TE TUPU NGĀTAHI
SUPPORTING GROWTH

Warkworth Project Assessment of Alternatives

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Version 1.0

WAKA KOTAHI
NZ TRANSPORT AGENCY

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Responsibility	Name
Author	Sheetal Naidu, Simon Titter
Reviewer	Simon Titter, Natasha Garvan, Daniel Wilcocks
Approver	Chris Scrafton

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Acronym/Term	Description
AT	Auckland Transport
AUP: OP	Auckland Unitary Plan – Operative in Part
DBC	Detailed Business Case
IBC	Indicative Business Case
MCA	Multi-criteria analysis
NOR	Notice of Requirement
NPS:FW	National Policy Statement for Freshwater Management
PBC	Programme Business Case
RMA	Resource Management Act 1991
SEA	Significant Ecological Area
SGA	Te Tupu Ngātahi Supporting Growth Alliance
SME	Subject Matter Expert
TFUG	Transport for Future Urban Growth (PBC)
Waka Kotahi	Waka Kotahi NZ Transport Agency

PART A

Overview and Background

1 Introduction

1.1 Purpose of this report

The purpose of the Te Tupu Ngātahi programme (the programme) is to identify the recommended transport networks for route protection to support Auckland's planned greenfield growth over the next 10-30 years. The Warkworth Detailed Business Case (DBC) has identified the transport network for Warkworth. Eight NoRs are being submitted for components of the Warkworth transport network and these are the subject of this alternatives assessment and identified in Table 1-1 below.

Table 1-1. Warkworth NOR Projects

Project	NoR	Description
Northern Public Transport Hub and Western Link – North	1	New northern public transport hub and associated facilities including a park and ride at the corner of State Highway 1 (SH1) and the new Western Link – North. New urban arterial cross-section with active mode facilities between the intersection of SH1 and Te Honohono ki Tai (Matakana Link Road) to the proposed bridge crossing, enabling a connection for development in the Warkworth Northern Precinct as provided for in the Warkworth North Precinct.
Woodcocks Road (Western Section)	2	Upgrade of the existing Woodcocks Road corridor between Mansel Drive and Ara Tūhono (Puhoi to Warkworth) to an urban arterial cross-section with active mode facilities.
State Highway 1 – South	3	Upgrade of the existing SH1 corridor between Fairwater Road and the southern Rural Urban Boundary to an urban arterial cross-section with active mode facilities.
Matakana Road	4	Upgrade of the existing Matakana Road corridor between the Hill Street intersection and the northern Rural Urban Boundary to an urban arterial cross-section with active mode facilities.
Sandspit Road	5	Upgrade of the existing Sandspit Road corridor between the Hill Street intersection and the eastern Rural Urban Boundary to an urban arterial cross-section with active mode facilities.
Western Link – South	6	New urban arterial cross-section with active mode facilities between the intersection of SH1 and McKinney Road and Evelyn Street.
Sandspit Link	7	New urban arterial cross-section with active mode facilities between the intersection of Matakana Road and Te Honohono ki Tai (Matakana Link Road) and the existing Quarry Road.
Wider Western Link – North	8	New urban arterial cross-section with active mode facilities between Woodcocks Road and the Mahurangi River.

As part of the route protection process, this assessment of alternatives report has been prepared on behalf of Auckland Transport (AT) and Waka Kotahi NZ Transport Agency (Waka Kotahi), as the requiring authorities for the Warkworth strategic transport network. This report will support the Notices of Requirement (NoR) for designations and has been prepared in accordance with Section 171(1)(b) of the Resource Management Act 1991 (RMA).

Section 171(1)(b) of the RMA requires that when making a recommendation on a NoR, a territorial authority shall have regard to whether adequate consideration has been given to alternative sites, routes, or methods of undertaking the work in circumstances where the requiring authority:

a) Does not have an interest in the land sufficient for undertaking the work; or
b) Where it is likely that the work will have significant adverse effects on the environment.

There are several principles and key considerations for a requiring authority to apply and adhere to when undertaking an assessment of alternatives and identifying a preferred option. Of note are the following:

a) The process should be adequately transparent and robust, and clearly recorded so that it can be understood by others;
b) An appropriate (but not exhaustive) range of alternatives should be considered; and
c) The extent of options considered, and the assessment of these options, should be proportional to the potential effects of the options being considered.

AT and Waka Kotahi do not have sufficient interest in the land required for the Project(s) and as such are required to give adequate consideration to alternatives.

Accordingly, this report covers the following matters:

- Overview of the previous business case processes and methodology for the consideration of alternatives (refer to Part A);
- Consideration of alternative routes and methods (refer to Part B).

1.2 Report structure

This report is structured as follows:

Section	Heading	Description
1	Introduction	Purpose of the report.
2	Assessment of Alternatives Methodology	Overview of the assessment of alternatives methodology used to develop and assess route options for the Warkworth IBC and DBC and ultimately determine the Warkworth transport network.
3	Background	Summary of the business case history and process leading to the identification of the Indicative Strategic Transport Network.
4	Route refinement development and assessment methodology	Overview of the gap analysis undertaken between the IBC option assessment process and the DBC option assessment process.

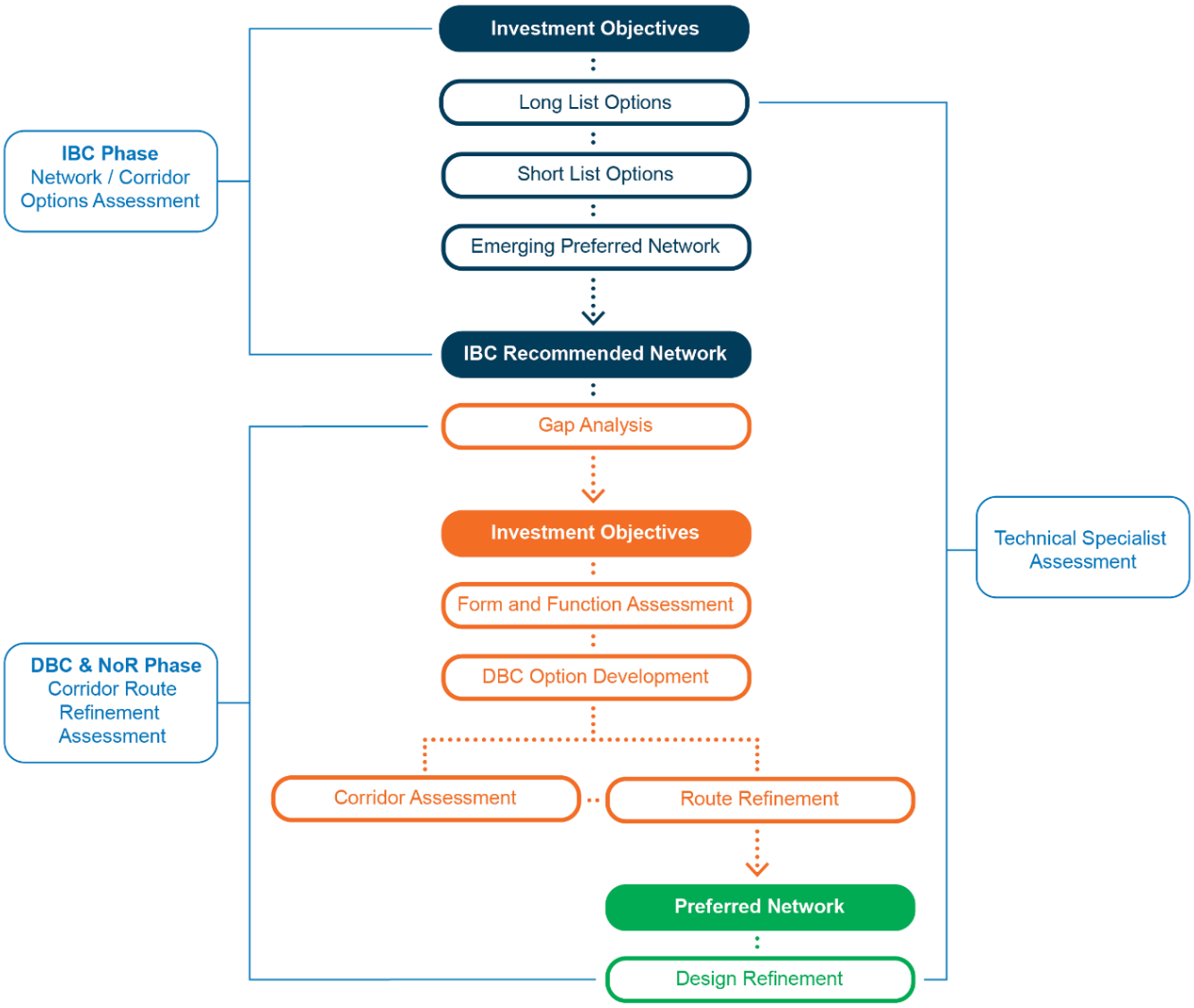
Section	Heading	Description
5	Warkworth Assessment of Alternatives	Overview of the assessment of alternatives process for the 8 NoRs which are the subject of this report.
5.2	NOR 2	Option development and assessment for the Existing State Highway 1 Upgrade (Southern Section).
5.3	NOR 3	Option development and assessment for the Woodcocks Road Upgrade.
5.4	NOR 4	Option development and assessment for the Matakana Road Upgrade.
5.5	NOR 5	Option development and assessment for the Sandspit Road Upgrade.
5.6	NOR 6	Option development and assessment for the new Western Link – South.
5.7	NOR 7	Option development and assessment for the new Wider Western Link (Northern Section).
5.8	NOR 8	Option development and assessment for the new Sandspit Link.
5.9	NOR 1	Option development and assessment for the new Northern Public Transport Hub + Western Link – North.
6	Post DBC Option Refinement	Refinement of the recommended transport network based on engagement post DBC.

2 Assessment of Alternatives Methodology

2.1 Overview

This section provides an overview of the assessment of alternatives methodology used to develop and assess route options for the Warkworth transport network and ultimately determine the preferred option. This methodology was applied to both the Indicative Business Case (IBC) and the Detailed Business Case (DBC) processes. In some instances, where specific circumstances required, deviation from the process set out below occurred. Where the process was deviated from, this is identified and described within the following sections. Figure 2-1 below provides an overview of the corridor and route refinement assessment of alternatives process.

Figure 2-1. Summary of the Assessment of Alternatives Process



The process for the assessment of alternatives was as follows:

a) **The development of multicriteria assessment framework**
To guide the evaluation and comparison of options across the Supporting Growth Programme, a Multi-Criteria Assessment (MCA) framework was developed. The MCA is a common tool that is

often used to assist in the decision-making process and provides an opportunity to understand how different options compare against a set of standard and grouped criteria. This interdisciplinary framework was tailored for the Supporting Growth Programme and developed in consultation with AT, Waka Kotahi and Manawhenua. The MCA framework is set out in Section 2.3.

b) **Option Development**
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), an iterative process was undertaken when developing options with an increasing level of detail and refinement occurring depending on the stage of assessment. For example, options developed for a “corridor assessment” were developed as wide corridors across extensive geographical areas generally at the IBC phase whereas “route refinement” options were more developed options within an identified preferred corridor generally at the DBC phase unless where specified.

c) **Te Tupu Ngātahi GIS Options Assessment Viewer**
Once developed, all options were uploaded to the Te Tupu Ngātahi GIS Options Assessment viewer, which was an online, interactive tool created specifically to allow all technical experts to view all known constraints within the vicinity of the option subject to evaluation.

d) **Briefing Packs**
Briefing packs were provided to technical experts with an outline of the options to be assessed, the criteria to be used in undertaking this assessment including the MCA framework, and a pre-scoring spreadsheet.

e) **Pre-scoring**
In advance of interdisciplinary workshops, experts were asked to pre-score options using the MCA tool so that these could be compiled and discussed during the workshop. Supporting each score was an explanation (reason) for the score.

f) **Interdisciplinary workshops**
MCA scores were presented and challenged in an interdisciplinary workshop. Experts were given the opportunity to amend their scores in light of the discussion at the workshop, if they felt that was appropriate. The presence of the design team at the workshop provided a valuable opportunity for experts to clarify / confirm the nature of all the options before confirming or assigning their final scores. It should be noted that, while the MCA tool was typically used when undertaking a Corridor or Route level assessment, it was not the sole means of assessing options, but was complementary to the decision-making process.

g) **Analysis and testing of results**
Upon completion of the workshops, the Project Team met to review and test the results. Where necessary, technical experts were brought in to review the scores and provide additional context.

h) **Identification of technical preferred**
Once assessment of the findings of the technical workshops was complete, the Project Team identified emerging technical preferred option(s).

i) **Engagement**
Following identification of the technical preferred option, assessment of stakeholder feedback was then undertaken.

j) **Analysis and testing of results**
Upon completion of the engagement period, the Project Team met to review the technical preferred option(s) in light of the feedback received through engagement and refine the options as necessary.

k) **Recommendation by the Project Team**
Once the emerging preferred options were confirmed and the Project was identified, the Project Team presented the assessment and overall recommendation to seek endorsement of the option prior to presenting the option to the AT and Waka Kotahi Boards as a recommendation for approval.

2.2 Option development

The option development process for both the IBC and the DBC phases was an iterative process with an increasing level of detail and refinement occurring depending on the stage of assessment. At the end of each stage (for instance, upon the completion of the IBC and at the beginning of the DBC) the Project Team considered if any new information had become available since the previous assessment was undertaken that could potentially impact or influence the development of options. If new information was available, the consideration of options was developed accordingly.

Potential options were developed in a group / workshop setting with representatives of the Project Team and where relevant, technical experts. Each workshop considered the following:

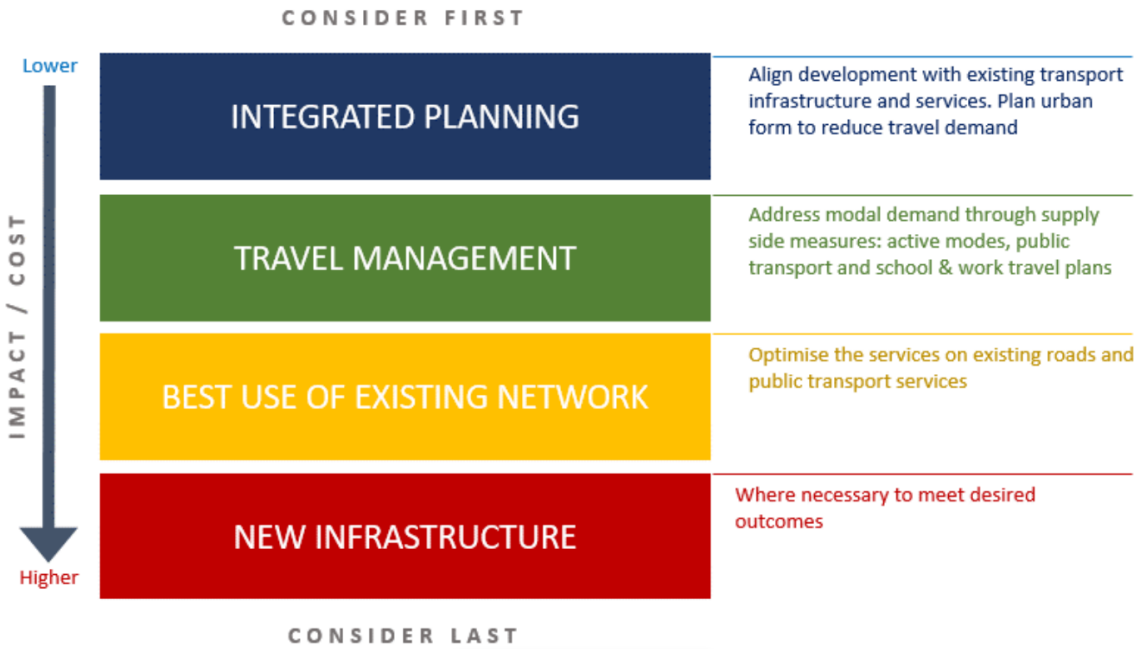
a) Any new information identified since the previous options assessment process (e.g. through a Gap Analysis)
b) The anticipated typology for that option
c) Known physical constraints that would influence the consideration of options (for example, topography and geology)
d) Mapped features, including Auckland Unitary Plan Operative in part (AUP:OP) zones, precincts, overlays and controls
e) Known community facilities and places of significance as identified by Manawhenua
f) New information obtained during site visits with the Project Team and technical experts, Manawhenua and AT / Waka Kotahi
g) The outcomes from previous and ongoing engagement (including stakeholder and community)
h) The overall strategic function of the network, and relevant engineering matters including the indicative cross-section and road typology.

In developing options, the project team and specialists first considered options that integrated with land use planning and reduced the need to travel through utilisation of the existing transport infrastructure in the first instance. Options that increased the network capacity through the provisions of new transport infrastructure were considered last. This approach aligns with the intervention hierarchy approach of prioritising lower impact and cost-effective options first, the intervention hierarchy approach is shown in Figure 2-2 below.

In summary, use of the existing network was considered first, however, to achieve the identified transport outcomes, new infrastructure was identified as being required for projects where appropriate.

For options where new infrastructure was required corridor assessment was undertaken to identify a preferred route alignment, which was then refined and in further detail (route refinement). Where the existing network was to be utilised and upgraded, route refinement considered whether upgrades may be accommodated, generally widening to the left, right or both sides of the corridor.

Figure 2-2. Intervention hierarchy approach



2.3 Options Assessment framework

2.3.1 Multi criteria assessment

A Multi Criteria Assessment (MCA) Framework was developed for the wider programme of work, in consultation with AT, Waka Kotahi and Manawhenua. The MCA criteria included the relevant Investment Objectives and was largely based on the four well-beings: Cultural, Social, Environmental and Economic. The MCA Framework is appended to this report as Appendix A.

Criteria were developed for consideration by Manawhenua under the cultural wellbeing grouping. On review, Manawhenua stated a preference to rank options where possible (rather than score) and to provide a collective Manawhenua response, rather than each iwi individually. Accordingly, Manawhenua representatives expressed their views and provided specialist cultural advice on key issues through the optioneering and assessment of alternatives process.

For the DBC, where the IBC – DBC gap analysis recommended the project progress through a route refinement assessment rather than a corridor assessment, a refined MCA criteria was utilised, the criteria was designed to be specific to the relevant constraints or considerations for the corridor under assessment. For example, some projects did not have any specific identified heritage constraints or considerations, as a result this criterion was omitted from the MCA criteria for the particular project

and noted as N/A in the specific project MCA assessment because it was considered that further detailed assessment (from that previously undertaken at the IBC corridor assessment phase) of the project against this criterion was not required in order to inform the route refinement assessment process. Projects recommended for a route refinement assessment or a corridor assessment in the DBC are identified in Table 2-1 below.

As noted in Table 2-1 below, projects identified to progress through route refinement in the Warkworth DBC were those requiring upgrades to existing road corridors. As such, a single centreline route option following the existing road corridor was developed in GIS. At the assessment stage, the project team and technical specialists applied the relevant constraints map to the single centreline route option developed and determined whether the corridor should be widened from the centreline / or to the east / west to avoid and / or minimise impacts based on the constraints within proximity to the corridor. The options to upgrade the corridor utilising the centreline or widening to the east / west were subsequently assessed by the Project Team against the refined MCA criteria with technical experts where required to identify the preferred option.

Table 2-1. DBC corridors assessment recommendation

Project	Level of assessment
Northern Public Transport Hub and Western Link - North	Corridor refinement
Woodcocks Road Upgrade	Route refinement
State Highway 1 Upgrade	Route refinement
Matakana Road Upgrade	Route refinement
Sandspit Road Upgrade	Route refinement
Western Link – South	Corridor refinement
Wider Western Link	Corridor refinement
Sandspit Link	Corridor refinement

2.3.2 Scoring methodology

Technical experts were appointed to undertake assessments of the options in their area of expertise. The experts were required to differentiate between the effects experienced in the existing environment and effects that would be experienced in a realistic, future environment (as discussed further below). This differentiation is particularly relevant within the Future Urban Zone (FUZ), which is earmarked for urban development but currently functions, primarily, as a rural area.

The MCA used a graduated scoring scale, ranging from -5 for Very High Adverse Effect to +5 Very High Positive Impact (see Table 2-2) to score options against the MCA Framework. The varying shades of green represent what was identified in the MCA as a score above '0' and is associated with a positive impact, whereas shades of red represent what was identified in the MCA as a score below '0' and is associated with an adverse impact.

Table 2-2 MCA scoring scale

Effects criteria	Scoring
Very high adverse impact	-5
High adverse impact	-4
Moderate adverse impact	-3
Low adverse impact	-2
Very low adverse impact	-1
Neutral impact	0
Very low positive impact	1
Low positive impact	2
Moderate positive impact	3
High positive impact	4
Very high positive impact	5

Scoring was completed by technical experts (ecologists, stormwater experts, archaeologists, etc.) and the Project Team (including planners, designers, transport engineers). Scores were presented and challenged in an interdisciplinary workshop setting.

When considering the options and assigning scores, experts considered options and potential effects in the context of a likely future environment within which the transport corridor would likely be operating. It is considered that there are broadly two likely future environments that could apply:

a) Environments that are likely to experience material change as a result of urbanisation; and
b) Environments that are not likely to materially change in the future.

When considering the future environment, there are four scenarios that are likely to eventuate through the Te Tupu Ngātahi Programme, two of which have a high probability of change as a result of a signal of land use change by way of operative planning provisions. These are outlined in the table below:

Table 2-3 Overview of likely scenarios eventuating through the Te Tupu Ngātahi Programme

Environment today	Zoning	Likelihood of change	Likely future state environment
Rural	Rural	Low	Rural
Rural	Urban	High	Urban
Rural	Future Urban	High	Urban
Urban	Urban	Low	Urban

Unless circumstances suggested otherwise, when considering effects in areas where there was a high likelihood of change, the approach that was adopted was that construction effects were to be considered in the context of an un-urbanised environment and operational effects were to be considered within the context of an urbanised environment. This is on the basis that while construction is likely to occur prior to urbanisation, the relevant project is to operate in an urbanised environment.

In addition to the MCA framework, several additional (and important) inputs were included in the assessment framework as outlined in Table 2-4 below.

Table 2-4 Other inputs in the MCA framework

Project Partners, including Manawhenua, and landowner feedback	Project partner feedback for each option identifying scale / validity of objections; identified preference / proposed changes to options etc. Feedback provided by other key stakeholders, the community and landowners.
Policy Analysis	Options alignment with the strategic policy framework including the AUP:OP, the Auckland Plan, and the Warkworth Structure where it assisted in differentiating between options.
Indicative costs	High level indication of costs (including construction and property purchase) where it assisted in differentiating between options.

2.4 Intersection and stormwater approach

2.4.1 Intersection Form Assessment Methodology

An assessment was undertaken to identify likely intersection forms for the Warkworth transport network. The purpose of this process was to identify the indicative intersection controls and subsequent footprint implications. It is noted that the final decision of the form and control of the intersections, could be modified when further land use certainties are known at time of implementation.

For the purposes of the intersection assessment the following factors were considered:

- Safety
- Transport network function (movement) and land use function (place)
- Form and Level of Service (LOS) / Quality of service required for different modes
- Land use integration
- Site specific constraints
- Urban form
- Design constraints
- Roundabout vs signals guidance
- Network staging and route protecting
- Future land used assumptions
- Future transport network assumptions.

For each intersection control chosen, design features were also considered to ensure that the intersection meets the needs of different users safely and effectively and responds to the site-specific factors. This check was done by the engineering and urban design teams following the initial selection process completed by the transport planning team.

The guidance adopts a ‘Safe System’ approach and recommends roundabouts as the first choice for at-grade intersections due to the safety benefits for vehicular traffic resulting from slowing down through traffic and reducing the number of conflict points. However, where roundabouts are not considered appropriate for example due to engineering constraints or land use implications, signalised intersections were then considered.

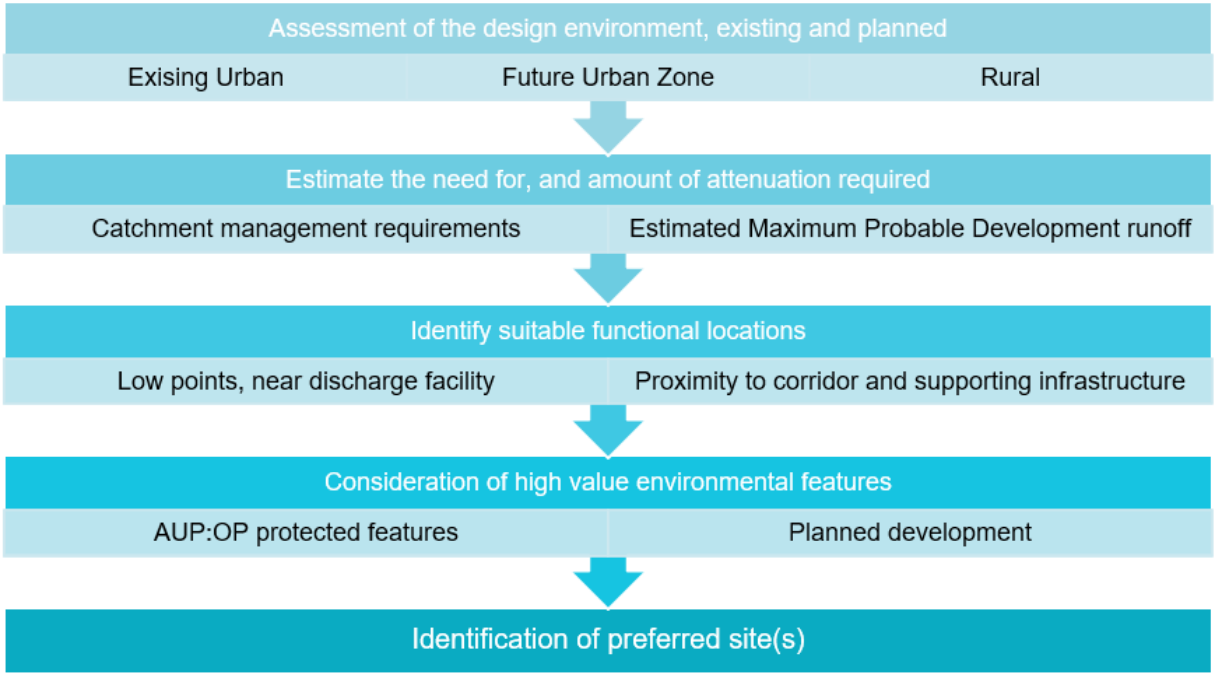
The intersection assessments have been consolidated to consider the key intersections – specifically Arterial to Arterial or Arterial to Collector roads. Intersections with a local road are generally priority-controlled intersections and are assumed to remain priority-controlled intersections in the future.

SIDRA modelling was undertaken to inform the intersection size requirements. It should be noted that in some cases modelling constraints resulted in limited turning volumes. In these cases, high level assumptions on likely turning movements were utilised.

2.4.2 Stormwater Infrastructure Design and Management

As part of route protection, the projects are required to identify and appropriately protect the land necessary to enable the future construction, operation, and maintenance of required transport corridors / infrastructure. The design has therefore considered the appropriate stormwater management methods to meet likely catchment needs and achieve the future regulatory requirements the process for identifying stormwater treatment form and location is summarised in Figure 2-3 below.

Figure 2-3. Stormwater infrastructure design and location approach



2.4.2.1 Design Environment Assessment

The type of stormwater management device was identified based on the Te Tupu Ngātahi design framework which considered:

- The surrounding existing and planned land-use
- Form of the transport route
- Road hierarchy
- How connectivity to adjacent properties would be provided.

This approach is summarised in Table 2-5 below.

Table 2-5. Stormwater System Design Approach

Design Environment	Conveyance	Treatment	Retention	Detention (Attenuation)	Diversion
Existing Urban – footpath and cycleway within existing road reserve	Pits and pipes	Discharge across berm	Raingarden	Wetland / pond	N/A
Existing Urban – increased road reserve and road upgrade	Pits and pipes	Raingardens or treatment wetland / pond, or as a lesser preference, proprietary treatment devices	Raingarden	Wetland / pond	N/A

Design Environment	Conveyance	Treatment	Retention	Detention (Attenuation)	Diversion
Future Urban Zone	Pits and pipes preferred	Raingardens or treatment wetland / pond	Raingardens	Wetland / pond	Diversion drain or cut-off channels as required
Rural	Conveyance channels	Treatment swales or treatment wetland / pond	Retention swales	Attenuation swale or wetland / pond	Diversion drain or cut-off channels as required

2.4.2.2 Need and scale of attenuation required

Design of attenuation devices was undertaken at a high level to determine the need for, and amount of attenuation required, the design approach considered the following:

- Evaluate the overall catchment management plan requirements as approved by Council to determine if attenuation or a “pass it forward” approach was proposed for the catchment
- Determine the road runoff discharge conditions for any tie ins to existing systems or discharge to overland flow paths
- Estimate runoff from maximum probable development in the catchment (i.e., maximum expected impervious areas).

This information was used in the:

- Design of a primary (10-year) network to cater for the estimated runoff
  - Location and sizing of primary (10-year) attenuation devices (if required) to address any capacity constraints in the downstream network, or to reduce the size of stormwater infrastructure (e.g., pipes) required
- Identification of secondary (100-year) flow paths and floodplains
  - Location and sizing of secondary (100-year) attenuation devices to reduce floodplain and overland flow path extents and avoid directly impacting on these.

2.4.2.3 Suitable functional location

If a wetland was required, the location of the wetland was selected by identifying a suitable functional location. The functional location considered the off-line low point along the alignment (based on existing topography), which was in sufficient proximity to the corridor for ongoing maintenance access, and suitably located for supporting infrastructure such as pipes and discharge outlets to nearby natural streams.

Where there were opportunities to upgrade or share existing public stormwater assets these were preferred and have been selected in various places along the corridors. Co-locating or upgrading existing assets has the benefit of reducing project land requirements, more effectively managing ongoing maintenance requirements through larger and fewer stormwater facilities, rather than multiple smaller devices. If practicable, across the Warkworth Package, new wetlands were also designed to service multiple routes, to achieve co-location efficiencies.

2.4.2.4 Consideration of high value environmental features

Once functional locations were considered the design then sought to avoid high value environmental features and where practicable minimise impacts on existing residential or business development.

Where new information or opportunities became available, the Project Team refined the stormwater solutions design and location. For example, where a consent might be granted for new development, the team made efforts to reconfigure ponds or discharge outlets to reduce impacts on developer aspirations and private property. However, this was not always practicable in constrained corridors.

2.4.2.5 Summary

The stormwater solution preferred is generally use of centralised wetlands. Wetlands have the benefit of being more effective to operate and maintain, they serve as both attenuation and treatment, and they reduce the overall corridor cross section width. Swales and raingardens for example would impact many owners along the corridor, and in existing urban areas where development is built up this would be particularly undesirable. Additionally, the Warkworth transport network is seeking to support growth, and developable land adjacent to the corridors should therefore be maximised. Wider corridors for open channel systems and swales would not be as supportive of this objective as wetlands.

3 Summary of previous business case processes

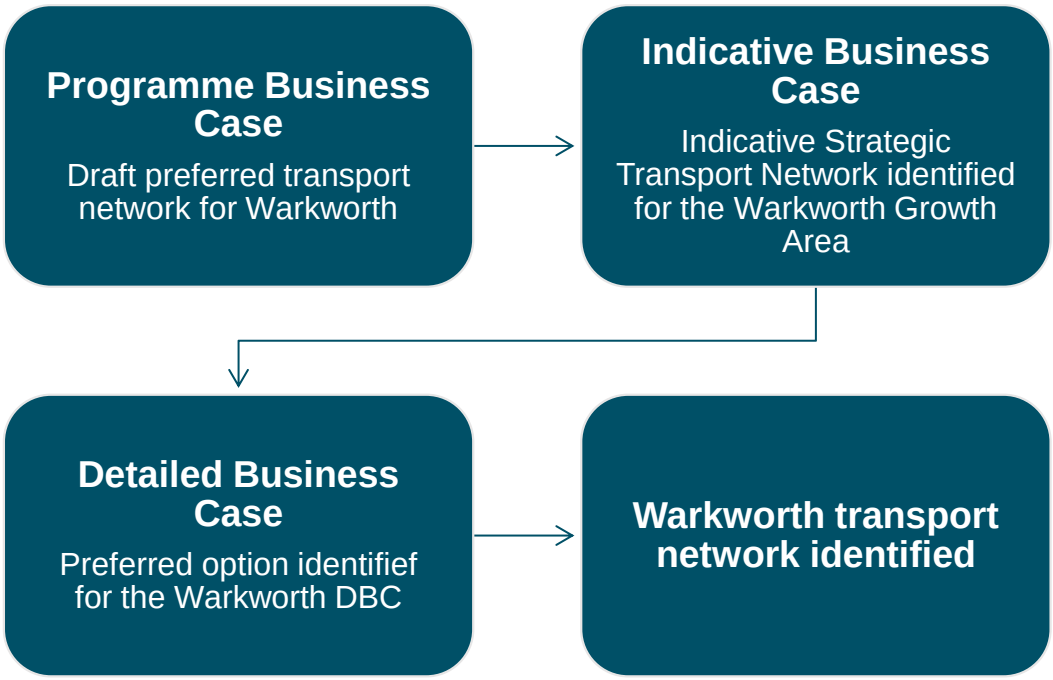
3.1 Overview

To determine the most appropriate transport solution to respond to the scale and pace of growth in Auckland, AT and Waka Kotahi worked in partnership to develop business cases for each of Auckland's identified growth areas: Warkworth, North, North West and South. To date, this process has involved the following:

a) The completion of a Programme Business Case (PBC) in 2016, which identified a high-level Preferred Programme and Transport Network for Warkworth, North, North West and South Auckland
b) The completion of four IBCs in 2019, which identified an Indicative Strategic Transport Network (ISTN) for Warkworth, North, North West and South Auckland
c) The progression of a number of Detailed Business Cases for the ISTN which started in mid-2019 and identified projects for route protection including the Recommended Strategic Warkworth Network.

This Warkworth process is illustrated in Figure 3-1 below.

Figure 3-1. Process leading to the identification of the Warkworth transport network



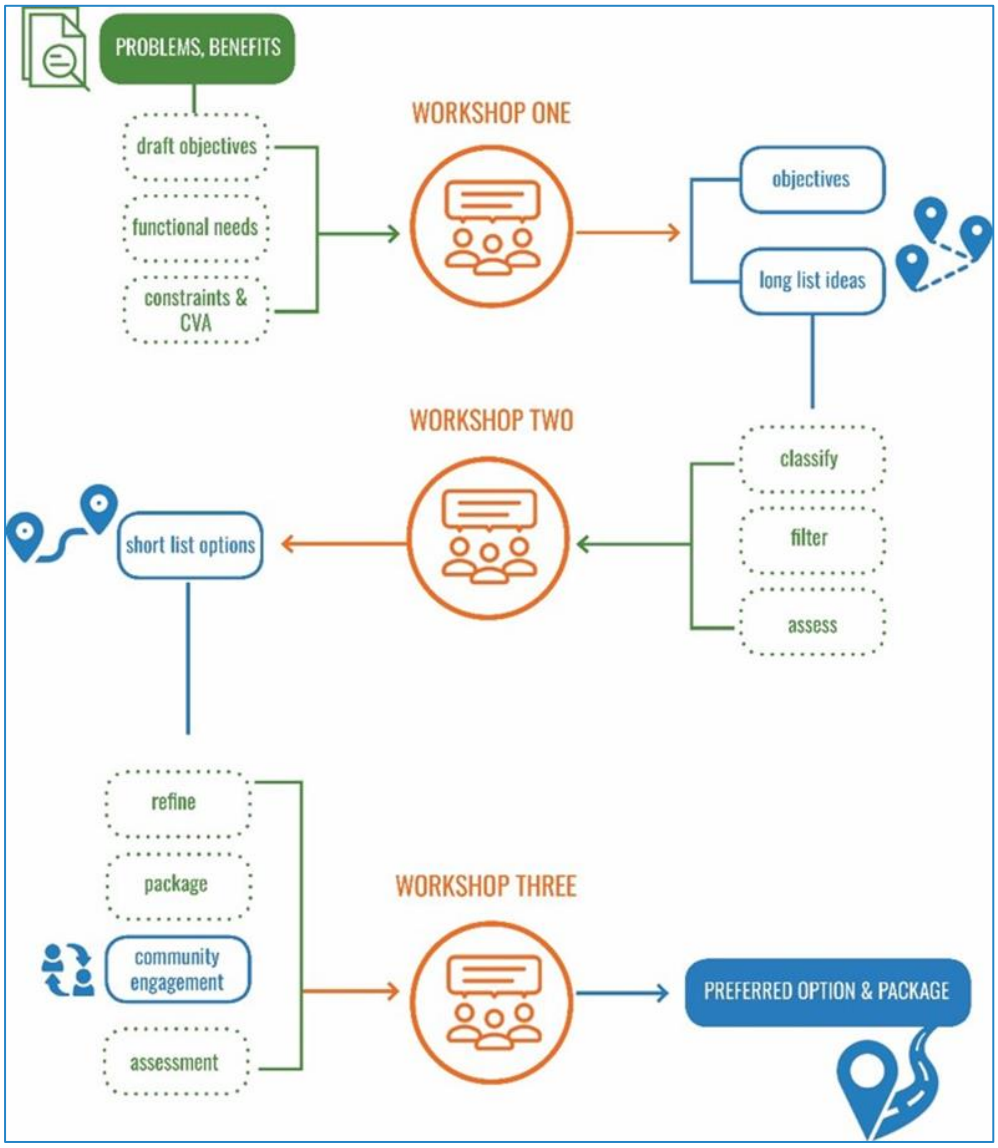
The PBC identified a draft preferred transport network within the Warkworth area. The IBC then further tested and developed the recommendations of the PBC. The purpose of the IBC process was to confirm the recommendations of the PBC were robust and to develop a recommended transport network that met the investment objectives for the region for AT Board / Waka Kotahi Board approval.

