

APPENDIX F – MULTI CRITERIA ANALYSIS REPORT

IDENTIFICATION AND ASSESSMENT OF POSSIBLE ROUTE
OPTIONS – MULTI-CRITERIA ANALYSIS WITH COMMUNITY
INVOLVEMENT

ŌTAKI TO NORTH OF LEVIN

PREPARED FOR NEW ZEALAND TRANSPORT AGENCY

September 2017



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1. Introduction

1.1. Background

This report provides information on investigations undertaken in relation to the identification and evaluation of possible locations for a suitable route for a potential four-lane expressway between Taylors Road (to the north of Ōtaki) and State Highway 1 (SH1) north of Levin. The future route would also take into account and provide for State Highway 57 (SH57).

A number of reports have described the investigations undertaken to date on the Ōtaki to North of Levin project¹.

Previous investigations have involved extensive consultation over several years, including with stakeholders and the wider community². They have also involved close liaison with Horowhenua District Council (HDC), and, as appropriate, Kāpiti Coast District Council (KCDC), Horizons Regional Council (HRC) and Greater Wellington Regional Council (GWRC). In 2015, HDC recommenced work on a Town Centre Development Strategy as part of its overall Growing Levin study³. As part of the information to assist the development of this strategy the NZ Transport Agency (the Transport Agency) has undertaken to work together with HDC to investigate possible long-term road transport options that would take traffic, particularly heavy vehicle traffic, away from the main town centre.

Earlier investigations as part of the Ōtaki to North of Levin (O2NL) project had determined that a four-lane expressway could not be practically accommodated within the existing town centre or nearby urban area for a number of reasons⁴. Similarly, any route option which would pass to the west of Levin urban area had also been largely ruled out in earlier investigations⁵.

1.2. Objectives

The O2NL project comprised the northern-most section of the Wellington Northern Corridor, and will assist meeting its overall objectives.

The specific current objectives for the O2NL project are to:

- Reduce travel times on the state highway network;
- Reduce deaths and serious injuries on the state highway network;
- Enhance the resilience of the state highway network; and
- Provide appropriate connections that integrate the state highway and local road networks to serve urban areas.

These are influential in processes of route choice and concept design for a future expressway in the area and have been taken into account in the work documented in this report.

1.3. Process

This report sets out the most recent investigations to assist the NZ Transport Agency to determine route options for a four-lane expressway from Taylors Road to north of Levin. The investigations build on earlier options assessment work for this project.

As part of a 'refreshed' approach to community and stakeholder engagement, the Transport Agency wished to involve a broader range of people, particularly from community and

¹ A full list of previous reports is included as Appendix A in the report "Ōtaki to North of Levin – Taylors Road to Levin Northern Connection – Report on Identification and Assessment of Options", Stantec, APR, December 2016.

² Details and outcomes of public consultation are contained in the various consultation reports. The public consultation activity has been supplemented with meetings with key stakeholders, particularly with Iwi.

³ Growing Levin seeks to leverage off the improved travel times to Wellington which will result from the completion of the sections of the Wellington Northern Corridor RoNS to the south, and to enhance the ability of the town to attract new residents, commercial and industrial activity, and visitors. Subsequent work undertaken by HDC has had a wider economic focus.

⁴ See "Ōtaki to North of Levin RoNS – Corridor Stage Initial Considerations", MWH, July 2011.

⁵ See "Scoping Report – Ōtaki to North of Levin Expressway", MWH, July 2012.

stakeholder groups, and Iwi representatives, in investigating route options⁶. To ensure that any process addressed community expectations, the options to be considered would need to involve a representative range of routes, including some that may have been removed from consideration earlier in the technical investigations. This was to include some options that individuals and groups had suggested as part of the most recent engagement processes.

The investigations described in this report can therefore be considered as a community-based review of route options. This review was undertaken at a stage when investigations had identified and indicated a number of route options for wider consultation through the established ACRE (Area, Route, Corridor, Easement) method which was being applied in the overall project. Figure 1-1 sets out the steps in the ACRE process and shows how the review described in this report relates to this method⁷. The community review ensures that the information about the area is up-to-date, that the range of values held by the community is recognised and will be taken into account in any Transport Agency decision, and the information on which route choice decisions are based are open to community input and critique⁸.

The process described in this report had the benefit of information, comments and suggestions from the 2017 public engagement, wider engagement with Iwi, and also the participation of the Project Reference Group (PRG) which had been established for the project⁹.

Having determined this general approach, a specific process was determined which would seek to meet both the Transport Agency's and the wider communities' (as expressed through the PRG processes) expectations.

The work followed four stages, broadly, as follows:

- Stage 1:** The project team, involving the Transport Agency and its consultant team, updated information on constraints and opportunities mapped for the initial Area stage in 2011. It also prepared maps of a range of broad routes for consideration and evaluation through the community-based process.
- Stage 2:** A community workshop (Workshop 1) was held to review and revise, as appropriate, the preliminary corridors and the route options evaluation criteria.
- Stage 3:** A community workshop (Workshop 2) was held to determine if any of the possible routes were fatally flawed, to score each option against the agreed criteria and to determine a 'community' weighting for the criteria.
- Stage 4:** The project team undertook analysis of the findings from the community workshop.

The remainder of this report describes the investigations, analysis and findings of these four stages of work. The investigations described cover work done in the period from July to September 2017. However, the wider range of earlier investigations and the information which had been gained at these earlier stages, contributed significantly to the ability to undertake the work described in this report over a relatively short period. Throughout, information from consultation and engagement processes have been taken into account as work proceeded.

The investigations have led to the identification of a short list of options. These options will be further shortlisted after undertaking transport modelling and continuing discussions with Tangata Whenua, and the shorter list will be the subject of future stakeholder and community

⁶ Consultation and engagement on the project had recommenced in May 2017. The basis of the consultation undertaken between May and July 2017 reflected changes in the project scope from earlier consultation exercises. Details of the methods and outcomes of the most recent consultation, which provided a platform for the investigations described in this report, are provided in "SH1 Ōtaki to North of Levin: Engagement Summary Report – May-July 2017", NZTA, August 2017
<https://www.nzta.govt.nz/projects/wellington-northern-corridor/Ōtaki-to-north-of-levin/publications>

⁷ Note that this figure is a considerable simplification. At all steps consultation was involved and detailed information was collected prior to decisions being taken. In particular, the Route (i) stage involved numerous complex investigations and analyses. The work undertaken in the various steps have been fully described in the project reports. The Executive Summary of the Scheme Report (July 2017) includes Figure 3-1 which provides a Project History flow chart.

⁸ It is recognised that some aspects of the Area have changed considerably since the project commenced in 2011, that the community itself has changed with many new people living in the district, and that transport patterns have also changed.

⁹ See 2017 consultation report, *ibid*, particularly sections 4.1(4) and 5.11 and Appendix D of that report.

consultation. The outcomes of the consultation processes will assist the Transport Agency in its identification of a preferred option or options.

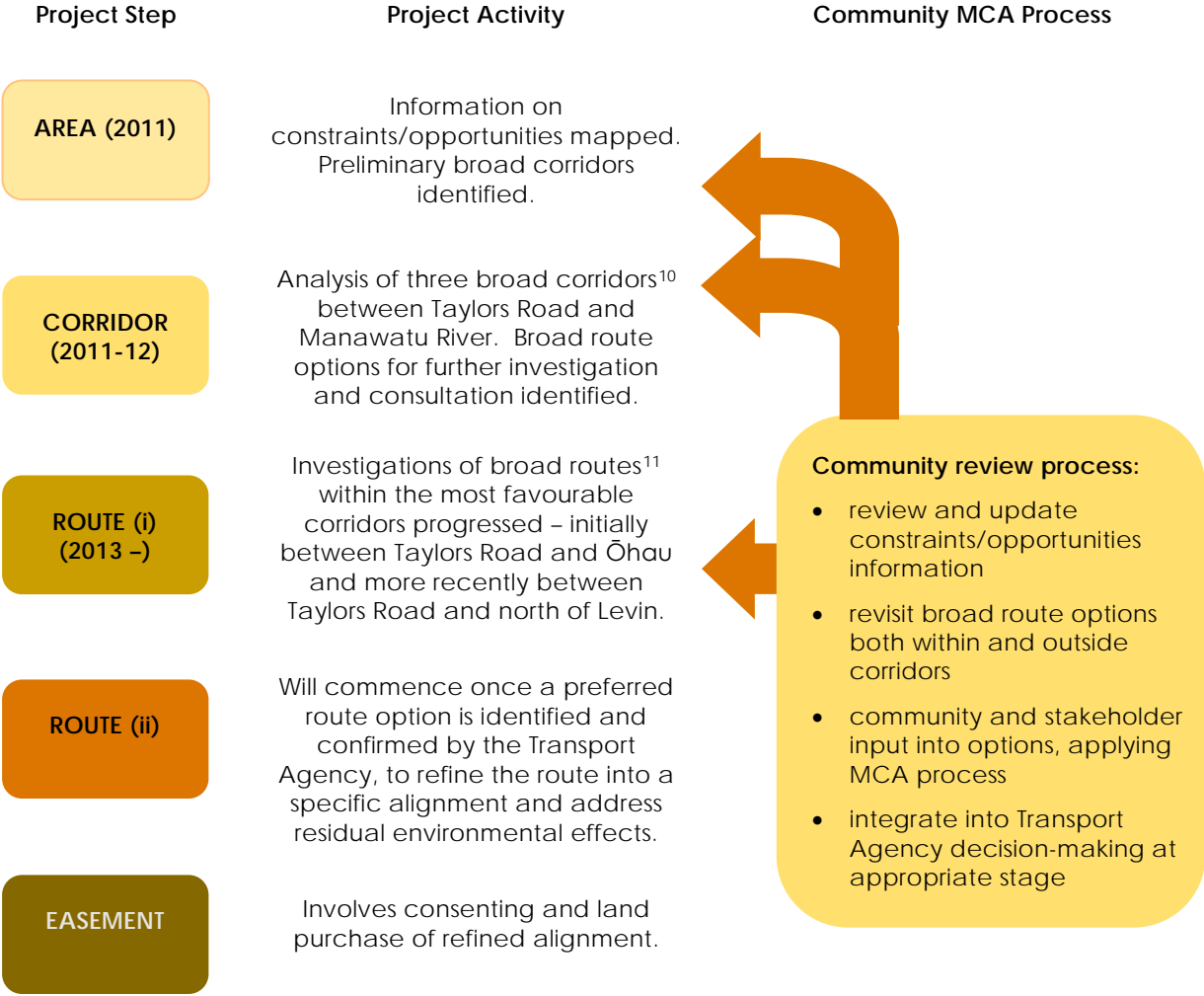


Figure 1-1: Schematic Diagram of Relationship between Overall O2NL Process and Community MCA Process

¹⁰ Each several kilometres in width, to allow for route options to be investigated within the Corridors.

¹¹ Each 150-300m in width to allow for later refinement to avoid or mitigate adverse effects.

2. Updating Information on Constraints and Opportunities and Identification of Route Options

2.1. Area Map Update

Stage 1 focused on confirming the constraints and opportunities within the Area, and undertaking a preliminary identification of possible routes.

This work updated earlier investigation work undertaken at the Area Stage. The following section provides a brief summary of the investigation work.

Given that the Transport Agency has decided to consider an expressway from Taylors Road to north of Levin, this entire area was the basis for the updated constraints work. The study Area is shown in Figure 2-1.

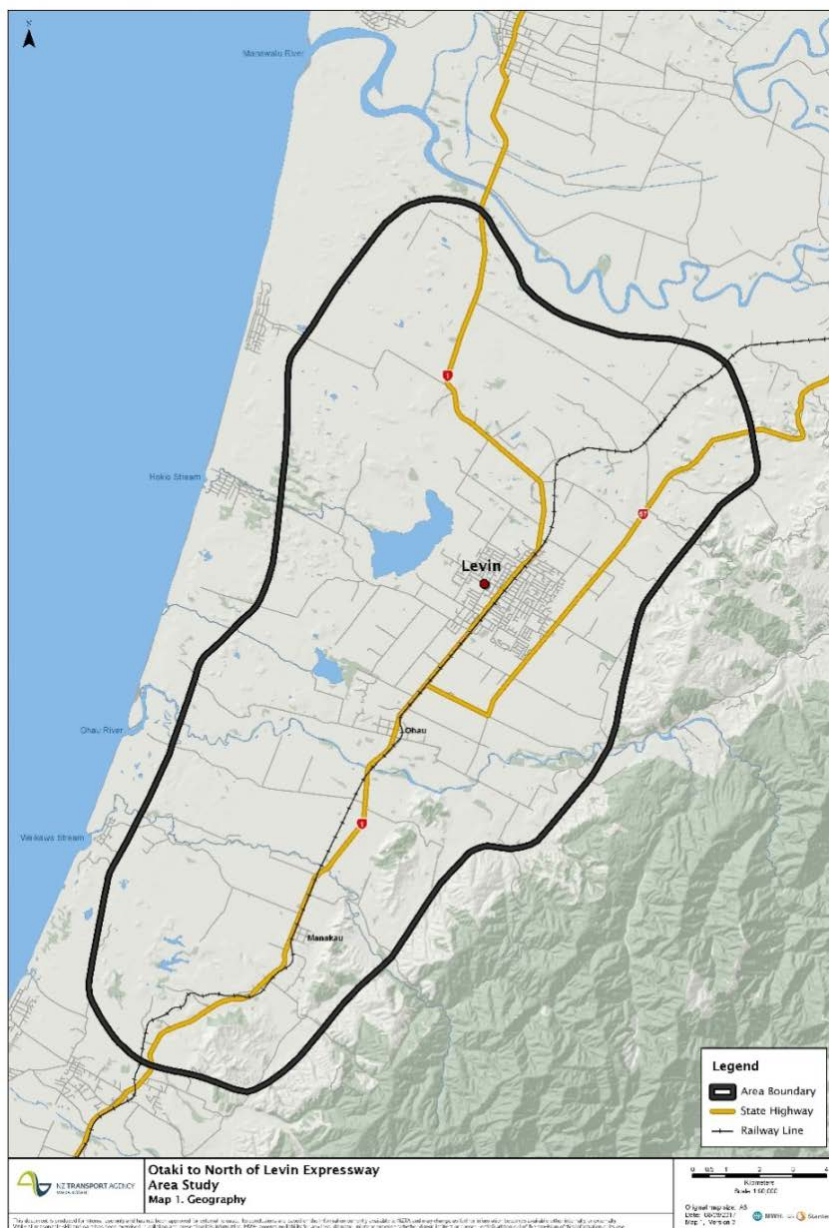


Figure 2-1: Study Area

Constraints information for this area had been gathered initially at the Area stage of the project, and reviewed as necessary for subsequent stages¹². The current phase of work involved a review and update of the various constraint maps based on more recently available information. Table 2-1 summarises the updates made to the constraint maps¹³.

Table 2-1: Summary of Update to Constraint Maps

Constraint Map	Description of further work
1 Geography	No changes
2 Landscape\Urban Design Quality	No changes following a review
3 Landscape\Urban Design Capability	No changes following a review
4 Landscape\Urban Design Features	No changes following a review
5 Heritage Areas	Updated from current notable tree and heritage site data (HDC) and known archaeological sites (NZ Archaeological Association)
5A Archaeological Risk	New map based on current understanding of risks of encountering archaeological sites
6 Tangata Whenua Areas of Significance	Updated based on parcel areas of Māori Freehold Land 2017 (initial assessment only)
7 Lifelines	Reviewed and updated National Grid lines
8 Population Distribution	Updated based on Land parcel data July 2017 (LINZ)
9 Geological Constraints	No changes following a review
10 Natural Hazards	No changes following a review
11 Flooding	Updated with some limited new flood hazard information (Horizons)
12 Ecological Areas of Significance	Updated following a review
12A Protected Areas	New map recording protected areas of Crown Land (NaPALIS ¹⁴)
13 Land Use Capability	Updated based on LUC data July 2017 (MfE)
14 Land Ownership	Additional reserve and Māori Land parcels added. Designations updated
15 District and Regional Plans	Updated based on information from HDC
16 Contaminated Land	Updated based on information from HDC
17 Contours	No changes

¹² Details of the original Area mapping and the associated set of 17 maps are provided in the report "Area Analysis Report", MWH August 2011. As the subsequent stages had focussed on Corridor investigations and specific route options, it was considered appropriate to revisit the Area maps and comprehensively update them.

¹³ Full details of the review and update process and the complete set of replacement maps are provided in the report "Ōtaki to North of Levin – Area Mapping Update", Stantec, August 2017

¹⁴ Information from the National Property and Land Information System – received late in the workshop process and used as a check of other information.

2.2. Identification of Preliminary Route Options

As the recent consultation and engagement had indicated community interest in a wide geographic spread of routes across the Area, the Transport Agency wished to revisit a number of earlier route options which had not been proceeded with at the start of the Route (i) stage in Figure 1-1. Through the PRG, it also sought to examine some entirely new options.

The preliminary routes for the analysis are shown on Figure 2-2. They were developed from the sources set out in Table 2-2, and involved a review of aerial photographic information as well as the constraints mapping to ensure that major constraints were avoided as far as possible, and, in general terms, the most practicable route through each locality was mapped.

Each option is shown on Figure 2-2 as a 300 metre wide band. This width allows flexibility to locate an expressway alignment within the band, and to leave room to avoid any particular features and address other adverse effects that may come to light during the detailed work of developing an alignment. The broad routes as shown provide for the minimum geometric standards appropriate for an expressway.

The corridors are split into southern and northern sections. The southern and northern sections join south of Ōhau or in the vicinity of SH57/Arapaepae Road. The southern and northern sections can be combined in various ways to create multiple whole-of-route options.

Table 2-2: Preliminary Route Sources

Section No.	Source
S1	Based on Corridor 46 from 2012 Scoping Report – initially not shortlisted but retained for consultation
S2	Based on Option T02 from 2013 - 2016 investigations (Further Options Report/Draft Scheme Report) but cut short to tie into western options to the north.
S3	Based on Option T02 from 2013 - 2016 investigations (Further Options Report/Draft Scheme Report).
S4	Based on Option T015 from 2013 - 2016 investigations (Further Options Report/Draft Scheme Report).
S5	Based on Option T017 from 2013 - 2016 investigations (Further Options Report/Draft Scheme Report).
S6	Based on Corridor 76 from 2012 Scoping Report – initially not shortlisted but retained for consultation
S7	Based on Corridor Section J from 2012 Scoping Report
N1	Based on historical option from 2000 Himatangi to Waikanae Study
N2	New option, developed to link southern options to N1 east of Lake Papaitonga.
N3	Based on Corridor 46 from 2012 Scoping Report – initially not shortlisted but retained for consultation
N4	Based on Option NC4 from 2016 investigations (Further Options Report/Draft Scheme Report).
N5	Based on Option NC5 from 2016 investigations (Further Options Report/Draft Scheme Report).

1 Ōtaki to north of Levin – options overview

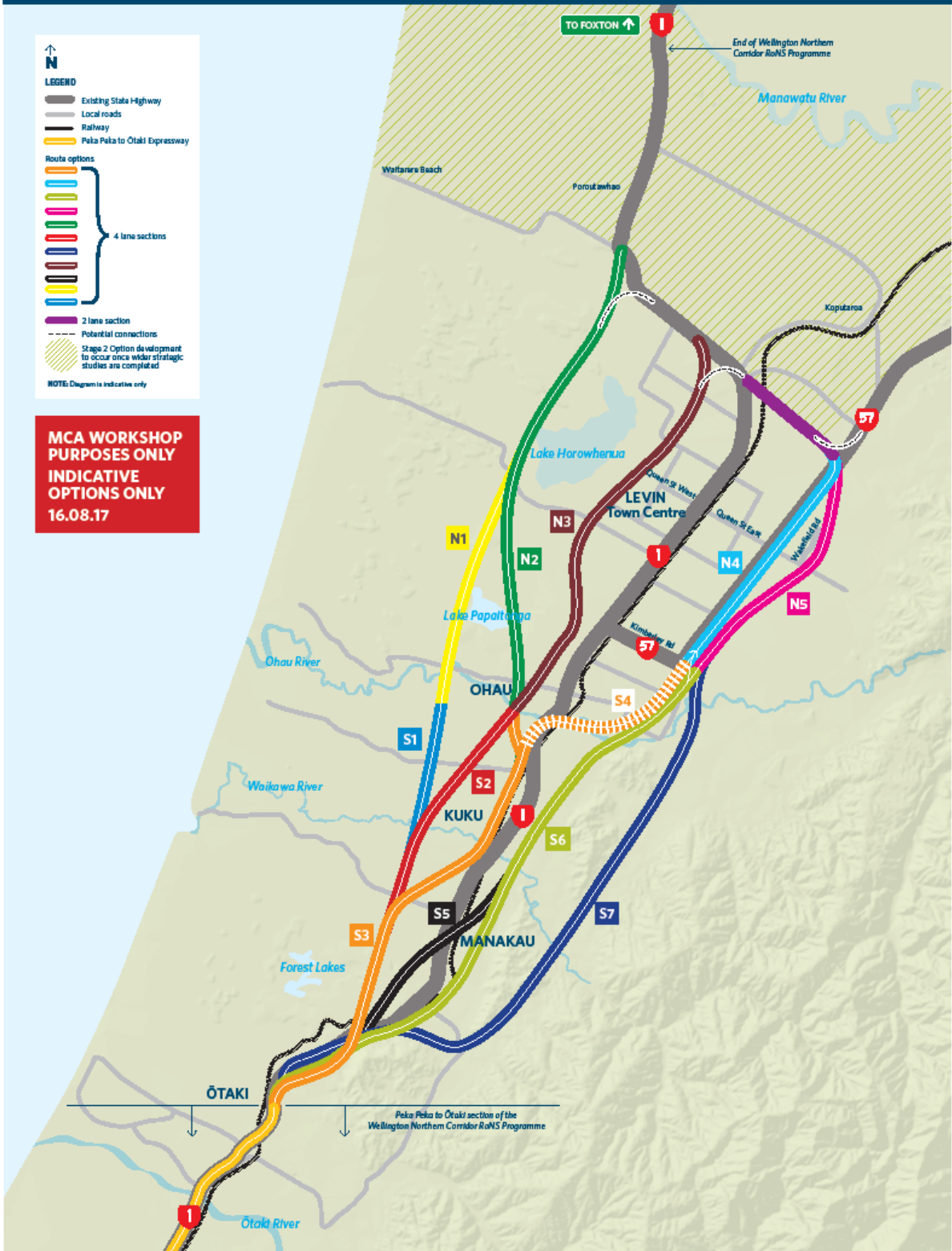


Figure 2-1: Preliminary Route Options

3. Workshop 1

3.1. Introduction

The Transport Agency sought to ensure that both Iwi and the PRG were able to take part in the community-based MCA process. It was considered important firstly that there should be a good understanding of the purpose, approach, and method of MCA and secondary that as many Iwi representatives, stakeholders and community representatives were able to be involved as possible.

At the PRG meeting prior to the first workshop¹⁵ a presentation was made and discussion held on the background and methodology of MCA. The powerpoint presentation is included as Appendix A.

Two workshops, one including a site visit for the participants to inspect the route options, were considered necessary and appropriate for the overall process. It was recognised that community and Iwi participants would have limited time to be involved in the process. The two workshops were therefore timed as afternoon and evening sessions as close together as practicable in August 2017. Further details of the workshops are provided in the following sections.

For both workshops a draft agenda and briefing paper were provided in advance. For Workshop 1, this is included, along with the workshop notes¹⁶, in Appendix B. Material for Workshop 2 is provided in Appendix C.

3.2. Overview

The agenda for Workshop 1 involved:

- Introductions/purpose of day
- Quick MCA refresher
- Route presentation and discussion
- Specialists introduction to their subject area
- Site visit/field trip
- Discussion on criteria (based on ideas in Background and Briefing Note plus site visit)
- Questions throughout.

The updated constraints maps described in section 2.1 were put up on the walls at the start of this workshop and were referred to during discussions.

The key questions that were canvassed at this workshop were:

- Are the preliminary route options the right ones? Are there any that should be removed? Are there additional routes that should be included?
- Are the draft criteria suggested in the briefing note the right ones? Has anything important been overlooked? Are things that don't matter included?

3.3. Review of Preliminary Route Options

The meeting notes from Workshop 1 (see Appendix B) describe the discussion on the options more fully. In summary the following changes were requested by the workshop attendees to the options:

- Add an option to the west of corridor S1/N1, which may avoid some of the values impacted by S1N1

¹⁵ PRG meeting 17th August 2017. Hard copies were made available to all participants.

¹⁶ The Transport Agency issued invitations to PRG members and Iwi. The list of those who attended each workshop is provided in the workshop meeting notes in Appendix B and C.

- Add a western route in the north which runs to the west of Lake Papaitonga on the alignment of N1 and then heads east to go east of Lake Horowhenua on the alignment of N3, again in an attempt to avoid some the values impacted by other options
- Add an option to the east of the Gladstone Greenbelt area, to avoid or mitigate potential effects on that area
- Add a northern option aligning with existing transmission line through the Gladstone Greenbelt Area, to utilise the existing the utility corridor.

It was agreed that new route options should be added in response to these requests at Workshop 1, as shown in Figure 3-1. The options that were added at this point for evaluation at Workshop 2 are:

- S8 / N6 – a far western, whole-of-route option
- N7 – a western option which connects in the south to S1 and which follows the N1 alignment to the west of Papaitonga and then crosses to the east of Lake Horowhenua joining the N3 alignment
- N8 – a far eastern option which connects to any of S4, S5, S6 and S7 in the south
- N9 – an eastern option which broadly follows the existing transmission line¹⁷ and connects to S7 in the south.

3.4. Review of MCA Criteria

An important part of Workshop 1 was to review a draft set of criteria to be used in the evaluation of the options in Workshop 2.

Before Workshop 1, preliminary criteria had been developed taking the following factors in account:

- The MCA process needs to include criteria that are relevant in terms of the decision that the Transport Agency needs to make
- Criteria should relate to:
 - The overall project objectives;
 - The ability to obtain RMA and other approvals to proceed with the project;
 - Impacts on the community which will be affected by the project; and
 - Practical aspects such as the ability for the project to be constructed, long-term exposure to natural hazards etc.
- Costs need to be taken into account.

Based on these considerations the following preliminary criteria were developed and circulated to workshop attendees prior to the workshop¹⁸:

- **Landscape/Visual Impact** – this takes into account existing landscape character (including degree of modification and presence of structures) and the likely impact that a particular route option would have. It includes potential landscape and urban design effects when passing through or near to townships or lifestyle areas, but not the direct visual effects on dwellings (which came into the category of impacts on dwellings).
- **Ecological Impacts** – this criterion covers ecological values, including indigenous vegetation areas that are nationally, regionally or locally significant in terms of habitat values or the presence of species, and the potential effects on waterways (lakes, rivers and streams) and wetlands.

¹⁷ Note that this line no longer comprises part of the National Grid, and is technically now part of the electricity distribution network.

¹⁸ Note that these criteria were generally consistent with criteria applied in the various MCA analyses undertaken at earlier stages of the project – see earlier reports.

- **Archaeological Risk** – this criterion takes into account known archaeological and heritage sites and features, and also the risk of encountering archaeological features, or areas of significance.

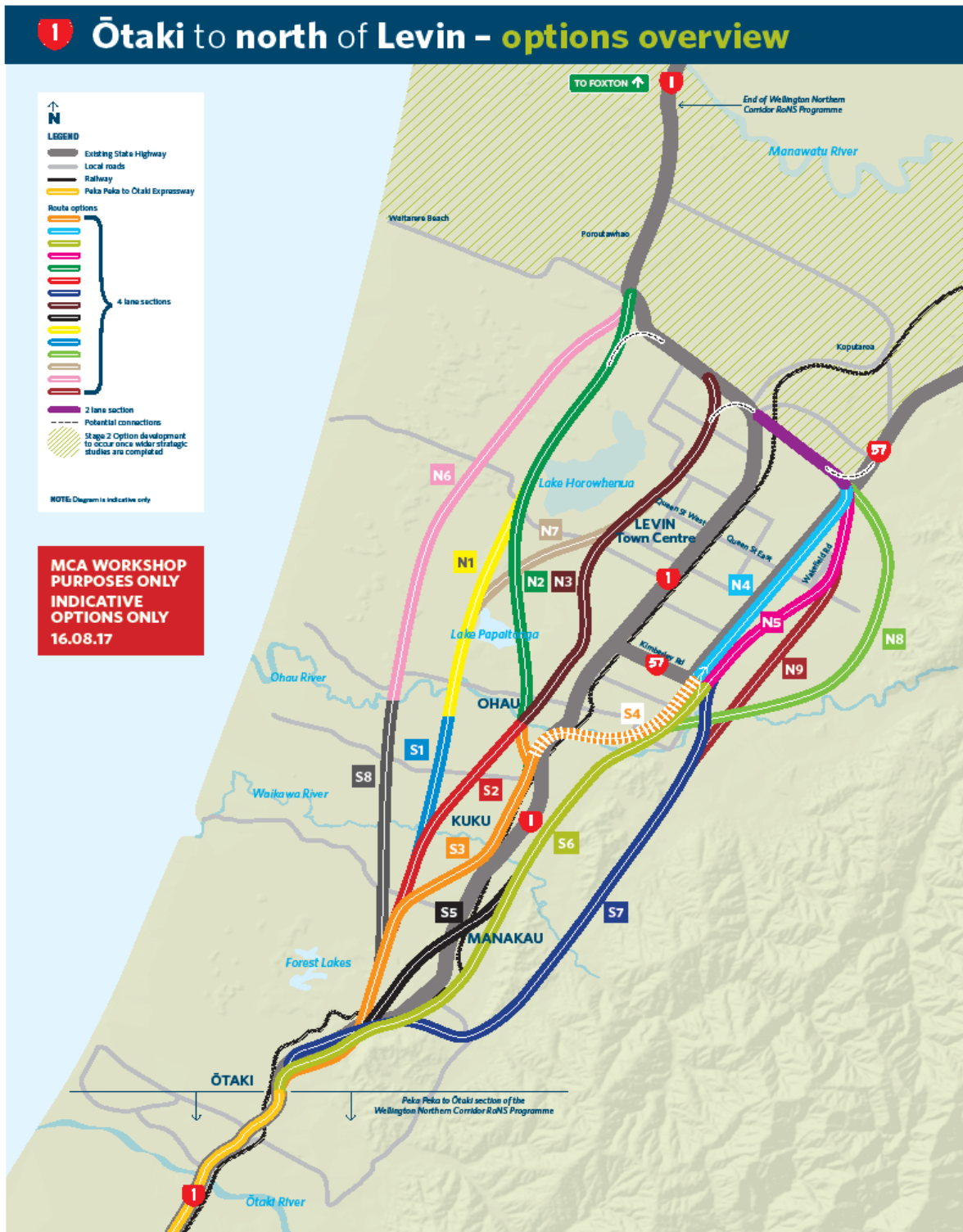


Figure 3-1: Route Options Following Workshop 1

Cultural Values – this takes into account the range of values that Tangata Whenua are likely to associate with the area, including past and present associations, key areas of settlement (marae and papakianga), waahi tapu (if known) and other cultural value, areas of use (e.g. food gathering) current ownership, and important elements of the natural environment such as waterways and wetlands.

Productive Land Values – this criterion takes into account the inherent productive values of Classes I to III soils, and the current productive land use pattern.

Social/community impacts – this incorporates a range of considerations such as severance, general urban amenity, recreation impacts, and construction impacts.

Impact on Dwellings – this criterion takes into account direct effects on existing dwellings, including the need to remove dwellings or the potential need for mitigation of adverse effects associated with an expressway route option.

District and Regional Plan and Consentability– this criterion includes consideration of both zoning and plan objectives and policies, and any major impediments through plans to a route option.

Fit to Project Objectives – this criterion covers travel time, safety and long-term resilience.

Property Degree of Difficulty – this included the number of properties, extent of severance of existing properties, the general ability to align a route option with property boundaries, potential for effect on farming/business operations, and any known land tenure issues.

Engineering Considerations – this criterion addressed expected difficulties with construction of a route option (constructability), including matters such as likely geotechnical considerations, extent of structures needed, and potential flooding and groundwater issues.

Cost – indicative order of cost of options.

During the workshop the relevance of 'fit to project objectives' was questioned. It was agreed that this should be retained as it incorporated matters such as access to Levin, which is an important factor for the community. The scope of the 'District and Regional Plan and Consentability' criterion was questioned. It was agreed that this criterion overlaps with other criteria and also does not cover the full breadth of relevant plans and strategies. The scope of the social/community impact criterion was also questioned. Some at the workshop considered that this criterion should be split into multiple criteria.

The Workshop 1 discussions also identified a range of possible additional criteria:

- Noise
- Amenity
- Safety
- Fit with economic development, and future urban and rural development proposals (including urban and rural development)
- Urban design impacts & urban form
- Impact on land value
- How does each option constrain / facilitate options at the north end of the study area (long term strategic thinking)
- Travel cost of longer routes, not just travel time
- CO₂ emissions
- Access to Levin

This feedback was to be taken into account in a revision of the criteria in advance of Workshop 2.

3.5. Site Visit

A key aspect of Workshop 1 was a comprehensive site visit. This enabled all workshop participants the opportunity to view all routes, including the new route localities identified earlier in the workshop, from roads and other public viewpoints prior to the discussion on criteria. Prior to the site visit, the specialists for the project had briefed the workshop on the scope and aspects of general importance for their specialist aspect within the Area. The specialists also attended the site visit to point out features, answer questions and learn any new information from community participants.

4. Workshop 2 and Subsequent Analyses

4.1. Overview

Following on from Workshop 1, the agenda for Workshop 2 involved:

- The presentation of the revised route options (Figure 3-1)
- Discussion on whether any of the options were fatally flawed
- Confirmation of the criteria
- Scoring of the options
- A discussion on the weighting to be applied to each criteria in the analysis of the scoring.

Again, a briefing note had been precirculated along with the draft agenda prior to the workshop (see Appendix C).

4.2. Fatal Flaws

At Workshop 1 it had been agreed that, before scoring the options against the criteria, it should first be identified if any of the options has a “fatal flaw” that is so significant that the option should be removed from further consideration.

A ‘fatal flaw’ was described as a condition or circumstance that means the option (in this case a route section) will not be able to be achieved. It can include an element of risk – a risk that is so great that the option is not worth pursuing. Fatal flaw analysis involves a high bar. Options that are highly difficult but not fatally flawed should remain in the mix and be scored adversely in the MCA process.

During discussion on this matter at the workshop, broad agreement was reached that identifying and removing any route section from further consideration on the basis of a fatal flaw was not appropriate. This conclusion was reached by the workshop because it was considered that most of the options had a significant adverse impact on some key criteria, which might be considered to be a fatal flaw by some at the workshop. Choosing not to run any option through the MCA process as a result of this would not allow the overall pros and cons of each option to be understood and assessed. It was also suggested that through more detailed discussion on the criteria relatively minor alignment adjustments may be identified which could potentially avoid a fatal flaw. It was also noted that the MCA evaluation is not the end of the process. Options can be further investigated, and alignment adjustments assessed, if there would be benefit in doing so.

As a result of this, it was agreed that potential fatal flaws would be identified and recorded through the MCA process by a score of 5*.

4.3. Finalising the MCA criteria

Prior to Workshop 2 changes to the MCA criteria at Workshop 1 had been reviewed. It was found that a number of the requested changes were captured in the criteria presented at Workshop 1 or could readily be included within a criterion. Table 4-1 indicates how the various issues raised in Workshop 1 are addressed in the criteria.

Table 4-1: Response to Workshop 1 Feedback on Criteria

Point to Include	Included in Criterion
Noise	Social/community/recreational impacts (as part of amenity)
Development of urban areas	District development
Ability to adapt to future option further north	Fit to project objective
Recreational values	Social/community/recreational impacts

Point to Include	Included in Criterion
Length	Fit to project objectives
Paris agreement/greenhouse gases	Fit to project objectives
Architectural heritage values	Impact on heritage
Local cultural values (non-Tangata Whenua)	Social/community/recreational impacts; Landscape/visual impacts; Impact on heritage; District development
Safety	Fit to project objectives
Amenity	Social/community/recreational impacts
Urban design and urban form	Landscape/visual impacts; District development
Impacts on land value	Not specifically included as a separate criterion as too uncertain and not an RMA consideration. Taken into consideration in social and property criteria

Some modifications to criteria were proposed as a result of comments made at Workshop 1. Therefore the following revised criteria descriptions were proposed.

Landscape/Visual Impact – this takes into account existing landscape character (including degree of modification and presence of structures) and the likely impact that a particular route option would have. It includes potential landscape and urban design effects when passing through or near to townships or lifestyle areas. It excludes direct visual effects on dwellings, effects of severance, and amenity considerations.

Ecological Impacts – this criterion covers ecological values, including indigenous vegetation areas that are nationally, regionally or locally significant in terms of habitat values or the presence of species, and the potential effects on waterways (lakes, rivers and streams) and wetlands.

Impact on Heritage – this criterion takes into account known archaeological and heritage sites and features, and also the risk of encountering archaeological features, or new areas of significance.

Tangata Whenua Cultural Values– this takes into account the range of values that Tangata Whenua are likely to associate with the area, including past and present associations, key areas of settlement (marae and papakianga), waahi tapu (if known) and other cultural value, areas of use (e.g. food gathering) current ownership, and important elements of the natural environment such as waterways and wetlands.

Productive Land Values – this criterion takes into account the inherent productive values of Classes I to III soils (present and future), and the current productive land use pattern.

Social/Community/Recreation Impacts – this incorporates a range of considerations such as severance, general amenity (including exposure of communities to noise), recreation impacts, and impacts during the construction phase.

Impacts on Dwellings – this criterion takes into account direct effects on existing dwellings, including the need to remove dwellings, and the potential need for mitigation of adverse effects on dwellings near an alignment.

District Development – this criterion includes consideration of impacts on current district plan provisions, and likely future growth areas.

Fit to Project Objectives – this criterion covers travel time, safety, long-term resilience and the ability to connect effectively to Levin¹⁹.

Property Degree of Difficulty– this includes the number of properties, extent of severance of existing properties, the general ability to align a route option with property boundaries, potential for effect on farming/business operations, and any known land tenure issues.

Engineering Considerations – this criterion addresses expected difficulties with construction of a route option (constructability), including matters such as likely geotechnical considerations, extent of structures needed, and potential flooding and groundwater issues.

Cost – indicative order of cost of options.

These revised criteria were applied by the Workshop 2 attendees.

4.4. Multi-Criteria Analysis of Route Options

4.4.1. Scoring System

The general approach to scoring used at Workshop 2 is set out in Table 4-2. This was discussed at both workshops and it was confirmed that much less was understood about benefits than adverse effects. While the project would not proceed unless there were benefits, these are not understood at the level of individual criteria. Therefore the focus in scoring would be on the adverse effects and difficulties within the criteria.

Table 4-2: Basis for Scoring used in the MCA

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.

As already noted the workshop group elected to use a score of 5* where it was considered that an adverse effect in relation to a criterion may be a fatal flaw.

4.4.2. Scoring Process

Workshop 2 applied the decision conferencing process in accordance with earlier discussions and briefing notes²⁰. The overall process was facilitated and, despite the large and diverse group²¹, it was possible to get through most of the extensive agenda set out. Most attendees at Workshop 2 had also been present at Workshop 1, and community and stakeholder participants

¹⁹ Note that operating costs, which had been included in the criterion in the briefing note, were removed during the Workshop 2 process.

²⁰ See information in Appendices A and C.

²¹ See Workshop 2 notes in Appendix C. The MCA process was facilitated by Sylvia Allan.

had attended earlier PRG meetings so were familiar with both the processes and the routes involved.

Specialists briefed to lead off discussion did so after the discussions on criteria and scoring system. The criteria were described and discussed by the relevant specialist, identifying issues relevant to each route option. Following this, the workshop attendees raised any questions or matters relating to the implications of a particular route option, and the score proposed by a specialist for each route option. Extensive use was made of aerial “fly-overs” and other materials during the explanations and discussions.

Each criterion was scored for the southern options first, and then for the northern options. In most cases a single agreed score was awarded. However in a few cases the workshop process did not reach a single score. In such circumstances, both scores were recorded (see Table 4-3 and Table 4-5). The various Iwi representatives present provided separate scores for the sections relevant to them (see later discussion for northern and southern section discussions and Appendix G).

The specialists’ background notes and assessments of the route options are included in Appendices D to M.

The MCA scores and the basis for scoring is summarised below. Where more than one score was recorded, this is explained²².

4.4.3. Scoring of Criteria – Southern Sections

The outcomes of the scoring of the southern sections are set out in Table 4-3, with key points from the discussion leading to the scores outlined below.

The following paragraphs of the report include a summary of the introduction made by the relevant specialist. To avoid unnecessary repetition in the report, this summary is not repeated in those paragraphs of the report which set out the assessment of the northern sections.

Notwithstanding, the specialist introductions apply equally to how the northern sections were assessed.

Table 4-3: Scoring of Southern Route Options

Criteria	Landscape/Visual Impact	Ecological Impacts	Impact on Heritage	Tangata Whenua Cultural Values	Productive Land Values	Social/Community/ Recreation Impacts	Impact on Dwellings	District Development	Fit to Project Objectives	Property Degree of Difficulty	Engineering Considerations	Cost
S1	2	1	4	5/4	3	2	3	1	3	5	3	2
S2	2	2	4	5/5	3	2	3	1	1	5	3	2
S3	3	3	4	5/5	3	2	3	1	1	5	3	2
S4	4	5	4	3/5	4	3	5	2	2	5	3	4
S5	4	4	4	4/4	4	5	5	3	1	5	2/3	4
S6	2	2	2	2/2	4	5	5	3	1	4	2	3
S7	3	5	2	3/3	4	2	4	1	3	4	3	4
S8	2	1	4	5/5	2	1	3	1	3	5	3	2

²² Note that in some cases the workshop process resulted in scores which were different from those proposed by the specialists who provided the base case information. The specialists have each been asked to indicate as part of the relevant Appendix where they have any disagreement with the workshop score. This ensures the professional independence of those workshop participants, while not affecting the outcomes of the workshop process.

Table notes:

1. Cells containing two scores are reflective of different views at the workshop.
2. Separate scores for Tangata Whenua Cultural Values were provided by representatives of Ngāti Wehi Wehi (noted first) and Ngāti Tukorehe (noted second).

Landscape/Visual Impact –The specialist introduction at the workshop noted that landscape and visual assessment considers three things: physical matters, aesthetic qualities and cultural meanings. Broadly landscape can be thought of as what we would see if we knew the full story about an area. Part of the assessment is to consider how well an option fits with a landscape, i.e. better options follow the patterns of the landscape, rather than cutting across them.

In this context Options S1, S2, S6 and S8 are considered to fit reasonably well with landscape patterns. However each of these options was scored 2, as they all contain some components which represent a minor difficulty in terms of landscape and visual impact. For example, the proximity of S6 to Manakau township counts against this option from a landscape perspective²³. Option S3 was scored 3 (reasonable difficulty) because the fit to landscape patterns is not as good as in Options S1, S2, S6 and S8. Option S7 was also scored a 3 because of the extent of earthworks (landform modification) that are expected with this option. Options S4 and S5 were identified as having extensive areas of difficulty (score 4) because they criss-cross and bisect plains and therefore have the worst fit to landscape patterns.

While there was general agreement at the workshop, some of the scores differed from those initially proposed by the specialist. This is noted in Appendix D.

Ecological Impacts – The specialist introduction for this criterion noted that the assessment used desktop sources (Department of Conservation, Land cover, QEII covenants, Regional Council, Horowhenua District Council and iwi) to develop a related constraint layer. This information had been supplemented by local knowledge and site visits undertaken over many years. Various indigenous systems have been considered including terrestrial and aquatic systems. Consideration has also been given to impacts on species and sites with special status. In general terms, the recommended scoring was based on the physical extent of encroachment on areas with ecological value, ecological significance of the areas and the degree to which affected areas can be avoided by refining the alignment within the 300m corridor.

Route options S1 and S8 are considered to have no or few impacts on ecological values and were therefore scored a 1. Options S2 and S6 were scored 2 (minor difficulty) as each encroaches only to a limited extent on areas with ecological value and it is expected that the significance of these effects can be mitigated by refining the alignment within the 300 m wide corridor. Option S3 was scored 3 (reasonable difficulty) because three areas of ecological potential are within the corridor, although the effects on two of these areas are expected to be able to be mitigated through route refinement. Option S5 was scored 4 (extensive difficulty) because three ecological areas of regional significance are encroached upon. Due to the orientation and proximity of these ecological areas the effects of Option S5 on these areas will be difficult to mitigate. Both Options S4 and S7 scored 5 (extreme difficulty) because these options encroach on multiple, significant ecological areas, with very limited or no opportunity to mitigate the effects.

Some modifications to the scoring from the specialists' original proposals were made as a result of new information at the workshop. See Appendix E.

Impact on Heritage – The specialist introduction noted that the forest line from 1872 is key to the distribution of sites with significant heritage value. Prior to 1872, land east of the forest line was mainly covered in forest, although there were some larger clearings for cultivation, occupation or other purposes. The forested areas were less densely occupied than the dune lands closer to the coast and the clearings. The coastal and clearing areas that were more densely occupied are those areas where the highest number of archaeological sites have been found and can be expected to be uncovered in the future. In general terms archaeological risk increases further west, except in main clearing sites where early pākehā traces, as well as Tangata Whenua traces, are expected.

In this context the western options (Options S1-S4 and S8) were scored a 4 (extensive difficulty) as they cross various clearings in the 19th century forest pattern, with a corresponding high risk of disturbing archaeological sites. S5 was also scored a 4 because of its expected impact on known and unknown sites west and north of Manakau. Options S6 and S7, which are entirely to

²³ It is noted that the effects of this proximity are given most direct consideration in relation to the Social/Community/Recreation and Impact on Dwellings criteria.

the east of State Highway 1 were scored 2 (minor difficulty). These routes have lowest identified archaeological risk.

Tangata Whenua Cultural Values – Representatives of local iwi (Ruakawa represented by the two marae south of Levin – Ngāti Wehi Wehi and Ngāti Tukorehe) provided the specialist role for this criterion. Their introduction noted that all options west of the current State Highway 1 are very difficult from a Tangata Whenua perspective due to the numerous urupā and other sites of significance in the area, and the extent of Māori land ownership. Eastern options raise fewer issues. While there are areas of concern in the east, these tend to be more readily mitigated than is the case west of State Highway 1.

Key considerations for all sections were the potential for adverse effects on the cultural landscape and environment, on wāhi tapu, and on Māori land. These were rated separately and an overall score indicated for each route section.

Southern sections were scored separately by Ngāti Wehi Wehi and Ngāti Tukorehe, leading to two scores in some sections because of the different implications for each group.

Options S2, S3 and S8 were scored 5 by both Ngāti Wehi Wehi and Ngāti Tukorehe, indicating high degrees of difficulty across all aspects for these route sections. Option S1 was scored 4 by Ngāti Wehi Wehi, but 5 by Ngāti Tukorehe due to the potential for direct effects on land ownership and cultural sites. Option S5 was scored 4 by both groups; but Option S4 scored 3 by Ngāti Wehi Wehi but 4 by Ngāti Tukorehe. Option S6 was regarded as least adverse by both groups and scored a 2, while Option S7 was awarded 3 by both due to some risk to cultural sites.

Productive Land Values – The specialist introduction noted that the assessment of this criterion has focussed on the Landuse Capability Classification System (LUC). In terms of LUC, categories 1-3 are of interest in terms of land productivity, particularly classifications 1 and 2. Scoring was based on the area of encroachment on these more productive land categories.

At the workshop Option S8 was scored 2 (minor difficulty) because this option impacts on less class 1 and 2 land than the other southern options. Options S1, S2, S3 scored 3 (reasonable difficulty) because these options impact on a moderate amount of class 1 and 2 land. Options S4, S5 S6 and S7 scored 4 (extensive difficulty) because the area of class 1 and 2 land impacted by these options is greater.

During discussion at the workshop it was noted that the assessment of productive land value as presented did not consider the current subdivision pattern. The presence of rural residential subdivision significantly reduces the productive potential of land. As a result of this discussion and subsequent comments from workshop attendees, further work on the implications of current subdivision and zoning patterns has been undertaken. See section 5.1 of this report and Appendix P. This section of the report applies the scoring from Workshop 2.

Social/Community/Recreation Impacts - The specialist introduction noted that impacts on three factors need to be considered under this criterion. These are:

- Severance - interruption of physical and social coherence of a community
- Amenity values -as defined in the RMA, including noise effects
- Opportunities for active and passive recreation.

Each of these factors was first assessed using an impact rating of low, moderate and high. An overall criterion score was then applied.

This criterion was of high importance to many of those in the workshop, and there was considerable discussion as to localities and scoring.

Option S8 was scored 1 (few difficulties) because of its relative isolation from dwellings and relative lack of special amenity and recreation values along the route. Options S1, S2, S3 and S7 were scored 2 (minor difficulty) because of their proximity to only limited number of dwellings and also because of the limited special amenity and recreation values along the route. Option S4 was scored a 3 (reasonable difficulty) because of its proximity to the clusters of dwellings south of Ōhau and impact on high amenity values, such as those at Bishops Vineyard. Options S5 and S6 were scored 5 (extreme difficulty) because of their impacts on, and around, Manakau.

Modifications to proposed scores were made during the workshop and some proposed scorings remained unresolved (with two scores recorded). See Appendix I.

Impacts on Dwellings – The assessment of this criterion considered dwellings directly in the alignment of the routes. In terms of scoring, scores 1 and 2 were not used because all options were recognised as having considerable adverse effects through direct effects on individual dwellings. The scores given were based on the following ranges of numbers of dwellings directly impacted: 1-30 (score 3 – reasonable difficulty), 31-50 (score 4 – extensive difficulty), more than 50 (score 5 - extreme difficulty).

In this respect, Options S1, S2, S3 and S8 scored 3 (reasonable difficulty), Option S7 scored 4 (extensive difficulty) and Options S4, S5 and S6 scored 5 (extreme difficulty).

District Development –The assessment against this criterion is mainly based on the 2015 District Plan zones. It also considered the Council review of these zones, although it is acknowledged that this review process is at an early stage and there was little hard information. It was noted that there is flexibility in how areas with development potential are designed and developed, and that this flexibility could be used to mitigate the impact of the route options.

Options S1, S2, S3, S7 and S8 were scored 1 (few difficulties) because their impact was on rural zoned land. The impact on the productive capacity of this land is assessed under the Productive Land Value criterion. Option S4 scored 2 (minor difficulty) to reflect the impact this route would have on the small development capacity remaining in the Ōhau Greenbelt Residential Area. Options S5 and S6 scored 3 (reasonable difficulty) because of the effect on the future development potential that has been identified north of Manakau.

Fit to Project Objectives - The specialist introduction recommended that the assessment of this criterion start with the consideration of the combined whole-of-route corridors. This was recommended because southern or northern options on their own cannot achieve the project objectives. Most of the southern and northern options can form a half of multiple whole-of-route options. Because of this the criterion score given to each of the southern and northern sections was proposed to be based the best performing whole-of-route option which it forms part of.

The assessment of the whole-of-route options was against the four project objectives, which are:

- Reduce travel times on the state highway network
- Reduce deaths and serious injuries on the state highway network
- Enhance the resilience of the state highway network
- Provide appropriate connections that integrate the state highway and local road networks to serve urban areas

The assessment of travel time was based simply on the calculation of journey length and volume of traffic expected on the route.

In relation to safety, it was noted that the key issue is how many people transfer to the new, safer expressway. How many vehicles do this will be contingent on how attractive the route is from a travel time perspective. Therefore the options assessment against the safety objective is the same as for travel time objective. In terms of resilience, it was noted that there are not a lot of hazards in the study area compared to other parts of New Zealand. All options duplicate current highway. The only option which stands out as being less resilient is S7, due to its location on a fault line. For local connectivity a broad consideration was undertaken based on the distance of the route from Levin.

Based on these considerations the following scores were awarded to the southern options:

- Options S2, S3, S5, and S6 were scored 1
- Options S4 was scored 2
- Options S1, S7 and S8 were scored 3.

Property Degree of Difficulty – The specialist introduction noted that the assessment of this criterion needs to consider the requirement for property reconfiguration, business relocations, the difficulty associated with acquiring Māori land, difficulties arising from the presence of easements on Māori land and large farming severances.

Options S1, S2, S3, S4, S5 and S8 scored 5 primarily due to the significant amount of Māori freehold land and the significant number of easements registered against titles. There were also specific additional issues associated with purchase of Tatum Park for Options S3 and S4, and Allied Concrete and the Bishops Vineyard land for Option S4. Options S6 and S7 scored 4 due to the

presence of a quarry and also the number of Māori freehold properties. However it was considered that these options do not contain the easement issues associated with options such as Options S1 and S2.

Engineering Considerations – The specialist introduction noted that in assessing this criterion four sub-attributes need consideration. These are described briefly below with the weighting of each sub criteria provided in brackets:

- The number of structures expected on the route, i.e. how complex the construction will be and the long term maintenance liability/resilience risk of more structures (10%)
- Geometry – whether a route is a high standard or includes a multitude of curves with minimum standards (20%)
- Geology and geotechnical considerations (50%)
- Flooding risk – based on constraint maps from Horizons Regional Council (20%)

Options S1, S2, S3, S4, S5 and S8 scored 3 given they all have a relatively high number of structures and are subject to some flood risk. Option S7 was also scored 3 due to the number of low standard curves on the route and the presence of some geotechnical issues. Option S6 scored a 2 given that there would be minor issues with all four sub-attributes.

Cost – The specialist introduction noted that this criterion was assessed by splitting each option into sections of normal construction and sections of complex construction, and by considering the number of structures required on each route. The outcome was a relative construction cost.

The southern options scored as follows:

- Options S1, S2, S3 and S8 were scored 2
- Option S6 was scored 3
- Options S4, S5 and S7 were scored 4.

4.4.4. Option 7A Consideration

During the second workshop, the possibility of a further route that followed Option S7 from the south but then cut back across onto Option S6 north of Manakau was raised.

Following Workshop 2 the Transport Agency requested that this should also be considered, so a plan was prepared and each of the specialists were asked to provide a score for this particular option. This is included below in Table 4-4 alongside scores for Option S7.

Table 4-4: Scoring of Option S7A

Criteria	Landscape/Visual Impact	Ecological Impacts	Impact on Heritage	Tangata Whenua Cultural Values	Productive Land Values	Social/Community/ Recreation Impacts	Impact on Dwellings	District Development	Fit to Project Objectives	Property Degree of Difficulty	Engineering Considerations	Cost
S7	3	5	2	3/3	4	2	4	1	3	4	3	4
S7A	4	5	2	3	3 ²⁴	1 ²⁵	5	1	3	4	4	5

²⁴ Note that the specialist indicated this could be scored either 3 or 4, as could Option S7 which the workshop had accorded a 4 as shown. [The current score provides a more favourable basis for this option.](#)

²⁵ The specialist for this criterion had also proposed Option 7 as a 1, but the workshop participants considered this to be a 2. In the specialist’s opinion there is little difference between Option 7 and 7A. As with the Productive Land criterion score, this score provides a more favourable basis for the analysis of this route.

Table 4-4 shows that the differences between Option 7 and Option 7A are as follows:

- Landscape/Visual – worse than S7 in that the route is only partly confined to the valley and that it would include dog-legs to negotiate both the Waiauti and Kuku Stream valleys.
- Impact on Dwellings – Option 7A is worse than Option 7 due to more dwellings being directly affected
- Engineering Considerations and Cost – Option 7A is worse than Option 7 due to a greater number of lower radii curves and also there are significant constructability issues with the route heading back onto route Options S6 from S7 in the Waiauti valley. These difficulties are also reflected in costs.

In addition to the above, it is noted that the Option S7A corridor is some 800m longer than Option S7 and therefore would have significantly fewer benefits in transport terms when compared to Option S7.

Option 7A appears to provide no benefits over Option 7 but additional impacts and dis-benefits²⁶ and therefore this option has not been included in any further analysis. Further investigations and analysis could, however, be undertaken.

4.4.5. Scoring of Criteria – Northern Sections

The outcomes of the scoring of the northern sections from Workshop 2 are set out in Table 4-5, with key points from the scoring discussion set out below.

Table 4-5: Scoring of Criteria – Northern Sections

Criteria	Landscape/Visual Impact	Ecological Impacts	Impact on Heritage	Tangata Whenua Cultural Values	Productive Land Values	Social/Community/ Recreation Impacts	Impact on Dwellings	District Development	Fit to Project Objectives	Property Degree of Difficulty	Engineering Considerations	Cost
N1	5	4	4	5*	2	3	3	1	3	4	3	2
N2	5	5*	4	5*	2	3/4	4	1	3	4	3/4	3
N3	4	2	4	5*	3	5	5	4	1	5	2/3	2
N4	2	4/5	4	3	3	4	5	4	1	3	2	1
N5	2	1	2	3	3	3/4	5	4	1	3	2	1
N6	2	5	4	5	2	2	3	1	3	4	3/4	4
N7	5	4	4	5*	3	5	4	4	3	4	3/4	2
N8	4	1	2	3	4	4	5	3	3	3	2	2
N9	1	5	2	3	4	3/4	5	4	1	3	2	2

Table notes:

1. Cells containing two scores are reflective of different views at the workshop, or lack of workshop resolution.

²⁶ This was despite its scoring being shown as technically more favourable under two criteria (see earlier explanation in previous footnotes).

