Supporting Growth

Trig Road Corridor Upgrade

Assessment of Alternatives

Volume 2 Appendix A

December 2022

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Document Status

Version	Responsibility	Name
2020 Draft	Authors	Matthew Kerr-Ridge Nicolai Berry
	Reviewer	Bryce Julyan Diana Bell Jill Gregory Andrew Beatson
1.0	Author	Bridget O'Leary
	Reviewer	Andrew Beatson
	Approver	Tracey Grant

Revision Status

Version	Date	Reason for Issue
1.0	December 2022	Final for Issue

Table of Contents

Tables

Figures

Appendices

Acronyms

Acronym/Term	Description
AC DBC	Auckland Council Housing Infrastructure Fund Detailed Business Case
AEP	Annual Exceedance Probability
AT	Auckland Transport
AUP:OP	Auckland Unitary Plan Operative in Part 2016
FULSS	Future Urban Land Supply Strategy
FUZ	Future Urban Zone
GD01	GD01: Stormwater Management Devices Guide
GD04	GD04: Water Sensitive Design Guide
HIF	Housing Infrastructure Fund
MCA	Multi-Criteria Analysis
NoR	Notice of Requirement
PBC	Programme Business Case
PPC5	Proposed Plan Change 5
RMA	Resource Management Act 1991
SG DBC	Supporting Growth Detailed Business Case
SH18	State Highway 18
The Project	Trig Road Corridor Upgrade
Waka Kotahi	Waka Kotahi NZ Transport Agency

1 Introduction

1.1. Purpose of this Report

Auckland Transport (**AT**) as a requiring authority under the Resource Management Act 1991 (**RMA**), is serving a Notice of Requirement (**NoR**) on Auckland Council (as the territorial authority) to designate land in the Auckland Unitary Plan: Operative in Part 2016 (**AUP:OP**) to enable the construction, operation and maintenance of the Trig Road Corridor Upgrade (the **Project**).

The Project consists of an upgrade of Trig Road, Whenuapai, between the State Highway 18 (**SH18**) over-bridge and Hobsonville Road, to form an urban arterial corridor to support the anticipated urban residential development in Whenuapai. The upgrade will provide a widened transport corridor which includes two traffic lanes and new walking and cycling facilities.

To ensure the Project integrates into the existing transport network the Project also includes:

- The upgrade and widening of approximately 500 metres of Hobsonville Road, including the signalisation of the existing intersections of Hobsonville Road with Trig Road and Luckens Road; and
- The reconfiguration of the existing traffic layout on the Trig Road SH18 over-bridge and upgrade of walking and cycling provisions north of the over-bridge. These works will occur entirely within the existing road reserve.

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

a. the requiring authority does not have an interest in the land sufficient for undertaking the work; or

b. it is likely that the work will have a significant adverse effect on the environment.

AT does not have an interest in all of the land required for the Project and so AT is required to give adequate consideration to alternative sites, routes and methods in accordance with section 171(1)(b).

The purpose of this report is to document both the development of alternatives and the process used to assess and compare options in order to provide the information necessary to inform an assessment under section 171(1)(b) of the RMA for the Project and to demonstrate that a thorough and robust assessment of alternatives has been undertaken.

1.2. Structure of this Report

The structure of the report is as follows:

Section	Heading	Description
1	Introduction	Purpose and structure of the report.
2	Background	Summary of the relevant project background which has directed the options development process, including a summary of the business case history for the Project, and a discussion on the development of the investment objectives and project objectives.
3	Summary of Corridor Option Development and Assessment	Summary of the development and assessment of corridor options for the Project as part of the Auckland Council Housing Infrastructure Fund Detailed Business Case.
4	Consideration of Alternative Routes	Overview of the development and assessment of corridor options and route options for the Project as part of the Supporting Growth Programme Detailed Business Case, and the identification of the recommended option.
5	Stormwater Assessment	Overview of the assessment of stormwater options for the Project.
6	Alternative Methods	Overview of the assessment of alternative methods for implementing the Project.
7	Conclusions	Summary of conclusions.

2 Background

The delivery of bulk infrastructure is critical to enabling the urban development of greenfield land. As such, Auckland Council developed the Future Urban Land Supply Strategy (**FULSS**) to help provide clarity and certainty around when future urban land will have bulk infrastructure in place and be ready for urban development. In July 2017, the FULSS was updated in line with the AUP:OP zoning to establish an indicative approach to the staged urbanisation of rural land over the next 30 years.

In response to the FULSS, AT, Waka Kotahi NZ Transport Agency (**Waka Kotahi**), and Auckland Council identified a need to determine the most appropriate transport responses to support this envisioned urban growth.

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.

The Supporting Growth Programme was established in 2018 and is a collaboration between AT and Waka Kotahi to plan and identify the required transport network to support Auckland's future urban growth areas over the next 30 years. AT and Waka Kotahi have partnered with Auckland Council, Manawhenua and KiwiRail Holdings Limited and are working closely with stakeholders and engaging with the community to develop the strategic transport network to support Auckland's growth areas. Trig Road is located within the North West Growth area (refer to AEE for further detail).

2.1. Project Area – Overview

This report relates to the North West growth area. Particularly, it relates to the upgrade of Trig Road which is located in Whenuapai, in the North West of Auckland. The majority of the area surrounding Trig Road is zoned as Future Urban Zone (**FUZ**) under the AUP:OP with the exception of the existing residential land use along Hobsonville Road which is zoned Residential – Mixed Housing Urban. The area was also subject to Proposed Plan Change 5 (**PPC5**) which sought to rezone the areas zoned FUZ to urban zoning to enable intensive residential development to occur. PPC5 was withdrawn on 16 June 2022, however given the proximity to the existing urban area along Hobsonville Road this pocket of FUZ land is expected to be subject to private development initiatives in the near future.

2.2. Overview of the Option Development and Evaluation Process

In 2016, the Programme Business Case (**PBC**) was completed which identified a high-level draft preferred strategic transport network to support all of the growth areas in Auckland. This initial option development process involved workshops and collaborative consultation with multiple stakeholders to formulate potential options and interventions.

For the North West growth area, the PBC considered 80 long list options and 39 short list options, ultimately recommending 13 transport network components, including improved local transport connections across Whenuapai to provide improved functionality and active mode facilities, and greater access to existing and greenfield areas and across SH18. The upgrade of Trig Road was identified as a key component of the improved local transport network – with the section of Trig Road south of SH18 identified as a key route for enabling the development of housing which is anticipated on the adjacent land.

Following the completion of the PBC and the identification that Trig Road requires upgrading as a key component of the improved local network, the Crown announced its recommendation (in principle) to provide a loan to Auckland Council to fund $300 million of bulk infrastructure in North West Auckland through the Housing Infrastructure Fund[1] (**HIF**). This funding of bulk infrastructure was estimated at the time to support the early construction of at least 10,500 new homes in North West Auckland.

In order to consider the extent to which the HIF could be used to fund the investment of all infrastructure required to support accelerated development in Whenuapai and Redhills, Auckland Council prepared the HIF Detailed Business Case (**AC DBC**). The AC DBC was supported by the Transport Network Option Evaluation Report that assessed options for the Trig Road alignment.

The AC DBC concluded that as Whenuapai was identified in the FULSS for Decade 1 housing development and was subject to PPC5, the upgrade of Trig Road between SH18 and Hobsonville Road was a key transport project which would enable housing development to occur in this area. As such, part of the HIF was allocated for the construction of the Project (including design and planning) with the expectation that the Project would be constructed within 3-5 years. AT does not currently have an interest in all the land necessary to construct the Project so there is an immediate need to secure the land necessary to undertake the works.

Following the AC DBC, the Supporting Growth Programme prepared the Supporting Growth Detailed Business Case (**SG DBC**) which specifically developed and evaluated options for the Project. The SG DBC included further corridor and route refinement, multi-criteria analysis (**MCA**) and input from stakeholder/community engagement to assess options for Trig Road.

The options from the SG DBC were then subject to further review, taking into account the additional protection afforded to natural wetlands under the National Policy Statement for Freshwater Management 2020.

The development and assessment of alternatives for the Project has therefore been completed through sequential options development processes in the PBC, AC DBC and SG DBC. This process forms the basis for this report and a summary of this process is outlined in Figure 1 below.

[1] The HIF was established by the Crown in 2016 to provide 10-year interest-free loans to high-growth councils. The funds were provided to help address funding constraints of high growth councils, with the purpose of funding core infrastructure to support housing development and increase housing supply. With approval of the HIF in 2017 for bulk infrastructure in the North West, Auckland Council is expected to repay this loan by 2027.