The section to follow briefly describes the optioneering process that was undertaken during the IBC phase of works. This process resulted in the identification of the Warkworth ISTN which was approved for further investigation in the DBC.

3.2 Indicative Strategic Transport Network

The IBC optioneering process is shown in Figure 3-2 below.

Figure 3-2. IBC Optioneering Process



Optioneering began with the development of a long list of options and this process focused on developing breadth and depth of possible interventions, network sections and options. As a result, over 100 options were considered as part of the initial longlist development. The long list was subsequently filtered to exclude options that were:

a) considered beyond the scope of the IBC (i.e. those that were outside the project area or beyond the control of AT or Waka Kotahi);

b) land use options (such opportunities were discussed separately with Auckland Council);
c) already part of a designated / consented / funded project;
d) considered business as usual, so would otherwise be implemented (for example: use of staging);
e) considered unfeasible due to significant physical constraints – based on a high-level engineering assessment; and
f) duplicates of another option.

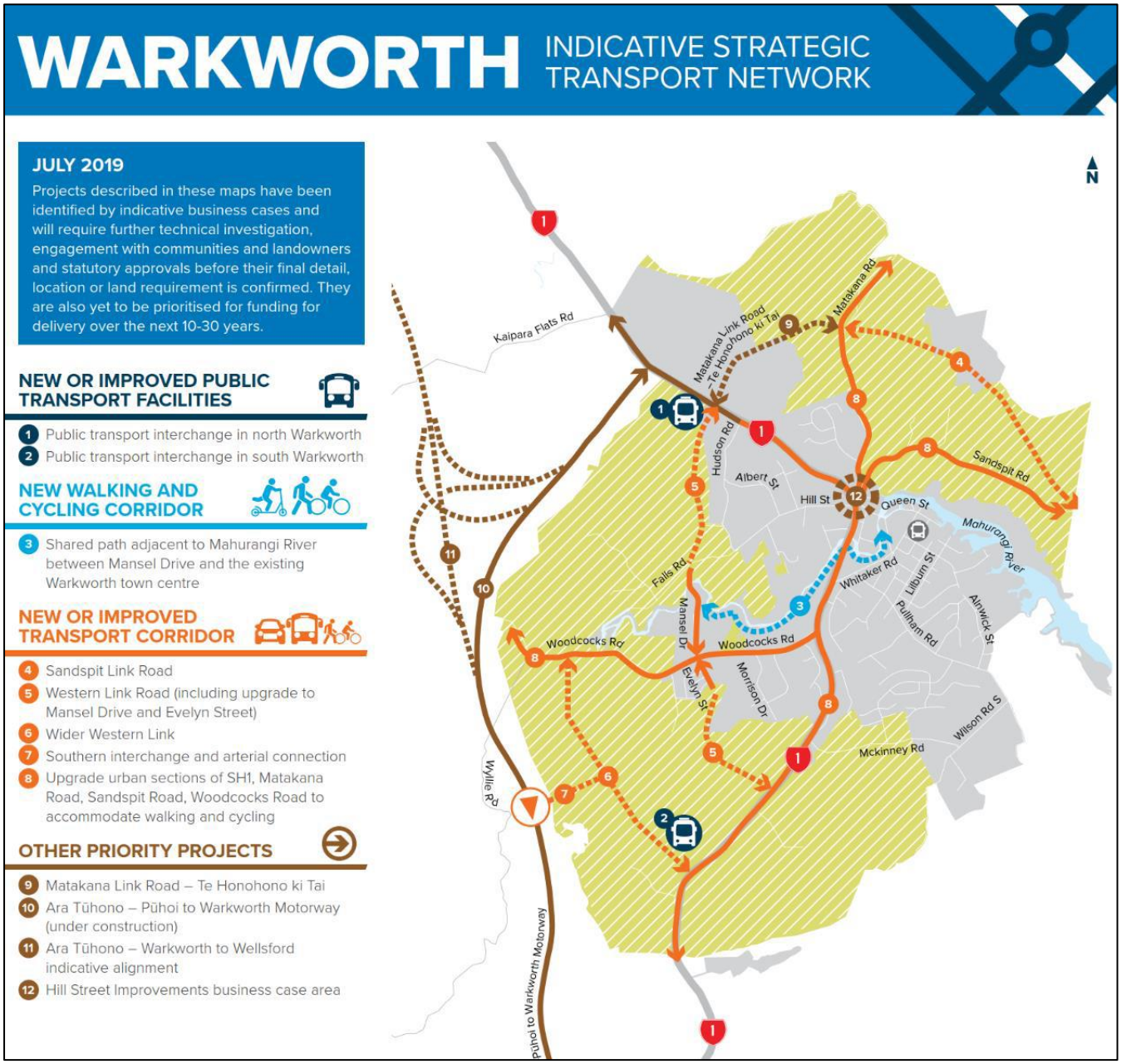
Following the filtering process, the remaining options were categorised by type, grouped by geographic extent, and assessed against the Te Tupu Ngātahi MCA framework in a workshop setting. This process resulted in a number of options being recommended to proceed to a shortlist.

Following this the recommended shortlist underwent a refinement and packaging process. This included the preparation of indicative cross sections which assumed a 30m wide corridor for SH1, a 20m wide corridor for existing collector-type roads, and a 25m wide corridor for new arterials to provide a guide as to where the corridor could be located, with the refined alignment to be determined as part of the DBC. This also involved packaging together individual sections and assessing competing options (or packages of options) and interdependencies between different options.

Feedback on the refined short list was also obtained through one round of external stakeholder and public engagement in June 2018. This involved a series of workshops with elected members, stakeholders and public open days. The purpose of this engagement was to provide stakeholders and the public with an opportunity to review and provide input into the overall IBC recommended network and for the Project Team to identify matters that will inform that network.

Following the engagement period, the short list was evaluated, and the Warkworth Indicative Strategic Transport Network as set out in Figure 3-3 below was identified:

Figure 3-3 Warkworth Indicative Strategic Network recommended through the IBC



3.3 Identification of the Warkworth Detailed Business Case

Following the identification of the Indicative Strategic Transport Network at the IBC phase, the IBC gave consideration to the below matters and provided an indication of how projects could be packaged in the future and progressed at the DBC phase:

- Identifying sections of the components that could “stand alone” as projects;
- The environment each section sits within, and where that environment changes;
- The urgency for the delivery of any section of a component; and
- The complexity of any section of a component.

Following on from this, all sections of the Indicative Strategic Transport Network were grouped into packages for the purposes of further refinement at the DBC phase. These packages and the indicative route protection mechanisms for each project to be further addressed in the DBC phase are shown in Table 3-1 below.

Table 3-1. IBC indicative DBC packages and route protection mechanisms

Package	Components	Indicative Mechanism	Priority
W1 New Arterials and new interim park and ride	Western Link - North	Developer agreement or NOR	High
	Western Link - South	NOR	High
	Upgrade to Mansel Drive	NOR	High
	Sandspit Link	NOR	Medium
	Interim Park and ride	NOR (if required)	High
W2 Upgrades to arterials	State Highway 1 upgrade – widening to add active modes and public transport (include. Hill Street Bridge)	NOR alteration	High
	Woodcocks Road	NOR	High
	Whitaker Road	NOR	High
	Matakana Road	NOR or potential for delivery via 'business as usual' consents teams	Medium
	Sandspit Road	NOR or potential for delivery via 'business as usual' consents teams	Medium
W3 Interchanges	Southern Interchange	NOR / Alteration	Medium / high
	South public transport interchange	NOR	Medium
	Wider Western Link	NOR	Medium
W4 Collector Road Improvements	McKinney Road, Wilson Road, Pulham Road, Alnwick Road	Unknown at this stage (AT)	Medium
W5 Cycleways along waterways	East-west cycleway connection along streams	Unknown at this stage (AT)	Medium / high

3.4 Components of the Warkworth DBC

The Warkworth DBC encompasses 12 projects from the IBC Indicative Strategic Network components shown above. Together these projects form a cohesive transport response for Warkworth to respond to planned future growth. The transport investment identified in the DBC will enable an integrated transport system with a range of strategic and local elements supporting mode choice in Warkworth. It is predicated on creating a connected walking and cycling network and supporting an enhanced local and regional public transport system. The timing for implementation will vary and will be dependent on the release of surrounding land use.

The DBC considered the case for investment and refinement of options for the following projects from the IBC noting that the collective benefit of the network outweighs the individual benefits to each element.

- New Northern Public Transport Hub and Park and Ride
- New Southern Public Transport Hub
- New Southern Motorway Interchange on Ara Tūhono
- Upgrade to SH1
- Upgrade to Woodcocks Road
- Upgrade to Matakana Road
- Upgrade to Sandspit Road Upgrade
- Western Link – North
- Western Link – Central Upgrade
- Western Link – South
- Wider Western Link
- Sandspit Link.

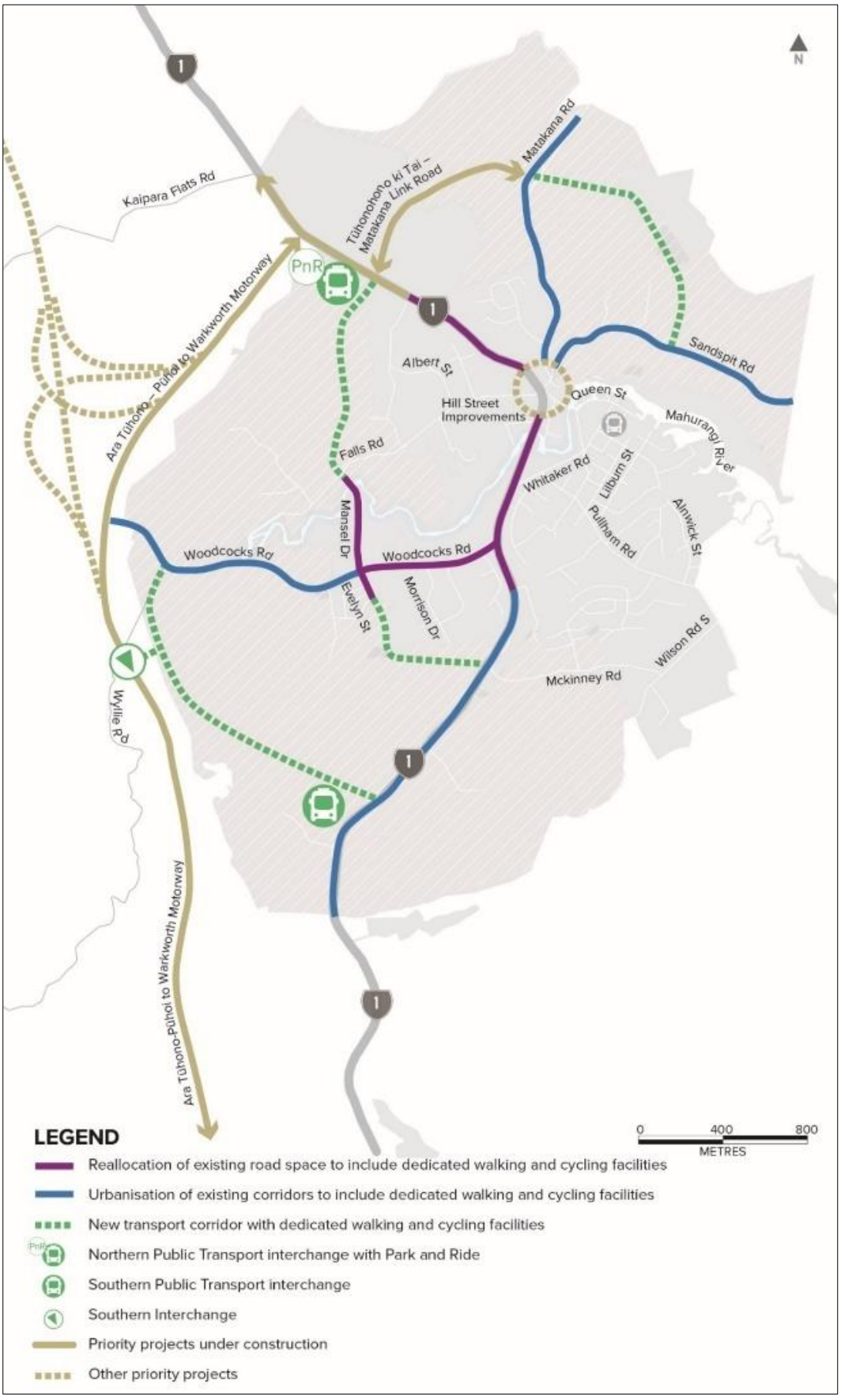
These projects form the arterial roads for Warkworth, but the DBC acknowledged that there will also need to be a complementary collector road network and other cycle connections. The Mahurangi Shared Path between Mansell Drive and the existing town centre was excluded from the DBC and remains part of the Rodney Local Paths Plan (formerly known as the Greenways project). The Hill Street improvements project was progressed by a separate business case in parallel to the Warkworth DBC. The Warkworth IBC projects which did not proceed to the Warkworth DBC, and the reasons why are shown in Table 3-2 below.

Table 3-2. IBC recommended projects excluded from the DBC

Warkworth IBC Project	Reason for exclusion from Warkworth DBC
Interim Park and Ride	The interim park and ride as part of the IBC recommended network was funded by the Local Board / AT and shifted out of the project scope.
W4 Collector Road Improvements McKinney Road, Wilson Road, Pulham Road, Alnwick Road	IBC recommended that Package W4 (Collector Road Improvements) of the IBC recommended network requires completion of a DBC and that this will need to be procured separately by the appropriate owner (AT or the Transport Agency).
W5 Cycleways along waterways East-west cycleway connection along streams	IBC recommended that W5 of the IBC recommended network will require completion of a DBC and that this will need to be procured separately by the appropriate owner (AT or the Transport Agency).

The Warkworth IBC projects which proceeded to the Warkworth DBC are shown in Figure 3-4 below.

Figure 3-4. Warkworth DBC Projects



4 Route refinement development and assessment methodology

4.1 Overview

The following section provides an overview of the gap analysis undertaken prior to the commencement of the DBC, this included a review of the IBC assessment, policy updates, developer aspirations and interdependencies. Following gap analysis, a land use and constraints mapping exercise and corridor form and function assessment were undertaken to develop new options and refined routes.

4.2 Gap analysis – IBC to DBC

Prior to the commencement of the DBC assessment of alternatives process, a gap analysis was undertaken for the Warkworth Indicative Strategic Transport Network (ISTN). The purpose of this exercise was to review how the ISTN was identified, and to check if any information or assumptions had changed since the corridor assessment was completed for the IBC. This included policy direction and statutory documents (for example, plan changes), and any issues that required further consideration. The gap analysis included the following:

- Review of Te Tupu Ngātahi Programme Business Case (formerly Transport for Future Urban Growth (TFUG)) recommendations
- Review of the corridor assessment undertaken and the Warkworth IBC (main document and Options Assessment Report), including the long list and the short list options, and the reasons why options were recommended or discounted
- Consideration of the alignment of the recommended options with relevant policy documents (for example, Government Policy Statement on Transport, AUP:OP), in particular, to see if anything had changed since the Warkworth IBC and corridor assessment recommendations
- Consideration of the alignment with strategic plans, other statutory documents and developer aspirations that may have progressed from the IBC. For example, structure plans, plan changes (or appeals), recent NORs and developer plans
- Consideration of other projects planned in the area
- Consideration of feedback from landowner engagement.

The gap analysis also identified whether the IBC corridor assessment had considered alternatives proportional to the scale of potential effects of each Project. Where new information was identified, or the corridor assessment did not consider alternatives proportional to potential effects sufficiently, additional assessment was recommended at the DBC phase. To achieve the level of assessment required to progress to route protection, two approaches to developing options were recommended for transport components in the Warkworth DBC:

Corridor assessment - involves the development of additional options or geometric variations to the IBC recommended option within a defined study area. These options had the potential to deviate from the IBC recommended option identified in the Indicative Strategic Transport Network. Upon completion of the corridor assessment process, the recommended option was then progressed through to the route refinement assessment process (described below).

A corridor assessment was deemed necessary where the gap analysis determined that:

a) New information, for example, land use changes, new growth projections and any issues and opportunities identified through engagement with stakeholders and landowners since the completion of the IBC, had the potential to influence that option; and / or
b) Assessment undertaken at the IBC phase was not considered to be proportional to the scale of potential effects.

Route refinement – options based on an IBC recommended option but with refinement based on the effects, constraints and opportunities from corridor widening on either side, both sides, or a combination.

Route refinement was deemed appropriate (and so a corridor reassessment was not necessary) where a gap analysis had determined that:

a) The option had adequately considered all known information (including land use changes, engagement etc.) relating to that option; and
b) Options considered at the IBC phase had sufficiently considered alternatives proportional to the scale of potential effects.

A summary of the analysis undertaken for each Project is summarised in each of the Project specific sections and the approach recommended for option development for each NOR project in the DBC phase is outlined in Table 2-1 of section 2.3.1.

4.3 Land Use Review and Constraint Mapping

Following gap analysis, a review of the AUP:OP maps and constraints was undertaken. The purpose of the review was to identify potential constraints, inform design development and refinement, and identify whether additional corridor options should be developed. Key constraints included:

- Geological conditions
- Natural hazards such as flooding
- Cultural values – as identified by Manawhenua
- Contours and likely project earthworks requirements
- Strategic land use plans including live zoning, future urban areas and structure plans
- Identified sensitive areas through the AUP:OP overlays, conflicts with critical services and special purpose zones
- Environmental constraints.

Constraints were mapped on Te Tupu Ngātahi GIS and discussed at a workshop with the Project Team and specialists.

4.4 Form and Function Assessment

To determine the desired function, and therefore the future form of alternative options, a form and function assessment process was undertaken in 2021.

4.4.1 Corridor Assessment Principles

The Corridor Form Assessment Framework (CFAF) has been designed by Te Tupu Ngātahi to provide a consistent methodology to define the desired corridor form and function requirements and ensure all modes are considered. The CFAF assessments were completed for all multi-modal corridors within the Warkworth recommended network, except for the Wider Western Link Road, Western Link – North and Western Link – South. The corridor form and function requirements for these corridors were endorsed during early works, a summary of the findings from this work is summarised in the below section.

The CFAF output recommends traffic capacity, bus priority measures, walking and cycling facilities and other corridor elements which influence the corridor footprint. All modes are considered in the development of the cross-section, however facilities for all modes may not necessarily be provided. The resulting cross-section forms the basis for route protection for the corridor.

The form and function of a corridor is determined using a combination of 'place' and 'movement' significance on the individual setting:

- **Place factors** consider the existing land use, future land use plans and trip generators present in the catchment area. It also includes an assessment of the future density of residential, industrial or mixed land use and local / regional trip attraction areas e.g. metro stations, schools, hospitals.
- **Movement factors** consider the hierarchy of the corridor in the regional road network (PT network, strategic freight network), modal priorities for the corridor and existing and future traffic volumes to determine the future typology and recommendations for a corridor function. Movement is considered at both local and network levels to ensure that duplication of facilities is avoided, and the corridors have targeted modal functions.

Table 4-1 below provides a summary of the inputs and outputs of the CFAF tool used during the assessment.

Table 4-1. Inputs and Outputs of the CFAF tool

Inputs	Modelling inputs required	Parameters	Outputs	Impact on modelling
Place and corridor function	No	Qualitative assessment based on the Roads and Streets Framework (RASF)	Determines the purpose of the route and feeds into wider modal priority assessment	N/A
Public transport	No	AT Remix File[1]	Public transport priority	No
Walking and cycling	No	Te Tupu Ngātahi primary and secondary walking and cycling network used, based on urban design framework	Helps with geometric design, determining suitable paths and	Chosen facility type for different corridors coded into SAMM

[1] Te Tupu Ngātahi Remix File refers to the Auckland Transport vision of the 2048+ bus network. Data and routes are subject to change.

Inputs	Modelling inputs required	Parameters	Outputs	Impact on modelling
			which sides to include the facility	
General traffic	Yes	ADT volumes used, extracted from SATURN	If PT priority needed, helps determine whether corridor is route protected for 2 or 4 lanes	Number of lanes included in MSM, used for SATURN outputs
Freight	Yes	User Class 3 (heavy vehicles) divided by total of all user classes (all vehicles) to determine the percentage of freight. Data extracted from SATURN	Informs role within wider freight network and whether specific freight measures are needed along corridor	Yes
Speed Environment	No	Assumption based on RASF and future land use. Parameters for high and low speed based on the IBC design philosophy	High level assessment concludes a low speed of 50/60km/h or a high speed of 80km/h. These are the base assumptions for the speed, subject to vary through the DBC Optioneering process	Speed along each network included in MSM, used for SATURN outputs

4.4.2 Updated CFAF cross-sections

The output from the CFAF process indicates the necessary width required to provide a Te Tupu Ngātahi cross section and subsequently meet the outcomes sought by the Alliance. However, due to significant physical and environmental constraints, not all the corridors on the Warkworth recommended network can accommodate the initial identified CFAF cross-section.

These corridors include:

- Matakana Road
- Sandspit Road.

Due to identified constraints along these corridors, bespoke cross-sections were developed through the option assessment process and is further detailed in project specific sections under Section 5.

4.5 Route protection methods

Upon identification of the DBC transport network, in accordance with Section 171(1)(b) of the RMA, an evaluation of alternative methods was undertaken for the Warkworth Package. As part of the consideration of alternatives, the options for statutory approval that enable route protection and future implementation were considered in light of a number of contextual elements including project strategic importance, project urgency / timing and project complexity risk profile.

A range of options were considered including:

a) Designations;
b) Resource consents;
c) Landowner / developer negotiations;
d) Plan changes (initiated or submitted on);
e) Structure plans; and
f) Traditional property acquisition.

Upon testing these options in the context of Warkworth and alongside consideration of programme wide criteria, designations were considered to be the most logical and effective method to protect a route in an evolving environment for the following reasons:

a) A designation provides certainty to all parties including the community and affected landowners;
b) It is a well-recognised and understood tool for route protection which also enables land acquisition processes through the link to the PWA;
c) It maximises flexibility for future implementation;
d) It negates the need for additional land use consents to implement works authorised under the district plan (s9(3) of the RMA); and
e) It will continually provide for future operation and maintenance requirements.

In some cases, alternative mechanisms to designations such as plan changes and landowner agreements, and existing statutory provisions were identified as being a more appropriate form of route protection. These approaches to route protection were preferred where there were areas of active interest for development and where plan changes or the equivalent had already been confirmed and / or proposed. In the context of this report the following NOR projects are relevant:

- **NOR 1 Northern Public Transport Hub and Western Link – North**
  The southern section of the Western Link corridor is provided for through the Plan Change 25 process and the provisions of the Warkworth North Precinct Plan
- **NOR 7 Wider Western Link – North**
  The southern section of the corridor will be provided for via the Plan Change process in combination with landowner agreements.

5 Warkworth Assessment of Alternatives

5.1 Overview

The Warkworth DBC confirmed the transport network for Warkworth and the route protection strategy determined the route protection approach for each project in the transport network. The following section provides a summary of the assessment of alternatives process undertaken for the eight projects undergoing route protection via an NOR process. These projects are shown in Figure 5-1 below.

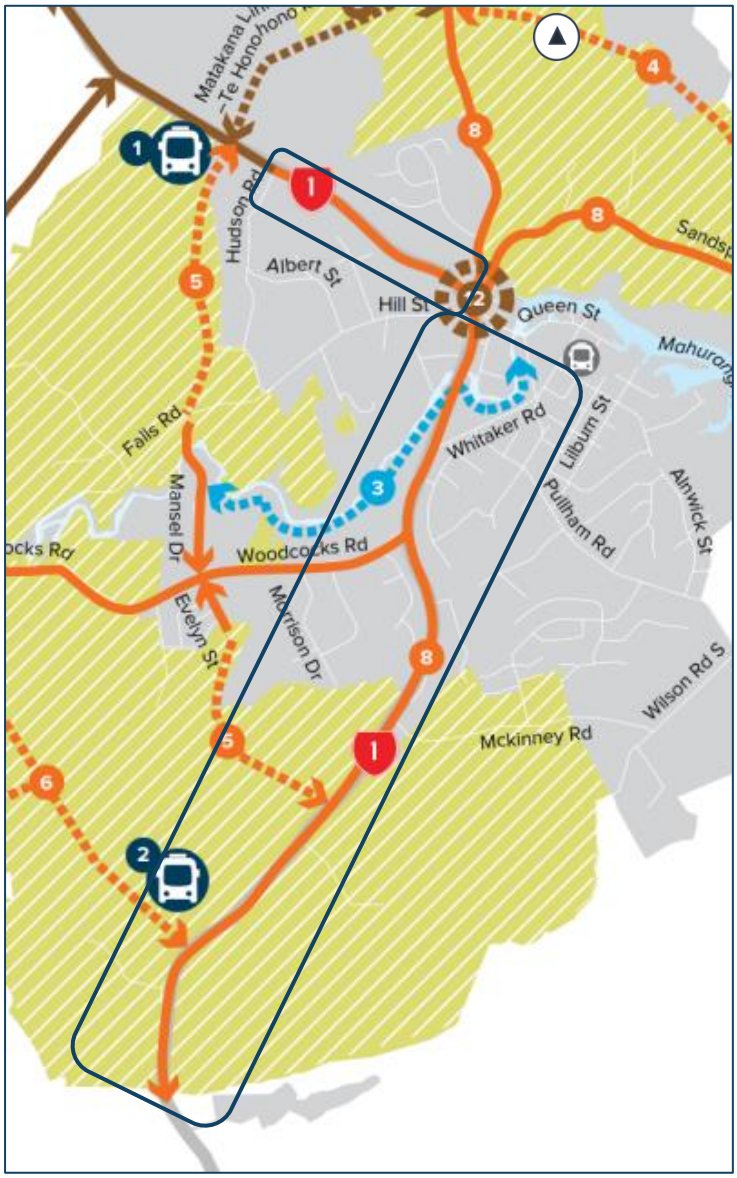
Figure 5-1. Warkworth NOR Projects Overview

5.2 NOR 2 Existing State Highway 1

5.2.1 Corridor Overview

The IBC recommended option for the upgrade of SH1 to provide for an urban arterial cross section with active mode facilities is shown in Figure 5-2 below.

Figure 5-2. IBC SH1 Upgrade

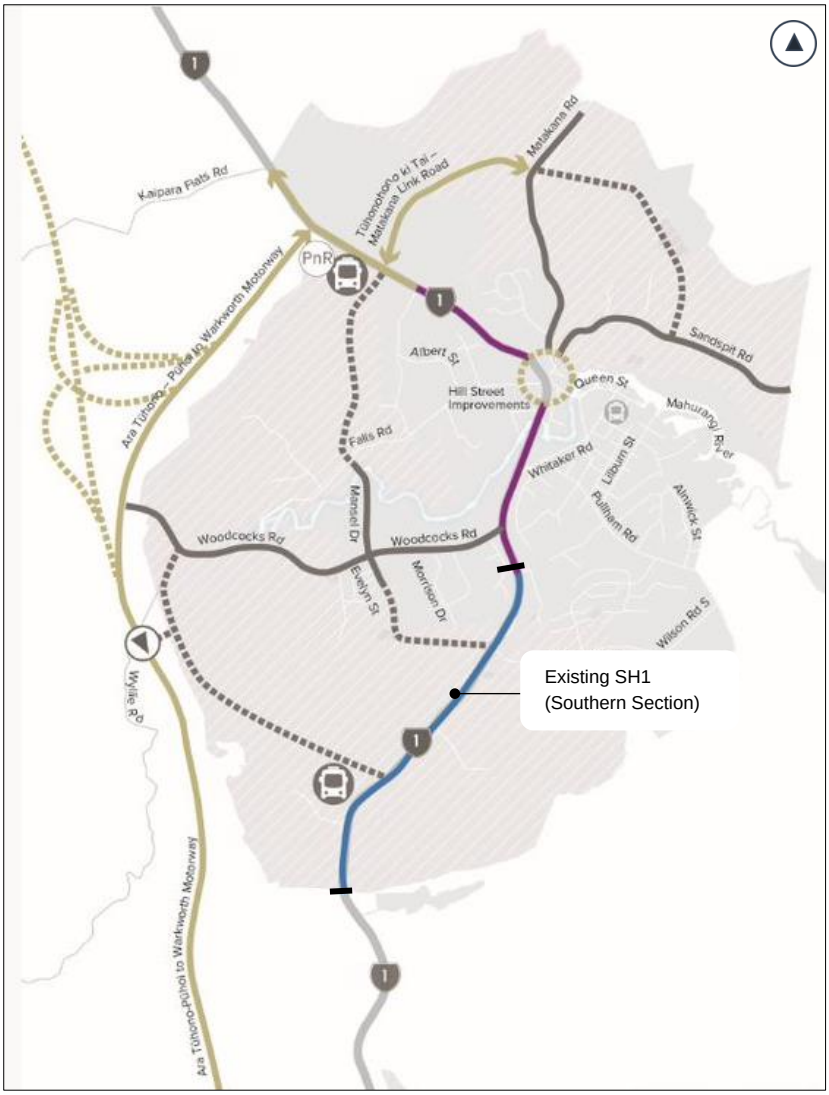


Upon the completion of Ara Tūhono – the Pūhoi to Warkworth motorway the role of the existing SH1 will change. Much of the existing traffic through Warkworth will shift from the current route and the Hill Street intersection in the central Warkworth township, allowing SH1 to function as an urban arterial. Meaning the existing SH1 will become the key north-south route for public transport to connect local communities and town centres as well as the central spine for active transport choices to encourage safer cycling, and greater pedestrian access.

For the purpose of this report, only the option development and assessment process for the existing SH1 from Fairwater Road to the edge of the southern FUZ boundary (existing SH1 southern section)

will be outlined in the following sections The report will not cover the option development and assessment process for the existing SH1 from Hudson Street to Fairwater Road as the assessment outcome for this extent (as part of the existing SH1) in the DBC identified that upgrades would be completed utilising the reallocation of road space within the existing road corridor. As a result, route protection via the NOR process is not required. Figure 5-3 below provides an overview of the corridor extent relevant to this report.

Figure 5-3. Overview of existing SH1 (Southern Section)



5.2.2 Gap Analysis

The gap analysis concluded that adequate corridor assessment was undertaken at the IBC phase and a need for further corridor assessment was not required for the upgrade of the existing SH1 (southern section). The analysis recommended that the corridor should progress through route refinement in the with consideration given to the following:

- Changes in land use along the extent of the corridor section with the northern section being an existing urban area and the remainder of the corridor generally being rural with future urban zoning
- Consider integration with the following the projects:
  - Ara Tūhono – Puhoi to Warkworth Motorway

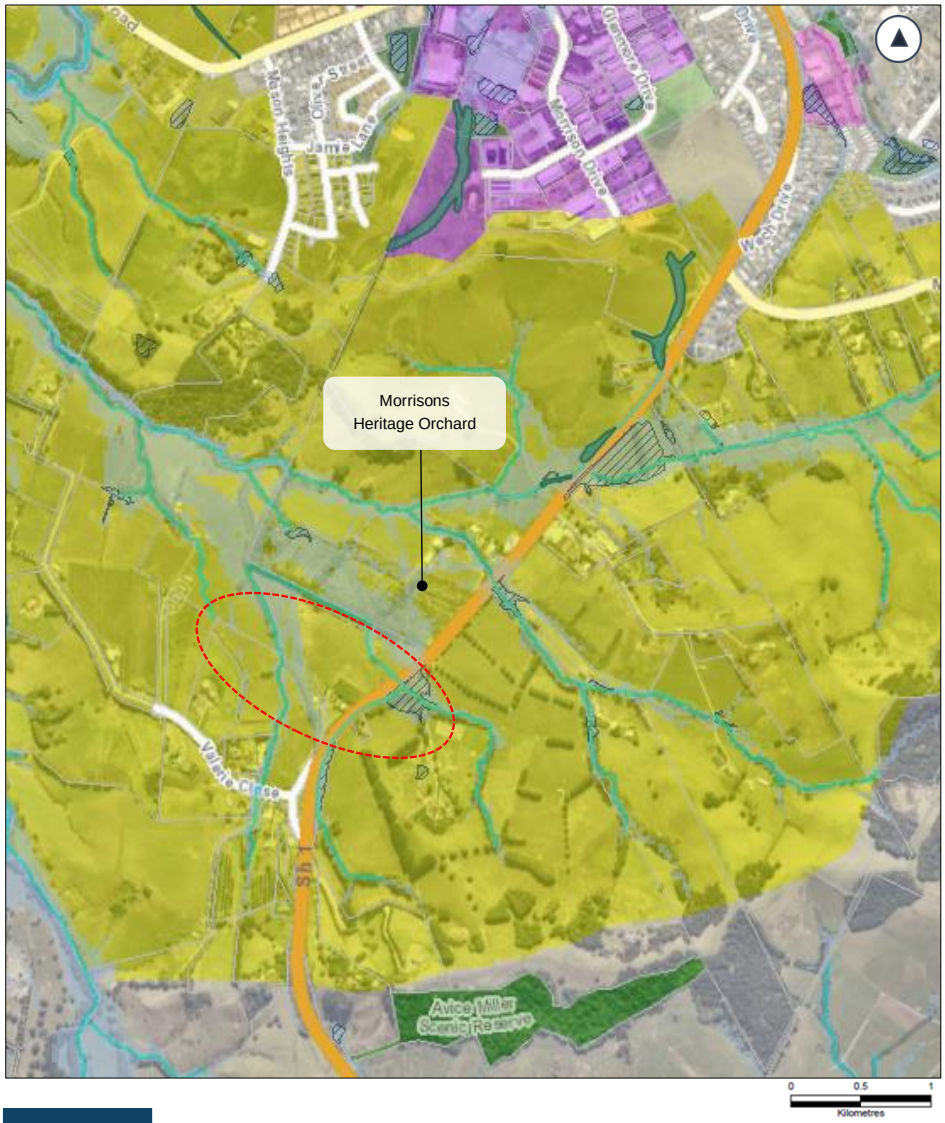
- Proposed Warkworth South Plan Change area.

5.2.3 Route: Option Development

In developing options, the Project Team considered the following known key features in the area. These are mapped in Figure 5-4 below and include:

a) Commercial, residential, and rural properties fronting the corridor
b) Flood plains indicated to flow on sections of the SH1 carriageway
c) Large flood plain alongside SH1 from Mahurangi River
d) Potential natural wetlands adjacent to corridor
e) Existing SH1 designation (6763) along length of existing corridor
f) Proposed Warkworth South Plan Change area
g) Morrisons Heritage Orchard.

Figure 5-4. Map of key constraints and features



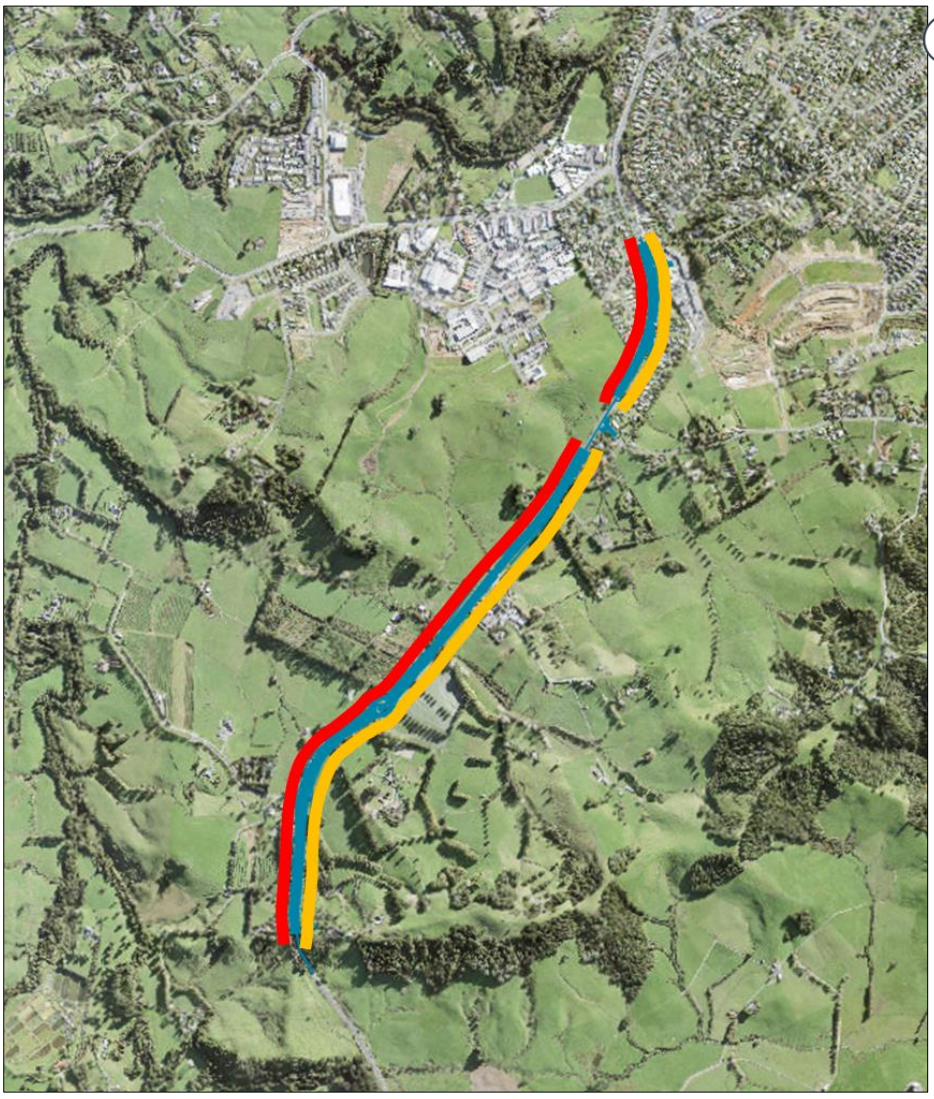
Approx proposed Plan Change area
Floodplains
Existing urban area
Future Urban Zone
Business – Local Town Centre Zone

In consideration of the land uses and constraints within the corridor extent three options were developed for the southern section. These are shown in Table 5-1 and Figure 5-5 below and are discussed in the sections to follow.

