Roads of National Significance
Peka Peka to Ōtaki Expressway

Route Options Review

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Allan Planning and Research Ltd

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Prepared for New Zealand Transport Agency

Author Sylvia Allan
B Sc (Hons), Dip TP, FNZPI

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1. INTRODUCTION

1.1 Background

The proposed Peka Peka to Ōtaki Expressway project is one of the eight projects comprising the Wellington Roads of National Significance (RoNS). The Peka Peka to Ōtaki project covers the area between Te Kowhai Road at the southern end, and Taylors Road at the northern end. The project draft objectives have been most recently set out in a Statutory Approvals Management Plan[1] and are:

" • *to provide a significantly improved transport link from Peka Peka and North Ōtaki by developing a State Highway to expressway standards that connects and integrates with the Mackays to Peka Peka and Levin to Ōtaki sections of the Wellington Northern Corridor.*
- *to provide relief from severe congestion by efficiently serving the Ōtaki Township, its future development and the wider Ōtaki area.*
- *to improve the journey time and reliability of travel by providing appropriate access to and from the State Highway to efficiently serve the Ōtaki Township, its future development and the wider Ōtaki area.*
- *to improve the safety of travel by assessing the need for local road access across the expressway at Te Horo and provide such access if required."*

The project[2] has been the subject of numerous investigations and studies over many years and several consultation stages with stakeholders and the wider public. In December 2009 the New Zealand Transport Agency (NZTA) Board adopted a preferred route option, subject to further review and investigation of five specific matters as the project proceeded[3]. This option was substantially the same as an earlier (2003) alignment approved by the Transit New Zealand (Transit)[4] Board, following consideration of a range of options.

As possible route alternatives had been considered over a long period, NZTA decided that it was appropriate to commission a review of the historical work, update it as necessary, and bring the findings together in a comprehensive report. This report describes the methodology for the review and the findings.

1.2 Reasons for the Review

The review has been undertaken for three main reasons:

1. To ensure the NZTA and the wider community can be confident that past and present studies and investigations have led to a situation where all parties can be clear that a range of feasible route options have been considered prior to the NZTA Board making a final decision on route selection;

[1] This document, dated March 2011 is on the NZTA Project Website. The document advises that the objectives are currently under review. These objectives sit within a wider framework such as the Land Transport Management Act 2003 and the Government Policy Statement on land transport funding (GPS).
[2] While the objectives for a roading project varied slightly in wording over time, the basis for the expressway has been partly driven by the growing urban development in the Te Horo – Ōtaki area and the need for improved connection to the Wellington urban area, including for traffic from north of the project area.
[3] These were: a review of the form and location of the interchanges providing access to Ōtaki and Te Horo (in light of submissions that had been received); a review of signage to indicate destinations off the State highway; that the design should allow for future double tracking of the North Island Main Trunk Railway line through Ōtaki; that the alignment is reassessed against current planning requirements prior to preparation of the notice of requirement; and that NZTA should work with KCDC, the Ōtaki Community Board and the community in general with a view to integrating the expressway.
[4] The predecessor of the NZTA in respect to the State highway system.

2. To ensure that there has been adequate consideration of, and appropriate documentation of the aspects involved in the identification and rejection of, alternative route options in terms of section 171(1)(b) of the Resource Management Act (RMA) 1991[5]; and
3. To consider and evaluate alternative route options which have arisen in recent consultative processes[6].

1.3 Meaning of Route

For the purpose of the review, the term "route" refers to a notional alignment for an expressway, some 200 metres in width, but takes into account effects which extend beyond this width.[7]

1.4 Review Team

The review has been undertaken under the management of independent planning consultant, Sylvia Allan of Allan Planning and Research Limited. It has been assisted by input from Peter Coop of Urban Perspectives Limited, which is providing the statutory planning input to the Peka Peka to Ōtaki project, and a range of technical experts led by URS Limited. Opus International is the lead consultant to NZTA on the Peka Peka to Ōtaki Expressway.

1.5 Review Questions

In undertaking the review, a series of review-type questions has been posed.

The ability to answer "yes" to the questions is a measure of the adequacy of the investigations.

The questions were:

- Were a significant range of route options considered?
- Was sufficient and an appropriate range of information applied in identifying route options?
- Was there opportunity for genuine consultation on route options[8]?
- Were appropriate criteria applied in the consideration of options?

The review responses to these questions are given in the conclusion of this report, section 5.

If the answers to any of these questions is "no", the scope of the review enables a level of remedy of them, to the extent of completing a comprehensive review report and findings. Whether subsequent NZTA Board action may be required or desirable is beyond the scope of the review.

[5] This section requires that a territorial authority, in considering a notice of requirement, have particular regard to whether "adequate consideration" has been given to alternative sites, routes, or methods of undertaking the work in question, in circumstances where the requiring authority does not have an interest in the land sufficient for undertaking the work, or where it is likely that adverse effects on the environment will be significant. Note that this report addresses routes only. The term "sites" in a roading context is considered to relate to matters of detail such as intersection locations, which are part of ongoing investigations for the Peka Peka to Ōtaki project. Alternative methods are not covered in this review.
[6] I.e., those since December 2009.
[7] This compares with the actual anticipated designated width of approximately 60 metres. The 200 metres provides some flexibility to avoid potential effects on any specific sites, and also enables construction, any cuttings or embankments, etc.
[8] Consultation on options is not essential under the RMA but is usually considered to be good practice, because (among other reasons) the community holds both information and values that can assist in making decisions.

1.6 Description of Area

The Peka Peka to Ōtaki section of the Wellington RoNS traverses the geographical area between two other RoNS projects, one to the south and one to the north. To the south is the Mackays to Peka Peka RoNS project which has its northern-most extent near Te Kowhai Road, Peka Peka; to the north is the Ōtaki to north of Levin project which has its southern-most extent in the vicinity of Taylors Road. The approximate length of an expressway through the Peka Peka to Ōtaki project is 13 kilometres.

The area is a coastal plain with coast to the west and dunelands adjacent and to some distance inland from the coast. To the east are the steeply-rising slopes of the Tararuas behind the plain formed by the Ōtaki River. The Ōtaki River is a significant feature in a wide shingle bed. A number of smaller streams also cross the plain both to the south and to the north. The distance from coast to hills varies between 4 kilometres at the south end of the project area and 7 to 10 kilometres inland of Te Horo and Ōtaki.

State Highway 1 and the North Island Main Trunk railway line run approximately parallel to the coast and 3 to 4 kilometres inland from it. The small coastal settlements of Peka Peka, which consists largely of lifestyle blocks, and Te Horo beach, a more traditional grid-based coastal settlement, are accessed from State Highway 1. Te Horo itself is the centre of a wider rural community, which is served by a range of facilities (shops, school and some rural commercial facilities) clustered adjacent to and near the State highway. Ōtaki Beach and Ōtaki are separate settlements clustered at the coast and around several roads at right angles to and along State Highway 1, including on both sides of the railway line. The urban form of Ōtaki is unusual, as it extends at varying densities and intensities from the coast inland onto rising land, and almost to the foothills – a continuous distance of some six kilometres. Key commercial facilities are located on State Highway 1 and at several locations closer to the beach, while the racecourse and some other non-residential activities lie to the east of the railway line.

Most of the land on the plain and lower foothills is in agricultural and horticultural uses, and there are patches of bushland on the plain and dune lakes and wetland areas closer to the coast.

The area is entirely within Kapiti Coast District and the Greater Wellington Region.

1.7 Review Methodology

The review was proposed to be undertaken on a structured basis in several stages as follows:

Stage 1: Initial screening of options already considered and review of basis for decisions to retain or reject.
Stage 2: Review of a range of material to identify any options not adequately considered.
Stage 3: Decision on options which required further consideration and evaluation.
Stage 4: Scoping and technical review of feasibility of options.
Stage 5: Scoping of aspects for investigations by expert advisors, which would later form the basis for a multi-criteria evaluation of options.
Stage 6: Review and preliminary evaluation of options by specialist experts.
Stage 7: Multi-criteria analysis of route options.
Stage 8: Subsequent analysis, including sensitivity analysis and application of different weighting systems.
Stage 9: Preparation of review report.

The method would proceed only to the stage that was considered necessary. In other words, the process could have stopped at the conclusion of Stages 1 or 2 if it was found that an adequate range of options had been considered. Even if options had been identified which had not been adequately considered, the process could have stopped at Stage 4 if they were found to be unrealistic from a technical or engineering point of view. At Stage 6, if the specialists' preliminary evaluations had revealed a clear preference, the process could have terminated at that stage.

It was recognised that if all stages were completed, undertaking Stages 5 to 8 (for however many routes were evaluated in this way) would together contribute to the understanding and consideration of alternatives in terms of section 171(1)(b).

As explained in the following section of this report, all of the above stages were undertaken. As the investigations proceeded, two route options were identified which had not been previously considered. To ensure that these could be fairly evaluated in an appropriate context, an evaluation was also simultaneously undertaken of the Board-preferred option and one additional route – giving four options, all evaluated within the same framework. This contributed to a robust review process.

The following sections of the report address Stages 1 to 8 above. The report concludes with a discussion of the findings of the review.

2. STAGES 1 TO 3 – SCREENING OF OPTIONS

2.1 Preliminary Review (Stage 1)

A detailed review was undertaken of previous route options by Peter Coop of Urban Perspectives. This review, in the form of an advisory Memo, is provided as Appendix 1 to this report. In preparing this report, all of the documentation referred to by Mr Coop has been obtained and reviewed.

Appendix 1 summarises the prolonged history of a road proposed through the current project area, which has been variously described as a motorway, expressway or arterial[9]. The history commenced in the 1950s with the proclamation of the original "Sandhills" route through the coastal duneland between south of Paraparaumu to north of Levin. This route option was removed from Peka Peka north (by uplifting of the designation) in the late 1980s; however, in the mid 1990s, by agreement between Kapiti Coast District Council (KCDC) and Transit, action commenced to designate a similar route from south of Raumati to Peka Peka as a district arterial. This designation was confirmed by the Environment Court in 2002[10] and is currently shown in the District Plan.

In 1998, Transit commissioned a "Himatangi to Waikanae Study" to investigate the "best" State highway improvements to manage traffic using the State highway system. In the Peka Peka to Ōtaki section, this investigated the possibility of a new State highway system along a range of possible coastal routes with different configurations, or, alternatively, improvements and modifications to the existing State Highway 1 (including parallel sections and staging options). The State Highway 1-based option was loosely described as the "Central route", although its exact location was only broadly defined around the existing highway.

Transit considered various options in December 2000, and followed the recommendation to reject a coastal route in preference to a Central route. There were a range of reasons for rejecting a coastal route configuration. Amongst them were advice received from the Department of Conservation and others about "cultural heritage matters" including the presence of archaeological sites, wetland areas, land/water interfaces, and waahi tapu, including urupa; advice from others on impacts on protected and unprotected natural areas including wetlands, cultural values, and heritage and archaeological sites; and capital and ongoing maintenance and repair costs along with engineering risk-related aspects such as long bridge structures and poorer ground conditions.

In 2001 and 2002, a Scheme Assessment Report relating to the Central route was prepared. This outlined and considered options to the immediate east and west of State Highway 1 and the railway line south of the Ōtaki River – and a range of options (five in all) between the Ōtaki River and the Waitohu Stream south of Taylors Road. The options were evaluated by a team on the basis of environmental and cultural impacts, adequate separation from residential areas, severance issues and cost. A route to the east of the existing State Highway 1 alignment and the railway line (known as the Eastern route) was identified as the preferred option for most of the length.

Subsequent consultation in 2002 and 2003 identified other route options including a western (Te Wāka route) option, with a number of minor variants. This was the subject of further investigations and an addendum to the Scheme Assessment Report. While the Te Wāka option was preferred in terms of ecological impacts and heritage, other considerations, including archaeological impacts, landscape, social impacts, landscape, noise, land use, economics, business impacts and construction staging led to its rejection, and the confirmation of the central (Eastern route) option.

[9] This report focuses on the route options, rather than on detailed design and capacity considerations which are the subject of other work.
[10] As a result, in the shorter term, Transit and more recently NZTA, concentrated on targeted improvements to the existing State Highway 1 route while supporting the KCDC designation.

More recent studies (a 2005 Maunsell Ltd "Western Corridor Study", and 2008 and 2009 studies by Opus International Consultants) have reviewed options relating to the Central corridor, and have endorsed the Eastern route option identified in the 2002 Scheme Assessment Report (now referred to as the Board Preferred Option). Refinements are continuing, with the benefit of more recent public consultation.

Consultation between 2009 and 2011[11] has however also included claims by local residents that the Sandhills route is preferable to the Board Preferred Option for an expressway, that the effects of the Board Preferred Option are greater than assessed, that the Te Wāka option has not been seriously considered, and that Eastern route options closer to the Tararua ranges have not been considered.

