

An aerial photograph of an industrial area situated along a large body of water. The foreground shows a wide expanse of water with ripples. The middle ground is dominated by several large, rectangular industrial buildings with flat roofs, interspersed with parking lots filled with vehicles. A road or canal runs along the water's edge. In the background, a dense residential or commercial area is visible, extending towards a range of hills under a cloudy sky.

# CONSIDERATION OF ALTERNATIVES

## 8.0 Consideration of Alternatives

### Overview

An extensive option evaluation process was undertaken to arrive first at a Preferred Corridor, and then a Preferred Alignment within the Preferred Corridor. Alternatives were assessed at all stages of Project development, including use of existing corridors. The Preferred Alignment was confirmed to be the construction of new road infrastructure in the Onehunga – Penrose area with connections to SH1 and SH20. Further design refinements were undertaken to the Preferred Alignment reflecting the detail of the assessment of effects on the environment undertaken at that stage of the Project.

The option evaluation process involved a robust, comprehensive and iterative process which commenced at a large scale, considering options across the Onehunga – Penrose area, and then progressed to consideration of detailed alignment and design.

The initial phase involved identification and consideration of over 40 project components, which were reduced to a Long List of 16 corridor options. From these, six Short List corridor options were identified and considered in greater detail and a Preferred Corridor was identified. Once the Preferred Corridor was identified a wide range of alignment options were considered, to identify the Preferred Alignment within the Corridor.

An assessment framework was developed and applied that reflected the desired transport outcomes and captured the expected environmental and social impacts.

The process involved a multi-disciplinary team, use of Multi Criteria Analysis (MCA), then a design review to inform decision-making, extensive consultation with stakeholders and landowners and further iterative amendments to the options to account for new information and stakeholder feedback. Throughout the process, consideration has been given to feedback received, especially from key stakeholders and affected landowners and to the relevant planning provisions, especially regarding reclamation and opportunities for the avoidance of significant adverse effects.

This section outlines the consideration of alternatives and includes:

- Alternative methods;
- Alternative routes;
- Alternative sites and locations;
- Alternative alignments and interchanges / connections to the network; and
- Alternative designs, including construction methods and alternative measures to avoid, remedy and mitigate identified adverse effects on the environment.

This Assessment of Alternatives has been prepared in a number of separate parts:

- This chapter contains (for both the Preferred Corridor and the Preferred Alignment):
  - A high level overview of the processes used to identify (and assess) options;
  - a summary of the processes used to identify a Preferred Corridor option and a preferred alignment within that corridor;
  - a summary of the option scoring and analysis;
  - option refinements following consultation and technical review; and
  - further considerations used to identify the preferred corridor and alignment.

- The *Report 1: Supporting Material for the Consideration of Alternatives* in *Volume 3: Technical Reports* presents the detailed assessments, MCA criteria, scoring and drawings for the corridor options and for the alignment options.

The initial phase of the Project focused on identifying the most appropriate corridor for the Project. It commenced at a broad scale and systematically narrowed the geographic area of assessment to the identified route and alignment options. At each stage of this process, the existing natural and built environment was taken into account, as well as social and cultural values.

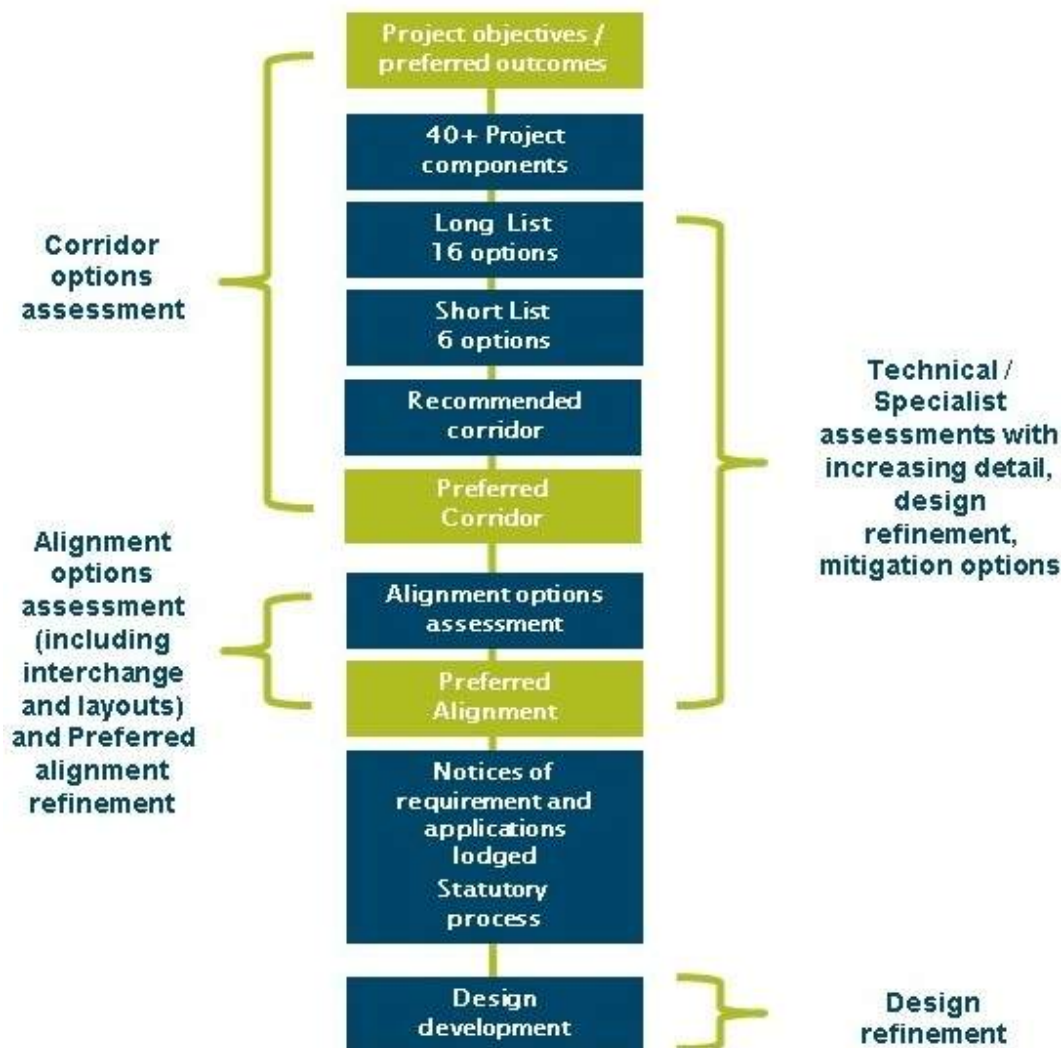
The preliminary assessment was primarily based on desk top analysis and the outcomes of preliminary consultation. Subsequently, the options assessment was supplemented by more detailed field investigations and targeted stakeholder and community engagement activities and feedback. The information derived from this process was fully considered and incorporated into the decision-making process during the development of the Preferred Alignment.

The Project has also been influenced by project partners and key stakeholders including Mana Whenua, Auckland Council, Auckland Transport and Department of Conservation (DOC). This chapter sets out the decision-making process involved in the evaluation of alternative routes, sites and methods, with reference to the relevant statutory requirements, and the key steps involved in the assessment process, which were broadly as follows (and as illustrated in Figure 8-1 below):

- Assessment of corridor options;
- Assessment of alignment options; and
- Preferred alignment.

Further detail regarding alternatives to address specific or potential environmental effects associated with the Project is provided in *Volume 3: Technical Reports*.

Figure 8-1: Summary of the Assessment of Alternatives



The assessment methodology has incorporated:

- The use of a MCA to assist in identifying potential effects and assessing the different components and options (including the development of project specific criteria);
- Engagement with stakeholders, affected landowners and the public at various stages of assessment;
- Iterative changes to the design as more detail and information was obtained from engagement and technical assessment; and
- Monitoring of the effect of changes to the design against the objectives.

### 8.1 Problem identification

The Project started with identification, assessment and prioritisation of problems within a wide study area stretching from Onehunga (north west), Sylvia Park (north east), East Tāmaki (south east) and Māngere (south west). Key problems identified with the transport network related to a lack of reliable public transport between Māngere and Sylvia Park and the constrained connections into and out of Onehunga-

Penrose. Working with key stakeholders and drawing on information gathered through consultation, these two problems were well defined.

Following the assessment of the problems, the Transport Agency made a decision to focus on addressing the immediate problems north of the Māngere Inlet (e.g. by increasing the capacity of the existing network or adding a new road and connections)<sup>40</sup>. This connection would address the constrained connections into and out of Onehunga-Penrose. As outlined in *Sections 2 and 3* of this AEE, the Transport Agency identified the benefit of constructing new infrastructure to connect SH20, the Onehunga Town Centre and industrial area and SH1.

To enable design of a solution that addressed the problem, objectives for the transport connection were defined. These set aspirations to be achieved in the delivery of a solution but did not define a specific solution. The objectives are listed in *Section 3.0 Project Development* of this AEE.

The assessment of alternatives for the purposes of the RMA commenced once the Transport Agency identified the need for intervention through the development of existing or new road infrastructure to assist to address the identified problems. The alternatives to be considered by the Transport Agency were those that are within its powers (i.e. the purpose for which it is approved as a requiring authority).

## 8.2 Purpose of this chapter

Under the RMA, a consideration of alternative routes, sites and methods of undertaking the work is relevant in relation to the NoRs and to some aspects of the activities for which resource consent is sought. Section 171(1)(b) of the RMA requires a territorial authority, when considering a NoR, to have particular regard to:

*“Whether adequate consideration has been given to alternative sites, routes and methods of undertaking the work (if a requiring authority does not have an interest in the land sufficient for undertaking the work, or it is likely that work will have a significant adverse effect on the environment).”*

The Transport Agency does not have an interest in all of the land required for the Project. While the Crown will continue to acquire the necessary property interests after the NoR has been lodged, it will not have completed the property acquisition process prior to the NoR being determined. Consequently, consideration of alternative sites, route and methods needs to be undertaken. The alternatives considered by the Transport Agency were those that are within its powers to undertake.

The Transport Agency must robustly assess alternatives, but it is not obliged to select any particular option, including the one that scores the ‘best’ under any particular assessment system used. Section 171(1)(b) of the RMA only requires that a requiring authority give adequate consideration to alternatives. It is for the Transport Agency to choose which alternative to adopt.

A consideration of alternatives is also required under other provisions of the RMA (such as the Fourth Schedule) and under various provisions of the relevant planning documents. In particular, there is also a policy framework flowing through the statutory documents from Part 2 of the RMA to the New Zealand Coastal Policy Statement (NZCPS) and the AUP (OP) – that directs consideration of alternatives, particularly when considering reclamation and in the coastal environment. These matters are addressed partly in this chapter and partly in the other relevant parts of this AEE.

<sup>40</sup> Auckland Transport is pursuing a separate solution to the public transport problem.

### 8.3 Alternative corridor options

#### 8.3.1 Project context

During the development of the Project a wide range of information about the economic conditions, the performance of the transport network and values of the natural environment was collated and analysed. The relevant parts of that information and the broader context for the Project are comprehensively outlined in other sections of this AEE.

#### 8.3.2 Indicative Business Case Phase: development of corridor options

The first step in the identification of the Preferred Corridor was the identification of a number of route components. Route components were pieces of existing road network that could be upgraded or areas where new road infrastructure could be created that could feasibly assist in addressing the problem identified regarding the constrained connections into and out of Onehunga-Penrose. The identification of segments assisted with the development of options and components of options. The components were primarily identified in a series of specialist workshops involving a range of specialists and representatives of the Transport Agency.

These segments were:

- Segment A – SH20 north of the Gloucester Park Interchange<sup>41</sup>
- Segment B – Gloucester Park Interchange
- Segment C – Gloucester Park Interchange to Captain Springs Road (approximately)
- Segment D – Captain Springs Road to Great South Road
- Segment E – Great South Road to SH1
- Segment F – Southern Motorway Widening



<sup>41</sup> The term “Gloucester Park Interchange” was used in the Indicative Business Case when referring to the Neilson Street Interchange. They refer to the same area.

### 8.3.2.1 Project components

Over 40 project components were developed and selected to represent a range of intervention from low levels of new investment (i.e. limited new road infrastructure) to options which involve much greater intervention and investment (i.e. more extensive new road infrastructure) and to cover a variety of locations. The Project components are illustrated in Figure 8-2. The colours indicate components/sections assessed.

**Figure 8-2: The corridor project components identified**



The segments were assessed using a range of criteria (which are discussed in more detail below) to identify transportation performance and potential effects. Where similar components were identified, the best alternative proceeded to the development of the long list of options. When there was no equivalent alternative, the component was progressed to the development of the long list.

Some components located at the eastern or western end of the Project could be independent from those at the other end, and could therefore be prejudiced depending on which option they were included in. As a result, the options were designed to also be able to differentiate such components that is, by having 'sister' options that only differed by that one component).

### 8.3.2.2 Long List of corridor options: 16 Options

Taking into account feedback from a series of stakeholder workshops in August and September 2014 and the outcomes of assessment against various criteria, the viable components were reviewed and packaged into a long list of 16 viable options. Different combinations of components were used to form the 16 options. The options are outlined in Table 8-1 and maps can be found in *Appendix A: Long List Individual Option Assessment* contained in *Report 1: Supporting Material for the Consideration of Alternatives, Volume 3*.