2. Single scores under Tangata Whenua Cultural Values were provided by representatives of Muaupoko.

The following discussion focuses on the reasons for the scores above. For a more general discussion on how the scoring for each of the criteria was approached see Section 4.4.3.

Landscape/Visual Impact – Option N9 scored 1 (few difficulties) as it fits well with landscape patterns, including being square to current cadastral patterns and has the potential to follow the transmission line. Options N4, N5 and N6 scored 2 (minor difficulties) because they generally fit with the landscape patterns, but each had a specific factor which warranted a more adverse score than Option N9, e.g. for N6 this relates to the cultural connections with the landscape. Options N3 and N8 scored 4 (extensive difficulties). This score was given to N3 because of the impact of the option on the outskirts of Levin and on Lake Horowhenua. It was given to N8 because of its impact on the significant Tararua landscape and likely impacts on two reserves.

Options N1, N2 and N7 scored 5 (extreme difficulties). For all three options this score was awarded because of their impact on Lake Papaitonga, and in the case of Options N2 and N7 also because the option cuts across landscape patterns.

It is noted that some of the scores agreed at the workshop differ from those recommended by the relevant specialist. These differences are detailed in Appendix D.

Ecological Impacts – Options N5 and N8 scored 1 (few difficulties) as there are no identified ecological constraints on these corridors. Option N3 was scored 2 (minor difficulty), which reflects that while there are bush areas and wetlands potentially impacted by the route it is expected that these can be avoided through route refinement within the 300 m wide corridor. Options N1 and N7 were scored 4 (extensive difficulties). In the case of Option N1 the effects are on the fringe of Lake Papaitonga and also duneland. In the case of Option N7 this score was awarded due to impacts on multiple small forest areas which are likely to be difficult to avoid. Options N2, N4, N6 and N9 all scored 5 (extreme difficulty) because of their impacts on multiple high value ecological areas. Within the workshop group there were some views that the effects of N4 may be able to be mitigated through route refinement and therefore a score of 4 may be more appropriate. The score for Option N2 was 5*, signalling that the effect may be close to a fatal flaw because of the route's impact on Lake Papaitonga.

Impact on Heritage – Options N1, N2, N3, N4, N6 and N7 all scored 4 (extensive difficulty). For Options N1, N2 and N6 this score was because the route traverses the archaeological high risk area. Options N3 and N7 are largely east of this area but proximity to Lake Horowhenua also introduces a high archaeological risk. Option N4 was awarded a score of 4 due to the impact of the route on the Prouse homestead and curtilage. Options N5, N8 and N9 were scored 2 (minor difficulties) because all three routes are through low risk areas.

Tangata Whenua Cultural Values – The scores for the northern route options were provided by a representative of the Muaupoko Tribal Authority applying the same considerations as had been applied for the southern sections. Options N4, N5, N8 and N9 were scored 3 as they all lie to the east of Levin which is considered as having less cultural associations and less risk (including little or no remaining Māori land ownership). Option N6 scored 5 (extreme difficulty) because of its western location and conflict with cultural values. Options N1, N2, N3, and N7 were scored 5* (extreme difficulty / potential fatal flaw) because of their route locations within areas of significant Māori land and proximity to features and areas with significant value to Muaupoko, including Lakes Horowhenua and Papaitonga.

Productive Land Values – Options N1, N2 and N6 were scored 2 (minor difficulty) due to low amounts of class I and II land impacted by the route. Options N3, N4, N5 and N7 scored 3 (reasonable difficulty) given the moderate level of class I and II land impacted. N8 and N9 scored 4 (extensive difficulty) as these options impact the greatest area of class I and II land.

As reported for the southern route options, some concern was expressed as to the veracity of the scores for this criterion so a review was undertaken post-workshop as reported in section 5.1 of this report.

Social/Community/Recreation Impacts – Option N6 scored 2 (minor difficulty) given the relative lack of constraints along the route. Option N1 scored 3 (reasonable difficulty) due to the impact on the golf course and proximity to Lake Papaitonga. Scoring of Options N2, N5 and N9 was fully resolved. Scores of both 3 and 4 were applied to these options, reflecting that some thought the impact of the options was more significant than others. N2 was given these scores due to proximity to the golf course and Lake Papaitonga and because of anticipated severance effects on the Ōhau township extension. Options N5 and N9 were given these scores because of the severance of Gladstone from the remainder of Levin. Options N4 and N8 scored 4 (extensive

difficulty) due again to the severance effects on the Gladstone community and in the case of N8 due to impacts on the recreation facilities east of Gladstone. Options N3 and N7 scored 5 (extreme difficulty) due to the severance of Levin from Lake Horowhenua and also due to the amenity impacts of the routes.

Impacts on Dwellings – Options N1 and N6 would impact between 1-30 dwellings and therefore scored 3 (reasonable difficulty). Options N2 and N7 would impact between 31-50 dwellings and therefore scored 4 (extensive difficulty). Options N3, N4, N5, N8 and N9 would impact on greater than 50 dwellings and therefore scored 5 (extensive difficulty).

District Development – Options N1, N2 and N6 scored 1 (few difficulties) as they cross rural land. The productive potential of rural land is addressed through the Productive Land Value criteria. Option N8 was scored a 3 (moderate difficulties) because the option impacts on the development potential in the far eastern part of the Gladstone area. Options N4, N5 and N9 scored 4 (extensive difficulty) due to the impact of these options on the central and western part of the Gladstone area. Options N3 and N7 also scored 4 (extensive difficulty) due to the impact on the development potential of the residential and industrial areas on the western edge of Levin.

There was some debate in the group that the impacts of Options N4, N5 and N9 warranted a score of 5. This score was not adopted because of the potential to mitigate effects on the development potential of Gladstone through structure planning and good urban design. It was therefore considered that the difficulties of these options could not be described as 'extreme'.

Fit to Project Objectives – Options N3, N4, N5 and N9 were scored 1 (few difficulties) which reflects the expected reduction in travel times of these options and the safety benefits arising from the resulting high transfer of traffic onto the safer expressway route. Options N1, N2, N6, N7 and N8 scored 3 (moderate difficulties) due to lower travel time reductions and the lower attractiveness of the route, which is expected to mean fewer vehicles will use the safer expressway. Options N1, N2, N6 and N8 are also further from Levin, therefore impacting on their accessibility to that centre.

Property Degree of Difficulty – Options N1, N2, N6 and N7 scored 4 (extensive difficulty). All options will require the purchase of a large amount of Māori land. Options N1 and N2 have the added difficulty of the golf course purchase. Option N3 was scored a 5 (extreme difficulty) due to the need to purchase the Alliance Group site, the presence of Māori land and the presence of recreation reserves along the alignment. Options N4, N5, N8 and N9 scored 3 (reasonable difficulty) mainly because there is currently no Māori land identified along these alignments.

Engineering Considerations – Options N4, N5, N8 and N9 scored 2 (minor difficulty) which reflects the limited number of structures and the very limited number of curves at minimum geometric standards. Options N1, N2 and N6 were scored 3, reflecting slightly more structures. Options N3 and N7 also scored 3 because of their poorer geometry.

During group discussion questions were raised about whether the geometry of Option N3 could be improved through further design. It was noted that if this did occur it may improve the score for this option to 2. Both scores were applied. Group discussion also questioned whether the scores for Options N2, N6 and N7 reflect the true geotechnical risk in the area, which arises from the presence of peat materials. It was agreed that the scores for these options should be recorded at 4 as well as 3, and addressed as part of sensitivity testing.

Cost – This criterion assesses the relative construction cost of the options. Options N4 and N5 were scored 1 and would be the least expensive options. Options N1, N3, N7, N8 and N9 were scored 2; Option N2 was scored 3. As the most expensive option, Option N6 scored 4.

4.5. Weighting Systems

4.5.1. Workshop Weighting

It was recognised by the workshop that all criteria are not of equal importance and that different people may accord them different importance. There was acceptance that the criteria did not represent a "base case" and there was no benefit in an analysis with all criteria accorded equal

weight. This approach has been consistent with all earlier MCA exercises undertaken in relation to the project²⁷.

A “Workshop” weighting was sought, and led to considerable discussion and some debate at the end of Workshop 2. The weights for the various criteria arrived at are presented in Table 4-6. This can be regarded as the community workshop weighting as it was performed as part of the workshop process and in the context of the comprehensive scoring exercise which had just been undertaken.

The workshop participants determined that the most important aspects were ecological impacts, impacts on heritage, Tangata Whenua cultural values, social/community/recreation and fit to project objectives. The first four of these were identified as key and enduring issues for the community. Fit to project objectives was considered of equal importance because it includes access to Levin which is also a key and enduring issue for the community.

The next most important criteria were identified to be impacts on dwellings and property degree of difficulty. Both were noted to address factors which directly affect members of the community. However these were of less weight than the social, community and recreation criterion as it was recognised that financial compensation would be available to dwelling and property owners. Productive land was considered the next most important criterion. While this issue is considered very important, its slightly lower rating reflects the relatively small extent of land involved.

District Development and Landscape/Visual Impacts were rated lower. Landscape was given this rating because the workshop attendees considered that landscapes change anyway and any effects can be mitigated. District Development was rated lower because the group accepted that there is flexibility in how future development patterns can adjust to the presence of an expressway. The two criteria identified as being of lowest importance were Engineering Considerations and Cost. Both were considered to be of limited importance to the local community.

The workshop attendees were made aware that additional weighting systems would also be applied along with sensitivity analysis. The next section explains the basis for these alternative weighting approaches.

Table 4-6: Workshop Weighting

Weighting of Criteria (out of 10)	Landscape/Visual Impact	Ecological Impacts	Impact on Heritage	Tangata Whenua Cultural Values	Productive Land Values	Social/Community/ Recreation Impacts	Impact on Dwellings	District Development	Fit to Project Objectives	Property Degree of Difficulty	Engineering Considerations	Cost
Workshop	6	10	10	10	8	10	9	6	10	9	2	2

4.5.2. Additional Weighting Systems

A range of additional weighting systems was developed. These are shown alongside the workshop weighting in Table 4-7 and are described in general terms below. The RMA and Quadruple Bottom Line systems have been developed by Allan Planning and Research on the basis of understanding a range of possible relevant considerations²⁸.

²⁷ Weighting systems are usually much more challengeable than scoring, as they can be readily developed from a range of different perspectives. Thus a single result is always vulnerable to criticism that the weighting system is wrong. An alternative means of investigating the robustness of a preference is to subject the scoring to a range of weightings and review the outcomes in terms of their consistency and range of differences.

²⁸ This type of process has been applied in similar analyses on the O2NL project to ensure overall robustness in analysis. The weighting systems generally reflect those used earlier, as well as on other infrastructure projects.

RMA Section 6 Weighting – This weighting system is related to the Resource Management Act approvals regime that will eventually be applied. Section 6 matters are those of national significance which must be recognised and provided for in all decisions. The weighting places emphasis on three of the four section 6 RMA aspects potentially at play in respect of the project (ecology, heritage and Tangata Whenua values) but recognises that other values also have a place. Natural landscape values have not been elevated to the same level as the other section 6 matters in this analysis, as few “outstanding” qualities and elements were identified in the area affected by the route options by the specialist involved, and it would thus be inappropriate to elevate them to a very high weight. Some weight is placed on the district plan analysis in this case, as this can be considered reflective of section 6 matters, but other criteria are left at low levels.

Four further weighting systems are related to quadruple bottom line considerations. The analysis on this basis is relevant to matters to be taken into account under the Land Transport Management Act and other national infrastructure policy approaches. They are also pertinent to RMA and Local Government Act considerations²⁹.

Social – all criteria have a social component, so all are given some weight. The highest weighting is given to Social/Community Recreation and direct impact on dwellings, followed by Tangata Whenua and archaeological risk aspects (which have a high social component in this area), to property effects and to district plan considerations. All other criteria have some social relevance in this productive rural area, with productive land and engineering aspects least relevant.

Environment – this places the highest weight on the physical environmental element of ecology, with other criteria which integrate physical environmental considerations with social/community values also given some weighting. Criteria without a physical environment component are omitted.

Cultural – this highly weights Tangata Whenua cultural values and archaeology/heritage, followed by ecological and Social/Community/Recreation, but also acknowledges cultural significance in the established rural landscape and its settlement pattern, and its remaining ecological values, all of which have a cultural dimension.

Economic – this excludes a number of criteria which have little or no direct economic bearing on the project or the local economy. It emphasises cost and effects on property, but applies some weighting to other criteria with an economic component.

The Transport Agency then sought further weighting systems to be applied. These are shown at the end of Table 4-7.

Table 4-7: Weighting Systems Applied (Includes Workshop Weighting)

Weighting of Criteria (out of 10)	Landscape/Visual Impact	Ecological Impacts	Impact on Heritage	Tangata Whenua Cultural Values	Productive Land Values	Social/Community/Recreation Impacts	Impact on Dwellings	District Development	Fit to Project Objectives	Property Degree of Difficulty	Engineering Considerations	Cost
Workshop	6	10	10	10	8	10	9	6	10	9	2	2
RMA Sec 6	6	10	10	10	2	5	3	5	3	2	2	2
Social	5	5	8	8	3	10	10	8	5	8	3	5
Environment	5	10	3	3	3	0	0	3	0	0	0	0
Cultural	5	3	10	10	0	5	3	0	0	0	0	0
Economic	0	0	1	0	5	5	5	5	5	8	5	10

²⁹ This quadruple bottom-line weighting is a different type of evaluation from the Benefit Cost Ratio (BCR) evaluation normally undertaken by the Transport Agency.

Draft MCA Guide	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	10	3.33	3.33	3.33
PRG 1	5	8	6	5	9	10	9	9	8	5	0	0
PRG 2	5	8	9	10	9	10	9	9	8	5	0	0

Draft MCA Guide - NZ Transport Agency has recently released a draft guideline on MCAs. Whilst there are a number of outstanding issues raised by submitters on this draft, a weighting system based on this has been developed for comparative purposes. This distributes weightings of one third to criteria relating to project objectives, one third to those relating to implementability (in this case spread between property degree of difficulty, cost and engineering) and one third towards impacts (in this case allocated equally across the remainder of the criteria).

Additional Community Weightings - At the PRG meeting following the workshops a number of community representatives³⁰ stated that they felt rushed developing the Workshop Weighting system during the second workshop³¹. Accordingly, the attendees of that PRG meeting were offered an opportunity to develop a new weighting system which reflected their further consideration since the workshop. There were however differing opinions within the group as to the importance of heritage and historic cultural values; some thought they were fundamental considerations, while others thought that more weight should be applied to current communities. Accordingly two further weighting systems were added. These were not considered to replace the workshop weighting system developed at the second workshop.

These are shown in Table 4-7 as:

- **PRG 1** – with a relatively lower weighting of heritage and cultural values
- **PRG 2** – with a relatively higher weighting of heritage and cultural values

These three alternative weighting systems can provide a form of sensitivity analysis, and a check on the robustness of the outcome.

4.6. Analysis

4.6.1. Northern and Southern Sections

An initial analysis was undertaken looking at the raw scores for each of the southern and northern sections to determine if any stood out performing particularly poorly or particularly well. To do this the number of high scores (scores of 1s and 2s) and low scores (scores of 4 and 5) were determined for each option. This is shown for the southern sections in Table 4-8, and for the northern sections in Table 4-10 later in this report.

Southern Sections

As noted above Tangata Whenua values scores were provided separately by Ngāti Wehi Wehi and Ngāti Tukorehe for the southern options. Where these differed, the score shown in Table 4-7 (and used in the analysis in Table 4.9) is the lower score indicating less significant difficulty. This situation applied to the scores for Options S1 and S4. The alternative, higher, scores were also considered as part of sensitivity analysis as discussed below.

The scores were also run through the weighting systems provided above to obtain weighted scores for each option, as shown in Table 4-9.

³⁰ It is noted that not all attendees from the MCA workshop were present at the subsequent PRG meeting.

³¹ The weighting was developed after the original finish time following a long day of participation.

Table 4-8: Southern Scores

Option	Landscape and Visual	Ecology	Heritage	Tangata Whenua Values	Productive Land	Social/Community	Impacts on Dwellings	District Development	Project Objectives	Property Degree of Difficulty	Engineering Considerations	Cost
S1	2	1	4	4	3	2	3	1	3	5	3	2
S2	2	2	4	5	3	2	3	1	1	5	3	2
S3	3	3	4	5	3	2	3	1	1	5	3	2
S4	4	5	4	3	4	3	5	2	2	5	3	4
S5	4	4	4	4	4	5	5	3	1	5	2	4
S6	2	2	2	2	4	5	5	3	1	4	2	3
S7	3	5	2	3	4	2	4	1	3	4	3	4
S8	2	1	4	5	2	1	3	1	3	5	3	2

Table 4-9: Analysis of Southern Route Sections (Scores x Weights for Different Weighting Systems)

Option	Workshop Weighting	RMA Part 2	Social	Natural Environment	Cultural	Economic	Draft MCA Guide	PRG1	PRG2
S1	2.87	2.68	2.82	2.07	3.11	2.84	2.94	2.62	2.76
S2	2.87	2.92	2.86	2.56	3.47	2.63	2.36	2.58	2.78
S3	3.04	3.18	2.99	3.11	3.69	2.63	2.44	2.76	2.94
S4	3.72*	3.70*	3.69*	4.04*	3.75*	3.65*	3.25*	3.64*	3.61*
S5	3.87*	3.87*	3.99*	3.89*	4.22*	3.76*	2.93	3.88*	3.89*
S6	2.97	2.60	3.15	2.33	2.67	3.35	2.38	3.16	3.05
S7	3.17	3.07	3.03	3.52	2.83	3.24	3.22*	3.07	3.02
S8	2.78	2.73	2.76	2.07	3.25	2.63	2.90	2.43	2.65

As can be seen from Table 4-8, all the southern route sections involve difficulties which have resulted in scores of 5 under one or more criteria. In particular, it can be noted that Option S5 has been awarded scores of 5 in three criteria (productive land, social/community, and property degree of difficulty). While these criteria carry less weight than some others, particularly in the RMA section 6 weighting, they are found in association with scores of 4 for all but three other criteria. Option S4 similarly has scores of 5 in terms of ecology, impacts on dwellings and property degree of difficulty, and three additional scores of 4. These indicate significant hurdles overall for these route sections. Options S2, S3, S6 and S8 each have two scores of 5, but scores of 4 are less

frequent in these options, as they also are in Options S1 and S7 which have only one score of 5 each.

Table 4-8 has applied the most favourable score in circumstances where two scores were awarded (as in the Tangata Whenua cultural values criterion). If the alternative scores (shown in Table 4-3) had been allocated, Option S4 would have included four scores of 5, including Tangata Whenua cultural values, and Option S4 would have equalled most other routes with two scores of 5.

Table 4-9 provides a comparative score for each of the southern options, applying the weighting systems from Table 4-7³². In each column of the table the smallest number indicates the most favourable options and the largest number the least favoured. Asterisks mark the two “worst” options under each weighting system.

Based on the above analysis, it is clear that Options S4 and S5 perform less adequately than the others. These options have the highest number of 4s and 5s in the raw score analysis, and almost consistently perform worst under all weighting systems. It is therefore considered that options S4 and S5 should be discounted.

In terms of the alternative scores awarded for the southern route sections (see Table 4-3), a sensitivity test was undertaken taking into account the larger (more adverse) scores as below:

- S1 Tangata Whenua Values – could be a 5 rather than a 4 – this test was run and it did not make a significant change to the results
- S4 Tangata Whenua Values – could be a 5 rather than a 3 – this option is being discounted so no further evaluation is needed
- S5 Engineering Considerations – could be a 3 rather than a 2 –this option is being discounted so no further evaluation is needed

The same analysis was performed without the cost criterion scores. This did not change the order of options in Table 4-9 above.

Northern Sections

Table 4-10: Northern Scores

Option	Landscape and Visual	Ecology	Heritage	Tangata Whenua Values	Productive Land	Social / Community	Impacts on Dwellings	District Development	Project Objectives	Property Degree of Difficulty	Engineering Considerations	Cost
N1	5	4	4	5	2	3	3	1	3	4	3	2
N2	5	5	4	5	2	3	4	1	3	4	3	3
N3	4	2	4	5	3	5	5	4	1	5	2	2
N4	2	4	4	3	3	4	5	4	1	3	2	1
N5	2	1	2	3	3	3	5	4	1	3	2	1
N6	2	5	4	5	2	2	3	1	3	4	3	4
N7	5	4	4	5	3	5	4	4	3	4	3	2
N8	4	1	2	3	4	3	5	3	3	3	2	2
N9	1	5	2	3	4	3	5	4	1	3	2	2

³² Note that, as in Table 4-8, the most favourable scores have been applied where the workshop awarded more than one score.

Table 4-11: Analysis of Northern Route Sections (Scores x Weights for Different Weighting Systems)

Option	Workshop Weighting	RMA Part 2	Social	Natural Environmental	Cultural	Economic	Draft MCA Guide	PRG 1	PRG 2
N1	3.42	3.67	3.29	3.74	4.19	2.67	3.13	3.16	3.30
N2	3.65	3.92*	3.55	4.11*	4.36*	2.98	3.32*	3.39	3.51
N3	3.70*	3.68	3.90*	3.26	4.33	3.35*	2.67	3.73*	3.82*
N4	3.24	3.30	3.29	3.41	3.53	2.71	2.21	3.41	3.40
N5	2.59	2.38	2.77	2.07	2.58	2.57	1.96	2.78	2.77
N6	3.27	3.52	3.17	3.56	3.72	2.98	3.22	2.93	3.10
N7	4.02*	4.17*	4.03*	4.19*	4.56*	3.39*	3.42*	4.04*	4.10*
N8	3.09	2.75	3.15	2.44	3.00	3.08	2.86	3.27	3.21
N9	3.07	3.02	3.06	3.48	2.78	2.88	2.24	3.27	3.21

As for the southern route section options, all northern options include aspects which have been identified as of extreme difficulty for the location of a route. In some cases, these have been noted as potentially a fatal flaw (see Table 4-5). The route sections which may be fatally flawed and the criteria under which this conclusion was reached are:

- Option N1 – Tangata Whenua cultural values
- Option N2 – Tangata Whenua cultural values and ecological values
- Option N3 – Tangata Whenua cultural values
- Option N7 – Tangata Whenua cultural values

In terms of the cumulative degree of difficulty as expressed through the number of scores of 5 awarded, Option N3 would seem to be the most problematic with four scores of 5, Option N2 and N7 the next each with three scores of 5, followed by Options N1, N6 and N9 each with two. Only Options N4, N5 and N8 have one 5 and these are all in the criteria of impacts on dwellings³³. Options N4 and N7 both have a large number of 4s (four and five respectively).

As with Table 4-8, Table 4-10 applies the lowest workshop score and the dual scoring in Table 4-5 should be inspected. The differences in the main are in the score of 3/4 category, but with Option N4 being awarded an alternative 5 in the ecological criterion. This would potentially put it in the same grouping as Options N1, N6 and N9.

Table 4-11 provides a comparative score under each of the weighting systems for each of the northern route options. As can be seen, Option N7 consistently scores most adversely, with either Options N2 or N3 the next most adverse.

Based on the above analysis it is clear that Options N2, N3 and N7 perform worse than the others. As shown these options have the highest number of 4s and 5s in the raw score analysis, and consistently have the worst outcomes in the analysis in the overall analysis in Table 4-11. It is therefore considered that options N2, N3 and N7 should be discounted.

In terms of the alternative scores recorded for the northern route sections (see Table 4-5), a sensitivity test was undertaken applying the larger (more adverse) scores, as set out below:

³³ Where mitigation through compensation is possible.

- N1 Engineering considerations – could be a 4 rather than a 3 – this test was run and it did not make a significant change to the results
- N2 Social/Community/Recreation – could be a 4 rather than a 3 – this option is being discounted so no further evaluation is needed
- N2 Engineering considerations – could be a 4 rather than a 3 – this option is being discounted so no further evaluation is needed
- N3 Engineering considerations – could be a 3 rather than a 2 – this option is being discounted so no further evaluation is needed
- N4 Ecology – this could be a 5 rather than a 4 – as noted later in this report, this particular aspect will be subject to further investigation in order to confirm the most applicable score.
- N5 Social/Community/Recreation - this evaluation was carried out and was still the most preferred across all weighting scenarios
- N6 Engineering considerations – could be a 4 rather than a 3 – this evaluation was carried out and did not make a significant change to the results
- N7 Engineering considerations – could be a 4 rather than a 3 – this option is being discounted so no further evaluation is needed
- N9 Social/Community/Recreation – could be a 4 rather than a 3 – this evaluation was undertaken and it resulted in this option dropping a couple of places in preference under the Social Weighting system.

The overall analysis was also performed without the cost scores included. This did not change the order of options in the tables above.

4.6.2. Combined Routes

The remaining northern and southern sections (excluding those discounted from the analysis above) were then combined to form complete routes where possible. Appendix N provides more detail of all potential combinations of south and north route sections and their combined scores.

With the worst performing individual sections removed (Options S4, S5, N2, N3 and N7), ten potential combined route options remain. These remaining routes comprise two western options (S8N6 and S1N1), and eight eastern options; four with S6 in the south (referred to as S6 options) and four with S7 (referred to as S6 options), as shown in Figure 4-1. An analysis of their favourability in terms of the MCA is presented in more detail under the various weighting systems as set out in Table 4-12.

Table 4-12: Analysis of Combined Route Options

Combined Options	Workshop Weighting	RMA Part 2	Social	Natural Environment	Cultural	Economic	Draft MCA		
							PRG1	PRG2	
S8N6	6.1	6.3	5.9*	5.6	7.0	5.6*	6.1	5.4*	5.7*
S1N1	6.3	6.4	6.1	5.8	7.3	5.5*	6.1	5.8*	6.1
S6N4	6.2	5.9	6.4	5.7	6.2	6.1	4.6*	6.6	6.5
S6N5	5.6*	5.0*	5.9*	4.4*	5.3*	5.9	4.3*	5.9	5.8*
S6N8	6.1	5.4*	6.3	4.8*	5.7	6.4	5.2	6.4	6.3
S6N9	6.0	5.6	6.2	5.8	5.4*	6.2	4.6	6.4	6.3
S7N4	6.4	6.4	6.3	6.9	6.4	6.0	5.4	6.5	6.4

Combined Options	Workshop Weighting	RMA Part 2	Social	Natural Environment	Cultural	Economic	Draft MCA	PRG1	PRG2
S7N5	5.8*	5.5	5.8*	5.6	5.4*	5.8	5.2	5.9	5.8*
S7N8	6.3	5.8	6.2	6.0	5.8	6.3	6.1	6.3	6.2
S7N9	6.2	6.1	6.1	7.0	5.6	6.1	5.5	6.3	6.2

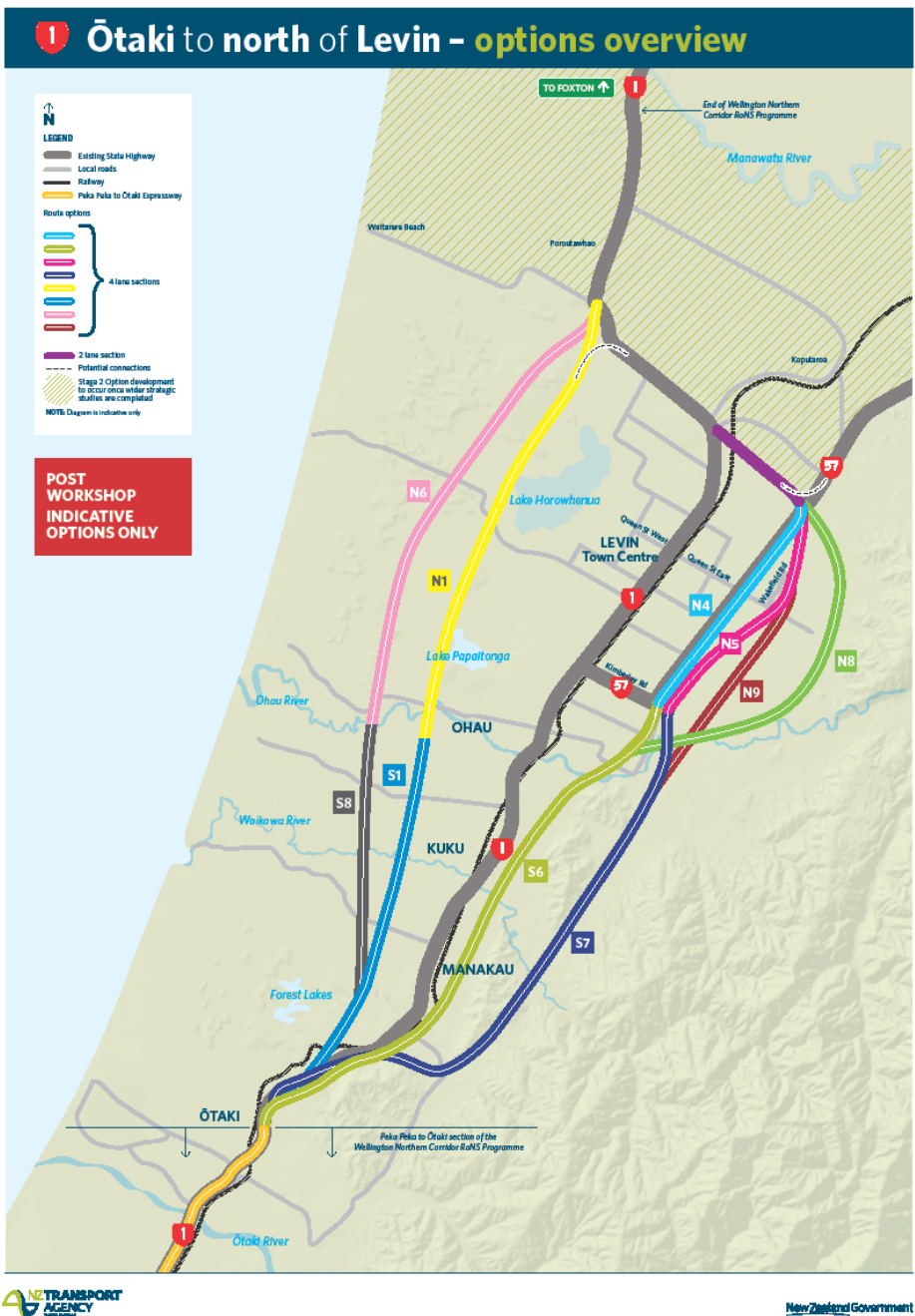


Figure 4-1: Options shortlisted for further investigation

The scores shown for each combined route in Table 4-12 are the sum of the relevant route sections from Tables 4-9 and 4-11, rounded to one decimal place. Lowest scores indicate best performing options overall, and highest scores worst. Asterisks indicate the two best performing options under each weighting system, including a number where there were equal “second” scores.

The scores shown in Table 4-12 are presented in graphical form in Appendix O.

The implications of the information in Table 4-12 is set out in Table 4-13. This indicates overall how each option ranked under each weighting system. A rank of 1 represents the option which performed the best under a particular weighting, while a rank of 10 represents the worst performing option under that weighting.

Table 4-13: Summary of rankings

Combined Option	Workshop Weighting	RMA Part 2	Social	Natural Environment	Cultural	Economic	Draft MCA	PRG1	PRG2
S8N6	4=	8	2=	3=	9	2	8=	1	1
S1N1	8=	9=	4=	6=	10	1	8=	2	4
S6N4	6=	6	10	5	7	6=	2=	10	10
S6N5	1	1	2=	1	1	4	1	3=	2=
S6N8	4=	2	8=	2	5	10	4=	7=	7=
S6N9	3	4	6=	6=	2=	8	2=	7=	7=
S7N4	10	9=	8=	9	8	5	6	9	9
S7N5	2	3	1	3=	2=	3	4=	3=	2=
S7N8	8=	5	6=	8	6	9	8=	5=	5=
S7N9	6=	7	4=	10	4	6=	7	5=	5=

Table 4-13 indicates that there are some routes that perform better than others under most weighting scenarios.

Of the western options S8N6 generally rates better than S1N1 in all bar one weighting system, however both perform poorly under RMA Part 2 and cultural weightings (as well as the Transport Agency’s draft MCA weighting).

Of the S6 options, the variant with N5 as the northern section performs best in all weighting systems. The same is true of the S7 options.

There are, however, some differences between the western, S6 options and S7 options when comparing under the different weighting systems, which can be summarised below:

- **Workshop Weighting:** Under this weighting S6N5 and S7N5 perform best. Options S7N4 and S7N9 (along with S1N1) perform poorly under this weighting.
- **RMA Part 2:** Under this weighting, S6N5 again performs well, as do S7N5 and S6N8. The western options as well as the N4 and N9 variants however perform poorly.
- **Social:** the options again perform similarly but S8N6, S6N5 and S7N5 perform slightly better than the others
- **Environmental:** This has the largest spread in scores with the S7 options generally performing poorly. Option S7N5 is an exception to this being the third best scoring option. Option S6N5 is clearly the best performing, and Options S6N8 is the second best option under this weighting.
- **Cultural:** Again there is a large spread in scores in this weighting system, with the western options being the worst performing.. Options S6N5, S6N9 and S7N5 perform well.

- **Economic:** The western options perform best in this weighting system.
- **Draft MCA Guidelines:** The S6 options perform best in this weighting system, with the exception of N6N8.
- **PRG 1:** The western options score best in this scenario, particularly Option S8N6.
- **PRG 2:** The scores are more even in this scenario with Options S8N6, S6N5 and S7N5 being the best performing.

From the earlier discussion of the scoring outcomes, it is clear that there is no option which is free of issues, problems or environmental impacts. This analysis has provided a formalised, transparent and structured means of comparing the various options.

The process has identified some considerations that require further detailed analysis before the options are shortlisted further. These are:

- **Tangata Whenua implications:** Some of the routes were considered to be fatally flawed from the workshop analysis due to their potentially significant impact on sites of significance, areas of previous occupation and because they involve extensive areas of Māori land. Further discussions with local Iwi are needed to better understand these impacts and whether western options should proceed to public engagement processes.
- **Linkages to key areas:** Some of the routes did not appear to have the potential to provide adequately for access from the expressway to the key destinations of Levin or SH57 north of the study area. The combined routes need to be modelled using the Ōtaki to north of Levin Traffic Model to confirm this assessment and to determine if the routes would meet the project objectives.
- **Constructability:** Some of the alignments go through parts of the project area which have not been considered in detail previously. Further information on these routes will need to be collected and the engineering and constructability aspects considered to ensure that a road can be built along the route sections indicated.
- **Additional Ecological Advice:** Further investigation will also be undertaken on bush areas along corridor N4 due to uncertainty as to the appropriate scoring³⁴.
- **Review of Productive Land Criterion:** Subsequent to the workshop, as a result of concerns raised with the Transport Agency, the basis of and scoring for the productive land criterion were reviewed. This is the subject of a separate brief report, included as Appendix P.

The outcomes of the proposed actions above and the MCA outcomes will provide information to assist the Transport Agency to make a decision on which options should proceed to public and stakeholder consultation.

³⁴ This has subsequently been undertaken and is provided as an Addendum to Appendix E.

5. Conclusion

This report has summarised the techniques and analysis of possible broad routes for a continuation of the Wellington Northern Corridor from Taylors Road through to north of Levin. The process described in this report can be described as a community-based review of route options, using MCA techniques. Subsequent analysis has been undertaken by the project team, but has also been subject to reporting to the established CRG. This report explains the analyses undertaken, which will assist the Transport Agency in making decisions on options for further investigation and the phase 2 engagement process.

The investigations to date have assumed a four-lane expressway standard. The routes identified can be described as largely greenfield, impinging to at specific locations on existing settlements and urban areas. The present SH1 is assumed to remain as a continuous route available for local traffic.

The findings of the analysis have highlighted that all routes have issues that would need to be addressed through route refinement and mitigation.

Whilst the MCA analysis has indicated a number of options which do perform well overall, a number of additional actions are recommended before a short list of routes can be chosen for public and stakeholder consultation.

It is noted that the level of analysis during the community-based MCA, whilst founded on a very good knowledge of the study area, is still at a high level and based on broad route areas rather than a designed alignment. Accordingly a short list of feasible options should form the basis for consultation before undertaking further refinement of one or more identified routes. Further refinement of alignments within the broad routes, as well as interchange options, may require additional analyses after the next round of consultation.

Appendices



Appendix A MCA Powerpoint for PRG Meeting

MULTI-CRITERIA ANALYSIS (MCA)

AN AID TO DECISION-MAKING

MCA Background

Used when important aspects cannot be turned into \$ values (such as heritage, cultural, ecological values, or range of risks).

An advancement on earlier techniques such as cost-benefit analysis, goals achievement matrix, planning balance-sheet.

First developed and tested on transport projects in Hong Kong in the 1970s. Demonstrated that any group of people, given the same information and the opportunity to discuss it, will reach similar conclusions.

Definition of Multi-Criteria Analysis (MCA)

"An analysis technique that takes into account a range of criteria which are both qualitative and quantitative in nature and which reflect the social, cultural, economic and environmental characteristics of the project outcomes."

"MCA provides a open and traceable method of weighing up the advantages and disadvantages of different options taking account of both tangible and intangible issues."

Ref: Optimised Decision Making Guidelines – A Sustainable Approach to Managing Infrastructure. Pub. By NZ National Asset Management Steering (NAMS) Group, 2004.

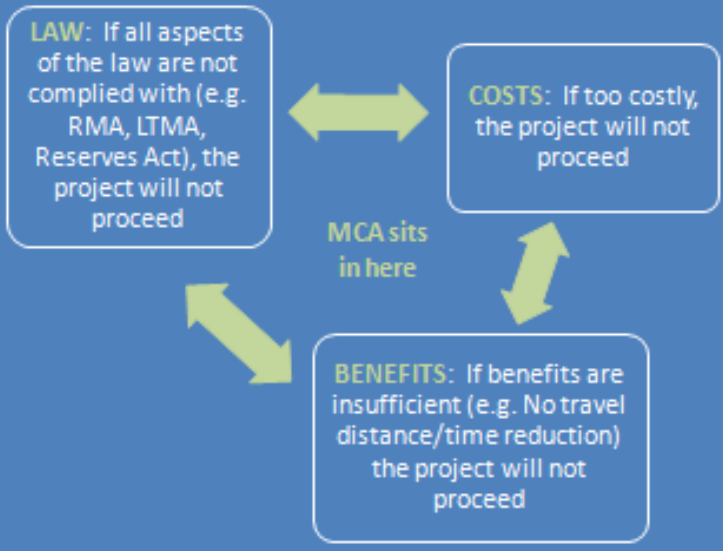
The MCA Methodology

The Multi-criteria Analysis (MCA) Methodology is now widely used.

It relies on adequate information (depending on the level of detail of the project at the time), and on systematic analysis and "testing" of that information.

It involves scoring different options against a number of criteria which reflect the issues that need to be considered (recognising that there may be constraints on what can be done).

Constraints (NZ Transport Agency “bottom lines”)



Examples of where MCA is used

Local authority projects, for example, in wastewater treatment projects with many variables:

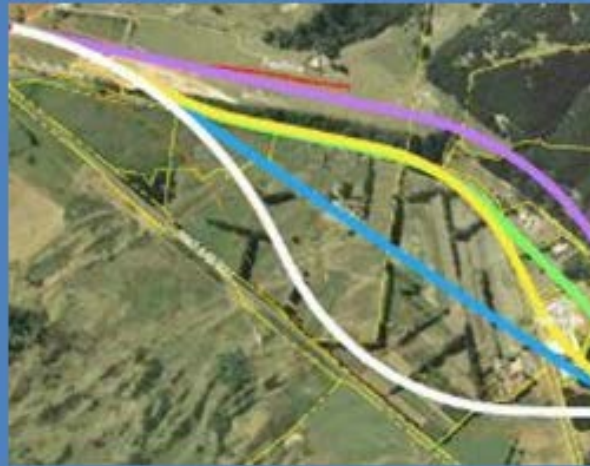
- type
- capacity
- location
- life/duration.



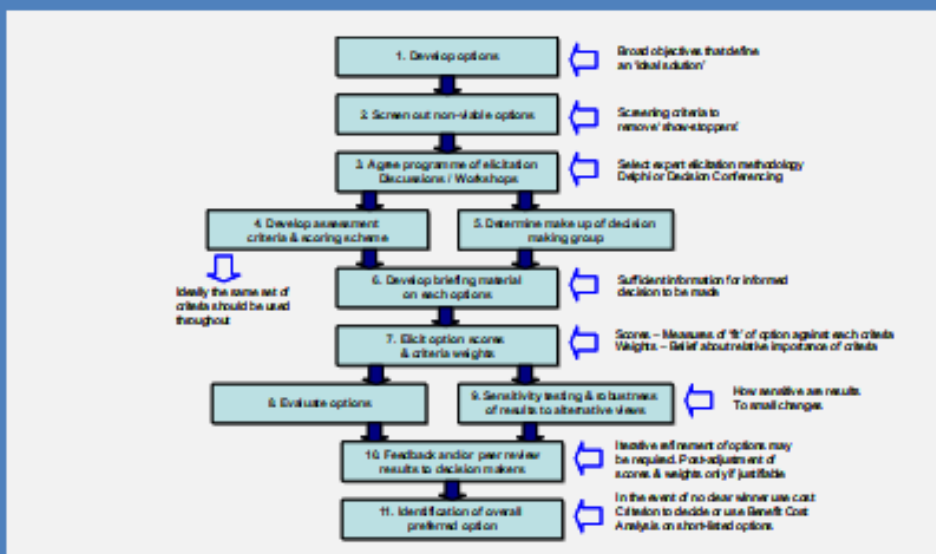
Examples of where MCA is used (cont)....

Network utility projects, for example, planning transmission lines and roading projects:

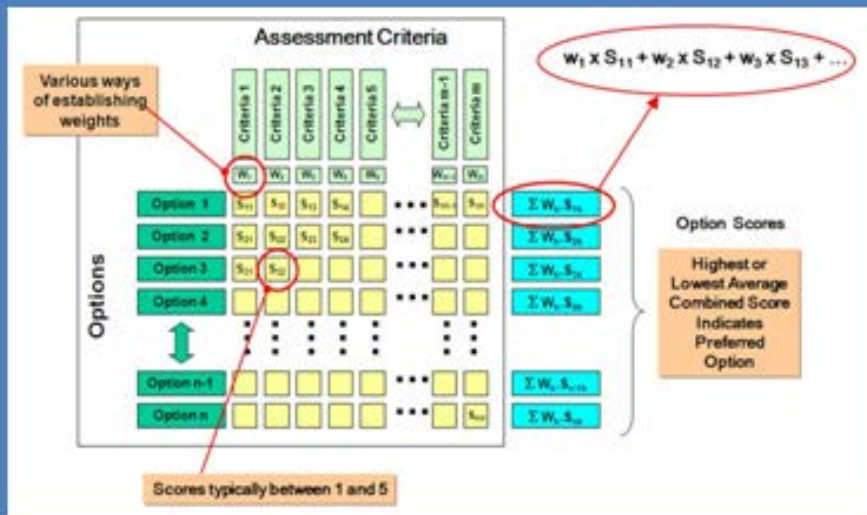
- route location
- interconnections/ substations
- interconnections/ interchanges.



The MCA Process



MCA – Scoring and Weighting



Scores and Weights – What do they represent?

Scores represent how favourable an option is considered to be as regards to a particular criteria. This is done first.

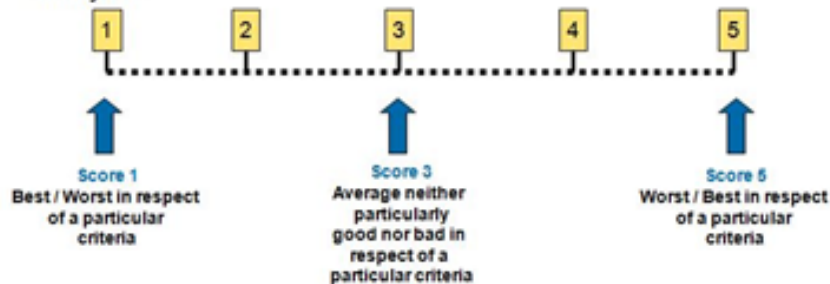
They avoid the need to define a common scale of measurement (e.g. cost) across a diverse set of criteria, some which may be difficult to quantify.

Typically scores between 1 and 5 are used, where 5 represents the "worst" score and 1 the "best" score.

Scoring Scheme

Criteria must be written down, so it is clear to all just what is encompassed by a criterion.

The assigned scores become the "base data" for the analysis.



Scores and Weights – What do they represent?

(cont).....

Weights represent beliefs about how important a particular criteria is compared to other criteria. This is done after the scoring is complete.

If all criteria are considered to be equally important then all weights are the same.

Different people may have different views about the relative importance of criteria.

A range of different weightings (from different viewpoints) should be applied. This makes the analysis more robust (and provides a form of sensitivity analysis).

Criteria

- Need to be described (i.e. What is the scope/included in each criterion)
- If there are several aspects within one criterion, these may be broken-down and evaluated separately before being combined. This helps understand what was “behind” the score
- Try to avoid double-counting (although some values may occur in several criteria)
- Number of criteria should be between 8 and 12.

Methods

Two generally accepted methods:



Decision Conferencing – workshop process, scoring and weighting through discussion and consensus, but informed by expert views.

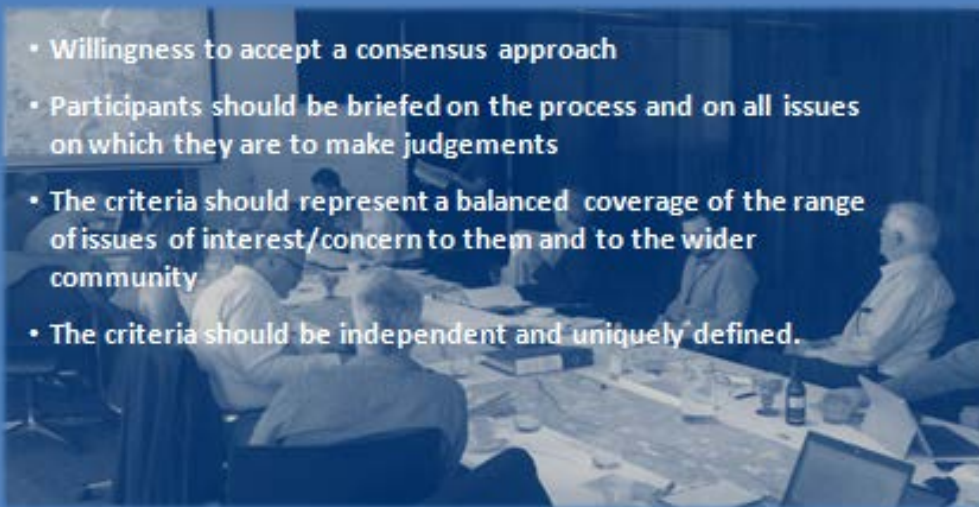
Delphi Process – individuals provide scores remotely. These are moderated by the process manager. Not such a robust process.

Making the MCA Analysis Valid

- Inclusion of variety of stakeholders
- Seek alternative views – weighting systems
- Openness and honesty in the expression and capture of beliefs
- Sensitivity analysis (or several weighting systems) to explore robustness of results
- If no clear preference is identified there should be a willingness to probe further, possibly by other means (e.g. Benefit-cost analysis, pair-wise comparisons).

General Guiding Principles

- Willingness to accept a consensus approach
- Participants should be briefed on the process and on all issues on which they are to make judgements
- The criteria should represent a balanced coverage of the range of issues of interest/concern to them and to the wider community
- The criteria should be independent and uniquely defined.



Final thought.....

MCA should be used as a tool to probe the dimensions of a problem and inform decision-making. The process should guide the decision-maker, but not make the decision for them.



Appendix B

Workshop 1 Information and Notes

- Briefing Note
- Draft Agenda
- Workshop 1 Notes

BACKGROUND AND BRIEFING NOTE ŌTAKI TO NORTH OF LEVIN RONS COMMUNITY MCA WORKSHOPS

Workshop 1

This note is provided as background to all participants at the two Community Multi-Criteria Workshops for the Ōtaki to north of Levin Road of National Significance (RoNS) Project. It provides a brief description of the work we will be undertaking over the two workshops, and then sets out information for the first workshop. An Agenda for Workshop 1 is also attached.

1. BACKGROUND

The New Zealand Transport Agency (the Transport Agency) has been investigating a wide area in Horowhenua District and the northern part of Kapiti District for a possible RoNS expressway between Taylors Road and north of Levin. Considerable information has been collected and a wide range of possible broad corridors and routes have been identified and considered.

In early 2107 the Transport Agency decided to take a more active participatory approach with the wider community to help it identify and choose a route option to proceed with. As well as comprehensive public engagement and closer liaison with Iwi, a Project Reference Group (PRG) has been established.

Before deciding on the possible route(s) for wider public engagement, the Transport Agency wishes to review a wide range of possible routes through a process which involves representatives of Iwi and the PRG. This will include broad route options which have been considered earlier, but also options which have been raised in recent public engagement.

The process proposed to be used is Multi-Criteria Analysis (MCA). It is a method which enables a wide range of different aspects to be taken into consideration in evaluating options, and provides a systematic framework for working through the merits and disadvantages of each option. The PRG has been briefed on the method in general terms³⁵, and a further refresher will be provided during each of the workshops.

The MCA process is based on information, including information about the route options themselves and the environment within which they would be located. For that reason, the first workshop includes background about options, a site visit to look at the options together, and a discussion on the criteria to apply.

2. OUTLINE OF WORKSHOPS 1 AND 2

The two workshops are being held on 22nd and 29th August, at Te Takere (Library) in Levin. We are allowing a time of 1pm to 8pm on each day, but it may be shorter. It is important that we have enough time to discuss matters fully and not be rushed. More detailed Agendas will be sent out with the Background and Briefing Notes for both days.

³⁵ PRG Meeting #3.

Workshop 1 will involve (see detailed Agenda):

- Cup of tea on arrival
- Introductions/purpose of day
- Quick MCA refresher
- Route presentation and discussion
- Specialists very quick introduction to their subject (what to look for on the field trip) [only if time – otherwise proceed to field trip]
- Site visit/field trip (specialists to identify key areas of value as we go)
- Refreshments – light meal
- Discussion on criteria (based on ideas in Background and Briefing Note plus site visit)
- Next session
- (Questions throughout).

Area constraints maps will be up on the walls at the start of this workshop, and the route options will be presented as overlays on aerials for the discussion.

This workshop involves a site visit, which will be undertaken on roads and public spaces (we cannot go onto private land). Safety is paramount and for that reason we will not be able to alight from the bus alongside SH1 or SH57. In other places we will be able to get out, so please wear suitable footwear and clothing.

Workshop 2 will involve (detailed Agenda will be sent out in advance):

- Cup of tea on arrival
- Review of notes from first workshop and Agenda for day
- General discussion/questions
- Confirm criteria from last workshop (discussion based on pre-circulated Briefing Note)
- Scoring
- MCA scoring process on route options, north and south sections separately – based on constraints, specialist input and workshop discussion
- General discussion on interchange options and capture thoughts/comments
- Weighting systems
- Where to next?

3. WHO IS ATTENDING?

As well as community representatives and Iwi, there will be a number of people from the Transport Agency and the technical specialists who have been working on the Project (engineers, planners, archaeologists, landscape experts, etc). They will also be sharing their knowledge and information by being part of the process. There will also be a small number of observers from the Transport Agency. Everyone taking part in the MCA process will be there as an individual, although they may be bringing the values of a group into the process.

4. ROUTE OPTIONS

The Project's technical advisors have developed a number of route options in draft. These will be put up on the screen for discussion during Workshop 1.

Each option will be shown as a broad band 150-200 wide. This is to allow flexibility to locate an expressway alignment within the broad route, and leaves room to avoid any particular features that may come to light. The options are not "set in stone" and will be able to be modified on the day.

Some of the route options that have been developed can be connected up in a number of ways. For that reason we will be looking generally at route sections south of Levin (southern sections) and around Levin (northern sections), as well as how they might join together. For any options which are to the west of Levin, we need to also consider connections back to State Highway 57 as that state highway is an important part of the road network providing access to and from Palmerston North, to Levin and Wellington. It also carries a considerable volume of traffic, notably freight.

During the discussion on route options we will be keen to find out if any of the options have “fatal flaws” that are so significant that the option should be removed from further consideration. An example of a fatal flaw on a route would be a route that went through and could not avoid a cemetery or urupa, a very significant patch of bush, or a particularly important piece of community infrastructure (a reserve, waste-water treatment plant or water reservoir). There may be other difficulties (such as heritage buildings, which may be able to be shifted) with the route options, but these will be addressed through the scoring at the second workshop.

5. CRITERIA

An important part of the first workshop is to consider and develop a set of criteria against which the route options can be evaluated.

A number of criteria have been used in earlier MCA exercises for this project, and a possible set of criteria are set out here for discussion. The MCA process needs to include criteria that are relevant in terms of the decision that the Transport Agency needs to make. This includes criteria that relate to:

- The overall project objectives;
- The ability to obtain RMA and other approvals to proceed with the project;
- Impacts on the community which will be affected by the project; and
- Practical aspects such as the ability for the project to be constructed, long-term exposure to natural hazards etc.

Cost also needs to be taken into account (normally options would be evaluated with and without a cost criterion).

It is important that the scope of the criteria are appropriate to the area being considered and the scale of the options. In this case we will be assessing broad routes over approximately 22km (straight line distance), so the criteria need to remain reasonably broad.

The following 12 criteria are set out as a basis for discussion:

Landscape/Visual Impact – this takes into account existing landscape character (including degree of modification and presence of structures) and the likely impact that a particular route option would have. It includes potential landscape and urban design effects when passing through or near to townships or lifestyle areas, but not the direct visual effects on dwellings (which came into the category of impacts on dwellings).

Ecological Impacts – this criterion covers ecological values, including indigenous vegetation areas that are nationally, regionally or locally significant in terms of habitat values or the presence of species, and the potential effects on waterways (lakes, rivers and streams) and wetlands.

Archaeological Risk – this criterion takes into account known archaeological and heritage sites and features, and also the risk of encountering archaeological features, or areas of significance.

Cultural Values – this takes into account the range of values that tangata whenua are likely to associate with the area, including past and present associations, key areas of settlement (marae and papakianga), waahi tapu (if known) and other cultural value, areas of use (e.g. food gathering) current ownership, and important elements of the natural environment such as waterways and wetlands.

Productive Land Values – this criterion takes into account the inherent productive values of Classes I to III soils, and the current productive land use pattern.

Social/community impacts – this incorporates a range of considerations such as severance, general urban amenity, recreation impacts, and construction impacts.

Impact on Dwellings – this criterion takes into account direct effects on existing dwellings, including the need to remove dwellings or the potential need for mitigation of adverse effects associated with an expressway route option.

District and Regional Plan and Consentability – this criterion includes consideration of both zoning and plan objectives and policies, and any major impediments through plans to a route option.

Fit to Project Objectives – this criterion covers travel time, safety and long-term resilience.

Property Degree of Difficulty – this included the number of properties, extent of severance of existing properties, the general ability to align a route option with property boundaries, potential for effect on farming/business operations, and any known land tenure issues.

Engineering Considerations – this criterion addressed expected difficulties with construction of a route option (constructability), including matters such as likely geotechnical considerations, extent of structures needed, and potential flooding and groundwater issues.

Cost – indicative order of cost of options.

The ideal number of criteria for an MCA is 8-12, so we should consider modifications to, or reductions in the number, of the above criteria rather than adding more.

We may evaluate some of the criteria on the basis of their components and recombining them. This will be discussed at the start of Workshop 2.

5. PROJECT OBJECTIVES

The project objectives provide background. These are included for information as they will contribute to some of the criteria set out above. They sit within the wider Wellington Northern Corridor RoNS objectives. The wider Wellington Northern Corridor RoNS objectives are:

- *To enhance inter-regional and national economic growth and productivity;*
- *To improve access to Wellington's CBD, key industrial and employment centres, port, airport and hospital;*
- *To provide relief from severe congestion on the State highway and local road networks;*
- *To improve the journey time reliability of travel on the section of SH1 between Levin and the Wellington airport; and*
- *To improve the safety of travel on State highways.*

The objectives for the O2NL project are:

- *Reduce travel times on the state highway network;*
- *Reduce deaths and serious injuries on the state highway network;*
- *Enhance the resilience of the state highway network; and*
- *Provide appropriate connections that integrate the state highway and local road networks to serve urban areas.*

6. PROCESSES

We are undertaking this process as a team, recognising that everyone has information to bring to the process. The processes are designed to encourage questioning and discussion and reaching consensus as far as possible. We have allowed sufficient time for discussion and debate. Everyone should contribute, and nobody should dominate the discussion. We will be careful that does not happen. Where consensus is not reached, we will

record this and the basis for the difference in views and test our outcomes to see if the differences would make any change in them.