In summary, the following conclusions can be drawn from Stage 1 investigations as part of the review.

In terms of coastal route options:

- A range of coastal (or Sandhills) route options has been sufficiently investigated and rejected for reasons that are valid in RMA terms, including a range of section 6 RMA matters. It is likely, if further evaluation were undertaken, that these reasons would be stronger now than in the past[12].

In terms of central route options:

- A range of central route options has been investigated in some detail several times over the past decade. The reasons for favouring the Board Preferred Option have been based on a range of RMA and practical considerations, including limiting adverse effects on people. While the Board Preferred Option gives rise to section 6 considerations, and a range of other adverse effects, there is ongoing work on avoidance or mitigation of residual effects. On balance, other options in the central route are likely to have equal or greater adverse effects.

In terms of route options to the west of the existing State highway:

- As an alternative to both coastal and central routes, a number of options variously described as the Te Wāka routes were adequately investigated in the mid 1990s.

In summary, coastal route options do not require further consideration[13]. Similarly, central route options have been thoroughly considered, and generic variants (such as options to the immediate west of the State highway, or with different localised alignments) to the current Board Preferred Option do not require further consideration[14].

Route options that may require further consideration are discussed below.

[11] Formal consultation processes were initiated in 2009 and 2011. However, the Board also heard public submissions in 2010.
[12] Due to greater information and understanding of values, including ecological, heritage, and tāngata whenua values, and a broadened interpretation of Treaty principles.
[13] This is also confirmed from analysis work being undertaken further north in the Ōtaki to north of Levin RoNS project, which has mapped significant ecological, archaeological and tāngata whenua values close to the coast, and identified these as major impediments to an expressway route in that area.
[14] As noted, the preferred option is the subject of ongoing detailed design, including mitigation to address remaining effects.

2.2 Options not Adequately Considered (Stage 2)

From the above discussion, and as identified in Appendix 1, it is clear that route options which may lie to the east of the Board Preferred Option, had not been evaluated prior to the commencement of this review process.

This was understandable during the time that the focus was on the Himatangi to Waikanae motorway and the coastal (Sandhills) option, but is less understandable from 2000 onwards when investigations were undertaken on options that were more confined in length.

It is apparent that consultation processes have raised the possibility of, and demonstrated a level of community interest in, routes through rural land east of Te Horo and Ōtaki[15]. One such route was identified on a map produced during consultation processes in 2009 to 2010[16].

As part of the ongoing investigations relating to the current Peka Peka to Ōtaki RoNS, and prior to the commencement of this review, Opus was requested to identify potential
Eastern (Foothills) route options and to undertake a preliminary review of their technical feasibility[17]. One of these routes is very similar to that mapped in the 2010 submissions, and the other can be described as an intermediate plains option. This intermediate option effectively fills an obvious gap in the range of options[18].

It is noted that the Eastern-most option extends beyond the current extent of the Peka Peka to Ōtaki RoNS project, to the vicinity of the small settlement of Manakau.

While eastern options have clearly not been covered in any detail in any earlier studies, this comment does not apply to routes to the west of the current State Highway 1, between the highway and coastal (Sandhills) options. A Te Wāka route was clearly considered at the Transit Board's request as a follow-up to consultation on the 2002 Scheme Assessment Report. However, in contrast to the ongoing investigations which have been associated with the Central route, the Te Wāka option has not been the subject of recent review. It has subsequently also been the subject of public submissions. Thus, while there is no suggestion that this route was not adequately considered in 2003, it would be reasonable to include it in any further reviews.

2.3 Options which Require Further Evaluation (Stage 3)

The two eastern routes referred to above are considered worthy of further evaluation as representative of options in that general vicinity. This evaluation has been progressed since the commencement of the review by Opus on the basis of the considerations set out in the report "Alternative Corridors Technical Feasibility Report – Draft V2" (the Technical Feasibility Report)[19]. The two route options were developed by Opus on the basis of known environmental and engineering information, along with discussions with key technical advisors[20].

From the perspective of this review, the two eastern route options identified are considered an appropriate basis for further investigation and review of options.

[15] Including an October 2009 submission from KCDC to NZTA, which raised, but appeared to dismiss the option on the basis of unidentified "issues and impacts".
[16] See Appendix 1 to this report (Appendix 4). This option was included in the joint submission of the Te Horo Road Action Committee (THRAC) and County and Rahui Road Group (CRRG).
[17] This was an initiative of the project team, supported by NZTA's Regional Decision Making Team (DMT).
[18] The intermediate option could be as envisaged in the KCDC 2010 submission, which refers to an option to the east of Ōtaki "around the edge of the Waitohu Plateau residential area".
[19] Draft V2, April 2011, Opus.
[20] Not including the reviewer, as the investigation was undertaken prior to the commencement of this review.

The Technical Feasibility Report also shows a Te Wāka option. This has similarly been developed on the basis of known information, and in this case, previous investigations. It is considered to reflect the "best" of the previous western options.

Finally, as a "base case", it is important to subject the currently Board Preferred Option to the same type of analysis as the three alternatives above. This ensures robustness and comparability in outcomes.

The route options which are considered appropriate to include in a further review are shown in Figure 1 on the following page. As noted in the Technical Feasibility Report, these options depart from the existing State Highway 1 alignment at different points and comprise different lengths and components of new expressway or modified existing State Highway. To ensure a fair comparison, each option must be considered as having the same starting and completion points.

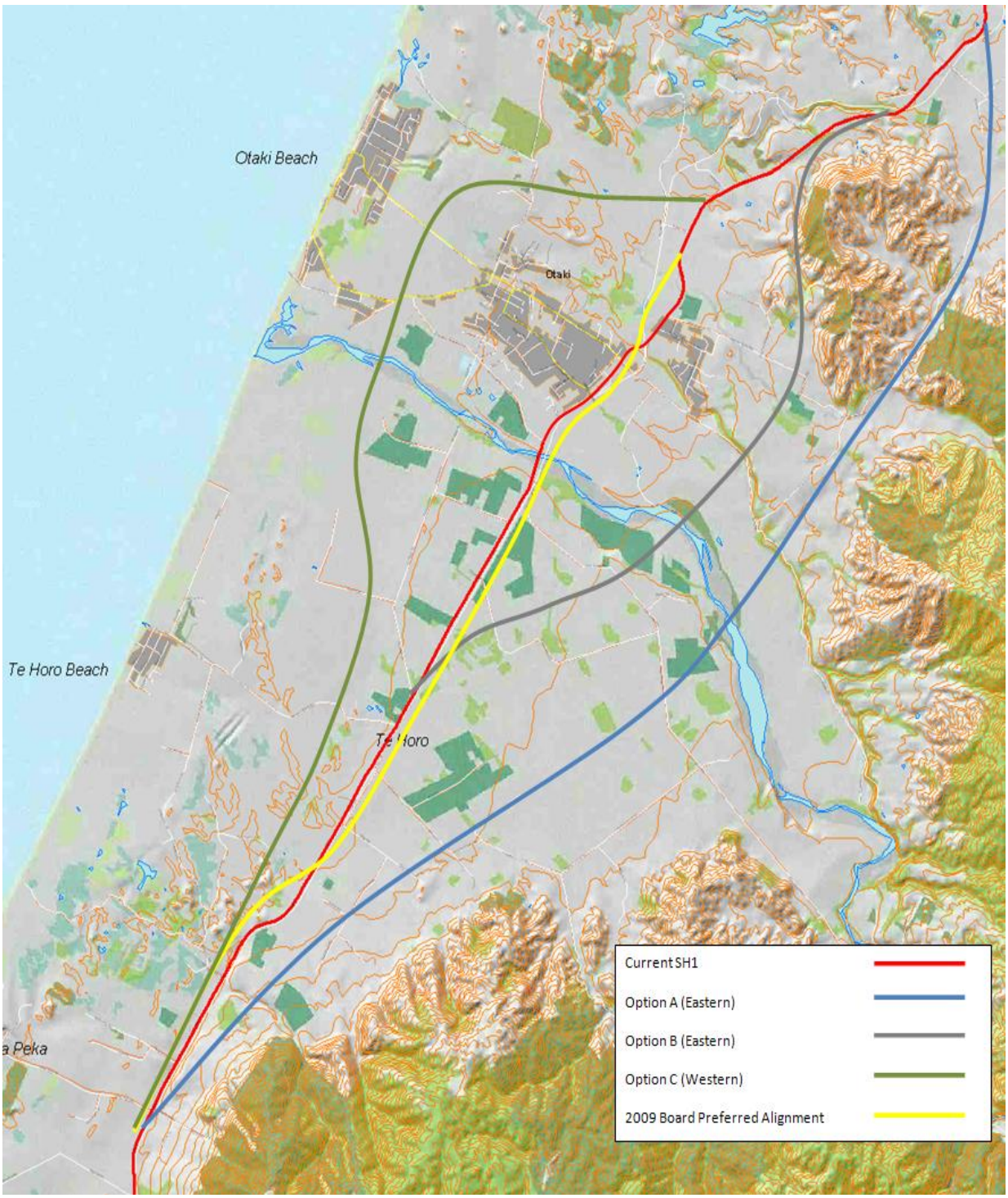

Figure 1: Route Options for Further Evaluation (from Technical Feasibility Report)

3. STAGES 4 TO 6 – INFORMATION COLLECTION AND PRELIMINARY ANALYSIS

3.1 Options Scoping and Technical Review (Stage 4)

3.1.1 Corridor Identification

Although the identification of options to the east and west of the Board Preferred Option was commenced prior to the commencement of this options review, the approach, as described in the Technical Feasibility Report, demonstrates acceptable practice.

Opus, as technical advisors to NZTA, wished to be sure that the route options it had been requested to consider, were technically capable of being designed and built. In addition, options needed to be sufficiently developed for costs to be estimated.

For the Te Wāka options, routes had been previously advanced in some detail as a consequence of consultation on the 2003 Scheme Assessment Report Addendum[21], and a brief review was needed to determine which option was the most suitable to proceed with. The route option that was chosen avoids a number of constraints (such as horticultural, lifestyle and residential areas) and crosses the Ōtaki River at right angles, to the west of the main transmission lines. This is similar to the option mentioned in consultation processes[22], and is shown as Option C in Figure 1.

For the eastern route options, a route similar to that suggested through consultation processes was identified[23]. The location of this is described in the Technical Feasibility Report as follows: "the Eastern Foothills option lies at the eastern-most boundary of potential credible options". East of this, the ground rises steeply and major earthworks would be required in some places. In addition, the diversion would be greater than would be reasonable for a route in this general location.

The Technical Feasibility Report also noted that there were multiple opportunities to locate an expressway route between the eastern-most, Option A, route and the Board Preferred Option which approximately follows the existing State Highway 1 and railway line corridor. By a process of examining constraints, the option shown in Figure 1 as Option B was arrived at. The reasoning is as set out below[24]:

> *" To provide for further eastern alternatives that could be located closer to Ōtaki (with an aim to reduce travel/accessibility dis-benefits associated with shifting the corridor too far to the east of Ōtaki) alignments would logically diverge from the existing Board Preferred corridor north of Te Horo. A tie in further to the south would either impact on Te Horo, or equate to the eastern foothills option (A). The resulting option is termed Option B.*
>
> *The diverge north of Te Horo for Option B has not been located further north to minimise the impact on more fertile and established horticultural land close to the Ōtaki River and the regionally significant bush remnant areas. As identified in the PP2O Urban and Landscape Design Framework (ULDF) and Ōtaki Vision, KCDC has placed an emphasis on the potential for further development of the more rich fertile land to the east of the existing SH1. The indicative route of Option B aims to strike a balance between the less developed (horticultural) land to the south/east and that to the west of proposed route B.*

[21] See Appendix 1 to this report (Appendix 3).
[22] Eg, in the THRAC and CRRG 2010 submission – see Appendix 1 (Appendix 4) to this report.
[23] Although this was linked back into the State Highway 1 corridor just south of Manakau rather than continuing to the north along the foothills as shown in Appendix 1 (Appendix 4). This is discussed later in this report.
[24] Extract from pages 8 and 9 of Technical Feasibility Report.

On the northern side of the Ōtaki River the route (Option B) has been placed as close to Ōtaki as practicable without impacting on the Ōtaki Māori Racing Club, associated stables, and potential for future development around the Waitohu Valley Rd area. The route has also been aligned such that it will cross perpendicular to the Ōtaki River and aims to avoid the bulk of residences along Ringawhai Road.

North of the Ōtaki River two options for route Option B were identified for investigation. The western route (B2) follows around the base of the foothills and then joins into the existing SH1 near the Pukehou Rail Bridge, while the eastern route (B1) follows a valley further to the east and then joins into the existing SH1 at a similar location. The western route (B2) is likely to have significant lifestyle property impacts given the number of lifestyle properties present, while the eastern route could result in large volumes of cut and significant cut heights as it passes through a valley between two ridges."

