Hybrid widening to minimise property impacts along the corridor.
- The Business – Light Industry Zone is avoided and impacts on the Open Space - Community Zone (occupied by Massey Leisure Centre) are minimised by widening to west (Option 6) in the northern section of Don Buck Road.
- Property impacts are less significant by widening on both sides (Option 1) of the road in the mid-section of Don Buck Road.
- Widening to the east (Option 7) in the southern section of Don Buck Road will allow the road to tie in with the Housing Infrastructure Fund project, including the intersection with Don Buck Road and Road. This will minimise the number of properties impacted across both projects.

DON BUCK ROAD FTN UPGRADE – SEGMENT 2 ROUTE REFINEMENT AND ASSESSMENT

OPTIONS	IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	KEY IMPACTS					SUMMARY OF ASSESSMENT	Preferred	
					Heritage	Land Requirement	Stormwater	Social cohesion	Transport			Construction
1 SGA 30m cross section Holding the existing centreline	✓	✓	✓	✓	High impact	High impact	Low impact	Medium impact	Low impact	High impact	Significant property and access impacts on both sides of corridor.	x
2 SGA 24.6m constrained No flush median, holding the existing centreline	✓	✓	✓	✓	Medium impact	High impact	Medium impact	Low impact	Medium impact	High impact	Significant property and access impacts on both sides of corridor.	x
3 SGA 27.1m constrained With flush median, holding the existing centreline	✓	✓	✓	✓	Medium impact	High impact	Medium impact	Medium impact	Low impact	High impact	Significant property and access impacts on both sides of corridor.	x
6 SGA 30m cross section Holding the eastern boundary and widening west	✓	✓	✓	✓	Medium impact	High impact	Low impact	Medium impact	Low impact	High impact	Significant property and access impacts on both sides of corridor.	x
7 SGA 30m cross section Holding the western boundary and widening east	✓	✓	✓	✓	High impact	High impact	Low impact	High impact	Low impact	High impact	Significant property and access impacts on both sides of corridor.	x

RECOMMENDED OPTION – Do not progress with route protection and maintain existing corridor width

- Due to topography, all options have significant property impacts on the town centre, social infrastructure and key utilities.
- Maintaining the corridor as two lanes resulted in very little change to traffic volumes (based on modelling weekday peak traffic flows, generally +/-5% change).
- With the retention of a two lane corridor this will likely result in a decreased Level of Service (LoS) on the Royal Rd to Triangle Rd segment, which could impact on bus services in this segment as buses will be travelling in the general traffic lane. It is however noted that in the future, this corridor will serve only one FTN service (14 Westgate-Henderson-New Lynn). This service is anticipated to be a high frequency service in the peak periods (every 6 mins), but as a frequently stopping cross town service. There will be 'faster' routes to Henderson and New Lynn available on other public transport services, such as the Upper Harbour Crosstown service, via Royal Rd station.
- **Given the potential significance of the impacts on the Local Centre and the absence of significant transport benefits the decision was to not recommend upgrading Don Buck Road between Royal Road and Redhills Road.** It is further recommended that this part of Don Buck Road corridor is considered as a future project for Auckland Transport which would focus on what improvements could be provided within the existing road reserve for the full remaining length of Don Buck Road between Royal Road and Swanson Road to develop a contiguous and consistent upgrade for the corridor.

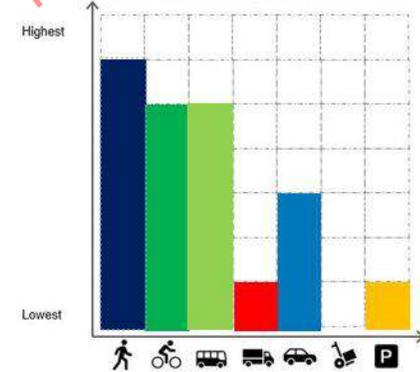
DON BUCK ROAD FTN UPGRADE – EMERGING PREFERRED OPTION DEVELOPMENT

Following option assessment, the extent of Don Buck Road to be included in the Te Tupu Ngātahi Programme has been reduced to between Fred Taylor Drive and Royal Road.

INTERSECTION FORM ASSESSMENT

Intersection	Recommendation	Comment
Don Buck Road/Westgate Drive	Signals	As per the Redhills Precinct Plan, to be developer delivered and due proximity consider integration with Hobsonville Road intersection.
Don Buck Road/ Rush Creek Drive	Signals	No change to the existing other than formalised Right Turn bays within flush.
Don Buck Road/Beauchamp Drive	Signals	Signals to be implemented by developer. Endorsed by AT Resource Consent team.
Don Buck Road/Royal Road	Signals	Developed as part of the HIF DBC. Public transport priority to connect to proposed rapid transit station at Royal Road Station.

Future Modal Priority



HOW SOLUTION MEETS FUTURE MODAL PRIORITY

- Provision for bus lanes to support FTN bus services and all signalised intersections to have bus priority measures.
- Provision for separated cycle facilities and footpaths on both sides.
- Retention of existing level of traffic capacity i.e. one lane in each direction.

DESIGN REFINEMENTS

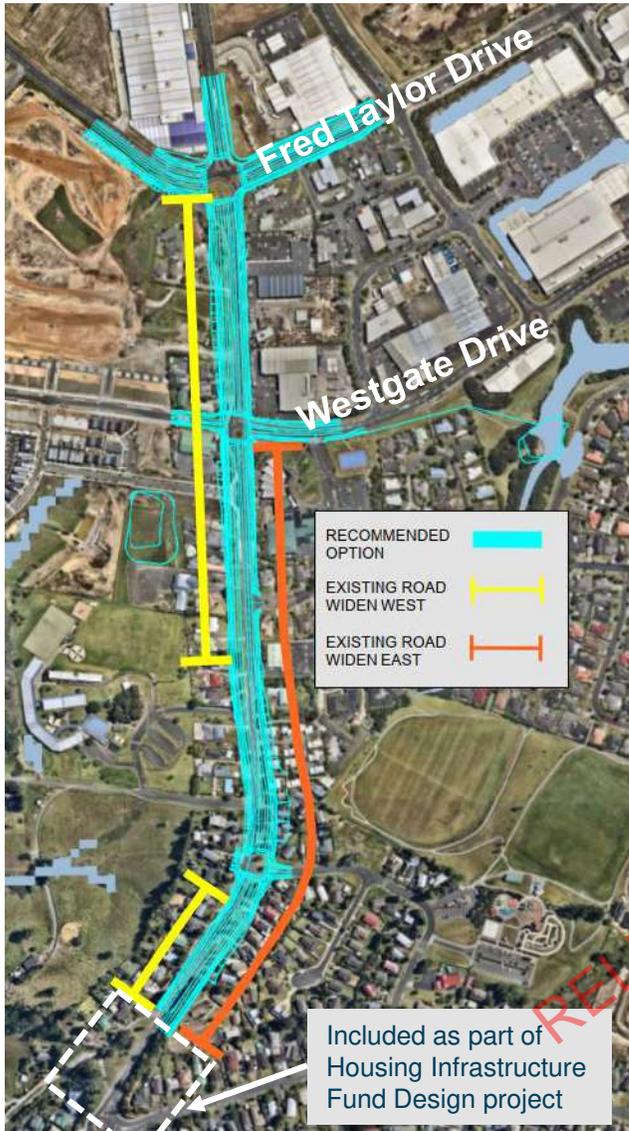
- Centreline of roadway shifted to be centred within the centre of the designation.
- Near Beauchamp Drive centreline further shifted towards properties which were impacted regardless to minimise impacts on the other side of the road.
- Multiple retaining walls included on the eastern side and northern side along Fred Taylor Drive to avoid impacting adjacent properties.
- Some additional widening required on the western side of Don Buck near Royal Road to better tie in with HIF design.

MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN

Issues	Complexity Rating
Existing intersection arrangements and existing development constraints	M
Public transport priority measures on Don Buck Road.	H
Incorporation of intersection design of Royal Road as part of the Housing Infrastructure Fund into Don Buck Road design due to complexities around two large retaining walls and low level access.	H
Design requirements associated with upgrading existing stormwater wetlands.	M
Consideration of extent of underground services, i.e. Watercare on western side and new Vector infrastructure on eastern side (Westpark Drive to Fred Taylor Drive)	M

DON BUCK ROAD FTN UPGRADE – RECOMMENDED OPTION

RECOMMENDED OPTION FOR DON BUCK ROAD



RISKS

- Proposed upgrade of existing wetland in Rush Creek Reserve may be more complex than anticipated given the large catchments.
- Significant cost and disruption associated with relocation of Watercare infrastructure.
- Inability to avoid impact on some business along eastern side requiring demolition of buildings or needing to shift the alignment to the west.
- Change in HIF Designation.

INTERDEPENDENCIES

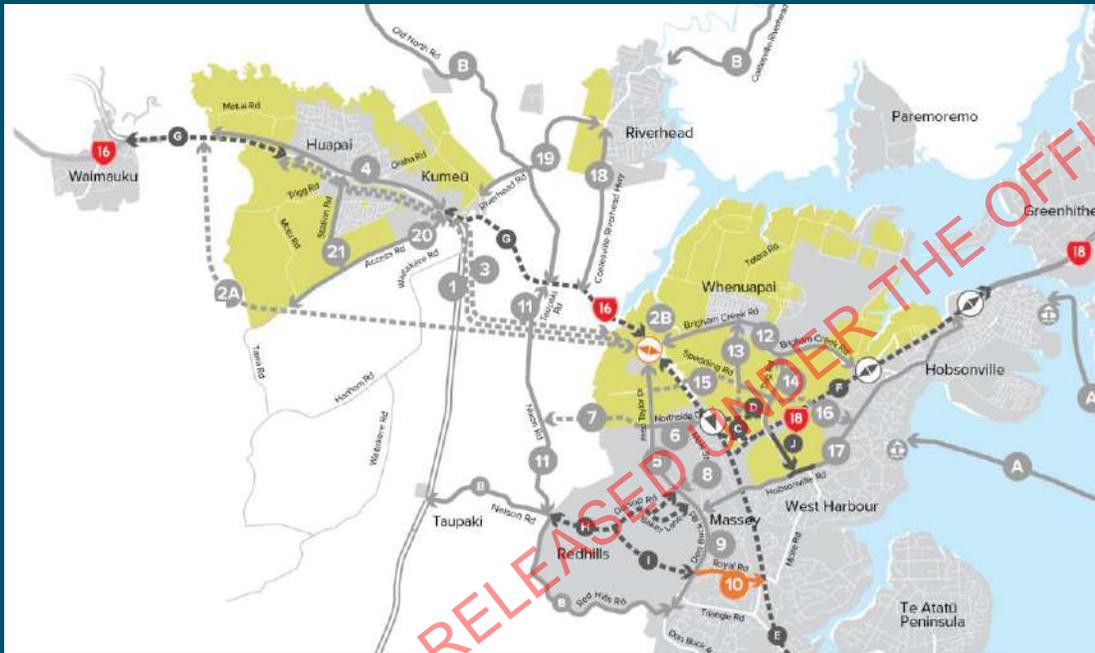
- Intersection with Royal Road Intersection and Fred Taylor Drive as part of the Housing Infrastructure Fund DBC.
- NWRTN – City Centre to Westgate RTC

ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives	Alignment
<p>Access</p> <p>Improve access to economic and social opportunities along an integrated Don Buck Road</p>	<p>Key corridor with dual purpose to provide access from Redhills to both a future RTC station and the strategic highway network.</p>
<p>Reliability</p> <p>Enable reliable people movement between Redhills and SH16</p>	<p>Improved reliability of public transport with dedicated bus lanes and bus priority.</p>
<p>Mode Choice</p> <p>Support transformation mode share in Redhills by providing a high quality, safe and attractive movement of people along Don Buck Road</p>	<p>Multimodal corridor with separated cycle facilities on both sides as well as enhanced public transport facilities to support a frequent bus service.</p>
<p>Safety</p> <p>Provide improvements on Don Buck Road that contribute to a transport network that is free from DSIs</p>	<p>Provision of separated cycle facilities and improved intersection controls to support safety of turning traffic.</p>
<p>Integration</p> <p>Provide a transport system that is integrated with land use enabling a more sustainable, high quality, connected urban form which supports growth in the North West.</p>	<p>High proportion of existing land use and future urban land use with access to high quality active mode facilities and public transport, subsequently facilitating the growth along the corridor and within the Redhills area.</p>
<p>Climate Change</p> <p>Supporting transformation to a low carbon transport system through the increase of people movement capacity by bus, walking and cycling.</p>	

Royal Road FTN Upgrade

Project 10



ROYAL ROAD FTN UPGRADE – PRELIMINARY ASSESSMENT

PROJECT #10 ROYAL ROAD FTN UPGRADE



GAP ANALYSIS

- North West DBC reconfirms IBC Indicative Transport Network alignment.

PURPOSE

- Distributes future Redhills growth and connects people to rapid transit stations, regional active modes and the SH16 motorway interchange.
- Needs to support reliable FTN access to RTC and provide improved walking and cycling facilities.

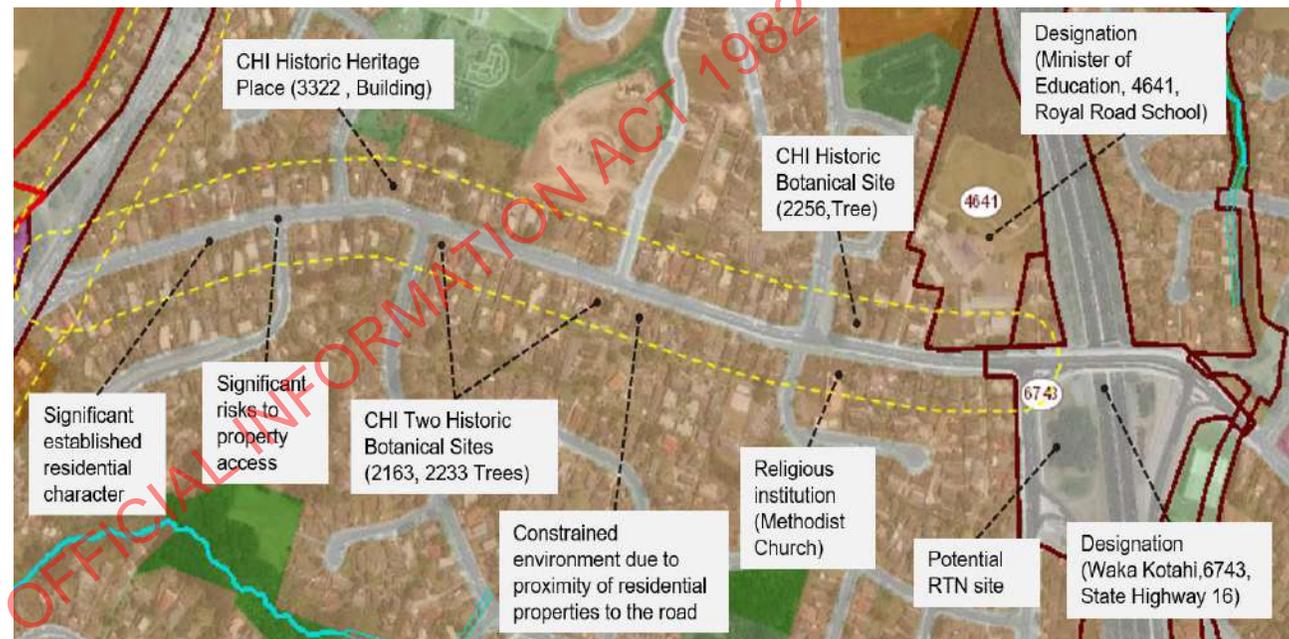
LAND USE



- Future Urban Zone
- Residential - Terrace Housing and Apartment Buildings Zone
- Residential Mixed Housing Urban Zone
- Business - Light Industry Zone
- Business – General Business Zone

- Existing road adjacent mixed house urban zone.
- Corridor to serve new live zone at Redhills.
- Intensification opportunities due to proximity to proposed RTC station.

CONSTRAINTS



Steep topography a constraint for property access. Historic and social infrastructure (church and school) located along the corridor.

FORM AND FUNCTION ASSESSMENT

EXISTING CROSS SECTION



FUTURE CROSS SECTION



DBC OPTION DEVELOPMENT

- Four lane cross section options to be developed and assessed to minimise impacts.
- Five options assessed:
 - Three widening options: equally from centreline, to the north or to the south.
 - Consideration to be given to constrained cross sections, with and without flush median.

ROYAL ROAD FTN UPGRADE – ROUTE REFINEMENT AND ASSESSMENT

OPTION ASSESSMENT

KEY IMPACTS

High impact
 Medium impact
 Low impact

OPTIONS

IO1: Access
 IO2: Reliability
 IO3: Mode
 IO4: Safety
 Heritage
 Land Requirement
 Stormwater
 Social cohesion
 Transport
 Construction

SUMMARY OF ASSESSMENT

Preferred

Options	IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	Heritage	Land Requirement	Stormwater	Social cohesion	Transport	Construction	Summary of Assessment	Preferred
1 SGA 30m cross section Widening equally from existing centreline	✓	✓	✓	✓	Low impact	High impact	Low impact	Medium impact	Medium impact	High impact	Significant property and access impacts on both sides of the corridor. Considerable impact on access to existing properties on both sides of the road due to steep topography.	x
2 SGA 24.6m constrained No flush median. Widening equally from existing centreline	✓	✓	✓	✓	Low impact	High impact	Medium impact	Low impact	Medium impact	Medium impact	Reduced transport outcomes and similar property effects to full width. Less space for stormwater	x
3 SGA 27.1m constrained With flush median. Widening equally from existing centreline	✓	✓	✓	✓	Low impact	High impact	Medium impact	Medium impact	Medium impact	Medium impact	Significant property and access impacts. Less space for stormwater	x
6 SGA 30m cross section Widening to the north only – holding southern boundary	✓	✓	✓	✓	Medium impact	High impact	Low impact	Medium impact	Medium impact	Medium impact	Achieves transport outcomes and reduces property impacts to one side only. No regrading/access issues for southern side public roads.	✓
7 SGA 30m cross section Widening to the south only – holding northern boundary	✓	✓	✓	✓	Low impact	High impact	Low impact	High impact	High impact	High impact	Reduced property impact to one side. Significant access issues for properties and public roads on the south side.	x

EMERGING PREFERRED OPTION – OPT 6 WIDENING TO THE NORTH

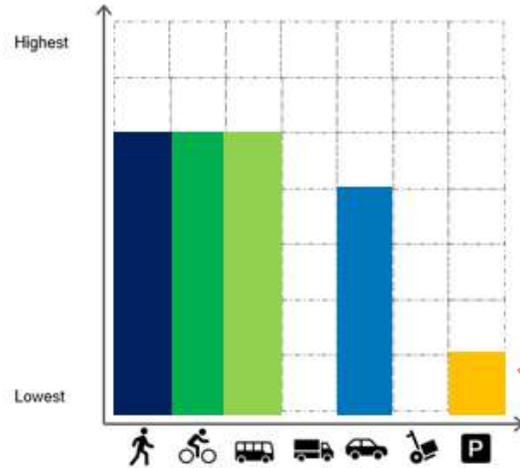
Reasons for selection

- Property impacts largely restricted to one side of the road.
- Avoids regrading/access issues for public roads and properties on south side.
- Proximity to RTC likely to drive densification - north side closer to Westgate and better topography compared to the south side for redevelopment.
- Note one heritage building (44 Royal Road) at risk - opportunity for local relocation.

ROYAL ROAD FTN UPGRADE – EMERGING PREFERRED OPTION DEVELOPMENT

INTERSECTION FORM ASSESSMENT

Intersection	Recommendation	Comment
Royal Road/Cyclamara Road	Right Turn Bay	Flush median to incorporate turning movements.
Royal Road/Kemp Road	Right Turn Bay	Flush median to incorporate turning movements.
Royal Road/Beauchamp Road	Signals	Centralized signals will support platooning effect, access to recreational facilities.
Royal Road/Lawson Creek	Right Turn Bay	Flush median to incorporate turning movements. Opportunity for left in left out (LILO) access if required in future with parallel route signalised.
Royal Road/Westgate Drive	Signals	Existing signals. Increased public transport priority at intersection.
Royal Road/Makora Road	Signals	Existing signals. Increased public transport priority at intersection.



HOW SOLUTION MEETS FUTURE MODAL PRIORITY

- Provision for bus lanes to support FTN services and bus priority at intersections.
- Provision for separated cycle facilities and footpaths on both sides of the corridor.
- Retention of existing level of traffic capacity i.e. one lane in each direction.

DESIGN REFINEMENTS

- Alignment shifted to the north to ensure that the level of the back of the footpath is maintained on the southern side.
- 1 proposed new wetland located where full acquisition of property will be required
- 2 proposed upgrades of existing wetlands
- Retaining walls included on the eastern end of Royal Road in front of the church and school

MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN

Issues	Complexity Rating
How buses will access the future proposed rapid transit station site.	H
Integration of existing wetland to be upgraded with rapid transit station design.	H
Integration with the Royal Road School Master planning.	L
Alternative access to church off Vadam Rd, including possible access to properties along existing low level access.	M
Integration with Housing Infrastructure Fund project at Royal Road intersection	L
Opportunity exists for AT to complete strategic property acquisitions near Jack Smyth Court near the Royal Road intersection to allow for redevelopment of existing Council housing.	M

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ROYAL ROAD FTN UPGRADE – RECOMMENDED OPTION

RECOMMENDED OPTION FOR ROYAL ROAD



RISKS

- Royal Road rapid transit station does not proceed and FTN route no longer required on Royal Road.
- Housing Infrastructure Fund designation boundary changes.
- Additional property acquisition required.
- New location to be found for proposed existing wetland upgrade due to lack of opportunity to integrate into RTC station design.

INTERDEPENDENCIES

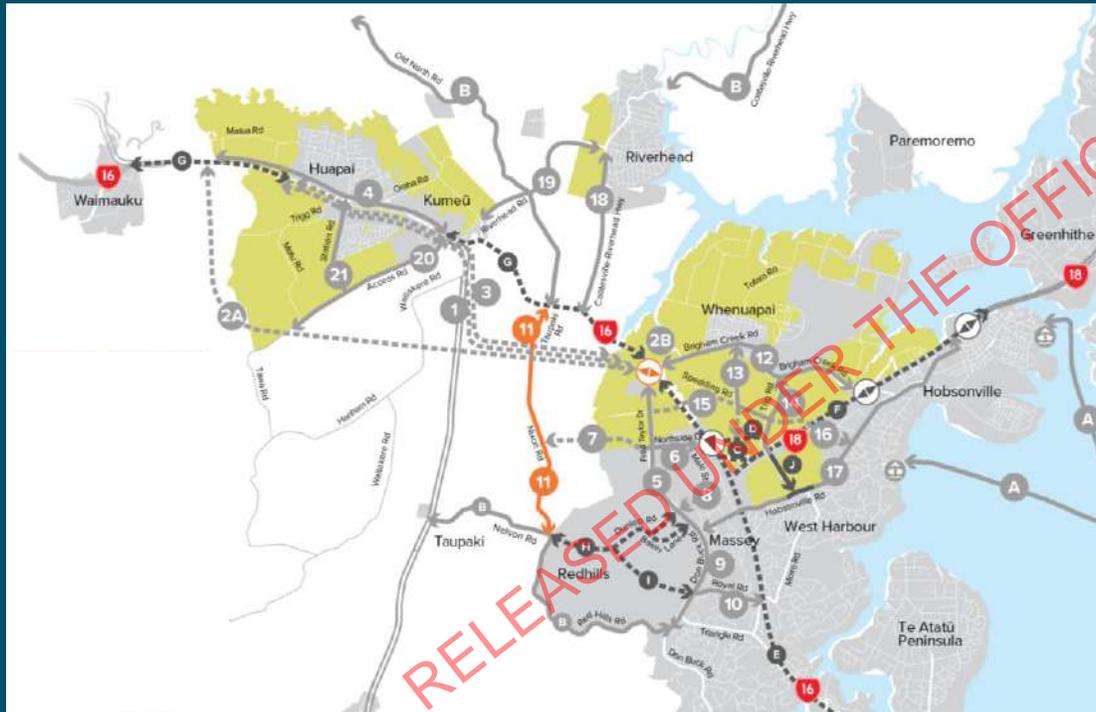
- City Centre to Westgate – Royal Road rapid transit station.
- Royal Road/ Don Buck Road intersection upgrade as part of Housing Infrastructure Fund project.

ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives		Alignment
Access	Improve access to economic and social opportunities along an integrated Royal Road	Key corridor with dual purpose to provide access from Redhills to both a future RTC station and the strategic highway network.
Reliability	Enable reliable people movement between Redhills and SH16	Improved reliability of public transport with dedicated bus lanes and bus priority.
Mode Choice	Support transformation mode share in Redhills by providing a high quality, safe and attractive movement of people along Royal Rd	Multimodal corridor with separated cycle facilities on both sides as well as enhanced public transport facilities to support a frequent bus service to connect Redhills to a future RTC station. The wider area role to provide non vehicular access to the RTC results in this being a critical link to the FTN infrastructure and a key driver for modal shift.
Safety	Provide improvements on Royal Road that contribute to a transport network that is free from DSIs	Provision of separated cycle facilities and improved intersection controls to support safety of turning traffic.
Integration	Provide a transport system that is integrated with land use enabling a more sustainable, high quality, connected urban form which supports growth in the North West.	High proportion of existing land use and future urban land use with access to high quality active mode facilities and public transport, subsequently facilitating the growth along the corridor and within the Redhills area.
Climate Change	Supporting transformation to a low carbon transport system through the increase of people movement capacity by bus, walking and cycling. Key modal connection to the proposed City Centre to Westgate RTC station at Royal Road which has a transformational role in providing for mode shift in the North West. Royal road FTN helps maximise the RTC contribution to mode shift through the provision of direct, efficient and well connected bus and walking and cycling connections to the station.	

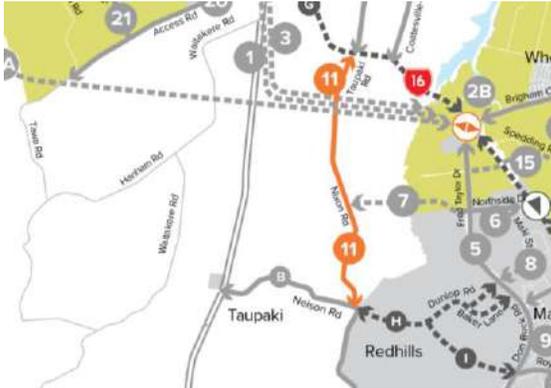
Taupaki Road/Nixon Road Upgrade

Project 11



TAUPAKI ROAD/NIXON ROAD UPGRADE – PRELIMINARY ASSESSMENT

PROJECT #11 TAUPAKI ROAD/NIXON ROAD UPGRADES



PURPOSE

- Local alternative access between Redhills and Kumeū and key cycle connection in Rodney Greenways plan.
- Needs safety improvements and active mode facilities.

GAP ANALYSIS

- North West DBC reconfirms IBC Indicative Transport Network alignment.
- No Taupaki Road interchange to be provided with the ASH alignment. No requirement for increased vehicular capacity.

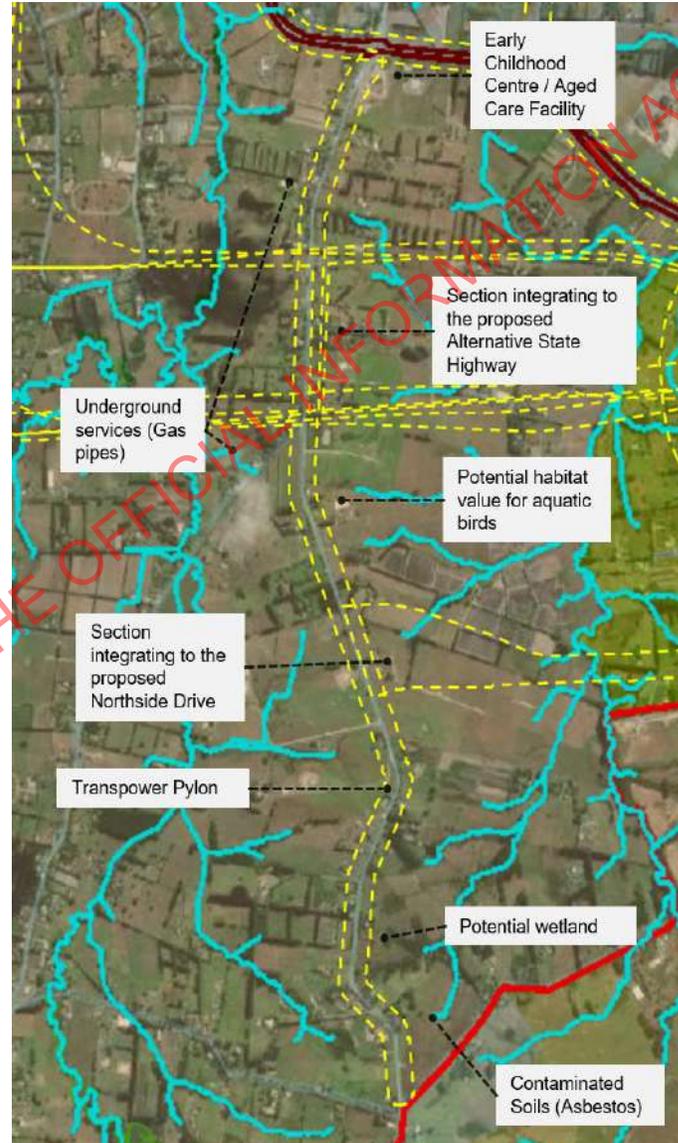
LAND USE



- Future Urban Zone
- Residential - Terrace Housing and Apartment Buildings Zone
- Residential Mixed Housing Urban Zone
- Rural - Countryside Living Zone
- Fletcher Residential Ltd Site

- Land use along the corridor is Rural - Countryside Living Zone with provision for low intensity subdivision.
- Long term aspirations (2045+) for Fletcher Residential Ltd to rezone and develop an urban village. Development not specifically assessed in this DBC as outside current FUZ boundary.

CONSTRAINTS



FORM AND FUNCTION ASSESSMENT

EXISTING CROSS SECTION



FUTURE CROSS SECTION



DBC OPTION DEVELOPMENT

To improve rural safety, a decision was made by Auckland Transport that the appropriate future speed environment for Taupaki Road and Nixon Road would be reduced from 80km/hr to 60km/hr.

Three options were taken forward to Option Assessment:

- Upgrade existing road to a high speed rural 24m cross section based on a 60km/hr posted speed (70km/hr design speed).
- Maintain existing road alignment and add walking and cycling facilities to the western side.
- Maintain existing road alignment and add walking and cycling facilities to the eastern side.
- Green stormwater infrastructure assumed for all options as per existing rural standards.

TAUPAKI ROAD/NIXON ROAD UPGRADE – ROUTE REFINEMENT AND ASSESSMENT

		KEY IMPACTS											SUMMARY OF ASSESSMENT	
		IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	Heritage	Land Requirement	Stormwater	Social cohesion	Transport	Construction			
		 High impact Medium impact Low impact											Preferred	
2	SGA 24m cross section Holding the centreline	✓	✓	✓	✓							<ul style="list-style-type: none"> Addresses existing geometric deficiencies, safety issues associated with future increase in vehicular traffic and improved safety for active modes. Least preferred with property impacts on both sides of the corridor. 	x	
3W	SGA 24m cross section Widen on the western side (Active modes only)	✓	✓	✓	✓							<ul style="list-style-type: none"> Less connectivity to wider active mode network as active modes on opposite side of road to the adjacent land use growth. Will require all active mode users to cross the road to access facilities. Property impacts on one side of the corridor. Potential impacts on Transpower pylons. Opportunity to reduce cross section to 20m to further reduce impacts. 	x	
3E	SGA 24m cross section Widen on the eastern side (Active modes only)	✓	✓	✓	✓							<ul style="list-style-type: none"> Active mode on eastern side provides better connectivity to future growth in the Redhills area and wider active mode network. Ecological effects of the option can be appropriately mitigated It does not address existing geometric deficiencies on the road corridor, but these can be addressed with alternative non infrastructure measures through Auckland Transport led safety improvement programmes. Opportunity to reduce cross section to 20m to further reduce impacts. 	✓	

EMERGING PREFERRED OPTION – OPTION 3E WIDENING TO THE EAST

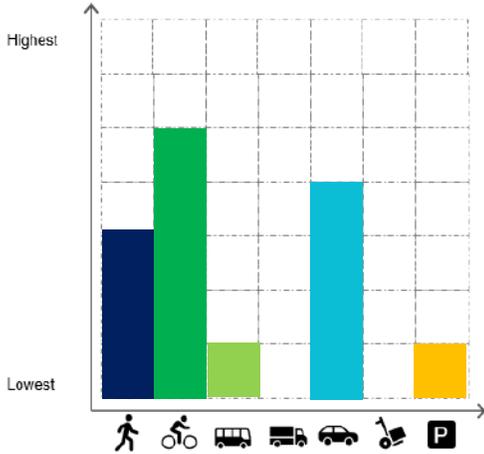
The preferred option is a revised Option 3E based on a 20m cross section, providing walking and cycling facilities on the east of the corridor. A revised Option 3E was chosen as the preferred option because:

- Option 3E provides better connectivity to future growth in the Redhills area to the east of the corridor, and better connectivity to the future active mode network.
- Option 3E provides a cost-effective solution to improve access to active mode facilities and contributes to area wide mode shift and active mode safety. It does not address existing geometric deficiencies on the road corridor, but these can be addressed through AT led safety improvements.
- Ecological effects of the Option 3E can be appropriately mitigated.

TAUPAKI ROAD/NIXON ROAD UPGRADE– EMERGING PREFERRED OPTION DEVELOPMENT

INTERSECTION FORM ASSESSMENT

Intersection	Recommendation	Comment
Taupaki Road/SH16	Single lane Roundabout	Existing Roundabout no change proposed.
Taupaki Road/ Nixon Road	Single lane Roundabout	New treatment to address safety.
Taupaki Road/Nelson Road	Single lane Roundabout	Already proposed as part of the Housing Infrastructure Fund.



HOW SOLUTION MEETS FUTURE MODAL PRIORITY

- Provision for active mode corridor on eastern side of corridor. Connects to future cycle facilities on ASH, SH16 and the local roads of New Northside Drive West and HIF East West arterial.
- Retention of existing level of traffic capacity i.e. one lane in each direction.

Future Modal Priority

DESIGN REFINEMENTS

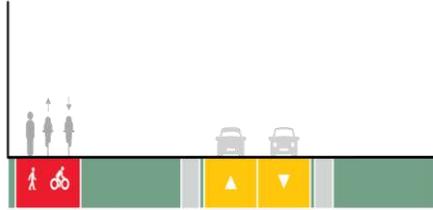
- Reduced cross section of 20m adopted to reduce impacts on adjacent rural land. Note that due to challenging topography, localised additional widening has been required to maintain property access and provide suitable stormwater treatments.
- Additional upgrade to the Taupaki Road/Nixon Road intersection to address localised safety concerns and correct sub-optimal alignments.
- **Auckland Transport endorsed this corridor not proceeding to route protection due to low risk of land development and no vehicular interface with the ASH. It was agreed a lower level of design detail for this corridor would be appropriate.**

MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN

Issues	Complexity Rating
Additional flood modelling to confirm size of swales and location of additional wetlands	M
Complementary non infrastructure safety measures to be investigated to support lower speeds along the corridor.	L
Section of active mode corridor between ASH and SH16 is important for network connectivity and should be considered as part of the ASH project.	L

TAUPAKI ROAD/NIXON ROAD UPGRADE – RECOMMENDED OPTION

RECOMMENDED OPTION- TAUPAKI ROAD/NIXON ROAD UPGRADE



RISKS

- Development pressures or unplanned plan changes may require the triggers for route protection to be reconsidered.
- Green infrastructure land requirements are unaffordable.

INTERDEPENDENCES

- Alternative State Highway.
- New Northside Drive West.
- Housing Infrastructure Fund Redhills corridors.

ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives		Alignment
Access	Improve access to economic and social opportunities for active modes on Taupaki Road/Nixon Road connecting Redhills to Kumeū-Huapai.	Alternative active mode connection to facilitate trips between Redhills and Kumeū-Huapai that are not required to traverse the Brigham Creek Interchange.
Mode Choice	Support transformation mode share in Redhills by providing a high quality and attractive active mode facility on Taupaki Road/Nixon Road.	Provision of new active mode facility on a rural corridor. Northern section will provide additional connectivity between the ASH and SH16 shared path, thus completing this section of cycle network.
Safety	Provide improvements on Taupaki Road/Nixon Road that contribute to a transport network that is free from deaths and serious injuries.	Provision of separated active mode facilities. Upgrade to the intersection at Taupaki Road and Nixon Road to improve safety.
Climate Change		Provision of high quality rural active mode facilities will enable mode shift to active modes to support a low carbon transport system in growth areas. This route supports a wider proposed active mode network in the North West. Provision of green infrastructure to manage stormwater future proofs for climate change adaptation.

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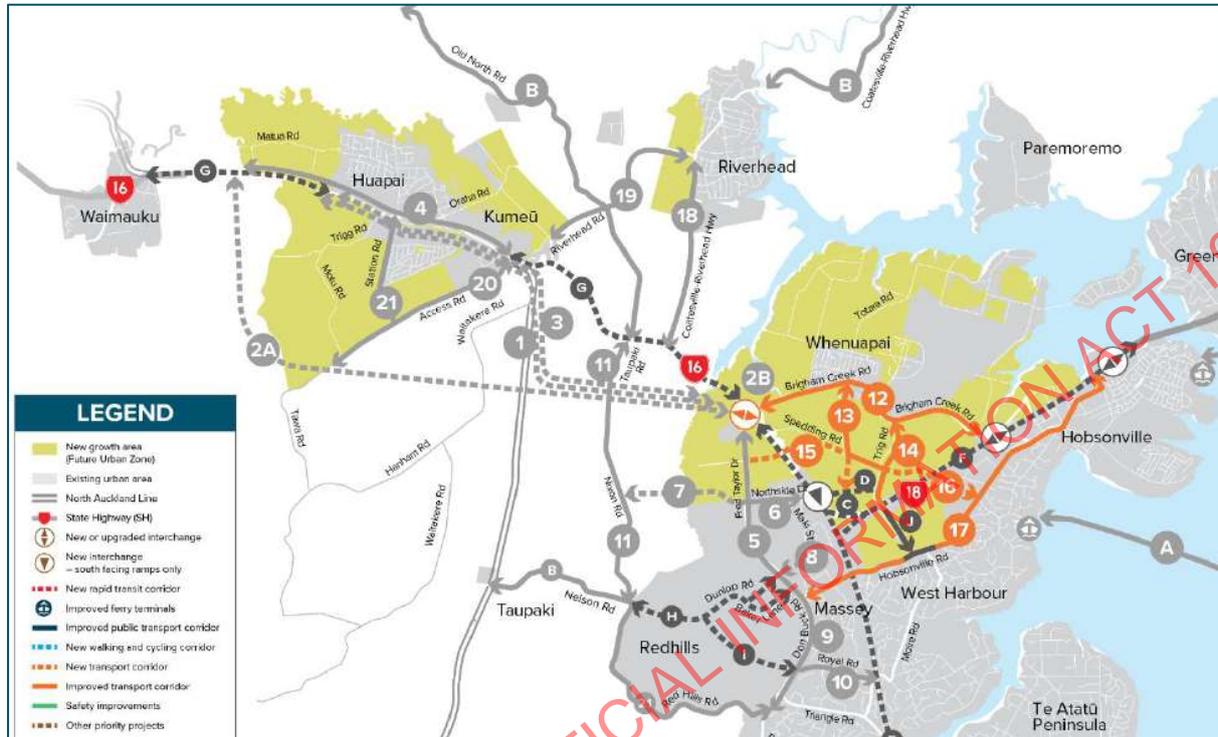
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Whenuapai Option Development

9.7 Whenuapai options development and assessment

The Whenuapai projects are shown in Figure 9-5 below.

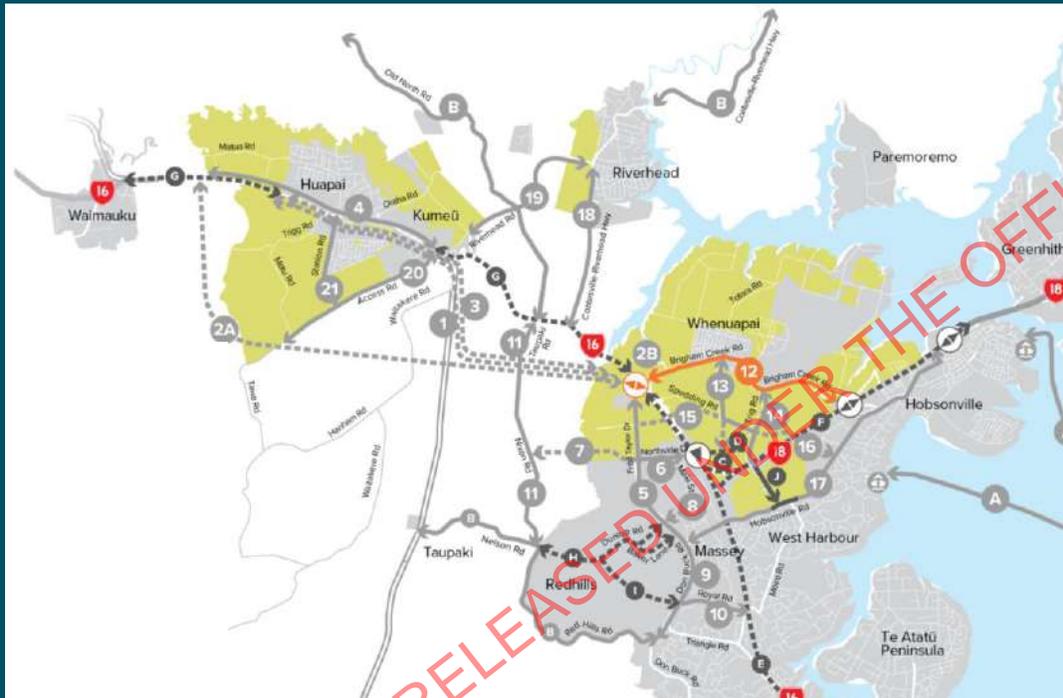
Figure 9-5 Whenuapai options assessment corridors



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Brigham Creek Road Upgrade

Project 12

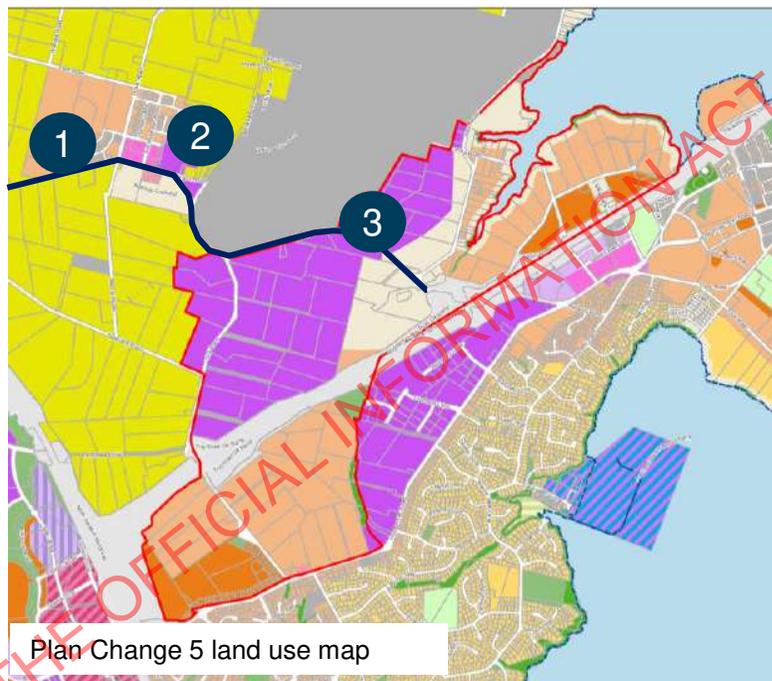


BRIGHAM CREEK ROAD UPGRADE – PRELIMINARY ASSESSMENT

PROJECT #12 BRIGHAM CREEK ROAD UPGRADE



LAND USE



Plan Change 5 land use map

- Land use along the corridor is a mix of Future Urban, Light Industry and Mixed Housing Urban Zoning.
- RNZAF Whenuapai airbase is adjacent the corridor. Has operational requirements that impact overhead height, pavement height and operation of Brigham Creek Road.
- Existing town centre in central section.

- Future Urban Zone
- Residential - Terrace Housing and Apartment Buildings Zone
- Residential - Mixed Housing Urban Zone
- Business - Light Industry Zone
- RNZAF Whenuapai airbase

PURPOSE

- Distributes future Whenuapai growth and connects people to rapid transit stations and the SH16 and SH18 motorway interchanges.
- Will support local bus services and active modes as well as remain a key link in the North West freight network.
- Provides access to the local Whenuapai centre.

GAP ANALYSIS

- North West DBC reconfirms IBC Indicative Transport Network alignment.

FORM AND FUNCTION ASSESSMENT

EXISTING CROSS SECTION



FUTURE CROSS SECTIONS

- 1 Brigham Creek Interchange to Totara Avenue
- 2 Totara Avenue to Tamatea Avenue
- 3 Tamatea Avenue to SH18 Interchange



OR



- 2 Totara Avenue to Tamatea Avenue



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BRIGHAM CREEK ROAD UPGRADE – CONSTRAINTS ASSESSMENT AND OPTION DEVELOPMENT



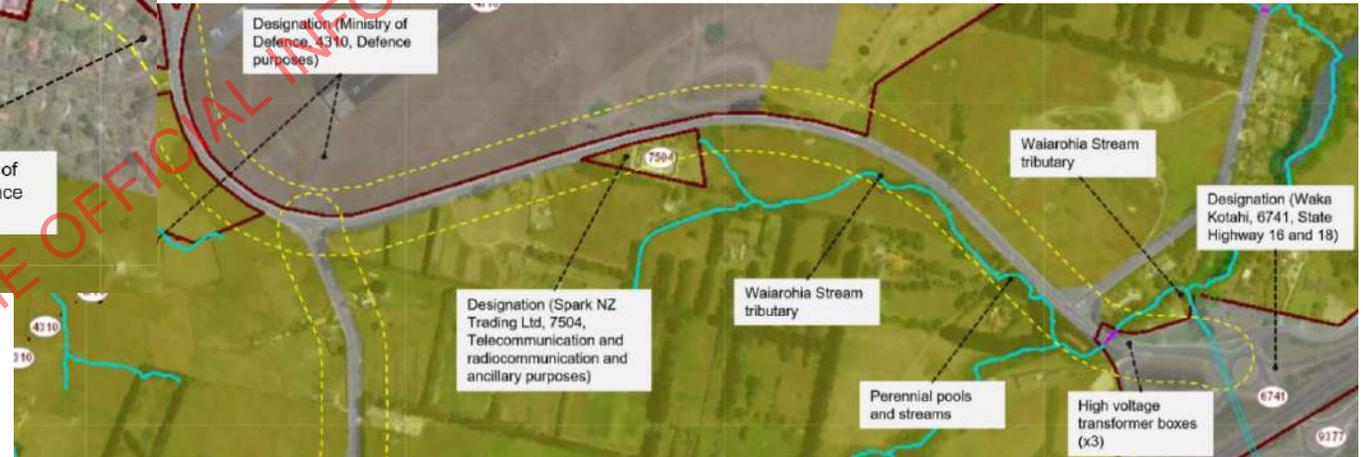
CONSTRAINTS

WESTERN SECTION

- Existing Whenuapai Precinct 1 high density residential development that supports growth in Whenuapai.
- Existing Whenuapai Precinct 2 development which includes commercial development.
- Ministry of Defence housing.

EASTERN SECTION

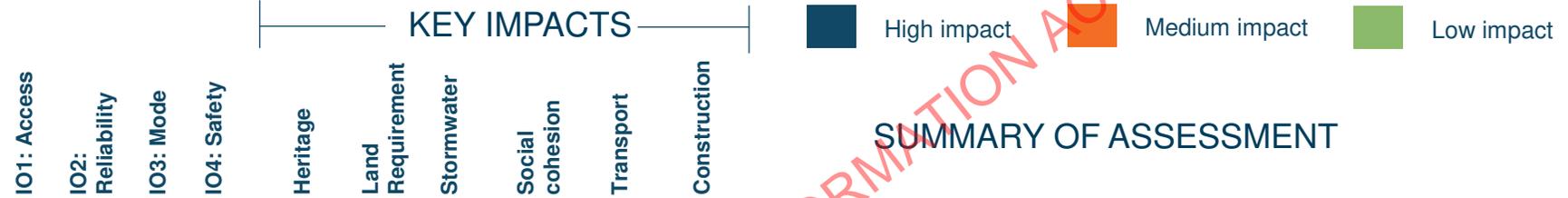
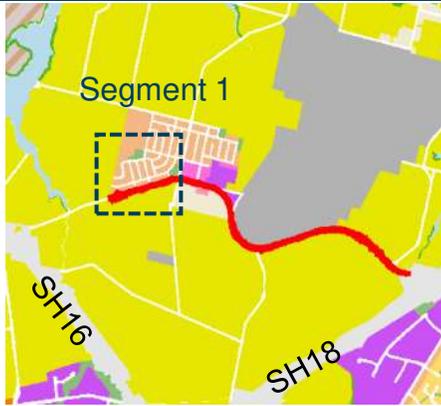
- Significant telecommunications cable designation south of the airbase.
- Ecological features to the east of the airbase.