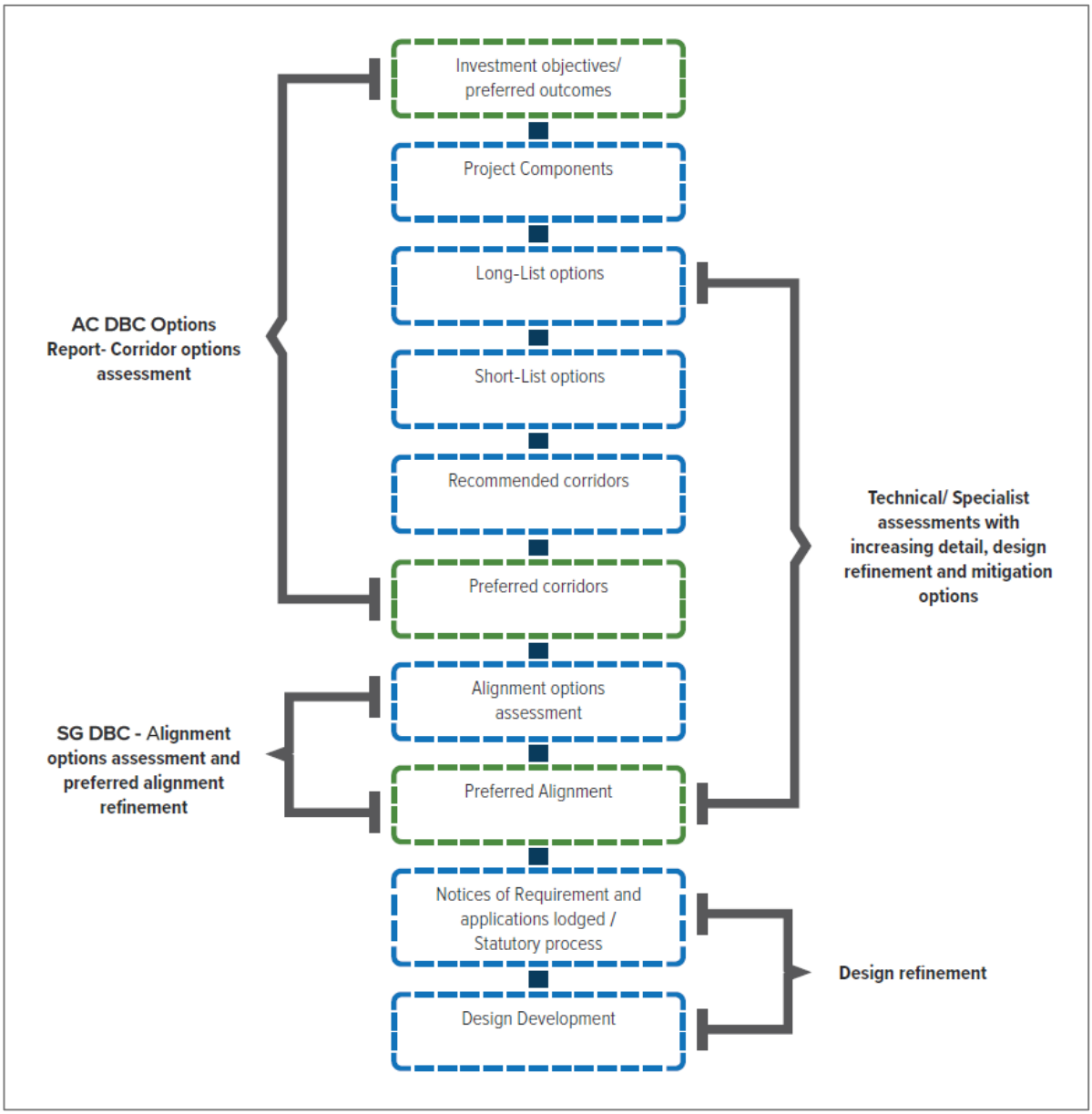

Figure 1: Options Development Process

2.3. Trig Road Investment Objectives and Project Objectives

Investment objectives were developed through the AC DBC process to assist with option assessment and investment decisions. These were developed at an area wide level for Whenuapai and Redhills and therefore did not contain project specific detail.

The investment objectives were then refined through the SG DBC process to confirm whether they remained relevant when focusing on the transport network option evaluation for the North-West HIF area. As discussed at section 4.4 of this report, options have been assessed against the investment objectives in each of the MCA processes to assist in identifying the preferred option for the Project.

The investment objectives have then been used to develop the RMA project objectives that are specific to the Project. This process is shown in Figure 2 below.

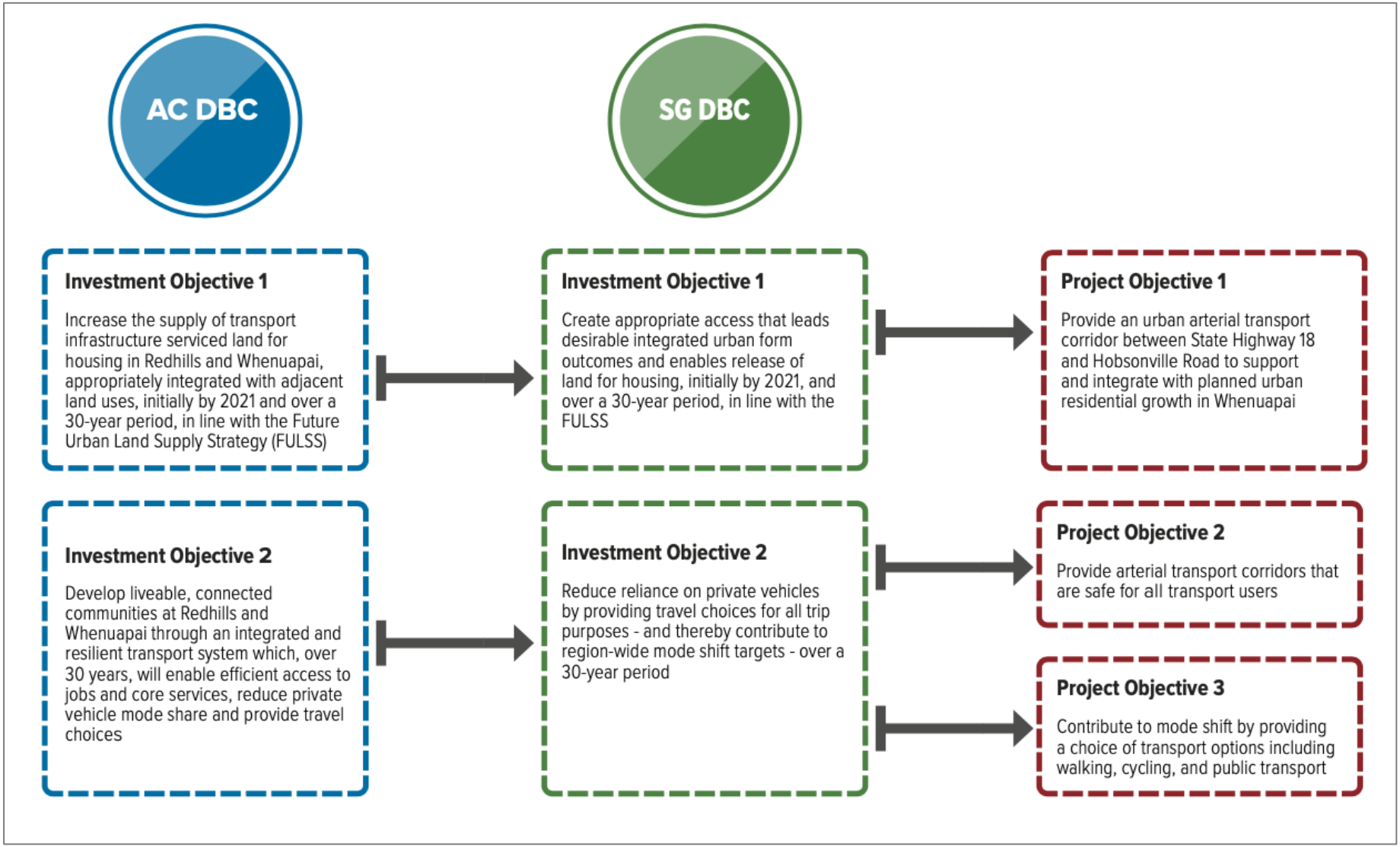

Figure 2: Development Process for Project Objectives

3 Summary of Corridor Option Development and Assessment

As noted above, following the Crown's recommendation (in principle) to provide a loan to Auckland Council to fund $300 million of bulk infrastructure in North West Auckland through the HIF, Auckland Council undertook to assess which parts of the PBC recommended network should be accelerated through the HIF funding.

This section of the report briefly describes the options assessment undertaken as part of the AC DBC which built on the conclusions of the PBC that an improved road corridor at Trig Road was required.

For the purposes of this assessment, a 32m wide cross section was assumed for all Whenuapai assessments in order to accommodate the recommended typologies and key features of an urban arterial road.

3.1. Overview of Assessment Framework

To enable a structured, consistent, systematic and replicable process for assessing alternatives and options, an MCA framework was developed for the AC DBC. The MCA is a 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 developed collaboratively, drawing on the collective knowledge and experience of AT, Waka Kotahi, Auckland Council, Manawhenua and the Supporting Growth Programme team. This framework, with additional refinements, would later form the basis of the Supporting Growth Programme wide MCA framework (as discussed further at section 4.4), and was used during the SG DBC options assessment process discussed at section 4 of this report.

The MCA framework utilised for the AC DBC adopted four broad criteria – investment objectives, implementability, assessment of environmental effects and opportunity outcomes and applied the following principles:

- The process should be transparent and ideally replicable, allowing additional options to be consistently assessed if they are developed or raised after the original options;
- The environmental effects component of the MCA framework would be finer grained and would require specialist input; and
- No in-built weighting would be applied, although sensitivity testing could be undertaken as appropriate.

The full MCA framework used for the corridor assessment is set out in Appendix 1 to this report. The MCA used a graduated 11-point scoring scale, ranging from -5 for Very High Adverse Effects to +5 Very High Positive Impacts. A final overall score was based on a qualitative assessment of potential effects.

In addition to the MCA scoring, the options and their scores were discussed at a workshop with the Project stakeholders and Manawhenua. These stakeholders included members of the Supporting Growth Programme Partners (Waka Kotahi, AT) and Auckland Council. The workshops helped to test options and scoring and assist with determining which options should proceed to the next stage and be assessed further.

3.2. Options Development and Assessment

Three primary options for an upgraded transport corridor between SH18 and Hobsonville Road were developed through the AC DBC, as shown in Figure 3 below with each option varying towards the southern end of Trig Road where it connects in with Hobsonville Road. Option A deviates from the existing Trig Road alignment to the west, connecting in with Hobsonville Road at Cyril Crescent, while Option C deviates to the east of the existing Trig Road alignment to connect into Hobsonville Road at Luckens Road. Option B follows the existing Trig Road alignment for the length of Trig Road and connects into Hobsonville Road at the existing intersection between Trig Road and Hobsonville Road.