Table 5-1: SH1 Upgrade – Southern Section

Option	Description
1	Holding centreline and widening equally on both sides
2	Widen to the west (hold eastern boundary)
3	Widen to the east (hold western boundary)

Figure 5-5. SH1 Upgrade Options Developed



LEGEND

- Option 1
- Option 2
- Option 3

5.2.4 Route: Option Assessment

As outlined in Section 2, options were assessed against the investment objectives and criteria within the four well-beings; cultural, social, environmental and economic. The project team engaged in a refined MCA workshop to undertake an assessment, placing each option on a gradual scale from 'Very High Adverse Effect' (red) to 'Very High Positive Impact' (green).As noted in Section 5.4 MCA in the route refinement phase was targeted, where there had previously been a corridor assessment of the project at the IBC phase and where there were no identified constraints under a specific criterion which required further consideration, this criterion was not revisited and is shown as N/A in Table 5-2 below.

Table 5-2 below identifies the assessment outcomes for the existing SH1- South

Table 5-2: SH1 Upgrade Section 3 option assessment summary

MCA Criteria	Option 1	Option 2	Option 3
I.O.1 – Access			
I.O.2 – Integration			
I.O.3 – Travel Choice			
Heritage			
Land use			
Land Requirement			
Stormwater			
Ecology			
Construction impacts			
Construction disruption			
Urban Design	N/A	N/A	N/A
Social Cohesion	N/A	N/A	N/A
Human health and wellbeing	N/A	N/A	N/A
Landscape / Visual	N/A	N/A	N/A
Natural Hazards	N/A	N/A	N/A
Construction cost / risk	N/A	N/A	N/A

The project team reviewed and compared the options identified above and noted that all the options achieved the investment objective, all options support planned growth and enables transport and land use integration. All proposed options additionally improve the resilience of the network and foster reliable people movement through the provision active mode amenities.

Key differentiating factors between the options were impacts on heritage, land requirement, stormwater, ecology, and construction impacts / disruption. Option 2 was assessed as having a higher potential impact on the Morrison's Heritage Orchard and the natural wetland compared to the other options as a result of widening to the west. While all options had stormwater impacts, Option 2 and 3

were assessed as requiring more work within the floodplains intersecting with the corridor. It was identified that Option 3 would also have potential higher adverse impacts on land requirement compared to the other two options due to a greater impact on the larger section of existing urban area the northern extent of the corridor, including businesses and residential properties. Resulting in higher potential encroachment into these properties and the associated construction impacts and disruption.

Accordingly, the Project Team identified Option 1 as the preferred option. While the option does have a potential impact on the identified natural wetland, it has the least amount of works required within the floodplains, has the lowest level of adverse effect on land required and physical works to the existing carriageway. During the assessment the project team additionally identified that there were potential design options that could be considered in the design refinement phase to minimise the option's impacts on the Morrison Heritage Orchard. A qualitative summary of the assessment outcomes for the preferred and discounted options are provided in Table 5-3 and Table 5-4 below.

Table 5-3: Assessment outcome for the preferred option

Option	Assessment Outcome
1 (holding centreline and widening equally on both sides)	• Option has a lower adverse land requirement impact, widening equally on both sides potentially requires less full or partial property acquisitions compared to Option 2 and 3. While option has a potential impact on the frontage of the Morrison's Heritage Orchard, it was identified that there were potential design options that could be considered in the design refinement phase to minimise impacts on the orchard • There is a potential flooding risk along the existing corridor due to the corridor being in a large floodplain in the central section, in the tapered end of a smaller floodplain in the southern section and is adjacent to flood prone areas along the eastern extent However, option has lesser works located in the floodplains compared to Option 1 and 2 • Option potentially in proximity to the ecological wetland along its north-western extent • Option results in requirement for less physical works as minimal widening of the pavement is required as such there is less embodied carbon associated to this option.

Table 5-4: Assessment outcomes for the discounted options

Option	Assessment Outcomes
2 Widen to the west (hold eastern boundary)	• Option has the most potential to adversely impact the Morrison's Heritage Orchard as a result of requiring a higher degree of encroachment into the property for construction purposes • Potentially higher adverse land requirement and construction disruption impacts compared to Option 1 due to affecting an existing residential area in the northwest resulting in more full or partial property acquisitions • Option requires works within large floodplains in the central and southern section • Option in close proximity to the ecological wetland adjacent to the corridor in the northern section • Option would require more physical works to the existing carriageway due to widening / rebuild of the pavement on the western side as such there is more embodied carbon associated to this option.
3 Widen to the east (hold	• Potentially higher adverse land requirement and construction disruption impacts compared to Option 1 and 2 due to affecting a larger existing urban area in the northeast, including residential properties and various commercial businesses • Impacts on Heritage Orchard limited to localised construction effects along the frontage

Option	Assessment Outcomes
western boundary)	• Option requires works within large floodplains in the central and southern section • Option would require more physical works to the existing carriageway due to widening / rebuild of the pavement on the eastern side as such there is more embodied carbon associated to this option.

5.2.5 Engagement

Table 5-5 below provides a summary of the project specific feedback received from engagement with Te Tupu Ngātahi partners, stakeholders, and community members.

Table 5-5. Existing SH1 Engagement Feedback

Project	Feedback
SH1 Upgrade	• Support for dedicated walking and cycling facilities along the corridor and support for access to local facilities and town centres • General agreement for the principle to provide an urban arterial road for southern section following the centreline principles • Support to upgrade the bridge on SH1 • Support for road widening in some locations.

5.2.6 Option Refinement

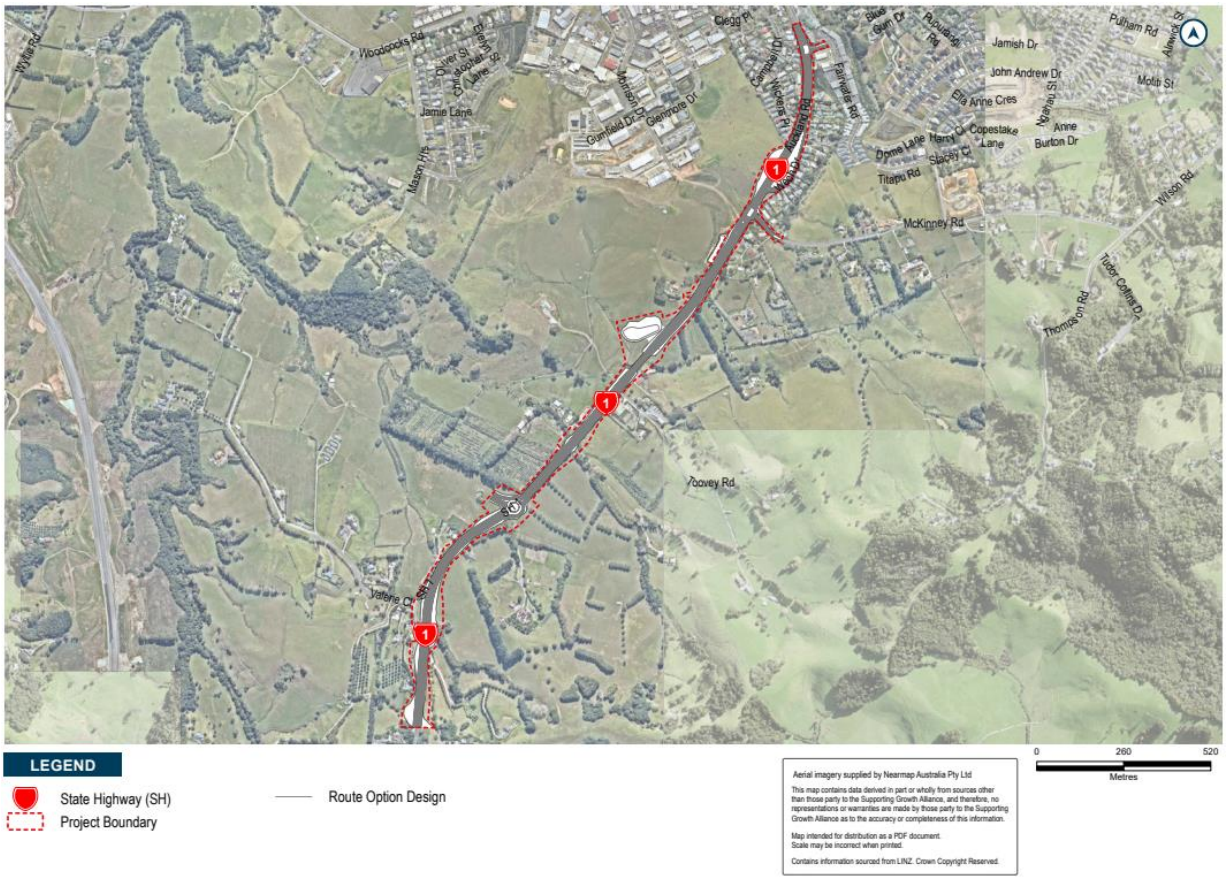
During the detailed design phase, the following refinements were made to the preferred option:

- Upon the review of the Revision A drawings of the proposed corridor upgrade, the proposed alignment centreline has been pulled back to the existing centreline to reduce impact on The Range Warkworth
- Impact on Morrison's Heritage Orchard to be minimised through construction of a retaining wall along the orchard's frontage. The project team considered widening the corridor to the east in this location to minimise impacts however it was identified that this would encroach further into the Warkworth South Plan Change area to the east. On balance, it was noted that providing a retaining wall along the frontage of the Morrison's Heritage Orchard was the preferred option whilst avoiding impact on the plan change area to the east of the corridor in this section.

5.2.7 Option Summary

Following the engagement and option refinement process the existing SH1 (southern section upgrade was confirmed and is illustrated below in Figure 5-6.

Figure 5-6. Existing SH1 (southern section)



5.3 NOR 3 Woodcocks Road

5.3.1 Corridor Overview

The IBC recommended option for the upgrade of Woodcocks Road to provide for an urban arterial cross section with active mode facilities is shown in Figure 5-7 below.

Figure 5-7. IBC Woodcocks Road Upgrade

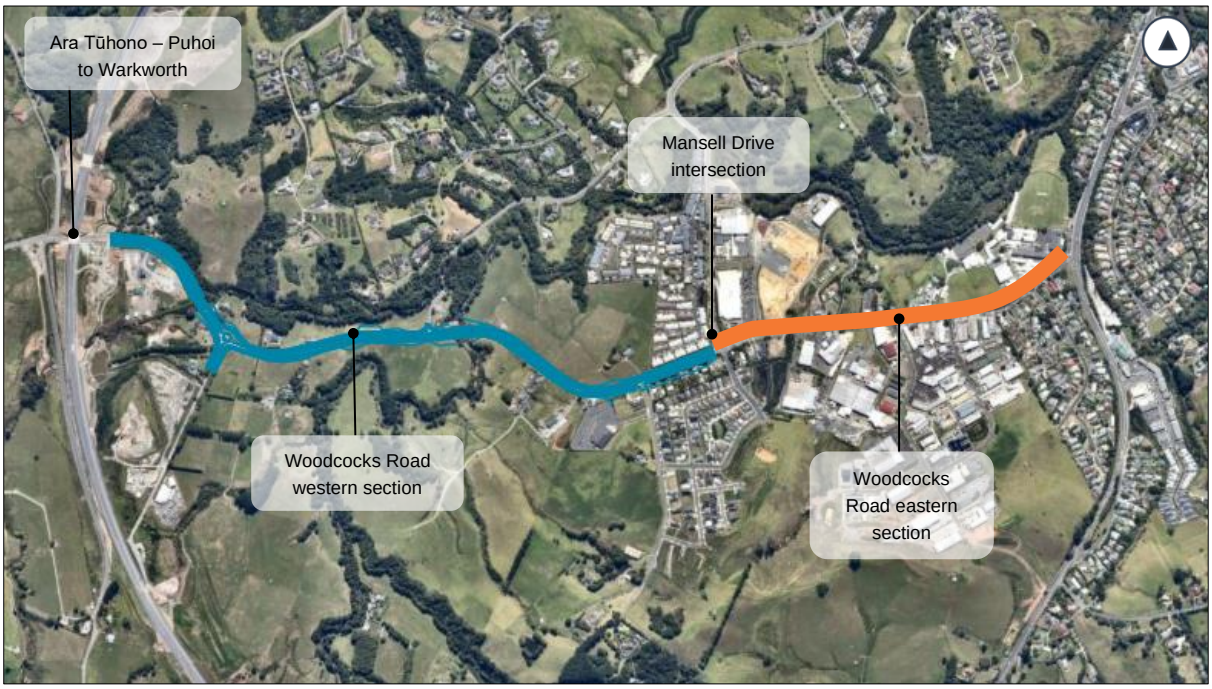
5.3.2 Gap Analysis

The gap analysis concluded that adequate corridor assessment was undertaken at the IBC phase and a need for further corridor assessment for Woodcocks Road was not required. The analysis recommended that the corridor should progress through route refinement for the upgrade of Woodcocks Road and consider the following:

- Changes in land use along the corridor – the eastern portion of the corridor consists of a relatively built-up environment adjacent to the industrial centre which changes to rural land use west of Mansel Drive.

Following the recommendations of the gap analysis the Project Team, as part of the option development process to give regard to land use variation along the corridor, split the corridor into two sections; a western ‘rural’ section extending from the Ara Tūhono intersection in the west to the Mansel Drive intersection in the east, and an eastern ‘urban’ section extending from Mansel Drive in the west to the corridor’s intersection with SH1 in the east (see Figure 5-8 below for section overview).

Figure 5-8. Woodcocks Road section overview



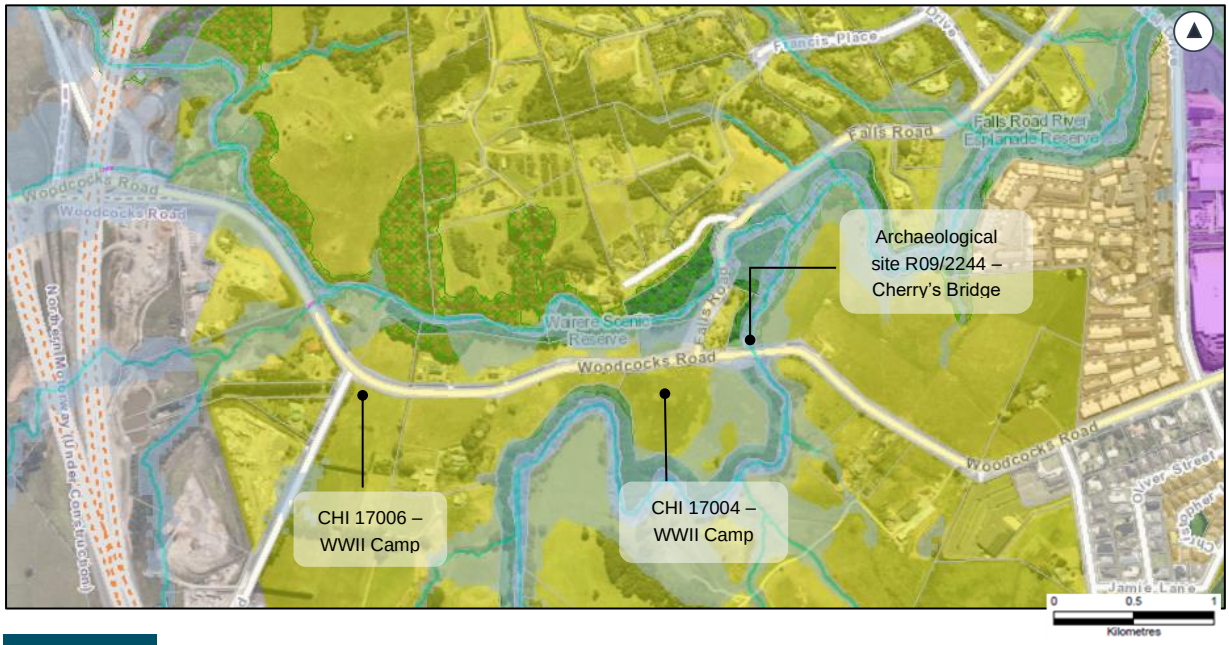
For the purpose of this report, the option development and assessment process for the eastern section of the corridor (from Mansel Drive intersection to SH1) will not be outlined in the following sections. The assessment outcome for the eastern section identified that upgrades would be completed for the section utilising the reallocation of road space within the existing road corridor due to the surrounding existing environment including industrial uses and Mahurangi College located north of the corridor. As a result, route protection via the NOR process is only required for the western section of Woodcocks Road.

5.3.3 Route: Option Development

In developing options for the western section of the corridor, the Project Team considered the following known key features mapped in Figure 5-9 below and include:

- Cultural heritage inventory and archaeological sites along the extent of the corridor
- Significant ecological areas to the north of the corridor
- Flood plains and areas of high flooding potential through the midsection of the corridor
- Open space conservation zoning adjacent to river / streams within the Woodcocks Road extent
- Open space informal recreational zoning within the Woodcocks Road extent.

Figure 5-9: Woodcocks Road Constraints Map

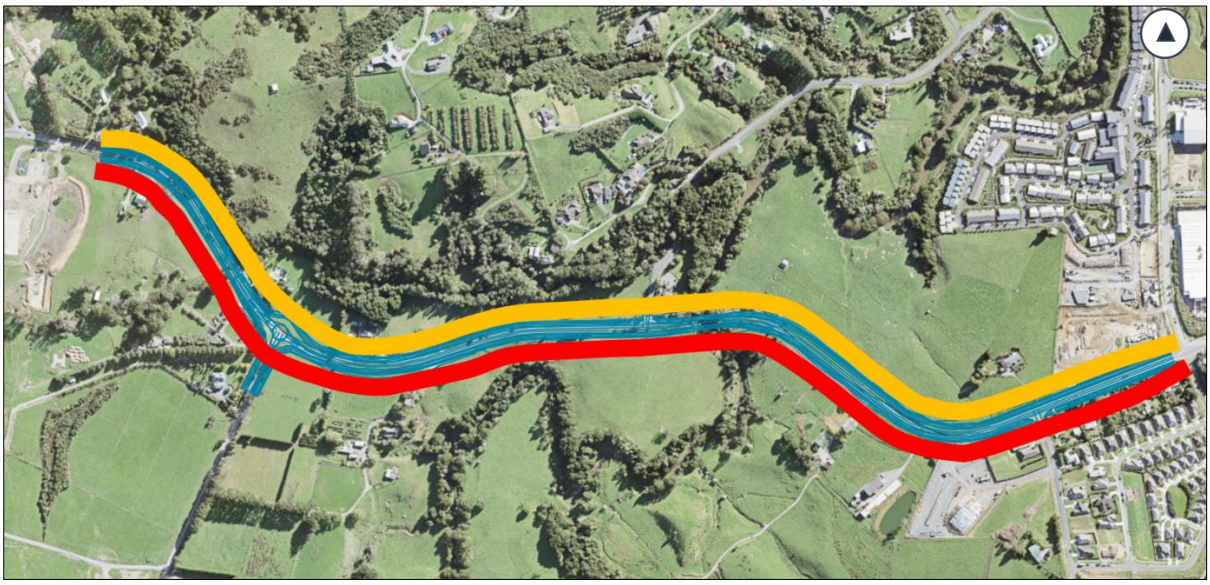


In consideration of the above factors, three options were developed through route refinement as outlined in Table 5-6 and Figure 5-10 below. These are discussed in the sections to follow.

Table 5-6: Woodcocks Road (western section) options

Option	Description
1	SGA 24m cross section – Holding centreline and widening equally on both sides
2	SGA 24m cross section – Widening to the south (hold northern boundary)
3	SGA 24m cross section – Widening to the north (hold southern boundary)

Figure 5-10. Woodcocks Road (Western Section) Options Developed



5.3.4 Route: Option Assessment

A route refinement assessment was undertaken for the western section of the corridor by the Project team. As outlined in Section 2, options were assessed against the Investment Objectives and criteria within four well-beings, cultural, social, environmental, and economic. The project team engaged in a workshop to undertake an assessment, placing each option on a gradual scale from 'Very High Adverse Effect' (red) to 'Very High Positive Impact' (green). As noted in Section 5.4 MCA in the route refinement phase was targeted, where there had previously been a corridor assessment of the project at the IBC phase and where there were no identified constraints under a specific criterion which required further consideration, this criterion was not revisited and is shown as N/A in Table 5-7 below.

The following table identifies the outcomes from this assessment.

Table 5-7: Woodcocks Road Upgrade Assessment (Western Section)

MCA Criteria	Option 1	Option 2	Option 3
I.O.1 – Access			
I.O.2 – Integration			
I.O.3 – Travel Choice			
Heritage			
Land use			
Land Requirement			
Stormwater			
Ecology			

MCA Criteria	Option 1	Option 2	Option 3
Construction impacts			
Construction disruption			
Urban Design	N/A	N/A	N/A
Social Cohesion	N/A	N/A	N/A
Human health and wellbeing	N/A	N/A	N/A
Landscape / Visual	N/A	N/A	N/A
Natural Hazards	N/A	N/A	N/A
Construction cost / risk	N/A	N/A	N/A

Overall, the assessment identified that all the options achieved investment objectives, all options support planned growth and enabled transport and land use integration. All options additionally improved the resilience of the network and supported reliable people movement through the provision of active mode amenities.

Due to a large upstream catchment of the Mahurangi River located in the central section of the corridor all options had the same stormwater and potential flooding risks with the key differentiators between the options being heritage, land requirement and ecology. Generally, option 3 had a higher overall adverse impact compared to option 1 and 2. The option of widening to the north has a greater potential impact on the heritage site (CHI 2244 Cherry's Bridge), will potentially have a higher amount of property acquisition, more adverse impact on the Open Space – Informal Recreational Zone, and impacts on the Open Space – Conservation Zone and SEA located along the northern extent of the corridor.

While option 1 and 2 are preferred to option 3, both options were assessed as having similar impacts. There is a slight variation in heritage impact based on Option 1 being in closer proximity to CHI 2244, with regard to land requirement, Option 2 has a more adverse land requirement impact as it will encroach further into properties however Option 1 has potential impacts on land use due to localised impacts on the Open Space – Informal Recreation Zone in the north and Conservation Zone that runs north-south through the midsection of the corridor. As there was only a slight variation between Option 1 and 2 the project team selected both options as the preferred options to progress to the detailed design stage for further refinement.

Table 5-8: Assessment outcome for the preferred option

Option	Assessment Outcome
1 (holding centreline and widening equally on both sides)	• Option has a lower adverse land requirement impact, widening equally on both sides potentially requires less full or partial property acquisitions, with reference to the existing residential area in the eastern section of the corridor, compared to Option 2 and 3 • Potential for the corridor to have localised adverse impacts on the Open Space – Informal Recreation Zone and SEA in the north (slightly greater than option 2), avoids impacts on stream, and Conservation Zone that runs north-south through the midsection of the corridor • Option has a potential impact on CHI 2244 (Cherry's Bridge) but to a lesser degree compared to Option 3 • Option results in requirement for less physical works as minimal widening of the existing pavement is required as such there is less construction

Option	Assessment Outcome
	disruption and embodied carbon associated to this option than option 1 and 3.
2 Widen to the south (hold northern boundary)	• Potential localised construction impacts only on the SEA, avoids stream and Open Space – Informal Recreation Zone to the north of the existing corridor • Potentially higher adverse land requirement and construction disruption impacts compared to Option 1 due to having a greater impact on an existing residential area to the south- of the eastern section of the corridor likely resulting in more full or partial property acquisitions • Potential moderate adverse impact on the Open Space Conservation – Zone to the south of the option • Option would require more physical works to the existing carriageway due to widening / rebuild of the existing pavement on the southern side as such there is more construction disruption and more embodied carbon associated to this option than option 1 • Option has less potential impact on CHI 2244 (Cherry's Bridge) compared to Option 1 and 3

Option 3 was discounted by the Project Team for reasons outlined in Table 5-9 below.

Table 5-9: Assessment outcomes for discounted option Woodcocks Road Upgrade (western section)

Option	Assessment Outcomes
3 SGA 24m cross section – Widen to the north (hold south boundary)	• Potentially higher adverse land requirement and construction impacts compared to Option 1 due to affecting an existing residential area, which includes an established retirement village complex, to the north of the eastern section of the corridor likely resulting in more full or partial property acquisitions • Potential moderate impacts on the SEA, stream and Open Space – Informal Recreation Zone to the north and Open-Space – Conservation Zone running north-south through the midsection of the corridor • Option would require more physical works to the existing carriageway due to widening / rebuild of the pavement on the northern side as such there is more construction disruption and embodied carbon associated to this option • Option has potential moderate adverse impact on CHI 2244 (Cherry's Bridge)

5.3.5 Engagement

The following section provides a summary of the project specific feedback received from engagement with Te Tupu Ngātahi partners, stakeholders, and community members.

Project	Feedback
Woodcocks Road Upgrade	• General agreement from all partners and stakeholders on the provision of a 24m wide corridor in the western section • Community members are supportive of walking and cycling facilities along the entire length of the corridor • During initial engagement the Ministry of Education requested that Mahurangi College and the future planned school at 100 Woodcocks Road be considered in any upgrade to the corridor by the Project team.

5.3.6 Option Refinement

Based on the outcome of the option assessment, at the design refinement stage a preferred alignment confirmed utilising the strongest components of the two preferred options. As a result, the corridor will generally be upgraded using centreline widening, where this impacts on the SEA and Open Space – Conservation Zone localised widening to the south will be utilised to minimise these impacts.

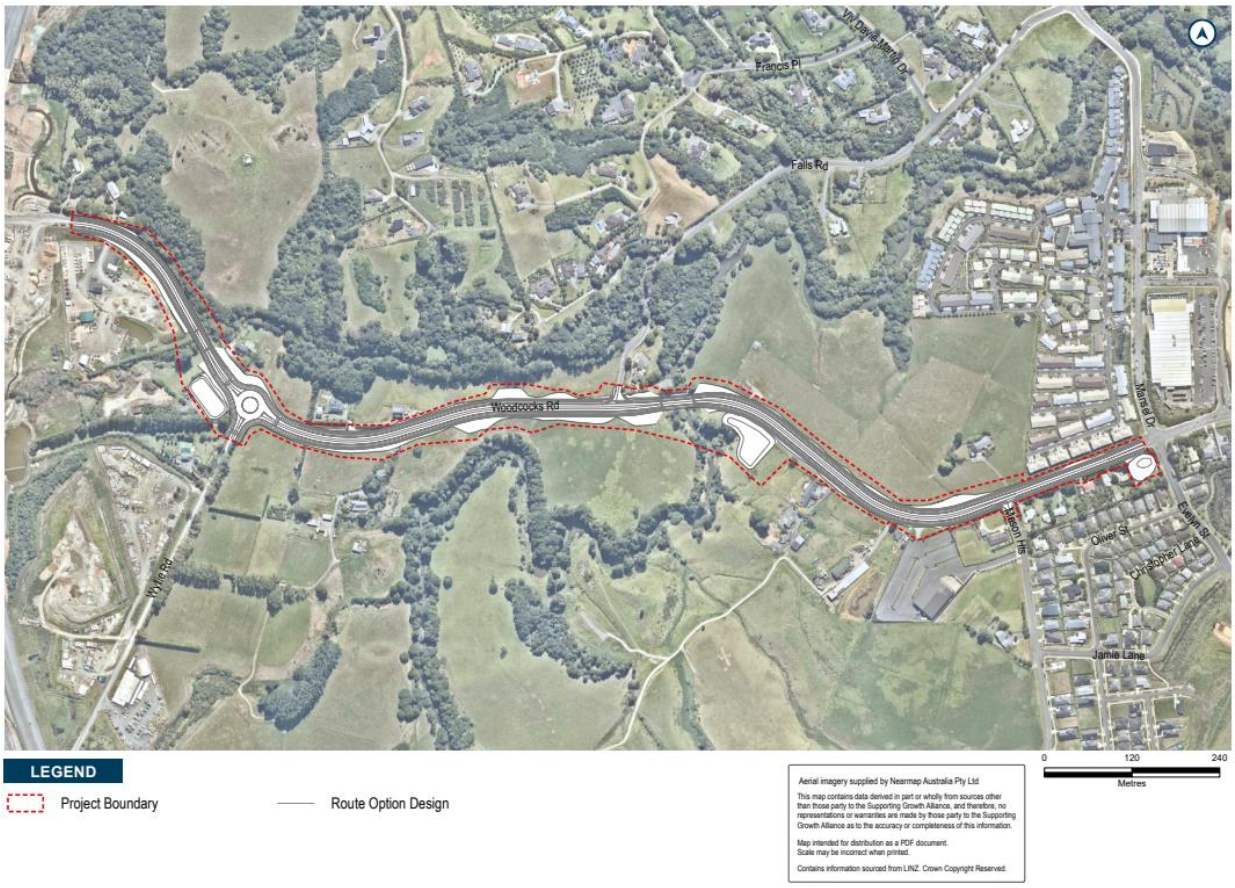
Feedback received from the Ministry of Education was applied to the option development and assessment process and the preferred option avoids property impact on the future planned school site (100 Woodcocks Road) with the implementation of cycling facilities and footpaths on both sides of the corridor supporting active mode user access to the planned school.

Upon the production of Revision A drawings, the project team identified the need to reduce the corridor width from 24m to 20m with the provision of walking and cycling amenities on both sides of the road on the eastern section of the corridor to reduce property and construction impacts on residential properties adjacent to the southern extent of the corridor in this section.

5.3.7 Option Summary

Following the option development and assessment process the preferred route refinement option for the upgrade of Woodcocks Road upgrade is shown below in Figure 5-11 below.

Figure 5-11: Preferred Route Refinement Option Woodcocks Road Upgrade (western section)

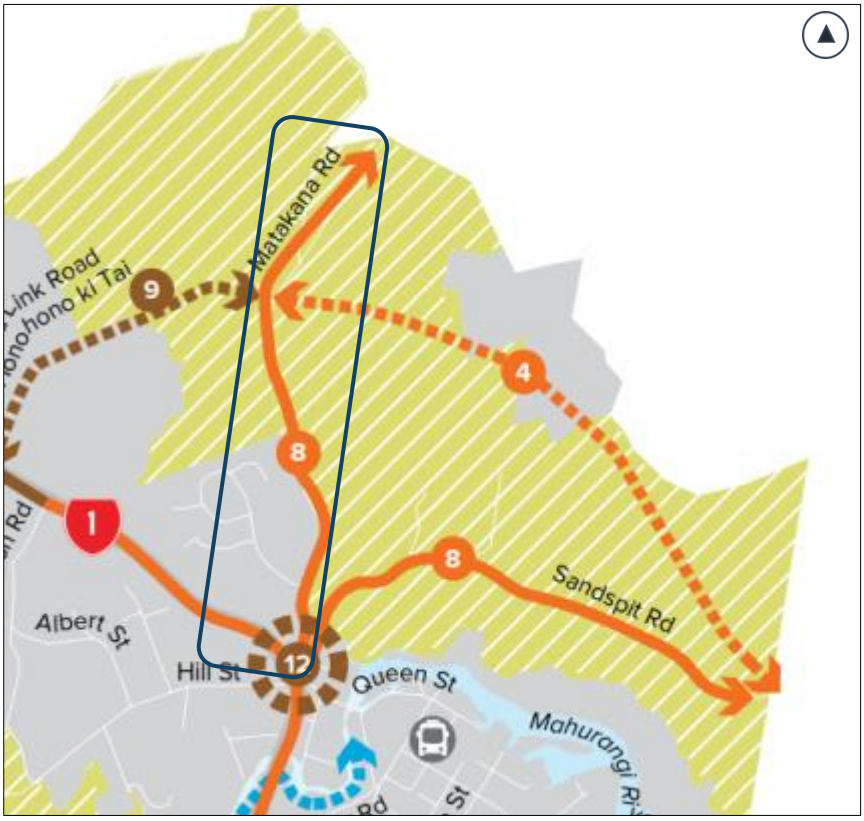


5.4 NOR 4 Matakana Road

5.4.1 Corridor Overview

The IBC recommended for the upgrade of Matakana Road to provide for an urban arterial cross section with active mode facilities is shown in Figure 5-12.

Figure 5-12: IBC Matakana Road Upgrade



Matakana Road is an existing corridor in the Warkworth transport network and forms a north south connection for all modes between the Warkworth growth areas and the Kōwhai Coast. An upgrade of Matakana Road to include walking cycling provisions will have the following outcomes:

- Improves accessibility for the northern growth area to access Warkworth Town Centre and schools
- Contributes to the development of a low carbon cycle network in Warkworth supporting area wide mode shift by completing a primary link in the network
- Contributes to improved active mode safety outcomes along the corridor
- Integration with the transport network and land use will contribute to a corridor with high quality urban form.

5.4.2 Gap Analysis

The gap analysis concluded that adequate corridor assessment was undertaken at the IBC phase and a need for further corridor assessment was not required for the upgrade of Woodcocks Road. The analysis recommended that the corridor should progress through route refinement and consider the following:

- Integration with the Auckland Transport (AT) Hill Street Intersection Upgrade including tie in point and extent of works required for the corridor
- Tie into Te Honohono ki Tai (Matakana Link Road) intersection.

5.4.3 Route: Option Development

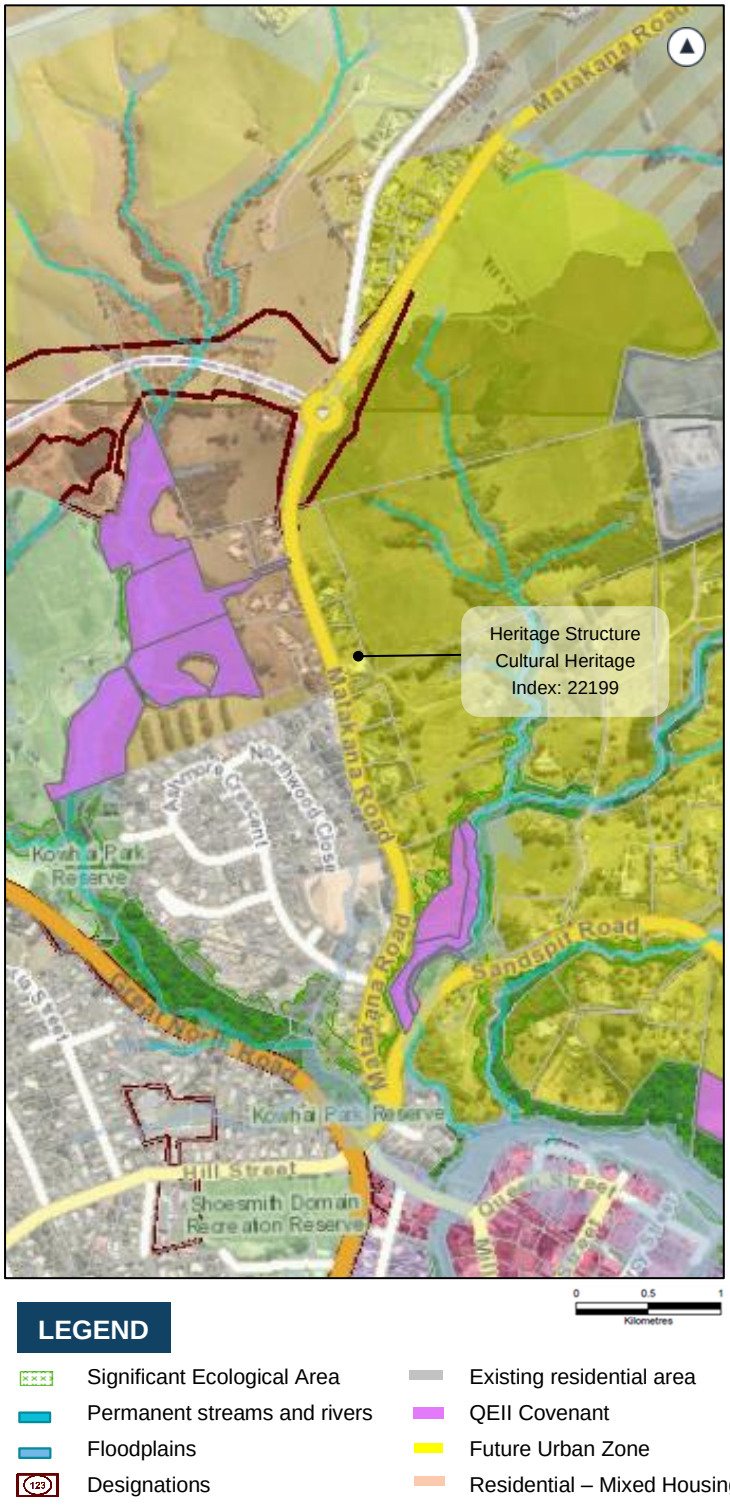
Options for the initial route refinement were generally limited to an area extending from the Matakana Road – Hill Street intersection in the south to the edge of the FUZ boundary for the following reasons:

a) The scope of Te Tupu Ngātahi is to provide for the upgrade and provision of new infrastructure within the future urban areas of Warkworth and this scope does not extend to the rural urban area outside of the FUZ boundary.