OPTION DEVELOPMENT

- Due to differing land uses and constraints, corridor split into three segments for localised MCA assessment. Note Segment 1 is considered in option development from the Totara Creek Bridge to Totara Road. Remaining corridor between Totara Bridge and Brigham Creek Roundabout is included in the Brigham Creek Interchange project (Project 2B)
- All options are for a 30m cross section. Note that through the town centre, a specific Te Tupu Ngātahi town centre cross section has been used which allows for greater berm/footpath width and provides additional pedestrian amenity within the town centre.
- Three widening options tested - widening on both sides, widening to south only and widening to north only.

BRIGHAM CREEK ROAD UPGRADE – SEGMENT 1 ROUTE REFINEMENT AND ASSESSMENT



SUMMARY OF ASSESSMENT

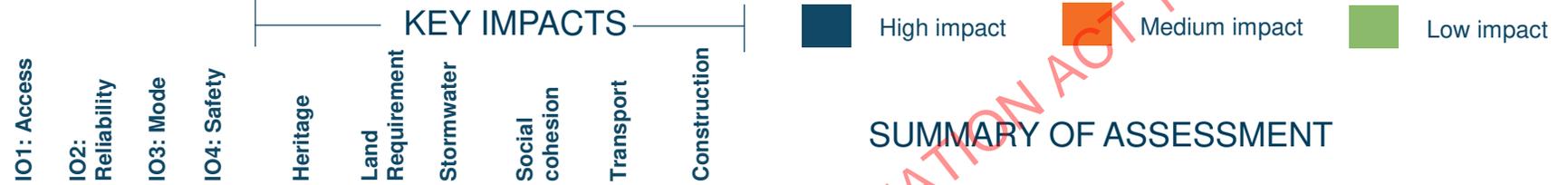
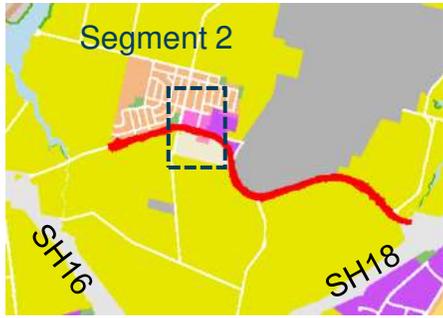
		IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	Heritage	Land Requirement	Stormwater	Social cohesion	Transport	Construction		Preferred
1	SGA 30m cross section Holding the existing centreline and widening the road on the northern and southern side.	✓	✓	✓	✓	Low impact	High impact	Low impact	High impact	Low impact	High impact	Option 1 has significant impacts on the properties located within the Whenuapai Precinct 1 and impacts on the southern side of the road corridor and encroaches in the Open Space.	x
2	SGA 30m cross section Holding the northern boundary and widening the road to the south.	✓	✓	✓	✓	Low impact	Medium impact	Low impact	Low impact	Low impact	Medium impact	Option 2 avoids impacts on existing compact housing and extends into the Future Urban Zone to the south.	✓
3	SGA 30m cross section Holding the southern boundary and widening the road to the north.	✓	✓	✓	✓	Low impact	High impact	Medium impact	High impact	Low impact	High impact	Option 3 has less ability to integrate the road corridor into the Future Urban Zone and has adverse effects on the existing urban design character of Whenuapai Precinct 1. Additionally, there is greater impact upon the existing stormwater system and potential requirement for increased flood attenuation.	x

EMERGING PREFERRED OPTION – OPTION 2 – HOLDING NORTHERN BOUNDARY AND WIDENING TO SOUTH

Reasons for selection

- Avoids the small lot residential properties within the Whenuapai Precinct 1 development, which have been developed to scale and density that supports growth within Whenuapai. The road widening can be better integrated into the Future Urban Zone located on the southern side of the road corridor.
- The property impacts and land requirement will largely be limited to the south side of the road corridor.
- Construction costs and risks will be lower as less properties to be demolished. There are also less utilities located on the southern side of the road corridor.
- It allows for a greater buffer between the widened road and the Totara Creek reducing the potential for adverse ecological effects.

BRIGHAM CREEK ROAD UPGRADE – SEGMENT 2 ROUTE REFINEMENT AND ASSESSMENT



		IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	Heritage	Land Requirement	Stormwater	Social cohesion	Transport	Construction		Preferred
1	SGA 30m cross section Holding the existing centreline and widening the road on the northern and southern side.	✓	✓	✓	✓	Low	Medium	Low	Medium	Low	Medium	Option 1 has the potential to deliver better Urban Design Outcomes for the Whenuapai Local Centre. Additionally, the option enables retention of the neighbourhood centre and retains the character of Single House Zoning/NZDF standalone housing.	✓
2	SGA 30m cross section Holding the northern boundary and widening the road to the south.	✓	✓	✓	✓	Low	High	Low	Medium	Low	Medium	Option 2 has significant property impacts on the RNZAF residential properties and the Neighbourhood Centre properties. Additionally, there are reduced urban design outcomes in terms of the interface with the street and impacts on the character of the Residential – Single House Zone / RNZAF residential properties.	x
3	SGA 30m cross section Holding the southern boundary and widening the road to the north.	✓	✓	✓	✓	Low	High	Low	Medium	Low	Medium	Option 3 has significant impacts on the RNZAF properties / land located within the Local Centre and Industrial land. Additionally, there are Reduced urban design outcomes in terms of the interface with the street and impacts on the character of future development within Business - Local Centre Zone.	x

EMERGING PREFERRED OPTION – OPTION 1 WIDENING BOTH SIDES

Reasons for selection

- Widening on both sides allows the widened road corridor to have an enhanced interface between the road and surrounding land uses on both sides of the corridor.
- Greatest opportunity for refinement to minimise property impacts and the land requirement.

Consideration was given to reducing the cross section to two lanes through the local centre however this was discounted due to:

- Uncertainty about scale and location of the future local centre (project team is aware of potential future plan changes in new locations).
- Uncertainty about resulting town centre requirements such as wider footpaths, flush medians and pedestrian connectivity requirements. The wider cross section maintains future flexibility to achieve desired transport outcomes.
- Retains flexibility for bus priority through the town centre if required, particularly in the interim.
- Brigham Creek Road's current strategic role as a connection between SH16 and SH18 will continue until the implementation of the SH16/SH18 Connections project which currently has an unknown timing and no funding. Should land use changes eventuate without this infrastructure, this would place additional pressure on the Brigham Creek corridor to provide for all transport modes within two lanes.

BRIGHAM CREEK ROAD UPGRADE – SEGMENT 3 ROUTE REFINEMENT AND ASSESSMENT



IO1: Access

IO2: Reliability

IO3: Mode

IO4: Safety

Heritage

Land Requirement

Stormwater

Social cohesion

Transport

Construction

KEY IMPACTS

High impact

Medium impact

Low impact

SUMMARY OF ASSESSMENT

Preferred

		IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	Heritage	Land Requirement	Stormwater	Social cohesion	Transport	Construction		Preferred
1	SGA 30m cross section Holding the existing centreline and widening the road on the northern and southern side.	✓	✓	✓	✓	Low impact	Low impact	Medium impact	Low impact	Low impact	High impact	Option 1 has significant impacts upon the Spark Designation and the potential for impacts on the RNZAF airbase by widening towards the runway.	x
2	SGA 30m cross section Holding the northern boundary and widening the road to the south.	✓	✓	✓	✓	Low impact	Low impact	High impact	Low impact	Low impact	High impact	Option 2 (along the eastern section) was discounted as there are significant impacts upon the Spark Designation. Additionally, there is potential for greater ecological and stormwater effects due to the proximity to the Waiarohia Stream and associated features. Western section avoids RNZAF.	✓ Hybrid
3	SGA 30m cross section Holding the southern boundary and widening the road to the north.	✓	✓	✓	✓	Low impact	Low impact	Low impact	Low impact	Low impact	Medium impact	Widening to the north in the western part of this segment impacts the RNZAF runway. However to the east this widening avoids the Spark designation and has less ecological impacts..	✓ Hybrid

EMERGING PREFERRED OPTION – HYBRID OF OPTIONS 2 & 3

Reasons for selection

- A hybrid option responds to key constraints along the corridor by widening to the south in the west to avoid the RNZAF runway and widening to the north in the east to avoid the Spark Designation. This approach is supported by the respective Requiring Authorities.
- Widening north in the eastern section of the segment minimises the potential for ecological and stormwater effects due to be further from the Waiarohia Stream and associated features.



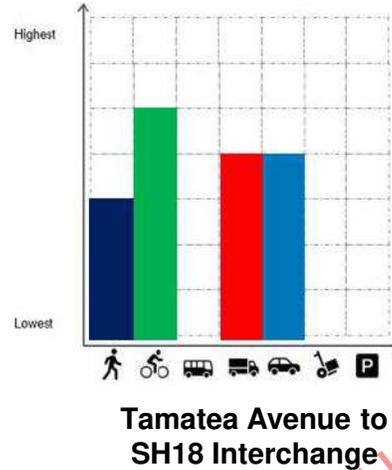
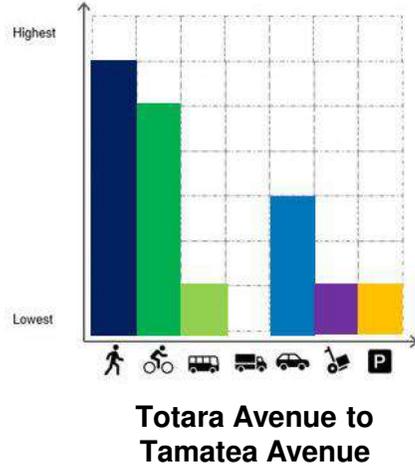
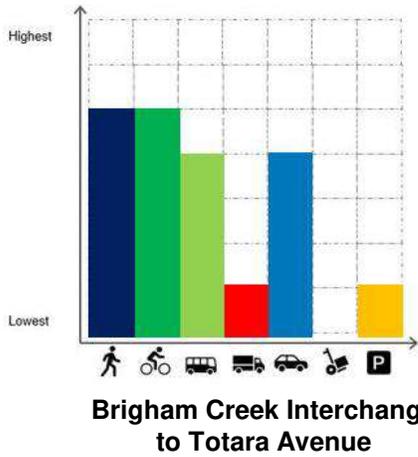
BRIGHAM CREEK ROAD UPGRADE – EMERGING PREFERRED OPTION DEVELOPMENT

INTERSECTION FORM ASSESSMENT

Intersection	Recommendation	Comment
Joseph MacDonald Drive	Priority controlled.	Existing intersections are priority controlled. Proposed to be retained, signals provided at Totara Road. RT Bay can be formed in flush, or solid median provided if desired.
Brigham Creek Road/Boyes Avenue	Priority controlled.	Existing intersections are priority controlled. Proposed to be retained, signals provided at Totara Road. RT Bay can be formed in flush, or solid median provided if desired.
Brigham Creek Road/Totara Road/Māmari Road	Signals	Existing Signals with additional capacity to be investigated. Developer provided intersection with degree of future proofing. PT priority to be developed on Mamari leg.
Brigham Creek Road/Ngahue Crescent	Priority controlled.	Existing intersections are priority controlled. Very small traffic volumes. RT Bay can be formed in flush, or solid median provided if desired.
Brigham Creek Road/Nils Anderson Road	Priority controlled.	Existing intersections are priority controlled. Proposed to be retained, signals provided at Totara Road. RT Bay can be formed in flush, or solid median provided if desired.
Brigham Creek Road/Tamatea Road	Signals	Opportunity to implement urban treatment. Opportunity to decrease to two lanes west of intersection.
Brigham Creek Road/Trig Road	Dual Lane Roundabout	No PT priority, separated from high ped and cycle area.
Brigham Creek Road/Kauri Road	Dual Lane Roundabout	Dual Lane Roundabout, high turning volumes expected to and from Kauri Road in peak periods.
Brigham Creek Road/SH18 connections	Signalised Interchange	As per SH16/18 DBC

BRIGHAM CREEK ROAD UPGRADE – EMERGING PREFERRED OPTION DEVELOPMENT

FUTURE MODAL PRIORITY



HOW SOLUTION MEETS FUTURE MODAL PRIORITY

- Provision for bus lanes if desired and all signalised intersections to have bus priority measures.
- Provision for separated cycle facilities and footpaths on both sides of the corridor.
- The provision of additional capacity in the central section (adjacent the local centre) primarily protects for the flexibility for bus priority in the future if desired, as well as additional space to respond to bespoke town centre requirements such as wider footpath widths and space for pedestrian connectivity.

DESIGN REFINEMENTS

- Development of a hybrid solution to best avoid constraints.
- Widening to both sides at the western end to provide more equitable land take as no building constraints.
- Geometry from Brigham Creek Bridge to Joseph McDonald Dr modified to aligned with developer proposing private plan change.
- Alignment shifted to the west in front of the NZDF runway to align back berm with existing property boundary on the east.
- Alignment shifted north into NZDF land just after Trig Rd to align back berm with existing property boundary on the south to minimise impact of Spark cable station.
- Alignment shifted east just after Spark cable station to align back berm with existing property boundary on west to minimise impact on tributary of Waiarohia Stream.
- Accommodation of NZDF revised safety areas south of runway.
- Roundabout at Kauri Rd revised to signals.

MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN

Issues	Complexity Rating
Height of pavement and vehicles at end of NZDF runway to be considered taking into account height restrictions	M
Intersections with Airport Rd and Tamatea Ave currently shown as the 'Do Min' access proposal to NZDF Airbase. Further engagement and consideration of NZDF access and pedestrian connectivity.	M
Investigation of feasibility of using NZDF stormwater dry pond to be investigated. Consideration to be given to construction requirements.	M
Coordination of proposed upgrades to existing stormwater wetland near Kauri Rd. with Waka Kotahi SH16/18 Connections Project.	M
Engagement with Spark & Southern Cross Cable regarding protection and construction requirements.	L
Tie in and interface details with businesses near existing town centre	M

BRIGHAM CREEK ROAD UPGRADE – RECOMMENDED OPTION

RECOMMENDED OPTION FOR BRIGHAM CREEK ROAD



RISKS

- Uncertainty regarding location and urban form of the local centre.
- NZDF operational changes including access to base.
- Alignment with developer led collector roads and intersections.
- Protection requirements of Southern Cross Cable and adjacent utilities.

INTERDEPENDENCIES

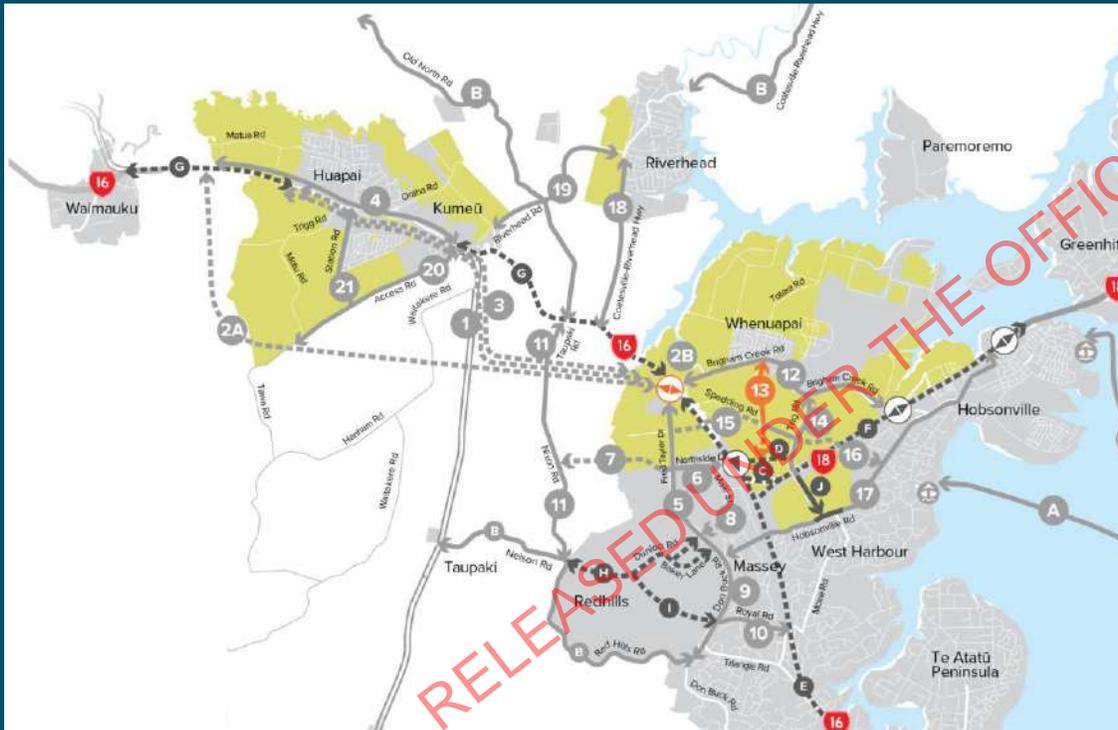
- Waka Kotahi SH16/18 Connections.
- Brigham Creek Interchange.
- Māmari Road FTN Upgrade.
- Trig Road Upgrade.
- Sinton Bridge Upgrade.

ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives		Alignment
Access	Improve access to economic and social opportunities along Brigham Creek Road.	Upgraded access through Whenuapai which focuses on improving local access and connecting key land uses within Whenuapai as well as access both SH16 and SH18. Also provides key local access from Kumeū-Huapai and Riverhead to Whenuapai to access future employment.
Reliability	Enable reliable people and freight movement on Brigham Creek Road.	Improved reliability of public transport with bus priority at intersections and potential for bus lanes in central section.
Mode Choice	Support transformational mode share in Whenuapai by providing a high quality, safe and attractive movement of people along Brigham Creek Road.	Multimodal corridor with separated cycle facilities on both sides as well as enhanced public transport facilities to support a frequent bus service.
Safety	Provide improvements on Brigham Creek Road that contribute to a transport network that is free from deaths and serious injuries.	Provision of separated cycle facilities and improved intersection controls to support safety of turning traffic.
Integration	Provide a transport system that is integrated with land use enabling a more sustainable, high quality, connected urban form which supports growth in the Whenuapai.	Specific town centre cross section in the centre section to support land use. Focuses on contiguous active mode facilities along the length of the corridor. Intersection upgrades to support active mode permeability across the corridor.
Climate Change	Supporting transformation to a low carbon transport system through the increase of people movement capacity by bus, walking and cycling.	

Māmari Road FTN Upgrade

Project 13



MAMARI ROAD FTN UPGRADE – PRELIMINARY ASSESSMENT

PROJECT #13 MAMARI ROAD FTN UPGRADE

PURPOSE

- Distributes future Whenuapai growth and connects people to rapid transit stations, regional active modes and the SH16 motorway interchange.
- Needs to support reliable FTN access to Westgate and provide improved walking and cycling facilities.

LAND USE



- Land use along the corridor is primarily Future Urban Zoning.
- NZDF Designations on eastern side for operations and housing.

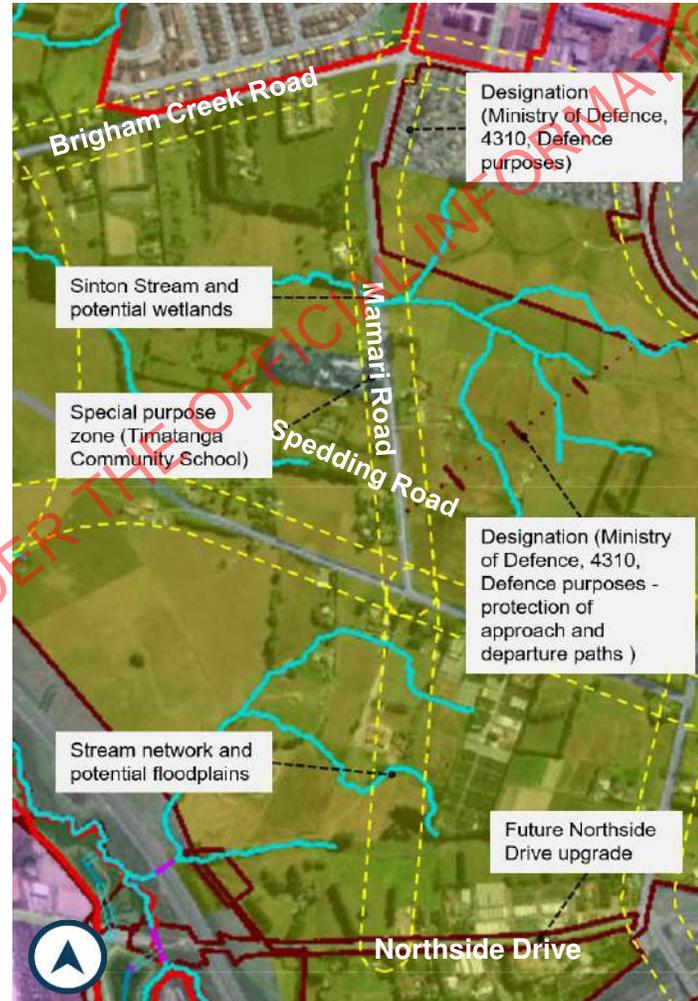
- Future Urban Zone
- Residential - Terrace Housing and Apartment Buildings Zone
- Residential - Mixed Housing Urban Zone
- Business - Light Industry Zone
- Business – General Business Zone

- Existing rural road
- New extension

GAP ANALYSIS

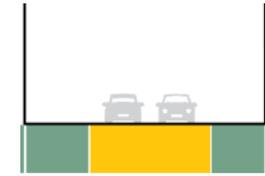
- North West DBC reconfirms IBC Indicative Transport Network alignment.

CONSTRAINTS



FORM AND FUNCTION ASSESSMENT

EXISTING CROSS SECTION



FUTURE CROSS SECTION



DBC OPTION DEVELOPMENT

Segment 1: Upgrading rural road

- Between Brigham Creek Road and Spedding Road.
- 30m cross sections.
- Three widening options considered:

1A: Widening equally on both sides from centreline.

2A: Widening to the west.

3A: Widening to the east.

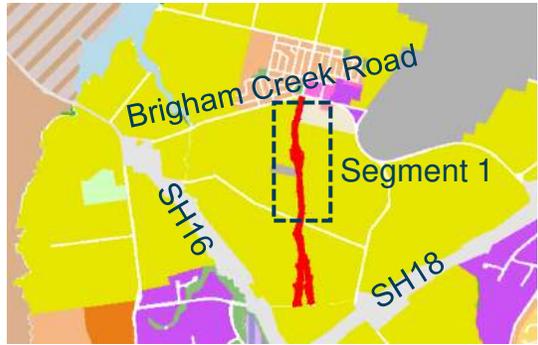
Segment 2: New extension

- Between Spedding Road and Northside Drive.
- Two options initially considered

1B: Western intersection connection on Northside Drive

2B: Eastern connection on Northside Drive and connecting with the intersection proposed as part of the SH16/18 Connections Project.

MAMARI ROAD FTN UPGRADE – SEGMENT 1 ROUTE REFINEMENT AND ASSESSMENT



KEY IMPACTS



SUMMARY OF ASSESSMENT

OPTIONS	IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	Heritage	Land Requirement	Stormwater	Social cohesion	Transport	Construction	Preferred
1A SGA 30m cross section Holding the existing centreline	✓	✓	✓	✓	Low impact	High impact	Low impact	Low impact	Low impact	Medium impact	x
2A SGA 30m cross section Widen west only (hold east side of the road)	✓	✓	✓	✓	Low impact	Low impact	Low impact	Low impact	Low impact	Medium impact	✓ Hybrid
3A SGA 30m cross section Widen east only (hold east side of the road)	✓	✓	✓	✓	Low impact	Low impact	Low impact	Low impact	Low impact	Medium impact	✓ Hybrid

EMERGING PREFERRED OPTION – HYBRID OF OPTIONS 2A AND 3A

Reasons for selection

- Option 2A in the northern section and southern section and Option 3A in the central section of segment 1.
- Hybrid avoids key planning constraints along the corridor, including the MOD designation (both the RNZAF housing and landing lights), and the Timatanga Community School / Special Purpose - School Zone in the mid-section of the segment.
- Minimises the land requirement / property impacts in relation to the RNZAF housing and Timatanga Community School.

MAMARI ROAD FTN UPGRADE – SEGMENT 2 ROUTE REFINEMENT AND ASSESSMENT



KEY IMPACTS



SUMMARY OF ASSESSMENT

		IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	Heritage	Land Requirement	Ecology	Social cohesion	Transport	Construction	Preferred	
B1	SGA 30m cross section South west Connection with Northside Drive upgrade	✓	✓	✓	✓							<ul style="list-style-type: none"> Reduced number of properties affected (4 compared to 7). Intersection alignment discounted due to less ability to manage queuing at interchanges. Less impact on Pikau Stream and floodplains. 	✓ Hybrid
B2	SGA 30m constrained South east Connection with Northside Drive upgrade	✓	✓	✓	✓							<ul style="list-style-type: none"> Provides more separation to manage queuing and traffic operations between the intersection with Northside Drive and the proposed SH16/18 Connections project. Impacts upon steams and wetland habitats in northern section of this segment. 	✓ Hybrid

EMERGING PREFERRED OPTION – REFINED HYBRID OPTION

- Hybrid of both options to better respond to constraints (as shown in diagram).
- The refined alignment incorporates the B2 intersection alignment with Northside Drive which performs better against the reliability investment objective. This is because the location maximises the distance between Māmari Road and potential queuing from the future Northside Drive interchange which is proposed as part of the SH16/18 Connections Project.
- Localised realignment (in green) to minimise environmental effects on existing streams and wetlands.



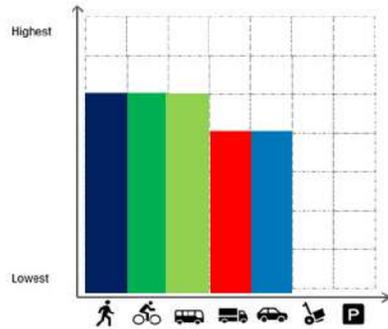
Segment 2 Hybrid shown in green

MAMARI ROAD FTN UPGRADE – EMERGING PREFERRED OPTION DEVELOPMENT

INTERSECTION FORM ASSESSMENT

Intersection	Recommendation	Comment
Māmari Road and Brigham Creek Road	Signals	Existing Signals with additional capacity to be investigated. Developer provided intersection with degree of future proofing. PT priority to be developed on Mamari leg.
Māmari Road and Spedding Road	Dual Lane Roundabout	Note that performance is slightly lower for vehicles, LoS D in PM peak – 160m queues on Spedding Road approach.
Māmari Road and Northside Drive	Signals	Signalised intersection recommended as part of SH16/18. Access for a fourth arm to not be precluded for buses and local access south of Northside Drive.

HOW SOLUTION MEETS FUTURE MODAL PRIORITY



Future Modal Priority

- Provision for FTN bus network with bus lanes and priority at intersections. Main north south bus connection for Whenuapai – particularly important to connect residential development north of Brigham Creek Road to the RTC and Westgate.
- Provision for separated cycle facilities and footpaths on both sides of the corridor.
- Supports freight by providing direct link from Northside Drive and Trig Road interchanges to industrial land zoned adjacent Māmari Road.
- Retention of existing level of traffic capacity i.e. one lane in each direction.

DESIGN REFINEMENTS

- Near Brigham Creek Road Intersection alignment shifted west to minimise impact on NZDF housing.
- South of Pikau Stream and Northside Drive, alignment weaves to the east then the west to avoid the Timatanga Community School as well as the NZDF landing lights.
- South of Spedding Road, avoid wetlands, reduce the need for future stream compensation and extent of erosion and sediment controls during construction.
- Southern segment aligned down the middle of 82 Trig Road as per discussion with property owner. This allows residual land to be split into more regular parcels of property.
- Intersection with Northside Drive modified to match adjusted Māmari alignment. This location is slightly west of the proposed location in the SH16/18 Connections SSBC, however the new intersection location meets the intent of the SSBC in that it connects Māmari to Northside Drive and does not preclude a further bus only connection direct to Westgate. Traffic operation of the intersection has been checked and confirmed to not adversely impact either the SH16 or SH18 ramps.

MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN

Issues	Complexity Rating
Potential to shift alignment further east in front of Timatanga Community School to lessen impact.	M
Diversion drain on western side near Timatanga Community School	L
Review of intersection location on Northside Drive which differs to location proposed by SH16/18 Connections project	L
Dry ponds design to meet NZDF requirements.	L
Structural and geotechnical design of bridge over Pikau Stream.	M

MAMARI ROAD FTN UPGRADE – RECOMMENDED OPTION

RECOMMENDED OPTION FOR MAMARI ROAD



ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives		Alignment
Access	Improve access to economic and social opportunities by providing an integrated multi-modal corridor from Whenuapai to Redhills	Key corridor with dual purpose to provide access from Whenuapai to both a future RTC station and the strategic highway network. Provides alternative link from Whenuapai to both Northside Drive and Trig Road motorway interchanges which is beneficial for freight vehicles to access the industrial zoned land.
Reliability	Enable reliable people and freight movement between Whenuapai and Redhills	Improved reliability of public transport with dedicated bus lanes and bus priority.
Mode Choice	Support transformational mode share in Whenuapai by providing a high quality, safe and attractive movement of people along Mamari Road	Multimodal corridor with separated cycle facilities on both sides. Critical FTN bus link from Whenuapai to the strategic network. Integrates with further planned bus link south of Māmari Road that connects directly to Westgate.
Safety	Provide improvements on Mamari Road that contribute to a transport network that is free from deaths and serious injuries	Provision of separated cycle facilities and improved intersection controls to support safety of turning traffic.
Integration	Provide a transport system that is integrated with land use enabling a more sustainable, high quality, connected urban form which supports growth in the North West.	30m cross section provides flexibility for future mid block crossing locations to improve permeability. Integrates with SH16/18 Connections project at Northside Drive.
Climate Change	Supporting transformation to a low carbon transport system through the increase of people movement capacity by bus, walking and cycling. Māmari Road infrastructure provides a direct connection to Westgate to support non vehicular access from Whenuapai to the future RTC network and will therefore expand the Westgate RTC catchment and maximise the RTC mode shift.	

RISKS

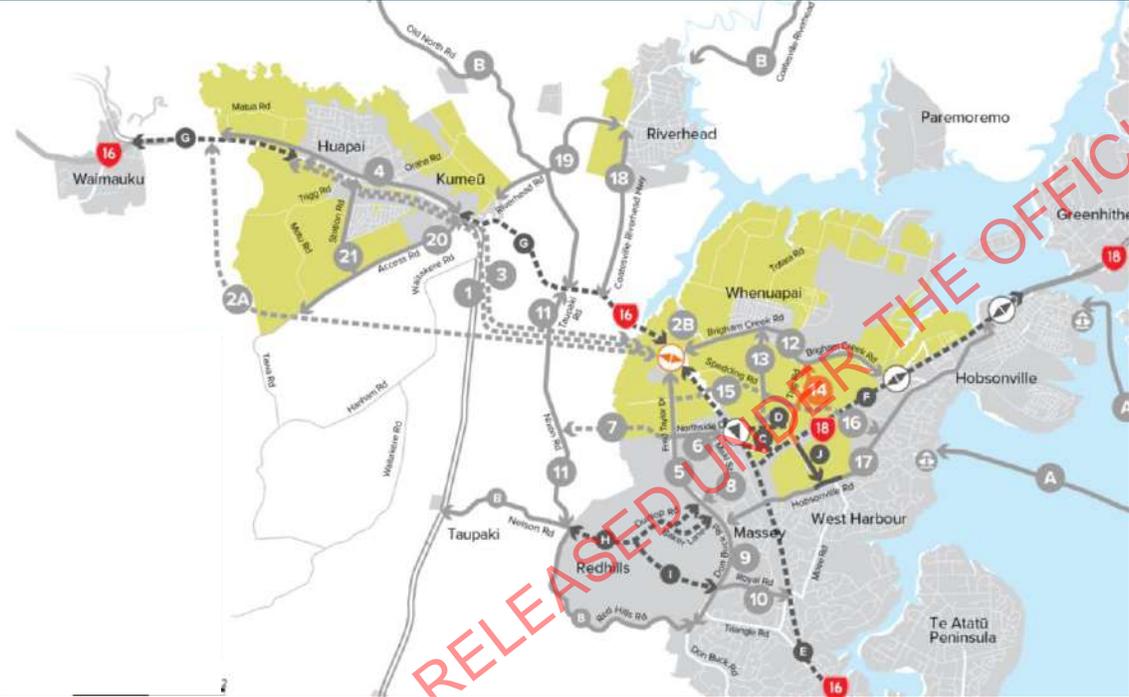
- Impact on Timatanga Community School is not acceptable and requires redesign.
- Proposed relocation of intersection with Northside Drive requires redesign. To be managed in parallel with the SH16/18 Connections Project NOR documentation.
- Consenting issues do proximity of sensitive ecological features.

INTERDEPENDENCES

- Northside Drive Extension as part of Waka Kotahi's SH16/18 Connections Project.
- Brigham Creek Road Upgrade.
- New Spedding Road East.
- New Spedding Road West.

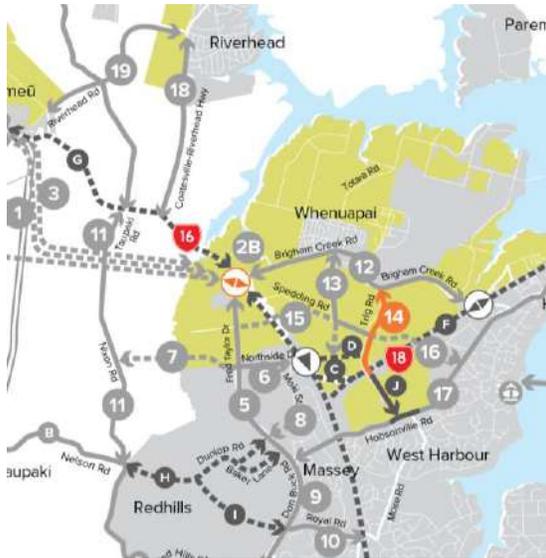
Trig Road Upgrade

Project 14



TRIG ROAD UPGRADE – PRELIMINARY ASSESSMENT

PROJECT #14 TRIG ROAD UPGRADE



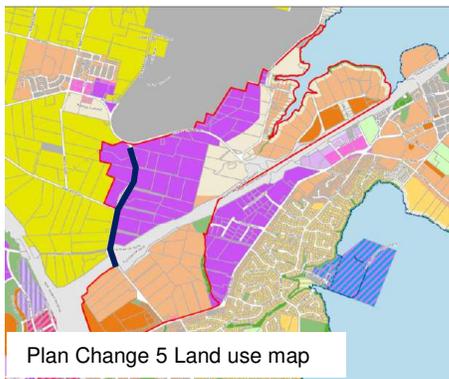
PURPOSE

- Key freight connection between Whenuapai employment area and SH16 and SH18.
- Needs to support active modes and freight.

GAP ANALYSIS

- North West DBC reconfirms IBC Indicative Transport Network alignment.

LAND USE



- Future Urban Zone
- Residential - Terrace Housing and Apartment Buildings Zone
- Residential - Mixed Housing Urban Zone
- Business - Light Industry Zone
- Business – General Business Zone

- Land use along the corridor consists of Light Industry, Future Urban and Mixed Housing Urban zoning.

CONSTRAINTS

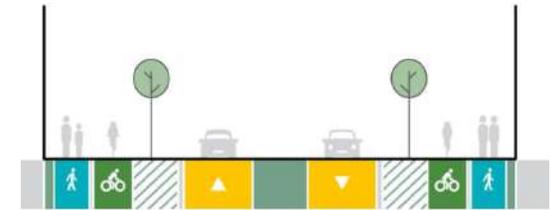


FORM AND FUNCTION ASSESSMENT

EXISTING CROSS SECTION



FUTURE CROSS SECTION



DBC OPTION DEVELOPMENT

Three 24m cross section options were identified:

These were:

- **Option 1** - holding the existing centreline and widening the road on the eastern and western side.
- **Option 2** - holding the eastern boundary and widening the road to the west.
- **Option 3** - holding the western boundary and widening the road to the east.

TRIG ROAD UPGRADE – ROUTE REFINEMENT AND ASSESSMENT



SUMMARY OF ASSESSMENT

		IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	Heritage	Land Requirement	Stormwater	Social cohesion	Transport	Construction		Preferred
1	SGA 24m cross section Holding the existing centreline	✓	✓	✓	✓	Low	Low	Low	Low	Low	High	By holding the centreline, there is a more equitable land requirement through the corridor. This is achieved by impacting both sides of the corridor so there is less property impact compared to solely widening in one direction.	✓
2	SGA 24m cross section Widen west only (hold eastern boundary)	✓	✓	✓	✓	Low	High	Low	Low	Low	High	By widening in one direction there is a less equitable land requirement compared to Option 1.	x
3	SGA 24m cross section Widen east only (hold western boundary)	✓	✓	✓	✓	Low	High	Low	Low	Low	High	By widening in one direction there is a less equitable land requirement compared to Option 1.	x

EMERGING PREFERRED OPTION – OPTION 1

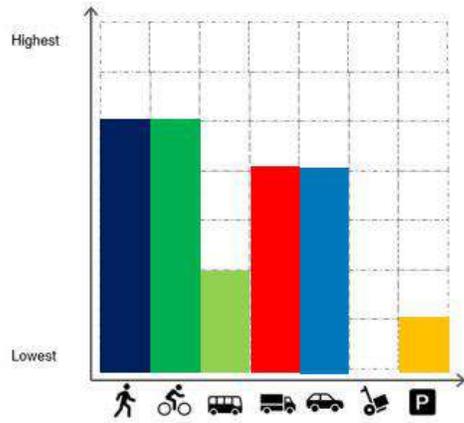
- The emerging preferred option is to hold the existing centreline and widening the road on the eastern and western side.
- No significant constraints were identified along the corridor to influence an east or west alignment.
- The centreline approach will impact more properties on both sides of the road. The extent of the land requirement, however, will generally be less from each impacted property compared to the land required from impacted properties by widening to either the east or west side only.

TRIG ROAD UPGRADE – EMERGING PREFERRED OPTION DEVELOPMENT

INTERSECTION FORM ASSESSMENT

Intersection	Recommendation	Comment
Trig Rd /Spedding Rd	Single Lane Roundabout	Generic single lane approach appropriate
Trig Rd/Brigham Creek Rd	Dual Lane Roundabout	No PT priority, will integrate with BCR (4 lanes)
Trig Road and SH18 On-Ramp	Signals	Space availability, complex intersection with Northside Drive interaction
Trig Road and SH18 Off-Ramp	Signals	Space availability, will need to provide connectivity to future shared path on SH18

HOW SOLUTION MEETS FUTURE MODAL PRIORITY



Future Modal Priority

- Provision for separated cycle facilities and footpaths on both sides of the corridor
- Direct freight connection from Northside Drive (SH16) and Trig Road (SH18) interchanges to future zoned industrial land along Trig Road.
- Retention of existing level of traffic capacity i.e. one lane in each direction

DESIGN REFINEMENTS

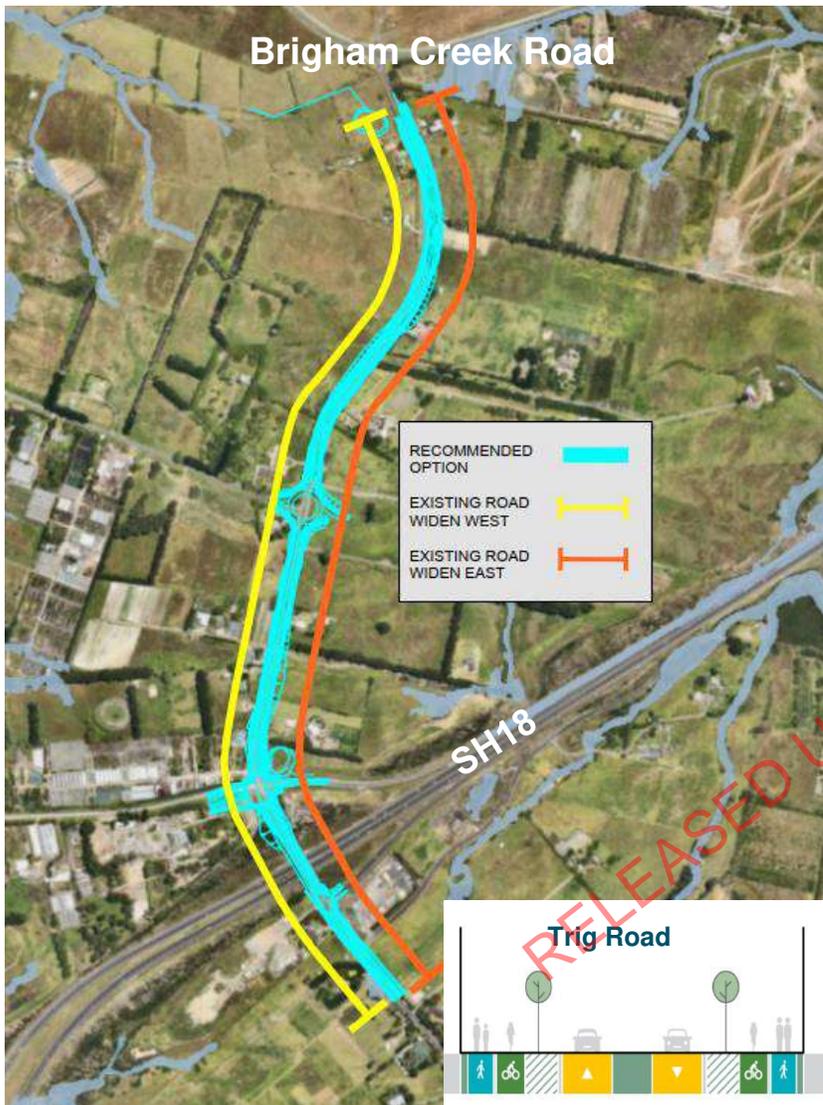
- Vertical levels reviewed to minimise isolated low points.
- Straightened the approaches to the roundabout with Spedding Road.
- Proposed re-allocation of existing road space across Trig Road bridge.

MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN

Issues	Complexity Rating
Plan Change 5/Structure Plan ITA – signalisation of all intersections identified.	L
Constrained footprint at the interchange intersections.	L
Integration with Watercare's NH2 & NI projects.	L
Property access near intersection with Northside Drive.	L
Structural and geotechnical design of active modes bridge over SH18.	M
Cycle crossing facilities over the motorway ramps	M

TRIG ROAD UPGRADE – RECOMMENDED OPTION

RECOMMENDED OPTION FOR TRIG ROAD



ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives		Alignment
Access	Improve access to economic and social opportunities by providing an integrated multi-modal corridor from Whenuapai to Redhills	Key north-south the link within Whenuapai. Will connect Whenuapai employment area directly to the SH18 interchange which improves freight accessibility.
Mode Choice	Support transformational mode share in Whenuapai by providing a high quality, safe and attractive movement of people along Trig Road	Multimodal corridor with separated cycle facilities on both sides. Connects to active mode facilities proposed on Trig Road south of SH18 interchange and completes the network between Whenuapai and Hobsonville road. Connects to proposed strategic cycle facility on SH18.
Safety	Provide improvements on Trig Road that contribute to a transport network that is free from deaths and serious injuries	Provision of separated cycle facilities and improved intersection controls to support safety of turning traffic. Cross section provides future opportunity for mid block crossings to improve corridor permeability and safety.
Climate Change	Provision of high quality active mode facilities will enable mode shift to active modes to support a low carbon transport system in growth areas.	

RISKS

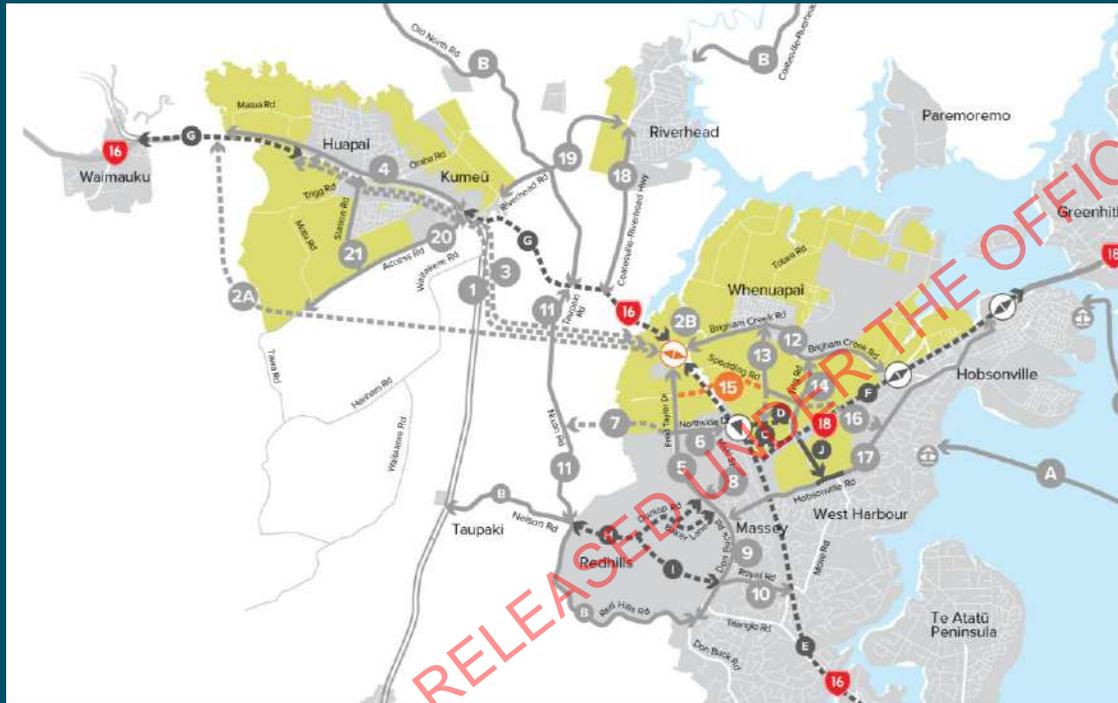
- Consistency of facilities with the bi-directional cycle way as part of interface with Housing Infrastructure Fund project.
- Alignment with developer led collector roads and intersections.

INTERDEPENDENCES

- Upgrade of Northside Drive and interchange as part of Waka Kotahi's SH16/18 Connections Improvements Project
- Trig Road upgrade as part of Housing Infrastructure Fund project

New Spedding Road West

Project 15



NEW SPEDDING ROAD WEST – PRELIMINARY ASSESSMENT

PROJECT #15 - PURPOSE

- New east-west connection that will support active mode and public transport connectivity between Whenuapai and Redhills and connect to the new RTC station at Brigham Creek.
- Increased resilience and reduction of severance for Whenuapai by providing a non-interchange SH16 crossing to support local movements for all modes.

GAP ANALYSIS

- North West DBC reconfirms IBC Indicative Transport Network alignment.

LAND USE



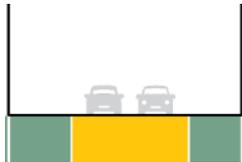
- Future Urban Zone
- Residential - Terrace Housing and Apartment Buildings Zone
- Residential - Mixed Housing Urban Zone
- Business - Light Industry Zone

★ Proposed location for future RTC station

- Land use along the corridor primarily consists of Future Urban zoning.
- Western end in close proximity to proposed RTC station.