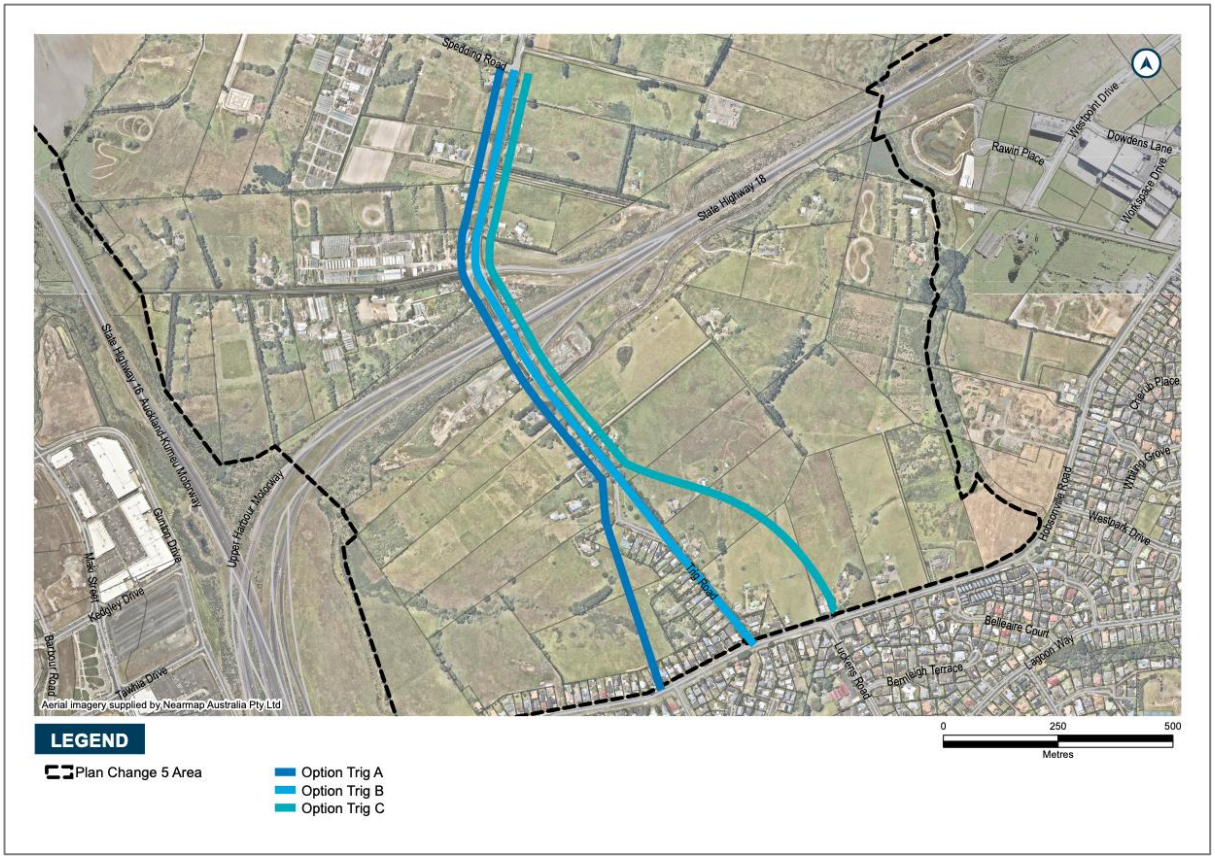

Figure 3: Corridor Assessment Options

At this stage of the assessment process, the information used to inform the consideration of the different options was primarily derived from desktop assessments. When assessing the three options, consideration was had to the purpose of the upgrade and potential realignment of Trig Road which is to increase supply of land for housing, and to improve access for Whenuapai residents to adjacent land uses in Hobsonville, as well as rapid transit and ferry services, effects of the options on existing properties access, and the need to minimise the number of intersections along Hobsonville Road.

The options were assessed against the MCA framework in a workshop setting. Technical specialists were provided with information packs prior to workshops occurring to inform them of the MCA process and allow them to undertake pre-scoring and assessment. Workshops were then held with representatives from Auckland Council, AT, Waka Kotahi and Manawhenua to allow discussion of options and the scores assigned by technical specialists, and for technical specialists to confirm their scores.

Following the assessment process of the three long list options, the Project Team identified Option C as the preferred option, and the only option recommended to be taken to the shortlist, on the basis that:

- Options B and C performed best in achieving the investment objectives as they provided a more strategic transport connection into the existing transport network along Hobsonville Road.
- Option A performed significantly worse in all criteria due to providing sub-optimal transport connections, creating land redundancy from the alignment and considerable effects to the existing land use, as well as resulting in a more constrained environment which would likely result in greater construction impacts and costs.
- Option C avoided potential impacts on the existing residential land use along the southern section of Trig Road; however, it would require substantial earthworks and new stream crossings to construct the diversion of Trig Road into a new intersection with Luckens Road.
- Option B utilised the existing Trig Road alignment and intersection; however, the existing residential land use along the southern section of Trig Road was identified as a potential constraint to widening the corridor due to the close proximity of dwellings to the road frontage. Furthermore, there was uncertainty as to whether the signalisation of the Hobsonville Road intersections at Luckens Road and Trig Road could achieve as efficient a strategic transport connection as the new intersection at Luckens Road proposed for Option C.

Stakeholders generally preferred Option C because it provided more strategic transport connections at Luckens Road through to the ferry terminal at West Harbour Marina.

Following the recommendation that only Option C should be taken to the short list, the short list process tested six alternative options derived from Option C. These options varied in relation to the location of widening of Option C (i.e. widening on the west only, east only, or both).

Following the short list assessment, which went through a similar workshop MCA process, it was concluded that further design and engineering assessment was required to determine a preference between the options. As such these options were re-tested through the SG DBC. This is discussed in further detail at section 4.2 of this report.

4 Consideration of Alternative Routes

As noted above, the process taken to considering alternatives for the Project was sequential and iterative, with each stage of assessment being informed by the previous stage of assessment and an increasing level of detail and refinement occurring depending on the stage of assessment. As such, the SG DBC built on the AC DBC.

4.1. Overview of further design undertaken prior to Options Assessment

As noted in the AC DBC, further design and engineering assessment was required to determine a preferred option. Further design work was undertaken as part of the SG DBC which identified that the earthworks required for Option C to realign Trig Road to connect to Luckens Road and achieve current roading standards were greater than previously anticipated and would result in the road needing to be as much as 15m (equivalent to a four-storey building) above the surrounding ground level. The earthworks would also have a greater area of impact on Trig Stream than anticipated, which the realigned corridor would need to cross.

Stemming from this issue, it was considered that there were several secondary impacts which could have the potential to compromise the viability of the alignment including:

- Landscape and visual impacts;
- Ecological impacts;
- Severed access to existing parcels of land;
- Compromised pedestrian and cyclist access;
- Severance effects for adjacent land use; and
- Poor value for money.

These issues were assessed as having potential to impact the ability of the option to meet the project objectives and achieve a satisfactory value for money outcome. As such, a decision was made to undertake further options development and assessment at a corridor level to ensure the best option was chosen to take forward to route refinement and that this decision was based on a robust process.

4.2. Review of Corridor Options

As a result of the above, the original three options considered during the earlier corridor assessment phase as part of the AC DBC (as shown above in Figure 3 and recreated again below in Figure 4), were reconsidered.

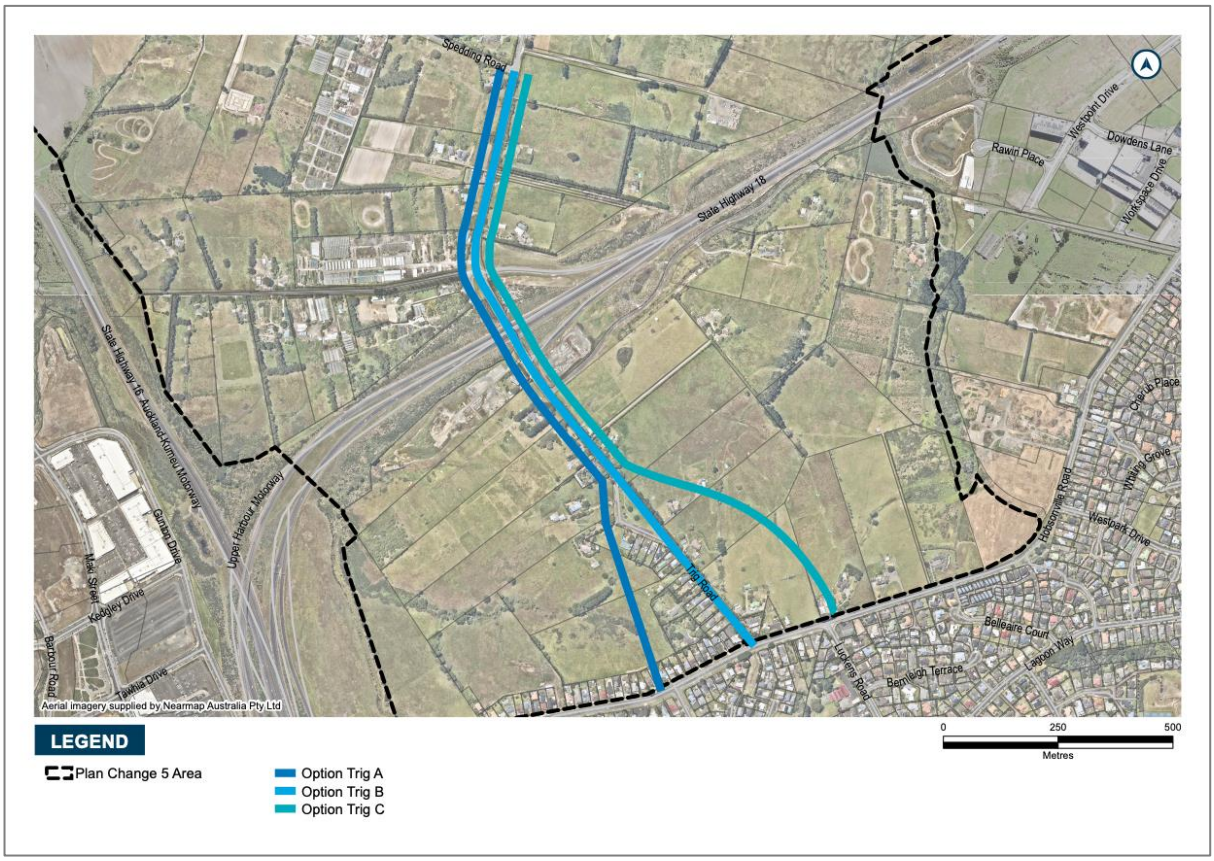

Figure 4: Reconsideration of Corridor Assessment Options

Option A was considered to be the least effective in achieving the investment objectives because it would result in less area available for housing, did not integrate well with the planned neighbourhood centre and provided the least effective connection to the local centre and ferry terminal. The connection point with Cyril Crescent was also assessed to be unsuitable for an arterial road. All of these concerns had been identified during the initial corridor assessment process and as such it was concluded that the previous work and conclusions as part of the AC DBC relating to Option A were still valid. Accordingly, it was reconfirmed that Option A was not a viable option and Option A was not considered further.