In developing options, the Project Team also considered current and future land uses, and the following known key features in the area. These are mapped in Figure 5-13 below and include:

a) Cultural heritage structure to the northeast of the corridor (CH1 2219)
b) A mixture of native and exotic woodland to the west of the corridor and cedar trees located to the southwest of the corridor
c) Overland flow path, flood plains, and SEA in the southern section of the corridor
d) Tie into the Hill Street Intersection Upgrade and Te Honohono ki Tai intersection
e) Te Honohono ki Tai designation
f) Existing urban area along the western length of the corridor
g) QEII covenant.

Figure 5-13. Matakana Road - Constraints Map

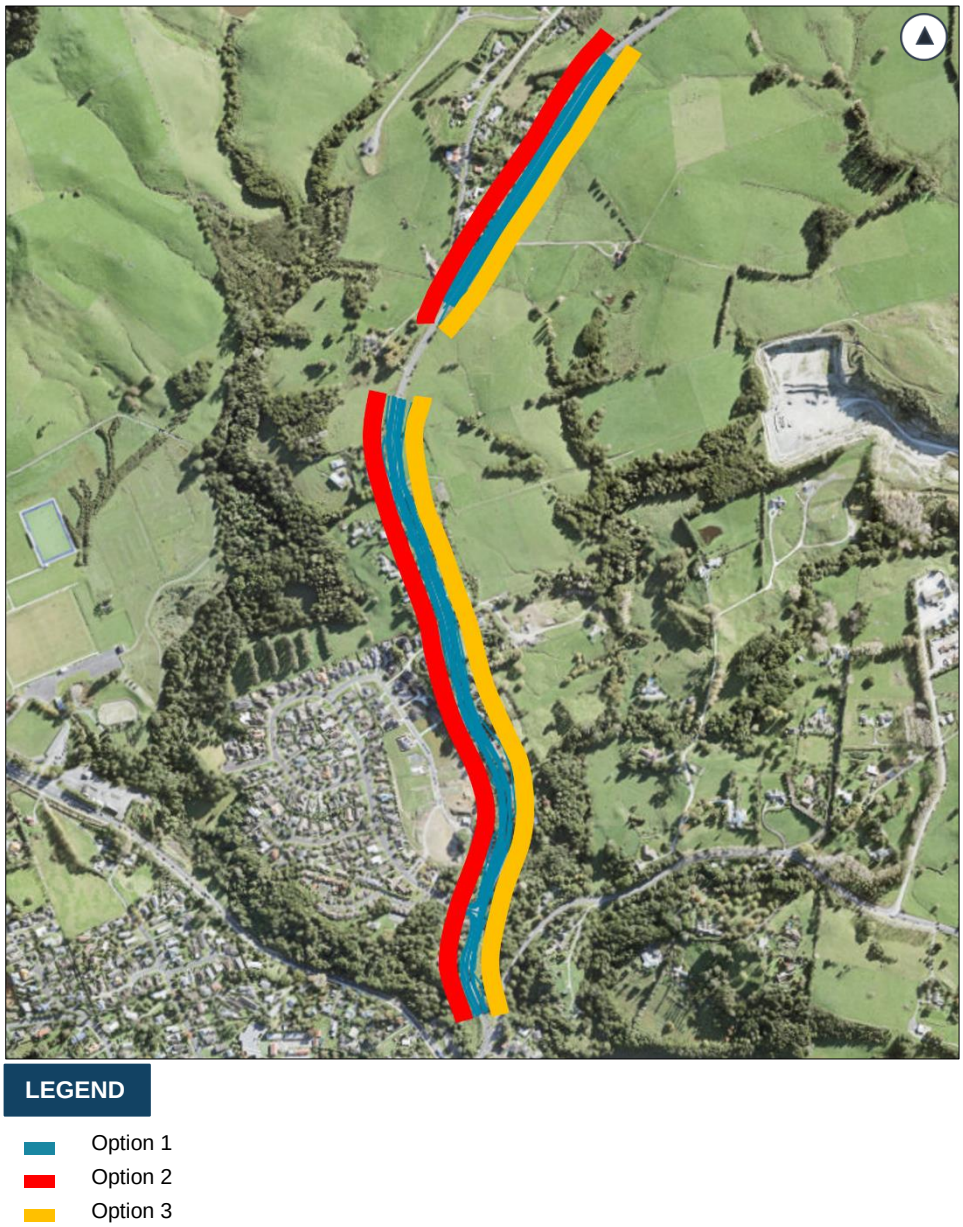


Three options were developed through route refinement as outlined in Table 5-10 and Figure 5-14 below. These are discussed in the sections to follow:

Table 5-10: Matakana Road Upgrade Options

Option	Description
1	SGA 24m cross section - Holding centreline and widening equally on both sides
2	SGA 24m cross section - Widen to the west (Hold eastern boundary)
3	SGA 24m cross section - Widen to the east (Hold western boundary)

Figure 5-14. Matakana Road Upgrade Options Developed



5.4.4 Route: Option Assessment

As outlined in Section 2, options were assessed against the Investment Objectives and criteria within four well-beings, cultural, social, environmental, and economic. The project team engaged in a workshop to undertake an assessment, placing each option on a gradual scale from 'Very High Adverse Effect' (red) to 'Very High Positive Impact' (green). As noted in Section 5.4 MCA in the route refinement phase was targeted, where there had previously been a corridor assessment of the project at the IBC phase and where there were no identified constraints under a specific criterion which required further consideration, this criterion was not revisited and is shown as N/A in Table 5-11 below.

Table 5-11 below provides a summary of the assessment outcomes for the Matakana Road Upgrade.

Table 5-11: Matakana Road Upgrade option assessment summary

MCA Criteria	Option 1	Option 2	Option 3
I.O.1 – Access			
I.O.2 – Integration			
I.O.3 – Travel Choice			
Heritage			
Land use			
Land Requirement			
Ecology			
Construction impacts			
Construction disruption			
Urban Design	N/A	N/A	N/A
Social Cohesion	N/A	N/A	N/A
Human health and wellbeing	N/A	N/A	N/A
Landscape / Visual	N/A	N/A	N/A
Natural Hazards	N/A	N/A	N/A
Stormwater	N/A	N/A	N/A
Construction cost / risk	N/A	N/A	N/A

Overall, all the options achieved the investment objectives and the differentiators between the three options were the level of land requirement, disruption of existing land use in existing urban areas, ecology, and heritage impacts. Of the three options, option 2 and 3 had the higher potential land requirement and impact on existing land use due to widening of the corridor to the east / west, in comparison although option 1 will have some impact with regard to these criteria the impact is to a lesser extent.

Additionally, option 2 and 3 had a higher adverse ecological impact of all three options due to the proposed widening of the corridor impacting on SEA and QEII to the southeast and SEA and mature woodland to the southwest. The project team noted that option 1 also had a potential impact on these ecological constraints but identified that the option could be refined the during the detailed design phase to avoid / reduce impacts on identified constraints.

Option 3 will additionally impact on the CHI located in the east of the central section of the corridor, Option 1 also potentially impacts on the CHI however the project team noted that this could be reviewed and refined during the detailed design phase to avoid / reduce impacts.

Overall, Option 2 and 3 have greater adverse impacts on the assessed criteria compared to Option 1. This is due to the proposed widening of the existing corridor to the east / west resulting in greater existing land use and land requirement impacts in addition to more impact on ecological features located in the southern section. Accordingly, the Project Team identified Option 1 as the preferred route refinement option for the reasons provided in Table 5-12 below.

Table 5-12: Assessment outcome of the preferred option

Option	Assessment outcomes
1 SGA 24m cross section - Holding centreline and widening equally on both sides	• Option has a lower adverse land requirement impact, widening equally on both sides potentially requires less full or partial property acquisitions compared to Option 2 and 3 through minimising impacts on existing residential zoned areas • Possibly reduces impacts on future land use along the western extent of the corridor as less encroachment onto the developable Residential - Mixed Housing Urban Zone is required • Potential impact on the CHI feature to the east of the central section can be considered and likely minimised during the detailed design phase, greater impact on setting than option 2 • Impacts of the option on constraints such as mature woodland to the southwest of the corridor and the SEA adjacent to the southeast and southwest of the corridor can be considered and minimised during the detailed design phase • Option results in requirement for less physical works as minimal widening of the existing pavement on either side of the corridor is required as such there is less embodied carbon associated to this option.

The remaining options were discounted by the Project Team for the reasons provided in Table 5-13 below.

Table 5-13: Assessment outcomes for the discounted options

Option	Assessment outcomes
2 SGA 24m cross section - Widen to the west (Hold eastern boundary)	• Option potentially has higher adverse land requirement and construction disruption impacts compared to Option 1 and 3 due to affecting a large existing residential area along the southwestern extent • Impacts on future land use along the western extent of the corridor due to encroachment into the Residential - Mixed Housing Urban Zone resulting in possible reductions of developable parcels and residual land • Potential impacts on CHI limited to localised construction effects on setting, avoids feature • Impacts on mature woodland and SEA to the southwest of the corridor • Option would require more physical works to the existing carriageway due to widening / rebuild of the pavement on the western side, as well as steep topography to the west of the corridor, as such there is more embodied carbon associated to this option.

Option	Assessment outcomes
3 SGA 24m cross section - Widen to the east (Hold western boundary)	• Option potentially has higher adverse land requirement and construction disruption impacts compared to Option 1 due to affecting existing residential properties in the central section of the corridor resulting in more full or partial property acquisitions • Impacts on SEA and QEII to the southeast of the corridor • Impacts on the CHI to the east of the central section • Option would require more physical works to the existing carriageway due to widening / rebuild of the pavement on the eastern side as such there is more embodied carbon associated to this option.

5.4.5 Engagement

Table 5-14 provides a summary of the project specific feedback received from engagement with Te Tupu Ngātahi partners, stakeholders, and community members throughout the option development and assessment process.

Table 5-14: Matakana Road upgrade engagement summary

Project	Feedback
Matakana Road upgrade	• Need to be aware of environmental areas identified as including native bush and existing sensitive areas • Consider support for dedicated walking and cycling facilities along the corridor and support for access to local facilities and town centres • General agreement of the principle to provide 24m road reserve on Matakana Road based on centreline widening • Community identified that the corridor was in poor condition and in urgent need for upgrade.

5.4.6 Option Design Refinement

Completion of further design works including the development of geometric designs which enabled the project team to review the detailed design of the corridor, confirmed that the preferred route refinement option (24m wide cross section utilising centreline widening) had adverse constructions impacts on environmental features (i.e. SEA) in the southern section of the corridor and property impacts along the southern section and mid length of the corridor due to topography adjacent to the corridor.

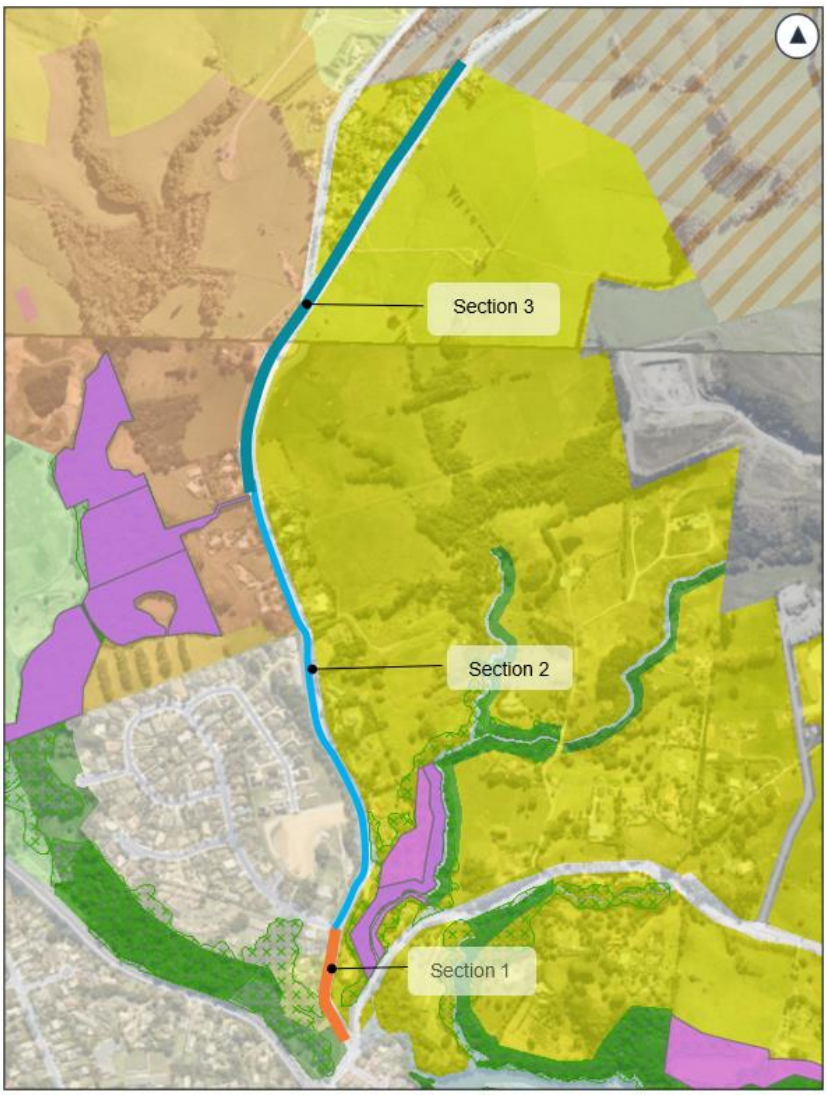
The design was subsequently refined to achieve improved land use outcomes and reduce impacts on the existing environment. These refinements did not compromise the proposed project's ability to achieve the investment objectives and continues to support mode shift to active modes through the provision of new, safe active mode facilities for the length of the corridor and new mode access to the Warkworth Town Centre and wider active mode network.

Through the refinement process due to the constraints and considerations within the corridor extent the corridor was split into three sections to better enable the project team to avoid and / or minimise impacts on the identified constraints specific to each section. The Matakana Road section extents are outlined below:

- **Section 1**: Hill Street intersection tie-in to Melwood Drive intersection
- **Section 2**: Melwood Drive intersection to the south of Te Honohono ki Tai (Matakana Link Road) intersection
- **Section 3**: South of the Te Honohono ki Tai (Matakana Link Road) intersection to north FUZ boundary.

Figure 5-15 below provides an overview of the Matakana Road option refinement sections.

Figure 5-15. Matakana Road – Option refinement sections



The following changes were made to the initial recommendation of a 24m wide cross section using centreline widening with cycle lanes and footpaths on both sides of the corridor:

- **Section 1:** Alignment reduced to a 17m wide cross section using centreline widening with bidirectional cycling on the western side between the Hill Street and Melwood Road intersection due to identified constraints and considerations including; integration (tie-in) with the (non-SGA) Hill Street intersection Project, the presence of SEA to the east of the corridor (with a QEII covenant area located further to the east), sloping topography immediately adjacent to the corridor, and existing single house zoned residential properties to the west of the corridor that appear

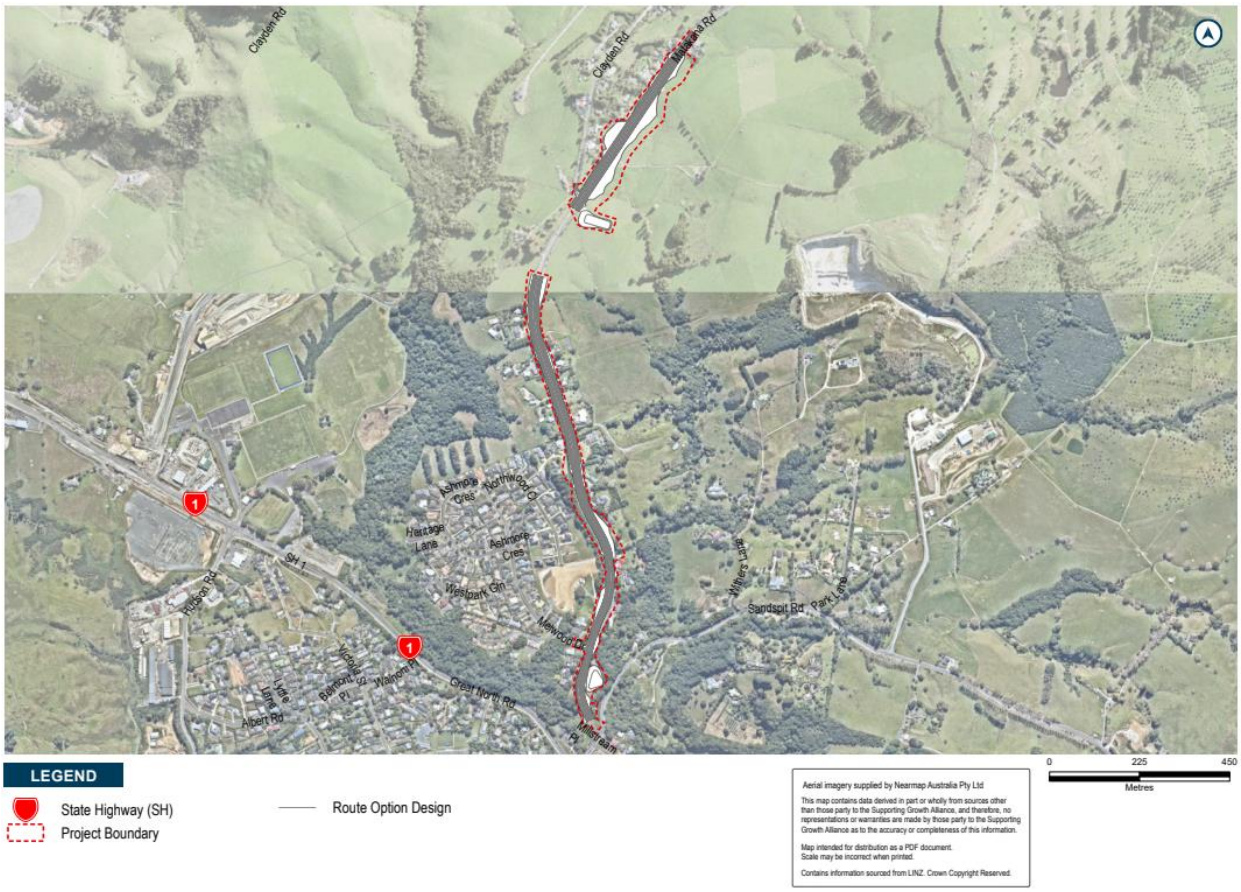
unlikely to be redeveloped as it is identified as an existing residential area in the Warkworth Structure Plan. A reduction in the cross section from 24m to 20m wide was tested however this still resulted in property and SEA impacts

- **Section 2:** Recommendation to widen to the west with a 20m wide cross section from Melwood Road to south of the Te Honohono ki Tai (Matakana Link Road) intersection, resulting in the need to straighten the corridor in some areas, due to the initial recommendation resulting in impacts to the FUZ and substantial property impacts on the recently established residential development to the west of the corridor, as a result of steep topography directly adjacent to the formed road. The project team tested a number of alternative options for this section to mitigate and reduce impacts including:
  - A reduced 20m wide cross section utilising centreline widening rather than the option to utilise a 20m wide cross section and widen to the west as noted above. However, this option was discounted as there is insufficient space for the corridor to be implemented, without resulting in the same or similar impacts on the FUZ and residential property, due the steep topography located to the west of the corridor
  - A 24m wide cross section utilising widening to the east only. However, this option was discounted as it still resulted in impacts to the west, as well as resulting in considerable impacts on the FUZ, while also impacting on the SEA and QEII covenant area located to the east of the corridor
  - The recommended refined option was identified as the best outcome for this section as the reduced 20m wide corridor will provide a suitable transition to and from the reduced 17m wide corridor to the south and into the 24m wide corridor to the north while achieving transport outcomes by providing for cycle lanes and footpaths on both sides of the corridor and reduce the previously adverse property impacts on west of the corridor
- **Section 3:** From south of Te Honohono ki Tai (Matakana Link Road) intersection to the northern extent of the project at the FUZ boundary the corridor will continue as a 24m wide cross section utilising centreline widening and will have cycle lanes and footpaths on both sides of the corridor. The initial corridor recommendation remains applicable to this section of the corridor as it does not have ecological, topographical, or residential constraints which require avoidance.

5.4.7 Option Summary

Following the engagement and option refinement process the Matakana Road upgrade was confirmed and is illustrated below in Figure 5-16.

Figure 5-16: Matakana Road upgrade

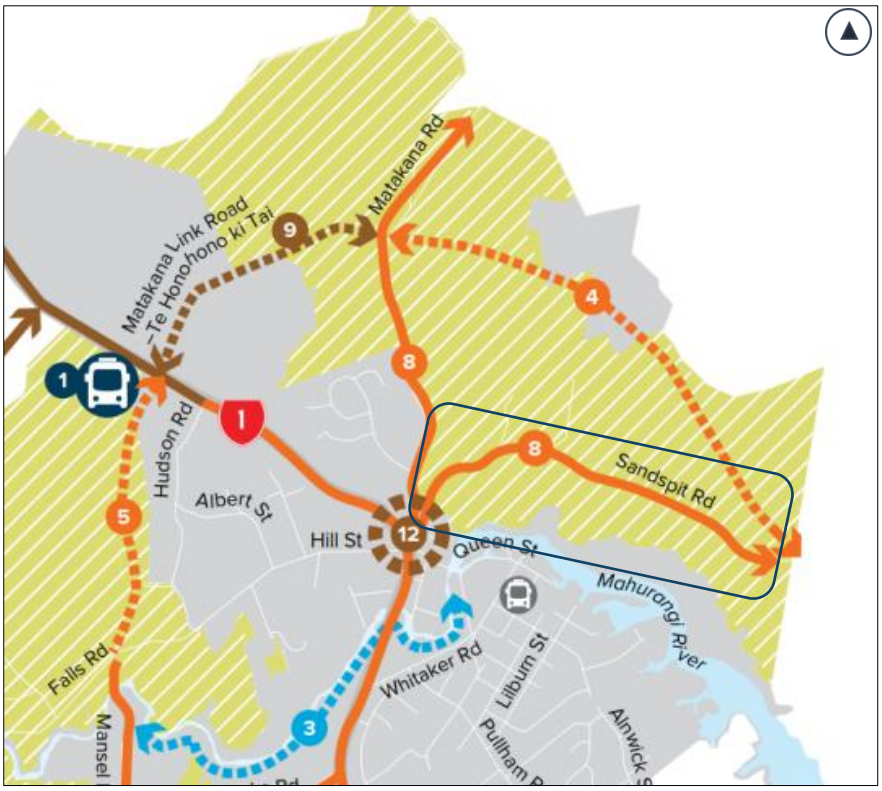


5.5 NOR 5 Sandspit Road

5.5.1 Corridor Overview

The IBC recommended option for the upgrade of Sandspit Road to provide for an urban arterial cross section with active mode facilities is shown in Figure 5-17.

Figure 5-17: Overview of Sandspit Road Upgrade



Sandspit Road is an existing corridor in the Warkworth transport network and forms a key east-west connection between the north-east Warkworth growth area and the Mahurangi Peninsula. An upgrade of Sandspit Road to include walking cycling provisions will have the following outcomes:

- Improve accessibility for active mode users to social and economic opportunities around Warkworth
- Contributes to development of a low carbon network in Warkworth
- The provision of active mode facilities supports area wide mode shift as well as contributing to improved safety outcomes along the corridor
- Integration with the transport network and land use will contribute to a corridor with high quality urban form.

5.5.2 Gap Analysis

The gap analysis confirmed adequate corridor assessment was undertaken at the IBC phase and a need for further corridor assessment was not required for the upgrade of Sandspit Road. The analysis recommended that the corridor should progress through route refinement and give consideration to the following:

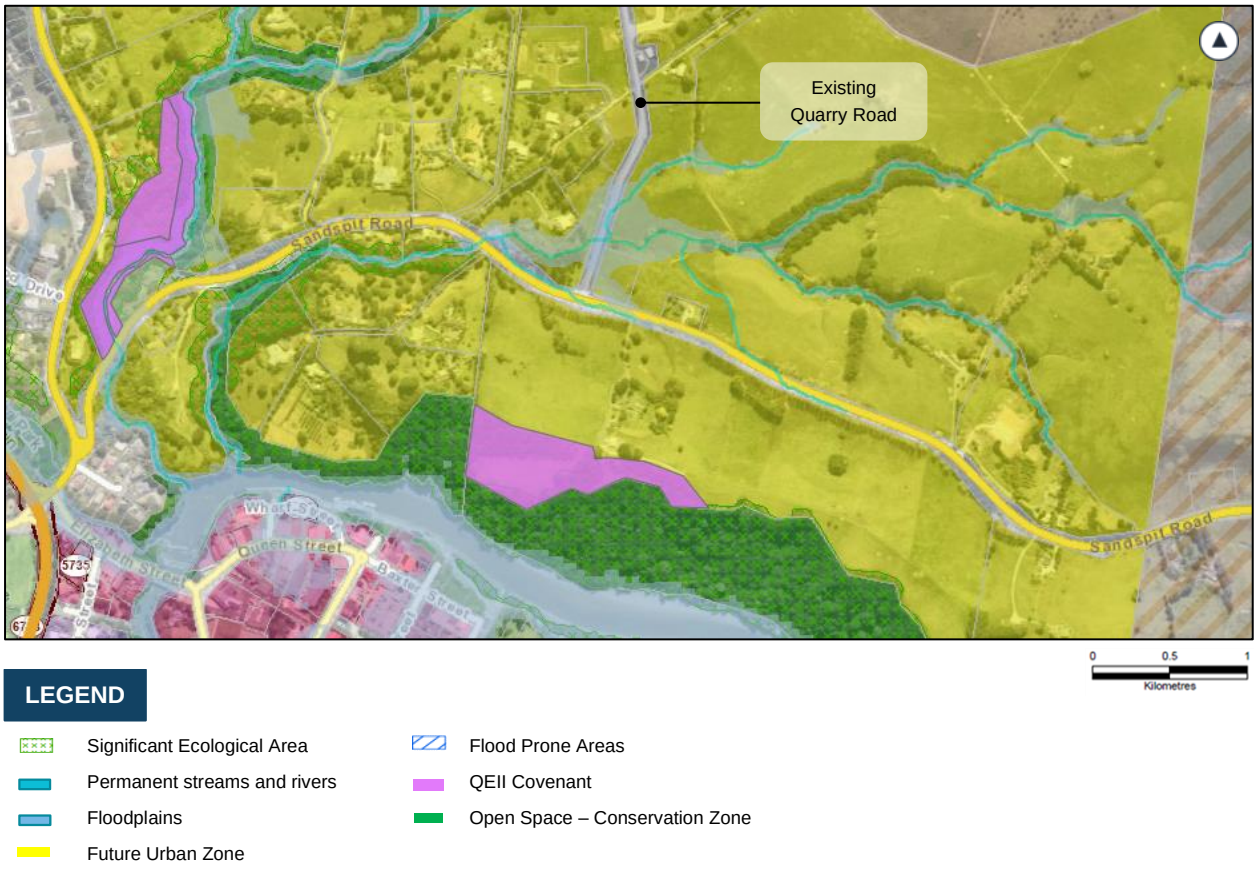
- Integration with the Auckland Transport (AT) Hill Street Intersection Upgrade including tie in point and extent of works required for the corridor.

5.5.3 Route: Option Development

In developing options, the Project Team considered the following known key features in the area in addition to future and current land uses within the corridor extent. These are mapped in Figure 5-18 below and include:

a) SEA to the north and south of the western extent of the corridor
b) Permanent streams and flood plains in the western extent of the corridor
c) Tie in with the Hill Street Intersection Upgrade and existing quarry road
d) Queen Elizabeth II (QE11) covenant to the north of the western section of the corridor
e) Open Space – Conservation Zone to the north and south of the western extent of the corridor
f) Steep topography and a large existing retaining wall.

Figure 5-18: Sandspit Road Constraints Map



In consideration of the above factors, three options were developed for route refinement as outlined in Table 5-15 and Figure 5-19 below. These are discussed in the sections to follow:

Table 5-15: Sandspit Road Upgrade Options

Option	Description
1	SGA 24m cross section - Holding centreline and widening equally on both sides
2	SGA 24m cross section - Widen to the north (Hold southern boundary)
3	SGA 24m cross section - Widen to the south (Hold northern boundary)

Figure 5-19. Sandspit Road Options Developed

5.5.4 Route: Option Assessment

As outlined in Section 2, options were assessed against the Investment Objectives and criteria within four well-beings, cultural, social, environmental, and economic. Technical specialists engaged in a full day MCA workshop to undertake an assessment, placing each option on a gradual scale from 'Very High Adverse Effect' (red) to 'Very High Positive Impact' (green). As noted in Section 5.4 MCA in the route refinement phase was targeted, where there had previously been a corridor assessment of the project at the IBC phase and where there were no identified constraints under a specific criterion which required further consideration, this criterion was not revisited and is shown as N/A in Table 5-16 below.

The following table identifies the outcomes from this assessment.

Table 5-16: Sandspit Road Upgrade option assessment summary

MCA Criteria	Option 1	Option 2	Option 3
I.O.1 – Access			
I.O.2 – Integration			
I.O.3 – Travel Choice			
Land use			
Land Requirement			
Stormwater			
Ecology			
Construction impacts			
Construction disruption			
Social Cohesion	N/A	N/A	N/A
Human health and wellbeing	N/A	N/A	N/A
Landscape / Visual	N/A	N/A	N/A
Natural Hazards	N/A	N/A	N/A
Construction cost / risk	N/A	N/A	N/A

The assessment identified that all options achieved the investment objectives. Due to a large floodplain located in the north-western extent of the corridor, the remainder of this floodplain running north-south through the western section of the corridor, and streams intersecting various sections of the corridor, all options were assessed as having potential flooding risks.

The key differentiators between the options were ecology, land requirement, and construction impacts / disruption. Due to widening north / south both option 2 and 3 had a moderate adverse impact on the SEA in the western and central sections of the corridor, more land requirement, and would cause greater disruption to the Open Space – Conservation Zone running north-south in the western section of the corridor.

The project team noted that option 1 could potentially impact on the SEA on the western and central section of the corridor, the QEII located on the northern extent of the western section and the Open Space – Conservation Zone but identified that these impacts could be reduced at the design refinement stage through consideration of utilising localised widening along the corridor where required. Accordingly, option 1 was identified as the preferred by the project team for the reasons identified in Table 5-17 below.

Table 5-17: Assessment outcome for the preferred option

Option	Assessment Outcome
1 SGA 24m cross section - Holding centreline and widening equally on both sides	• Minimises impacts on SEA and QEII located on the northern extent of the western section and the SEA in the central section • Lower potential adverse impacts on the Open Space – Conservation Zone running north-south through the western section of the corridor compared to Option 2 and 3 • Option has a lower adverse land requirement impact, widening equally on both sides potentially requires less full or partial property acquisitions compared to Option 2 and 3 with the topography adjacent to the corridor exacerbating impacts to the north and the south

Option	Assessment Outcome
	• Option results in requirement for less physical works as minimal widening of the existing pavement is required, and with option less impacted by topography adjacent to corridor, as such there is less embodied carbon associated to this option • Minimises impacts on streams and works required within floodplains adjacent to the corridor.

The remaining options were discounted by the Project Team for the reasons outlined in Table 5-18 below.

Table 5-18: Assessment outcomes for discounted options

Option	Assessment Outcome
2 SGA 24m cross section - Widen to the north (Hold southern boundary)	• Option potentially has higher adverse land requirement and construction disruption impacts compared to Option 1 due to affecting existing residential properties along the northern extent of the corridor • Impacts on the Open Space – Conservation Zone, QEII, and SEA to the northwest of the corridor • Option would require works in a large extent of the floodplains located adjacent to the central section of the corridor • Option would require more physical works to the existing carriageway due to widening / rebuild of the pavement on the northern side, and steep topography adjacent to corridor, as such there is more embodied carbon associated to this option.
3 SGA 24m cross section - Widen to the south (Hold northern boundary)	• Option potentially has higher adverse land requirement and construction disruption impacts compared to Option 1 due to affecting existing residential properties along the southern extent of the corridor • Impacts on the SEA located in the central section of the corridor as well as indigenous vegetation and stream which runs parallel to corridor to the southwest corridor section • Impacts on streams adjacent to the corridor along the southern extent and would require works in the stream in the southwestern section • Impacts on the Open Space – Conservation Zone to the southwest of the corridor • Option would require more physical works to the existing carriageway due to widening / rebuild of the pavement on the southern side, and steep topography adjacent to corridor as such there is more embodied carbon associated to this option.

5.5.5 Engagement

Table 5-19 below provides a summary of the project specific feedback received from engagement with Te Tupu Ngātahi partners, stakeholders, and community members.

Table 5-19. Sandspit Road upgrade engagement summary

Project	Feedback
Sandspit Road upgrade	• Strong support for the urbanisation of Sandspit Road and walking and cycling facilities • General agreement of the principle to provide 24m road reserve on Sandspit Road based on centreline widening • Community identified that the corridor was in poor condition and in urgent need for upgrade.

5.5.6 Option Refinement

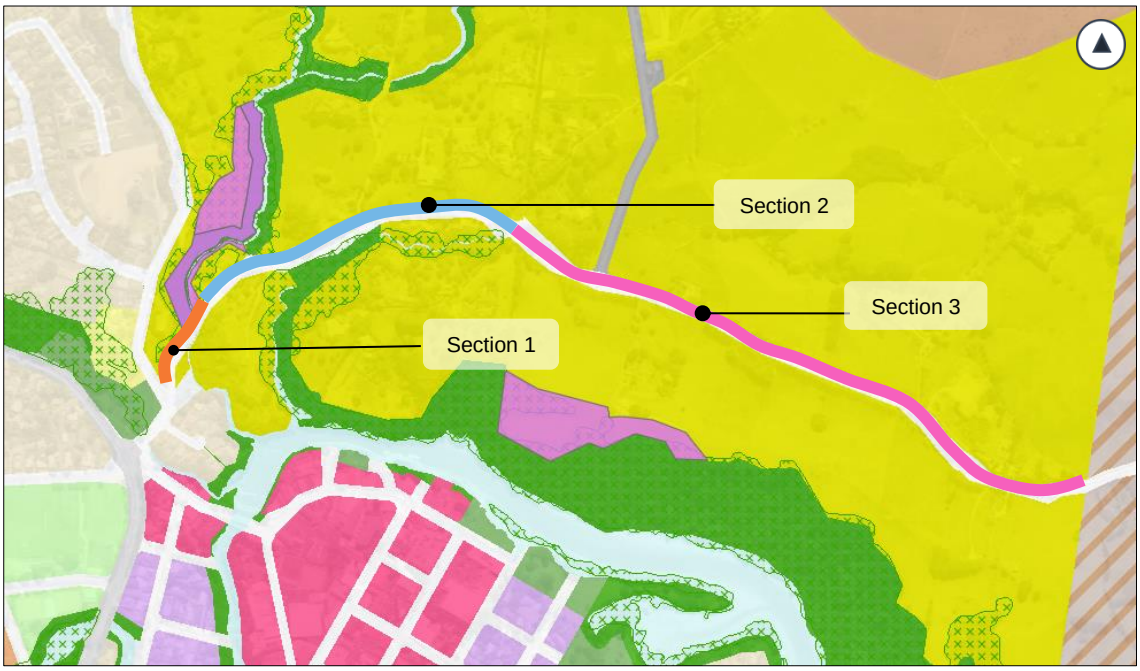
Completion of further design works including the development of geometric designs enabled the project team to review the detailed design of the corridor which identified that as a result of the need to provide for the upgrade to the existing stormwater culvert in the western section (Hill Street intersection tie-in to first existing bridge) to support the future resilience of the corridor, the preferred route refinement option would result in adverse construction impacts on SEA / QEII covenant and Open Space – Conservation Zone areas to the west of the corridor, and an existing stream parallel to the road on its southwestern extent which therefore made the recommended option inappropriate.

The Project team subsequently tested refinements to the design of the western section of the alignment to minimise, or avoid, impacts on these areas. Through this refinement process it was identified that due to the identified constraints and considerations there was a need to split the corridor into three sections to better enable the project team to avoid and / or minimise impacts on the identified constraints specific to each section. The sections are outlined below:

- **Section 1**: Hill Street intersection tie-in to after the first bridge (stream) crossing adjacent to SEA / QEII
- **Section 2**: First bridge to second bridge
- **Section 3**: Second bridge to eastern FUZ boundary.

An overview of the Sandspit Road sections is shown in Figure 5-20 below.