The preference for the northern end of Option B was B1, and this is incorporated in Figure 1 as part of Option B.

It is noted that both Options B and C include sections on or adjacent to State Highway 1 which have been investigated in detail as part of the Board Preferred Option. As a result of the configuration of Option A, all other options include an as yet uninvestigated section of State Highway 1 at the northern end.

This review confirms the appropriateness of this overall approach in developing options for further consideration to the east of the Board Preferred Option. The two eastern options (Option A and B) have been arrived at on the basis of an examination of the environmental, social and practical constraints across the eastern plains. There are different associated impacts, costs and benefits.

The Technical Feasibility Report refers to Options A, B and C as "corridors" which is appropriate terminology at the stage of broad analysis and consideration of constraints.

3.1.2 Consideration of Technical Feasibility

Some elements of technical feasibility were built into the identification of the "corridors" including basic geometric requirements for an expressway and the ability to cross features such as waterways, the railway and existing roads at as close to right angles as possible.

To provide assessments of technical feasibility and cost, it was necessary to move from a corridor concept to an alignment concept, so that conceptual design considerations could be taken into account. Such considerations included ground conditions, gradient, earthworks volumes, river, road and rail crossings, and property impacts including connectivity. The alignments included in the Technical Feasibility Report have enabled technical engineering and transportation assessments to be carried out, cost estimates to be prepared and an economic analysis to be undertaken.

The technical studies found that all options were technically feasible, and all were within a similar cost range to the Board Preferred Option.

These studies also found that the potential transport benefits of all options were less than the Board Preferred Option. This is largely because of the continued use of the State Highway 1 route by

vehicles with origins or destinations within Ōtaki[25]. All options are effective in terms of through traffic.

There was thus no technical, cost or cost-benefit reason to reject any of the options at this stage, and no basis not to subject any of the options to further investigations in order to understand their implications better.

3.2 Scoping of Specialist Investigations (Stage 5)

This stage in itself involved a number of separate considerations, as it is a precursor to the later multi-criteria analysis. Key considerations related to:

- What aspects should be subject to specialist evaluation?
- How were the options being evaluated to be described and defined?
- What form should the evaluations take and how should they be presented?

The aspects for specialist evaluation needed to foreshadow the multi-criteria analysis, if this analysis was to be carried out in Stage 7. It was anticipated that the following specialist knowledge/information areas would be required:

- Ecology (terrestrial and freshwater)
- Archaeology/historic buildings and places
- Cultural values
- Landscape and visual
- Social impact
- Property considerations
- Planning and urban growth
- Natural hazards
- Land quality
- Construction
- Lifeline impacts[26].

The Peka Peka to Ōtaki project team included an appropriate range of expertise, and briefs were prepared for the key specialists. For some areas such as construction and impacts on lifelines, it was not expected that specialist reports would be needed. Much of the necessary information had already been obtained in preparing the Technical Feasibility Report. Similarly, property information would be a matter of GIS mapping. The main specialist areas were however subject to specific investigations and review.

The immediate question which arose was how the route options should be defined. It was considered that the routes which had been developed for the Technical Feasibility Report should form the basis of the specialist evaluations, but that:

1. Some flexibility needed to be built into the route location, as the conceptual design had been able to identify and address specific environmental matters only in a generic sense.

[25] Other findings of the Technical Feasibility Report relate to social and environmental considerations, and are revisited in later stages of this report.
[26] "Lifelines" provide access to essential services during and shortly after emergencies. They are usually considered to include basic transport systems, communications and electricity.

2. The effects associated with roads extend beyond their physical footprint, and allowance needs to be made for the ability to identify and mitigate effects, including through carriageway location and design.

Thus it was decided that the specialist assessments should be based on a nominal 200 metre wide route based around the centerline of the routes which had been subject to the technical review. The exception was the "base case" Board Preferred Option where sufficient work had been undertaken to define the route and flexibility was not required.

Assessment of a 200 metre wide route is appropriate when evaluating options, as it allows for refinement in detail and provides opportunities to avoid or mitigate localised constraints and issues. Undertaking the specialist investigations on the basis of a route which is wider than required is best practice. In addition, the specialists were to consider effects beyond the 200 metre route. It was acknowledged that the spread of effects in terms of different specialist areas would vary, so experts were asked to form their own judgments on these[27]. The extent of property effects (affected land parcels and dwellings) was however based on a 100 metre wide typical route within the 200 metre wide route, to avoid overstatement.

Scopes were prepared for the specialists' tasks by URS on the basis of notes provided by Allan Planning and Research as part of the review.

Appendix 2 includes the request for proposal provided to the specialists[28], and a follow-up note providing further clarification arising from a number of questions raised by various specialists during the time they were undertaking their investigations.

From Appendix 2, it can be noted that:

- The evaluations were primarily desk-top, but could be followed up in the field;
- It was expected that the specialists would largely define the scope of the attributes they were reporting on;
- Short reports only were expected[29];
- An overall assessment of each route was requested (based on a five-point scale, double-negative through zero to double positive) as a coarse measure (Note: the findings were to be reviewed on this basis prior to determining whether a multi-criteria assessment was needed);
- The specialists were invited to consider undertaking their assessments on the basis of sub-lengths of the options, or sub-categories of their specialist fields, prior to re-combining them into a single evaluation; and
- Fatal flaws on any route were to be identified.

Most of the specialists had already been involved in a range of studies relating to the Board Preferred Option. They had undertaken assessments of that route, including assessments relating to mitigation of effects overall, and effects of detailed options of interchange configurations. This had included advising the Peka Peka to Ōtaki project team of their assessments for various multi-criteria analyses[30] of local area options (including for interchanges). Thus all specialists were generally familiar with the expectations of, and uses for, their evaluations

[27] I.e. effects of noise, visual impact and air quality will vary depending on a range of factors and may be fully mitigated due to an expressway where it is in a cutting, but still perceptible at some distance where land is generally flat and lacking screening or where the expressway is raised above the surrounding land.
[28] Note that the timing was such that the initial screening of options was still in progress, and options at each end of the Board Preferred Option were subject to consultation processes.
[29] The scope indicated two pages, but all specialists provided much more comprehensive evaluations.
[30] Referred to as MCAT – or multi-criteria analysis tool – in Appendix 2.

It was made clear to the specialists, including through the briefing notes, that they were to approach their investigations from an "option-neutral" position, disregarding the NZTA Board's current stated preference.

3.3 Specialists' Investigations and Preliminary Evaluations (Stage 6)

Specialists' investigations were undertaken in April and May 2011 and comprised a series of Working Papers for consideration as part of the overall review. These are included as Appendices 3 to 10 to this report and generally relate to the list of items scoped in section 3.2. The specialist working papers covered all aspects except for district plan matters and productive land use effects. Both of these aspects were allocated to specialists[31] to review, but written material was not prepared. Rather, information was collected and provided verbally at the multi-criteria analysis workshop discussed in the next section[32]. Constructability was considered to be a subset of overall costs, in that difficulties in construction had been allowed for as part of costs, and was also reported on this basis.

From an initial review of the first of the various working papers with their assessments, it became apparent that it would be necessary to undertake a full multi-criteria analysis. This was because of the range of differences between the various route options, which in many cases were very close. Where a particular specialist had broken down the assessment into sub-categories (for example, as occurred with the social and community impacts and transport effectiveness evaluations), differences in one sub-category were sometimes off-set in another category. It was considered that this information and analysis should be subject to the scrutiny of a workshop process.

Thus a decision was made to proceed to a multi-criteria analysis, involving the specialists and other project advisors.

[31] Peter Coop of Urban Perspectives on District Plan analysis, and Tabitha Manderson of Opus on productive land use effects.

[32] Had a decision not been made to proceed to a full multi-criteria analysis workshop, reports on these aspects would have been obtained.

4. FURTHER ANALYSIS OF OPTIONS

4.1 Multi-criteria Analysis (Stage 7)

The context for a typical multi-criteria analysis is given in Figure 2 below. As the process to evaluate and review route options was staged, as explained in section 1.7 of this report, items 3, 4 and 5 in Figure 1 were replaced by the identification and scoping of briefs for the specialist advisors. The decision methodology (i.e. Delphi method or decision conferencing) was deferred until the working papers had been received and reviewed.

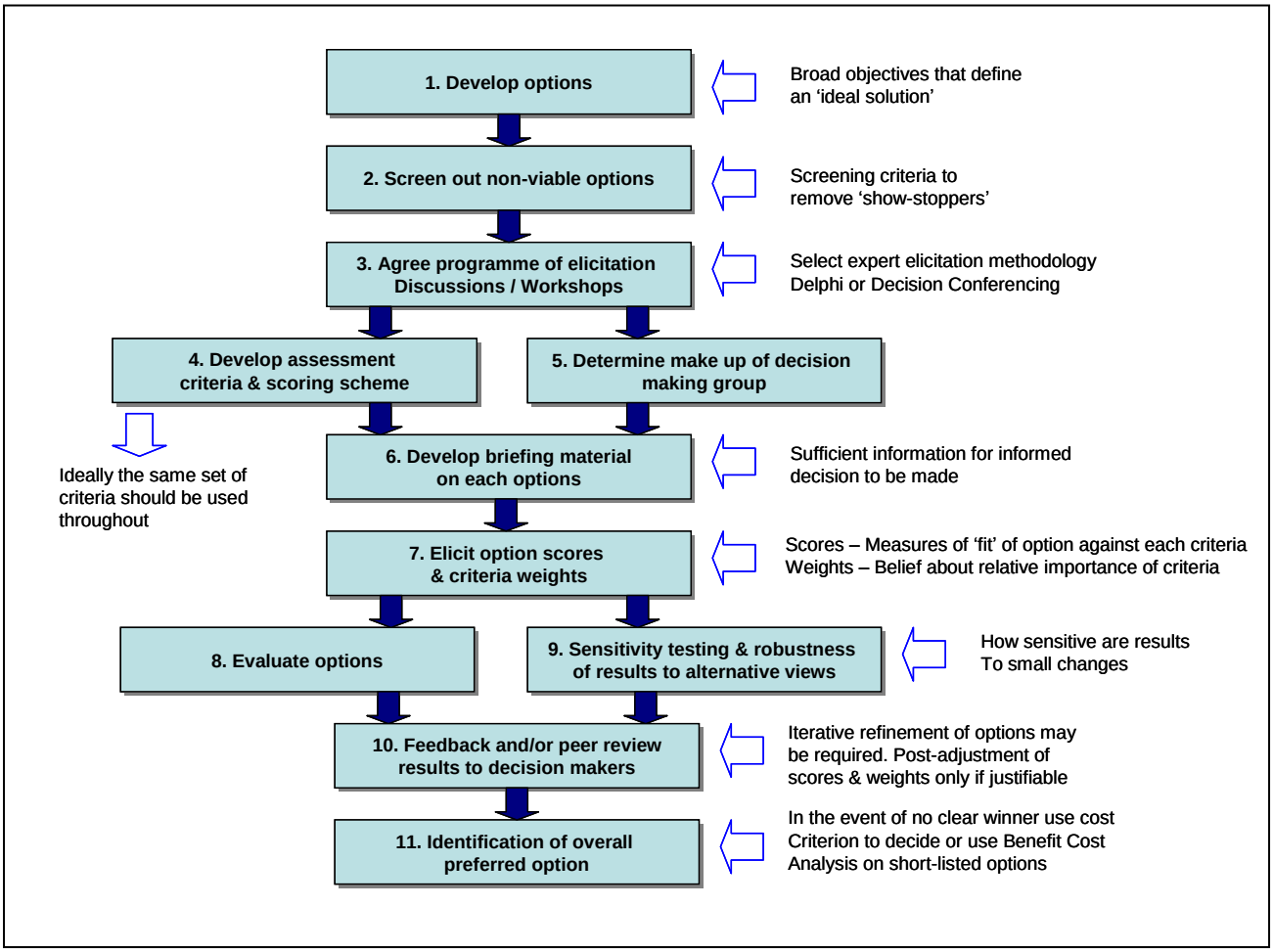

Figure 2: Multi-Criteria Assessment Process

The multi-criteria analysis methodology is a key element of analysis, and a useful aid to decision-making. Multi-criteria analysis is particularly applicable when there are several options to choose between, and where there are numerous complex considerations involved. Multi-criteria analysis is thus commonly used in assessments of options for infrastructure. It is a useful tool for evaluations, including those under the Resource Management Act (RMA) and Local Government Act (LGA), to compare and assess alternative proposals where there are multiple objectives, and where there are a range of diverse potential adverse and beneficial effects affecting different areas and/or communities[33]. The range of attributes that are relevant to a decision between options can be numerous and varied, and it is necessary in such circumstances to bring together the information in a reliable and credible way.