FORM AND FUNCTION ASSESSMENT

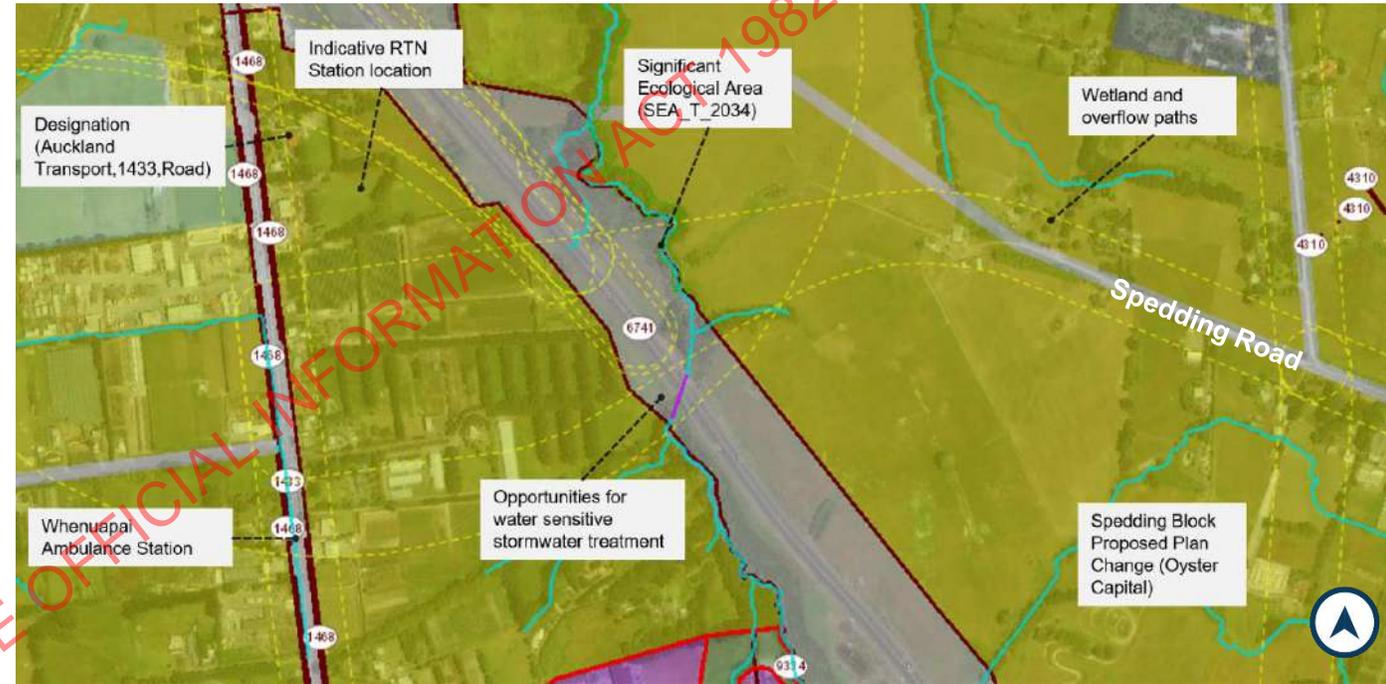
EXISTING CROSS SECTION



FUTURE CROSS SECTION



CONSTRAINTS



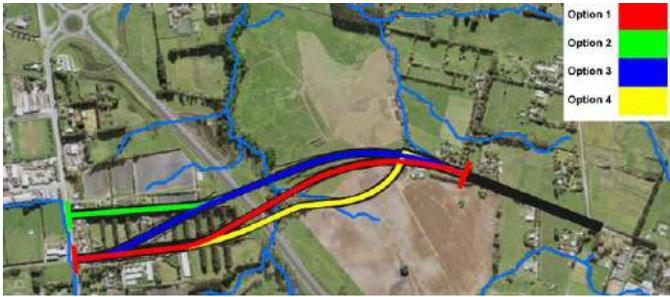
Main ecological constraint is the Totara creek and the Significant Ecological Area. Future width of the State Highway at 6 lanes forms a wide corridor to bridge.

DBC OPTION DEVELOPMENT

Total of four options were identified and taken forward to an Options Assessment Workshop. Variables tested included:

- Two western connections on Fred Taylor Drive – Four way intersection with Hailes Road and a new 'T' intersection with Fred Taylor Drive.
- Three bridge alignments over the stream and SH16.

NEW SPEDDING ROAD WEST – ROUTE REFINEMENT AND ASSESSMENT



KEY IMPACTS



OPTIONS

SUMMARY OF ASSESSMENT

OPTIONS	IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	KEY IMPACTS						SUMMARY OF ASSESSMENT	Preferred
					Heritage	Land Requirement	Ecology	Social cohesion	Transport	Construction		
1 SGA 24m cross section Holding centreline	✓	✓	✓	✓	Low	Medium	Low	Low	Low	Medium	Least impact on Totara Creek and located further away from the SEA. Hailes Road connection preferred. Longest bridge length.	✓
2 SGA 24m cross section Fred Taylor Drive at T intersection – Northern Bridge	✓	✓	✓	✓	Low	Medium	Medium	Low	Low	Medium	Reduced accessibility and connectivity as it does not connect to Hailes Road. Impacts upon the SEA. Additionally, there is less interface between the option and Totara Creek.	✗
3 SGA 24m cross section Fred Taylor Drive and Hailes Road intersection – Northern Bridge	✓	✓	✓	✓	Low	Medium	Low	Low	Low	Medium	Least impact on Totara Creek but some impacts upon the SEA. Additionally, there is less interface between the option and Totara Creek. Greater footprint within the Totara Creek.	✗
4 SGA 24m cross section Fred Taylor Drive and Hailes Road intersection – Southern Bridge	✓	✓	✓	✓	Low	Medium	Medium	Low	Low	Medium	Potential impacts upon the wetlands (if present) and there is less interface between the option and the Totara Creek. Greater footprint within the Totara Creek. Shortest bridge length	✗

EMERGING PREFERRED OPTION – OPTION 1

- Least impact on Totara Creek and associated riparian strip creating a greater opportunity for enhancements. The option also creates a greater opportunity for the transport corridor to interface with the stream area.
- The option does not directly impact on the SEA or potential surrounding wetlands.
- Connects at the preferred western connection at Hailes Road.

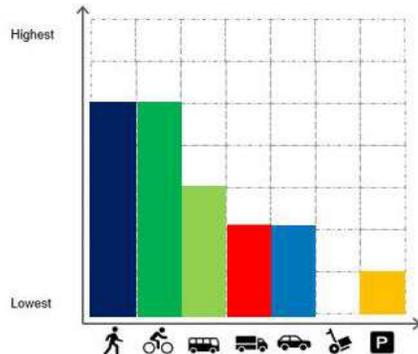
NEW SPEDDING ROAD WEST– EMERGING PREFERRED OPTION DEVELOPMENT

INTERSECTION FORM ASSESSMENT

Intersection	Recommendation	Comment
Spedding Road West/Fred Taylor Drive	Dual Lane Roundabout	Also assessed under Fred Taylor Drive. Greenfield opportunity to implement well performing roundabout.
Spedding Road West/Māmari Road	Dual Lane Roundabout	Also assessed under Māmari Slightly unbalanced flows. Greenfield intersection, more conservative footprint with roundabout to enable flexibility.
Spedding Road West/Trig Road	Single Lane Roundabout	Also assessed under Trig Road Greenfield intersection.

HOW SOLUTION MEETS FUTURE MODAL PRIORITY

- Provision for separated cycle facilities and footpaths on both sides of the corridor
- Retention of existing level of traffic capacity i.e. one lane in each direction
- Provides key bus link for Whenuapai to access proposed future RTC station.



Future Modal Priority

DESIGN REFINEMENTS

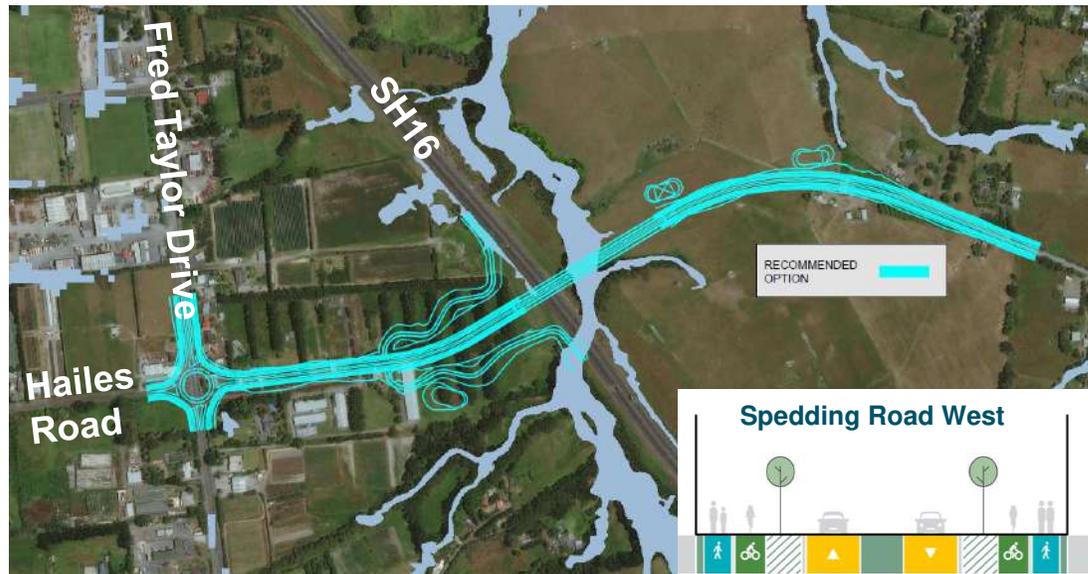
- Balancing earthworks fill requirements at bridge abutments versus lengthening the bridge structures.
- Rationalising property requirements along Fred Taylor Dr to consider low retaining wall design along the property boundary.
- Coordinate alignment tie-ins on Fred Taylor Dr, either side of Spedding Rd West / Hailes Rd roundabout with the Brigham Creek Interchange and Fred Taylor Dr Upgrade designs.

MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN

Issues	Complexity Rating
Existing intersection arrangements and existing development constraints.	M
Exploration of opportunities for enhancement of riparian features of the Totara Creek , associated SEA and wetland features through native planting fencing and pest control.	M
Interface with the future RTC station as part of the North West City Centre to Westgate DBC. Seek to enhance bus and active mode connections to this station from Spedding Road West.	H
Consideration of interface if RTC depot is identified near this location.	H
Interface with proposed Oyster Plan Change – realignment, east of SH16 maybe necessary to accommodate the plan change development.	M
Reassess the 255m long bridge structure and adjoining abutment design for cheaper design alternatives that will minimise the construction footprint on the significant ecology in that area.	H

NEW SPEDDING ROAD WEST – RECOMMENDED OPTION

RECOMMENDED OPTION FOR SPEDDING ROAD WEST



The preferred option is the **central** bridge alignment with a western connection to Fred Taylor Drive **at Hailes Rd.**

RISKS

- Complex consenting conditions regarding works near streams and wetlands
- Bridge structure required to be steel bridge to span over proposed SH16 widening works.
- Ecological mitigation not acceptable to manawhenua.
- Insufficient integration with the RTC stations and alignment.

INTERDEPENDENCIES

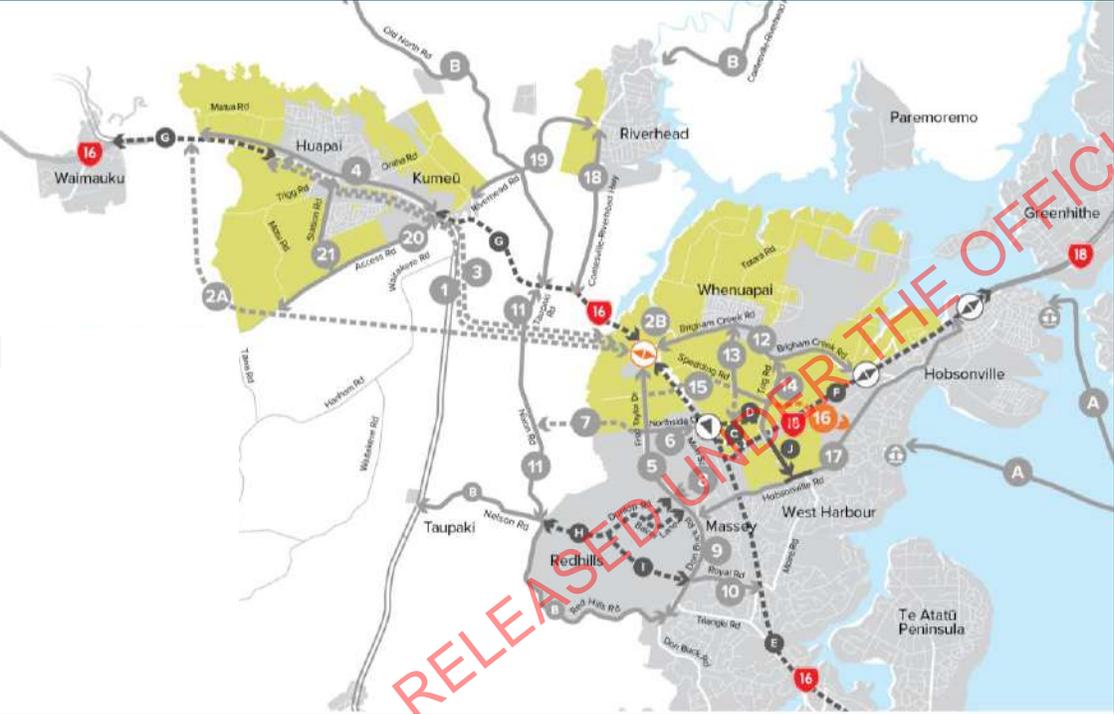
- NWRN project – City Centre to Westgate RTC.
- Waka Kotahi SH16/18 Connections Project.
- Māmari Road FTN Upgrade.
- Fred Taylor Drive FTN Upgrade.

ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives		Alignment
Access	Improve access to economic and social opportunities by providing an integrated multi-modal corridor from Whenuapai to Redhills	Provides new link for local trips between Whenuapai and Redhills. Key corridor to provide access from Whenuapai to a future RTC station and provide a secondary east west function within Whenuapai.
Reliability	Enable reliable people and freight movement between Whenuapai and Redhills	Additional local crossing of SH16 into Whenuapai improving resilience to access growth area. Improved reliability of public transport allowing access to the SH16 RTC station without traversing a motorway interchange.
Mode Choice	Support transformational mode share in Whenuapai by providing a high quality, safe and attractive movement of people along Spedding Road West	Multimodal corridor with separated cycle facilities on both sides as well as enhanced public transport facilities to support a frequent bus service to an RTC station.
Safety	Provide improvements on Spedding Road West that contribute to a transport network that is free from deaths and serious injuries	Provision of separated cycle facilities and improved intersection controls to support safety of turning traffic.
Integration	Provide a transport system that is integrated with land use enabling a more sustainable, high quality, connected urban form which supports growth in the North West.	Cross section provides future opportunity for mid block crossings to improve active mode permeability. Hailes Road link integrates with Fred Taylor Drive and has proximity to interim and future RTC stations. Provides direct east west connections from Whenuapai south to Fred Taylor Park sports fields.
Climate Change	Supporting transformation to a low carbon transport system through the increase of people movement capacity by bus, walking and cycling. Spedding Road West provides new east west connectivity between Whenuapai and the Brigham Creek RTC station. A good quality bus service on this link will maximise the wider catchment for the RTC station which would have otherwise been severed by SH16 and further improve mode shift for Whenuapai.	

New Spedding Road East

Project 16



NEW SPEDDING ROAD EAST – PRELIMINARY ASSESSMENT

PROJECT #16: PURPOSE

- New east-west connection that will support active mode and public transport connectivity between Whenuapai and Hobsonville and connect to proposed SH18 RTC.
- Increased resilience and reduction of severance for Whenuapai by providing a non-interchange SH18 crossing to support local movements for all modes.

GAPS ANALYSIS

- North West DBC reconfirms IBC Indicative Transport Network alignment.

LAND USE

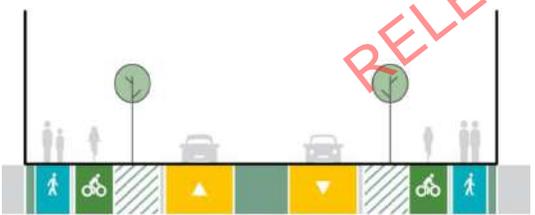


- Future Urban Zone
- Residential - Terrace Housing and Apartment Buildings Zone
- Residential - Mixed Housing Urban Zone
- Business - Light Industry Zone
- Business – General Business Zone

- Land use along the corridor primarily consists of Future Urban and Light Industry zoning.
- Link connects with development occurring on Hobsonville Road.

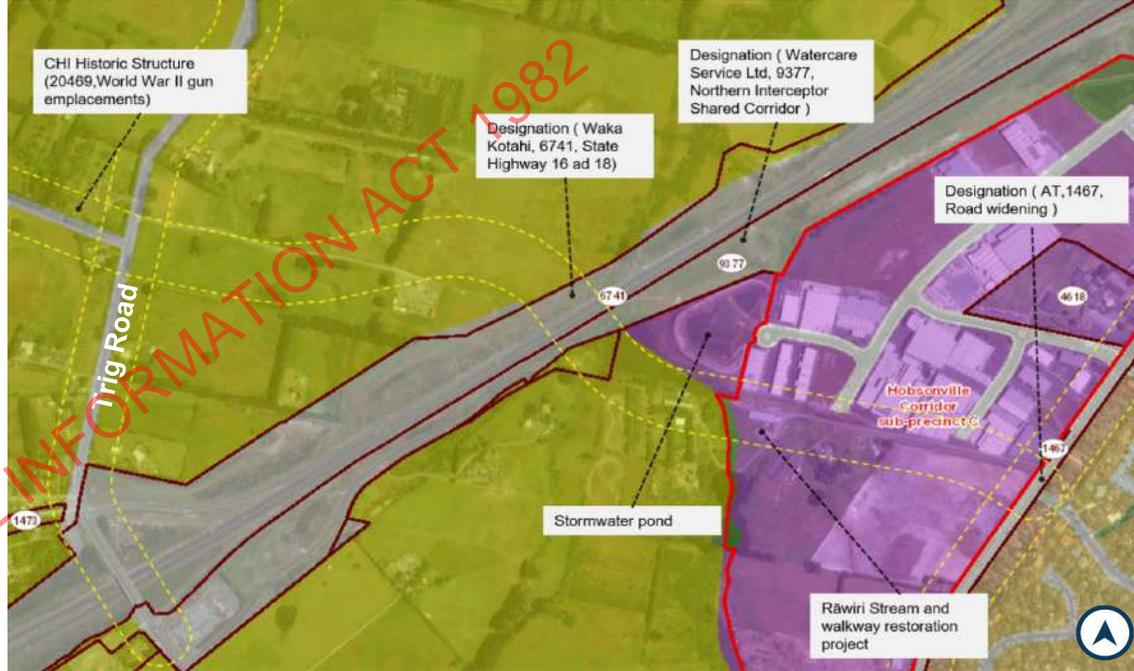
FORM AND FUNCTION ASSESSMENT

FUTURE CROSS SECTION



CONSTRAINTS

- Main ecological constraint is the Rawiri Stream and associated restoration areas adjacent the proposed bridge crossing.



DBC OPTION DEVELOPMENT

- Three options were identified and taken forward to an Options Assessment Workshop.
- Options focused on different bridge alignments to cross SH18 and Rawiri Stream.
- Eastern and western connections same in all options.



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NEW SPEDDING ROAD EAST – ROUTE REFINEMENT AND ASSESSMENT



KEY IMPACTS



SUMMARY OF ASSESSMENT

		IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	Heritage	Land Requirement	Ecology	Social cohesion	Transport	Construction	Preferred
1	SGA 24m cross section Northern alignment	✓	✓	✓	✓	Medium impact	Medium impact	Low impact	Low impact	Low impact	Low impact	✓
2	SGA 24m cross section Central option	✓	✓	✓	✓	Medium impact	Medium impact	Low impact	Low impact	Low impact	Medium impact	x
3	SGA 24m cross section Southern alignment	✓	✓	✓	✓	Medium impact	Medium impact	Low impact	Low impact	Low impact	Medium impact	x

EMERGING PREFERRED OPTION – OPTION 1

- Reduced construction cost due to the shorter perpendicular bridge crossing over SH18.
- Least impact on Rawiri Stream and associated floodplains and wetland.
- Residual land can be integrated / amalgamated with surrounding land uses.
- Opportunity to refine design to adopt a hydrologically sensitive design and provide mitigation, such as ecological landscaping.

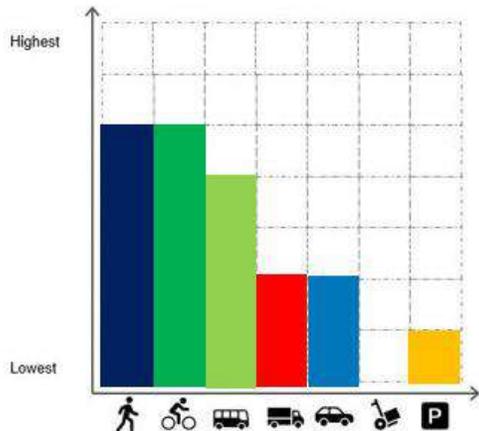
NEW SPEDDING ROAD EAST – EMERGING PREFERRED OPTION DEVELOPMENT

INTERSECTION FORM ASSESSMENT

Intersection	Recommendation	Comment
Spedding Road East and Trig Road	Dual Lane Roundabout	Also assessed as part of Trig Road.
Spedding Road and Hobsonville Road	Existing consent for signals	Signals implemented as part of development adjacent.

HOW SOLUTION MEETS FUTURE MODAL PRIORITY

- Provision for separated cycle facilities and footpaths on both sides of the corridor.
- Retention of existing level of traffic capacity i.e. one lane in each direction.
- Connects to future collector network to provide bus access to the proposed SH18 RTC station.



Future Modal Priority

DESIGN REFINEMENTS

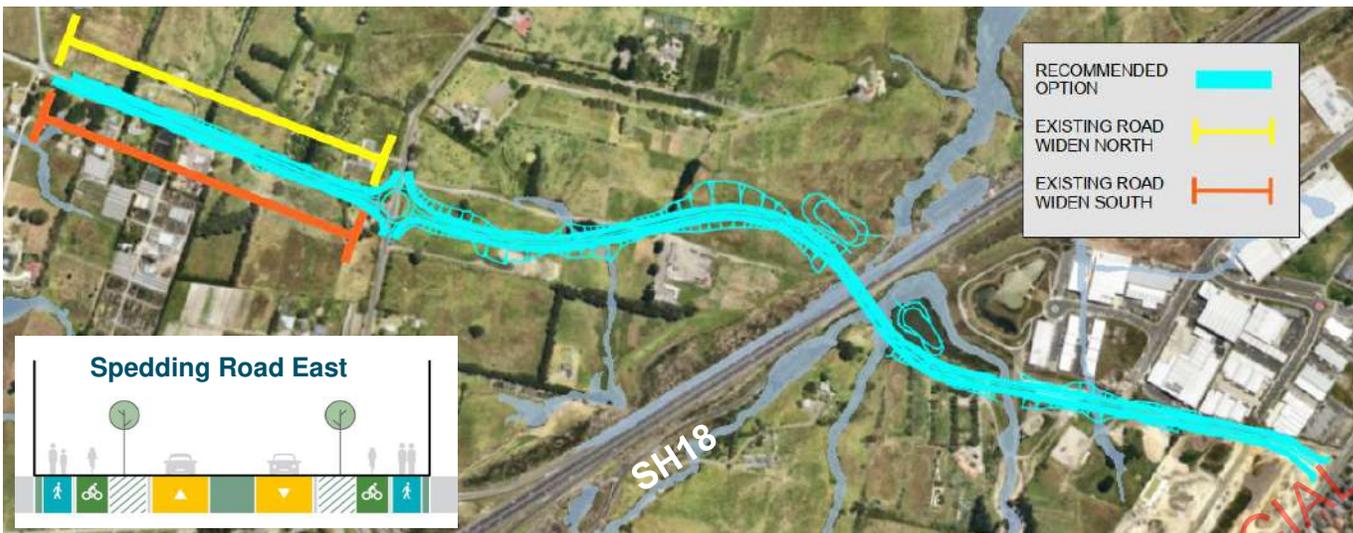
- Raising of vertical levels for proposed bridge crossing over Rawiri Stream.
- Retaining wall included along northern side between bridges.
- Stormwater wetland proposed each side of the SH18 to allow for stormwater management.
- Optimised cut and fill balance

MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN

Issues	Complexity Rating
Existing intersection arrangements and existing development constraints.	M
Structural and geotechnical design of bridge over SH18	H
Placement and orientation of bridge piers to minimise impact on streams and wetlands.	H
Potential to incorporate some stormwater flows into the existing nearby facilities	M
Potential to reduce cut slope of 1V:5H on the basis of detailed ground investigations	M
Interface with Watercare projects Northern Interceptor and North Harbour No. 2 watermain site at 27 Trig Road.	M
Interface with SH16/18 Connections project and the future location of the RTC station. Consideration of strategic property acquisition around RTC station	H
Further engagement with developers on eastern side of SH18 towards Hobsonville Road	M

NEW SPEDDING ROAD EAST – RECOMMENDED OPTION

RECOMMENDED OPTION FOR SPEDDING ROAD EAST



RISKS

- Complex consenting conditions regarding works near streams and wetlands
- Bridge structure required to be steel bridge to span over proposed SH18 widening works.
- Reconstruction of road near 96 and 98 Hobsonville Road due to poor geometry being achieved.

INTERDEPENDENCIES

- Widening of SH18 as part of Waka Kotahi's SH16/18 Connections Improvements Project.
- NWR TN project – SH18 proposed stations.
- Trig Road Upgrade
- Māmari Road FTN Upgrade

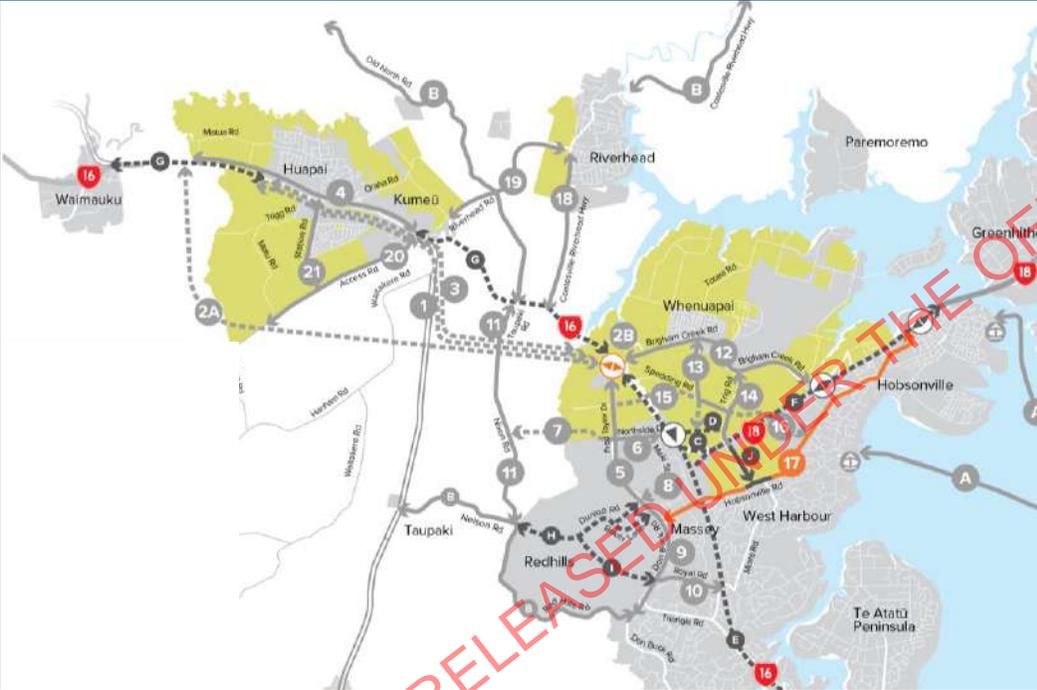
The preferred option is the **northern** alignment across SH18.

ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives		Alignment
Access	Improve access to economic and social opportunities by providing an integrated multi-modal corridor from Whenuapai to Redhills	Improve access for all modes between Hobsonville and Whenuapai employment destinations. Removes local trips from adjacent interchanges.
Reliability	Enable reliable people and freight movement between Whenuapai and Redhills	Improved reliability of public transport allowing access to the SH18 RTC station without needs to traverse an interchange. Additional link into Whenuapai improving resilience to access growth area.
Mode Choice	Support transformational mode share in Whenuapai by providing a high quality, safe and attractive movement of people along Spedding Road East	Multimodal corridor with separated cycle facilities on both sides. Supports access to a future SH18 RTC Station.
Safety	Provide improvements on Spedding Road East that contribute to a transport network that is free from deaths and serious injuries	Provision of separated cycle facilities and improved intersection controls to support safety of turning traffic.
Climate Change	Supporting transformation to a low carbon transport system through the increase of people movement capacity by bus, walking and cycling. Spedding Road East provides new east west connectivity between Whenuapai and the future SH18 RTC station. A good quality bus service on this link will maximise the wider catchment for the RTC station which would have otherwise been severed by SH18 and ultimately increase mode shift for Whenuapai.	

Hobsonville Road FTN Upgrade

Project 17



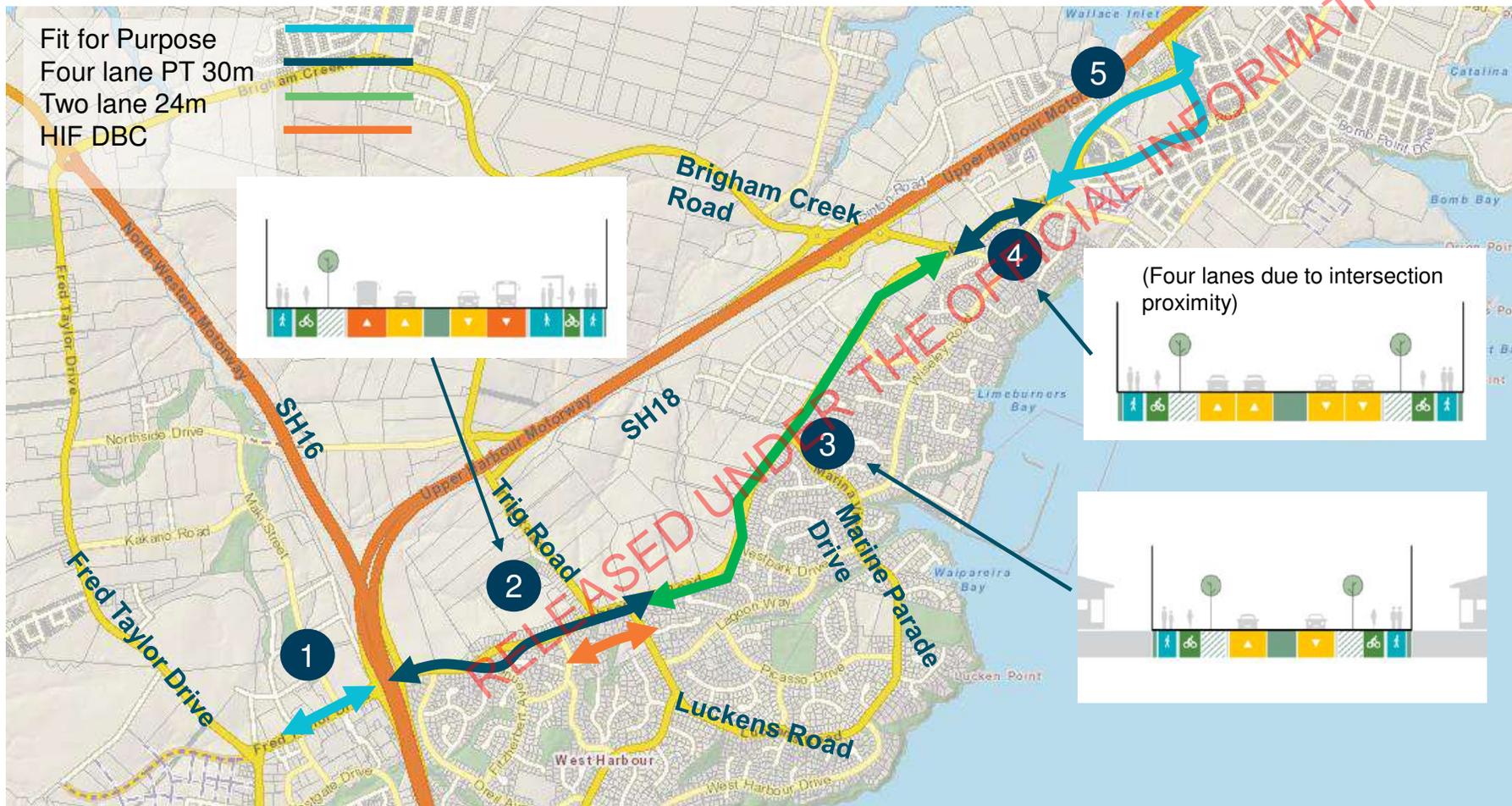
HOBSONVILLE ROAD FTN UPGRADE – PRELIMINARY ASSESSMENT

PURPOSE

- Connects Hobsonville to Westgate.
- Upgrade supports active modes and bus priority measures.

FORM AND FUNCTION ASSESSMENT

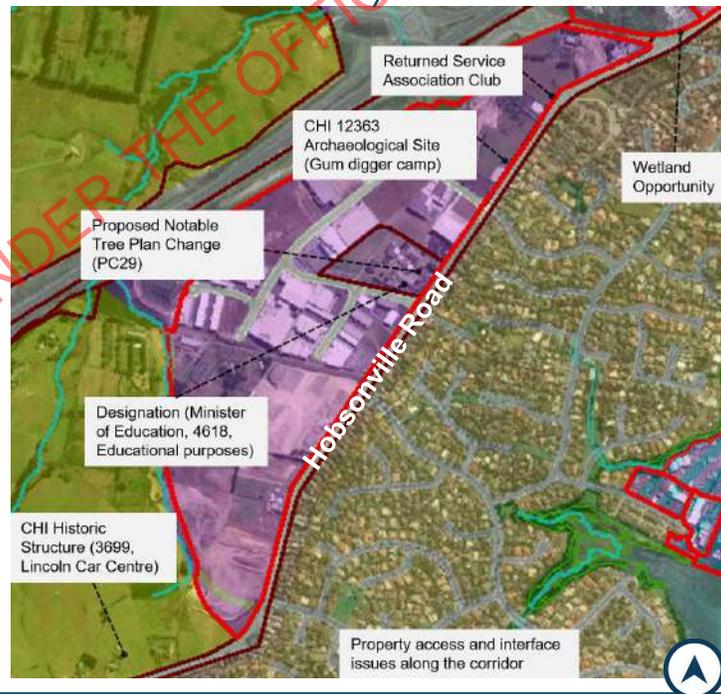
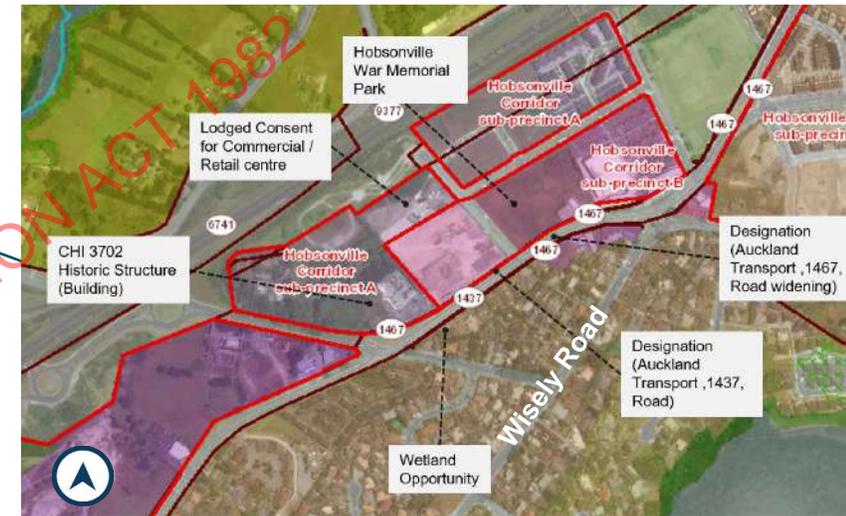
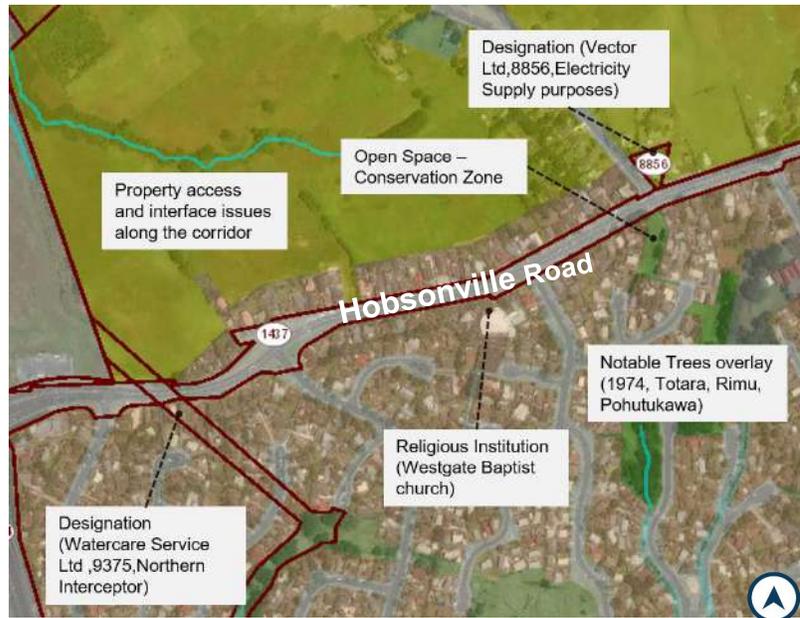
EXISTING CROSS SECTIONS



FUTURE CROSS SECTIONS

- Hobsonville Road was divided into 5 segments to be assessed as part of the Form and Function Assessment.
- **Segments 1 and 5** were classified as Fit for Purpose corridors. For these segments it was found that there was either sufficient width in the carriageway to allow for a reallocation of space or adequate provisions for all modes of transport to achieve the desired outcomes for the corridors. Subsequently, no further assessments were completed for these segments.
- **Segment 2** (SH16 Interchange to Luckens Road) - four lanes with bus lanes.
- **Segment 3** (Luckens Road to Brigham Creek Road) - two lanes.
- **Segment 4** (Brigham Creek Road to Hobsonville Point Road) – four lanes due to proximity to signalised intersections rather than a capacity upgrade.

HOBSONVILLE ROAD FTN UPGRADE – CONSTRAINTS



2 Segment 2 (SH16 to Luckens Road)

- Main constraints are utility services and property access issues due to topography.

3 Segment 3 (Luckens Road to Brigham Creek Road)

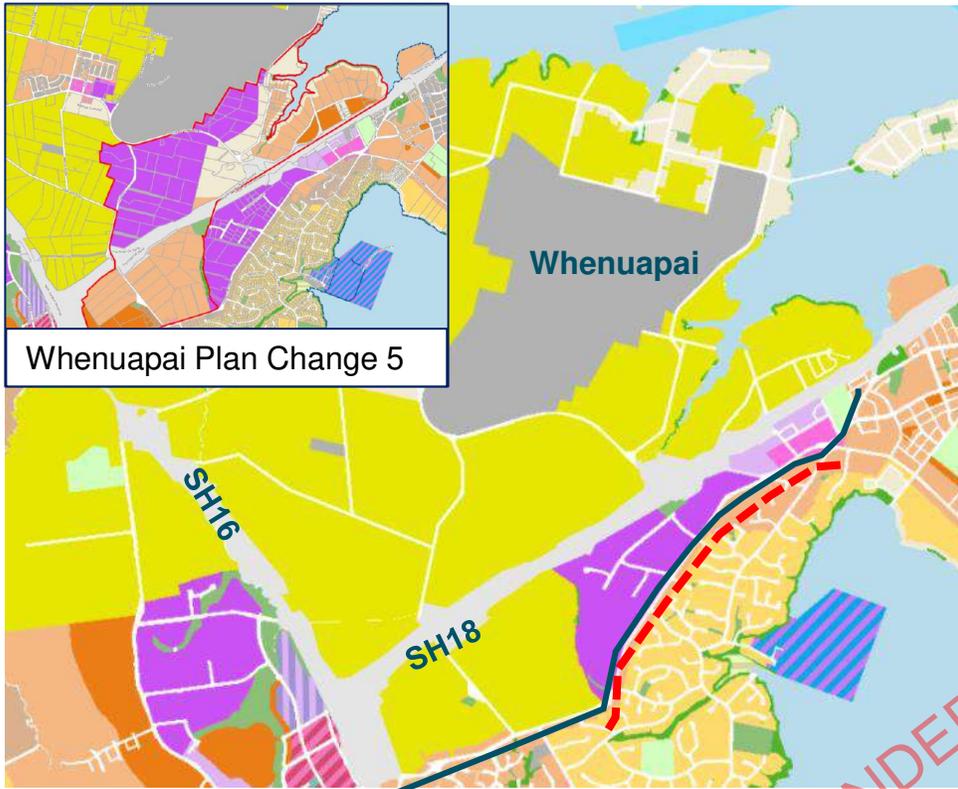
- Main constraints are Hobsonville School, Returned Services Association Club and an archaeological site. Some wetland opportunities identified.

4 Segment 4 (Brigham Creek Road to Hobsonville Point Road)

- Main constraints are lodged consents for a retail centre and the Auckland Transport designations (1437 and 1467). A wetland opportunity was identified.

HOBSONVILLE ROAD FTN UPGRADE – LAND USE AND OPTION DEVELOPMENT

LAND USE



- Future Urban Zone
- Residential - Terrace Housing and Apartment Buildings Zone
- Residential - Mixed Housing Urban Zone
- Business - Light Industry Zone
- Business – General Business Zone
- Hobsonville Road NOR widening designation was lodged in 2012. Located between Westpark Drive and Wisely Road.

- Whenuapai Plan Change 5 is currently in progress at the time of this North West DBC.
- Future development land is focused on the northern side of Hobsonville road with zoning changes as part of the Whenuapai Plan Change 5 expected to include Light Industry, Mixed Housing Urban and Terrace House and Apartment Building Zoning.
- The south side of the corridor has existing residential land use and will remain Mixed House Urban and Suburban zones.
- Development is well progressed on the northern side of Hobsonville Road between Westpark and Wisely Road lending urgency to confirming route protection along corridor.
- Existing land use is developed close to the corridor and with a steep topography future driveway access and gradients are a challenge for any corridor widening.

DBC OPTION DEVELOPMENT

- Eight options were initially considered.
- Due to the highly constrained nature of this corridor, four of these options had reduced widths for the 4-Lane 30m cross sections on the route.
 - Option 2: 24.6m
 - Option 3: 27.1m
 - Option 4: 20.6m
 - Option 5: 21.4m
- Options 2,4 and 5 were discounted as unable to meet the investment objectives. Option 3 was not taken forward to Option assessment but retained as an option to be considered alongside option refinement to avoid or minimise effects on properties along the corridor.
- Remaining four options were taken forward to Option Assessment:

Option	4 Lane	2 Lane	Widening
Option 1	30m	24m	Holds centreline. Widens north and south.
Option 6	30m	24m	Holds back of northern footpath. Widens south.
Option 7	30m	24m	Holds back of southern footpath. Widens north
Option 8	30m	24m	Variation of Option 6 which avoids Hobsonville School i.e. no widening in front of and immediately adjacent to the school

HOBSONVILLE ROAD FTN UPGRADE - SEGMENT 2 ROUTE REFINEMENT AND ASSESSMENT

OPTIONS	IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	KEY IMPACTS						SUMMARY OF ASSESSMENT	Preferred
					Heritage	Land Requirement	Stormwater	Social cohesion	Transport	Construction		
1 SGA 30m cross section Holding centreline, widen both sides	✓	✓	✓	✓	Low impact	High impact	Low impact	Low impact	High impact	High impact	Option 1 has less land use integration opportunities. Increased property impacts and land requirement by widening the road on both the northern and southern sides. High impact on driveways.	x
6 SGA 30m cross section Widen to south	✓	✓	✓	✓	Low impact	High impact	Low impact	Low impact	High impact	High impact	With Option 6 there are extended property impacts on the southern side of the road due to the topography. Additionally, there are less land use integration opportunities and increased engineering complexity and construction footprint. High impact on driveways.	x
7 SGA 30m cross section Widen to north	✓	✓	✓	✓	Low impact	Medium impact	Low impact	Low impact	Medium impact	Low impact	Option 7 by widening to the north minimises the impact to properties. Additionally, the option avoids the issues that widening to the south presents due to the difficult topography. Moderate impact on driveway access.	✓
8 SGA 30m cross section Same as Option 6 but avoids Hobsonville School	✓	✓	✓	✓	Low impact	High impact	Low impact	Low impact	High impact	High impact	With Option 8 there are extended property impacts on the southern side of the road due to the topography. Additionally, there are less land use integration opportunities and increased engineering complexity and construction footprint. High impact on driveways	x



EMERGING PREFERRED OPTION – OPTION 7: WIDEN TO NORTH

- Greater potential for integration into Future Urban Zone development.
- Least property impact of all options. Potential to influence future development to avoid or reduce driveway issues.
- Residential character on the southern side of Hobsonville Road is maintained.
- Avoids the more challenging topography to the south reducing engineering complexity.

HOBSONVILLE ROAD FTN UPGRADE - SEGMENT 3 ROUTE REFINEMENT AND ASSESSMENT

OPTION ASSESSMENT

KEY IMPACTS

High impact
 Medium impact
 Low impact

OPTIONS

IO1: Access
 IO2: Reliability
 IO3: Mode
 IO4: Safety
 Heritage
 Land Requirement
 Stormwater
 Social cohesion
 Transport
 Construction

SUMMARY OF ASSESSMENT

Preferred

Options	IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	Heritage	Land Requirement	Stormwater	Social cohesion	Transport	Construction	Summary of Assessment	Preferred
1 SGA 24m cross section Holding centreline, widen both sides	✓	✓	✓	✓	Low	High	Low	Low	Low	Medium	Option 1 has less land use integration opportunities. There are increased property impacts and land requirement by widening the road on both the northern and southern sides.	✗
6 SGA 24m cross section Widen to south	✓	✓	✓	✓	Low	Medium	Low	Low	Low	Medium	With Option 6 there are extended property impacts on the southern side of the road due to the topography. Additionally, there are less land use integration opportunities and increased engineering complexity and construction footprint.	✗
7 SGA 24m cross section Widen to north	✓	✓	✓	✓	Low	Medium	Low	Low	Low	Medium	Option 7 by widening to the north minimises the impact to properties. Additionally, the option avoids the issues that widening to the south presents due to the difficult topography. The option also allows for better integration with consented developments.	✓
8 SGA 24m cross section Same as Option 6 but avoids Hobsonville School	✓	✓	✓	✓	Low	Medium	Low	Low	Low	Medium	With Option 8 there are extended property impacts on the southern side of the road due to the topography. Additionally, there are less land use integration opportunities and increased engineering complexity and construction footprint.	✗



EMERGING PREFERRED OPTION – OPTION 7: WIDEN TO NORTH

- Greater potential for integration into the future land use scenarios on sites which have not been developed or consented within the Hobsonville Road Corridor.
- Reduced requirement for full acquisition of sites due to the large size of the lots and as development has generally respected the NOR boundary.
- Avoids the topographical challenges of widening the road to the south and reduces driveway impacts.
- Residential character on the southern side of Hobsonville Road is maintained.
- The option can be further refined through the use of a reduced cross-section to avoid impacting Hobsonville School.

HOBSONVILLE ROAD FTN UPGRADE - SEGMENT 4 ROUTE REFINEMENT AND ASSESSMENT

OPTION ASSESSMENT

OPTIONS	IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	KEY IMPACTS						SUMMARY OF ASSESSMENT	Preferred
					Heritage	Land Requirement	Stormwater	Social cohesion	Transport	Construction		
1 SGA 30m cross section Holding centreline, widen both sides	✓	✓	✓	✓	Low impact	High impact	Low impact	Medium impact	Low impact	Medium impact	Option 1 has less land use integration opportunities. There are increased property impacts and land requirement by widening the road on both the northern and southern sides.	x
6 SGA 30m cross section Widen to south	✓	✓	✓	✓	Low impact	Medium impact	Low impact	Medium impact	Low impact	Medium impact	With Option 6 (western segment) there are extended property impacts on the southern side of the road due to the topography. Additionally, there are poor social cohesion outcomes due to the impacts on the community facilities.	✓ Hybrid
7 SGA 30m cross section Widen to north	✓	✓	✓	✓	Low impact	High impact	Low impact	Medium impact	Low impact	Medium impact	With Option 7 (eastern segment) there are impacts on development with associated property impacts and land requirement. There are also poor social cohesion outcomes due to impacts on community facilities, shops and services	✓ Hybrid
8 SGA 30m cross section Same as Option 6 but avoids Hobsonville School	✓	✓	✓	✓	Low impact	Medium impact	Low impact	Medium impact	Low impact	Medium impact	With Option 8 (western segment) there are extended property impacts on the southern side of the road due to the topography. Additionally, there are poor social cohesion outcomes due to the impacts on the community facilities.	x



EMERGING PREFERRED OPTION – HYBRID OF OPTION 6 & 7

- Hybrid option to respond to localised constraints.
- Western segment: hold northern footpath and widen to south (Opt 6) with a reduced cross section to:
 - Avoid business and community facilities on the northern side of Hobsonville Road.
 - Use reduced cross section to minimise property, land use, social cohesion and heritage impacts on south side of corridor.
- Eastern segment: hold southern footpath and widen to north (Opt 7):
 - Reduced requirement for full acquisition due to larger size of lots and general respect of the NOR boundary.
 - Avoids impact on a medical practice located on the south side of Hobsonville Road.
 - Residential character on southern side of Hobsonville Road is maintained.

