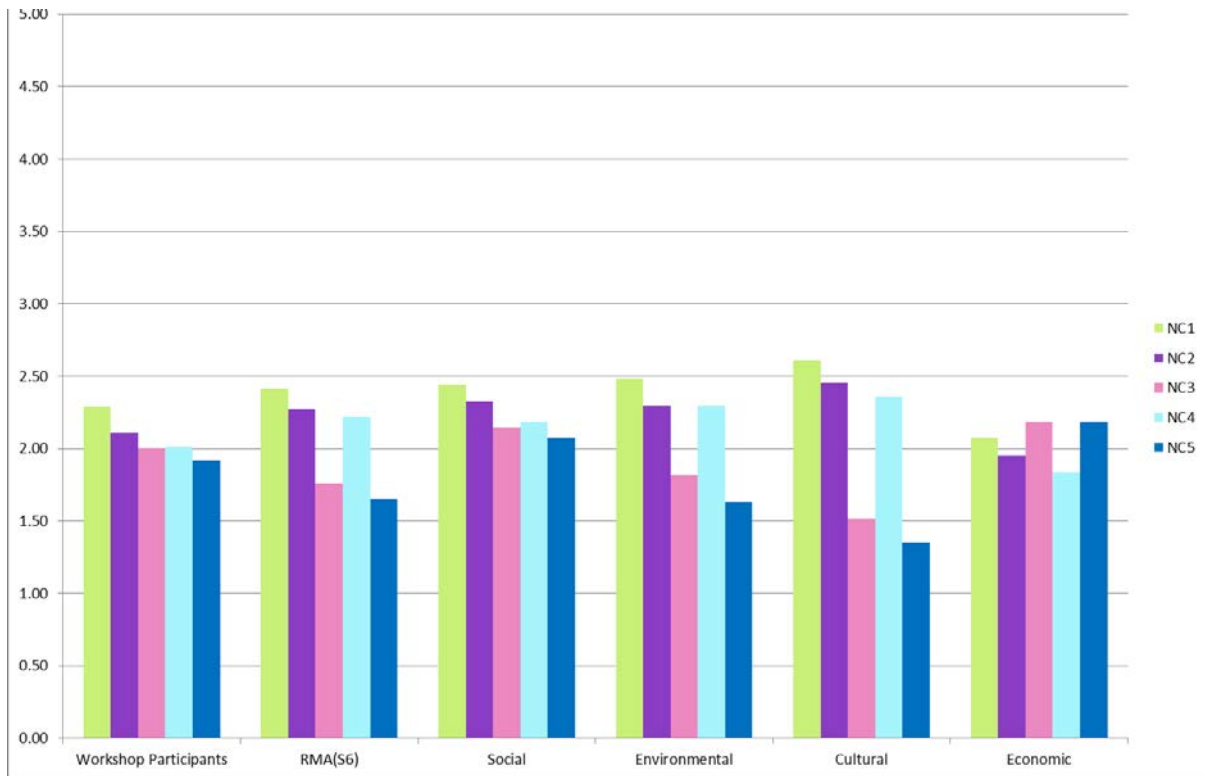
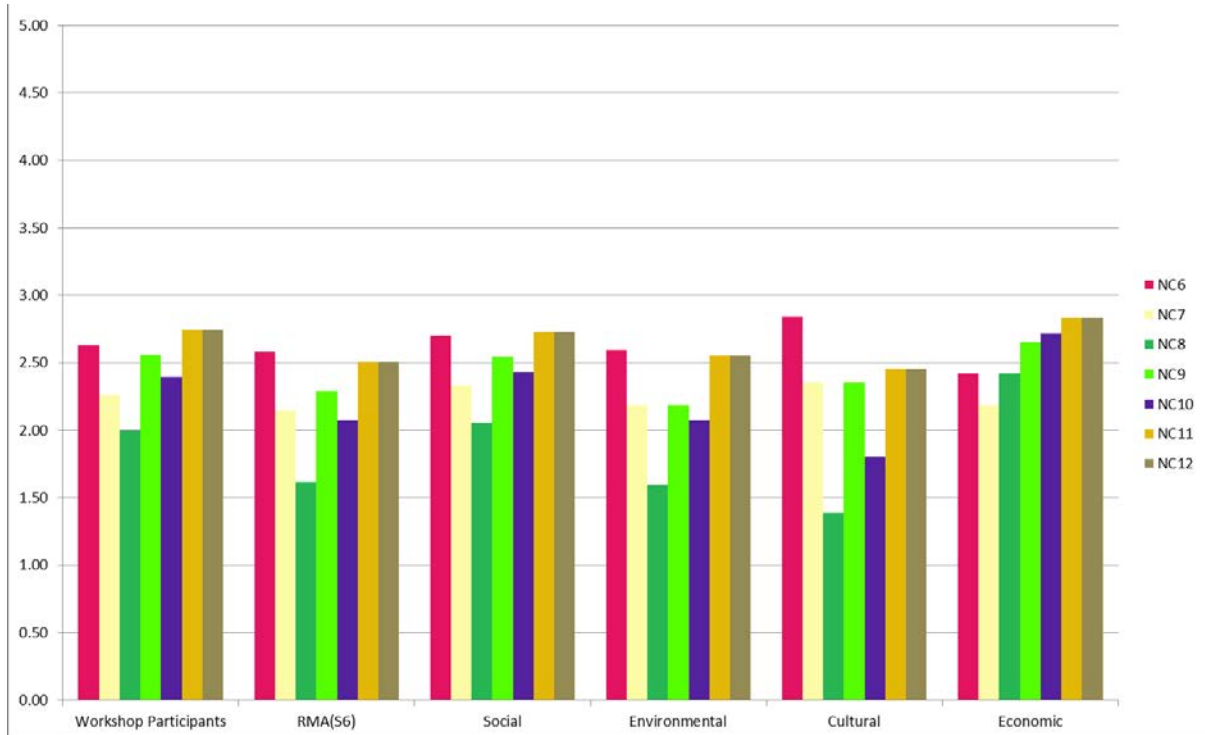


Appendix I: Graphic Representation of Analysis of Southern and Northern Route Options – NC1 to NC1

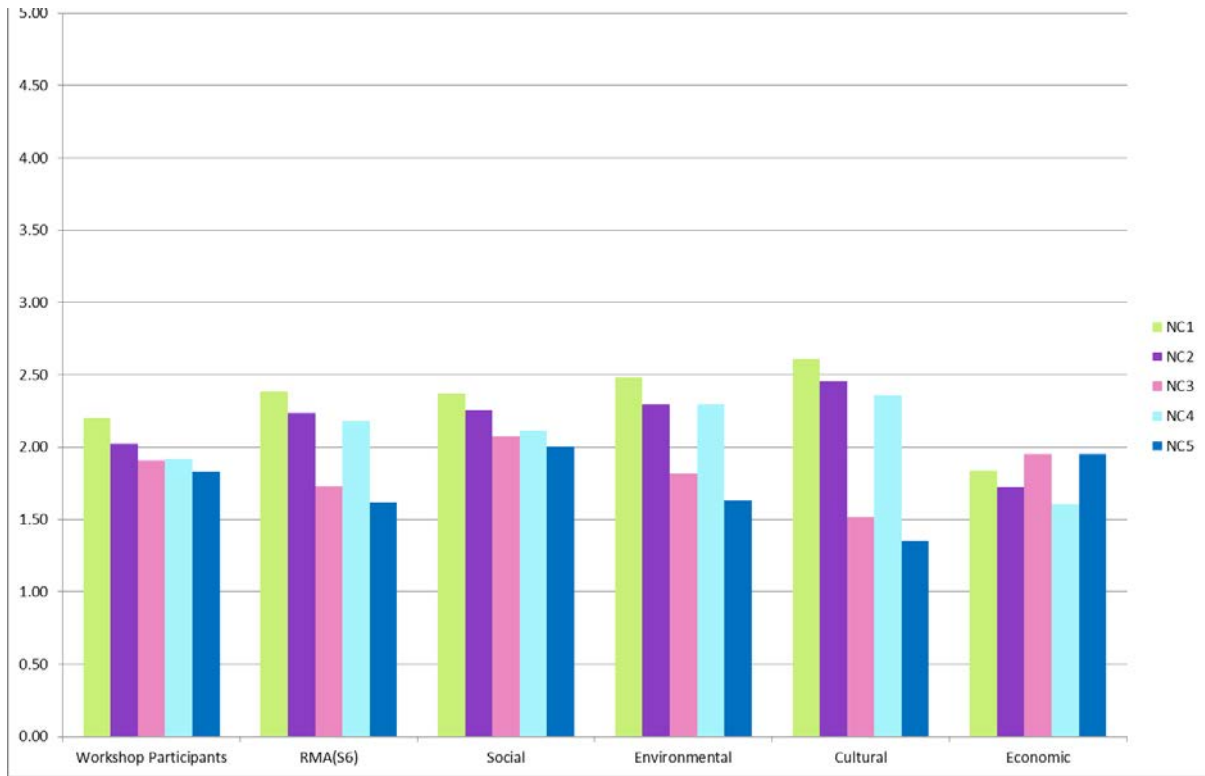
Graphed Outcome of MCA Analysis – Southern Section Route Options NC1-NC5, Costs Included



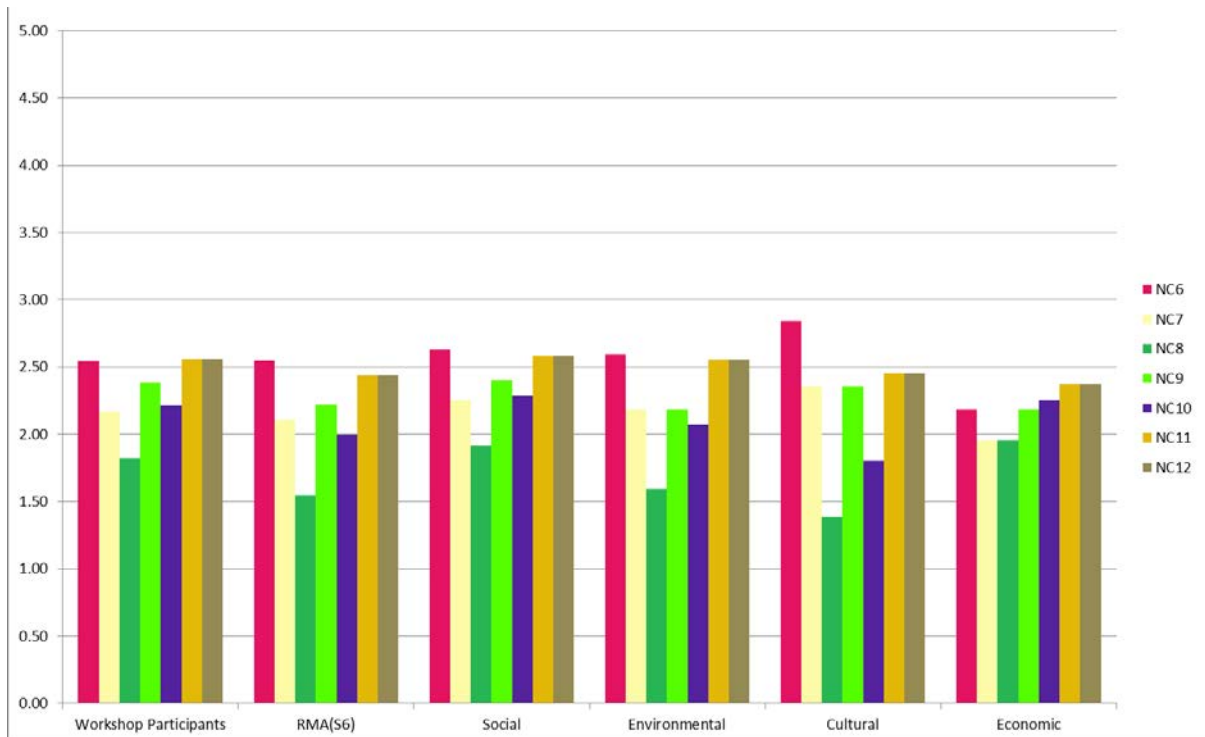
Graphed Outcome of MCA Analysis – Northern Section Route Options NC6-NC12, Costs Included



Graphed Outcome of MCA Analysis – Southern Section Route Options NC1-NC5, Costs Excluded



Graphed Outcome of MCA Analysis – Northern Section Route Options NC6-NC12, Costs Excluded



Appendix J: Agenda, Briefing Note and Background Note for the Third Workshop

LEVIN NORTHERN CONNECTION OTAKI TO NORTH OF LEVIN RONS

Workshop on Routes and Intersections

Tuesday 25th October 2016, 9am-5pm
17th Floor, 1 Willis Street, Wellington

DRAFT AGENDA

1. **Introduction**
 - Introductions
 - Background, decisions to date, any questions raised regarding broader project (Greg Lee)
 - Review of notes from Second Workshop and any changes (Sylvia Allan)
 - Confirm agenda (all)
2. **Outcome of Second Workshop (Route Options for Northern Connection)**
 - Options analysis and preferred options (Sylvia Allan)
 - Integrating sections (All)
3. **Refresher on Preferred Route Options for Taylors to Ohau (T2O)**
 - Process used and preferences identified (Phil Peet)
4. **Joining T2O options with Northern Connection options (Arapaepae/Kimberley Road vicinity)**
 - Options identified (Jamie Povall)
 - Agree methodology to be used (Sylvia Allan/ Jamie Povall)
 - Discussion and documentation (All)
5. **Interchange options**
 - Options identified (Jamie Povall)
 - Principles used to short list
 - Transport Agency Requirements for SH1/SH57 connection (Greg Lee)
 - Identification of fatal flaws
6. **Integrated Route/Interchange Options**
 - Description of Options (Jamie Povall)
 - Discussion and agreement on Criteria (Sylvia Allan/Phil Peet)
 - Application of criteria (All)
7. **General Discussion and Next Steps**
 - Further development of options
 - Report preparation
 - Approach to next steps in consultation.

LEVIN NORTHERN CONNECTION OTAKI TO NORTH OF LEVIN RoNS

Briefing Note for Route Investigation Workshop (Third Workshop) Tuesday 25th October 2016

Background

The New Zealand Transport Agency (the Transport Agency) has been continuing investigations into appropriate options for further consideration to address the short, medium and long term road transport needs in the area between the northern extent of the approved Peka Peka to Otaki RoNS section and approximately the junction of Arapaepae Road and SH57, east of Levin.

This has now been extended to undertake a similar process for the area east and north of Levin, including a possible connection from SH57 across to SH1 north of Levin.

As part of the investigations, we are undertaking a process to identify a small number of route options which would provide connectivity while managing environmental effects and meeting the Transport Agency's objectives for the RoNS, as well as the District Council's objectives for growth and the town centre's environmental improvement. We also need to look at location of any major structures and intersections, and consider local road connectivity and access. The intention is that the preferred options would then be subject to stakeholder engagement, including broad community consultation.

To achieve an integrated, comprehensive and robust approach to route development, it was initially agreed that the investigations and technical expert input should be undertaken in two stages (although it was recognised that further stages may be needed to address matters of detail both before and after consultation processes if any option proceeds), as follows:

Stage 1: Initial team workshop involving a site visit, followed by a workshop session to share information and to begin to develop possible route options for further analysis.

Stage 2: Following further technical consideration of route options, a further workshop to collectively review the options, including through MCA processes, as appropriate.

The Stage 1 site visit and workshop to the wider area was carried out on 3rd August 2016. The Stage 2 Workshop was held on 16th September. The notes from the second workshop are attached for information.

The analysis of route options identified that the preferred options for the southern section were, in order, Routes 3, 5 and 4: and for the northern section, Routes 7, 8 and 10. These are only sections, and at present the preferred options are not integrated, so further work is needed. The Stage 2 Workshop also looked at possible interchange locations and layouts for the route options in general terms, without undertaking a formal analysis of options.

It is now necessary for us to look at the full length of expressway from Taylors Road to north of Levin, taking into account how the various route options may be integrated, and also how these route may be integrated with the local network through interchange locations and design.

Preparation for the Third Workshop

For the Third Workshop, we need to refresh our understanding of the T2O preferred options (TO17, TO2 and TO4), and look at how they may be integrated with the southern section of the northern connection (in the vicinity of Arapaepae Road).

We also need to look at linking up the southern and northern sections of the northern connection (a discussion of the practical locations for continuous routes) to the east and north of Levin.

Possible continuous options have been developed by the engineering team, still at the broad "corridor" scale of approximately 150-200m wide, and without consideration of design detail. The basis for these options and the primary reasons for their identification will be discussed at the workshop.

A map showing the route options and the areas that still need consideration in detail is being provided in advance of the Workshop to the technical experts for their more detailed consideration. For everyone else, these options will be explained and discussed early in the workshop.

We also want to consider each of the route options in conjunction with a range of possible intersection locations and designs. This is becoming critical, as it is that aspect that will be of key concern to local people as well as the Council. Again, plans showing these options are being provided in advance to the technical experts so they can prepare for the Workshop. It is likely that we will be using broader criteria for this analysis than in the past, but the criteria (which will be circulated in draft later this week) will still include matters such as "environmental impacts" and "property impacts" so technical experts should refresh their understanding, and add further detail where practical.

We are not expecting that we will score these integrated options on a 1-5 basis as in the past. It is more likely that the Workshop will capture advantages and disadvantages as a means to further refine down the options and identify whole route preferences which will then be further developed prior to consultation.

Please come prepared to help identify and discuss suitable criteria for the integrated options we will be evaluating.

Final Points

Once again, there will be quite a lot of material to cover, so this is going to be a hard-working day. Please come prepared for this. An agenda is being provided separately.