**Table 8-1: Long list options**

Long List Reference No	Corridor Option
Option 1	Existing route upgrade with freight lanes
Option 2	Existing route upgrade with new SH1 ramps at the South Eastern Arterial
Option 3	Existing route upgrade to SH20 with new inland route to new SH1 ramps at Mt Wellington
Option 4	Existing route upgrade to SH20 with new foreshore route to new SH1 ramps at Mt Wellington
Option 5	Galway Street to SH20 with new inland route to new SH1 ramps at Mt Wellington
Option 6	Galway Street link to SH20 with new inland route to existing SH1 ramps at Mt Wellington
Option 7	Galway Street link to SH20 to new Waikaraka / inland route to new SH1 ramps at Mt Wellington
Option 8	Galway Street link to new SH20 interchange with new SH1 ramps at Mt Wellington
Option 9	Neilson Street route to new SH20 interchange with new inland route to new SH1 ramps at Mt Wellington
Option 10	Galway Street link to SH20 with new rail corridor route to new SH1 ramps at Mt Wellington
Option 11	Galway Street link to SH20 with new rail / local road route to new SH1 ramps at Mt Wellington
Option 12	Galway Street link to SH20 with new inland route to new SH1 ramps near Panama Road
Option 13	New SH20 Onehunga interchange with new foreshore route to new SH1 ramps near Panama Road
Option 14	New SH20 Onehunga interchange with new foreshore / inland route to new SH1 ramps at Mt Wellington
Option 15	New SH20 Onehunga interchange with full foreshore route to new SH1 ramps at Mt Wellington
Option 16	New full foreshore motorway connection SH20 to SH1

The long list of options comprised a mix of upgrades to existing roads and construction of new roads. It included lower cost through to higher cost options. These were compared with the ‘do minimum’ approach, which represented the expected baseline if none of the options were implemented but taking into account the anticipated land use growth and investment in the transport system across Auckland.

The long list of options was designed in sufficient detail, to allow broad assessment of transport outcomes and high level technical/environmental assessments. The outputs from the assessments were used to evaluate the long list options through an MCA framework.

**8.3.2.3 Criteria and scoring**

Project specific transportation performance measures were developed which focused on how to best measure the performance of the options against the identified benefits. The separate assessments reflect the different problems and benefits identified during the initial consideration of an east west connection. The performance measures were developed so they were quantifiable where possible. The 13 performance measures address transportation, safety and access matters and are described in full in *Appendix B: Transport Performance Benefits and Measures of Performance* contained in *Report 1: Supporting Material for the Consideration of Alternatives* in Volume 3. The purpose of using an MCA was to gather information on the widest possible range of effects so the Transport Agency could have a broad range of information.

The performance of the options against the intended project benefits (which subsequently formed the basis of the Project Objectives) was one of a number of areas under the MCA. The three transport related benefits identified during the Project development phase were:



- Benefit 1: An improvement in travel times and travel time reliability between businesses in the Onehunga-Penrose industrial area and SH1 and SH20;
- Benefit 2: An improvement in safety and accessibility for cycling and walking between Māngere Bridge, Onehunga and Sylvia Park; and
- Benefit 3: Improvement in journey time reliability for buses between SH20 and Onehunga town centre.

The MCA criteria were developed by senior specialists in their fields with input from a range of experts and stakeholders including Mana Whenua. The criteria were designed to ensure that issues of concern to all specialist disciplines and stakeholders could be assessed for all options.

The criteria are set out in *Appendix C: MCA Key Result Areas and Criteria for Corridor options* contained in *Report 1: Supporting Material for the Consideration of Alternatives* in Volume 3. The criteria cover the following broad areas:

- Transport outcomes and hence performance against objectives;
- Cost / benefit;
- Consentability;
- Constructability;
- Urban design and townscape;
- Social;
- Natural environment;
- Health; and
- Cultural and heritage.

Investigation and refinement also assisted in providing more in-depth assessment of each of the options. This included traffic modelling and technical assessments, which ultimately informed the MCA assessment and identified a recommended alignment.

An eleven point MCA scale was used for the assessments ranging from +5 (significantly positive effects), 0 (neutral) through to -5 (significantly adverse / negative effects). The assessment is a continuum and the scoring for each key result area was informed by the individual assessment against the defined criteria, but each score for each criterion was an overall qualitative assessment on the basis of the technical expert opinion.

Relevant experts provided input to the MCA process. This incorporated preparation of individual assessments evaluating the options followed by MCA workshops. The workshops provided the forum for collating, discussing and challenging the evaluations with relevant experts participating and reporting on different key result areas and criteria. The process considered and evaluated each of the long list options against all criteria.

Assumptions for the option assessment were also recorded to provide consistency across all assessments. As an example it was assumed that the proposed cycle path would be located north of an alignment. Some broad issues were also reported on by more than one expert i.e. heritage, natural environment, planning and constructability.

A final assessment was issued by each team lead in relation to their criterion. The final scores were therefore the result of expert assessment and opinion.

a. **Specific outcomes and important contextual factors**

A number of specific desirable outcomes and important contextual factors were identified during the development of the Project and the options evaluation. Some of these were included as specific criteria in the MCA, but it was recognised that their differentiation could get lost amongst the averaging and aggregating inherent in such MCA processes. Subsequently, the following specific outcomes and contextual factors were expressly considered in both the option selection and subsequent design development:

- Limiting land acquisition from industrial activities where such take would adversely impact on the viability of such areas;
- Limiting effects on the safe and efficient access to businesses along the Church–Neilson Streets corridor;
- Providing transport outcomes that will not compromise the land use plans of the Auckland Council (in particular the intention to support industrial land uses in Onehunga and Penrose);
- Limiting conflicts between freight vehicles and buses;
- Limiting impact on travel times for through traffic on SH1 and SH20; and
- Providing appropriate social, cultural and environmental outcomes.

Some of these factors reflect the Transport Agency’s statutory functions and the general requirements of the RMA (providing for appropriate social, cultural and environmental outcomes) and others were incorporated into all design options as a minimum requirement (e.g. limiting impact on travel times for through traffic on SH1 and SH20 through extra lanes).

b. **Results**

The result of the MCA of the Long List of corridor options was to report on and present the outcomes of the MCA. This included an analysis for each option with detailed reasons for progressing or abandoning an option for further investigation.

The outcomes are presented in a number of different forms:

- An Assessment Summary with the key advantages, disadvantages and comments in a tabular form – as set out in *Appendix D: Assessment Summary of Long List Corridor Options* contained in *Report 1: Supporting Material for the Consideration of Alternatives* in Volume 3.
- Individual Option Assessments with a route map, a text summary of the assessment outcome, a visual representation of the scores in each key area and a short comment on those key criteria – as set out in *Appendix A: Long List Individual Option Assessment* contained in *Report 1: Supporting Material for the Consideration of Alternatives* in Volume 3.
- Multi Criteria Analysis Summary is a tabular summary of the assessment for each option against each criterion – not included in this report but included within the business case documentation.

#### 8.3.2.4 Short list of corridor options

Following completion of the Long List assessment, six options were selected to progress to the short list for further detailed assessment and consultation. It was also found that the better-performing options on the Long List could be grouped into three categories depending on whether they used the existing roads, a wholly new road or a mix of existing and new roads. The six options represented a combination of low and high investment options. Where a group of options from the Long List displayed similar characteristics the “best” option was chosen to move forward, but overall the Short List was devised to provide a range of low-high investment options in a range of new and existing corridors. As a result the six options with the best MCA scores were not necessarily taken forward to the Short List.

The shortlisted options and the reasons for their selection are set out in Table 8-2<sup>42</sup>. The figures below illustrate the six options.

**Table 8-2: Short listed options**

Long List Option No.	Description	Reason for shortlisting	Shortlist Option No.
1	Existing route upgrade with freight lanes	Represents low change, impact and cost option	A
2	Existing route upgrade with new SH1 ramps at the South Eastern Arterial / SH1 interchange	Represents a moderate cost option with slightly greater opportunity to address problems in the network	B
5	Galway Street link to SH20 with new inland route to new SH1 ramps at Mt Wellington	Moderate cost option providing transport benefits (this was 'best performing; from group of similar road upgrade options)	C
8	Galway Street link to new SH20 Interchange with new inland route to new SH1 ramps at Mt Wellington	Represents an alternative interchange configuration from that in Option 5	D
13	New SH20 Interchange with new foreshore route to new SH1 ramps near Panama Road	Represents high cost option that fully separates through traffic from Neilson Street / Church Street but would have greater impacts on some environmental aspects (e.g. from reclamation)	E
14	New SH20 Interchange with new foreshore route to new SH1 ramps at Mt Wellington	Similar to Option 13 but provided for more eastern connection to SH1 and opportunity for full connection to East Tāmaki	F

<sup>42</sup> These reasons are contained in Table 7.2 of the Indicative Business Case.

Figure 8-3: Short list Option A



Figure 8-4: Short list Option B



Figure 8-5: Short list Option C



Figure 8-6: Short list Option D



Figure 8-7: Short list Option E



Figure 8-8: Short list Option F



Building on the work done for the Long List assessment further concept design work was undertaken on the short listed options. This included further geometric investigations and consideration of operational performance, safety concerns, ground conditions, service location, utilities and environmentally sensitive areas. Option B had the most significant alterations as additional capacity was added to the design to address the anticipated extra traffic that would be attracted to the corridor.

It was also considered whether additional concept design work would have improved the performance and / or lessened the impacts from the other long list options. The conclusion was that no different outcome would be achieved even if further design work was undertaken.

The assessment of the short list options involved the following steps:

- Assessment against the transportation performance measures;
- Assessment of environmental and social context of the area and implications of each option;
- An MCA to compare the results for each option;
- Assessment against Project Objectives; and
- Overall consideration and decision.

a. **Transportation performance**

The first step in the assessment of the short list options was to assess the transportation performance of each option in greater detail using the Project specific transportation performance measures, as outlined in *Appendix B: Transport Performance Benefits and Measures of Performance* contained in *Report 1: Supporting Material for the Consideration of Alternatives* in *Volume 3*.

A few additional measures were included to reflect the increased level of design and the need for finer comparison between options. For comparison purposes an assessment was also undertaken of a 2013 Do Minimum scenario (which represents an existing environment baseline) and 2026 Do Minimum scenario (which represents a future environment without the Project). Quantifiable measures and results were used where possible and a final score assigned for each measure (using the eleven point scoring system). The full results of that assessment are contained within *Appendix E: Transport Performance Assessment Detail* contained in *Report 1: Supporting Material for the Consideration of Alternatives* in *Volume 3*.

The options scored variably across the different measures; some of the most significant differences were as follows:

- Option A was the poorest performing option on nearly every measure providing little improvement to the existing congested connections to SH1 and SH20 and poorly connected pedestrian/cycle links. While this option generally had less adverse impacts on the physical environment (as it represented little change from the existing environment) it did not provide potential positive impacts as other options did (e.g. for land use and social variables);
- Option B provided improved connectivity to SH1 via the existing corridor, however, this led to a significant increase in traffic on that corridor, and created adverse transport outcomes accessing properties. It was also found to not be an enduring solution, as the new problems created within the corridor would inevitably lead to the need for further upgrades or new infrastructure. It was similar to Option A in the MCA evaluation in terms of impacts, with the exception of the connection at SH20 and potential impacts on the Outstanding Natural Feature (Te Hōpua Tuff Ring);
- Options C and D did provide improved transport outcomes and contributed to the objectives of the Project. However, these options had limited ability to provide 'enduring transport benefits', particularly when compared with Options E and F. Specifically, poor conditions were found on the sections where the existing corridors were retained as the major access route; and
- Options E and F had the most enduring benefits and created the most resilient network, noticeably more than Options C and D and significantly better than Options A and B.

b. **Environmental effects and social impacts assessments**

Following the Transport Performance assessment, a more detailed assessment of the environmental and social context of the area and the implications for each option were commissioned through eleven

specialist reports. The reports were based on expert, independent analysis to assist the assessment of options and scope future consenting. The reports covered:

- Heritage;
- Visual and landscape amenity and urban form;
- Noise;
- Air quality;
- Social impact;
- Groundwater;
- Contaminated land;
- Erosion and sediment control;
- Stormwater;
- Ecology; and
- Coastal processes.

Typically, the level of environmental and social effect was consistent with the scale of the new infrastructure proposed under an option. However, a number of general key issues were raised by the assessments and were particularly relevant factors in the assessment of alternatives, including:

- All reclamation options had the opportunity to achieve environmental enhancement and benefits through capture of leachate and contaminants resulting from historic activities;
- All options would involve new stormwater treatment to some degree and this would have a positive impact on the quality of stormwater run-off and water quality in the Manukau Harbour;
- Options that created a new alignment would have a positive impact on residential amenity where they removed traffic from town centres and residential areas;
- All options that passed by Anns Creek needed particularly careful design and consideration of effects given the significant environmental values associated with that area. Likewise, all options that involved new structures in the vicinity of Te Hōpua Tuff Ring would need particularly careful design and consideration of effects;
- The heritage and coastal assessments did not support any options that impacted on Mutukāroa-Hamllins Hill. This view was supported by Mana Whenua who consider the area to be wāhi tapu; and
- There would be construction effects and disruption due to direct effects and construction traffic. An “off-line” alignment would likely reduce both these types of effect.

Potential effects of the Project on the important environmental and cultural values associated with Anns Creek, Mutukāroa-Hamllins Hill, ONLs and reclamation in the Coastal Marine Area (CMA) were discussed in detail in the relevant assessments. All of those areas have significant values that are reflected in relevant planning documents. The need to avoid effects on these values or if avoidance was not possible then remedy or mitigate as much as possible such effects, was expressly part of the considerations and assessments.

**c. Multi Criteria Assessment of Short List**

The third step in the assessment was a full MCA of the Short List using the same criteria and eleven point scoring method used in the Long List. Consistent with the Long List, assessment scores were assigned to each individual criterion and then an overall score for a key result area/group of criteria was assigned. For example, scores for all the criteria related to “Urban Design and Townscape” were individually identified and then an overall score for “Urban Design and Townscape” was identified.