HOBSONVILLE ROAD FTN UPGRADE – EMERGING PREFERRED OPTION DEVELOPMENT

INTERSECTION FORM ASSESSMENT

Segment	Intersection	Action	Comment
	Hobsonville Road/Orel Avenue	Right Turn Bay	No Change, engineering note challenging topography
	Hobsonville Road/Fitzherbert Ave	Right Turn Bay	No Change, engineering note challenging topography
	Hobsonville Road/Cyril Crescent	Right Turn Bay	No Change, engineering note challenging topography
	Hobsonville Road/Trig Road	Signals	Signals designed through the HIF
	Hobsonville Road/Luckens Road	Signals	Signals designed through the HIF
	Hobsonville Road/Westpark Drive	Signals	Signals as per consented design by developers.
	Hobsonville Road/Marina View Drive	Signals	Existing consent for signals
	Hobsonville Road/Dowdens Lane	Signals	Existing Signals
	Hobsonville Road/Brigham Creek Rd	Roundabout	Williams Road to be incorporated at the Roundabout
	Hobsonville Road/Williams Road	Roundabout	To be incorporated with Brigham Creek Roundabout
	Hobsonville Road/Wisely Road	Remove	Close approach from Clark Road . Need to consider active mode access as part of this.
	Hobsonville Road/Memorial Park Lane	Signals	Existing signals to remain

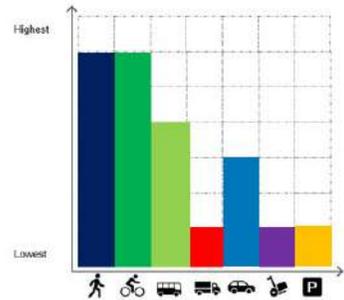
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HOBSONVILLE ROAD FTN UPGRADE – EMERGING PREFERRED OPTION DEVELOPMENT

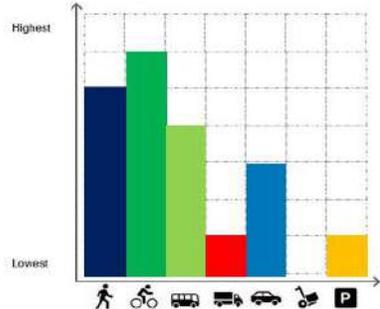
FUTURE MODAL PRIORITY



Segment 2 (SH16 to Luckens Road)



Segment 3 (Luckens Road to Brigham Creek Road)



Segment 4 (Brigham Creek Road to Hobsonville Point Road)

HOW SOLUTION MEETS FUTURE MODAL PRIORITY

- Hobsonville Road supports FTN level of bus services. Bus lanes are to be provided where traffic congestion is likely. Bus priority provided at intersections along the route where delays are expected.
- Provision for separated cycle facilities and footpaths on both sides of the corridor.
- Additional lane capacity in Segment 2 is for provision of bus lanes.
- Additional lanes for Segment 4 is not for additional vehicle capacity but because of geometric requirements arising from the lane gains and drops associated with traffic signals in close proximity.

DESIGN REFINEMENTS

- Development of a hybrid solution to best avoid constraints. Principles of widening identified in option assessment generally upheld. However some minor localised widening also required on the non-dominant sides along the route to respond to topographical challenges e.g. in Segment 3 some widening to the south is also required.
- Application of a two lane 21.6m and for lane 28.6m cross-section to minimise property impacts.
- Reduction of taper length on exit for bus priority lane in front of Hobsonville Road School to minimise impacts.
- Placement of proposed new stormwater wetlands in appropriate locations to minimise property impacts. Suitable existing wetlands proposed to be upgraded.
- Appropriate tie in with existing SH16 Interchange.
- Roundabout at intersection with Brigham Creek Road revised to be signals. Design of intersection allows tie in with existing road, as well as proposed works part of Waka Kotahi SH16/18 Connections Project.

MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN	Complexity Rating
Existing intersection arrangements and existing development constraints.	M
Tie in with Waka Kotahi SH16/18 Connections Project.	
Further assessment of driveways, especially at interface with new developments.	
Appropriateness of discharge points from stormwater wetlands.	
Geotechnical design considerations associated with Wetland 3.	
Further engagement with Watercare concerning the pump station near Trig Road and the North Harbour No.1 Water Main in the road.	
Tie in and interface details with businesses near Hobsonville Point Road.	

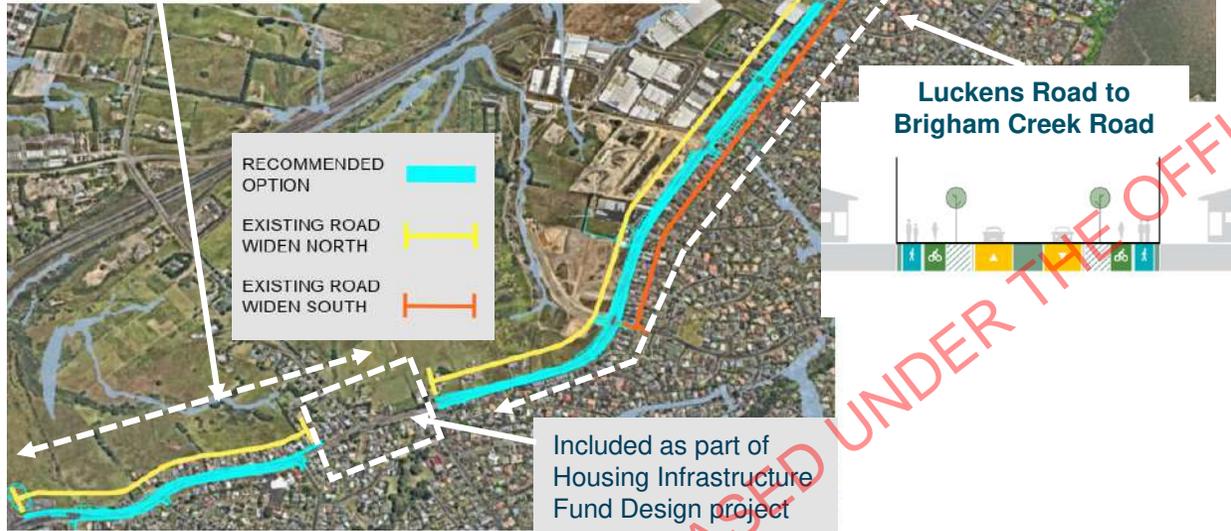
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HOBSONVILLE ROAD FTN UPGRADE – RECOMMENDED OPTION

RECOMMENDED OPTION FOR HOBSONVILLE ROAD



SH16 to Luckens Road



RISKS

- Large amount of land acquisition required in segment 3 opposite Hobsonville Road School.
- Significant development along the corridor limiting design flexibility in future.

INTERDEPENDENCIES

- NWRN – SH18 RTC Stations.
- New Spedding Road East.
- Waka Kotahi SH16/18 Connections Project near intersection with Brigham Creek Road.

ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives	Alignment
<p>Access</p> <p>Improve access to economic and social opportunities by providing an integrated multi-modal corridor from Whenuapai to Redhills</p>	<p>Corridor supports access to employment zoning as part of Whenuapai Plan Change 5 adjacent Hobsonville Road as well as to employment nodes in Whenuapai and Westgate. Corridor provides local access to both the proposed SH18 RTC as well as SH16 RTC at Westgate.</p>
<p>Reliability</p> <p>Enable reliable people and freight movement between Whenuapai and Redhills</p>	<p>Bus lanes and priority measures for public transport at key intersections and at congested sections of corridor will improve people movement reliability.</p>
<p>Mode Choice</p> <p>Support transformational mode share in Whenuapai by providing a high quality, safe and attractive movement of people along Hobsonville Road</p>	<p>Multimodal corridor that prioritises buses and has a complete active mode network, including separated cycle facilities, along both sides of Hobsonville Road.</p>
<p>Safety</p> <p>Provide improvements on Hobsonville Road that contribute to a transport network that is free from deaths and serious injuries</p>	<p>Provision of high quality, separated cycle facilities to improve active mode safety. Improved intersection controls to support safety of crossing people as well as turning traffic .</p>
<p>Integration</p> <p>Provide a transport system that is integrated with land use enabling a more sustainable, high quality, connected urban form which supports growth in the North West.</p>	<p>High proportion of existing land use and future urban land use with access to high quality active mode facilities and public transport. Cross sections providing sufficient space to allow future mid block crossings to improve pedestrian permeability. Road widening focused in areas where there is opportunity to integrate with new FUZ developments.</p>
<p>Climate Change</p> <p>Supporting transformation to a low carbon transport system through the increase of people movement capacity by bus, walking and cycling. Supports local bus network that will serve SH18 RTC bus stations and ferry terminal.</p>	

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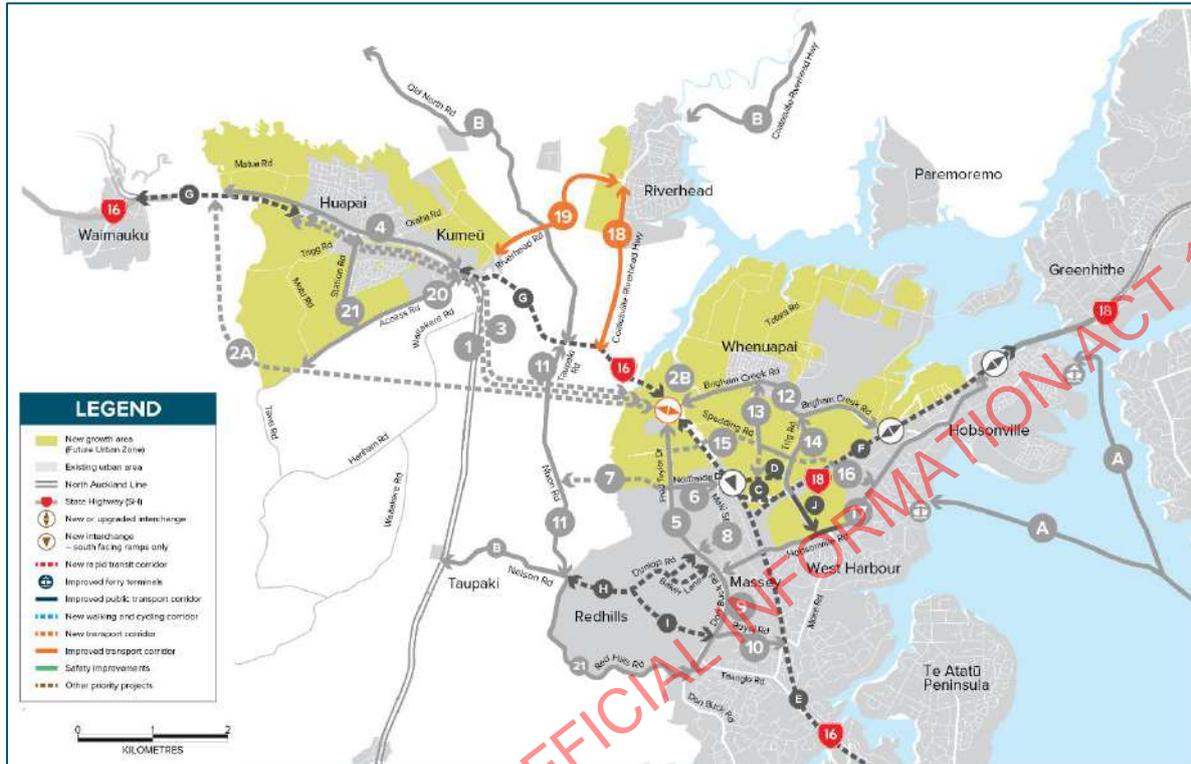
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Riverhead Option Development

9.8 Riverhead options development and assessment

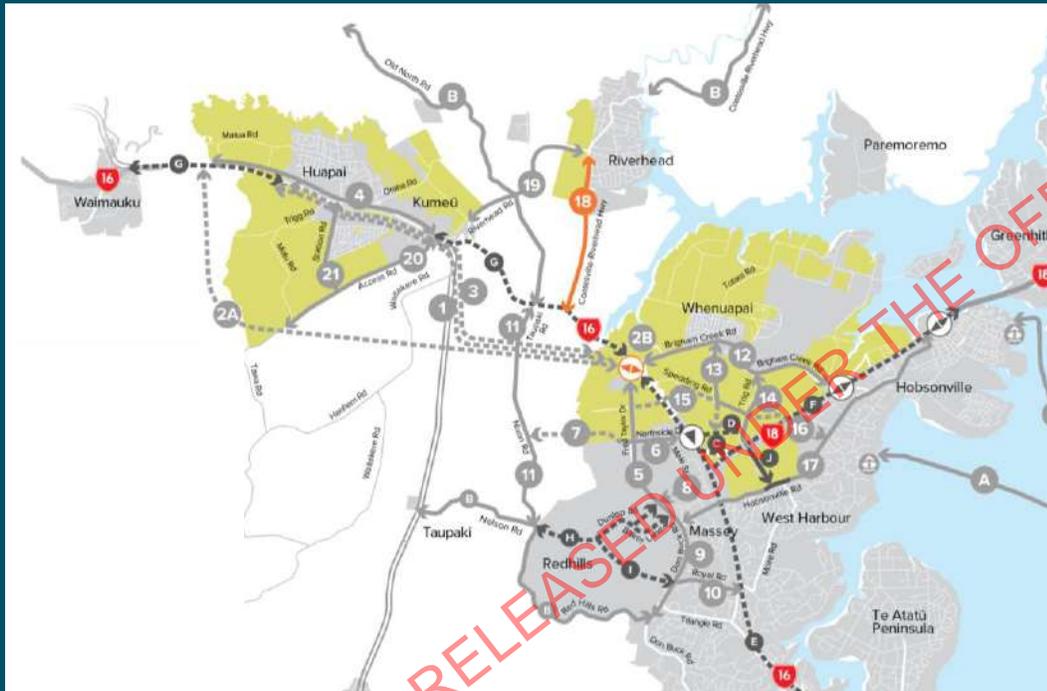
The Riverhead projects are shown in Figure 9-6 below.

Figure 9-6 Riverhead option assessment corridors



Coatesville-Riverhead Highway Upgrade

Project 18



COATESVILLE – RIVERHEAD HIGHWAY – PRELIMINARY ASSESSMENT AND OPTION DEVELOPMENT

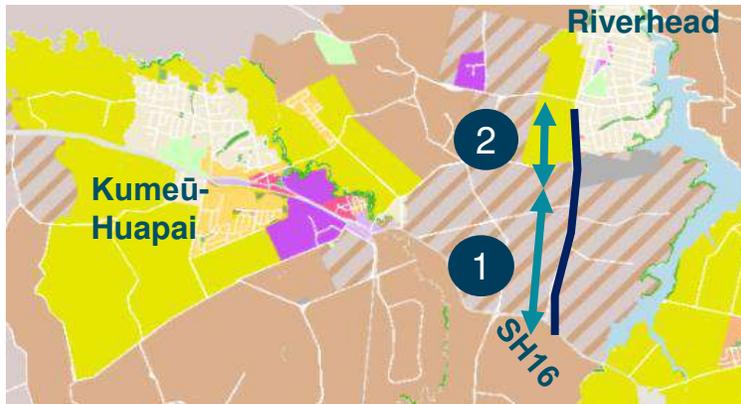
PROJECT #18: PURPOSE

- Connects Riverhead to strategic road network and rapid transit at Brigham Creek or Westgate.
- Will support active modes and reduce safety risk on the corridor.

GAP ANALYSIS

- North West DBC reconfirms IBC Indicative Transport alignment.

LAND USE



	Future Urban Zone		Residential - Single House Zone
	Residential - Terrace Housing and Apartment Buildings Zone		Rural - Mixed Rural Zone
	Residential - Mixed Housing Urban Zone		Rural section
	Residential - Single House zone		Urban section

- The land use along the corridor includes mixed rural, single house, future urban and neighbourhood centre zoning.
- Majority of corridor will remain with rural land use.

FORM AND FUNCTION ASSESSMENT

EXISTING CROSS SECTION



FUTURE CROSS SECTION (Rural)



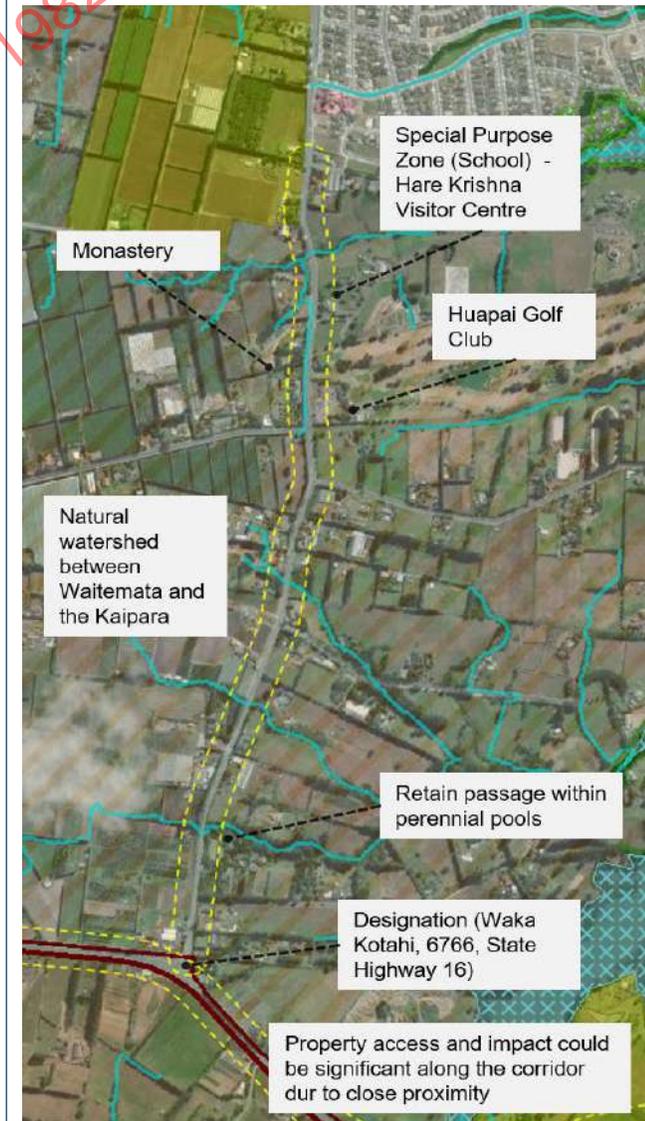
FUTURE CROSS SECTION (Urban)



DBC OPTION DEVELOPMENT

- AT confirmed assumption of a posted speed of 60km/h (70km/hr design speed).
- Three options were assessed:
 - Option 2: 24m rural realignment.
 - Option 3W: Existing road alignment with shared path on the western side.
 - Option 3E: Existing road alignment with shared path on the eastern side.

CONSTRAINTS



COATESVILLE – RIVERHEAD HIGHWAY UPGRADE – ROUTE REFINEMENT AND ASSESSMENT



OPTIONS	SUMMARY OF ASSESSMENT										Preferred	
	IO1: Access	IO3: Mode	IO4: Safety	Heritage	Land Requirement	Stormwater	Social cohesion	Transport	Construction			
2	SGA 24m cross section High speed rural realignment 24m cross section based on a 70km/h design speed.	✓	✓	✓	Low	Medium	Low	Low	Low	Low	Achieves transport outcomes. Additionally, this option accommodates active modes on the western side to least number of intersections to cross. This option also addresses the alignment related safety issues noted along the corridor.	✓
3W	SGA 24m cross section Holding existing alignment, with active mode facilities added to the western side	✓	✓	✓	Low	Low	Low	Low	Medium	Medium	Does not address the safety issues associated with the existing geometrical alignments on Coatesville – Riverhead Highway.	x
3E	SGA 24m cross section Holding existing alignment, with active mode facilities added to the eastern side	✓	✓	✓	Low	Medium	Low	High	Medium	Medium	Does not address the safety issues associated with the existing geometrical alignments on Coatesville – Riverhead Highway. Less integrated with future development within the FUZ and future urban design outcomes of the FUZ development. Impacts on the Water pump station and Electricity Pylons.	x

EMERGING PREFERRED OPTION – OPTION 2

- Active modes provided on the preferred western side of Coatesville – Riverhead Highway and can be integrated with the Riverhead FUZ.
- Water Pump Station on the eastern side is avoided.
- Reduced number of intersections which will need to be crossed on the western side resulting in less potential conflicts for active modes.
- Addresses key safety issues along the corridor, which is the primary access from Riverhead to the Westgate and future employment areas in Whenuapai.
- The increased construction costs are considered to be value for money given the additional rural safety improvements.
- The increased land requirement is acknowledged but is considered to be necessary to improve safety on the corridor.

COATESVILLE – RIVERHEAD HIGHWAY UPGRADE – EMERGING PREFERRED OPTION DEVELOPMENT

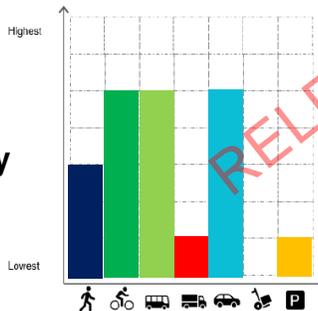
INTERSECTION FORM ASSESSMENT

Intersection	Recommendation	Comment
Coatesville-Riverhead Highway (1)/SH16	Single lane Roundabout	To be developed as part of Safer Road Programme (WK)
Coatesville-Riverhead Highway (1)/Moontide Road	Right Turn Bay	Historical crash record – rear collisions, vertical visibility restrictions
Coatesville-Riverhead Highway (1)/Riverland Road	Right Turn Bay	Historical crash record – rear collisions, vertical visibility restrictions
Coatesville-Riverhead Highway (1)/Old Railway Road	Single Lane Roundabout	Historical crash record – rear collisions, vertical visibility restrictions
Coatesville-Riverhead Highway (2)/Riverhead Point Drive	Single lane Roundabout	Town centre adjacent, likely four-way intersection
Coatesville-Riverhead Highway (2)/Riverhead Road	Single Lane Roundabout	No change – Existing Roundabout

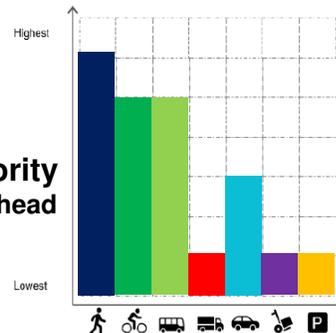
HOW SOLUTION MEETS FUTURE MODAL PRIORITY

- Provision for separated cycle facilities and footpaths on both sides of the corridor
- Retention of existing level of traffic capacity i.e. one lane in each direction

1 Rural
Future Modal Priority (SH16 to Short Road)



2 Urban
Future Modal Priority (Short Road to Riverhead Road)



DESIGN REFINEMENTS

- Vertical geometry designed to correct deficiencies specifically near Moontide and Riverland Roads.
- Roundabout with Riverhead Point Drive revised to signals.
- Approach geometry of roundabout with Old Railway Road revised to avoid impacting the Riverhead Pump Station.
- Proposed cross-section updated to include the treatment swales as the preferred stormwater management systems on either side.
- Reduction in amount of wetlands for treatment and attenuation due to ability of proposed swales to do this.
- Urban berm environment introduced in front of Borich food market.

MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN

Issues	Complexity Rating
Swale width to be further considered and refined.	M
Existing intersection arrangements and existing development constraints.	M
Integration with final design for SH16/Coatesville-Riverhead highway roundabout design.	M
Opportunity to coordinate with Watercare regarding replacement of the Riverhead Pump Station and wastewater lines (~10 years).	H
Nothing to warrant bus lane provision at this stage. Should this change, this could potentially be accommodated within designated corridor if an urban stormwater solution is adopted.	M

COATESVILLE – RIVERHEAD HIGHWAY UPGRADE – RECOMMENDED OPTION

RECOMMENDED OPTION FOR COATESVILLE – RIVERHEAD HIGHWAY



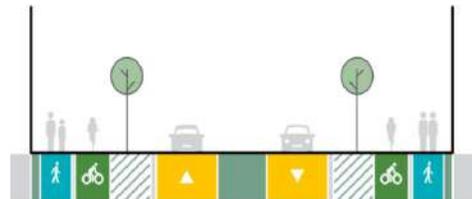
ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives		Alignment
Access	Improve access to economic and social opportunities along Coatesville – Riverhead Highway	Key corridor with dual purpose to provide access from Riverhead to both a future RTC and the strategic highway network.
Mode Choice	Support transformation mode share in Riverhead by providing a high quality, safe and attractive movement of people along Coatesville – Riverhead Highway	Multimodal corridor with separated cycle facilities on both sides in the urban area and a shared path in the rural corridor. Provision for bus priority measures to support a frequent bus service.
Safety	Provide improvements on Coatesville – Riverhead Highway that contribute to a transport network that is free from DSIs	Provision of separated cycle facilities and improved intersection controls to support safety of turning traffic. Geometric deficiencies addressed to improve safety.
Climate Change	Supporting transformation to a low carbon transport system through the increase of people movement capacity by bus, walking and cycling. Provision of green infrastructure to manage stormwater future proofs for climate change adaptation.	

RURAL CROSS SECTION



URBAN CROSS SECTION



RISKS

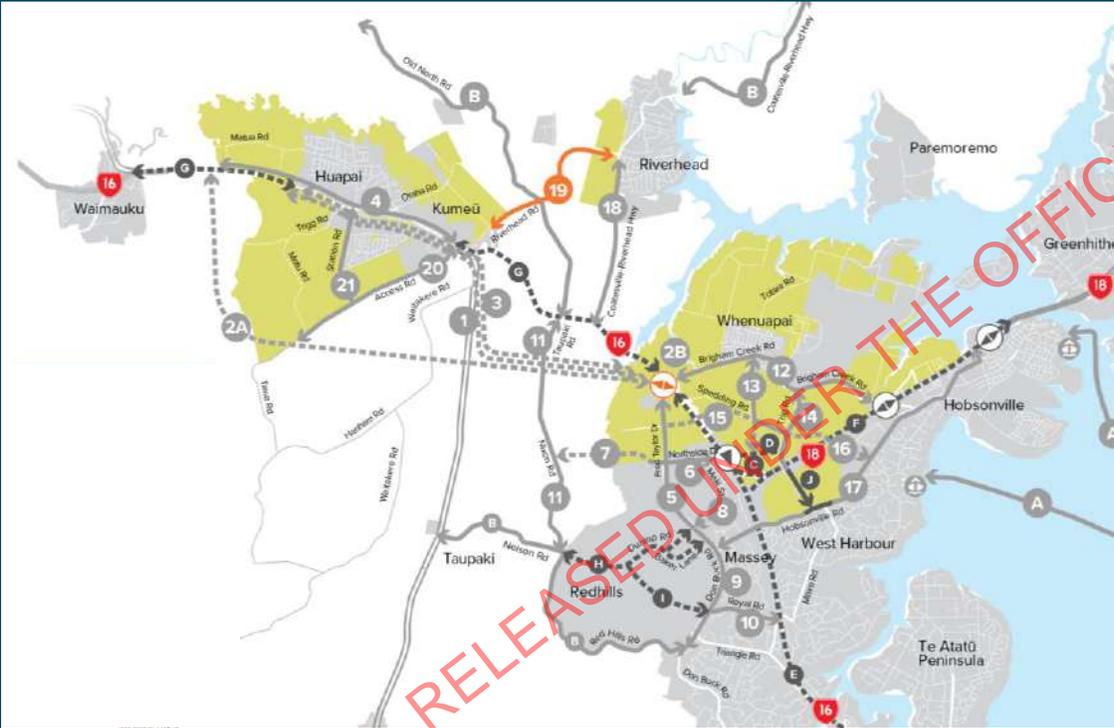
- Management of utilities along this corridor.
- Future decision on stormwater solution could require less land than is being protected.
- Small lots of land in FUZ might be developed adjacent the road boundary prior to the corridor being upgraded. This could result in localised property issues with driveway regrading or buildings impacted by physical works.

INTERDEPENDENCIES

- SH16 Safety Improvements Project
- Riverhead Road Upgrade

Riverhead Road Upgrade

Project 19



RIVERHEAD ROAD UPGRADE – PRELIMINARY ASSESSMENT AND OPTION DEVELOPMENT

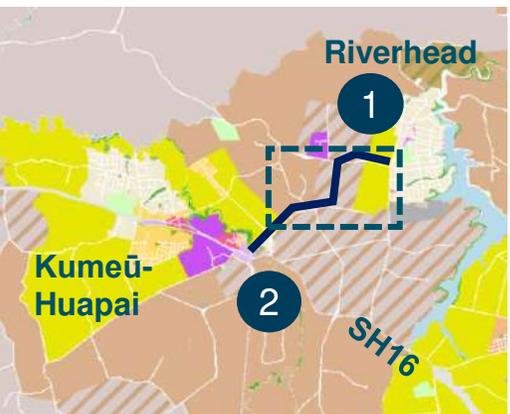
PROEJCT #19: PURPOSE

- Connects Riverhead to social and employment infrastructure in Kumeū-Huapai.
- Key cycle connection in the Rodney Greenways plan.

GAP ANALYSIS

- North West DBC reconfirms IBC Indicative Network alignment.

LAND USE



- Future Urban Zone
- Residential - Terrace Housing and Apartment Buildings Zone
- Residential - Mixed Housing Urban Zone
- Rural - Mixed Rural Zone
- 1 Segment 1 Rural
- 2 Segment 2 Western connection

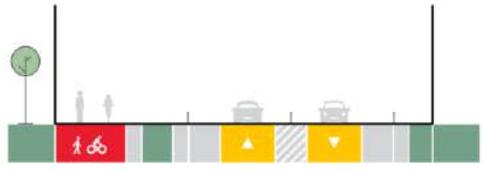
- Connects Future Urban Zoned communities. Midblock, the adjacent land use being predominantly Rural-Countryside Living and Rural zoned land.

FORM AND FUNCTION ASSESSMENT

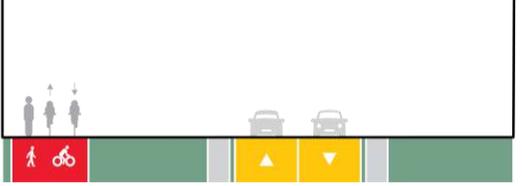
EXISTING CROSS SECTION



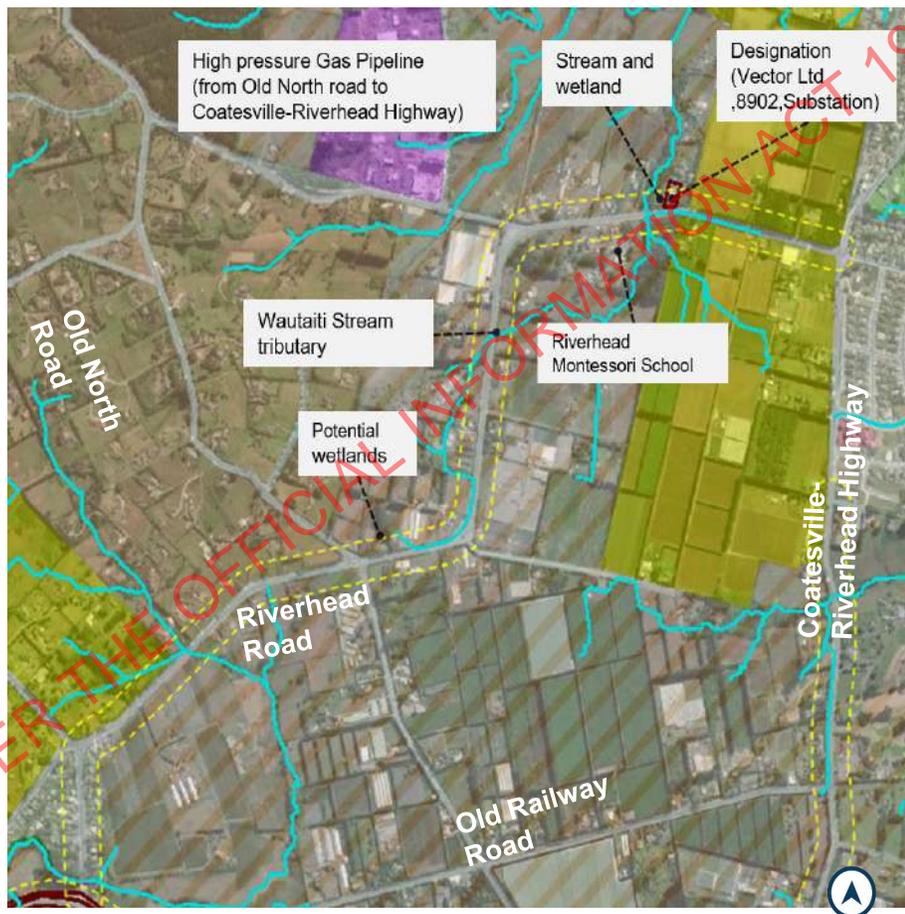
FUTURE URBAN CROSS SECTION



FUTURE RURAL CROSS SECTION



CONSTRAINTS



DBC OPTION DEVELOPMENT

Segment 1: Upgrading rural road

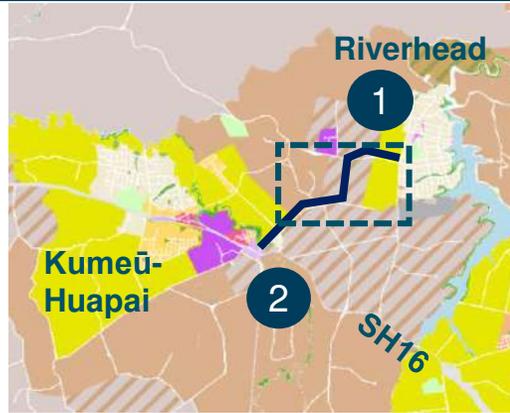
- Between Coatesville-Riverhead Highway and Koraha Road.
- AT confirmed assumption of a posted speed of 60km/h (70km/hr design speed). Three options were assessed:
- **Option 2:** 24m high speed rural realignment.
- **Option 3N:** Existing road alignment with shared path on the northern side.
- **Option 3S:** Existing road alignment with shared path on the southern side.

Segment 2: Urban connection

- Between Koraha Road and SH16.
- Two options tested:
- **Option 1:** Western side of Weza lane and a bridge over Kumeū River
- **Option 2:** Active mode facility on Riverhead Road.

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RIVERHEAD ROAD UPGRADE – SEGMENT 1 ROUTE REFINEMENT AND ASSESSMENT



KEY IMPACTS

High impact
 Medium impact
 Low impact

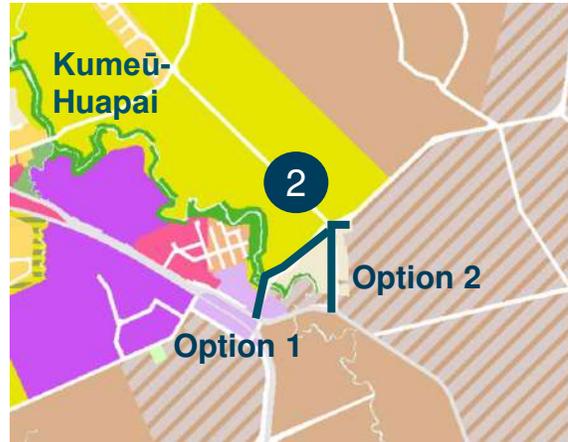
SUMMARY OF ASSESSMENT

		IO1: Access	IO3: Mode	IO4: Safety	Heritage	Land Requirement	Stormwater	Social cohesion	Transport	Construction		Preferred
2	SGA 24m cross section Upgraded Hybrid 24m cross-section	✓	✓	✓							Impacts on the gas pipeline and powerlines. Realignment addresses geometric safety issues. A higher land requirement due to property impacts on both sides of the road corridor and extensive realignment.	x
3N	SGA 24m cross section Widen to the North-West for Rural Shared Path	✓	✓	✓							Achieves transport outcomes with active mode provision. Safety improvements can be achieved by intersection upgrades. Better integration with the FUZ in Kumeū-Huapai and active modes on western side provides best connectivity to Weza Lane .	✓
3S	SGA 24m cross section Widen to the South-East for Rural Shared Path	✓	✓	✓							Active modes on eastern side has less integration with FUZ land. Impacts on the powerlines located on Riverhead Road. Safety improvements can be achieved by intersection upgrades. Slightly lower property impacts as Option 3N.	x

EMERGING PREFERRED OPTION – OPTION 3N

- Provision of active modes on the western side of the rural cross section integrates well with the Kumeū-Huapai FUZ located on the northern/western side of Riverhead Road. It also provides better connectivity to Weza Lane (the preferred option in Segment 2) and in turn will provide better connectivity to Kumeū-Huapai town centre.
- Safety issues can be appropriately addressed through intersection upgrades at localised points, and do not warrant the upgrade of the whole road corridor.
- The option has slightly higher property impacts compared to Option 3S; however, this is balanced against the benefits Option 3N provides in terms of active mode connectivity and the lesser impacts on infrastructure.
- The option minimises impacts on existing utilities and infrastructure. Reduced costs and construction disruption as work within the road corridor is limited.

RIVERHEAD ROAD UPGRADE – SEGMENT 2 ROUTE REFINEMENT AND ASSESSMENT



IO1: Access
IO3: Mode
IO4: Safety
Heritage
Land Requirement
Stormwater
Social cohesion
Transport
Construction

SUMMARY OF ASSESSMENT

		IO1: Access	IO3: Mode	IO4: Safety	Heritage	Land Requirement	Stormwater	Social cohesion	Transport	Construction		Preferred
1	Addition of an active mode facility on the western side of Weza Lane.	✓	✓	✓	Low impact	Medium impact	Low impact	Low impact	Low impact	Medium impact	Achieves transport outcomes. Direct connection to Kumeū-Huapai town centre, aligned with Greenways plan. Better integration with the Kumeū-Huapai FUZ located on the west side of Weza Lane. Requires new shared path bridge.	✓
2	Provision of an active mode facility on Riverhead Road.	✓	✓	✓	Low impact	Low impact	Low impact	Low impact	Medium impact	Medium impact	Less direct route to Kumeū-Huapai from Riverhead. Potential safety issues with active mode users seeking to cross to the southern side SH16 between Riverhead Road and Weza Lane. No adjacency to FUZ area. Would require new bridge crossing on SH16 to connect Riverhead Road to the SH16 Main Road facilities.	x

EMERGING PREFERRED OPTION – OPTION 1

- It provides a direct connection between Kumeū-Huapai and Riverhead, avoiding SH16 between Riverhead Road and the entrance to Kumeū-Huapai.
- The active modes can be integrated with the Kumeū-Huapai FUZ located on the west side of Weza Lane
- Aligns with existing paths and future paths in the Greenways Plan (2016) for Kumeū-Huapai.
- The option can help deliver better urban design and gateway opportunities at the entrance to Kumeū-Huapai.
- Construction disruption is minimised as Weza Lane is not a heavily trafficked road and the active modes will be positioned away from existing residential properties. However a new shared path bridge will be required.

RIVERHEAD ROAD UPGRADE – EMERGING PREFERRED OPTION DEVELOPMENT

INTERSECTION FORM ASSESSMENT

Intersection	Recommendation	Comment
Riverhead Road/ SH16	Single lane Roundabout	Rural environment – speed control/threshold opportunity
Riverhead Road/ Koraha Road	Single lane Roundabout	Rural environment – speed control/threshold opportunity
Riverhead Road/Old North Road	Single lane Roundabout	Existing Roundabout
Riverhead Road/Deacon Road	Single lane Roundabout	Rural environment – speed control/threshold opportunity
Riverhead Road/Coatesville-Riverhead Highway (2)	Single lane Roundabout	Existing Roundabout
Riverhead Road/ SH16	Single lane Roundabout	Rural environment – speed control/threshold opportunity

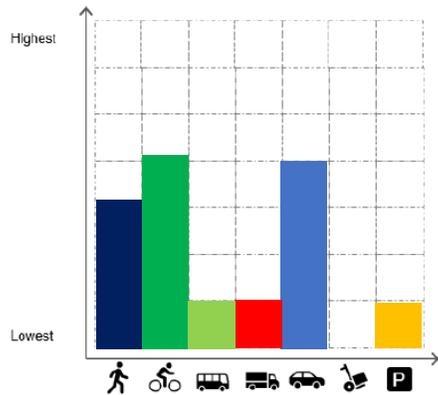
DESIGN REFINEMENTS

- Roundabout with Old Railway Rd removed to only include tie-in of the active mode facility on either side.
- Vertical geometry raised at several existing stream crossings to provide appropriate freeboard.
- Proposed cross-section updated to include the treatment swales as the preferred stormwater management system.
- Reduction in amount of wetlands for treatment and attenuation due to ability of proposed swales to do this.

MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN

HOW SOLUTION MEETS FUTURE MODAL PRIORITY

- Provision for separated cycle facilities and footpaths on both sides of the urban section of corridor. Shared path on northern side of Riverhead road in rural sections.
- Western connection via Weza lane, a low volume connection direct into Kumeū-Huapai town centre.
- Retention of existing level of traffic capacity i.e. one lane in each direction.
- Safety improvements for all modes with intersection improvements.

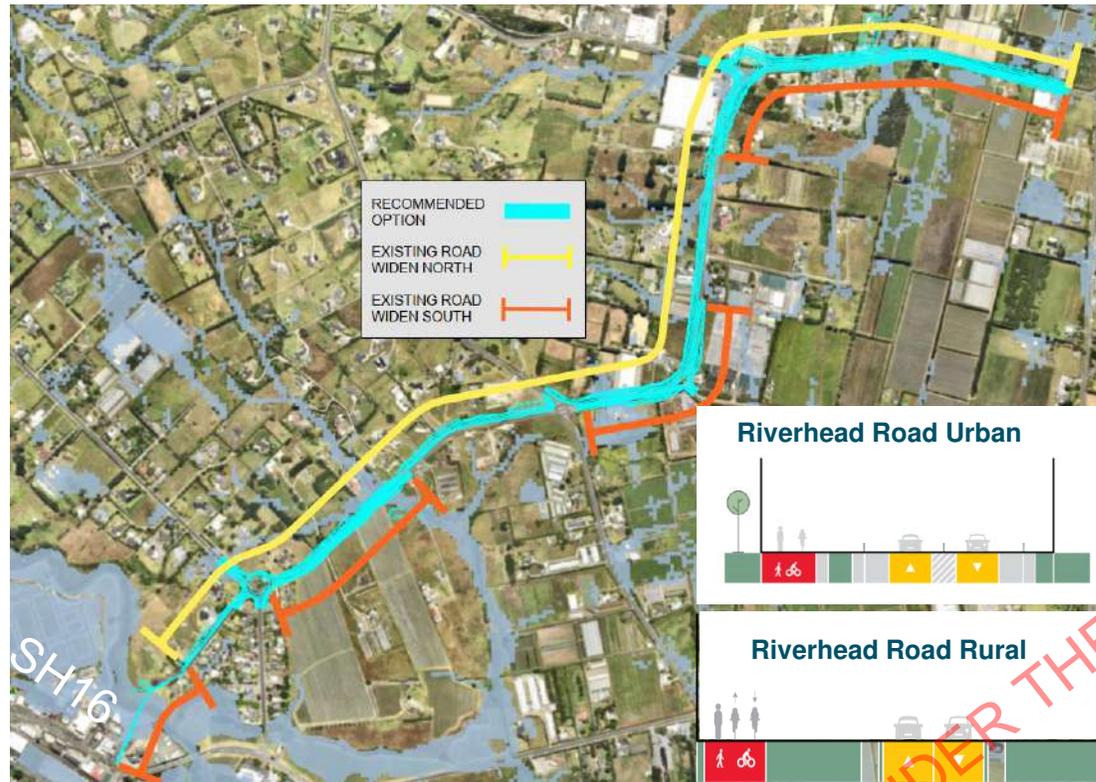


Future Modal Priority

Issues	Complexity Rating
Swale width to be further considered and refined.	M
Existing intersection arrangements and existing development constraints.	M
Further engagement with Vector regarding relocation of the existing above ground power lines, as well as protection of high pressure gas line.	M
Investigate further as part of value engineering the possibility of widening existing pedestrian bridge over Kumeū River.	H

RIVERHEAD ROAD UPGRADE – RECOMMENDED OPTION

RECOMMENDED OPTION FOR RIVERHEAD ROAD



ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives		Alignment
Access	Improve access to economic and social opportunities along Riverhead Road.	Key corridor better connects active mode users between Riverhead and Kumeū-Huapai town centre. Route integrates with new FUZ and connects with existing recreational pathways adjacent Kumeū River.
Mode Choice	Support transformation mode share in Riverhead by providing a high quality, safe and attractive movement of people along Riverhead Road.	New active mode facilities to support increase in active mode share. Facilities connect directly and safely to town centre. Facilities provided on both sides in the FUZ zone adjacent Riverhead.
Safety	Provide improvements on Riverhead Road that contribute to a transport network that is free from DSIs.	Intersection improvements for all modes to address existing safety issues. New facilities decrease exposure risk for active mode users. Western connection utilises low volume roads and green space rather than a busy vehicular road.
Climate Change	Supporting transformation to a low carbon transport system through the increase of people movement by provision of well connected active mode facilities. Provision of green infrastructure to manage stormwater future proofs for climate change adaptation.	

RIVERHEAD RECOMMENDATION

- Active mode facilities to the north of the existing alignment on Riverhead road to maximise active mode connectivity, minimise crossing points and best use the existing corridor.
- Active modes to be provided on Weza Lane adjacent FUZ land and connect directly into the Kumeū town centre.
- Opportunity to consider intersection improvements along the route to address existing safety issues

RISKS

- Additional property acquisition for green infrastructure treatment unaffordable.
- If development pressure urbanises land between Riverhead and Kumeū then active mode facilities may no longer be an appropriate solution on an urbanising corridor. Note the additional corridor width to support the green infrastructure could be repurposed for an urban 24m cross section that provides two sided facilities.

INTERDEPENDENCIES

- SH16 Main Road Upgrade.
- Coatesville-Riverhead Highway Upgrade.

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Kumeū-Huapai Option Development

9.9 Kumeū-Huapai options development and assessment

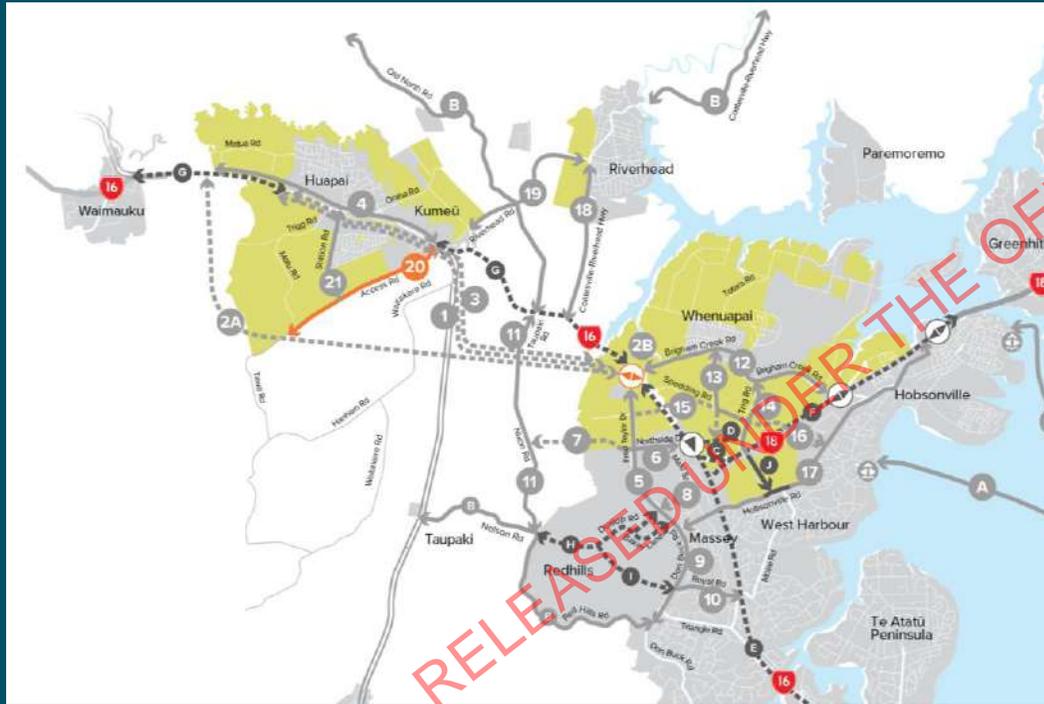
The Kumeū-Huapai projects are shown in Figure 9-7 below.

Figure 9-7 Kumeū-Huapai option assessment corridors.