As we have most of our technical experts available for this workshop, it is expected that they will help in taking a lead on discussion for their particular subjects of interest. However, as we are moving into aspects of how the options will serve the local as well as the regional and national community, the importance of the contribution of those who work with the local community all the time will continue to be highly important.

The current stage of work is strictly confidential, and needs to be kept so.

Any questions, please get in touch with me on 021-655-155, or Phil Peet on 027-211-8246. See you on 25th October 2016.

Sylvia Allan, Allan Planning and Research Ltd, 16th October 2016

BACKGROUND NOTE

Possible Criteria for Multi-Criteria Analyses Workshop 25th October 2016

We will be undertaking two separate MCA-type exercises at Tuesday's workshop.

- Firstly, **Agenda Item 4** – this involves looking at TO2/4 and TO17, probably from the Ohau River to the Kimberley Road vicinity. This in part reviews earlier investigations, but also addresses the connection options at the northern end (of which there will be five, as will be explained at the workshop). This exercise is necessary because we have only ever evaluated the area north of the Ohau on TO2/4 (Option 5A) as a 2-lane highway, whereas we have evaluated TO17 as a 4-lane expressway.
- Secondly, **Agenda Item 6**, an MCA on the integrated Route/Interchange Options for the whole route from Taylors Road to north of Levin.

While the approach, methodology and criteria need to be agreed at the workshop, the following criteria are put forward for consideration.

Agenda Item 4 – Ohau River to Kimberley Road Vicinity

It is proposed that we apply the same criteria that have been used for all earlier MCAs in this general vicinity, including MCAs on the wide range of options which led to the identification of TO2/4 and TO17 as preferred options to be proceeded with to public consultation, and the separate exercise that led to the preference for route 5A north of Ohau from several routes for TO2/4. While these criteria may not all apply to all options, and we may want to add criteria relating to property effects and dwellings in particular, we should discuss this at the start of the exercise.

The 11 criteria used in previous exercises are set out below, as a basis for this section of the workshop.

1. **Landscape/Visual** – this took into account 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 values⁴⁴, particularly those relating to patches of indigenous vegetation 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 and heritage sites and features, and also archaeological risks (i.e. the likelihood of encountering archaeological site).
4. **Tāngata Whenua 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.
5. **Productive Land Uses** – as reported and discussed at the workshop, this criterion took into account soils and the New Zealand Land Use Capability Classification, in particular classes 1 to 4 (productive land), the current productive landuse pattern, and potential severance effects on productive units.
6. **Social/Community Impacts** – this incorporated a range of considerations including severance effects, access to and from settlement areas and townships, general urban amenity, connectivity to community services and facilities, recreational effects, and construction impacts. (Note – direct effects on land including dwellings were included under specific land ownership effects.)

⁴⁴ 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.

7. **District and Regional Plans and Consentability** – this criterion includes consideration of both zoning and plan objectives and policies, and any major impediments through the plans to a route location.
8. **Fit to Project Objectives** – this criterion covered levels of service, and efficiency and effectiveness (in terms of best value solutions). The assessment took into account the local network and the various state highway components.
9. **Specific Land Owner/Land Use Effects** – this criterion considered impacts on areas which could potentially pose difficulties for the location of an option – including Crown Land, Māori multiple-owned land, QEII Trust conservation land, as well as particular landuses.
10. **Engineering Degree of Difficulty** – this 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”, additional provisions to address natural hazards such as hydrological impact, and general degree of difficulty in construction.
11. **Costs** – costs took into account the actual capital construction costs, including the range of matters identified under constructability, plus contingencies.

An alternative approach would be to just identify and note any additional issues which would be associated with a 4-lane expressway north of the Ohau on the TO2/4 option which may not have been identified in earlier 2-lane analyses, and then concentrate on the northern end of these routes, where the main distinguishing aspects are likely to be the local property/dwelling/amenity effects.

Agenda Item 6 – Integrated Route/Interchange Options

For this exercise, we do not want to re-evaluate the routes as this has been undertaken in the past to identify preferred route options, but rather to look at the implications/performance of the integrated routes with interchanges – at the moment there are 16 combinations to evaluate (see recent email from Jamie Povall, 4:00pm, 20th October 2016). This will require a different set of criteria from those used for the routes only, and are more directed at the interchanges and how they work in combination with the routes. Possible criteria are set out below for discussion at the workshop, along with the names of those who would lead the discussions.

1. **Landscape/Visual** – this covers effects on landscape character, including degree of modification, presence and impact of structures at intersections, and “fit” of intersections into landscape (Gavin Lister).
2. **Ecological Impact/Risk** – any impacts on valued ecological areas (Sylvia Allan in the absence of Adam Forbes).
3. **Land Take** – total area, number of parcels affected, implications on parcels, productive values (Kris Connell, Lachie Grant).
4. **Impacts on Cultural/Heritage/Archaeological Values** – impacts on Maori-owned land, areas with tangata whenua values, archaeological and heritage values risks and/or issues. Taking into account known values and likelihood of encountering archaeological sites (Morrie Love, Daniel Parker).
5. **Effects on Dwellings** – visual, noise, and amenity effects and direct loss of dwellings (Gavin Lister, Chris Connell).
6. **Local Connectivity/Severance** – effectiveness of route/interchange combinations in relation to local trips, access to services, providing for local/community travel patterns (Phil Peet).
7. **Geometry** – effectiveness/adequacy of route and interchange layout and design, route length implication on journey times (Phil Peet).

8. **Town Centre Access** – ability to provide effective connectivity to town centre (Phil Peet/ Sylvia Allan).
9. **Cost** – includes route and interchange costs; indicative only (Jamie Povall).
- 10.

These need to be discussed, expanded, added to, or deleted at the workshop.

Note in relation to above:

- staging opportunities have been specifically excluded as a criterion, as discussed in relation to Workshop 2
- project objectives are not included as a criterion, but are encapsulated in some of the above criteria.

Scoring

It is proposed that we use the same 1 to 5 scoring system as in the past. This is set out below:

Score	Description
1	The option presents few difficulties on the basis of the criterion being evaluated, taking into account reasonable mitigation proposals. There may be significant benefits in terms of the attribute.
2	The option presents only minor areas of difficulties on the basis of the criterion being evaluated, taking into account reasonable mitigation proposals. There may be some benefits in terms of the attribute.
3	The option presents some areas of reasonable difficulty in terms of the criterion 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 option includes extensive areas of difficulty in terms of the criterion being evaluated, which outweigh perceived benefits. Mitigation is not readily achievable.
5	The option includes extreme difficulties in terms of achieving the project on the basis of the criterion being evaluated.

However, we may wish to recast the descriptions in the light of the different nature of the criteria we are likely to be applying.

Please consider these aspects and come along with the intention of contributing to a good discussion.

Sylvia Allan
21st October 2016

Appendix K: Notes from Third Workshop – 25th October 2016

DRAFT

Meeting Name	Levin Northern Corridor Connection Third Workshop		
Meeting Venue	Buddle Findlay, 1 Willis Street		
Date Of Meeting	Tuesday 25, October 2016	Time Of Meeting	9:00am – 5:15pm

Attendees	Initials	
Greg Lee	GL	NZ Transport Agency
Caroline Horrox	CH	NZ Transport Agency
Mark Spring	MS	NZ Transport Agency
Jasvinder Madhar	JM	NZ Transport Agency
Shaun Harvey	SH	NZ Transport Agency
Phil Peet	PP	MWH
Jamie Povall	JP	MWH
Chris Scrafton	CS	MWH
Marten Oppenhuis	MO	MWH
David Allen	DA	Buddle Findlay (in part)
Thaddeus Ryan	TR	Buddle Findlay
Morrie Love	ML	Raukura Consultants
Lachie Grant	LG	Landvision
Sylvia Allan	SA	Allan Planning and Research
Daniel Parker	DP	Insite Archaeology
Kevin Peel	KP	Horowhenua District Council
Daniel Haigh	DH	Horowhenua District Council
David McGonigal	DMc	Horowhenua District Council (<i>consultant</i>)
Anna Wood	AW	Horowhenua District Council
Gavin Lister	GLi	Isthmus
John Foxall	JF	Horizons
Kris Connell	KC	The Property Group
Mitchell Bray	MB	The Property Group

Apologies	Initials	
Adam Forbes	AF	Forbes Ecology
Chris Robson	CR	MWH
David McCorkindale	DM	Horowhenua District Council

ML formally welcomed the group.

Agenda, briefing notes (two) and alignments (provided to technical experts) were all pre-circulated.

The draft Agenda was confirmed.

1. Introduction/Background (ML/GL/SA)

- 1.1 GL set out the background of the current project work and explained the current stage of the investigations.
- 1.2 The NZ Transport Agency (the Transport Agency) has been continuing investigations into the short, medium and long term road transport needs in the Otaki to North of Levin area (between Taylors Road and north of Levin).
- 1.3 Prior to undertaking community engagement on these proposals, the Transport Agency has elected to progress investigations beyond the Taylors to Ohau section, and to include improvements to the east and north of Levin. This will allow community consultation to be undertaken for the full area as a single coordinated engagement process.
- 1.4 This is the third of three workshops:
 - o The first entailed a site visit and then a workshop to set the scene and enabled the experts to get a preliminary understanding of the current environment prior to indicative routes being prepared, including mapping of known constraints within the corridor of interest. Notes from that workshop had been circulated and confirmed.
 - o The second entailed a workshop to share knowledge and test the collective understanding of the performance of the initial concept alignment options against assessment criteria (performance means understand likely scale of effects) including a formal multi-criteria analysis of the various options identified and discussed;
- 1.5 The purposes of this workshop are to:
 - o Review the findings of the second workshop MCA and consider how the preferred options could be combined.
 - o Refresh our understanding of the Taylors to Ohau (T2O) preferred options (TO17, TO2 and TO4). It was noted that TO2 and TO4 were very similar, and for the purpose of the Workshop (and future consultations), TO2 should be used as a proxy for TO4 as well.
 - o Look at linking up the southern and northern sections of the Northern Connection (a discussion of the practical locations for continuous routes) to the east and north of Levin.

- o Following the combination of the more preferred T2O options with the more preferred Northern Connection options, to consider each of the route options in conjunction with a range of possible intersection locations and designs. The term 'More preferred' refers to the previous MCA analysis undertaken separately for the T2O section and Northern Connection (NC) section.
 - o Undertake a multi-criteria analysis of the options; and
 - o Determine a "workshop" weighting of assessment criteria.
- 1.6 No decisions on routes or intersection designs have been made to date and none will be made today. Information will be used as an input to the decision making process.
- 1.7 Today is about understanding the performance of the different options on the table.

2. Outcome of Second Workshop (Route Options for Northern Connection)

Southern Section:

- 2.1 Routes NC3 and NC5 were identified as the preferred options from the second workshop
- 2.2 SA outlined additional work undertaken since the previous workshop:
- o Routes NC1 – 5 had been subject to analysis on the basis of a RMA s6 and social, environmental, cultural and economic weighting, in addition to the workshop weighting;
 - o Routes NC1 – 5 were also assessed with cost and without cost. No real differences between the outcomes from the two assessment processes.

Northern Section:

- 2.3 On the basis of the same analysis, NC8 was identified as the preferred option with NC10 second. These were quite clear preferences.

Overall:

- 2.4 It was noted that the preferred southern option does not align with the preferred northern option (i.e. they do not connect at the boundary between the two sections, at Queen Street)
- 2.5 A question was raised as to why there were no options for north of Levin identified as preferred (for the area between Heatherlea East Road, Roslyn Road, SH1 and SH57). PP noted that there was a very clear preference at the northern end taking into account the topography (landscape effects), ecological and cultural values, the need for a rail crossing and the alignment of SH1 and that it is a wide corridor (providing sufficient design flexibility). It was also noted that this was a short length of the northern section, and there were options for the remainder of the route length.
- Workshop participants were in agreement with these points. HDC representatives noted issues with Roslyn Road access if an option further south had been retained in this area.
- 2.6 Route options were tabled and briefly discussed. Workshop participants were provided combinations of the preferred southern and northern sections.
- 2.7 The question of whether an option in the middle but too readily discounted? – further thought of a mid-option required (NC13), that connects to Queen Street between NC8 and NC10.

3. Analysis of Option NC13

3.1 Participants were asked (as a group) to undertake an assessment of the NC13 Option utilising the Assessment Criteria adopted for previous Project assessments. The following provides a summary of this assessment:

Landscape and Visual

3.2 Main effect in this area constitutes impact on houses. Slightly greater impact from NC13 than NC5.

Ecology⁴⁵

3.3 No real issues. NC13 route slightly worse than NC5 due to some mature indigenous trees.

Archaeology

3.4 A historic homestead (associated with the Adkins family) was noted as being present to the north of Queens St and very close to or within the NC13 route. This property has been heavily modified. This historic house would be impacted by the NC13 route but not the NC5 route. Thus NC13 route worse than NC5 route.

Tangata Whenua

3.5 No real difference between NC13 and the NC5 routes.

Productive Soils

3.6 Both routes are similar in terms of this criterion - neutral.

District Plan

3.7 Both routes bisect the identified growth area. Both routes would score poorly on this criterion.

Impacts on dwellings NC13 affects more existing dwellings just north of Queen St, and some approved and not yet built. It also impinges more closely on Redwood Grove. NC5 preferred.

Fit to project objectives

3.8 No real difference between NC5 and NC13.

Property degree of difficulty

3.9 No real degree of difference between NC5 and NC13.

Cost

3.10 Red route is the same as NC10 to the south. Very close to NC 5 at north.

Overall

3.11 On balance, it was decided that NC13 had a number of issues which meant that it should not be preferred to the NC5/NC10 option. However, ways should continue to be sought, when refining the alignment of NC5/NC10 to make the alignment as straight and direct as possible.

4. Refresher of Preferred Route Options for Taylors to Ohau (T2O)

4.1 PP provided participants with an outline of the processes used and preferences identified over a number of analyses and a considerable period for the T2O section. Key comments included:

- o With regards to Taylors Road to Ohau (T2O), originally five options were identified (from a much wider range of options) being TO1 – TO5 each of which also had a 'variant' option TO1A-TO5A at the southern end). Later, and as a result of discussions

⁴⁵ All ecological assessments noted in these minutes are to be confirmed by AF.

with local iwi, three additional options were added (TO15 – TO17). Out of the analysis of all options TO17 was identified as the preferred. TO2 was second preferred option.

- o The preferred option of the NC section doesn't connect with preferred option for the T2O sections so options for both have been taken through.
- o Confirmation that, if the purple route is the preferred choice in the NC, it can connect to either route to the south. Joining up the T2O options with the NC options near Kimberley Road was not resolved at Workshop 2.
- o The options are not interchange dependent, in other words any option is compatible with any interchange option.
- o TO2 option only previously considered as a two lane option north of the Ohau River. The question of whether this option should be considered as a 4 lane option was raised i.e. whether an MCA process for options north of Ohau River Bridge should be undertaken or whether further analysis of any issues if the TO2 route becomes a four lane highway should be documented. It was agreed this exercise should be carried out.
- o Noted that TO17 was considered as a full length four lane in most recent (route refinement) investigation.

4.2 The following issues were raised in relation to TO2 north of the Ohau River.:

- o TO2 as a two lane option just about avoids three areas of significant native bush.
- o Geometry is expected to be difficult due to limited area to weave the alignment whilst maintaining acceptable horizontal geometric standards.
- o Four lane option would be difficult to avoid all three areas of native bush.
- o An alternative TO2 could be possible to avoid the bush, by swinging further south. It is not certain whether this would be geometrically possible, given the alignment and river terraces. Such an alternative was expected to be difficult, if not unachievable
- o TO2 cannot avoid the Maori Land block regardless, but a 4-lane expressway would have greater implications.
- o 'Swing' of TO2 needs to retain distance from river terraces (i.e. from crossing river, heading east whilst avoiding valued bush, then turning north to connect into NC options)
- o Northern TO2 options (solid and dashed orange alignments) should be dismissed as a result of impacts on ecological areas.
- o Need to check cultural issues/land ownership around Muhunua Rd
- o TO2 is likely to affect a substantial number of archaeological sites, primarily located around forest clearings occupied by Maori, both north and south of the Ohau River. North of the Ohau River TO2 runs parallel to the southern boundary of the Wera-o-whango clearing. This clearing, and the land between it and the river, was intensively occupied before and during the 19th Century: there may be substantial archaeological deposits in this area.

4.3 The following questions were raised by workshop participants:

- o Why there are no additional options for north of Levin identified (for the area between Heatherlea East Road, Roslyn Road, SH1 and SH57)

PP noted that there was a very clear preference at the northern end and that it is a very wide corridor. No disagreement with this approach was noted.

- o For the T2O section, and for southern portion of the route a question was raised as to whether an option to the east of the foothills had been undertaken (with the alignment running much further east, near to the intersection of Corbetts Road, Waitohu Valley Road & South Manakau Road). Those involved in the earlier analysis (PP, MO and SA) referred to assessments undertaken approximately five years ago (See Scoping Report, Otaki to North of Levin Expressway, July 2012, esp Appendix J) . This option was dismissed for various reasons including geotechnical, degree of difficulty, route distance and inability to connect back into PP20 preferred option.

5. Joining T2O options with Northern Connection options

- 5.1 JP provided a summary of options and the principles used to identify the presented list of connections that could join T2O options with NC options near Kimberley Road. The western NC route is now referred to as NC4 and the eastern option as NC5.
- 5.2 Participants were asked (as a group) to undertake an assessment of the Options utilising the Assessment Criteria adopted for the second workshop. The following provides a summary of this assessment:

Landscape and Visual

- 5.3 The two eastern options joining both southern routes to NC5 are better than the two western options as they affect less houses and have less impact on the local road network. However, all options would be workable.

Ecology

- 5.4 Marginal preference for eastern options over western options due to potential for localised steams/wetland areas west of Arapaepae Road.