At the first workshop, we will be asking questions such as:

- Are the routes we have identified to look at the right ones? Are there any that should be removed? Are there additional routes that we have overlooked?
- Are the criteria that we have suggested the right ones? Has anything important been overlooked? Have we included things that don't matter? (Remember we will be weighting the criteria later on, so the criteria we have set out do not need to be equally important).

General questions and questions of clarification will be encouraged throughout.

7. CONCLUSION

This is an exciting and important exercise for the project. We look forward to working together over the next fortnight.

If you have any questions at this stage, please contact Lonnie Dalzell on 021 453 195, lonnie.dalzell@nzta.govt.nz, or Sylvia Allan on 021 665 155, sylvia.allan@ihug.co.nz.

Sylvia Allan
17th August 2017

DRAFT AGENDA

ŌTAKI TO NORTH OF LEVIN COMMUNITY MCA

Workshop 1, Tuesday 24th August 2017 – 1pm to 8pm

Te Takeretanga o Kura-hau-pō, Library, 10 Bath Street, Levin – Rimu and Totara Rooms

Chair: Lonnie Dalzell

1. INTRODUCTION

1pm	Light refreshments on arrival	Lonnie Dalzell
1.05-1.15pm	Introductions and purpose of day, confirm agenda	All
1.15-1.20pm	Constraints maps	Sylvia Allan

2. OPTIONS DISCUSSION

1.20-1.25pm	Basis for development	Phil Peet
1.25-2.30pm	Description and discussion on options	Phil Peet

3. WHAT ARE WE LOOKING AT?

2.30-3pm	Specialists quick introduction to their subject area – what is it and why it is important (each specialist five minutes or less): <ul style="list-style-type: none">• Adam Forbes• Gavin Lister• Daniel Parker• Lachie Grant• Morrie Love (or Iwi rep)• Andy Mott	
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4. FIELD TRIP

3-3.10pm	Introduction to bus trip, route and safety briefing	Phil Peet
3.15pm	Assemble on bus for site visit (specialists to identify areas of value and answer questions as we go)	
5.30pm	Return to Te Takeretanga o Kura-hau-pō (Approximate)	
5.30-6.10pm	Refreshments	

5. CRITERIA

6.10-6.20pm	MCA Refresher/Basis for criteria	Sylvia Allan
6.20-7.30pm	Discussion on criteria	Sylvia Allan/Phil Peet
7.30-8pm	Any issues arising? Preparation for Workshop 2	All/Lonnie Dalzell

ŌTAKI TO NORTH OF LEVIN COMMUNITY MCA

Workshop 1, Meeting Notes

Tuesday 22 August 2017 – 1pm to 7.45pm

Attendees

Daniel Haigh, David McCorkindale, David McGonigal, Kevin Peel, John Foxall, Lindsay Poutama, Rob Warrington, Christine Mitchell, Bernie Wanden, Barry Judd, Graeme Bagrie, Sue Forde, Chris Clarke, Jeremy Manks, Barry Petherick, Carol Shore, Julia Burgess, Karen Prouse, Allan Mitchell, Geoff Lewis, Heather Heron-Speirs, David Keeling, Guy Brown, Pam Robinson, Coral Aldridge, Lonnie Dalzell, Greg Lee, Sarah Cronwright, Jas Madhar, Ross I'Anson, Sylvia Allan, Phil Peet, Jessica Andrew, Daniel Parker, Niketi Toataua, Gavin Lister, Lisa Rimmer, Adam Forbes, Lachie Grant, Richard Peterson, Andy Mott, Jamie Povall, Kris Connell, Mitchell Bray

Introduction

The meeting started with a Karakia. Lonnie welcomed everyone, and everyone present briefly introduced themselves.

The Agenda was confirmed.

This MCA process is the first, for this project, to be undertaken with the community, stakeholder and iwi. We are aiming to be more open and transparent when short-listing options and to ensure that we have better local information to help inform decision making.

Note: Project team responses to questions are shown in italics.

Comment about the recent announcement from the National Party about RoNS priorities:

From an O2NL project point of view, this election campaign material does not affect our current investigation process, as whatever route is chosen as the recommended corridor will take into account potential future extension options and will not preclude options for future plans for SH improvements. The proposed extension to Sanson has the potential to be several years away from any detailed investigation being undertaken.

Constraints maps

Pointed out that maps around the walls were updates of the ones that were prepared in 2011/12 and will be available on line, but are currently still in draft. Note that the colour grading used has darkest as the greatest constraint. Please give us feedback if anything is missing or has been overlooked.

Q. Did anything change on the constraints maps as a result of recent consultation?

Yes for example we've picked up additional sites such as additional heritage sites

Options discussion

Project team presentation

In 2011 various routes were identified based on the corridors with the least constraints. These routes have been used as the basis for most of the routes presented at workshop 1. However the options presented also took into account recent community feedback, particularly the desire to include an option further to the west.

The road options have been split into northern and southern sections to allow for a more straight-forward MCA process. Seven southern options and five northern options have been identified, with the split being approximately at Ōhau. Splitting the options in this way makes it easier to assess the various combinations of options.

The options include routes west of Levin and east of Levin. Another key issue that the project team has considered in identifying the routes is the connection between SH57 and SH1.

The route options presented are shown as 300m wide corridors. This is significantly wider than what will be actually needed. The corridors will be refined down for the next stage of work.

A fly-through of each of the route options was shown at the workshop, starting with the southern routes and followed by the northern routes.

During the flyovers it was noted that there is minimum geometric standards that need to be met to maintain an appropriate road environment, which is consistent with other parts of the country. These geometric standards mean that there are constraints on how severely the road can curve and turn to avoid specific constraints.

Related questions

Q. Do the double lines on the options overview plan show a dual carriageway?

Yes. The only section which is not proposed as dual carriageway is the 2 lane link between SH57 and SH 1 in the north of the study area.

Q. Does the constraint maps go further west than the most western option?

Yes

Q. Are you looking at an option further west?

The options get harder and harder the further west you go, with constraints increasing. But we can.

Q. What will be the actual width of the highway?

The pavement width would be approximately 30 m, but the total width of the corridor depends on additional elements beyond the road itself including swales and cuts in steeper country but is typically up to say 100m wide (can be wider and can be narrower).

Q. Are the options going all the way to the Manawatū River?

Not at this point, they terminate at various points just north of Levin. There would need to be a transition / upgrade to tie the expressway back to the current highway at the northern point of each option. This is a separate exercise to be undertaken by the Transport Agency.

Q. Option N4 – Rather than overlay over the existing road (SH57), will this option be a new parallel alignment?

Yes.

Q. Options N1 & N2 – Who would take responsibility for the access back to Levin from these options?

As part of the expressway there will be interchanges and linkages back to Levin, but these will be assessed and identified in detail in later stage of the work, including working with HDC.

A request was made to add an option further west than the western most option. It was agreed to include a more western option for the second workshop.

A question was put to NZTA whether it was open to leasing land and therefore providing income to the land owner. NZTA indicated that the current legislation would not allow leasing options.

There was also some discussion on whether a route should be shown through the Forest Lakes area. The significant constraints in this area were described. No request was made to include an option through this area.

Bus trip debrief

Further options needs to be looked at further to the west and east of the options presented to the workshop.

A key issue expressed by some in the group is that the route selected needs to be accessible to and from Levin.

A composite option to the west of Levin was discussed, which travelled west of Lake Papaitonga and east of Lake Horowhenua to avoid some of the most productive soils, provided good access going north and access to Levin. However, the speaker noted that from a Māori cultural perspective western options are likely to be a 'no-go'.

It was noted that the soil maps are not totally accurate as they don't take into account very localised differences. Any additional information should be made available to the project team to make the maps more accurate.

Criteria

A short presentation was made by Sylvia Allan from the project team on the purpose and principles of the Resource Management Act (RMA), identifying those aspects particularly relevant to the study area. It was noted that these parts of the RMA have been used to inform the proposed criteria.

The 12 criteria proposed in the workshop briefing note were then presented by Sylvia Allan and the project team specialists. The following comments on each of these were made by the group:

- Does the archaeological criteria include heritage values as well as sites? – *Yes, this will be clarified*
- Broaden the 'productive land values' criterion to include future productive potential
- Where do aspects of the wider culture fit (beyond cultural values to tangata whenua)? It was noted that broader cultural impacts are covered by landscape, social/community criteria, however they are hard to define and evaluate at this scale. Noted that landscape assessment and District Plan criteria pick up on this issue.
- Community impacts is key issue, and need to be factored in.
- Can social/community impact and impact on dwellings be combined? This should be one of the main criteria. *Explained that the two are actually quite different. One is direct social impact on individual households; the other a broader consideration of physical and other impacts on communities.*
- Impact on dwellings – how is this defined? *This will include houses within 50 meters of the 300 m wide corridor, i.e. a total corridor width of 400 m*
- High value food growing land is inherently valuable not just economically valuable. Future values need to be recognised.
- Under social and community impact, can 'recreation' be brought into the criterion heading?
- Suggestion that the District and regional plan criterion be expanded to include other strategies and plans, and that 'consentability' is excluded from this criterion and is instead combined with the 'Property degree of difficulty' criteria.
- Should 'fit to project objectives' be dropped from the criteria? It was noted that this criterion includes 'access to Levin' so should be retained so at very least the 'scale' of the connection / access route can be considered at a broad level. The project team also noted that interchanges will be considered following the MCA scoring of options at the next workshop
- Will the options be able to be differentiated on 'property degree of difficulty'? *Yes it is considered that it will be possible to judge this criterion and there is likely to be differences between the options*

During the discussion above various additional criteria were suggested by the group:

- Noise
- Amenity
- Safety (*noted that this is one of the project objectives and so is considered under that Project objectives criterion*)
- Fit with economic development, and future urban and rural development proposals (including urban and rural development)
- Urban design impacts & urban form

- Impact on land value
- How does each option constrain / facilitate options at the north end of the study area (long term strategic thinking)
- Travel cost of longer routes, not just travel time
- CO₂ emissions
- Access to Levin

The project team agreed to go away and consider this feedback. Amended criteria will be included in the Briefing Notes for the next session and can be discussed at the start of the next workshop.

It was suggested that workshop 2 should involve a two-step process. The first step would be a fatal flaw assessment, or quick sieve, to reduce the options. This first assessment would be based on the NZTA's stated project objectives and factors identified by the group as being 'imperatives'. Noted that some attendees had asked what could be a fatal flaw (for example would loss of/ impact on family with historical ties to the area be fatal?) Options which could not meet either the NZTA objectives or the group's imperatives would not proceed to the full MCA assessment. Step two would be the full MCA assessment.

There was a counter view presented that a full discussion on all options should be undertaken to ensure transparency.

It was agreed that the project team would consider how the two stage process might work, and a discussion on whether to use this approach will held at the start of workshop 2. The aim is that the approach taken will be the consensus view of the group.

Whichever approach is taken, it will be important that it is clearly documented so that the wider community can understand why some options were or were not dropped out early.

Scoring process

The project team described the scoring process for the MCA assessment. It is proposed that for each criterion a nominated specialist would provide information and start the discussion on the scoring. This would then lead into a wider group discussion and ideally consensus on the scoring of each option against each criterion. Weighting systems would also be addressed.

Workshop Two

Tuesday 29 August 2017 – 1pm

Appendix C Workshop 2 Information and Notes

- Briefing Note
- Draft Agenda
- Workshop 2 Notes

BACKGROUND AND BRIEFING NOTE

ŌTAKI TO NORTH OF LEVIN RONS COMMUNITY MCA WORKSHOPS

Workshop 2

This note is provided as background to all participants at the two Community Multi-Criteria Workshops for the Ōtaki to north of Levin Road of National Significance (RoNS) Project. It provides a brief description of the work we will be undertaking over the two workshops, and then sets out information for the second workshop. An Agenda for Workshop 2, along with the notes from Workshop 1 and an updated route option map, is also attached.

1. BACKGROUND

The New Zealand Transport Agency (the Transport Agency) has been investigating a wide area in Horowhenua District and the northern part of Kapiti District for a possible RoNS expressway between Taylors Road and north of Levin. Considerable information has been collected and a wide range of possible broad corridors and routes have been identified and considered.

In early 2107 the Transport Agency decided to take a more active participatory approach with the wider community to help it identify and choose a route option to proceed with. As well as comprehensive public engagement and closer liaison with Iwi, a Project Reference Group (PRG) has been established.

Before deciding on the possible route(s) for wider public engagement, the Transport Agency wishes to review a wide range of possible routes through a process which involves representatives of Iwi and the PRG. This will include broad route options which have been considered earlier, but also options which have been raised in recent public engagement.

The process proposed to be used is Multi-Criteria Analysis (MCA). It is a method which enables a wide range of different aspects to be taken into consideration in evaluating options, and provides a systematic framework for working through the merits and disadvantages of each option. The PRG has been briefed on the method in general terms³⁶, and a further refresher will be provided during each of the workshops.

The MCA process is based on information, including information about the route options themselves and the environment within which they would be located. For that reason, the first workshop provided background about options, a site visit opportunity to look at the options together, and a discussion on the criteria to apply. As a result of that workshop, new route options have been added, and the draft criteria put forward in the Background and Briefing Note for Workshop 1 have been modified.

³⁶ PRG Meeting #3.

2. OUTLINE OF WORKSHOP 2

Workshop 2 will involve (detailed Agenda attached):

- Cup of tea on arrival
- Review of notes from first workshop and Agenda for day
- General discussion/questions
- Fatal flaw analysis
- Confirm criteria from last workshop (discussion based on pre-circulated Briefing Note)
- Scoring
- MCA scoring process on route options, north and south sections separately – based on constraints, specialist input and workshop discussion
- Weighting systems
- General discussion on interchange options and capture thoughts/comments
- Where to next?

This will be an intensive session with a great deal to cover.

3. ROUTE OPTIONS

Additional route options have been developed following Workshop 1. These are shown on the attached Plan and will be explained at the start of Workshop 2.

4. FATAL FLAW ANALYSIS

As agreed at Workshop 1, we will firstly identify if any of the options has a “fatal flaw” that is so significant that the option should be removed from further consideration.

A fatal flaw can be described as a condition or circumstance that means the option (in this case a route section) will not be able to be achieved. It can include an element of risk – a risk that is so great that the option is not worth pursuing. Fatal flaw analysis involves a high bar. Options that are highly difficult but not fatally flawed should remain in the mix and be scored adversely. Most fatal flaws will relate to aspects which are unconsentable in RMA terms, or where property cannot be compulsorily acquired, or where unresolvable legal challenges may arise. Other bases for fatal flaws may be routes that are so circuitous that they will not serve strategic transport needs. Engineering complexity is rarely a fatal flaw, although natural hazard exposure may be.

An example of a fatal flaw on a route would be a route that went through and could not avoid a cemetery or urupa, a very significant patch of bush, or a particularly important piece of community infrastructure (a reserve, waste-water treatment plant or water reservoir). Considering routes that are much wider than will actually be needed is one way of minimising a fatal flaw on any route section. A fatal flaw would need to apply to close to the whole of the width of a route. A route option may include significant difficulties (such as heritage buildings, which may be able to be aligned around, or the buildings themselves shifted) which attract negative scores but are probably not likely deemed sufficient to comprise a fatal flaw.

5. CRITERIA

A number of criteria were put forward for discussion at Workshop 1. These have been somewhat modified as a result of comments made. Revised descriptions are set out below.

Landscape/Visual Impact – this takes into account existing landscape character (including degree of modification and presence of structures) and the likely impact that a particular route option would have. It includes potential landscape and urban design effects when passing through or near to townships or lifestyle areas. It excludes direct visual effects on dwellings, effects of severance, and amenity considerations.

Ecological Impacts – this criterion covers ecological values, including indigenous vegetation areas that are nationally, regionally or locally significant in terms of habitat values or the presence of species, and the potential effects on waterways (lakes, rivers and streams) and wetlands.

Impact on Heritage – this criterion takes into account known archaeological and heritage sites and features, and also the risk of encountering archaeological features, or new areas of significance.

Tangata Whenua Cultural Values – this takes into account the range of values that tangata whenua are likely to associate with the area, including past and present associations, key areas of settlement (marae and papakianga), waahi tapu (if known) and other cultural value, areas of use (eg food gathering) current ownership, and important elements of the natural environment such as waterways and wetlands.

Productive Land Values – this criterion takes into account the inherent productive values of Classes I to III soils (present and future), and the current productive land use pattern.

Social/Community/Recreation Impacts – this incorporates a range of considerations such as severance, general amenity (including exposure of communities to noise), recreation impacts, and impacts during the construction phase.

Impacts on Dwellings – this criterion takes into account direct effects on existing dwellings, including the need to remove dwellings, and the potential need for mitigation of adverse effects on dwellings near an alignment.

District Development – this criterion includes consideration of impacts on current district plan provisions, and likely future growth areas.

Fit to Project Objectives – this criterion covers travel time, operating costs, safety, long-term resilience and the ability to connect effectively to Levin.

Property Degree of Difficulty – this includes the number of properties, extent of severance of existing properties, the general ability to align a route option with property boundaries, potential for effect on farming/business operations, and any known land tenure issues.

Engineering Considerations – this criterion addresses expected difficulties with construction of a route option (constructability), including matters such as likely geotechnical considerations, extent of structures needed, and potential flooding and groundwater issues.

Cost – indicative order of cost of options.

The table below sets out aspects raised at Workshop 1 and indicates where they have been included.

Items from Workshop 1:

Point to Include	Included in Criterion
Noise	Social/community/recreational impacts
Development of urban areas	District development
Ability to adapt to future option further north	Fit to project objective
Recreational values	Social/community/recreational impacts

Length	Fit to project objectives
Paris agreement/greenhouse gases	Fit to project objectives
Architectural heritage values	Impact on heritage
Local cultural values (non-tangata whenua) ³⁷	Social/community/recreational impacts; Landscape/visual impacts; Impact on heritage; District development
Safety	Fit to project objectives
Amenity	Social/community/recreational impacts ³⁸
Urban design and urban form	Landscape/visual impacts; District development
Impacts on land value	Not specifically included as too uncertain and not an RMA consideration

6. SCORING

It is proposed that we apply a typical 1 to 5 scoring method. An indicative scoring system is set out below for discussion at the start of the scoring process.

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 or opportunities 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 fully avoided. Mitigation is not readily achievable at reasonable cost, and there are few or no apparent opportunities for mitigation related benefits.
4	The option includes extensive areas of difficulty in terms of the criterion being evaluated. 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.

Note that mitigation could include a wide range of techniques from physical systems like noise screening and/or low-noise surfaces, removal and/or replacement of aspects lost (vegetation, habitats), financial compensation, etc.

³⁷ As this is a broad and undefined concept which is likely to vary widely amongst people within the community, it is appropriate that it is broken down and spread across various criteria.

³⁸ Visual amenity (apart from impacts on nearby dwellings) is covered in landscape/visual impacts.

7. PROCESSES

A range of specialists has been nominated to introduce the various criteria, to explain the content, and to comment on the route sections in detail, and to provide a tentatively suggested scoring for each.

This information will be discussed, debated and tested with the intention of achieving a consensus score for each route section for each criterion. Reasons for the scoring will be recorded. If consensus is not reached, the different score(s) will be recorded and the reasons also recorded. This will be used later as part of sensitivity testing.

To maximise efficiency, it is likely that we will score criterion by criterion, southern and northern route sections separately.

From experience, what may seem like a very slow process at the start will speed up. We need to make sure we leave sufficient time for an overall review of the scores.

We will also try to develop at least one workshop-agreed weighting system, and may look at other systems.

General questions and questions of clarification will be encouraged throughout.

8. CONCLUSION

This is an exciting and important exercise for the project. We look forward to working together on the detailed analysis for this workshop.

If you have any questions at this stage, please contact Lonnie Dalzell on 021 453 195, lonnie.dalzell@nzta.govt.nz, or Sylvia Allan on 021 665 155, sylvia.allan@ihug.co.nz.

Sylvia Allan
24th August 2017

DRAFT AGENDA
ŌTAKI TO NORTH OF LEVIN COMMUNITY MCA
Workshop 2 Tuesday 29th August 2017 – 1pm to 8pm

Te Takeretanga o Kura-hau-pō, Library, 10 Bath Street, Levin – Rimu and Totara Rooms

Chair: Lonnie Dalzell

1. INTRODUCTION

1pm	Light refreshments on arrival	Lonnie Dalzell
1.05-1.15pm	Introductions and purpose of day, confirm Agenda and notes from Workshop 1	All

2. OPTIONS UPDATE AND FATAL FLAWS

1.15-1.25pm	Description and discussion of new options	Phil Peet
1.25-2pm	Fatal Flaw discussion (can any options be ruled out?)	All

3. MCA SCORING/WEIGHTING

2pm-2.10pm	Update on and confirm criteria	Sylvia Allan
2.10-2.15pm	Scoring system	Sylvia Allan
2.15-6.30pm	Discussion by criteria/route sections (order TBC) <ul style="list-style-type: none"> • Landscape/Visual Impact • Ecological Impacts • Impacts on Heritage • Tangata Whenua Cultural Values • Productive Land Values • Social/Community/Recreation Impacts • Impacts on Dwellings • District Development Peterson/ • Fit to Project Objectives • Property Degree of Difficulty • Engineering Considerations • Cost 	Lisa Rimmer Simon Beale Daniel Parker Iwi/ Niketi Toataua Lachie Grant Sylvia Allan Kris Connell/ Mitchell Bray Richard Daniel Haigh Phil Peet KrisConnell/ Mitchell Bray Jamie Povall/ Andy Mott Jamie Povall
6.30-6.45pm	Overall review of scores and development of weighting systems	Sylvia Allan

4. INTERCHANGE OPTIONS

6.45-7pm	Interchange descriptions/options	Phil Peet/ Jamie Povall
7pm-7.45pm	Discussion, comments on interchange options	Phil Peet/ Jamie Povall

5. WINDUP

7.45-8pm	Any issues arising? What happens next?	All/Lonnie Dalzell
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Note: there will be breaks at approximately 3.15pm and 5.30pm for refreshments.

Ōtaki to North of Levin Community MCA

Workshop 2, Meeting Notes

Tuesday 29 August 2017 – 1pm to 9.30 pm

Attendees

Graeme Bagrie, Jeremy Manks, Barry Petherick, Carol Shore, Julia Burgess, Karen Prouse, Allan Mitchell, Geoff Lewis, Heather Heron-Speirs, David Keeling, Guy Brown, Lindsay Poutama, Rob Warrington, Pam Robinson, Paddy Jacobs, Wayne Hodge, Adam Tulloch, Tony Burgess, Nadine Nicholls, Daniel Haigh, David McGonigal, John Foxall, Kevin Peel, Christine Mitchell, Bernie Wanden, Barry Judd, Coral Aldridge, Lonnie Dalzell, Greg Lee, Sarah Cronwright, Jas Madhar, Sylvia Allan, Phil Peet, Richard Peterson, Jamie Povall, Lisa Rimmer, Lachie Grant, Andy Mott, Daniel Parker, Simon Beale, Niketi Toataua, Kris Connell, Mitchell Bray, Amos Kamo, Jo Wilkins.

Introduction

The meeting was started with a karakia. Lonnie welcomed everyone and reminded everyone that the purpose of the day was to collectively assess the performance of corridor options and so everyone is encouraged to participate. The agenda was confirmed and comments on the meetings notes for meeting 1 were requested to be sent to Sylvia or Lonnie.

Following a question from the group, the basis for the Māori land constraint layer was discussed (Map14). It was noted that the information has come from Corelogic. It has not at this point been checked on a title by title basis. It was noted that Map 6 was currently the most up to date information held by Transport Agency. It was acknowledged that there may be some inaccuracies in terms of Māori freehold land on the information that is shown on Map 6.

A concern was raised by members of the group about how much work was on the agenda for the day. As part of this it was noted that if we do not do the process well now it may lead to dispute later in the process. The limited information on some criteria, the overall amount of information that group members have been required to consider in preparation for the day and the late timing of the release of the landscape report were also concerns to some in the group. A concern was raised about the accuracy of the data underlying Map 11 – Flooding, in particular in relation to the large flooding area shown in the north west of the study area.

In response to these concerns it was suggested that we review progress relative to the agenda later in the day and if necessary a further session could be scheduled. With regard to the information challenges it was acknowledged that at this point in the process of selecting options it is not practical or necessary to provide detailed information on all criteria and options, assessments can and need to be made based on high level judgements, with help from specialists on the criteria and using the combined knowledge of the group. As the options are shortlisted more detailed information will be provided on the remaining options. With specific reference to the concerns about the flood map, this will be investigated with Horizons Regional Council.

It was also noted that the specialists involved, while sharing their knowledge and listening to the responses, were entitled to independently hold their own professional views, which may be somewhat different from the scores that the workshop gave particular items.

Options update

Five additional options added since the last meeting were introduced. These are:

- S8 a far western route in the south
- N6 a far western route in the north
- N7 linking N1 and N3 routes between Lakes Papaitonga and Horowhenua
- N8 far eastern option around the outskirts of the Gladstone area
- N9 along the alignment of the electricity transmission lines through the Gladstone area

A flyover of each of the new routes was shown.

There was some discussion about why S8 does not go west of Forest Lakes (previously discussed during workshop #1). The reasons for this were explained as being the significance of the lakes themselves from an ecological and cultural perspective. Also it was not practical to go west of Forest Lakes as this would result in considerable route elongation and create geometrical difficulties.

There was a brief discussion about how the corridors were chosen in the first place. Corridors have been identified using the constraints maps, with the proposed route options avoiding as many constraints as possible.

Q. Why is the link road only 2 lanes?

Because traffic splits between SH57 and SH1, therefore there is no need for the dual carriageway. It was noted that it would be designed to enable it to be widened in the future. Land purchase would provide for potential four-laning.

Fatal Flaws

The group was asked whether any options should be removed due to fatal flaws, noting that the bar for fatal flaw was very high.

It was suggested that N1, N2 and N7 are fatally flawed because they cross the edge of Lake Papaitonga. N1 was raised also as a fatal flaw because of the number of urupa involved, which cannot be avoided. It was also noted that Lake Horowhenua is expected to be given special status through Treaty of Waitangi processes. This cannot be reflected in a MCA score of 5, and therefore options impacting on the Lake may be fatally flawed.

Q. How far away from Lake Horowhenua do we need to be to avoid effects on it?

As far as possible.

It was noted that through the recent consultation process the community had requested genuine western options be included in the option assessment process. A concern was expressed that the western options have too many constraints to be genuine options. Members of the project team noted that this is a challenge with western options, but Transport Agency is responding to requests expressed during community consultation and at the first workshop, and based on very preliminary assessments has included what appear the most feasible western options.

A concern was raised that identifying fatal flaws of options now was not appropriate because many options had a significant adverse impact and not running each option through the MCA process would not allow the pros and cons of each option to be assessed overall. It was also suggested that relatively minor alignment adjustments may be identified which can avoid the fatal flaws. It was also noted that the immediate MCA evaluation is not the end of the optioneering process. Options can be further investigated, and alignment adjustments assessed, if it is identified by the group that there would be benefit in doing so.

Agreed that potential fatal flaws would be identified and recorded as we moved through the process (by a score of 5*).

Criteria

The revised criteria were introduced based in the meeting briefing note. In response to a specific concern it was noted that 'noise' is included under amenity in the social / community / recreation criteria.

A concern was raised that too many factors were included in the social/community/recreation criteria. The view was expressed that each of social, community and recreation are equally as important as some of the other factors which are stand-alone criterion. In response, the point was made that all of the criteria have several factors within them, and that this was the nature of option assessment at this stage of the process. Overall, given the number of criteria already, the consensus was that we would, during the assessment of this criterion, keep amenity, recreation and severance in separate columns so that the relative effects on each factor remains visible to the group and to the wider public during subsequent consultation. However a single score would be awarded for each route under the social, community, recreation criterion.

It was raised that land value was not included as a criterion. It was noted that land value is reflected in several criteria, including 'social, community, recreation', 'impacts on dwellings' and 'property degree of difficulty'. The level of complexity around land values and the uncertainty (i.e. some land gains value, other loses it) was noted.

Scoring

In relation to scoring a concern was raised that the proposed method of scoring in the briefing note requires the group to consider both difficulties/effects and benefits. It was suggested that in some instances options may have both benefits and adverse effects under a single criterion and that this would be difficult to reconcile in a single score.

In response to this, the concern was acknowledged as legitimate generally. However, it was noted that in this project the options would have benefits in relation to only a very limited number of the criteria (possibly only 'Fit to Project Objectives'). For most of the criteria, given the current "broad corridor" level and the standard Transport Agency mitigation provisions that would be applied, the focus should be on the adverse effects of the options. Therefore this issue is not expected to arise. It is noted that once more detailed work is undertaken the opportunity to develop beneficial elements will be able to be considered.

Criteria

Note: the following are short summaries of the discussion at the workshop. More detailed assessments from the specialists will be included in the MCA report.

Engineering considerations

The specialist introduction noted that this criterion excludes cost. 4 sub-attributes have been considered. These are described briefly below with the weighting of each sub criteria provided in brackets:

- A broad brush assessment of the number of structures expected on the route, i.e. how complex the construction will be and the long term maintenance liability / resilience risk of more structures (10%)
- Geometry – whether a route is a high standard or a multitude of minimum standards (20%)
- Geology and geotechnical considerations (50%)
- Flooding risk – based on constraint maps from Horizons Regional Council (20%)

Sub-attributes were scored on scale of 1-5, and then weighted as per percentages in brackets above.

Option	Score	Commentary (# in brackets = sub-attribute score)
S1	3	Quite a lot of structures (5), only one curve at minimum (2), a few geotechnical issues (3), some flood risk (3)
S2	3	Quite a lot of structures (5), only one low standard curve (2), a few geotechnical issues (3) some flood risk (3)
S3	3	Quite a lot of structures (5), 3 curves in the minimum standard range (4), a few geotechnical issues (3), some flood risk (3)
S4	3	Has the most structures (5), 2 low standard curves (3), a few geotechnical issues (3), some flood risk (3)
S5	3	A lot of structures (5), 1 low standard curve (2) minimal geotechnical issues (2), some flood risk (3)
S6	2	Less structures (4), only 1 low standard curve (2), minimal geotechnical issues (2), some flood risk (3)
S7	3	Less structures (4), 2 low standard curves (3), a few geotechnical issues (3), minimal flood risk (2)
S8	3	Quite a lot of structures (5), 2 low standard curves (3), a few geotechnical issues (3), more extensive flood risk (4)

It was noted that from an engineering perspective the southern routes are reasonably similar and this is reflected in the scores.

Option	Score	Commentary (# in brackets = sub-attribute score)
N1	3	Moderate extent of structures (3), only one curve at minimum standard (2), a few geotechnical issues (3), more extensive flood risk (4)
N2	3	Moderate extent of structures (3), only one curve at minimum standard (2), a few geotechnical issues (3), more extensive flood risk (4)
N3	3	No structures (1), four curves at minimum standard (5), minimal geotechnical issues (2), minimal flood risk (2)
N4	2	Limited extent of structures (2), only one curve at minimum standard (2), minimal geotechnical issues (2), no flood risk (1)
N5	2	Limited extent of structures (2), only one curve at minimum standard (2), minimal geotechnical issues (2), no flood risk (1)
N6	4	Moderate extent of structures (3), only one curve at minimum standard (2), more significant geotechnical issues (4), more extensive flood risk (4)
N7	3	No structures (1), two curves at minimum standard and two just above (4), a few geotechnical issues (3), some flood risk (3)
N8	2	Moderate extent of structures (3), no curves at minimum standard or just above (1), minimal geotechnical issues (2), minimal flood risk (2)
N9	2	Limited extent of structures (2), only one curve at minimum standard (2), minimal geotechnical issues (2), minimal flood risk (2)

The concern regarding the accuracy of the flooding map, particularly the large area in the north west, was re-visited. It was noted that if the flood risk was in fact lower than indicated by the map then this might reduce the criterion score for the north western N6 option by 1 to 3 but N1 would remain the same. This is to be investigated further with Horizons Regional Council.

On N3, a question was raised about the score of a 5 for the geometrics sub-attribute. To test the sensitivity of the score for this option the geometrics sub-attribute score was reduced to 4. This would have the effect of reducing the overall criterion score for this option to 2. Further investigation will consider if this is possible and if so alternative scoring will be included as part of sensitivity testing.

It was suggested that the geotechnical score on N1, N2, N7 may not reflect the true geotechnical risk in the area due to the presence of peat materials. The specialist was fully aware of the peat materials but the comments were tested by increasing the score from 3 to 4 for geotechnical considerations. This would increase the overall score for all three options to 4, this will be investigated further and potentially included in sensitivity testing.

In relation to liquefaction in the western areas it was recommended that the work of Dr Huhana Smith be reviewed.

Ecological Impacts

The specialist introduction for this criterion noted that the assessment was largely based on desktop sources (Department of Conservation, Land cover, QEII covenants, Regional Council, Horowhenua District Council and iwi), supplemented by site visits. Various indigenous systems had been considered including terrestrial and aquatic systems. Consideration had also been given to impacts on species and sites with special status. In general terms, the recommended scoring was based on the physical extent of encroachment on areas with ecological value.

Option	Score	Commentary
S1	1	no obvious constraints, assumed to miss QEII covenant
S2	2	May compromise QEII covenanted area within the corridor, but possibly can avoided through the design process
S3	3	impacts significant area of bush occupying a gully (northern end of corridor)
S4	5	significant ecological areas, particularly on outskirts of Ōhau, don't believe that these areas could be avoided with a four-lane road
S5	4	forest valley system near Manakau, and two other areas
S6	2	some values in southern portion, Stables Bush,
S7	5	Some significant values in the southern portion, completely bisects one particular area
S8	1	no obvious constraints

Q. How were waterways considered, including in the Forest Lakes area – Several options cross gullies in this area?

Mitigation for run-off and hydrological impacts during construction and operation will need to be given careful consideration during future design stages. NZTA standards require a good level of stormwater run-off treatment as well as designs to ensure that run-off rates do not increase flooding effects. This was considered as part of 'reasonable mitigation' in the scoring of options.

Q. Would it be possible to cross the Ōhau River further west (S4)?

It is not considered practicals to do so as there are so many other constraints, including the rail line, urupa, etc.

Option	Score	Commentary
N1	4	Impacts on western fringe of Lake Papaitonga, stable dune system (high values), but can be avoided or partially avoided (2), if cannot be avoided would be a (4)
N2	5	Significant impacts on the eastern fringe of Lake Papaitonga (possibly a fatal flaw). Following questions and comments about three steep gullies it was agreed that this might be able to be mitigated by bridging

N3	2	Bush area in north and at Ōhau River, possibly able to be avoided through detailed route alignment
N4	5	Impacts on two bush areas which are nationally significant. While the bush could be avoided, any road through this area would remove the potential for future linkage of the 2 areas. During discussion an alternative score was suggested of 4 because of potential for route to go through the gap between the 2 areas.
N5	1	No obvious constraints
N6	5	Numerous areas of high value, some in close proximity with limited potential to avoid the areas. In discussion some concern was expressed that the current land use is already impacting the value of this area, i.e. the value is lower than is being suggested in the score. Evidence of liquefaction.
N7	4	Number of forested areas, difficult to avoid
N8	1	No obvious constraints
N9	5	Riparian forest area will be bisected, while physical extent of the impact is small, because the impact is on riparian values, this means the area is likely to include high diversity and it is noted nationally significant species have been found in this location.

Tangata Whenua Cultural Values

The specialist introduction noted that all options west of the current SH1 are fraught from a tangata whenua perspective due to the numerous urupa and other sites of significance in the area, and the extent of Māori landownership. Eastern options are less of an issue. While there are areas of concern, these tend to be more readily mitigated than is the case west of SH1. It was also noted that an expressway would generate social and economic issues for tangata whenua, but the focus of the assessment has been on specific cultural value.

Separate scores for the southern options were provided by representatives of Ngāti Wehi Wehi and Ngāti Tukorehe. The northern scores were provided by a representative of Muaupoko.

Scoring:

S1 - (4/5) S2 - (5/5) S3 - (5/5) S4 - (3/5) S5 - (4/4) S6 - (2/2) S7 - (3/3) but more work required to understand if there would be effects on toma associated with deep caves in this location and intangible effects S8 - (5/5)

N1 – (5) N2 - (5) N3 – (5) N4 – (3) – eastern options remain of concern as potential for effects on water flow to lakes and also potential road related pollution of the water.

N5 – (3) N6 – (5) N7 – (5) N8 – (3) N9 – (3)

Q. Can the western corridors be moved to reduce the score?

It was suggested that while the corridors could be moved, this wouldn't reduce the score, and the reasons for this is shown by the archaeological layer presented by Daniel Parker.

Impact on Heritage

The specialist introduction noted that the forest line from 1872 is key to the distribution of sites of significance to iwi. Prior to that date, land east of the forest line was mainly covered in forest, although there were some larger clearings for cultivation, occupation or other purposes. The forested areas were less densely occupied than the dune lands closer to the coast and the clearings. The coastal and clearing areas that were more densely occupied are those areas where the highest number of archaeological sites have been found and can be expected to be uncovered in the future. In general terms therefore the pattern of archaeological risk is that this increases further west, except in main clearing sites where early pakeha culture as well as tangata whenua traces could be expected.

It was noted that an assessment of known sites within 500m either side of the proposed corridors has been used as the basis for scoring, i.e. a 1.3km wide corridor overall for each option. This is because it best indicates the risk of archaeological sites being impacted by an option, taking into account uncertainty about the accuracy of historic information and the expected archaeological landscape. This approach was based on learnings from the recent Mackays to Peka Peka project where a much greater density of archaeological finds than was predicted occurred. Noted that there was no fatal flaws in this criterion, but that archaeological finds can have very significant impact on construction programme.

In the south S1 – S5, S8 were scored a 4, while S6 & S7 were scored a 2.

In the north N1-3, N6 and N7 were scored a 4. N5, N8 & N9 were scored a 2. N4 was scored 4 because of the presence of the Prouse Homestead.

Social / Community / Recreation

The specialist introduction noted that three factors have been considered under this criterion. These are:

- **severance - interruption of physical and social coherence of a community (S)**
- **amenity values, as defined in the RMA, including noise effects (A)**
- **recreation (opportunities for active and passive) (R)**

Each of these factors was first assessed using an impact rating of low, moderate and high. An overall criterion score was then applied.

It was noted that severance is not the same thing as connectivity, which relates to the ability of people to move between different parts of the district. An assumption has been made that, through further design, connectivity will be similar to the current situation.

Each of the factors were assessed as either low (L), medium (M) or high (H) impact so as to generate an overall corridor option score.

Options	S	A	R	Comment	Score
S1	L	L	L	Sparsely populated rural area, no particular rural character, avoids obvious recreation sites	2
S2	L	L	L	No obvious constraints	2
S3	L	L	L	No obvious constraints	2
S4	L	M	L	Amenity impacts on Ōhau, particularly vineyard subdivision	3
S5	H	H	>L	High severance particularly between the part of the township to the west and the domain, marae and the main township, also noise effects (echo)- need to look at option which avoids Manakau	5
S6	H	H	>L	Severance and amenity effects through Manakau south subdivision - need to look at option which avoids Manakau	5
S7	L	L	M	Recreation use in camping ground	2
S8	L	L	L	No obvious constraints	1

During discussion an alternative alignment to avoid Manakau by following S7 and then linking back to S5/6 alignment was suggested. The project team will look at this as an option and report back to Project Reference Group.

It was noted that the end point of the Peka Peka to Ōtaki expressway limits options at the southern end.

Options	S	A	R	Comment	Score
N1	L	L	M	Reasonably sparsely populated, proximity to Lake Papaitonga, golf course	3
N2	L/M	L/M	M	Reasonably sparsely populated, proximity to Lake Papaitonga, golf course	3/4
N3	H	H	H	Separates the lake from Levin, major severance, recreation facilities lost, also amenity issues at Ōhau and Levin	5

N4	M	M	L	Increased surface area of carriageway. Severance of Gladstone area from Levin, although connectivity maintained.	4
N5	M	L/M	L	Severance of Gladstone area from Levin, although connectivity maintained.	3/4
N6	L	L	L	No obvious issues	2
N7	H	H	H	Separates the lake from Levin, major severance, recreation facilities lost, proximity to Lake Papaitonga	5
N8	M	M	H	Severance of Gladstone area from Levin, although connections maintained. Impact on recreation facilities east of Gladstone area – The Trig and Gladstone Reserve.	4
N9	M	L/M	M	Severance of Gladstone area from Levin, although connections maintained.	3/4

Productive Land Values

The specialist introduction noted that the assessment of this criterion has considered the NZ Land Resource Inventory, soil type, slope and land use capability (LUC) assessments. In terms of LUC, categories 1-3 are of interest in terms of land productivity, particularly classifications 1 and 2. It was noted that the assessment of productive land value has not considered the current subdivision pattern/lifestyle blocks. The presence of rural residential subdivision significantly reduces the productive potential of land.

Option	Score	Commentary
S1	3	Total area of option 336 ha, 334 ha in classes 1-3, 192 ha in classes 1-2
S2	3	Total area of option 345 ha, 337 ha in classes 1-3, 207 ha in classes 1-2
S3	2	Total area of option 358 ha, 342 ha in classes 1-3, 186 ha in classes 1-2
S4	4	Total area of option 522 ha, 508 ha in classes 1-3, 256 ha in classes 1-2
S5	4	Total area of option 502 ha, 474 ha in classes 1-3, 308 ha in classes 1-2
S6	4	Total area of option 508 ha, 476 ha in classes 1-3, 207 ha in classes 1-2
S7	4	Total area of option 560 ha, 498 ha in classes 1-3, 134 ha in classes 1-2
S8	2	Total area of option 327 ha, 321 ha in classes 1-3, 120 ha in classes 1-2

Option	Score	Commentary
N1	2	Total area of option 376 ha, 263 ha in classes 1-3, 69 ha in classes 1-2
N2	2	Total area of option 382 ha, 307 ha in classes 1-3, 100 ha in classes 1-2
N3	3	Total area of option 348 ha, 338 ha in classes 1-3, 234 ha in classes 1-2
N4	3	Total area of option 282 ha, 282 ha in classes 1-3, 185 ha in classes 1-2
N5	3	Total area of option 301 ha, 301 ha in classes 1-3, 190 ha in classes 1-2
N6	2	Total area of option 408 ha, 118 ha in classes 1-3, 9 ha in classes 1-2
N7	3	Total area of option 376 ha, 331 ha in classes 1-3, 160 ha in classes 1-2
N8	4	Total area of option 441 ha, 415 ha in classes 1-3, 250 ha in classes 1-2

N9	4	Total area of option 363 ha, 363 ha in classes 1-3, 222 ha in classes 1-2
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Landscape / Visual Impact

The specialist introduction noted that landscape assessment considers three things:

- physical matters
- aesthetic
- cultural meanings

Broadly landscape can be thought of as what we'd see if we knew the full story about an area. Part of the assessment is to consider how well an option fit with a landscape. That is, better options will follow the patterns of the landscape, rather than crossing them. All options have adverse landscape effects (even if score 1) and scoring has focussed on comparison so as to assist option selection.

Q. Please explain the factors that need to be considered in relation to heritage patterns?

These include shared and recognised values, and may include factors that are not on national lists.

Q. If the landscape is able to absorb the road, is that part of the assessment?

Yes that is one of the factors, the assessment should consider the effects arising from landform modification.

Option	Score	Commentary
S1	2	The option presents a reasonably good fit with landscape patterns, one issue is that it does bisect two landscape areas and would have some rural community impact
S2	2	Similar reasons to S1
S3	3	This option does not follow the landscape patterns as well options S1 and S2
S4	4	This is the worst option in terms of crossing landscape patterns. Concerns also arise due to its close proximity to Ōhau
S5	4	This option crosses landscape patterns and is close to Manakau
S6	2	This option presents quite a good fit with the landscape patterns. Its proximity to the Manakau village and heights counts against the option.
S7	3	Large earthworks required for this option, i.e. landscape modification
S8	2	This option presents a reasonably good fit with landscape patterns – could tuck in and around dunes. However the cultural connections with these landscapes counts against this option.

Q. How can S5 and S6 score so differently?

S5 crosses the landscape and would involve a large structure over the rail line, whereas S6 follows the landscape pattern better.

Q. Have you used the 2011 report?

Have used the most up to date aerals (2017). 2011 report is background data.

Option	Score	Commentary
N1	5	The proximity of this option to Lake Papaitonga represents a significant effect.

N2	5	The proximity of this option to Lake Papaitonga represents a significant effect. In addition the option cuts across landscape patterns.
N3	4	This score recognises the fairly significant issues arising from this option's proximity to Levin and associated urban design issues
N4	2	This option works in well with current patterns, its within a relatively open landscape, and detailed design should enable localised effects to be avoided or mitigated

N5	2	This option works slightly less well compared with N4, i.e it cuts across the landscape somewhat. There is however more potential to avoid effects on the homestead and bush. Therefore on balance a similar score to option N4.
N6	2	This option present a reasonably good fit with landscape patterns. It could tuck in and around dunes. However the cultural connections with these landscapes counts against this option.
N7	5	This option would have significant effects on the highly valued Lakes and it also cuts across landscape patterns.
N8	4	This option will impact the Tararua foothills.
N9	1	This option works in well with current patterns, it is within a relatively open landscape.

Q. Has light pollution been considered?

It was not part of the landscape assessment, covered under amenity. It was noted however that lighting is only likely at the interchanges.

A concern was expressed that this is not based on on-ground understanding. The specialist noted that they have been on the ground, and recognise this as being important for the assessment.

Q. Wouldn't the valley behind Manakau be a valued landscape?

This could well be categorised as a 'significant amenity landscape' under the Resource Management Act.

Q. Can the expressway be used to advertise the Lakes? An opportunity?

Possibly with greater distance from the Lakes, proximity of some options to the Lakes is a real issue.

Disappointment was expressed about the scores for the options impacting on the Queen Street east area.

Q. How important was the at-grade Queen Street crossing suggestion to the score for N4?

It was taken into account. The score could be improved by best practice design such as full or partial expressway trenching of the expressway (with Queen Street kept at grade/where it is now), although this could have implications on the bush nearby and complications in terms of groundwater and engineering.

Q. Would potential noise mitigation measures create a landscape effect that should be taken into account?

In broad terms mitigation measures are part of the effects of a four lane highway and have therefore been considered in the assessment.

Q. Is it possible to put the expressway below natural landform?

Yes, but will depend on ground conditions, ground water levels etc. In some areas would have visual impacts – cuts in hilly areas.

District Development

The specialist introduction notes that this criterion was an assessment in relation to District development rather than the District Plan. This avoids overlap with other criteria. The assessment has assessed the development potential left in urban zones. It has not considered development potential in rural zones as this is addressed through the productive land criterion.

The assessment is mainly based on 2015 District Plan zones, but also considered Council still developing review of these zones. It was noted that the Council will try to marry up growth areas with the preferred RoNS alignment and that some alignments cut across currently deferred development areas and that is borne out in scoring.

Scoring for the southern options was as follows:

Option	Score	Commentary
S1	1	Impacts Rural Zone land only – land based productive effects covered elsewhere.
S2	1	Impacts Rural Zone land only – land based productive effects covered elsewhere.

S3	1	Impacts Rural Zone land only – land based productive effects covered elsewhere.
S4	2	Impacts on the Ōhau Greenbelt Residential area. An existing development, which is mainly subdivided. There is not a significant amount of development potential remaining. Effects on existing houses / community covered under other criteria. Minor effect on development potential.
S5	3	A future growth area is being considered to the north of Manakau by Council. This will be impacted by the option. The area is not expected to have large development potential, therefore the impact is less extensive than the Gladstone area.
S6	3	Impacts on rural residential subdivision south east of Manakau. These effects covered under other criteria. However, a growth area is being considered to the north of Manakau by Council. This will be impacted by the option. The area is not expected to have large development potential, therefore the impact is less extensive than the Gladstone area.
S7	1	Impacts Rural Zone land only – land based productive effects covered elsewhere.
S8	1	Impacts Rural Zone land only – land based productive effects covered elsewhere.

Option	Score	Commentary
N1	1	Impacts mainly Rural Zone land – land based productive effects covered elsewhere.
N2	1	Impacts on existing rural residential subdivision north west of Ōhau. The amenity effects and loss of dwellings is covered in other criteria. Otherwise impacts Rural Zone land only – land based productive effects covered elsewhere.
N3	4	Impacts the western edge of Ōhau Greenbelt Residential area. Also and more significantly impacts industrial (important) and residential areas on west of Levin. Impact not as extensive as in Gladstone area, but impact on industrial land is important for District development.
N4	4	Impacts the western edge of the Gladstone greenbelt residential area, for its entire length. Aligns with corridor shown in the structure plan. Notwithstanding council considers that effects of this scale would be extensive. This area may also present opportunities for further residential development. Mitigation is likely however through good practice structure planning.
N5	4	Splits Gladstone greenbelt residential area, severs areas from each other. Diagonal alignment cut across grid layout which can be expected to reduce subdivision efficiency. Effects considered to be extensive. Mitigation is likely however through good practice structure planning.
N6	1	Impacts on rubbish dump, expect covered in ‘property degree of difficulty’. Otherwise impacts Rural Zone land only – land based productive effects covered elsewhere.
N7	4	Impacts industrial (important) and residential areas on west of Levin. Impact not as extensive as in Gladstone area, but impact on industrial land is important for District development.
N8	3	Impacts on the eastern edge of the Gladstone Greenbelt area. Mainly developed. Little severance impacts as on the eastern edge.
N9	4	Splits Gladstone greenbelt residential area, severs areas from each other. Impacts or close to the future local commercial area shown on structure plan. Mitigation is likely however through good practice structure planning.

Impacts on dwellings

The specialist introduction noted that because of the large number of properties impacted by the various options a high level assessment has been undertaken using 2016 aerials (some limitations, new or recent developments aren't included). The assessment looked at property parcels (approx. 1,400) and considered dwellings directly in the alignment of the routes. In terms of scoring, scores 1 and 2 were not used because all options are considered to have negative effects on individual properties. All of the options impacted dwellings to some degree, and to those properties the effect is negative. The scores given were based on the following ranges of dwelling impacted: 1-30 (score 3), 31-50 (score 4), more than 50 (score 5).

S1 (3) S2 (3) S3 (3) S4 (5) S5 (5) S6 (5) S7 (4) S8 (3)

N1 (3) N2 (4) N3 (5) N4 (5) N5 (5) N6 (3) N7 (4) N8 (5) N9 (5)

Q: How close properties can be to an expressway?

This relates to properties that are directly affected and the amount of land that needs to be taken. There is guidance on how close dwellings can be to proposed state highways available. Greg to circulate guidance via Lonnie.

Property degree of difficulty

The specialist introduction noted that this assessment considered the need for property reconfiguration, commercial relocations, the difficulty associated with acquiring Māori land, easements on Māori land which are likely to introduce a large number of parties into negotiations and large farming severances.

Options S1, S2, S3, S4, S5 and S8 were scored 5 primarily due to the significant amount of Māori freehold land and the significant number of easements registered against titles. There were also specific additional issues associated with purchase of Tatum Park for option S3 and S4, and Allied concrete and the Bishops Vineyard for option S4.

S6 and S7 were scored 4 due to the presence of a quarry and also the number of Māori freehold properties. However these options do not contain the easements issues associated with options such as S1 and S2.

Options N1, N2, N6 and N7 were scored 4. All options will require the purchase of a reasonable amount of Māori land. Options N1 and N2 have the added difficulty of the golf course purchase.

Option N3 was scored a 5 due to the need to purchase the Alliance Group site, the presence of Māori land and the presence of recreation reserves along the alignment.

Options N4, N5, N8 and N9 were scored 3 mainly because there is currently no Māori land identified along these alignments.

Q. How will you work through the Māori land acquisition?

It is achievable through negotiation, and takes a degree of collaboration / goodwill on both sides to come to a negotiated agreement.

Fit to project objectives

The specialist introduction noted that this assessment involved consideration of combined corridors along the entire route. This was required because southern or northern options on their own would not achieve the project objectives.

Most of the southern and northern options can form part of multiple combined corridors. Because of this the criterion score given to each of the southern and northern options was based the best performing combined corridor which it forms part of.

The assessment of the combined corridors was against the four project objectives, which are:

- **Reduce travel times on the state highway network**
- **Reduce deaths and serious injuries on the state highway network**
- **Enhance the resilience of the state highway network**
- **Provide appropriate connections that integrate the state highway and local road networks to serve urban areas**

The assessment of travel time was based simply on the calculation of journey length and volume of traffic expected to be using the route.

In relation to safety, it was noted that the key issue is how many people transfer to the new safer road. How many do this will be contingent on how attractive the route is from a travel time perspective. Therefore the options assessment against this objective is the same as for travel time.

In terms of resilience, it was noted that there is not a lot of hazards in the study area compared to other parts of New Zealand. All options duplicate current highway. The only option which stands out as being less resilient is S7, due to its location on a fault line.

Local connectivity – broad consideration based on separation from Levin.

Based on these considerations the following scores were awarded to the southern options:

- S2, S3, S5, and S6 scored 1
- S4 scored 2
- S1, S7 and S8 scored 3.

Scoring for the northern options was:

- N3, N4, N5 and N9 scored 1
- N1, N2, N6, N7 and N8 scored 3.

Cost

The specialist introduction noted that this criterion was assessed by splitting each option into lengths of normal and lengths of complex construction, and by considering the extent of structures required on each route. The outcome was a relative construction cost.

The southern options scored:

- S1, S2, S3 and S8 scored 2
- S6 scored 3
- S4, S5 and S7 scored 4.

The northern options scored:

- N4 and N5 scored 1
- N1, N3, N7, N8 and N9 scored 2
- N2 scored 3
- N6 scored 4.

Weighting of criteria

It was noted that multiple weightings would be applied to the criteria to help decision making on the best options. The group discussed a 'community weighting', it was agreed that this should be based on the degree to which criteria relate to factors with long term enduring effects on the community.

The weighting selected for the group was as follows:

Criteria	Weight (%)	Reasons
Landscape/visual	60	The group consider that change will occur anyway, and that effects can be mitigated
Ecology	100	This was considered to be a key enduring issue for the community.
Heritage	100	This was considered to be a key enduring issue for the community.
Tangata Whenua	100	Issues of significance to tangata whenua were considered to be a key enduring issue for the community.
Productive land value	80	While the loss of productive was recognised as very important to the community, the small extent of land involved reduced the weighting given to this criteria.
Social, community, recreation	100	This was considered to be a key enduring issue for the community.
Impact on dwellings	90	This was considered significant to the community, although it was noted owners would be financially compensated.

District development	60	Accepted that there is flexibility for the future development patterns to adjust to the presence of the expressway
Fit to project objectives	100	As these objectives in consideration of access to Levin this was considered to be a key enduring issue for the community.
Property degree of difficulty	90	As this criterion includes severance effects for farmers, it is therefore significance to community
Engineering matters	20	The associated issues were generally consider to be short term and of less relevance to the community.
Cost	20	Cost was considered to be of limited relevance to the community, although it was acknowledged that they are tax payers.

Next Steps

As the meeting had run well over time, it was drawn to a close. The one outstanding Agenda item not covered was interchange options. It was agreed that the project team would work through the outcomes of the MCA assessment and would report back to the next Project Reference Group on the results. It was agreed that the interchange options and implications would also be discussed at the next Project Reference Group.

The next Project Reference Group meeting will take place on Thursday 28 Sept.

The meeting finished with a Karakia.

**Appendix D Landscape and Visual Workshop
Background Notes**

Isthmus.

ŌTAKI TO NORTH OF LEVIN ROADING PROJECT

BACKGROUND REPORT FOR COMMUNITY/STAKEHOLDER WORKSHOP

LANDSCAPE + VISUAL + URBAN DESIGN

Client: Stantec on behalf of NZTA
 Project: Ōtaki to North of Levin Roading Project
 Code: 2923
 Report: Background Report for Community and Stakeholder Workshop
 Landscape +Visual+ Urban Design
 Status: Final C
 Date: 14 December 2017
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No.	Date	Details	Author	QA
1	27/08/2017	Draft 1	Gavin Lister	Lisa Rimmer
2	14/09/2017	Final	Gavin Lister	Lisa Rimmer
3	20/11/2017	Final B (para. 3.34)	Gavin Lister	Lisa Rimmer
4	14/12/2017	Final C	Gavin Lister	Lisa Rimmer

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1 INTRODUCTION

- 1.1 This report provides background on 'landscape and visual' matters that were considered at a stakeholder workshop held 29 August 2017 at Levin to compare alternative routes for the Otaki to north-of-Levin highway project. The routes were compared by way of a multi-criteria analysis (MCA) across a range of criteria.
- 1.2 Scores for the 'landscape and visual' criterion were recommended to the workshop participants by landscape architects engaged by the NZ Transport Agency. The recommendation included an explanation of the reasons, and relativity comparisons between the different options. This report sets out the recommended scores and reasons.
- 1.3 The final workshop scores, however, were agreed by the participants and do not necessarily agree with those recommended by the landscape architects. The report identifies where this is the case.

What is 'landscape and visual'?