Figure 5-20. Sandspit Road Section Overview



The following refinements were applied to the initial corridor recommendation:

Section 1: Recommendation for a reduced 18m cross section from the Hill Street intersection to the first bridge, with an interim active mode boardwalk to the south of the corridor parallel to the road connecting to the Hill Street Intersection. Design works revealed that the initial recommendation of a 24m cross section would have a considerable impact on the SEA and stream network adjacent to the corridor, as well as the QEII covenant to the north, and result in high volumes of earthworks due to the steep topography. Additionally, it was identified that construction of the initial 24 cross section would require works to the existing stormwater culvert within the section resulting in adverse flooding effects downstream.

The recommended refined option was identified as the best outcome for this section of the corridor to respond to planned land use and achieve the urbanisation, resilience, and transport outcomes of the corridor and any other future urbanisation will occur within the existing road corridor.

The refined recommendation results in a reduced corridor cross section but continues to achieve investment objectives. The recommended refinement provides access by supporting mode shift to active modes through the provision of a new, safe active mode facility which increases travel choice and contributes to safety outcomes. An alternative option to widen to the east with a 150+ bridge was considered however was discounted due to the high cost and complex constructability associated with this option.

Section 2: A reduced 20m cross section with centreline widening from the first bridge to the second bridge to avoid impacts on the SEA on either side of the corridor and high volumes of earthworks associated with the topography and ease ties into section 1 and section 3 of the corridor.

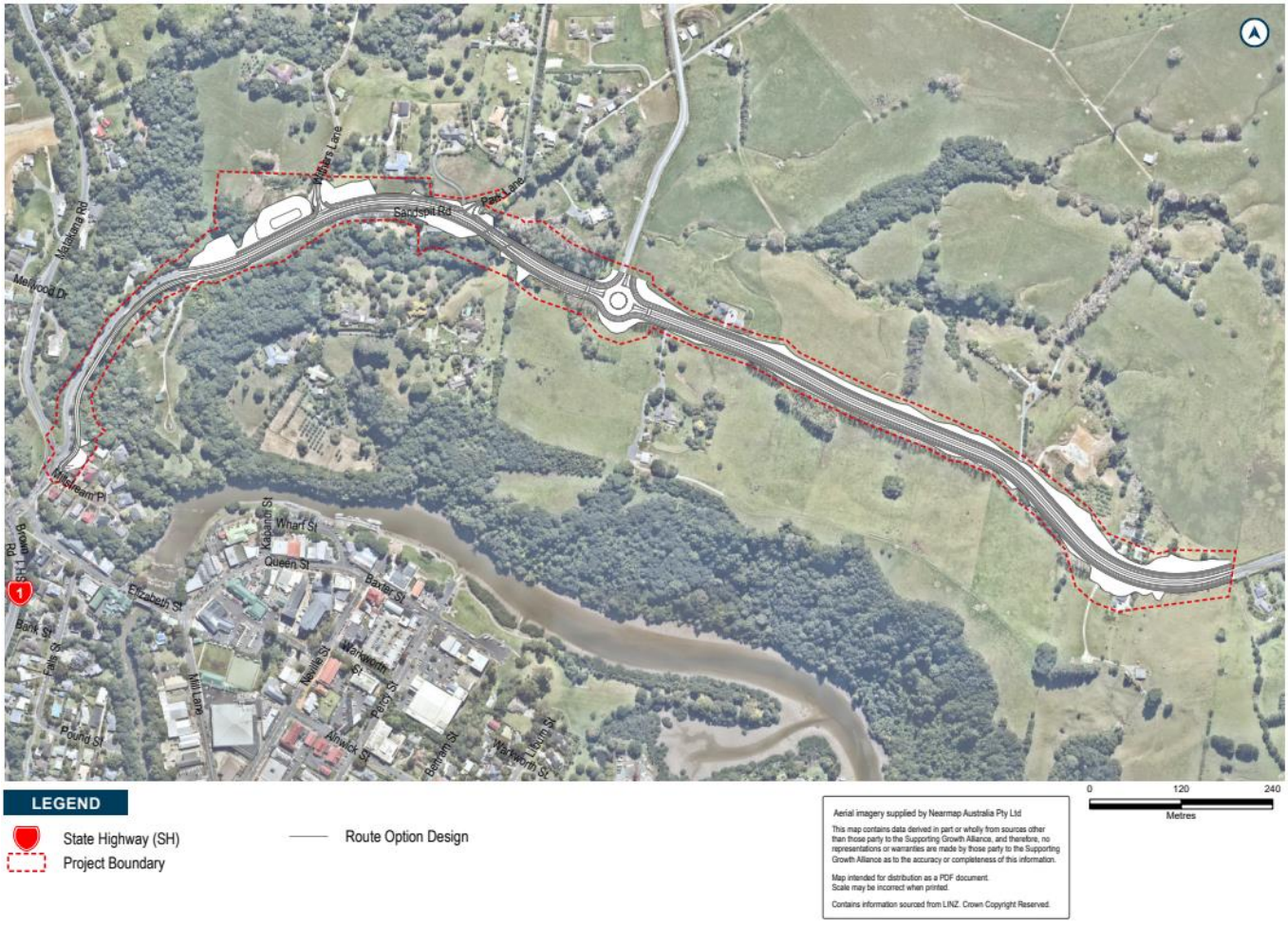
Section 3: From the second bridge to the eastern extent of the project at the FUZ boundary the corridor will continue as a 24m wide cross section utilising centreline widening and will have cycle lanes and footpaths on both sides of the corridor due to becoming less constrained through this

section. The initial corridor recommendation remains applicable to this section of the corridor as it does not have ecological, topographical, or residential constraints which require avoidance.

5.5.7 Option Summary

Following the engagement and option refinement process the Sandspit Road upgrade was confirmed and is illustrated below in Figure 5-21.

Figure 5-21: Sandspit Road upgrade

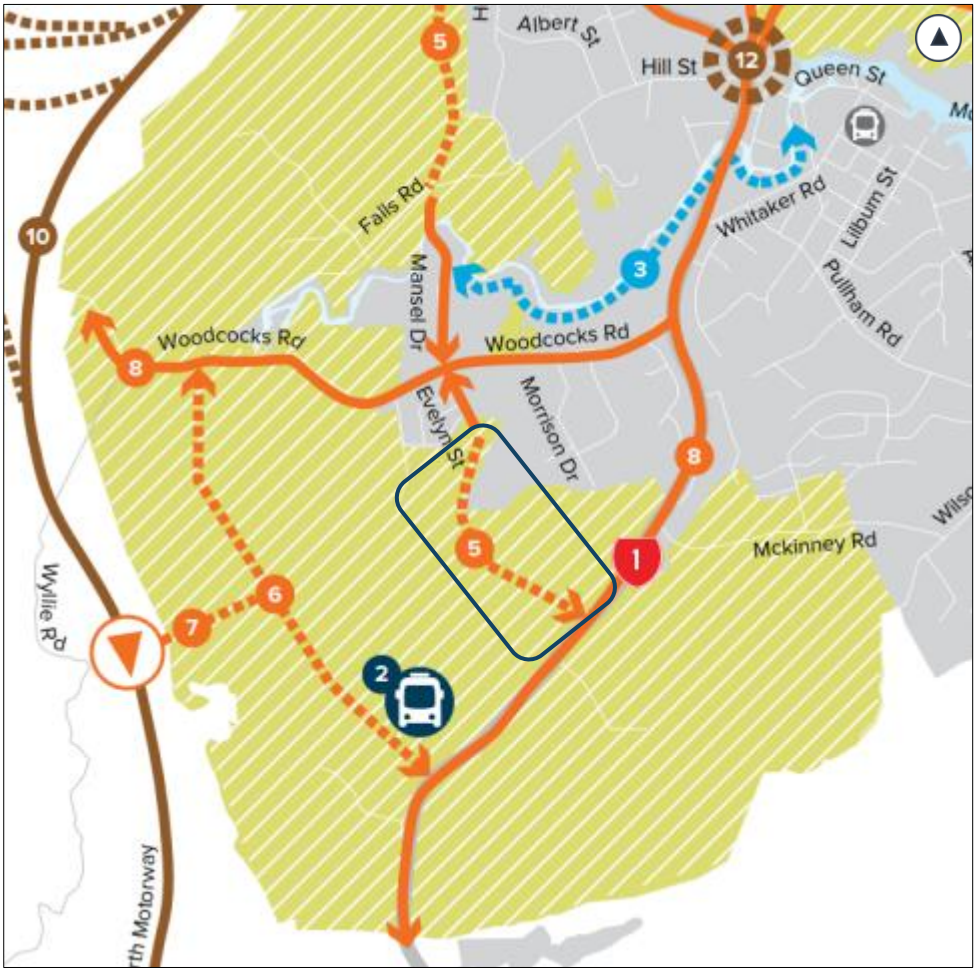


5.6 NOR 6 Western Link – South

5.6.1 Corridor Overview

The IBC recommended option for the new Western Link – South including an urban arterial cross section with active mode facilities is shown in Figure 5-22 below.

Figure 5-22: IBC Western Link - South



The Western Link – South is a proposed new corridor with the purpose of providing connectivity between the southern and northern Warkworth growth areas. The corridor is anticipated to improve network efficiency and integrate with and support the planned urban growth and future transport network in Warkworth.

5.6.2 Gap Analysis

The gap analysis concluded that the Western Link – South should undergo further optioneering through the corridor assessment process. This was due to new corridor alignments being suggested by landowners through engagement, and the following constraints being identified as part of early constraints mapping:

- Pohutukawa grove significant to the landowner in the north-eastern section of the study area
- Large flood plain in the south-eastern section of study area near SH1 and ecological features within the study area i.e., wetlands

- A new landowner dwelling within the study area
- Finalised Warkworth Structure Plan as the IBC was informed by the draft Warkworth Structure Plan.

5.6.3 Route: Option Development

For the purposes of option development, the corridor was split into two segments (as shown in Figure 5-23 below).

a) Northern segment: Corridor located between the tie in with Evelyn Street to the southern extent of the industrial zone
b) Southern segment: Corridor located between the boundary with the industrial zone and SH1.

The segments for the corridor were identified based on the presence of live zoned industrial land and the Project Team being made aware of existing developer / landowner activity in the north, including existing lodged consents. Corridor segmentation allowed for the specific characteristics of each section to be given due consideration, and the flexibility to respond to these, through the option development process.

Figure 5-23: Western Link - South section overview

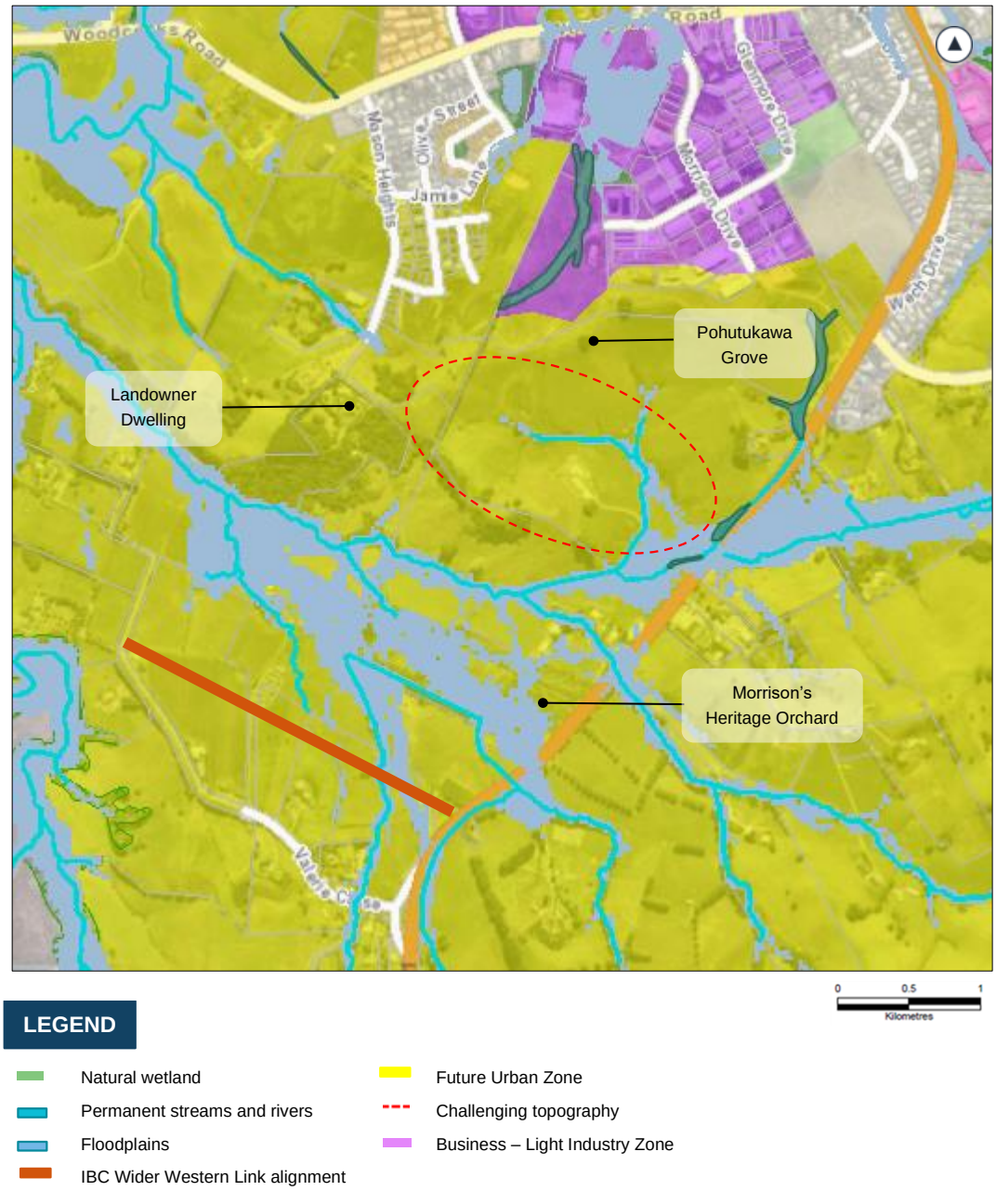
Options for the initial corridor assessment were limited to an area extending from Evelyn Street in the north to SH1 in the south and southeast for the following reasons:

a) Enables development in the south-west Warkworth
b) Provides a direct through onto Mansel Drive and Te Honohono ki Tai
c) Relieves pressure off the eastern section of Woodcocks Road (between Mansel Drive and existing SH1).

In developing options, the Project Team also considered the following known key features in the area. These are mapped in Figure 5-24 below and include:

- Presence of large flood plains and permanent streams to the south
- Pohutukawa grove – significant to landowner and indicatively identified in the Warkworth Structure Plan as an area of open space
- Challenging topography
- Landowner dwellings
- Proximity to the Wider Western Link and Morrison's Heritage Orchard.

Figure 5-24. Western Link - South Constraints Overview



In consideration of the above factors, five options including the IBC option were developed for corridor assessment as outlined in Table 5-20 and Figure 5-25 below. These are discussed in the sections to follow.

Table 5-20: Western Link - South options long list

Option	Description
1	McKinney Road connection / Landowners revised preferred option
2	Landowner indicatively proposed alignment
3	Southern SH1 connection (north of IBC SH1 connection and flood plains)
4	IBC Alignment
5	IBC SH1 connection with refined alignment

Figure 5-25: Western Link - South long list options overview

Constraints mapping for this project was completed in conjunction with the initial option development process. During this process, an option south of the IBC alignment (shown as Option 4 in the above figure) was considered but discounted for the following reasons prior to progressing through to the corridor assessment phase.

a) Proximity of the option, notably the SH1 connection to the Wider Western Link
b) Proximity to flood plain SH1 intersection likely located in major flood plain
c) Is a longer route to connect back to more northern SH1 connections.

5.6.4 Route: Option Assessment

As outlined in Section 2.3, options were assessed against the Investment Objectives and criteria within four well-beings, cultural, social, environmental, and economic. Technical specialists engaged

in a full day MCA workshop to undertake an assessment, scoring each option on a gradual scale from 'Very High Adverse Effect' (red) to 'Very High Positive Impact' (green).

The following table identifies the outcomes of this assessment.

Table 5-21: Western Link - South MCA assessment summary

MCA Criteria	Option 1	Option 2	Option 3	Option 4	Option 5
I.O.1 – Access					
I.O.2 – Integration					
I.O.3 – Travel Choice					
I.O.4 – Resilience					
Heritage					
Land use					
Urban Design					
Land Requirement					
Social Cohesion					
Human health and wellbeing					
Landscape / Visual					
Stormwater					
Ecology					
Natural Hazards					
Construction impacts					
Construction disruption					
Construction cost / risk					

The Project Team reviewed and compared the options identified above and noted that all options generally scored positively in relation to the investment objectives, land use, and urban design outcomes.

Key differentiators between the options were the extent of impact the options would have on ecological, landscape, stormwater, and construction outcomes. Whilst all the options had some degree of adverse impact on these outcomes, Option 4 and 5 had a higher potential adverse ecological impact compared to the other options. Similarly, Options 1 to 3 had a higher potential construction cost / risk in comparison to the other options but were also assessed as having lower adverse social cohesion impacts.

The MCA scoring did not show a clear preferred option for the whole alignment. The technical specialists and project team preferred the southern section of Option 1 and the northern section of Option 4 and identified an opportunity to create a hybrid option utilising the preferred sections of each option to address the differing constraints within the extent of the corridor.

The remaining options were discounted by the Project Team for the reasons provided in Table 5-22 below.

Table 5-22: Assessment outcomes for discounted Western Link - South options

Option	Assessment outcomes
2 Landowner indicatively proposed alignment	• Northern section of the option severs existing industrial land and southern section runs through the centre of future urban zoned land • Provides low positive contributions to amenity and quality values • Impacts on streams and wetlands.
3 Southern SH1 connection (north of IBC SH1 connection and flood plains)	• Located within proximity to the flood plain • Provides low positive contributions to amenity and quality values • Impacts on streams and wetlands but to a lower extent then Option 2 • Option severs existing industrial land in the northeast of the alignment.
5 IBC SH1 connection with refined alignment	• Southern section of the alignment provides a less direct connection to central and eastern future urban zoned land • Northern section of the alignment cuts through existing industrial land and results in residual existing industrial land being located on the western side of the corridor • Provides low positive amenity and quality values • Crosses three permanent streams and the southern section of the alignment is located within the floodplain near SH1.

Following the identification of the preferred options, the Project Team identified matters to further consider to create a hybrid option of the abovementioned options as follows:

a) Shifting the northern section of the Option 1 alignment west to minimise impacts on existing industrial land
b) Shifting the southern section of the Option 4 alignment to the east to avoid floodplains, wetlands, and the landowner dwelling
c) Consider alternative intersection location to account for safety sight line issues for the SH1 intersection.

As noted above, following the identification of the preferred options for the northern and southern sections of the Western Link – South, a hybrid option of option 1 and 4, Option 6, was developed by the project team for further assessment. The option details and refinement outcomes for Option 6 are outlined and shown in Table 5-23 and Figure 5-26 below.

Table 5-23: MCA Refined – Option 6 (refined Option 1 and Option 4)

Option	Refinement outcomes
6 (hybrid of Option1 and 4)	• Option sleeves around the existing industrial area and forms a boundary (buffer) between the industrial area and FUZ land • Avoids the large flood plain and wetlands

Option	Refinement outcomes
	• The southern connection point with SH1 is in a safe location and addresses safety sightline concerns, without the need for SH1 corridor works.

Figure 5-26. Overview of Western Link - South Option 6

Once the refined option was developed and loaded onto the Te Tupu Ngātahi GIS viewer, the project team and technical specialists participated in an MCA workshop to assess and score the option against the MCA criteria.

Table 5-24 below identifies the outcomes of the assessment

Table 5-24: Western Link - South Option 6 MCA summary

MCA Criteria	Option 6
I.O.1 – Access	
I.O.2 – Integration	
I.O.3 – Travel Choice	
I.O.4 – Resilience	
Heritage	
Land use	
Urban Design	
Land Requirement	
Social Cohesion	
Human health and wellbeing	
Landscape / Visual	

MCA Criteria	Option 6
Stormwater	
Ecology	
Natural Hazards	
Construction impacts	
Construction disruption	
Construction cost / risk	

The Project Team reviewed the option identified above and noted it achieved investment objectives, and land use and urban design outcomes. The team also identified that the option still impacted on an identified heritage feature within the corridor extent and remained in close proximity to the Pohutukawa grove identified as significant to the landowner. The option was however assessed as having a decreased ecological impact, in that it had the lowest level of wetland interaction and avoided majority of the flood plain effects associated with the other options. Additionally, the northern section of the alignment improved urban design outcomes by forming a boundary (buffer) between the FUZ and existing industrial area. Accordingly, the Project Team identified Option 6 as the preferred option for the reasons specified in Table 5-25 below.

Table 5-25. Assessment outcome for the preferred option

Option	Assessment Outcome
6 (hybrid of Option1 and 4)	• Sleeves FUZ and industrial zoning and prevents severance of the existing industrial land • The buffer between future residential and industrial land uses provides an appropriate transition between existing and planned industrial land and future residential land • Avoids key ecological features and floodplains • Southern connection point with SH1 is an acceptable transport outcome.

5.6.5 Engagement

Table 5-26 below provides a summary of the project specific feedback received from engagement with Te Tupu Ngātahi partners, stakeholders, and community members.

Table 5-26: Western Link - South engagement summary

Project	Feedback
Western Link – South	• General agreement from Auckland Council with the proposed emerging preferred option – the alignment forming a buffer between industrial land and future residential was strongly supported • There is a preference for the Pohutukawa grove to be avoided as it is significant to the landowner • Project team to consider difficult terrain and topography in the design phase • Concerns around the proximity of the emerging preferred SH1 intersection to the existing McKinney, and potential operational and safety concerns resulting from this.

5.6.6 Option Refinement

In consideration of feedback received through engagement, the project team completed further investigations in relation to the location of the preferred SH1 intersection and identified opportunities for design refinements with the purpose of further minimising potential impacts of the emerging preferred option.

Table 5-27 below outlines the refinements completed and outcomes.

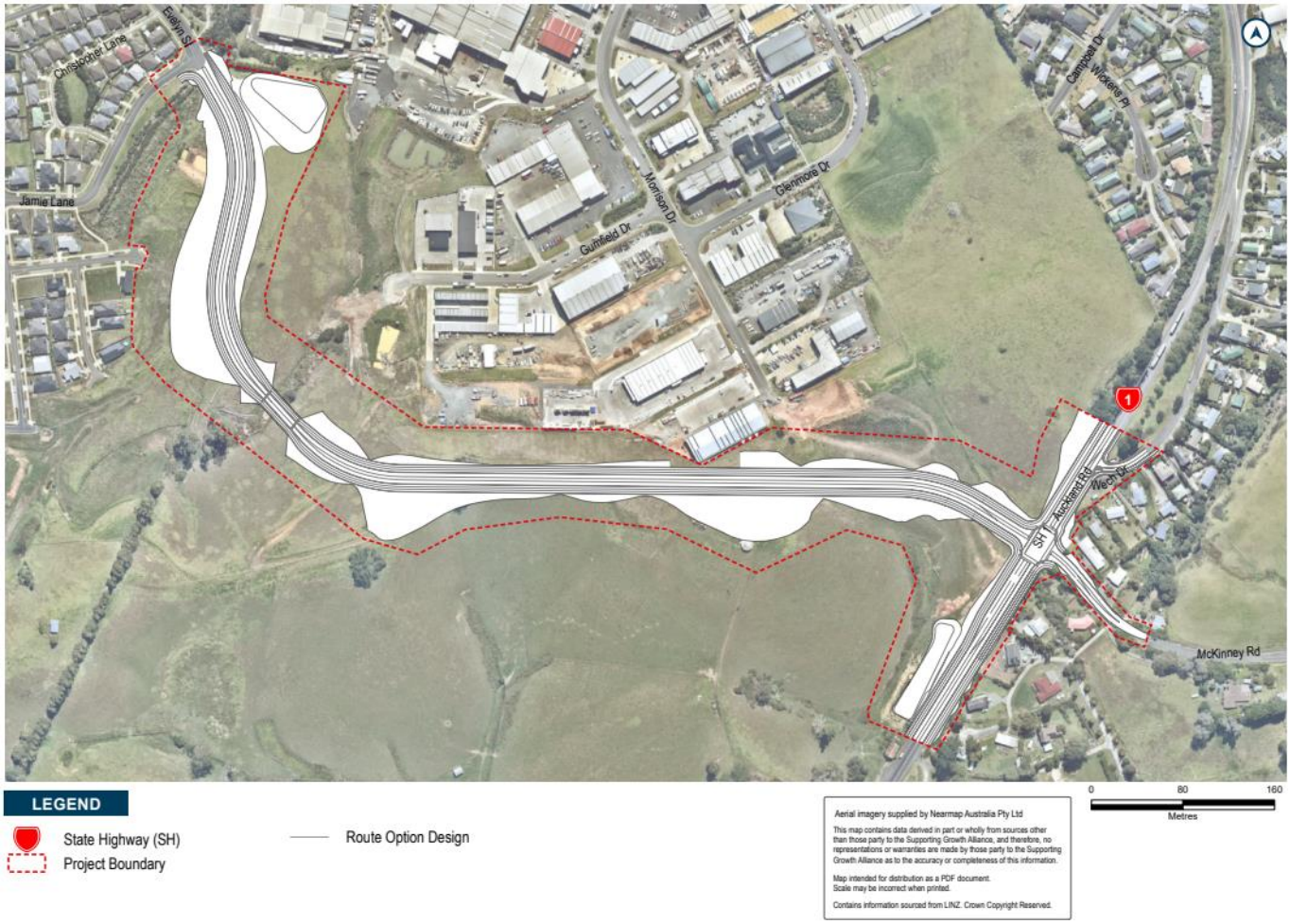
Table 5-27: Post Engagement Refinement

Option	Refinement outcomes
6A	• Alignment has been shifted to minimise impact on wetlands and floodplains and avoids impacting on the Pohutukawa grove • Alignment has been shifted west further into the future urban zoned land to further minimise impact of the alignment and earthworks on existing and future industrial land use • Alignment has been adjusted to utilise the existing SH1 intersection connection at McKinney Road to avoid conflict between a new intersection (as proposed by the emerging preferred option) in close proximity to the existing, while providing improved east-west connectivity across SH1 • Note: Further investigation confirmed that sight distance on SH1 issue is able to be improved through corridor improvement works.

5.6.7 Option Summary

Following the engagement and option refinement process the Western Link - South alignment was confirmed and is illustrated below in Figure 5-27.

Figure 5-27: Western Link – South Refined Recommended Option

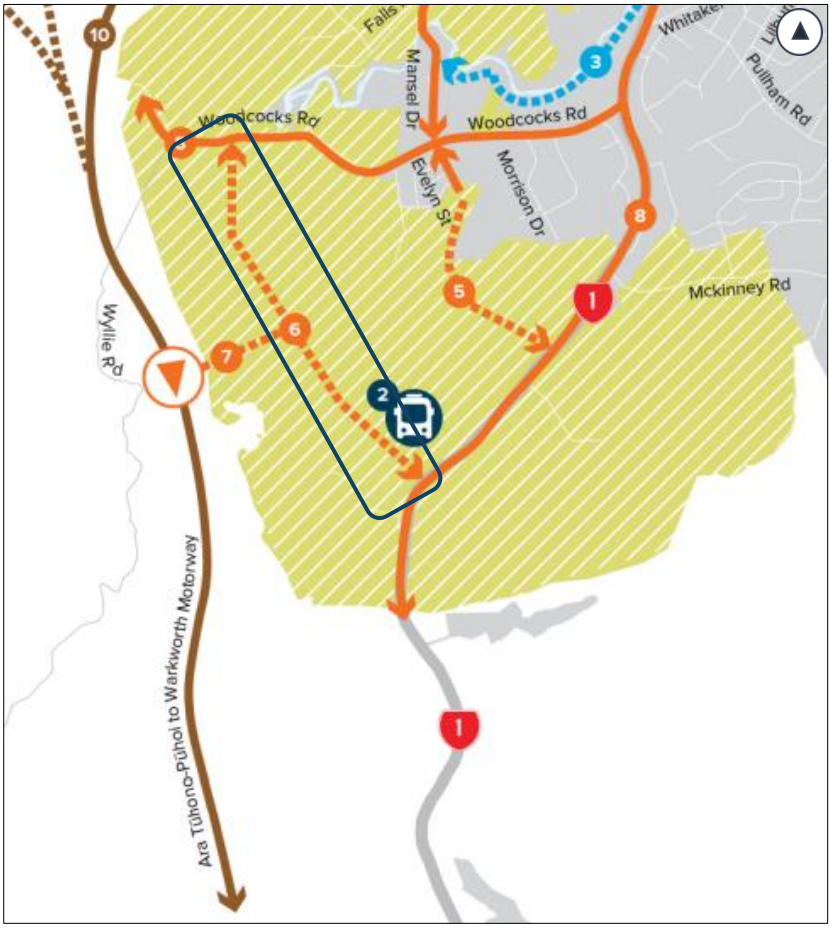


5.7 NOR 7 Wider Western Link – North

5.7.1 Corridor Overview

The IBC recommended option for the Wider Western Link including an urban arterial cross section is shown in Figure 5-28 below.

Figure 5-28: IBC Wider Western Link



The Wider Western Link is a new proposed corridor located within the southern Warkworth growth area, the corridor will provide connectivity through Warkworth from the southern growth area, improve network efficiency and resilience, in addition to integrating with and supporting planned urban growth and the future transport network in Warkworth.

5.7.2 Gap Analysis

The gap analysis recommended the Wider Western Link undergo further optioneering through the corridor assessment process and consider the following:

- Key connections to Woodcocks Road (north), the Southern Interchange (central), and the existing SH1 (south)
- Warkworth South – Draft Plan Change and proposed Wider Western Link alignment.

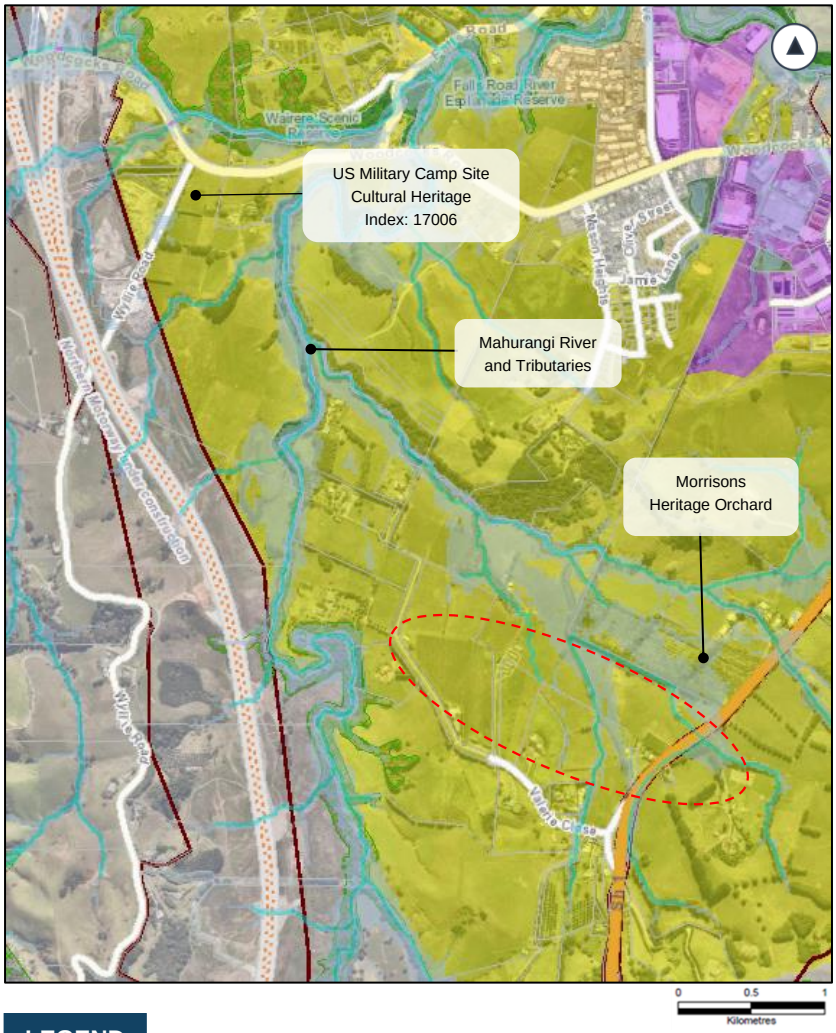
5.7.3 Route: Option Development

Options for the initial corridor assessment were developed within the corridor study area recommended by the IBC, extending from Woodcocks Road in the north to the existing SH1 in the south. For all the options developed, the form of the northern section of the alignment followed the IBC alignment as at the initial corridor assessment phase it was considered best placed to avoid the identified constraints in the north whilst achieving overall project outcomes.

In developing options, the Project Team also considered the following known key features in the area. These are mapped in Figure 5-29 below and include:

a) Cultural heritage sites in the northern section
b) Proposed draft Warkworth South Plan Change for a large area of land under individual ownership located to the south of the Mahurangi River
c) The Mahurangi River and its tributaries run through the area, in addition to riparian woodland and vegetation associated with the river and its tributaries
d) Morrison's Heritage Orchard located to the southeast of the area
e) The indicative location of the local centre and Southern PT Hub as shown in the Warkworth Structure Plan
f) Permanent streams and flood plains, including large flood plains associated with the Mahurangi River
g) The eastern portion of the study area is hilly, with majority of the land area having a variation topography.

Figure 5-29. Wider Western Link Constraints Map

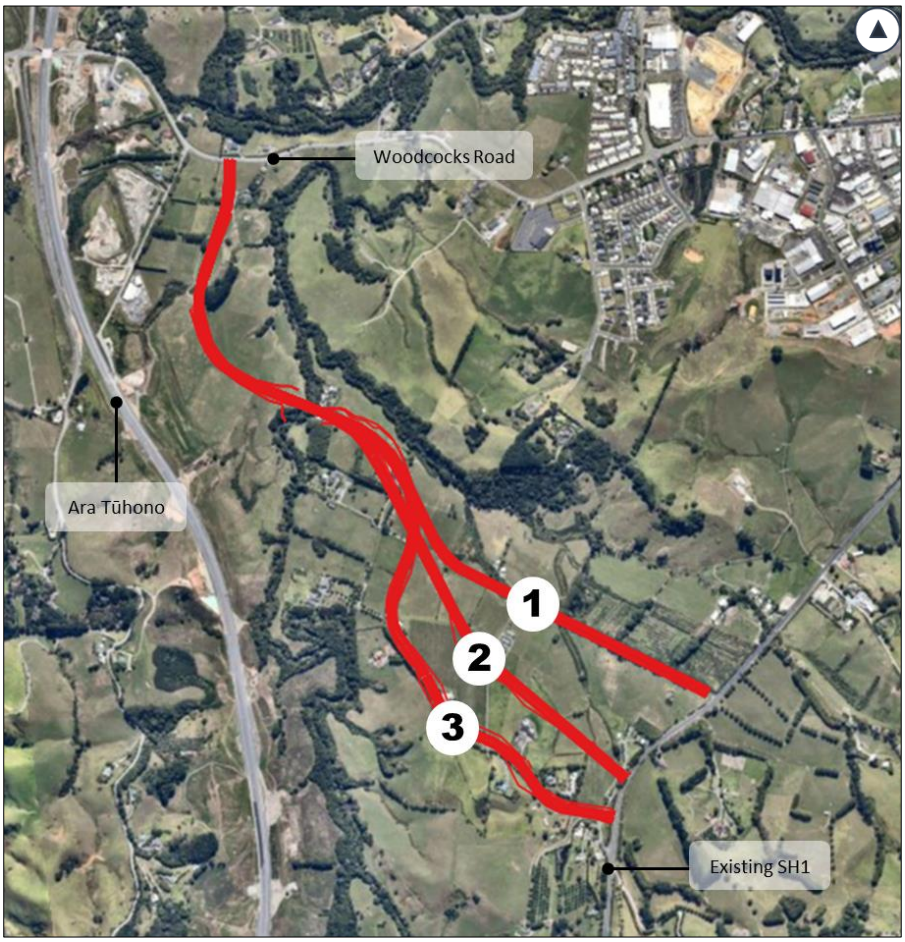


In consideration of the above factors, three options were developed for corridor assessment as outlined in Table 5-28 and Figure 5-30 below. These are discussed in the sections to follow:

Table 5-28: Wider Western Link Options

Option	Description
1	Waimanawa (Warkworth South) Concept Plan Change Alignment
2	IBC alignment
3	Connection via Valerie Close

Figure 5-30: Overview of Wider Western Link options



Alignment options further south of Option 3 were not considered by the Project team due to the challenging topography, proximity to the Mahurangi River, environmental considerations such as the SEA, and the area's distance from key Warkworth Structure Plan elements such as the local centre and Southern PT Hub.

5.7.4 Route: Option Assessment

As outlined in Section 2.3, options were assessed against the investment objectives and criteria within four well-beings, cultural, social, environmental, and economic. Technical specialists engaged in a full day MCA workshop to undertake an assessment, scoring each option on a gradual scale from 'Very High Adverse Effect' (red) to 'Very High Positive Impact' (green).

The following table identifies the outcomes from this assessment.