Archaeology

- 5.5 No real difference between any of the options.

Tangata Whenua

- 5.6 Neutral between the options.

Productive Soils

- 5.7 Eastern option marginally better.

District Plan

- 5.8 No real difference between any of the options.

Impacts on dwellings

- 5.9 Equally difficult.

Fit to project objectives

- 5.10 No real difference between any of the options.

Property degree of difficulty

- 5.11 Does not appear to be any material difference between the options.

Engineering degree of difficulty

- 5.12 Western option marginally preferred.

Cost

- 5.13 Western option marginally preferred, but of a similar order.

Summary

- 5.14 An option that avoids the bush areas to the south (for TO2 connections) then connects to the NC alignments east of McLeavey was likely to be preferred. For TO17 a route further east was marginally preferred.
- 5.15 Two additional points were noted:
- o The density of local roads in this area means that any option will be complex.
 - o A new subdivision has been approved giving access to 11 lots from Arapaepae Road opposite the end of McLeavey Road.

6. Interchange options

- 6.1 JP provided a description/explanation of interchange options. Key points include:
- o 6 general locations for interchanges are being considered. They are identified as Northern Extent; SH57; Queen St; Tararua Rd; Ohau River and Manakau.
 - o The existing SH1 will remain in place as an alternative route between Otaki and Levin.
 - o Consistent with RoNs, there are three types of interchange options being considered:
 - Full diamond;
 - Half diamond;
 - Bifurcation.
 - o Roundabouts are not considered appropriate for the standard of road wanted.
 - o Interchange at Manakau has moved from the previous location under consideration, to further north, following advice from HDC.
 - o The area south of the Ohau River is possible for a bifurcation or full interchange at Manakau, but not both. Reason being that previous modelling for TO17 shows very little demand for Manakau interchange if a bifurcation is provided.
 - o Tararua Rd and Queen St are only a couple of kilometres apart. As such it is not proposed to provide full interchanges at both.
 - o The option at SH57 (north of Levin) is always a bifurcation as this is a NZ Transport Agency requirement to maintain a very high standard of connection between these two important state highways. Due to geometric constraints, if any form of interchange is provided at Queen Street, then the existing SH57 needs to be closed off immediately south of the SH57 bifurcation (it is too close to the Queen Street interchange to meet road design standards). If no interchange is provided at Queen Street, then the existing SH57 can be maintained through the bifurcation.
 - o The Northern Extent (i.e. to reconnect with SH1) interchange option is only looking at a half diamond to provide grade separation and remove the crash risk particularly from right turn movements, given this will be a heavily used intersection for all traffic travelling to and from Levin from SH1 to the north. Looking at suitable options, some form of grade separation is required to maintain appropriate movements. This is a long term solution; medium term could be something else (such as an at-grade roundabout)
 - o For all options the expressway will generally be at grade with local road network flyovers at key locations.

- o Keeping the entire existing SH open for the entire route is now a project expectation, and will help meet the project objective for resilience.
- o If bifurcation is preferred at Ohau River then an interchange at Manakau will not be proposed (due to demand and spacing of interchange facilities).

6.2 Workshop participants raised the following issues/concerns/comments:

- o Concerns raised regarding lack of interchange (and a bifurcation instead south of Kuku) just north of Manakau. A diamond interchange here would have significant effects and would not be beneficial in terms of traffic volumes (low) and potential costs (high).
- o At SH57 (northern end of Levin), from a local network perspective some participants stated that they would not want to see a bifurcation with no local access there.
- o All options for SH57 are bifurcation following discussions with NZTA National Office representatives, to provide a very high standard between two important state highways. This decision has been formalised through NZTA meetings and minutes as part of the interchange strategy.

7. Integrated Route/Interchange Options

7.1 SA and PP led a discussion regarding the criteria that should be adopted for the MCA to be undertaken, taking into account routes and interchanges. It was noted that all route options had been the subject of previous MCAs and all had been identified as preferred or close to preferred. The criteria to be used in the analysis should encompass both the routes and the interchanges, ensuring that the criteria were suitable for the impacts of the interchanges which may be different from the routes on their own.

7.2 Participants considered the criteria that had been pre-circulated (Background Note – Possible Criteria for Multi-Criteria Analysis Workshop, 25th October 2016). The following criteria were adopted for the MCA process:

- o **Landscape/Visual** – this covers effects on landscape character, including degree of modification, presence and impact of structures at intersections, and “fit” of intersections into landscape (Gavin Lister).
- o **Ecological Impact/Risk** – any impacts on valued ecological areas (Sylvia Allan in the absence of Adam Forbes).
- o **Property effects** – direct effects such as total area, number of parcels affected, implications on parcels, productive values (Kris Connell, Lachie Grant).
- o **Impacts on tangata whenua values** – impacts on Maori-owned land, areas with tangata whenua values and severance between important areas (Morrie Love)
- o **Impacts on Archaeological and Heritage Values** - Taking into account known values and likelihood of encountering archaeological sites (Daniel Parker).
- o **Effects on Productive Land** – loss of productive values due to direct loss of land and severance of existing productive units (Lachie Grant).
- o **Effects on Dwellings** – indirect effects including visual, noise, and amenity effects and direct loss of dwellings (Gavin Lister, Kris Connell).
- o **Local Connectivity** – providing for local/community travel patterns and access to centres of Manakau, Ohau, Otaki, Kimberley and the rest of Horowhenua (Phil Peet).

- o **Geometry** – effectiveness/adequacy of route and interchange layout and design (inclusive of safety), route length implication on journey times (Jamie Povall).
- o **Access to Levin** – ability to provide effective connectivity to Levin including the town centre (Phil Peet/ Sylvia Allan).
- o **Cost** – includes route and interchange costs; indicative only (Jamie Povall).
- o **Fit with District Plan (Structure Plan 13)** – the degree to which the option is consistent with the anticipated land use patterns of Structure Plan 13 (Chris Scrafton)

7.3 A discussion was held as to the scoring system and it was decided to continue to use the one to 5 method of scoring. The descriptors are to be modified to reflect the circumstances of this MCA.

8. Application of Criteria

8.1 The MCA was undertaken on options that had been developed using a combination of TO17 and TO2 with a range of interchange types. The options were provided schematically on a single page to allow for comparisons but were also considered on the basis of indicative overlay plans showing the affected areas.

8.2 Through the MCA workshop, the following general comments were made regarding assessment against the various criteria:

Landscape and visual

- o Potential effects on Queen St interchange and Bifurcation at Ohau are significant. Western options don't fit the landscape as well as the eastern options.
- o Bifurcation at SH57 is reasonably substantial but is common to all.

Ecology

- o Potential effects on bush at Queen Street one of the biggest issue, but also important to avoid the bush at Muhunua East Road.

Property Effects

- o Difficult to identify full complexity of effects on any land, including maori land, given that the design detail of the interchanges is only available at a very high level to date.
- o Need to consider criterion as "degree of difficulty".
- o Options 3A and 4A are close to being fatally flawed due to the extent of impact on maori freehold land and associated interests (such as rights of way for example).

Productive land values

- o TO17 is preferred over TO2. NC4 preferred to NC5.

Cultural Values

- o TO2 severs aori communities from the coast. These all get scored as a 5.

Archaeological risk/built heritage risk

- o The interchanges don't really affect the scoring.
- o For most part TO17 and NC5 are the best.

Effects on dwellings

- o Discussion of best approach to measure this. Comes down to direct effects plus effects on remaining dwellings in proximity – mainly visual and noise.

Local Connectivity

Lots of uncertainty regarding interchange needs and effects on travel patterns.
Need to revisit later and check against modelling results. However, clearly some are worse than others, particularly for settlements south of Ohau.

Geometry

- o No material difference in any options for safety as all propose very high standard interchanges and RONS design standards for the alignments, based on a design speed of 110kph (RoNS standard).
- o Length and alignment (horizontal curvature) make up the consideration.
- o '2' variant options are the shortest followed by the 1 options, then 4 then 3.
- o Curvature wise, 3s are worst, then 4s and then 1s and 2s are equally the best (based on considerations of the curve radii being proposed, particularly 1100m and 820m radii given these are the RONS desirable and minimums).
- o 4 is worse than 3 but not to an extent that warrants a differentiation of score.

Cost

- o Does not include contingency, no 3D design, no land costs, no local road costs other than local road bridges.
- o Based on a linear corridor rate (informed by other projects) on expressway and structures (inc. interchanges costs). Bridge costs based on indicative size of bridges.
- o Range of 10% difference between all options.
- o Primarily influenced by number of structures.

8.3 The table on the following pages provides a summary of the MCA workshop exercise.

Option	Landscape Visual	Ecological Impact	Property Effects	Impacts on Cultural Values	Impacts on Heritage and /or Archaeology	Effects on Dwellings	Local Connectivity	Geometry	Levin Access	Cost	Productive Land
1A	<ul style="list-style-type: none"> Concerns regarding the Queen St interchange; Ohau River bifurcation seems to result in unnecessary adverse effects. Overall, one of the worst options. 	<ul style="list-style-type: none"> Potential for some ecological impact 	<ul style="list-style-type: none"> Extensive difficulties with land take, particularly around Queen St. 	<ul style="list-style-type: none"> Significant impacts on cultural values – incl Ohau River. 	<ul style="list-style-type: none"> Some concerns regarding heritage and archaeological values. 	<ul style="list-style-type: none"> Direct effects on dwellings moderate Some indirect effects on dwellings due to proximity. 	<ul style="list-style-type: none"> No real benefit for people to the south of Ohau. 	<ul style="list-style-type: none"> Significant benefits. 	<ul style="list-style-type: none"> Some impacts on those wanting to travel to/from Palmerston North Access to Wellington will improve. Best option for access from Manakau to Levin 	<ul style="list-style-type: none"> Relatively low cost. 	<ul style="list-style-type: none"> Minor concerns regarding productive land.
1B	<ul style="list-style-type: none"> As bad as 1A. Overall, one of the worst options. 	<ul style="list-style-type: none"> Potential for some ecological impact 	<ul style="list-style-type: none"> Extensive difficulties with land take 	<ul style="list-style-type: none"> Significant impacts on cultural values – incl Ohau River. 	<ul style="list-style-type: none"> Some concerns regarding heritage and archaeological values. 	<ul style="list-style-type: none"> Direct effects on dwellings moderate Minor concern regarding indirect effects. 	<ul style="list-style-type: none"> No real benefit for people to the south of Ohau 	<ul style="list-style-type: none"> Significant benefits. 	<ul style="list-style-type: none"> Difficulty getting to Tararua to Kimberley. Will need a flyover - to be added. 	<ul style="list-style-type: none"> Relatively low cost. 	<ul style="list-style-type: none"> Minor concerns regarding productive land.
1C	<ul style="list-style-type: none"> Some concerns regarding landscape and visual impacts. Not as bad as 1A or 1B. 	<ul style="list-style-type: none"> Potential for minor ecological impact 	<ul style="list-style-type: none"> Extensive difficulties with land take, particularly around Queen St. 	<ul style="list-style-type: none"> Some impacts on cultural values. Not as bad as 1A or 1B. 	<ul style="list-style-type: none"> Minor concerns regarding heritage and archaeological values. 	<ul style="list-style-type: none"> Direct effects on dwellings moderate Some indirect effects on dwellings due to proximity. 	<ul style="list-style-type: none"> Some concerns however not as bad as 1A or 1B as there are some benefits for Manakau residents 	<ul style="list-style-type: none"> Significant benefits. 	<ul style="list-style-type: none"> Extensive difficulties, worse than 1A and 1B. 	<ul style="list-style-type: none"> Relatively medium cost. 	<ul style="list-style-type: none"> Minor concerns regarding productive land.
1D	<ul style="list-style-type: none"> Some concerns but doesn't impact on any sensitive areas. 	<ul style="list-style-type: none"> Potential for minor ecological impact 	<ul style="list-style-type: none"> Some difficulties with land take. Not as bad as 1A, 1B or 1C. 	<ul style="list-style-type: none"> Some impacts on cultural values. Not as bad as 1A or 1B. 	<ul style="list-style-type: none"> Minor concerns regarding heritage and archaeological values. 	<ul style="list-style-type: none"> Direct effects on dwellings moderate Minor concern regarding indirect effects. 	<ul style="list-style-type: none"> Some concerns however not as bad as 1A or 1B. 	<ul style="list-style-type: none"> Significant benefits. 	<ul style="list-style-type: none"> Minor difficulties, has full access arrangements at both the north and south 	<ul style="list-style-type: none"> Relatively high cost. 	<ul style="list-style-type: none"> Minor concerns regarding productive land.
2A	<ul style="list-style-type: none"> Minor concerns but probably the best option. 	<ul style="list-style-type: none"> Potential for some ecological impact 	<ul style="list-style-type: none"> Some difficulties with land take. Not as bad as 1A, 1B or 1C. 	<ul style="list-style-type: none"> Some impacts on cultural values. Not as bad as 1A or 1B. 	<ul style="list-style-type: none"> Risk of impacts on Prouse Homestead. 	<ul style="list-style-type: none"> Direct effects on dwellings moderate Minor concern regarding indirect effects. 	<ul style="list-style-type: none"> Minor concerns, results in relatively good connectivity for everyone. 	<ul style="list-style-type: none"> Significant benefits. 	<ul style="list-style-type: none"> Minor difficulties, has full access arrangements at both the north and south 	<ul style="list-style-type: none"> Relatively medium cost. 	<ul style="list-style-type: none"> Minor concerns regarding productive land.
2B	<ul style="list-style-type: none"> Some concerns primarily as a result of the bifurcation. 	<ul style="list-style-type: none"> Potential for extensive ecological impact due to Ohau bifurcation. 	<ul style="list-style-type: none"> Some difficulties with land take. Not as bad as 1A, 1B or 1C. 	<ul style="list-style-type: none"> Potential for extensive impacts on cultural values – incl Ohau River. 	<ul style="list-style-type: none"> Risk of impacts on Prouse Homestead. 	<ul style="list-style-type: none"> Direct effects on dwellings moderate Minor concern regarding indirect effects. 	<ul style="list-style-type: none"> Some concerns. Not as good as 2A for Manakau. 	<ul style="list-style-type: none"> Significant benefits. 	<ul style="list-style-type: none"> Slightly better than 2A on the assumption that there is an upgrade at the SH1 intersection. 	<ul style="list-style-type: none"> Relatively medium cost. 	<ul style="list-style-type: none"> Minor concerns regarding productive land.
2C	<ul style="list-style-type: none"> Some concerns primarily as a result of the bifurcation. 	<ul style="list-style-type: none"> Potential for extensive ecological impact due to Ohau bifurcation 	<ul style="list-style-type: none"> Extensive difficulties with land take. 	<ul style="list-style-type: none"> Potential for extensive impacts on cultural values – incl Ohau River. 	<ul style="list-style-type: none"> Extensive difficulties as potentially results in impacts on Prouse Homestead 	<ul style="list-style-type: none"> Direct effects on dwellings moderate Minor concern regarding 	<ul style="list-style-type: none"> Some concerns. Not as good as 2A for Manakau. 	<ul style="list-style-type: none"> Significant benefits. 	<ul style="list-style-type: none"> Worse than 2B as connectivity to bifurcation is not there. Slightly better than 1B. 	<ul style="list-style-type: none"> Relatively low cost. 	<ul style="list-style-type: none"> Minor concerns regarding productive land.