Access Road/Tawa Road Upgrade

Project 20



ACCESS ROAD/TAWA ROAD UPGRADE – PRELIMINARY ASSESSMENT AND OPTION DEVELOPMENT

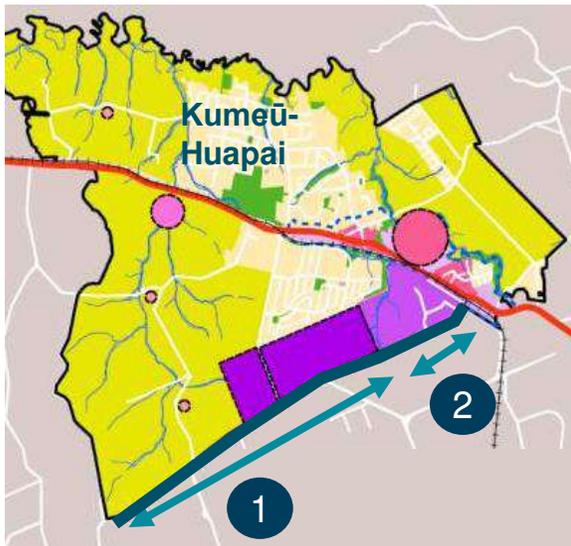
PROJECT #20: PURPOSE

- Provide key strategic link to the new ASH. Support freight by providing direct connection between SH16 and planned industrial land use.
- Supports local bus service and provides active mode link to future primary active mode facilities on the ASH.

GAP ANALYSIS

- North West DBC reconfirms IBC Indicative Transport Network alignment.

LAND USE

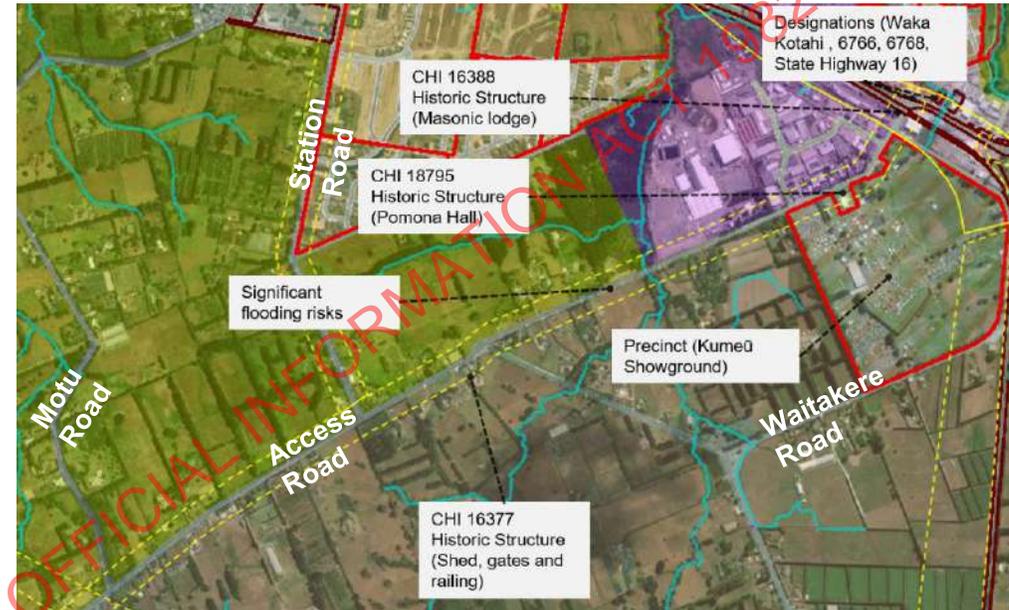


- Future Urban Zone
- Rural - Countryside Living Zone
- Business - Light Industry Zone (Existing)
- Business - Light Industry Zone (Future)
- Expanded town centre
- Proposed new local centre
- 1 Existing Rural segment
- 2 Existing Urban segment

Auckland Council North West Spatial Land Use Strategy (May 2021)

- This corridor is the rural edge of Kumeū- Huapai. Eastern side of the corridor is to remain Rural-Countryside Living zoned.
- Future land use plans show the Light Industry zoning to be expanded to the south west. The Tawa Road interchange with the ASH will connect freight vehicles directly to this future land use.
- Remainder of land use is FUZ.

CONSTRAINTS



- Main constraints on this corridor are flooding risks, industrial buildings in the urban area and the Kumeū showgrounds.
- Number of historic structures along the corridor – generally set back from the fenceline.

FORM AND FUNCTION ASSESSMENT

EXISTING CROSS SECTION



FUTURE CROSS SECTION



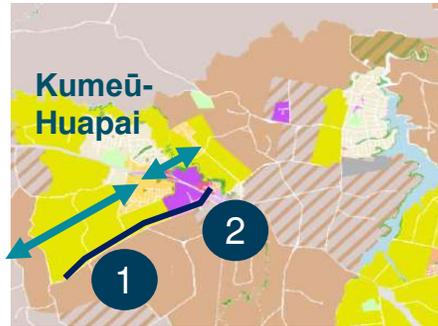
Note additional lanes could be used for bus priority north of Station road.

DBC OPTION DEVELOPMENT

Three 30m cross section options were developed:

- **Option 1** – Widening both sides.
- **Option 2** – Widening to the south.
- **Option 3** – Widening to the north.

ACCESS ROAD/TAWA ROAD UPGRADE – ROUTE REFINEMENT AND ASSESSMENT



KEY IMPACTS



IO1: Access
IO2: Reliability
IO3: Mode
IO4: Safety

Heritage
Land Requirement
Stormwater
Social cohesion
Transport
Construction

SUMMARY OF ASSESSMENT

Preferred

		IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	Heritage	Land Requirement	Stormwater	Social cohesion	Transport	Construction		
1	SGA 30m cross section Holding centreline	✓	✓	✓	✓	Medium impact	High impact	Low impact	Medium impact	Low impact	Medium impact	Increased extent of property impacts by impacting property on both sides of the road. Impacting on the Rural - Countryside Living Zone where development is not anticipated to occur, and so less ability to integrate the road. Impacts existing light industry zoning in segment 2.	x
2	SGA 30m cross section Widen to the south (Hold northern boundary)	✓	✓	✓	✓	Medium impact	Medium impact	Low impact	Low impact	Low impact	Low impact	Achieves transport outcomes. Less integration with Rural Countryside Living zoning in segment 1. Land impacted on single side of the road. Avoids commercial properties in segment 2. Some impact to the Kumeū Showgrounds and adjacent properties, but land can still be used.	✓ Hybrid
3	SGA 30m cross section Widen to the north (Hold southern boundary)	✓	✓	✓	✓	Low impact	Medium impact	Low impact	Medium impact	Low impact	Medium impact	Achieves transport outcomes. In rural section, can be integrated into the FUZ and minimises impacts on the rural properties. In the urban section significant impacts on business Light Industry Zone which will be expanded in the future.	✓ Hybrid

EMERGING PREFERRED OPTION – HYBRID OPTION 2 AND 3

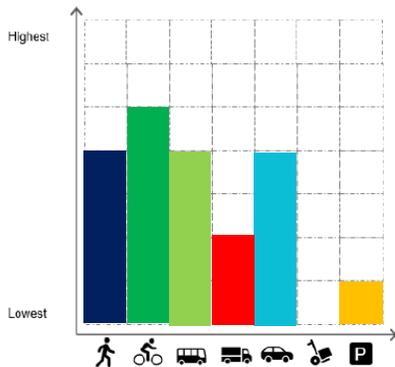
- Hybrid option to best avoid the constraints along the corridor.
- Segment 1 : Option 3 (widening to north) can be better integrated into the Future Urban Zone located on the north side of the corridor and minimises the extent of property impacts and land requirement for road widening.
- Segment 2 : Option 2 (widening to south) avoids the Business-Light Industry Zone. Minor impacts on Kumeū Showgrounds and carpark for the Kumeū Community Centre to be minimised through design.

ACCESS ROAD/TAWA ROAD UPGRADE – EMERGING PREFERRED OPTION DEVELOPMENT

INTERSECTION FORM ASSESSMENT

Intersection	Recommendation	Comment
Access Road/SH16	Signals	Need to integrate with the RTC option
Access Road/Waitakere Road	TBC	Noted complexity with integration with Access Road, Railway line and queueing.
Access Road/Station Road	Single/Dual Lane Roundabout	Urban/Rural one side
Access Road/Motu Road	TBC	
Access Road/Pomona Road	TBC	
Access Road/ ASH	Dual Lane Roundabout	To be investigated further – Possible route protection for grade separated interchange

HOW SOLUTION MEETS FUTURE MODAL PRIORITY



Future Modal Priority

- Provision for separated cycle facilities and footpaths on the western (urban) side of the corridor. The rural edge has no active mode facilities to reinforce the different land uses on each side of the corridor.
- Capacity increased to two lanes in each direction. South of Station Road is to meet the vehicular requirements of the Tawa Interchange of the ASH. North of Station Road, there are no parallel routes to Access Road and it is an important corridor to connect to the Rapid Transit Corridor. Whilst not an FTN route there are local bus services and it is possible that peak bus priority might be required in the future to ensure bus reliability or an interim bus based RTC services. The provision of four lanes along the length also removes a potential “hour glass effect” between Station Road and the Access Road/ SH16 Main Road intersection.

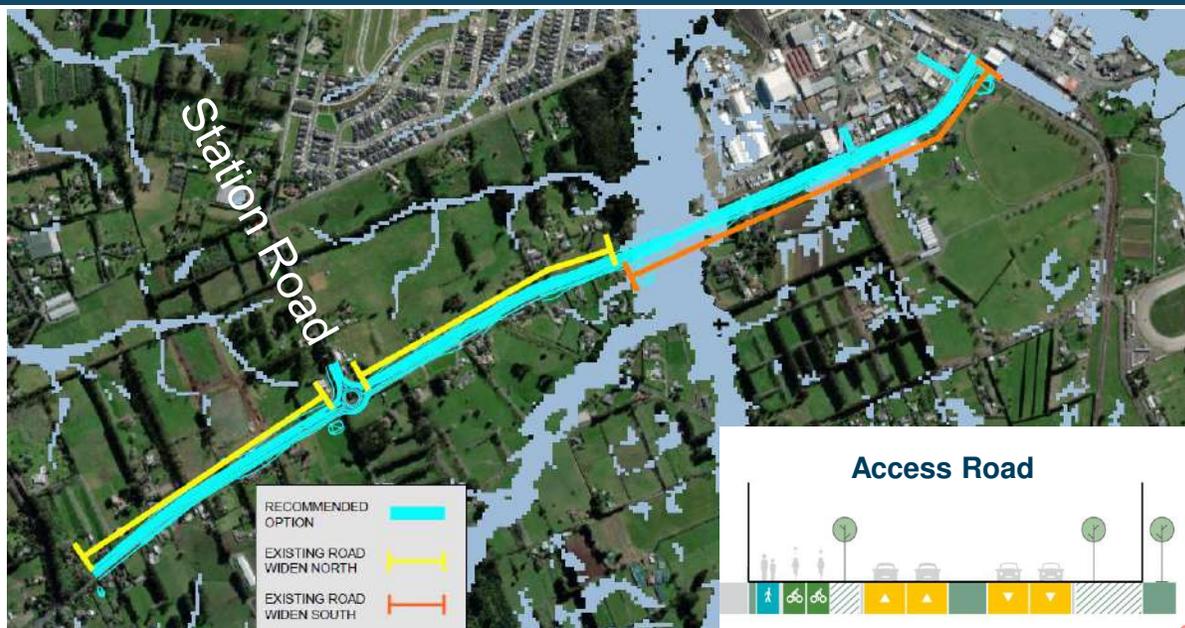
DESIGN REFINEMENTS

- Proposed cross-section updated to include the treatment swales as the preferred stormwater management system.
- Reduction in amount of wetlands for treatment and attenuation due to ability of proposed swales to do this.
- Allow for construction area to build a temporary stream bridge and the associated temporary road realignment as additional footprint.
- Incorporate retaining wall designs to reduce property requirement along the rural section with allowances for additional stormwater pipes and catchpits.
- Look at opportunities for stormwater pond location to be contained within single property lots.

MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN

Issues	Complexity Rating
Assumption of additional road capacity between Station Road and Waitakere Road could be revisited during future detailed design.	M
Detailed assessments for the stormwater requirements for rural design and review the function of the swale and any design considerations to reduce the stormwater management design footprint along the route.	M
Detailed interface at side roads intersections particularly within the industrial area.	M
Assessment of accommodation works requirements along the corridor	H
Detailed investigations of driveways to private properties	
Consider requirements of the community centre parking and vehicle turnarounds.	

ACCESS ROAD/TAWA ROAD UPGRADE– RECOMMENDED OPTION



RISKS

- Southern Cross International Fibre Cable Network unable to be protected during the works i.e. found to be shallower and relocation and realignment of Access Rd will be required.
- Additional property acquisition for green infrastructure treatment unaffordable.
- Impacts on Community Centre and Kumeū Showgrounds too high for 30m width. Narrower cross section might be required.

INTERDEPENDENCIES

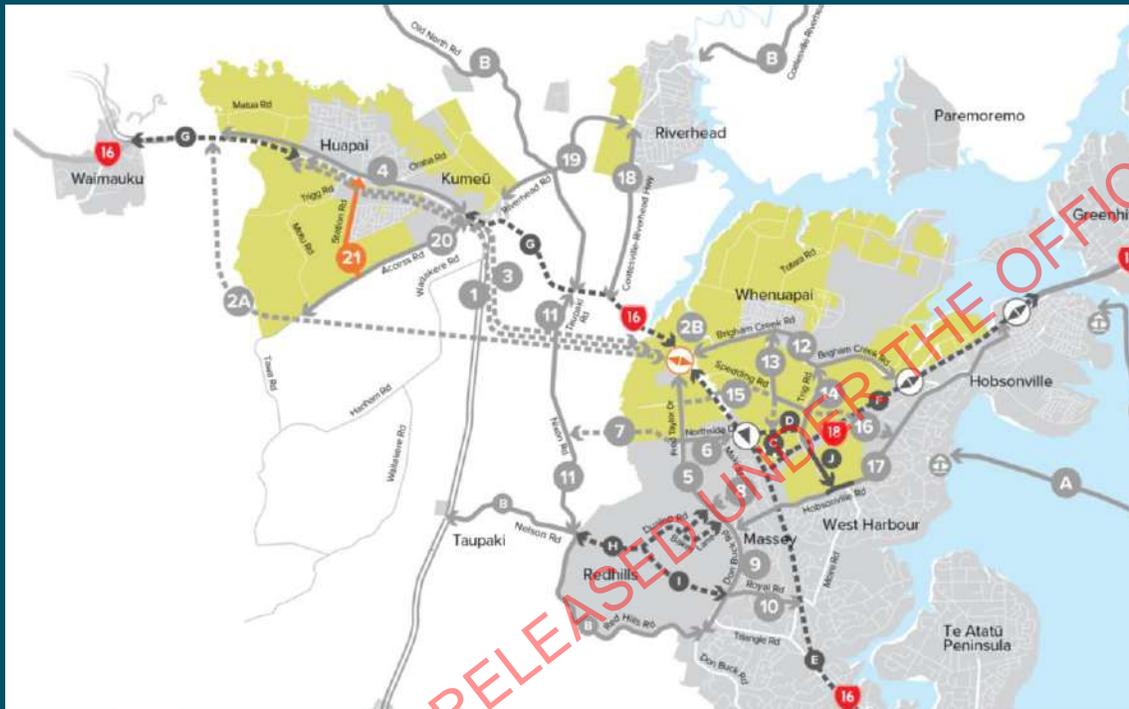
- Rapid Transit Corridor/SH16 Main Road Upgrade.
- Station Road Upgrade.
- Alternative State Highway.
- Kumeū-Huapai Special Housing Area (SHA) Improvement.

ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives		Alignment
Access	Improve access to economic and social opportunities along an integrated Access Road	Multimodal corridor provides a key link from southern growth area to the future RTC station in Kumeū and town centre. Direct access for heavy vehicles from the ASH to the future light industrial zoned land removing need to enter Kumeū and town centre improving amenity.
Reliability	Enable reliable people movement to key strategic routes and destinations in Kumeū-Huapai	Improved reliability for freight vehicles by direct access from the ASH.
Mode Choice	Support transformational mode share in Kumeū-Huapai by providing a high quality, safe and attractive movement of people along Access Road	Multimodal corridor with active mode corridor on the future urban side only (to reinforce rural edge).. Cross section provides space for bus lanes north of Station Road should they be required to support RTC access. Additional capacity south of Station Road predominately to support ASH and trips accessing the southern part of the growth area
Safety	Provide improvements on Access Road that contribute to a transport network that is free from deaths and serious injuries	Provision of separated cycle facilities and improved intersection controls to support safety of turning traffic.
Climate Change	Supporting transformation to a low carbon transport system through the increase of people movement capacity by bus, walking and cycling. Provision of green infrastructure to manage stormwater future proofs for climate change adaptation.	

Station Road Upgrade

Project 21



STATION ROAD UPGRADE – PRELIMINARY ASSESSMENT AND OPTION DEVELOPMENT

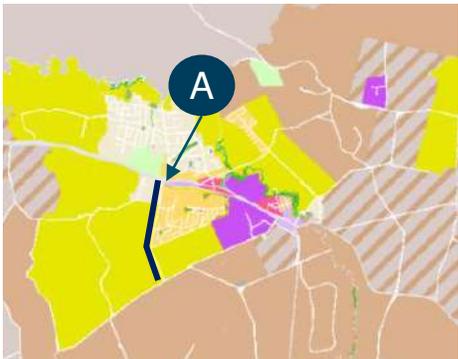
PROJECT #21: PURPOSE

- Connect SH6 Main Road to Access Road providing key north south link in the FUZ.
- Important link for active modes and future local bus services to connect to future rapid transit facilities in Kumeū-Huapai.

GAP ANALYSIS

- North West DBC reconfirms IBC Indicative Transport Network alignment.

LAND USE



- Future Urban Zone
- Residential -Terrace Housing Apartment Buildings
- Residential -Mixed Housing Urban Zone
- Business - Light Industry Zone
- Rural- Mixed Rural Zone
- A Special Housing Area

- Station Road sits within the heart of the Future Urban Zone of Kumeū -Huapai.
- Existing Special Housing Area development to the north east of the corridor. High density residential development.

CONSTRAINTS



- Main constraint is the newly developed compact urban form of the Special Housing Area and the existing Huapai District School.

DBC OPTION DEVELOPMENT



Segment 1

- Not in this scope. Included as part of SH16 Main Road Upgrade.

Segment 2,3 and 4

- A 24m cross section holding the centreline and equal widening to the east and west was developed and applied to these three segments.
- Following on from this, a further assessment of impacts from localised widening to just the east or west was considered.

FORM AND FUNCTION ASSESSMENT

EXISTING CROSS SECTION



FUTURE CROSS SECTION



STATION ROAD UPGRADE – ROUTE REFINEMENT AND ASSESSMENT

OPTION ASSESSMENT

OPTIONS

KEY IMPACTS

High impact
 Medium impact
 Low impact

SUMMARY OF ASSESSMENT

Preferred

OPTIONS	IO1: Access	IO2: Reliability	IO3: Mode	IO4: Safety	Heritage	Land Requirement	Stormwater	Social cohesion	Transport	Construction	SUMMARY OF ASSESSMENT	Preferred
1 SGA 30m cross section Holding centreline and widening equitably to the east and the west.	✓	✓	✓	✓							Segment 1: Out of scope. To be considered under the SH16 Main Road Upgrade Project. Segment 2: Huapai Triangle has recently upgraded this section and corridor has a sufficient width of 24m cross section. No further land requirement. Segment 3: Compact urban form development consented on the eastern side which is impacted by centerline widening. Impact avoided if widened to the west and integrated into the Future Urban zone. Segment 4: No significant impacts identified to indicate single side widening.	✓



EMERGING PREFERRED OPTION

Segment 2: Utilise the existing corridor. The recently constructed existing corridor at 24m will support future growth. By utilising the existing corridor there will be no further impacts on the existing Huapai School and the Huapai Triangle Precinct which is currently in development.

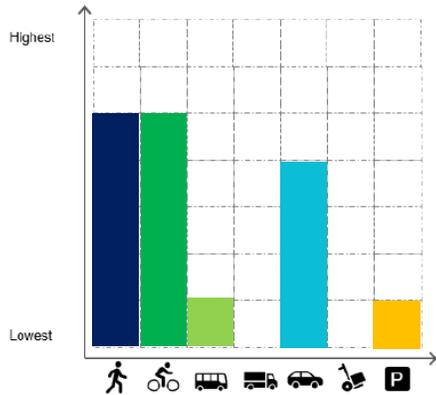
Segment 3: Hold eastern boundary and widen to the west. The road widening can be better integrated into the Future Urban Zone located on the west side of the road corridor and avoid property impacts on existing properties and future development within the Huapai Triangle Precinct.

Segment 4: Widen both sides of the corridor. No significant constraints were identified along the segment to influence an east or west development. The centerline approach will impact properties on both sides of the road but the extent of lane required from each property will be less and can be integrated into the Future Urban Zone development on each side of the corridor.

STATION ROAD UPGRADE – EMERGING PREFERRED OPTION DEVELOPMENT

INTERSECTION FORM ASSESSMENT

Intersection	Recommendation	Comment
Station Road/SH16	Signals	Need to consider integration with the RTC solution
Station Road/Nobilo Road	Single Lane Roundabout	Compact Urban Roundabout
Station Road/Access Road	Dual Lane Roundabout	Urban/Rural one side



Future Modal Priority

HOW SOLUTION MEETS FUTURE MODAL PRIORITY

- Provision for separated cycle facilities and footpaths on both sides of the corridor.
- Retention of existing level of traffic capacity i.e. one lane in each direction.

DESIGN REFINEMENTS

- Design for tie-in at the northern extents of the corridor up to the recently constructed Schoolside Rd intersection.
- Incorporate retaining wall designs to reduce property requirement along the developed section of the route.
- Look at opportunities for stormwater pond location to be contained within single property lots.

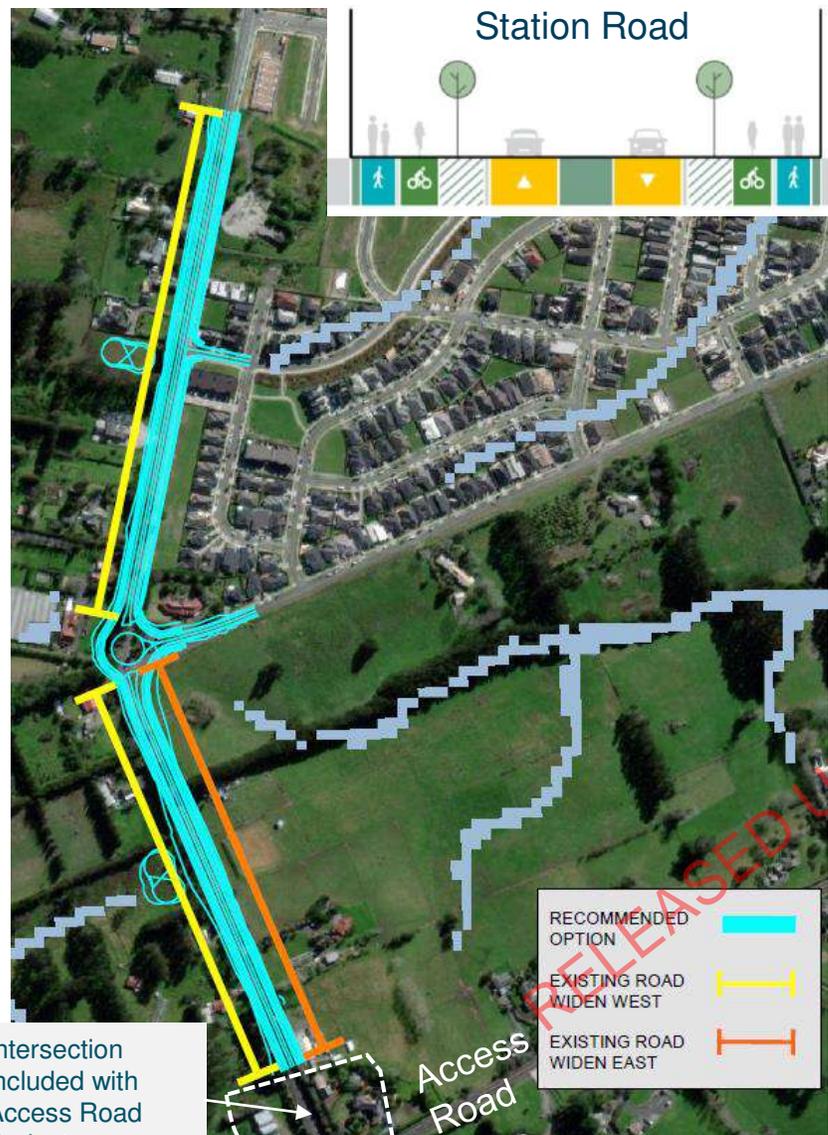
MATTERS TO CONSIDER FURTHER IN DETAILED DESIGN

Issues	Complexity Rating
Existing intersection arrangements and existing development constraints	M
Assessment of accommodation works requirements along the corridor.	L
Detailed investigations of driveways to private properties.	M

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STATION ROAD UPGRADE – RECOMMENDED OPTION

RECOMMENDED OPTION FOR STATION ROAD



ALIGNMENT AGAINST INVESTMENT OBJECTIVES

Investment Objectives	Alignment
<p>Access</p> <p>Improve access to economic and social opportunities along an integrated Station Road</p>	<p>Central north south corridor that connects residential and educational land uses on Station Road to SH16 Main Road and it associated land uses of future RTC stations, town/local centres and open space.</p>
<p>Mode Choice</p> <p>Support transformational mode share in Kumeū-Huapai by providing a high quality, safe and attractive movement of people along Station Road</p>	<p>Provision of separated active mode facilities on both sides of Station Road to connect and complete part of network with future facilities on Access Road and SH16 Main Road. Provision of safe active mode provision supports mode shift for Huapai School pick up and drop off.</p>
<p>Safety</p> <p>Provide improvements on Station Road that contribute to a transport network that is free from deaths and serious injuries</p>	<p>Provision of separated cycle facilities and improved intersection controls to support safety of turning traffic.</p>
<p>Climate Change</p> <p>Provision of high quality active mode facilities will enable mode shift to active modes to support a low carbon transport system in growth areas.</p>	

RISKS

- Alignment with developer led collector roads and intersections, namely at Podgora Avenue and Nobilo Crescent.

INTERDEPENDENCIES

- Rapid Transit Corridor/SH16 Main Road Upgrade.
- Access Road Upgrade.
- Kumeū-Huapai Special Housing Area (SHA) Improvement.



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Recommended Option

10 Recommended North West Package

The recommended North West transport package is shown in Figure 10-1. This is a comprehensive transport solution that provides:

- A safe, reliable transport system that supports North West growth and urbanisation.
- A transport network that supports the long term development of a low carbon transport system to support future growth and facilitates mode shift from private vehicles to public transport and active modes to reduce greenhouse gas emissions.
- Improved access to employment and social amenities.
- Support for intensification of adjacent land uses, particularly transit oriented developments and high density housing. Transport corridors maximise opportunities for walk up catchments to future rapid transit stations.
- Separation of the strategic trips from the local trips to support better placemaking in urbanised centres, provide direct freight connections and get the “right trips using the right corridors”.
- Increased reliability for public transport and resilience through urbanised alternative routes to improve safety on the North West rural roads.
- An areawide focus on safety through a holistic set of measures including Road to Zero safety principles, fully separated cycling facilities, well designed intersections and sufficient space for all modes to interact safely.

The outcomes will be achieved by targeted investment in:

- A high quality, fast and reliable Rapid Transit Corridor to connect Kumeū-Huapai to Westgate and city centre.
- A new Alternative State Highway that will remove strategic trips from within Kumeū-Huapai. This will improve amenity and access to the Kumeū town centre, support the implementation of the RTC and provide direct heavy vehicle access from the State highway to the future industrial area.
- A reliable bus infrastructure network that connects both existing and new land uses to key destinations and RTC stations. It will support both FTN and local bus services and includes measures such as 17.5km of new bus lanes and provision for intersection bus priority at key locations in the network.
- 21 corridors that include upgraded walking and cycling facilities to improve safety, attractiveness and connectivity within and between areas. This corresponds to 67km of new and improved cycle network. The suite of cycling measures include:
 - Strategic facilities adjacent the RTC and ASH which support separated, uninterrupted and higher speed cycling.
 - Separated cycle lanes on urban corridors and shared paths on rural corridors.
- Two new corridors (Spedding Road East and West) that provide additional crossings of SH18 and SH16 respectively to provide for local movements between Whenuapai and either Hobsonville or Redhills.

Figure 10-1 Recommended North West Transport Package for Route Protection



North West Preferred Transport Network

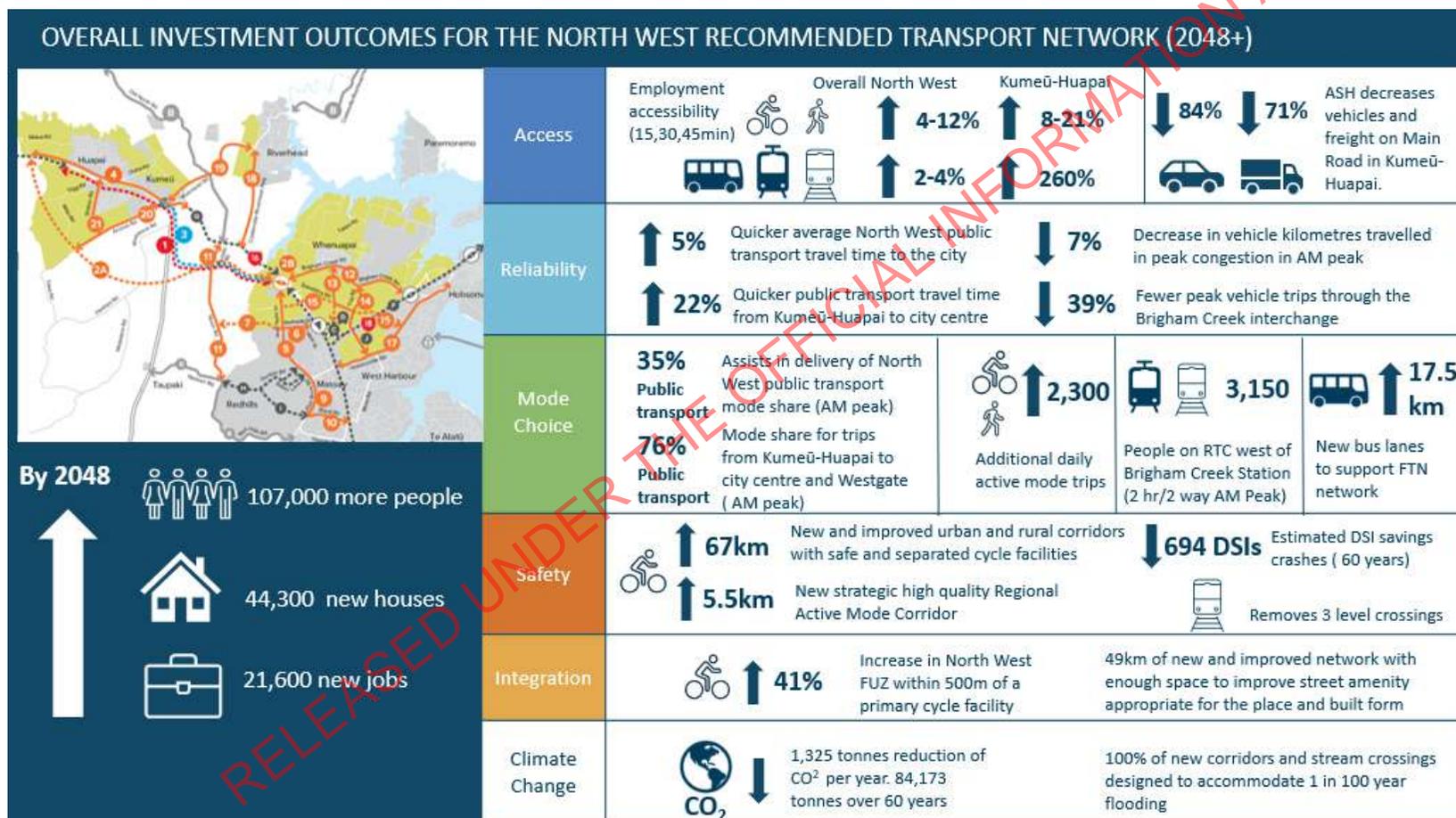


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10.1 Key Performance Indicator Outcomes

The key outcomes for this recommended network are shown in Figure 10-2. Additional detailed information on overall outcomes for the North West as well as the individual strategic corridors and local interventions by area are included in **Appendix C: Transport Outcomes Report**.

Figure 10-2 Outcomes for the North West recommended network



As previously discussed in Section 9.1 the Do Minimum for this business case assumes the introduction of two key transformational projects: the rapid transit corridor between City Centre and Westgate and the SH16 to SH18 Connections project which improves motorway connections between SH16 and SH18 and provides south facing ramps at Northside Drive. These projects realise a large initial tranche of transport benefits in the North West due to their step change impacts.

The North West DBC recommended programme provides transport benefits by:

1. Supporting the realisation of further benefits from these earlier interventions e.g., through investment on local roads to improve connectivity to rapid transit stations to maximise station catchments.
2. Delivering additional transport benefits which are largest for the Kumeū-Huapai catchment which as a result of this DBC programme is now also directly connected to the rapid transit network. This is reflected in the summary outcomes shown above where the additional improvements to public transport mode share are more modest for the overall network reflecting the supporting nature of the interventions but significant for Kumeū-Huapai trips where new step change interventions are proposed.

This recommended programme is a holistic package of interventions and whilst individual options may vary in their performance when considered in isolation, the performance of the programme is greatly increased when considered as a connected and complementary transport response. This results in the sum of the whole being greater than the sum of the individual parts. Each individual project addresses a local issue but then has a wider role in extending or completing an active mode or public transport network which has a flow on effect to the transport choices, reliability and efficiency area wide.

Additional commentary on the key investment theme outcomes is summarised in Table 10-1.

Table 10-1 Investment theme commentary

North West Theme	Commentary
Access	<ul style="list-style-type: none"> • For the overall North West, the additional investment in active modes improves the accessibility for active modes to employment within 45 mins by up to 12% which reflects the investment in creating a network of walking and cycling facilities to connect to key destinations, rapid transit and FTN stations. This active mode network will be even further enhanced once collector roads with additional facilities are implemented through the structure planning and development process. Despite the previous assumed investment in the first stage of rapid transit from the City Centre to Westgate, the DBC recommended network further improves accessibility to employment by up to 4% within 15 mins. • For Kumeū-Huapai this accessibility has been measured as 260% (or additional 60,000 jobs) when compared with the 45 min PT accessibility in the Do Minimum and this is directly attributable to the extension of the RTC from Westgate to Kumeū-Huapai. The new strategic cycle facilities adjacent the RTC and ASH as well as local connections on SH16 Main Road result in a 21% increase for the 30 min accessibility by active modes.
Reliability	<ul style="list-style-type: none"> • The investment in the RTC extension and the network wide bus lane and bus priority results in an improved overall public transport travel time to the city centre of

North West Theme	Commentary
	<p>5% which increases to 22% (or an estimated 17 minutes) for trips originating in Kumeū-Huapai.</p> <ul style="list-style-type: none"> The people throughput of the recommended DBC network increases by about 13% to the east of Riverhead Road, however it is also estimated that the vehicle kilometres travelled in the peak congestion in the North West reduces by 7%. This reduction is attributable to a combination of measures including an increase in public transport patronage removing trips from the network as well as an improved strategic connection which moves vehicle trips from the congested local network to the new ASH facility which better provides for those longer vehicle trips. The design of the split fork SH16 Brigham Creek Interchange diverts a significant proportion of trips between Riverhead and Whenuapai away from the interchange, thus resulting in better separation of local and strategic movements which is estimated to be a 39% reduction in trips through the interchange compared with the Do Minimum scenario. This is of particular benefit for the local cycling trips which are better separated from the motorway interchange and will experience a safer journey.
<p>Mode choice</p>	<ul style="list-style-type: none"> Mode shift from private vehicles to public transport or active modes is a key part of the DBC's climate change response and the recommended programme's reduction in emissions and congestion. The cumulative effect of investment in the North West is expected to deliver by 2048+ an overall AM public mode share of approximately 35% which is a combination of the transformational rapid transit infrastructure and a cohesive and well connected local bus service and active mode network that supports the RTC as well as local journeys to key employment areas in Westgate and Whenuapai. The extension of the RTC is forecast to carry around 3,150 people in the AM peak period. It is forecast to have a significant impact on travel behaviour from Kumeū-Huapai, with 76% of AM peak trips to Westgate or City Centre expected to be public transport journeys. This demonstrates a clear mode shift for key destinations and supports the desire for a low carbon transport network. The investment in active mode facilities is expected to create at least 2,300 additional daily active mode trips in the North West. The proposed network includes a dedicated 5.5km for the RAMC which will extend the strategic Northwestern Cycleway between Brigham Creek and Kumeū-Huapai. The recommended network includes 17.5km of new bus lanes to support the FTN network. In addition, bus priority has been allowed at a wide range of key intersections throughout the North West. This will improve bus reliability and the attractiveness of buses as a transport option in the North West and is a key contributor to the mode shift of local North West trips from private vehicles to public transport.
<p>Safety</p>	<ul style="list-style-type: none"> Every corridor in the North West has investment in active mode facilities to create a connected and safe network. This includes over 67km of new or improved corridors and the separated cycle facilities will improve the actual and perceived safety of cycling in the North West. Estimated DSI savings over 60 years of 694. Removal of three level crossings as part of the RTC project (Trotting course Drive, Access Road and Matua Road).

North West Theme	Commentary
Integration	<ul style="list-style-type: none"> The DBC recommended network has a total growth area of FUZ around 2,045 ha. In the Do Minimum, only 17% of this growth is within 500m of a primary cycle facility however this increases up to 58% with the investment of the recommended programme highlighting the significantly increased connectivity of the active mode network. 49km of corridors have sufficient space in the recommended cross sections for future designs to provide street furniture, lighting, tree planting and additional berm space in local centres to support people movement. The recommended network has two new rapid transit stations (as part of the RTC) which link to future town centre and local centre land uses in Kumeū-Huapai to maximise both the catchment as well as opportunities for Transit Oriented Developments. The recommended network focuses on connecting freight movements between industrial areas and the state highway network with minimal impact on local arterials. Examples are the ASH which connects directly to planned industrial land in Kumeū-Huapai and Trig Road which connects to future industrial land in Whenuapai and leave the parallel Māmari Road to focus on priority of bus provision. All planned corridors support maximising intensification opportunities within currently planned zoning e.g., AUPOIP planned Terrace Housing and Apartment Building zones are well served by bus infrastructure and active mode facilities. The NPS:UD will provide further intensification opportunities for the North West and this principle has been incorporated into decision making for the North West. Specific integration examples include key infrastructure such as Kumeū-Huapai RTC station location and alignment, residual land at SH16 Brigham Creek Interchange, integration with future RTC station at Brigham Creek as part of NWRTN project and Brigham Creek Road local centre.
Climate Change Response	<ul style="list-style-type: none"> The recommended network is based on the premise of maximising mode shift in the North West. It is estimated to achieve a reduction in CO2 emissions of 1,325 tonnes per year compared to the Do Minimum scenario. This is cumulatively around 85,000 tonnes over the next 60 years. The recommended network has been adapted to respond to 1 in 100 year flooding with 100% of new corridors and stream crossings meeting Q100 flood level immunity. 90% of existing road being route protected have provision to be vertically raised to meet Q100 flood level immunity. Rural roads provide sufficient space for the provision of green stormwater infrastructure if desired. Conserve and provide opportunities to enhance the natural environment and cultural heritage including wetlands, SEA's, streams and vegetation stands.

10.2 Sustainability outcomes

The concept of sustainability is in synergy with Te Ao Māori (Māori world view) and the interconnectedness and interrelationship of all living and non-living things. The development of the North West recommended transport network has been undertaken holistically and is based around the three principles of social, environmental and economic sustainability.

The overarching sustainability principles were introduced in Section 6.3 and are shown again in Figure 10-3 below.

Figure 10-3 Sustainability principles

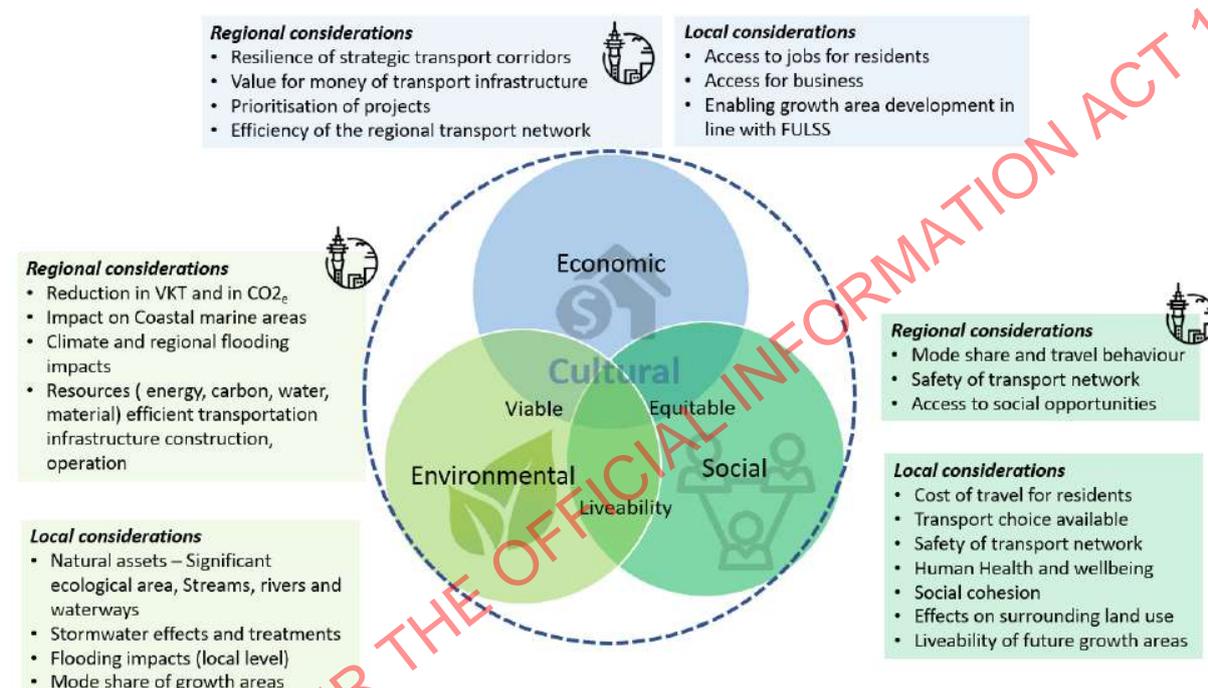


Figure 10-4 to Figure 10-6 detail how the recommended programme delivers against these three principles to support a strong North West culture, better community outcomes and create liveable communities.

Figure 10-4 North West environmental outcomes



Figure 10-5 North West social outcomes

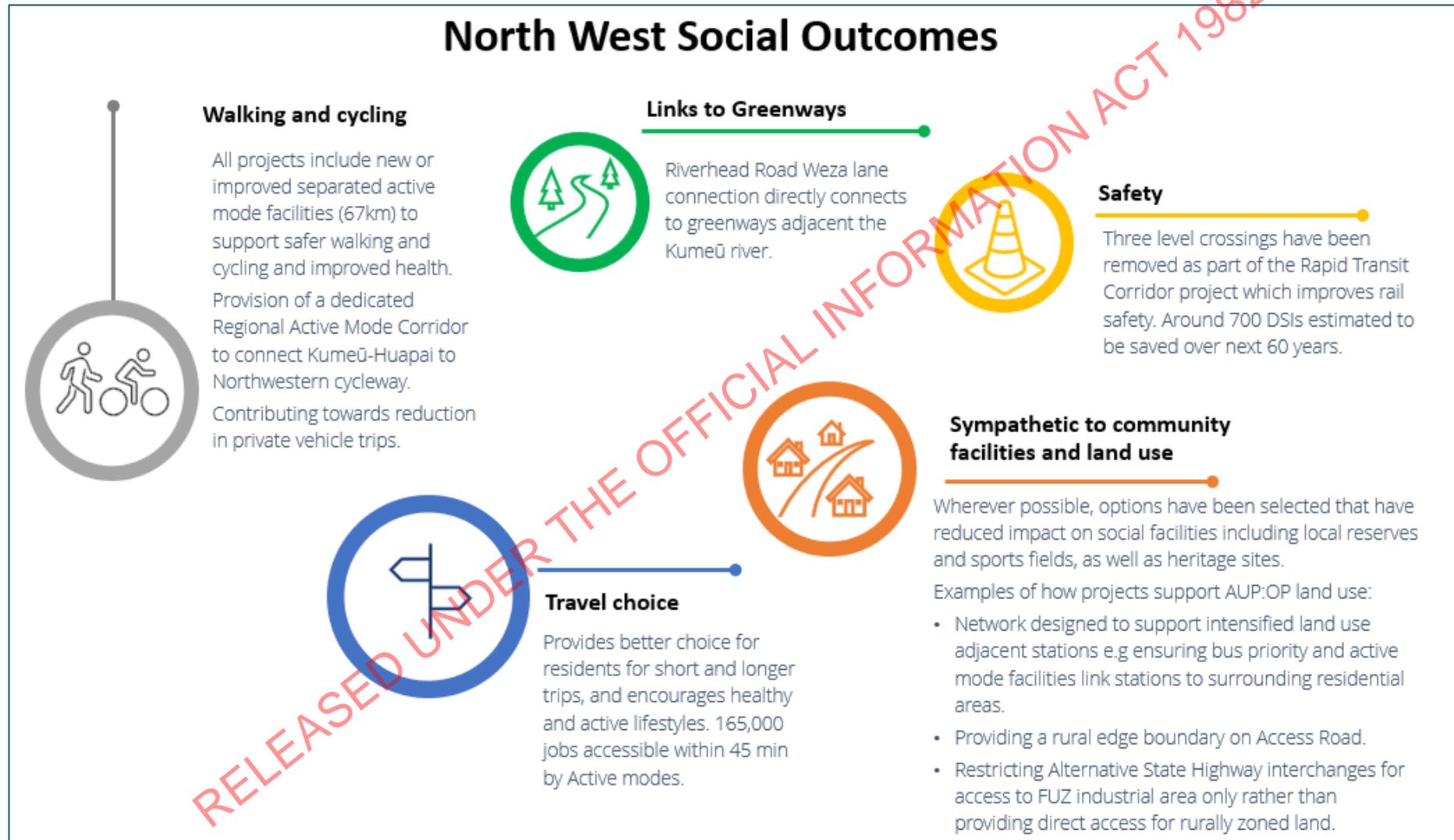
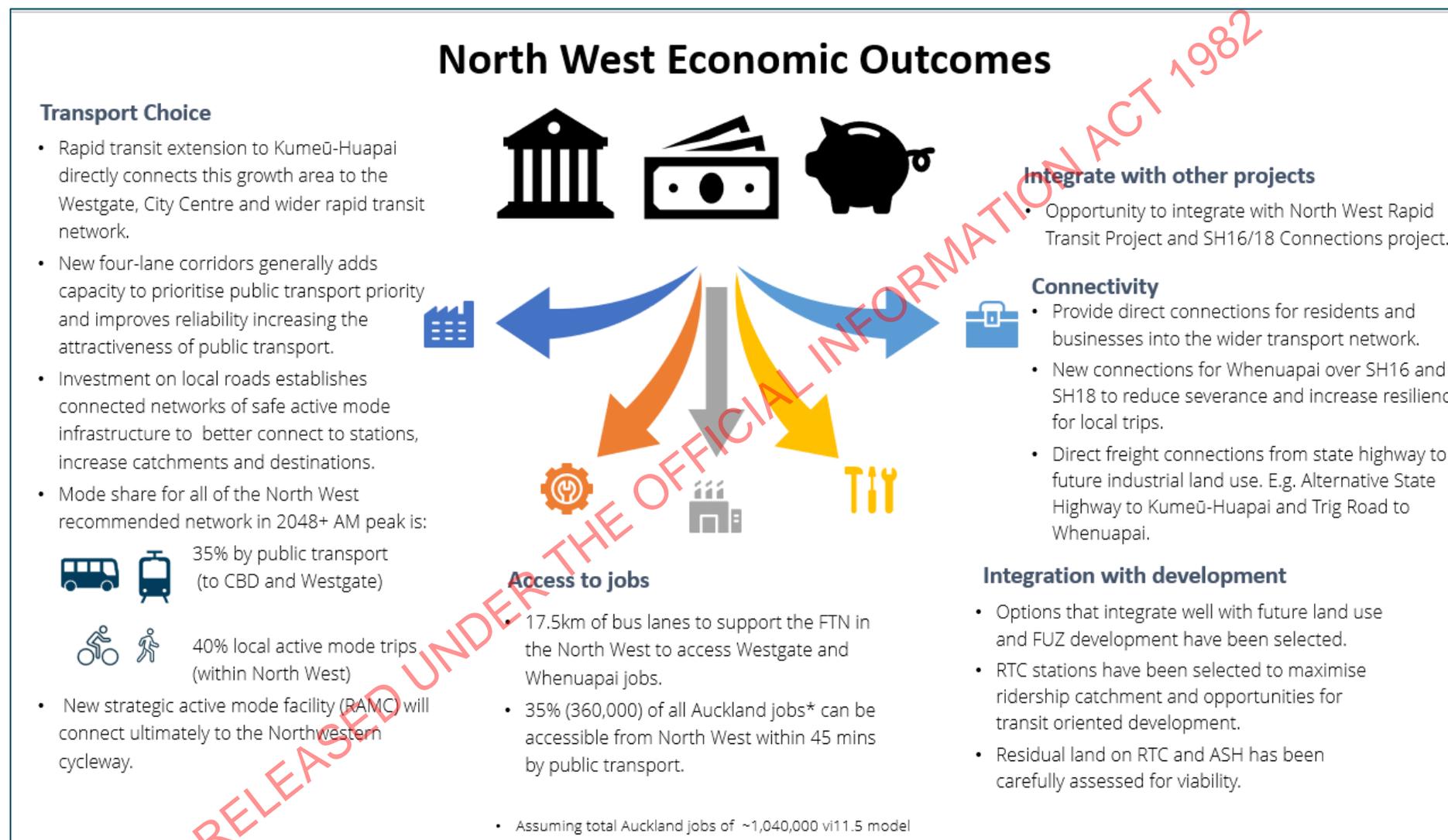


Figure 10-6 North West Economic outcomes



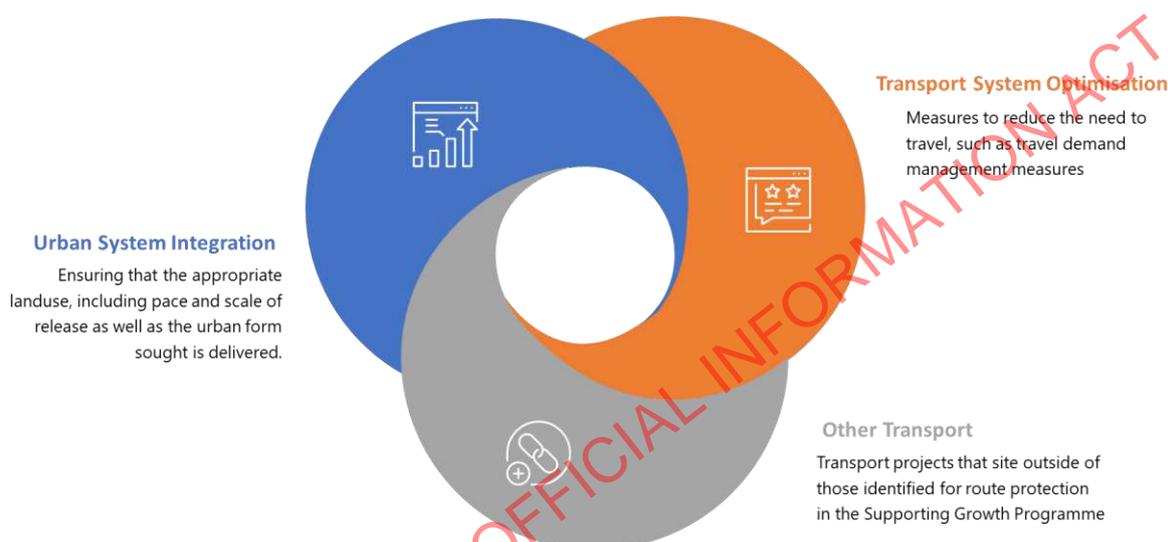
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10.3 Supporting measures

If all the transport infrastructure projects identified in the Te Tupu Ngātahi programme were successfully delivered this would not guarantee or optimise the outcomes sought from the programme. This is due to the wide range of other necessary elements, including pre-conditions to investments, that also need to be implemented and monitored to ensure the successful overall outcome of the programme.