- 1.4 The 'landscape and visual' criterion was introduced as a composite of the physical landscape, its aesthetic qualities, and the cultural meanings associated with it. Examples of how these aspects are interwoven include:
- The more we understand about a landscape (such as its historical, cultural or ecological layers) the more we appreciate it (the more we know the more we see).
 - The extent to which the road fits the natural and human patterns of the physical landscape influences how aesthetically pleasing it will be.

What are we scoring?

- 1.5 The purpose of the scoring is to compare route options on the basis of the likely 'landscape and visual' effects of the expressway. This includes the overall effect of the highway on the physical landscape, and its visual or aesthetic effects, in the context of the landscape's relative significance or values. The term 'fit with landscape' is useful shorthand for such effects.
- 1.6 While the scores convey relative effects, they are relative to routes being compared. Any expressway is likely to have substantial effects. A score of '1' does not mean that there will not be significant adverse effects – rather that it is amongst the least effects that might be anticipated for an expressway in the landscape context, whereas a '5' means the option is amongst the worst in that context.
- 1.7 This also reflects the importance given to different matters in the RMA. For example, additional weighting is given to adverse effects on an 'outstanding natural landscape', or for landscapes with particular significance to mana whenua.
- 1.8 It is useful to use the full range 1 to 5 to distinguish between best and worst options where there are real differences between them. To do otherwise means scores tend to bunch in the middle. For this reason an option can be ranked '1' despite the inevitable adverse effects that would follow from construction of an expressway.

Refining the alignment

- 1.9 The scores outlined in this report assume that best efforts will be made to find the best practicable alignment within the 300m wide corridors. For instance, the scoring assumes that attention will be paid to avoid discrete natural and human features such as stands of bush, urupā, heritage places, to minimise the number of houses affected, and to fit as closely as possible to the cadastral pattern. Specific assumptions are noted where relevant. To put it another way, a common-sense rather than a pedantic approach was taken to ranking options. To that extent, a set of design principles are attached that we envisage would be adopted for the subsequent refinement of the design.

Mitigation

- 1.10 A '5' ranking is not necessarily a fatal flaw, but is amongst the worst options. It may be made acceptable where extensive mitigation is able to overcome the potential adverse effects.

2 NORTHERN AREA

- 2.1 Summary of relative landscape scores for northern area (west to east) [1 = best, 5 = worst]. The left hand column lists scores recommended to the workshops,, and the right hand column indicates instances where the workshop chose a different score.

Option	Recommended score	Workshop score (where different)
N6	2	
N1	5	
N2	5	
N3	5	4
N7	5	
N4	1	2
N5	3	2
N9	1	
N8	4	

Western Options

Baseline Assessment

- 2.2 The following tables are copied from the 2011 baseline assessment¹ are a general description of the existing landscapes traversed by the route options west of Levin. (The landscape units are depicted on Figure 1 appended to this report).

1c: Levin's north-west outskirts (Kawiu Road area)	
	<p>Description Rolling terraces with incised gullies. The area has a rural character, modified by its proximity to Levin, including dairy farming, cropping, and some lifestyle uses. One of the two principal Muaūpoko marae (Kawiu) is located on Kawiu Road with views to Lake Horowhenua.</p>
mod-low	<p>Landscape Quality The landforms are undistinguished and the vegetation is almost completely modified, although there are small pockets of remnant forest.</p> <p>Aesthetically the area has no distinguishing or memorable features, and the rural character is modified by the location on the outskirts of Levin. There are views of Lake Horowhenua from parts of the landscape unit.</p> <p>However the area has associations with the Kawiu marae, including connections between the marae and Lake Horowhenua.</p>
mod	<p>Absorption Capability Biophysical effects would likely be low taking into account the subdued landforms and modified streams and vegetation.</p> <p>Aesthetic effects would generally be low given the mixed peri-urban character, however there would be visual amenity effects on some nearby properties, and potential effects on the marae, including potentially disrupting landscape connections between the marae and Lake Horowhenua.</p>

¹ NZTA Roads of National Significance – Ōtaki to North of Levin, Landscape and Urban Design Baseline Report (Second Draft), Isthmus, April 2011

2a: Dune country	
	<p>Description</p> <p>Rolling to steep sand-dunes, with small inter-dune wetlands and lakes. Land use is mostly dairy farming and plantation forestry, with areas of regenerating native vegetation.</p> <p>Hökio Stream (the Lake Horowhenua outflow) cuts across the dune country following the toe of a low escarpment on the stream's northern bank, and characterised by its sandy bed (in contrast to streams originating in the Tararuas).</p>
mod-high	<p>Landscape Quality</p> <p>The natural landscape values associated with the dune landforms, the inter-dune wetlands and lakes, with Hökio Stream, and areas of regenerating vegetation.</p> <p>The dune landforms themselves have interest as geomorphic features, including small dune lakes and interdune wetlands. The dune landforms have an intimate scale, are reasonably picturesque, and are enhanced by the patches of regenerating bush, although the aesthetic and natural landform qualities are reduced to some extent by the forest plantations. (The New Zealand Geo-preservation Inventory has identified the Hökio Beach dunefields as a significant feature. It is located south of Hökio Beach and west of the study area. The inventory describes the dunes in that area as “an example of one of the most extensive areas of sand and related aeolian features in New Zealand, including blowouts, sand passes and lag surfaces. Classified as an extremely well defined landform of scientific/educational value.”)</p> <p>The Hökio Stream has significance to aquatic life because it provides the connection between Lake Horowhenua and the sea. It is backed by its small escarpment which is locally distinctive, and in places back-dropped by regenerating vegetation.</p> <p>Hökio Stream is recognised in Muaūpoko pepeha as a key landscape feature.</p>
mod-low	<p>Absorption Capability</p> <p>A new road would likely result in significant modification to the dune landforms, potentially impact on the wetlands and dune lakes found in the area, and have some effect on natural character at any crossing point over the Hökio Stream.</p> <p>Visibility from the wider landscape would be constrained by topography, and potential visual amenity effects from dwellings would be limited by the low settlement density, although there are potential visual amenity effects on one of the marae.</p> <p>There are potential effects on the associations tangata whenua have with the Hökio Stream.</p>
	<p>Specific Features</p> <p>The principal feature is the Hökio Stream, which connects Lake Horowhenua with the sea, and which has significance to tangata whenua. Although the stream has been degraded over the years, Muaūpoko are currently restoring parts of the stream banks. There may be an opportunity to contribute to restoration of the stream if a road alignment were to be sought through this area, however any crossing point would need to be located in a way that minimises effects on the visual and physical connections between the lake and the coast, and between the marae and the lake. Effects on natural character might be reduced by locating a crossing point in already modified locations such as the vicinity of the existing transmission lines, landfill access, or Moutere Road.</p> <p>Other localised features include:</p> <ul style="list-style-type: none"> • The marae west of Moutere Road • Small wetlands and dune lakes • Patches of regenerating native bush

2b: West backdrop to Lake Horowhenua	
	<p>Description</p> <p>Rolling to steep sand-dunes, typically oriented perpendicular to the coast. Land use is mixed dairy farming, plantation forestry, limited cropping, and the Levin Golf Course. Some small stands of remnant kahikatea forest.</p> <p>Hökio Stream (the Lake Horowhenua outflow) is a distinctive feature: The stream traces the toe of a small escarpment around the north perimeter of a small plain (former lake bed). There are small stands of kahikatea and a distinctive urupā on the plain, and some regenerating vegetation on the escarpment adjacent to the lake outflow.</p>

	A principal marae, Kohuturoa, is located on a terrace overlooking the south end of the lake, and another marae is located further down Hōkio Stream. Otherwise there is low settlement density with a small number of farmhouses.
mod-high	<p>Landscape Quality</p> <p>As above, the dune landforms have significance as inland outliers of a more extensive dune field. The dunes are reasonably prominent as a backdrop to Lake Horowhenua, and the highest one (84m identified as A4NE on map NZTM) is a localised landmark.</p> <p>The area in the vicinity of the Lake Horowhenua outflow has more significant values, including natural values associated with the wetland and regenerating bush at the lake outflow, the picturesque qualities of the stream, escarpment and urupā; and value of the area to Muaūpoko, including the landscape connection between the marae, Lake Horowhenua and the Hōkio Stream. The values associated with Hōkio Stream are described in 2a above.</p>
low	<p>Absorption Capability</p> <p>A road would:</p> <ul style="list-style-type: none"> • Likely result in significant modification to the dune landforms, in particular the escarpment on the north side of Hōkio Stream. Several kahikatea stands and the most prominent dune hill (A4NE) would be specific features that would need to be avoided. • Likely result in impact on the landscape connections between the marae and Lake Horowhenua. The marae, two urupā and several kahikatea stands would be specific features that would need to be avoided. • Likely bisect the Levin Golf Course. • Potentially affect the backdrop to views across Lake Horowhenua, although such effects could be avoided depending on the alignment. • Potentially have visual amenity effects on the two marae and some rural houses, although the low settlement density would limit the extent of such effects.
	<p>Localised Features</p> <p>Localised features include the following:</p> <ul style="list-style-type: none"> • Kohuturoa marae • Urupā in the vicinity of Hōkio Stream and marae • Remnant kahikatea stands on the peat plain near the Lake Horowhenua outflow • Hōkio Stream (see 2a above)

	<p>2d: East backdrop to Lake Horowhenua</p> <p>Description</p> <p>Narrow strip of land between Lake Horowhenua and Levin. Mostly flat, including former lake bed and terraces. Mixed land uses reflecting the peri-urban context, including pastoral farmland (dairy farming), sports fields, abattoir, and sewage treatment plant. Activities in the adjacent parts of Levin include Te Kowhai Reserve (a bush reserve surrounding an historic homestead used for functions), the Levin Race Course, industrial activities, and a small amount of suburban housing.</p>
mod-low	<p>Landscape Quality</p> <p>The landscape quality is low, notwithstanding the proximity to Lake Horowhenua and Te Kowhai Reserve. Views of the lake are restricted by the low elevation and the band of vegetation around the lake's margin. The strip of land is completely modified, used for either dairy farming or urban activities.</p> <p>The aesthetic qualities are reduced by the proximity to Levin, including the industrial fringe in the south-west corner, and the sewage works.</p>
mod-low	<p>Absorption Capability</p> <p>A road would:</p> <ul style="list-style-type: none"> • Affect the connection between Levin and Lake Horowhenua: Physical connection could be maintained but the road would create visual severance, and an overpass would be prominent in the viewshaft along Queen Street west. • Have visual effects on Lake Horowhenua and the reserve, • Likely impact on the playing fields, • Have potential effects on Te Kowhai bush and reception centre (although the latter is screened by the surrounding bush). • Have visual amenity effects on properties on Levin's outskirts. As discussed above such properties include a small number of residential properties, but are mostly industrial properties, and include the race course. <p>The potential to restore the lake's natural setting might be an opportunity. A road alignment in the vicinity might be acceptable if sufficient buffer distance was provided and wetland forest restored between the road and the lake.</p>
	<p>Localised Features</p> <p>Localised features include the following:</p>

	<ul style="list-style-type: none"> • Te Kōwhai Bush and reception centre • Lake-side reserve • Sewage treatment works
--	--

3a: Dune country	
	<p>Description</p> <p>Rolling to steep sand-dunes, with some inter-dune valley flats and some small dune lakes. Land use includes dairy farming and plantation forestry. The area is traversed by twin transmission lines.</p>
mod-low	<p>Landscape Quality</p> <p>The vegetation cover is almost completely modified, with only very occasional natural remnants. The dune landforms are modified to some extent by forestry and are less distinctive than that further north. While the rolling dunes are moderately picturesque, they are not particularly memorable, and the aesthetic qualities are reduced by the transmission lines, forest plantations, and drained inter-dune flats. The area has a working landscape character.</p>
mod-high	<p>Absorption Capability</p> <p>The subdued topography and modified vegetation cover and watercourses would reduce the potential effects of earthworks on natural features. Some localised wetland areas are specific constraints that could be avoided. Visual amenity effects would likely be low: the area has low visibility from the wider landscape, and settlement density is low. The main concentration of dwellings is on Hōkio Sand Road, although there is a gap in dwellings in the vicinity of where the transmission lines cross that road.</p>

3b: Sand plains and dunes	
	<p>Description</p> <p>Sand plains that have been extensively drained, interspersed with rolling sand dunes. Mostly dairy farming land use with a low settlement density.</p>
mod-low	<p>Landscape Quality</p> <p>The vegetation cover is almost completely modified, with occasional remnant trees and patches of regenerating vegetation. The outflow from Lake Papaitonga (Waiwiri Stream) traverses the area, although the stream and its associated wetlands have been modified.</p> <p>The area has a pleasant pastoral rural character with rolling topography, but is not otherwise memorable. (Lake Papaitonga is mapped as a separate feature because it is distinct and largely contained by the surrounding dunes / escarpment).</p>
mod-high	<p>Absorption Capability</p> <p>The subdued topography and modified nature of the vegetation and drainage would reduce potential impacts on natural features.</p> <p>The area has low visibility from the wider landscape, and settlement density is low, with the main concentration of dwellings being along Hōkio Sand Road.</p> <p>There would be potential effects on views from Lake Papaitonga, which has high landscape significance (see following landscape unit). While the lake is largely enclosed on three sides, it opens to views of the farming landscape beyond the lake's western end. Potential effects could be avoided and remedied by maintaining sufficient distance separation and restoration of wetland forest at the lake's western end.</p>
	<p>Localised Features</p> <p>Localised features include the following:</p> <ul style="list-style-type: none"> • Waiwiri Stream (the outflow from Lake Papaitonga) traverses the area. Although modified, the stream has significance to tangata whenua, and has landscape value as the connection between Lake Papaitonga and the sea. There may be opportunities to restore the stream and former wetlands if a road were to be built in this area.

3c: Lake Papaitonga and margins	
	<p>Description</p> <p>Dune lake, partly enclosed by former sea cliffs. The north and east ends of the lake are surrounded by remnant lowland native forest, although the lake opens to a modified pastoral landscape to the west and south. There are two islands. The larger is a steep sided stack, the other a constructed island pa near the west end of the lake. The lake margins and bush is a reserve with walking tracks and boardwalks.</p>
high	<p>Landscape Quality</p> <p>The area has high natural values resulting from the area of remnant forest enclosing part of the immediate</p>

	<p>catchment, a remnant of warm lush lowland forest in an otherwise modified landscape. The Lake is listed in the NZ Geopreservation Inventory as having earth science significance. It is described as an “excellent example of a dune dammed lake. One of few remaining examples of surrounding natural forest.” Ecological values include habitat of <i>Paryphanta</i> land snails. However part of the margins have been modified, the lake level lowered, and water quality reduced due to surrounding land uses, including straightening of the outflow (Waiwiri Stream), part draining of the large swamp (Reporoa) at the lake’s western end, and clearance of some of the encircling forest.</p> <p>The lake has high significance to tangata whenua: It was a former centre of Muaūpoko and the site of a massacre by Te Rauparaha in 1823 during the musket wars. It is understood Ngāti Raukawa also maintain an interest in the lake.</p> <p>The area also has historic associations with naturalist Walter Buller, who acquired land surrounding the lake and carried out early bird studies at the lake. While Buller is something of a controversial figure, he was a leading figure of the Scenery Preservation Movement, an early conservation movement.</p> <p>The lake has relatively high aesthetic values, resulting from the lake itself, the picturesque islands and enclosing landform at the eastern end, and the backdrop native forest, although the values are reduced by the modified margins to the west and south.</p> <p>The lake and its enclosing bush warrant recognition as an outstanding natural feature. Although the coherence of the lake’s landscape context is reduced by the modified land at the western end, there are sufficient natural, aesthetic and associative values to make the feature outstanding. The modified margins and water quality could also be remedied through restoration of the wetland forest.</p>
low	<p>Absorption Capability</p> <p>The high natural, perceptual and associative values mean that any road through the forest or immediate vicinity of the lake would have high effects.</p> <p>As discussed above, Lake Papaitonga and its forested margins warrants recognition as an Outstanding Natural Feature so a road in this landscape unit is likely to raise RMA s6(b) matters.</p>

3d: Cropping plains west of SH1	
	<p>Description</p> <p>Flat river terraces, with high quality soils characterised by cropping land use, exotic shelter belts with amenity trees around individual farm houses. A productive landscape with a relatively close pattern of rural settlement, but few lifestyle properties.</p>
low	<p>Landscape Quality</p> <p>There are no natural features of note, with the exception of the backdrop bush of the adjacent Lake Papaitonga (3c), and the landscape has been substantially modified.</p> <p>The area has an attractive character of a ‘working’ landscape, but is otherwise undistinguished. The rural character is influenced by proximity to Levin’s industrial outskirts.</p>
mod-high	<p>Absorption Capability</p> <p>The flat, modified topography means effects on natural features would be low. There would be some loss of a productive soil.</p> <p>There would be visual amenity effects from farmhouses, although such effects could be reduced by maintaining sufficient separation from roads (for instance mid-block between CD Farm Road and Bruce Road).</p>

3e: Lifestyle terrace west of Ohau	
	<p>Description</p> <p>Flat to rolling topography, on a terrace above the Ohau River and west of Ohau settlement. Former pastoral farming landscape, but recently subdivided and developed for closely settled lifestyle properties.</p>
mod-low	<p>Landscape Quality</p> <p>The area has relatively low natural values: The land cover is completely modified, and landforms modified to some extent through subdivision.</p> <p>The area has a relatively close pattern of subdivision of small lifestyle properties, so that it has a semi-suburban character in places, and has relatively low aesthetic qualities.</p>

mod-low	<p>Absorption Capability</p> <p>Although it is likely that a road could be built through this area with little significant effect on natural landscape values, there would be visual amenity effects due to the concentration of semi-rural properties.</p>
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N6

Existing Landscape

2.3 The route crosses landscapes 2a and 3a (description above).

'Fit with landscape' (potential landscape and visual effects)

2.4 The option has a reasonably good fit with the physical landscape. It is located in the dune country so as to minimise impacts on the more closely settled and productive plains landscapes and would be relatively low visual prominence because of the dunes. While it would require modification of the dune landforms, the corridor is sufficiently near the inland edge of the dunes to avoid bisecting the area as a whole.

- Traverse relatively steep dune landforms, requiring earthwork modification to the land.
- Potential effects on dune wetlands, although avoids higher concentration of such wetlands further west.
- Crosses Hōkio Stream, but avoids the concentration of features around the outlet from Lake Horowhenua.
- Relatively good fit with cadastral pattern.
- Relatively few houses impacted - although effects on some houses.
- Opportunity to concentrate effects with those of transmission corridor.
- **Recommended score '2'**

Relativity comparison

2.5 This is the best of the western options from a landscape perspective. It reduces potential adverse effects by locating sufficiently far west to avoid effects on Lake Horowhenua, and on the culturally important landscape around the outfall from the lake to Hōkio Stream – and the associated maraes, kāinga, urupā, and landscape connections. While it would still cross the Hōkio Stream (and therefore the connection between the lake and sea) there would be sufficient separation from the lake and other features to mitigate such effects. At the same time, the route is sufficiently near the inland margins to avoid the core area of the dune country, including the main concentration of dune wetlands.

N1

Existing Landscape

2.6 The route crosses 2b and 3b. (See above).

'Fit with landscape' (potential landscape and visual effects)

2.7 The option has a reasonably good fit with the physical landscape, following the edge between the plains and sand dunes. However, it passes through one of the most sensitive landscape

areas (the outflow from Lake Horowhenua along the Hōkio Stream) and also close to Lake Papaitonga which we consider would qualify as an ONF/ONL.

- Crosses Hōkio Stream and interrupt connections and features (marae, urupā) between stream and Lake Horowhenua.
- Require modification of dune country west of Lake Horowhenua.
- Would be visible in the western backdrop to Lake Horowhenua.
- Passes close to western edge of Lake Papaitonga, crossing wetlands downstream of the lake. Would be visible in views from lookout down the lake from its eastern end.
- Bisects Levin golf course.
- However, direct impacts on relatively small number of rural houses and lifestyle properties.
- **Recommended score '5'**

Relativity comparison

- 2.8 This is one of the worst options because of a combination of adverse effects on the sensitive landscape around the outflow from Lake Horowhenua, and impacts on the backdrop to Lake Papaitonga. It is slightly better than N2, though, because it skirts the edge of the plain to a greater extent, and the effects on Papaitonga would be greater for N2.

N2

Existing Landscape

- 2.9 This route crosses 2b, 3d, 3e. It also clips part of clip 3c (Lake Papaitonga). (See above).

'Fit with landscape' (potential landscape and visual effects)

- 2.10 We consider Lake Papaitonga would qualify as an ONF/ONL for the reasons set out in the baseline assessment, and that the alignment across the bush at the eastern end would be a fatal flaw – this could be addressed by locating the detailed alignment east of the bush.
- 2.11 Even with this change, the option would still have a poor fit with the landscape – in particular it would cross one of the most sensitive landscapes in the district around the outlet of Lake Horowhenua and would 'clip' the edge of Lake Papaitonga bush.
- Passes through one of the most sensitive landscape areas (the connection from Lake Horowhenua along the Hōkio Stream).
 - Passes close to Ngatokowaru Marae, and an alignment east of the marae would sever its connection with Lake Horowhenua.
 - Require modification of dune country west of Lake Horowhenua.
 - Would be visible in the western backdrop to Lake Horowhenua.
 - Cuts diagonally across the cadastral pattern and area of productive soils south of Hōkio Beach Road.
 - Crosses Hōkio Stream and interrupt connections and features (marae, urupā) between stream and Lake Horowhenua.
 - Passes close to Lake Papaitonga which I consider would qualify as an ONF/ONL.

- Direct impacts on moderate number of rural houses and lifestyle properties west of Ohau and south of Hōkio Road – otherwise relatively low density of dwellings north of Hōkio Road.
- **Recommended score '5'**

Relativity comparison

- 2.12 We consider this the worst of the northern options (with N7), because of a combination of the effects on the sensitive landscape around the outflow from Lake Horowhenua, the impacts on Papaitonga, and its diagonal alignment bisecting the landscape south of Hōkio Beach Road.

N3

Existing landscape

- 2.13 The route crosses landscapes 1c, 2d, 3d, 3e (description above) – it appears the historic homestead at Te Kowhai Reserve has been removed.

'Fit with landscape' (potential landscape and visual effects)

- 2.14 Although it is aligned with the 'grain' of the landscape, it is a landscape of particular significance to Levin, and there will be significant effects on the margins of Lake Horowhenua and the connections between the town and the lake.
- Reasonable fit with cadastral pattern although cuts diagonally across pattern on productive land south of Hōkio Beach Road.
 - Flat topography, but crosses tributary streams close to Lake Horowhenua.
 - Severs Levin from Lake Horowhenua.
 - Visual effects on Kawiu Marae (potential severance from Lake Horowhenua if alignment further to the west).
 - Visual effects on reserve and margins of Lake Horowhenua.
 - Visual effects on properties on edge of Levin and direct impacts on moderate number of rural dwellings.
 - **Recommended score '5'** (possibly could be reduced to '4' with extensive mitigation).
 - **Workshop score '4'** in order to distinguish this option from those in close proximity to Lake Papaitonga (ONF) although it was acknowledged that the route would cause severance between Levin and Lake Horowhenua and have significant impact on existing recreation facilities.

Relativity comparison

- 2.15 One of the worst options because of its effects on the margins of Lake Horowhenua, severance of the lake from Levin, and on Kawiu Marae. It might be reduced to '4' and made acceptable (just) in landscape terms if the road was on structure and combined with very extensive mitigation so as to restore the forest margin to the lake, and embed the highway within forest.

N7

Existing landscape

2.16 The route crosses landscapes 1c, 2d, 3d, 3e. (See above).

'Fit with landscape' (potential landscape and visual effects)

2.17 The route is similar to N3 in that it passes between Levin and Lake Horowhenua. It has a poor fit with landscape in this area:

- Severs Levin from Lake Horowhenua.
- Visual effects on reserve and margins of Lake Horowhenua – in this regard it is worse than N3 because it is closer to the lake and follows a greater length of its margins.
- Visual effects on Kohuturoa Marae.
- Visual effects on Kawiu Marae (potential severance from Lake Horowhenua if alignment further to the west).
- Visual effects on properties on edge of Levin and direct impacts on moderate number of rural dwellings.

2.18 In addition the route has a poor fit with landscape south of Hōkio Beach Road:

- Cuts diagonally across grain of landscape to pass to the west of Lake Papaitonga and then back to pass east of Lake Horowhenua (weaving between the two most significant features).
- Passes close to Lake Papaitonga (which we consider would qualify as an ONF/ONL), visual effects on the western end of the lake, and impacts on the wetlands below the lake.
- Direct impacts on moderate number of rural houses and lifestyle properties west of Ohau.
- **Recommended score '5'**

Relativity comparison

2.19 We consider this, along with N2, the worst of the northern options because of its effects on both Lakes Papaitonga and Horowhenua, severance of Lake Horowhenua from Levin, impacts on both Kohuturoa and Kawiu Marae, and that it criss-crosses against the grain of the landscape (almost as if it goes out of the way to maximise impacts).

Eastern Options

Baseline Assessment

2.20 The following tables are copied from the 2011 baseline assessment are a general description of the existing landscapes traversed by the options east of Levin.

2g: Terraces east of Levin	
	<p>Description</p> <p>Flat terraces between Levin and the Tararua foothills. The area has a relatively intensive horticultural and agricultural land use, including dairy farming, cropping, orchards, poultry farms, glasshouses. There are also pockets of closely-settled lifestyle or semi-rural properties.</p> <p>SH57 (Arapaepae Road) runs adjacent to Levin's eastern edge, with rural properties on the opposite side.</p>

mod-low	<p>Landscape Quality</p> <p>The land is relatively modified, and has few natural features apart from occasional remnant stands of native forest on the eastern side of the landscape unit. (The most significant is Waiopahu Reserve at the end of Queen Street East just outside the landscape unit).</p> <p>Aesthetically the landscape unit derives most of its values from the backdrop hills -the area forming a connection between Levin and the Tararua foothills. Otherwise the rural character is modified by its adjacency to Levin, the existing State highway, transmission line, pockets of closely settled lifestyle subdivision, and the intensive productive activities including glasshouses and poultry farms.</p>
mod-high	<p>Absorption Capability</p> <p>The topography is flat and modified, and could relatively readily accommodate a road. In addition it is noted:</p> <ul style="list-style-type: none"> • The character of Arapaepae Road is already determined by the existing SH57, and properties on the edge of Levin typically already have fences to reduce amenity effects. However the number of houses built close to the eastern side of the road means that widening of the existing State highway is likely to have effects on adjoining properties. • A green-fields route would have visual amenity effects from rural houses, particularly where pockets of lifestyle properties are concentrated. • A new road through this unit would introduce a small degree of visual severance between Levin and the Tararua mountain backdrop.
	<p>Localised Features</p> <p>Localised features include the following:</p> <ul style="list-style-type: none"> • The Prouse homestead and curtilage on Queen Street East • Small stands of bush, including a stand adjacent to Arapaepae Road south of the intersection with Queen Street East

2h: Foothills east of Levin	
	<p>Description</p> <p>Junction between plain and Tararua foothills. The area has a relatively intensive horticultural and agricultural land use, including dairy farming, cropping, orchards, poultry farms, glasshouses, and an area of closely-settled lifestyle properties.</p>
mod	<p>Landscape Quality</p> <p>The most significant natural feature is Waiopahu Reserve at the end of Queen Street East.</p> <p>Aesthetically the landscape unit derives most of its values from the backdrop hills -the area forming a connection between Levin and the Tararua foothills. Otherwise the rural character is modified by its adjacency to Levin, the existing State highway, transmission line, pockets of closely settled lifestyle subdivision, and the intensive productive activities including glasshouses and poultry farms.</p>
mod-low	<p>Absorption Capability</p> <p>The junction between plains and foothills is relatively sensitive in landscape terms, particularly taking into account the band of lifestyle properties through this area. Any road alignment through this landscape unit is likely to impact on Waiopahu Reserve or its immediate surrounds. A new road through this unit would introduce a small degree of visual severance between Levin and the Tararua mountain backdrop.</p>

3h: Terraces east of SH1	
	<p>Description</p> <p>Rolling to flat terraces above the Ohau River. Land use includes a mix of dairy farming, cropping and lifestyle properties. There are several stands of remnant lowland tōtara forest.</p> <p>Two rural roads (Kimberley Road and part of Arapaepae Road) have been upgraded over the years as SH57, which serves Palmerston North and Hawkes Bay from the south.</p>
mod	<p>Landscape Quality</p> <p>The area has a pleasant rural character enhanced by the close backdrop of the Tararua Ranges, and more particularly in the southern part of the landscape unit where the landscape is enhanced by the river terraces and remnant stands of tōtara bush. There is a picturesque vineyard subdivision south of Ohau, and an historic church in a rural setting approximately 1km east of Ohau.</p>
mod	<p>Absorption Capability</p> <p>The subdued topography and modified land cover could accommodate a road with relatively low effects on natural values, so long as remnant bush stands were avoided.</p> <p>There would be visual amenity effects in terms of rural houses which are clustered along rural roads. Elsewhere visual amenity effects would be less significant, and would be reduced by the numbers of trees in parts of this landscape unit.</p>

	<p>Localised Features Localised features include the following:</p> <ul style="list-style-type: none"> • The church of Saint John the Baptist 1km east of Ohau. The church was built in 1901, one of a series of picturesque rural churches between Wellington and Wanganui designed by architect Frederick de Jersey Clere. • The remnant tōtara forest stands south-east of Ohau.
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N4

Existing landscape

2.21 Route crosses mostly landscape 2g and small part of 3h (description above)

'Fit with landscape' (potential landscape and visual effects)

2.22 Relatively good fit with the landscape

- Square with cadastral pattern.
- Flat topography. Open landscape. No watercourses.
- Square to the cadastral pattern.
- Square to eastern edge of Levin, consistent with existing boundary between urban and rural areas (acknowledging the proposed growth area).
- Constraints with heritage house/parkland and separate stand of bush near Queen Street (may be able to thread alignment in open space between).
- Direct impact on moderate number of dwellings. Close to several others.
- **Recommended score '1'** (assuming alignment avoids Prouse homestead and bush).
- **Workshop score '2'** on the basis that, while the option has a good fit with landscape patterns, there is risk to the bush remnant and Prouse homestead that may not be able to be mitigated and could cause some severance and effects on homestead setting.

Relativity comparison

2.23 This is one of the best options because it follows the edge of the rural residential landscape between Levin and the Tararuas, and is parallel with the landscape 'grain' (existing highway, edge of Levin, property pattern). We consider it would be a '1' except for the presence of the Prouse homestead and the small nearby stand of bush (although the alignment could thread between these).

2.24 A real distinction should be made between this option and those in the vicinity of Lake Horowhenua because the latter landscape raises several RMA s6 matters, including the significance of the landscape to mana whenua, and the natural character of the lake margins. The severance between Levin and the lake (N3) would be more pronounced than the severance between Levin and the Tararuas which have the benefit of greater separation. The western options N1-N3 would also have more immediate effects on recreation.

2.25 It is worth noting, with respect of this landscape, that the quality and absorption capability rankings are relative. All landscapes have their own qualities and histories and are special to people who live there. Notwithstanding, we do need to discern differences to help choose the best (or 'least worst') route for the highway. In discerning such differences we are guided by the priorities set out in the RMA.

- 2.26 Points raised at the previous workshop included that the area east of Levin includes an area identified as a growth area for the town, has prime soils in places, is important for recreation, has a heritage house (Prouse homestead and curtilage) close to N4, and there will be effects on people in the vicinity of N5. It is worth bearing in mind the following:
- It is understood that Council is currently in the process of deciding the type and form of urban expansion east of Levin. The highway can either bisect an area or form an edge. Which alignment is preferable will depend on the pattern of planned urban development: N4 would make a good edge between urban Levin and a large lot residential landscape to the east. On the other hand, N5 might make a better edge between urban expansion on Levin's eastern side, and a semi-rural landscape beyond the highway.
 - The main recreation considerations (from a landscape perspective) would be maintaining connections to the Tararua foothills, and avoiding Waiopehu Reserve.
 - The heritage values of the Prouse homestead and its curtilage are now better understood than when the baseline assessment was carried out. This feature may be addressed as a matter of detailed alignment. For example, avoiding an interchange at Queen Street would be one way of making the highway as compact as possible and minimising potential landscape/visual effects. Another option to minimise such effects would be for the highway to go under Queen Street in an underpass.
 - It is worth acknowledging that any highway alignment will have direct effects on those living nearby. A landscape goal is to minimise effects on properties as much as possible, but also recognise that it is not possible to build a highway without having some such impacts.

N5

Existing landscape

- 2.27 As with N4, the option crosses 2g and 3h. Descriptions above.

'Fit with landscape' (potential landscape and visual effects)

- 2.28 The corridor could have a reasonably good fit with landscape – although not as good as N4.
- Flat topography. Open landscape. No watercourses.
 - But cuts diagonally across cadastral pattern.
 - Bisects existing rural and lifestyle area and proposed growth area.
 - Direct impact on moderate number of rural dwellings and clusters of lifestyle properties. Close to several others. May be reduced by following existing transmission line for part of alignment.
 - **Proposed score '3'**
 - **Workshop score '2'** on the basis of relativity with N4: while not as good a fit with landscape patterns as Option N4, it avoids the valued features of Prouse homestead and adjacent bush. The workshop considered the options to be equivalent on balance.

Relativity comparison

- 2.29 N5 is a little worse than N4 because it bisects the rural residential landscape between Levin and the hills, and doesn't follow the landscape grain as well – i.e. it follows a more diagonal alignment. However, it does avoid the Prouse homestead, and could be better edge between urban development and a rural residential landscape – it depends how Council intends development to occur in this area.

N9

- 2.30 This alternative links with S7 (it is similar to N5 but straighter at southern end, and follows transmission line to greater extent).

Existing landscape

- 2.31 The option crosses 2g and 3h – descriptions above.

'Fit with landscape' (potential landscape and visual effects)

- 2.32 Good fit with landscape pattern
- Flat topography. Open landscape. No watercourses – crosses Ohau River adjacent to transmission line.
 - Square to the cadastral pattern.
 - Follows existing transmission corridor.
 - But bisects existing rural and lifestyle area and proposed growth area.
 - Direct impact on moderate number of rural dwellings and clusters of lifestyle properties. Close to several others. May be reduced by following existing transmission line.
 - **Proposed score '1'**

Relativity comparison

- 2.33 N9 is slightly better than N5 and N6 because it is squarer with the cadastral pattern, affects fewer houses, and has the potential to follow transmission line.

N8*Existing landscape*

- 2.34 The option crosses mainly landscape 2h and a small corner of 3h. The descriptions for these in the base line assessment are still accurate. (Description for 2h below, 3h above).

'Fit with landscape' (potential landscape and visual effects)

- 2.35 Reasonably poor fit with landscape.
- Follows junction between edge of terraces and foothills, reasonably flat – although would cut through spur north of Denton Road and across several streams.

- Potential effects on Kimberley Reserve – would need to be aligned in vicinity of where transmission line crosses Ohau River.
- Potential effects on Waiopehu Reserve.
- Reasonably poor fit with cadastral pattern – avoiding features such as Kimberley Reserve and Waiopehu Reserve mean the alignment will cut diagonally across such patterns.
- Minimises disruption of proposed growth area.
- Direct impact on pattern of rural and lifestyle properties along Gladstone and Denton Roads.
- **Proposed score '4'**

Relativity comparison

- 2.36 This option is worse than N4 and N5 because it traces a more sensitive landscape closer to the Tararuas, and because of likely impacts on Waiopehu and Kimberley Reserves. It would also likely have greater effects on existing dwellings.

Connection between SH1 and SH57

- 2.37 This is not scored because it is common to all options. However, it is worth noting that the interchanges that would be required to connect with western options could have their own adverse effects – for example an east-facing connection between route option N1 and the existing SH1 is close to the cluster of maraes near the Waitarere curves.

3 SOUTHERN AREA

3.1 As a guide, the best fit with landscape tends to be achieved by either following toe of the foothills on the inland edge of the plains, or the margins of the sand dunes on the western side of the plains – the choice would be influenced by the preferred option in the northern area. However, routes that criss-cross the plains typically do not have as good a 'fit' with the landscape. Likewise option 7A which criss-crosses from the plains to the eastern valley and back again does not have as good a 'fit' with landscape.

3.2 Summary of Recommended scores:

Option	Recommended score	Workshop score (where different)
S8	1	2
S1	2	
S2	2	
S3	3	
S3 and S4	4	
S5	4	
S6	3	2
S7	3	
S7A	4	

Western Options

Baseline Assessment

3.3 The following tables are copied from the 2011 baseline assessment are a general description of the existing landscapes traversed by the western route options south of Ohau.

4a: Dune Country	
	<p>Description</p> <p>Rolling to steep sand-dunes, with some small dune lakes and inter-dune valley flats. Mostly dairy farming with some small forest plantations. The unit is traversed by twin transmission lines.</p> <p>There are a number of historical sites on the lower Waikawa Stream, and a 'heritage trail' signboard.</p>
mod	<p>Landscape Quality</p> <p>The main natural features are the dune landforms themselves, and the two main waterways (Ohau River and Waikawa Stream). The land cover, including the margins of the waterways, has been almost completely modified, with only occasional natural remnants.</p> <p>The rolling dunes have a quiet rural character, with relatively few buildings, but are otherwise unremarkable aesthetically. The transmission lines detract from amenity to some extent.</p> <p>There are historical associations with the lower reaches of the Waikawa Stream. Te Rauparaha established his first pa in the district at the mouth of the Waikawa Stream. Sites relating to early Pākehā settlement are associated with the period in the mid C19th when the main route was along the beach and there was a small port at the then combined mouths of the Ohau River and Waikawa Stream.</p>
mod	<p>Absorption Capability</p> <p>The dune topography in this area is relatively subdued reducing the potential impact of earthworks, so long as wetland areas were avoided. The character is already modified to some extent by the existing transmission lines, and potential visual amenity effects would be limited by the low settlement density.</p>

	However there is potential for effects on the individual historic sites and some potential for effects on the cluster of sites as a whole.
	<p>Specific Features</p> <p>The lower Waikawa Stream is a linear feature bisecting the landscape unit. Several historic sites are distributed along the stream. Although the stream is modified, any road crossing would need to take account of natural character.</p>

4b: Plains west of SH1	
	<p>Description</p> <p>Generally flat topography comprising the flood plains of the Ohau River, Waikawa and Manakau Streams. The lower lying land is subdivided by a network of drains. Mostly dairy farming. Relatively open 'big sky' landscape with occasional exotic trees and shelter belts. There are strips of lifestyle properties along Waikawa Beach Road and Takapu Road.</p>
low	<p>Landscape Quality</p> <p>Natural values are low taking into account the subdued topography, modified land cover and drainage, and relatively intensive pastoral land use.</p> <p>Aesthetically the area has a 'working' rural character and only minor topographic features. Takapu Road has somewhat higher amenity because of rolling topography and greater number of trees.</p>
mod-high	<p>Absorption Capability</p> <p>The subdued topography, modified land cover and drainage, and working rural character lend themselves to accommodating a road in relative terms.</p> <p>The low settlement density would limit potential visual amenity effects from dwellings. The main exceptions would be in the vicinity of Takapu Road and Waikawa Beach Road, although there may be potential to avoid dwellings in these areas.</p>
	<p>Specific Features</p> <p>The main waterways (Ohau River, Waikawa Stream, and Manakau Stream) are linear features which would need to be crossed by any new road alignment, which would need to take natural character effects into account. Natural character of these waterways is most affected at the existing highway and railway crossing points. However each waterway has been modified through adjacent land use, removal of the indigenous forest cover, and in some places through stop banks and modifications to the channels.</p>

5g: Valley and terrace east of SH1 (base of Pukehou)	
	<p>Description</p> <p>This small landscape unit comprises a terrace at its southern end, leading into a valley that traces the toe of the backdrop hills.</p>
mod	<p>Landscape Quality</p> <p>Natural landscape values are moderately low. There is a small stream in the valley, and prominent topography, but the land cover and stream margins are modified. However the rolling topography, relatively high tree cover, and proximity to steep backdrop hills lend the area moderately high aesthetic qualities.</p>
mod	<p>Absorption Capability</p> <p>The cluster of houses at the southern end of this landscape unit would potentially be impacted on in terms of visual amenity by a new road in the landscape unit.</p> <p>On the other hand the valley at the northern end of the landscape unit could more readily accommodate a road because the valley is aligned parallel to existing SH1 and is sufficiently wide to accommodate a road as well as the stream. Visual amenity of a small number of dwellings would potentially be affected.</p>

S8

Existing landscape

- 3.4 The corridor crosses landscapes 5g, 4b, 4a. (Descriptions above).

'Fit with landscape' (potential landscape and visual effects)

- 3.5 There are a string of historical and natural features along the Waikawa Stream valley. We assume that this alignment would avoid this area by crossing Waikawa Beach Road east of

intersection with Takapu Road before swinging west. On that assumption, the corridor would have a good fit with the landscape:

- Crosses a relatively narrow section of the plains and the margins of the sand dune country.
- Minimises impact on the plains area – while it would require modification of the dunes, the dunes in this area are reasonably subdued and the corridor is sufficiently near the inland edge of the dunes to also avoid bisecting the dune area as a whole.
- Potential effects on dune wetlands, although avoids higher concentration of such wetlands further west.
- Opportunity to concentrate effects with those of transmission corridor.
- Relatively good fit with cadastral pattern.
- Relatively few houses impacted.
- **Recommended score '1'**
- **Workshop score '2'** on the basis that, while option S8 has a relatively good fit with landscape patterns, there would be some impacts on more sensitive dune landforms (compared to S1) and because of shared and recognised cultural connections for mana whenua (this option was scored a 5 by both iwi groups for these reasons).

Relativity comparison

- 3.6 This is the best of the western options. By following the margins it avoids the more sensitive core area in the centre of the dune country. At the same time it reduces effects on the plains landscape, will impact relatively few dwellings, and have low visual prominence. There is an opportunity to follow the transmission corridor. However, it is acknowledged that the area has greater significance to mana whenua groups.

S1

Existing landscape

- 3.7 The route crosses 4b and 5g (clipping a corner of 5b). (Descriptions above).

'Fit with landscape' (potential landscape and visual effects)

- 3.8 Reasonably good fit with the landscape
- The corridor is mostly flat – although rolling topography around the base of Pukehou and some gullies southwest of Manakau.
 - Open landscape – effects on relatively few dwellings.
 - However, bisects open plains landscape.
 - Cuts diagonally across cadastral pattern – bisects productive farmland.
 - **Recommended score '2'**

Relativity comparison

- 3.9 Somewhat worse than S8 because it bisects the plains landscape to a greater extent.

S2

Existing landscape

3.10 S2 crosses the same landscapes as S1 (i.e. 5g, 4b). (Descriptions above).

'Fit with landscape' (potential landscape and visual effects)

3.11 Reasonably good fit with the landscape

- The corridor is mostly flat – although rolling topography around the base of Pukehou and some gullies southwest of Manakau.
- Open landscape – effects on relatively few dwellings.
- Reasonably good fit with cadastral pattern – avoids settlements at Whakahoro and Kuku.
- However, bisects open and productive plains landscape.
- **Recommended score '2'**

Relativity comparison

3.12 Similar to S1 in most respects. Slightly better fit with landscape 'grain'. However, should not be scored '1' because it does not have as good a fit as S8.

S3

Existing landscape

3.13 S3 crosses the same landscapes as S1 and S2 above (i.e. 5g, 4b). (Descriptions above).

'Fit with landscape' (potential landscape and visual effects)

3.14 Moderate fit with the landscape

- The corridor is mostly flat – although rolling topography around the base of Pukehou and some gullies southwest of Manakau.
- Open landscape – effects on relatively few dwellings - although potentially bisects community at Whakahoro Road and cluster of dwellings at kuku Beach Road.
- Reasonably good fit with cadastral pattern – follows railway corridor for part of area.
- However, cuts diagonally across productive plains landscape north of Waikawa Beach Road.
- **Recommended score '3'**

Relativity comparison

3.15 Similar to but slightly worse than S2 because cuts across landscape grain to a greater extent, and potential severs community at Whakahoro Road and Kuku Beach Road.

Eastern Options

Baseline Assessment

3.16 The following tables are copied from the 2011 baseline assessment are a general description of the existing landscapes traversed by the eastern route options south of Ohau.

3h: Terraces east of SH1	
	<p>Description</p> <p>Rolling to flat terraces above the Ohau River. Land use includes a mix of dairy farming, cropping and lifestyle properties. There are several stands of remnant lowland tōtara forest.</p> <p>Two rural roads (Kimberley Road and part of Arapaepae Road) have been upgraded over the years as SH57, which serves Palmerston North and Hawkes Bay from the south.</p>
mod	<p>Landscape Quality</p> <p>The area has a pleasant rural character enhanced by the close backdrop of the Tararua Ranges, and more particularly in the southern part of the landscape unit where the landscape is enhanced by the river terraces and remnant stands of tōtara bush. There is a picturesque vineyard subdivision south of Ohau, and an historic church in a rural setting approximately 1km east of Ohau.</p>
mod	<p>Absorption Capability</p> <p>The subdued topography and modified land cover could accommodate a road with relatively low effects on natural values, so long as remnant bush stands were avoided.</p> <p>There would be visual amenity effects in terms of rural houses which are clustered along rural roads. Elsewhere visual amenity effects would be less significant, and would be reduced by the numbers of trees in parts of this landscape unit.</p>
	<p>Localised Features</p> <p>Localised features include the following:</p> <ul style="list-style-type: none"> • The church of Saint John the Baptist 1km east of Ohau. The church was built in 1901, one of a series of picturesque rural churches between Wellington and Wanganui designed by architect Frederick de Jersey Clere. • The remnant tōtara forest stands south-east of Ohau.

4i: Terraces south-east of Manakau	
	<p>Description</p> <p>A relatively small and discrete area comprising terraces and foothill toe-slopes, contained by spurs of the Tararua foothills. The underlying land use is pastoral farming, but the area has been recently subdivided for lifestyle properties.</p>
mod	<p>Landscape Quality</p> <p>The area has an intimate scale, nested against the backdrop hills. It has a pleasant and quiet rural character, although the character is changing to a relatively closely settled lifestyle landscape.</p>
mod-low	<p>Absorption Capability</p> <p>The small scale of the landscape unit and the prevalence of lifestyle properties (some of which are elevated with views over the area) mean there would likely be significant visual amenity effects.</p> <p>Large scale earthworks would also likely be required to accommodate a road through the spur between Manakau and the backdrop hills.</p>

4g: Plains north-east of Manakau	
	<p>Description</p> <p>Plains between the Ohau River and Waikawa Streams, with backdrop Tararua Range foothills to the east. Land use is characterised by cropping and dairy farming. A prominent quarry is located at the north end of foothills above the Ohau River.</p>
mod-low	<p>Landscape Quality</p> <p>The plains themselves are undistinguished, but have a rural character that is enhanced by the close backdrop foothills (including the small distinctive knoll 'Ebey'). The only noteworthy natural features on the plains are the Ohau River and Waikawa Stream, the margins of both of which are modified.</p>
mod-high	<p>Absorption Capability</p> <p>The flat topography, modified land cover and modified stream margins could readily accommodate a road in</p>

	<p>relative terms. Any road would need to cross the Ohau River and Waikawa Streams which would likely result in some impact on the natural character of these waterways, although each waterway has been modified through adjacent land use and removal of the indigenous forest cover.</p> <p>The open landscape increases the area from which the road might be visible, but the flatness of the topography also lends itself to mitigation by tree planting.</p> <p>There are potential visual amenity effects from rural houses, but settlement density is relatively low.</p>
	<p>Specific Features The Ohau River and Waikawa Stream are linear features crossing the landscape unit as discussed above.</p>

4k: Valley	
	<p>Description A relatively narrow valley between the escarpment of the Tararua Ranges and an outlier range of hills. The valley follows the northern Ohariu Fault. Rural character with pastoral farming, small plantations, and some lifestyle properties. A double transmission line follows the valley. The north end of the hills and valley is truncated by the Ohau River and its river terraces, and including an extensive bush area at Kimberley Reserve.</p>
mod	<p>Landscape Quality The valley generally has a pleasant rural character without being particularly noteworthy. The transmission line detracts from visual amenity. The exception is the area at the north end in the vicinity of Kimbolton Reserve which has high levels of amenity and recreational use.</p>
mod	<p>Absorption Capability For the most part the topography is relatively gentle and could accommodate earthworks for a road. Similarly the pastoral land use, and existing transmission line increase the ability to accommodate a road. The valley has low visibility from the wider landscape, although there are pockets of residences that would likely be affected. There would likely be significant effects, however at Kimberley Reserve / Ohau River and Waikawa Stream discussed below.</p>
	<p>Specific Features There are two locations where effects would be more significant.</p> <ul style="list-style-type: none"> • Kimberley Reserve and the Ohau River. The area has relatively high natural values, and the Ohau River has high natural character at this location. (There is an area adjacent to the transmission lines immediately west of Kimberley Reserve that has a higher absorption capability). • The Waikawa Stream and North Manakau Road traverse the middle section of the valley. The stream is incised at this location so that there is a relatively constrained saddle. Manakau Road is a picturesque rural road following Waikawa Stream and providing access to the Tararua Ranges.

S4

Existing landscape

- 3.17 S4 is an east-west link on the north bank of the Ohau River. It crosses landscape 3h. Description above.

'Fit with landscape' (potential landscape and visual effects)

- 3.18 By itself, the S4 link has a moderate fit with the landscape:
- Cuts across the plains landscape – however following the Ohau River valley helps anchor it in the landscape
 - Cuts diagonally across the landscape grain in the vicinity of Muhunoa East Road, affecting a number of rural and lifestyle dwellings. Also cuts across undeveloped part of vineyard lifestyle subdivision.
 - Corridor encroaches on stands of tōtara bush – however it is assumed the alignment can be fine-tuned to avoid direct impacts.

- By itself, the recommended score for the S4 link is '3'. However, S4 needs to be considered in conjunction with option S3. The recommended overall score for S3 and S4 = '4'

Relativity comparison

- 3.19 This option needs to be considered in conjunction with S3. Together the option has relatively poor fit with the landscape because it criss-crosses the plains from east to west and back east again. To put it another way, if an option to the east of Levin is preferred, it is preferable in landscape/visual terms to also keep to the eastern side of the plains to avoid such criss-crossing (and the associated adverse landscape and visual effects) in favour of a closer 'fit' following the edges of the natural and human landscape patterns.

S5

Existing Landscape

- 3.20 S5 crosses 5g, 4b, 4g and 3h. Descriptions from baseline study above.

'Fit with landscape' (potential landscape and visual effects)

- 3.21 Moderately poor fit with landscape
- While it traces toe of hills north of Waikawa Stream – the option criss-crosses plains in the vicinity of Manakau, cutting diagonally across the landscape 'grain' (i.e. property and local road pattern).
 - Impacts on clusters of properties west of Manakau, and at North Manakau Road and north of Ohau River (Muhunoa East, McLeavy and Arapaepae Roads).
 - **Recommended score '4'**

Relativity comparison

- 3.22 Somewhat similar to, but slightly worse than, S6. It does not follow the topography as well: rather it criss-crosses and bisects the plains in the vicinity of Manakau. While it avoids the sensitive Manakau Heights area, this is off-set by impacts on houses west of and to the north of Manakau.

S6

Existing Landscape

- 3.23 S6 crosses landscapes 5g, 4i, 4g, 3h. Descriptions above. Note that there has been additional lifestyle development in the Manakau Heights area since the baseline assessment was undertaken.

'Fit with landscape' (potential landscape and visual effects)

- 3.24 Reasonably good fit with landscape
- Follows around toe of Pukehou, and traces toe of hills along inland side of plains.
 - Generally reasonably good fit with cadastral pattern, skirts edge of productive plains.

- Crosses Ohau River near quarry.
- Passes 'behind' Manakau township.
- However, bisects valley at Manakau Heights.
- Impacts on lifestyle properties at Manakau Heights, and clusters of dwellings at North Manakau Road and north of Ohau River (Muhunoa East, McLeavy and Arapaepae Roads).
- **Recommended score '3'**
- **Workshop score '2'** on the basis that the option S6 has a good fit with landscape patterns, and to achieve relativity with option 7. Compared to option 7, Option S6 would require less earthworks and modification to the natural landscape, and would be located in a more modified landscape.

Relativity comparison

- 3.25 S6 is the preferable of the western plain options because it follows the natural topography, skirts the edge of the plains, and passes 'behind' Manakau. It has a reasonably good fit with landscape 'grain' (property and local road network), and avoids the need to criss-cross the existing SH1 and NIMT. It is better than S5 because the latter criss-crosses the plains and has a worse fit with the landscape grain – acknowledging that S5 avoids impacts the Manakau Heights lifestyle area.
- 3.26 A score of '1' or '2' would have been recommended for S6 except for impacts on the Manakau Heights lifestyle area – hence the recommended score of '3'.

S7

Existing landscape

- 3.27 S7 crosses landscapes 5g, part of 4i, 4k and 3h (descriptions above).

'Fit with landscape' (potential landscape and visual effects)

- 3.28 The route has a moderate good fit with the landscape:
- The route traces the toe of Pukehou, and follows the line of the valley to the east – however it requires a dog-leg section of alignment along the valley of the Waiauti Stream (Manakau South Road).
 - Relatively steep and constrained saddle between South Manakau Road and North Manakau Road, and several incised gullies, which would require substantial landform modification.
 - Low visibility.
 - Relatively small number of dwellings affected (would skirt south side of Manakau Heights area) – however highway would be the dominant feature in what is currently a quiet and picturesque valley.
 - Likely to pass close to Waikawa Stream reserve and picnic area (potential direct impacts that could be avoided by alignment).
 - Potential adverse effects on Kimberley Bush – could be avoided by aligning crossing of Ohau River adjacent to transmission line.
 - **Recommended score '3'**

Relativity comparison

- 3.29 This option is quite different from the others. It scores moderately well because its effects would be largely confined to a discrete narrow valley away from the more closely settled plains landscape. However, these advantages are offset by the dog-leg needed to negotiate the Waiauti Stream valley, the landform modification required because of the steeper topography, the effects on the small communities within the valley, and the greater natural character of the valley.

S7A

This option was added and considered following the workshop at the request of the NZ Transport Agency.

Existing landscape

- 3.30 S7A crosses landscapes 5g, part of 4i, 4k 4g and 3h (descriptions above).

'Fit with landscape' (potential landscape and visual effects)

- 3.31 The route has a poor to moderate fit with the landscape, somewhat poorer than 7:
- The route traces the toe of Pukehou, and follows the line of the valley to the east – however it requires a dog-leg section of alignment along the valley of the Waiauti Stream (Manakau South Road).
 - Relatively steep and constrained saddle between South Manakau Road and North Manakau Road, and several incised gullies, which would require substantial landform modification.
 - The route then diverges from S7 to return to the coastal plain along the valley of Waikawa Stream. It then follows the toe of the foothills around the edge of the coastal plain in an alignment similar to that of s6.
 - Overall the criss-crossing from plain to western valley and back again detracts from fit with landscape.
 - Reasonably low visibility and prominence from wider landscape (although dominant within western valley).
 - Reasonably small number of dwellings affected (would skirt south side of Manakau Heights area) – however highway may bisect cluster of lifestyle properties on Manakau North Road (depending on alignment), and highway would be the dominant feature in what are currently quiet and picturesque valleys.
 - Likely to pass close to Waikawa Stream reserve and picnic area.
 - **Recommended score '4'**

Relativity comparison

- 3.32 This score for this option benefits from the route being partly confined to a discrete narrow valley away from the more closely settled plains landscape, and to the edge of the plains east of Kuku. However, these advantages are offset by the dog-legs needed to negotiate both the Waiauti and Kuku Stream valleys, the landform modification required because of the steeper

topography, and the effects on the small communities within the valley. It is worse than option 7 because of the worse fit with landscape pattern (because of the two doglegs and spreading of effects to both the valley and plains) and the greater number of properties in the vicinity of North Manakau Road and Martins Road.