Option	Landscape Visual	Ecological Impact	Property Effects	Impacts on Cultural Values	Impacts on Heritage and /or Archaeology	Effects on Dwellings	Local Connectivity	Geometry	Levin Access	Cost	Productive Land
		and Queen St half-diamond.			due to Queen St half diamond.	indirect effects.					
2D	<ul style="list-style-type: none"> Extensive concerns, primarily as a result of the Queen St interchange. 	<ul style="list-style-type: none"> Potential for significant adverse ecological effects due to full diamond at Queen St. 	<ul style="list-style-type: none"> Extensive difficulties with land take. 	<ul style="list-style-type: none"> Potential for some impacts on cultural values. 	<ul style="list-style-type: none"> Extensive difficulties as results in impacts on Prouse Homestead. 	<ul style="list-style-type: none"> Direct effects on dwellings moderate Minor concern regarding indirect effects. 	<ul style="list-style-type: none"> Some difficulties but one of the best options. 	<ul style="list-style-type: none"> Significant benefits. 	<ul style="list-style-type: none"> Similar to Option 2C but with better connectivity to the north. 	<ul style="list-style-type: none"> Relatively low cost. 	<ul style="list-style-type: none"> Minor concerns regarding productive land.
3A	<ul style="list-style-type: none"> Some concerns as some bends and curves in alignment but one of the best western options. 	<ul style="list-style-type: none"> Potential for minor adverse ecological effects. 	<ul style="list-style-type: none"> Volume of impacts on Maori freehold land and current caselaw indicate a significant degree of difficulty with this option to the extent that it is almost a fatal flaw. Manakau full diamond has greatest risk. 	<ul style="list-style-type: none"> TO2 severs maori communities from the coast. This results in potentially significant adverse cultural effects. Other cultural impacts with TO2 options. 	<ul style="list-style-type: none"> Significant risk of archaeological impacts associated with TO2 	<ul style="list-style-type: none"> Direct effects on dwellings moderate Minor concern regarding indirect effects. 	<ul style="list-style-type: none"> Some difficulties but good overall connectivity. Not as good as "2s" 	<ul style="list-style-type: none"> Some difficulties. The worst curvature of all options and amongst the longest options. 	<ul style="list-style-type: none"> Minor difficulties, has full access arrangements at both the north and south 	<ul style="list-style-type: none"> Relatively high cost. 	<ul style="list-style-type: none"> Some concerns regarding productive land. TO2 options have greater impacts on productive values/activities.
3B	<ul style="list-style-type: none"> Extensive concerns, primarily as a result of the obtrusive interchange at Ohau River. 	<ul style="list-style-type: none"> Potential for some adverse ecological effects. 	<ul style="list-style-type: none"> Some difficulties with land take. 	<ul style="list-style-type: none"> TO2 severs Maori communities from the coast. This results in potentially significant adverse cultural effects. Other cultural impacts with TO2 options. 	<ul style="list-style-type: none"> Significant risk of archaeological impacts associated with TO2. 	<ul style="list-style-type: none"> Direct effects on dwellings moderate Minor concern regarding indirect effects. 	<ul style="list-style-type: none"> Some difficulties but good overall connectivity. Not as good as "2s" 	<ul style="list-style-type: none"> Some difficulties. The worst curvature of all options and amongst the longest options. 	<ul style="list-style-type: none"> Best option. Good connectivity. 	<ul style="list-style-type: none"> Relatively medium cost. 	<ul style="list-style-type: none"> Some concerns regarding productive land.
3C	<ul style="list-style-type: none"> Extensive concerns, similar to 3B. 	<ul style="list-style-type: none"> Potential for some adverse ecological effects. 	<ul style="list-style-type: none"> Extensive difficulties with land take. 	<ul style="list-style-type: none"> TO2 severs Maori communities from the coast. This results in potentially significant adverse cultural effects. Other cultural impacts with TO2 options. 	<ul style="list-style-type: none"> Significant risk of archaeological impacts associated with TO2. 	<ul style="list-style-type: none"> Direct effects on dwellings moderate Minor concern regarding indirect effects. 	<ul style="list-style-type: none"> Some difficulties but good overall connectivity. Not as good as "2s" 	<ul style="list-style-type: none"> Some difficulties. The worst curvature of all options and amongst the longest options. 	<ul style="list-style-type: none"> Some difficulties. Similar to Option 1B. 	<ul style="list-style-type: none"> Relatively low cost. 	<ul style="list-style-type: none"> Some concerns regarding productive land.
3D	<ul style="list-style-type: none"> Extensive concerns. 	<ul style="list-style-type: none"> Potential for some adverse ecological effects. Avoids 	<ul style="list-style-type: none"> Extensive difficulties with land take. 	<ul style="list-style-type: none"> TO2 severs Maori communities from the 	<ul style="list-style-type: none"> Significant risk of archaeological impacts 	<ul style="list-style-type: none"> Direct effects on dwellings moderate 	<ul style="list-style-type: none"> Extensive difficulties regarding 	<ul style="list-style-type: none"> Some difficulties. The worst curvature 	<ul style="list-style-type: none"> Some difficulties. Same as Option 1A. 	<ul style="list-style-type: none"> Relatively low cost. 	<ul style="list-style-type: none"> Some concerns regarding

Option	Landscape Visual	Ecological Impact	Property Effects	Impacts on Cultural Values	Impacts on Heritage and /or Archaeology	Effects on Dwellings	Local Connectivity	Geometry	Levin Access	Cost	Productive Land
		the Queen Street bush.		coast. This results in potentially significant adverse cultural effects. • Other cultural impacts with TO2 options.	associated with TO2.	• Some concerns regarding indirect effects.	local connectivity.	of all options and amongst the longest options.			productive land.
4A	• Some concerns but less intrusive at Manakau and Tararua St. than "3" options.	• Potential for some adverse ecological effects.	• Volume of impacts on Maori freehold land and current caselaw indicate a significant degree of difficulty with this option to the extent that it is almost a fatal flaw. • Manakau full diamond has greatest risk.	• TO2 severs Maori communities from the coast. This results in potentially significant adverse cultural effects. • Other cultural impacts with TO2 options.	• Significant risk of archaeological impacts associated with TO2	• Direct effects on dwellings moderate • Minor concerns regarding indirect effects.	• Minor difficulties. Relatively good connectivity for everyone.	• Some difficulties. Not as bad as "3" options.	• Minor difficulties, has full access arrangements at both the north and south	• Relatively high cost.	• Some concerns regarding productive land.
4B	• Extensive concerns, particularly with regards to impacts at Ohau River.	• Potential for extensive adverse ecological effects due primarily to Ohau River bifurcation but also half-diamond at Queen St.	• Some difficulties with land take.	• TO2 severs Maori communities from the coast. This results in potentially significant adverse cultural effects. • Other cultural impacts with TO2 options.	• Significant risk of archaeological impacts associated with TO2.	• Direct effects on dwellings moderate • Minor concerns regarding indirect effects.	• Some difficulties but generally good. A lot of travel on existing network required.	• Some difficulties. Not as bad as "3" options.	• Some difficulties. Similar to Option 1B.	• Relatively low cost.	• Some concerns regarding productive land.
4C	• Extensive concerns, particularly with regards to impacts at Ohau River.	• Potential for extensive adverse ecological effects including those from Ohau River bifurcation.	• Some difficulties with land take.	• TO2 severs Maori communities from the coast. This results in potentially significant adverse cultural effects. • Other cultural impacts with TO2 options.	• Significant risk of archaeological impacts associated with TO2 • Some risk of impacts on Prouse Homestead due to half diamond.	• Direct effects on dwellings moderate • Minor concerns regarding indirect effects.	• Some difficulties but generally good. Similar to 4B. The full interchange at Tararua St helps people travelling north.	• Some difficulties. Not as bad as "3" options.	• Slightly better than 2A on the assumption that there is an upgrade at the SH1 intersection.	• Relatively medium cost.	• Some concerns regarding productive land.
4D	• Significant concerns. The worst option.	• Potential for significant adverse ecological effects	• Extensive difficulties with land take.	• TO2 severs Maori communities from the coast. This	• Extensive difficulties as results in impacts on Prouse	• Direct effects on dwellings moderate • Some concerns	• Some difficulties but no real difference to	• Some difficulties. Not as bad as "3" options.	• Some difficulties. Same as Option 1A.	• Relatively low cost.	• Some concerns regarding productive land.

Option	Landscape Visual	Ecological Impact	Property Effects	Impacts on Cultural Values	Impacts on Heritage and /or Archaeology	Effects on Dwellings	Local Connectivity	Geometry	Levin Access	Cost	Productive Land
		including full diamond at Queen St and Ohau River bifurcation .		results in potentially significant adverse cultural effects. • Other cultural impacts with TO2 options.	Homestead. This option has the worst impact on the Homestead. • Significant risk of archaeological impacts associated with TO2	regarding indirect effects.	other "4" options.				

Appendix L: Information from Technical Experts for Combined Route/Interchange MCA

isthmus

ŌTAKI TO LEVIN ROAD OF NATIONAL SIGNIFICANCE

MCA: COMBINED ROUTES AND INTERCHANGES

URBAN DESIGN + LANDSCAPE + VISUAL

Client: MWH on behalf of NZTA
Project: Ōtaki to Levin 'Roads of National Significance'
Code: 2923
Report: MCA: Combined Routes and Interchanges
Status: Final
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1 INTRODUCTION

- 1.1 The Ōtaki to North of Levin Roads of National Significance (RONS) falls into two sections north and south of Kimberley Road. Previous analysis narrowed the options to two alternatives in each of these north and south sections – providing four possible combinations of overall route.

	<i>Westerly</i>	<i>Easterly</i>
North	NC-4	NC-5
South	TO-2	TO-17

- 1.2 Some 15 interchange options have also been designed for these routes.
- 1.3 The purpose of this report is to assess the relative merits of a combined route (i.e. the four combinations outlined above) together with interchange options. A total of 16 route and interchange alternatives were assessed at a Multi-criteria Analysis (MCA) workshop held in Wellington on 25 October 2016. The information contained in this report formed part of the background to the workshop.

2 CONTEXT

- 2.1 The area is described in the ‘Landscape and Urban Design **Baseline Report**’ (Isthmus April 2011), with further detail in subsequent reports.
- 2.2 In summary, the area is **gently-rolling-to-flat coastal plain and river terraces**, with a backdrop of the Tararua Ranges foothills. It is a **productive rural landscape** including dairying and other pastoral farming, substantial areas of cultivated ground, and other intensive uses such a stud farm, nursery, poultry farms, glass houses and a vineyard.
- 2.3 The main natural features are the **streams and rivers** which run from east to west across the plain, including the Ohau River and Waikawa Stream. The area north-east of Levin contains the north-flowing Koputaroa Stream and its tributaries, which feed into the Manawatu River. There are also **remnant stands of tōtara forest** on the terraces north of Ōhau River and east of Levin.
- 2.4 State highway 1 (**‘SH1’**) and the ‘North Island Main Trunk’ (**‘NIMT’**) railway run north-south across the coastal plain, perpendicular to the rivers and streams. Local roads typically branch off SH1 either west toward the coast or east toward the hills. SH57 diverges from SH1 south of Levin, and passes to the east of Levin.
- 2.5 **Settlements** are located along the railway line and SH1, including the historical settlements of Manakau and Ōhau, the Ngāti Wehi Wehi and Tukuorehe Maraes – along with their associated settlements and urupā – and Levin.

- 2.6 **Levin** is Horowhenua's main town. It is laid out on a grid street pattern, bisected by SH1 which also serves as the 'main street'. The North Island Main Trunk runs parallel to the main street, effectively dividing the town into an east and west part. The main perpendicular axis, Queen Street, further partitions Levin into four quadrants.
- 2.7 SH57 runs along Arapaepae Road on Levin's eastern boundary. It separates the urban part of Levin from an area to the east that is increasingly taking on a rural residential character. Another pattern worth noting is clustering of Industrial activities in the southern part of Levin.
- 2.8 There is a reasonably **close pattern of rural settlement**, reflecting the intensive agriculture, and also pockets of **rural-residential** subdivision. As a consequence, each of the route alternatives unavoidably affects such properties.

3 METHOD

- 3.1 Sixteen alternatives were identified comprising different combinations of the four route options and combinations of interchange.
- 3.2 An overall landscape + visual assessment was made for each alternative. It is a measure of the extent to which the option 'fits' the landscape and the likely effects of the alternative taking into account such aspects as:
- Topography
 - Natural features such as streams, stands of bush
 - 'Grain' – alignment with patterns formed by property boundaries, roads and blocks, settlements, edges in land use
 - Footprint of the interchanges
 - Visual impacts – this includes such characteristics of the interchanges as simplicity, legibility, and prominence of structures.
- 3.3 In this instance effects on dwellings was assessed separately and not as part of the landscape and visual criterion.
- 3.4 Options were scored on a five-point scale: 1 = best, 5 = worst. The scoring is for the purpose of comparing alternatives. A score of 1 means an option is amongst the best alternative that could be achieved by a highway within the particular area. It doesn't mean that it will have no adverse effects. However, the scores are intended to indicate the degree of difference between options. For example the difference between 1 and 2 indicates reasonably modest difference in effects, while a 5 score would have substantially greater effects than a 1 option. More than one option can have the same score if the degree of effects would be more or less similar.
- 3.5 The scoring is based on routes 150m wide. There will be further opportunities to improve design and reduce effects during subsequent design phases.

- 3.6 Although it is not part of this report, it is worth commenting on the ‘effects on dwellings’ criterion which was measured by counting houses falling within the 150m route width. This measure is a proxy given that an indicative highway designs were not available for the different routes. A four-lane highway is typically 60m wide, so if an alignment in the centre of the route is assumed, the criterion would capture those dwellings within the highway footprint and typically 45m either side. It is acknowledged that dwellings further than 45m are still likely to be adversely affected depending on actual details, and also that the actual alignment may not be in the centre of a route. However, in the absence of a design it is considered a reasonable proxy measure for the purpose of comparing routes.

4 COMPARISON OF OVERALL ROUTES AND INTERCHANGES

Option 1A

- 4.1 Combines TO-17 and TO-5 – an easterly option nearest the Tararua foothills and the following interchanges:
- Bifurcation south of Ōhau River
 - Diamond at Queen Street
 - Closed SH57 bifurcation (no direct connection to Arapaepae Road)
 - Half diamond (south facing) north of Levin
- 4.2 The ‘1’ route has a reasonably good fit with landscape, tracking the Tararua foothills on the east side of the plains, passing behind Manakau, crossing the Ōhau River at an appropriate location, and achieving a reasonably good fit with the cadastral and block pattern. North of Levin the route is mid-block between Roslyn and Heatherlea Road. However, it does not have quite as good a ‘fit’ with the landscape as the ‘2’ options because it cuts diagonally across the cadastral grain east of Levin.
- 4.3 The interchanges would be amongst the least preferred for the following reasons:
- The bifurcation south of the Ōhau River has a large footprint, would require an additional crossing of the Ōhau River (with consequent natural character effects), would further partition land on the south bank of the River.
 - The diamond interchange at Queen Street is a ‘moderate’ option. While the location is flat, has low prominence, and few natural features, it is within a closely settled rural-residential area (impacts on dwellings are addressed under a separate criterion).
 - The closed bifurcation at SH57 is a ‘moderate’ option. While the connections between SH1 and SH57 would be relatively simple and compact, it would be somewhat less legible because of the closure of the intuitive connection with Arapaepae Road – to put it another way, the interchange would disrupt a key element of the existing landscape pattern.
 - While the south-facing half-diamond north of Levin would provide access to the north end of the main street, the form of the interchange is not legible and appears unnecessarily circuitous. This design is common to all the options so will not help in

differentiation. However, it is recommended that refinements be investigated to improve the landscape outcomes.

- 4.4 Taking these matters together, the option is moderately poor because the NC5 alignment does not fit the grain of the landscape quite as well as NC4, because of the adverse effects of the bifurcation south of Ōhau River, and the ‘moderate’ effects of the other interchanges. It is scored ‘4’.¹

Option 1B

- 4.5 Combines the ‘1’ route with the following interchanges:
- Bifurcation south of Ōhau River
 - Half diamond (south facing) at Tararua Road
 - Half diamond (north facing) at Queen Street
 - Closed bifurcation at SH57/Arapaepae Road
 - Half diamond (south facing) north of Levin
- 4.6 The ‘1’ route has a reasonably good fit with landscape as described above for Option 1A.
- 4.7 The interchanges would be amongst the least preferred for the following reasons:
- The bifurcation south of the Ōhau River is a relatively poor option as described for Option 1A.
 - The location of the half-diamond at Tararua Road is relatively unobtrusive – it is flat, has no natural features of note (it would affect dwellings which are assessed separately). However, while the half-diamonds at Tararua Road and Queen Street are individually smaller than a full diamond, splitting them in this manner introduces additional clutter and reduces legibility compared to a single interchange.
 - The closed bifurcation at SH57 bifurcation is a ‘moderate’ option as described for Option 1A.
 - The south-facing half-diamond north of Levin is a ‘moderate’ option as describe for Option 1A, and is common to all the options.
- 4.8 Taking these matters together, the option is scored ‘4’ – it is similar to Option 1A except for the two half-diamonds. While the two half-diamonds are slightly worse than the single diamond at Church Street, the differences are not sufficient to result in a different score.

Option 1C

- 4.9 Combines the ‘1’ route with the following interchanges:
- Diamond at Manakau
 - Diamond at Queen Street
 - Closed bifurcation at SH57/Arapaepae Road
 - Half diamond (south facing) north of Levin

¹ The option was bracketed ‘4’ or ‘5’. The workshop favoured the lower score because a distinction was warranted to equivalent TO2 based options.

- 4.10 The route has a reasonably good fit with landscape as described above for Option 1A.
- 4.11 The interchanges would have moderate effects as follows:
- The location for the diamond interchange north of Manakau is open, flat, has few natural features that would be affected, and is back-dropped by the Tararua foothills. The effects would be much less than the bifurcation south of the Ōhau River.
 - The diamond interchange at Queen Street is a 'moderate' option as described for Option 1A.
 - The closed bifurcation at SH57/Arapaepae Road is a 'moderate' option as described for Option 1A.
 - The south-facing half-diamond north of Levin is a 'moderate' option as describe for Option 1A, and is common to all the options.
- 4.12 Overall, the combination of interchanges is better than Options 1A and 1B because of the preference for the Manaku interchange over the bifurcation south of the Ōhau River. The option is scored '3'.

Option 1D

- 4.13 Combines the '1' route with the following interchanges:
- Diamond at Manakau
 - Diamond at Tararua Road
 - Open bifurcation at SH57/Arapaepae Road
 - Half diamond (south facing) north of Levin
- 4.14 The route has a reasonably good fit with landscape as described above for Option 1A.
- 4.15 The interchanges are reasonably good as follows:
- The diamond interchange north of Manakau is a relatively 'good' option as described for Option 1C.
 - The location of the diamond interchange at Tararua Road is unobtrusive. It is flat, has no apparent natural features that would be impacted, and has relatively low visibility. (It would affect dwellings but such effects are assessed separately).
 - The open bifurcation at SH57Arapaepae Road is a variant that would keep Arapaepae Road open. While it would cover a wider footprint, the overall arrangement would be more legible. Overall it is simpler and more elegant than the alternative.
 - The south-facing half-diamond north of Levin is a 'moderate' option as describe for Option 1A, and is common to all the options.
- 4.16 Overall, the combination of interchanges is better than 1-C. However, the difference is not sufficient to change the overall score. Option 1-D is similarly scored '3'.