[33] The use of multi-criteria analysis is recommended by the NAMS (the New Zealand National Asset Managers Support organisation) and is a key element of the Optimised Decision Making Guidelines promoted by that organisation.

Figure 3 shows how multi-criteria analysis is applied. Key aspects to be taken into account in the decision are identified, defined, and scored on a consistent basis. Once scored, they can then be weighted as appropriate and combined into a single option score. In multi-criteria analysis processes, the scores can be seen as surrogates for measures of value for an aspect (allowing for the effects of diverse criteria, with different units, to be combined). The weights represent beliefs or assumptions about what is important in a particular situation or to a particular group of decision makers.

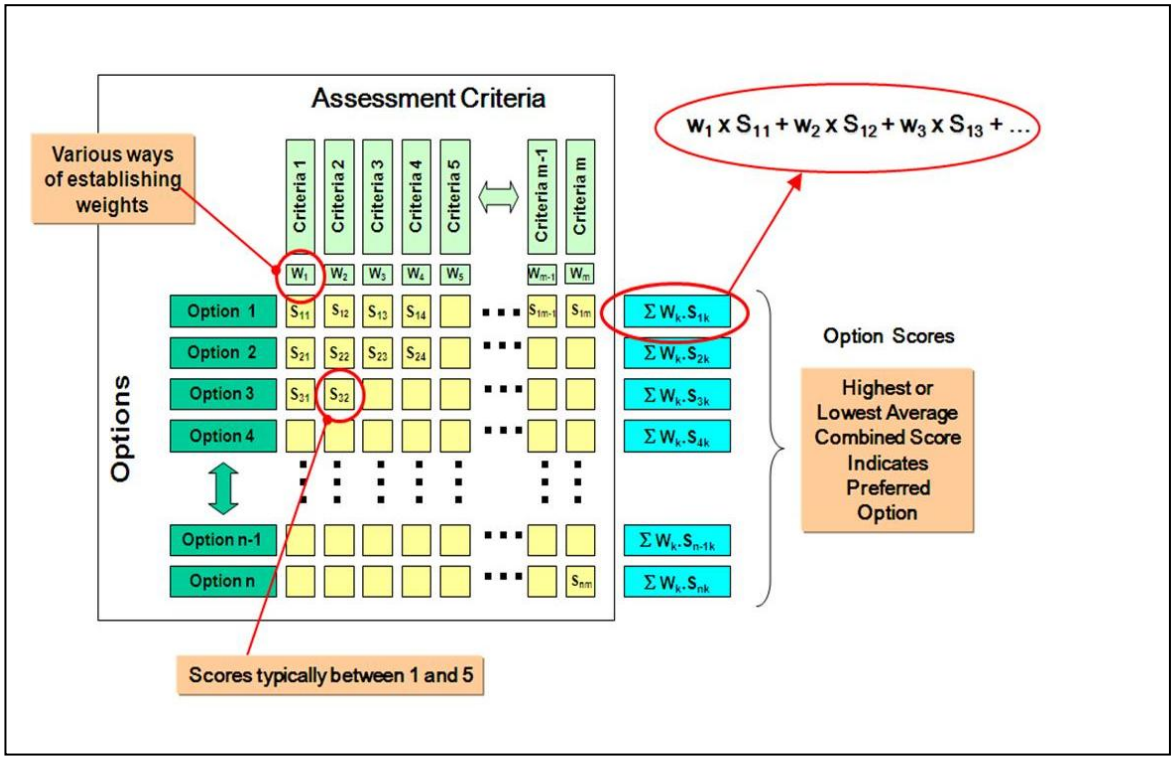

Figure 3: Multi-criteria Analysis Scoring and Weighting (Source: Steve Oldfield, MWH)

4.2 Decision Methodology

Decisions on criteria, scoring and weighting are ideally made by a group of informed people through a process that allows for testing through discussion, questions and answers. When the criteria are diverse and areas of specialist judgment are called-for, the preferred method is through a "decision conference" or facilitated workshop session, at which a participating group of specialists and generalists share information and work through the issues, finally deciding on the score for each criterion[34]. Ideally consensus is reached on the scores.

This process was used for the application of the multi-criteria analysis on the four route options for the Peka Peka to Ōtaki RoNS.

A multi-criteria analysis workshop, facilitated by Allan Planning and Research, was organised and held on 7 June 2011.

[34] The method is based on the demonstrated hypothesis (from international research in the early 1990s on roading projects) that groups of people, given the same information and the opportunity to test the information, will make similar decisions on preferences, regardless of their backgrounds.

Appendix 11 includes the briefing note, agenda and list of attendees for the workshop.

An alternative method which could have been used is the Delphi method, where criteria are scored by individual technical and specialist experts and combined by an individual generalist who, at the same time, checks the robustness of the assessment. In this case, the assessments undertaken by the specialists could have been applied by the Delphi method, but there were felt to be numerous benefits from an in-depth workshop. These benefits included drawing out the detail of the various assessments through discussion and questioning, and the involvement of project leaders who are particularly familiar with the project and the area, as well as examination and testing of the information through the shared scoring process.

4.3 Options and Assessment Criteria

The options for evaluation were as set out in the Technical Feasibility Report, and are listed in Table 1 below.

Table 1: Options for Multi-criteria Analysis

Option A	The route option close to the eastern foothills separated from State Highway 1 between Peka Peka and Manakau
Option B	The route option across the eastern plains, leaving State Highway 1 between north of Te Horo and south of Atkins Road
Option C	The route option to the west of State Highway 1 between south of Mary Crest and Taylors Road – the Te Waka option
Option D	The Board Preferred Option

The attributes for assessment, or assessment criteria, are based on the aspects identified for investigation early in the review. They are relatively broadly-based, as is appropriate for the scale of the project and the nature of the route options being evaluated.

The assessment criteria need to reflect matters that are important within the Resource Management Act, and the Land Transport Management Act, taking into account the decision criteria that will eventually be brought to bear through RMA processes. They should also be able to be categorized across all of the "four well-being" considerations – social, environmental, cultural and economic. This assessment is shown in Table 2 on the following page.

As can be seen from Appendix 2, the specialists were required to scope their own criterion or criteria. This was subject to review as part of the workshop processes[35]. A brief description of the scope of each of the criteria follows after Table 2.

[35] Any earlier queries from specialists in the case of their reviews had been responded to as part of the review role.

Table 2: Assignment of Criteria to Generic Evaluation Frameworks

Criterion	LTMA (S20) Objective*, NZTS Objective**, and GPS*** Aspect	Examples of relevant RMA Aspects	LGA QBL Aspect
1. Landscape/Visual Impacts	Environmental Sustainability	S5, S6(b), S7(c) and (f)	Environmental
2. Ecology	Environmental Sustainability	S5, S6(a) and (c), S7(d)	Environmental
3. Archaeology/Heritage	Environmental Sustainability	S5, S6(f)	Cultural
4. Cultural Values	All objectives	S5, S6(e) and (g), S7(a), S8	Cultural
5. Social/Community Impacts	Environmental Sustainability/Safety and Personal Security/Access and Mobility/Public Health	S5, S7(c)	Social
6. District Plan	Environmental Sustainability/Economic Development/Public Health	S5, S104, S171	All aspects
7. Transport Effectiveness/ Fit with Project Objectives	All objectives	S5, S7(b), S171	Social/Economic
8. Effects on Lifelines	Environmental Sustainability/Safety and Personal Security/Access and Mobility/Economic Development	S5	Social/Economic
9. Natural Hazards	Environmental Sustainability/Safety and Personal Security/Access and Mobility	S5, S7(i)	Social/Economic
10. Productive Land Uses	Economic Development	S5, S7(b) and (g)	Social/Economic
11. Specific Land Ownership	Environmental Sustainability	S5, S171	All aspects
12. Constructability	Environmental Sustainability/Economic Development	S5	Environmental/ Economic
13. Cost	Economic Development	S5, S7(b)	Economic

* The Land Transport Management Act is currently under review and some objectives may change.
** New Zealand Transport Strategy (current version, 2008).
***Government Policy Statement on Land Transport Funding (2009, to be replaced from 1 July 2012).

1. **Landscape/Visual** – This took into account topography and existing landscape character (including degree of modification and presence of structures), route length and presence of dwellings nearby, any outstanding landscape or natural character components, and important landscape/natural features.

2. **Ecology** – This criterion focused on terrestrial ecology values[36], particularly those relating to patches of bush and wetlands which are nationally, regionally or locally significant in terms of habitat values and presence of known species.

3. **Archaeology/Heritage** – This criterion took into account presence of known archaeological sites and heritage buildings.

4. **Cultural Values** – This took into account the range of cultural values including values relating to the natural environment (waterways and wetlands, areas of indigenous vegetation), key areas of settlement (marae, papakainga) and use (food gathering areas), and known wāhi tapu relating to the different hapu and iwi of the area.

5. **Social/Community Impacts** – This incorporated a range of considerations including severance effects, accessibility to townships (relating to business activity), support for urban land uses, connectivity to community services and facilities, recreational effects, and construction impacts. Amenity effects were not included[37]. (Note – direct effects on land including dwellings were included under specific land ownership effects.)

6. **District Plan** – As reported and discussed at the workshop, this criterion includes consideration of both zoning and plan objectives and policies, and the "strategic fit" of a major transport route within the urban and rural plan context (note – urban growth was included under social and community impacts).

7. **Transport Effectiveness/Fit to Objectives** – This criterion covered traffic efficiency, active travel (pedestrian and cycle opportunities), traffic safety and severance and access. The assessment took into account the local network and the various State highway components.

8. **Effects on Lifelines** – This criterion provided a preliminary transport-based risk assessment taking into account risks associated with the number, separation, location and configuration of the main transport routes through the area for each of the options. Other lifelines were not addressed as they were not considered to be affected by any of the options.

9. **Natural Hazard Effects** – This took into account flood hazard (including ponding areas) and tsunami exposure.

10. **Productive Land Uses** – As reported and discussed at the workshop, this criterion took into account the NZ Land Use Capability Classification, in particular classes 1 to 4 (productive land), the presence of land parcels greater than 4 hectares in area, and potential severance effects on productive units.

11. **Specific Land Ownership Effects** – This criterion identified types of land ownership which would potentially pose difficulties for the location of an expressway route – specifically Crown Land, designated land, Māori multiple-owned land and QEII Trust covenanted land, as well as estimating numbers of potentially affected parcels and dwellings.

[36] While aquatic ecological values were considered, it was determined that effects would be localised and similar between all options. They would be largely mitigated through design and managed through the construction stage.
[37] Note – visual amenity is addressed in the landscape and visual assessment. Noise and air quality were addressed separately at a later date (see section 5.2.1 of this report).

12. **Constructability** – Constructability was assessed on the basis of physical components such as volume and balance of earthworks (cut and fill suitability of/issues with material), structures, temporary works, access management, risks around "unknowns", and general degree of difficulty in construction.

13. **Costs** – Costs took into account the actual capital construction costs, including the range of matters identified under constructability, plus contingencies.

In assessing options, reasonable mitigation was taken into account.

There are thirteen assessment criteria, which is an acceptable number, although at the top end of the range[38]. The number and scope of the criteria were confirmed by the workshop.

It was noted that there was some potential for double counting, particularly with constructability and cost, hazards and lifelines, aspects of social assessment (i.e. the community vision) and the district plan criterion, and archaeology/heritage and culture. It was decided that these issues could best be handled during the scoring and weighting discussions. It was also noted that in some cases, the same aspects could justifiably be assessed under two criteria (such as the separate heritage and cultural values associated with some marae and urupa, and the separate ecological and cultural values of streams, waterways and bush). The possibility of removing cost from the analysis and considering it as a separate item was also raised.

It was noted that the number of people directly affected (by loss of housing) was not included in the social assessment. It was, however, included in the specific ownership criterion.

A gap was also identified in the area of amenity values relating to exposure to physical effects of noise and air quality. Additional information has been gathered and is discussed later in this report.

4.4 Scoring System

For the multi-criteria analysis, the scoring system moved from the provisional assessment provided by the specialists, to a five-point numerical system, as set out in Table 3.

Table 3: Basis for Scoring in Multi-criteria Analysis

Score	Description
1	The corridor option presents few difficulties on the basis of the attribute being evaluated, taking into account reasonable mitigation proposals. There may be significant benefits in terms of the attribute.
2	The corridor option presents only minor areas of difficulties on the basis of the attribute being evaluated, taking into account reasonable mitigation proposals. There may be some benefits in terms of the attribute.
3	The corridor option presents some areas of reasonable difficulty in terms of the attribute being evaluated. Effects cannot be completely avoided. Mitigation is not readily achievable at reasonable cost, and there are few or no apparent benefits.
4	The corridor option includes extensive areas of difficulty in terms of the attribute being

[38] Eight to twelve criteria is the ideal. With an increasing number of criteria, each criterion reduces in importance and it can become difficult to distinguish between options.