Differences between recommended and workshop scores

- 3.33 The range of factors in landscape and visual matters combined with the degree of subjectivity involved means it is likely that different people will arrive at different scores: reasonable people might reasonably disagree. Notwithstanding, the workshops adopted our recommended scores in all but five instances. The revised scores by the workshop participants are credible because of the reasons given in each case. Nevertheless, we stand by our initial recommendations in three of the five instances for the reasons given below. In the remaining two instances the new information on landscape values presented is sufficient to lead us to revise our scores:

	<i>Recommended score</i>	<i>Workshop score</i>	<i>Reasons</i>
N3	5	4	<p>The workshop score was revised downwards in order to distinguish this option from those in close proximity to Lake Papaitonga (ONF) although it was acknowledged that the route would cause severance between Levin and Lake Horowhenua and have significant impact on existing recreation facilities.</p> <p><u>We continue to recommend a score of '5'</u> for the reasons set out in paragraph 2.14. The effects for a route between Levin and Lake Horowhenua are considered to be of similar magnitude to routes near Lake Papaitonga albeit for different reasons, and that equivalent scores are warranted. However, we reconfirm that this option might become a '4' with extensive mitigation as described in paragraph 2.14.</p>
N4	1	2	<p>The workshop score was increased on the basis that, while the option has a good fit with landscape patterns, there is risk to the bush remnant and Prouse homestead that may not be able to be mitigated and could cause some severance and effects on homestead setting.</p> <p><u>We revise our recommended score from '1' to '2'</u> because of the new information on the significance of the Prouse homestead and curtilage. However, as noted, there may be potential for the alignment to avoid the homestead area.</p>
N5	3	2	<p>The workshop score was reduced from '3' to '2' on the</p>

	<i>Recommended score</i>	<i>Workshop score</i>	<i>Reasons</i>
			<p>basis of relativity with N4: while not as good a fit with landscape patterns as Option N4, it avoids the valued features of Prouse homestead and adjacent bush. The workshop considered the options to be equivalent on balance.</p> <p><u>We continue to recommend a score of '3'</u> for reasons set out in paragraph 2.28, and because we consider N4 remains better than N5 – a difference in relativity therefore being warranted.</p>
S8	1	2	<p>The workshop score was increased from '1' to '2' on the basis that, while option S8 has a relatively good fit with landscape patterns, there would be some impacts on more sensitive dune landforms (compared to S1) and because of shared and recognised cultural connections for mana whenua (this option was scored a 5 by both iwi groups for these reasons).</p> <p><u>We revise our recommended score from '1' to '2'</u> because of new information about the significance of the dune area to Mana Whenua – although it is understood these partly relate to the consequences of continuing this option further to the north and this section of remains relatively good in landscape terms for reasons set out in paragraph 3.6.</p>
S6	3	2	<p>The workshop score of '2' was reduced from '3' on the basis that option S6 has a good fit with landscape patterns, and relativity with option 7: Compared to option 7, Option S6 would require less earthworks and modification to the natural landscape, and would be located in a more modified landscape.</p> <p><u>We continue to recommend a score of '3'</u> because of effects in Manakau Heights area. S6 and S7 are unlike options. The main disadvantage for S6 is the number of properties and fine grain landscape at Manakau Heights. The main disadvantage for S7 is effects on natural features (acknowledging some affected rural properties). If the options were to be differentiated in score, we would be more likely to recommend increasing the score for S7 from '3' to '4'.</p>

APPENDIX ONE: URBAN AND LANDSCAPE DESIGN PRINCIPLES

Overall Principles:

The following over-arching urban and landscape design principles should be followed in the route selection and alignment phases:

1. The **first priority** should be to **avoid** adverse effects and seek opportunities for **positive** effects. Such goals are best achieved during route selection and alignment phases. Remediation and mitigation should be a second order priority carried out later in the design process. The urban designer and landscape architect should play an integral role in the iterative route selection and alignment phases, and subsequent development of the highway design.
2. Urban and landscape design measures should be **integrated with the other disciplines** (including civil and structural engineering, stormwater and ecology) to achieve a cohesive integrated design.
3. An urban and landscape design **philosophy and concept** should be developed for the whole project. It should form the foundation for the 'Urban and Landscape Design Framework' to be developed at subsequent SAR and NoR phases.
4. Urban and landscape design measures should ideally be carried out in **collaboration with the communities** along the route.
5. The urban and landscape design measures should be **consistent with the other RoNS projects on the coastal plain** (i.e. MacKays to Peka Peka, Peka Peka to Otaki). In general the adopted approach comprises split carriageways with a 9m median and a wire rope barrier. The medians are to be used for stormwater treatment where appropriate.
6. Design for the Otaki to North of Levin RoNS should likewise be consistent with the following **NZTA documents**:

<i>NZTA Documents</i>	<i>Description</i>
Urban Design Policy	High level policy which includes the following: <ul style="list-style-type: none"> • Urban design is more than aesthetics: It concerns the structure and form of urban and rural landscapes including circulation, activities and form; • Urban design is to be a central component of NZTA projects; and • Urban design is to be integral to the design process from project conception through to detail design.
Bridging the Gaps	Design principles relating to urban design aspects
Landscape Guidelines (Final Draft)	Design principles and standards relating to landscape design.

Specific Principles and Guidelines

Integration with Rural Landscape

Most of the Ōtaki to north of Levin RoNS will traverse a rural landscape. It also the most rural in character of the Wellington RoNS. The design should therefore **integrate the road into the rural landscape** by adopting the following principles:

- Minimise impacts on **productive rural activities**. For instance fine tune the alignment to follow property boundaries, or boundaries between different land use types. (For instance the alignment might skirt the toe of hills between cropping land and grazing land). Maintain sensible sizes and geometry for parcels of productive land. (For example cropping fields require sensible proportions for machine working).

- Minimise disruption to the existing **rural road network**. Avoid severance of roads and creation of cul-de-sacs where possible. This includes maintaining the connectedness of the existing SH1 as an arterial route connecting Manakau, Ohau and Levin and the sequence of marae settlements along that road.
- Avoid severance of **community facilities** from their community. For instance avoid severing local halls, marae, churches or schools from the immediate area served by such facilities. Such features are identified in the Baseline Assessment.
- Avoid particular natural **landscape features**, such as distinctive local landforms, human features such as urupā, community and heritage buildings (for instance the Prouse homestead), and areas of significant vegetation. For instance there are distinctive tōtara/kahikatea stands south of Levin and distinctive dune landforms north of Levin. The more significant features have been mapped in the Baseline Assessment and taken into account in the identification of route options. These should continue to be avoided during selection and refinement of a preferred route and alignment.
- Design the landscape measures so that they are in **scale** with the broad landscape. While detail measures will be needed to address specific effects (such as views from a dwelling), they should be part of a larger canvas. Carry out planting in bold patterns with a small number of visually dominant species to reflect natural patterns. (Avoid the ‘fruit salad’ appearance that can arise when there is not a dominant species).
- Reinforce the existing **patterns** of the underlying landscape. For instance reinforce natural patterns such as stream courses and escarpments, and reinforce human patterns such as the road network and pattern of fields and shelter belts.
- Use **plant associations characteristic of the area**. For instance the tōtara and kahikatea association characteristic of terraces near Ohau, and the flax, cabbage tree, kahikatea association characteristic of wetlands.
- Extend **adjacent land use and vegetation** as close to the highway shoulder as possible consistent with road safety and practical land management of the highway margins.
- **Contour earthworks** to tie in with adjacent topography. Adopt mono-slope batters in preference to benching (the Ōtaki to north of Levin RoNS is through relatively subdued topography so that it should be possible to avoid the need for benched batters).
- Incorporate **low impact storm-water devices** such as swales and wetlands. Such devices are in keeping with the natural history of the area and are likely to have ecological and visual benefits as well as storm-water functions.
- Use **eco-sourced** stock of species naturally occurring in the area.
- Follow **safety standards**, such as use of frangible species and clear zones. It may be preferable in some instances to trade off the introduction of crash barrier so that planting can be safely carried out closer to the carriageway.
- Refer to the ‘Landscape Design’ Guidance Notes in the NZTA Urban Design Principles, and the ‘Guidelines for Highway Landscaping’.

Natural Character of Rivers, Streams and their Margins

Natural Character includes both biophysical and visual design considerations. The Ōtaki to north of Levin RoNS alternative corridors have already been selected in part to avoid Lakes Horowhenua and Papaitonga, and the Hōkio and Waiwiri Streams connecting those lakes with the coast. However the project must unavoidably cross the Ohau River, Waikawa Stream, Manakau Stream and a number of smaller streams and watercourses. The corridor options also pass close to several wetlands. The design should seek to **minimise effects on both the biophysical and visual aspects of natural character** at streams and wetlands. General principles include:

- Cross rivers and streams at **right angles**.
- **Bridge** significant streams in preference to culverts. Where culverts are used they should be designed to be ‘fish friendly’, for instance by allowing a naturalistic stream bed to form within the culverts.

- Adopt **twin bridges** for the dual carriageways, to allow light between spans to the stream.
- Design bridges so that informal **pedestrian access** is maintained along rivers and streams.
- Re-instate or restore **riparian vegetation** upstream and downstream of crossings. Such vegetation can off-set any biophysical effects of the bridge or culvert on the stream, visually reinforce the natural landscape patterns, and soften the appearance of embankments and culverts.
- Avoid any **wetlands**.

Connections with Levin and other Settlements

Connectedness includes both **configuration** and **legibility**. The Ōtaki to north of Levin RoNS should promote connections between the highway and adjacent settlements, make the connections legible, and maintain the integrity of the existing road and settlement network.

- Design access points to the existing SH1 north and south of Levin to enable travellers to pass through the town without the need to backtrack to re-join the highway. As discussed above, maintain the connectedness of existing SH1 as the main arterial route linking Levin and other settlements within its hinterland.
- Design the principal access point to Levin so that it connects logically to existing arterial street network.
- Create a visually distinct identity for each interchange. This may be achieved by borrowing from the surrounding landscape, ensuring that the landscape character continues unbroken to the interchange. Alternatively it may be created through art or design within the interchange (for example patterning of bridge barriers, retaining walls, or bold landscape design). The latter approach is most likely to be appropriate at the principal Levin Interchange.
- Any artwork should be commissioned in collaboration with the community.

Bridges and Underpasses

- Maintain local roads on their existing alignment where feasible, and preferably at their existing grade.
- Integrate pedestrian and cycle paths with existing roads
- Adopt twin bridges for highway overpasses to maintain light to the underpass.
- Use splayed and sloping bridge abutments to maximise the openness of underpasses.
- Use a consistent design theme for bridges in the Ōtaki to north of Levin RoNS. Maintain simple, clean lines given the rural setting for most of the area traversed.
- Introduce shadow lines to bridge parapets to reinforce horizontal lines. Otherwise avoid fussy designs.
- Maintain views from bridges over roads and streams by adopting concrete and pipe barriers. Use different barriers at bridges compared to the rest of the route, to highlight the different conditions created by bridges.
- If separate pedestrian and cycle underpasses are necessary to maintain good connectivity, configure such underpasses so that they are straight, have straight approaches with good sightlines, have good surveillance, are inviting (sufficient width and height) are bright and well lit, and well drained.
- Refer to the 'Road Bridges' and 'Underpasses' Guidance Notes in 'Bridging the Gaps'.

Highway Furniture

Reduce the visual clutter from the highway furniture (e.g. barriers, lights, signs and gantries). Such fittings should be:

- Designed as a suite with a common design language: Use consistent materials, colours, jointing types and sections etc ;
- Simplify the variety within each type of element: For instance limit the types of safety barrier, types of sign poles, types of noise wall etc.

- Use recessive colours (unless consciously used to enhance legibility);
- Use detailing that is visually refined and ‘clean’. Avoid unnecessary ornamentation;
- Avoid short lengths of barriers (i.e. avoid stop-start barriers). Techniques to avoid barriers include locating structures further from the carriageway.
- Pay particular attention to the aesthetics of transition between barrier types.
- Create a sharp edge between the shoulder and adjacent vegetation, avoiding the ‘in-between’ strip and reducing the need for herbicide maintenance.

Views

Minimise effects on views from private properties (particularly from dwellings) and public viewpoints.

- Refine the alignment to **maximise separation** from dwellings, or to **pass ‘behind’** the main outlook from nearby dwellings.
- **Soften views** and integrate the highway into the landscape by planting. As discussed above, such planting should be rural in character and scale. It is not necessary to screen the road to mitigate effects. Groups of trees in the intervening landscape can soften the view and increase the perspective depth (i.e. inserting middle-ground vegetation can increase perception that the road is part of the background).

Noise Walls

Align the highway and/or use low noise surfacing to **avoid the need for noise walls** as a first preference (maximise separation from dwellings, see above).

Where noise walls are unavoidable, refer to the ‘**Noise Wall**’ Guidance Notes in the NZTA Urban Design Principles. The following points are made in summary:

- Use **consistent materials and design** for any noise walls required, to reduce visual clutter.
- Use **appropriate materials for the context**. For instance timber panel walls with a recessive treatment may be most appropriate in the rural sections of the Ōtaki to north of Levin RoNS, while more industrial materials and bolder design may be appropriate in the vicinity of Levin.
- Align the top of the wall to **follow the road’s vertical alignment**.
- Where possible use **contoured earth mounds** to replace noise walls, or to reduce their height.

Plant both sides of any walls to visual soften their appearance and avoid graffiti. An exception may be appropriate where a decision is made to incorporate artwork into the wall.

APPENDIX TWO: LANDSCAPE UNITS PLAN

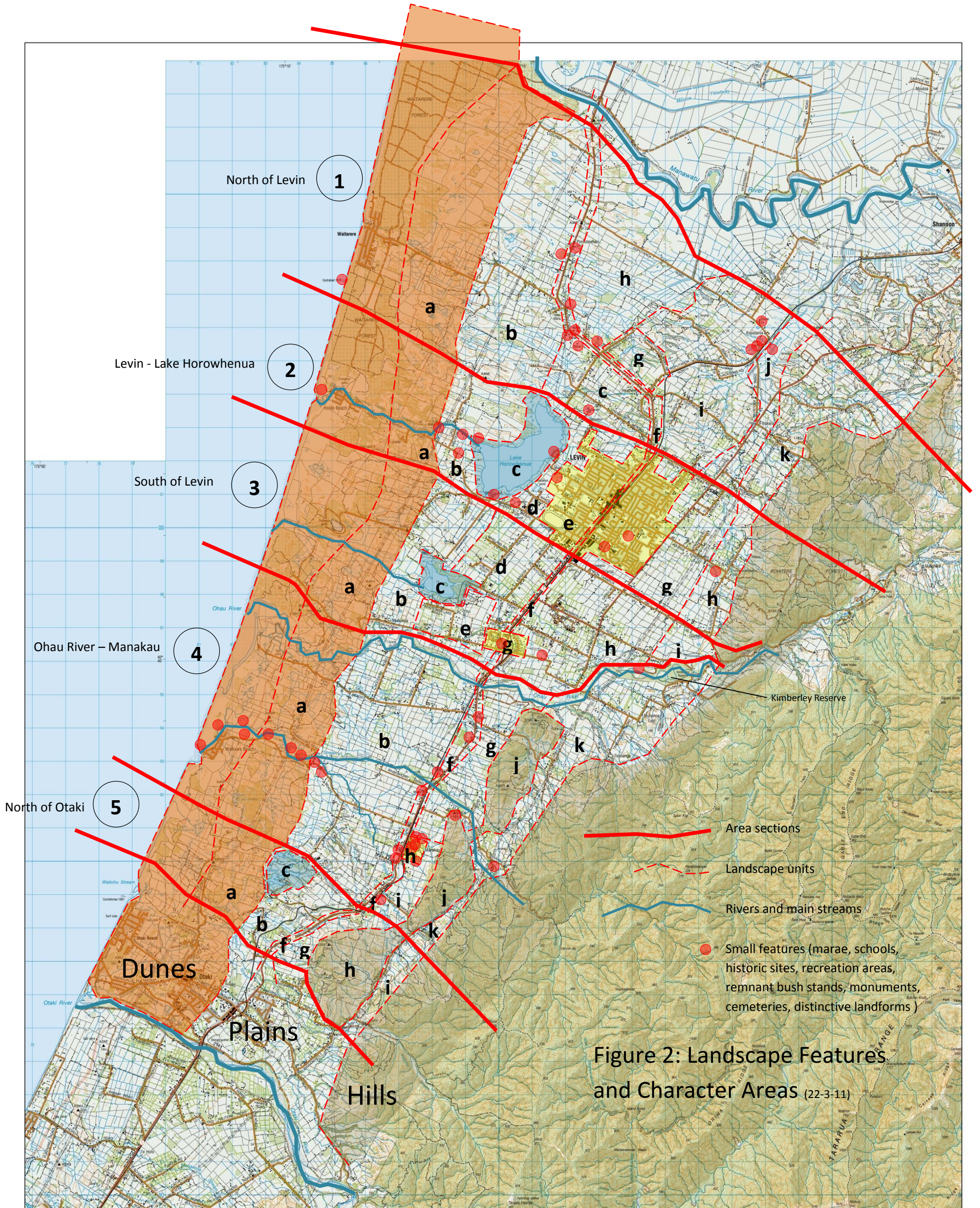


Figure 2: Landscape Features and Character Areas (22-3-11)

Appendix E Ecology Workshop Background Notes, with Addendum

|

7 September 2017
By E-mail

Allan Planning & Research Ltd
26 Patrick Street
Petone (5012)



Forbes Ecology
Dr. Adam Forbes
PO Box 8740
Havelock North (4157)
Hastings
New Zealand

Attn: Sylvia Allan

Dear Sylvia,

Re: Taylors Road to Levin North Connection, Scoring of Ecological Constraints by Route Option

1. Introduction

This short report sets out the draft scores assigned to the route options updated on 16 August 2017 and the information drawn upon in assigning the constraint scores based on the anticipated ecological effects. The notes were prepared as background for the community MCA workshop, 29th August 2017.

2. Method

An ecological constraints map (Fig. 1) and supporting information covering the study area was prepared by Forbes Ecology (FE; Forbes, 2017)). This information provided the principal mechanism for proposing scores using the 1 to 5 scoring system. The ecological constraints map depicts habitat extents and species locations of either national or regional significance. A full description of the method used to identify and evaluate ecological significance of features within the study area is presented in Forbes (2017).

The scoring system used is the same as applied by the workshop process, acknowledging that the focus of the scoring was on adverse effects rather than the potential for benefits.

Typically, the criteria were applied with specific consideration of the following aspects:

- The degree that mapped areas of ecological significance, represented as polygons or points, are encroached upon by each of the options,
- The level of ecological significance of a given ecological constraint,
- The degree that the affected areas can be avoided, taking account of the scope afforded by the 300 metre wide route, the configuration of the affected areas, and highway design constraints.

The location and level of ecological significance of ecological constraints was determined by Forbes (2017) using the following information sources:

- Foxton Ecological District Survey Report for the Protected Natural Areas Programme (Ravine 1992),
- Manawatu Plains Ecological District Survey Report for the Protected Natural Areas Programme (Ravine 1995),
- Manawatu-Wanganui One Plan (Schedule B: Surface water values & Schedule F: Terrestrial ecosystems),
- Kapiti Coast District Council District Plan,

- New Zealand Plant Conservation Network species lists¹,
- DoC herpetological database records,
- E-bird²,
- The following GIS layers³:
 - New Zealand Land Cover Database (Version 4),
 - Protected Areas Network map (DoC, QEII National Trust, Nature Heritage Fund Covenants, Local Council Reserves via the Reserves Act, and Nga Whenua Rahui covenants),
 - Contemporary Wetland Extent map (Wetlands of National Importance (WONI)),
 - Landcover Database,
 - NZMS 260 Topomaps,
 - Regional Council survey data,
 - QEII National Trust data,
 - WERI (DoC) database.

In addition to the above information sources, the constraints map was updated with information gathered during the public consultation field visit and meeting held on the 22nd of August 2017.

3. Scoring

Following are the recommended scoring and supporting rationale underpinning the scoring of each of the route options. This should be read in conjunction with Figure 1.

3.1 Southern Route Options

S1

S1 was assigned a score of 1. Although a remnant area of forest protected by a QEII covenant is affected it encroaches only slightly into the route on the eastern side by the junction with the S2 route option.

S2

S2 was assigned a score of 2 as the same area protected by a QEII covenant encroaches across approximately half of the route just beyond the junction with S1. We have assumed the highway could bypass this protected forest beyond its eastern flank. This represents the only area of potential difficulty along the route.

S3

S3 was assigned a score of 3 as three areas of regional significance encroach into the route towards Ohau. These are a QEII covenanted area known as Whitemans Bush, a small area of broadleaved forest/treeland of regional significance and an area of tawa-totara forest known as Poutama Bush. We have assumed that the highway could bypass the QEII covenanted area and broadleaved forest/treeland without too much difficulty. However the northern most area of tawa-totara forest, Poutama Bush poses the greatest degree of difficulty owing to its lineal shape and potential degree of encroachment.

¹ Available from: http://www.nzpcn.org.nz/factsheet_index.aspx

² Available from: <http://ebird.org/ebird/places>

³ All available from: <http://ourenvironment.scinfo.org.nz/ourenvironment>

S4

S4 was assigned a score of 5 as a number of areas of ecological significance are encroached upon by the route to the east and south of Ohau. One of the affected sites is Bishops Bush, a 3 hectare forest of mature totara, matai, titoki, mahoe and kawakawa of regional significance. In particular, the close proximity of other regionally significant areas of forest in the vicinity of Bishops Bush poses an extreme difficulty to the route as avoidance of some of the forest remnants would not be possible.

S5

S5 was assigned a score of 4 as three areas of regional significance are encroached upon over a short distance on the western outskirts of Manakau. These include an wetland denoted 50A by DOC, that is contiguous with a QEII Covenant on the same wetland. Two small forest remnants, known by DoC as site 50B, would be affected by this option north west of Manakau. The lineal orientation of the wetland and proximity of forest remnants to each other poses an extreme level of difficulty as avoidance of the wetland and one of the forest remnants would not be possible. The northern extent of the option would encroach on McLeavey Bush.

S6

S6 was assigned a score of 2. While three areas of regional significance are encroached upon they present a minor level of difficulty and could be avoided. These are three forest remnants; listed in the KCDC District Plan notated from south to north as Pukehou Bush, Stables Bush and Knights Bush. The first two are described as kohekohe-mahoe forest and the latter kahikatea-mahoe treeland.

S7

S7 was assigned a score of 5 as seven areas of regional significance are encroached upon by this route option. These are forest remnants that occur in three general localities; south and east of Manakau and east of Ohau. From south to north these are described as Pukehou Bush, a forest remnant south of Knights Bush, an extensive area of forest that spans the route, the western extremity of Tararua Forest Park known locally as the Waikawa Stream Picnic Area and two areas of riparian forest associated with the Ohau River main stem and tributary in the vicinity of Muhunua East Road.

Avoiding the extensive area of forest south of Waikawa Stream Picnic Area will not be possible and avoidance of the other areas of forest along the route especially near Muhunua Road East may not be possible.

S8

S8 was assigned a score of 1 as no areas of national or regional significance are affected.

3.2 Northern Route Options

N1

N1 was assigned a score of 4 as the route encroaches on a reserve managed by DOC which extends beyond the north west corner of Lake Papaitonga. The reserve encompasses the outlet stream to the lake. DOC is proposing to enhance the reserve through active management. The route also encroaches slightly on a forest remnant south of Lake Papaitonga and QEII covenanted area and a duneland near the junctions with the N2 and N7 route options.

The DOC reserve presents a high level of difficulty as it spans the entire width of the route.

N2

N2 was assigned a score of 5+ (fatal flaw) as it crosses the eastern margins of the Lake Papaitonga wetland complex featuring three forested gullies. The complex has been identified as nationally significant as it is a large naturally occurring wetland and a good example of a nationally under represented ecosystem. Bittern (Nationally Critical; Robertson et al. 2017) and the indigenous landsnail *Powelliphanta traversi*, species each with a conservation status are recorded in the area. There is a high probability of other nationally threatened species occurring in this area also.

Lake Papaitonga poses a potential fatal flaw to the route. Avoiding the gullies is not possible.

N3

N3 was proposed with a score of 3 as the route encroaches on three apparently unnamed forest remnants located towards the northern end of the route, which present a reasonable level of difficulty owing to their relative proximities of the remnants.

At the southern end the route encroaches slightly on Tarrant Bush, a totara treeland, and at the northern end (east of Te Whanga Road) a wetland associated with native forest would be affected.

N4

N4 was assigned a score of 4 as the route passes near Arapaepae Bush and an adjacent forest remnant. Arapaepae Bush is nationally significant owing to the presence of *Powelliphanta traversi*, a threatened and protected indigenous land snail. The bush also provides habitat for high numbers of skinks and has high invertebrate values. The forest remnants pose a key area of difficulty for the route. The fauna values of the directly adjacent (to the east) is unknown but is of regional significance regarding forest ecosystem type.

N5

N5 was assigned a score of 1 as no areas of national or regional significance are affected.

N6

N6 was assigned a score of 5 as the route encroaches on two areas of stable duneland west of Lake Horowhenua that are classified as rare ecosystem types and are regionally significant. The dunelands support ephemeral wetlands.

The extent of the dunelands and their relative locations pose an extreme level of difficulty in achieving a satisfactory route alignment. Encroachment on either one of the dunelands is unavoidable.

N7

N7 was assigned a score of 3 as the route encompasses a remnant of swamp forest near the Lake Horowhenua protected by a DoC conservation covenant. Other bush remnants fall within the route option, including Te Kowhai Bush and three unnamed remnants located near Lindsay Road. In combination these constraints represent areas of reasonable difficulty.

N8

N8 was assigned a score of 1 as no areas of national or regional significance are affected by the route.

N9

N9 was assigned a score of 4 as it encroaches on an area of riparian forest bordering the Ohau River which is regionally significant and fringes the western boundary of the Kimberley Scenic Reserve which is nationally significant. The reserve abuts the area of riparian forest.

The riparian forest spans the entire route and represents a major area of difficulty to the route as it cannot be avoided.

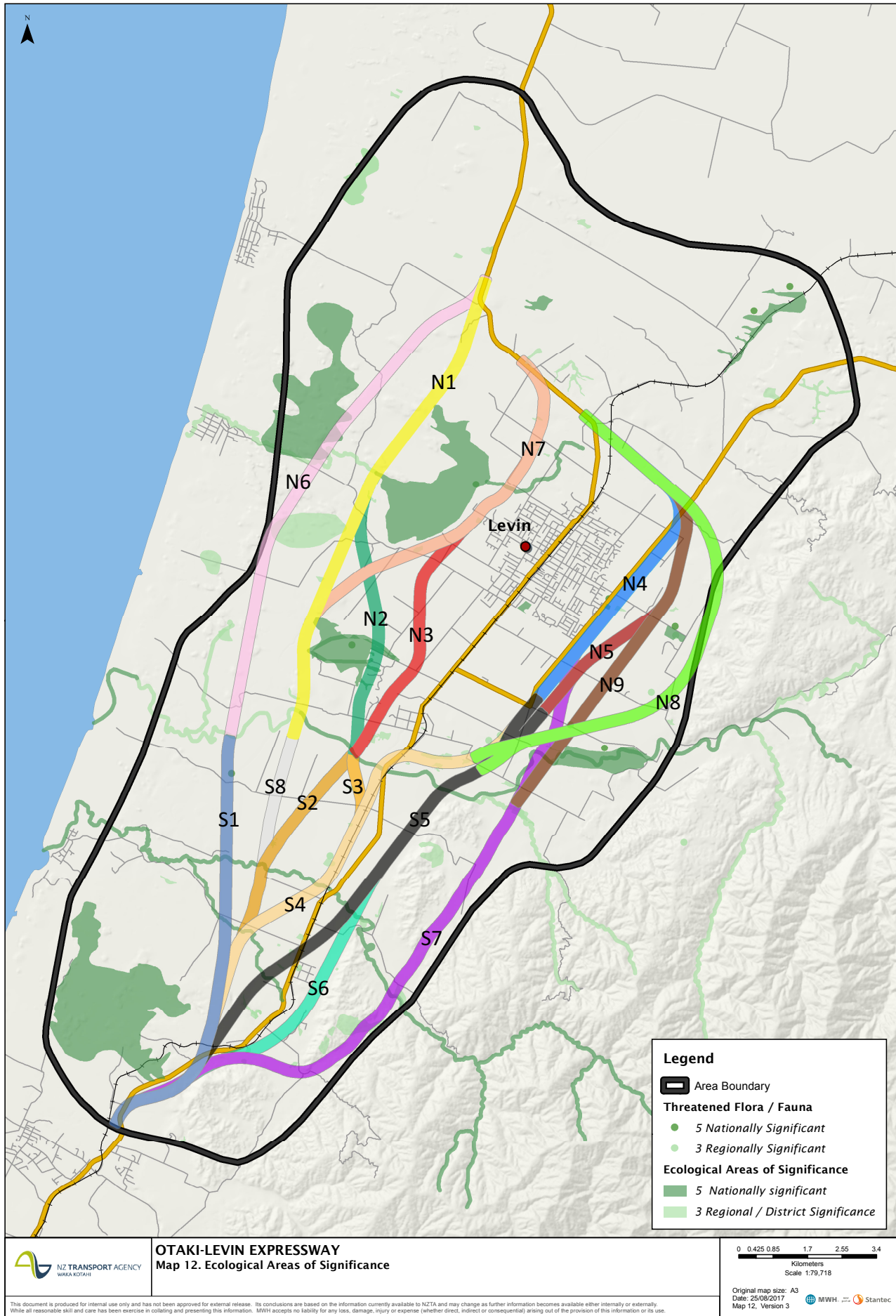


Figure 1: Route options, and nationally and regionally significant ecological constraints, identified within the study area.

4 Summary

Table 1 provides a summary of the scoring and key ecological constraints for each of the options.

Table 1: Constraint scoring and key ecological constraints by route option.

Route Option	Score	Key Areas of Difficulty
S1	1	Nil
S2	2	QEII protected bush
S3	3	Poutama Bush
S4	5	Bishops Bush and nearby forest remnants
S5	4	Forest remnants (50B forests)
S6	2	Pukehou Bush and Stables Bush
S7	5	Forested area east of Manakau and Waikawa Stream Picnic Area
S8	1	Nil
N1	4	DOC reserve at Lake Papaitonga outlet
N2	5+	Lake Papaitonga
N3	3	Lindsay A & B Bush
N4	4	Arapaepae Bush
N5	1	Nil
N6	5	Dunelands west of Lake Horowhenua
N7	3	Forest remnant protected by QEII Covenant
N8	1	Nil
N9	4	Riparian forest bordering Ohau River

Authors' Comments:

During Workshop #2 the workshop participants raised the following issues:

- Concern was raised by a local resident that the shared southern route options north of Otaki and west of Manakau could adversely affect the feeder streams to the Forest Lakes wetland complex. It was agreed that this was a construction issue that would be addressed through appropriate mitigation to ensure the hydrology and water quality of the streams and the receiving wetlands would not be adversely affected.
- An officer from the Horowhenua District Council noted that Bishops Bush on S4 is one of the highest value remnants in the District.
- Recent information supplied by LINZ shows that a reserve managed by DOC extends beyond the north west corner of Lake Papitonga and encompasses the outlet stream. The reserve extends across the entire width of the N1 route. DOC is proposing to enhance the reserve through active management.
- The workshop score of 2 for N3 was based on a misinterpretation during the workshop of the mapped route over the length where N2 overlaps with N7. The workshop score for N3 should have been a 3 to reflect the route crossing through Lindsay A & B Bush.
- A NZTA representative and the Landscape Architect believe there is sufficient room for an expressway to pass between Arapaepae Bush and the remnant immediately to the east on route N4. Phil calculated the gap between the remnants to be in the order of 100 metres. Our score of 4 was on the basis that avoidance of both bush sites could be achieved. Based on current knowledge of the potential values present in Arapaepae Bush and the adjacent remnant, if avoidance of these remnants was not achievable, a score of 5 is recommended.
- The ecologists endorse the workshop score of 4 of N7. This is on the basis that N7 would affect additional sites compared to N3, and that N3 scored 3.
- The ecologists agree with the workshop score of 5 for N9 if avoidance of the riparian forest area is not possible.
- A local resident drew attention to the presence of *Powelliphanata traversii* in McLeavey's bush on S7 and N9.

Please feel free to contact us to discuss this summary report.

Report Authors



Dr. Adam Forbes
Forbes Ecology



Simon Beale
Beale Consultants Limited

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Addendum – Notes Regarding Site Visit to Arapaepae Forests

● Adam Forbes 

20 October 2017 at 10:42 AM



Arapaepae Forest Areas, Summary of Ecology Constraints

[Details](#)

To: phil.peet@stantec.com, Cc: Greg Lee2, Lonnie Dalzell

Dear Phil,

On the 3/10/17 I undertook a site visit to the two adjacent forest areas located near the Prouse Homestead/south east of the SH57–Queen Street East Intersection. For reference, I have attached a copy of aerial imagery of each of the two forest areas showing the tracklog from my visit. I refer to the two forest areas as the ‘easternmost’ and ‘westernmost’ based on their position relative to one-another.

The purpose of the site visit was to verify the nature of the habitats present in the context of the level of constraint that the two vegetation areas present to the N4 Otaki to North of Levin (O2NL) route option. For this I use the Horizons Manawatu One Plan Schedule F framework for determining the habitat status and importance of the two forest areas. The conclusions reached below are based on information currently available to me. Data obtained through more detailed investigations could result in amendments to my current conclusions.

Westernmost forest:

Summary details:

- Roughly square shaped forest stand of approximately 1.4 ha.
- Forest canopy predominantly titoki (trunk diameters up to 69.8 cm dbh) and mahoe. One mature matai specimen (19.3 cm dbh) present near the eastern boundary; one mature rewarewa specimen present near western (road frontage) boundary. Two hinau and two titoki are present in pasture between the eastern and westernmost forests.
- Many exotic weed trees present, including flowering cherry, exotic conifers, and a Eucalyptus.
- Evidence on site of recent stock grazing (pugging, defecation, impacted understorey) and mechanical clearance of the forest vegetation (unclear whether vegetation clearance consent has been obtained for this clearance).

I also note (as previously advised) that the bush is referred to (Ravine 1995) by the Department of Conservation as Arapaepae Bush (site 77) and lists the site as:

- Dominated by tawa and mahoe. [this is interesting as only one tawa tree was seen, it is not known how much tawa has been recently cleared from the site].
- Containing *Powelliphanta traversii* snail.

The recent vegetation clearance has not reduced the forest extent, more so it has led to locally severe disturbance (to soils and vegetation) and made areas of the forest canopy discontinuous.

With regard to the One Plan Schedule F habitat status and importance, the forest area is consistent with the Hardwood/Broadleaved Forest Habitat Type. This is on the basis of tawa, titoki, rewarewa and the podocarp species, matai, being present. The forest area is greater than the minimum One Plan Threatened status size threshold of 0.25 ha. Accordingly, this Forest Type has a Classification of Threatened. Although there have been no recent snail surveys, given *Powelliphanta traversii* is noted from this forest previously, I must assume a reasonable probability of the snail still inhabiting the forest patch. This is despite the recent clearance and disturbance of the site (i.e., snails may still exist in undisturbed areas). Under the One Plan, indigenous forest containing *Powelliphanta* land snails are considered At Risk habitats, thus adding another aspect of importance to the forest habitat. Specific detailed survey by a suitably qualified and experienced Entomologist would be required to verify the status of the *Powelliphanta* population in the westernmost forest patch.

On this basis, I uphold the previous constraint ranking of Nationally Significant (Regionally Significant Forest & Nationally Threatened Species).

Easternmost forest:

Summary details:

- Roughly triangular shaped forest stand of approximately 2.4 ha.
- The indigenous component of the forest canopy is discontinuous, with intervening canopy areas filled by exotic conifers, flowering cherry, exotic palm spp, amongst other weed species.
- The indigenous component of the canopy comprises karaka, titoki (up to 51 cm dbh), red matipo, and mahoe. One matai (38.1 cm dbh) and one black maire were noted. A number of other native species are present in lower abundances.

The landowner has provided anecdotal information that 1) the site has been fenced and stock excluded for the past 20 years, 2) *Powelliphanta* snails have been observed in the past in the easternmost bush, and 3) native geckos are present.

The composition is similar to the westernmost forest, the difference being that native dominance is less in the easternmost fragment, with the native canopy component being discontinuous and interspersed with exotic canopy species. Although there have been no recent snail surveys, given *Powelliphanta traversii* are anecdotally noted from this forest previously, and from adjacent forests (westernmost and Waiopēhu Scenic Reserve to the east), I have no grounds to assume that the snail no longer inhabits the forest patch. Specific detailed survey by a suitably qualified and experienced Entomologist would be required to verify the status of the *Powelliphanta* population in the easternmost forest patch.

With regard to the One Plan Schedule F habitat status and importance, the forest area is most consistent with the Hardwood/Broadleaved Forest Habitat Type. This is based on the presence of broadleaved species such as black maire, titoki, and the podocarp species, matai. However, the native component is discontinuous and forms less than 1 ha cover in the above listed native species (based on examination of high-resolution aerial imagery). On this basis, the easternmost forest is excluded as being a Threatened Habitat by One Plan Schedule F Table F.2(a) ii. (a). However, accounts of *Powelliphanta* mean that the easternmost forest is still likely to be At Risk Habitat Classification.

On this basis, based on data and accounts currently available, the easternmost forest would present a constraint to N4 until such time as the presence of threatened fauna could be eliminated through detailed field investigations.

I also inspected the gardens/remainder of the grounds and one large diameter northern rata was of interest, however none of the features present triggered One Plan Schedule F criteria.

Please contact me if you have any questions on this email.

Kind regards,
Adam

Dr. Adam Forbes
Principal Ecologist

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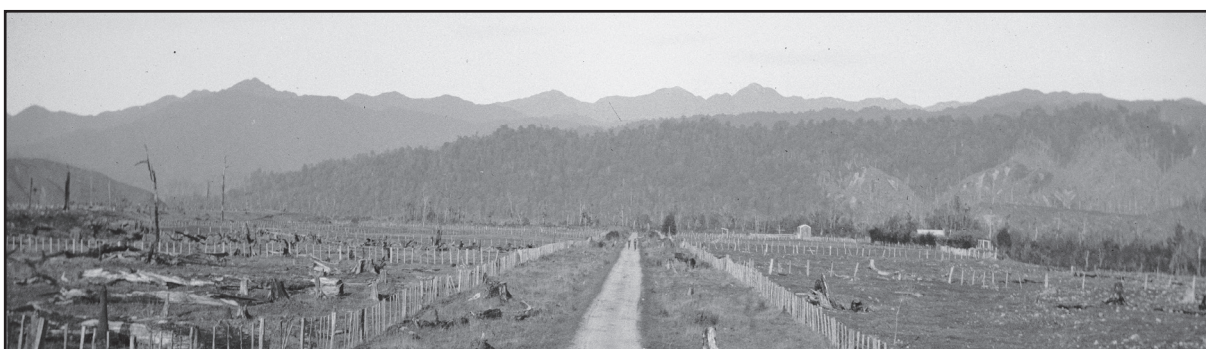
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Appendix F Heritage Workshop Background Notes



**An Analysis of the Archaeological Risks for Route Options Within
the North of Otaki to North of Levin Options Area**



Prepared by:

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Date: November 2017

QUALITY INFORMATION

Title: An Analysis of the Archaeological Risks for Route Options Within the North of Otaki to North of Levin Options Area

Reference: iSA17_3

Author(s): Daniel John Parker

Revision History:

Draft	12 August 2017	Parker
Review	September 2017	NZTA
	November 2017	Sylvia Allan
Final	9 November 2017	Parker

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INTRODUCTION

Since 2013 inSite Archaeology has been part of a team of technical experts providing research and advice to the New Zealand Transport Agency (the Transport Agency) in regards to potential route options for a new expressway between Taylor's Road and north of Levin: part of the Otaki to North of Levin Roads of National Significance project. Research into the archaeological risks associated with the various route options was undertaken in four stages related to proposed changes to the project scope between 2013 and 2016, as outlined below in the order of progression:

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

Daniel Parker (2017), *An Overview of Archaeological Risks Identified Within the Combined Routes, North of Otaki to North of Levin, Options Area*, research report prepared for the New Zealand Transport Agency

In early 2017 the Transport Agency decided to take a more active participatory approach with the wider community to help it identify and choose a route option to proceed with (Allan 2017). As part of this community engagement, the Transport Agency reviewed a wide range of possible routes over the course of a two-day Multi-Criteria Analysis (MCA) workshop that included input from the Transport Agency, technical experts, community group and iwi representatives¹. Sixteen possible route options were identified and scored: 11 developed by the Transport Agency prior to the workshop, with five more added at the request of community participants after the first day.

Route options were presented as broad corridors 300 to 600 metres in width and would require refinement involving further investigations across a range of aspects to arrive at a final design. Routes were also divided into southern and northern segments to keep the number of route options at a manageable level while also allowing various north-south connection combinations to be evaluated. All southern options begin at Taylor's Road, north of Otaki, and terminate at various positions south of Levin on an east-west spread. Northern options continue on from the southern alignments to reconnect with State Highway 1 at various positions to the north of

¹ This workshop was held on the 22nd and 29th of August 2017. Background information to the project and a field trip to key sites throughout the project area were presented on the 22nd. An introduction to the MCA process, discussion of key issues and scoring of route options took place on the 29th.

Levin (Figure 1).

The Transport Agency recognises that historic heritage, which includes archaeological sites, is a non-renewable resource that, “constitute[s] a unique and invaluable record which contributes to our understanding of the history and cultures of New Zealand” and that the “Avoidance of development impacts on, and preservation in situ of, historic heritage places are always the preferred options” (NZTA, 2015: 8). The following report describes and discusses the archaeological information that was presented at the workshops of the 22nd and 29th of August 2017 and the key reasons underlying the archaeological scoring of these route options to assist the Transport Agency in its decision making and the achievement of these objectives.

While previous MCA exercises followed a largely consistent methodology with regards to analysis and scoring, significant changes to the background archaeological data and project scope necessitated the development of a new method for scoring route options. The details of this new methodology and its underlying reasoning are presented below, followed by a brief background history of settlement and occupation in the Horowhenua region. The report concludes with an analysis of the route options presented to the workshop and discusses the scoring of each option in regards to the Transport Agency’s historic heritage objectives.

RESEARCH METHODOLOGY

Route options reviewed by inSite Archaeology during earlier MCA exercises were generally evaluated and scored on the basis of potential effects to registered Historic Places, recorded archaeological sites, known archaeological sites, and unknown archaeological sites², with an emphasis on the potential effects to specific Historic Places, recorded and known archaeological sites. Scoring for individual route options reflected a largely qualitative assessment of potential effects that was possible due to the limited number of options under review and their relatively tight geographic spread. However, the August 2017 workshop greatly expanded both the number of route options and their geographic spread. Given the changes in conditions it was not possible to continue with the previously established methodology in the time frame available (see Parker 2013: 12-16, 2015: 10-16, 2017: 5-8). Instead, a more quantitative approach using archaeological information compiled for a revision of the 2012 scoping report was undertaken (Peet et al., 2012).

2 Registered Historic Places, predominantly historic buildings but also including archaeological sites, are “significant and valued historical and cultural heritage places” recognised and listed by Heritage New Zealand. The New Zealand Archaeological Association maintains an online database of archaeological sites that includes basic site details and location information. While the Association database contains a substantial number of sites, it is not a complete record and there are many known sites that are not included. For this reason, sites listed in the Association database are referred to as being ‘recorded sites’, while sites not included in the database, but identified through other sources, are ‘known sites’. Where there is no direct evidence for archaeological sites, but their presence is strongly inferred – on the basis of patterns in the distribution of known and recorded sites – reference may be made to potential ‘unknown’ sites.

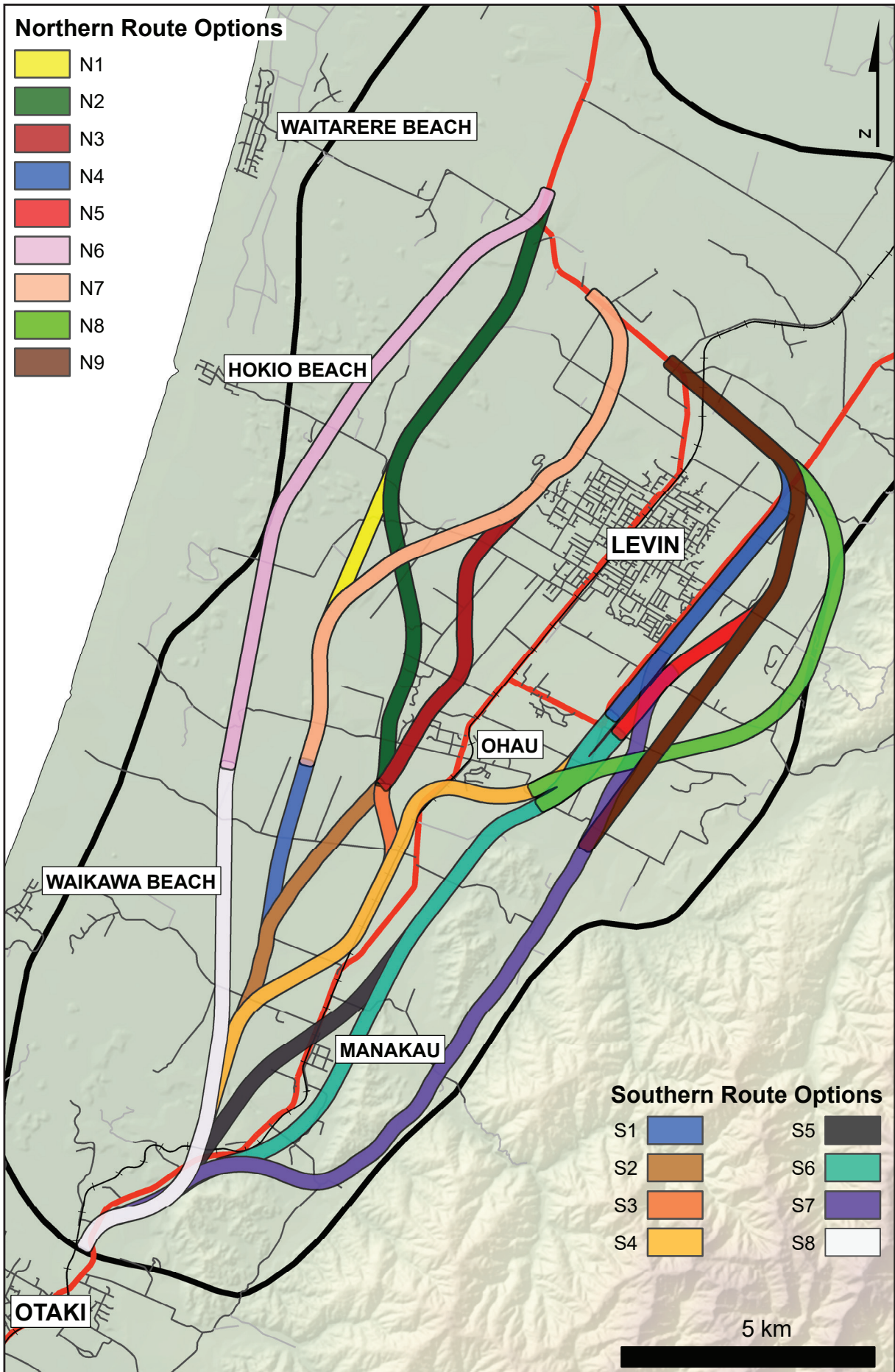


Figure 1: Route options under consideration for an expressway between Taylor’s Road and north of Levin. Existing highways shown in red.

Due to the dependent relationship of the methods of analysis and scoring on the form of the revised area scoping archaeological site data – also produced by inSite Archaeology – a brief discussion of the revised area scoping data is presented below³. This is followed by a description of the methods of analysis and scoring used during the August 2017 MCA workshop.

Summary of Area Scoping Archaeological Site Data Revision

The 2012 (Peet et al.: 49) scoping report collated three types of information from two official sources: historic buildings and notable trees, from the Horowhenua District Plan, and archaeological sites from the New Zealand Archaeological Association (NZAA) Site Recording Scheme database. In regards to archaeological sites, which is the focus of this report, at that time the NZAA held records for 55 sites that were located in the scoping area (Peet et al., 2012: Appendix D, Map 5). By July 2017, when the scoping revision was undertaken, the number of recorded sites had increased to 71. While this was a substantial increase (44%) in the number of recorded archaeological sites, it was felt that on its own the NZAA data substantially underrepresented both the magnitude and distribution of archaeological risk throughout the scoping area.

In response, inSite Archaeology was commissioned to undertake an examination of additional sources to supplement the data already compiled. In order to meet the requested timeframe for provision of the revised archaeological site data, a decision was made to limit the study of new sources to the published maps of Leslie Adkin (1948) and historic Māori Land and Survey Office plans of the Horowhenua District pre-dating 1900⁴. Most importantly, in order to include a broader range of information that better reflects the distribution of archaeological risk at the regional level, a somewhat looser definition of what constitutes an ‘archaeological site’ was used instead of the legal definition established in the Heritage New Zealand Pouhere Taonga Act (HNZPTA) of 2014⁵. The threshold for establishing an ‘association with human activity’ was lowered to include any place with a historic Māori-name association and any unnamed features of the natural environment that are generally regarded as having been focal points for past human activity. In doing so, the potential range of site types is expanded to include natural landscape features such as dunes, hills, lagoons, lakes, mountains, rivers and streams. There are a range of sources, for both the Horowhenua and wider New Zealand, which indicate that many of these places have, or are likely to have, an archaeological component that is as yet

3 For a more complete discussion of the revised area scoping archaeological site data, please see the following report, *Otaki to North of Levin - Area Mapping Update*, Stantec, August 2017.

4 Adkin’s (1948) book on place-names of the Horowhenua and their topographic/historical background includes more than 20 maps showing the location of more than 500 archaeological sites or sites of significance to iwi. More than 200 survey plans pre-dating 1900 were studied for this revision with more than 350 new sites identified. Where sites were identified in both historic survey plans and Adkin maps, the survey plan data was assumed to be more accurate and used to identify the approximate site location.

5 The legislative definition of an archaeological site is provided by the HNZPTA 2014, which states that an archaeological site is:

- Any place in New Zealand, including any building or structure (or part of a building or structure), that:
- Was associated with human activity that occurred before 1900 or is the site of the wreck of any vessel where the wreck occurred before 1900; and
 - Provides or may provide, through investigation by archaeological methods, evidence relating to the history of New Zealand; and
 - Includes a site for which a declaration is made under section 43(1)

unrecognised due to issues of surface visibility or a limited history of landscape study⁶.

From these new sources, and with the revised ‘site’ definition, an additional 768 sites were identified to give a new total of 877 archaeological sites within the scoping area⁷.

In many cases, it was possible to define a detailed site location and extent, but for the sake of consistency with sites where this information was lacking and continuity with the previous scoping data, all new site location information was recorded with a point geometry. While discarding extent information compounds some of the historic errors associated with the recording of site locations and the difficulty of estimating the potential degree of adverse effects, the effect of this decision is somewhat limited for smaller sites, such as houses or whare, midden, springs, etc. However, for significantly larger sites that may be a hectare or more in size – such as pā or kāinga, cultivations, burial grounds, forest clearings, rivers, swamps etc – the effect of reducing a site to a single point is substantially more distorting.

The distortive effect produced by the reduction of site location and extent to a single point was overcome by interpolation of the point distribution, using a point density function, to an area (raster) coverage: conversion of archaeological information into a similar mapping scheme as ‘landscape/urban design quality’ and ‘landscape absorption capability’ (Peet et al., 2012: Appendix D, Maps 2 and 3) being a key objective of the area scoping revision project. As the purpose of the analysis was to illustrate the broad trends in the archaeological landscape, site density was calculated on a per square kilometre basis. The resulting risk map (Figure 2) is not only a suitable guide to the distribution of archaeological risk for the Otaki to North of Levin project as it relates to registered Historic Places, recorded and known archaeological sites but also the potential risks related to the distribution of unknown archaeological sites.

Methodology Applied to Scoring of August 2017 MCA Workshop

As described above, route options considered during previous MCA exercises were assigned scores on the basis of a largely qualitative assessment of potential adverse effects to specific, identified archaeological sites. Research that supported the discussion of potential effects to specific sites, however limited, was possible due to the limited number of site options under consideration and their tight geographic spread. For the present workshop, given the number of route options and their geographic spread, it is not possible to achieve the same level of discussion in the timeframe available.

The archaeological risk map provides a basis for qualitatively scoring route options, but provides no means of differentiating the potential effects of adjacent route options with similar risk profiles, nor any indication of the magnitude of differences between high and low-risk areas (Figure 3). To achieve greater differentiation, the total number of potentially affected sites was counted for each route option using the point locations of sites collected during the revision of the area scoping data and polygons of the route corridors supplied by Stantec New

6 Information included in Adkin’s (1948) place-name descriptions and native testimony recorded in the minute-books of local land claims hearings amply indicate this to be the case.

7 The total includes revised numbers for NZAA recorded archaeological sites and historic buildings. Notable trees were not included in this analysis.

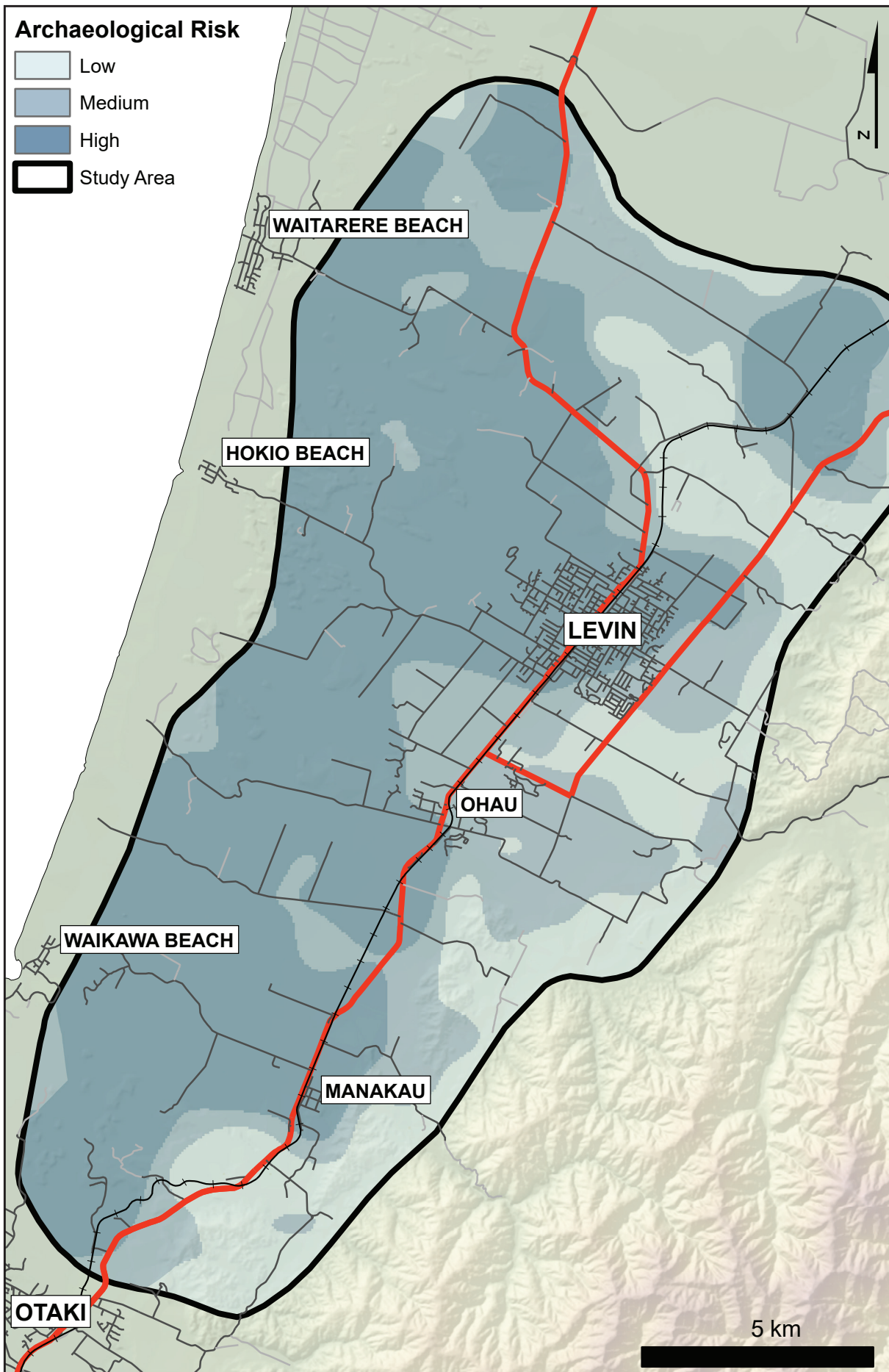


Figure 2: Estimated archaeological risk levels in the project study area based on a density analysis of the revised area scoping site data.

Zealand. Two counts were compiled for each route option: the first, counting only those sites with a point located inside the boundary of the route option, and the second, counting not only sites located inside the route boundary, but also all sites located within 500 m or less of the route boundary. These route-and-site counts allow for greater differentiation of potential effects for routes crossing areas with similar risk profiles and were the primary basis for scoring the route options presented at the MCA workshop on the 29th of August.

In regards to scoring the route options, greater weight was given to the route-and-site counts that included sites within 500 m of the route boundaries. There are three reasons for this:

1. As discussed above, the simplification of site location and extent information to a single point introduces a range of potential errors and distortions. Extending the site count to include sites located beyond route boundaries ensures that smaller sites which may mistakenly be located just beyond a boundary, and larger sites which may have their point location outside, but extend across a boundary, are also included in the route-and-site counts.
2. Expanding the area of analysis provides a wider perspective on the potential range of site types and the patterns of occupation that may be present inside the route option. Some site types or occupation patterns that are only visible in the wider landscape will also be present inside the route option but as an invisible and as yet unknown risk⁸.
3. The comparison of within-boundary and boundary-plus-500-m route-and-site counts provides a guide to the relative intensity of historic occupation in the landscapes traversed by the route options. Routes with fewer sites, relative to other options, in their boundary-plus-500-m counts are likely to be located in landscapes with lower occupation intensities. For routes where the intensity of historic occupation appears to be higher, the unknown archaeological risks are also likely to be higher.