Option 2A

- 4.17 Combines TO-17 and TO-4 with the following interchanges:
- Diamond at Manakau
 - Diamond at Tararua Road
 - Open bifurcation at SH57/Arapaepae Road
 - Half diamond (south facing) north of Levin
- 4.18 The '2' route combines TO17 and NC4. The southern part tracks the Tararua Foothills on the east side of the plains, passes behind Manakau, crosses the Ohau River at a logical location, and achieves a reasonably good fit with the cadastral and block pattern. The northern part runs parallel to the eastern edge of Levin, offset from Arapaepae Road. It has a good fit with the landscape in this section, following the boundary between urban Levin and the rural and rural-residential landscape to the east. The route passes between two stands of bush and 'heritage' vegetation at Queen Street, although it appears that there is sufficient room to accommodate the highway without encroaching on the vegetation so long as an interchange is not required at this location. North of the Levin the route is aligned mid-block between Roslyn and Heatherlea Road. Overall, Route 2 has a slightly better fit with the landscape than the '1' route.
- 4.19 The interchanges are amongst the most preferred as follows:
- The Manakau diamond (east) is a relatively 'good' option as described for Option 1C.
 - The Tararua Road diamond is a relatively 'good' option as described for Option 1D.
 - The open bifurcation is the preferred of the two variants for the interchange between SH1 and SH57 as described for Option 1D.
 - The south-facing half-diamond north of Levin is a 'moderate' option as describe for Option 1A, and is common to all the options.
- 4.20 Overall, Option 2A combines the best route, and the preferred combination of interchanges. It is ranked '2'.²

Option 2B

- 4.21 Combines the '2' route with the following interchanges:
- Bifurcation south of Ōhau River
 - Diamond at Tararua Road
 - Open bifurcation at SH57 / Arapaepae Road
 - Half diamond (south facing) north of Levin
- 4.22 The '2' route is the preferred of the alternatives as descried for Option 2A.
- 4.23 The interchanges are assessed as follows:
- The bifurcation south of Ōhau River is a relatively poor option in landscape terms as described for Option 1A.

² The score was bracketed '1' and '2'. On balance the workshop favoured '2'.

- The Tararua Road diamond is a relatively ‘good’ option as described for Option 1D.
- The open bifurcation at SH57/Arapaepae Road is the preferred of the two variants .
- The south-facing half-diamond north of Levin is a ‘moderate’ option as describe for Option 1A, and is common to all the options.

4.24 The difference between Options 2A and 2B is that the latter includes the bifurcation south of Ōhau River which is a less preferred option. The option is ranked ‘3’.

Option 2C

4.25 Combines the ‘2’ route with the following interchanges:

- Bifurcation south of Ōhau River
- Half diamond at Tararua Road
- Half diamond at Queen Street
- Closed bifurcation at SH57/Arapaepae Road
- Half diamond (south facing) north of Levin

4.26 The ‘2’ route is the preferred of the alternatives as described for Option 2A.

4.27 However, the interchanges are relatively poor as follows:

- The bifurcation south of Ōhau River is a relatively poor option in landscape terms as described for Option 1A.
- The half-diamonds at Taraua Road and Queen Street are a ‘moderate’ option as described for Option 1B.
- The closed bifurcation between SH1 and SH57 is the less preferable of the two variants as described for option 1A.
- The south-facing half-diamond north of Levin is a ‘moderate’ option as describe for Option 1A, and is common to all the options.

4.28 Overall, while the ‘2’ route is the preferred route alignment, the combination of interchanges is amongst the less preferable. The option is ranked ‘3’.³

Option 2D

4.29 Combines the ‘2’ route with the following interchanges:

- Manakau diamond (east)
- Queen Street diamond (west)
- Closed bifurcation at SH57/Arapaepae Road
- Half diamond (south facing) north of Levin

4.30 The ‘2’ route is the preferred of the alternatives as described for Option 2A.

³ The option was bracketed ‘3’ or ‘4’. The workshop favoured the lower score, considering that the preferred alignment balanced the less preferred interchanges, and that a distinction was warranted between Options 2C and 2D.

- 4.31 The interchanges are mixed as follows:
- The Manakau diamond (east) is a relatively 'good' option as described for Option 1C.
 - The Queen Street diamond (western variant) would require removal of a stand of bush and a historic house with grounds of stately trees and a second stand of bush (on the south side of Queen Street). The adverse landscape effects would be 'high'.
 - The closed bifurcation between SH1 and SH57 is the less preferable variant as described for Option 1A.
 - The south-facing half-diamond north of Levin is a 'moderate' option as describe for Option 1A, and is common to all the options.
- 4.32 The difference between Options 2C and 2D is that the latter includes the Queen Street diamond (western variant) which would have significant adverse effects. The option is scored '4'.

Option 3A

- 4.33 Combines TO-2 and NC-5 with the following interchanges:
- Diamond at Manakau (west)
 - Diamond at Tararua Road (west)
 - SH57 bifurcation
 - Half diamond (south facing) north of Levin
- 4.34 The '3' route combines the western route option south of Kimberley Road and the eastern option north of Kimberley Road. It would be somewhat less preferable than the '1' and '2' route options for the following landscape and visual reasons:
- The Ohau River crossing point is good in that it concentrates effects on natural character in the vicinity of exiting bridges.
 - The route passes stands of significant totara bush on the north bank of the Ohau River. While it is assumed that the alignment can be refined to avoid encroaching on the main stands, it appears that effects on some groups of trees are unavoidable.
 - While sections of the route have a good fit with the landscape grain, such as in the south and where the route parallels the NIMT railway, the section north-west of Manakau and the section east of Levin cuts diagonally across the grain. The route does not obviously respond to broad scale natural or human landscape features.
 - The route bisects the small settlement at Whakahoro Road in the vicinity of Ngāti Wehi Wehi Marae.
- 4.35 The following comments are made on interchanges:
- Manakau diamond interchange (west) is a 'moderate' option. It is located in a large open area with no natural features. However, it is somewhat worse than the Manakau diamond interchange (east) because it is not anchored by backdrop hills but rather in is a more prominent location in the middle of the landscape, and is diagonal to the grain of the landscape.
 - The Tararua Road diamond (east) is relatively good as described for Option 1D.

- The open bifurcation at SH57/Arapaepae Road is the preferred variant as described for Option 1D,
- The south-facing half-diamond north of Levin is a ‘moderate’ option as describe for Option 1A, and is common to all the options.

4.36 Overall, the option comprises the least preferable route, which is somewhat worse than the ‘1’ and ‘2’ options and slightly worse than the ‘4’ options (see below). The interchanges are reasonably good, but slightly less preferable than those for the equivalent Option 1D because the Manakau diamond (west) would not fit the landscape quite as well as the Manakau diamond (east). The option is ranked ‘3’.

Option 3B

4.37 Combines TO-2 and NC-5 with the following interchanges:

- Bifurcation north of Ōhau River
- Diamond at Tararua Road (west)
- Open bifurcation at SH57
- Half diamond (south facing) north of Levin

4.38 The ‘3’ route is the least preferable, as described for Option 3A – slightly worse than the ‘4’ options, and somewhat worse than the ‘1’ and ‘2’ options.

4.39 The following comments are made on the interchanges:

- The bifurcation on the north bank of the Ōhau River is somewhat preferable to the bifurcation south of the Ōhau River, but is still amongst the least preferred options. By comparison with the bifurcation south of the Ōhau River it is in a less obtrusive location adjacent to the small cement works and in a more treed area. However, it would encroach onto the horse facility. The interchange flyover and ramps could have reasonably simple and clean lines, but the roundabout configuration is visually awkward.
- The Tararua Road diamond (east) is relatively good as described for Option 1D.
- The open bifurcation at SH57/Arapaepae Road is the preferred variant as described for Option 1D,
- The south-facing half-diamond north of Levin is a ‘moderate’ option as describe for Option 1A, and is common to all the options.

4.40 Overall, the option comprises the least preferable route, and a ‘moderate to less preferred’ combination of interchanges. The option is ranked ‘4’.⁴

Option 3C

4.41 Option 3C combines the ‘3’ route with the following interchanges:

- Bifurcation north of Ōhau River

⁴ The option was bracketed ‘3’ or ‘4’. The workshop favoured the higher score because of weight given to the adverse effects of the bifurcation north of the Ōhau River.

- Half diamonds at Tararua Road (east) and Queen Street (east)
- Closed bifurcation at SH57
- Half diamond (south facing) north of Levin

4.42 The '3' route is the least preferable as described for Option 3A.

4.43 The interchanges are 'moderate' options as follows:

- The bifurcation north the Ōhau River is amongst the least preferred' of the options as described for Option 3B.
- The two half diamonds east of Levin are a 'moderate' option as described for Option 1B.
- The closed bifurcation at SH57/Arapaepae Road is less preferred variant as described for Option 1A.
- The south-facing half-diamond north of Levin is a 'moderate' option as describe for Option 1A, and is common to all the options.

4.44 Overall, the option comprises the least preferable '3' route and 'moderate to least preferred' interchange options, slightly worse in three instances than equivalent options. The option is ranked '4'.

Option 3D

4.45 Option 3D combines the '3' route with the following interchanges:

- Bifurcation north of Ōhau River
- Diamond at Queen Street (east)
- Closed bifurcation at SH57
- Half diamond (south facing) north of Levin

4.46 The route is the least preferable option, slightly worse than the '4' options, and somewhat worse than the '1' and '2' options, as described for Option 3A.

4.47 The interchanges:

- The Ohau north bifurcation is amongst the least preferred of the options as described for Option 3B.
- The Queen Street diamond (east) is a 'moderate' option, as described for Option 1A, slightly worse than a single diamond at Tararua Road for instance.
- The closed bifurcation at SH57 is slightly less preferable than the equivalent open option as described for Option 1A.
- The south-facing half-diamond north of Levin is a 'moderate' option as describe for Option 1A, and is common to all the options.

4.48 Overall, the option comprises the least preferable route and 'moderate to less preferred' interchange options, slightly worse in three instances than equivalent options. The option is ranked '4'.

Option 4A

- 4.49 Option 4A combines TO-2 and NC-4 with the following interchanges:
- Diamond at Manakau (west)
 - Diamond at Tararua Road (west)
 - Open bifurcation at SH57/Arapaepae Road
 - Half diamond (south facing) north of Levin
- 4.50 The '4' options combine the two western route options. Such a route is slightly better than the '3' options and slightly less preferable than the '1' and '2' options. South of Kimberley Road it shares the same characteristics as the '3' route as follows:
- The Ōhau River crossing point is good in that it concentrates effects on natural character in the vicinity of existing bridges.
 - The route passes stands of significant tōtara bush on the north bank of the Ōhau River. While it is assumed that the alignment can be refined to avoid encroaching on the main stands, it appears that effects on some groups of trees are unavoidable.
 - The route bisects the small settlement at Whakahoro Road in the vicinity of Ngāti Wehi Wehi Marae.
 - While sections of the route have a good fit with the landscape grain, such as in the south and where the route parallels the NIMT railway, the section north-west of Manakau cuts diagonally across the grain.
- 4.51 However, north of Kimberley Road, the '4' option shares the same characteristics as the '2' route:
- The north part of the '4' route has a good fit with the landscape, following the boundary between urban Levin and the rural and rural-residential landscape to the east.
 - The route passes between two stands of bush and 'heritage' vegetation at Queen Street, although it appears that there is sufficient room to accommodate the highway without encroaching on the vegetation so long as an interchange is not required at this location.
 - North of the Levin the route is aligned mid-block between Roslyn and Heatherlea Road.
- 4.52 The interchanges are relatively 'good' as follows:
- The Manakau diamond (west) is a 'moderate' option as described for Option 3A.
 - The Tararua Road diamond (west) is a 'good' option, as described for Option 2A.
 - The open bifurcation at SH57/Arapaepae Road is the preferred variant as described for Option 1D.
 - The south-facing half-diamond north of Levin is a 'moderate' option as describe for Option 1A, and is common to all the options.
- 4.53 Overall, the '4' option is a 'moderate' route, slightly better than the '3' options, but slightly worse than the '2' options. The interchanges are relatively good options, although

the Manakau diamond (west) is slightly less preferable than the eastern alternatives. The option is ranked '3'.⁵

Option 4B

- 4.54 Option 4B combines the '4' route with the following interchanges:
- Bifurcation north of the Ōhau River
 - Half diamonds at Tararua Road (west) and Queen Street (west)
 - Closed bifurcation at SH57
 - Half diamond (south facing) north of Levin
- 4.55 The route is a 'moderate' option as described for Option 4A – slightly better than the '3' options and slightly worse than the '2' options.
- 4.56 The interchanges are 'moderate' options:
- The bifurcation north of the Ōhau River is amongst the least preferred of the options as described for Option 3B.
 - The half diamonds at Tararua Road (west) and Queen Street (west) are a 'moderate' option as described for Option 2C.
 - The closed bifurcation at SH57/Arapaepae Road is the less preferable variant.
 - The south-facing half-diamond north of Levin is a 'moderate' option as describe for Option 1A, and is common to all the options.
- 4.57 Overall, the option comprises the 'moderate' '4' route, and 'moderate' interchanges. It is ranked '4'.

Option 4C

- 4.58 Option 4C combines the '4' route with the following interchanges:
- Bifurcation north of the Ōhau River
 - Diamond at Tararua Road (west)
 - Open bifurcation at SH57/Arapaepae Road
 - Half diamond (south facing) north of Levin
- 4.59 The '4' route is a moderate option as described for Option 4A.
- 4.60 The interchanges are a relatively good combination as follows:
- The bifurcation at the Ōhau River is amongst the least preferred of the options as described for Option 3B.
 - The diamond at Tararua Road (west) is a 'good' option as described for Option 2D.
 - The open bifurcation at SH57 is the preferable of the equivalent options.
 - The south-facing half-diamond north of Levin is a 'moderate' option as describe for Option 1A, and is common to all the options.

⁵ The score was bracketed '2' and '3'. The workshop on balanced favoured '3' because a distinction is warranted between 4C and 2A.

- 4.61 Overall, the option comprises the moderate '4' route, and mix of good and 'moderate to least preferred' interchange options. The option is ranked '4'.⁶

Option 4D

- 4.62 Option 4D combines the '4' route with the following interchanges:
- Bifurcation north of the Ōhau River
 - Diamond at Queen Street (west)
 - Closed bifurcation at SH57/Arapaepae Road
 - Half diamond (south facing) north of Levin
- 4.63 The route is a moderate option as described for Option 4A.
- 4.64 The interchanges are amongst the least preferable as follows:
- The bifurcation north of the Ōhau River is amongst the least preferred of the options as described for Option 3B.
 - The diamond at Queen Street (west) is the least preferable of the alternative options as described for Option 2D because of the impacts on the stand of bush, and the historic house and grounds.
 - The closed bifurcation at SH57 is the less preferable of the equivalent options.
 - The south-facing half-diamond north of Levin is a 'moderate' option as describe for Option 1A, and is common to all the options.
- 4.65 Overall, the option comprises a 'moderate' route and the least preferable interchanges in most instances. The option is ranked '5'.

5 SUMMARY AND OBSERVATIONS

- 5.1 The relative scores are as follows:

<i>option</i>	1A	1B	1C	1D	2A	2B	2C	2D	3A	3B	3C	3D	4A	4B	4C	4D
<i>score</i>	4	4	3	3	2	3	3	4	3	4	4	4	3	4	4	5

- 5.2 With regards landscape matters, in summary:
- The '2' **route option** (setting aside interchanges) is preferable, slightly better than the '1' and '4' route options. The '3' route option is the least preferable.
 - The preferable **interchange options** are:
 - Manakau diamond (east)
 - Tararua Road diamond (west)
 - Open bifurcation at SH57/Arapaepae Road
 - North Levin half diamond (common to all options)

⁶ The option was originally ranked '3'. The workshop preferred a score of '4' for this option, placing greater weight on the adverse effects of the bifurcation north of the Ōhau River

- **Overall** (taking routes and interchanges together) the 2A option ranks highest. Options 1C, 1D, 2B, 2C, 3A and 4A also rank well, the main differences being in the southern end. Option 4D is the least preferred.

5.3 The following further observations are made following the workshop:

- There appears (subject to traffic design considerations) no reason not to choose an open bifurcation at SH57/Arapaepae Road – it is better with regards fit with landscape, and would provide the best connections between Levin and Palmerston North.
- It would be desirable to have interchanges north and south of Levin to facilitate continuing flow of appropriate traffic along the main street. This would be consistent with Levin’s historical urban form and the concentration of activity along the street. While this would be achieved by the diamond interchanges at Tararua Road or the bifurcations north or south of the Ōhau River, Tararua Road is preferable for landscape reasons. Tararua Road would also provide north and south facing access to the highway from industrial properties in the south part of Levin, reducing the need for heavy traffic to use the main street. However, a consequence of a Tararua Road interchange may be a requirement for a more direct connection between Tararua Road and Cambridge Street across the NIMT railway.
- While Queen Street provides good access to Levin’s cross axis, it is preferable to favour north-south traffic along the main street for reasons outlined above.
- An interchange at Tararua Road and an open bifurcation at SH57/Arapaepae Road would render a Queen Street interchange redundant. This would avoid the potential significant adverse effects of the Queen Street diamond (west).
- Refinements should be investigated for the half-diamond north of Levin to provide a simpler and legible interchange.

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14 January 2017

Otaki to North of Levin RoNS- MCA Workshop - Local Connectivity and Town Centre Access Criteria

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0	8/12/2016	Initial Draft	Phil Peet			

1 Introduction

This note summarises the assessment of the Taylors Road to North Levin options against two criteria for the MCA assessment:

- **Local Connectivity:** this criterion considers movement to and from the smaller areas of population within the district, specifically Manakau, Ohau and Kimberley East.
- **Town Centre Access:** this criterion considers movement to and from the Levin urban area, specifically considering Levin south, Levin central and Levin north areas.

Each of the above population areas above were considered as one end of a trip. Multiple other ends were considered, specifically Otaki (or destinations south on SH1), Palmerston North (or destinations north on SH57) and Foxton (or destinations north of SH1).