The outcomes of the Short List MCA are outlined in *Appendix F Short List MCA Results* contained in *Report 1: Supporting Material for the Consideration of Alternatives* in Volume 3. At this stage of the process the estimated cost was also identified for each option, but cost was not a specific criterion in the MCA.

The MCA process was not designed or intended to simply identify the option with the best MCA score and recommend that as the Preferred Corridor.

However, for completeness the total scores for the short list options (with no weighting) were:

- Option A = -4
- Option B = -23
- Option C = -4
- Option D = -8
- Option E = -18
- Option F = -8

A weighting exercise was undertaken in respect of the transportation performance of each option in order to ensure that the key transport benefits of the Project – improving travel times and travel reliability between business in the Onehunga-Penrose industrial area and SH1 and SH20 – were given appropriate prominence in assessing options. These transport benefits directly correspond to the Project objectives (i.e. the Transport Agency’s reasons for undertaking the work). The weightings were:

- 75% for Benefit 1;
- 12.5% for Benefit 2; and
- 12.5% for Benefit 3.

The key conclusions of the weighted MCA are:

- Options E and F offer the greatest connectivity between the Onehunga-Penrose freight hub and SH1/SH20. In this way, these options best achieve transport benefit 1 (improved travel times);
- Options C and D offer direct and mostly off-road cycle options so best achieve transport benefit 2 (improved cycle and walking access); and
- All options improve journey time reliability for buses between SH20 and Onehunga Town Centre so assist to achieve Benefit 3, although Option F does this the best.

The total scores for the short list options, inclusive of weighting for the transport components, were:

- Option A = -3.8
- Option B = -22.9
- Option C = -3.9
- Option D = -7.9
- Option E = -17.9
- Option F = -8.0

The overall scores for each Option only changed marginally as a result of the weighting.

d. Consultation on Short List

Consultation was undertaken on the Short List Options with the public and key stakeholders. The responses received during that consultation related to:

- Transport performance including traffic volumes and congestion, providing for freight, multi-modal and public transport, rail and general transport performance. There was support for walking and cycling;
- Affordability and cost of options including the importance of value for money;
- Concern for loss or residential and business land;

- Concerns for community severance with Neilson Street upgrade options or severance to foreshore for foreshore options;
- Protection of environmental features including Gloucester Park, Te Hōpua, Anns Creek and Mutukāroa-Hamlins Hill;
- Enabling the safe and efficient movement of freight; and
- Business disruption during construction.

### 8.3.2.5 Recommended corridor option selection

The decision on the Recommended Corridor (which eventually became the Preferred Corridor) option took into account the performance against Project Objectives, the information contained in the various specialist assessments undertaken, the outcomes of consultation and the results of the MCA.

A summary of the information obtained and analysis undertaken for the short listed options is contained in *Appendix G Summary of Short List Options* for and the more detailed assessment of the options is contained in *Appendix H Short List Individual Option Assessment* contained in *Report 1: Supporting Material for the Consideration of Alternatives* in Volume 3.

Options A, B and D did not perform well against the transport, and other, criteria so were discounted on that basis.

In relation to Option C (upgrade with new Galway Street and inland connections):

- It performed well from a transport perspective and achieved the Project Objectives in the short term;
- The benefits were not enduring i.e. they only last for the medium term before problems arise again and new solutions would be required, such as further investment in the area. In particular by 2036 the traffic volumes in the western section of Neilson Street are predicted to have reached a level that makes property access difficult and would result in an unacceptable level of service;
- The route would affect areas of high environmental values around Anns Creek, which would need to be considered carefully but would not involve reclamation or extensive works in the Te Hōpua Tuff Ring;
- There was some potential for environmental enhancement in the Anns Creek area but no opportunity for enhancement work along the foreshore;
- Some land from business would be required especially through the inland port; and
- Subsequent investigations as part of the Route Alignment MCA and Consultation has also identified potential impacts from construction on the Southdown Reserve and over the existing KiwiRail designations which were not known at the time of the MCA but represent problems with Option C.

In relation to Option E (new foreshore connection):

- This performed well from a transport perspective and had enduring transport benefits;
- The option minimises acquisition of business land, in comparison to Option C, but involves acquisition of residential land in Mt Wellington instead of business land along Sylvia Park Road;
- Due to the route's location alongside residential land, and along the foreshore, it performs poorest from an environmental and social/community perspective; and
- The option does provide opportunities for enhancement due to the foreshore location.

Taking into account all the relevant material Option F, a full link between SH20 and SH1 with connections to the local road network, was chosen as the Preferred Corridor. It was recommended that further analysis be undertaken. Key factors in that recommendation were:



- Option F had superior transport performance and delivered the most enduring benefits, especially compared to upgrading parts of Neilson Street. By having the most enduring benefits it would maximise return on investment and remove or delay the need for further investment in the area;
- Option F best delivered the Project Objectives of improved connectivity, travel times and reliability (including travel time savings of 4 to 7 minutes depending on route), and greater resilience along the Nelson/Church corridor (via removal of up to 10,000 vehicles per day);
- Option F did not involve any substantial acquisition of residential or any business land along Neilson Street but did involve land requirement around the inland port and around Miami Parade;
- The potential need for reclamation and the NZCPS provisions in locations of high environmental value were balanced against the potential opportunities for environmental betterment; and
- The option gives opportunities for positive environmental outcomes which were of great interest to key stakeholders, especially Mana Whenua.

It was identified that further work was required to determine how best to deliver Option F. This would include consideration of staging, conceptual design refinement, methods to avoid, remedy or mitigate potential adverse effects and continued collaborative engagement with stakeholders.

### 8.3.3 Option refinement for preferred corridor

The outcomes of the assessment of the long list and short list options were contained within the Indicative Business Case that was presented to the Transport Agency Board in December 2014.

The Board confirmed the Recommended Corridor, which then became the “Preferred Corridor” and also requested that additional assessment be undertaken regarding:

- Key stakeholder engagement;
- Refining the Recommended Corridor particularly a foreshore route (requiring reclamation) compared to an inland;
- Staging options due to possible funding constraints; and
- Cost refinement.

#### a. Further stakeholder engagement

During the first half of 2015 additional engagement occurred with delivery partners and key stakeholders including discussions with Mana Whenua, Transpower, DOC, Auckland Transport, Auckland Council, Auckland Business Forum and KiwiRail. The engagement was targeted at ensuring risks and opportunities were fully understood during development of the Recommended Corridor.

#### b. Option refinement

In response to the requests for additional assessment from the Transport Agency Board, two alternative route options were assessed:

- An arterial route partially along the foreshore and then partially through the industrial land along Miami Parade and the inland ports; and
- An arterial route fully along the foreshore.

Design refinement and further assessment and analysis of each alternative alignment was undertaken. The outcomes were:

- Identification that the heavy industrial land traversed by the inland route was likely to be heavily contaminated due to the historic use of the land. The foreshore route would minimise earthworks required on known contaminated land.

- That the foreshore route offered potential to deliver positive environmental outcomes through containment of existing contaminants. For this reason, some key partners (such as Mana Whenua) indicated strong support for this route.
- The foreshore route would minimise the land required from heavy industrial land, which was identified as a scarce resource to be protected by Auckland Council and was of significant value to the landowners themselves.
- The foreshore route involved higher existing environmental values than an inland route. However, technical assessments and discussions with project partners indicated that design and mitigation measures could minimise effects on these values and fit with the policy direction.

On balance the foreshore route was preferable because it performed best from a transport perspective, provided network resilience, and provided opportunities for the integrated treatment of the foreshore edge and to bring back mauri of the Māngere Inlet. In addition, feedback from key stakeholders and project partners indicated a preference for the foreshore route if environmental impacts are effectively mitigated where possible and opportunities to contain existing contaminants were implemented.

Further analysis of the likely traffic movements indicated that a connection to Captain Springs Road, rather than Angle Street, delivered marginally better transport outcomes while also providing more flexibility in delivering the route in stages.

It was also considered whether any of the changes, but especially adopting the full foreshore route alignment, would have altered the previous scoring undertaken in the MCA and the decisions reached about the Preferred Corridor. None of the changes were considered to be of sufficient significance to alter the previous scoring and ranking of options or the ultimate decision for Option F.

#### c. Transport Agency decision

The further work was completed and a report presented to the Transport Agency Board in May 2015. At that meeting the decision was made to approve a staged, complete link between SH1 and SH20, based on Option F, as amended through the additional information, as the Preferred Corridor.

The Transport Agency Board directed further public engagement on the Preferred Corridor was to be undertaken and development / further investigation of this approach.

### 8.3.4 Option refinement

#### 8.3.4.1 Corridor refinement

Further refinements to the form of the alignment (i.e. Option F) were then investigated and assessed. The refinements were focused on improving transport outcomes and capturing some of the wider opportunities highlighted through stakeholder engagement. The investigations were a natural extension of the analysis to date, as the Project progressed through the investigation and design phase.

The refinements included:

- Confirmation of the foreshore route variation on the eastern side of Captain Spring Road as opposed to an inland route;
- Confirmation of Captain Springs Road as the main north-south connection to the existing Neilson Street/Church Street corridor rather than an interim connection via Angle Street;
- Inclusion of a connection to Hugo Johnston Drive from the new corridor; and
- Enhanced connections surrounding Gloucester Park including connections to Orpheus Drive.

It was identified the connection to Hugo Johnston Drive:

- Improved transport performance, with improved connection to the industrial area and greater network resilience;
- Reduced traffic on Church Street and Great South Road and improved the performance of the Great South Road / Sylvia Park Road connection;
- Could involve works on contaminated land;
- Would increase delays for through traffic on Hugo Johnston Drive and at the Hugo Johnston Drive/Church Street intersection;
- Would result in direct impacts on properties along Hugo Johnston Drive not previously affected by the Preferred Corridor;
- This connection could not be added to Short List Options A and B; but it could be added to Short List Options C, D, E and F so did not affect the relative MCA scores for each of those options; and
- The inclusion of this connection would not impact on the selection of the recommended corridor.

Enhanced connections around Gloucester Park were investigated in order to respond to feedback from stakeholders, enhance the ability to deliver the benefits and address safety concerns. The refinements included:

- A connection between Onehunga Wharf and Orpheus Drive; and
- Increased connection from the Onehunga Wharf to Onehunga Mall / Onehunga Harbour Road through a grade separated link.

The merits of these options considered included:

- The Orpheus Drive connection would improve general traffic, walking and cycling access to the foreshore;
- A local access to the Onehunga Wharf was strongly supported by the local community but had the potential to increase impacts on Te Hōpua Tuff Ring and require more land acquisition;
- The future use of the Onehunga Wharf was unknown; and
- The inclusion of this connection would not impact on the selection of the recommended corridor.

A final assessment was undertaken as to whether any of the refinements would materially affect the previous option assessments. The conclusion was that the refinements (either individually or collectively) did not materially affect the previous assessments; therefore there was no need to repeat the MCA process.

#### 8.3.4.2 Transport performance

The transport performance of the Preferred Corridor was reviewed again at this stage of the project development in order to ensure that the analysis and assumptions within the previous stages were accurate. This process reiterated that existing transport problems impose significant congestion and reliability costs and restrict local and regional growth which the project seeks to address. The wider benefit of congestion relief within the existing corridor, and separation of local and through traffic, was expected to be enhancement of the transport network performance and stimulation of economic activity.

From a transport perspective vehicle volumes on the western section of Neilson Street would exceed desirable capacity immediately if constraints were removed at either end without addressing the middle part of the alignment. This indicated a need for work on all the corridor to occur sequentially.

#### 8.3.4.3 Stakeholder feedback

From April to July 2015, further stakeholder engagement was held. The details of this are set out in *Section 9.0: Engagement* of this AEE.

The outcomes of this engagement influenced the development of the Preferred Corridor which is discussed below.

#### 8.3.4.4 Transport Agency decision

The assessment of the various refinements was compiled into the Draft Business Case that was presented to the Transport Agency Board in December 2015. Formal approval from the Board to progress with the Preferred Corridor and develop a preferred alignment was given on 11 December 2015.

### 8.4 Development of the preferred alignment

Once the Preferred Corridor was confirmed the second major phase of the route identification commenced. This process sought to confirm a Preferred Alignment within the Preferred Corridor and therefore involved a more detailed analysis than the consideration of options for the Preferred Corridor.

The design philosophy set parameters for the design options. Key parameters included:

- An arterial road with local connections;
- A design speed of 70kph on the arterial;
- Capacity for large freight vehicles; and
- Development of a Landscape and Urban Design Framework to influence the project connections, form and place-making influence.

The further refinement of the alignment was undertaken through an integrated design process with a multi-disciplinary design, legal, planning and specialist team. A detailed MCA process was undertaken of key project features along the corridor, each with workshops attended by technical specialists.

The first step in the identification of the Preferred Alignment was to divide the project into six sections and identify a number of options for each section. Each section has a range of different issues to consider, with some commonalities across the alignment. Key issues that were identified and developed further fed into the MCA process.

#### 8.4.1 Option development

During the selection process for the Preferred Corridor, desktop assessments, site visits and consultation with stakeholders identified a number of constraints and opportunities along the corridor. This information, along with mapped constraint data (e.g. extent of Outstanding Natural Features (ONF)) was compiled to identify alignment opportunities, constraints and design outcomes being sought from the EWL. This information together with design safety considerations and physical technical considerations informed the development of alignment options.

These alignment options were then subject to the MCA process discussed below. Selected specialists and experts participated in design workshops to inform option development; this resulted in new alignment options being developed prior to the MCA assessment and some further options were identified as an outcome of the process.