Score	Description
	evaluated, which outweigh perceived benefits. Mitigation is not readily achievable.
5	The corridor option includes extreme difficulties in terms of achieving the project on the basis of the attribute being evaluated.

4.5 Workshop Process

The workshop proceeded in accordance with the agenda and process in Appendix 11, with a key component being the scoring of the options for each criterion. In all but a few circumstances consensus was reached. Where it was not, dissenting views were noted and will be addressed in sensitivity analysis.

Table 4 shows the scores awarded at the workshop. This provides the raw data for further analysis.

Table 4: Scores for Options from Workshop

Route Option	Landscape/Visual	Ecology	Archaeology/Heritage	Cultural Values	Social/Community Impacts	District Plan	Transport Eff/Fit to Objectives	Effect on Lifelines	Natural Hazards Effects	Productive Land Use Effects	Specific Ownership	Constructability	Costs
A Eastern Foothills	4 (5)	5	1	1	2	3	4	2	2	4	3	2	3
B Eastern Plains	4	(3) 4	3	(2) 3	2	3	3	2	2	3	3	1	2
C Western	3	2	5	5	2	2	3	3	5	3	4	3	3 (4)
D Central	2	3	4	4	2	1	2	2	3	(2) 3	4	3	3

Note: numbers in brackets represent minority views on aspects where consensus was not reached. These are later used for sensitivity analysis.

The workshop process generally confirmed the initial analysis carried out by the specialists by awarding similar scores. The main differences, and the reasons for them, are noted below:

- For landscape assessment, Option A (the Eastern Foothills) was scored 4 by consensus, with some considering it should be a 5, because of the degree of change to an existing landscape which is relatively natural and currently entirely rural.
- The ecological criterion was scored for Options B and D (the Eastern Plains and Central options) somewhat lower than the initial specialist's assessment. This took into account the ability to mitigate effects on regionally significant bush remnants at Marycrest. The Eastern

Plains option, Option B, was, by agreement, scored a 4 but some considered a score of 3 would be more appropriate.

- The archaeological and heritage scores reflected the expert evaluation of options, but drew a slightly greater distinction between Option D (the Central option), where built heritage sites are known to be affected but mitigation is possible, and Option C (the Western option) where there are potentially direct and indirect effects as known and potentially numerous unknown sites.
- The specialist report on cultural values had not indicated a preliminary scoring for the route options, but the commentary and discussion in the specialist report provided the basis for discussion at the workshop. The highest negative score was awarded to Option C (the Western route option) on the basis of knowledge of the past (such as battle sites in this area) and present values, with respectively lower values for Option D (Central route) next, followed by Option B (Eastern Plains option). Some considered that Option B should be a 2 rather than a 3, as adverse cultural effects would be considered lower than with Option D. The area impacted by Option A (the Eastern Foothills) was likely to have been used least by tāngata whenua, despite still having ecologically-related values.
- The analysis of the social criterion had been undertaken on the basis of five sub-considerations. The specialist advisors informed the workshop that, on three of these (severance, current and future land uses, and disturbance) there were many variations across the four options, to the extent that all routes were roughly equivalent. There were small differences between the two remaining sub-considerations of economics (as defined) and impacts on recreational aspects, however, these largely off-set each other. Following considerable discussion, the workshop awarded equivalent scores to each route option.
- There were no prior scores for the District Plan criterion. The scores awarded mirrored the advice and discussion at the workshop, that the Plan seeks to retain rural and productive character in the district's rural areas and roading (such as the proposed expressway) would be characterised as urban infrastructure. Thus Alternative D (the Central option) was scored best and Options A and B (the two Eastern route options) scored as having the greatest degrees of difficulty (at a level of 3, rather than the most negative 5 on the scoring system).
- The transport criterion scores were similarly presented on a composite basis, based on four considerations. The workshop awarded scores between 2 and 4 based on discussion around the differences between the options.
- Productive land use effects had not been subject to prior assessments. On the basis of advice from the specialist, Option A, the Eastern Foothills option, was scored worst at 4, with the remaining options scored at 3. Some felt that Option D, the Central route, should be scored a 2 because of the degree of existing land fragmentation.
- Cost and constructability had been evaluated together, but were discussed as separate criteria at the workshop. In cost terms, Options A, C and D were considered similar (i.e. all options except the Eastern Plain route option) although some considered the additional costs associated with more uncertain ground conditions and flood management design aspects would justify a score of 4 rather than a 3. Option B was most straight-forward and therefore estimated as least cost and a lower score. In terms of constructability, similar conclusions were reached, although the better ground conditions and less closely settled nature of Options A and B (the two Eastern options) led to lower scores than for the other two routes).

The workshop also developed a weighting system which represents the agreed view of the key technical and specialist advisors team involved in the Peka Peka to Ōtaki RoNS project. The workshop was aware that additional analyses would be undertaken as a later exercise, along with sensitivity analysis applying the different scores from the workshop.

The agreed weighting system is as set out below in Figure 4.

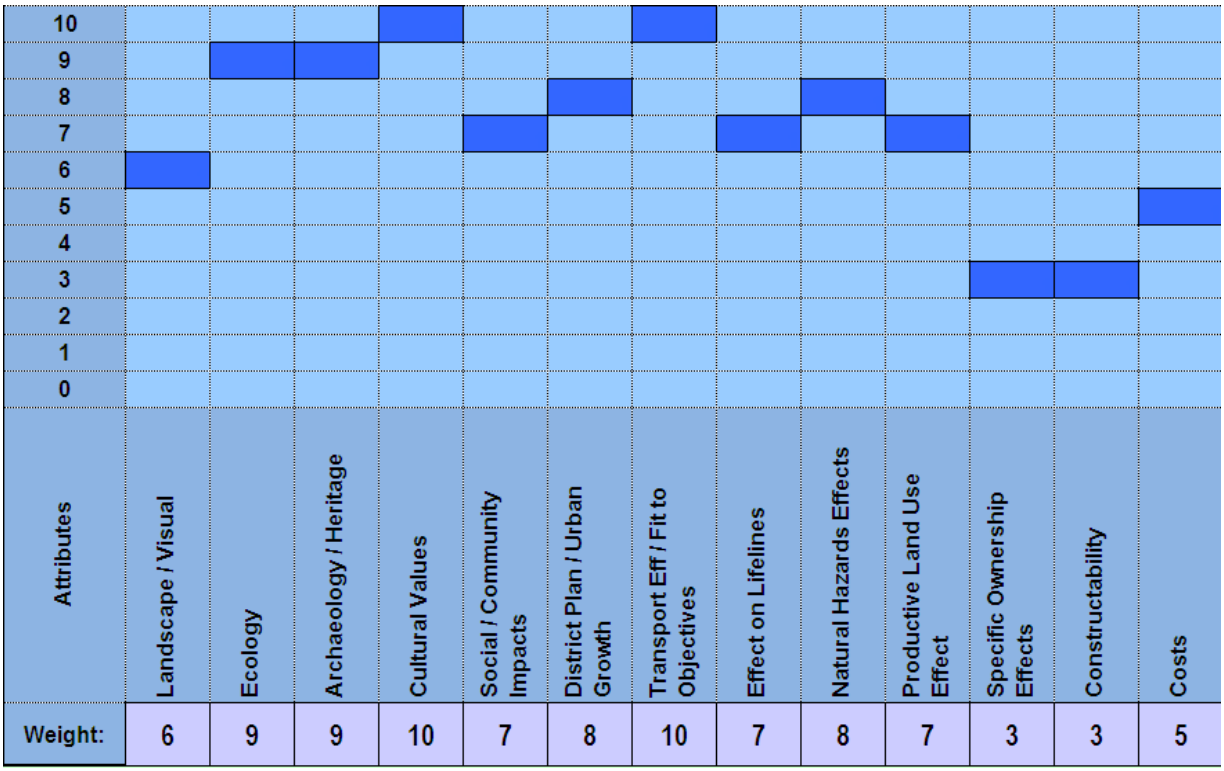

Figure 4: Weighting Elicited from Workshop Process

This placed greater weight on cultural values and compliance with objectives, followed by the two key RMA section 6 matters of ecological values and archaeological values. Lesser weight was placed on costs, constructability and specific ownership effects[39]. The visual representation is a useful tool in allocating weight.

4.6 Further Analysis (Stage 8)

As noted above, the scores from the workshop process provide the raw data for further analysis to assist identifying the preferred option.

One weighting system was developed at the workshop. The application of the scores to the weighting identifies a preferred option. The finding can be subject to sensitivity testing by identifying how much the scoring would have to be varied (i.e. by how many points the original scores would need to be "wrong") to change the preference. This gives an indication of the robustness of the outcome. Similar sensitivity testing could be carried out on the basis of weighting systems.

Weighting systems are usually much more challengeable than scoring, as they can be readily developed from a range of different perspectives. Thus a single result is always vulnerable to criticism that the weighting system is wrong. An alternative means of investigating the robustness of a preference is to subject the scoring to a range of weightings and review the outcomes in terms of their consistency and range of differences.

[39] The latter largely because of the compensation provisions of the Public Works Act.

To analyse the route option preferences, a range of weighting systems has been developed. These are shown in Appendix 12 and are described in general terms below. Note that the first weighting system is the only one that has been developed on a group basis and subject to discussion by a group. The other seven systems have been developed by Allan Planning and Research on the basis of understanding a range of possible relevant considerations[40].

- **Workshop Weighting** – this weighting was developed in discussion and agreement at the workshop and could be described as the technical view of NZTA's project advisors.
- **RMA Section 6 Emphasis Weighting** – this places maximum weight on three of the four section 6 RMA aspects potentially at play in respect of the project (ecology, archaeology and cultural values). Landscape values have not been elevated to the same level in this analysis, as "outstanding" qualities and elements were not identified in the area affected by the route options by the specialist involved, and it would thus be inappropriate to elevate them to a very high weight. Some weight is placed on the district plan analysis in this case, as reflective of section 6 matters, but other criteria are left at a very low level.
- **RMA Part 2 Balanced Weighting** – this provides a more even weighting system (the most even of all the weighting systems applied). This reflects that the criteria are all relevant considerations in a Part 2 RMA analysis, particularly section 5.
- **Community Weighting** – this system has been developed on the basis of placing the highest weights on the range of issues that are most likely to be of general interest and concern to the wider community in the area, recognising that there will be some diversity of views and that all aspects are important to a range of sections of the community.

The remaining weighting systems are related to quadruple bottom line considerations. The analysis on this basis would be particularly relevant if this was a local authority project, through LGA requirements, but is also generally related to matters to be taken into account under a LTMA and other national infrastructure policy approaches.

- **Environment** – this places the highest weight on the physical environmental element of ecology, with other criteria which integrate physical environmental considerations with social/community values also given some weighting. Criteria without a physical environment component are omitted.
- **Social** – all criteria have a social component, so all are given some weight. The highest weighting is given to social and community impacts, followed by lifelines, ownership effects and district plan considerations.
- **Cultural** – this highly weights cultural values, but also places weight on archaeology/heritage followed by ecological and social/community impacts.
- **Economic** – this excludes a number of criteria which have little or no economic bearing on the project or the local economy. It emphasises cost and transportation objectives, but applies some weighting to other criteria with an economic component[41].

The eight weighting systems have been applied to the workshop scores set out in Table 4. Results are given in Table 5 on the next page and shown graphically in Figures 5 to 12 on the following pages.

[40] This type of process has been applied in similar analyses for major infrastructures in the past, to ensure robustness in analysis.
[41] This quadruple bottom-line weighting is a different type of evaluation from the Benefit Cost Ratio (BCR) evaluation normally undertaken by NZTA.

Table 5: Analysis of Route Options (scores x weights for different weighting systems)

Weighting System	A. Eastern Foothills	B. Eastern Plains	C. Western	D. Central
Workshop	2.76*	2.80*	3.36	**2.74***
RMA Section 6	**2.67**	3.05*	3.48	2.98*
RMA Part 2	2.75*	**2.69***	3.33	2.79*
Community	2.72*	**2.64**	3.30	2.73*
Environment	3.00	3.18	3.36	**2.90**
Social	2.66*	**2.64***	3.27	2.72*
Cultural	**2.35**	3.02*	3.60	3.05*
Economic	2.83	**2.24**	3.02	2.56

Notes:
- The asterisk (*) denotes where the difference between options is not, or marginally, significant.
- Preferred option highlighted in blue.