2 Assumptions

A few assumptions were made during the analysis:

- The current SH1 north of Otaki will be connected into Taylors Road and this will have an appropriate and direct connection into Otaki as part of the Peka Peka to Otaki project.
- Levin East has not been specifically assessed as an interchange will be provided at either Tararua Road or Queen Street which provides good access. It is noted that at the workshop, the Horowhenua District Council (HDC) representatives stated that at the location where an interchange is not provided, a local road overbridge needs to be constructed for local movements. This has yet to be assessed.
- With either interchange option east of Levin (Tararua Road or Queen Street) it is likely that an upgrade of this road with Oxford Street (current SH1) will be required. Improvements at both may also be necessary regardless of the interchange option and these may need to be significant infrastructure solutions.
- During the workshop, it was agreed that the options that did not have a local road connection between Kimberley Road and Tararua Road, east of the new expressway, should have this link added. The analysis presented in this report assumes this link is present in all options.
- Modelling has yet to be undertaken and this may provide further insights into potential local connectivity issues
- During the workshop it was also noted that each interchange should be individually tested for need. This was raised in particular to the Manakau interchange and its need alongside a Tararua Road interchange but it equally applies to other locations as well.

It is important to note that the local road network connections developed for the options demonstrate a likely scenario. Further testing and development of these will be required during the route refinement stage.

3 Assessment

Prior to the workshop, an assessment of each key movement was undertaken and assessed as being:

-	Negative impact; loss of connectivity or more than minor re-routing required
0/-	Negligible impact, but slightly worse than existing e.g. minor re-routing or lengthening
0	Connectivity would be as current situation
0/+	Negligible impact, but slightly better than existing, e.g. slight route shortening or an alternate route is now available
+	Positive impact; efficient access onto and off the new expressway

The full assessment table was used as input into discussion at the workshop. The following discussion relates to key points of the assessment and the scoring given during the workshop.

3.1 Local Connectivity

Option 1A

- No Manakau interchange so movements to/from this location do not benefit from the expressway being constructed.
- Utilises NC5 at the northern end which means trips to/from Palmerston North are slightly longer
- Kimberley East traffic has a slightly longer route to access Levin or destinations north of SH57
- Overall Score: 4

Option 1B

- Note that it is assumed that a connection is provided between Kimberley Road and Tararua Road which was not shown on the original plans)
- No Manakau interchange so movements to/from this location do not benefit from the expressway being constructed.
- Utilises NC5 at the northern end which means trips to/from Palmerston North are slightly longer
- Kimberley East can access Levin via Tararua Road therefore this is slightly better than 1A.
- Overall Score: 3

Option 1C

- Manakau interchange provides good connectivity within this area
- Otherwise as per 1A
- Overall score: 3

Option 1D

- Manakau interchange provides good connectivity within this area
- Utilises NC5 at the northern end which means trips to/from Palmerston North are slightly longer although access at Tararua Road slightly reduces this impact
- Overall score: 3

Option 2A

- Similar to 1D but less of a detour as this route runs closer to Levin
- Overall score: 2

Option 2B

- No Manakau interchange so movements to/from this location do not benefit from the expressway being constructed.
- Tararua interchange provides good connectivity for Kimberley East
- Overall score: 3

Option 2C

- Similar to 1B but less of a detour as this route runs closer to Levin
- Overall Score: 3

Option 2D

- Similar to 1C but less of a detour as this route runs closer to Levin
- Overall Score: 2

Option 3A

- Similar to 1D
- Overall Score: 3

Option 3B

- Similar to 2B
- Overall Score 3

Option 3C

- Similar to 1B
- Overall Score 3

Option 3D

- Similar to 1A
- Overall Score 4

Option 4A

- Similar to 2A
- Overall Score 2

Option 4B

- Similar to 2C
- Overall Score 3

Option 4C

- Similar to 2B
- Overall Score 3

Option 4D

- Similar to 3D but better alignment north of Kimberley Road
- Overall Score 3

The above is summarised in the table below showing the key issues and scoring.

	No Manakau I/C so no benefit to Manakau	Route north of Kimberley Road is longer	No Tararua I/C so Kimberley East has longer route	Score
1A	1	1	1	4
1B	1	1		3
1C		1	1	3
1D		1		3
2A				2
2B	1			3
2C	1			3

2D			1	2
3A		1		3
3B	1	1		3
3C	1	1		3
3D	1	1	1	4
4A				2
4B	1			3
4C	1			3
4D	1		1	3

3.2 Levin Connectivity

Option 1A

- No connection from north Levin to SH57 north – drivers would need to travel south to Queen Street before heading north
- Utilises NC5 at the northern end which means trips to/from Palmerston North are slightly longer
- Overall Score: 3

Option 1B

- Similar to 1A in terms of Levin connectivity
- Overall Score: 3

Option 1C

- No connection at either Tararua or Ohau therefore direct access into South Levin is poor.
- No connection from north Levin to SH57 north – drivers would need to travel south to Queen Street before heading north
- Utilises NC5 at the northern end which means trips to/from Palmerston North are slightly longer
- Overall score: 4

Option 1D

- Utilises NC5 at the northern end which means trips to/from Palmerston North are slightly longer
- No bifurcation which limits trip choice for south of Levin
- Overall score: 2

Option 2A

- No bifurcation which limits trip choice for south of Levin
- Overall score: 2

Option 2B

- No connectivity concerns for Levin
- Overall score: 1

Option 2C

- No connection from north Levin to SH57 north – drivers would need to travel south to Queen Street before heading north
- Overall Score: 3

Option 2D

- Similar to 1C but less of a detour as this route runs closer to Levin
- Overall Score: 4

Option 3A

- Similar to 1D

- Overall Score: 2

Option 3B

- Utilises NC5 at the northern end which means trips to/from Palmerston North are slightly longer
- Overall Score 2

Option 3C

- Similar to 1B
- Overall Score 3

Option 3D

- Similar to 1A
- Overall Score 3

Option 4A

- Similar to 2A
- Overall Score 2

Option 4B

- Similar to 2C
- Overall Score 3

Option 4C

- Similar to 2B
- Overall Score 1

Option 4D

- Similar to 2C in terms of Levin connectivity
- Overall Score 3

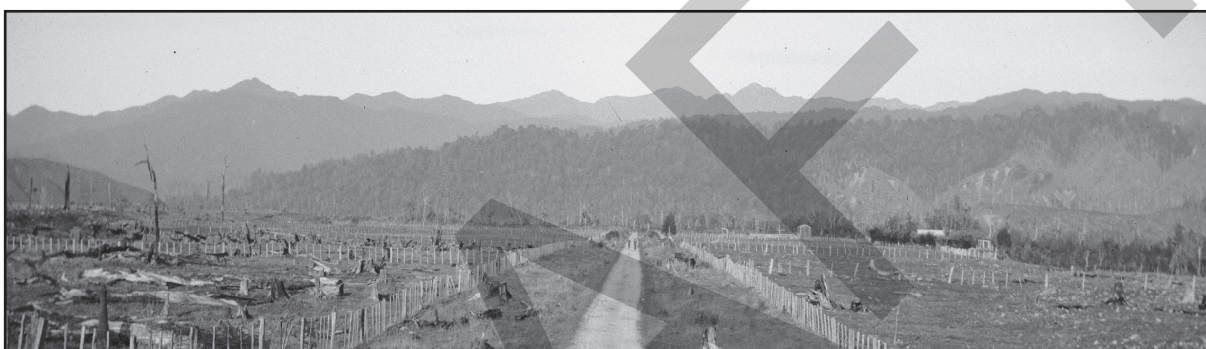
The above is summarised in the table below showing the key issues and scoring.

	Only Queen and Manakau I/C; no direct connection to expressway for South Levin	No connection at 1/57 North; backtracking required for Levin North to Palmerston North	Route north of Kimberley Road is longer and further away from Levin	No Bifurcation which limits trip choice for South Levin	Score
1A		1	1		3
1B		1	1		3
1C	1	1	1	1	4
1D			1	1	2
2A				1	2
2B					1
2C		1			3
2D	1	1		1	4
3A			1	1	2
3B			1		1
3C		1	1		3
3D		1	1		3
4A				1	2

4B		1			3
4C					1
4D		1			3



**An Overview of Archaeological Risks Identified Within the
Combined Routes, North of Otaki to North of Levin, Options' Area**



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Introduction

Research into the archaeological risks associated with the Otaki to North of Levin Roads of National Significance project has been undertaken in three stages. This staged approach is related to proposals for changes to the project scope between 2013 and 2016, as outlined below in order of progression:

1. Proposed upgrades to the connection of SH1 and SH57, Manakau to South of Levin.
2. Proposed upgrades to the connection of SH1 and SH57, North of Otaki to South of Levin.
3. Proposed options for a SH1 bypass of Levin, the Levin Northern Connection.

Twenty-eight options for a new alignment of SH1 and its connection with SH57 were reviewed across these three stages. On the basis of expert advice and public consultation the 28 potential alignments were refined to just four alternatives: two for the upgrade and connection of SH1 and SH57 from the North of Otaki to South of Levin (TO2 and TO17); and, two for the Levin Northern Connection (NC4 and NC5). For each of the four possible combined routes four alternative interchange schemes were developed. This research note evaluates and scores the overall known archaeological risks for the 16 combined route and interchange options.

Interchange design and placement has not been considered until now, though the archaeological risks associated with each of the alternate alignments for the combined route options have been described in reports and research notes prepared for previous stages. Aside from some new inputs from iwi, the basic archaeological facts underlying previous MCA reports remain the same and will not be repeated here. A summary of the archaeological risks for each of the four alignments, drawn from previous reports and including relevant updates, is provided after a general historic background to the wider landscape. For more detailed information about the archaeological risks associated with these alignments and the wider landscape, please see previous reports and research notes prepared for the aforementioned stages:

Daniel Parker (2013), *An Assessment of the Archaeological Risks Associated with Proposed Upgrades to the Connection of SH1 and SH57: Manakau to Levin*, research report prepared for MWH New Zealand Limited

Daniel Parker (2015), *An Assessment of the Archaeological Risks Associated with Proposed Upgrades to the Connection of SH1 and SH57: Otaki to Levin*, research report prepared for the New Zealand Transport Agency

Daniel Parker (2016), *A Brief Overview of the Archaeological Risks Identified Within the Levin Northern Connection Options' Area*, research note prepared for the New Zealand Transport Agency

Summary of Background History

Traditional Māori and European historical accounts indicate that the forested land east of the coastal dune belt was not intensively settled until after the completion of the Manawatu-Wellington Railway in 1886. Prior to this, the forest was used primarily for resource gathering, including bird snaring, collecting forest fruits and obtaining timber. Tracks out of the district also passed through the forest. The thickness of the forest, outside of the clearings and tracks, made navigating through the forest almost impossible and:

“people [were] apt to walk in circles and become lost in a few acres. From time to time the mill-hands would go pig or cattle hunting and be missing for a night or even two.”¹

Sites relating to Māori occupation during this period were generally located in small clearings (both natural and man-made), areas of raised ground, or along the margins of the streams and tracks that crossed the forest. The largest of these clearings, some of which contained sizeable settlements, are for the most part located east the existing SH1 (Figure 1).

The first Europeans to settle on the Horowhenua coast were predominantly whalers or traders who arrived in the mid decades of the 19th century. These early settlers lived in or nearby the Māori settlements among the coastal dune belt and traded for raw materials that could be on sold in the Wakefield settlements or exported to the markets in Sydney. This substantially changed in 1886 when the Manawatu-Wellington Railway, which passed through the former Weraroa clearing at what is now the southern end of Levin (Figure 1), was completed. Existing European settlement shifted from the coast to inland nearer the railway line which provided the primary trade and communication route. An influx of new settlers was attracted by the vast tracts of land made available by the government at the burgeoning settlements of Otaki, Manakau, Ohau, Levin and Shannon. Felling of the dense lowland forests by the incoming settlers, in order to fulfil their obligations to the government to ‘improve’ the land, resulted in a rapid transformation of the Horowhenua landscape. So dramatic was this change in such a short space of time that Park states:

“Never before or since has a New Zealand landscape been so quickly and ruthlessly ‘cleared’. Within 20 years of the forest tunnel [Manawatu-Wellington Railway] being cut, only nature’s geological lineaments were still there.”²

Although much of the European settlement history in the Horowhenua District is concentrated within the formerly forested inland-zone, there are relatively few qualifying archaeological sites due to the short timeframe between the shift to inland settlements and the legislative cut-off date that defines what is and isn’t an archaeological site³. Within the combined routes

1 Page 116, Wilson, H., 1959 *My First Eighty Years*, Hamilton.

2 Page 269, Park, G. (1995). *Nga Uruora: The Groves of Life - Ecology & History in a New Zealand Landscape* Victoria University Press.

3 The Heritage New Zealand Pouhere Taonga Act 2014 defines an archaeological site as any place in New Zealand, including any building or structure (or part of a building or structure), that:

a. Was associated with human activity that occurred before 1900 or is the site of the

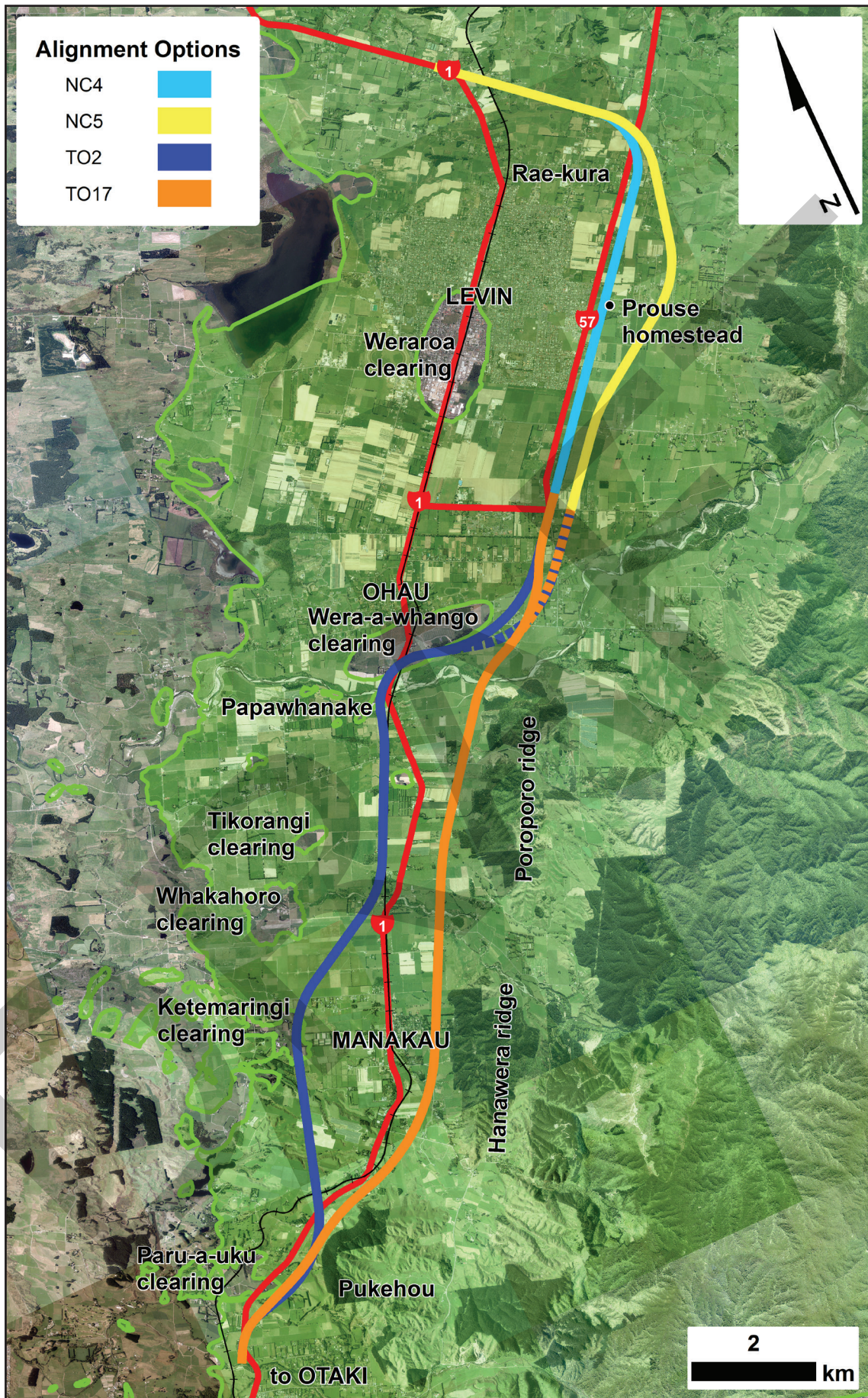


Figure 1: Combined route alignments, existing State Highway and North Island Main Trunk Railway network from north of Otaki to north of Levin. Extent of dense podocarp forest and major clearings in 1872 also shown (SO11038).

options' area archaeological sites with a European association can generally be placed into one of three categories:

1. Homesteads and associated farming structures;
2. Civic buildings and retail stores; and
3. Industrial sites associated with forest clearance/saw milling.

These sites are generally located near existing town and village centres, the North Island Main Trunk Railway (NIMTR) and old roads (Figure 1).

wreck of any vessel where the wreck occurred before 1900; and

b. Provides or may provide, through investigation by archaeological methods, evidence relating to the history of New Zealand; and

c. Includes a site for which a declaration is made under section 43(1)

Given that the bulk of European settlement did not move inland until after the construction of the Manawatu-Wellington Railway in 1886, this only leaves a 14-year window for any European settlement activity to have left physical traces that may be considered, by legislative definition, an archaeological site.

Review of Previously Identified Archaeological Risks for Combined Route Alignments

TO2: North of Otaki to South of Levin

Paruauku clearing was located approximately 1.5 km north of the present Otaki town boundary directly to the west of Pukehou hill. Court records indicate that both the clearing and the land surrounding it were intensively occupied by Maori in the 19th century. Witnesses in both the Manawatu Kukutauaki No. 4 and Pukehou 4G claims state that this land was originally occupied by Muaūpoko.