##### 8.4.1.1 Geographic areas evaluated

The following geographic areas (also referred to as sections) were identified as requiring separate MCA evaluation. These geographic areas do not necessarily correlate to the 'sectors' detailed in *Section 6.0: Description of the Project* of this AEE. The design options are detailed in *Appendix J Workshop Information Packages* contained in *Report 1: Supporting Material for the Consideration of Alternatives* in Volume 3 (which includes some of the information issued to the assessment team for each of the sectors). The options are summarised below.

a. **Neilson Street Interchange**

Four options were considered for connections between SH20 and the EWL and local road connections (Neilson Street and Onehunga Harbour Road). The options were:

1. A standard motorway interchange with signalised intersections and a bridge connection of SH20 (refer to Figure 8-9).
2. Retention of the existing interchange, trenched connections between SH20 and EWL and no bridge over SH20 (refer to Figure 8-10).
3. Free flow linkages between SH20, local roads and EWL rather than signalised. Bridge connection over SH20 (refer to Figure 8-11).
4. An additional freeflow option (developed in response to issues and evaluation comments received on the other three Options, was considered at a later stage of the process (refer to Figure 8-12).

**Figure 8-9: Neilson Street Option 1**



**Figure 8-10: Neilson Street Option 2**



**Figure 8-11: Neilson Street Option 3**



**Figure 8-12: Neilson Street Option 4**



**b. Bund design foreshore / coastal edge**

Eight<sup>43</sup> options were evaluated in this area. Options considered alignments mostly on land, mostly in the CMA, partially on CMA and land and both inland and coastal stormwater treatment options. The options were:

1. Inner Inlet bridge with no permanent reclamation, proprietary stormwater and a shared path on the southern side of the bridge.
2. Prior to the MCA workshop it was confirmed this option (which involved a tunnel) would not be assessed further due to the inability for a tunnel design to provide the necessary connections to Alfred Street, Captain Springs Road and the MetroPort land. Without those connections the route would not be able to achieve the Project Objectives and so this route was not pursued. A tunnel design also presented significant engineering and technical design challenges.
3. Reserve edge embankment alignment constructed over the existing foreshore, propriety stormwater treatment, new shared path on southern side of embankment.
4. Reserve edge embankment outside of property boundaries with additional outer bund including a wetland for stormwater treatment and shared path.
5. Inner Inlet embankment to be constructed in the Māngere Inlet adjacent to land, no stormwater treatment.
6. Outer Inlet embankment approximately 50m from coastal boundary with wetland between foreshore and embankment. Shared path to remain and new one to south of embankment.
7. Prior to the workshop it was confirmed this option would not be assessed further.
8. Inland alignment within private property and the majority over landfills. Proprietary stormwater treatment, existing shared path to remain.
9. Inner Inlet embankment immediately outside CMA with mechanical stormwater treatment capturing road and regional stormwater. Existing shared path to remain and a new one to the south of the embankment.
10. Inner Inlet embankment adjacent to the land with additional outer bund for stormwater wetland capturing road and regional stormwater. Existing shared path to remain and a new one to the south of the embankment.

**c. Anns Creek to Great South Road (including Hugo Johnston Drive)**

Four options were evaluated through the MCA. The options were:

1. Bridge structure through Coastal Protection Area / SEA Marine 1 avoiding majority of ecological features, bridging over rail corridor, grade separation at Hugo Johnston Drive (refer to Figure 8-13).
2. Bridge structure through Coastal Protection Area / SEA Marine 1, avoids some property but further into ecological features, at grade signalised intersection at Hugo Johnston Drive (refer to Figure 8-14).

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<sup>43</sup> Originally there were 10 options, but only eight were considered as part of the MCA. All options retained their original option number.

3. Bridge structure through Coastal Protection Area / SEA Marine 1, avoids some property but further into ecological features, at grade non-signalised intersection at Hugo Johnston Drive including a roundabout to south of alignment (refer to Figure 8-15).
4. Bridge structure avoiding coastal and ecological areas, encroaching more into private property, and slip lanes at Hugo Johnston Drive. This option was developed in response to issues and potential adverse effects identified with Options 1-3 which all impacted on the CMA (refer to Figure 8-16).

Figure 8-13: Anns Creek Option 1

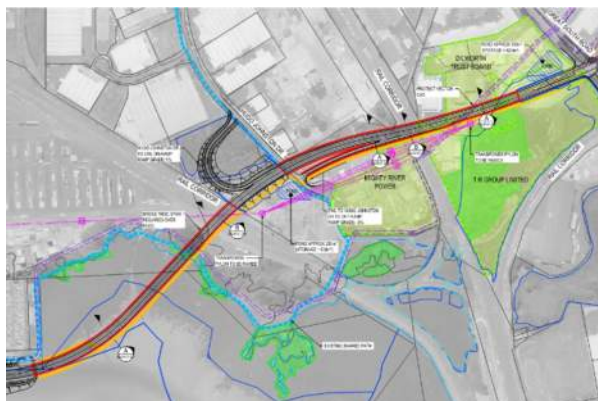


Figure 8-14: Anns Creek Option 2



Figure 8-15: Anns Creek Option 3



Figure 8-16: Anns Creek Option 4



d. **Princes Street Interchange**

Five options were evaluated through the MCA process. The options were:

1. A new overbridge to the north of the existing bridge, lining up with Princes Street. It included modified on/off ramps to SH1 and signalised pedestrian and cycling crossing facilities (refer to Figure 8-17).
2. A new overbridge on the existing alignment, lining up with Princes Street east. It included relocation of the southbound on-ramp entry to the north of the bridge (refer to Figure 8-18).
- 2B. Similar to Option 2 but included additional mitigation options.
3. A single point urban interchange with all four ramps connecting at a single signalised interchange. It included an alignment north of the existing and a modified Princes Street east alignment (refer to Figure 8-19).

4. A full diamond interchange with the bridge to the north of the existing (refer to Figure 8-20).

Figure 8-17: Princes Street Option 1



Figure 8-18: Princes Street Option 2



Figure 8-19: Princes Street Option 3



Figure 8-20: Princes Street Option 4



e. **Ōtāhuhu Creek crossing**

There were four options evaluated through the MCA. The options were:

1. New single span bridge across the culvert, retaining the existing culvert and SH1 structure.
2. New four span bridge extension with an abutment on either side of culvert, piers either side of creek and no retaining.
3. Extending embankment into causeway for extra lane and culvert extension.
4. Replacement of culvert and embankment with a new bridge over SH1.

f. **Design option workshop**

In addition to the detailed MCA, design option workshops were held for specific locations where differences related primarily to land required or feasibility of alignments so a comprehensive MCA was considered unnecessary. The locations were:

- **Neilson Street / Captain Springs Road intersection** – the impacts specifically relate to land use impacts on open space land and commercial properties, as well as integration with the local road / cycle network. To differentiate between alignment options, detailed engagement with landowners (particularly Auckland Council (Parks) and the Maungakiekie-Tāmaki Local Board) informed selection of the design option; and



- **Sylvia Park Road to SH1** – the design and safety constraints identified through this section were complex. At the time of undertaking option evaluations, two practicable options had been developed, one informed by the significant land use constraints in the area (being significant land uses and infrastructure), the other by safety considerations for the alignment. In summary, the constraints of this area include:
  - meeting appropriate Transport Agency safety standards;
  - maintaining important local road connections, including the future Auckland Transport bus connections at Sylvia Park Road and the Mt Wellington Highway / Sylvia Park connection;
  - recognising the significant physical constraints of Transpower’s transmission lines through this area;
  - recognising the vertical constraints of significant Watercare infrastructure (particularly at Great South Road);
  - seeking to avoid major land uses where possible and maintaining accesses to properties, including Pacific Rise; and
  - minimising impacts on sites of significant cultural value (including Mutukāroa-Hamllins Hill and the identified wāhi tapu site / area at the Mt Wellington Interchange).

While it was anticipated that there would be further option development for alignment design in this area (responding to these constraints) no MCA was undertaken on ‘alignment options’ as it was concluded that the detail of design between options was more appropriately considered in the next phase of assessment (e.g. once environmental assessments and landowner consultation has been undertaken).

Following the workshops, three hui were held with Mana Whenua which involved the following components:

- Presenting and discussing options;
- Discussing the MCA process and Mana Whenua input to this process (cultural values report); and
- Gathering feedback on the design options being considered.

Two workshops were held with Auckland Council to present and discuss options.

#### 8.4.1.2 Multi Criteria Analysis criteria

The criteria for the alignment options MCA were based on the criteria used for the earlier MCAs under the Long List and Short List Corridor options. Specific topic areas and criteria were reviewed and developed taking into account the Transport Agency objectives, key RMA matters (in particular sections 6, 7 and 8 of the RMA) and directives of National Policy Statements and Plans. A copy of these criteria is provided in *Appendix I MCA Criteria for Alignment options* contained in *Report 1: Supporting Material for the Consideration of Alternatives* in Volume 3 along with the scoring system used. The criteria relate to the following topics:

- Performance against Project Objectives;
- Road safety;
- Construction;
- Operation;
- Social and economic;
- Natural environment; and
- Cultural and heritage.

The MCA was a qualitative evaluation of different options against each criterion using a collaborate workshop with a range of technical experts. For the purpose of evaluation, the assessment was based on a standard set of design options presented to all experts.

For consistency, the assessment was undertaken on the basis of design options 'without mitigation'. This was undertaken so that the cost evaluation of options was consistent to the impact assessed. However, in addition to the assessment, specific comment was recorded on the ability for the effects assessed to be mitigated (this is discussed further in the process summary below).

#### 8.4.1.3 Scoring

An eleven point scale (consistent with earlier phases of MCA) was used ranging from +5 (significantly positive effects), 0 (neutral) through to -5 (significantly adverse / negative effects). Attachment I provides a summary of the scoring matrix used. The matrix provided guidance to the qualitative assessment.

It is noted that scores were not provided for 'Mana Whenua values' (one criteria) on the basis that the Mana Whenua groups identified and recorded issues and where relevant alignment preferences, rather than a single score (which was considered insufficient to reflect their broader scope of values).

#### 8.4.1.4 Multi Criteria Analysis process

The process for MCA evaluation followed these key steps:

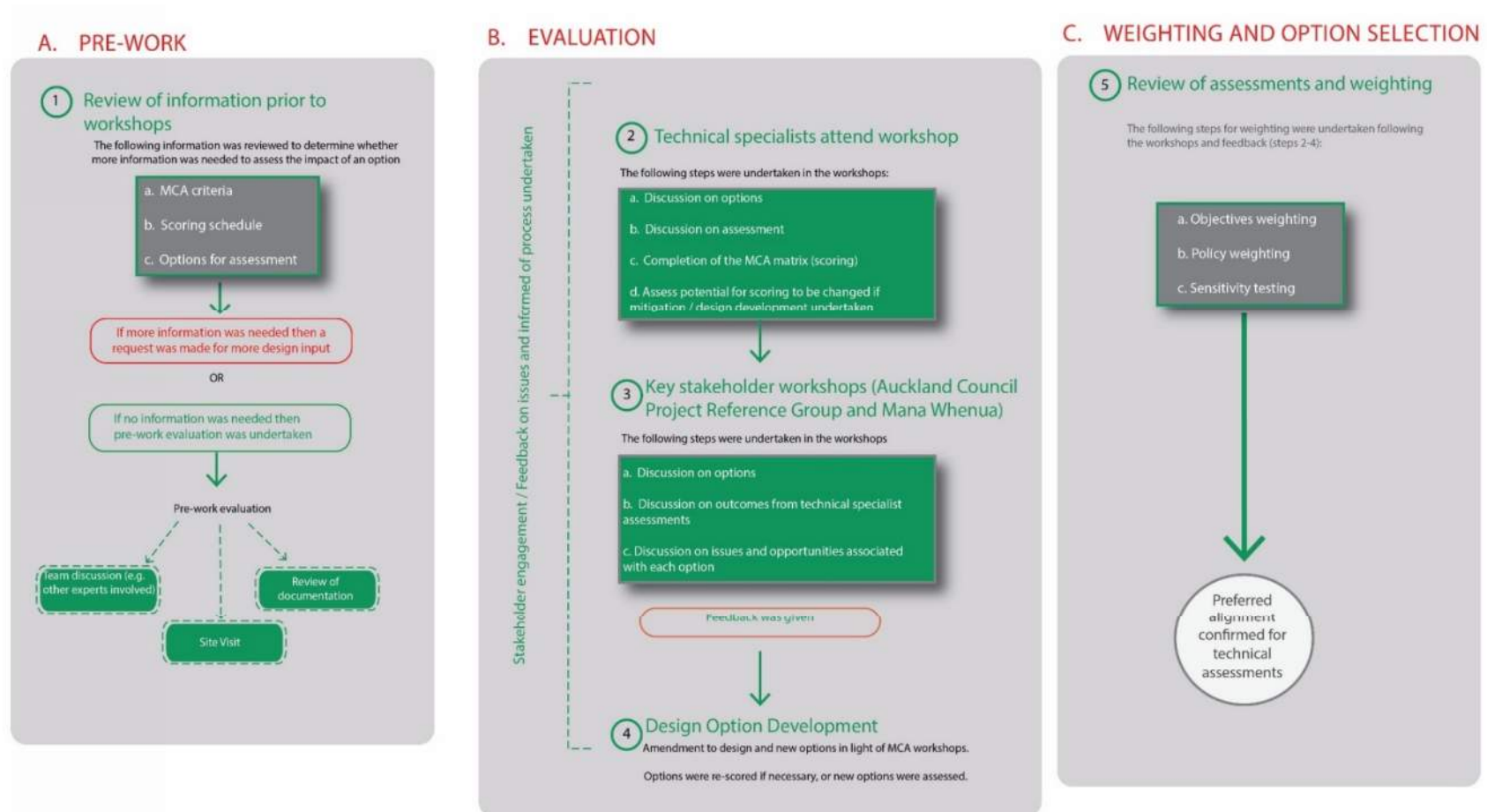
- **Briefing** - An information package was prepared and circulated for each geographic area for discussion and evaluation at the MCA workshops. Each package contained a short memorandum providing background and summarising each option, detailed design plans and cross sections and extracts from the planning documents to identify key environmental features. The full suite of plans for each option is contained in *Appendix J: Workshop Information Packages* contained in *Report 1: Assessment of Alternatives* in Volume 3.
- **Pre-Workshop Assessment** - This phase involved investigations and collecting base information to inform the option assessment. In some instances, (e.g. in the case of the foreshore bund options), an initial briefing session workshop was held with experts to explain the design variations of options (prior to the assessment workshop).
- **Workshop Assessment** - At each section workshop<sup>44</sup>, the nominated experts provided an assessed score (using the 11 point system) for each of the options presented. The purpose of a workshop in this step was to gain a shared understanding of the design options and to discuss impacts / considerations of the experts in reaching the MCA scoring under specific criteria. Where appropriate, outstanding issues were identified. All scores from the workshop assessment were 'preliminary' to enable assessment by Mana Whenua prior to finalising.
- **Finalised assessment** - Following the workshop and Mana Whenua inputs the assessments were completed.
- **Design development** - The final step of the option assessment was to confirm if the scoring undertaken could be substantially changed if mitigation / design amendment was made. If this opportunity was identified, further design development was undertaken. In a number of cases, this resulted in 'new design options' or sub-options being identified (e.g. Option 2b at Princes Street Interchange, and Option 4 in the case of the Neilson Street Interchanges). In these cases, further assessment was undertaken to confirm the revised scoring for the new option/sub-option being considered.