Option B had previously performed better than Option A and had performed similarly to Option C. It was not previously preferred over Option C however as the connection point at Hobsonville Road was considered to not be as direct as that provided by Option C with Luckens Road. Option B was also previously assessed as having higher potential construction effects due to the existing residential development towards the south of Trig Road. However Option B was assessed as having higher potential opportunities associated with improved access and amenity for the wider walking and cycling network.

Overall it was considered that Option B performed similarly to Option C and so may prove to be a viable alternative, subject to the construction impacts being able to be managed satisfactorily. In conjunction with the identification of potentially greater impacts as a result of Option C than was anticipated during the initial corridor assessment during the AC DBC, it was recommended that further development of route options for Option B should be undertaken alongside assessment of route options for Option C. This would allow further investigation of these options with particular

consideration being given to design geometrics, intersection connections with Hobsonville Road, stormwater design and costing.

4.3. Development of Options

In developing the route options for Options B and C, the known constraints and opportunities identified during the previous corridor assessment phase were examined to help refine the design and minimise potential impacts for each option.

The interface with approximately 25 existing private properties along the southern section of Trig Road was identified as a constraint to developing Option B. In particular, to avoid impacts on these dwellings widening would need to be predominately on the eastern side of the road corridor.

Furthermore, having existing vehicle accesses onto arterial corridors that are across pedestrian and/or cycle paths is also undesirable as this can reduce network efficiency and can create a safety risk for vulnerable road users. An Option B variant (Option Trig B1) was therefore developed which utilised service lanes along the road corridor to test the viability of removing direct access from existing dwellings onto the arterial corridor.

To minimise the potential impacts of Option C a refined alignment was developed to reduce the scale of earthworks required to establish this option. In particular, the gradients of the approach to the Luckens Road intersection were refined with particular consideration given to minimum engineering standards.

The intersection configuration of Hobsonville Road between Trig Road and Luckens Road had also been identified as a potential constraint, particularly for Option B. In response to this, the intersection configuration for all options was developed further with consideration of signalised intersections and roundabout sub-options for each option. Table 1 and Figure 5 outlines the three route options developed for the assessment. The alphabetic naming convention comes from the long list stage of the corridor assessment phase as part of the AC DBC, with the addition of a number for the slip lane variant identified above.

Table 1: Trig Corridor Assessment Options

Option Name	Option Description
Option B	Widening on the eastern side of the existing Trig Road corridor, with direct vehicle access from adjacent properties maintained.
Option B1	Widening on the eastern side of the existing Trig Road corridor, with a slip lane to provide vehicle access from adjacent properties.
Option C	Realignment of Trig Road to the east to tie in with Luckens Road and Hobsonville Road.

Figure 5: Route Refinement Options

4.4. Overview of Assessment Framework

4.4.1 Multi-Criteria Analysis

Following design refinements and further options development, specialists were engaged to assess route options using the MCA process. By this time, the Supporting Growth Programme had finalised a programme wide Supporting Growth Programme MCA framework, in consultation with AT, Waka Kotahi and Manawhenua. The MCA criteria included investment objectives (as discussed further below) and the four well-beings: Cultural, Social, Environmental and Economic. Several sub-criteria were developed under each well-being grouping.

The MCA was not the sole means of assessing options but was complementary to the decision-making process, which also incorporated input from AT, Manawhenua, feedback from the consultation and engagement process, subject-matter experts and the Project Team. The MCA criteria were tailored to suit the specific issues relevant to the Trig Road/Whenuapai area, consistent with the Supporting Growth Programme MCA and the earlier corridor assessment framework. A rationalisation process was undertaken to identify any criteria in the Supporting Growth Programme MCA criteria for which scoring may be inappropriate and/or unnecessary – either due to duplication of the criteria with the investment objectives or the inability of any particular criteria to differentiate between options. The criteria are set out at Appendix 2.

4.4.2 Scored Criteria

Technical experts were appointed to undertake assessments of the options in their area of expertise.

The Supporting Growth Programme MCA framework used a graduated scoring scale, ranging from -5 for Very High Adverse Effects to +5 Very High Positive Impacts to score options against the MCA framework.

Scoring was completed by technical experts and discussed at several MCA workshops. Prior to each workshop, experts were provided with a briefing pack, which contained the MCA criteria and scoring guidelines, an overview of each of the options, and a pre-scoring worksheet where they documented their approach and key assumptions that informed their scoring. On the day of a workshop, the draft scores and commentary were challenged in a group setting. The experts then considered the issues raised in discussion and finalised their scores.

4.4.3 Non-scored Criteria

In addition to the scored criteria, there are four non-scored criteria considered as part of the Supporting Growth Programme MCA framework. These criteria are less suited for scoring through the MCA scoring framework. Instead these criteria are considered through a descriptive (qualitative) assessment which can be used to help to direct decision making (in combination with the scored criteria). A description of the non-scored criteria (as specified by the Supporting Growth Programme MCA framework) is provided in Table 2.

Table 2: Non-scored Criteria

Criteria	Description
Stakeholder feedback	Stakeholder feedback for each option identifying scale/validity of objections, identified preference/proposed changes to options etc. Feedback provided by other key partners/stakeholders.
Policy analysis	Options alignment with the strategic policy framework including the AUP:OP and Auckland Plan with consideration to provisions that derive from section 6 of the RMA. Ensure the strategic framework assessment does not consider detailed issues raised in the effects criteria.
Value for money	Provide an estimate of likely value for money in conjunction with transport outcomes and construction costs.
Manawhenua	Optioneering commentary including (but not limited to) identification of cultural issues or any other matter related to an option, providing input commentary on criteria scoring, identification of cultural issues etc.

4.4.4 Investment Objectives

As described in section 2.3, for the purpose of undertaking an assessment of options, the investment objectives were refined for this phase of assessment. These investment objectives were developed with a view to supporting the NoR processes that would follow. Table 3 outlines the Trig Road specific investment objectives for this stage.

Table 3: Trig Road Investment Objectives

Investment Objectives	Sub-criteria
Investment Objective 1 Create appropriate access to the Whenuapai FUZ land that facilitates desirable urban form outcomes and enables the release of land for housing, initially by 2021, and over a 30-year period, in line with the FULSS.	• Network connectivity and integration • Intersection performance • Traffic performance • Housing yield • Timing of infrastructure • Severance effects • Direct access
Investment Objective 2 Reduce reliance on private vehicles by providing travel choices for all trip purposes, thereby contributing to region-wide mode shift targets, over a 30-year period.	• Mode share • Public transport prioritisation • Cycling provision • Gradient

4.4.5 Intersection Assessment

To assess the intersection design options with Hobsonville Road (signals v roundabouts) a further refined MCA framework was developed, comprised of a limited set of MCA criteria appropriate for the scale of variation in proposed intersection form. The key factors for assessment were the footprint and function of each option. Accordingly, along with the investment objective scoring, the criteria outlined in Table 4 were selected for their ability to differentiate between the proposed intersection forms.

Table 4: Intersection Options MCA Criteria

Criteria	Commentary
Urban design	Providing design insight between intersection forms and associated external impact on surrounding community.
Land requirement	Confirm the extent of impact on surrounding properties, including the number and type of properties affected.
Landscape/visual	Consider the visual impacts associated with the design variants.
Construction cost/risk	Detail the likely cost and risk profile between both intersection forms.
Safety	Safety for all transport users, including private vehicles, public transport, pedestrians, cyclists, and other road corridor users.

4.5. Assessment of Options

The options for Trig Road were assessed against the above framework. The results of that assessment are discussed in detail below.

4.5.1 Investment Objectives

Option C comprises a more efficient intersection layout connection to Luckens Road when compared against the dog-leg intersection in Options B/B1, as it requires traffic to turn onto Hobsonville Road before turning down Luckens Road. For Options B/B1, higher traffic volumes will require the

signalisation of both the Trig Road/Hobsonville Road intersection, and the Hobsonville Road/Luckens Road intersection to enable them to perform effectively. From a network performance perspective, Options B/B1 are less direct and less efficient for users travelling north-south along Trig Road and onto Luckens Road. Overall, Option C is assessed to perform slightly better than Options B/B1 for intersection and traffic performance, but both options still meet the sub-criteria of Investment Objective 1.

As discussed above, following further design and development of Option C, it has become apparent that significant earthworks would be required to achieve the alignment, and the corridor would have a larger than anticipated footprint on the greenfield land. This may result in potential housing yield in this area being lower than that anticipated at the previous phase of work. Therefore, Option B which retains direct access performs better against this criterion of Investment Objective 1 and may eventually enable a higher housing yield than that considered in the previous phase of work as it has a smaller footprint and leaves more available developable land. Option B1 with the slip lane access is likely to provide a greater housing yield than Option C, but a slightly lesser housing yield than Option B with direct access because of the larger corridor footprint required to establish services lanes.