Table 5-29: Wider Western Link MCA Summary

MCA Criteria	Option 1	Option 2	Option 3
I.O.1 – Access			
I.O.2 – Integration			
I.O.3 – Travel Choice			
Heritage			
Land use			
Urban Design			
Land Requirement			
Social Cohesion			
Human health and wellbeing			
Landscape / Visual			
Stormwater			
Ecology			
Natural Hazards			
Construction impacts			
Construction disruption			
Construction cost / risk			

The Project Team reviewed and compared the options identified above and noted that all the options assessed achieved the investment objectives with Option 2 scoring less favourably compared to Option 1 and 3. In relation to adverse impacts, Option 1 had the overall highest adverse impact due to its impacts on stormwater, landscape and ecological constraints, this was followed by Option 3 which was assessed as needing a high land requirement and having more adverse construction impacts compared to the other options, along with high adverse ecological impact. Compared to Option 1 and 3, Option 2 had the least overall adverse impact. The option had a high adverse ecological impact but had lower land requirement, construction, stormwater, and landscape impacts whilst also achieving land use, urban design, and social cohesion outcomes.

Accordingly, the Project Team identified Option 2 as the preferred option for the reasons outlined in Table 5-30 below.

Table 5-30. New Wider Western Link - Preferred Option

Option	Assessment Outcomes
2	• Achieves investment objectives

Option	Assessment Outcomes
IBC alignment	• Option aligns with the Warkworth Structure Plan alignment, and it is anticipated that the alignment will integrate well with future development in the area • Provides moderate positive contributions to amenity and quality values • Increases connectivity in the western growth area, and to the southern growth area and industrial land to the north of the alignment • Has the farthest distance from potential impact on ecologically sensitive areas such as riparian margins, SEAs, and wetlands • Provides a good east – west connection across SH1. • Suggested refinements to reduce or avoid the ecological impacts (flooding, streams) of the option include the opportunity to seek a hybrid approach between Option 1 and 2.

The remaining options were discounted by the Project Team for the reasons outlined in Table 5-31 below.

Table 5-31: Assessment outcomes for the discounted Wider Western Link options

Option name	Assessment Outcomes
1 Waimanawa (Warkworth South) Concept Plan Change Alignment	• A large portion of the alignment is located within a floodplain, including the SH1 connection, the alignment additionally impacts the highest number of streams and location of stormwater treatment is difficult • Fragmentation of the Mahurangi River corridor and riparian corridor of tributaries between SEA's • Alignment has the greatest proximity to ecologically sensitive areas (riparian, corridors, SEA's, wetlands).
3 Connection via Valerie Close	• The ridgeline topography in the south of the study area limit's development potential of the local centre and Southern PT Hub • Alignment generally avoids flood plains and the location of stormwater treatment is not an issue however the option has the greatest road surface area to treat • Alignment fragments the Mahurangi River corridor and riparian corridor of tributaries between SEA's • Alignment runs within the zone of influence of the Mahurangi River and associated SEA • Adverse construction impacts on the existing road and access connections to properties on Valerie Close.

5.7.5 Engagement

Table 5-32 provides a summary of the project specific feedback received from engagement with Te Tupu Ngātahi partners, stakeholders, and community members.

Table 5-32: Wider Western Link engagement summary

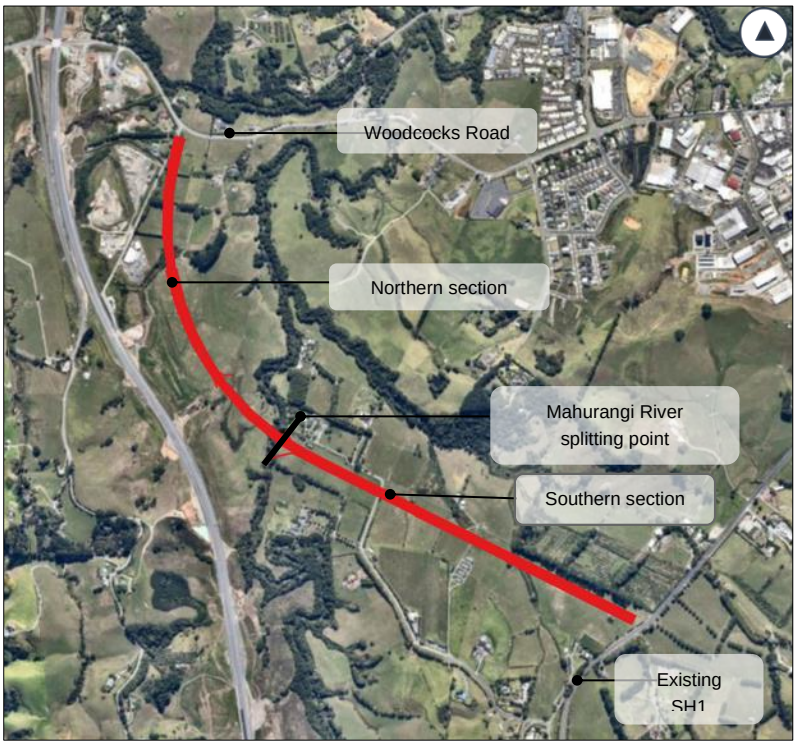
Project	Feedback
Wider Western Link	• An east-west connection over SH1 is desired, particularly for local bus connections • Consider whether the emerging preferred option's intersection location in the south achieves the best outcome, and adequately provides for the implementation of a four-way intersection • Suggestion to consider whether the northern end of the route can connect into Wyllie Road to have a single intersection with Woodcocks Road • Preference for a route which travels adjacent to the Morrison Heritage Orchard boundary • Crossings of the Mahurangi River should be minimised • Project team to be aware of environmental impacts including bats.

5.7.6 Option Refinement

Following engagement and feedback received, and to reflect the outcomes of the completed Route Protection Strategy[2] for Warkworth which recommended that different sections of the corridor be route protected utilising different mechanisms. The alignment for the Wider Western Link was split into a northern section and a southern section for the purpose of further option development and refinement. The splitting point between the two sections was the Mahurangi River, with the northern section connecting to Woodcocks Road in the north and the southern section connecting to SH1 in the south. Figure 5-31 below provides an overview of the sectioning of the Wider Western Link.

[2] Appendix L Warkworth Route Protection Strategy - Final .pdf

Figure 5-31: Overview of Wider Western Link Section Overview



5.7.6.1 Northern Section

Feedback was received relating to the use of the existing Wyllie Road corridor and the existing intersection with Woodcocks Road as the northern connection point, as well as on a potential alternative crossing point of the Mahurangi River. The project team subsequently developed an additional option for the northern alignment of the Wider Western Link and assessed this through the MCA framework alongside the northern section of the preferred option (Option 2 – IBC alignment).

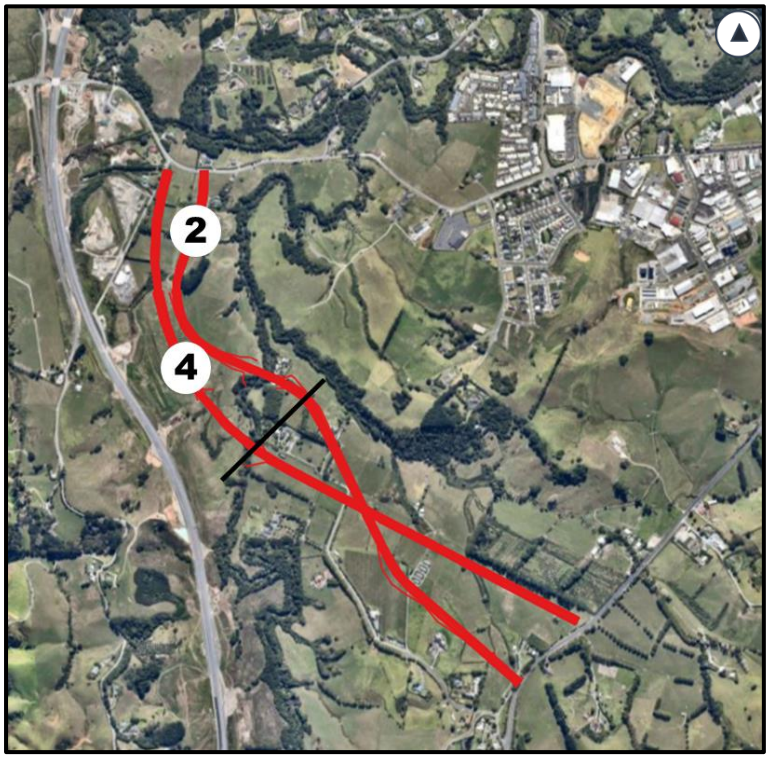
The Project team also considered a further option which connected centrally (between Options 1 and 2) to Woodcocks Road. However, this was discounted by the Project team and not taken through to MCA assessment due to an identified conflict with the existing intersection of Woodcocks Road with Wyllie Road, with operational and safety concerns resulting in the option not being viable.

Details of the additional option for the northern section are provided in Table 5-33 and Figure 5-32 below. These are discussed in the sections to follow.

Table 5-33: Post engagement additional northern section options

Option	Description
4	Wyllie Road Connection
2	IBC alignment

Figure 5-32. Wider Western Link northern section overview



The following table identifies the outcomes from this assessment.

Table 5-34: Wider Western Link northern section MCA summary

MCA Criteria	Option 4	Option 2
I.O.1 – Access		
I.O.2 – Integration		
I.O.3 – Travel Choice		
Heritage		
Land use		
Urban Design		
Land Requirement		
Social Cohesion		
Human health and wellbeing		
Landscape / Visual		
Stormwater		
Ecology		
Natural Hazards		
Construction impacts		
Construction disruption		
Construction cost / risk		

The Project Team reviewed and compared the options identified above and noted that while both the options had the same heritage, construction, and landscape outcomes, Option 4 was the generally preferred option because of its reduced land requirement and ecological impact. Compared to Option

2, Option 4 was additionally assessed as having greater land use and integration outcomes as a result Option 2 was discounted.

Accordingly, the Project Team identified Option 4 as the preferred route refinement option for the reasons specified in Table 5-35 below:

Table 5-35. Assessment outcome for the preferred option

Option	Assessment Outcome
4 Wyllie Road Connection	• Alignment requires low modification to the current topography in the area • The use of the existing (Wyllie) road reduces landowner impacts and additional property acquisition – retains large developable area for future heavy industrial land use, and is an efficient use of existing infrastructure • Mahurangi River crossing point aligns with proposed plan change alignment for the southern section • The Mahurangi River is only required to be crossed once to provide connection to southern interchange • Avoids the Open Space – Conservation Zone and the natural stream management area overlay adjacent to the Mahurangi River.

Option 2 was discounted by the Project Team for the reasons outlined in Table 5-36 below.

Table 5-36: Assessment outcomes for the discounted option

Option	Assessment Outcomes
2 IBC alignment	• Alignment crosses the Open Space – Conservation Zone and the natural stream management area overlay adjacent to the Mahurangi River • Greater landowner / property acquisition - impacts on two separate private properties • Splits future developable industrial land and result in multiple road frontages – reduced land use outcomes for future heavy industrial land use • Greater land use impact due to greater land requirement and property acquisition for additional intersection and new alignment • Results in the fragmentation of the Mahurangi River and the riparian corridor between SEAs- requirement to cross the Mahurangi River twice to achieve connection to southern interchange.

5.7.7 Option Summary

As noted above, route protection for the Wider Western Link will be through two differing processes. The northern section of the corridor will be route protected via the NOR process and the southern section of the will be protected via the Plan Change process in combination with landowner agreements. To ensure the ability to implement the full alignment should the PPC not proceed, the project team through the option development and assessment process have identified ‘anchor points’ including the Mahurangi River crossing point and the intersection with SH1 which will be route protected via the existing SH1 NOR and the Wider Western Link NOR respectively. The location of

the ‘anchor points’, being Mahurangi Crossing point and the SH1 intersection, reflects the outcomes of the assessment for the Wider Western Link. The SH1 intersection location aligns with the indicative (DBC) alignment of the southern section of the Wider Western Link, taking account of the constraints present in the intersection locality including permanent streams, and the Heritage Orchard site to the east. The recommended Wider Western Link – North alignment is shown in Figure 5-33 below.

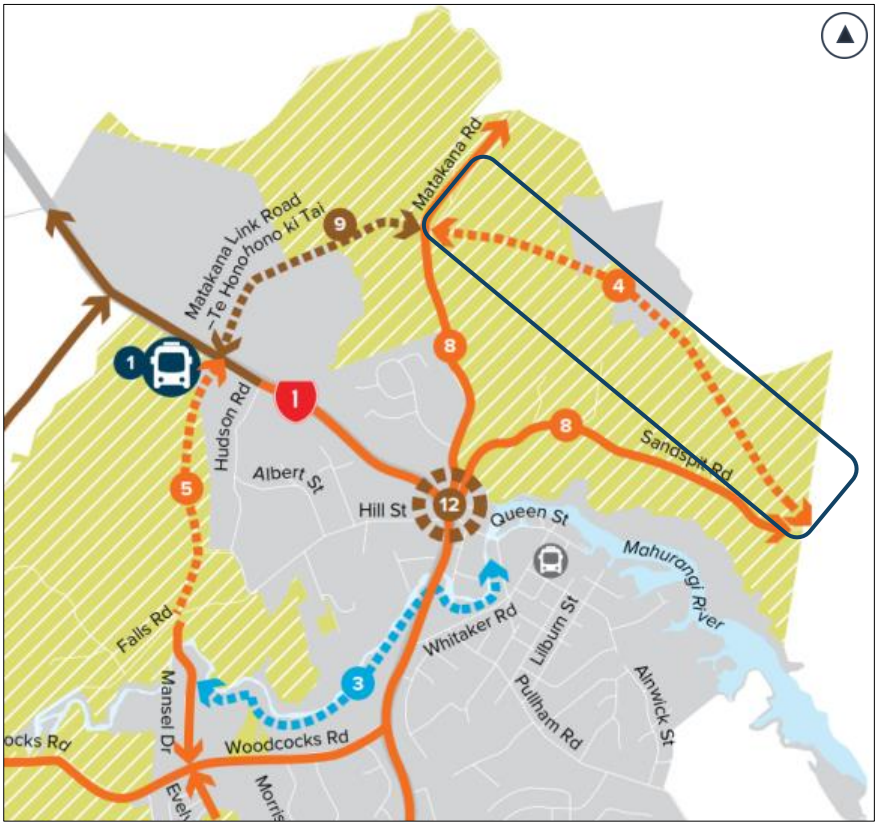
Figure 5-33. Wider Western Link - North recommended alignment

5.8 NOR 8 Sandspit Link

5.8.1 Corridor Overview

The IBC recommended option for the new Sandspit Link including an urban arterial cross section with active mode facilities is shown in Figure 5-34 below.

Figure 5-34: Indicative DBC Sandspit Link alignment



Sandspit Link is a proposed new corridor located in the northern Warkworth growth area. The purpose of the corridor is to provide local connectivity within the north-east Warkworth growth area and improve connectivity to the Kōwhai Coast and Mahurangi Peninsula.

5.8.2 Gap Analysis

The gap analysis concluded that the Sandspit Link should undergo further optioneering through the corridor assessment process and assess the following:

- Option's within and outside of the FUZ boundary in consideration of identified key constraints in the study area.
- Location of the eastern connection with Sandspit Road and whether final location aligns with the corridor purpose.

5.8.3 Route: Option development

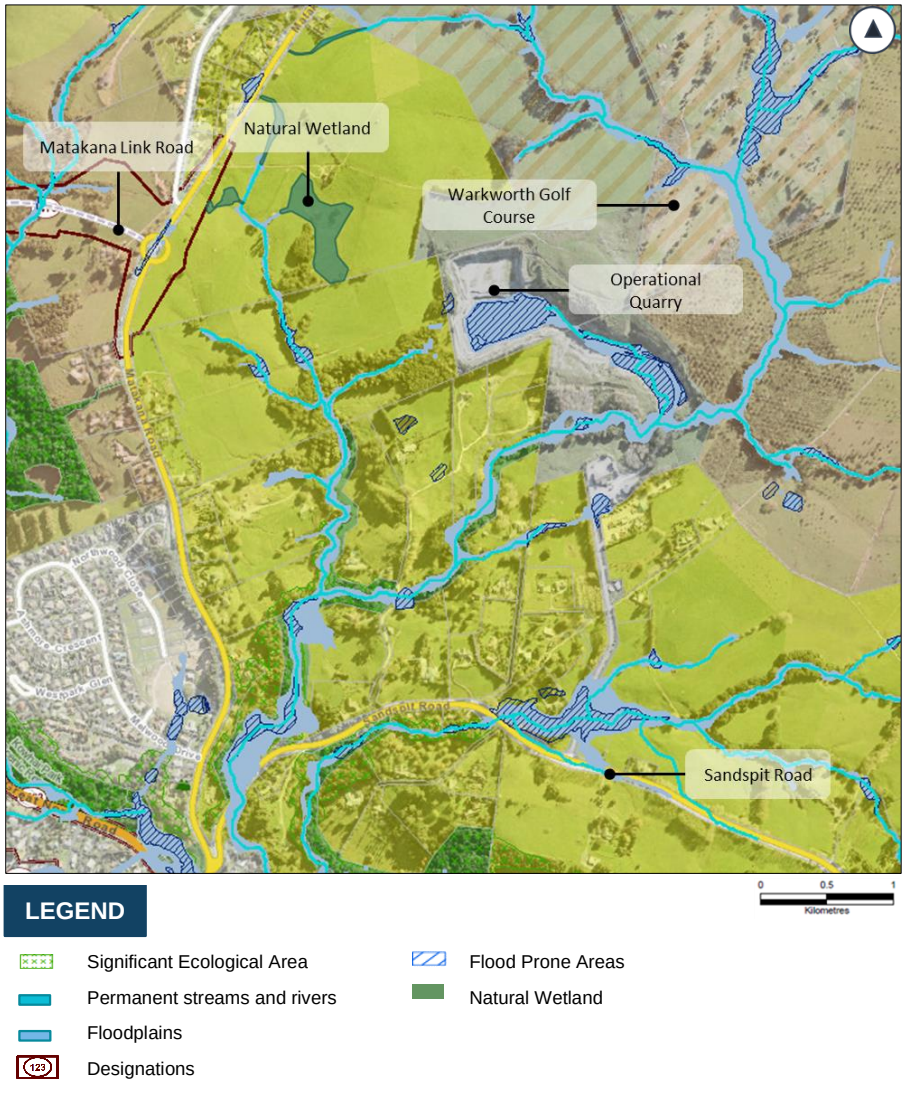
Options for the initial corridor assessment were generally limited to an area extending from Matakana Road in the north to Sandspit Road in the south for the following reasons:

a) Connection with Te Honohono ki Tai in the north
b) Warkworth Structure Plan recommendation of an alignment within the study area.

In developing options, the Project Team considered the following known key features in the area. These are mapped in Figure 5-35 below and include:

a) Permanent streams and flood plains
b) Native woody and riparian vegetation including SEA
c) Hill slope seep, valley head seeps and natural wetlands present
d) Surface ponding - avoid fragmenting potential bird corridors between nearby ponds
e) Warkworth golf course in the north of the study area
f) Matakana Link Road designation
g) Operational quarry in the northern growth area.

Figure 5-35. Sandspit Link Constraints Overview

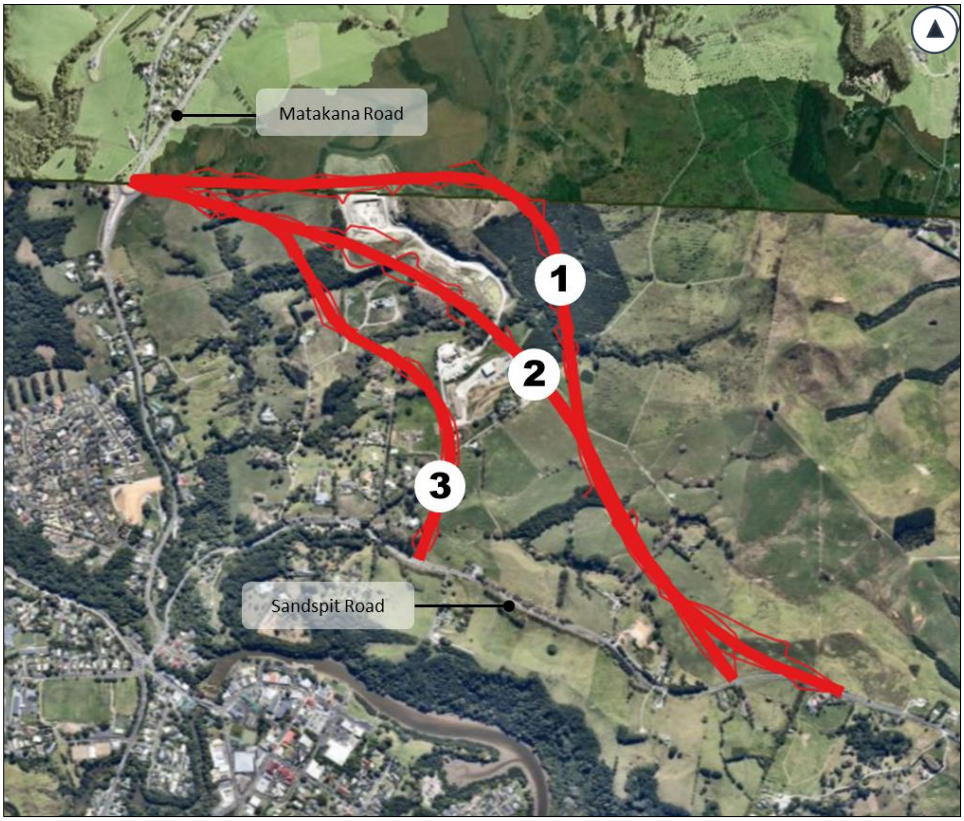


In consideration of the above factors, three options were developed for corridor assessment as outlined in Table 5-37 and Figure 5-36 below. These are discussed in the sections to follow.

Table 5-37: Sandspit Link Options

Option	Description
1	Rural alignment north of the quarry
2	IBC alignment
3	Southern alignment through FUZ

Figure 5-36: Overview of options for Sandspit Link



5.8.4 Route: Option Assessment

As outlined in Section 2, options were assessed against the Investment Objectives and criteria within four well-beings, cultural, social, environmental, and economic. Technical specialists engaged in a full day MCA workshop to undertake an assessment, scoring each option on a gradual scale from 'Very High Adverse Effect' (red) to 'Very High Positive Impact' (green).

The following table identifies the outcomes from this assessment.

Table 5-38: Sandspit Link MCA Summary

MCA Criteria	Option 1	Option 2	Option 3
I.O.1 – Access			
I.O.2 – Integration			
I.O.3 – Travel Choice			
I.O.4 – Resilience			
Heritage			
Land use			
Urban Design			
Land Requirement			
Social Cohesion			
Human health and wellbeing			
Landscape / Visual			
Stormwater			
Ecology			
Natural Hazards			
Construction impacts			
Construction disruption			
Construction cost / risk			

The Project Team reviewed and compared the options identified above and noted that Option 3 met the investment objectives, land use and urban design outcomes, and had the lowest adverse impacts with the exception of ecological and social cohesion outcomes whereby all options were assessed as having similar impacts. Whilst Option 2 and Option 1 had similar effects, the Project Team discounted Option 2 due to the risks associated to an alignment going directly through the centre of the quarry and the associated uncertainty around its future operations.

At this stage due to there being no clear preference between the remaining options, the Project Team identified opportunities to further refine and minimise the effects of Option 1 and Option 3 for reassessment. The suggested refinements for each option are specified in Table 5-39 below.

Table 5-39. Option 1 and 3 Refinements

Option	Suggested Refinements
1 Rural alignment north of the quarry	• Alignment to be shifted further to the south and north to avoid the Warkworth Golf Course and reduce impacts on the quarry and to reduce stream crossings / impacts through the central section • Shift the option's eastern connection with Sandspit Road to align with the FUZ boundary.
3 Southern alignment through FUZ	• Shift alignment to the north-east to minimise impact on permanent streams, vegetation and conservation zone • Shift southern intersection connection with Sandspit Road to the west to avoid streams.

Option 2 was discounted for the reasons specified in Table 5-40 below.

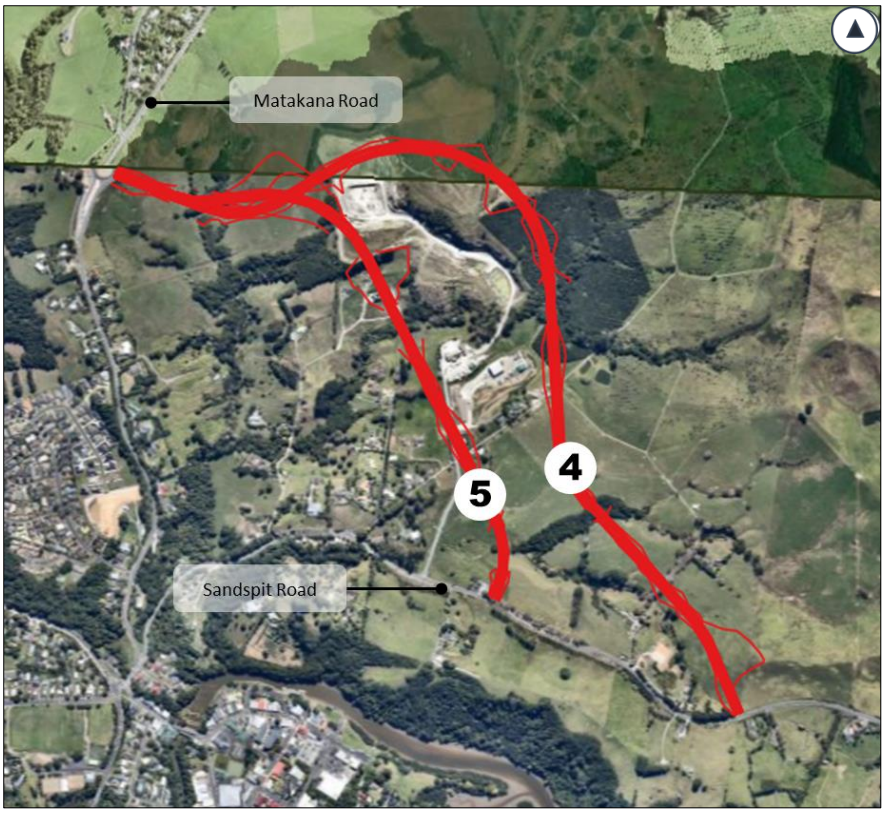
Table 5-40. Assessment outcomes for the discounted option

Option	Assessment outcome
2 IBC alignment	• The alignment is longer compared to Option 3, resulting in the requirement for greater earthworks • The option will largely be constructed on greenfields however there are some landslide features observed around slopes and streams • There is a higher construction and environmental risk associated to an alignment going through a quarry.

Following the refinements of Option 1 and 3, two new options were developed by the Project Team and are shown in Figure 5-37 below:

- **Option 4** (Refined Option 1)
- **Option 5** (Refined Option 3).

Figure 5-37: Overview of Sandspit Link refined options



Following the development of the new refined options, a second MCA workshop was conducted with the project team and technical specialists in attendance. The following table identifies the outcomes from this assessment.

Table 5-41: MCA Worksop 2 Summary

MCA Criteria	Option 4	Option 5
I.O.1 – Access		
I.O.2 – Integration		
I.O.3 – Travel Choice		
I.O.4 – Resilience		
Heritage		
Land use		
Urban Design		
Land Requirement		
Social Cohesion		
Human health and wellbeing		
Landscape / Visual		
Stormwater		
Ecology		
Natural Hazards		
Construction impacts		
Construction disruption		
Construction cost / risk		

The project team reviewed and compared the options identified above and noted that overall Option 5 was assessed as having less adverse impacts on the outlined criteria in comparison to Option 4. The key differentiators between the two options were the land use, urban design, and social cohesion impacts each option derived.

Accordingly, the Project Team identified Option 5 as the preferred route refinement option for the following reasons specified in Table 5-42 below.

Table 5-42. Assessment outcome for preferred option

Option	Assessment Outcome
5 Refined Option 3	• Option minimises impacts on the identified vegetation area and open space - conservation zone • Provides for ability to integrate with local network and future land use connections • Option will result in the smallest amount of catchment fragmentation and the smallest extent of wetland and stream impacts • Option increases connectivity between north-east Warkworth and the Mahurangi peninsula.

Option 4 was discounted by the Project Team for the reasons outlined in Table 5-43 below:

Table 5-43: Assessment outcomes for discounted Sandspit Link option

Option	Assessment Outcomes
Option 4 Refined Option 1	• Separation from the FUZ prevents good land use outcomes for future development through limited opportunities for integration and localised connections • Impacts on streams / riparian features / potential wetland minimised through refined alignment, crossing and intersection locations • Second longest route and highest earthwork cost • Option will increase potential for urban spread to occur outside of the RUB into rural land use, in line with Auckland Council feedback identifying a potential risk of future 'urban creep' into rural zones for options located outside of the current Rural Urban Boundary • Quarry creates a severance and reduces connectivity for active mode users.

5.8.5 Engagement

Table 5-44 provides a summary of the project specific feedback received from engagement with Te Tupu Ngātahi partners, stakeholders, and community members.

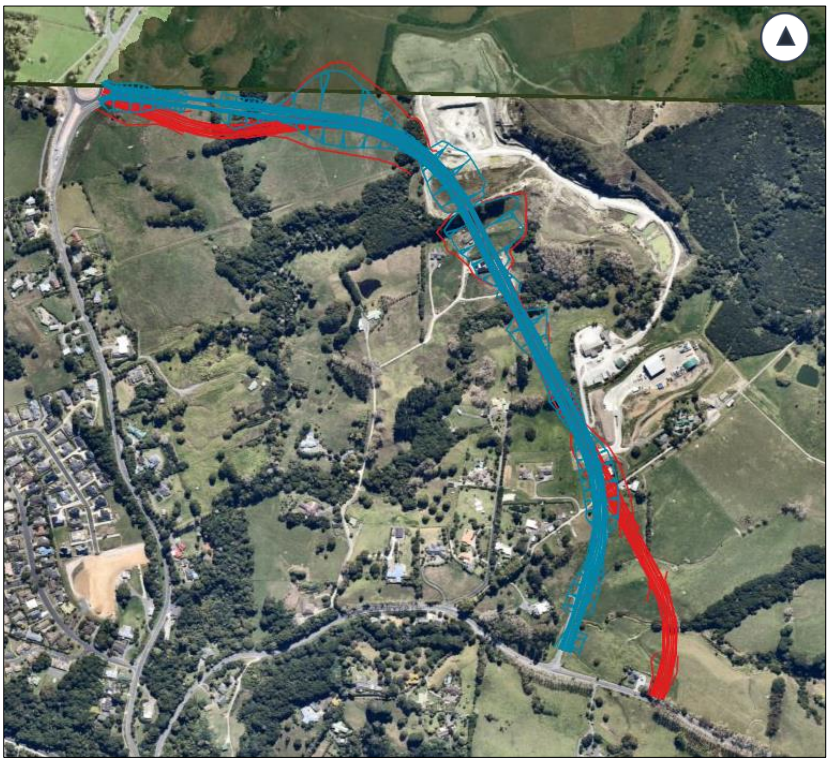
Table 5-44. Engagement Summary

Project	Feedback
Sandspit Link	• Auckland Council preference for corridor to be within the FUZ area and not extend out to the Rural Urban Boundary (RUB). Concerns that an alignment in the RUB will encourage further urban sprawl • Consider a crossing of the Mahurangi river east of the town centre • Strong support for this link, with the community members adding that the corridor was needed urgently due to congestion issues resulting from the opening of Te Honohono ki Tai (Matakana Link Road) • Community members also shared a preference for the corridor to be located closer to the RUB to provide a 'bypass function'.

5.8.6 Option Refinement

Following engagement feedback and further ecological and design investigations, the project team confirmed that the inner / southern alignment (Option 5) as the preferred option (as opposed to an outer / northern route) for the reasons previously identified at the MCA phase. An opportunity to refine the preferred option was identified to further minimise environmental impacts and utilise existing infrastructure at the southern connection point with Sandspit Road. As a result, the northern section of the option was shifted slightly north to reduce ecological vegetation impacts and the southern connection point of the emerging preferred option with Sandspit Road was shifted west to utilise the existing quarry road and intersection. This subsequently reduced the extent of permanent stream(s) impacted. Figure 5-38 below illustrates the refinement made to the emerging preferred option.

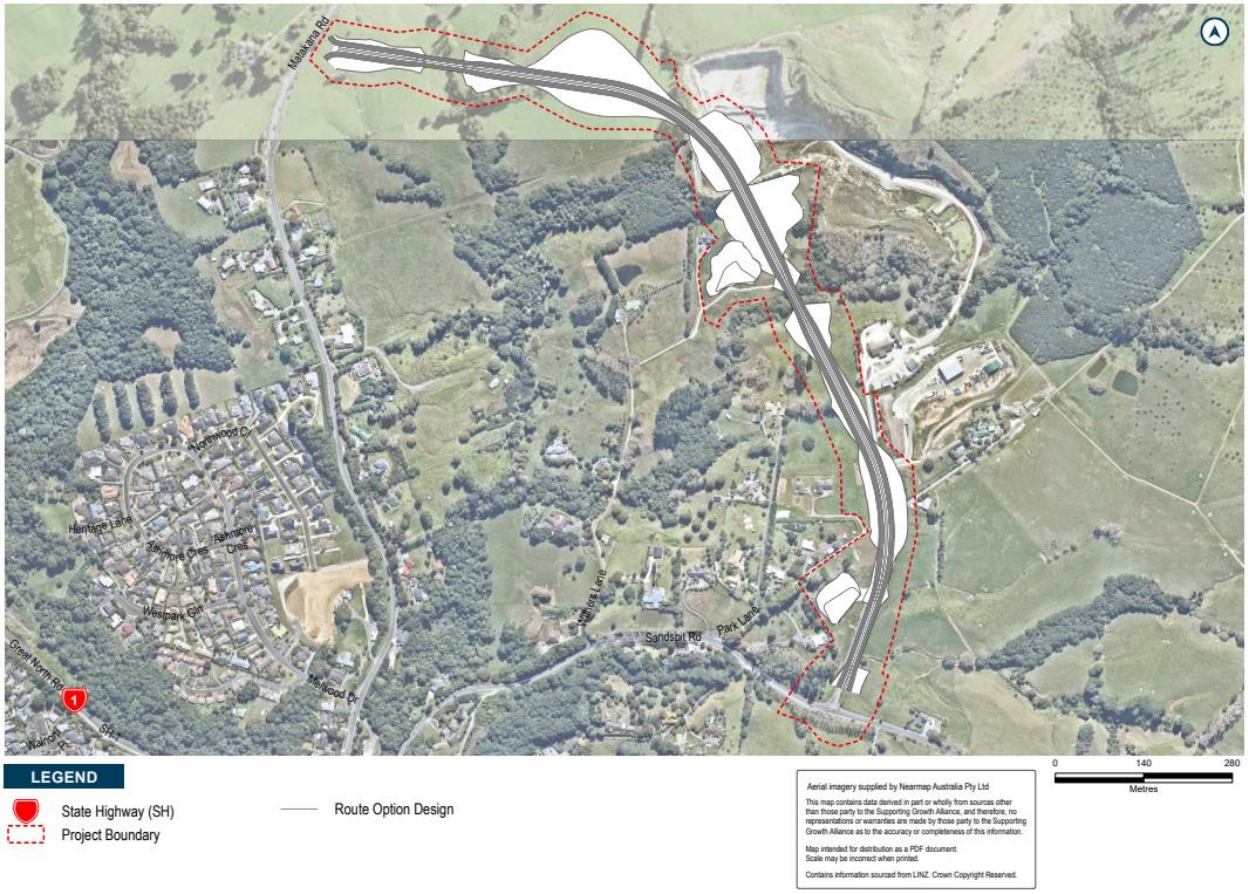
Figure 5-38. Sandspit Link Option Refinement



5.8.7 Option Summary

The recommended alignment for Sandspit Link is shown in Figure 5-39 below.