Little is mentioned about the original Muaūpoko occupation in the Court records other than that they had a bird snaring place, named Pikiwahine, in the vicinity of the clearing.

Chance discoveries of human remains related to historic battles in the vicinity of Pukehou are a possibility. Speaking before the Court in 1873, Rikihana te Tarure of Ngāti Koroki describes an occasion when walking from the base of Pukehou to Otaki village where “the bones of a dead Muaūpoko fell from a tree on [to] the road”.

In 1877, as surveyed in a plan of the Waikawa Native Reserve (ML193, ML193A), Ketemaringi clearing was located 1.2km to the west of the present Manakau village, and covered an area of approximately 45 hectares. Located nearby to the south west of Ketemaringi were the extensive Takapu-o-kāingara cultivation grounds, though this site is not expected to be affected.

In the 19th century the clearing was occupied by the Ngāti Wehiwehi, with

Adkin (1948:185) locating the Ketemaringi pā in the north west corner adjacent to the Autaha swamp. Early plans show a number of details about the clearing, including the location of huts, individual allotments, walking tracks, rail and wire fences, and a flagpole. Adkin also states that an early European settler to the region, Thomas Bevan sen., had a homestead within the Ketemaringi clearing.

To the south of the clearing was another Ngāti Wehiwehi settlement, the Te Raeroa kāinga. In the 1940s surface evidence for this settlement was still visible, with Adkin (1948:330) noting depressions relating to subterranean storage pits and several patches of shell midden disturbed by ploughing. The Te Raeroa kāinga appears to be the point of highest archaeological risk in this area within the Ketemaringi clearing.

A settlement composed of a small number of buildings located between the Waikokopu and Kuku streams, observed in 1942 aerial photographs, was initially suspected of being the remnants of a former 19th century Māori settlement and cultivation ground (Parker 2013: 24-5). Iwi informants have clarified that, while these buildings were eventually occupied by Māori, they were originally constructed as part of the workers' camp for the Manawatu-Wellington Railway. It is not known if the buildings visible in 1942 are representative of the extent of the original camp.

There is a risk of finding human remains near the south bank of the Kuku Stream as a result of an historic battle in this area. There is also a small cemetery located behind the Kuku Dairy Factory that was used a burial place for still-born babies in more recent times.

Directly south of the Ohau River there was a small clearing associated with the name Papawhanake in historic plans (ML369, SO11038). A surveyor's camp is known to have been located in this clearing, but further research is required to determine what other sites may be at risk here.

Māori Land Court records mention the presence of cultivations at Te Wera-a-Whango, "a former large natural bush-clearing on the stony flat on the north side of the Ohau River between the railway station and Ohau hamlet". The exact location of this former clearing is no longer known, but maps prepared by Adkin (e.g., 1948: map VI) with the aid of Māori informants place the clearing to the north of the remnant stand of Totara that abuts the southern boundary of the Ohau Gravels Vineyard, beyond the TO2 alignment. However, historic survey plans (ML369, SO11038) place the clearing further south in an area that is crossed by TO2.

Also in the vicinity of Te Wera-a-Whango was a camp where 60 men were employed completing ballasting and other tasks for the railway, though this camp may have been located to the current Ohau village.

Outside of the currently known sites, other unknown sites associated with Māori birding activities, movement across inland trails, or cultivation in forest clearings may be encountered anywhere along the alignment. There is also a possibility of encountering temporary settlements related to earlier periods of activity (i.e., pre-1800) or Muaupoko refuges from the period of conflict with Ngāti Toa (i.e., early decades of the 19th century). Evidence for these types of activities is more likely to be found near water sources.

TO17: North of Otaki to South of Levin

Paruauku clearing was located approximately 1.5km north of the present Otaki town boundary directly to the west of Pukehou hill. Court records indicate that both the clearing and the land surrounding it were intensively occupied by Maori in the 19th century. Witnesses in both the Manawatu Kukutauaki No. 4 and Pukehou 4G claims state that this land was originally occupied by Muaūpoko.

Little is mentioned about the original Muaūpoko occupation in the Court records other than that they had a bird snaring place, named Pikiwahine, in the vicinity of the clearing.

Chance discoveries of human remains related to historic battles in the vicinity of Pukehou are a possibility. Speaking before the Court in 1873, Rikihana te Tarure of Ngāti Koroki describes an occasion when walking from the base of Pukehou to Otaki village where “the bones of a dead Muaūpoko fell from a tree on [to] the road”.

There is a risk of finding human remains near the south bank of the Kuku Stream as a result of an historic battle in this area.

NC4: South of Levin to Levin Northern Connection

Most archaeological sites with Māori associations known to be located within the Levin Northern Connection options’ area can only be defined to a broad ‘area of interest’ and specific details of site location or extent cannot be defined. This issue with ambiguous site location is due to two factors:

1. Difficulties with accurate surveying in dense forests during the late 19th and early 20th centuries when some Māori occupation site locations were recorded, and

2. The difficulty of relocating past Māori occupation sites in a landscape that was largely devoid of aides to location identification after the forest had been cleared.

Sites relating to European occupation located within the Northern Connection area are fewer, but are generally better known and more accurately located.

There are 27 sites or natural features with known Māori associations in the Northern Connection area that may be affected, but other unknown archaeological sites of Māori association are also likely to be affected. While the effects of any selected alignment option are likely to be greatest on birding, clearing or cultivation sites, these sites are the least well known in terms of location and extent. It is not possible to evaluate option risks on the basis of minimising effects to these sites.

Sites associated with creeks, springs and streams are able to be more accurately located, though there is little knowledge about the exact nature and extent of the archaeological features associated with these sites. As a general rule, the closer a given option is to a water source, or the greater the effect of an option on a water source, the more likely it is to affect archaeological sites.

There is one site of particular note, a small hill named Rae-kura located in the vicinity of the SH57 and Roslyn Road intersection. A local Māori who was engaged as a labourer in the late 1970s/early 80s reports that human remains were uncovered at this location. In the course of digging a hole for an in-ground swimming pool. This find occurred before the introduction of heritage protection legislation in New Zealand and there are currently no independent records to support or refute this. However, the description of the find context (with apparent oven remains) and documentary evidence that this place was of some importance to Māori adds to the credibility of this report.

Sites associated with industrial timber milling are expected to be encountered in the area, but details of the location and extent of these sites are currently unknown. In particular, the remains of tramways that crossed the forest and were used to transport raw logs to the mill centres nearer the railway line at Levin are like to be affected by any alignment option that passes through the area.

One site of European association is highly likely to be affected: the Prouse homestead located near the SE corner of SH57 and Queen Street East (1024 Queen Street). Rates roll and archival news research indicates that other homesteads constructed pre-1900 are or were likely to have been located within the Northern Connection area and some of these unidentified homesteads may be affected by NC4.

The Prouse family were one of the first European families to settle at the new Levin township in the late 1880s. In addition to their business activities, both the men and women of the family made a significant contribution to the social and economic life of the town. The family's efforts were recognised by the town with the inclusion of plaques and trees for the brothers Richard and James Prouse at a memorial planting, held at the Weraroa Domain in 1923, for 13 of the early pioneer men who played an important role in the development of the town and wider district.

Since its construction in 1891, the home at 1024 Queen Street has been continuously occupied by the descendants of James Prouse through to the present day. The house itself has not been structurally modified, though some of the other historic buildings on the property are in a derelict or ruined state. In addition to the buildings on the property, there are likely to be a number of buried 'in-ground' features that are also of archaeological value (i.e., old garden beds, rubbish pits, wells, etc.).

With its links to the early settlement and establishment of the Levin township and the relatively 'pristine' condition of the house, the Prouse homestead is of significant archaeological, historic and cultural value for both the town of Levin and the wider Horowhenua District.

Other significant individuals in the wider district are known to have had notable houses, though many of these are also known to have been demolished. While there are also a number of small cottages that belonged to farm or railway workers remaining in Levin and the wider Horowhenua, many other significant tangible links to Levin's early history have been lost from the built landscape. Options using the NC4 alignment would not only have a significant direct adverse effect on the Prouse homestead, but also a significant cumulative effect on the heritage landscape of the Horowhenua District. Strong consideration should be given to rejecting any options that would have an adverse effect on the Prouse homestead.

NC5: South of Levin to Levin Northern Connection

Most archaeological sites with Māori associations known to be located within the Levin Northern Connection options' area can only be defined to a broad 'area of interest' and specific details of site location or extent cannot be defined. This issue with ambiguous site location is due to two factors:

1. Difficulties with accurate surveying in dense forests during the late 19th and early 20th centuries when some Māori occupation site locations were recorded, and
2. The difficulty of relocating past Māori occupation sites in a landscape

that was largely devoid of aides to location identification after the forest had been cleared.

Sites relating to European occupation located within the Northern Connection area are fewer, but are generally better known and more accurately located.

There are 27 sites or natural features with known Māori associations in the Northern Connection area that may be affected, but other unknown archaeological sites of Māori association are also likely to be affected. While the effects of any selected alignment option are likely to be greatest on birding, clearing or cultivation sites, these sites are the least well known in terms of location and extent. It is not possible to evaluate option risks on the basis of minimising effects to these sites.

Sites associated with creeks, springs and streams are able to be more accurately located, though there is little knowledge about the exact nature and extent of the archaeological features associated with these sites. As a general rule, the closer a given option is to a water source, or the greater the effect of an option on a water source, the more likely it is to affect archaeological sites.

Sites associated with industrial timber milling are expected to be encountered in the area, but details of the location and extent of these sites are currently unknown. In particular, the remains of tramways that crossed the forest and were used to transport raw logs to the mill centres nearer the railway line at Levin are like to be affected by any alignment option that passes through the area.

Evaluation of Archaeological Risks for Interchange Schemes

Of the 16 interchange and bifurcation options modelled for the combined routes (Table 1, see also Figures X, Y, Z main report), 14 are expected to result in no more than a negligible or low *additional* adverse effect. Two interchange options, G and H, located at Queen Street, Levin, and in the immediate vicinity of the Prouse homestead are expected to result in a high level of *additional* adverse effects to this site and its significant values ⁴.

Where an interchange or bifurcation option in Table 1 is scored a negligible risk of additional adverse effects there are, at present, no known sites in the affected area. However, there may be unknown sites in these areas that will be affected and that are predominantly expected to be: small, discrete sites associated with forest-based subsistence activities such as birding snaring, forest fruit and timber collection etc; or, larger areas of pastoral land or cultivation grounds, potentially associated with farming structures and residential buildings, established after the onset of forest clearance in the late 19th century. While these sites are likely to have high

⁴ See Parker (2016) for details on the Prouse homestead.

Table 1: Expected *additional* adverse effects for interchange and bifurcation options, grouped by alignment position.

INTERCHANGE/ BIFURCATION OPTION	TO2	TO17	NC4	NC5
A	Low			
B	Negligible			
C		Negligible		
D		Low		
E		Negligible		
F			Low	
G			High	
H			High	
I			Low	
J				Low
K				Low
L				Low
M				Negligible
N				Negligible
O			Low	
P				Low

information values, their overall archaeological values are generally low⁵. Options scored a low additional adverse effect will, or are highly likely to, effect known sites associated with a similar range of activities. The higher score being given to reflect that there will be a known adverse effect.

The NC4 route alignment will have a substantial adverse effect on the significant archaeological and historic values of the Prouse homestead and the two Queen Street interchange options for this alignment – G and H – would add to this effect. Earthworks associated with option H are likely to result in the destruction of all buildings, structures and subsurface archaeological features located at this site. Option G is likely to have a similar level of additional adverse effect, though it may not be as totally destructive.

Summary and Scoring of Archaeological Risks for Combined Routes and Interchanges

The archaeological risks associated each of the combined route and interchange options are largely determined by the route alignments with the placement and design of interchanges having, for the most part, little effect. All route options are expected to affect known as well as unknown archaeological sites, though the level of effect is not uniform. Research prepared at earlier stages of this project showed a preference, from an archaeological perspective of minimising adverse effects, for alignments located furthest to the east. This general statement also holds true for the combined routes now under investigation. The underlying reason for this eastern preference is due to the close relationship between historic biogeography and the patterns of past human occupation: i.e., the further any route is aligned to the east, the deeper it

⁵ Residential buildings being one exception to this.

moves into a landscape that was formerly covered by a dense podocarp forest where there are fewer archaeological sites.

Combined Route Options 1A-D: TO17 and NC5

From an archaeological perspective, this is the most favourable route. After moving north from Otaki, the TO17 alignment passes to the east of Manakau along the western flank of the Hanawera and Poroporo ridges, crossing the Ohau River east of the Wera-a-whango clearing, and connecting to NC5 approximately 300 m east of SH57/Arapaepae Road. Other than at where it passes the high-risk Pukehou and Paru-a-uku clearing areas, there are no known sites along the remainder of this alignment.

As yet unknown sites are likely to be present along the TO17 alignment, but these are generally expected to be of low overall archaeological value. There are a number of small springs at the western foot of the Hanawera and Poroporo ridges and effort should be made to avoid or minimise effects to these natural features. Water sources in this area are likely to have been focal points for past human activity and were also used as repositories for taonga in some instances. There is also the potential for human remains to be found in the vicinity of the Kuku Stream in connection with an historic battle in this area.

There are a small number of sites – Kohitere, Otahinga, Tamaituatia, Waiore – known to be located towards the southern extent of NC5, but at the present time there is insufficient information to provide an accurate location for these sites. These sites are just as equally likely to be affected by NC5 as NC4, or by neither. North of Queen Street, NC5 may have a high effect on the Kaiwhakiekie bush cultivation site. This site is likely to have high information value, but low overall archaeological value. North of Kaiwhakiekie, no known sites are expected to be affected though unknown sites are likely to be located in proximity to the many creeks and streams in this area⁶. At the northern extent of NC5 there is a small risk that the Waituhi birding site will be affected, though this too is a high information, low overall value site.

Combined Route Options 2A-D: TO17 and NC4

This is the second most favourable route. The route alignment and archaeological risks for the TO17 section remain the same as outlined above, but with a connection to NC4 approximately 100 m east of SH57/Arapaepae Road at its northern extent.

Archaeological risks at the southern extent of NC4 are the same as for NC5, above: i.e., the Kohitere, Otahinga, Tamaituatia and Waiore sites may or may not be affected. Immediately to the south of where NC4 crosses Queen Street, the alignment is likely to have a substantial adverse effect on the Prouse homestead. Inclusion of an interchange in at this location – Options G and H – will compound these effects. A full-diamond interchange – Option H – at this location will likely result in the destruction of all buildings, structures and subsurface archaeological features located at this site. Given its significant archaeological and historic values, considerable effort should be given to avoiding any adverse effects at this site.

⁶ See Parker (2016: Figure 6)

Continuing north towards Roslyn Road, northeast Levin, the NC4 alignment turns to the west heading towards its connection with the existing SH1 northwest of Levin. Local residents have stated that human remains were found at Rae-kura during the excavation of an in-ground pool. The Rae-kura hill itself will not be affected by NC4 and human remains are not expected to be uncovered in this area, but there is the potential for other sites associated with human activities to be uncovered in the general vicinity. There is also evidence to suggest the presence of at least one clearing or refuge area in this general location⁷. While historic maps and court records indicate that the Te Hawera or Pakihi sites, or both, are located in the general vicinity of NC4, neither site can be located with any certainty at the present time. There is a moderate risk that one or more of these sites will be affected.

North of Roslyn Road, as NC4 continues towards the existing SH1, no known sites are expected to be affected though unknown sites are likely to be located in proximity to the many creeks and streams in this area. As with NC5, at the northern extent of NC4 there is a small risk that the Waituhi birding site will be affected.

Combined Route Options 3A-D: TO2 and NC5

This is the third most favourable route. As with TO17, TO2 passes through the high-risk Pukehou and Paru-a-uku clearing areas to the east of the existing SH1. However, north of Pukehou TO2 crosses SH1 and the NIMTR and continues on an alignment west of the existing SH1 until after it has crossed the Ohau River. Approximately 1.5 km to the west of Manakau, the alignment passes through the Ketemaringi clearing⁸. There are a number of sites with high archaeological values in this area, though the Te Rae-roa kāinga and Bevan homestead are the only known sites that are likely to be affected⁹.

North of Ketemaringi, TO2 follows an alignment parallel to the NIMTR. Immediately to the south of Kuku Beach Road, TO2 will substantially damage or destroy any archaeological remains associated with the Manawatu-Wellington Railway workers camp in this area¹⁰. Water sources in this area are likely to have been focal points for past human activity and were also used as repositories for taonga in some instances. As with TO17, there is the potential for human remains to be found in the vicinity of the Kuku Stream.

South of the Ohau River, TO2 is likely to affect the remains of a former survey camp – high information value, low overall value – and will pass through the Papawhanake clearing. There the present time little is known about this clearing, but there may be high value sites located within its bounds. Immediately to the north of the river, at Pari-kawau, an old fruit gathering ground will be affected by TO2 and the Option B bifurcation, though this is likely to be a site of low archaeological value. Turning to the east, TO2 passes through the southern margins of the former Wera-a-whango clearing¹¹. The exact extent of the clearing is not particularly clear at the

7 Forest refuges were sometimes used as safe places for women and children during times of battle.

8 See Parker (2015).

9 At the Combined Routes MCA meeting of the 25th of October, there was a brief discussion about the potential for the Option A interchange to be moved further south. Any shift of the Option A interchange to the south is likely to result in substantial additional adverse effects to high value sites in this area that are currently unaffected.