From a severance perspective, Option C is assessed as performing poorly against this criterion. This is due to the height difference that would be created between the arterial corridor and the adjacent land, with embankments up to 15m above the surrounding land resulting in a significant physical impediment between land use on either side of the corridor. Option B is assessed as having less severance impacts than Option C and additionally would be an improvement over the existing situation as new walking and cycling crossings will be enabled – there are currently no crossings on Trig Road. Option B1 is assessed as having slightly greater severance effects than Option B, due to the greater footprint and cross section required to establish service lanes, although Option B1 still performs better than Trig C.

Option C is assessed as being slightly more favourable than the other options in terms of provisions for cycling. This is due to there being no direct private property access for the realigned section of the corridor, which means cycling infrastructure can safely be provided on both sides of the corridor. With Option B, if some direct accesses are maintained (particularly along the southern section of Trig Road), there are potential risks to people who cycle (and walk) due to the potential conflicts with vehicles requiring access across their paths. This may make walking and cycling less attractive due to the safety perception issues associated with driveways. Option B1 performs better than Option B in this regard as it avoids direct vehicle access along the corridor, instead utilising service lanes.

All options result in constraints to active modes from a gradient perspective, with Option C having a gradient of 8% over parts of the alignment and Option B/B1 having a gradient of 7.7% over parts of the alignment. This may discourage some active mode users from using this route, although as this only affects a limited section of the corridor for each option this constraint is considered to be minimal.

4.5.2 MCA Scoring

This section provides a summary of the key differentiators between each of the options based on the scoring from the MCA framework.

Cultural heritage and archaeology

Option C scored negatively for cultural heritage and archaeology due to the potential for accidental discovery of unknown archaeological and other heritage during construction. However it was noted

that this option largely traverses historically pastural/rural uses, therefore there is only low potential for European farming heritage to be discovered during construction. Options B/B1 scored neutrally as the works would largely be within the existing road corridor.

Social Economic

The direct access of Option B was preferred over the slip lanes of Option B1 as the longer-term impacts of a slip lane on the surrounding developing urban environment and the additional footprint that may be required could hinder provision of future access connections and land use patterns. Option B was also preferred over Option C due to the much larger area of land required for the re-alignment of Trig Road as part of Option C to connect into Luckens Road.

Option B was also the preferred option in relation to urban design matters, contributing positively to the amenity and quality of the future urban environment due to improved connectivity, safety and urban amenity. Conversely, Option C was less favoured due to Option C requiring large scale and physical presence (due to large fill volumes required) which was deemed to dominate the future urban landscapes. Option B1's slip lanes and subsequent wider cross section were also deemed to be a poorer outcome than Option B.

Option C was deemed to have marginally less adverse impacts on human health and wellbeing in relation to increases in noise/vibration and air quality for adjacent properties, largely due to Option B/B1's closer proximity to the existing dwellings along the southern section of Trig Road.

Natural Environment

Overall, Options B/B1 scored more favourably than Option C for the natural environment criteria. Climate change outcomes were largely similar across all options, with all options achieving positive climate change outcomes through the provision of walking and cycling facilities to encourage greater mode shift. Option C had greater impacts on stormwater and ecology largely because Option C was anticipated to have greater impact on existing watercourses and will require larger construction/earthworks.

There were more notable differences in landscape/visual outcomes due to the large scale of fill required for Option C and its prominent visual proximity to surrounding land uses and natural character values. Option C therefore scored a high adverse impact for the natural environment criteria.

Constructability and design

Option C was considered to have more positive outcomes in relation to user safety due to providing improved intersection arrangements, with Options B/B1 scoring less favourably as a greater number of existing vehicle accesses would need to be retained compared to a new alignment. Furthermore, Option C provided a marginally better outcome regarding construction impacts on utilities/infrastructure and construction disruption as it was largely greenfield, therefore avoiding existing utilities sites and having minimal impacts on properties along the existing road corridor.

Option C however was deemed to have greater negative construction costs and risk compared to Options B/B1, attributable to the much larger fill area/volume and additional land requirements.

4.5.2.1 Non-Scored Criteria

A range of non-scored criteria were assessed for the Trig Road route options.

Stakeholder Feedback

Overall, Option B was the stakeholders most preferable option as the alignment follows the existing road, reducing impacts on properties and land acquisition and resulting in far less construction and fill requirements compared to Option C. Furthermore, there was a preference for Option B's direct access over slip lanes as it allows a continuation of existing uses for existing properties, has a smaller footprint to establish and provides greater flexibility for access to adjacent land considering zoning is likely to transition to greater urban density in the future.

Most landowners along Trig Road would be impacted by frontage requirements or temporary occupation, and were therefore largely concerned with maintaining access, loss of amenity, construction works and timeframes. Most landowners were supportive of Option B and the subsequent safety improvements and walking and cycling opportunities it would provide, and whilst there are several properties impacted by full acquisition, Option C traverses greenfield land and impacts more properties than Options B/B1, including severing some large properties. Furthermore, most landowners expressed concern about the extent of fill and ecological impacts of Option C.

Policy Analysis

Policy E27.3 in the AUP:OP seeks to manage vehicle access onto arterial roads to maintain efficient movement of people and goods on the network. Option B's widening of Trig Road without slip lanes will provide a suboptimal outcome in the short term by maintaining the various existing road accesses, however this outcome is anticipated to be incrementally rectified as adjacent properties are developed and accesses amalgamated in accordance with AUP:OP access controls. In contrast, the implementation of slip lanes in Option B1 would provide short-term alignment with the road's arterial function, however does not align with the typical roading hierarchy for the long-term. As noted above, as a new corridor, the part of Option C that does not follow the existing Trig Road alignment would be able to manage vehicle access as there would be no existing accesses which need to be considered.

Value for Money

The cost of slip lanes as part of Option B1 are likely to be higher with additional land purchase and construction requirements, however from an economic perspective, slip lanes would have higher travel time benefits with less delays from turning movements.

It was concluded that overall, cost savings could be achieved by using the existing alignment over Option C, or Option B with slip lanes.

Manawhenua

Manawhenua supported Options B/B1 and were concerned with the environmental and ecological impacts of Option C due to earthworks and fill requirements.

4.6. Recommended Option

In terms of the investment objectives, Option C performed slightly better or equal to Option B1 in terms of network connectivity and integration, intersection performance, traffic performance, timing of infrastructure, direct access and cycling provision. Option B performed better than Option C and Option B1 in terms of housing yield and severance effects. Overall, Option C provided a marginally better contribution to achieving the investment objectives.

However, the MCA indicated that Option B and Option B1 when compared to Option C, had better outcomes on all of the natural environment criteria, the heritage/archaeology measures, and construction costs/risks criteria. Option B scored slightly better than Option B1 and Option C in terms of urban design and land requirements. By utilising an existing corridor as proposed in Option B/B1 there is a reduced impact on land acquisition. The proposed geometric design also reduces the amount of fill required compared to Option C. Given these elements, Options B and B1 have a significantly lower construction cost compared to Option C, even when allowance is made for the upgrade of two intersections on Hobsonville Road.

Overall, while Option C scored well against the investment objectives, the overall impact on the environment and the enduring urban form outcomes of Option C meant that Option B, an existing alignment option, also achieved the investment objectives, without the urban form and environmental impacts. As such Option B with direct access was the preferred option for the required upgrade of Trig Road.

4.7. Intersections

Following identification of the preferred option for the required upgrade of Trig Road, alternative intersection forms (signals or roundabouts) were assessed through a limited MCA assessment, as set out at section 4.4.5 of this report, at the two intersections between Trig and Hobsonville Roads and Luckens and Hobsonville Roads.

If a signalised intersection is chosen for the Trig and Hobsonville Roads intersection then a signalised intersection should be chosen at Hobsonville and Luckens Roads to enable co-ordination between the two intersections and to provide the best outcomes for safety, as well as accessibility for pedestrians, cyclists and people using public transport, particularly when considering adjacent land use.

Overall, signals are the preferred treatment for the intersections as they are more in keeping with the urban environment, take up less land, and create less severance for pedestrians. They are also perceived to be safer than roundabouts which will encourage use of active modes and can be prioritised for public transport.

Given the uncertainty around timing and delivery of rapid transit elsewhere on the North West network, the intersection of Trig Road and Hobsonville Road should be route protected for bus movements. This level of priority is not possible in a roundabout form without significant land requirements.

5 AC DBC and SG DBC Option Review

The options assessments in the AC DBC and SG DBC were undertaken prior to the introduction of the National Policy Statement for Freshwater Management 2020 (NPS-FM). A further review of options considered in each DBC was subsequently undertaken with a focus on the impacts on natural wetlands.

It was found:

AC DBC

- The three long-list route options (Option A, B and C) all scored equally in terms of ecological impacts in the MCA undertaken as part of the AC DBC. Option A performed significantly worse in other criteria due to provision of sub-optimal transport connections, land redundancy from the alignment and considerable effects to existing land use (e.g. alignment passes through an existing kindergarten) and was therefore discarded.
- On review, it was found Option A was likely to result in wetland impacts, as a wetland system runs in an east to west direction on the western side of Trig Road, where the Option A alignment would fall.
- It was not confirmed whether the wetland impacts resulting from Option A would be greater, comparable to, or less than those resulting from Options B and C. However, given the comparatively poor performance of Option A on other criteria (discussed above) and that wetland impacts would not be avoided by Option A, it was concluded that the decision to discard this option need not be revisited.

SG DBC

- Trig Road runs along a ridgeline, with wetland features located both to the east and west. The wetland features impacted by the preferred option (Option B) are located on the eastern side of the existing road alignment.
- Both Options B and B1 would impact the wetland located near the southern end of the Trig Road corridor, which extends to the eastern edge of the existing road formation. However, Option B1 would impact the wetland to a greater extent, as this option features a wider road corridor at the southern end of the alignment to accommodate the slip lane.
- Option C, which would divert the southern end of Trig Road to the east to meet Hobsonville Road at the Luckens Road / Hobsonville Road intersection, would have greater impacts on natural wetlands in comparison to Option B. Both Options B and C would impact the wetland located near the southern end of the Trig Road corridor, but at different locations. Option B would affect the upper reaches of the wetland feature, right at the top of the catchment, thereby having little effect on the hydrology of the wetland; the remainder of the wetland is downstream and would not be affected. In contrast, Option C would intersect the wetland feature approximately 100m further downstream, resulting in not only direct impact at the crossing location, but also impacting the hydrological function of the section of wetland upstream of the crossing. Additionally, Option C would impact an additional wetland as the alignment pushes further east.