These elements can be broadly summarised into three areas, being Urban System Integration, Transport System Optimisation and Other Transport, as shown in Figure 10-7.

Figure 10-7 Additional contributory elements



It is critical that each of these elements are delivered in parallel and in collaboration with this programme of transport interventions to optimise and deliver the full range of outcomes sought. For example, if the projected land use is not delivered the planned transport system will be sub-optimal, underutilised and critical elements such as mode-shift targets will not be met.

Specific North West complementary measures are summarised in Table 10-2. Management of these measures are discussed further in the Management Case of this DBC (Section 14).

Table 10-2 Supporting measures for the North West Recommended Network

Supporting measure	Measure	North West application
Urban System integration	Ongoing land use and transport integration	<p>This programme of transport interventions is intrinsically linked to the urban system including land use, urban form & place quality, density & proximity, and employment self-sufficiency. Te Tupu Ngātahi recognises this with place making and liveability outcomes a key focus area, alongside alignment with the future pace, location and scale of the proposed growth.</p> <p>It is therefore critical that these urban system integration outcomes are delivered alongside and at the appropriate timing for the transport interventions recommended.</p>

Supporting measure	Measure	North West application
		<p>The North West has large areas of FUZ that is yet to be structure planned. Building on from the recommended DBC network, continued discussions will be required with Council to help shape the supporting collector and local road network to best support the overall North West transport outcomes. This could include how to maximise development around stations and where higher density housing is best supported by the transport network. It could also include items such as consideration of bus priority measures or local cycling networks on newly developed roads. Alternative local cycling routes on these local and collector roads will help reduce the cumulative effects of the multiple roundabouts and signals on busy urban arterials like Hobsonville Road and Fred Taylor Drive. Linking these local paths throughout the district to the planned arterial networks will support wider uptake of cycling.</p> <p>Land use integration discussions will also need to be extended to identified government partners such as Kāinga Ora or Panuku as well as third party developers to maximise opportunities to best connect developments with the transport network.</p>
Transport system optimisation	Travel Demand Management	The Te Tupu Ngātahi programme IBCs identified a wide range of Travel Demand Management initiatives to ensure the demand pressure on the transport system of Auckland substantial growth is appropriately managed prior to the transport system being called upon to move people to and from their destinations. These measures are a combination of locally driven interventions and whole of region measures, which make coordination and collaboration across the multiple parties required challenging.
	Increased bus frequencies	The North West recommended network creates a connected FTN network and provides many opportunities to add intersection bus priority measures to improve bus reliability. However, without the operational funding to actually increase bus services and the overall attractiveness of the service, the public transport mode shift will not be realised.
	Fleet Management	Whilst mode shift is preferable to reduce emissions there is also a role for better fleet management to support emission reduction targets. This could include wider government-led initiatives to support the uptake of electric vehicles (including buses) to reduce emissions from private vehicles and could also extend to the introduction and uptake of biofuels. Emission modelling in 2048+ includes an assumption of ~66% of the total fleet being electric and this is a major contributor to reduction in emissions. Therefore, this is a very important measure to support the overall reduction in emissions and maximise the outcomes of the North West recommended network.
Other Transport	Implementation of key projects	<p>This programme relies on a number of other transport projects being in place within the transport system to support the North West preferred transport network and realise the desired transport outcomes. Examples of this in the North West are:</p> <ul style="list-style-type: none"> • Implementation of the City Centre to Westgate RTC as part of the North West Rapid Transit Network. Without this infrastructure there is a risk that the transformational mode shift in the North West will not be

Supporting measure	Measure	North West application
		<p>achieved as there will be insufficient public transport capacity. There remains an opportunity to use some or all of the route protected land for a reduced RTC option.</p> <ul style="list-style-type: none"> Implementation of the SH16/18 Connections Project. This project realises key strategic motorway connections that will removes strategic trips off the local Whenuapai transport network. Transport improvements will still be achieved through the Whenuapai North West projects without SH16/18 Connections. However, because the North West projects assume SH16/18 Connections will be implemented, they are not sufficient on their own to achieve optimum outcomes. Accordingly, without SH16/18 Connections Brigham Creek Road will remain heavily (although still less) trafficked and may not be able to urbanise appropriately. <p>The North West DBC has identified project dependencies in Section 5.3.</p>
	<p>Rural safety improvements</p>	<p>Using existing Auckland Transport safety programmes to progress rural safety upgrades for previously identified routes of Old North Road, Coatesville Riverhead Highway (north of Riverhead), Redhills Road and Nelson Road. In addition, as growth occurs other rural roads within the North West may start to experience increased pressure so a wider monitoring programme for other roads in the area would be beneficial.</p>

10.4 Difference to the IBC network

The recommended North West transport network is mostly aligned with the IBC network as shown in Figure 10-8. The corridors highlighted in red are the corridors that have changed since the IBC and additional details of these changes are summarised in Table 10-3.

Figure 10-8 Comparison of the North West DBC network to the IBC network

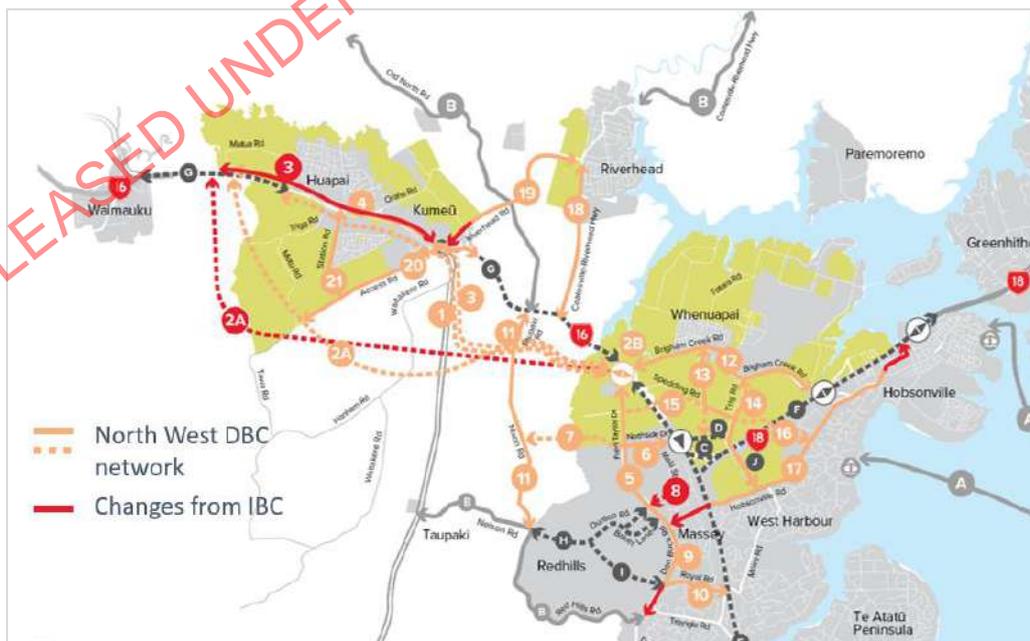


Table 10-3 Summary of changes between North West DBC and IBC networks

Corridor	What has changed
Alternative State Highway Refined alignment	<p>The alignment has remained with an eastern connection at Brigham Creek Interchange and a western connection with SH16.</p> <p>The central section is further south to respond to ecological and land use constraints. The section west of Tawa interchange is aligned further east in the FUZ to respond to topographical and environmental constraints to the west of the FUZ. A cycle facility will be provided along the length of the ASH.</p>
Regional Active Mode Corridor Reduced extents	<p>Further assessment in the DBC identified that the RAMC facility was only required to connect Westgate to Kumeū-Huapai and then the future proposed local cycling network would provide suitable connections to access the town centre, local centre and future residential and industrial land uses.</p>
Dunlop Road Removal from the recommended transport network	<p>Dunlop Road has been confirmed as fit for purpose. No requirement for further investment along this corridor and it has been excluded from the North West recommended transport network.</p>
Don Buck Road Exclusion of section from Royal Road to Redhills Road	<p>There are significant land use impacts for widening on Don Buck Road between Royal Road and Redhills Road including property impacts on the local centre, community facilities and utilities. Given this and the absence of significant transport benefits, the decision was made to exclude this section and widen Don Buck Road between Fred Taylor Drive and Royal Road only. It is further recommended that this southern section of Don Buck Road corridor is considered for inclusion in the Connected Communities Programme.</p>
Hobsonville Road Reduced extents	<p>The form and function assessment identified that following sections of the Hobsonville Corridor were Fit for Purpose:</p> <ul style="list-style-type: none"> Hobsonville Point Road/Buckley Ave. Fred Taylor between Don Buck Road and SH16. <p>For these segments it was found that there was either sufficient width in the carriageway to allow for a reallocation of space or adequate provisions for all modes of transport to achieve the desired outcomes for the corridors. Subsequently, no further assessments were completed for these segments and they have been removed from the recommended transport network.</p>
Riverhead Road Weza Lane connection	<p>Option assessment identified that Weza lane rather than Riverhead Road was the preferred western connection for the Riverhead Road Cycle lane. This was because it provided a more direct connection between Kumeū-Huapai and Riverhead, avoiding SH16 between Riverhead Road and the entrance to Kumeū-Huapai. It also aligned well with existing and future paths in the Greenways (2016) Plans. Therefore, the Weza lane connection replaced the Riverhead Road connection as shown on the IBC plans</p>

10.5 Staging assessment

Given the long term nature of this route protection DBC, there is some uncertainty as to the final land use and timings for supporting infrastructure upgrades. The following sections discuss the resilience of the proposed network to these external uncertainties.

10.5.1 What happens if the “Do Minimum” infrastructure is delayed?

One other aspect to consider is how the recommended network might be impacted should the Do Minimum network (which includes projects such as the SH16/18 connections and SH16 and SH18 rapid transit network) either not be delivered or have a delay in delivery. These are key projects to the overall North West transport network which is why they have been assumed in the Do Minimum. Issues to note include:

- One of the outcomes for the SH16/18 connections project is to remove the strategic function from Brigham Creek Road which currently connects the two motorways. Should this not happen then Brigham Creek Road is likely to be much busier than currently predicted. This route is however recommended to be protected for 30m which does allow some flexibility to absorb additional traffic, at the expense of place making in Whenuapai. Should SH16/18 be delayed it is possible that the upgrades of Brigham Creek Road would need to be brought forward. Similarly, the alternative east west corridors along Spedding Road West and East could be required earlier to help dissipate the additional east-west load on Brigham Creek Road. So, it would likely result in an infrastructure timing issue rather than a capacity issue.
- If there are delays to the SH16 RTC network then an interim rapid transit solution to Westgate would be preferable for Kumeū-Huapai, or alternatively a delay to the release of land. Whilst this DBC does not include the scope for detailed review of interim rapid transit options, some thought has been given to how existing SH16, ASH/Access Road, rural section of the RTC and existing passenger rail could be used for interim RTC¹⁴. It is not likely that the full implementation of the North West RTC extension would occur if the SH16 rapid transit project is not progressed at all as there would be insufficient capacity south of Westgate to accommodate the passengers generated by the North West RTC extension. However, under this scenario, there remains an opportunity of some/all of the route protected land to be used for a reduced rapid transit option and would likely concentrate moving people from Kumeū to Westgate to join the bus based measures being currently progressed on the Northwestern motorway.
- The North West recommended network is designed to connect with the SH18 rapid transit but the Whenuapai network is not necessarily dependent on it being in place. Hobsonville Road is the exception and would however be under significantly more pressure without the people moving capacity of the parallel SH18 rapid transit corridor. The central section of Hobsonville Road remains as two lanes in the future network and there is limited scope/ high property impact to widen to four lanes to provide bus priority beyond the intersection bus priority that the North West DBC programme allows for.

¹⁴ For more information refer to the RTC technical note included as an attachment in Appendix C: Transport Outcomes Report

10.5.2 What happens if the surrounding land use changes?

The North West DBC is based on the land release for the growth areas identified as part of the FULSS. With the changes to the NPS:UD and the inherent uncertainties related to third party developers high level consideration has been given to the resilience of the proposed network to significant land use changes. Key issues are discussed in Table 10-4 below. Note no “contingency corridors” or designations are planned but risks and issues are highlighted.

Table 10-4 Resilience of the proposed network to land use changes

Change	Commentary
Whenuapai airbase is rezoned	<p>There are currently no strategic plans for the Whenuapai Airbase to be decommissioned, however the project team has thought about the implications on the network should this occur. The dual north south corridors of Māmari Road and Trig Road provide suitable spines to access northern Whenuapai. If the airbase land was to be subject to a plan change it is expected that a new north spine would be needed (likely connecting with Trig Road) to provide collector access for the new land. There could be some implication with additional land being required at the Trig Road/airbase intersection but this could be accommodated if needed on the airbase side. So overall the network could be expanded. Under this scenario it is envisaged that Māmari Road would remain the key bus route and Trig Road is not over capacity as a two lane road, so no additional capacity would be recommended for Trig Road.</p>
Urban sprawl	<p>The North West growth area is surrounded by rural land use and there remains the possibility of future plan changes and urban sprawl. Possible locations for sprawl might be between Access Road and Redhills North, between Riverhead and Kumeū or between Kumeū and Waimakau. From a network perspective these land use implications have been considered at a high level with the following observations:</p> <ul style="list-style-type: none"> • Both the ASH and the RTC do not preclude an interchange or station at Taupaki which could respond to urbanisation of this rural area. • The Redhills east west network has capacity to accommodate additional traffic from the west (e.g Taupaki) and could connect these additional trips into the strategic public transport or vehicle network. • Riverhead Road and Coatesville Riverhead Highway had currently got protection for swales and the road space would be sufficient for an urbanised cross section if intensification happens along these key arterials and the function of the road needs to be changed. • Local access is not provided for on the western section of the ASH, however if this was an expressway in the future this could be considered. The section of SH16 between the ASH and Waimauku does not require any additional space at this stage, however if the land use near Waimauku does significantly change this section of road might need further consideration. • There is some capacity on the ASH and RTC if further intensification west of Kumeū-Huapai does occur. The park and ride facilities at the western station is an end of line facility to support wider connection to the RTC. The RTC alignment itself has been designed to allow further extension to Waimauku if required (although not provided in this designation). • The ASH currently joins back onto SH16 west of Fosters Road. Taking the corridor around Waimauku was discounted due to lack of transport demand and ecology,

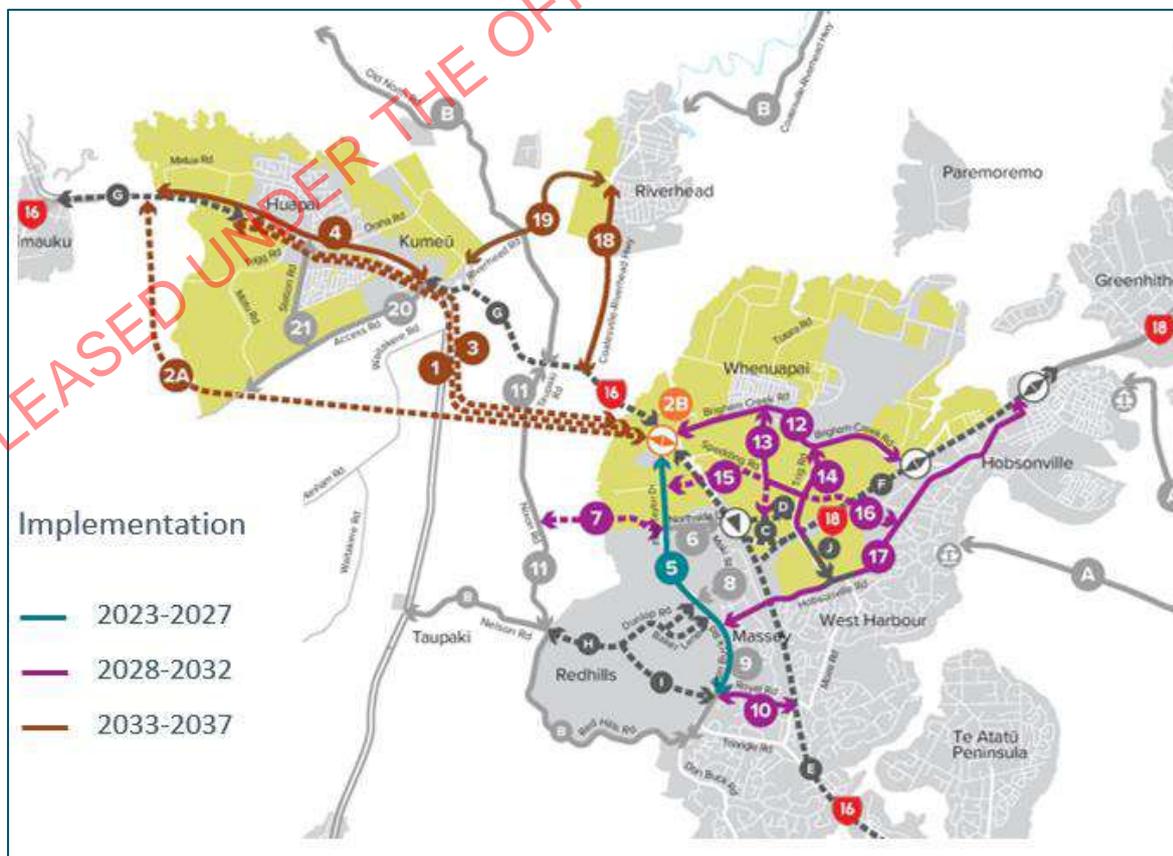
Change	Commentary
	stormwater and construction issues. This alignment does not preclude SH16 being extended north to Hellensville if desired in the future.

Therefore, the network has been designed with future additions possible but this will all be predicated on the final land use. The new strategic corridors do not preclude future connection points; however, we are not advocating provision of these at this stage. We consider the proposed network is robust to external land use changes. The main impact from land use changes will be the order of infrastructure development. If land use in Kumeū-Huapai continues unabated out of sequence compared with Whenuapai and Redhills there could be pressure to bring forward either the RTC or ASH earlier. However, the proposed staging of the RTC would provide some much need public transport provision to Kumeū-Huapai and possibly delay the need for the ASH. Under this scenario it is expected that the local arterials might need to be upgraded in tandem with the land use. Similarly, if the NWRTN project proceeds at pace, there could be merit in escalating the delivery of Spedding Road West to connect Whenuapai to the new RTC station at Brigham Creek and maximising the initial RTC catchments.

10.5.3 Alternative staging

The North West DBC has assumed the following project staging as agreed with Waka Kotahi and Auckland Transport. This has been used in the transport modelling and the economic evaluation for the North West DBC. It is broadly based on the FULSS land use release and the modelling land use i11.5.

Figure 10-9 Assumed infrastructure staging



This assumed staging is very peaky and assumes the implementation of the large programme in a relatively short timeframe which may have affordability issues. As such, as part of the development of the North West DBC, alternative staging has been explored to understand how the staging could change with either land use changes, slower uptake of land use or delays for implementation.

Appendix L: Staging Considerations provides more details on this assessment and associated considerations.

Due to the uncertainty regarding the timing and form of specific land use activities, a principle-based approach is regarded as the best way to manage and deliver the desired transport and land use outcomes consistently. This recognises that staging in many cases will either be determined by regional, inter-regional and local priorities, which heavily rely on the scale and rate of growth.

A set of principles were developed, which linked staging decisions to broader strategic goals regarding travel demand management and modal shift. These principles supported the following outcomes:

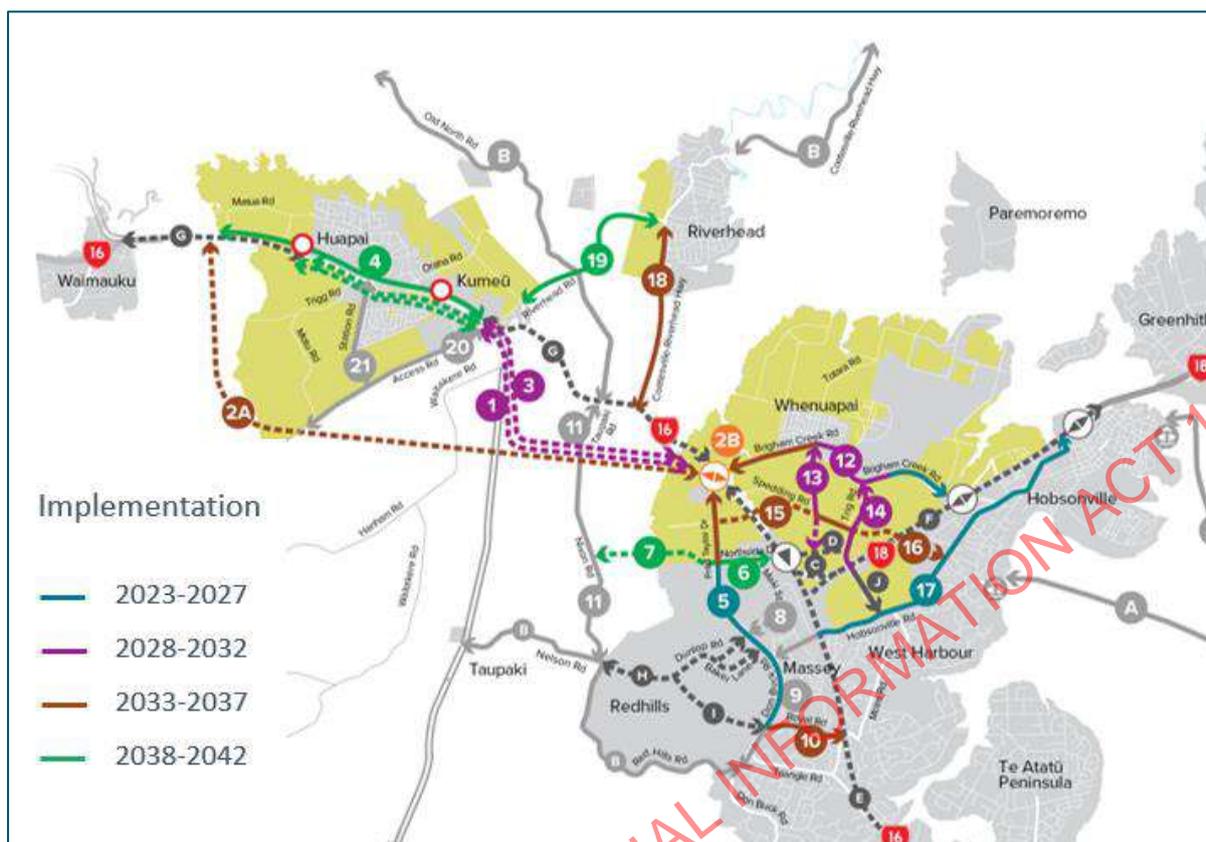
- Immediate shift to more sustainable travel choices.
- Manage adverse impacts of development on the wider system.
- Support the desired urban form, particular high density, quality urban environments.
- Recognise the need to support both place and movement function.
- Provide affordable staging plans that match development staging.
- Protect for longer-term needs.

The suggested principles for North West staging are:

- Programme public transport and active mode facilities and services from the outset of urban development to support a shift to more sustainable travel.
- Prioritise public transport and active mode facilities that support attractive access to the RTC stations.
- Consider staging of elements of a project to match likely development stages and system needs, whilst also considering pathways to achieve the full-build elements.
- Consider the needs to support place-function, not solely movement function.
- Provide safe travel by all modes.
- Staging that can respond to the timing, scale and form of urban development.

As a result, a potential alternative staging was developed which is shown in Figure 10-10.

Figure 10-10 Alternative staging plan



Key changes include upgrading key corridors in Whenuapai and Redhills first, implementing the RTC in two parts and delaying the implementation of the ASH and full rapid transit. Specifically:

- Local corridors in Whenuapai and Redhills are prioritised early.
- RTC is staged in two parts with the rural part being constructed in 2028-2032 along with interim RTC stations to form the basis for interim RTC facilities.
- ASH is implemented as the next strategic project in 2033-2037 with the view this could be used as an alternative route for interim RTC while the long term RTC facility is constructed in 2038-2042.

This is one possible alternative staging option and the impact of this on early property acquisition has been detailed in the financial case. The profile does shift the investment from a substantially complete network in 2037 to a comparable position five years later in 2042 in the alternative staging. This staging has the additional benefits to provide more time for the land use and funding to respond.

11 Economic Case

This section summarises the economic analysis which has been prepared for the full recommended package. The North West DBC is for the purposes of route protection, rather than imminent implementation. The appraisal has therefore been targeted at this decision (to progress to route protection), rather than at the more detailed assessment that could be expected for an implementation decision.

This economic evaluation has been undertaken in accordance with the Waka Kotahi NZ Transport Agency Economic Evaluation Manual (EEM).

Appendix H: Economics Assessment sets out the full methodology, assumptions, scenario testing, incremental analysis, and sensitivity analysis undertaken. For economic assessment purposes the North West DBC has been split into the following packages in Table 11-1.

Table 11-1 Economic packages for assessment.

Economic Package	Corridors included
RTC	RTC and RAMC
ASH	ASH and Brigham Creek Interchange
Redhills	Fred Taylor Drive FTN Upgrade, New Northside Drive West, Don Buck Road FTN Upgrade, Royal Road FTN Upgrade, Taupaki Road/Nixon Road Upgrade
Whenuapai	Brigham Creek Road Upgrade, Māmari Road FTN Upgrade, Trig Road Upgrade, New Spedding Road West, New Spedding Road East, Hobsonville Road FTN Upgrade
Kumeū-Huapai and Riverhead	SH16 Main Road, Coatesville-Riverhead Highway Upgrade, Riverhead Road Upgrade, Access Road Upgrade, Station Road Upgrade

For the economic assessment the SH16 Main Road upgrade has been included in the arterials package with Kumeū-Huapai and Riverhead arterials. The benefits for SH16 Main Road upgrade are mainly associated with active modes/ health improvements and minor bus benefits. The main Kumeū-Huapai public transport benefits are attributed to the RTC project. The reduction in traffic on SH16 Main Road is an outcome associated with the ASH, so these traffic benefits are counted in the ASH BCR. This protocol has been established to avoid double counting of benefits. It is noted that the section of Main Road between Access Road and Kumeū River would likely need to be upgraded to enable the RTC, but this is a small proportion of the SH16 Main Road costs and it was decided to retain the full SH16 Main road costs with the active modes/ health benefits in the Kumeū-Huapai and Riverhead package. For more information refer to Appendix H.

11.1 Key assumptions

The key assumptions assumed in the economic analysis are shown in Table 11-2.

Table 11-2 Key economic assumptions

Assumption Type	North West DBC Assumptions
Base date	1 July 2020
Time zero	RTC - 1 July 2031, 4 year construction period ASH - 1 July 2031, 4 year construction period Redhills - 1 July 2028, 2 year construction period Whenuapai - 1 July 2027, 3 year construction period Kumeū-Huapai, Riverhead- 1 July 2032, 3 year construction period
Analysis period	<ul style="list-style-type: none"> The economic analysis for the strategic projects – RTC and ASH have been carried out for 60 years as considered suitable for long-lived infrastructure projects. All the core benefits, costs and BCRs are based on 60 years period, but are sensitivity tested with 40 years period. The economic analysis for the local project packages – Kumeu-Huapai-Riverhead, Whenuapai and Redhills are carried out for 40 years analysis period as base estimate, but sensitivity tested for 60 years.
Travel time benefits	<ul style="list-style-type: none"> Assessment of base and congested (CRV) travel time benefits from the SATURN models except for the RTC (MSM Models used).
Vehicle operating costs	<ul style="list-style-type: none"> Assessment of base running vehicle operating costs (VOC) from the SATURN models other than RTC (using MSM Model).
Discount rates	<ul style="list-style-type: none"> Discount rate 4% applied to all annual benefits and costs, but sensitivity tested for 3% and 6%.
Transport reliability benefits	<ul style="list-style-type: none"> Assumed as 8% of the base travel time benefit, as a standard approach. Public transport reliability benefits are estimated as 70% of public transport user benefits in the commuter peaks and 40% in other periods.
Public transport reliability	<ul style="list-style-type: none"> For RTC, the PT reliability is predicted to be 90% in commuter peaks and 40% in other peaks. For ASH, the public transport reliability effect is considered as 0% of public transport user benefits.
Emissions	<ul style="list-style-type: none"> CO2 benefits are calculated from VEPM 6.1 Emissions.
Walking and cycling benefits	<ul style="list-style-type: none"> Estimated based on trip demand and travel cost matrices from SAMM, using the same method as used for PT benefits in the MSM, and using same approach as South DBCs.
WEBS	<ul style="list-style-type: none"> WEBS calculated for a test-case of the full package in 2048+ and for RTC as a representation of strategic projects, in accordance with the MBCM, then applied to the project using an adopted percentage uplift to the conventional benefits. The analysis is done for three principal type WEBS – Agglomeration, Imperfect Competition impact and Labour supply impact.

11.2 Cost

This section summarises the project construction and property costs prepared for the economic analysis. Indications of operational and maintenance costs have also been given. The estimates and appraisal have been developed with available information for the purpose of informing a decision whether to invest in route protection.

Detailed information is included in **Appendix D: Cost Report**.

11.2.1 Capital Cost

Cost estimates (expected cost P50) and property costs for each individual project are outlined in Table 11-3.

It is worth noting the following key cost assumptions:

- The mode agnostic assumption for the RTC presents some uncertainty for station size and location. For the purposes of this DBC, an indicative station footprint has been identified and land value priced by Auckland Transport. A provisional sum for the expected type and scale of station has been adopted for the construction cost of the two RTC stations
 [REDACTED] These have been based on other stations designed to a DBC level within the Te Tupu Ngātahi programme. However, it is expected that in the future these costs should be revisited in more detail.
- Taupaki Road/Nixon Road Upgrade project early in the DBC was confirmed with owners to not proceed to route protection due to its rural location. The owners requested the walking and cycling project continue to be included in the North West DBC but agreed that the expected very long term timing for implementation did not warrant a DBC level of costing at this stage. It was therefore agreed that a fit for purpose costing approach was suitable for this corridor and as such an update to the IBC costing based on new design information was agreed by both Waka Kotahi and Auckland Transport IQA teams to be sufficient. Updated costing information would be sought during the Single Stage Business Case (SSBC) stage of this individual project.
- Property pricing undertaken by AT does not include Auckland Council property as when AT is acquiring land under the Public Works Act (PWA) it is doing so on behalf of Auckland Council.

Table 11-3 Capital Costs

No.	Package Projects	P50 Cost (Undiscounted, \$M)	P50 Property Cost (Undiscounted, \$M)
1,3	<ul style="list-style-type: none"> Rapid Transit Corridor (RTC) Regional Active Mode Corridor (RAMC) 	█	█
4	<ul style="list-style-type: none"> SH16 Main Road Upgrade 	█	█
2A/2B	<ul style="list-style-type: none"> Alternative State Highway (ASH) Brigham Creek Interchange 	█	█
5	Fred Taylor Drive FTN Upgrade	█	█
6	Northside Drive East Upgrade	█	█
7	New Northside Drive West	█	█
9	Don Buck Road FTN Upgrade	█	█
10	Royal Road FTN Upgrade	█	█
11	Taupaki Road/Nixon Road Upgrade	█	█
12	Brigham Creek Road Upgrade	█	█
13	Māmari Road FTN Upgrade	█	█
14	Trig Road Upgrade	█	█
15	New Spedding Road West	█	█
16	New Spedding Road East	█	█
17	Hobsonville Road FTN Upgrade	█	█
18	Coatesville-Riverhead Highway Upgrade	█	█
19	Riverhead Road Upgrade	█	█
20	Access Road/Tawa Road Upgrade	█	█
21	Station Road Upgrade	█	█
	Total	4,803	█

The P50 estimated costs for the North West projects includes the following costs.

- Property.
- Project development.
- Pre-implementation.
- Physical works and Implementation.

A breakdown of these cost components is shown graphically in Figure 11-1 and Figure 11-2.

Figure 11-1 North West P50 Cost estimates – by project type



Figure 11-2 North West P50 Cost estimates – by project area



11.2.2 Operation and maintenance costs

Operating and maintenance costs associated with the North West are shown in Table 11-4. The following descriptions describe how these costs were assessed.

Table 11-4: Other Annual Costs (undiscounted costs NZ\$ million)

Item	RTC	ASH	KHR	Whenuapai	Redhills
RTC Stations (annual)					
RTC Tracks (annual)					
General Corridor maintenance (annual)					
Road Resurfacing (every 10 years)					

Station and Track Maintenance

From WSP Opus report ¹⁵, the recommended track maintenance cost is based on current Auckland rail network costs of ██████ per track km and ██████ per track km for electrification. The length of NW RTC from Huapai to Brigham Creek Road is 20 track kms. The station maintenance cost for large stations mentioned is ██████ per annum. Since, the cost estimation is done in 2017, it has been updated with update factor of 1.06 to adjust to July 2020 cost.

Regional Active Mode Corridor Maintenance

The RAMC is expected to have some maintenance cost associated with the cycle way and the footpath like general maintenance and resurfacing. For the purpose of this assessment, an annual cost of ██████ per linear km of new infrastructure has been assumed. Resurfacing can be expected to occur periodically throughout the life of a pavement. An allowance of ██████/m² has been provided at 10-year intervals. Reconstruction of the pavement has not been provided for, as it is assumed that the pavement life will exceed the 40-year evaluation period. The maintenance cost assumed have been derived from the traffic corridor cost, as agreed previously during IBC and Rail economics DBC. The maintenance cost for RAMC is considered under the RTC package under the general corridor maintenance category.

General Road Maintenance

Maintenance of road and transport corridors will vary significantly depending on a number of factors. For the purpose of this assessment, an annual cost of ██████ per linear km of new infrastructure has been assumed for urban 2 lane road, ██████ per linear km of new infrastructure has been assumed for urban 4 lane road. For the rural 2 lane road a general maintenance cost of ██████ per linear km

¹⁵ WSP Opus Report Oct 2017 PG 24 Table 4.7

is assumed. Hence, for the roads which undergo upgrades from rural to urban has an additional maintenance cost of [REDACTED] per linear km for 2 lanes.

Road Resurfacing

Resurfacing can be expected to occur periodically throughout the life of a pavement. An allowance of [REDACTED]/m² has been provided at 10-year intervals. Reconstruction of the pavement has not been provided for as it is assumed that the pavement life will exceed the 40-year evaluation period.

Bridge Maintenance

The bridge maintenance cost is ignored because the bridge construction cost is not available in isolated form from the total construction cost for each of the individual projects.

11.2.3 Public transport operating costs

PT operating costs were adopted from those used in the IBC, namely [REDACTED] km for buses and [REDACTED] km for light rail. Although the cost of operating PT services depends on several variables (distance travelled, drivers' salaries, fleet maintenance and parking, etc.), at this stage a simplification was used. The operation costs for bus and rail services were estimated using a cost rate per VKT, based on 2017/18 data provided by Auckland Transport. These rates were applied to the change in bus and light rail service kms from the MSM model.

The change in farebox revenue was calculated from the models, but only used in the Government BCR. The revenue was not included in the National BCR as it is considered an economic transfer. The farebox revenue obtained from MSM for the RTC stations have been discounted in similar way as the benefits as mentioned in Section 1.3.6. The list of all the project costs available for the economics is summarised in the **Table 11-5**.

11.2.4 Project costs for economic assessment

The project costs used in the economic assessment are shown in Table 11-5.

Table 11-5: NPV Project Costs, [REDACTED]

Projects	PV capital Cost, [REDACTED]	PV Maintenance Cost, [REDACTED]	PV PT Operating Cost, [REDACTED]	PV total net costs, [REDACTED]
North West DBC	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
RTC (60 years)	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
ASH (60 years)	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Redhills	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Whenuapai	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Kumeū-Huapai and Riverhead	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

11.3 Benefits

The key economic benefits generated from the North West recommended programme are summarised in Table 11-6.

Table 11-6 North West economic benefits

Items	NPV Benefits (\$m)					
	North West DBC	RTC (60 yrs)	ASH (60 yrs)	Redhills (40 yrs)	Whenuapai (40 yrs)	KHR (40 yrs)
Travel Time Costs						
Congestion Costs						
Trip Reliability						
Vehicle Operating Costs						
Active Modes						
Crash savings						
PT - Travel Time Benefits						
PT - Reliability						
PT - Health benefits						
CO2						
PV total net benefits						
WEBs %						
WEBs Benefits (excl Freight benefits)						
PV Benefits Including WEBs						
PV of total net costs						

Key observations

[REDACTED]

11.4 Benefit Cost Ratio (BCR)

The Base Estimate BCRs with and without Wider Economic Benefits (WEBs) are shown in Table 11-7 and Table 11-7. Overall, the North West programme is expected to achieve a **0.7-0.9 BCR**.

Table 11-7 North West DBC BCR excluding WEBs

Projects	PV total benefits, \$M PV	PV total net costs, \$M PV	PV Fare Revenue, \$M PV	National BCR
Rapid Transit Corridor/Regional Active Mode Corridor (60 years)	[REDACTED]	[REDACTED]	[REDACTED]	1.0
Alternative State Highway (60 years) includes Brigham Creek Interchange	[REDACTED]	[REDACTED]	[REDACTED]	0.9
Kumeū-Huapai/Riverhead (40 years) includes SH16 Main Road upgrade	[REDACTED]	[REDACTED]	[REDACTED]	0.2
Whenuapai (40 years)	[REDACTED]	[REDACTED]	[REDACTED]	0.7
Redhills (40 years)	[REDACTED]	[REDACTED]	[REDACTED]	0.4
North West DBC programme wide	[REDACTED]	[REDACTED]	[REDACTED]	0.7

Table 11-8 North West DBC BCR including WEBs

Projects	PV total benefits, \$M PV	PV total net costs, \$M PV	PV Fare Revenue, \$M PV	National BCR
Rapid Transit Corridor/Regional Active Mode Corridor (60 years)				1.3
Alternative State Highway (60 years) includes Brigham Creek Interchange				1.1
Kumeū-Huapai/Riverhead (40 years) includes SH16 Main Road upgrade				0.2
Whenuapai (40 years)				0.8
Redhills (40 years)				0.5
North West DBC programme wide				0.9

The North West recommended transport programme underpins the whole premise for growth in the North West and without it growth would be constrained. The evaluation is based on the standard evaluation methods for transport infrastructure, which is typically dominated by travel time savings. The purpose of many of the identified schemes are primarily about providing the basic infrastructure to make growth happen such as urbanising existing rural roads or providing new connections to enable the land use to develop. Therefore, although travel times may improve for those living in the area this is a secondary consideration to the fundamental requirement to provide access.

It is noted that the Kumeū-Huapai package has a low estimated BCR of around 0.2. This is due to the nature of these improvements being primarily for urbanisation and addition of active modes rather than traffic capacity improvements so there are not any traffic benefits directly associated with these projects and there is a limited benefit stream. If costs can be reduced for some of these corridors or costs of SH16 Main Road Upgrade between Access Road and Kumeū River be attributed to the RTC project then the BCR would be expected to improve somewhat but is not anticipated to reach 1.0. Notwithstanding the low BCR, these corridors do however continue to play a wider role in the transport outcomes for the North West as the corridors support the access to the RTC stations and provide significant connectivity gains for the walking and cycling network.

11.5 Range of BCR estimation

The BCR range estimation is split into analysis framework and parameter sensitivity tests. The Analysis framework includes Discount rate and Analysis period and Parameter sensitivity include %WEBs, PT Reliability, Active mode and traffic benefits variability. Full details are included in **Appendix H: Economics Assessment**.

The sensitivity tests show that the BCR have fairly small impact on the parameter sensitivity tests but larger variations are observed on discount rate and analysis period sensitivity. For the Rapid Transit Corridor, the BCR may range between 0.7-1.6 and for ASH 0.4-1.5. The North West Program-wide DBC BCR have not been tested for parameter sensitivity but given that it has negligible effect on BCR, and the BCR lies within the analysis framework range, it can be predicted to range between 0.5-1.2.

Table 11-9: Summary of BCR Range for the North West DBC Projects

Parameter	RTC	ASH	KHR	Whenuapai	Redhills	North West DBC
Analysis Framework	0.7-1.6	0.4-1.5	0.1-0.3	0.5-1.3	0.3-0.7	0.4-1.2
Parameter Sensitivity	1.2-1.4	0.9-1.4	0.2	0.7-0.9	0.4-0.5	-

The appraisal has not considered 3rd party funding (such as developer contributions), nor of more detailed staging scenarios in line with the growing travel demand (e.g., construction of station corridors expanded to full stations at a later date when needed). Both of these opportunities could increase the likely BCRs. The progressive development of this area over the next 30+ years suggests there would likely to significant opportunities for such strategies

11.5.1 Covid Scenario

The Land use growth might slow down due to Covid or any other unknown reasons in long term and hence the project start date might need to be delayed to meet the changed transport needs. We recognise such situation to arise but believe it will not have any significant impact on the economic returns from the project as the costs and benefits timestreams will be shifted with the project start

11.6 Investment prioritisation method

The Waka Kotahi Investment Prioritisation Method for the 2021–24 National Land Transport Programme (NLTP) has been used to understand the potential investment prioritisation for the North West DBC.

Factor	Rating
GPS alignment	<p>High – Very High</p> <p>Gives close effect to the GPS. The recommended North West network has a strong focus on safety, mode shift and better access to social and economic opportunities. This is provided through new connections, real transport choice and design improvements. The mode shift focus of the network fundamentally supports the development of a low carbon transport network for future growth. The new Alternative State Highway and upgrade arterial network supports improved freight connections.</p>
Efficiency	BCR 0.7-0.9 (VL)
Scheduling	<p>High.</p> <p>This programme has a high interdependency with two other strategic projects in the North West: North West Rapid Transit (including SH16 City Centre to Westgate and SH18) and SH16/18 connections. High criticality as the recommended programme directly supports the release of FUZ land. Without the investment the planned land release will not be able to occur at the same speed or density.</p>
Priority order	7
<p>Explain any variances from the existing NLTP priority order</p> <p>The North West IBC used the Waka Kotahi 2018-2021 Investment Prioritisation Method. This identified programme as High – Very high for alignment and low for Cost Benefit Appraisal.</p> <p>The North West DBC remains consistent with the GPS alignment and scheduling factors, however the efficiency has dropped. This is primarily due to the increase in costs (almost doubling for the strategic infrastructure) as detailed design has provided more detail about structures and assumptions for the RTC. The benefits have increase from the IBC, however it is noted that a lot of the recommended projects are based on urbanisation projects or upgrading existing walking and cycling facilities. These projects are not VKT based and therefore these benefits are not particularly well captured under the MBCM framework. Due to the route protection nature of this DBC, no consideration has yet been given to value engineering or alternative value capture methodologies. The IBC BCR included WEBS as part of its base BCR, however the new MCBM excludes WEBS from the base calculations. We have still reported a BCR range in this table to demonstate that the alignment between the IBC and DBC is not dissimilar when WEBS are considered.</p>	

Financial Case

12 Financial Case

This section outlines the Financial Case for both route protection and implementation of the recommended North West package. The Financial Case is based on several variables as long-term route protection has not been previously widely undertaken. The types of uncertainty include:

- Level of third party (developer) funding, as this requires negotiation, agreement and must be undertaken on a case by case basis.
- Change in quantum of property acquisition required.
- Cost of property is higher or lower than assumed.
- Growth is quicker or slower than assumed.

This uncertainty should be considered by funders when allocating property funding.

The following analysis is based on the staging assumed in the Economic Case which is broadly based on the FULSS and the estimated release of land in the North West. Section 10.5 discussed an example of an alternative staging which could deliver the high cost strategic infrastructure in parts and spreads out the local infrastructure expenditure. Given this is a route protection DBC, the effect of this possible alternative staging has been shown as a sensitivity during the discussion on property costs to assist the owners in understanding how early property acquisition might change depending on future implementation decisions.

12.1 Whole of life costs

The financial implications for Waka Kotahi and Auckland Transport can be summarised into the following categories:

- **Cost of route protection** (Post lodgement costs, early property acquisition and property implementation costs).
- **Implementation costs** (Project development, pre-implementation, project implementation).
- **Operations and Maintenance costs.**

The North West cashflow by project phase is shown in Figure 12-1. This demonstrates that the initial costs are predominantly route protection and development costs with implementation costs dominating the cashflow from 2028.

Figure 12-1 Whole of life North West cashflow (excluding contingency)



12.1.1 Cost of route protection

Route protection using NoR is the recommended mechanism for all projects identified in the North West package. The DBC seeks to progress the recommended upgrades to the next phase, which includes post-lodgement. Two key cost elements have been identified as being related to route protection.

[Redacted]
[Redacted]
[Redacted]
[Redacted]

Table 12-1 Professional service costs for North West post lodgement

12.1.1.2 Expected property costs of route protection

There is a potential property cost implication once the North West NoRs are lodged.

The Te Tupu Ngātahi Programme Wide Property Strategy identifies several different potential acquisition profiles for forecasting the potential property acquisition cashflow:

- Profile A: Designate and hold until implementation (generally applies to greenfield sites).
- Profile B: Designate and moderate acquisition (generally applies to brownfield sites).
- Profile C: Early acquisition (applicable for strategic sites).