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<sup>44</sup> Workshops were held over April and early May 2016.

- **Weighting** - This step considered the feedback from key stakeholders. Tests have been undertaken to consider the weighting of the criteria against different RMA policy matters and the overall Project objectives. The weighting process was used to sensitivity test the MCA results.
- **Recommended Option** - This final step included a review of the MCA results, the implications of weighting and the stakeholder engagement inputs to the process.

Figure 8-21: Multi Criteria Analysis process



#### 8.4.1.5 Weighting

Following the collation of raw scores for each option further analysis was undertaken to assist with understanding the advantages and disadvantages of certain options and to assist in identifying a Preferred Corridor. The use of weightings allows for sensitivity testing of the scores for each option and gives an indication of the robustness of the outcome. Further detail is provided on the identification of weightings is contained in *Appendix K: Weightings for MCA Scores for Alignment options* contained in *Report 1: Supporting Material for the Consideration of Alternatives* in Volume 3.

Seven different weighting systems were used:

- Transport / Project Objectives emphasis;
- Mana Whenua values driven by the priorities identified by Mana Whenua in the project engagement;
- Natural environment;
- Land requirements and impact on industrial activity;
- Landscape and geological;
- Social and community, recognising that these are RMA section 7 matters and social well-being is a core component of section 5 of the RMA; and
- Sections 5 and 6 of the RMA balance: Sought to apply a balanced approach to the competing matters, including the economic enablement as represented by Project Objectives and the section 6 matters of national importance while giving some emphasis to other relevant section 7 matters.

#### 8.4.2 Outcomes of Preferred Alignment Assessment

##### 8.4.2.1 Multi Criteria Analysis reporting

The record of the discussions and outcomes of the MCA workshops are contained within *Appendix L: Work Notes for Alignment options* contained in *Report 1: Supporting Material for the Consideration of Alternatives* in Volume 3.

The figures below provide a graphical summary of the outcomes from the MCA evaluation and reporting on the key considerations which informed the option selection for each segment. The 'best performing' option identified from the assessment process is highlighted in red for each sector, with those criteria scoring as 'positive' showing above the neutral line (in the blue area of the figure) and those scoring 'negatively' showing below the neutral impact line (in the red area of the figure).

As noted above, Mana Whenua did not provide a single 'score' for the Mana Whenua values criteria. Where relevant, comment is provided on their preference for options considered in each sector.