On this basis, Option B remained the preferred option.

Additionally, an opportunity was identified to refine the design of the preferred option to reduce wetland impacts. Further ecological assessment was undertaken in 2022, resulting in the delineation of additional areas of natural wetland as directed by the NPS:FM. The dry stormwater attenuation pond, in its original location, would have encroached on this area of wetland. In response the dry pond was shifted further south, thereby avoiding the wetland, while still being located sufficiently close to the low point along the road corridor to maintain functionality.

6 Stormwater Assessment

Alternative stormwater designs were considered for the recommended option. The stormwater options considered were directed by minimum stormwater outcomes and the engineering constraints of the Project area. While the evaluation of stormwater alternatives involved technical input from a range of other (non-engineering) disciplines, the primary decision-making process was driven by key engineering considerations which directed the feasibility and suitability of the options available.

As such, the MCA framework was not considered to be an effective decision-making tool for this purpose. Instead the assessment of stormwater design alternatives used the following process:

1. Identification of the expected minimum stormwater outcomes for the Project (Stormwater Design Philosophy Principles);
2. Analysis of key (engineering and non-engineering) constraints and design considerations which influence the potential stormwater design solutions; and
3. Qualitative evaluation of the potential stormwater design options available to achieve the desired stormwater outcomes within the context of the key constraints and considerations.

The following sub-sections outline this process in relation to the Project.

6.1. Stormwater Design Philosophy Principles

The key principles of the Stormwater Design Philosophy that were adopted for the consideration of stormwater design alternatives are outlined in Table 5.

Table 5: Stormwater Design Philosophy Principles

Topic	Stormwater Design Philosophy Principles
Stormwater Quality	• Avoid the potential impacts of stormwater runoff from new high contaminant generating impervious areas through the treatment of stormwater in accordance with GD01: Stormwater Management Devices Guide (**GD01**), where practicable.
Stormwater Quantity	• Avoid adverse effects on the operation and structural integrity of other infrastructure in a 100 year rainfall event. • Avoid increase in inundation affecting upstream and downstream properties in a 100 year rainfall event. • Adopt on-site stormwater solutions for the retention/detention of runoff from new impervious areas where practicable.
Operation and Maintenance	• Adopt whole of life considerations in the selection and design of the treatment devices – including design life, maintenance cost, and operational effectiveness. • Adopt water sensitive design principles (as specified by GD04: Water Sensitive Design Guide (**GD04**)) where practicable.

Construction	• Minimise construction effects where practicable by:
	  ◦ Limiting cut/fill requirements by locating stormwater devices in locations which utilise the natural topography of the Project area; and
	  ◦ Minimising the construction footprint of the Project by locating stormwater devices as close as possible to the transport corridor.

Ecology and Hydrology	• Avoid direct impacts on existing watercourses by locating stormwater devices offline, where practicable. • Avoid indirect impacts on the catchment hydrology by minimising changes to the general flow of groundwater and overland flow within the catchment.
Climate Change	• Avoid the potential impacts of climate change by designing to account for increased Average Recurrence Interval storm events as outlined in the Auckland Council Code of Practice for Land Development and Subdivision Chapter 4 – Stormwater (2015).
Private Property	• Minimise permanent impacts on private property by locating stormwater devices within the transport corridor where practicable. • Minimise impacts on established urban areas by locating stormwater devices in greenfield areas where these are available.

6.2. Constraints and Considerations

Table 6 provides an analysis of the key (engineering and non-engineering) constraints and design considerations which have influenced the potential stormwater design alternatives.

Table 6: Key Constraints and Design Considerations

Constraint	Description

Corridor Width	• While the general cross-section for the Project corridor provides sufficient space to establish raingardens, sections of the corridor are constrained by adjacent land use limiting the practicality of establishing raingardens. This includes:
	  • Reduced berm width along the southern section of Trig Road and parts of Hobsonville Road to minimise impacts on adjacent properties; and
	  • A flush medium is required along Trig Road and Hobsonville Road to maintain access to adjacent residential properties.

Topography	• Trig Road is located along a ridgeline which undulates along the alignment. Sections of the alignment are in excess of 8% grade. This may restrict the practicality of using raingardens. • The topography of the surrounding catchment is undulating with numerous high and low points which limits the practicality of locating stormwater devices.
Infrastructure capacity	• There is limited existing stormwater infrastructure along Trig Road (mostly along the southern section of Trig Road). • The existing stormwater infrastructure along Hobsonville Road has limited capacity. • There is no existing stormwater network in the greenfield area surrounding Trig Road. • The existing stormwater network south of Hobsonville Road has limited existing capacity.
Watercourse and hydrology	• There are existing wetlands located on the periphery of the transport corridor. • There are overland flow paths crossing the Project area and the surrounding catchment. • There are groundwater flows around Trig Stream which feed into the watercourse.

Whenuapai Airbase	• Whenuapai Airbase is located approximately 1.5km north of the Project area and has operational requirements which seek to limit the potential for bird strike. This is reflected in the Whenuapai 3 Stormwater Management Plan which was developed by Auckland Council as part of the Whenuapai Structure Plan and has been adopted for PPC5. This includes restrictions on the use of stormwater devices which have the potential to attract bird settling or roosting which is required by Standard I616.6.12 of PPC5.
Land use	• The existing transport corridor along Hobsonville Road and the southern part of Trig Road is constrained by existing residential land use which limits the availability of space adjacent to the corridor. • The current land use along most of Trig Road and along the western part of Hobsonville Road is currently rural in character but has been identified for future urban land use. While this provides less of a constraint compared with the existing urban environment in the southern area of the Project area, the Project is seeking to support growth and therefore developable land adjacent to the corridors should be maximised. Additionally, Integration with the future urban land use in this greenfield area needs to be accommodated.

6.3. Stormwater Design Options

GD01 was used to guide the range of potential stormwater devices which were considered for the Project. The range of potential stormwater devices each provide differing methods for managing the effects of stormwater runoff with the aim of achieving one or more of the following:

- Managing the impacts of stormwater quality and quantity
- Mimicking or replicating natural runoff and flow
- Meeting the stormwater quality requirements of the AUP:OP
- Aligning with water sensitive design principles (GD04).

Stormwater devices can generally be considered to provide one or both of the following functions:

1. Treatment of stormwater runoff to manage contaminants; and/or
2. Retention and/or detention of stormwater runoff to manage flow.

Table 7 provides a list of the potential stormwater devices which were considered for the Project and identifies the primary function(s) of each device.

Table 7: Potential Stormwater Devices and Function

	Treatment	Retention/Detention
Stormwater Wetland(s)/Pond(s)	✓	✓
Rain Gardens/Swales	✓	✓
Filtration Devices	✓	×
Detention Tanks	×	✓
Pervious Paving	✓	✓
Existing Network	✓	✓

The following sub-sections provide an analysis of the suitability of each of the potential stormwater management device options with respect to the Project area and stormwater design philosophy.

6.3.1 Consideration of Treatment Options

Table 8 provides commentary outlining the consideration of potential stormwater treatment options.

Table 8: Consideration of potential stormwater treatment options

Treatment Options	Comments
Stormwater Wetland(s)/Pond(s)	Due to the restrictions on establishing stormwater wetlands/ponds which require permanent water bodies (Standard I616.6.12 Stormwater ponds/wetlands PPC5) the available options are limited to the use of dry detention basin devices (dry ponds). A dry pond does not provide retention or water quality management functions and additional stormwater management solutions would be required to provide this function.
Rain Gardens/Swales	Rain gardens/swales are generally a favourable stormwater treatment option for transport corridors as they can often be incorporated into the design of the transport corridor and provide an effective treatment option with relatively low maintenance cost. The general corridor cross-section for the Project provides sufficient space to incorporate rain gardens/swales into the corridor. However, there are constrained sections of the corridor, along the southern part of Trig Road and along the western section of Hobsonville Road, which have reduced berm widths which would be unsuitable for rain gardens/swales. Introducing swales in these areas would impact numerous existing dwellings on either side of the corridor and is therefore undesirable. Where there is suitable adjacent land, rain gardens/swales could be established outside the corridor. This is viable along the northern section of Trig Road and western section of Hobsonville Road where there is immediately available flat greenfield land. However, the Project is seeking to support growth and therefore developable land adjacent to the corridors should be maximised. Provision of wider corridors for swales would not be as supportive of this objective. Rain gardens/swales may be viable within the median strip of the corridor where there is sufficient space. While the general corridor cross-section provides an ample medium strip along most of the corridor, this area is required to be maintained as flush medium to enable access to adjacent properties, therefore this space cannot be used for rain gardens/swales. Rain gardens/swales are ineffective at providing treatment at grades which are in excess of 8%. As approximately 180m of Trig Road has a slope greater than 8%, rain gardens/swales will be ineffective along these sections of the alignment and alternative treatment options will be required.
Stormwater Filters	Stormwater filters can provide effective treatment where it is possible to provide a bypass for events greater than the water quality storm event. There is sufficient corridor width to provide underground stormwater filters within the corridor. These devices require ongoing maintenance in accordance with the manufacturers' specification. The devices have limited lifespans and need to be replaced periodically. In comparison to other treatment device options the ongoing maintenance cost and limited life span makes this option cost inefficient. Stormwater filters also do not provide any retention/detention function and additional stormwater devices will be required to provide this function.