Figure 5-39. Sandspit Link recommended alignment



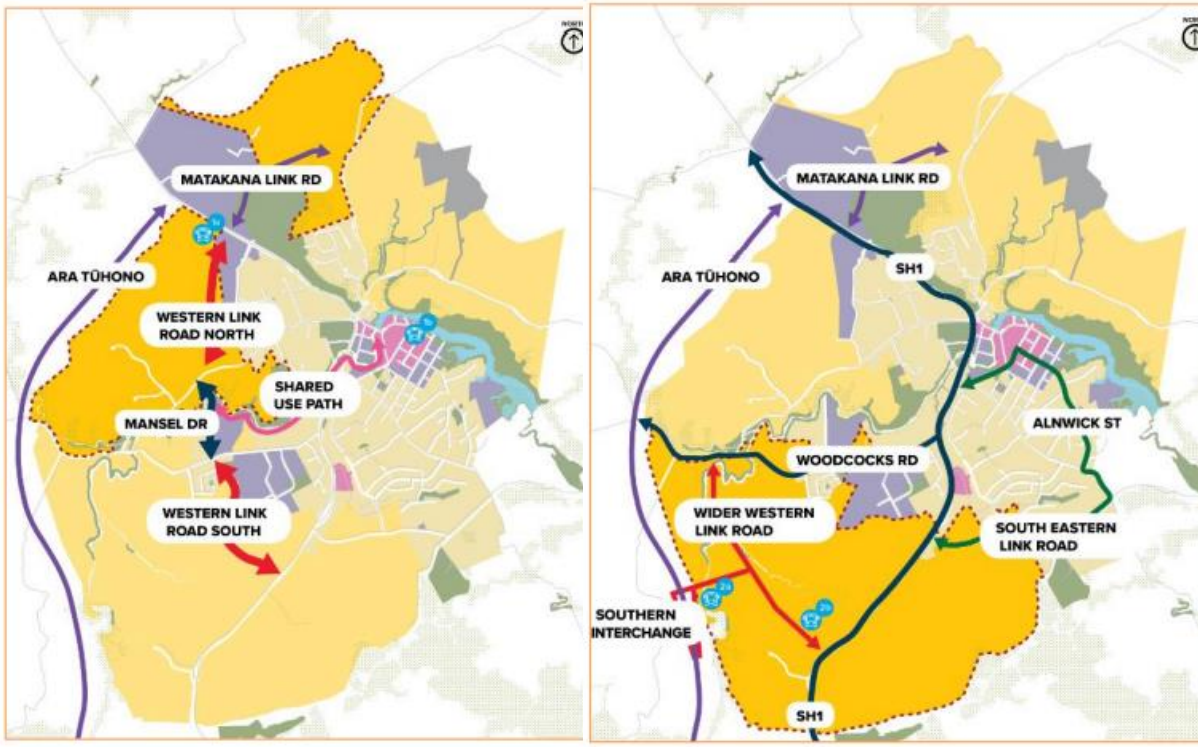
5.9 NOR 1 Northern Public Transport Hub and Western Link - North

5.9.1 Overview of IBC Recommendations

The IBC identified that two bus hub / interchanges were required, specifically:

- An interim bus hub / interchange in the north near the intersection of SH1 and Ara Tūhono. (Figure 5-40)
- An interim park and ride facility in north Warkworth. (Figure 5-40)
- A public transport interchange in the south near a future local centre (Figure 5-41)
- A longer-term park and ride near the southern interchange to Ara Tūhono (Figure 5-41).

Figure 5-40: IBC recommended options – Stage 1 **Figure 5-41: IBC recommended options – Stage 2**



5.9.2 Gap Analysis

The IBC to DBC gap analysis at the start of the DBC phase, identified that changes in policy and the availability of additional guidance (identified below) since the completion of the IBC resulted in the need for the DBC to re-evaluate the IBC recommendation. These key changes are summarised below in Table 5-45.

Table 5-45: Policy and Strategic Guidance Changes from IBC to DBC

Strategic Guidance	Key Direction	Change from IBC / Impact on DBC.
Draft AT Parking Strategy (2022).	• Manage parking to encourage travel by sustainable and efficient transport modes such as PT and cycle and micro-mobility • The intent of Park and Ride facilities are to extend access to the public transport network by capturing car trips nearer to their origin, facilitating mode shift to help ease congestion and reduce emissions • Park and Rides need to be run as a premium service, consistent with their strategic role. AT will implement pricing at Park and Ride sites to: a) Encourage people to access the station by modes other than private motor vehicle b) Discourage people from using the Park and Ride to access surrounding activities (i.e. people that are not catching public transport) c) Reflect the significant costs of providing and maintaining Park and Rides • Park and Ride services will be provided to support growth by improving access to the public transport network (primarily the Rapid Transit Network) in areas where frequent local bus services connecting to the station are not available and / or widespread • Park and Rides should be supported with Cycle and Micro-mobility (CAM) parking, more connecting bus services, more / better options for walking from nearby, car share / rideshare space and kiss and ride (drop off) areas • Some Park and Rides may be downsized or removed.	• Public transport interchange facilities to be focused closer to areas of density to improve accessibility for active modes and micro-mobility • Look for opportunities for Park and Ride to have dual functions such as intercepting vehicle-based trips while also maximising active mode catchment by provision of cycle parking and other facilities to support adjacent land uses • Capture car trips closer to origin rather than being focused on access / proximity to strategic network • Park and Ride to service hinterland of Warkworth where bus services are less frequent / widespread.
Auckland Plan 2050 (2018).	• To make public transport a preferred travel choice, we need an integrated system that consists of: a) A rapid transit network that provides fast, frequent and reliable travel between major parts of Auckland b) Frequent, connector and local public transport services, often running in dedicated bus or transit lanes, that focus on more local trips and provide access to rapid transit	• No impact on DBC, IBC consistent with Auckland Plan. • No rapid transit network proposed in Warkworth. • As per updated parking strategy.

Strategic Guidance	Key Direction	Change from IBC / Impact on DBC.
	c) Walking, cycling and Park and Ride facilities that make it easy for people to access public transport d) Refers back to AT Parking strategy.	
AT Transport Design Manual (2019).	• Public transport services should be seen as a network, along with walking and cycling trips at either end • Public transport planning needs to look at the entirety of the journey undertaken by users, from door to door, not just where services are running • Permeable street grids and small block sizes around public transport stops can help contribute significantly to patronage, while poor pedestrian linkages can substantially reduce walk-up catchment • Services need to be well integrated with the local area.	• Public Transport interchange facilities required to service a broader variety of uses including being accessible to areas of residential density (origin) to maximise active mode catchment potential.
SGA Design Framework and Tool Kit (2019)	• In the right location, park-and-ride facilities attract mode shift to public transport by increasing the accessibility of stations, thereby attracting new public transport trips that would not have occurred otherwise and / or otherwise would have been made entirely by private vehicles • However, park-and-ride facilities can come at a high cost per rider, work against walkability, increased localised congestion, and compete for space on land that could be used for transit-oriented development. Accordingly, it is generally not appropriate in town centres and is best used to serve areas where there is insufficient density to support feeder buses or a walk-up catchment – e.g. rural areas and developing fringe suburbs.	• Park and Ride to service hinterland of Warkworth where bus services are less frequent / widespread • Locate Public Transport interchanges to improve walkability from point of origin.

Based on the changes and updates to the policy framework between the IBC and the DBC it was considered that a re-evaluation of the proposed public transport facilities was warranted for the Warkworth DBC via a corridor assessment process. Key influences on this decision to undertake the revaluation were the direction provided by the Draft AT Parking Strategy (2022) with a shift in focus on Park and Ride facilities extending access to the public transport network by capturing car trips nearer to their origin, while facilitating mode shift to help ease congestion and reduce emissions. Greater emphasis was also placed on managing parking to encourage travel and access to stations by sustainable and efficient transport modes such as PT and cycle and micro-mobility, other than private motor vehicle. The AT Transport Design Manual also placed greater emphasis on public transport planning looking at the entirety of the journey undertaken by users, with public transport services to also be seen as a network, along with walking and cycling trips at either end. The IBC recommendation would require users to travel through Warkworth from Ara Tūhono and Te Honohono ki Tai, to access the hub resulting in inefficiencies, with emissions and congestion considerations, and potential for less connectivity to network as a whole, and ability to facilitate mode shift.

This will ensure that the proposed public transport facilities and associated elements including park and ride are fit for purpose and are located in optimal locations to support the design outcomes identified in the above frameworks.

5.9.3 Warkworth IBC Public Transport Review

The following section provides an assessment of the IBC recommended public transport facilities. This also includes consideration of relevant Te Tupu Ngātahi Design Framework Principles which are considered to be consistent with guidance from the Auckland Transport Design Manual.

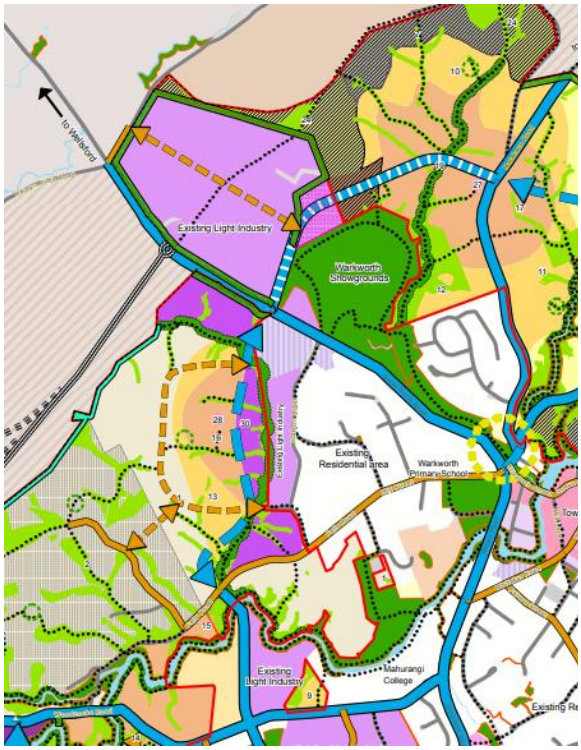
5.9.3.1 Interim Public Transport Interchange in North Warkworth

The Warkworth IBC identified that an interim northern PT hub was required in order to provide a Park and Ride facility that enabled convenient access to the 995 bus route. The IBC stated that this facility was likely to be required as an interim facility in the medium term (15 – 20 years), until such time that the southern interchange was provided, enabling access to Ara Tūhono, at which time the interim northern PT Hub would be relocated with the Park and Ride to the south.

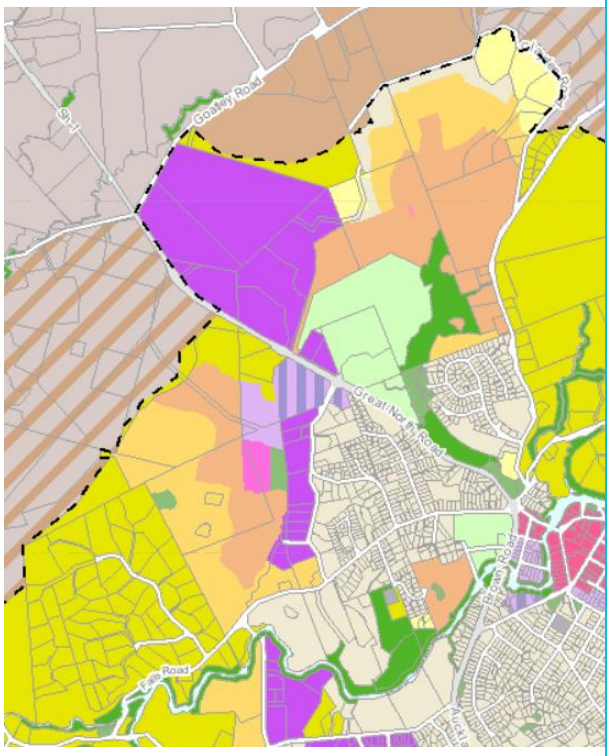
Land Use Assumptions

At the time of the Warkworth IBC, the Warkworth Structure Plan indicated that the northern area was likely to be low to medium density housing, with light industrial. The resulting land use enabled by Plan Change 25 in this area (now the Warkworth North Precinct) has seen an increased provision in medium density urban and suburban housing, business mixed use and general business zoning and a relatively large local centre that was previously not expected with the implications of this being greater density in the northern area then what was previously anticipated by the structure plan.

Warkworth North: Structure Plan



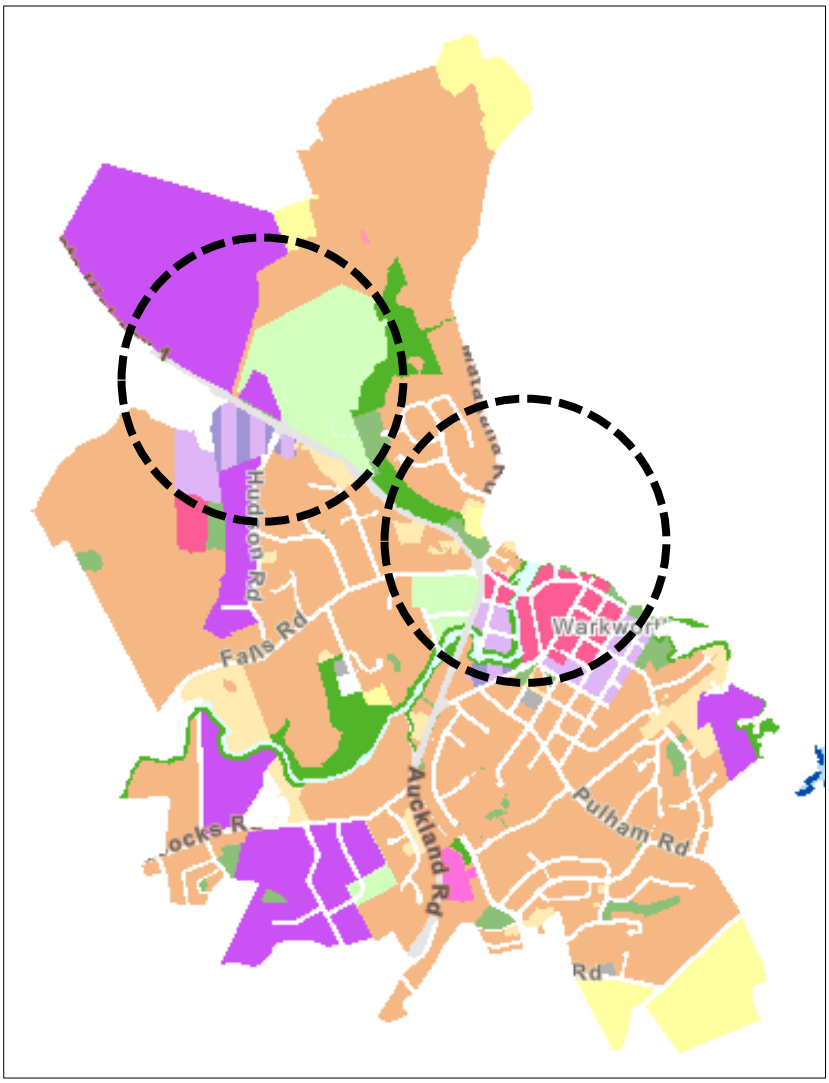
Warkworth North AUP



In addition to the Warkworth area, it is also noted the rural settlements to the north of Warkworth are also expected to experience ongoing growth. This includes in the areas of Algies Bay, Wellsford and Matakana.

The below figure shows an 800m radius within the north growth area, demonstrating the effective catchments of two public transport hubs in the north. The provision of a permanent PT Hub in the north will provide an opportunity for a strong walk-up catchment for this increasingly intensified area in Warkworth and will also provide connectivity to social infrastructure such as the Mahurangi Rugby Club and Warkworth Showgrounds.

Table 5-46: Approximate 1 Km Public Transport Catchment (PC 78 map)



Timing and Staging

The Warkworth IBC stated a preference for a long-term park and ride and public transport hub in the south near the southern interchange to access Ara Tūhono.

Further investigations through the Warkworth DBC recommended that implementation staging of the Southern Interchange be later (2048) than that assumed by the IBC (2028). This is a result of various factors including:

- *Climate Change*: the early implementation of access to Ara Tūhono is considered to potentially undermine wider mode shift objectives, and the possible delay in delivery of the interchange, while providing public transport options, may provide an opportunity to be consistent with policy objectives such as those identified in the Emissions Reduction Plan
- *Maximising Existing Assets*: the investment hierarchy drives prioritisation of investment in such a way that encourages the utilisation of existing infrastructure, and investment in new infrastructure on an 'as needed' basis. This approach to "sweat the assets" pushes the delivery of the Southern Interchange towards the end of the forecasted growth programme

- *Complex Delivery Mechanisms*: Ara Tūhono is being delivered by a public private partnership (NX2), with long term performance criteria. As such, it is considered that the implementation of the southern interchange will likely occur towards the later end of this contract period

Given the above considerations, any interim facility in the north is unlikely to be short term, but rather will be required to support the Warkworth area for a longer period then previously assumed in the IBC.

Existing Interim Facilities

The Rodney Local Board has recently provided an interim facility in the north of Warkworth consistent with the interim objectives of a northern PT interchange and park and ride in the IBC. The interim facilities include 137 parking spaces, two bus stops and a bus layover.

Figure 5-42: Warkworth Community Transport Hub

Through engagement with the Rodney Local Board, they have confirmed that they have medium to long-term development aspirations for this site, as part of wider redevelopments of Council land in the area.

While the site has been designed to support an immediate need, it is bound by SH1 and the Mahurangi River with limited opportunities to expand. As such the site is not adequate to accommodate the forecasted increase in demand for bus stops, bus layovers and likely medium to longer term park and ride demands.

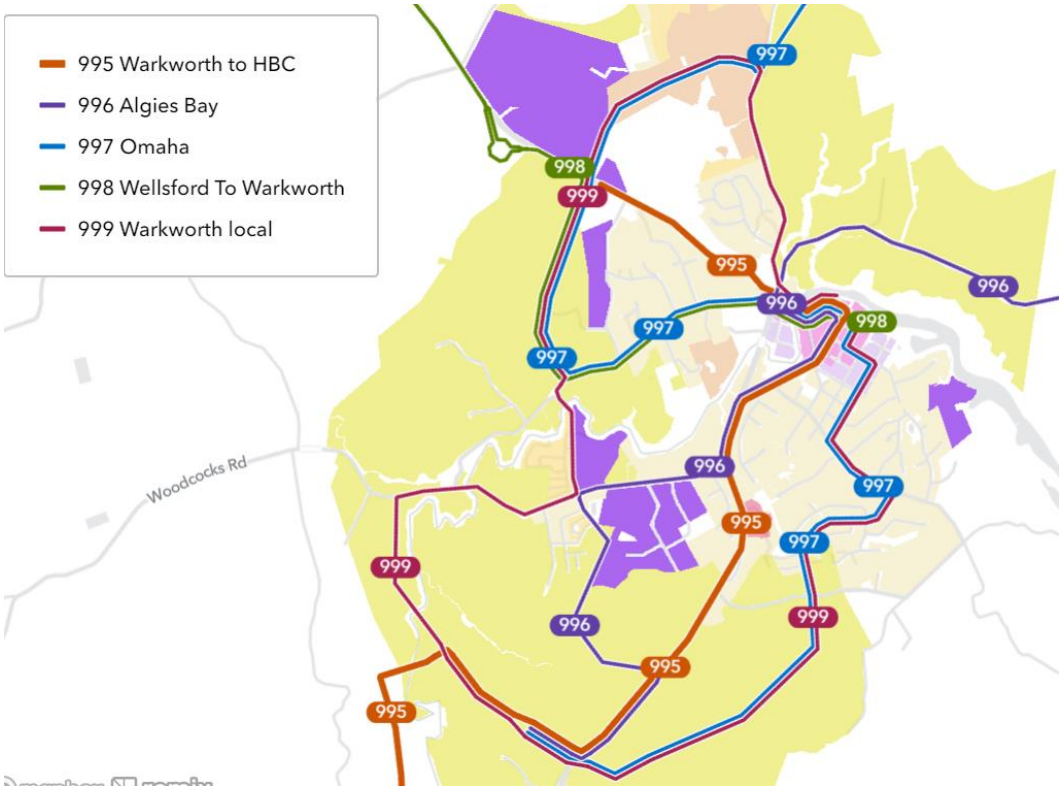
Wider Network Integration

In addition to servicing the local community, based on current travel demands, Warkworth acts as a central hub and gateway for a number of surrounding villages including Sandspit (7km), Snells Beach (8.5km), Algies Bay (10km) and Matakana (8.8km).

The indicative medium to long term network shows a confluence of routes in and around the northern Warkworth area. This presents a significant opportunity for interchange facilities in this area, enabling patrons to move between local services.

In terms of connections to the wider region, there is expected to be ongoing and increased demand for interregional bus services to townships further north such as Whangarei and Bay of Islands. These services will be able to reach Warkworth from Auckland and Whangārei via the Ara Tūhono roundabout. Given that the southern interchange is proposed to only have south facing ramps, this means that access to Auckland via Warkworth from Whangarei will continue to need to be via the northern interchange. A PT facility in the vicinity of this interchange will provide an efficient transfer location.

Figure 5-43: Indicative Public Transport Network in 2048



Overall, a long-term public transport hub facility in the northern growth areas is considered critical to achieving the wider transport outcomes for the area and should be considered a permanent facility rather than an interim facility as per the recommendations of the Warkworth IBC. In particular a northern PT interchange is considered to:

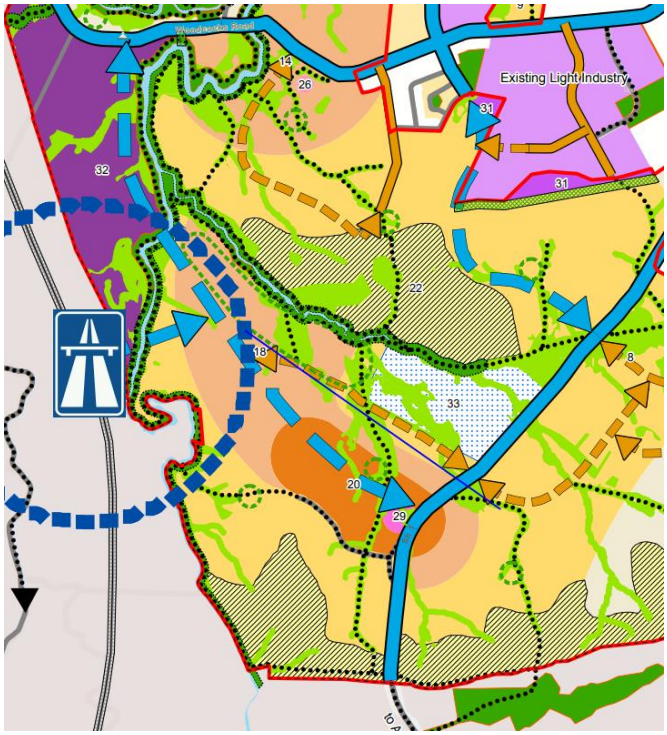
- Provide a strong long term public transport facility to support progressive development in the Northern growth area and expected brownfield development in the existing urban area in Warkworth
- Provide a facility to address Warkworth town centre constraints including a lack of layover facilities, staff facilities and limited bus stops
- Provide a key facility that can be utilised to achieve an integrated public transport connectivity without reliance on the implementation of the southern interchange with Ara Tūhono.

5.9.3.2 Southern PT Interchange

The Southern PT Interchange was identified in the IBC as being required to support the projected land use within Warkworth Structure Plan. The Warkworth Structure Plan indicated that this portion of Warkworth would include a local centre, and higher density houses, with Town House and Apartment Zoning indicated alongside the Wider Western Link.

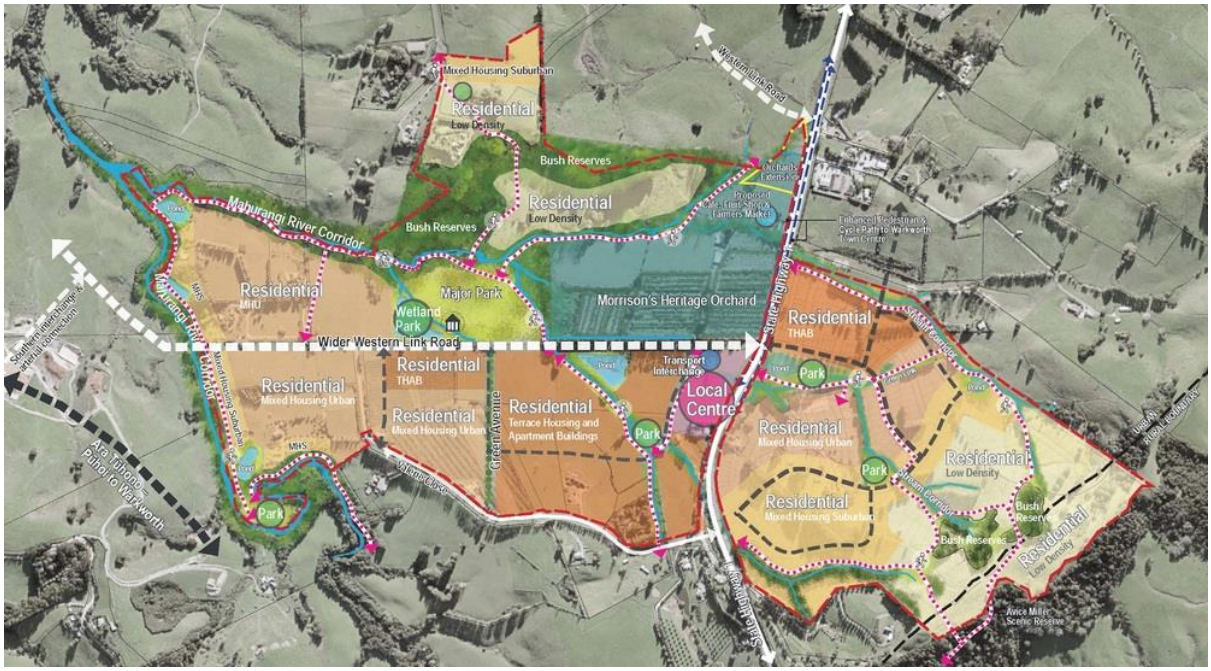
A critical element to the southern public transport interchange is the co-location of the local centre with a public transport facility. This will enable an integrated land use transport outcome for the southern growth area, which supports a walk-up catchment and offers opportunities for residents to travel efficiently within Warkworth without the requirement of a private vehicle.

Figure 5-44: Warkworth Structure Plan - Southern Growth Area



Current development plans indicate a strong land use alignment with the intention of the Warkworth Structure Plan, including a local centre co-located with a transport interchange, surrounded by high density residential land use.

Figure 5-45: Waimanawa Master Plan[3]



In the longer term, with the implementation of the southern interchange, this creates an opportunity to link regional services to Auckland with the public transport interchange, improving access for higher population areas.

Overall, a public transport interchange in the southern growth will provide significant transport and urban mobility benefits to the future southern community.

5.9.3.3 Park and Ride

A park and ride offers a significant opportunity to intercept and redirect car-based trips on to public transport – for those travelling beyond Warkworth. As identified above in Section 5.10.3.1, Warkworth acts as a central hub and gateway for a number of surrounding villages including Sandspit (7km), Snells Beach (8.5km), Algies Bay (10km) and Matakana (8.8km). Currently 2,625 people[4] travel to Warkworth from these areas and the broader hinterland for work or school, more than doubling the towns current population of 2,481[5].

Warkworth also sits 40min drive (43km) from Albany with approximately half (420)[6] of the departures from Warkworth traveling south to the Hibiscus Coast, North Shore, and Auckland City. In addition, about a quarter[7] of the people who depart from the hinterland around Warkworth also travel south to the Hibiscus Coast and beyond.

A park and ride for Warkworth is well aligned with the policy directions identified above. As a product, offering a park and ride will enable travellers from the wider area to transfer to public transport options at Warkworth, and will also support commuters from Warkworth a reliable public transport option to travel to Hibiscus Coast and beyond. Located within the fringe of Auckland, a Park and Ride in

[3] https://matakanaapp.co.nz/news/daily-news/1400-house-development-proposed-for-warkworth?id=60be929207ca64002be8742a
[4] Commuter.Waka.app
[5] 2018 census data
[6] Commuter.Waka.app
[7] Commuter.Waka.app

Warkworth supports a PT option for communities that otherwise would be difficult to service due to geography, limited populations, and network operational costs.

Park and Ride facilities are now directed through policy to provide for a broader variety of uses reflecting the significant costs of providing and maintaining park and rides. This can include functioning as an interchange for both regional and local bus trips.

The focus and role of a Park and Ride has shifted to capturing car trips closer to point of origin (people getting on the buses more efficiently) rather than maximising accessibility and proximity to a strategic network – in this case Ara Tūhono. In addition, a Park and Ride location should look to capture private vehicle trips from where bus services are less frequent / widespread but where there is still demand - in this case the hinterland and villages surrounding Warkworth.

In the right location, park-and-ride facilities attract mode shift to public transport by increasing the accessibility of stations, thereby attracting new public transport trips that would not have occurred otherwise and / or otherwise would have been made by car. Park-and-Ride's are generally not appropriate in town centres and are best used to serve areas where there is insufficient density to support feeder buses or a walk-up catchment – e.g. rural areas and developing fringe suburbs.

In this case, the Park and Ride is to serve people travelling to and from outlying settlements around Warkworth i.e. Matakana, Snells Beach who will not have a future high frequency bus service, acting as a bus interchange between multiple services, as well as supporting bus services between Warkworth and Auckland City.

The IBC recommended a park-and-ride near the southern interchange to Ara Tūhono. The location of a park and ride at the southern interchange with Ara Tūhono location does not align with updated Park and Ride policy and the principles of the Design Framework.

In particular, the implementation of the southern interchange was a key reason for shifting the park-and-ride to the south in the IBC as it would enable buses to efficiently gain access to and from the motorway route. However, the southern location fails to intercept people travelling in vehicles from outlying settlements. Park and Ride users would also need to traverse a large part of the local network contributing to additional local congestion, extra distance travelled, delay to local bus services and reduced amenity / safety for active mode users.

Based on the policy direction, principles, and travel demand profile of Warkworth the area that best addresses the Park and Ride requirements is located in the north. A Park and Ride in the north achieves the following:

- Encompasses a planned residential land use to maximise walk up catchment. This balances primarily serving the current dispersed catchment vs precluding potential users within a walk-up catchment
- Encompasses a planned local centre to connect key destinations and encourage use of the local bus network
- Captures travel to / from all major settlements is via four main corridors including SH1 (north) through to Wellsford, Tūhonohono ki Tai - Matakana Link Road, Matakana Road, and Sandspit Road. Once operational, Matakana Link Road will significantly shorten the distance to Ara Tūhono for those travelling from Matakana and beyond. Sandspit Link will also provide an alternative connection to SH1 (via Matakana Link Road) rather than through Hill Street Intersection for residents around Snell Beach. Capturing vehicles from these settlements before they traverse the local network is a key objective and aligns with the Design Framework and AT policies

- Similar to the above, a northern site is located on the edge of Warkworth at the confluence of several corridors connecting outlying settlements – therefore intercepting people in vehicles before they traverse a large area of local network
- Supports efficient bus access to Ara Tūhono in the interim and future and has the potential to widen the local catchment for the 995.

5.9.3.4 Summary of IBC Public Transport Review

The following table provides a summary of the IBC Public Transport Review:

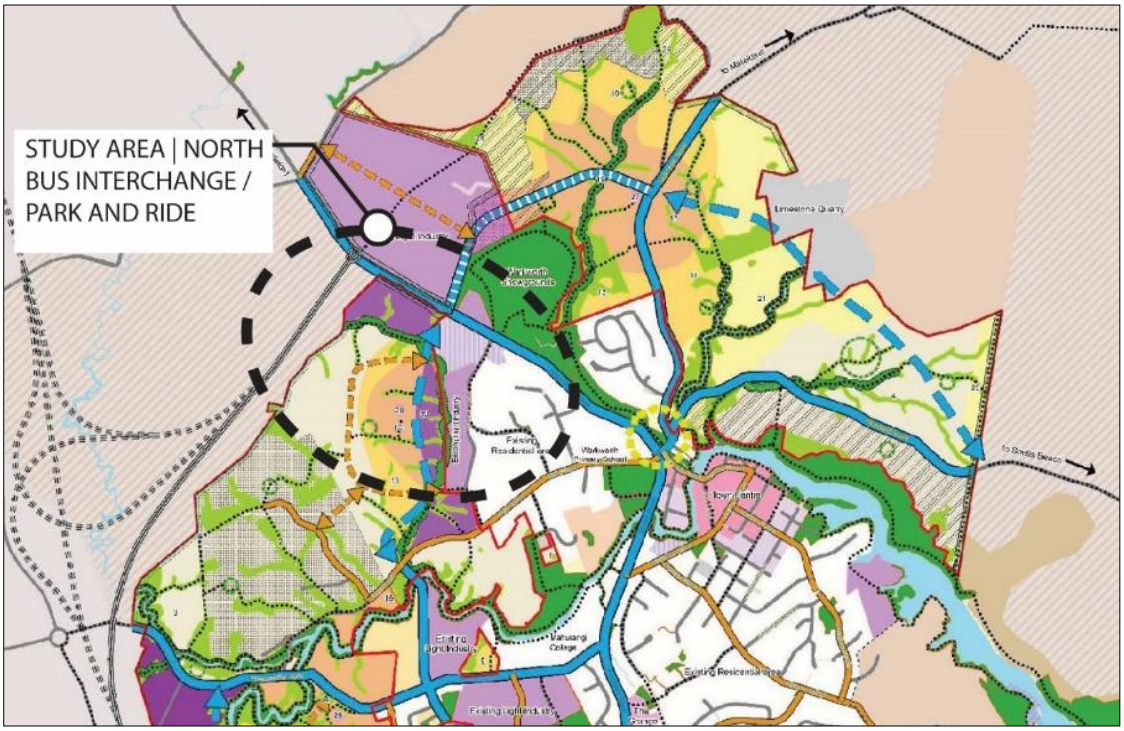
Table 5-47. Summary of the IBC Public Transport Review

Public Transport Facility	Warkworth IBC Recommendation	Warkworth DBC Recommendation
Interim Northern PT Interchange	• Provides PT access near Ara Tūhono until southern interchange is implemented • Move to the southern growth when this area is developed to support increased density • Provides support to constrained facilities in Warkworth town centre.	• Retain interim PT interchange as a long-term facility • Southern interchange timing likely to be later than previously assumed in IBC • Increased land use density in north Warkworth due to private plan changes and Council led plan changes • Interim Local Board facility insufficient to support projected growth • Continued support to constrained facilities in Warkworth town centre.
Southern PT Interchange	• Complements adjacent land uses such as the local centre and high density living • Supports an efficient public transport network and service pattern.	• Retain southern PT interchange (no change).
Park and Ride	• Appropriate facility given fringe location of Warkworth with outer rural settlements.	• Retain park and ride facility but integrate with a long term northern PT interchange.

5.9.4 Study Area for Northern PT Hub

A broad geographic study area in the north for the Northern PT Hub and Park and Ride facility is shown in Figure 5-46 below.

Figure 5-46. Recommended study area for the Northern PT Hub and Park and Ride circled in black



The recommended study area was identified for the following reasons:

a) Proximity to a planned local centre and surrounding high density living as identified in the operative Warkworth North Precinct Plan - location of a PT Hub and Park and Ride within the recommended study area would maximise the walk-up catchment to the public transport network
b) Intercepts people travelling to and from outlying settlements around Warkworth i.e. Matakana, Snells Beach with colocation of a park and ride with the PT Hub improving access to public transport for these travellers
c) Serves a dual function by intercepting vehicle-based trips and maximising accessibility to active mode catchment
d) Connects directly to a separated cycling and micro-mobility facility network
e) Supports local service interchange and potentially links to the Western Link which is an important north south corridor and key bus route in the future.

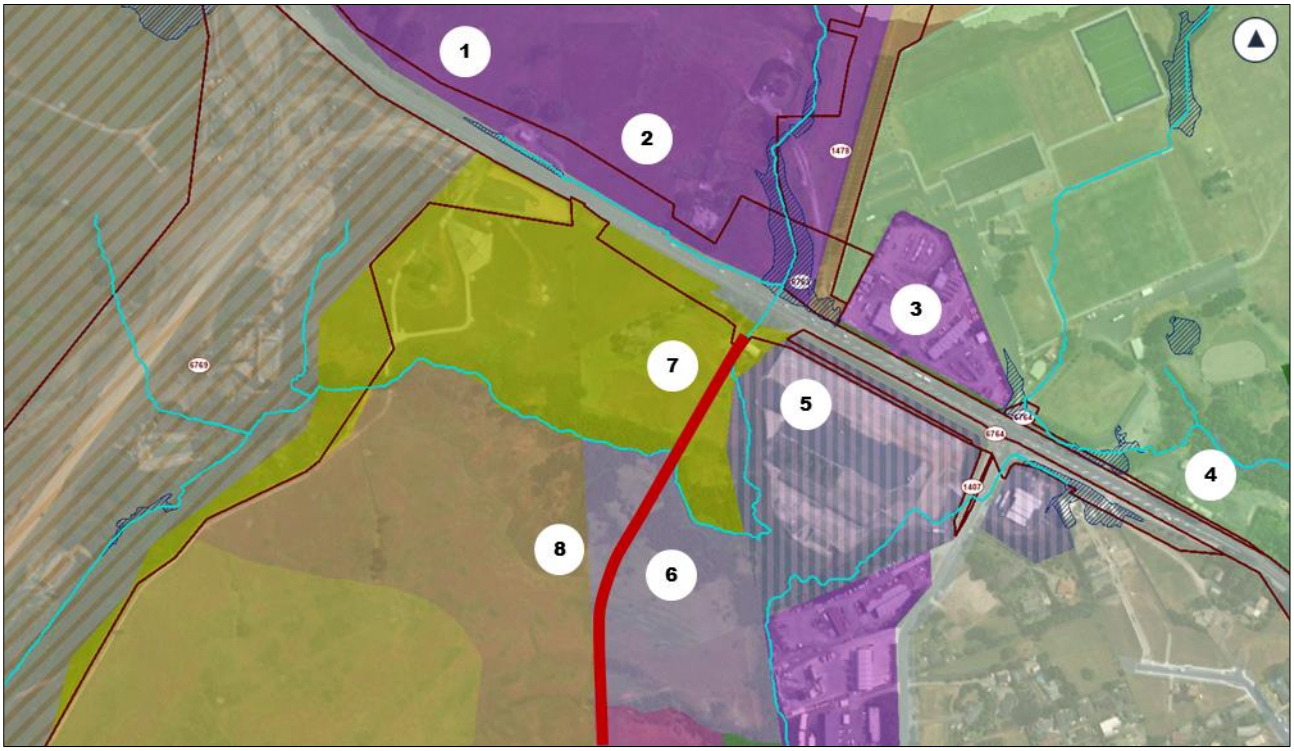
5.9.4.1 Study Area Refinement

In order to refine the proposed study area further, eight potential study areas for the Northern PT Hub and Park and Ride were developed for consideration as outlined below.