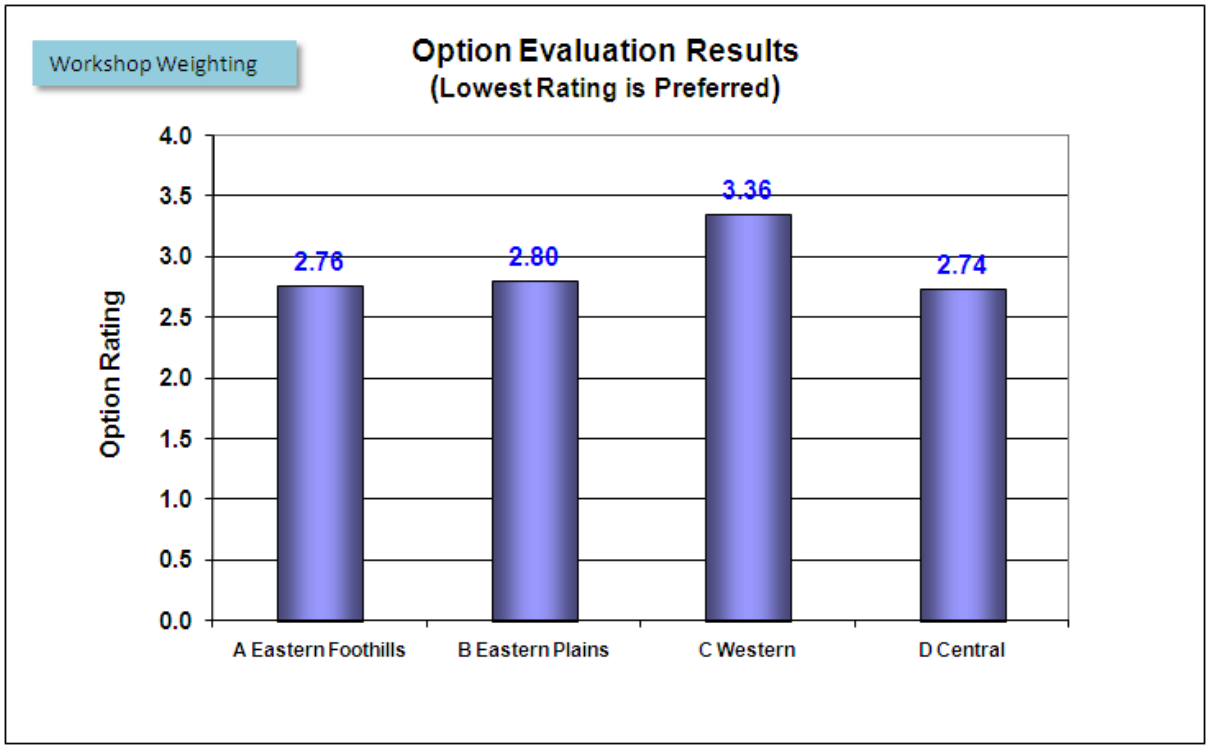

Figure 5: Analysis of Route Options on Workshop Weightings

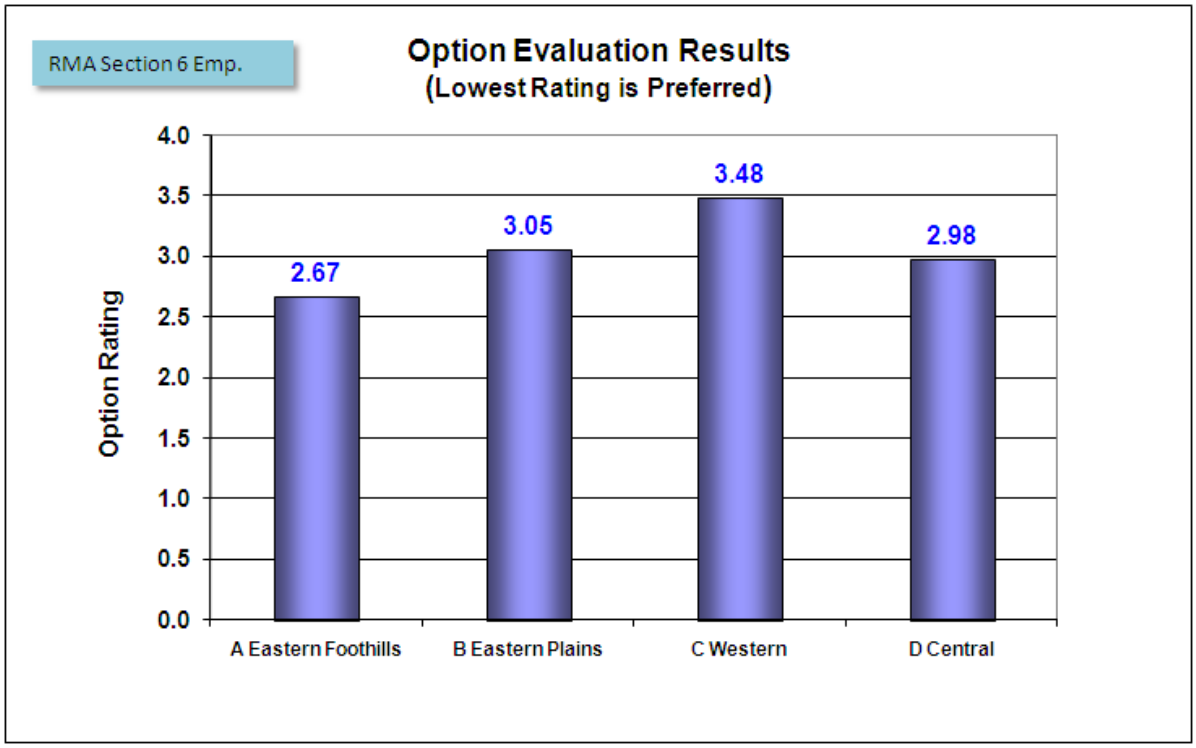

Figure 6: Analysis of Route Options on Weighting with RMA Section 6 Emphasis

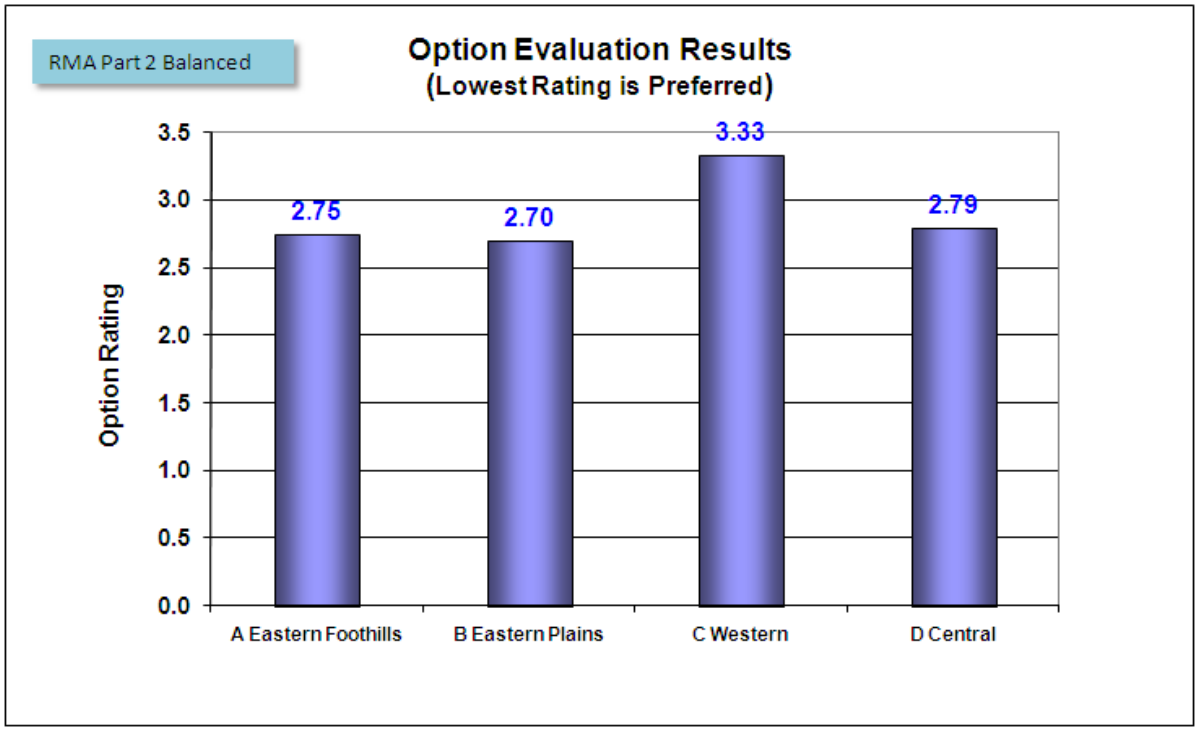

Figure 7: Analysis of Route Options on RMA Part 2 Balanced Weighting

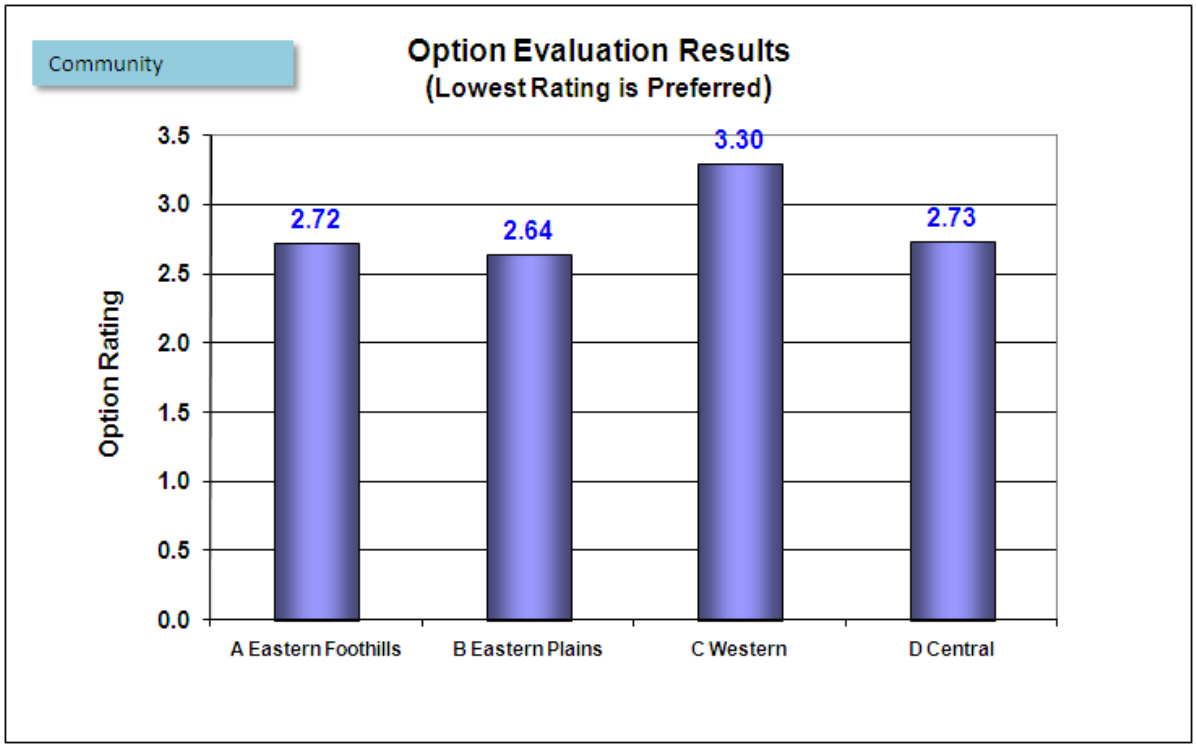

Figure 8: Analysis of Route Options on Community Weighting System

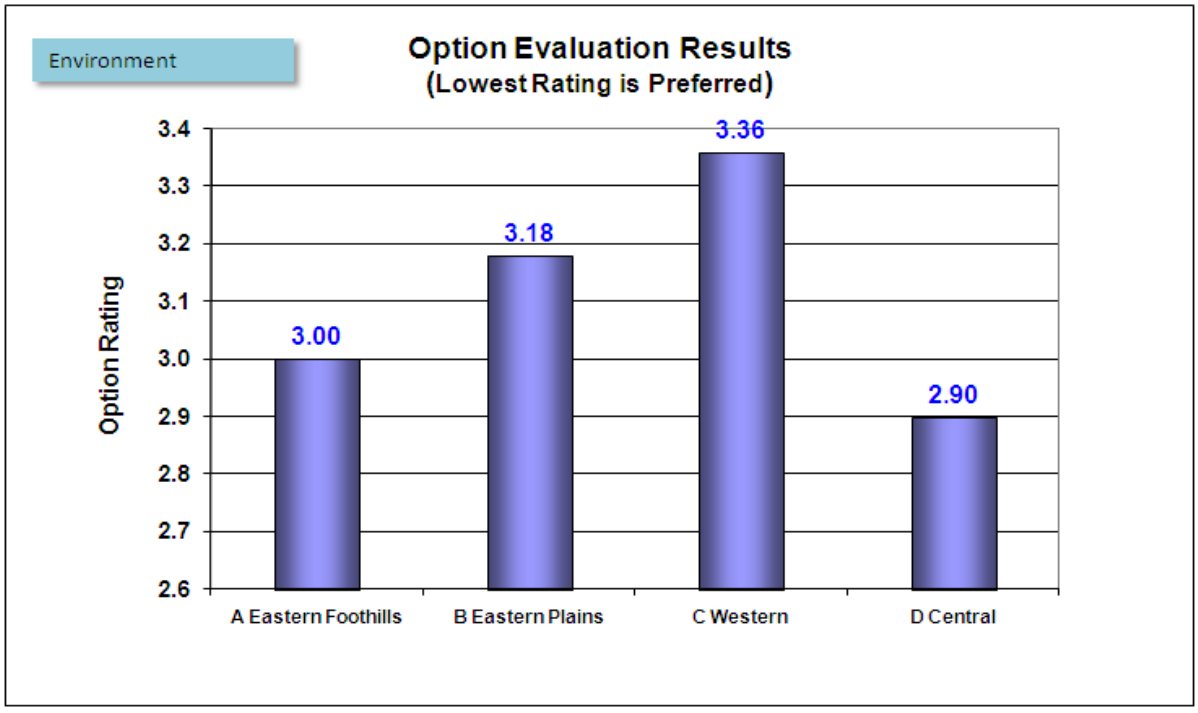

Figure 9: Analysis of Route Options on Environmental (Quadruple Bottom Line) Weighting