The North West profiles are shown in Table 12-2 below. Five of the brownfield corridors have been identified as profile B as these corridors are experiencing significant developer pressure and are also expected to be implemented first in the North West. Royal Road has currently been assessed as a profile A; however, this profile might be reconsidered in the future if the regeneration and development activity significantly change or increased certainty of a proposed RTC station changes the certainty for implementation. No project has been identified as a profile C due to the generally longer lead time for expected implementation. However, going forward further consideration to early acquisition of key sites such as RTC station sites might be considered by the owners as part of the commitment to land use and transport integration in the North West.

Table 12-2 Property acquisition profiles for North West¹⁶

No.	Package Projects	Profile A	Profile B	Profile C
1,3	<ul style="list-style-type: none"> • Rapid Transit Corridor (RTC) • Regional Active Mode Corridor (RAMC) 	✓		
4	<ul style="list-style-type: none"> • SH16 Main Road Upgrade 	✓		
2A/2B	<ul style="list-style-type: none"> • Alternative State Highway (ASH) • Brigham Creek Interchange 	✓		
5	<ul style="list-style-type: none"> • Fred Taylor Drive FTN Upgrade 		✓	
6	<ul style="list-style-type: none"> • Northside Drive East Upgrade 	No property acquisition		
7	<ul style="list-style-type: none"> • New Northside Drive West 	✓		
9	<ul style="list-style-type: none"> • Don Buck Road FTN Upgrade 		✓	
10	<ul style="list-style-type: none"> • Royal Road FTN Upgrade 	✓		

¹⁶ Note only corridors that are proceeding to route protection are included in this property assessment. Taupaki Nixon will require property if the project proceeds but it is not part of this NoR process so has been excluded from this assessment.

No.	Package Projects	Profile A	Profile B	Profile C
11	<ul style="list-style-type: none"> Taupaki Road/Nixon Road Upgrade 	No property acquisition		
12	<ul style="list-style-type: none"> Brigham Creek Road Upgrade 		✓	
13	<ul style="list-style-type: none"> Māmari Road FTN Upgrade 	✓		
14	<ul style="list-style-type: none"> Trig Road Upgrade 	✓		
15	<ul style="list-style-type: none"> New Spedding Road West 	✓		
16	<ul style="list-style-type: none"> New Spedding Road East 		✓	
17	<ul style="list-style-type: none"> Hobsonville Road FTN Upgrade 		✓	
18	<ul style="list-style-type: none"> Coatesville-Riverhead Highway Upgrade 	✓		
19	<ul style="list-style-type: none"> Riverhead Road Upgrade 	✓		
20	<ul style="list-style-type: none"> Access Road/Tawa Road Upgrade 	✓		
21	<ul style="list-style-type: none"> Station Road Upgrade 	✓		

The overall cashflow associated with the cost of route protection is shown in Figure 12-2



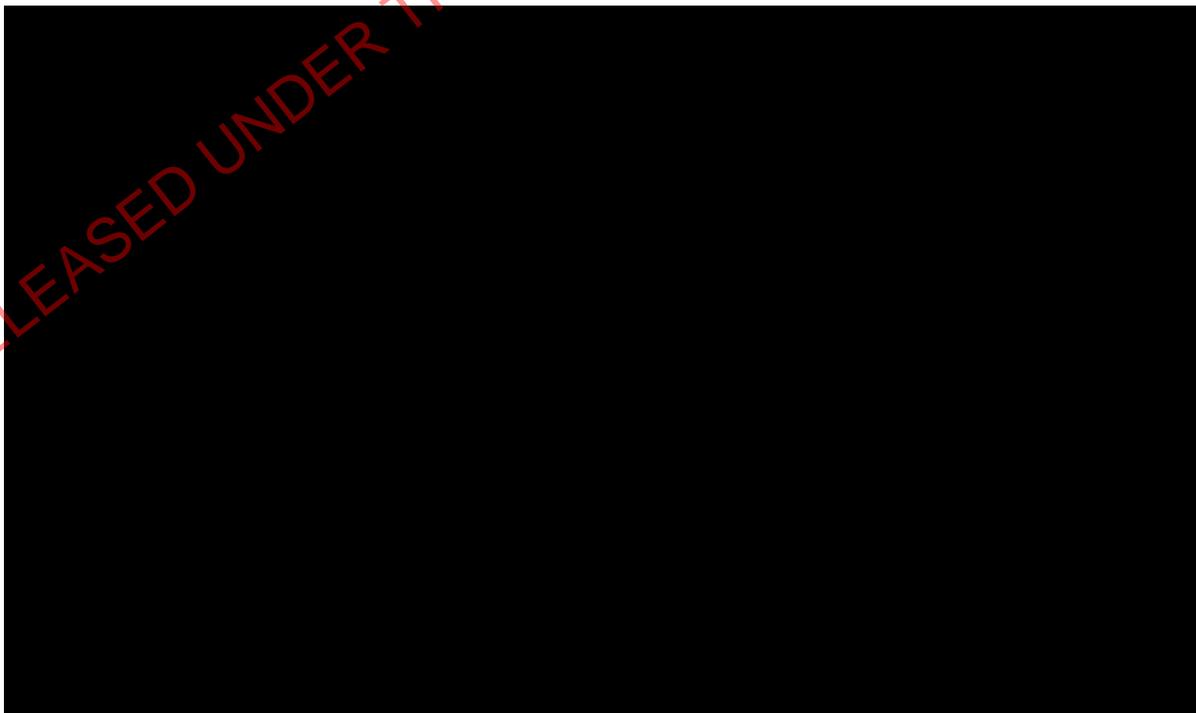
Figure 12-2 Cashflow for cost of route protection- NoR Post Lodgement Costs, Early Property Acquisition, Property Implementation



The first decade cashflow for the **route protection only** part of the property costs is shown in Figure 12-3



Figure 12-3 First decade cashflow for cost of route protection – NOR Post Lodgement Costs, Early Property Acquisition



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A final full property cashflow summary is provided in Figure 12-4



Figure 12-4 Total Property North West Cashflow split by project area including Early Property Acquisition and Property Implementation costs



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Table 12-3 Full Cost of Route Protection costs

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Figure 12-5 Early Property Acquisition Cashflow



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[REDACTED]

12.1.1.3 Impact of alternative staging on costs of route protection

The staging based on the FULSS land use essentially delivers the full North West transport network in 10 years. At an overall capital cost of around \$4.8Bn (P50) this is not anticipated to be practical or affordable. An alternative staging assessment was outlined in Section 10.5 with the overarching changes of focusing on upgrading key corridors in Whenuapai and Redhills first, implementing the RTC in two parts and delaying the implementation of the ASH and full rapid transit. These assumptions have been applied to the route protection costs to understand how these might change the costs.

shows the difference between the two staging scenarios. [REDACTED]

[REDACTED]

Figure 12-6 Comparison of cost of total route protection between two staging scenarios – includes NOR Post Lodgement costs, Early Property Acquisition and Property Implementation costs [REDACTED]

[REDACTED]



Figure 12-7 Comparison of cost of NoR post lodgement costs and early property acquisition in the first decade



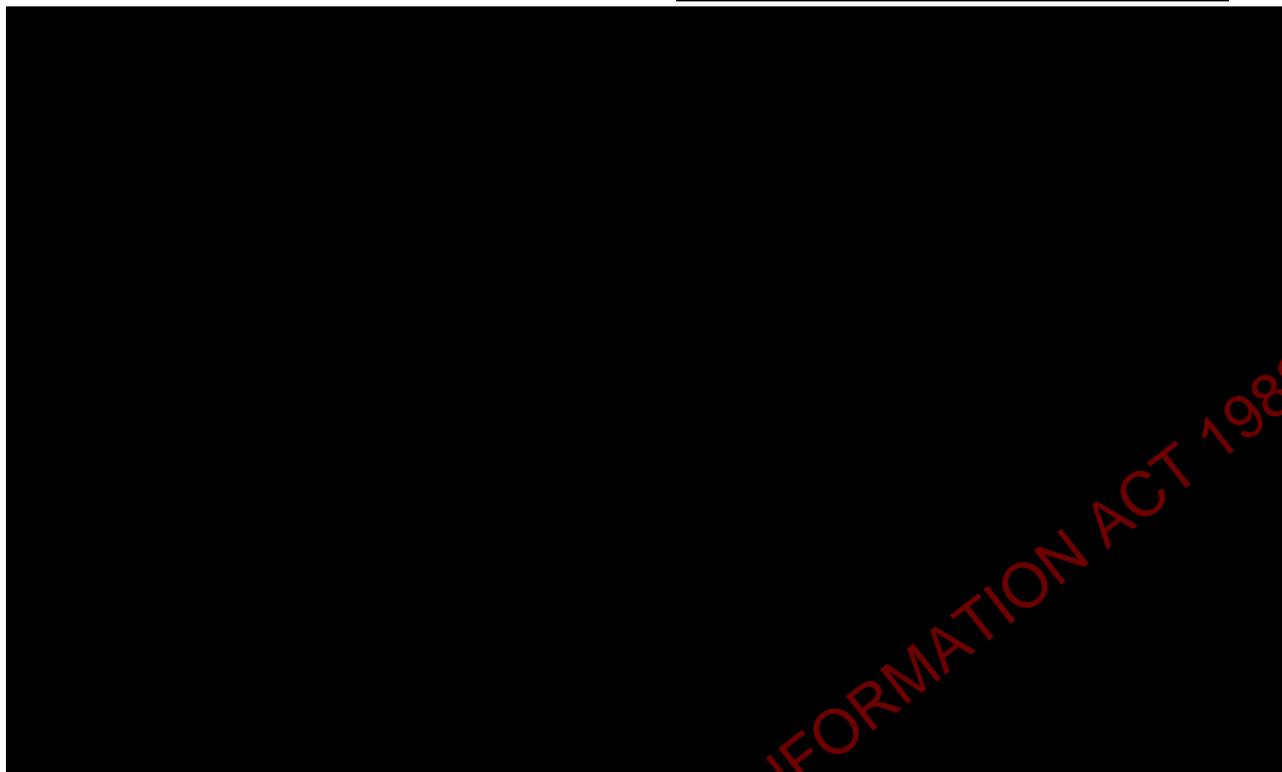
12.1.2 Implementation costs

The implementation costs include:

- Project development – including consultancy fees and Waka Kotahi and AT management costs
- Pre-implementation costs – including consenting, design fees, site investigations, consultation and iwi consultation.
- Project implementation costs. Associated with construction, as well as other non-construction costs associated with supporting the construction. An allowance of █████ of physical works costs has been allowed for non-construction costs associated with completion of the implementation phase. This is made up of █████ for consultancy fees to allow for a traditional measure and value contract, plus an additional █████ for Waka Kotahi / AT managed costs, and █████ for construction monitoring fees
- A “likely” construction escalation scenario of █████ has been adopted.

Figure 12-8 shows the project cashflow for the implementation costs with the assumed land use release scenario.

Figure 12-8 North West Cashflow – Implementation costs



12.1.3 Operational costs

The operational costs were described in Section 11.2.2 and these have been applied as an annual or one of cost as appropriate. The spend profile for these costs is shown in Figure 12-9 and as expected is weighted at the end of the assessment period once infrastructure is constructed.

Figure 12-9 North West Operational cost profile



12.2 Funding

12.2.1 Funding sources

Potential funding sources are detailed in Table 12-4.

Table 12-4 Potential funding sources for North West

Funding source	Commentary
National Land Transport Fund (NLTF)	The main funding stream for the North West Projects. For the 2018-21 NLTP, the total funds allocated is \$13.1b (excluding local share contribution of \$3.8b). This amounts to approximately \$4.3b per year. The NLTF funding is projected to increase to between \$4.5b and \$5b in 2028. At similar allocation percentage (using population as proxy), Auckland's NLTF share could be somewhere between \$1.5b and \$1.7b in 2028.
Approved organisations' local share	Auckland Transport, Auckland Council and KiwiRail are the most relevant organisations to contribute funds to the North West, with the majority of ownership resting with Auckland Transport.
Government grants	This is a long term delivery programme and the nature of additional government funds will vary throughout time. But it is feasible that one or more of the projects may qualify for criteria under separate government funding. Examples of current funding streams include projects being delivered under NZUP funding. This DBC cannot assume any of this type of funding but it is worth noting that the owners should be looking for opportunities to contest this type of future funding with North West projects. This would obviously increase the affordability of this large scale investment.
Other supplementary funding sources Refers to contributions that are additional to the NLTF, local share funding or Crown loans.	<ul style="list-style-type: none"> Financial contributions towards the costs of improving network infrastructure (Developer Contributions). Leasing temporary land requirement opportunities from Auckland Council. Land acquisition opportunities from Auckland Council. Debt finance and Public Private Partnerships (PPPs). Value capture / Beneficiary pays. <p>This DBC identifies cost saving opportunities from financial contributions from developers for the North West Programme. This assessment has not considered debt finance or value capture and it is recommended this is further explored by the owners as the Programme progresses.</p>

An analysis of the recently released Regional Land Transport Plan (RLTP) 2021-2031 is detailed in Table 12-5 and includes the following funding streams directly related to the North West recommended transport network.

Table 12-5 Identified RLTP funding

Item	Description	Funding status	Considered by RLTP if additional funding available
Greenfield transport infrastructure 2021/22-2030/31	Projects to support high priority greenfield growth areas, including new Redhills connections with appropriate public transport and active mode provision.	[REDACTED] [REDACTED] Category 1 - committed	
North West growth improvements	Local road upgrades supporting growth and facilitating better active and public transport in the Northwest growth area. This programme includes better public transport and active modes provision between Fred Taylor Drive and Maki Street.	[REDACTED] Category 3 – would require changes to current funding settings.	[REDACTED] [REDACTED]
Kumeū alternative access	New SH16 between Brigham Creek and SH16	Considered by ATAP	[REDACTED] [REDACTED]
Supporting Growth Route Protection Programme	There are three funded line items for Supporting growth covering the programme, site investigations and post lodgement and property purchase	[REDACTED] [REDACTED] [REDACTED] [REDACTED] Category 1 - committed	N/A

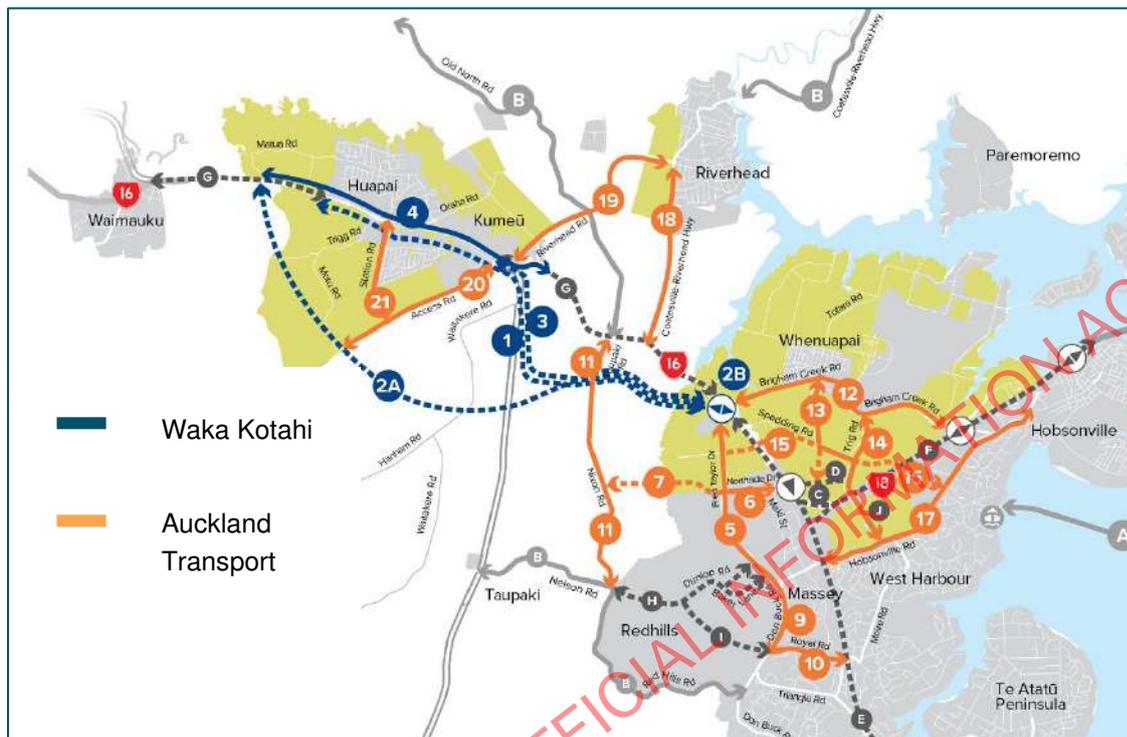
Whilst significant amounts of funding for the North West has been signalled, only one implementation project (Greenfield transport infrastructure) has confirmed funding. [REDACTED]
[REDACTED]
[REDACTED]

The Te Tupu Ngātahi programme itself is funded so there is programme wide funding for the North West NOR professional services going forward including pre lodgement and NOR documentation preparation. Preparation of this documentation does not in itself trigger the early property acquisition, this arises once the NOR is formally lodged.

12.2.2 Funding share

Based on discussions by owners the projects have been split for delivery by organisations as shown in Figure 12-10.

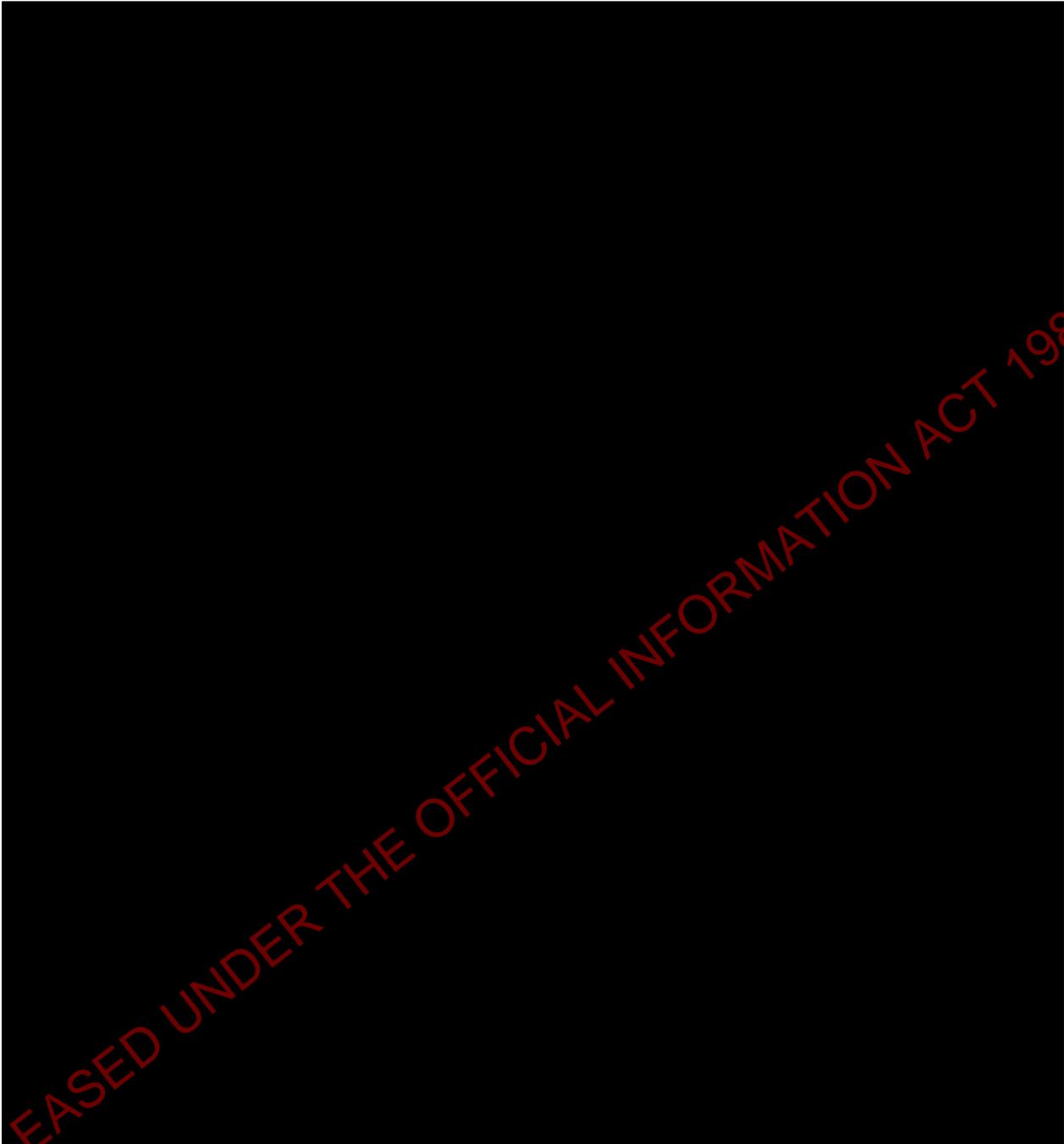
Figure 12-10 Projected split of owners for North West Projects



The RTC/RAMC/SH16 Main Road Upgrade is a complicated project and discussions are ongoing to the delivery and funding mechanisms for this project. The final decision will likely depend on the staging adopted for the RTC and ASH. For the purposes of this analysis, it has been assumed that the full project is owned and delivered by Waka Kotahi.

The assessment of funding has been undertaken using the project owners as a starting point. This assessment has been further refined to include identification of potential cost savings through additional supplementary funding sources such as land being vested by developers or potential KiwiRail contributions. The potential cost savings attributed to developer contributions have been based on the following high level principles in Table 12-6 and are consistent with principles being adopted in the North West IBC and the North West Infrastructure Funding (NWIF) project which is being undertaken in parallel to the North West DBC.

Table 12-6 Assumptions for developer contributions and potential cost savings



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The estimated funding split for the P50 costs is shown in Figure 12-11 and Figure 12-12. This highlights that the majority of funding (\$3.6Bn) is likely to be required from the National Land Transport Fund (NLTF) which consists of the Waka Kotahi share plus the Auckland Transport FAR share. There are good opportunities for the Auckland Transport share (and ultimately NLTF) to be reduced through the ability to harness contributory funding from developers which is currently estimated to have an indicative value around [REDACTED] for the North West DBC.

Figure 12-11 Funding Split for North West Projects (P50 Costs)



Figure 12-12 Funding Split for North West Projects by Project Area (P50 Costs)¹⁷



¹⁷ RTC project includes the RAMC and SH16 Main Road upgrade. ASH project includes the Brigham Creek Interchange.

12.2.3 First Decade protection affordability

The provenance of the first decade route protection liabilities have been discussed in Section 12.1.1.2 and Table 12-7 provides additional commentary on available funding for these liabilities.

Table 12-7 Decade 1 Cost for route protection (NoR and early property acquisition)

Area	Forecast Cost (undiscounted \$M)	Potential Funding
Professional services	[REDACTED]	Covered by RLTP Supporting Growth Programme funding.
Early property acquisition (Staging based on FULSS)	[REDACTED] [REDACTED] [REDACTED]	[REDACTED] [REDACTED] [REDACTED]
Early property acquisition (Alternative Staging)	[REDACTED] [REDACTED] [REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

12.3 Financial Case Summary

Table 12-8 summarises the first decade costs and current funding allocation for the assumed staging. As highlighted by the table, funding is currently allocated for NoR lodgement – however, additional funding will be required during this RLTP cycle to offset property risk arising from NoR.

Table 12-8 First decade North West Financial Case Summary [REDACTED]

Element	Base estimate ¹⁸ 2022-2032	Potential cost savings	Resultant Costs	Potential funding	Funding required
Professional services for NOR	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

¹⁸ Includes likely property and construction escalations. Base estimate so no contingency included.

¹⁹ Total estimated property savings are [REDACTED]

- Flexibility has been a particular necessity for the RTC due to the current uncertainty about mode and larger policy shifts such as the location of the Auckland Port. The current alignment protects for an RTC that can be implemented independent of any NAL decisions, but equally has the ability to laterally shift into the NAL designation should a future decision be made about the location of heavy rail. The alignment also provides for modal neutrality which needs to be fully grade separated. [REDACTED]

[REDACTED] This flexibility does come at additional cost in this DBC, but there is a pathway through subsequent stages to reduce cost as risks can be mitigated or better understood.

- Specific analysis has been undertaken to understand which intersections in the North West should remain route protected for roundabouts compared with intersections that have clear operational or legibility requirements for signals. In this way the additional footprints associated with roundabouts have been minimised.
- The need for the RAMC project has been considered in detail. The proposed shared path facility on SH16 as part of the SH16 Brigham Creek to Waimauku project will never provide the desired high quality, segregated strategic facility with sufficient capacity to safely serve the projected population in Kumeū-Huapai. The SH16 shared path will however remain a key active mode link for future Riverhead demand. The ASH project will provide half of the RAMC so the only additional part to this project is between the ASH and Kumeū via the rural RTC section adjacent the NAL. The RTC project will require additional footprint for construction purposes and it is likely that some of this construction space would eventually become the RAMC at the end of construction, so the result would be a reduction in temporary occupation swapping to permanent occupation rather than additional land take. It is noted that it is not intended that the RAMC gets built independently from the RTC.

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Commercial Case

13 Commercial Case

This section sets out the proposed approach to development of each project in relation to the recommended system described in the economic and financial cases. The following sections describe:

- Consenting / route protection strategy for each project.
- Property acquisition strategy for each project.
- Procurement strategy for the package.

13.1 Route protection approach

The Route Protection strategy has been developed to support the North West DBC and makes recommendations on the prioritisation, packaging and preferred planning mechanism to secure route protection for the North West recommended network. A separate consent strategy will be prepared as part of the NoR process which will confirm consenting pathways, required technical assessments and NoR staging.

Full details can be located in **Appendix J: Route Protection Strategy**

The proposed NoR packages are shown in Figure 13-1.

Figure 13-1 Proposed NoR packages

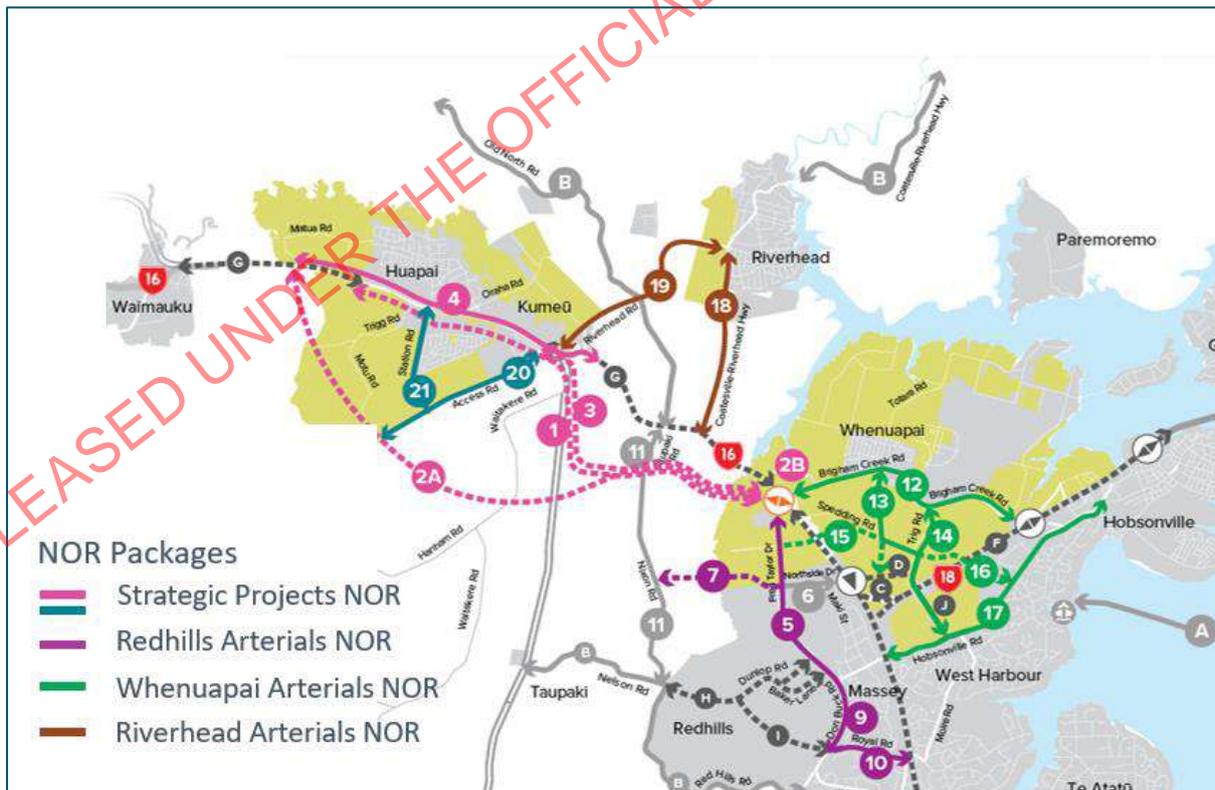


Table 13-1 to Table 13-4 summarises the route protection requirements. The urgency of route protection for each of the corridors is detailed in Table 13-5

Table 13-1 Strategic Kumeū-Huapai Package Summary

Strategic Kumeū-Huapai Package	Recommendation	Planning Context				Urgency	Complexity		
	Recommended Route Protection Mechanism	Existing land use	AUPOIP zoning	Land Ownership pattern	Environmental Constraints	Development pressures	Landowner certainty	Property Impacts	Public awareness / interest
RTC (urban section) RAMC SH16 Main Road Upgrade	Designation and Alteration to designation (6766)	Land uses are varied along the corridor and include residential, business/commercial, and light industrial.	Business, residential and FUZ	Fragmented	Limited constraints including: <ul style="list-style-type: none"> the Kumeū River Heritage Overlays along the corridor the various properties that front the road corridor Streams and wetlands in rural section 	High	High	Significant (including full acquisitions)	General public awareness – limited comments
ASH RTC (rural section)	Designation	Rural	Rural (majority) and FUZ	Fragmented	Natural wetlands (including high value wetlands) Streams Flood plains	High	High	Significant (including full acquisitions)	High public awareness – comments supporting and challenging alignment
Access Road/Tawa Road Upgrade	Designation	Rural, light industrial and Kumeū Showgrounds	Rural, Business, FUZ and Special Purpose	Fragmented	Limited urban constraints: <ul style="list-style-type: none"> Business / commercial properties adjacent to road Kumeū Showgrounds 	Medium	High	Moderate (largely partial acquisitions)	General public awareness – limited comments
Station Road Upgrade	Designation	Residential and rural	Residential and FUZ	Fragmented	Limited urban constraints: <ul style="list-style-type: none"> Urban development adjacent to road Huapai Primary School 	Medium	High	Moderate (largely partial acquisitions)	General public awareness – limited comments

Table 13-2 Redhills Package Summary

Redhills Package	Recommendation	Planning Context				Urgency	Complexity		
	Recommended Route Protection Mechanism	Existing land use	AUP OIP zoning	Land Ownership pattern	Environmental Constraints	Development pressure	Landowner certainty	Property Impacts	Public awareness / interest
New Northside Drive West	Designation	Residential and rural	Residential, Rural and FUZ	Fragmented	Environmental constraints include: The Ngongotepara Stream	Medium	High	Significant (including full acquisitions)	General public awareness – limited comments
Don Buck Road FTN Upgrade	Designation	Industrial, open space and residential	Business (Light Industrial), Open Space and Residential	Fragmented	Limited urban constraints: <ul style="list-style-type: none"> Property and social infrastructure 	Medium	High	Significant (including full acquisitions)	General public awareness – limited comments
Royal Road FTN Upgrade	Designation	Residential	Residential	Fragmented	Limited urban constraints: <ul style="list-style-type: none"> AUPOIP Historic Heritage Overlay at 44 Royal Road 	Medium	High	Significant (including full acquisitions)	General public awareness – limited comments
Fred Taylor Drive FTN Upgrade	Alteration to designation (1433)	Mixed land use between rural and business / residential	Residential, Business (Mixed Use and Light Industrial), Open Space and FUZ	Fragmented	Limited urban constraints: <ul style="list-style-type: none"> Property Fred Taylor Park (limited impact) 	Medium	High	Low – localised acquisition of land only	General public awareness – limited comments

Table 13-3 Whenuapai Package Summary

Whenuapai Package	Recommendation	Planning Context				Urgency	Complexity		
	Recommended Route Protection Mechanism	Existing land use	AUP OIP zoning	Land Ownership pattern	Environmental Constraints	Development pressure	Landowner certainty	Property Impacts	Public awareness / interest
Brigham Creek Road Upgrade	Designation	Rural, residential and Whenuapai NZDF airbase	FUZ, Residential, Open Space, Business (Local Centre, Neighbourhood Centre, Light Industrial) and Special Purpose – Airports and Airfields	Fragmented	Environmental and urban constraints: <ul style="list-style-type: none"> Sinton Slaughterhouse Waiarohia Stream Residential and business properties adjacent to corridor 	High	High	Moderate (largely partial acquisitions except in Whenuapai urban centre)	General public awareness – limited comments
Māmari Road FTN Upgrade	Designation	Residential and rural	Residential, FUZ and Special Purpose – School Zone	Few large lots, however, not sufficient certainty this can be delivered by developer	Environmental constraints include: <ul style="list-style-type: none"> Waterways and wetlands 	High	High	Moderate (largely partial acquisitions)	General public awareness – limited comments
Trig Road Upgrade	Designation	Rural	FUZ	Fragmented	Environmental constraints include: <ul style="list-style-type: none"> Wetlands (low ecological value) 	High	High	Moderate (largely partial acquisitions)	General public awareness – limited comments
New Spedding Road West	Designation	Rural	FUZ	Few large lots, however, not sufficient certainty this can be delivered by developer	Environmental constraints include: <ul style="list-style-type: none"> Totara Creek SEA 	High	High	Moderate (largely partial acquisitions)	General public awareness – limited comments
New Spedding Road East	Designation	Rural and light industrial	FUZ and Business (Light Industrial)	Few large lots, however, not sufficient certainty this can be delivered by developer	Environmental constraints include: <ul style="list-style-type: none"> Numerous streams and wetlands Rawiri Stream restoration projects 	High	High	Moderate (largely partial acquisitions)	General public awareness – limited comments
Hobsonville Road FTN Upgrade	Alteration to designation (1437)	Residential, commercial, light industrial and rural	Residential, Business (Light Industrial, Mixed Used and Local Centre), Open Space and FUZ	Fragmented	Limited urban constraints: <ul style="list-style-type: none"> Hobsonville Road School Properties adjacent to corridor 	High	High	Moderate (largely partial acquisitions)	General public awareness – limited comments

Table 13-4 Riverhead Package Summary

Riverhead Package / Projects	Recommendation	Planning Context				Urgency	Complexity		
	Recommended Route Protection Mechanism	Existing land use	AUP OIP zoning	Land Ownership pattern	Environmental Constraints	Development pressure	Landowner certainty	Property Impacts	Public awareness / interest
Coatesville-Riverhead Highway Upgrade	Designation	Rural and residential	Rural, FUZ and Residential	Fragmented	<ul style="list-style-type: none"> Existing arterial corridor with limited constraints. 	Medium	High	Moderate (largely partial acquisitions)	General public awareness – limited comments
Riverhead Road Upgrade	Designation	Residential, business, and rural	Rural, FUZ, Business (Weza Lane) and Residential	Fragmented	<ul style="list-style-type: none"> Existing arterial corridor with limited constraints. 	Medium	High	Moderate (largely partial acquisitions)	General public awareness – limited comments

Table 13-5 Urgency of route protection

Area	Project Corridor	Urgency	Rationale
Strategic Projects	<ul style="list-style-type: none"> Access Road Station Road 	Medium	<ul style="list-style-type: none"> The FUZ land adjacent to the corridor is not anticipated to be development ready until between 2028 -2032 according to the FULSS. There is however potential for out of sequence private plan changes.
	<ul style="list-style-type: none"> ASH and BCI 	High	<ul style="list-style-type: none"> The ASH attracted significant public and landowner interest during the engagement exercise. Delays have the potential to create uncertainty for landowners. Potential for residential subdivision of large lots within the Rural – Countryside Living Zone, and additional development along the corridor.
	<ul style="list-style-type: none"> RTC RAMC 	High	<ul style="list-style-type: none"> All corridors provide for the upgrade of active mode facilities and some corridors support a bus FTN; however, the RTC and RAMC allow for a fuller narrative to be told on the sustainable transport benefits of the wider North West transport network. Limited weight could be attached to the RTC and RAMC benefits if NoRs for these projects were not lodged prior to or simultaneously with NoRs for the wider network.
	<ul style="list-style-type: none"> SH16 Main Road 	High	<ul style="list-style-type: none"> Potential for new development to occur on vacant live zoned sites (residential and business zoning) along the corridor. Strategic public transport connections to / from Kumeū-Huapai attracted significant public interest during the engagement exercise.
Redhills	<ul style="list-style-type: none"> Northside Drive West Don Buck Road 	Medium	<ul style="list-style-type: none"> The Redhills North FUZ is not anticipated to be development ready until between 2028 -2032. However, there is potential for out of sequence private plan changes and for intensification to occur.
	<ul style="list-style-type: none"> Fred Taylor Drive 	Medium	<ul style="list-style-type: none"> New Northside Drive West will extend through a section of land zoned under the AUPOIP as Rural – Countryside Living Zone where no growth is anticipated, however the urban sections are the key sections requiring route protection. There is also the potential for rural development along the corridors.
	<ul style="list-style-type: none"> Royal Road 	Medium	<ul style="list-style-type: none"> The Royal Road FTN Upgrade is partly contingent on the CC2W rapid transit route and the station location in proximity to Royal Road. These CC2W decisions have the potential to result in a different alignment, potentially along Triangle Road instead of Royal Road. It is recommended that further work is undertaken to confirm the CC2W station location with AT, Waka Kotahi and Auckland Council prior to commencing work on the NoR for this corridor. Note once a CC2W station is confirmed, the potential for future intensification in line with the National Policy Statement - Urban Development is high.
Whenuapai	<ul style="list-style-type: none"> Trig Road Māmari Road Brigham Creek Road Spedding Road East Spedding Road West 	High	<ul style="list-style-type: none"> High development pressure once PPC5 is adopted and additional development is anticipated within the Whenuapai Stage 2 area.
	<ul style="list-style-type: none"> Hobsonville Road 	High	<ul style="list-style-type: none"> There is currently a high pace of development along the corridor, with SGA previously providing comments on pre-application proposals and resource consent applications along the corridor. The existing Designation 1437 by AT only provides incidental protection for SGAs proposed Hobsonville Road corridor as the designation is for a separate scheme and only provides interim protection.
Riverhead	<ul style="list-style-type: none"> Riverhead Road Coatesville-Riverhead Highway 	Medium Note: Sections of the corridor are low due to the rural zoning, but overall, the corridors are categorized as medium. This is due to the FUZ land and the Fletcher's Overseas Investment Office Approval.	<ul style="list-style-type: none"> The FUZ land adjacent to the corridor is not anticipated to be development ready between 2028 -2032 according to the FULSS. However, there is potential for out of sequence private plan changes, notably Fletchers has Overseas Investment Office approval to purchase 20ha of rural land within the Riverhead area. Large sections of Riverhead Road and Coatesville-Riverhead Highway are surrounded by rural zoned land where no growth is anticipated, however the urban sections are the key sections for route protection. There is also the potential for rural development along the corridors.

13.2 Property Overview

13.2.1 Wider Te Tupu Ngātahi Context

The full property overview for the North West DBC is included in **Appendix I: Property Overview**.

It is important to note that whilst this property overview has been developed for a DBC, the North West DBC is for route protection purposes only and therefore the property implications are different to those of a project where implementation is imminent. There will be a subsequent Implementation Detailed Business Case to seek approval for implementation funding for individual projects, which will include more detailed analysis of the property issues. This DBC also forms part of the wider Te Tupu Ngātahi programme of works that has developed a Programme Wide Property Overview that outlines the principles for property acquisition for the entire programme. These will guide the development of the property approach for North West with the key points being:

- The programme is about long-term affordability and property will be generally acquired closer to implementation.
- There will be a potential early property acquisition costs as soon as the NoR is lodged for each project.
- The Requiring authority will take the lead on property negotiations for that specific project, utilising the current processes of that organisation (Auckland Transport or Waka Kotahi).
- Advance Purchase Guideline processes will apply.
- Where there is opportunity for strategically important properties to be acquired, these should be taken.
- A programme wide property resource will look at opportunities for resultant value capture from residual land as part of the land use integration opportunities of the programme.

Early property acquisition costs are a critical issue once the identified projects are route protected and the Property Overview outlines the analysis and approach to providing as much certainty as possible to what this cost could be into the future.

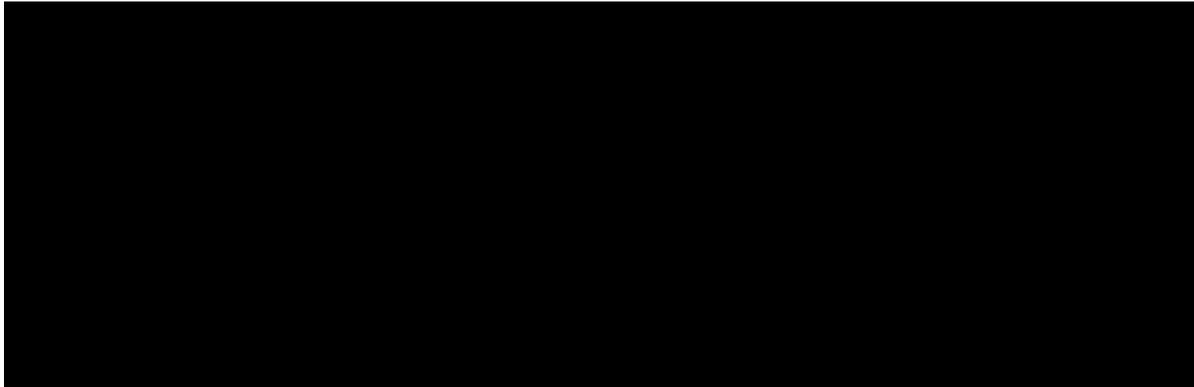
This Preliminary Property Overview is a living document developed for the route protection business case phase. Given the long-term route protection, this Overview will need to be revisited, reviewed and updated each decade and more frequently in the lead up to project implementation, during development of the detailed business cases and the design and advancement of the consenting and land acquisition programmes. The acquisition programme is dependent on detailed design and final land requirement plans being completed.

A total of 3,006 property interests have been identified for acquisition as outlined in Table 13-6. Once property duplications (e.g properties that might have partial land acquisition and temporary rental charges) are considered this results in a total of 1,831 individual properties

Table 13-6 [Redacted]



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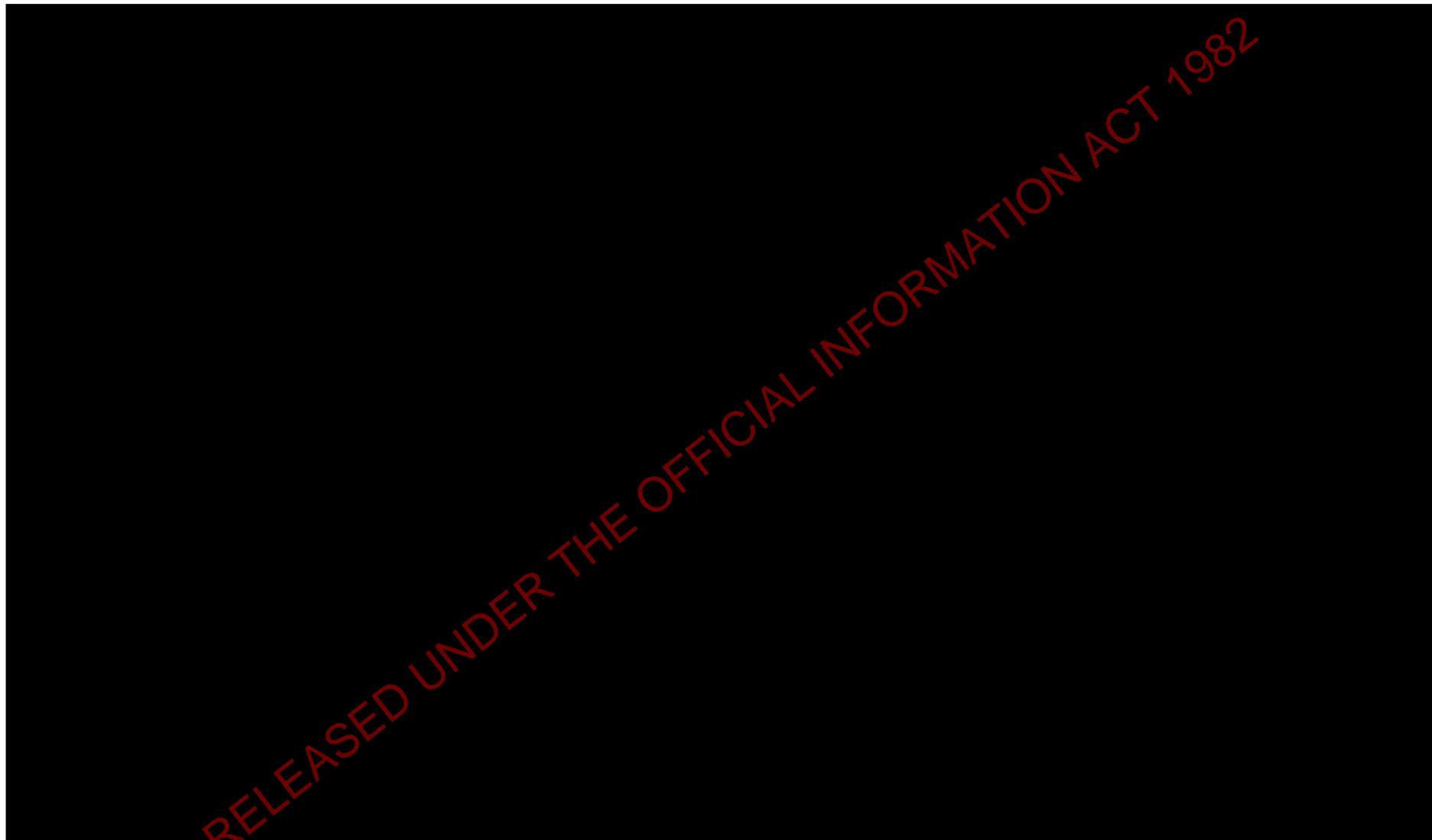


13.2.2 [Redacted]

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Table 13-7 Property Cost Breakdown



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13.2.3 Key property risks and opportunities

Due to the long term nature of the route protection approach, there are a number of risks and opportunities from a property perspective as shown in Table 13-8 below.

Table 13-8

Risks	Opportunities
[Redacted]	[Redacted]
[Redacted]	[Redacted]
[Redacted]	[Redacted]

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[REDACTED]

[REDACTED]

[REDACTED]

13.3 Procurement Plan

The scope of works for Te Tupu Ngātahi is to undertake the works necessary to support and obtain the designations for the recommended network (i.e., route protection) and does not currently include obtaining resource consents for individual projects. The timing and delivery model for the remainder of works needed to support resource consent applications should therefore be considered in the pre-implementation phase of work.

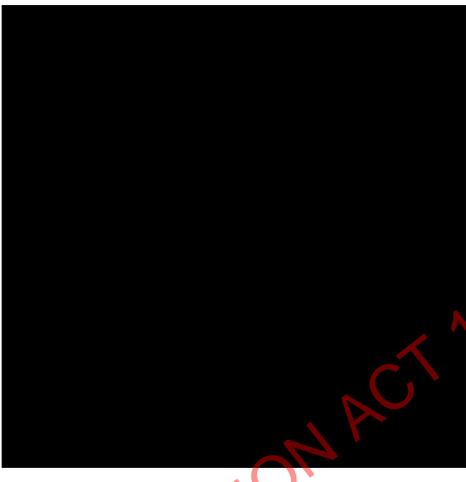
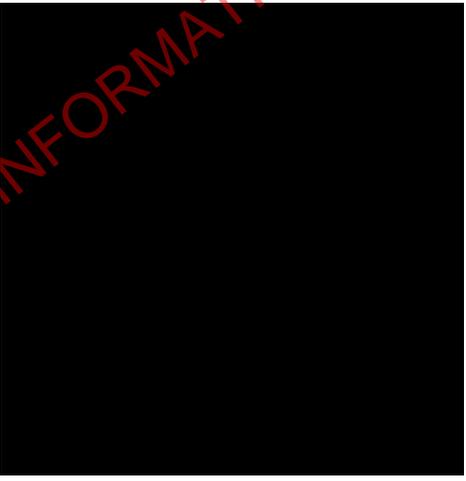
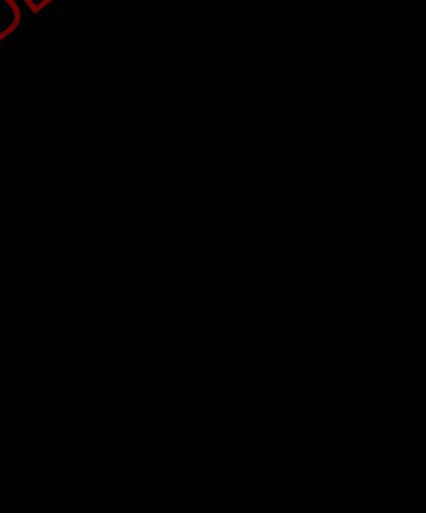
Once a project has been through the pre-implementation phase it will be ready for implementation. This will include detailed design, consenting and physical works. The delivery model will need to consider factors, including:

- Scale.
- Complexity.
- Programme.