Table 5-48. Northern PT Hub and Park and Ride Study Areas

Study Area	Study Area Description
1	Adjacent to Ara Tūhono
2	West of Te Honohono ki Tai (Matakana Link Road)
3	Adjacent to the Warkworth Showgrounds
4	Interim Council PT Hub
5	South of SH1 adjacent to the Warkworth Showgrounds
6	South of Option 5
7	IBC location for interim PT Hub
8	South of Option 7

Figure 5-47: Location options for Northern PT Hub & Park and Ride



5.9.4.2 Study Area Refinement – Assessment

To refine the northern study area and sieve out sub areas that will not meet the transport and land use outcomes being sought, a principle-based transport and land use assessment was undertaken.

The potential study areas for the Northern PT Hub and Park and Ride facility were considered against criteria based on principles from the Te Tupu Ngātahi Design Framework and Tool Kit, including:

- Active mode catchments and walkability
- Local identity: Placemaking potential and local identity
- Land use and future growth: Respond and integrate with adjacent and future land use / growth, respect natural features
- Modal Priority: efficient connectivity between transport modes
- Cross corridor connectivity and accessibility to / between facilities
- Environmental: impact on the environment.

Consideration also given to constructability i.e. any construction constraints, at a workshop with the project team, technical specialists, and SME's to identify a shortlist of location options for the Northern PT Hub and Park and Ride. The assessment was also informed by the outcome of the gap analysis and the constraints map exercise which identified key features / constraints to consider within the area.

This approach was considered appropriate to sieve the site locations to those that meet the design framework in the first instance and remove potential study areas that will not achieve wider transport and design outcomes.

Feedback received from engagement with Te Tupu Ngātahi partners and stakeholders was also considered. A summary of the feedback received is shown in Table 5-49 below.

Table 5-49. Summary of engagement for Northern PT Hub

Project	Feedback
Northern PT Hub and Park and Ride facility	• Preference for park and ride facility to be in the northern location • Study areas 1,6,8 too far away for efficient bus operation.

The following table identifies the outcomes of the assessment.

Table 5-50: Northern PT Hub and Park & Ride Study Area Assessment

Design Framework Principles	Study Area 1	Study Area 2	Study Area 3	Study Area 4	Study Area 5	Study Area 6	Study Area 7	Study Area 8
Active mode connectivity								
Active mode catchment								
PT & Vehicle Access								
Land use								
Constructability (Footprint)								
Environment								

The Project Team identified Study Area 6, 7 and 8 as the preferred study areas for further consideration and option development for the reasons identified in Table 5-51 below.

Table 5-51. Northern PT Hub and Park and Ride Preferred Location Options

Location	Assessment Outcome
Study Area 6 South of Study Area 5	• Study Area connects people and modes directly to key destinations such as the future town centre, Warkworth Showgrounds, and places of employment in the industrial area • Achieves active mode catchment and connectivity outcomes • Location aligns with density in the area.
Study Area 7 IBC location for interim PT Hub	• Dual accessibility ability to SH1 (left exit only) and the Western Link - North • Indicative PT Hub location noted in PC25 / Warkworth North Precinct Plan is within this quadrant.
Study Area 8 South of Option 7	• Study Area aligns with density in the area and is in proximity to the town centre • Study Area has future redevelopment potential • Park and ride facility is located closer to the town centre.

The remaining Study Areas were discounted by the Project Team for reasons identified in Table 5-52 below.

Table 5-52. Northern PT Hub and Park and Ride Qualitative Summary - Discounted Study Areas

Study Area	Assessment Outcomes
Study Area 1 Adjacent to Ara Tūhono	• Study Area conflicts with the Ara Tūhono interchange • Within industrial zoned land and as a result reduces walk up catchment from residential and recreational land uses • Flooding outcome is more extensive in the northern area • Impacts on industrial land which is in short supply.
Study Area 2 West of Te Honohono ki Tai (Matakana Link Road)	• Reduced active mode catchment due to SH1 severance and industrial zoning in the area • Flooding outcome is more extensive in the northern area • Impacts industrial land which is in short supply • Requires a more circuitous route for local buses.
Study Area 3 Adjacent to the Warkworth Showgrounds	• Reduced active mode catchment due to SH1 severance and industrial zoning to the west • Has a potential conflict with the Te Honohono ki Tai (Matakana Link Road) intersection • Impacts on Warkworth Showgrounds and industrial land use to the west which is in short supply.
Study Area 4 Interim Council PT Hub	• The expanded footprint of the facility in this location will likely impact on the Warkworth Showgrounds • Reduced active mode catchment due to land use including the SEA and limited property access due to topography

Study Area	Assessment Outcomes
	• SEA and permanent streams are adjacent to the location.
Study Area 5 South of SH1 adjacent to the Warkworth Showgrounds	• Pak N Save development is located on the corner site between the Western Link and Te Honohono ki tai. This is currently under development and creates a constraint • Creates conflict with Te Honohono ki Tai (Matakana Link Road) and SH1 intersection causing safety concerns for active mode users.

5.9.5 Route: Option Development

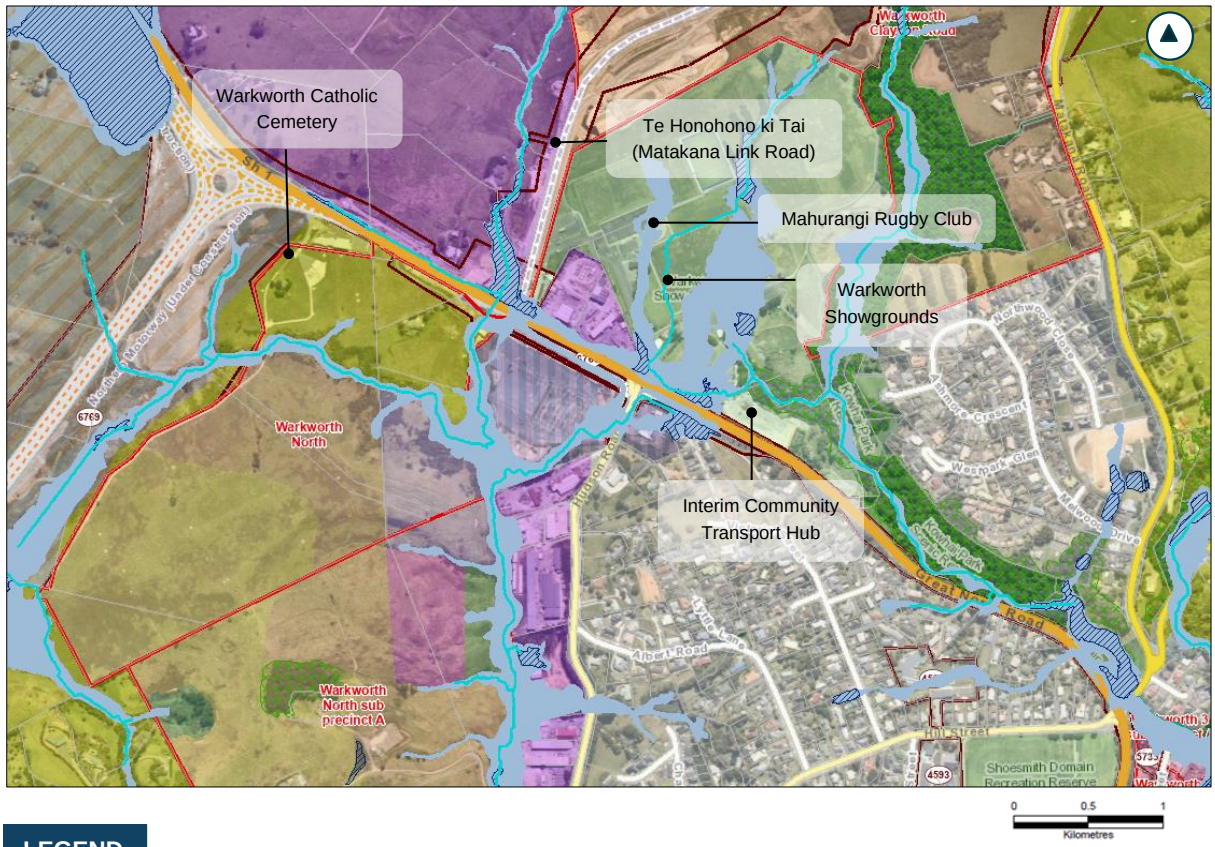
In developing options for the location of the PT Hub and Park and Ride, the Project Team also considered current and future land use in addition to known key features and constraints in the area. These are mapped below and include:

- Warkworth Catholic Cemetery in the western section
- Interim community transport hub station located adjacent to the Warkworth Showgrounds
- Floodplains particularly in the western and eastern sections
- SEA in the north-eastern section
- Permanent streams and flooding risk around the extent of Te Honohono ki Tai (Matakana Link Road)
- Warkworth Showgrounds and the Mahurangi Rugby Club located in the northern section
- Proximity to the intersection with Te Honohono ki Tai (Matakana Link Road) and the Ara Tūhono (Puhoi to Wellsford motorway) intersection in the west.

In terms of footprint assumptions for option development the following infrastructure requirements were determined through engagement with AT Subject Matter Experts. The footprint assumptions included:

- Four active bus stops
- Capacity for at least five services (terminating and through) Note: no reverse movements within the transport hub, so turning facilities to be considered in overall shape and dimensions
- Two layover spaces - includes long distance coaches to Northland
- Kiss and ride drop off facilities
- Bus Driver / Staff facilities to be provided for including a break room and a toilet which could be integrated with public toilets potentially
- Park and Ride for up to 250 spaces based on expected demand.

Figure 5-48: Northern PT Hub and Park and Ride Study area constraints mapping



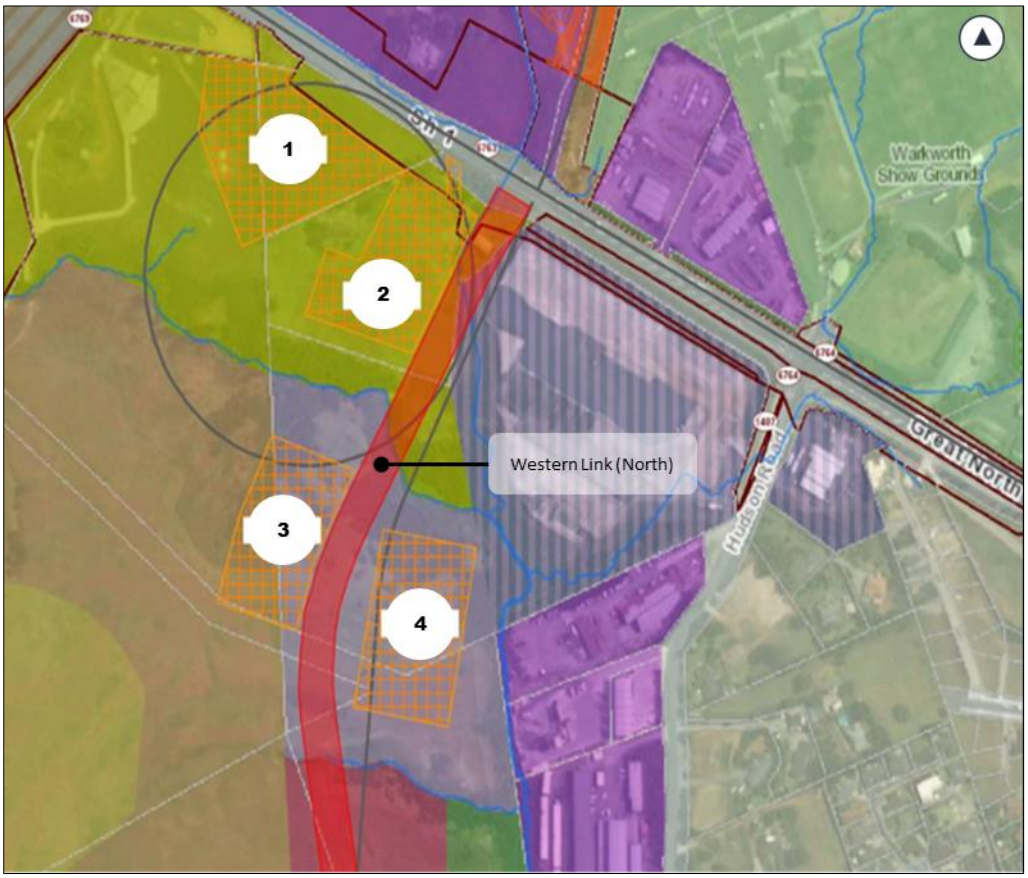
5.9.6 Route: Option Assessment

Indicative concept layouts for the four options located in the preferred Study Areas (6,7,8) were developed for assessment within the MCA Framework. These options are shown below in Table 5-53and Figure 5-49. The approximate number of carparks in each option was determined by the size and shape of each indicative concept layout.

Table 5-53: Northern PT Hub options

Option	Description
1	North-west of Western Link (approximately 238 carparks)
2	North-west (directly adjacent) to Western Link (approximately 229 carparks)
3	South-west of Western Link (approximately 214 carparks)
4	South-east of Western Link (approximately 221 carparks)

Figure 5-49: Indicative Northern PT Hub and Park & Ride options



Indicative facility concept layouts for the four options are shown in Figure 5-50, Figure 5-51, Figure 5-52, and Figure 5-53 below.

Figure 5-50: Option 1 Indicative Concept Layout

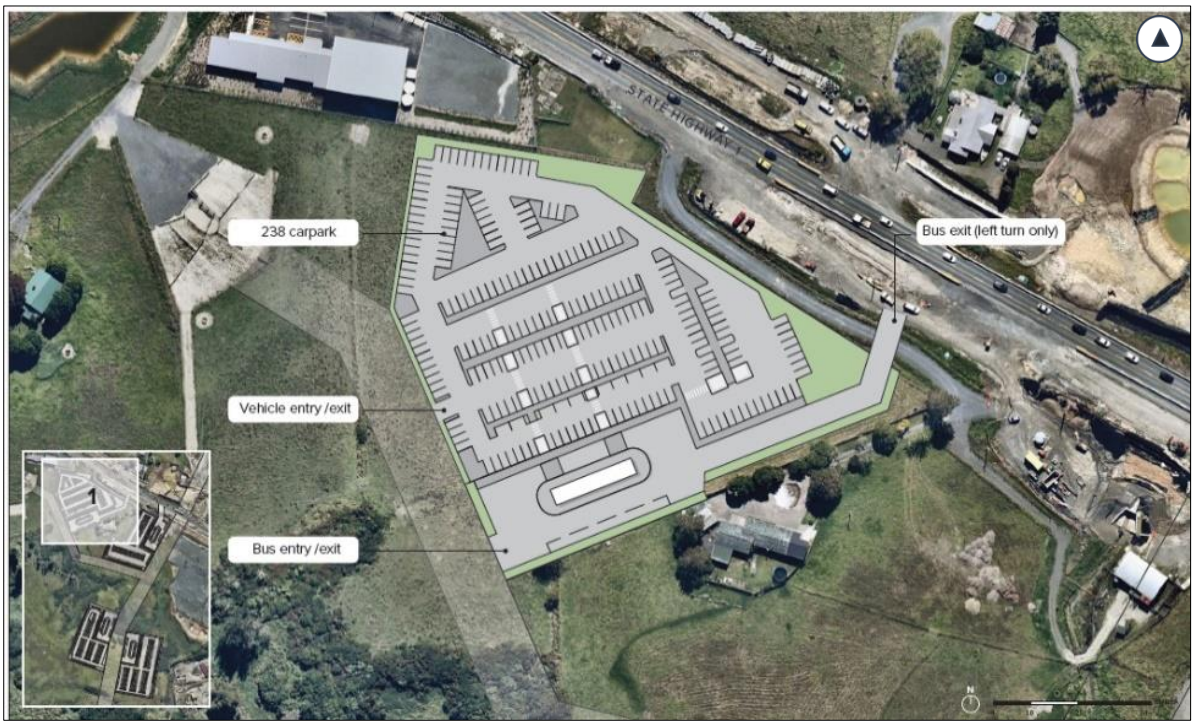


Figure 5-51. Option 2 Indicative Concept Layout

Figure 5-52. Option 3 Indicative Concept Layout

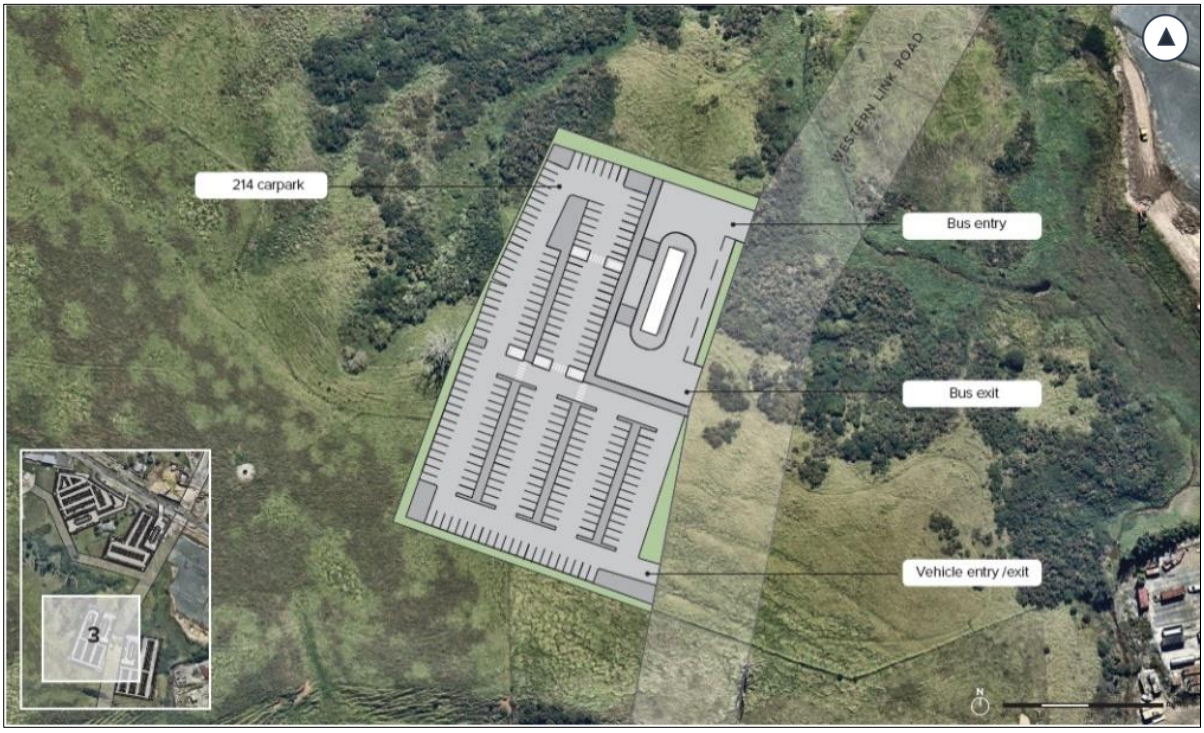


Figure 5-53: Option 4 Indicative Concept Layout

As set out in Section 5, options were assessed against the DBC investment objectives and criteria within four well-beings, cultural, social, environmental, and economic. Technical specialists engaged in a full day MCA workshop to undertake an assessment, scoring each option on a gradual scale from 'Very High Adverse Effect' (red) to 'Very High Positive Impact' (green).

The following table identifies the outcomes from this assessment.

Table 5-54: Northern PT Hub MCA workshop 1 scoring

MCA Criteria	Option 1	Option 2	Option 3	Option 4
I.O.1 – Access				
I.O.2 – Integration				
I.O.3 – Travel Choice				
Heritage				
Land use				
Urban Design				
Land Requirement				
Social Cohesion				
Human health and wellbeing				
Landscape / Visual				
Stormwater				
Ecology				
Natural Hazards				
Construction impacts				
Construction disruption				
Construction cost / risk				

The Project Team reviewed and compared the options identified above and noted that matters relating to ecology, stormwater, natural hazards, and construction were the key differentiators between options with options 1 and 3 scoring less favourably in this regard.

Accordingly, the Project Team identified Options 2 and 4 as the preferred options for further refinement and assessment for the reasons outlined in Table 5-55 below.

Table 5-55: Assessment outcomes for preferred options

Option	Assessment outcome
2 North-west (directly adjacent) to Western Link (approximately 229 carparks)	• Increased operational efficiency for buses with the facility located at the confluence of multiple bus services • Supports connectivity for services to the existing Warkworth town centre including Warkworth to Wellsford services • Facility's proximity to SH1 and Te Honohono ki Tai (Matakana Link Road) intercepts private vehicle trips from the hinterland well and the park and ride component of the facility integrates well with the surrounding commercial / industrial land use • Option has opportunity for integration with future commercial developments on adjacent General Business land.
4	• Option has an increased walking and cycling catchment due to proximity to the future local centre

Option	Assessment outcome
South-east of Western Link (approximately 221 carparks)	• High amenity values due to proximity to the local centre.

The remaining options were discounted by the Project Team for reasons outlined in Table 5-56 below.

Table 5-56: Assessment outcomes for discarded Northern PT Hub and Park & Ride options

Option	Assessment Outcome
1 North-west of Western Link (approximately 238 carparks)	• Has limited land use integration opportunities due to the distance from Western Link – North • Reduced access and connectivity for all transport modes from the northern Warkworth growth area as option is furthest from WLR-North and closer to industrial zoning north of SH1 and the Ara Tūhono intersection to the west • Has the largest footprint and land requirement.
3 South-west of Western Link (approximately 214 carparks)	• Proximity of park and ride component to residential zones will result adverse air quality and noise and vibrations effects • There is a likelihood of natural wetlands occurring within the site footprint • Location results in access barriers for public transport and town centre, access would require pedestrians and cyclists to cross the Western Link – North and PT and private vehicles to traverse the Western Link to get to the PT Hub and Park and Ride • Large extent of earthworks and a longer Western Link – North corridor is required.

5.9.7 Engagement

The following section provides a summary of the project specific feedback received from engagement with Te Tupu Ngātahi partners, stakeholders, and community members.

Project	Feedback
Northern PT Hub and Park and Ride facility	• Support for the location of the PT Hub in the north • Support for public transport options and sufficient park and ride facilities – some concern that the park and ride facility is too small • Provision for access by walking and cycling is important • Proximity and access to the Catholic cemetery is desirable • Provision of cycle and walking access including underpasses through to Warkworth town.

5.9.8 Option Refinement

Following the MCA workshop, refinements were suggested for the concept layout that may address initial concerns from the specialists regarding the stormwater and ecological impacts of Options 2 and 4, the project team completed refinements to the layout of the initial concept design, to test if this would potentially minimise their development and environmental impacts. Post refinement two further options were developed in Option 2a and Option 4a with these were then taken through the MCA process.

Table 5-57 below specifies the refinements made to Option 2 and 4 for reassessment as Option 2a and 4a.

Table 5-57. Refinements to preferred options

Option	Proposed Refinements
2	• Shift location west to avoid stormwater and ecological areas north-east of the site • Improve ability to repurpose residual land.
4	• Shift location south to avoid ecological and wetland areas to the north of the site • Redesign conceptual layout to position bus entry to the south of the facility to improve bus interface with the local town centre.

The refined concept layouts of each of the options is shown below in Figure 5-54 and Figure 5-55 below.

Figure 5-54. Option 2a - Northeast Western Link

Figure 5-55. Option 4a - Southeast Western Link

5.9.9 MCA Workshop 2

The project team and technical specialists participated in a subsequent MCA workshop after the development of refined options 2a and 4a.

The Table 5-58 below identifies the outcomes from this assessment for ease of comparison the assessment outcomes for Options 2 and 4 have also been added to the table below.

Table 5-58: Northern PT Hub MCA Workshop 2 scoring

MCA Criteria	Option 2a	Option 4a	Option 2 (for comparison only)	Option 4 (for comparison only)
I.O.1 – Access				
I.O.2 – Integration				
I.O.3 – Travel Choice				
Heritage				
Land use				
Urban Design				
Land Requirement				
Social Cohesion				
Human health and wellbeing				
Landscape / Visual				
Stormwater				
Ecology				
Natural Hazards				
Construction impacts				

MCA Criteria	Option 2a	Option 4a	Option 2 (for comparison only)	Option 4 (for comparison only)
Construction disruption				
Construction cost / risk				

The Project Team reviewed and compared the options identified above and noted that matters relating to stormwater, natural hazards, and construction were the key differentiators between options.

Accordingly, the Project Team identified Option 2a as the preferred route refinement option for the reasons identified in Table 5-59 below.

Table 5-59: Assessment outcomes for emerging preferred option

Option	Assessment Outcomes
Option 2a North-west (directly adjacent) to Western Link (approximately 228 carparks)	• Supports efficient bus operations through location of facility at the confluence of multiple services • Supports connectivity for services to the existing Warkworth town centre including Warkworth to Wellsford services • Park and ride facilities located to intercept trips from the hinterland and reduce car trips into the residential areas. Carpark located near business land use minimising impact on future urban form • Results in slightly lower walk-up catchment compared to some other options due to the adjacent industrial land use (north of SH1). However, this can be managed through improved bus services along the Western Link - North and SH1 • Option has opportunity for integration with future commercial developments on adjacent General Business land • Refined layout / location has reduced impacts on ecology and stormwater constraints • Lower extent of earthworks required compared to option 4a • Residual land to be utilised as access road to adjacent land uses.

Option 4a was discounted by the Project Team for the reasons outlined in Table 5-60 below.

Table 5-60: Assessment outcomes for the discounted option

Option	Assessment Outcomes
Option 4a South-east of Western Link (approximately 223 carparks)	• Site is located to the north of the future town centre and will take up additional space, option has a high acquisition cost compared to option 2a due to location in the mixed-use zone • Larger footprint compared to Option 2a resulting in a higher land requirement effect • Option potentially within floodplain alongside the stream • Option still borders a potential wetland • Evidence of land instability and slope creep near the park and ride location

Option	Assessment Outcomes
	• Location has steep slopes which will require large earthworks or retaining to form a level area • Option will require an additional bridge and long Western Link – North corridor.

5.9.10 Option refinement – Post stormwater design

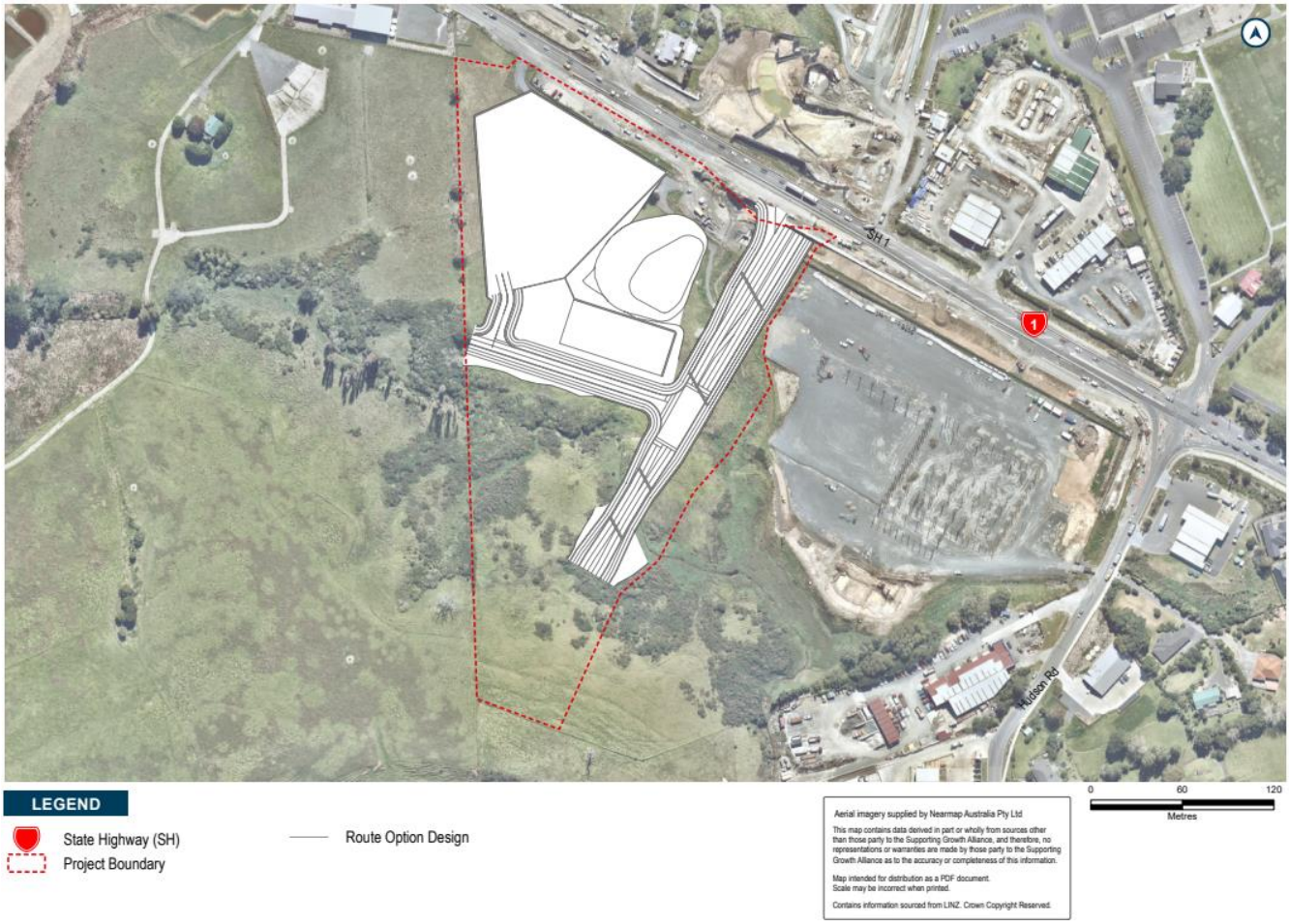
Following the identification of the emerging preferred location option (Option 2a) stormwater design works were undertaken as part of the 30 – 50% design development phase to identify the potential stormwater treatment options for the PT Hub and Park and Ride facility. These works concluded that the location of the stormwater treatment could not be provided for the Option 2a indicative layout as it currently existed, due to uneven topography in the area, and adverse construction impacts including on the planned local road connection from the WLR North. As a result, alternative facility layouts, within the general location of the emerging preferred option, were considered at a Project team workshop, which would allow for the provision of the required stormwater infrastructure in accordance with AT stormwater guidelines, while also continuing to achieve the facility outcomes achieved in this location, as well as maintaining local road access. The facility concept layout was subsequently refined, shifting the facility further to the west slightly in order to provide for the required stormwater treatment pond to be accommodated to the east of the facility, in a location that naturally dipped and operated as per the abovementioned stormwater guidelines.

As an alternative, prior to the location of Option 2a being shifted slightly west, the project team completed a design review on the second preferred option (Option 4a) to investigate whether the option would be more suitable. However, this option was dismissed due the steep topography of the area resulting in difficult stormwater wetland constructability unless earthworks or a retaining wall is provided to form a levelled area.

5.9.11 Option Summary

Following the option refinement process the preferred location for the DBC Northern PT Hub and Park & Ride facility was confirmed and is illustrated in Figure 5-55 below.

Figure 5-56. Recommended Northern PT Hub and Park and Ride Facility



6 Post DBC Option Refinement

Upon identification of the Warkworth transport network, the following refinements were made to the network.

- **NoR3 Woodcocks Road (Western Section)**
  Through a final review by the design team it was identified that implementation of the refined preferred corridor cross section (20m with walking and cycling facilities on both sides – cross section shown in Figure 6-1 below) would result in previously unidentified property and construction impacts on the existing residential area in the eastern section of the corridor as shown below in Figure 6-2. Specifically, the design extent and subsequent construction of the refined preferred option as it exists will require the demolition of an existing 2-3m retaining wall within the property boundary of the Summerset Retirement Village located to the northeast of the corridor. The existing wall would need to be replaced with a higher approximately 4-5m high retaining wall resulting in the likely need for the full acquisition of 10 residential units in order to facilitate the construction of the wall due the constrained area in this locality, and potential adverse impacts on the remaining (and future replacement) residential (retirement village) development, including amenity effects which could potentially affect the health and wellbeing of residents of the adjacent retirement village. Additionally, the Project team gave further consideration to options to limit property impacts on the existing residential (single house zone) development to the south of the corridor.

In considering an appropriate solution to address this matter the Project team noted an expressed preference from AT to avoid the use of shared paths and to retain separated active mode on each side of the corridor, as practicable. A reduced 15.9m cross section with separated cycling and walking provisions on both sides, but which excluded a berm and median strip, was subsequently identified as the preferred option for the eastern section of the corridor. This option still achieves the access, connectivity, and active mode transport outcomes for the corridor, while addressing the identified property and construction impacts on this section of the corridor. The remainder of the corridor to the west will be upgraded to a 24m wide cross section with walking and cycling provisions on both sides in accordance with the initial assessment.

Figure 6-1. Two-lane arterial 20m with cycling and walking provisions on both sides

Figure 6-2. Woodcocks Road reduced cross section extent shown in orange

WAKA KOTAHI
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Appendix 1: MCA Framework

1 Appendix 1: MCA framework

Well being	MCA topic	#	Criteria	Measure
Investment Objectives	**Investment Objectives**		Project specific	*Project specific (discussed in **Section 3.8.1**)*
Cultural	**1. Heritage**	1a	Heritage	*Extent of effects on:* • *Sites and places of valued heritage buildings, trees (with heritage value) and places.* • *Sites and places of archaeological value.* • *Sites and places of European cultural heritage value* • *Sites and places of significance to Manawhenua.*
Social	**2. Socio-economic impacts**	2a	Land use futures	*To what extent will the option impact on the future development of land (within the corridor, adjacent to it and impacted by it – i.e. consider all 3 scales), in relation to:* • *Underlying existing urban structure (block and street pattern)* • *Integration with the future landuse scenario (aligning housing delivery with infrastructure delivery)* • *Size and shape of potential development parcels to enable appropriate building typologies* • *Ability to consolidate residual land* • *Access that does not prevent neighbouring development.*
		2b	Urban design	*To what extent does the option support a quality urban environment (both current and future planned state)? particularly relating to:* • *Context and planned place making considerations* • *An inviting, pleasant and high amenity public realm* • *Open space integration*

Well being	MCA topic	#	Criteria	Measure
				• *Active interface between public and private realm* • *Scale of long term impact on the amenity and character of the surrounding environment.*
		2c	Land requirement	*Scale of public / private land (m2 / number of properties / special status of impacted property) required to deliver the option.*
		2d	Social cohesion	*Impact on connectivity / accessibility for the existing urban areas including access to:* • *Employment* • *Other communities or within the same community* • *Shops / services / other community and cultural facilities / 'attractors'* • *Severance of the existing community (including consented)* • *Scale of effect on existing community facilities and open space* • *Public access to the coast, rivers and lakes.*
		2e	Human Health and Wellbeing	*Will the option potentially affect any sensitive land uses nearby or consented (adjacent residential, childcare centres, hospitals, rest homes, marae and schools)? particularly relating to:* • *Air Quality* • *Contaminated Land* • *Noise and Vibration.*
Environmental	**3. Natural Environment**	3a	Landscape / visual	*Will the option have visual effects?* *Extent of effects on:* • *The natural landscape and features such as streams, coastal edges, natural vegetation and underlying topography – acknowledging planned changes to area in light of urban land use / zoning* • *Natural character and outstanding natural features / landscapes including geological features (mapped and protected features).*

Well being	MCA topic	#	Criteria	Measure
		3b	Stormwater	*Impact of operational stormwater (both quantity and quality) on the receiving environment, including:* • *Potential flooding effects of the option within the catchment* • *Extent and consequences of likely mitigation measures.*
		3c	Ecology	*Extent of effects on:* • *Significant indigenous flora* • *Significant habitats of indigenous fauna* • *Indigenous biodiversity* • *Stream / waterway ecology* • *Coastal environment (e.g. CMA).*
		3d	Natural Hazards	*Extent of effect on adverse geology; steep slopes; seismic impacts; other resilience risks (low level infrastructure near coastlines, inundation areas).*
Economic	**4. Transport**	4a	Transport system integration	*The extent to which the option achieves the following:* • *Integration with wider network and between modes* • *Resilience to operational incidents or short term life-line access disruption* • *Reduces the need to travel increase access to non-car choices.*
		4b	User Safety	*Extent of safety effects on all transport users, including:* • *People in public transport* • *People walking or cycling* • *People in private vehicles.*
	5. Construction impacts	5a	Construction impacts on utilities / infrastructure	*Requirements for relocation / design of existing infrastructure, including:* • *Consideration of safety impacts* • *Risk of continuity of service over construction* • *Engagement with utility providers* • *Opportunities for integration with other bulk infrastructure.*

Well being	MCA topic	#	Criteria	Measure
		5b	Construction Disruption	*Construction impacts on people and businesses regarding:* • *Traffic & noise* • *Earthworks related effects including dust* • *Quality of life and amenity* • *Economic impacts on businesses / community / town centres.*
	6. Cost & Construction Risk	6a	Construction costs and risk	*Assessed cost for construction of options including:* • *Complexity and risk in construction (including consideration of constructability)* • *Complexity in programme* • *Cost and complexity of safely undertaking works (including works on contaminated land).*