	Accordingly, stormwater filters are generally less favourable unless there are significant constraints which prohibit the use of other devices.
Pervious Paving	Pervious pavement will not be suitable for traffic areas of high acceleration, decelerating or turning. This option will not comply with the pavement and structural requirements of the Project.
Existing Public Stormwater Network	There is no existing stormwater treatment along Trig Road, therefore this is not a viable option. The existing stormwater network in the southern catchment of Hobsonville Road has limited capacity. As this is an existing built out urban catchment there are limited opportunities to expand this network, and no known plans to do so. As such, this is not a viable option.

6.3.2 Consideration of Retention and Detention Options

Table 9 provides commentary outlining the consideration of potential stormwater retention/detention options.

Table 9: Consideration of potential stormwater detention and/or retention options

Retention and Detention Options	Comments
Stormwater Wetland(s)/Pond(s)	As outlined in Table 8 due to the restrictions on permanent water bodies the available options are limited to the use of dry detention basin devices. Dry ponds utilise the natural land topography or have a temporary pool formed by capturing water and releasing it at a slower rate. These devices allow for detention during rainfall events and act as green space during antecedent or dry periods. Dry ponds reduce downstream flooding potential, minimise downstream channel erosion and include extreme flow management. They can provide aesthetics and further benefits from accessible green space between storm events. Maintenance advantages are recognised for dry ponds over wetlands and wet ponds. The key constraint to the use of a dry pond is the availability of sufficient space (it is noted that this is also a constraint for wetlands/wet ponds). As much of Trig Road is surrounded by greenfield land which is identified for future urbanisation this area is considered suitable for locating a dry pond. A dry pond does not provide retention or water quality management functions and therefore additional stormwater management devices to provide this function will be required.
Rain Gardens/Swales	Rain gardens/swales provide a hydrological function by reducing runoff volumes (through retention) and detaining runoff flows. However, they generally have limited capacity to attenuate larger events (1% Annual Exceedance Probability (**AEP**), 20% AEP) and generally need to be supplemented with additional stormwater devices for this function. As outlined in Table 8, the general corridor cross-section for the Project provides sufficient space to incorporate rain gardens/swales into the corridor. However, the following constraints are noted: • Sections of the corridor which have reduced berm widths would be unsuitable for rain gardens/swales. • Where there is suitable adjacent land, rain gardens/swales could be established outside the corridor, however, this would not promote the

	objective to support growth, as developable land adjacent to the corridor would be occupied by stormwater infrastructure. • Use of the medium strip needs to be retained as a flush medium and therefore cannot be used for rain gardens/swales. Rain gardens/swales are ineffective at providing retention/detention at grades which are in excess of 4%. As approximately 180m of Trig Road has a slope greater than 4%, rain gardens/swales will be ineffective along these sections of the alignment and alternative retention/detention options will be required.
Detention Tanks	Rainwater tanks (with reuse) will be uneconomical and are not considered to be an effective stormwater management tool for the Project.
Pervious Paving	Pervious pavement will not be suitable for traffic areas of high acceleration, decelerating or turning. This option will not comply with the pavement and structural requirements of the Project.
Existing Public Stormwater Network	There is limited existing stormwater networks along Trig Road providing only rudimentary retention/detention, therefore this is not a viable option. The existing stormwater network in the southern catchment of Hobsonville Road has limited capacity. As this is an existing built out urban catchment there are limited opportunities to expand this network, and no known plans to do so. As such, this is not a viable option.

6.4. Stormwater Recommendations

Based on the above assessments, the recommended stormwater system is a series of raingardens and a dry pond to prevent downstream flooding.

7 Alternative Methods

7.1. Introduction

The Project has funding and is ready for construction once the necessary approvals and the required land are obtained. AT has decided to use a designation as the method to deliver the Project. Section 171 of the RMA requires an assessment of alternative methods, in addition to routes and sites.

Other possible methods to achieve the Project include:

- Obtaining district resource consents;
- Securing the Project through landowner/developer agreements;
- Including the Project within a plan change or Unitary Plan 'Corridor Overlay';
- Traditional property acquisition; or
- A combination of the above.

7.2. Route Protection Mechanisms

Table 10 provides an assessment of the strengths, weaknesses and suitability of each of the available methods. The planning context, key risks and considerations which may influence the preferred route protection method were reviewed and evaluated taking into account the planning environment and identified risks and considerations.

Table 10: Consideration of methods to achieve the Project

Method	Consideration	Suitability
Designation	A NoR to designate land for a public work under the RMA provides a strong level of route protection from incompatible development particularly where development pressure is anticipated along the corridor. Once confirmed it also provides authorisation to undertake and maintain the works. A NoR has interim route protection effect as soon as the notice is lodged with Council which ensures the corridors will be protected from incompatible development from that date, enabling a cohesive interim protection for linear networks like roads. This effectively manages risk of development within the corridor that may otherwise hinder the proposed work. This is particularly important as the corridor includes urban zoned areas around Hobsonville Road. A designation, if confirmed, is included in the relevant district plan as a publicly visible layer. This provides visibility to the public about the intended land use and project extent. It also provides certainty to other infrastructure providers, developers and landowners about the future network location, enabling coordinated development planning. A designation enables streamlined delivery of a corridor following detailed design, by consenting the project requirements under the district plan and allowing OPWs to be sought at a later date. Designations also provide landowners with particular rights under the RMA to require acquisition if they can no longer have reasonable use of their properties.	**Strong**

Resource consents	Resource consent granted under a district plan gives approval to use or develop land. A resource consent, if granted, is not shown publicly in a district plan meaning the public would have limited awareness of its existence. It does not protect land or provide rights of exclusion that would hinder incompatible land use. It would be possible to progress the Project via district resource consents (along with necessary regional consents). This process would require a complex assessment against a range of district plan rules, resulting in a more complex application process and less cohesive conditions set.	**Weak**
Landowner/ developer negotiation	Landowner or developer negotiations can include private parties purchasing land and vesting roads that support development, or development agreements whereby a developer agrees to "set aside land for future transport corridor" and/or construction at a future point. Infrastructure Funding Agreements (IFA) are the preferred form of landowner/ developer agreement to enable delivery of transport infrastructure. IFAs provide route protection where a developer agrees to design and implement a project. For landowner agreements to be efficient, the aspirations and timing of each party must be aligned. Landownership along the Project corridor is fragmented; therefore, this method relies on individual property owners, who may not be developers (with sufficient capital or expertise) to enter into agreements. Private property owners with no development aspirations that are not part of a broader scheme may not have capacity or desire to negotiate such agreements. Where numerous independent properties and landowners are involved, the final solution is likely to be delivered piecemeal due to the impracticalities and timeframes required to negotiate complex agreements with the landowners for the corridor. In this instance land will be required from an estimated 47 properties, the majority of which are under individual ownership. IFAs with a large number of parties are generally impractical to implement and unlikely to protect the corridors within a reasonable time period. Additionally, it is not compulsory for landowners to enter into agreements, for linear corridors requiring a consistent network, agreement must be secured along the length of the route. A piecemeal approach significantly reduces the utility of this method for route protection purposes.	**Weak**
Plan Change/ Unitary Plan 'Corridor Overlay'	Proposed Plan Change 5 was withdrawn on 6 June 2022, therefore cannot be relied upon. A new Corridor Overlay could be included in the Unitary Plan to provide for the transport corridors. AUP:OP overlays can provide certainty to the community by publicly identifying the network, however they do not protect the land necessary for the works. Any overlays would require a plan change, this may not be an approach accepted by Council as the AUP:OP overlays are generally focussed on RMA Section 6 and 5 matters (e.g., heritage, significant ecological areas). There are existing infrastructure overlays in the AUP:OP for noise (e.g., Airport Noise Overlay, City Centre Port Noise Overlay) as well as the National Grid Corridor Overlay, which is most reflective of how an overlay may appear for a transport corridor. However, it is noted that the National Grid is also served by the NPS on electricity transmission which sets out key protections from the adverse impacts of third-party development. There	**Weak**

	is currently no NPS which would provide the required protection for key transport corridors. Progressing a 'Transport Corridor Overlay' within the AUP:OP is not considered as a viable route protection method for the Project.	
Traditional property acquisition	Traditional property acquisition to acquire the necessary land for the Project was considered. Land is typically purchased a few years before a project goes to construction and delivery, based on detailed design plans. Purchasing property at this stage ahead of detailed design may result in too much or too little land being required and may not enable construction areas to be protected which are required temporarily to construct the corridors. Like developer negotiations, traditional property purchase would not provide route protection until acquisition, where multiple owners are present this is unlikely to be achieved in a timely or consistent manner.	**Weak**

7.3. Recommendations

A designation is the recommended method for delivering the Project. A designation is the most efficient and effective mechanism for enabling construction, operation and maintenance of the Project as it will:

- Provide certainty to all parties by defining use and extent of the Project corridor
- Set aside the required area and restrict activities or use that may prevent or hinder the identified Project being realised
- Enable ongoing interim use of the required land by owners where it will not hinder the Project
- Allow detailed design to be undertaken prior to project delivery
- Provides authorisation under the district plan to undertake the works, and maintain and operate the transport corridor.

8 Conclusions

A wide range of alternatives have been investigated for addressing the transport needs for the Project area. A key driver for the assessment of alternatives was to avoid adverse effects where practicable. That evaluation confirmed that the upgrade of Trig Road and Hobsonville Road (between the intersections at Trig Road and Luckens Road) would provide a balance of strong transport and urban outcomes while minimising potential adverse effects.

The assessment of alternatives has been based on a comprehensive and replicable optioneering process. As such it is concluded that adequate consideration has been given to alternative sites, routes, or methods for undertaking the work, satisfying the requirements of section 171(1)(b) of the RMA.