As indicated by 2 and 3, above, a significant proportion of the archaeological risk associated with each route option relates to the issue of unknown sites. The potential scope of the unknown site risk is highlighted by recent archaeological investigations undertaken as part of the Transport Agency's Mackays to Peka Peka Expressway project. While the formal results are still being prepared, early indications are that the number of previously unknown sites discovered during construction was substantially greater than the number of sites known beforehand (Figure 4). Prior to preliminary route investigations for the Mackays to Pekapeka Expressway being undertaken only nine archaeological sites had been identified within 500 m of what would be the eventual route. Twenty-two new sites were identified by the project archaeologists prior to

⁸ With the vast majority of the world's archaeological sites unknown and invisible to human perception, due to their being hidden beneath the earth's surface, resolving the problem of site (in)visibility has been a challenge that archaeologists have grappled with for many decades. Since the 1960s, landscape based studies have been the preferred scale of analysis for archaeologists researching a range of questions (Kluiving and Guttmann-Bond, 2012: 9), including the detection of unknown sites (e.g., Bintliff, Howard, and Snodgrass, 1999; Campana, 2009). Internationally, the extent of landscape analysis beyond the design boundaries of major industrial/infrastructure projects varies in scale from hundreds of metres to kilometres in size (e.g., DOE and MDOC, 2009: 4.9-1-4.9-9; Lambert, Newman, and Oliver, 1996).

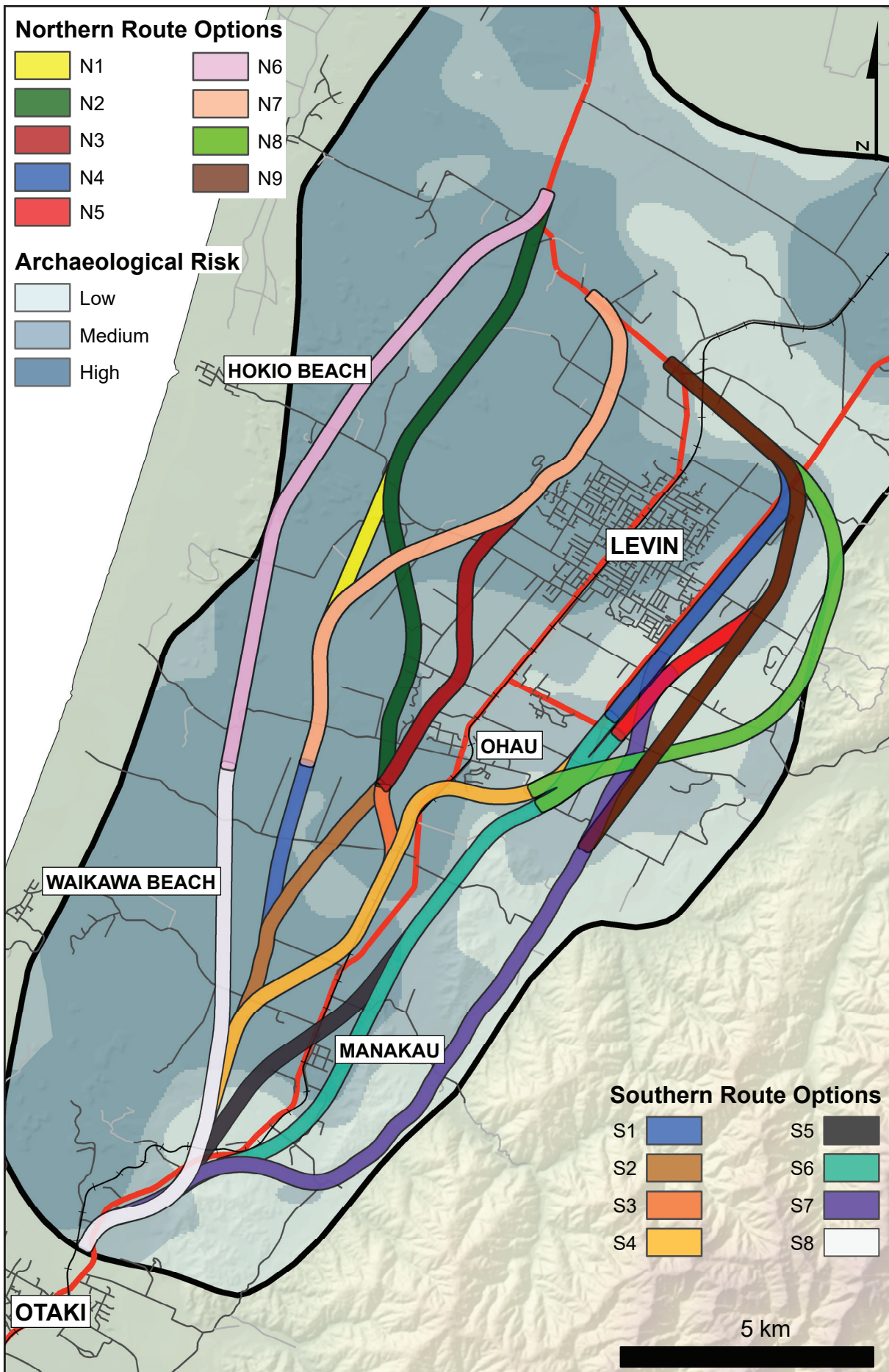


Figure 3: Route options in relation to the landscape of archaeological risks.

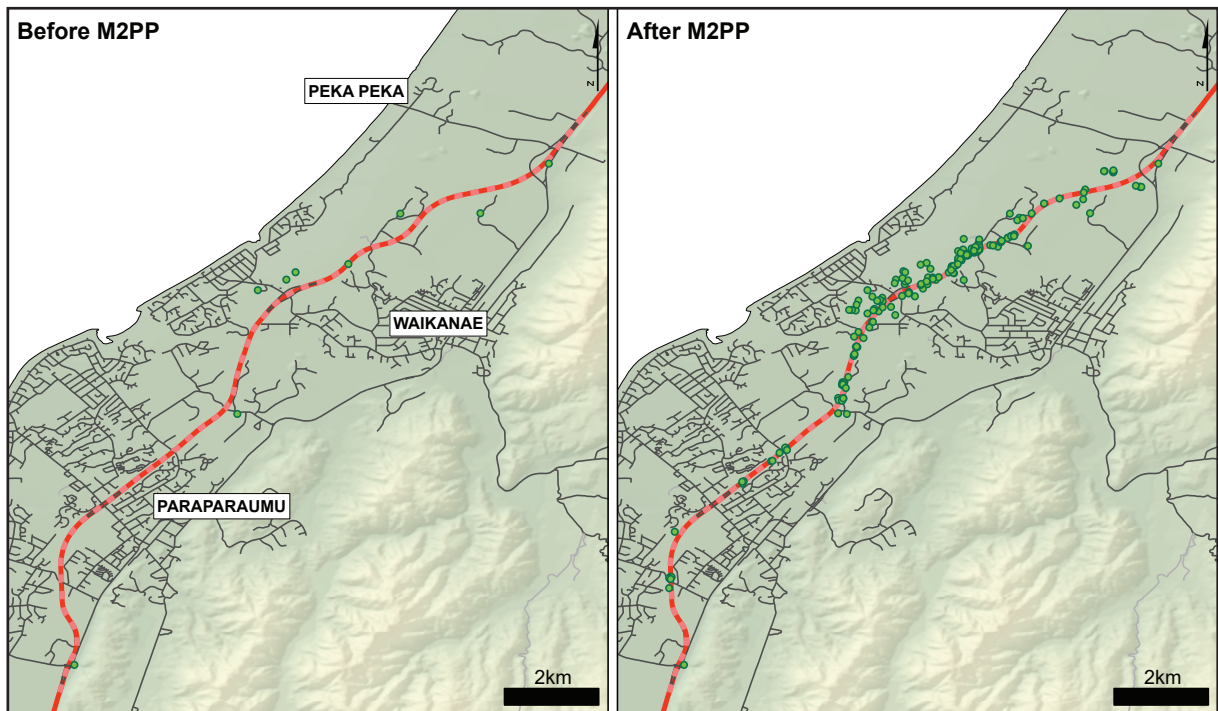


Figure 4: Two maps showing all archaeological site records held by the NZAA that are located within 500 m of the recently constructed Mackays to Peka Peka Expressway. (left) All site records created before route investigations and construction. (right) Total number of sites after route investigations and construction. More than 100 additional sites, pending approval, remain to be added to the NZAA records as a result of this project.

construction, with a further 200 new sites identified during the construction of the Expressway.

Earlier work undertaken by inSite Archaeology for the Transport Agency, as a part of the Waitarere Beach Road Curves project, contextualised project effects by studying the archaeological landscape within two kilometres of the project extent (Parker, 2015: 21-30). Use of a similar extent for the current project would result in substantial overlapping of adjacent route options, therefore a 500 m buffer beyond the route boundaries was used. This provided a wider landscape perspective without compromising the ability to differentiate the degree of risk associated with each route option.

The scores assigned during the MCA workshop of the 29th of August, as detailed below, were decided on the basis of the number of sites associated with each route option, relative to the number of sites associated with the competing options. It should be noted that while the total number of ‘affected’ sites varies for each route between the within-boundary and boundary-plus-500-m counts the broad trends remain the same and the same scores would be assigned regardless of which count is used. However, emphasis is placed on the boundary-plus-500-m counts due to the reasons described above that help to make the relative differences more pronounced.

With one exception⁹, scores were not weighted to account for effects relative to site values or significance. This was to ensure that the scoring was not biased by detailed information about

⁹ Option N4 has been given a weighted score based on the high value of a specific site identified during an earlier stage of investigation. The exceptional value of this site has been reviewed and confirmed by an independent expert.

specific sites that had been collected during earlier stages of the project. A comparable level of information could not be collated for all sites within the current timeframe. However, as a general guide, sites of higher archaeological value or cultural significance are more frequently located in the dune systems to the west of the Horowhenua district.

Before moving to a discussion of the route options and their scores a brief history of human occupation in the Horowhenua is provided, below. It summarises the underlying historical factors that have influenced the distribution of archaeological sites in the district and thus also the scoring of the route options.

BACKGROUND HISTORY

Radiocarbon (C14) determinations from coastal sites to the north and south indicate that Māori have occupied this part of the New Zealand coast for more than 700 years¹⁰. Within a relatively compressed landscape between the coast and the Tararua Ranges, there was a diverse mix of faunal and floral resources (Bevan sen., 1907: 10-11; O'Donnell, 1929: 5). Until the late-19th century, the major settlements and occupation sites of the various local iwi were predominantly located in the coastal dune belt and adjacent to the major rivers, streams, swamps, lagoons and inland lakes. The general disposition of Māori settlement in the district is succinctly illustrated by Keepa Rangihiwini (Major Kemp), a chief of Muaūpoko, who when asked where on the Horowhenua Block Muaūpoko had historically lived, replied:

On No. 11 alongside the [west of] lake [Horowhenua], from their ancestors down to the present day... They have permanent whares there; there are fortified pas [sic] there too. You could see the heaps of shells handed down from past generations; the other portion [i.e., the forest east of Lake Horowhenua] the birds and the rats occupied.” [emphasis added]¹¹

The forested land to the east of the district was not totally unoccupied, but traditional Māori and European historical accounts indicate that it was not intensively settled until after the completion of the Wellington-Manawatu 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 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.” (Wilson, 1959: 116)

10 See reference dates WK1757 and NZ0682 from the NZ Radiocarbon Database, at www.radiocarbon dating.

11 Testimony of Keepa Rangihiwini, quoted during the examination of Alexander McDonald by the Horowhenua Commission (AHJR 1896: 78).

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 west of State Highway 1 (Figure 5).

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 sold in the Wakefield settlements or exported to the markets in Sydney. This substantially changed in 1886 when the Wellington-Manawatu Railway, which passed through the former Weraroa clearing at what is now the southern end of Levin (Figure 5), was completed.

European settlement, in particular, shifted inland to be nearer the railway line which was now the primary transportation, trade and communication route. An influx of new settlers was attracted by the extensive 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 fulfill 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 (1995: 269) states:

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

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 railway construction, forest clearance/ saw milling and other agriculture.

These sites are generally located near the existing town and township centres, the North Island Main Trunk Railway (NIMTR) and old roads (Figure 5).

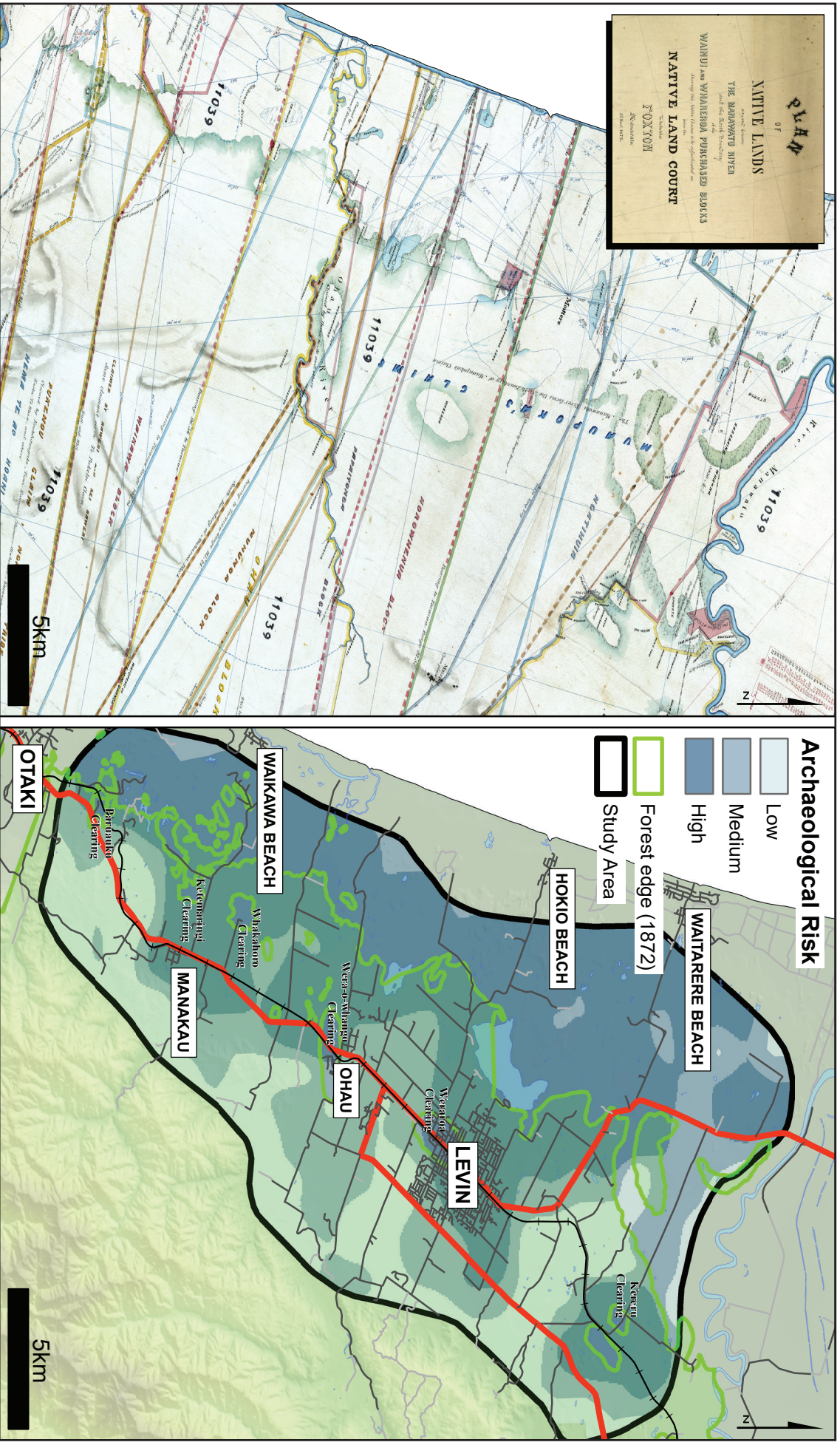


Figure 5: (left) Detail of historic survey plan SO 11039 (1872), showing some site locations and the boundary between the dense forest and open dune land. (right) The relationship between archaeological risk, the historic forest boundary and modern settlements.

ANALYSIS OF ROUTE OPTIONS AND SCORING

As outlined in the introduction, in regards to the assessment of state highway options, the Transport Agency recognises that historic heritage is a non-renewable resource and that the “Avoidance of development impacts on, and preservation in situ of, historic heritage places are always the preferred options” (NZTA, 2015: 8). In keeping with the Transport Agencies objectives, route options that are identified as having fewer potential effects to archaeological sites are accorded better scores than those with potentially greater effects. Scores are assigned on a 1 to 5 scale, where lower scores represent better route options with fewer effects relative to the other options under consideration. Southern and northern route options are scored separately. Individual route option plans are presented in Appendix I.

It is important to note that the width of the route options reviewed here are substantially in excess of the actual amount of land that is likely to be required for any expressway that may be constructed. Therefore, there is some scope to mitigate potential adverse effects to archaeological sites by incorporating site avoidance objectives during the design process. However, total site avoidance is unlikely to be possible, for any route option, given the Transport Agency’s geometric design constraints for new highways¹². There is also the potential that design changes made for the purpose of avoiding a known site result in otherwise avoidable adverse effects to an as yet unknown site. This is particularly true for the western route options located in areas with higher archaeological site densities. As a result, consideration of the potential for the mitigation of adverse effects by site avoidance is better left to the later stages of the project when more detailed design information will be available. Potential mitigation for route options is not discussed below though it should be noted that there is likely to be greater scope for mitigation by avoidance along the more eastern route options.

Southern Route Options

There are eight route options between the north of Otaki and south of Levin (Figure 6). Routes S1 to S7 were presented at the workshop on the 22nd and route S8 was added at the suggestion of community group representatives. All southern route options begin at Taylor’s Road, north of Otaki, and terminate on an east-west spread south of Levin. Four options – S1-3 and S8 – are predominantly located west of State Highway 1 and end at the southern bank of the Ohau River. Options S4 and S5 have portions of their alignment to the east and west of State Highway 1. Options S6 and S7 are entirely aligned to the east of the current highway. These final four alignments – S4-7 – cross the Ohau River and terminate adjacent to State Highway 57 in the vicinity of the Kimberley or Tararua roads.

Although all eight routes traverse what is usually a low-risk landscape inside the former forest margins, route-and-site counts at the boundary-plus-500-m level are noticeably larger for the

¹² For the Transport Agency’s geometric design guidelines see, <https://www.nzta.govt.nz/roads-and-rail/highways-information-portal/technical-disciplines/safety-and-geometric-design/geometric-design/>.

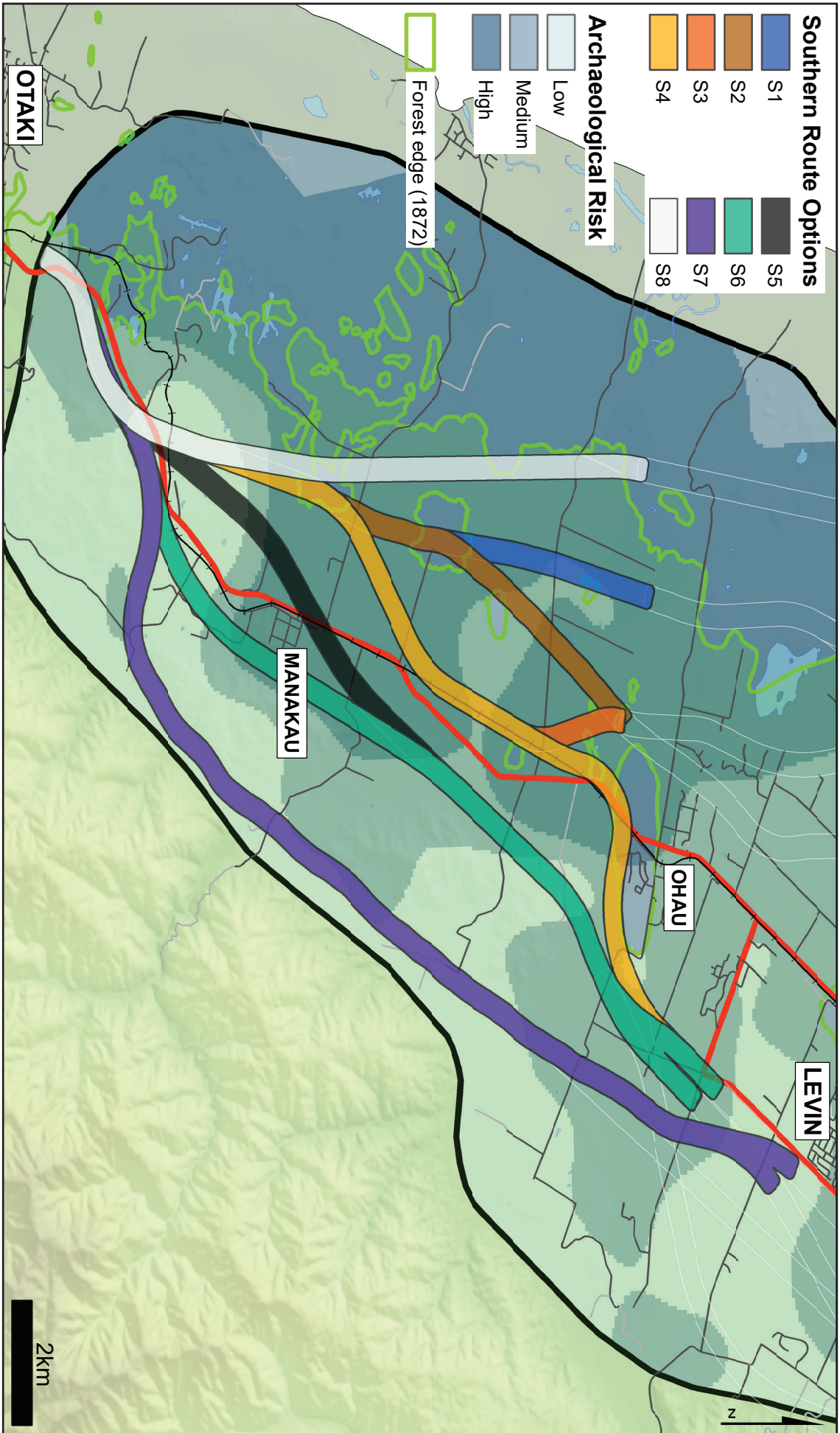


Figure 6: Route options and archaeological risk between the north of Otaki and south of Levin.

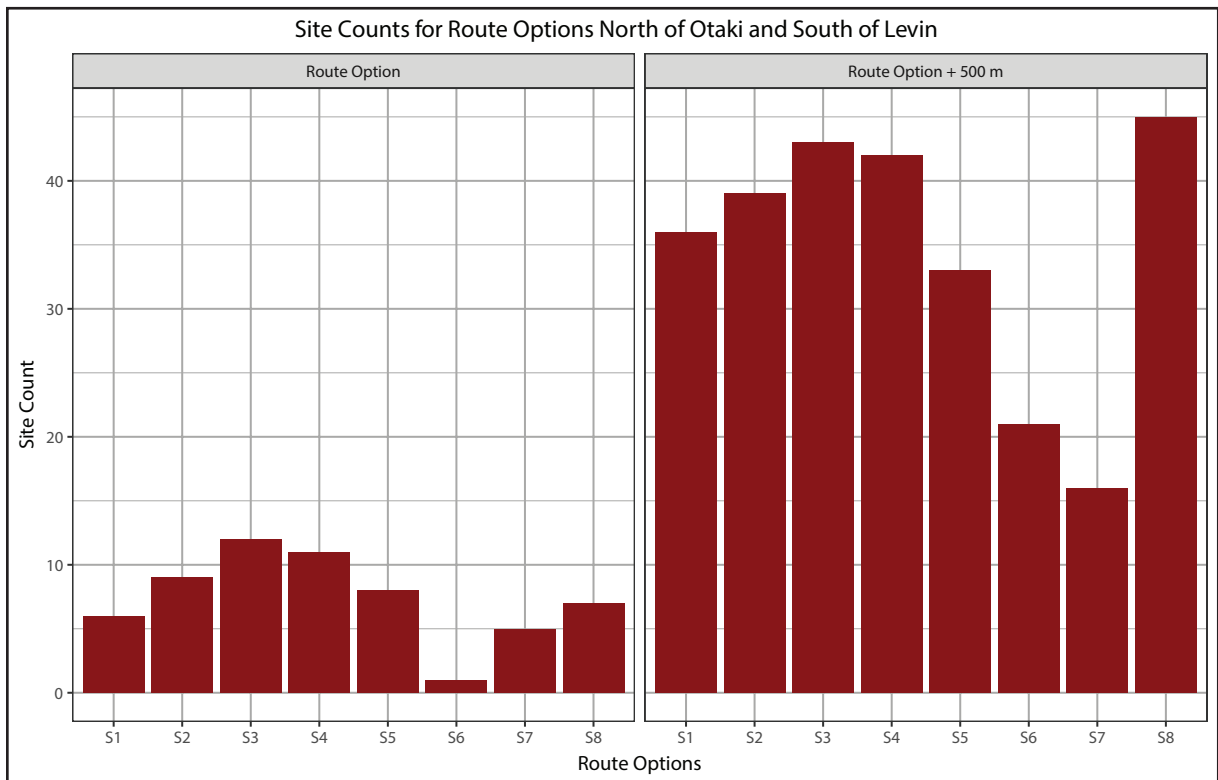


Figure 7: Route-and-site counts for southern route options between the north of Otaki and south of Levin.

options aligned to the west of State Highway 1 (Figure 7). This is due to these options passing through, or in close proximity, to a number of forest clearings that have a history of intensive occupation by both Māori and early European settlers. All four western options cross the Ketemaringi clearing, to the west of Manakau. S1 and S2 continue on through the Whakahoro clearing and then diverge, S1 clipping the Kai a te Toki clearing and S2 the Tikorangi clearing. After passing through the Ketemaringi clearing, options S3 and S4 move to the east and follow a route parallel to the NIMTR and intersect a number of smaller clearings on the southern bank of the Ohau River. On the north bank of the Ohau River, S4 cuts the large Wera-a-Whango clearing to the south of the Ohau township.

As the main open spaces in an otherwise densely wooded forest, the clearings listed above were focal points for a wide range of forest based activities and sites of intensive occupation by Māori and, at a later date, early European settlers. Sites associated with Māori occupation in these clearings are likely to be larger and more complex than sites located deeper in the former forest. A number of pā, kāinga and cultivation grounds are known to be present. Archaeological sites located in the clearings, of both Māori and European association, are likely to be older than those located in and around the settlements adjacent to the NIMTR. There is also a high risk of encountering new, unknown sites along these route options. For these reasons options S1, S2, S3, S4, and S8 are given a score of 4.

Option S5 crosses State Highway 1 and the NIMTR in two places, moving to the west at Pukehou and returning east to the north of Manakau township. The small portion of S5 aligned to the west of State Highway 1 and the NIMTR avoids the forest clearings crossed by the other western options. For the remainder of its alignment, S5 stays to the east of State Highway 1, crosses the Ohau River and ends with a dual connection option along Arapaepae Road (State

Highway 57), north of Kimberley Road. While this route avoids most of the major southern risk areas, it is likely to affect a number of sites located to the west and north of Manakau. There is also a high risk of encountering new, unknown sites associated with the early history of the Manakau township. This option is also given a score of 4.

Options S6 and S7 are entirely aligned to the east of State Highway 1 and cross the Ohau River. S6 follows a small gully between the Manakau township and the Hanawera Ridge, terminating in dual connection options at Arapaepae Road, north of Kimberley Road. S7 is the eastern most option and follows the Waiaute Stream to the east of the Hanawera Ridge, before following a north-eastern alignment terminating in dual connection options at Arapaepae Road, north of Tararua Road. Options S6 and S7 have the lowest known archaeological risk, with S6's greatest risk being its proximity to the Manakau township and S7's being its potential effects to Māori cultivation grounds adjacent to the Waiaute Stream and Ohau River. There is also an unknown sites risk, though this will be lower than that of the western options. There are fewer archaeological risks associated with options S6 and S7, therefore they are given a score of 2.

Northern Route Options

There are nine route options for the Levin northern connection (Figure 8). Routes N1 to N5 were presented at the workshop on the 22nd, with routes N6 to N9 added at the suggestion of community group representatives. The northern route options are a continuation of one or more of the southern options, starting south of Levin on an east-west spread and terminating to the north of Levin where they reconnect to State Highway 1. Five options – N1-3 and N6-7 – are aligned to the west of Levin and are reconnected to State Highway 1 in the vicinity of Kawiu and Waitarere Beach Roads. Four options – N4-5 and N8-9 – are aligned to the east of Levin and reconnect to State Highway 1 in the vicinity of Heatherlea East Road. As with the southern options, routes located further to the west have a higher degree of archaeological risk than their eastern counterparts. Overall, in comparison to the southern options, the archaeological risks are much greater for the northern options (Figure 9). This is due to the different environmental landscapes that are crossed and the intensity of historic occupation in this area, by both Māori and Europeans.

Three options – N1, N2, and N6 – pass to the west of Lake Horowhenua, with all or a substantial proportion of their alignment located in the coastal dune belt that was intensively occupied by Maori prior to the late 19th century. There are a great number of historic settlements in this area, from early Māori pā and kāinga¹³ to smaller hamlets of just one or two houses/whare belonging to Māori or Europeans. There are numerous horticultural and aquatic cultivations and a number of known burial grounds or urupā located along these corridors. Option N1 passes through an area containing several urupā to the south of Lake Papaitonga (Waiwiri). At their northern extent, both N1 and N2 are likely to affect access to the historic urupā at Paeroa¹⁴, which is still in use. The unknown archaeological risk, of any route either north or south, and of any site type, including burials, is greatest in this area. The unknown risk is likely to be greatest around

13 Several of these pā and kāinga are located on the dune ridge directly to the south of the State Highway 1-Waitarere Beach Road intersection.

14 This hill is also a pā site with numerous other sites clustered around it.

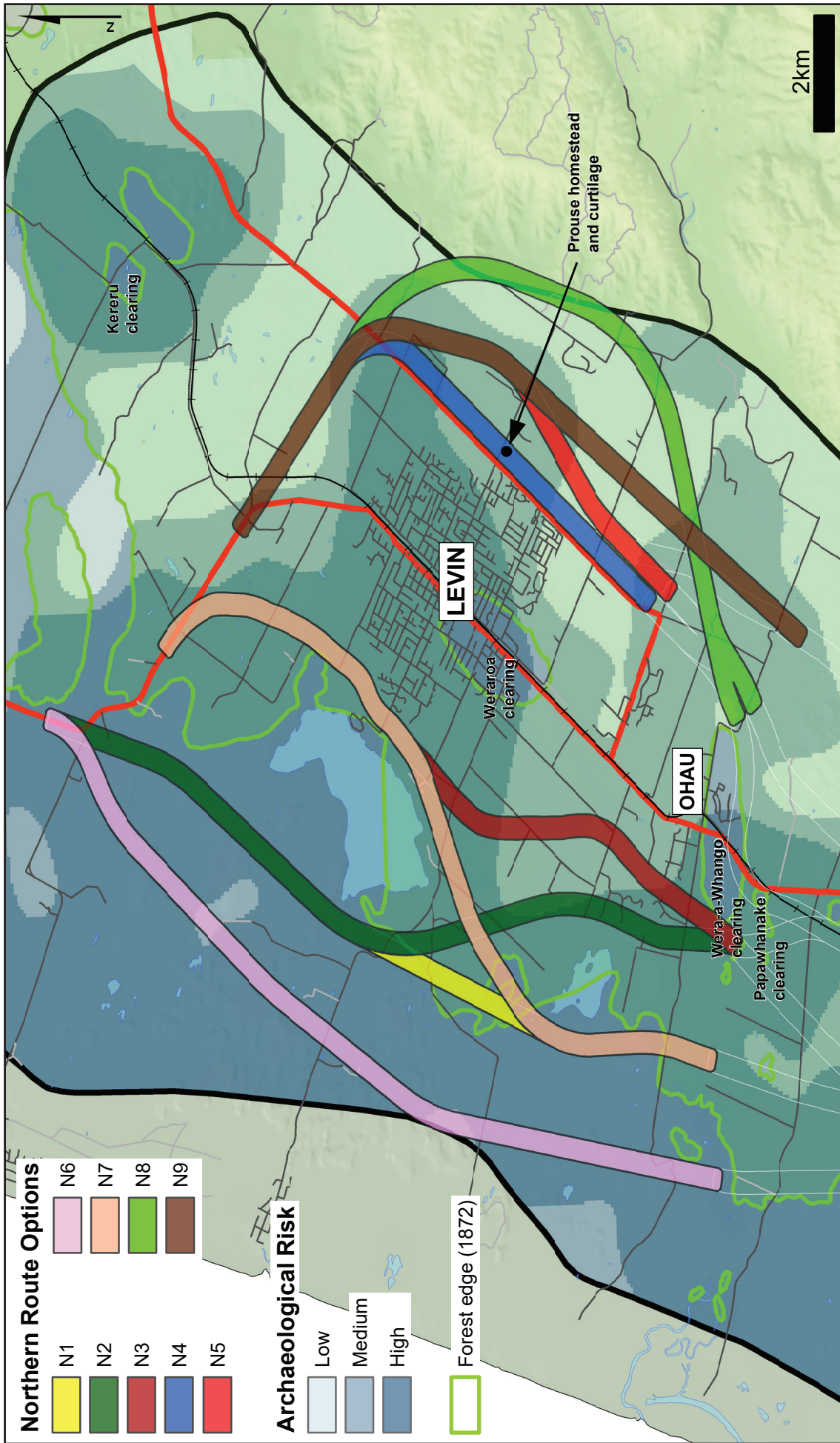


Figure 8: Route options and archaeological risk for the Levin Northern Connection.

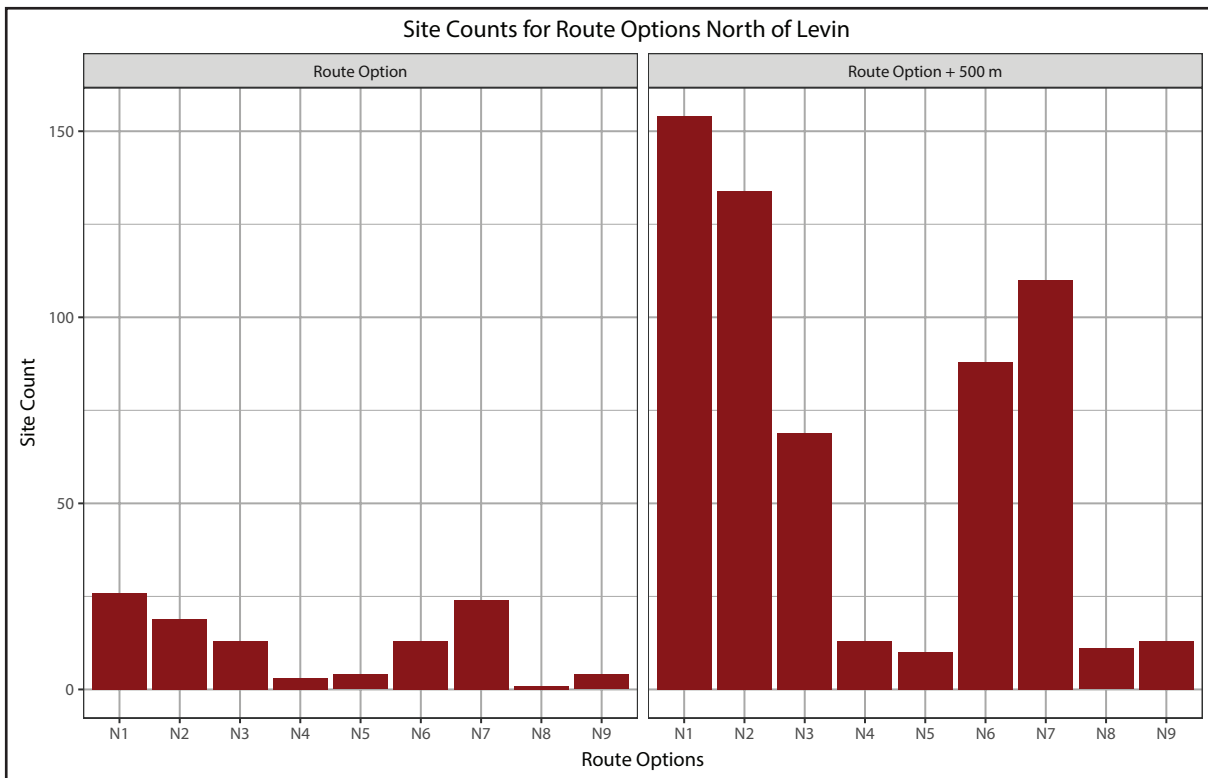


Figure 9: Route-and-site counts for the Levin Northern Connection route options.

the margins of the former lagoons and swamps that were focal points for subsistence activities, but sites may be found anywhere in the landscape (cf. Figure 4, which illustrates the known/unknown site risk for a similar environmental landscape). These options are scored as a 4.

Options N3 and N7 are also located west of Levin but are threaded between the town and Lake Horowhenua. While predominantly located inside the lower risk area of the former forest, in their proximity to Lake Horowhenua these routes are likely to affect a number of clearings on the eastern of the lake that served as cultivation grounds, hunting camps and access points for tracks inland. While there were generally few permanent settlements on the eastern side of the lake, prior to the 19th century, both routes are likely to affect a settlement in the former Ngurunguru clearing. Like option N1, in the vicinity of Lake Papaitonga N7 may affect a number of urupā and settlements in this area. While the unknown archaeological risk for these options is slightly lower than for those further to the west, there is still a sufficient unknown risk, in combination with the known risks, to score these routes a 4.

Four options – N4 and N5, and N8 and N9 – are aligned to the east, between Levin and the Tararua foothills. Options N4 and N9 are aligned parallel to State Highway 57, N4 is adjacent to the highway and N9 offset by approximately 1 km. N5 begins on an alignment parallel to the highway but diverts to the east towards the Waiopehu Reserve and N8 is located furthest to the east, skirting the base of foothills. North of Roslyn Road all four options turn northwest and reconnect to State Highway 1 in the vicinity of the Heatherlea East Road intersection. There are substantially fewer archaeological risks associated with these options, due to their being located in a landscape that was densely forested until the late 19th century. For the most part, it is not possible to identify specific risks for each of these eastern routes due to the poor quality of the site location information¹⁵. The risk of encountering unknown sites is lowest in this area

¹⁵ Most archaeological sites with Māori associations known to be located east of Levin can only be defined

and any sites that are found are expected to be relatively small. Given their low known and unknown risk profiles, options N5, N8 and N9 are scored a 2.

As previously mentioned, scores have not been weighted to account for effects relative to site values or significance. However, there is one exception. The general landscape in the vicinity of N4 is one of relatively low risk, as described above, but there is one specific, high-value site that is taken into consideration when scoring this option: the historic Prouse homestead, ‘Ashleigh’, at 1024 Queen Street, Levin. Reports prepared at earlier stages of this project had identified the Prouse homestead as being of, “significant archaeological, historic and cultural value for both the town of Levin and the wider Horowhenua District”. An independent review confirmed that the Prouse homestead had locally and possibly regionally significant value. In recognition of these exceptional known values and for consistency with earlier MCA route scoring, option N4 is given a score of 4.

Conclusion

There are a number of uncertainties that must be considered when undertaking archaeological research of this type: uncertainties of site location and extent, and even the existence of sites themselves. It is for this reason that a landscape approach, one that looks beyond the route boundaries, has been used here. The broad trends of historic occupation in the district were defined after a revision of the 2012 area scoping data (Figure 3). Specific differences in the scale of historic landscape occupation intensity have been made clearer by research presented in this report (Figures 7 and 9). It is also important to remember that this is only a measure of the archaeological risks in the known sample population. Archaeological investigations that were recently undertaken in a similar environment, for the Mackays to Peka Peka Expressway, indicate that there is likely to be a significant unknown component to the total population (Figure 4). Therefore, the relative differences in archaeological risk for each route option are likely to be far greater.

The history of human occupation in the Horowhenua District is long and complex, and while there is substantial variation in the intensity of historic occupation throughout the landscape, there are no ‘zero risk’ options for the proposed expressway. However, in accordance with the Transport Agency’s objective to avoid development impacts on historic heritage, the scores assigned to both southern and northern route options reflect a preference for options located to the east of the study area (Table 3). This scoring bias is a product of the history of human occupation in the district, that is itself a product of historic biogeography. The archaeological risks are greater for the western routes (Figure 3) because the intensity of human occupation has historically been far greater amongst the dunes, lagoons, lakes, swamps and forest margins than it is at present. Of course, the historically forested land to the east (Figure 5) has always been occupied, but intensive occupation of this land is only a relatively recent, late 19th century and

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 aids to location identification after the forest had been cleared.

onwards, phenomenon.

Table 1: Summary table of route options, scores and scoring definitions.

ROUTE OPTION	SCORE	DEFINITION
SOUTHERN OPTIONS		
S1	4	The option includes extensive areas of difficulty in terms of the criterion being evaluated. Mitigation is not readily achievable
S2		
S3		
S4		
S5		
S6	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.
S7		
S8	4	The option includes extensive areas of difficulty in terms of the criterion being evaluated. Mitigation is not readily achievable
NORTHERN OPTIONS		
N1	4	The option includes extensive areas of difficulty in terms of the criterion being evaluated. Mitigation is not readily achievable
N2		
N3		
N4		
N5	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.
N6	4	The option includes extensive areas of difficulty in terms of the criterion being evaluated. Mitigation is not readily achievable
N7		
N8	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.
N9		

Author comment:

Heritage was considered to be a key enduring issue for the community and was afforded a full (100%) weight in the community weighting schedule. The route option scores that I provided were accepted as presented and without challenge.

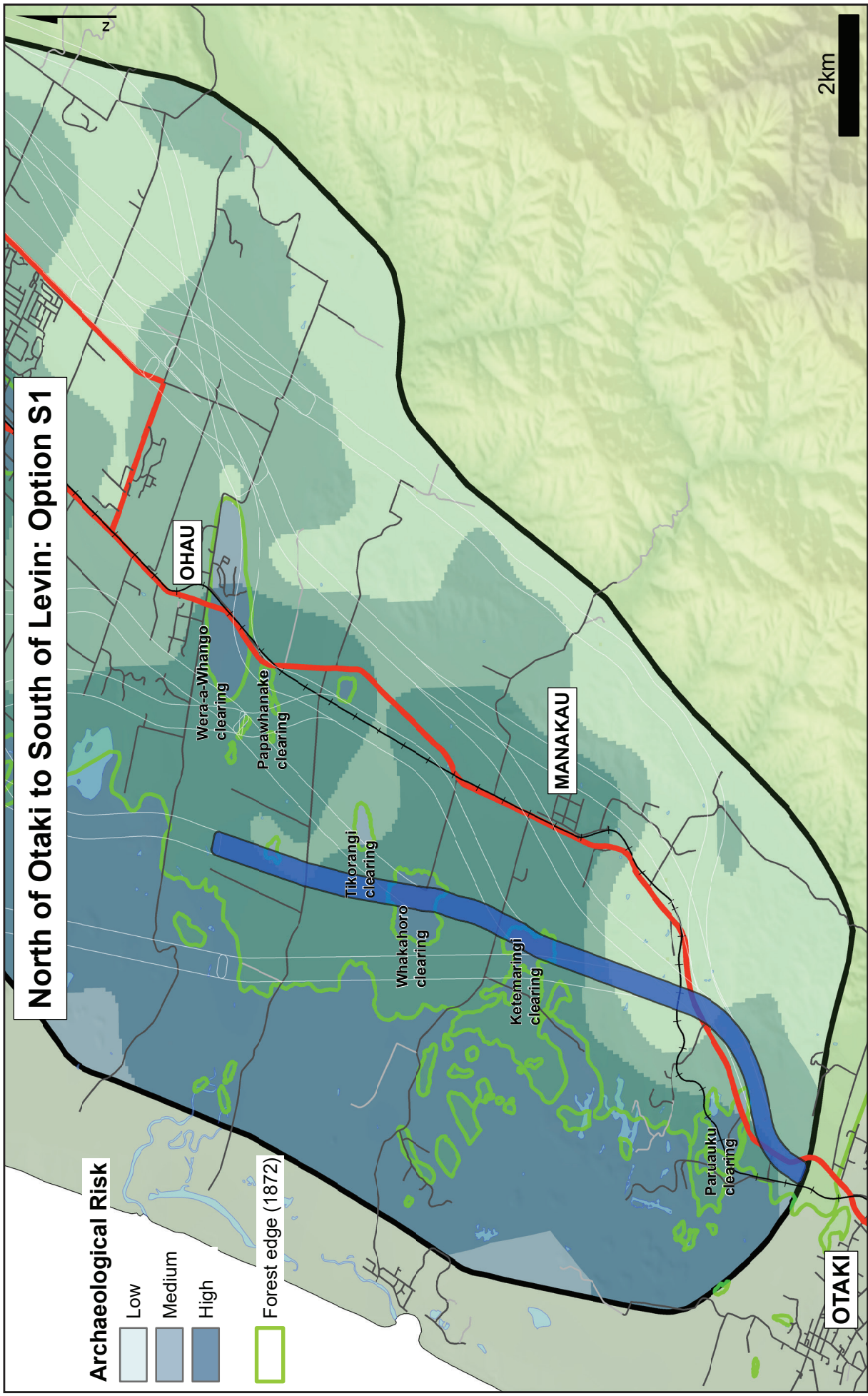
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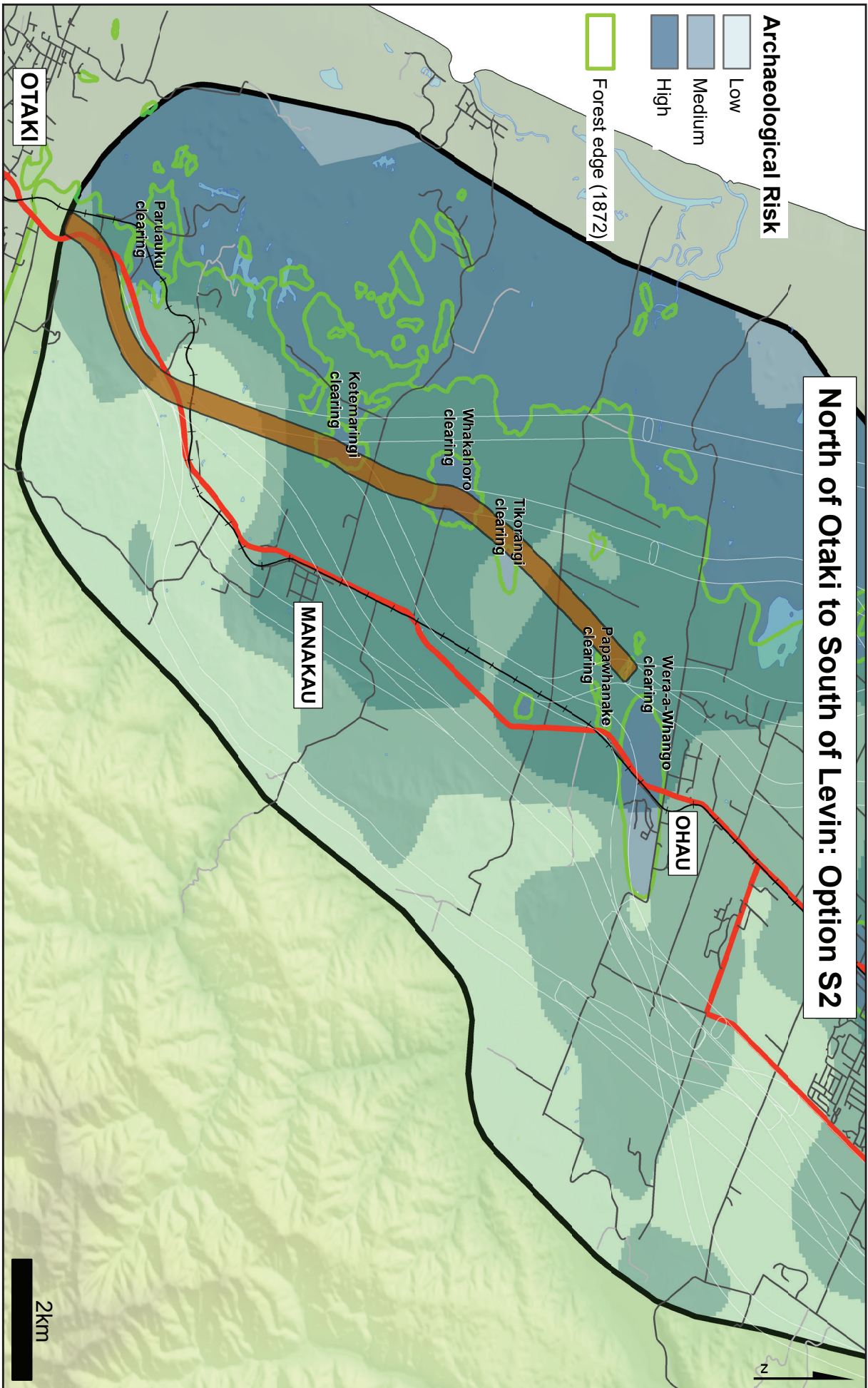
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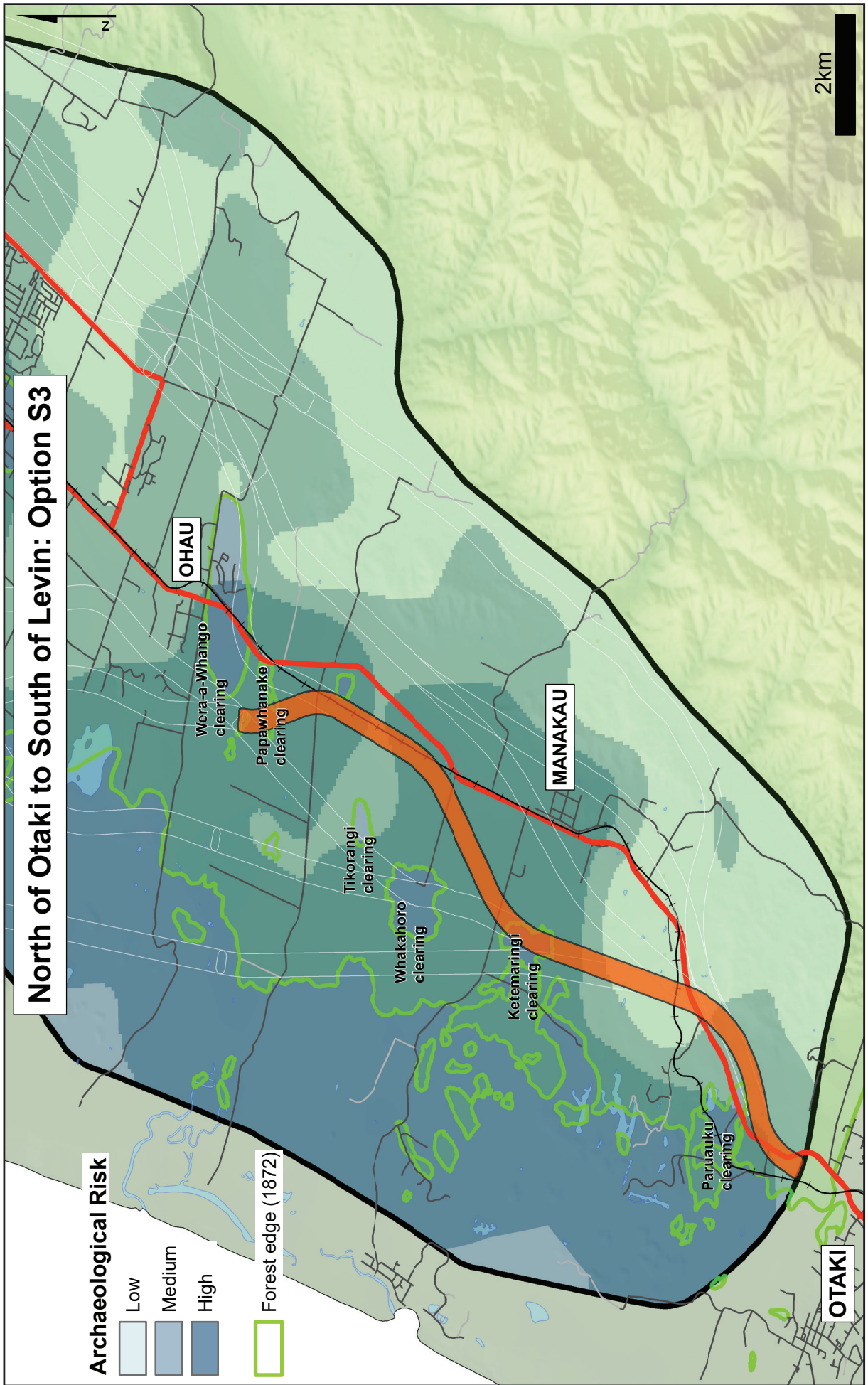
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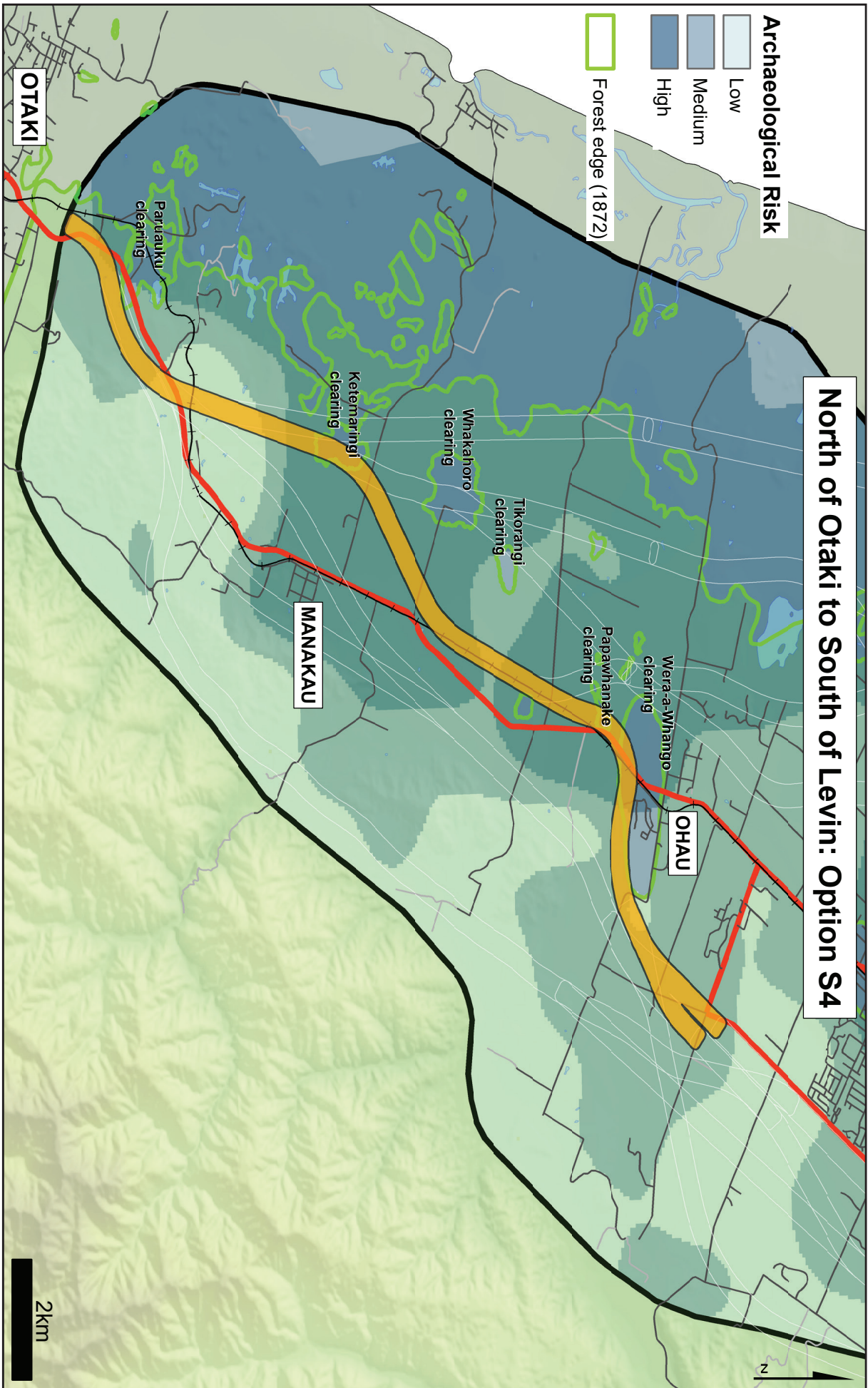
ROUTE OPTION PLANS

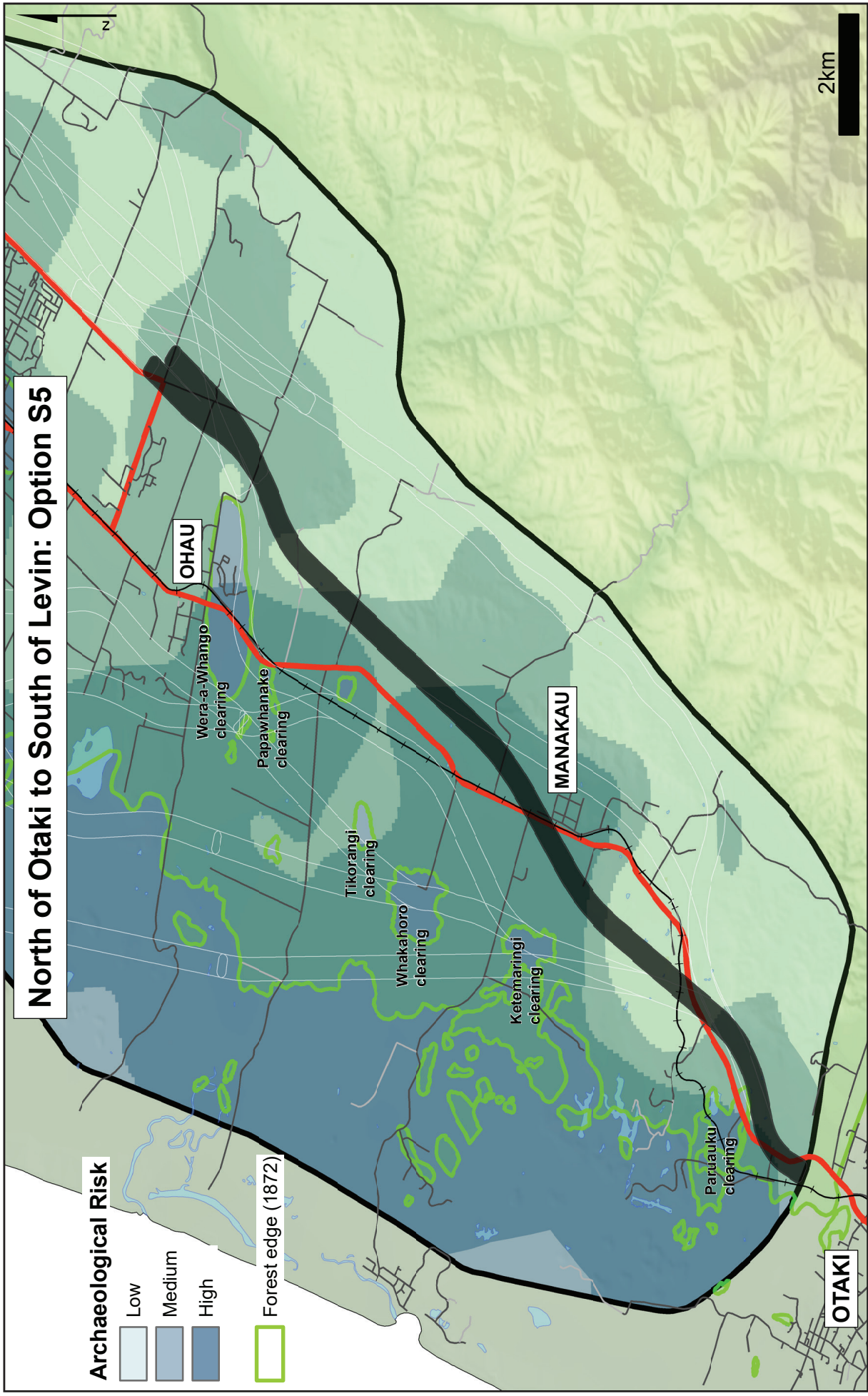
Separate plans for individual route options, each plan including: the archaeological risk model, approximate forest edge in 1872 (SO 11039), alternate route options (outlined in white), existing road network and the North Island Main Trunk Railway.