Figure 8-22: Neilson Street Interchange

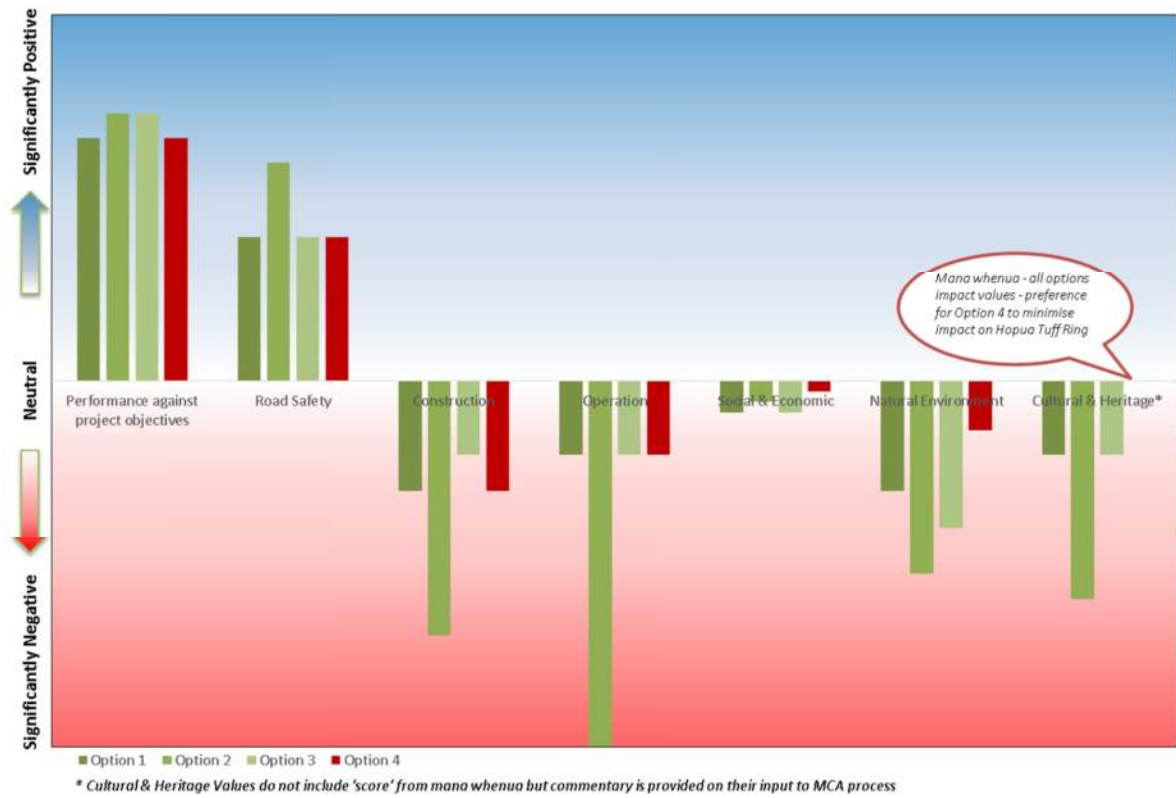


Figure 8-23: Foreshore options

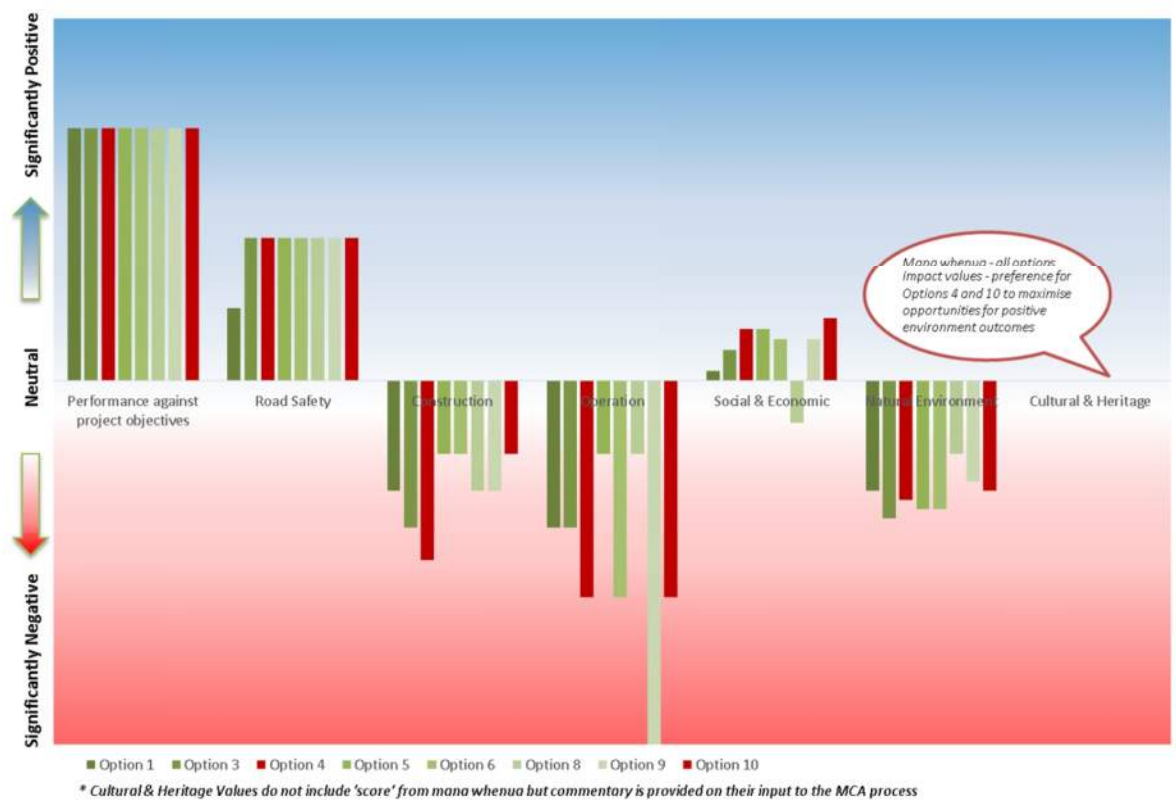


Figure 8-24: Anns Creek

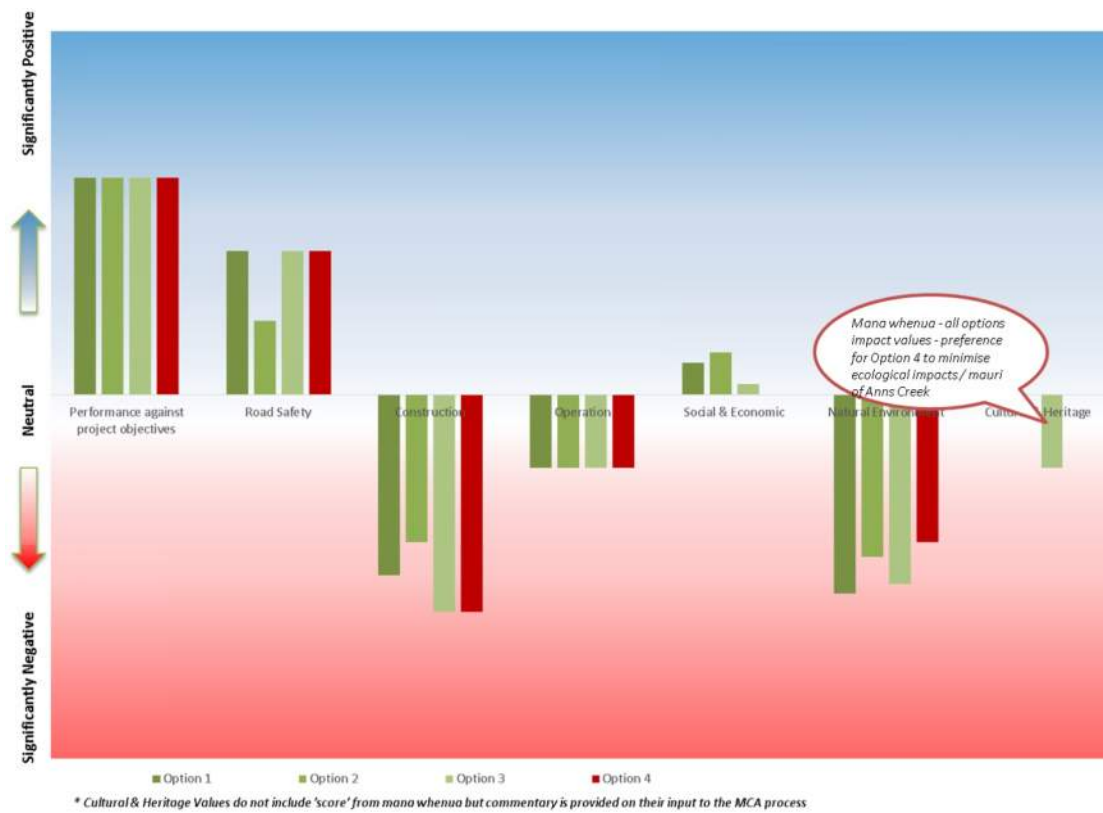


Figure 8-25: Ōtāhuhu Creek

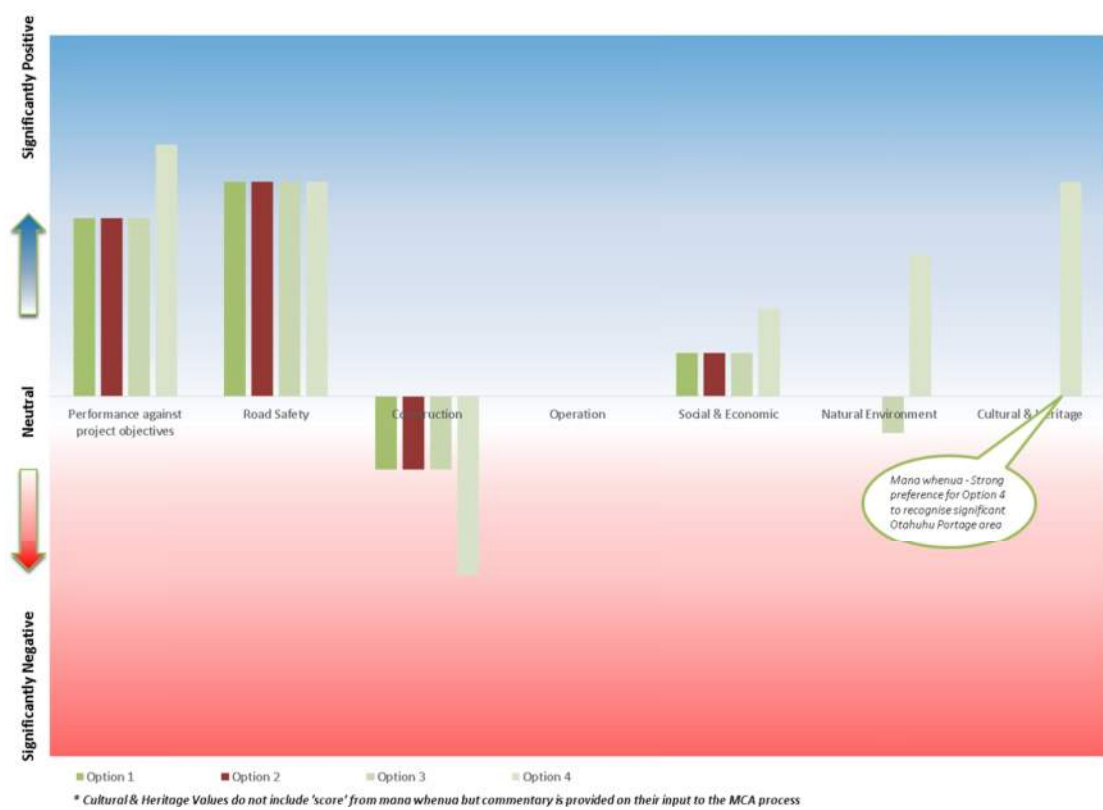
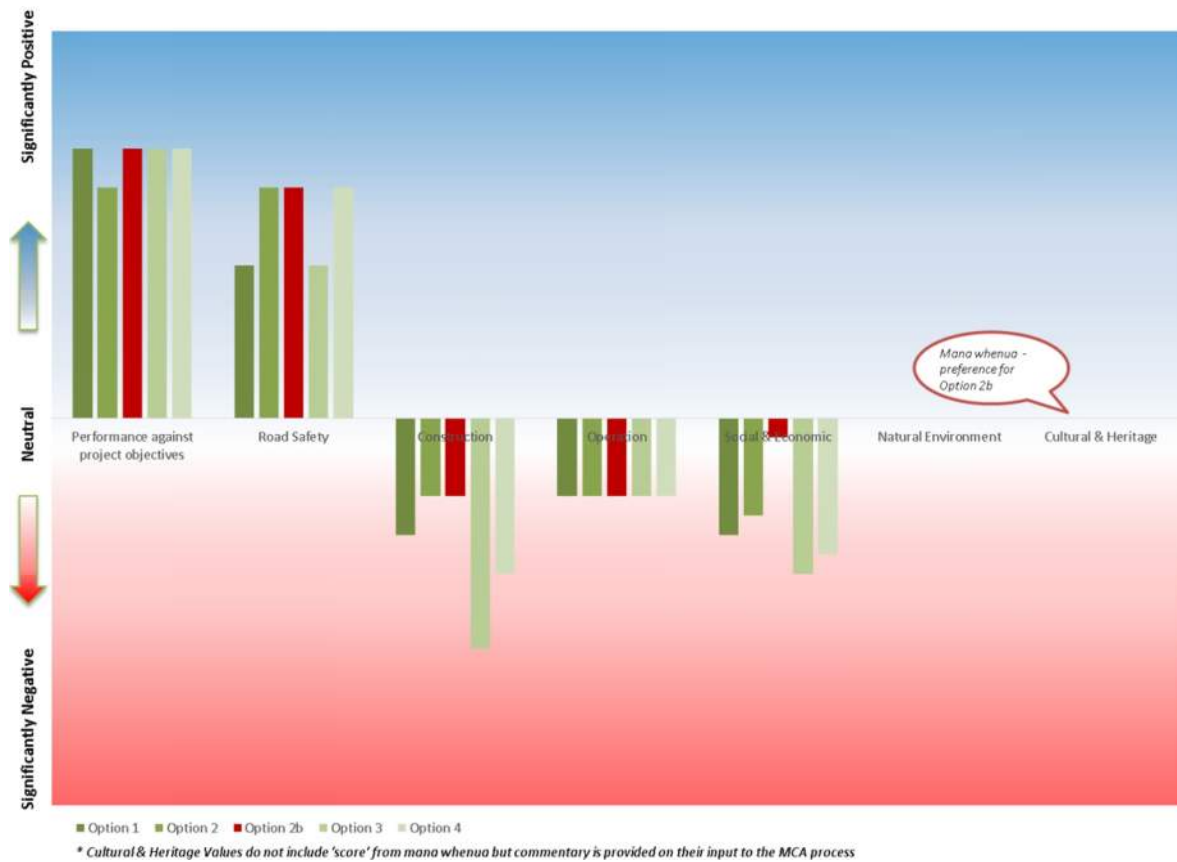


Figure 8-26: Princes Street Interchange



These raw scores then had a range of weightings applied to them. The weighted scores are contained with *Appendix M: Weighted MCA Scores for Alignment Options* contained in *Report 1: Supporting Material for the Consideration of Alternatives* in Volume 3.

### 8.4.2.2 Stakeholder engagement outcomes

From February 2016, consultation and engagement was undertaken with stakeholders. The purpose of this engagement has been to:

- Inform stakeholders and landowners of project progress to date, and programme going forward including opportunity for ongoing engagement; and
- Consult with key stakeholders on issues and opportunities associated with options being assessed through the MCA process to input into the decision on the Preferred Alignment.

Engagement has focused on key stakeholders (Auckland Council, Mana Whenua, and Auckland Transport). In addition, engagement has been undertaken with community representatives, major landowners, utility providers and other groups to inform the technical assessment of options. The outcomes of the engagement are summarised below.

In summary, key matters identified through stakeholder engagement that has informed design development and option assessment in this process includes the following:

- The importance of avoiding impacts on sensitive locations, geological and ecologically important values. In particular, this included:
  - Avoiding any permanent land modification of Te Hōpua tuff ring (identified as an ONF);
  - Avoiding the remnant lava flows along the coastline of the Māngere Inlet;



- Avoiding Anns Creek, particularly identified SEAs and Coastal Protection Areas; and
- Avoiding the urupā / culturally significant area at Mt Wellington.
- The importance of the area for economic activity, including:
  - Recognising the scarcity of business land in Auckland;
  - Maximising opportunities for traffic movement between Onehunga and Penrose; and
  - Avoiding stop-start traffic.
- Opportunities for environmental enhancement of degraded coastal environment:
  - Restoring the natural character of the coastal environment;
  - Managing stormwater and leachate discharges to Māngere Inlet to improve water quality of receiving environment;
  - Opportunities to restore ecological values of Anns Creek and foreshore wading areas;
  - Improving access to and along the CMA;
  - Re-establishing significant portage and coastal values of Ōtāhuhu Creek; and
  - Improving resilience to climate change for land at Onehunga – Penrose.
- The importance of opportunities to revitalise Onehunga Town Centre and the foreshore, including opportunities to improve connections between the community, foreshore, town centre and port.
- The importance of opportunities to create connections (or avoid barriers) to other modes of transport, particularly walking and cycling, and rail (including future rail).
- Improved recreational access to the foreshore and Māngere Inlet (including walking and cycling movements).

#### 8.4.2.3 Outcomes of the evaluation by sector

The following sections describe the key considerations and factors that were involved in choosing the preferred option in each section. As with the selection of the Preferred Corridor, the decision on the preferred option for each sector was informed by the MCA scoring, consultation feedback, relevant planning considerations and how each option met the Project Objectives.

##### a. **Neilson Street Interchange**

All options considered maintain the opportunity for a mass transit connection to Auckland Airport.

Option 2 (retention of the existing interchange, trenched connections between SH20 and EWL and no bridge over SH20) was dismissed on the basis of the potential adverse effects (including on environmental and Mana Whenua values) and cost. In addition this option did not contain commensurate benefits or contribute to the Project Objectives sufficiently (e.g. transport performance) to balance those potential adverse effects.

The transport difference between Options 3 and 4 (both free flowing linkages) is marginal. However, Option 4 performs consistently better against other criteria, particularly reducing impacts on the ONF values.

Comparing Options 1 and 4, Option 4 performs better in most cases. Option 4 is better particularly in respect of social and economic aspects, Mana Whenua values, and consideration of the relevant policy tests including the potential impacts on the coastal environment and ONF values.

On this basis, **Option 4 was carried forward for design, detailed technical assessment and engagement**<sup>45</sup>.

Key issues identified for further design and assessment investigation were:

- Opportunities to reduce impacts on the ONF values through more detailed assessment of the values of Te Hōpua tuff ring, design response, and urban design opportunities to celebrate the feature;
- Enabling continued connectivity between Old Māngere Bridge and Onehunga Town Centre;
- Integration of the southern section of EWL with Onehunga Wharf alignment;
- Maintaining opportunities for rail integration with design of structure at Galway Street (noting all design options provided for a future mass transit to the airport connection);
- A connection at Orpheus Drive and Onehunga Wharf;
- Assessment of the Aotea Sea Scouts Hall and integration with EWL; and
- Local road improvements and the interface with the local network (i.e. how to get the benefits out of Neilson Street with less traffic).

b. **Foreshore alignment**

Option 9 (involving an inner Māngere Inlet alignment with mechanical stormwater treatment) scored very poorly on operational costs and risk assessment for the environmental outcomes it would deliver. This scoring included the safety considerations for maintenance requirements on the mechanical treatment system. Although it scored positively for stormwater management there was a risk because the scale of the technology is untested.

Option 1 (involving a bridge design) and Option 3 (involving a reserve edge embankment alignment with no opportunity for catchment stormwater treatment) both scored poorly on:

- Mana Whenua values, reflecting the limited opportunity to address stormwater / leachate management to the Māngere Inlet (which was important to Mana Whenua based on their feedback), which was identified as a potentially significant opportunity with other options;
- The potential for leachate disturbance from piling within contaminated land; and
- The limited ability to restore the natural character of the coastal environment in the treatment of the coastal edge.

Option 5 (involving an inner Māngere Inlet embankment) addressed leachate discharges but had no opportunity for the management of wider catchment stormwater. Option 5 also increased the inland flood risk.

Option 6 achieved the stormwater management opportunities for the wider catchment, but did little for leachate (unless managed with the stormwater treatment) and required the road to be constructed on the outer bund. Due to the constraints of the road alignment, the naturalisation of the coastal edge may have required additional intrusion into the CMA. Option 6 also created a consequential increase in flooding risk for the land north of the bund if the storage capacity of the treatment area was exceeded.

Option 8 (involving an inland alignment) had the least opportunity for positive outcomes for stormwater management, leachate capture and natural character restoration, while still being an alignment 'close' to the coast. Given the significant potential impacts of disturbance at Waikaraka Cemetery it was assessed

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<sup>45</sup> Subsequent to this outcome an alternative design was put forward by the Onehunga Business Association. This was assessed by the Project team as discussed further in *Section 8.4.3.3* of this AEE.

with some reclamation at the western edge, which would then require bridging or crossing the Manukau Foreshore Walkway. This option also had potential significant land impacts on established industrial areas. The cost assessment for Option 8 provided for land cost, but not business disruption (which was potentially significant). It was recognised that this construction design might be appropriate in some areas of the alignment, particularly where there is an opportunity to construct the alignment without piling into the basalt thereby avoiding potential groundwater impacts.

Options 4 (reserve alignment with outer bund) and 10 (inner Māngere Inlet alignment with outer bund) had potential for positive stormwater and leachate management as well as opportunities for restoration of the natural character of the coastal edge and public access to and along the CMA. Option 4 had potential impacts on groundwater with the piling methodology proposed, particularly in areas of basalt. However, it was identified that if an alternative construction method could address this potential impact, it had the potential to reduce the extent of reclamation. This was considered beneficial from coastal processes, policy and ecological perspectives (noting existing ecological values are low to low-moderate, though there is an area of foraging for wading birds).

For the foreshore construction methodology, there could be areas of the foreshore where the soil composition and the historic use of clean fill meant it could be implemented without the leachate impact. This could apply to Option 4 or Option 8. Options 4 and 10 both provided the best opportunity for creation of a 'naturalised' foreshore edge providing public access to and along the coast and new ecological habitat. The leachate and stormwater treatment opportunities along with the restoration of a naturalised coastal edge were identified as very important by Mana Whenua for respecting and restoring the mauri of the Māngere Inlet.

On this basis, **Options 4 and 10 were taken for detailed technical assessment and consultation**, and design development sought to achieve the following outcomes:

- Provide for EWL alignment and local road connections;
- Restore and rehabilitate the natural character of the coastal environment and coastal edge;
- Provide public access to and along the CMA, including pedestrian and cycle connectivity;
- Improve water quality of the receiving coastal environment through the management of stormwater and leachate discharges (including opportunities for catchment-wide integrated solutions); and
- Improve resilience for future coastal inundation as a result of climate change related sea-level rise, which has the potential to increase flooding risk and potential for leachate disturbance.