Appendix 1. MCA – corridor assessment

Investment Objectives	Measures	
Performance against objectives	Investment Objective 1 *Increase the supply of transport infrastructure serviced land for housing in Redhills and Whenuapai, appropriately integrated with adjacent land uses, initially by 2021 and over a 30-year period, in line with the Future Urban Land Supply Strategy.*	
	Investment Objective 2 *Develop liveable, connected communities at Redhills and Whenuapai through an integrated and resilient transport system which, over 30 years, will enable efficient access to jobs and core services, reduce private vehicle mode share and provide travel choices.*	
Implementability	**Sub-criteria**	**Measures**
Consentabilty	Consentabilty	What is the level of complexity in gaining statutory approvals and scale/significance/costs of mitigation? Is a new designation or alteration required? Consideration of conflicting/ overlapping designations. Qualitative assessment of the number of consents required and consideration of the zoning and Plan objectives and policies.
Affordability	Operational/ Maintenance	Are there any factors that might affect the ability to operate or maintain the option over its projected life without major additional costs?
	Financial	Funding and likely BCR.
Stakeholders/ Customers	Stakeholders/ Customers	Expectation of this option to relevant stakeholders/customers (how aligned or otherwise is the option with these expectations)? Scale/validity of anticipated objections from stakeholders/customers related to this option (risk)? Alignment to strategic plans and policies (Central Government, Auckland Council, CCOs).
Assessment of Effects		
Transport	User safety	Safety for all transport users, including: • Private vehicles • Walkers/cyclists
	Transport system integration	Are there any wider transport system effects (i.e. impacts on other strategic connections and/or the existing transport network) and how well does the option meet the forecast transport demand?
Construction (temporary impacts)	Construction impacts on utilities and lifeline infrastructure	Requirements for relocation/design of alternative major infrastructure, including consideration of Safety impacts of such requirements and risk of continuity of service over construction.
	Construction costs	Assessed cost for construction of options including: • Complexity and risk in construction • Complexity in programme

		• Cost and complexity of undertaking works on contaminated land (including health and safety)
	Construction impacts	Impacts on people and businesses from disruption from traffic, dust, noise (including from a quality of life/amenity point of view and economic impacts on businesses).
Socio-economic	Urban Design: Land use futures	To what extent will there be impacts on the orderly development of land (within the corridor, adjacent to it and impacted by it – i.e. consider all 3 scales), in relation to: • Underlying urban structure (block and street pattern) • Size and shape of potential development parcels to enable appropriate building typologies • Ability to consolidate residual land • Access that does not prevent neighbouring development
	Social cohesion	Will the option impact on Connectivity/Accessibility for the public including access to: • Jobs • Other communities or within the same community (i.e. social cohesion) • Shops/services/other community and cultural facilities/'attractors' Will the options impact on existing community facilities and open space?
	Human Health	Are there any sensitive land uses nearby or clearly planned (childcare centres, hospitals, rest homes, marae, schools)? Will the option impact human health relating to: • Air Quality • Contaminated land • Noise and vibration
	Economic	Impacts on existing economic opportunities that are anticipated for future development (consideration will be given to economic activities that will change because of planned land use development).
Natural Environment	Landscape/ visual	Will the option have visual effects on the environment? The extent of effects on: • the natural landscape and features such as streams, coastal edges, natural vegetation and underlying topography – acknowledging planned changes to area considering urban land use/zoning • natural character and outstanding natural features/landscapes including geological features (mapped and protected features)
	Water quality	Impact of operational stormwater in regard to quantity and quality (including life supporting capacity).
	Ecology	Extent of effects on: • significant indigenous vegetation • significant habitats of indigenous fauna • indigenous biodiversity • stream ecology (recognising integration of ecology with future urban land use zoning and realistic future of some elements, such as intermittent streams)
Heritage	Heritage	Extent of effects on:

		• sites and places of valued heritage buildings and places • sites and places of archaeological value • sites and places of cultural heritage value
	Manawhenua	Extent of effects on the relationship of Māori to their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other Taonga (tangible and intangible). Extent of effects on Māori landholdings which includes marae, papakāinga and Maori land.
Opportunity Outcomes		
Holistic socio-economic considerations	Urban Design: Access and amenity (of the walking and cycling network)	Do the connections feel safe? • Is the option well overlooked or isolated from other activities and casual surveillance? • To what extent does the option require CPTED measures (e.g. lighting, landscape pruning, straightening of paths, removal of obstacles)? • Does the option help overcome safety concerns (perceptual) associated with cycling? • Are connections direct? • Does the option follow direct routes with minimal detours and waiting times to key destinations and existing infrastructure? • Does the option create severance and delay for pedestrians at key destinations? • Does the option provide connections to key PT interchanges? Are connections comfortable? • Does the option provide an easy gradient for walking and cycling? • Is there shade, shelter from wind; are the edges soft or hard, low or high? • Are connections coherent? • Is the option well integrated into a continuous and consistent cycling network? • Are connections attractive? • Is the option aesthetically pleasing and attracts new users? • Does it integrate with open space and stream corridors?

	Urban Design: Quality of the urban environment	To what extent does the option support (both current and future planned state):
		• An inviting, pleasant and high amenity public realm
		• Active interface between public and private realm (appropriate building entries and openings, front setbacks, streetscape)
		• Open space integration, e.g.
		  • Strong physical and perceptual relationship between activity nodes/ public spaces/public streets
		  • Adequate space for services, street furniture and people
		  • A ‘green web’ of sustainable landscape planting
		  • Reinforcing landscape/vegetation patterns
		  • Context and planned place making considerations e.g.
		  • response to/reading of underlying topography

		• locating views to landmarks and distinctive natural and/or built features [from the corridor] • impact on the outlook, landscape setting and character of existing neighbouring uses • requirements for noise walls or other barriers that may visually close off places • Type and scale of new structures (e.g. Project may be out of scale now but appropriate for desired future character)
	Climate Change	Opportunity to reduce the vulnerability to effects of climate change through siting of the option, thereby reducing requirements for adaptation.
	Social Equitability	Opportunity to increase local training and employment for workplace upskilling and increasing support for disadvantaged communities.
	Greenhouse gas emissions (GHG)	Opportunity to reduce GHG emissions through mode choice; and to reduce GHG emissions through the design and construction phase (i.e. ease of constructability, significance of earthworks resulting in fuel use and GHG emissions generation).
	Use of materials/ waste	Opportunity to reduce the amount of energy-intensive materials used in construction (e.g. asphalt, concrete, steel etc) and reduce the amount of waste produced through materials reuse (e.g. demolition materials from existing roads and structures, waste spoil etc).

Appendix 2. MCA – route assessment

Scored criteria

Criteria	Sub-criteria	Description
Heritage	**Heritage**	Extent of effects on sites and places of: • Valued heritage buildings, trees (heritage value) and places • Archaeological value • European cultural heritage value
Socio-economic impacts	**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 land use 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
	Urban design	To what extent does the option support (both current and future planned state) a quality urban environment, particularly relating to: • Context and planned place making considerations • An inviting, pleasant and high amenity public realm • Open space integration • Active interface between public and private realm • Scale of long-term impact on amenity and character
	Land requirement	Scale of public/private land (m^2/number of properties/unique status of impacted property) required to deliver the option.
	Social cohesion	Impact on 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
	Human health and wellbeing	Will the option potentially affect any sensitive land uses (adjacent residential, childcare centres, hospitals, rest homes, marae and schools)? Particularly: • Air quality • Contaminated land • Noise and vibration • Water quality
Natural environment	**Landscape/ visual**	The extent of effects on: • Streams, coastal edges, natural vegetation and underlying topography – acknowledging planned changes to area considering land use/ zoning

		• Natural character and outstanding natural features/landscapes including geological features (mapped and protected features)
	Stormwater	Impact of operational stormwater (both quantity and quality) on the receiving environment, including: • Life supporting capacity • Potential flooding effects of the option within the catchment • Extent and consequences of likely mitigation measures
	Ecology	Extent of effects on: • Significant indigenous flora • Significant habitats of indigenous fauna • Indigenous biodiversity • Stream/waterway ecology • Coastal environment (e.g. CMA)
Environmental opportunities	**Climate change outcomes**	• Opportunities to improve resilience to effects of climate change and requirement for adaptation e.g.: flooding, sea level rise, storm events, drought/heat wave • Climate Change risk assessment and adaptation options (not just an opportunity/treat as risk and opportunity) • Ability to mitigate greenhouse gas emissions (GHG) emissions – construction and operational; access to renewables; ability to use renewable
Transport	**User safety**	Safety for all transport users, including: • Private vehicles • Public transport • Pedestrian/cyclists/other road corridor users
Construction impacts	**Construction impacts on utilities/ infrastructure**	Requirements for relocation/design of infrastructure, including • Consideration of safety impacts • Risk of continuity of service over construction • Engagement with utility providers • Opportunities for integration with other bulk infrastructure
	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
Construction cost and risk	**Construction costs and risks**	Assessed cost for construction of options including: • Complexity and risk in construction (including consideration of constructability) • Complexity in programme • Cost and complexity of undertaking works on contaminated land (including health and safety)

Criteria from the Supporting Growth Programme framework determined to be unnecessary for the Project specific MCA and reasons why:

Criteria	Commentary
Social equitability	Given the similarity of the options which were being assessed (location, scale, mode, etc.) it was determined that this criterion would not provide a differentiating score and was not assessed. All options have an equal ability to provide for local training and employment for workplace upskilling and apply sustainable procurement methods.
Ecological opportunities	Given the similarity of the options which were being assessed (location, scale, mode, etc.) it was determined that this criterion would not provide a differentiating score. All options have an equal ability to include ecological restoration opportunities.
Transport integration	This criterion was addressed in Investment Objective 1 with a more localised context. It was determined that this criterion would replicate the score of Investment Objective 1 and was not assessed.
Maintenance costs	Given the similarity of the options which were being assessed (location, scale, mode, etc.) it was determined that this criterion would not provide a differentiating score. All options would have comparable maintenance costs.
Operational costs	Given the similarity of the options which were being assessed (location, scale, mode, etc.) it was determined that this criterion would not provide a differentiating score. All options would have comparable operational costs.
Behavioural change/ future technology opportunities	This criterion was addressed in Investment Objective 2 with a more localised context. It was determined that this criterion would replicate the score of Investment Objective 2 and was not assessed.