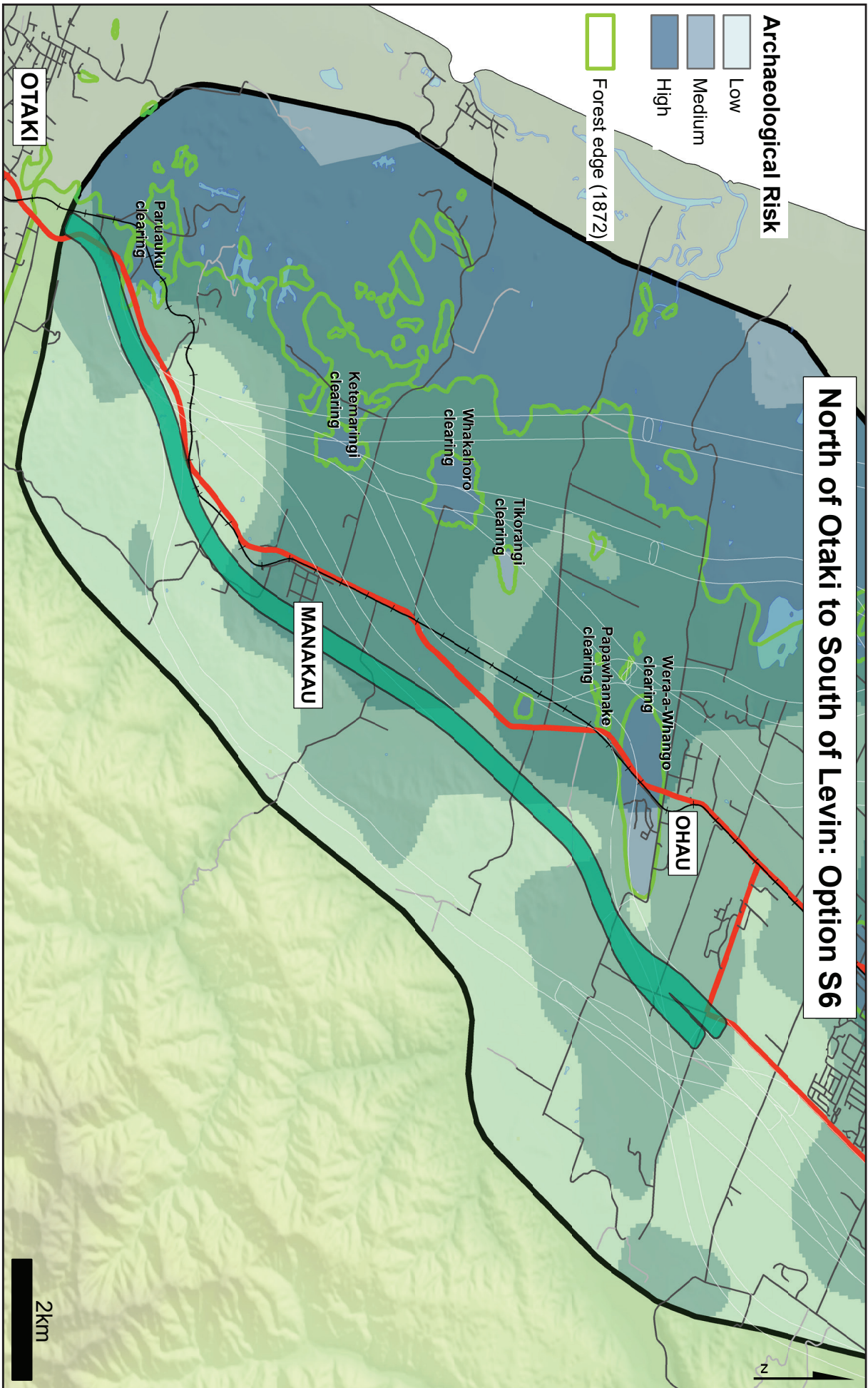


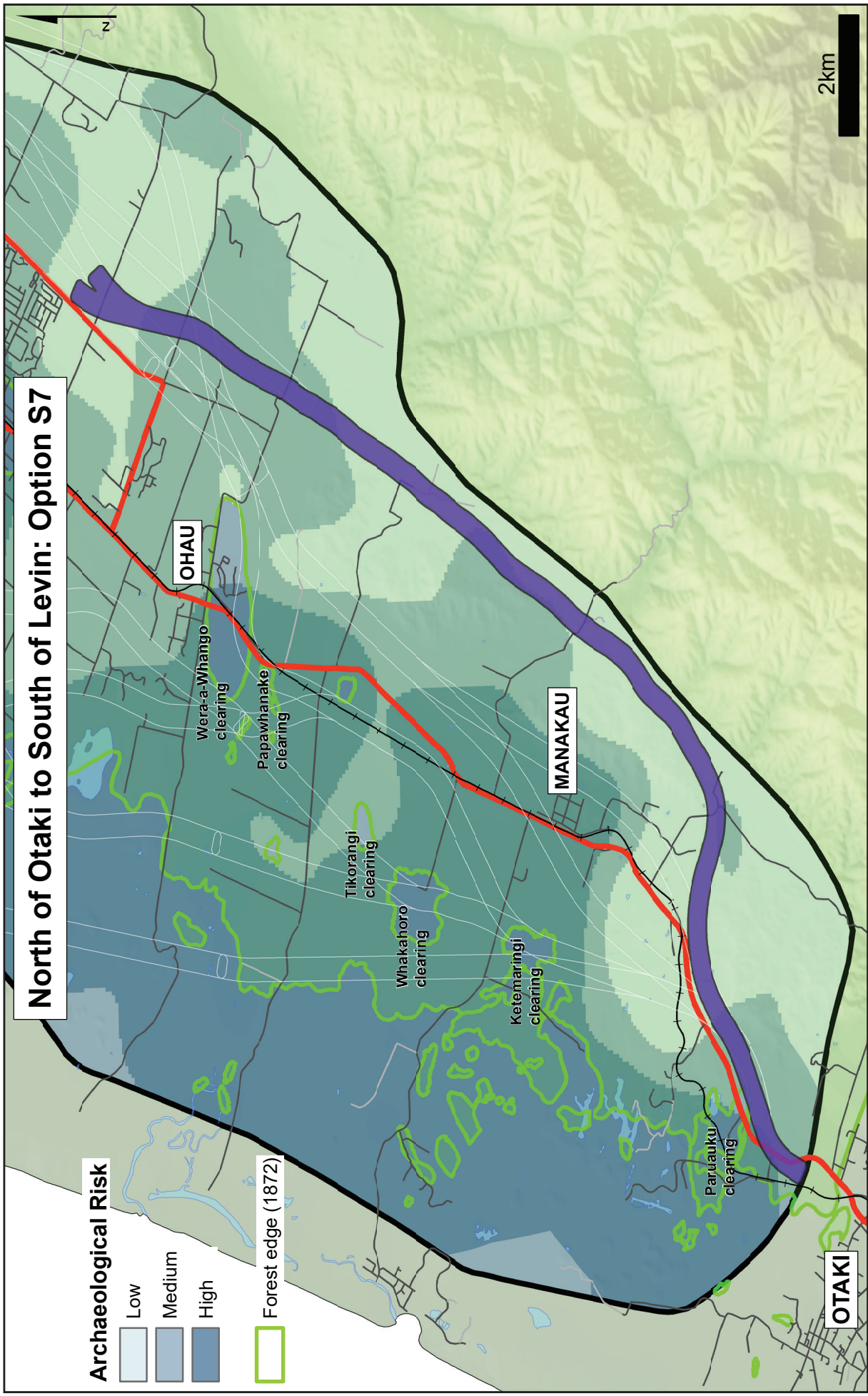


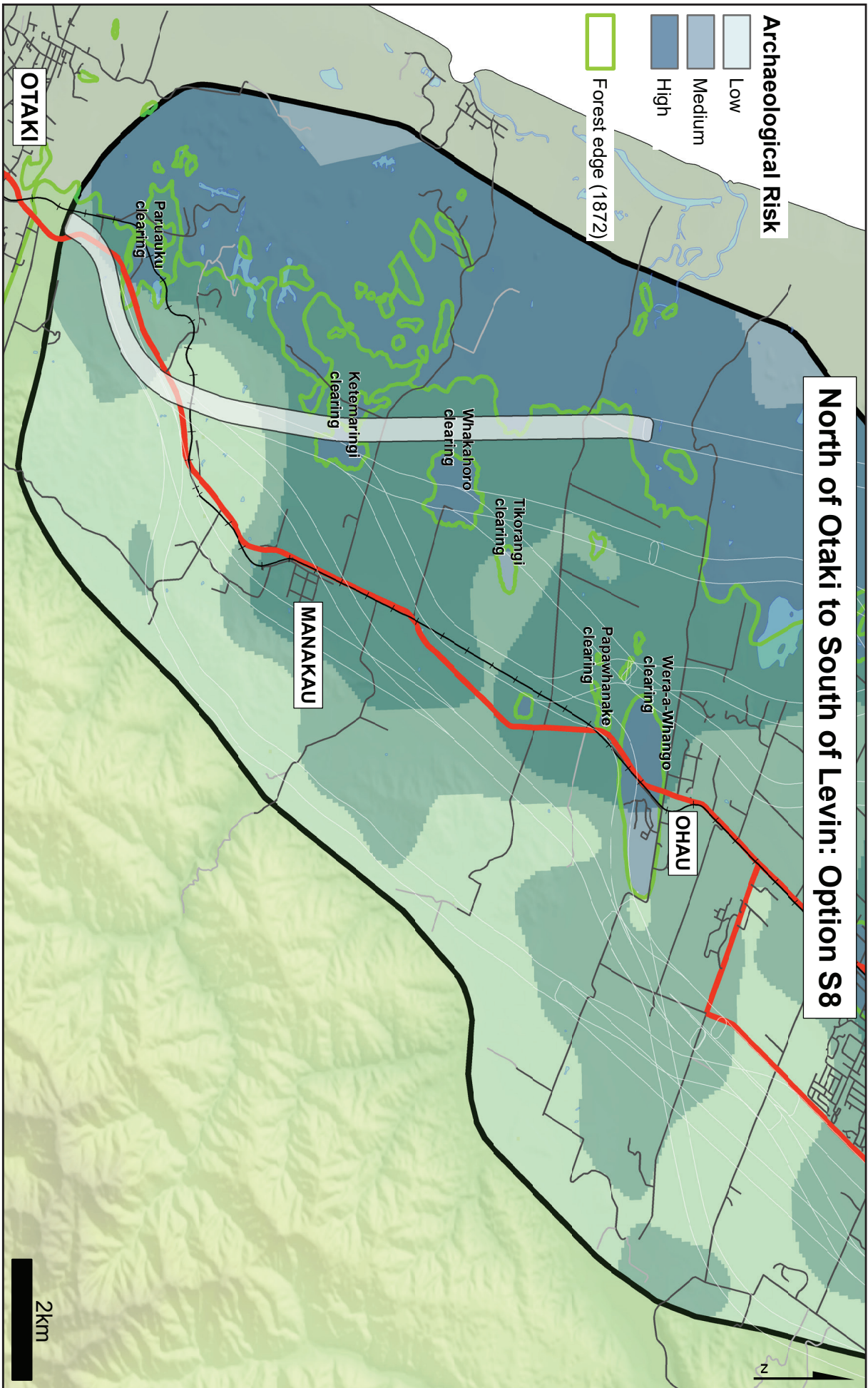


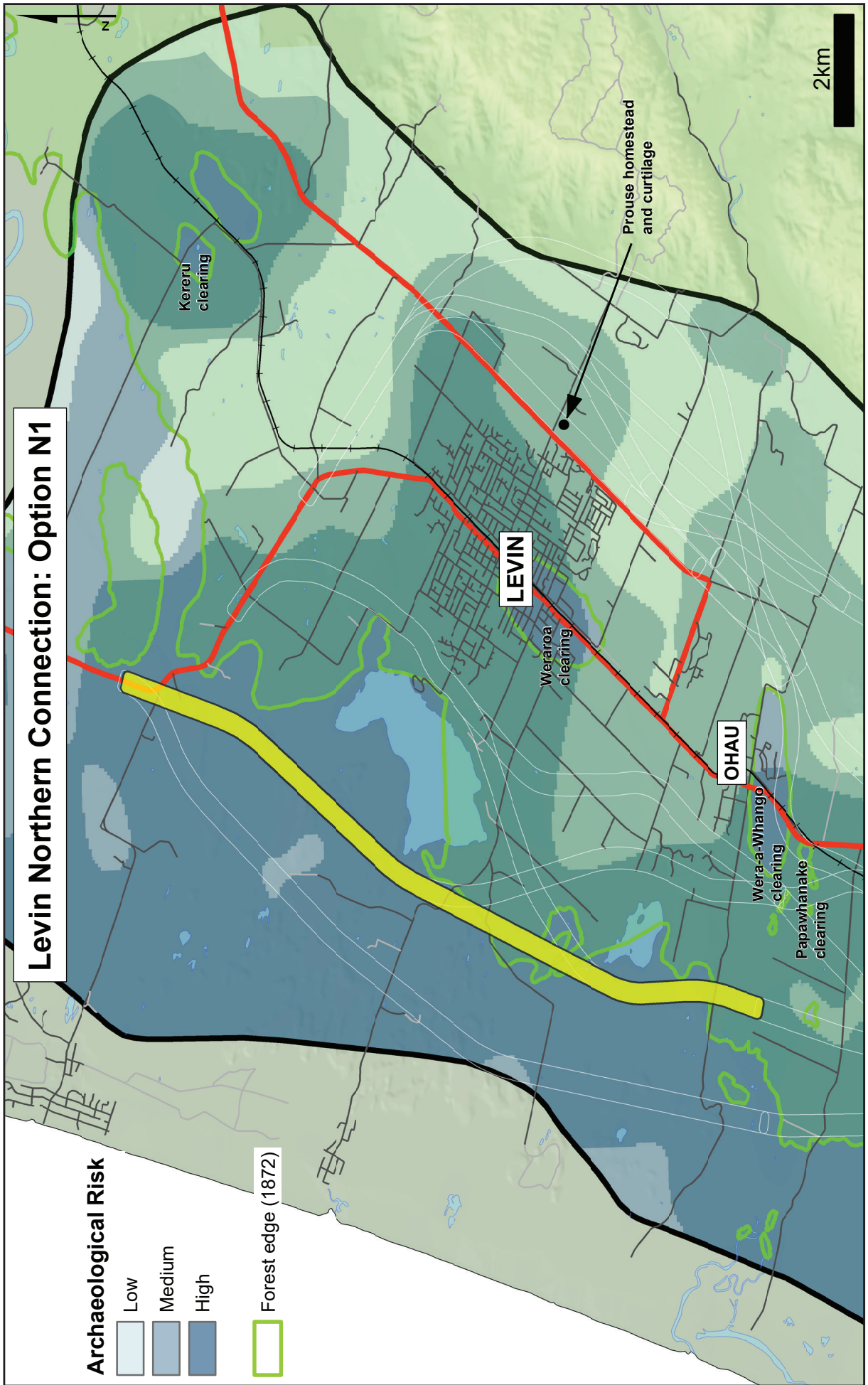


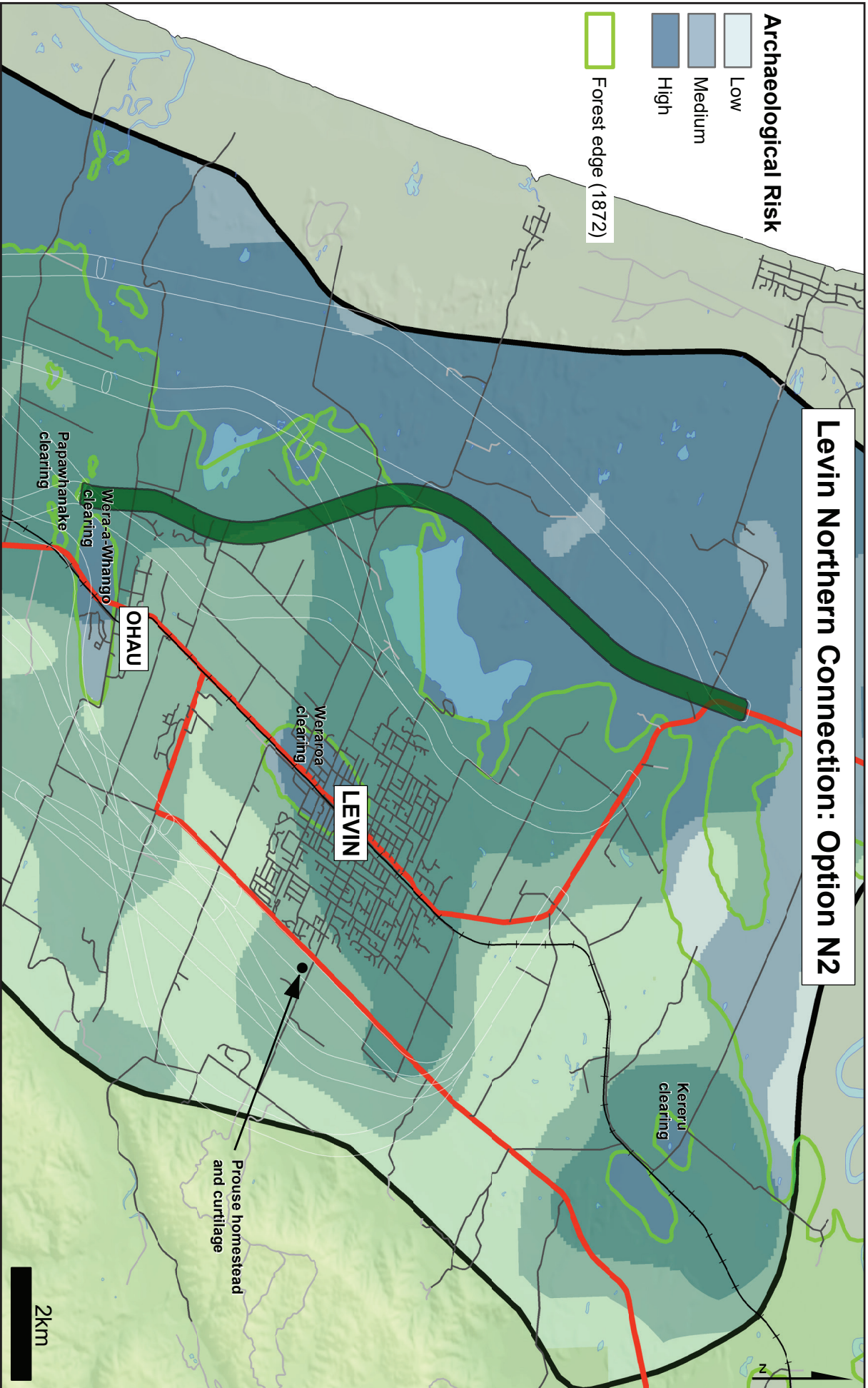


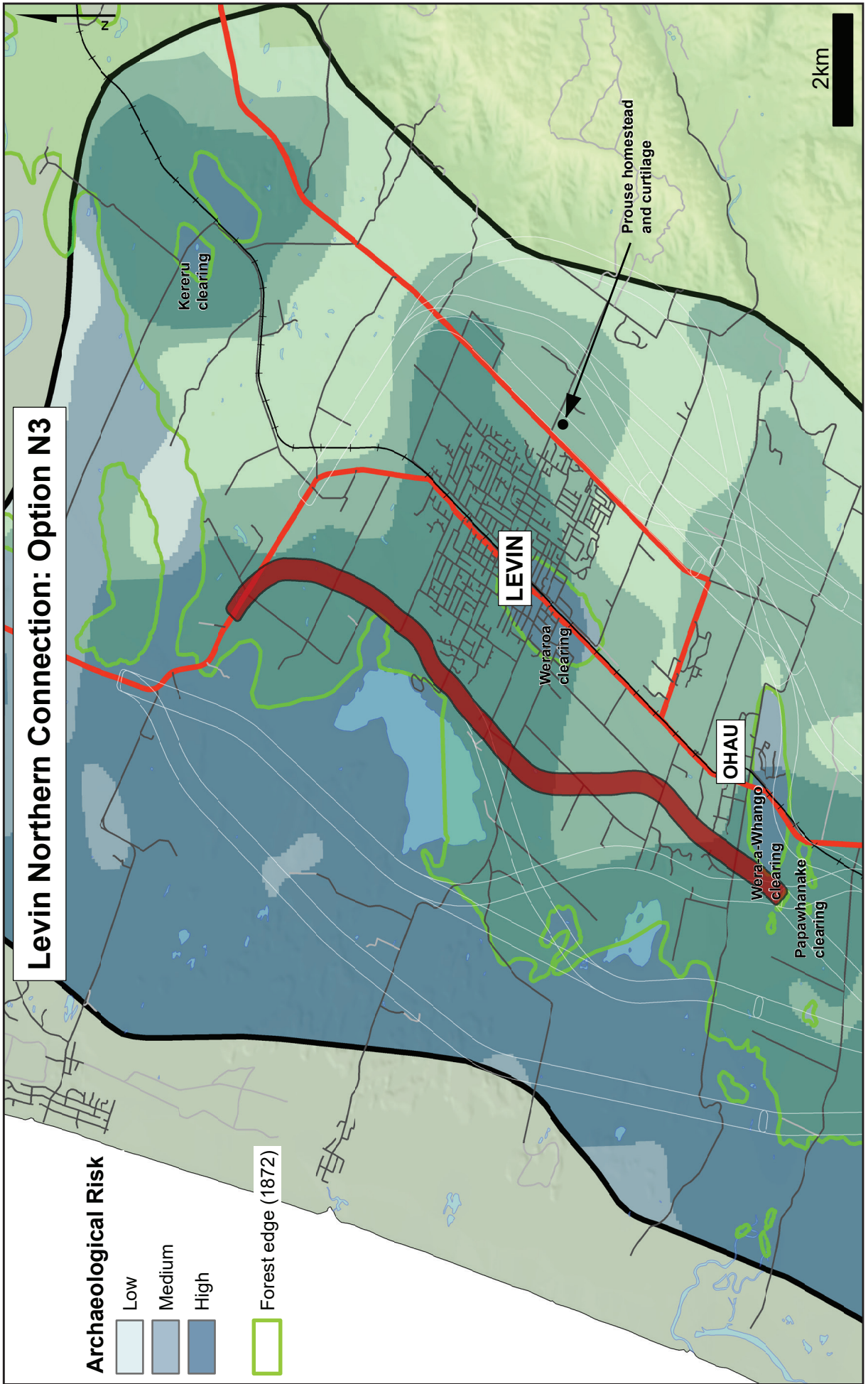


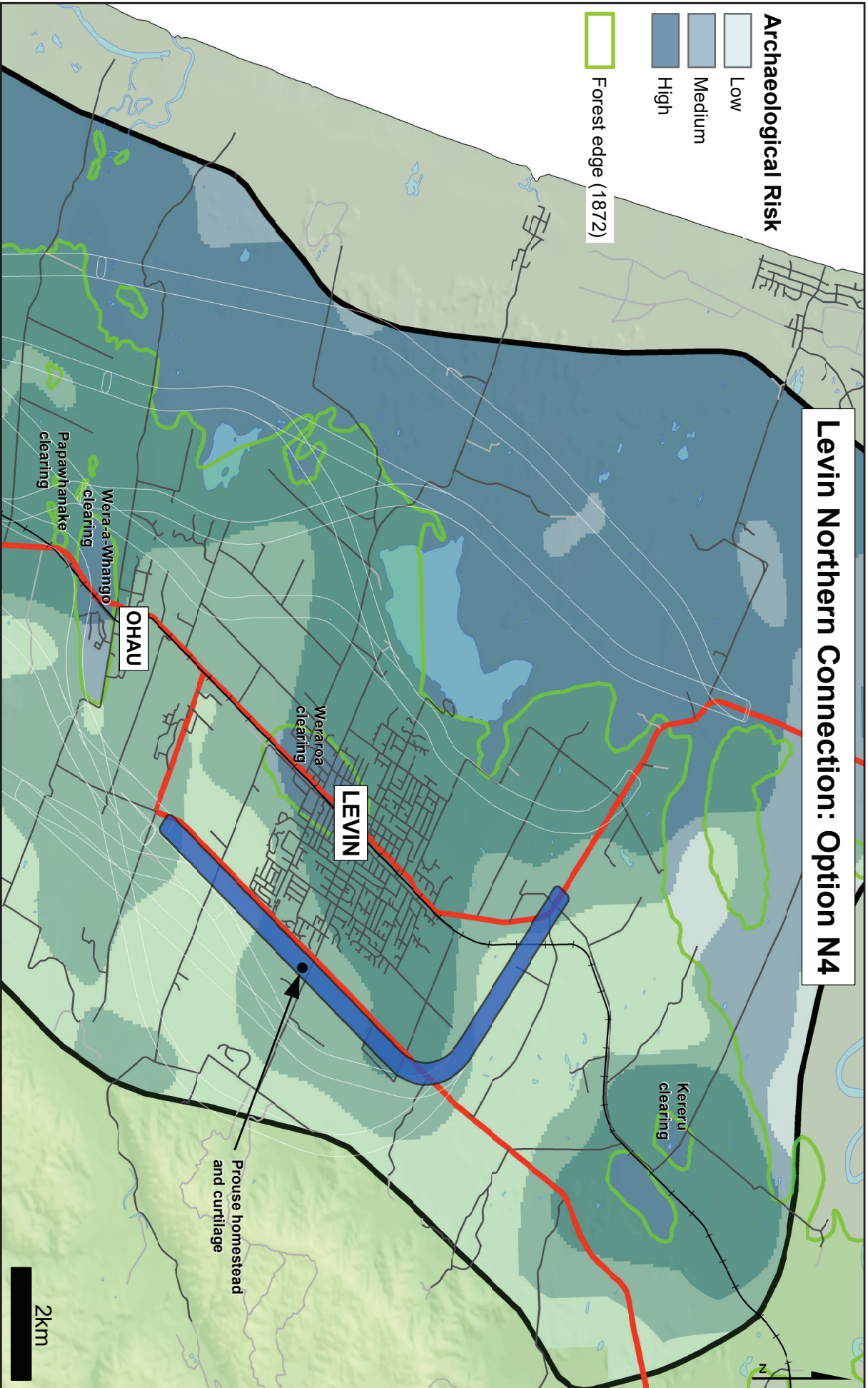


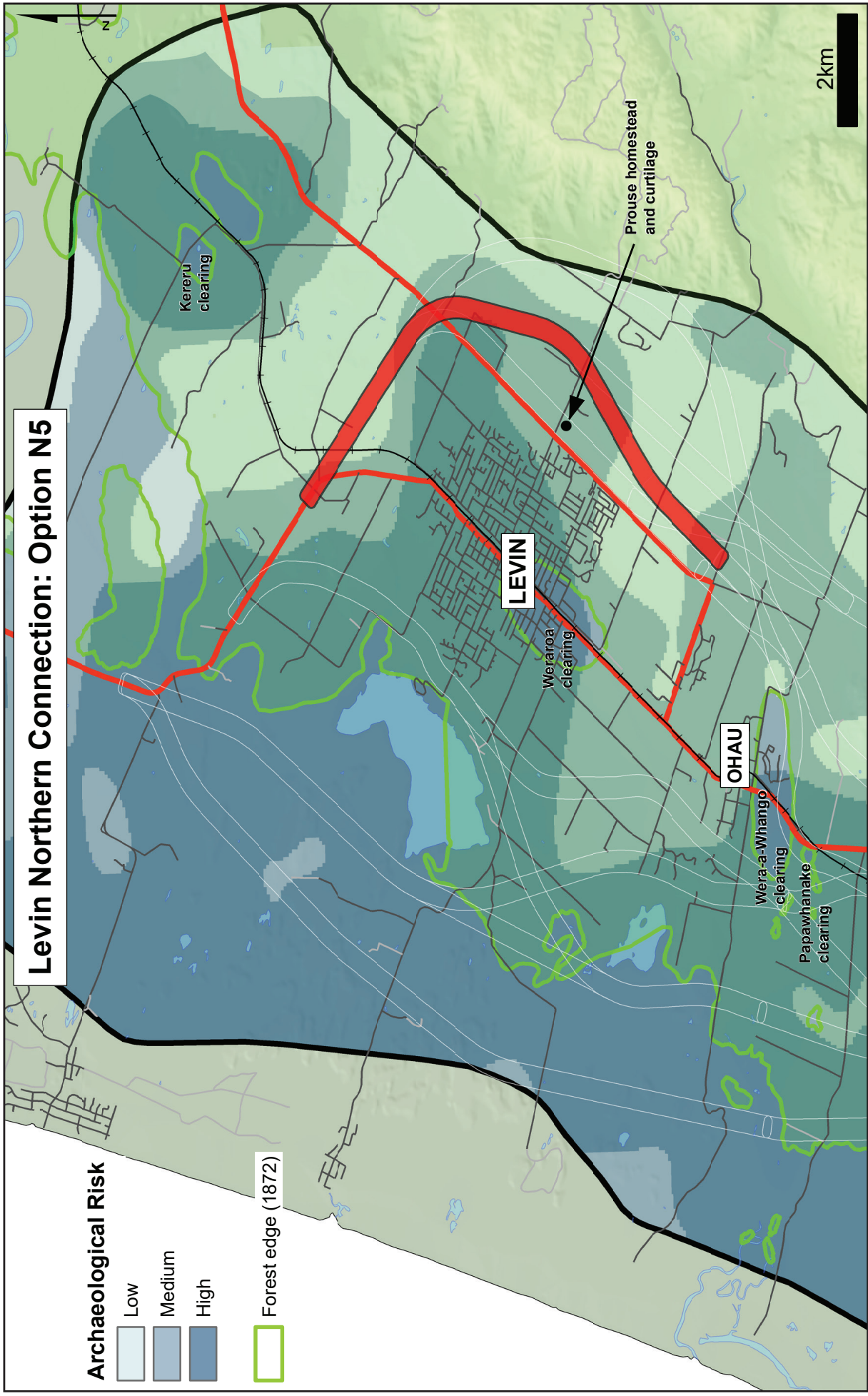


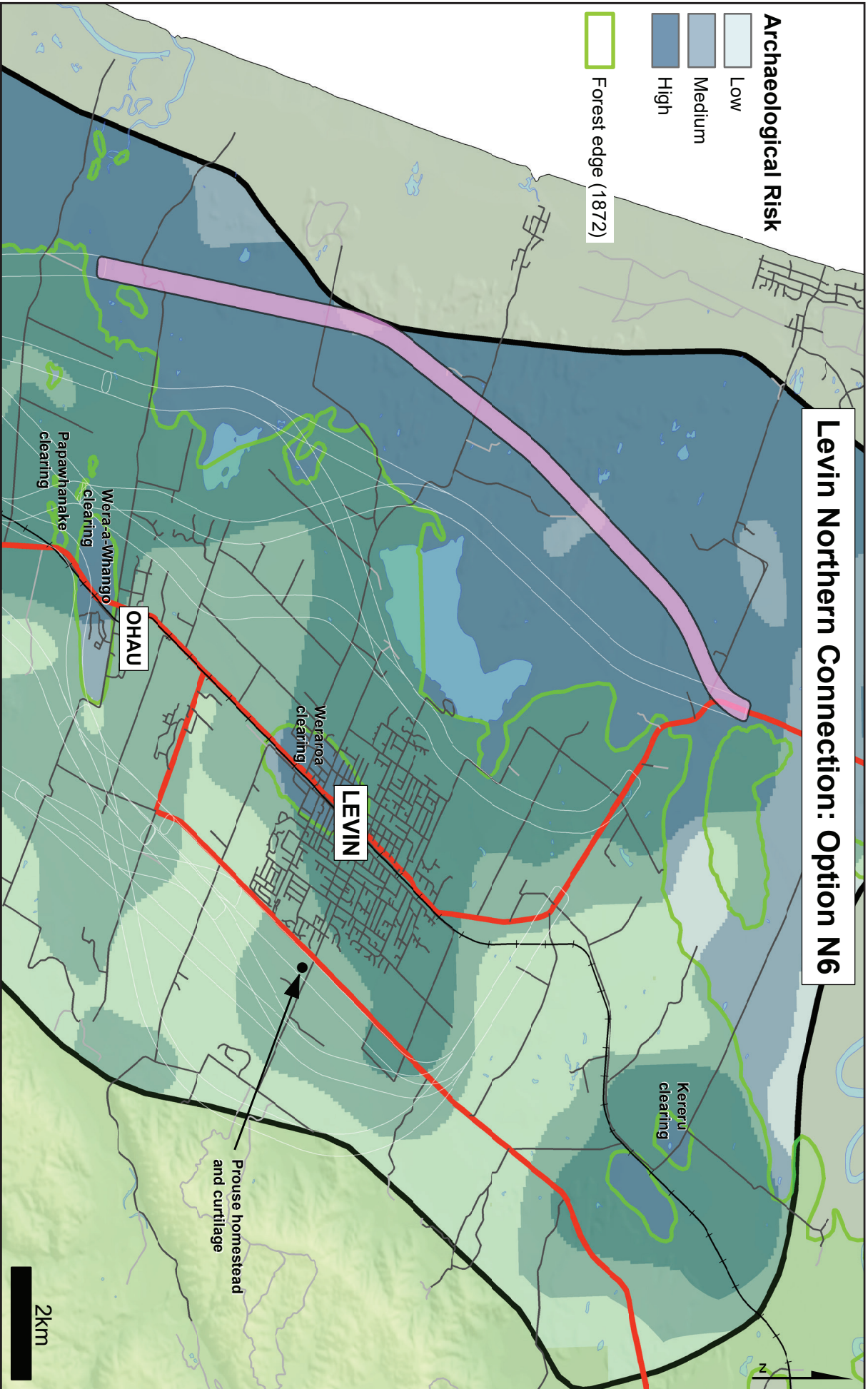


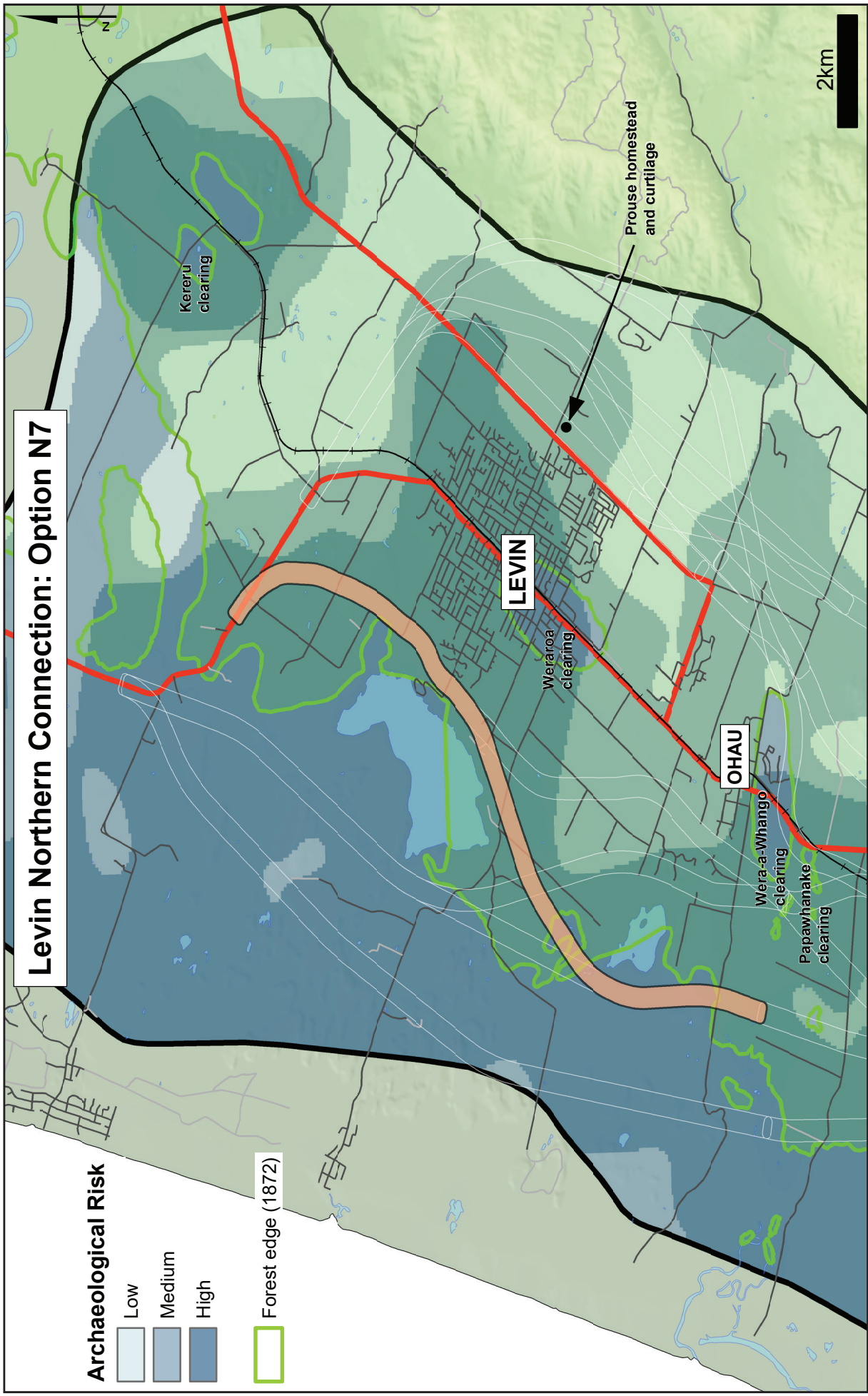


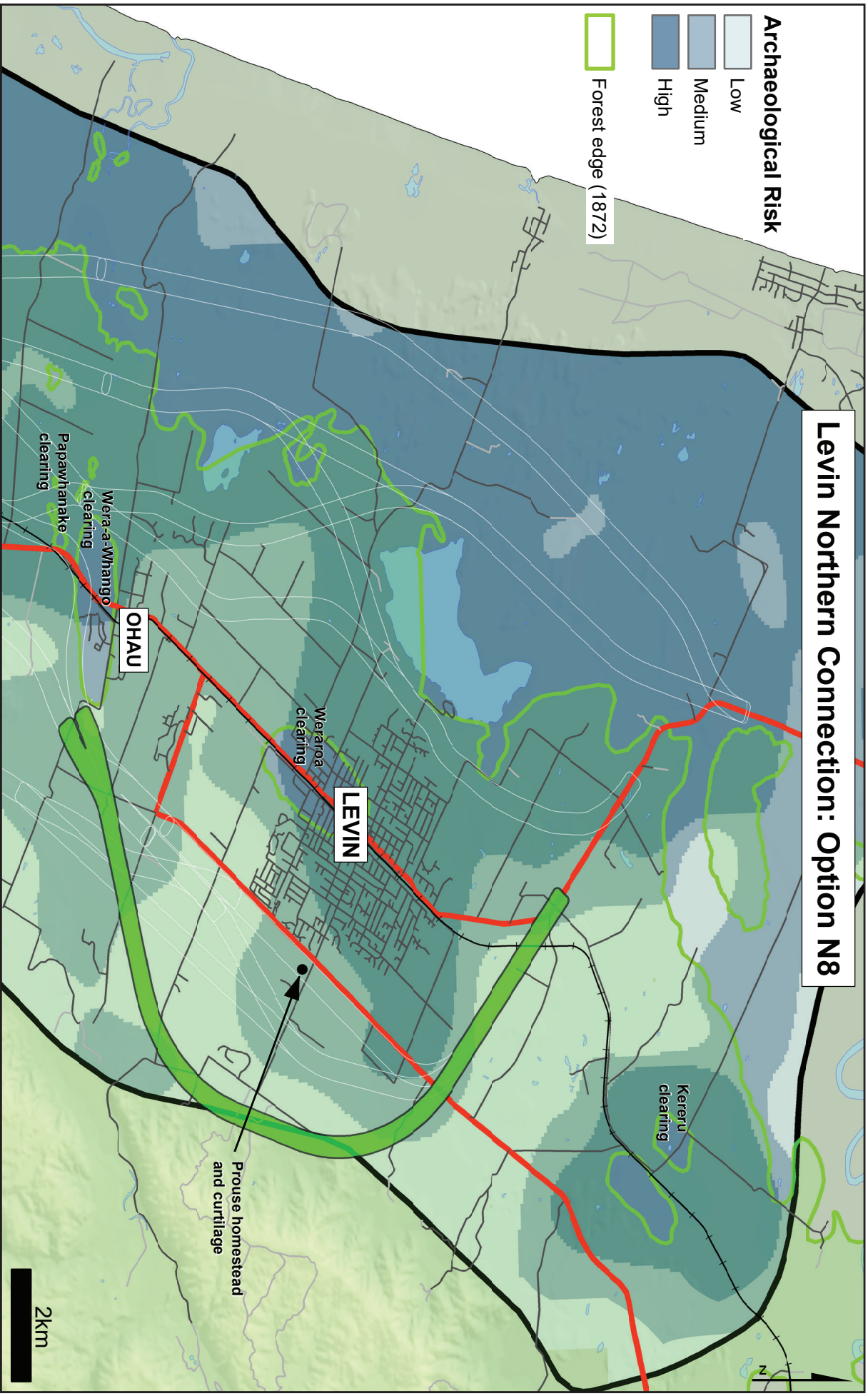


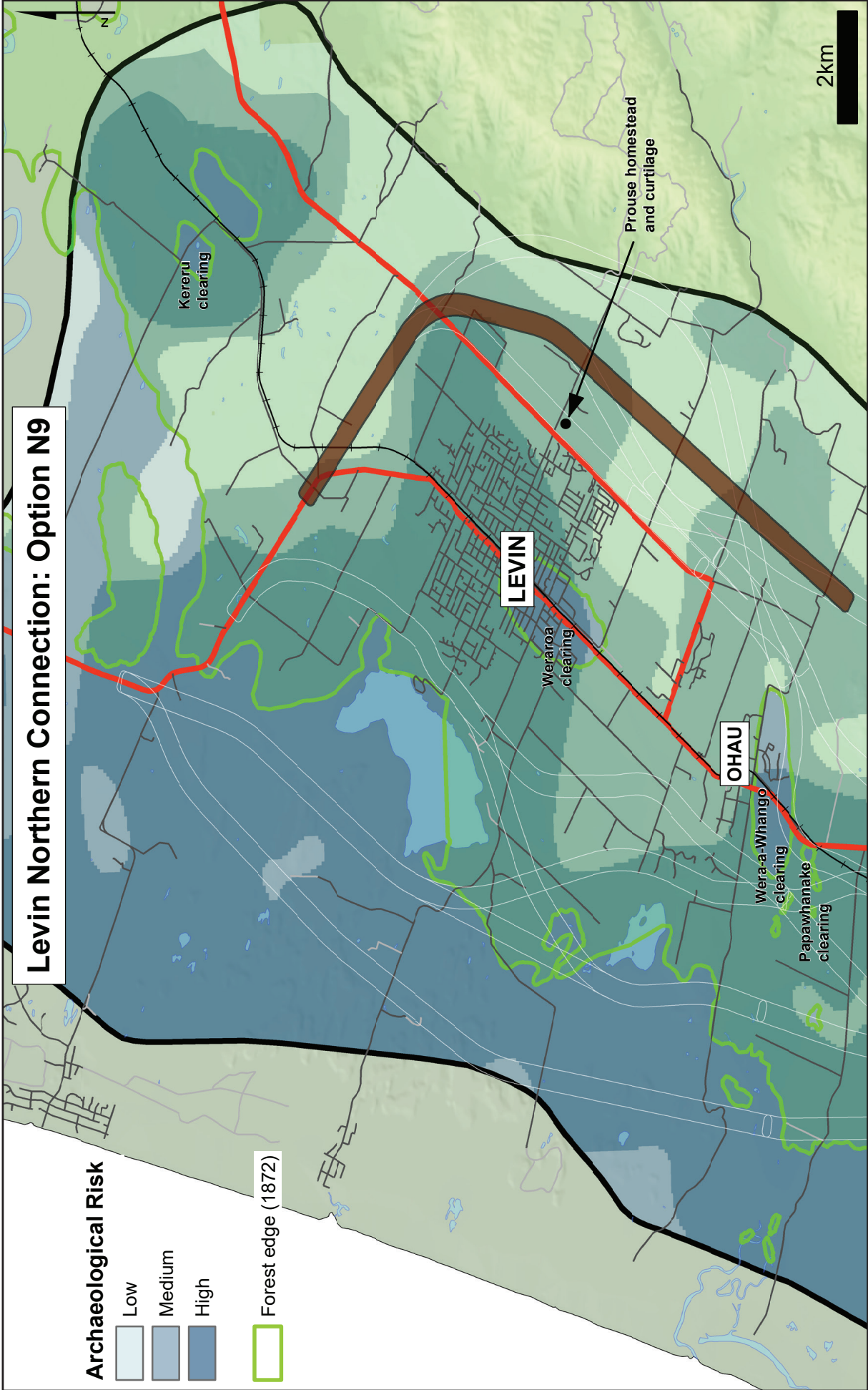












Appendix G **Tangata Whenua Values Workshop**
Background Notes

O2NL CULTURAL - MULTI CRITERIA ANALYSIS (MCA)

A mana whenua perspective on imperatives to this MCA process:

The *Ōtaki to North Levin Project (O2NL)* seeks to incorporate manawhenua values in order to understand issues and opportunities for inclusion in the design, construction, operation as well as the maintenance of this project. In this context NZTA has been investigating four key aspects; economic, social, cultural as well as environmental – these are terms that align with the holistic wellbeing in the intergenerational succession for Ngāti Raukawa and Muaūpoko iwi entities engaged with the emerging relationships for the O2NL project.

The inclusion of the listed iwi/hapu entities as 'Treaty partners' to the NZ Transport Agency adds both richness as well as complexity. The overarching aim is *to increase real, per capita human welfare resulting in wellbeing* through the O2NL project development. The accrued outputs from this emerging relationship are expected to create genuine benefits on a continuing basis, consistent with the agreed cultural, economic, environmental and social objectives.

Disclaimer

This MCA Cultural Report provides a high-level overview of cultural perspectives associated with the various O2NL route options as set out in appendix 1. This should not be interpreted as being the single iwi input into the O2NL project or representative of the entire Manawhenua view. Further work with Manawhenua throughout the route selection process is intended.

Definitions/Meanings that Apply:

Manawhenua	Also referred to as iwi and hapū, a term used to describe Māori who have tribal links the Kapiti Coast
Cultural values	The relationship of and their culture and traditions with their ancestral land, water, sites, wāhi tapu, and other taonga and areas of protected customary rights.
Cultural Landscape	Cultural landscapes are landscapes that have been affected, influenced, or shaped by human involvement. A cultural landscape can be associated with a person or event.
Moana/Awa/Roto/	Water bodies rivers, lakes, ocean, native bush stands of cultural value Ngahere
Wāhi Tapu	Wāhi tapu means a place sacred to Māori in the traditional, spiritual, religious, ritual, or mythological sense.
Urupā	Urupā reservations (Māori burial grounds) have a special status in legal terms as well as having family, spiritual, cultural and historical importance.
Māori Freehold Title	Māori customary land that had not been alienated and appointed (up to) ten Māori individuals into joint ownership.
Māori Reservations	Reservations may be set aside over land that is culturally, spiritually or historically significant to Māori. Common purposes include, papakāinga Marae and burial grounds

Introduction:

Manawhenua participation at MCA workshop 2 included representation from Ngāti Raukawa hapu Ngāti Wehiwehi and Ngāti Tukorehe. Muaūpoko Tribal Authority (MTA) was also in attendance.

The workshop opened with a karakia from Lindsey Poutama. An overview of the purpose of the workshop followed by a discussion of the various alignment options to be assessed. The participants were then asked to provide a perspective on options considered to be fatally flawed.

Representatives from Ngāti Raukawa and Muaūpoko suggested that a number of western alignment options are fatally flawed because they cross the edge of Lake Papaitonga as well as a number of potential impacts on urupa. It was also noted that Lake Horowhenua is expected to be given special status through Treaty of Waitangi processes similar to the recognition/personification status afforded to the Whanganui River. This cannot be reflected in a MCA score of 5 (fatal flaw), and therefore options impacting on the Lake may fit this criteria. These matters are explored in more detail in the following sections of this report.

Option Assessment - Cultural

In advance of providing scoring for the various alignment options Manawhenua representatives stressed the importance of understanding that their assessment of cultural values and impacts will be benchmarked against the four wellbeing's namely;

- (1) Cultural integrity
- (2) Environmental sustainability
- (3) Economic wellbeing, and
- (4) Social benefit.

These concepts were, however, evaluated in terms of the concepts of Cultural Landscape, presence/absence of wāhi tapu, and impacts on Māori land (see headings in table below).

The 4 wellbeing's, whilst not assessed individually for each alignment option i.e. S1-S8 and N1-N9 have helped to inform the scoring set out in the following tabulation. Further work with Manawhenua is recommended to extrapolate the pro's and or con's associated with the scoring particularly for alignment options west of SH1 Levin.

The specialist introduction at the beginning of the workshop noted that options west of the current SH1 are fraught from a Manawhenua perspective. This is largely due to the presence of sites of wāhi tapu significance (urupa etc) and other important cultural sites in the area, a further complicating factor is the presence of Māori land blocks –Māori freehold title and potential for impacts in Māori reservations. Further research is recommended to determine location, extent, status of governance arrangements of Māori land blocks. This will help identify/mitigate any potential legal challenges, ref; *Grace– Ngarara West A25B2A (2014) 317 Aotea MB 268 in the Māori Land Court; and Grace v Minister of Land Information [2014] NZEnvC 82 in the Environment Court.*

The eastern options were explained as being of less concern to Manawhenua. While there are areas of concern, these tend to be more readily mitigated than is the case west of SH1. It was also noted that an expressway could generate issues of a social/economic nature for Manawhenua particularly impacts on Māori commercial property as well as Māori enterprise in Levin i.e. agricultural etc. As noted, further work is required to understand these matters.

Scoring Methodology:

The agreed approach between representatives from Manawhenua was for Ngāti Raukawa (Ngāti Wehiwehi and Ngāti Tukorehe) to score the southern alignment options (each providing their own scores for options) and Muaupoko the northern options. Further discussion with Ngāti Raukawa hapu on options will occur on 19 October 2017.

SOUTHERN SECTIONS				
Option	Cultural Landscape/Environmental	Wāhi Tapu	Māori Land	Overall Score
S1	High Concern – crossing Ōhau/Waikawa Rivers sedimentation, food gathering areas.	High Potential for impact on pa sites and urupā	High Clusters of Māori land	4/5
S2	High As above	High As above	High As above	5/5
S3	High As above	High As above	High As above	5/5
S4	Moderate Some concern re; water quality	Low No known urupa	Low No identified Māori land blocks	3/4
S5	Moderate Cuts off two parts of Manakau – already severed, but this is worse	Moderate Unknown but potential for impacts	Moderate	4/4
S6	Low	Low No known urupā	Low No identified Māori land blocks	2/2
S7 & S7a	Moderate More work required	Moderate Unknown but potential for impacts	Moderate	3/3
S8	High More work required	High More work required	High More work required	5/5

NORTHERN SECTIONS				
Option	Cultural Landscape/Environmental	Wāhi Tapu	Māori Land	Overall Score
N1	High Proximity to lakes Papaitonga and Horowhenua – water quality and ecological impacts.	High Potential for impact on pa sites and urupā	High Clusters of Māori land	5
N2	High Proximity to lakes Papaitonga and Horowhenua – water quality and ecological impacts.	High Potential for impact on pa sites and urupā	High Clusters of Māori land	5
N3	High Proximity to lakes Papaitonga and Horowhenua – water quality and ecological impacts.	High Potential for impact on urupā	High Clusters of Māori land	5
N4	Moderate	Low	Low	3
N5	Moderate	Low	Low	3
N6	High Water body and ecological impacts	High Potential for impact on pa sites and urupā	High Clusters of Māori land	5
N7	High Same as above	High Same as above	High Same as above	5
N8	Moderate	Moderate Foothills area potential for impacts	Moderate	3
N9	Moderate	Moderate Same as above	Moderate	3

Discussion:

S1-8 Alignment Options

The scoring as provided by Manawhenua identified significant cultural constraint for all options west of SH1. Options S1, S2, S3, S4, S5 and S8 were scored 5 primarily due to the significant amount of Māori freehold land and the significant number of easements registered against titles. S6 and S7 were scored lower due to lower concentrations of Māori freehold properties. However, these options do not contain the easement issues associated with options such as S1 and S2.

There are impacts on cultural/heritage sites. The archaeologist introduction noted that the forest line from 1872 is key to the distribution of sites of significance to iwi. Prior to that date, land east of the forest line was mainly covered in forest, although there were some larger clearings for cultivation purposes. The forested areas were less densely occupied than the dune lands closer to the coast and the clearings. The coastal and clearing areas that were more densely occupied are those areas where the highest number of archaeological sites have been found and can be expected to be uncovered in the future. In general terms, therefore the pattern of archaeological risk is that this increases further west, except in main clearing sites where early pakeha culture as well as Manawhenua traces could be expected. A couple of workshop participants queried if the western corridors were to be moved, would this reduce the cultural/heritage scores? It was suggested that while the corridors could be moved, this wouldn't reduce the cultural score, and the reason for this is shown in the discussions on the archaeological criterion.

Manawhenua also noted the potential water quality impacts of S1-S8 western options on Moana/Awa/Roto, water bodies, rivers, lakes of cultural importance this includes Ōhau/Waikawa rivers.