Other matters which were to be addressed during, and in parallel with, the design process were:

- Reducing the extent of reclamation to the greatest extent practicable, particularly in identified areas of ecological value whilst recognising constraints of basalt and significant land use constraints;
- Understanding the problems in the existing environment, including the state of receiving environment and causes of environmental degradation, to better design treatment options;
- Liaison with Auckland Council on the ongoing operation of stormwater and leachate management systems;
- Development of an environmental strategy to determine the outcomes for the Māngere Inlet, including ecological impacts and mitigation/off-sets;
- Development of a public access strategy and urban design outcomes for the design development of the foreshore, including linkage at Alfred Street for pedestrians / cyclists; and
- Construction methodology for any reclamation and structures, and coastal processes of these options.

c. **Anns Creek**

All the options would have potentially significant adverse effects and significant issues were identified with all options.

Option 1 had industrial land impacts east of the rail corridor and impacts on the Southdown Reserve (which had consequential stormwater impacts), but it avoided areas of valued terrestrial ecology. There was little opportunity to address the discharges from leachate and stormwater along this area to the CMA. This option impacted on the valued coastal environments.

Options 2 and 3 impacted the Southdown Co-generation Plant but avoided the Transpower towers and other industrial land uses. These options impacted the area of terrestrial ecological value along with the Coastal Protection Area 1 / SEA Marine 1. Both options also avoided Southdown Reserve.

Option 4 sought to address the impacts on the CMA (including Coastal Protection Area 1 / SEA Marine 1) by locating the alignment on land along the northern foreshore. However due to the need to maintain a safe road design, there were consequential increases in property impact. These impacts included increased industrial land acquisition, impacts on Southdown Reserve and impacts on Transpower towers requiring relocation of two or three towers.

On the basis of this, the approach for **further design and technical assessment was a modified Option 4** to provide for signals at Hugo Johnston Drive to reduce travel speeds on the EWL which reduced the impact at Southdown Reserve. This would shift the alignment further to the south (south of the Southdown Co-generation Plant) and this would potentially impact on the valued ecological area and natural features at Anns Creek.

Other matters which were to be addressed during, and in parallel with, the design process were:

- Minimising impacts on Southdown Reserve;
- Opportunities for relocation of the heliport operations to address land use impacts associated with the foreshore option;
- Further understanding ecological values for the CMA, Anns Creek and Southdown Reserve and how impacts could be mitigated;
- Understanding business land impacts and overall business activity functionality of this area in the context of the wider City;
- The cycleway alignment through the area and connecting to Great South Road;
- Impacts on Transpower and First Gas assets; and
- Further understanding values of natural features in Anns Creek and mitigation of impacts.

d. **Great South Road – Sylvia Park Road – SH1**

Whilst a number of options were identified along this alignment, only one horizontal alignment option was identified as practicable for safety and land use reasons whilst seeking to avoid the transmission lines and encroachment into Mutukāroa-Hamllins Hill. This option provides for:

- An at grade intersection at Great South Road / Sylvia Park Road;
- Widening of Sylvia Park Road to the south (including acquisition of private property);
- A structure for south-facing ramps from Sylvia Park Road to SH1; and
- Auxiliary lanes on SH1 from new ramps to and through the Princes Street interchange.

Other matters which were identified as needing to be addressed during design and assessment to consider the potential opportunities to avoid, remedy and mitigate 'localised' impacts included:

- Detailed assessment of the safety implications of the alignment, including the design of the north-bound off-ramp from SH1;
- Cycleway connection to Sylvia Park;
- Land use impacts, particularly at Mt Wellington and Sylvia Park Road;
- Access to businesses at Great South Road / Sylvia Park Road intersection;
- Potential impacts and access to Mutukāroa-Hamllins Hill;
- Integration with significant infrastructure (Transpower and Watercare in particular); and
- Local road accesses and integration of EWL with local road / passenger transport corridors.

In subsequent engagement with key stakeholders, the consideration of options for either an at grade or grade separated intersection at the EWL / Great South Road / Sylvia Park Road intersection was raised. Further assessment of alternatives was undertaken for this intersection, with the result being a revised alignment incorporating a grade separated intersection. This is discussed further in Section 8.4.3.6 of this AEE.

e. **Ōtāhuhu Creek**

All options provided for a potential pedestrian and cycle connection over the Ōtāhuhu Creek.

Option 3 (extending the causeway and culvert extension) was dismissed because of its coastal process and natural environment impacts. The cost saving of this option was marginal, particularly if a standalone pedestrian and cycle bridge was also to be built.

Option 4 (replacement with a bridge) performed best in terms of long term environmental outcomes and, in particular, coastal processes, public access and recognising the culturally significant portage. However, the option had significant cost implications and potential adverse impacts during construction including disruption on SH1 and due to congestion could affect industrial land uses (and the general public).

Given these issues, detailed **technical assessment and engagement on Option 2** (new bridge with abutment), which avoids adverse effects on coastal processes (relative to Option 1) and provides better opportunity for pedestrian and cycleway provision was identified to be taken forward. While slightly higher cost than Option 1, it is able to be constructed quicker which was important for the operation of SH1. In addition, further assessment of the opportunities and positive environmental outcomes of Option 4 were also to be considered.

f. **Princes Street Interchange**

The interchange at Princes Street needs to be upgraded and replaced.

Options 1 (overbridge to north) and 3 (single point urban interchange) were not recommended as they did not perform as well for pedestrian and cycle connections which is a core Project objective. Option 4 (full diamond interchange) performed slightly better than Option 2b (overbridge south with mitigation) for pedestrians and cyclists, but potentially increased residential land acquisition. Depending on the design of the on-ramps to SH1, queues on local through traffic would be affected differently (either positively or adversely); this is relevant to both Options 2b and 4.

Following evaluation, safety review confirmed that Option 2b could address operational and safety requirements. On this basis, **Option 2b was taken forward** for design and technical assessment.

### 8.4.3 Further refinement incorporating feedback and technical assessment

Design, technical assessment and engagement with landowners, stakeholders and the general public identified a number of potential new alternatives or provided additional information on the already

identified alternatives. This information identified a series of design and route amendments. The most significant amendments are discussed below.

#### 8.4.3.1 Great South Road Intersection

Traffic modelling for the preferred option indicated that a new at grade East West Link / Great South Road / Sylvia Park Road intersection would have high traffic volumes, particularly in peak periods. The level of service (LoS) offered by the preferred option ranged from LoS D to E in 2026 with potential to decrease to LoS E to F in 2036. Long term performance of the intersection is a potential future risk as traffic volumes increase associated with Auckland's planned growth. In addition, during public engagement key stakeholders raised concerns about the potential for significant congestion at this intersection. Alternative designs for an at grade design did not sufficiently respond to this issue. A grade separated solution for the new East West Link / Great South Road / Sylvia Park Road, intersection has therefore been developed to respond to this issue, including improved cycle and pedestrian access, improved level of service for all movements including a substantial improvement for east west movement, and a more enduring and resilient design compared to the at-grade design.

The option development and evaluation process is set out in section 8.4.3.6.

#### 8.4.3.2 Connections to Port of Onehunga

Feedback and technical assessment confirmed the most appropriate alignment in the vicinity of Neilson Street and Te Hōpua tuff ring was the chosen free flow option, with the exception of the connection to the Port of Onehunga.

Auckland Council, Panuku and various members of the Onehunga community identified the potential impact the Project could have on the connections between the Onehunga Wharf and Onehunga Town Centre. The preferred option involved an at grade section of road adjoining the Wharf with a local road overpass directly connecting the Onehunga Wharf and Onehunga Mall.

In response to this feedback an alternative design was developed which involved constructing a trench along Onehunga Harbour Road with an at grade local road crossing over the deepest section adjacent to The Landing Hotel. The design increased construction costs and construction effects but will not affect the natural geological feature of Te Hōpua Crater. The trenching of the EWL will assist to provide better connections to the Onehunga Wharf, achieve a better urban design outcome and reduce the "barrier effect" potentially created by other options assessed.

#### 8.4.3.3 Alternative Neilson Street Interchange

During the engagement process in 2016 (refer to Section 9.5: Pre-lodgement engagement (2016) of this AEE) an alternative design for the Neilson Street Interchange was put forward by the Onehunga Business Association. The design presented by the Onehunga Business Association was conceptual. The Project team undertook further design of this alignment in consultation with the Onehunga Business Association. The outcome of this design development is referred to as the OBA Option and is illustrated in Figure 8-27.

Figure 8-27: OBA Option



More detailed information regarding the OBA Option can be found in Appendix O of *Report 1: Supporting Material for the Consideration of Alternatives* (Volume 3). The design is similar in form to the earlier Option 2 design which was developed from an interchange design put forward by The Onehunga Enhancement Society earlier in the option assessment process. The assessment of Option 2 is summarised at Section 8.4.2.3(a).

A review of the OBA Option was undertaken by comparing it to Option 2 on the basis of the similarities between Option 2 and the OBA design. This assessment included a review against the same MCA criteria previously applied to the assessment of Options 1-4 of the Neilson Street interchange. Where the potential scoring of the OBA Option against the MCA criteria was considered potentially different from the evaluation and scoring of Option 2 (refer to Section 8.4.1.1a of this AEE) further assessment was undertaken.

The assessment comparing Option 2, the OBA Option and the preferred Option 4<sup>46</sup> indicated:

- The OBA Option has greater time savings for some vehicle movements, but increased congestion for others. Particularly it provided improved travel times for movements between the EWL and SH20 southbound, but resulted in operational or capacity issues for SH20 between Queenstown Road and SH20A.
- Overall, the OBA Option performed the same for travel time savings and bus access as Option 2 and Option 4, but slightly worse for walking and cycling connections. The lower performance for cycling and walking arises due to higher traffic flows on Onehunga Mall and complexity in the regional cycle/walking path connections to the east (crossing the ramp connections between EWL and SH20 (south)).
- The OBA Option scored better compared to Options 2 and 4 for transport safety given simpler connections from SH20 to EWL.
- The OBA Option scored more poorly due to higher construction and operation costs compared to Option 4. The cost is significantly more than Option 4 due to the use of a tunnel and more structures.
- The OBA Option scored more poorly for all environmental criteria compared to Option 4. None of the options were specifically considered in respect of impacts on coastal processes in the earlier MCA process (this was because no options considered at that time involved change to the existing bridge structures or new bridge structures across the Māngere Inlet).
- In terms of the social outcome criteria, the options were the same or very similar in respect of the scores for access to the coast, built form and amenity, connectivity (for connection to the Onehunga

<sup>46</sup> To enable fair comparison between options, the scores reported relate to the original Option 4 alignment, not subsequent design development that has been undertaken .

Town Centre) and economic viability. However, the OBA Option did not score as well for quality of living, construction impact and heritage.

- The OBA Option would not provide better connectivity between Onehunga Town Centre and the Port of Onehunga than Options 2 or 4 because of the presence of a number of new structures and overpasses and fewer walking and cycling routes.
- The evaluation of the OBA option is further elaborated in Appendix O to *Report 1: Supporting material for the Consideration of Alternatives* in Volume 3.

From this process, Option 4 was affirmed as the most appropriate option to progress (subject to responding to the design issues identified for Option 4 from the initial MCA evaluation as set out in Section 8.4.2.3 of this AEE).

A full MCA workshop and assessment was undertaken for the OBA Option in December 2016 and followed the process set out in this section. This MCA involved a range of relevant experts who scored the OBA option in their relevant discipline. The scores against the relevant criteria were largely the same (or worse) than the earlier assessment of the OBA Option. As a result, none of the outcomes of this process altered the conclusions of previous assessments and decision making set out above.

#### 8.4.3.4 Foreshore alignment and design

Whilst a combination of two options was preferred, only one option that had the inner embankment on land and the outer embankment in the coast was presented to the public and stakeholders during consultation.

Feedback from key stakeholders and public expressed the importance of minimising the amount of the CMA to be reclaimed. This approach to minimise reclamation is consistent with the provisions of the NZCPS and the AUP (OP). Further design and technical assessment identified that the adverse effects of the construction of the road through the former landfill areas could be adequately remedied or mitigated to a greater degree than previously expected (although not entirely avoided). However, avoiding any physical works within Waikaraka Cemetery remained a key constraint and meant that it was not practicable to apply a single design option along the whole of the foreshore.

In light of this additional information, it was considered the more inland option between the eastern edge of Waikaraka Cemetery and the Ports of Auckland property was preferable as it reduced the area for reclamation while the additional adverse effects could be addressed. This involved constructing the road embankment on land to the greatest practicable extent, and the stormwater treatment wetlands within reclamations of the CMA. Meanwhile, for the part of the foreshore directly to the south of Waikaraka Cemetery the option to avoid physical works in the cemetery was identified as the most appropriate in light of the historic and amenity values of the cemetery.

Along with the identification of an alignment incorporating the parts of two options, a revised design for the foreshore edge was developed. This reduced the potential extent of reclamation and the effects on Waikaraka Cemetery. This is explained in greater detail in *Technical Report 6: Landscape and Visual Impact Assessment* and *Technical Report 12: Stormwater Assessment* contained in Volume 3.

#### 8.4.3.5 Anns Creek Estuary and Anns Creek

The original route alignment assessed by the specialists and outlined in public engagement followed the northern shoreline of Anns Creek Estuary, crossed the railway lines, proceeded south of the Southdown Co-generation Plant and through the centre of Anns Creek to an intersection with Great South Road and Sylvia Park Road. A number of amendments to the alignment in this area were proposed as a result of landowner feedback and technical assessment.

Technical assessment and information from KiwiRail identified that the proposed crossing of the railway lines would result in noticeable impacts on the operation of those lines and a potential additional line which may be constructed in the future. KiwiRail has a designation for railway purposes for this area. This



means that no work by other parties, including other requiring authorities can be undertaking in this corridor without formal approval of KiwiRail. KiwiRail's approval may be withheld or conditioned if proposed works prevent or hinder its railway activities.