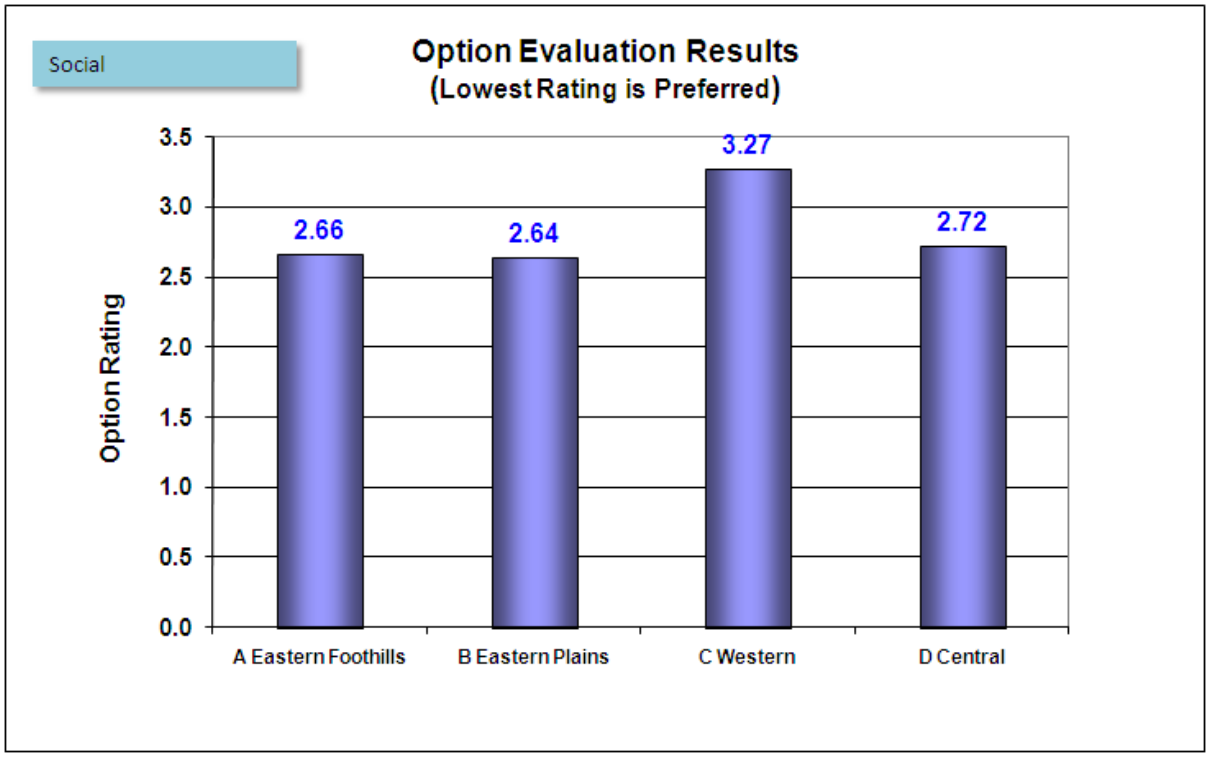

Figure 10: Analysis of Route Options on Social (Quadruple Bottom Line) Weighting

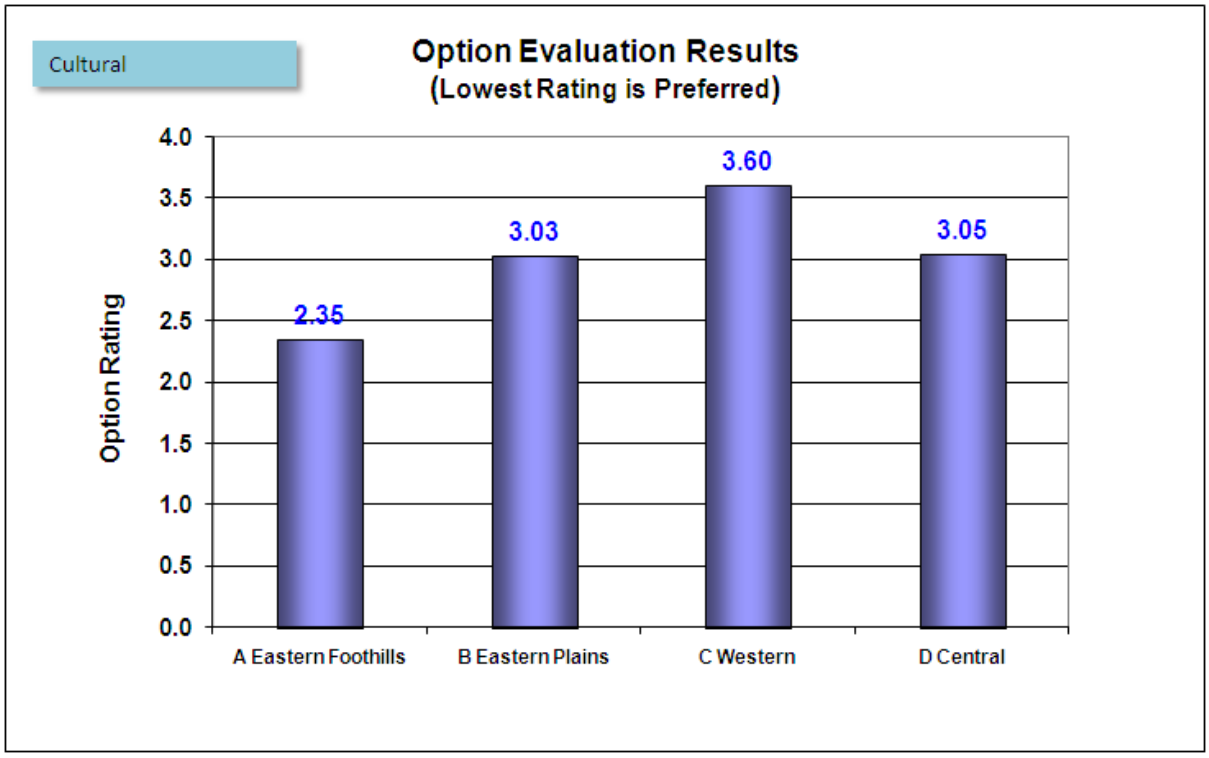

Figure 11: Analysis of Route Options on Cultural (Quadruple Bottom Line) Weighting

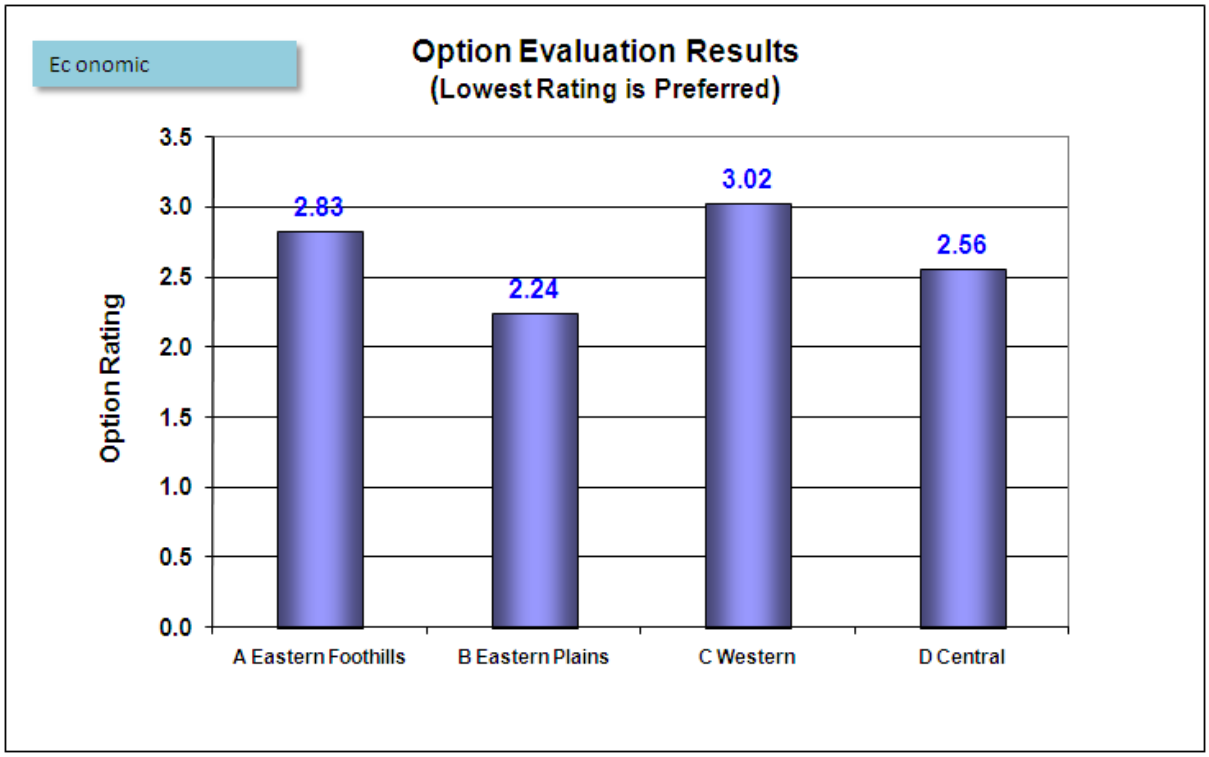

Figure 12: Analysis of Route Options on Economic (Quadruple Bottom Line) Weighting

As can be seen from Table 5 and Figures 5 to 12, the outcome is not particularly clear-cut in terms of three of the four route options evaluated. Clearly, Option C, the Western (or Te Wāka) option is never favoured and is always scored significantly lower than the others, regardless of weighting.

Option D, the Central, Board Preferred Option, is a clear preference in terms of the Environment quadruple bottom line weighting, and is marginally preferred under the Workshop weighting. It is the second and more often the third preference under other weighting schemes.

Option B, the Eastern Plains option is a clear preference under the Community and Economic quadruple bottom line weightings, and marginally preferred in terms of RMA Part 2 and Social quadruple bottom line assessments. It is "best" most often of all the weighting systems – however the difference is usually marginal.

Option A, the Eastern Foothills, is preferred in terms of RMA Section 6 and Cultural quadruple bottom line weighting systems.

On the basis of cost alone, Option B, the Eastern Plains option, would be preferred.

Further analysis was undertaken, excluding the "costs" criterion, to see if that made a material difference[42]. When the options were analysed without costs, Option A moved to being the "best" most often, being preferred under the RMA Section 6, RMA Part 2 and quadruple bottom line Social and Cultural weighting systems, and of equal preference to Options B and D on the Community weighting system. Option B is only preferred (when costs are taken out) under the Economic analysis and equally with Options A and D on the Community weighting.

[42] It had earlier been identified that there may be an element of double counting in including both costs and constructability in the analysis. A lead was taken from Figure 2, which suggests that costs could be used to clearly differentiate between close options.

Thus separately considering costs from the other criteria does not particularly help to clarify preferences.

A final analysis can be undertaken on the basis of the sensitivity of the scoring, where there was not complete agreement on the scores.

The score variations available for sensitivity testing are found on Table 4 and are included in Table 6. Table 6 shows the criteria where alternative scores were noted at the workshop, the routes they applied to, and their general implication in terms of the options they apply directly to.