10 Previously described as a possible 19th Century Māori settlement, Parker (2013: 24-5).

11 See Parker (2013).

present time, but Māori Land Court minutes and early historic accounts indicate that a number of archaeological sites of high and low values were present within this clearing. It is not clear what features, if any, will be affected in this area. East of the Wera-a-whango clearing TO2 turns north and connects with the southern extent of NC5.

The archaeological risks for NC5 are the same as described above.

Combined Route Options 4A-D: TO2 and NC4

The archaeological risks for the TO2 and NC4 alignments are as described above.

From an archaeological perspective, this is the least preferred route. It is the route that is likely to have the greatest adverse effect to archaeological values of the four combined route options.

Conclusion and Scoring

All four combined routes are likely to result in some damage to the archaeological values around Pukehou and Paru-a-uku clearing, but Option 4 is also highly likely to have a significant adverse effect on at least two other high value sites: Te Rae-roa kāinga and the Prouse homestead. Other high value sites, or sites of an uncertain value, such as the Bevan homestead, the railway workers and surveyors camps, Papawhanake and Wera-a-Whango clearings, are also likely to be affected. Option 3 will also affect the same places along the TO2 portion of its alignment, but has the added benefit of avoiding the Prouse homestead along its northern half. Option 2 will affect substantially fewer known sites along its southern TO17 route, but will have a substantial effect on the high value Prouse homestead. Option 1 has all the benefits of Option 2, with the added benefit of avoiding any effects to the Prouse homestead.

On the basis of attempting to minimise the level of adverse effects to archaeological values, the 16 combined route and interchange options are scored as follows:

Table 2: Proposed scoring of combined routes and interchange/bifurcation options on the basis of avoiding or minimising adverse effects to archaeological values.

INTERCHANGE/ BIFURCATION OPTIONS	COMBINED ROUTE OPTION			
	1	2	3	4
A	+	--	--	--
B	+	--	--	--
C	++	--	--	--
D	+	--	--	--

Appendix M: Implications of Route Options to the East of Levin

isthmus

ŌTAKI TO LEVIN ROAD OF NATIONAL SIGNIFICANCE

**IMPLICATIONS OF ROUTE OPTIONS NC4 & NC5
ON LEVIN EASTERN GROWTH AREA**

LANDSCAPE + URBAN DESIGN

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1 INTRODUCTION

1.1 Two route options have been shortlisted for the Ōtaki to North of Levin 'Road of National Significance' (**RoNS**) expressway in the area east of Levin:

- NC4 – which is adjacent to the existing edge of Levin parallel with Arapaepae Road
- NC5 – which swings in an arc approximately 1km east of Levin.

1.2 Arapaepae Road currently forms the eastern edge of Levin. The area east of Arapaepae Road comprises rural and rural-residential properties, but has been earmarked for further residential development. The purpose of this memo is to consider the implications of the routes on such development. The need for the investigation arose from a multi-criteria analysis (**MCA**) of a range of possible route options between Taylors Road (north of Otaki) and State Highway 1 north of Levin. During the MCA process the impact on the Gladstone Greenbelt Structure Plan area (which provides for semi-rural or large-lot residential development) was raised, and attention also drawn to recent investigations into potential urban development east of Levin.

1.3 The area in question is currently zoned 'Greenbelt Residential Deferred' for which the development standards include a minimum serviced lot size of 2000m². Lifting the 'deferred' status depends on a Council resolution that reticulated services are adequate to service the lots – in the meantime the provisions of the rural zone remain in place.

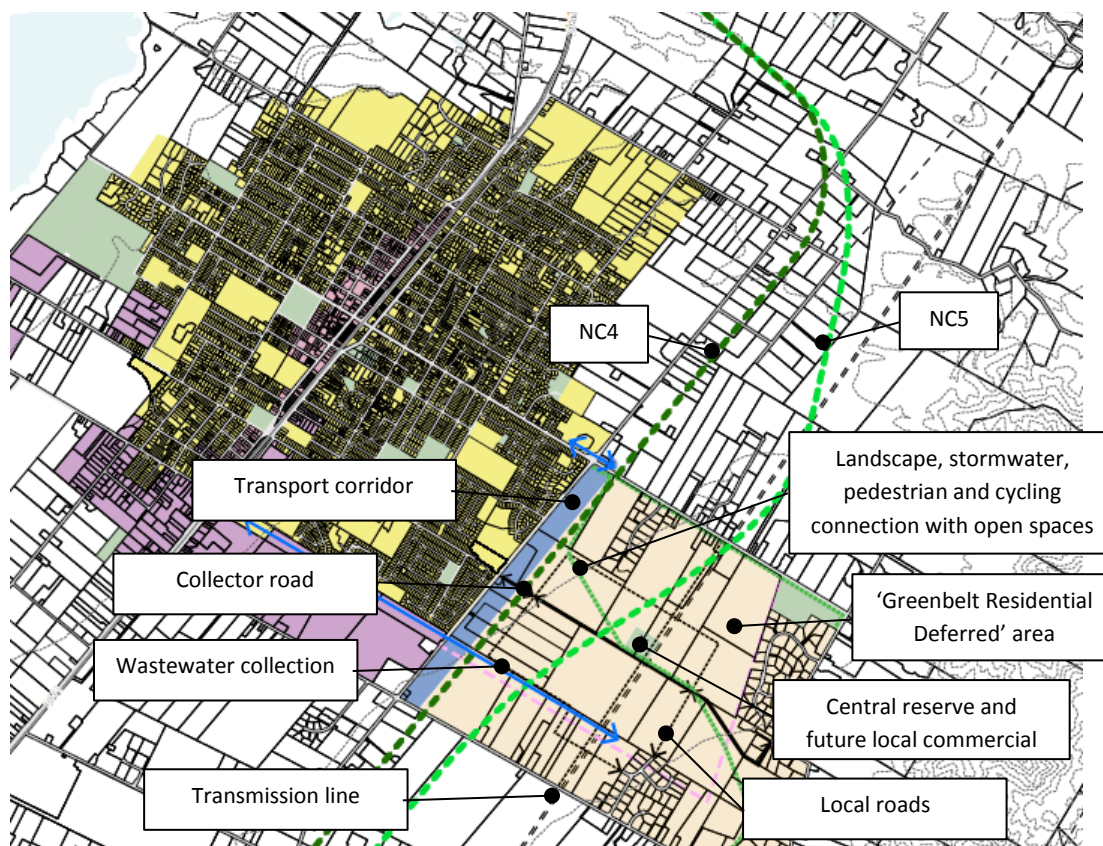


Figure 1: Map depicting NC4 and NC5 overlaid on Structure Plan 13 'Gladstone Greenbelt Levin – Queen Street/Tararua Road'

- 1.4 The structure plan for the area depicted above in Figure 1 (Structure Plan 13 in Schedule 8 of the operative Horowhenua District Plan) provides for a transport corridor adjacent to and on the eastern side of Arapaepae Road. It also depicts a basic network of roads, a greenway through the area, and a central reserve and local commercial node. It recognises the existing transmission line corridor, depicting a proposed local road aligned adjacent to the transmission lines. Otherwise, the 2000m² minimum lot size would provide for a semi-rural or large-lot residential type of development.
- 1.5 In the meantime, Council commissioned further recent investigations to accommodate projected growth in Levin over the next 20 years. These investigations have identified areas for potential urban residential development (on a pattern similar to Levin's current 500m² average lot size standards) including an area roughly 600 – 1000m wide east of Arapaepae Road between Queen Street East in the north and Tararua Road in the south. An area approximately 1000m wide is also identified south of Tararua Road for subsequent extension of such potential urban development.

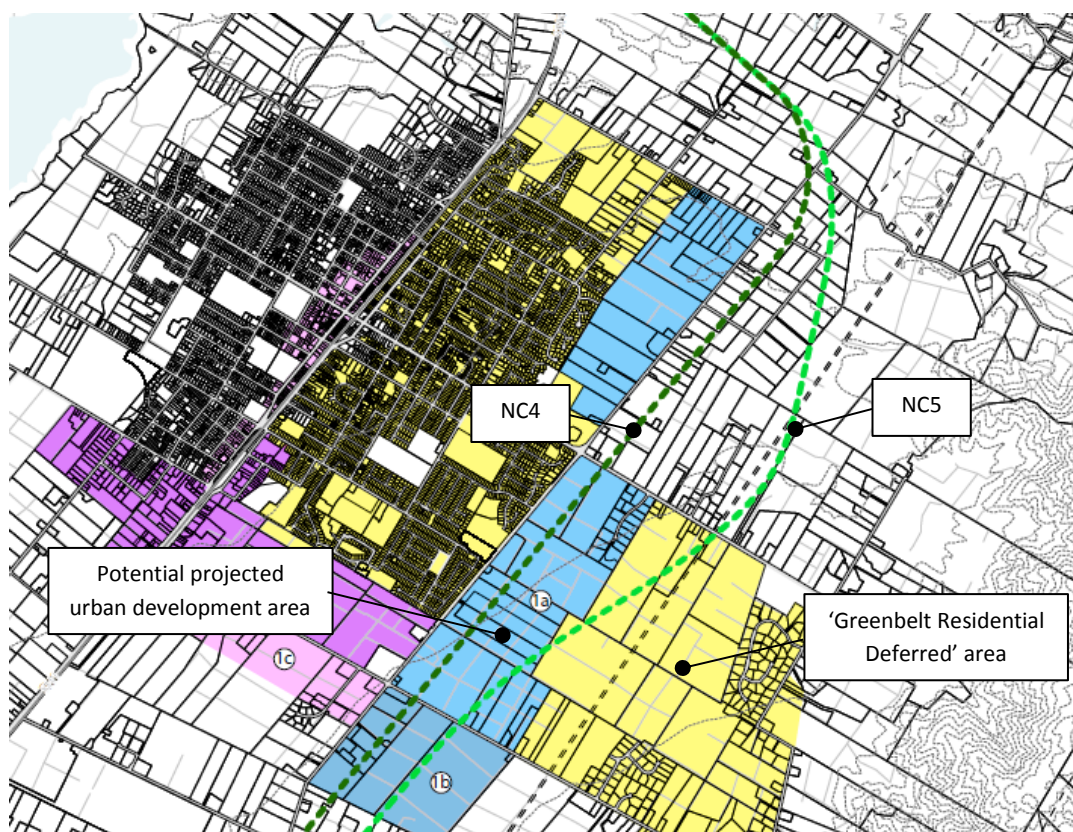


Figure 2: Map depicting NC4 and NC5 overlaid on 'Greenbelt Residential Deferred' area and potential projected urban development areas.

- 1.6 The RoNS standards require high-speed, dual-carriageway expressways with limited-access. These standards lead to the following characteristics that are relevant when considering future development:
- The expressways have limited crossing points – and therefore potential impacts on connectivity;
 - The expressway will potentially form a barrier between different landuses – which can be an advantage if one is seeking a defensible boundary between, for instance, urban and rural areas, but can also be a disadvantage if seeking to integrate areas with the same landuse; and
 - Areas immediately adjacent to the expressway will be exposed to adverse noise and visual amenity effects.
- 1.7 The following memo is a commentary on the implications of the NC4 and NC5 route options for each of the development scenarios discussed above in light of these characteristics.

2 IMPLICATIONS OF ROUTE OPTIONS FOR THE EXISTING STRUCTURE PLAN

NC4

- 2.1 NC4 would be in keeping with the existing structure plan:
- The expressway alignment follows the transportation corridor identified on the structure plan, except that it is transposed approximately 100m to the east to avoid the stand of bush adjacent to Arapaepae Road and some 300m south of Queen Street;
 - The alignment is square to the cadastral and road pattern (both the existing and proposed pattern), making for efficient subdivision;
 - The expressway would form a clear and defensible boundary between Levin's urban area and the type of semi-rural development envisaged by the structure plan;
 - There would be no impacts on features of the structure plan, such as the local road network, the green network ('landscape, stormwater, pedestrian and cycling connection with open spaces'), central reserve, and 'future local commercial'; and
 - The 100m wide strip of land that would be left between Arapaepae Road and the expressway could be realistically developed for 2000m² lots accessed from a re-purposed Arapaepae Road.

NC5

- 2.2 NC5 would disrupt the pattern of development provided for by the structure plan for the following reasons:
- The expressway would bi-sect the structure plan area. It would divide what would otherwise be a coherent area, compromise some features of the structure plan (i.e.

the location of the central reserve and ‘future local commercial’), and require reconfiguration of the proposed local road network and green network;

- The alignment is diagonal to the cadastral pattern, making for less efficient subdivision;
- The alignment would result in some land sandwiched between the expressway and transmission line corridor where they converge. It is likely, though, that the expressway and transmission line design would be integrated so that they are parallel with other where they come together, which would reduce the degree of impact on land development.

MCA Scoring

2.3 NC4 (as part of ‘Route 2’) received a more favourable ranking (for landscape and visual matters) in the MCA process for reasons that included:

- Its alignment adjacent to the eastern edge of Levin, reinforcing the existing boundary between urban Levin and the more rural or rural-residential character area; and
- Its square alignment with the cadastral and street pattern.¹

2.4 NC5, on the other hand, received a less favourable ranking (as part of ‘Route 1’) for reasons that included:

- Its bisecting of a rural and rural-residential area; and
- Its diagonal alignment to the cadastral and street pattern.²

3 IMPLICATIONS OF ROUTE OPTIONS FOR PROJECTED URBAN DEVELOPMENT

NC4

3.1 On the other hand, NC4 would be less preferable for the projected urban development being investigated east of Arapaepae Road for the following reasons:

- A new urban residential area in this location would be separated from Levin’s existing urban area by the expressway: the urban development would be forced to leap-frog the expressway. Such effects would be compounded by the width of the existing Arapaepae Road corridor and the 100m offset between Arapaepae Road and the expressway;
- The two points of access across the expressway at Queen Street and Tararua Road would be less suitable for urban development than for a lower density semi-rural type of development envisaged by the existing structure plan. The expressway would also hinder a possible new connection from Arapaepae Road to Liverpool Street;

¹ Ōtaki to Levin Road of National Significance, MCA Combined Routes and Interchanges, Urban Design + Landscape + Visual, Isthmus, 16 November 2016, paragraph 4.18

² Ibid, paragraph 4.2

- The 100m offset of NC4 from Arapaepae Road is an inefficient dimension for urban development because it is too deep for single urban lots and too shallow for three rows of lots and a street. (It is noted though, that the actual alignment of the future highway could be fine-tuned to fit development patterns given that the route is nominally 150m wide at this point and the highway footprint may occupy in the order of 60m or thereabouts). The relatively narrow width would also restrict choices as to the future character of Arapaepae Road after it is divested as a State Highway (for instance, opportunities to develop it as a wide boulevard entrance to Levin); and
- The expressway would be exposed to urban residential lots on both sides – which may require such measures as set-backs (i.e. it would reduce efficient use of land made available for urbanisation) or noise walls (with potential visual amenity effects).

NC5

3.2 NC5 could result in a more favourable outcome for projected urban development east of Levin – potentially forming a logical boundary between urban development on one side of the expressway and semi-rural type of development on the other side. However, such an outcome would require the urban development area being adjusted to fit the expressway:

- At Tararua Road route NC5 is approximately 450m from Arapaepae Road and the projected area for urban development is approximately 1km wide; and
- At Queen Street East NC5 is approximately 1km from Arapaepae Road and the area projected for urban development is approximately 600m wide.

3.3 Such an adjustment would bias the urban development area towards Queen Street, which is Levin's central east-west axis.

3.4 Subject to such an adjustment, NC5 would have the following benefits:

- It would enable the new urban development area to be contiguous and integrated with Levin's existing urban area. Arapaepae Road could be effectively re-purposed as an urban collector road, connecting directly with a hierarchy of streets within the new urban area, and providing for effective distribution between the new urban area and Levin's street network. Creating a connection to Liverpool Street would also be more straightforward exercise than NC4;
- The new highway would form a defensible boundary between Levin's urban area on the one hand, and large-lot semi-rural development on the other;³ and
- Only one side of the highway would abut urban residential lots, reducing potential requirements for measures such as noise walls or off-set buffers. Larger lots to the east would provide more opportunities to address noise by way of setbacks.

3.5 It is worth noting that urban development east of Levin would require new structure plans regardless of the expressway option selected: The new urban area would require

³ For instance, the two points of access across the expressway at Queen Street and Tararua Road would be more suitable for the lower density area east of the highway

master-planning, and the structure plan for the balance of the large-lot semi-rural area would require reconfiguration.

4 CONCLUSIONS

Existing Structure Plan

- 4.1 Option NC4 would have a better fit with the pattern of development envisaged under the 'Greenbelt Residential Deferred' zone and the existing structure plan. The NC4 alignment is consistent with the location of the transport corridor depicted on the structure plan – except for its offsetting by 100m to avoid a stand of bush. The alignment reinforces the existing boundary between urban Levin and the large-lot semi-rural development envisaged to the east, and it is square with the cadastral and street pattern allowing for efficient development.
- 4.2 Option NC5, in contrast, would bi-sect the semi-rural area east of Levin, disrupt key features of the structure plan, and would be diagonal to the cadastral and street pattern.

Projected Urban Development

- 4.3 On the other hand, Option NC5 would be better suited to the projected urban development currently being investigated, subject to such an urban area being fine-tuned to match the expressway alignment. NC 5 would enable the new urban area to be contiguous and better integrated with Levin's urban area. It would provide a logical boundary between the urban area on one side of the expressway and the large-lot semi-rural area on the other.
- 4.4 By comparison, Option NC4 would be less preferable for such projected urban development. The alignment would force the urban development to leap-frog the expressway. It would result in the new area being separated from and less strongly integrated with Levin. It would also result in an inefficient strip of land between the expressway and Arapaepae Road, and would expose both sides of the expressway to urban residential lots.

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