As a result of this feedback the previously selected option could not be implemented and consequently Options 2 and 3 (involving a bridge structure across Anns Creek Estuary) needed to be considered again. This also re-considered parts of the Option 4 alignment where the alignment had minimal land requirement from the Southdown Co-generation Plant. A new Option 5 was developed as an alternative design. Technical assessment identified that moving the alignment from land and constructing a bridge would result in more adverse effects on ecological values than the previously selected option. This was taken into account when designing the location and orientation of the bridge (in Option 5) that would minimise the adverse effects as much as possible. This impacted on the alignment or "launch point" of the bridge on the industrial land to the east of the Anns Creek Estuary.

Technical assessment of the ecological and ONF values in Anns Creek East identified a number of highly sensitive and valued areas with unique and irreplaceable fauna within the proposed alignment. As a result the alignment was moved to the north to avoid as far as practicable these sensitive locations. Particular care was taken with the location of the bridge piers and the construction areas to further reduce the potential effects. The alignment chosen in Anns Creek (as shown in Option 5 Appendix N to *Report 1: Supporting Documents for the Consideration of Alternatives*). sought to balance the need to minimise the ecological effects and the impact on the railway line, while avoiding the Southdown Co-generation Plant and most importantly ensuring the design of the structures was safe and efficient. Although the preferred alignment avoids the Plant the designation will extend into that site to accommodate potential construction activities or any potential amendments to the alignment.

#### 8.4.3.6 Great South Road Intersection

Following completion of the traffic modelling of the Preferred Alignment (as described in *Section 8.4* of this AEE) and feedback from a number of stakeholders (including Auckland Transport and road user groups), concerns were raised in respect of the long term operation and level of service of the Great South Road and Sylvia Park Road intersection. In particular that the intersection would result in longer than anticipated delays for east west traffic and the performance and level of service offered by the intersection would decrease over time and be unable to accommodate predicted future traffic flows. Additional assessments have been undertaken to determine if a different design, such as full grade separation, would improve the long term transport performance and level of service of this intersection. The option development and summary of outcomes for the intersection are set out below.

##### a. Option development

In response to issues noted in *Section 8.4.3.6* above, a number of alternative designs for the intersection were identified which allowed for at grade and grade separated connections and provided a through traffic movement for the east west traffic flow without the need to stop at the intersection. Options for grade separation included designs to put the EWL under Great South Road. However, these options were determined to be constrained and impracticable, particularly as a result of the location of significant underground services and ecological values of Anns Creek.

The options involved structures over Great South Road, with full movements to the EWL provided from Great South Road via a signalised intersection and connections to the elevated structures. The option assessment was constrained by the location of the existing Great South Road intersection, properties and surrounding protected features such as Mutukāroa -Hamlins Hill. An initial Project Team workshop was held to identify key opportunities and constraints using the planning, social, cultural and environmental assessments undertaken to date. From this, two new alignment options were developed. The options are shown in the drawings in *Appendix P Great South Road Intersection Assessment* contained in *Report 1: Supporting Documents for Consideration of Alternatives* in Volume 3.

Option 1: An extension of the viaducts over Anns Creek, grade separated over the Great South Road and Sylvia Park Road intersection and terminating at an at grade alignment east of the Great

South Road intersection. It included modified connections to Great South Road (refer to Appendix P of Report 1 for details).

Option 2: Extension of the existing Anns Creeks viaducts over Great South Road and Sylvia Park Road via a continuous bridge structure connecting to SH1 at Mt Wellington. It also included modified connections to Great South Road (refer to Appendix P of Report 1 for details). The net result of this design option is that the EWL would be completely separate from Sylvia Park Road.

These two options were then evaluated through an MCA and also compared to a base option which was the previous at grade intersection design.

b. Multi Criteria Analysis Criteria, Scoring, Analysis Process and Weighting

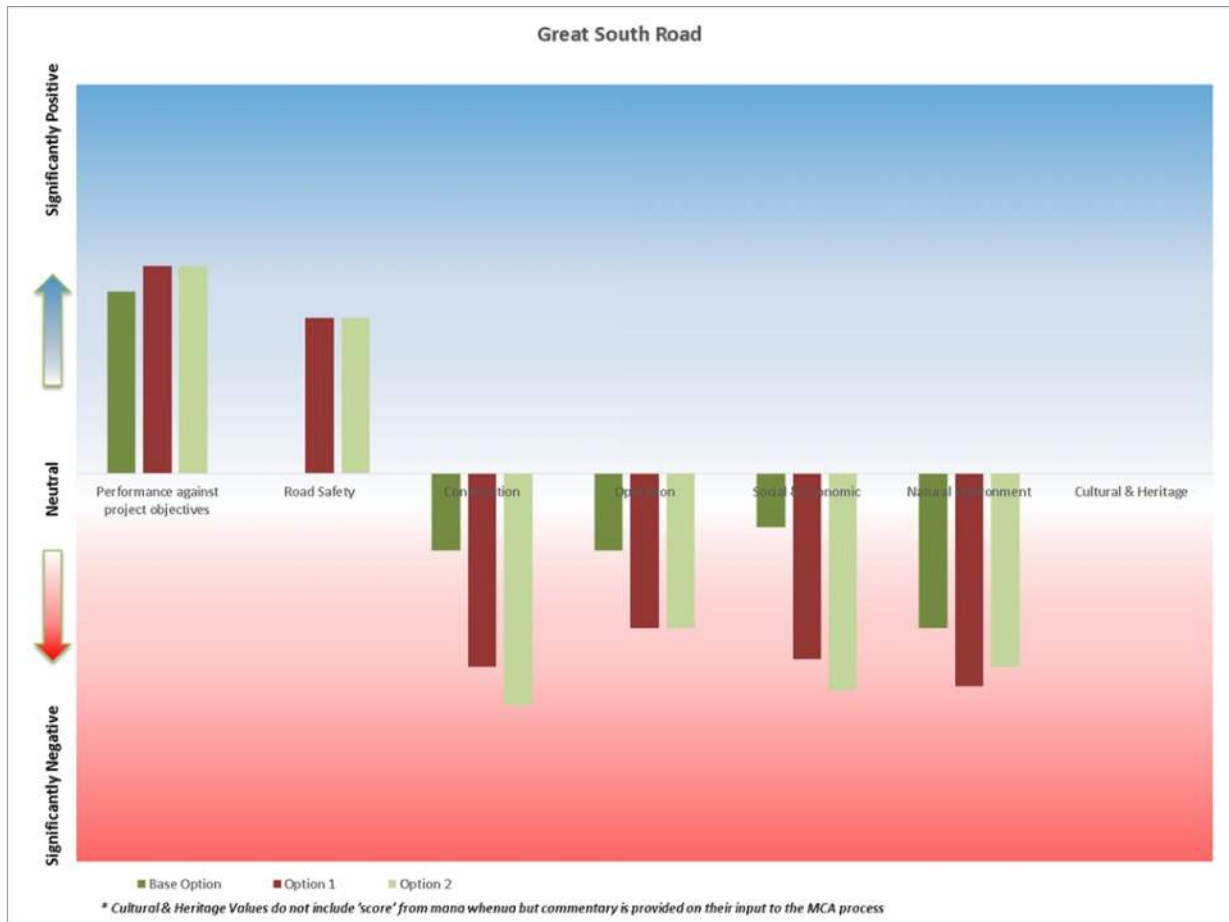
The MCA for Great South Road grade separation used the same assessment criteria as earlier options assessment (as set out in Sections 8.4.1.2 to 8.4.1.5 of this AEE). No weighting was applied to the MCA scores though, since only two options were assessed. Sections 8.4.1.2, 8.4.1.3, 8.4.1.4, 8.4.1.5 of this AEE outlines the MCA process, criteria and scoring used, including for the grade separated Great South Road intersection options.

c. Multi Criteria Analysis reporting

A record of the MCA outcomes for the Great South Road options assessment is contained within *Appendix P: Work Notes for Alignment Options* contained in *Report 1: Supporting Documents for Consideration of Alternatives* in Volume 3.

The figure below provides a graph summary of the outcomes from the MCA evaluation and reporting on the key considerations for the Great South Road intersection.

Figure 8-28: Great South Road



d. Stakeholder engagement outcomes

In a manner consistent with the development of earlier options, further consultation was undertaken with key stakeholders. This consultation was targeted to potentially affected landowners, Mana Whenua, Auckland Council, road user groups and Auckland Transport. The purpose of the additional consultation has been to:

- Inform stakeholders and landowners of the revised design, the reasons behind it and the revised programme going forward; and
- Consult with key stakeholders and landowners on additional issues associated with the revised design to enable opportunity for these issues to be considered in design refinement.

In addition, engagement has been undertaken with utility providers and other groups to inform the technical assessment of options. The key matters identified through stakeholder engagement that have informed design development and option assessment include:

- The importance of provision for pedestrian and cycling connections through the area given the higher speed environment and built form / structural elements of the option;
- Minor design amendments to address access and operational concerns for Stratex;
- Minor design amendments to enable the operation of other businesses in the area; and
- Design detail for structures to avoid the pier exclusion area in the Anns Creek area.

e. Outcomes of evaluation

The evaluation of the options at Great South Road was informed by the MCA scoring, consultation feedback, relevant technical considerations and how each option met the Project objectives. As with earlier assessments, the intention of the MCA process was to provide a summary of issues for decision making rather than being a decision making tool in itself.

Options 1 and 2 both performed better in terms of improved travel times between businesses and user safety when compared to the base option (i.e. the at grade intersection design). These criteria are reflective of the Project objectives.

Both Options 1 and 2 had higher adverse impact scores on the social and environmental criteria when compared to the at grade design option. These increased adverse effects were particularly noted for landscape, urban design and social criteria. At the time of assessment, the treatment of both pedestrian/cycle connections and overall operational speed of traffic on the EWL were issues impacting this scoring. In particular, the latter issue related to the urban form, landscape and character impacts of the EWL through the Anns Creek to Sylvia Park Road area (which is characterised as an 'industrial arterial area'), and the potential to generate cumulative impacts (e.g. increased traffic speeds and changing character of the Project) that would adversely impact on the visual, amenity, natural character and social outcomes of the Project further to the west (the foreshore section of the Project). These issues were identified as of significant concern.

Alignments involving grade separation of the intersection were considered to better meet the objectives of the Project, particularly Objective 1 (To improve travel times and travel time reliability between businesses in the Onehunga-Penrose industrial area and SH1 and SH20).

Options 1 and 2 involved a large number of similar features and characteristics. MCA scores for Options 1 and 2 were also very similar, and both met the Project objectives better than the base option.

Option 1 was preferred instead of Option 2 due to the following factors:

- Option 2 was significantly more expensive to construct than Option 1;
- Option 2 had greater construction impacts and affected the quality of access to nearby Mutukāroa-Hamllins Hill; and
- Option 1 further reduced the conflicts between road users and therefore improved road user safety compared to the base option and Option 2.

In selecting Option 1 it was identified that further detailed design work was required to:

- Address the quality and nature of pedestrian and cycle connections; and
- Maintain the urban arterial design philosophy of the Project for the foreshore section.

Following the MCA, further design development has been undertaken to address the issues and outcomes identified above. This has resulted in:

- Provision of a full grade separated shared path (at 4m width) across the Great South Road intersection, on the southern side of the EWL Main Alignment;
- Design and performance criteria for the shared path, that require it to:
  - be appropriately landscaped or to be retained as a more visually prominent element along Sylvia Park Road (maintaining appropriate separation between the road and pedestrian/cycle facilities);
  - acknowledge the Kāretu portage;
  - contribute to the urban design and landscape outcomes of the area (e.g. as a design statement shared path);

- Provision for connections between the shared path and Mutukaroa (via the Great South Road intersection);
- Design outcomes and proposed elements to respond to the need for the Mangere Inlet frontage (the urban arterial component) to be sufficiently different in appearance from the balance of the EWL to the east (the industrial arterial component), including a strong transition between these two components.

#### 8.4.3.7 State Highway 1 widening

The originally preferred alignment option retained the existing culverts across the Ōtāhuhu Creek either side of SH1. Acknowledging the effects of culverts, the opportunity to replace the culvert with a bridge and 'declaim' some land was identified. This proposed bridge would open the historic portage potentially having social and cultural benefits. The ability to repurpose this bridge for pedestrian and cycle use was identified as a key opportunity to provide benefits to the local community and was therefore considered to be preferred.

#### 8.4.3.8 Land adjoining the Māngere Inlet foreshore

Consultation and discussion with affected landowners identified potential impacts on a number of occupiers within the area of land owned by Ports of Auckland along the Māngere Inlet foreshore. This area of land includes the heliport which has specific operational requirements (through the civil aviation rules) and therefore specific locational requirements. The Agency has been actively engaging with affected landowners to reach a mutually acceptable outcome, in light of the potential impacts. However the aspirations and requirements of the various landowners remained uncertain and at the time of lodgement a mutually acceptable agreement had not been reached.

In order to provide additional flexibility to reach a mutually acceptable agreement the designation footprint was extended to include all of the site owned by Ports of Auckland. Some of that land may be used for construction.

#### 8.4.4 Preferred alignment

The numerous MCA processes, feedback from key stakeholders and the wider community, and revisions to the design have resulted in the Preferred Alignment. The Transport Agency approved the Preferred Alignment for lodgement in November 2016.

#### 8.4.5 Ongoing assessment of design refinements

The Preferred Alignment will be developed further in the detailed design phase. Alternative design refinements will continue to be considered as an integral part of the detailed design process. Alternatives may cover bridge designs, embankment cross sections, options for discharges and mitigation. Design refinements may also be required in response to safety audits, and maintenance and operational requirements.