Table 6: Analysis of Sensitivities, Summary Outcome if all Alternative Scores Applied

	Sensitivity	Base	Alternative	Effect of alternative on result
a	Central - Productive Land Use Effect	3	2	Makes Option D more favourable
b	Eastern Foothills - Landscape/Visual	4	5	Makes Option A less favourable (but not enough to stop it being preferred under RMA Part 2 weighting)
c	Eastern Plains - Ecology	4	3	Makes Option B more favourable
d	Eastern Plains - Cultural values	3	2	Makes Option B more favourable
e	Western - Costs	3	4	Makes Option C less favourable

If the alternative scores from Table 4 are applied selectively, it is possible to “force” a situation where Options B or D are preferred. These are shown in Tables 7 and 8. This demonstrates how close these two options are in terms of evaluating preferences. However, the basis for "forcing" the situation in this way is only marginally valid.

Table 7 shows that selective allocation of scores from Table 6 can shift the apparent preference to Option D, the Central route. This becomes “best” most often under the various weighting systems, with a slight environmental preference over Option B. Option B however remains equal on social/community analysis, and is preferred on economic weighting.

Table 8 shows that selective allocation of scores equally can shift the apparent preference to Option B. This becomes “best” under all but one weighting system (Cultural), at the same time that Option D is never “best”.

On this basis, Option B could be seen as more strongly favoured.

For completeness, Option A has been analysed on a similar basis. This is shown in Table 9 on the following page, and indicates that this option could also become preferred, although on a less clear basis.

Table 7: Analysis of Most Favourable Combination for Option D, Central Route

Weighting	Eastern Foothills	Eastern Plains	Western	Central
Workshop	2.83	2.80	3.41	**2.66**
RMA Section 6	**2.78**	3.05	3.52	2.95
RMA Part 2	2.81	**2.70**	3.42	**2.72**
Community	2.78	**2.64**	3.38	**2.65**
Environment	3.13	3.18	3.36	**2.82**
Social	2.72	**2.64**	3.35	**2.64**
Cultural	**2.43**	3.03	3.60	3.05
Economic	2.83	**2.24**	3.27	2.51

Note: most favourable combination for Central option (references to Table 6) – "a" to 2, "b" to 5, "c" to 4, "d" to 3, "e" to 4

Table 8: Analysis of Most Favourable Combination for Option B, Eastern Plains Route

Weighting	Eastern Foothills	Eastern Plains	Western	Central
Workshop	2.83	**2.60**	3.41	2.74
RMA Section 6	2.78	**2.71**	3.52	2.98
RMA Part 2	2.81	**2.53**	3.42	2.79
Community	2.78	**2.51**	3.38	2.73
Environment	3.13	**2.79**	3.36	2.90
Social	2.72	**2.52**	3.35	2.72
Cultural	**2.43**	2.65	3.60	3.05
Economic	2.83	**2.24**	3.27	2.56

Note: Most favourable combination for Eastern Plains option (references to Table 6) – "a" to 3, "b" to 5, "c" to 3, "d" to 2, "e" to 4

Table 9: Analysis of Most Favourable Combination for Option A, Eastern Foothills Route

Weighting	Eastern Foothills	Eastern Plains	Western	Central
Workshop	**2.76**	2.80	3.41	**2.74**
RMA Section 6	**2.67**	3.05	3.52	2.98
RMA Part 2	2.75	**2.70**	3.42	2.79
Community	2.72	**2.64**	3.38	2.73
Environment	3.00	3.18	3.36	**2.90**
Social	**2.66**	**2.64**	3.35	2.72
Cultural	**2.35**	3.03	3.60	3.05
Economic	2.83	**2.24**	3.27	2.56

Note: Most favourable combination for Eastern Foothills option (references to Table 6) – "a" to 3, "b" to 4, "c" to 4, "d" to 3, "e" to 4

4.7 Findings from Analysis

The overall conclusion from the multi-criteria and subsequent analysis is that the two eastern route options developed for the review are almost equivalent to the Board Preferred Central Route option in terms of the range of matters that contribute to decisions on route preferences under various legislative requirements. Of the two, the Eastern Plains option is generally preferred to the Eastern Foothills option.

The Western Route option is not favoured under any of the analyses.

The work involved to reach that finding has been rigorous, including:

- Review of options previously investigated, and community input
- Identification of possible areas for routes which had apparently not been considered in more than a cursory way
- Development of options in these areas and technical check of practicality
- Investigation of options by specialists within a framework suitable for multi-criteria analysis
- A multi-criteria workshop, eliciting scoring and a single weighting system
- Analysis of results on this basis, and subsequent further analysis applying additional weighting systems and alternative scorings (the latter from the workshop).

The final section of this report returns to the review questions and addresses a number of further points.

5. CONCLUSION AND DISCUSSION

5.1 Responses to Review Questions

Section 1.5 of this report posed a number of review-type questions identified at the start of the review process. These are now briefly discussed.

Were a significant range of route options considered?

The answer to this is found partly in Appendix 1, in Mr Coop's memorandum, as also summarised in section 2.2 of this report. While it is clear that a number of route options were identified and analysed over a long period, it is notable that the range of route options was always limited to areas around or to the west of State Highway 1. Thus the range of route options considered in the past was geographically limited to a greater extent than would be desirable had the process been commenced from scratch in recent years.

Was sufficient and an appropriate range of information applied in identifying route options?

The response to this question is "yes" in terms of the options that were considered. It is however not clear why the geographical range of options was initially limited, as no obvious fatal flaws were discovered in the analysis of eastern route options. Had the presence of the railway line been considered to be a limitation, it would not be a valid limitation, as the Board Preferred Option crosses the railway line.

Was there opportunity for genuine consultation on route options?

As noted earlier, consultation is not an RMA requirement, but it is considered to be good practice for a range of reasons. It is clear that, for the range of options that was considered, there was genuine consultation with both stakeholders and the wider public.

However, the extent of consultation was in part limited by the range of options put forward. It is not clear why the concept of eastern route options, which were identified in earlier consultation processes, were not subjected to further consultation (particularly as consultation processes were the basis for subsequent further consideration of the range of western (Te Wāka) route variants). It is not clear whether, or how, consultation on a broader range of options may have modified the decision that led to the Board Preferred Option. In particular it is noted that the cultural analysis prefers eastern routes, and there is no evidence of stakeholders (other than a brief comment from KCDC) influencing the non-inclusion of eastern options.

Were appropriate criteria applied in the consideration of options?

The answer to this review question is undoubtedly "yes" for the options that were considered. Again, however, this answer is of necessity limited to the routes that were considered.

As a result of the qualification inherent in the above answers to the review questions, the review proceeded to endeavour to fill the information gaps highlighted[43]. The outcomes of the further investigations and analyses, as reported particularly in section 4 of this report, are somewhat inconclusive in terms of preference, except in terms of the inappropriateness of a western alignment.

It would be appropriate therefore that these findings are reported to the NZTA Board.

[43] Apart from any consultation input.

5.2 Contribution of this Review to Consideration of Alternatives

As noted in section 1.7 of this report, the review process itself can contribute to the adequacy of consideration of alternatives. That has clearly been so in this case, where the approach was a staged one which provided the opportunity to remedy any omissions identified in earlier processes. As a result, not only have two new route options been identified (and sufficient information collected to enable an assessment of them in terms of relevant considerations for an expressway) but these two options have been evaluated within the context of the Board-preferred option as well as a western route option.

This has provided an updated and consistent approach to the evaluation of an appropriate range of alternative routes.

5.3 Other Matters

This section briefly traverses some disparate matters that have not been addressed earlier in this report, but which should also be kept in mind in any further analysis or advice.

5.3.1 Noise and Air Quality

These are matters which contribute to amenity and potentially to social impact. At the time that the multi-criteria analysis was carried out, information was not available on these two aspects.

The absence of information on these aspects of a further expressway was considered by workshop participants to be an important omission, even though it was unlikely to influence scoring overall. The workshop considered that information should be obtained and reviewed in the light of the multi-criteria analysis findings.

Subsequently, a report has been received on these aspects. This is included as Appendix 13 to this report.

In summary, the findings of this report are that, in terms of acoustics, Options C and D have least negative effects due to the least number of potentially affected properties (Option C) and the existing level of exposure and opportunities to mitigate effects (Option D). The two eastern options have equal negative effects from noise, both due to the introduction of traffic noise into an area currently unaffected and no corresponding benefit elsewhere[44].

In relation to air quality, the report finds that there are unlikely to be significant differences between the routes. To the extent that there are differences, Option C performs best, as it involves the least number of affected people, and Option D the worst due to the greatest number. Options A and B fall between these two, with only a minor distinction between them (Option A being closer to Option D but for different reasons).

As can be seen from Appendix 13, the variations between the route options in terms of these considerations are relatively minor. If anything, the assessment confirms the closeness of Options A, B and D found in the multi-criteria analysis. Option C has effectively been already excluded, although this option is considered to perform marginally best in terms of both those potential effects. The marginal preference for this option in terms of acoustic and air quality effects does not modify that finding.

[44] Due to continuing exposure to traffic noise in Te Horo and Ōtaki.

5.3.2 Linking the Peka Peka to Ōtaki RoNS with the Ōtaki to north of Levin RoNS

A small issue arises in the segmentation of the Wellington RoNS in this area.

As has been identified in this report, and in the Technical Feasibility Report, any comparison of route options must involve equivalent lengths of potential expressway routes. This was achieved for the purpose of this review by determining a northern extent of all routes that aligned with the THRAC and CRRG option, as defined in the Technical Feasibility Report. This is a credible northern extent for all the route options considered, and could link readily to a route to the north. However, the THRAC and CRRG eastern option (see Appendix 4 of Appendix 1 to this report) continued as an inland alignment to the north, and this option has not been included in this analysis.

Preliminary analysis of a potential corridor continuing along this alignment to the north is to be part of the Ōtaki to north of Levin RoNS project. To date this has identified a range of constraints and impediments along this alignment, including natural values, geotechnical and construction considerations, and planning issues (including regional plan aspects)[45]. Preliminary advice is that a route which could be a northern continuation of Option A in this review, is unlikely to be pursued further as an option for the Ōtaki to north of Levin RoNS.

5.3.3 Further Process in terms of the Review Findings

As outlined above, it is considered that the results of this review should be reported to the NZTA Board.

It would be open to the Board subsequently to follow any process or undertake any further analysis it chooses.

An option would be to undertake further stakeholder and/or public consultation on one or both of the eastern routes (Route Options A and B, but particularly Option B). This may help clarify views, opinions and preferences, and may elicit additional information on the eastern option(s) which could assist in determining the best option overall.

Another option would be for the Board to reconsider its preferences, taking into account the information in this report and any additional matters the Board considers particularly determinative of a preference between options.

For example, the Board could decide that travel, safety or BCA considerations should be determinative when all other criteria lead to ambiguous outcomes[46].

Given the robustness of the process set out in this report, it is considered that the only way to improve upon the quality of the multi-criteria analysis would be for the eastern options to be further developed and analysed to an equivalent state of technical understanding and knowledge of actual and potential effects that currently exists for the Board Preferred Option. There would be considerable cost and time involved in such a process. There is also the potential that, as a result of such further investigations, another option may be preferred to the current Board Preferred Option. This possibility would need to be considered in the context of section 171(1)(b) of the RMA, which requires only that, *inter alia,* a decision maker have particular regard to whether adequate consideration has been given to alternative routes.

[45] This analysis is not yet publicly available.
[46] Note that, from Fig 2, cost (or BCA) would normally be a final determinant. In this case, cost alone provides insufficient clarity.

5.4 Conclusion

This report sets out the basis, process and findings of a review of alternative routes undertaken for NZTA for the Peka Peka to Ōtaki RoNS.

The process has included a review of past investigations, and development and evaluation of three route options in addition to the Board Preferred Option.

Two of these options, to the east of State Highway 1, had not been previously identified and evaluated by NZTA or its predecessor organisation.

The evaluations involved preliminary development of reasonable alternative routes to check their technical feasibility, followed by specialist investigations of the implications of the route options (based on somewhat wider routes and taking into account adjacent areas). The initial analyses by the specialists were brought together through a multi-criteria analysis process, involving best practice techniques such as decision conferencing through a facilitated workshop at which information about the options was shared and tested. The outcome of the workshop was analysed on the basis of a range of weighting systems, and was also subject to further sensitivity analysis.

The general finding is that, while the western route option was clearly not preferred, the other three route options – the Board Preferred Option and two route options to the east – are closely matched when compared on the basis of the types of considerations that are appropriate to take into account when choosing a preferred expressway route. In particular, there is no clear preference between the Board Preferred Option and the Eastern Plains option on the basis of this multi-criteria analysis.

This general finding was not able to be clarified further through closer analyses of the multi-criteria analysis scoring, or from some additional information on potential effects, which had subsequently been obtained. This further emphasised the closeness of the options.

This review is to be reported to the NZTA Board to inform the Board's final decision on route selection.