Given that this implementation phase is many years away for most Te Tupu Ngātahi projects, a detailed procurement strategy should be developed for each project at an appropriate time in advance and closer to the implementation of each project.

Some initial issues for consideration during the implementation phase are summarised in Table 13-9.

Table 13-9 Implementation Procurement Strategy

Consideration	Strategic projects	Local Roads
Scale and complexity		
Timing and urgency		
Defined scope		
Supplier market conditions		

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Consideration	Strategic projects	Local Roads
Client involvement, control and capability		
Tangible demonstration of value for money		

These approaches should be reviewed in detail during the Implementation DBC phase once more detail is understood and a more definitive procurement approach can be made.

13.4 Required Services

Following the route protection level NoR approach described above, the remaining elements required to prepare this project for implementation include:

- Detailed design.
- Regional consents.
- Resource consents and management.
- Surveillance and quality assurance (MSQA).

Key matters to be considered are shown in Table 13-10.

Table 13-10 Considerations for required services

Consideration	Strategic projects	Local Roads
Scale and complexity		
Funding		

Consideration	Strategic projects	Local Roads
Timing and urgency	[REDACTED]	[REDACTED]
Defined scope	[REDACTED]	
Supplier market conditions	[REDACTED]	
Client involvement, control and capability	[REDACTED]	
Non-cost success factors	[REDACTED]	
Tangible demonstration of value for money	[REDACTED]	

These considerations indicate that the works proposed range from small to large scale works. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Overall procurement risk is low considering that with appropriate planning, there are skills, capability and client expertise to deliver these North West projects.

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Management Case

14 Management Case

The following sections describe the arrangements that will be implemented for the successful delivery of the recommended North West Transport Network. It describes the delivery arrangement for each phase of the route protection and tests the project planning, governance structure, risk management, stakeholder management, benefits realisation and assurance.

It is noted that the North West DBC sits within the wider context of the Te Tupu Ngātahi programme, and as such this management case draws on the overarching management case developed as part of the wider programme.

There are two distinct phases for delivery:

- Route protection – preparation of NoR documentation for lodgement.
- Post route protection management – post lodgement activities.

These are discussed separately in Sections 14.1 and 14.2 below. Each section discusses the specific governance, key activities, roles and responsibilities, risks and stakeholder engagement requirements applicable for that stage. This is followed by some additional overall programme management considerations.

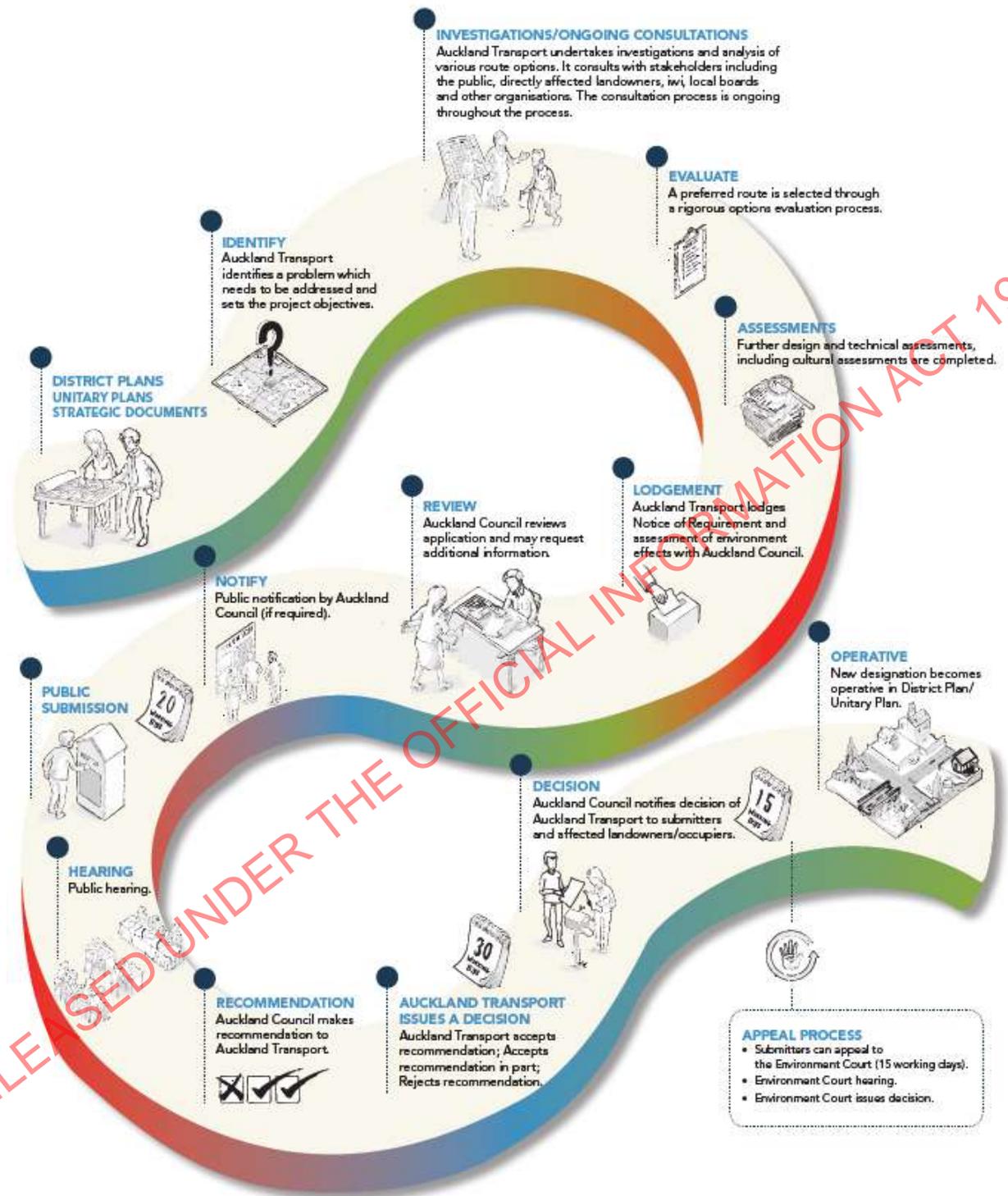
14.1 Route protection management

It is noted there are multiple methods to achieve route protection and this section is based on obtaining a transport designation. This section covers the preparation and lodgement of NoR documentation and any post lodgement activities to confirm the operative designation.

14.1.1 Route protection process

The route protection process is shown in Figure 14-1.

Figure 14-1 Route protection process

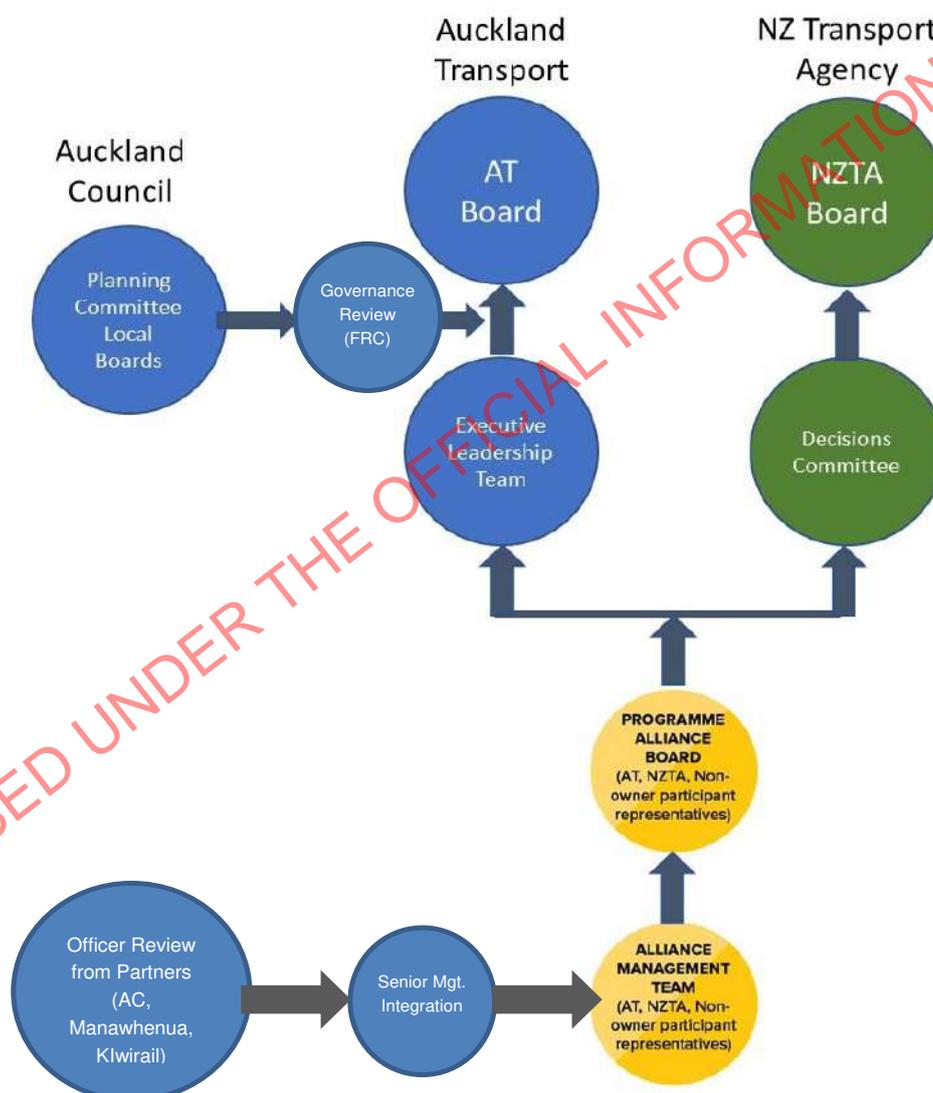


14.1.2 How is the route protection phase being governed?

Waka Kotahi and AT identified a collaborative Alliance model as the appropriate delivery mechanism to efficiently deliver this route protection. It is intended that the Alliance would also need to work collaboratively with owner and partner organisations in respect of wider land use, transport system planning and specific programme governance.

Governance in the context of the Alliance is defined as the processes by which the Alliance is directed, controlled and held to account. The Governance Management Plan has been developed and guides the implementation of a shared understanding of why, how and who is responsible for the effective governance of the Alliance. This structure is summarised below in Figure 14-2.

Figure 14-2 Te Tupu Ngātahi governance structure



The Alliance Board is ultimately responsible for approving Alliance deliverables for release. The Alliance Board does not replace the approval processes for AT or the Waka Kotahi.

The outcomes sought from the Te Tupu Ngātahi alliance over the next five years are:

- Business cases that confirm the recommended transport network and enable investors to make decisions on whether first decade projects will proceed to the implementation phase or alternatively to route protect corridors for longer term projects.
- The preferred transport network for each growth area is route protected within five years.
- Efficiency of process – by protecting the recommended networks in each of the four growth areas together, efficiencies are sought through the business case and NoR processes.

While projects without a physical footprint are not within the scope of Te Tupu Ngātahi, these projects (including TDM and maximising land use opportunities) are critical in meeting programme objectives and wider policy directives and are recommended to progress in parallel with the route protection task.

14.1.3 Who decides and approves the route protection approach?

The decision to formally lodge for route protection will ultimately be made by both AT and Waka Kotahi boards. There are however several steps preceding this ultimate decision as outlined in Figure 14-3. The process also allows for multiple review and staged approvals of the documents as they are prepared.

Figure 14-3 Route Protection approval process



14.1.4 How are different projects prioritised over others?

The benefits of route protecting each transport corridor varies subject to a range of matters, including:

- **Urgency** – development pressure including the lodgement of private plan changes, council structure planning, or the timing of related projects to the intervention.
- **Financial benefits obtained from protection** – route protection can reduce property and construction costs associated with a project. Benefits achieved are significant if protection is obtained prior to development but erodes over time for projects in the longer term.
- **Place shaping** – certain projects have an increased influence on the surrounding urban environment. Protection of these project corridors is likely to enable land use and shape the urban form within an area.

- **Potential for value capture** – Some projects have significant value capture opportunities which are enabled through corridor protection and increased certainty for land use and development opportunities.
- **Contribution to programme outcomes** – The extent to which a project contributes to the overall programme benefits including mode share, accessibility, resilience etc.

The North West has been prioritised by Te Tupu Ngātahi to progress as a complete programme through route protection due to the urgency of development and the size and scale of key strategic projects such as the RTC and ASH which are enablers for place shaping and achieving programme outcomes. The Te Tupu Ngātahi management team regularly review the overall programme prioritisation (at least every six months) and any changes are recommended to the Alliance board for endorsement. Approval to commence the pre-lodgement work for the North West was received in May 2021 and is programmed to start in July 2021.

14.1.5 Property

The Te Tupu Ngātahi Programme Wide Property Strategy identifies an approach for the securing of strategic properties. Whilst the vast majority (80%) of property purchase is typically anticipated in the three years prior to implementation of a project, this acquisition could occur prior to route protection being enacted, or during the route protection process. The Te Tupu Ngātahi Programme Wide Property Strategy identifies several different potential acquisition profiles for forecasting the potential property acquisition cashflow.

Typically, the purchase and ongoing management of these property purchases will be undertaken by the purchasing entities business as usual (BAU) property teams. Both AT and the Waka Kotahi have well proven and tested property management processes and dedicated teams in place to manage these property purchases and then the ongoing management of these properties.

14.1.6 NoR Lodgement

The management of the NoR process is shown in Table 14-1 below.

Table 14-1 Management of the NoR process

Stage	Management
Lodgement	<ul style="list-style-type: none"> • The decision to formally lodge documents will be made by the AT and Waka Kotahi board for all projects as per current processes for both organisations. This includes the Alliance getting owner endorsement from technical leads within each owner as per the earlier described Quality Assurance process and any 'pre board' committees as required. • To ensure that the documents prepared are appropriate to the receiving authority (Council) regular (fortnightly) meetings have been established with the regulatory arm of Council to agree levels of detail and standard consent conditions prior to lodgement.
Hearing	<ul style="list-style-type: none"> • Once the decision is made to lodge, and documents are formally lodged; SGA will manage the interface with the receiving authority (Council) and the hearing processes on behalf of the specific requiring authority (AT or Waka Kotahi). • Leading into and during the hearings there is a need for fast decision making in respect to a number of key aspects, including conditions, submitter negotiations and requests from the hearings panel/court.

Stage	Management
	<ul style="list-style-type: none"> Both AT and Waka Kotahi have considerable experience in managing these dynamic situations and the SGA team will work closely with the requiring authority (AT or Waka Kotahi) to ensure that the required delegations and decision-making approval processes are in place prior to lodgement.
Property agreements	<p>Where the identified route protection mechanism does not include a designation process, such as a developer agreement, the following steps will be undertaken:</p> <ul style="list-style-type: none"> Te Tupu Ngātahi working closely with AT and/or Waka Kotahi property teams will provide technical advice to negotiations. AT and/or Waka Kotahi will develop developer agreements. AT and/or Waka Kotahi property teams will remain the 'custodian' of the agreement and ensure any conditions are undertaken and the agreement is monitored and actioned as required.

14.1.7 Risk and opportunity management

The Te Tupu Ngātahi programme is a large programme comprised of multiple projects and a range of policy and land use uncertainties which transpire into risks and opportunities. These must be managed to enable successful delivery.

A Risk and Opportunity Management Plan has been developed and endorsed by the Te Tupu Ngātahi governance team. The risk management process is consistent with AS/NZS ISO 31000:2009 and is consistent with typical risk management processes undertaken by AT and Waka Kotahi.

A full risk report is included in **Appendix K: Risk Register** which includes details of the methodology undertaken to identify and manage risk for both the North West programme as well as individual project risks.

The key identified programme risks are shown in Table 14-2.

Table 14-2 Key Risks for the North West DBC



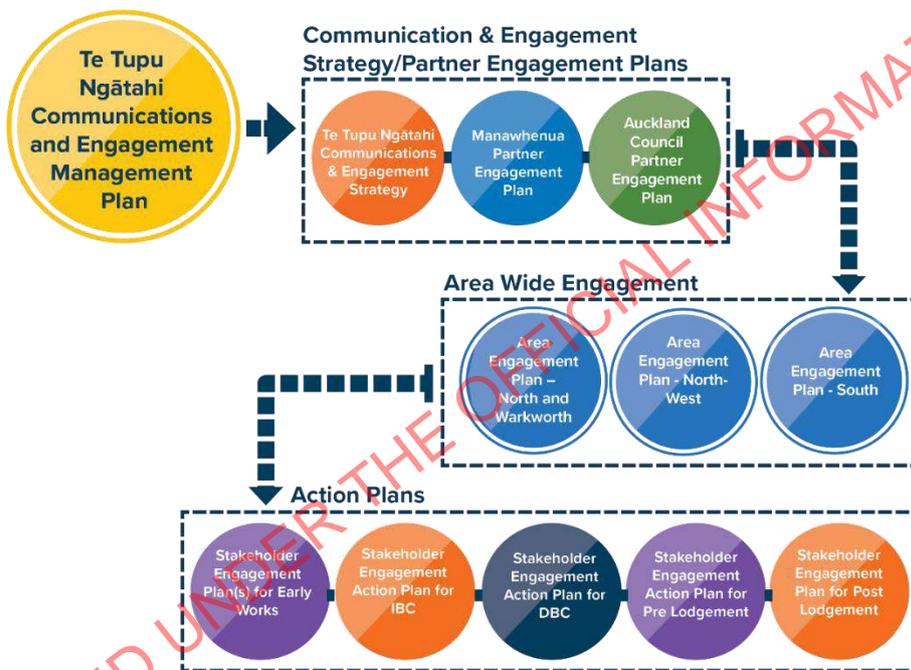
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14.1.8 Engagement

Te Tupu Ngātahi has an extensive and ongoing engagement and consultation programme. The purpose of this plan is not solely to ‘consult’ with partners and stakeholders, but also to collaborate and empower others, particularly partner organisations who have their own roles and responsibilities in delivery of an integrated urban transport system and sustainable land use pattern (e.g., particularly the Council).

A Communications and Engagement Management Plan has been prepared which outlines operational policies and procedures for managing the communications, stakeholder and community engagement workstream within Te Tupu Ngātahi. The Management Plan has informed the Communications and Engagement Strategy and a variety of plans to inform engagement with partners, key stakeholders and the community/public. The relationship of these documents is shown in Figure 14-4.

Figure 14-4 Te Tupu Ngātahi communications and engagement



The focus of the engagement at a programme wide level during the preparation of the NoRs is detailed in Table 14-3.

Table 14-3 Engagement during preparation of NoR

Theme	Programme Wide response	North West specific response
Manawhenua	<ul style="list-style-type: none"> Regular hui to communicate progress and discuss specific project activities. 	<ul style="list-style-type: none"> Regular hui. [Redacted]

Theme	Programme Wide response	North West specific response
Public engagement	<ul style="list-style-type: none"> • Continue to build understanding of wider Te Tupu Ngātahi progress and the process of route protection as set out in the Programme Wide Comms and Engagement Strategy • Continue one-on-one engagement with landowners / developers (e.g., meetings) regarding potential effects and opportunities for shared alignment in outcomes (e.g. through developer agreements) – particularly in areas where land is live zoned or is about to be. • Inform stakeholders about the processes for route protection (e.g., via e-updates, meetings and website information) and provide an opportunity for participation (i.e. submission on the NoR or similar as appropriate). 	<ul style="list-style-type: none"> • Development of engagement plan for NoR preparation phase. • For the North West particular regard will be given to the re-engagement strategy with landowners associated with the Alternative State Highway. • Initial land owner meetings will need to be held with property associated with the RTC and Brigham Creek Interchange projects which have had limited owner interactions to date.
Council engagement	<ul style="list-style-type: none"> • Critical ongoing discussion with the Council around land use and transport integration. This will include a range of interactions from detailed structure plans to wider discussions around achieving sustainable urban mobility in the un-zoned future urban areas. This will take place through specific Auckland Council/SGA forums, workshop environments and individual meetings. 	<ul style="list-style-type: none"> • Participation in Council land use forums. • Continued relationships with Council Plans and Places about future structure plans.
KiwiRail	<ul style="list-style-type: none"> • Ongoing discussion with Kiwirail as an investment partner in the transport networks required to support future urban growth. 	<ul style="list-style-type: none"> • Regular discussions to keep mutually informed of any changes to the NAL or potential impacts from the North West preferred transport network.
Stakeholders	<ul style="list-style-type: none"> • Provide information (and seek feedback) on staging and timing for the preferred network, including specific opportunities for sequencing of urban development (e.g., meetings with utility providers regarding integration of utilities within the future transport corridor). • Ongoing workshops and communications with Programme-wide stakeholders and stakeholder groups e.g., Development/Freight/Road Users Group, Active Modes/Public Transport Advocacy Group and Environmental/Social Impact Group 	<ul style="list-style-type: none"> • Ongoing attendance at existing stakeholder forums.
Environment	<ul style="list-style-type: none"> • Further understand specific issues/ environmental/ urban development effects and opportunities in the preferred network to identify potential design responses and environmental management / mitigation (for route protection documentation 	<ul style="list-style-type: none"> • Will be considered as part of the preparation of AEE documentation.
Property	<ul style="list-style-type: none"> • Identify opportunities for AT and Waka Kotahi to undertake early property acquisition (e.g. willing buyer/willing seller arrangements. Note leading this 	<ul style="list-style-type: none"> • Information to be passed on by project team to appropriate owner organisation.

Theme	Programme Wide response	North West specific response
	process is outside the specific scope of work for Te Tupu Ngātahi.	
Decision makers	<ul style="list-style-type: none"> Enable Te Tupu Ngātahi to inform decision makers on the risks and opportunities of potential route protection mechanisms for the preferred network. 	<ul style="list-style-type: none"> Regular update of risks and opportunities registers. Project team to work with Owner Interface Managers to allow briefing into owner organisations.

14.2 Post route protection management

This section covers the management of tasks after the designation has become operative.

14.2.1 Key tasks

During this phase of the programme the key tasks could include:

Table 14-4 Key tasks post designation

Task	Commentary
Management of designations obtained in previous phase.	This could include the management of conditions and the potential for monitoring lapse periods as required. The requiring authority for a project will be responsible for the management of a specific designation. Both AT and Waka Kotahi have existing and proven systems for the management of these designations and currently do this on a daily basis. The Te Tupu Ngātahi designations would be added to the respective requiring authority's current suite of designations to manage.
Scoping, procurement and delivery of required implementation DBCs.	<p>The DBCs undertaken have been focused on the case for investment in the route protection of the identified preferred interventions. It is acknowledged that given this route protection focus, there will need to be a further investment 'gate' to confirm the case for investment in the implementation of the identified interventions when required in the future. This subsequent investment decision will require appropriate information.</p> <p>It is proposed that this sits within the business case framework as an Implementation Detailed Business Case (ImpDBC). The scope of each ImpDBC will be informed by the specific intervention but is anticipated to include:</p> <ul style="list-style-type: none"> Review of any changes in critical assumption since package DBC completed. Further design development. Safety Audit. Parallel Estimate. Consenting Strategy. Confirmation of funding sources. Inter-dependences with other projects and any critical triggers. Procurement Strategy. <p>The scoping of this ImpDBC will be undertaken by the lead entity for the intervention and it is recommended that:</p>

Task	Commentary
	<ul style="list-style-type: none"> Scoping is undertaken at least three years prior to planned implementation. The ImpDBC is completed at least one year prior to planned implementation, earlier if property issues are anticipated.
<p>Scoping, procurement and delivery of projects to implementation.</p>	<p>Once a project has funding (through acceptance of ImpDBC) the next stage in the implementation of the project will include four stages as shown in Figure 14-5 below.</p> <p>Figure 14-5 Project implementation</p>  <p>Depending on the project, there will be a number of different options to deliver each of these stages. For example, consenting, design and implementation could all be procured separately from one another, or in one collective contract (such as an Alliance).</p> <p>This will be very dependent on the project risks as defined in the ImpDBC. It is anticipated that the ImpDBC will include a procurement strategy that will outline in detail how each of these steps will be procured and managed.</p> <p>Both AT and Waka Kotahi have the systems and capability to successfully manage the procurement and delivery of each of these steps.</p>
<p>Purchasing and management of property acquisitions.</p>	<p>Typically, the vast majority of property purchase for a project is anticipated in the three years prior to implementation of a particular project. The Programme Wide Property Strategy also outlines the need for a dedicated Supporting Growth Strategic Property Fund for advanced property purchase and a dedicated team to drive this fund.</p> <p>Both AT and Waka Kotahi have well proven and tested property management processes and dedicated teams in place to manage these property purchases and then the ongoing management of these properties.</p>
<p>Land use and transport integration optimisation activities.</p>	<p>Tasks could include continued input into future structure planning or progressing intensified land use development and Transit Oriented Development at stations. These tasks are likely to involve ongoing discussions with multiple organisations with the outcome to maximise land use and transport integration. Many of these have been identified in the next steps section of this North West DBC (Chapter 15).</p>

14.2.2 How will the North West programme be governed?

The Te Tupu Ngātahi scope finishes with the route protection of the identified transport corridors. Therefore, this next phase will be managed and governed directly by the project owners of Waka Kotahi and Auckland Transport. It is noted that a formal handover and knowledge transfer will need to occur between Te Tupu Ngātahi project team and the wider owner organisations to ensure the appropriate next steps are progressed.

These post designation activities are generally considered Business as Usual for the owners and it is expected that the owners would identify the relevant teams within the organisations to progress the tasks.

[REDACTED]

14.2.3 Risk and opportunity management

Both the AT and Waka Kotahi delivery systems and processes have risk management at their core. In terms of the key risks envisaged at this time for this stage of the programme, these are considered to be:

[REDACTED]

These risks (and others identified closer to the time) during the scoping and the continued project development phases will need to be proactively managed to ensure the successful implementation of the projects moving forward.

14.3 Overall programme management

14.3.1 Prioritisation

Prioritisation of the overall programme is a critical component to ensuring the programme outcomes are delivered, as prioritising the programme incorrectly could in fact undermine the outcomes sought.

Each individual DBC has identified an assumed prioritisation at this time to best deliver the outcomes sought. It is acknowledged that this a programme to 'support growth' and is therefore intrinsically linked to the scale and pace of development that eventuates as a result of land use zoning and market forces. Therefore, each DBC and the overall prioritisation has identified triggers for implementation of a number of the projects in the programme.

At the conclusion of the route protection process undertaken by Te Tupu Ngātahi there will be an overall programme implementation and prioritisation plan based on the information at that time and based on the key principles of scale and pace of development, mode share outcomes, placemaking and contribution to climate change response. Given this programme could take in the order of 30 years it is almost certain that circumstances will change that impact on the delivery and prioritisation of the programme.

14.3.2 Benefits realisation

Ongoing tracking and measurement are another important aspect of the programme to make sure the outcomes sought are delivered. This is particularly important for a programme of this scale and duration where there is likely to be considerable change in what actually occurs (such as pace and scale of land use) over this long time period.

The DBCs have therefore been developed with a consistent programme wide Benefit Logic Map (BLM). Adopting a BLM approach ensures the benefits of each project align with strategic objectives and help deliver the programme-level benefits. The BLM also allows proposed outputs to be logically mapped to benefits (via outcomes), so that different scenarios can be compared on the basis of their benefits impact. A single BLM for the programme will also:

- Allow subsequent time profiling of benefit realisation to inform prioritisation discussions, by sub-programme and programme.
- Allow more effective and consistent programme communications and stakeholder engagement.
- Minimise the amount of re-work when completing the benefits for the DBCs.
- Inform the consenting strategy.

The BLM will act as a reference document for validating each options' contribution to programme benefits. Analysing options in this way will immediately address the value for money strategic objective, by transparently demonstrating the:

- Contribution towards the desired GPS results (benefits).
- Return on the investment – expected benefits compared with expected cost.
- Reason for the decisions, especially where there is a cost benefit ratio lower than would normally be required for inclusion in the NLTP.²⁰

²⁰ Government Policy Statement on Land Transport, 2021, Section 3.2

In addition, value for money also requires investments to be made at the right time. Developing a benefit realisation profile based on when outputs are complete (i.e., when assets are commissioned) will allow resources to be focused on those activities that shift the benefits dial the most. Re-prioritising initiatives in the event that strategic objectives change or external factors dictate - becomes a simple exercise of re-mapping the outputs and outcomes to the updated benefit set.

14.3.3 Optimising the outcomes from Te Tupu Ngātahi Programme

Specific measures to support the North West recommended network have been detailed in Section 10.3.

Table 14-5 outlines the proposed management to ensure that these complementary and necessary elements are also delivered.

Table 14-5 Proposed management for supporting measures

Element	Organisations	Proposed Te Tupu Ngātahi Management
Urban System integration	<p>This is an incredibly complex arrangement as there are often competing needs and low cross party coordination in planning and implementation activities. It is critical that common outcomes are sought, clearly communicated to all parties for alignment and that parties are held to account in the delivery of their particular aspect of the complete solution.</p> <p>There are multiple parties involved in these aspects, including:</p> <ul style="list-style-type: none"> • Auckland Council (statutory & spatial planning, consent authority, civil & social infrastructure provider, local transport system specifier & operator, via CCO Auckland Transport). • Government departments (public facilities including schools and other facilities). • Developers (implement form and function ultimately). • Transport authorities (build stations and supporting infrastructure). • Kāinga Ora – an urban development agency to assist in delivering transport supportive urban outcomes. • Separation in metropolitan rail provision between public transport operators and infrastructure providers. • Council urban renewal agencies such as Panuku in Auckland. 	<p>Develop an urban strategy for the North West.</p> <p>All parties will be critical to its development, actions and active monitoring.</p> <p>It is proposed that as well as the current bodies tasked with urban outcomes, that a dedicated role is identified that is focused on the delivery, monitoring and implementing of the Urban Strategy.</p>
Transport system optimisation	<p>To be led by Waka Kotahi and Auckland Transport.</p> <p>Financial, technological and operational incentives are also needed to support mode shifts needed to address climate change and congestion.</p>	<p>Provide a dedicated TDM resource.</p> <p>It is proposed that a dedicated resource is tasked with ensuring the TDM elements identified are</p>

Element	Organisations	Proposed Te Tupu Ngātahi Management
		developed, implemented and monitored.
Other Transport	<p>It is critical that there is cross organisation collaboration and alignment on the implementation of these ‘other’ projects so that the outcomes sought can be delivered by all projects. There are many competing needs and challenges to aligning multiple projects and careful planning and management of this integration is required. There will need to be coordination between:</p> <ul style="list-style-type: none"> • Waka Kotahi (funding and state highway projects). • Auckland Transport (Local roads and public transport services). • KiwiRail (Rail infrastructure). • Developers (Key local transport links). • Kainga Ora. 	<p>Part time programme coordinator role</p> <p>To ensure the coordinated delivery in a dynamic environment, a part time programme coordinator role is proposed to ensure the necessary level of coordination is achieved.</p>

14.3.4 Ongoing programme management roles

It is proposed to manage identified roles through the establishment of a **Green Fields Action team**. This ongoing programme management team for the programme provides for a total of five roles as shown in Figure 14-6. This includes three roles to deliver optimised outcomes as detailed above and two additional roles for previously identified property tasks.

Figure 14-6 Project management team roles



15 Conclusion and Next Steps

This North West DBC sets out the rationale for investing in route protection for the North West. Based on the information provided throughout this document, the following approvals are sought:

1. Approval of the North West recommended transport network.

- Approval and endorsement is sought for the recommended options of the North West recommended transport network which includes:
 - Total of 21 recommended projects in the North West.
 - Five key pieces of strategic infrastructure including the Rapid Transit Corridor (and associated SH16 Main Road Upgrades and new regional cycling facilities) and the new Alternative State Highway (and associated upgrade of Brigham Creek Interchange).
 - Six local transport corridors including one new and five upgraded in Redhills.
 - Six local transport corridors located in Whenuapai.
 - Two rural transport corridor upgrades in Riverhead.
 - Two urbanised transport corridors in Kumeū-Huapai.

2. Approval of lodgement and route protection preparation for the North West.

- Approval for lodgement and route protection for the North West growth area which includes:
 - 16 corridors to be delivered over 4 NoR packages.
 - Full footprint for two RTC stations including Park and Ride for the Huapai Station.

It is noted that the preparation of NoR documentation for the North West is underway and documentation would be subject to standard review processes by Waka Kotahi and AT. A condition could be offered that AT/Waka Kotahi would go back to their boards once NOR documentation is complete if there are any substantial changes to be notified.

3. Approval for funding release for the North West post lodgement activities.

- Funding is available and will be unlocked with the above approvals.

4. Acknowledgement of the potential early property acquisition and associated risk arising from route protection of the recommended North West Package.

It is acknowledged that this business case is focussed on route protection and that there are funding implications associated with early property acquisition of this route protection. This business case does not seek to resolve issues surrounding the funding required for the delivery of the recommended new infrastructure and services. For a range of reasons including the impact of Covid-19 on forward revenue projections, there is significant uncertainty surrounding the ability to fund the programme using traditional funding mechanisms/ NLTF over the long-term.

Acknowledging this uncertainty and the forecast long-term funding gap it is recommended that route protection and resultant property purchases be completed at this time because:

Extensive previous work and strategic guidance have confirmed the growth projections for the North West (which is further strengthened by evidence of actual growth). Therefore, there is certainty that we are route protecting for an area that will need additional transport infrastructure in the future.

The very nature of route protection enables the provision of planned infrastructure rather than “responsive” infrastructure which typically results in infrastructure being retrospectively added and squeezed into available land that has already experienced growth related development. This planned approach therefore provides the owners with significant opportunity to front foot and respond to key issues such as climate change and other mitigation/ adaptation needs of the network. Importantly it also protects the ability to actually realise the step change transport outcomes (mode shift, land use integration and accessibility enhancements) which otherwise can be compromised as space is restricted.

Financially, a small investment now is forecast to save many millions of dollars in property and implementation costs that makes financial sense. Route protection requires some upfront expenditure but is cheaper than acquiring land later due to escalated property prices due to underlying growth in land values, rezoning and development.

Implementation will be considerably less difficult (and costly) due to a designation being in place prior to the growth.

Having route protection in place now provides increased certainty for developers, providing a better environment for co-funding agreements to be made, providing the best possible opportunity for increased affordability of the required infrastructure.

The most significant risk for route protecting now is affordability due to the early property acquisition costs. This can be managed through Programme wide initiatives to address this issue including:

1. Having a property team focussed on the Te Tupu Ngātahi programme.
2. Developing an agreed position for the programme on the approach and application to betterment.
3. Developing and providing programme position on advanced property purchase.
4. Provide agreed programme positions outlined above to the Auckland Transport and Waka Kotahi boards for endorsement in the fourth quarter of 2022.

There is also the challenge of funding the implementation of the options identified given the constrained NLTF. Whilst not the focus of this business case, it is important that Auckland Transport and Waka Kotahi work together to resolve this long-term funding challenge. It is almost certain given the challenges facing the NLTF that alternative funding mechanisms are required. Whilst both organisations have experience with these, the scale of the wider Te Tupu Ngātahi programme is of a scale not undertaken before, providing unique challenges and opportunities for alternative funding models.

15.1 Next Steps

The following key next steps for Te Tupu Ngātahi in terms of route protection are:

1. Preparation of documentation for NoR.
2. Approval to lodge the NoR.
3. Lodgement of NoR.
4. Post lodgement activities.

In a DBC this complex there have been a number of key activities that have been identified that need to be undertaken to either reduce residual risks, better manage uncertainty or unlock additional potential and opportunities for the projects. These activities will also support a handover to the owner organisations once the Te Tupu Ngātahi programme is completed. These are documented in Table 15-1 to Table 15-3 below and are split into general, strategic project and local project actions. Some fall outside the Te Tupu Ngātahi remit of route protection and in these instances, appropriate owners have been identified for the actions. These steps have been discussed with both Auckland Transport and Waka Kotahi to agree the best solution for ongoing management.

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Table 15-1 General next steps for North West

Project/s	Corridor	Next step	Action	Owner/s	Dates
1,2A,2B, 3,4,5,15, 18,19, 20 & 21	<ul style="list-style-type: none"> Redhills North: Fred Taylor Drive Upgrade, New Spedding Road West. Riverhead: Riverhead Road Upgrade, Coatesville-Riverhead Highway. Kumeū-Huapai: Rapid Transit Corridor, Alternative State Highway, SH16 Main Road Upgrade, Station Road Upgrade, Access Road Upgrade 	<p>Land use and transport integration for non- structure planned areas.</p> <p>Opportunities as part of future structure planning processes to ensure further integration between the preferred transport network and land use.</p>	<ul style="list-style-type: none"> Owners to continue to work with Auckland Council in further iterations of the Spatial Land Use framework. Owners to engage with Auckland Council in the structure planning process and preparation of Integrated Transport Assessments (ITAs). Consider instigating a recurring meeting to aid regular dialogue in the lead up to the commencement of the structure plan process. 	<p>Waka Kotahi/Auckland Transport/Auckland Council</p> <p>With interim support from Te Tupu Ngātahi.</p>	<p>2021 -2024 regular dialogue</p> <p>2025 Structure Plan development</p>
6-14, 16 & 17	<ul style="list-style-type: none"> Redhills and Whenuapai Corridors. 	<p>Land use and transport integration for areas which are live zoned, structure planned or in process of a plan change.</p> <p>Provide timely input into Resource consent process. Stay close with developers and work to find mutual solutions to implement transport infrastructure.</p>	<ul style="list-style-type: none"> Auckland Transport and Waka Kotahi Development Consents team assesses consents as part of Business as Usual activities. Te Tupu Ngātahi can assist through the fast track response team. Ongoing developer relationships to be continued. Build on existing Te Tupu Ngātahi regular meetings. Consideration will need to be given to resourcing and a full handover once the Te Tupu Ngātahi programme is completed. The Owner Interface Managers could be a starting point for future comments. Developer Relationships should continue to be managed by the Land Use Policy and Planning teams. Opportunity for the consenting focused Owner Interface Managers to foster a collaborative relationship between Auckland Transport, Waka Kotahi and Council. 	<p>Waka Kotahi/Auckland Transport</p> <p>With interim support from Te Tupu Ngātahi.</p>	Ongoing
All	Recommended North West Transport Network.	<p>Sustainability and Climate Change response.</p> <p>Organisations are developing strategies to respond.</p>	<ul style="list-style-type: none"> Climate change factors have already been incorporated in North West DBC e.g., through the transport outcomes/investment objectives, option selection, measurement of emissions. Te Tupu Ngātahi is developing a programme wide response to these broader issues and scope for NoR phase. Will continue to explore ways to mitigate greenhouse gas emissions through subsequent phases. Owner organisations are currently developing their own tools to assess and review projects against climate change. It is recommended that the Te Tupu Ngātahi projects are include in owner climate change assessment programmes at the appropriate future gateways to realise the maximum opportunities for mitigation and adaptation. 	<p>Waka Kotahi/Auckland Transport</p>	Ongoing
All	Recommended North West Transport Network.	<p>Property</p> <p>Management of property acquisition</p>	<ul style="list-style-type: none"> Develop overall plan for North West property purchase. Consideration of strategic advance purchases, agreeing developer agreements. 	<p>Waka Kotahi/Auckland Transport</p>	Ongoing
All	Recommended North West Transport Network.	<p>Changes to the Resource Management Act</p> <p>Impacts on the Route protection strategy.</p>	<ul style="list-style-type: none"> North West NoR team will continue tracking these policy changes and will need to adapt the strategy if required. Not expected to influence the “why” for route protection but might impact the “how”. 	<p>Te Tupu Ngātahi NoR team</p>	Ongoing

Table 15-2 Next steps – Strategic projects

Project/s	Corridor	Next step	Action	Owner/s	Dates
1,3 & 4	<ul style="list-style-type: none"> Rapid Transit Corridor SH16 Main Road Upgrade Regional Active Mode Corridor. 	Confirmation of RTC mode. Direction is being informed by Auckland Rapid Transit Plan and the work currently being undertaken by the Establishment Group for City Centre to Mangere.	<ul style="list-style-type: none"> City Centre to Westgate (CC2W) DBC (full implementation) to confirm mode. Expected to commence late 2021/2022. Modal decision could be late 2022. North West DBC team to continue using mode agnostic principles in NoR preparation. Working closely with CC2W team and wider Waka Kotahi/Auckland Transport to understand how the modal decision is progressing. If resolution is achieved during NoR timeframes then refinements to design based on modal choice could be undertaken e.g station location, alignment refinements and grade separation assumptions. 	Waka Kotahi/Auckland Transport / Te Tupu Ngātahi.	Ongoing
		RTC Station Locations. Final detailed station locations and alignment to be confirmed during NoR preparation. Consideration to be given to land use intensification around stations.	Waka Kotahi and Auckland Transport urban design and land use futures teams to commence discussions with: <ul style="list-style-type: none"> Potential wider partners such as Kāinga Ora or Panuku to understand the development potential around stations. Auckland Council Plans and Places Group regarding structure planning for the Kumeū town centre and access to the Kumeū RTC stations e.g boulevard. approach. To also include the consideration of a complementary north south road to provide access to the future Huapai RTC station. Consideration of the NPS:UD and potential third party developer interest. 	Waka Kotahi/Auckland Transport (Depending on the designated Requiring Authority). With support from Auckland Council.	Ongoing
		Continued dialogue with KiwiRail. To ensure visibility of projects within the Kumeū-Huapai corridor.	<ul style="list-style-type: none"> Set up recurring meetings to share information regarding changes in strategic policies and changes on the Kumeū rail corridor. Work with KiwiRail to optimise the RTC alignment west of Station Road. Noting that there are sections of the existing KiwiRail designation that are particularly wide, there are opportunities for the RTC project to negotiate with KiwiRail to use this additional space. This would require confirmation of KiwiRail's maximum development footprint needs to understand what space could be available for optimisation. Monitor wider government and KiwiRail policy for changes that might trigger investment in relocating the rail line e.g., Ports of Auckland relocation. 	Waka Kotahi/Auckland Transport Depending on the designated Requiring Authority.	Ongoing
		Consideration of interim rapid transit services. Opportunity to improve existing public transport services prior to the implementation of the RTC.	Develop a plan to assess the need for interim public transport improvements pre delivery of the RTC. This might consider aspects such as: <ul style="list-style-type: none"> Temporary bus services (such as frequent shuttles to Westgate) and infrastructure on SH16. Interim passenger rail services. Temporary use of RTC or ASH facilities for bus services. Impacts on planned RTC staging. 	Auckland Transport	Ongoing
2A	<ul style="list-style-type: none"> Alternative State Highway. 	Additional analysis to be considered in future business cases.	<ul style="list-style-type: none"> Further consideration for implementing an expressway rather than a motorway. Analysis for tolling or managed lanes. Opportunity to only have south east facing ramps at Tawa Road Interchange. Consideration of staged implementation of 2 and 4 lanes. Future land use in Waimauku. If private plan changes become significant then reconsideration of mitigation for SH16 between ASH western connection and Waimauku may be needed. Opportunity for land use planning discussions with Council for land adjacent the ASH to reallocate future urban areas and utilise the road network as a boundary. 	Waka Kotahi With support from Auckland Council on land use.	Ongoing
2B	<ul style="list-style-type: none"> Brigham Creek Interchange. 	Residual Land. The split fork design results in a central residual land area of around 6ha. It has	Waka Kotahi urban design and land use futures team to commence discussions with: <ul style="list-style-type: none"> Potential wider partners such as Kāinga Ora or Panuku to understand the development potential of this site. 	Waka Kotahi With support from Auckland Council.	2021

Project/s	Corridor	Next step	Action	Owner/s	Dates
		been confirmed developable but constrained.	<ul style="list-style-type: none"> Auckland Council Plans and Places Group to include this land use in future structure planning processes for Redhills North. As part of these conversations include access to the north eastern Whenuapai land use which is currently zoned as high density housing. 		
		Elevation of SH16 and RTC in the interchange design.	Significant urban design opportunities have been identified for swapping the elevation of SH16 and the RTC from an at grade assumption to above the local roads. The current design has been assumed so as not to preclude or unnecessarily constrain the RTC south of Brigham Creek Station. This opportunity will need to be explored in the NWR TN future scope and coordinated with future designs of the Brigham Creek Interchange. The current assumptions have the more conservative route protection footprint which maintains flexibility in design. However, it is expected that there are opportunities to optimise land footprint as the design progresses.	Waka Kotahi /Auckland Transport.	2022
Not in programme	<ul style="list-style-type: none"> SH16/18 Connections SSBC (not in North West DBC programme) 	<p>Integration with previous work on endorsed SH16/18 Connections SSBC.</p> <p>SSBC has not been route protected so investigating how the SSBC and North West DBC align and overlapping infrastructure is treated.</p>	<ul style="list-style-type: none"> Waka Kotahi to agree mechanism for route protection of the SSBC. Note this is currently under consideration to be included as part of the Te Tupu Ngātahi scope. 	Waka Kotahi.	2021
Not in programme	<ul style="list-style-type: none"> SH16 	Interim consideration of SH16 between Kumeū-Huapai.	<ul style="list-style-type: none"> Further consideration of how land use might change on SH16 between Brigham Creek and Kumeū-Huapai once SH16 is detuned following implementation of the ASH. Not in scope for Te Tupu Ngātahi corridors. 	Waka Kotahi /Auckland Transport With support from Auckland Council.	Ongoing

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Table 15-3 Next steps – Local projects

Project/s	Corridor	Next step	Action	Owner/s	Dates
6	Northside Drive East Upgrade	Reallocation of road space to improve quality of existing cycle facilities.	<ul style="list-style-type: none"> To be considered for inclusion in future Regional Land Transport Plans as a corridor improvement project for funding and prioritisation. 	Auckland Transport	Ongoing
9	Don Buck Road (Royal Road to Redhills Road)	Future investigation	<ul style="list-style-type: none"> It is further recommended that this part of Don Buck Road corridor is considered as a future project for Auckland Transport which would focus on what improvements could be provided within the existing road reserve for the full remaining length of Don Buck Road between Royal Road and Swanson Road to develop a contiguous and consistent upgrade for the corridor. 	Auckland Transport	Ongoing
11	Taupaki Road/Nixon Road Upgrades	Incorporation into wider Auckland Transport programmes. This project is not being progressed to route protection due to low risk of buildout and a lower priority for implementation.	<ul style="list-style-type: none"> Section of active modes path between ASH and SH16 is to be incorporated into the ASH NoR package to ensure the connection between key cycle facilities is provided. 	Te Tupu Ngātahi	Ongoing
			<ul style="list-style-type: none"> The remaining active modes facilities between ASH and Nixon Road is part of a broader Auckland Transport greenways cycling network. To be considered for inclusion in future Regional Land Transport Plans as a corridor improvement project for funding and prioritisation. [REDACTED] 	Auckland Transport	Ongoing
			<ul style="list-style-type: none"> A safety upgrade to the Taupaki Road/Nixon Road intersection is proposed as part of the preferred North West transport network. To be considered for inclusion in future Regional Land Transport Plans as a corridor improvement project for funding and prioritisation. 	Auckland Transport	Ongoing
11,18,19		Confirming space requirements for green infrastructure. For route protection all rural roads have currently followed existing stormwater policies and provided space for green infrastructure options including swales. This has a potential impact on land requirement.	<ul style="list-style-type: none"> Auckland Transport to confirm whether this full provision is required or if another stormwater solution will be acceptable. If a reduced requirement is preferred then rural road designs will require updating during the NoR phase. 	Auckland Transport	Ongoing
5-21	Local Roads	Exploration of redevelopment opportunities. This could apply to both publicly owned land and also contiguous private property acquisitions (e.g., North side of Royal Road).	<ul style="list-style-type: none"> Auckland Transport to lead discussions with Kāinga Ora and Panuku where potential sites are identified in the NoR. 	Auckland Transport	NoR phase

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Appendix Cover

Appendix A: North West Strategic Case

Appendix B: Options Assessment Report

Appendix C: Transport Outcomes Report

Appendix D: Cost Report

Appendix E: Urban Design Evaluation

Appendix F: Design Report

Appendix G: Engagement Summary

Appendix H: Economics Assessment

Appendix I: Property Overview

Appendix J: Route Protection Strategy

Appendix K: Risk Register

Appendix L: Staging Considerations

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