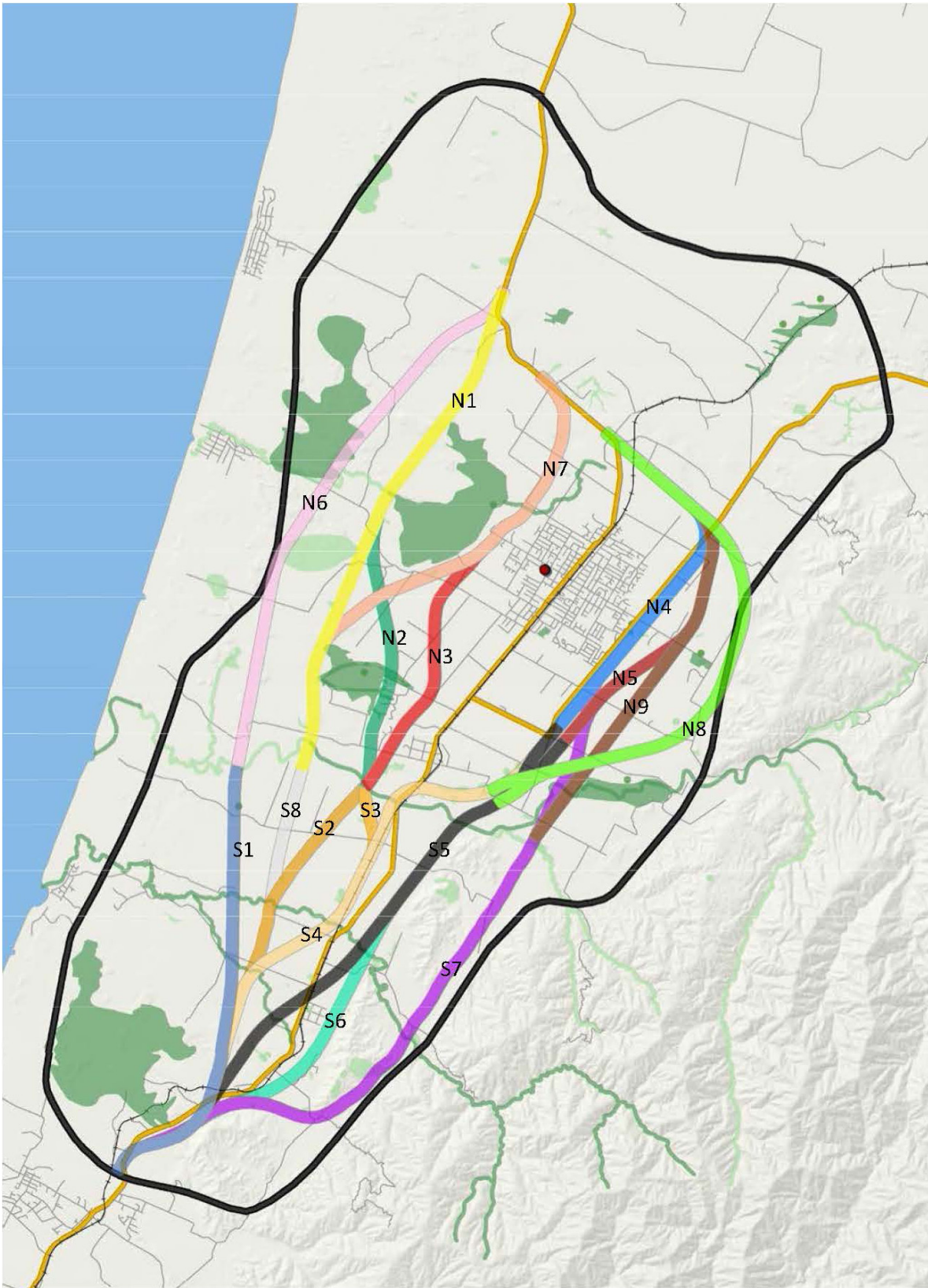
N1-9 Alignment Options

Alignment options N1, N2, N3, N6 and N7 generally scored at the higher end of the spectrum (i.e. larger numbers), as these options may require the alienation of Māori land. Additionally they all come within proximity to the Horowhenua/Papaitonga lakes. The lakes are governed by an independent governance entity - the Horowhenua Lakes Trust. Issues concerning the lake are coordinated through the Trust in accordance with regulations pursuant the *Te Ture Whenua Māori Act 1993*. Options N4, N5, N8 and N9 were scored moderately due to less impact on Māori land, wahi tapu and recorded cultural/heritage sites (archaeology) along these alignments.

Author Comment:

It is recommended that further work is undertaken once the preferred alignment options have narrowed to identify location and extent of Maori land blocks potentially affected. This should include analysis of governance structures/arrangements, land condition, legal status, commercial activities and valuation. This information will then help determine which alignment options are viable and also potential fatal flaws. A specialist or expert in Māori land law is required to undertake this work.

Further engagement with Ngāti Raukawa Manawhenua is recommended to assist in extrapolating issues pertaining to the MCA identification of cultural constraints and scoring. It is recommended that the MCA process is included as an agenda item for upcoming Ngāti Raukawa Hapu Integration Group (HIG) meetings for further discussion.



**Appendix H Productive Land Workshop Background
Notes**



Otaki to North Levin Road Realignment Productive Land Values

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September 2017
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1 CONCLUSIONS

In evaluating the options on productive land values, the following points are:

- Elite land/soils comprise of LUC classes I, II and III land. Protecting these resources is considered important as they are our most versatile and productive soils. Effectively they are a finite resource and if they are used for anything other than agricultural or horticultural production their versatility and productive values are lost for ever.
- In undertaking the analysis, the NZLRI database was used. This database was derived from 1:50,000 scale surveying which is sufficient at the district level and for this exercise. When extrapolated to the paddock scale there will be discrepancies. This is particularly so at the northern end of the study area where there are flat terraces dissected by small steep wet gully systems and in the sand country to the west where there is poor differentiation of the sand dunes and sand plains.
- The land resources vary significantly across the study area. Generally the western side of Levin is influenced more by wind-blown sand and peat, along with alluvium, alluvium over gravels and loess materials. The options on the eastern side of Levin are mostly alluvium, alluvium over gravels, loess over gravels or loess over unconsolidated sands. The soil types associated with the different options are influenced by the underlying geology. The better land is generally restricted to the alluvium and loess country. Slopes on the eastern side are mostly flat to undulating until the options past through the sedimentary country at the north or further to the east and here they are dominated by easy hill country. On the western side the presence of sand dunes further towards the coast can increase the slope. Those options closer to Levin on the western side are generally flat to undulating.
- There is very little difference in the impact on productive land (classes I to III) between the southern options heading west. When just the classes I and II are considered, option S8 has significantly less class I and II land compared to the other southern options going west. The southern options heading east tell a similar story of there being very little difference on the impact to class I to III land. When just class I and II land is considered then option S7 has significantly less highly productive land compared with the other options.
- On the northern side options N1, N2 and N6 have the least impact on productive land whilst options N8 and N9 are the most impactful.
- In terms of combinations of options, the combination of S8N6 is the least impactful on productive land, followed by S1N1, S2N2, and S3N2.
- All the analysis work has been undertaken on a 300 m corridor. In reality the width of this corridor will be approximately one third of this. This will have a huge impact to the area shown in this report compared to what will happen on the ground. What this means is, for example, the total options to the North West of Levin average about 346 ha under a 300 m width. This would actually be reduced to about 115 ha when this width is reduced to about 100 m. The area of classes I to III land for these four options averages 340 ha. With a reduced corridor width this total area is reduced to about 110 ha. In the overall scheme of things, the area of highly productive land that is affected is very small. The other route options to the south and west tell a similar story.
- No consideration as to the size of properties or the land uses were assessed as part of this analysis work due to the number of options on the table. It is however felt that those options that are associated with the east of Levin will dissect a greater number of lifestyle blocks compared with those options to the west. As a result it could be argued that where lifestyle blocks are located on highly productive land their productive

capability is quite often lost due to the fact that the land holding obtains income from external sources rather than the land or the area of productive land is reduced in size that it has become economically non-viable to maximise its productive potential. Further analysis of each option along with property boundaries and land covers would be required to dismiss this assumption.

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3 BACKGROUND INFORMATION

Over the last 4-5 years three stages were investigated for the realignment of State Highway 1 between Manakau through to north of Levin. These three stages included:

- Stage 1: Route options from Manakau to SH1/57 intersection (2013 & 2014)
- Stage 2: Routes from Otaki (Taylors Road) to SH1/57 (2014 & 2015)
- Stage 3: Routes from Otaki (Taylors Road) to north of Levin (Koputaroa Road) (2016 - ongoing)

For each stage various route options were investigated by a team of technical experts that considered landscape/visual, ecology, archaeology/heritage, cultural and tangata whenua values, and productive land values. I have been involved in stages 2 and 3 and tasked with the productive land values.

This report deals the area between Otaki to North Levin again but undertaken with greater community involvement. Some of the routes investigated in this report have been analysed before and some are new as a result of the consultation process with the community.

4 THE IMPORTANCE OF PRODUCTIVE LAND VALUES

Productive land values, particularly those from elite soils/land are recognised in the regional and district plans as important due to their level of high versatility and productive value. Elite soils/land is generally protected from activities other than intensive agricultural or horticultural production. Under the Landuse Capability classification system elite land are classes I, II and III land.

More often than not, urban subdivision for example, is steered away from the elite soils on to areas with less versatility and productive values. Roading should not be exempt from this approach. Elite soils are finite, and in our life time, they are no longer being made (or at least at a rate that is of productive use). This is the reason for some level of protection.

5 THE PROCESS USED

The most appropriate approach when considering the impact to the productive land value from the various route options is to analyse the land according to the Landuse Capability Classification system. The Landuse Capability Classification system is described in the next section.

The process has generally been a desk top exercise using regional scale landuse capability and land resource inventory mapping generated at 1:50,000 scale. Knowledge of the area from private paddock scale soil and landuse capability mapping within the study area has provided the opportunity to validate the broader scale mapping information in places.

Using the regional scale mapping we can determine the impact of the different routes on the different landuse capability classes. In short, the route options that have a lower impact on the more elite soils/land (landuse capability classes I, II, and III) will have less impact on the productive land values.

6 LANDUSE CAPABILITY AND LAND RESOURCE INVENTORY

The land resources in the region have been obtained from the NZLRI (New Zealand Land Resource Inventory). This survey was published at 1:50,000. The 1:50,000 scale information is adequate for this level of analysis but caution is advised if small individual property owners try to extrapolate this information to the paddock scale.

The land resource inventory (LRI) system involves mapping landscape units according to five inventory factors. These include rock type, soil unit, slope class, erosion type and severity, and vegetation.

From the LRI assessment, the area is then classified into land use capability (LUC) classes according to the level of limitations present for productive use. LUC classes range from class I land (elite land) through to class VIII land. LUC classes I to IV is considered suitable for arable and vegetable cropping, horticulture, intensive pastoral farming or production forestry. Class I land is the elite land with very little limitation to productive use. As you go from class I to class IV the level of limitations increase whilst the versatility decreases. Classes V, VI and VII have greater physical limitations and the level of land use intensity decreases significantly. Class VIII land has no productive value and is generally catchment protection land.

The LUC classes are then further broken down according to the most dominant limitation to production. These limitations include erosion, wetness, soil or climate.

Finally the LUC unit is derived from a combination of the LUC class and subclass along with the five land resource inventory factors. Hence it groups land with similar productive capability, levels of limitations, and land resource inventory factors.

The extent of the soils, rock and slope classes along with the LUC units and classes are shown in Appendix 1. Appendix 3 provides a legend for the symbols used on the maps and Appendix 4 describes the LUC units present.

7 OVERVIEW OF LAND RESOURCES IN THE STUDY AREA

Landuse Capability and Land Resource Inventory Maps are shown in Appendix 1 and with definitions in Appendix 3 and 4. The main points to note from these maps for the southern options include:

The southern options can be split into those options that head towards the western side of Levin and those that head towards the eastern side of Levin. In doing so, the areas associated with the options for the two groups are more closely aligned. From this it is noted that:

1. Options heading west of Levin (options S1, S2, S3, & S8)
 - The total areas for these four options range from 322 ha (Option S8) through to 346 ha (Option S3). S8 has the least land but this option ends up in the flood prone areas.
 - The slope classes between these options are fairly similar with around 90% flat to undulating, 9% rolling to strongly rolling and the remaining area hill country.
 - The geology changes slightly between the options with mostly alluvium, alluvium over gravels, loess over gravels or loess over unconsolidated sands. From a road building perspective option S8 does have significant areas of peat, peat and wind-blown sand, or alluvium over peat (about 46 ha or 14% of the area).
2. Options heading east of Levin (S4, S5, S6 & S7)
 - The options heading east are significantly longer than those heading west for the southern area. The total area for these four options range from 495 ha (Option S5) through to 553 ha (Option S7).
 - Generally the underlying geology is loess or alluvium over gravels or weakly consolidated sandstone.

- Slope classes can vary between options with S7 having around 69% flat to undulating and the other options range between 84% and 90%. The difference between S7 and the other options is that S7 has more rolling to strongly rolling country and slightly more hill country.

The northern options can also be split between the west and the east.

1. Options heading west of Levin (options N1, N2, N3, N6 & N7)
 - The areas range from 334 ha (option N3) through to 401 ha ((option N6).
 - The underlying geology varies significantly between the blocks. About 79% of option N6 is wind-blown sand flats and dunes and the rest is mostly peat dominated in the low lying areas between the dunes. Option N1 also has about 60% wind-blown sands and 15% peat dominated soils. Option N3 is dominated by loess, alluvium or alluvium over gravels. Option N7 has a significant area of peat (about 25%).
 - Options N1, N2 and N6 generally head for the flood prone land to the north.
 - All of the options except option N6 have all land less than 20 degrees. Option N6 is mostly rolling to strongly rolling (61%) and this reflects its location through the dune fields. The majority of options N3 and N7 are flat to undulating (92% each).
2. Options heading to the east of Levin (N4, N5, N8, & N9)
 - The areas range from 274 ha (option N4) through to 432 ha (option N8).
 - Options N4, N5 and N9 are virtually 100% flat to undulating. Option 8, which runs the closest to the ranges has 86% flat to undulating and 6% is classified as hill country. The rest is rolling to strongly rolling.
 - The underlying geology is mostly loess or alluvium over gravels.

8 IMPACT ON PRODUCTIVE LAND

Table 1 below shows the breakdown of LUC class for each option. Appendix 2 shows the route maps for each option and the land use capability classes along the routes. Also shown on Table 1 below is the MCA scoring for productive land.

Table 1. The breakdown of LUC classes along each option.

Option	LUC Class						Total Area (ha)	Total area for LUC classes 1-3 (ha)	Total area for LUC classes 1-2 (ha)
	1	2	3	4	6	7			
N1	0	68.1	192.1	44.1	64.1	0	368.4	260.2	68.1
N2	37.7	61.7	202.0	15.9	54.7	0	372.0	301.4	99.4
N3	151.6	75.9	99.5	7.3	0	0	334.2	326.9	227.5
N4	122.0	56.6	95.0	0	0	0	273.6	273.6	178.6
N5	127.4	56.6	109.5	0	0	0	293.5	293.5	184.0
N6		9.0	106.4	24.8	245.8	15.4	401.3	115.3	9.0
N7	70.1	84.6	167.9	34.4	7.9	0	364.9	322.6	154.7
N8	66.1	176.9	162.4	0	26.3	0	431.7	405.4	243.0
N9	124.3	89.5	138.8	0.4	0		353.0	352.6	213.8
S1	92.7	95.0	141.2	0	2.3	0	331.2	328.9	187.7
S2	130.9	71.7	128.7	3.0	2.3	0	336.7	331.3	202.6
S3	154.9	21.8	154.3	12.5	2.3	0	345.8	330.9	176.6
S4	194.6	48.6	244.6	10.0	2.3	0	500.1	487.8	243.2
S5	204.6	96.5	165.5	24.6	4.0	0	495.2	466.6	301.2
S6	127.1	80.3	268.5	26.0	7.8	0	509.8	475.9	207.3
S7	26.8	104.0	360.0	14.5	47.2	0	552.5	490.8	130.8
S8	69.4	46.1	200.2	1.5	4.5	0	321.7	315.7	115.5

Using the east and west of Levin differentiation again Table 1 above shows the following:

2. Southern options heading west of Levin (S1, S2, S3, & S8)
 - There is very little difference between the options for land that has been classified as classes I to III land – 331 ha for S8 to 353 ha for option S3.
2. Southern options heading east of Levin (S4, S5, S6 & S7)
 - There is very little difference between the options for land that has been classified as classes I to III – 476 ha for S5 to 521 ha for option S4.
 - Since there is very little difference between LUC classes I to III for these options, it is worth considering the amount of land that is just classes I and II land. Option S7 (136 ha) has significantly less class I and II land compared with the other options. The difference is made up from additional class III land.
3. Northern options heading west of Levin (N1, N2, N3, N6 & N7)
 - Option N6 has significantly less class I and II land and I-III land compared with the other options and N1 has the second least amount of productive land.

- Options N3 and N7 have significantly more classes I and II land compared with the other options
4. Northern options heading to the east of Levin (N4, N5, N8, & N9)
- Options N8 and N9 have significantly more productive land compared with options N4 and N5.

9 OPTION SCORING

The scoring system used to assess the options is shown in Table 2 below.

Table 2. The scoring system.

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.

Each option was assessed using the above criteria and the results of this are shown in the Table 3 below.

Table 3. Option scoring.

Northern Options		Southern Options	
Option	MCA scoring	Option	MCA scoring
N1	2	S1	3
N2	2	S2	3
N3	3	S3	3
N4	3	S4	4
N5	3	S5	4
N6	2	S6	4
N7	3	S7	3/4*
N8	4	S8	2
N9	4		

[* Authors comment: The agreed workshop scoring was 4 and the score recommended by the author at the workshop was 3. In review of this the author feels it could be a 3 or a 4.]

Table 3 above shows the following:

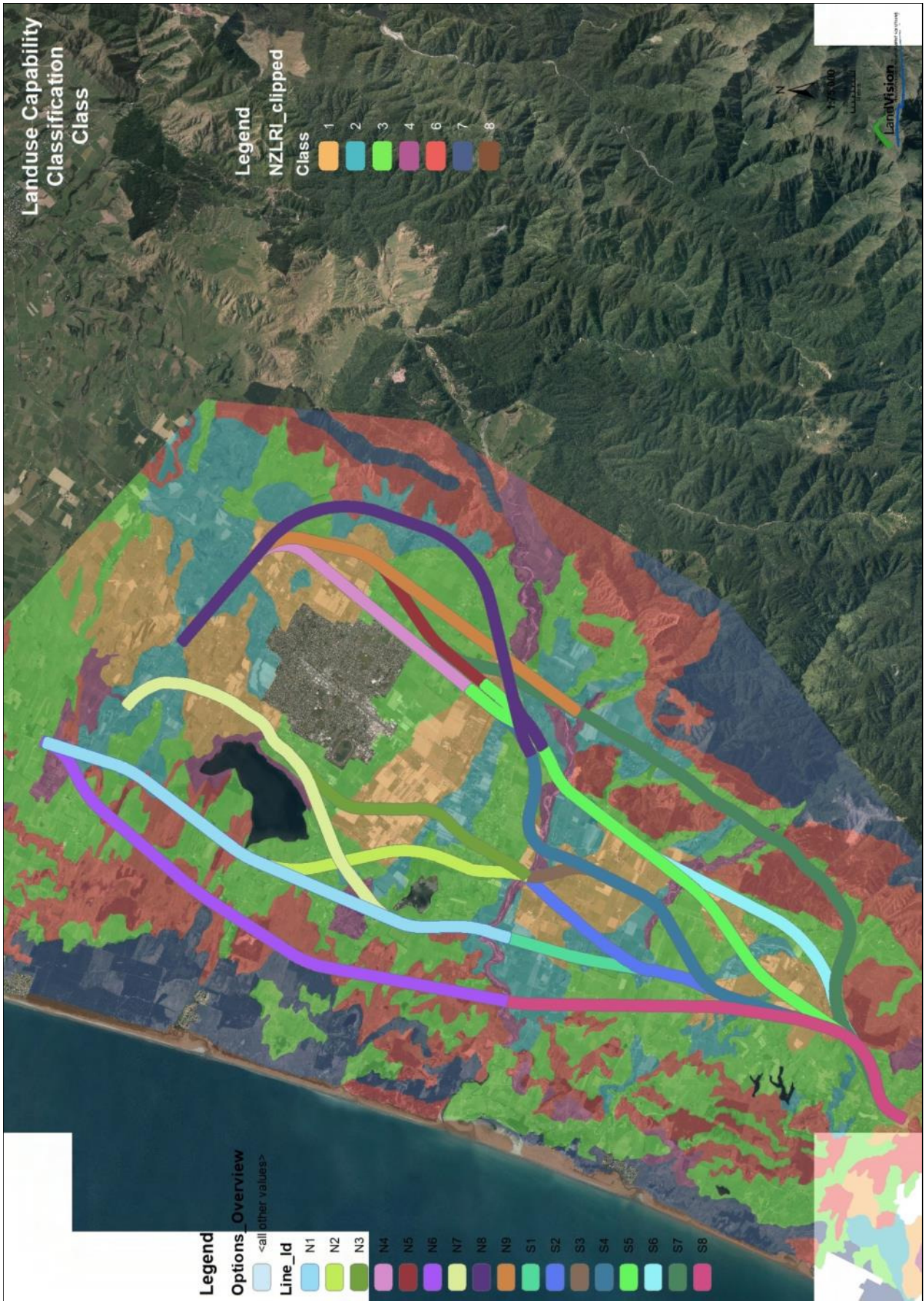
1. That the least impactful southern option is S8 followed by options S1, S2, and S3. All these options channel towards the western side of Levin. There is no difference in the scoring for any of the options channelling through the eastern side of Levin and these have all been scored as most impactful.
2. On the northern side options N1, N2 and N6 have the least impact on productive land whilst options N8 and N9 are the most impactful.
3. In terms of combinations of options, the combination of S8N6 is the least impactful on productive land, followed by S1N1, S2N2, and S3N2.

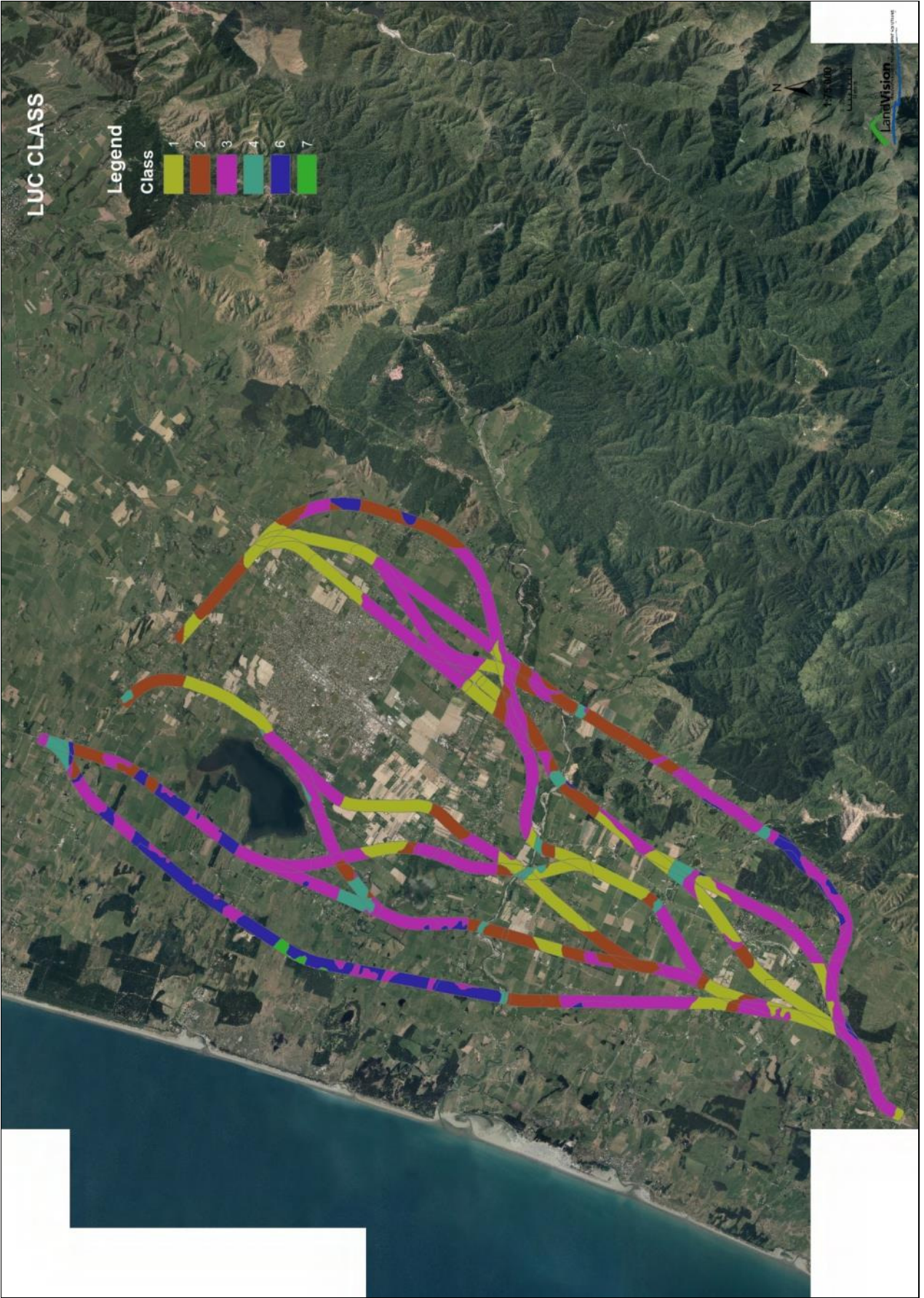
10 OTHER POINTS TO CONSIDER

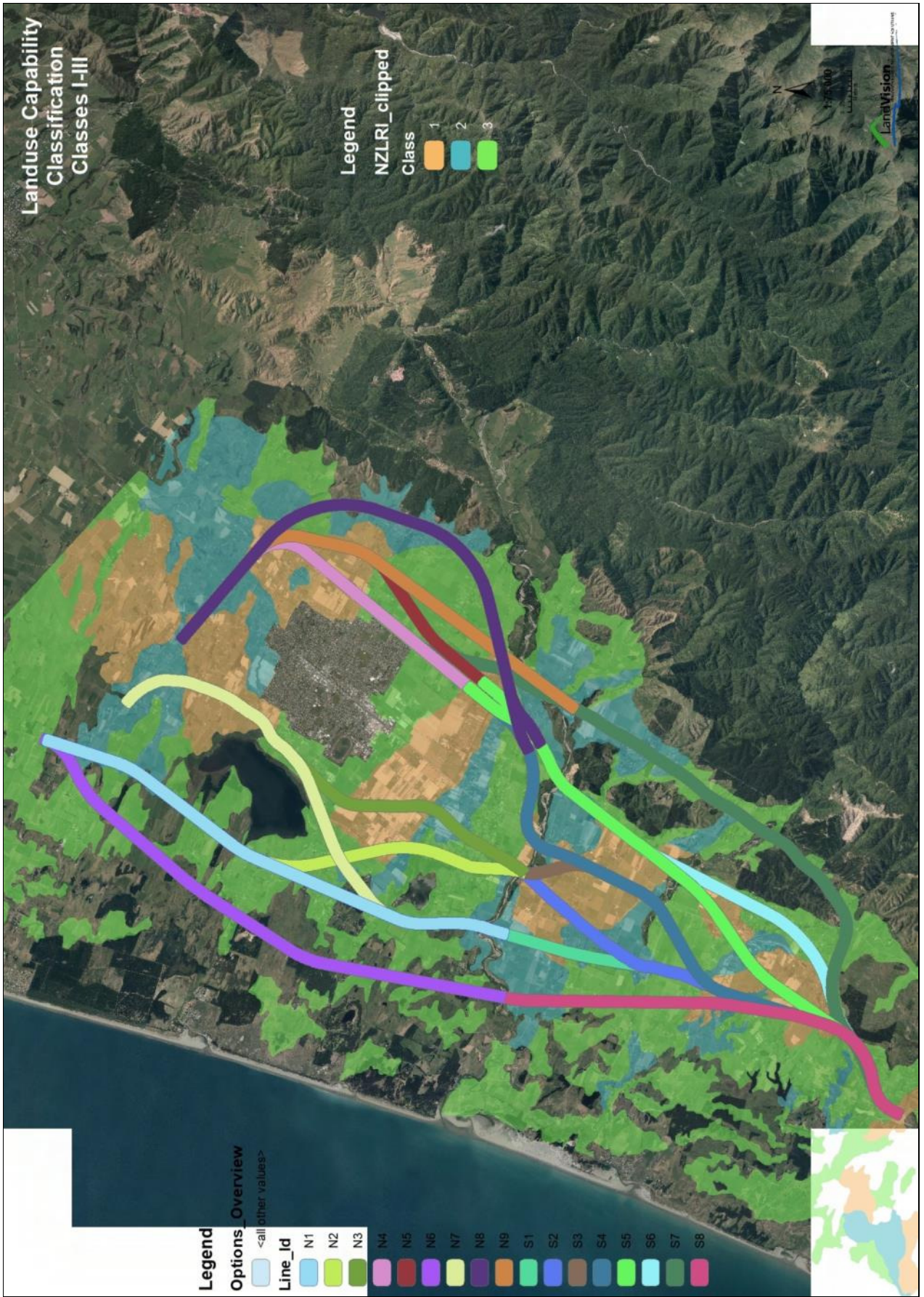
The following points should not be overlooked when determining the most appropriate option for any new road corridor:

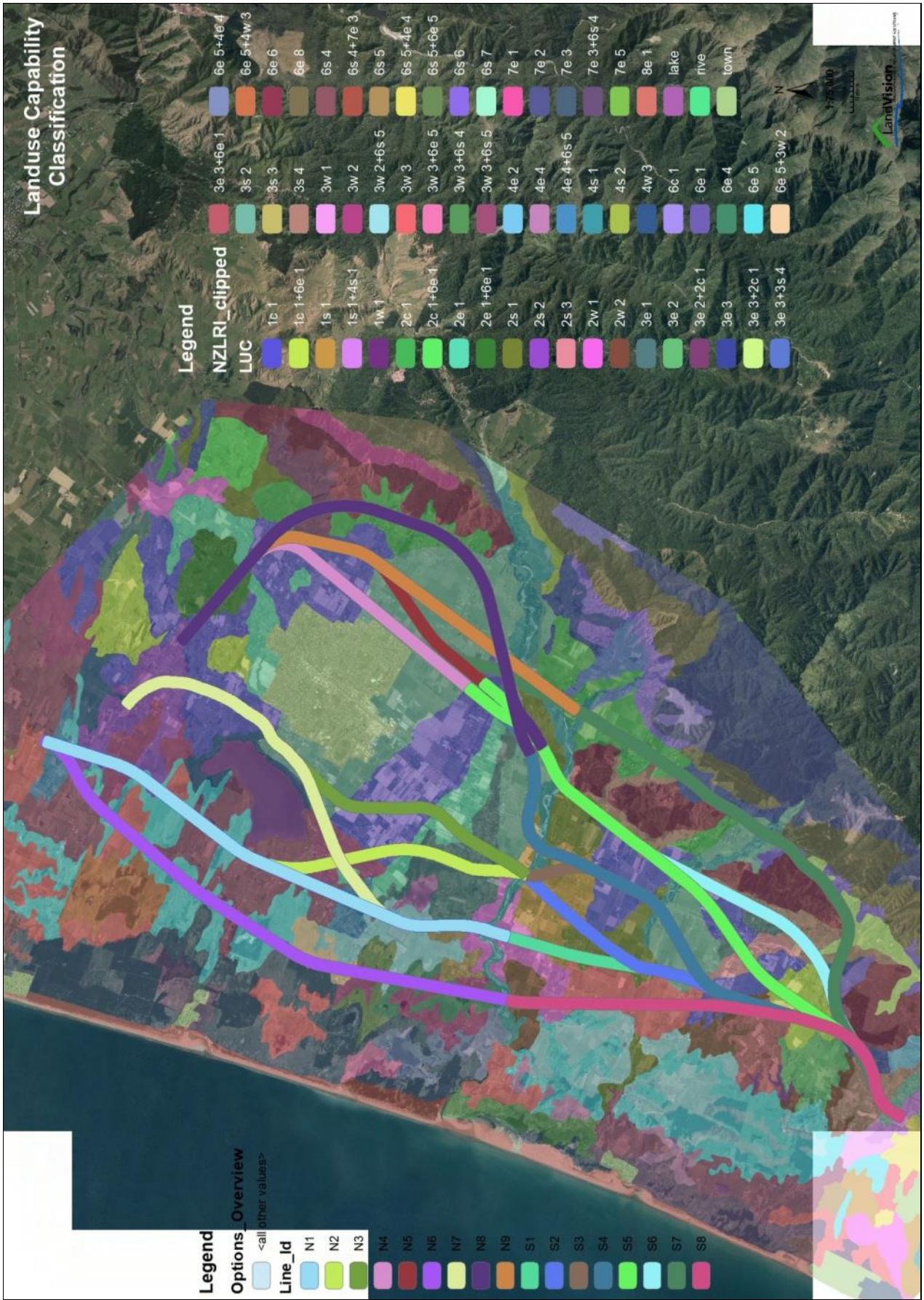
1. All the analysis work has been undertaken on a 300 m corridor. In reality the width of this corridor will be approximately one third of this. This will have a huge impact to the area shown in this report compared to what will happen on the ground. What this means is, for example, the total options to the North West of Levin average about 346 ha under a 300 m width. This would actually be reduced to about 115 ha when this width is reduced to about 100 m. The area of classes I to III land for these four options averages 340 ha. With a reduced corridor width this total area is reduced to about 110 ha. In the overall scheme of things, this area of highly productive land is very small when kept in perspective. The other route options tell a similar story.
2. No consideration as to the size of properties or the land uses were assessed as part of this analysis work due to the number of options on the table. It is however felt that those options that are associated with the east of Levin will dissect a greater number of lifestyle blocks compared with those options to the west. As a result it could be argued that where lifestyle blocks are located on highly productive land their productive capability is quite often lost due to the fact that the land holding obtains income from external sources rather than the land or the area of productive land is reduced in size that it has become economically non-viable to maximise its productive potential. Further analysis of each option along with property boundaries and land covers would be required to dismiss this assumption.

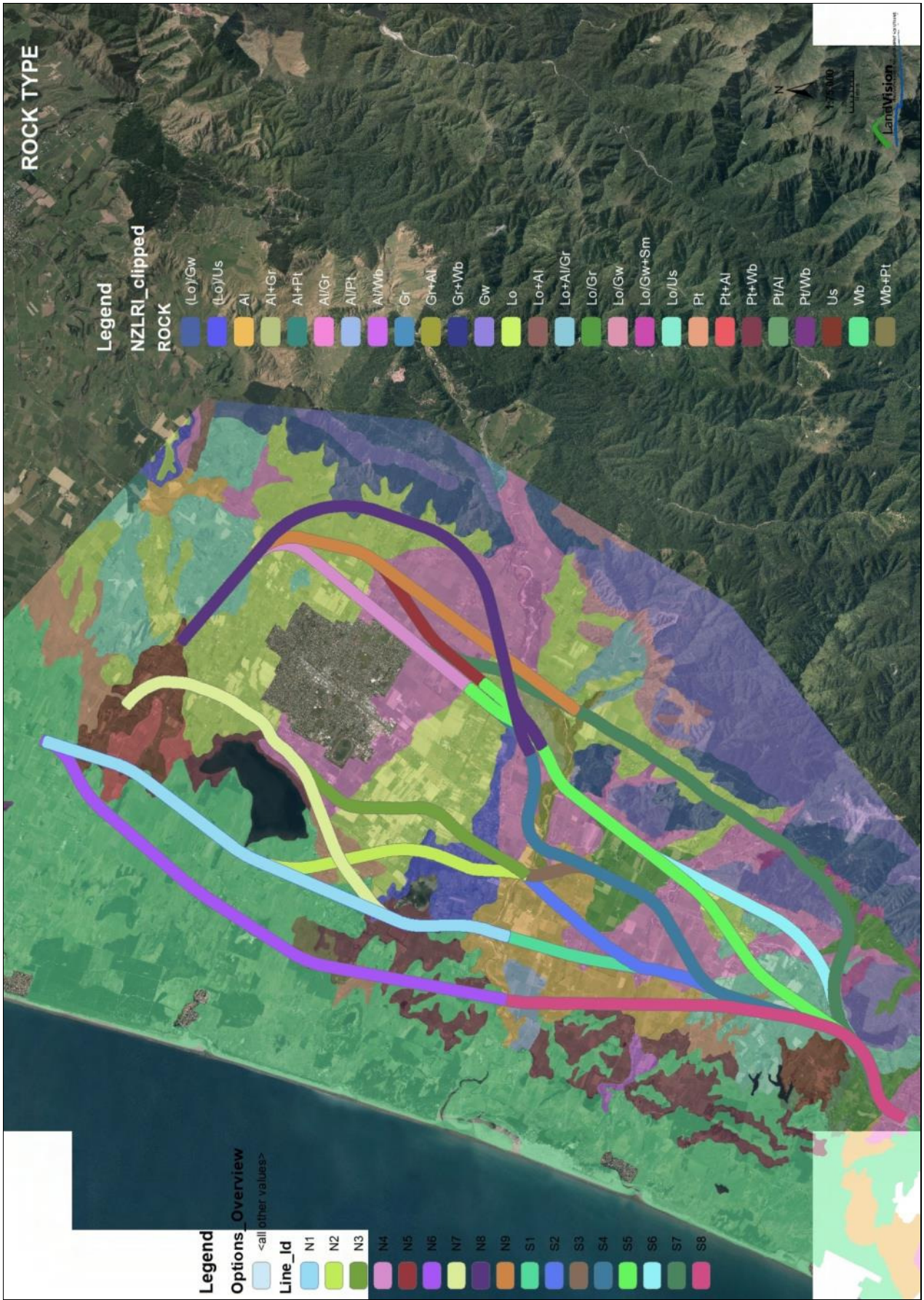
11 APPENDIX 1: LAND RESOURCES

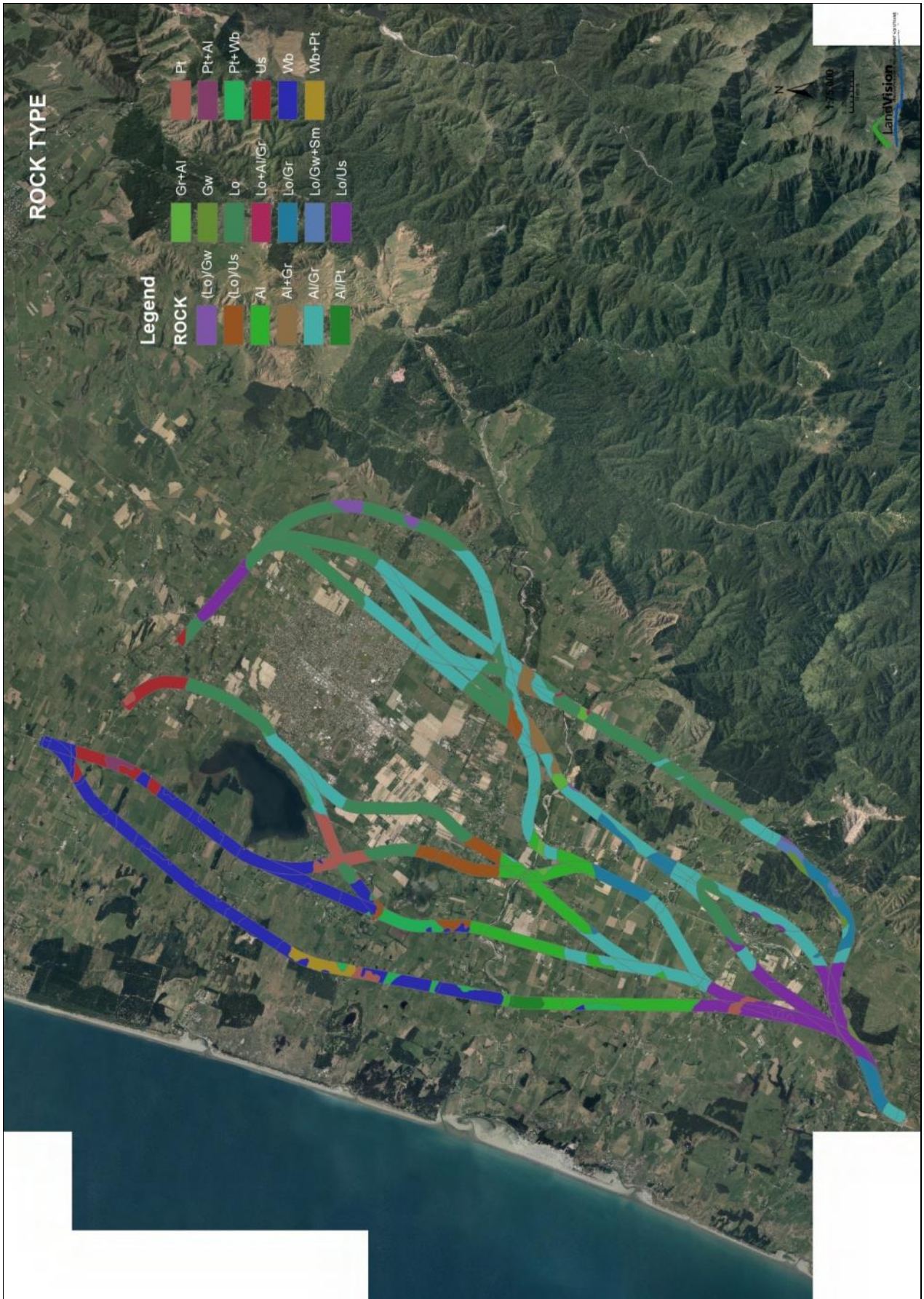


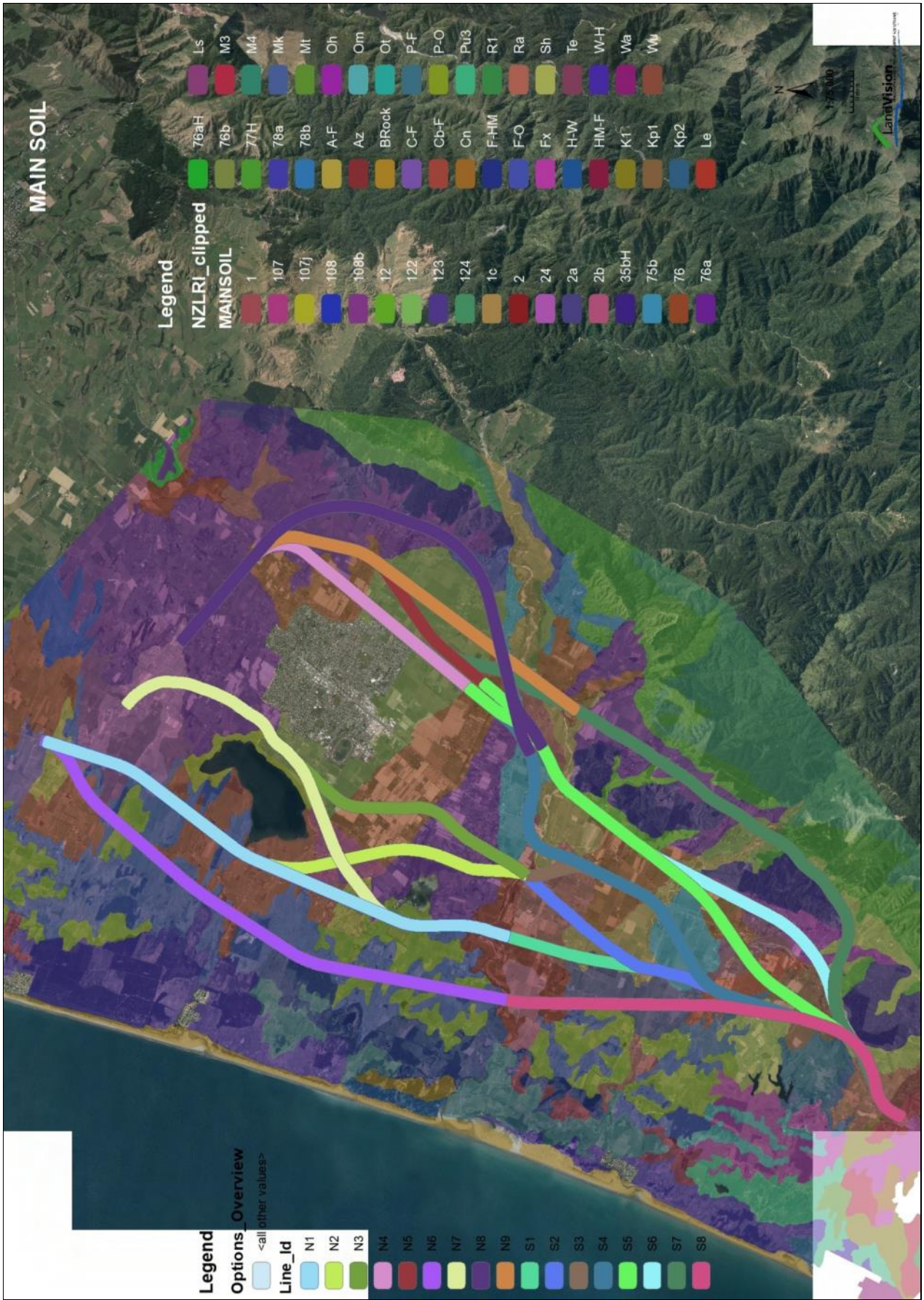


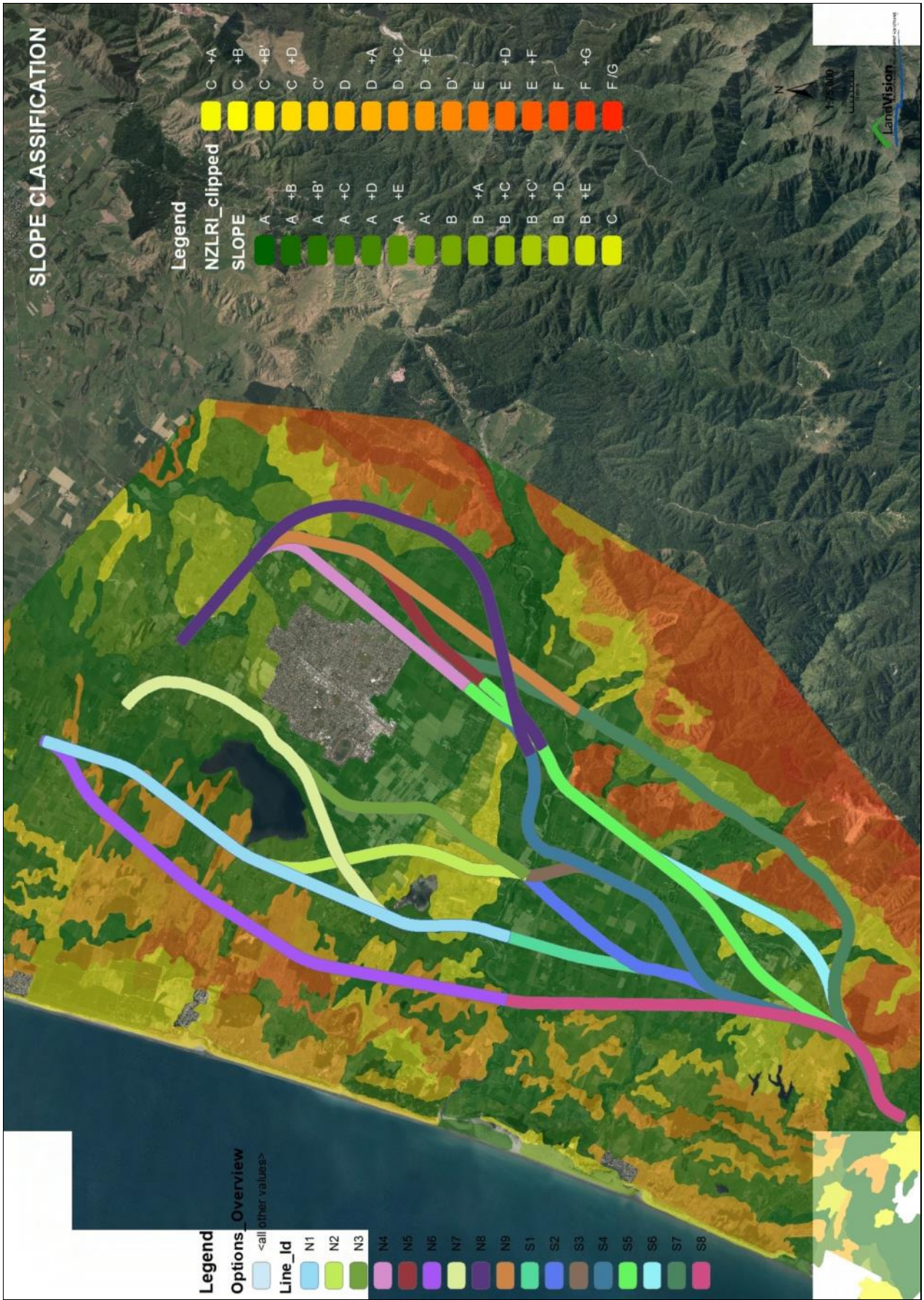


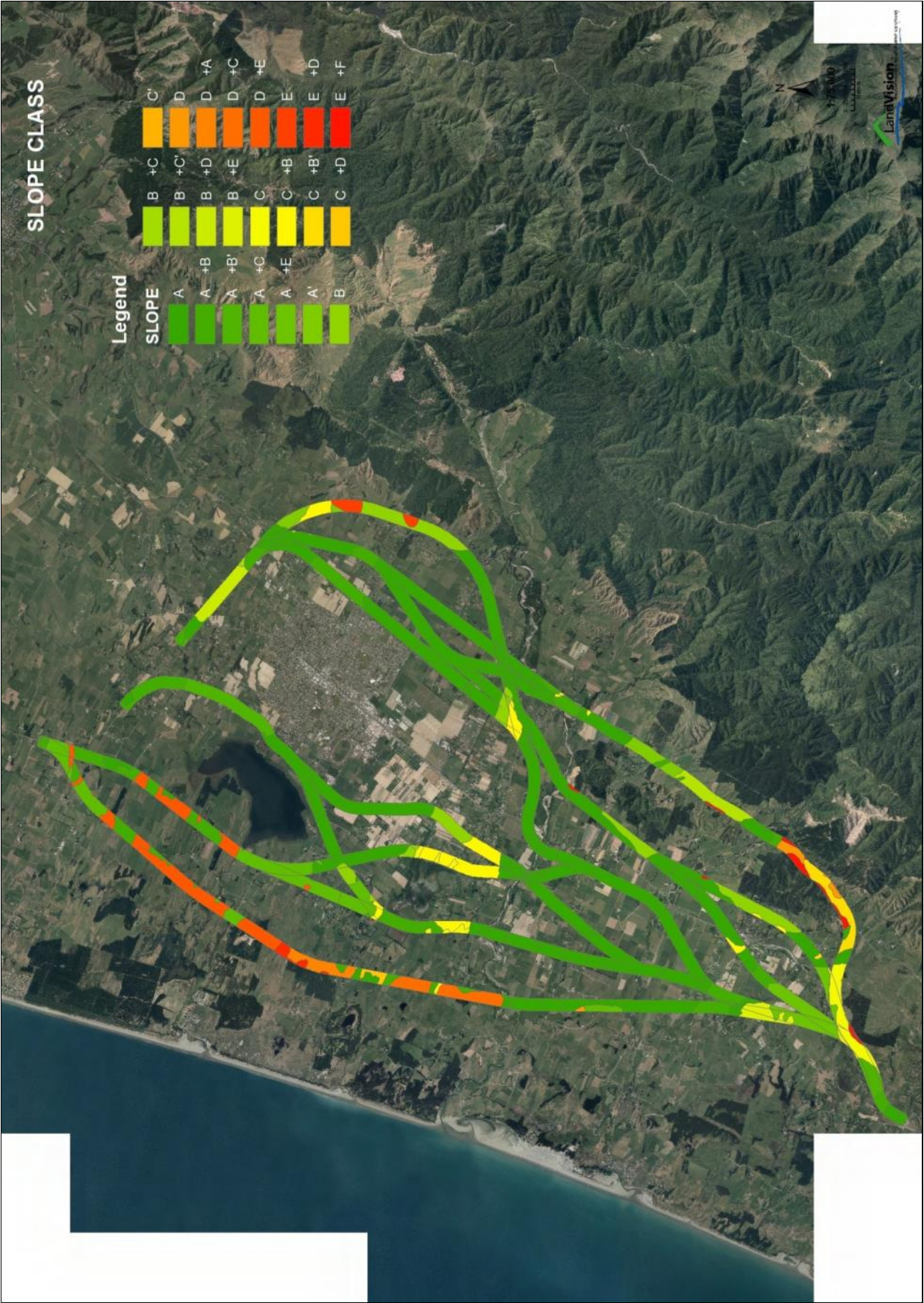












12 APPENDIX 2: ROUTE OPTIONS OVER STUDY AREA

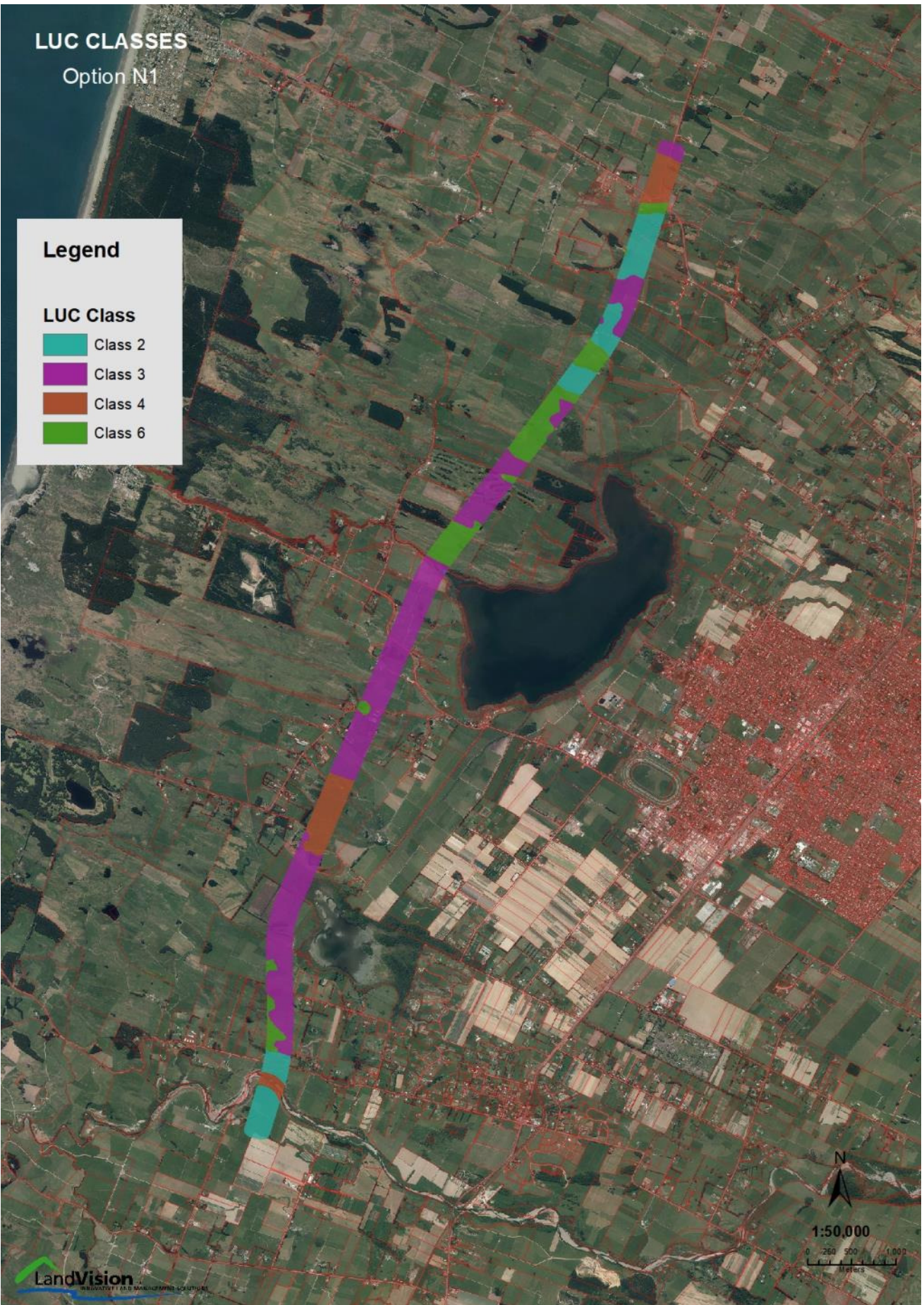
LUC CLASSES

Option N1

Legend

LUC Class

-  Class 2
-  Class 3
-  Class 4
-  Class 6

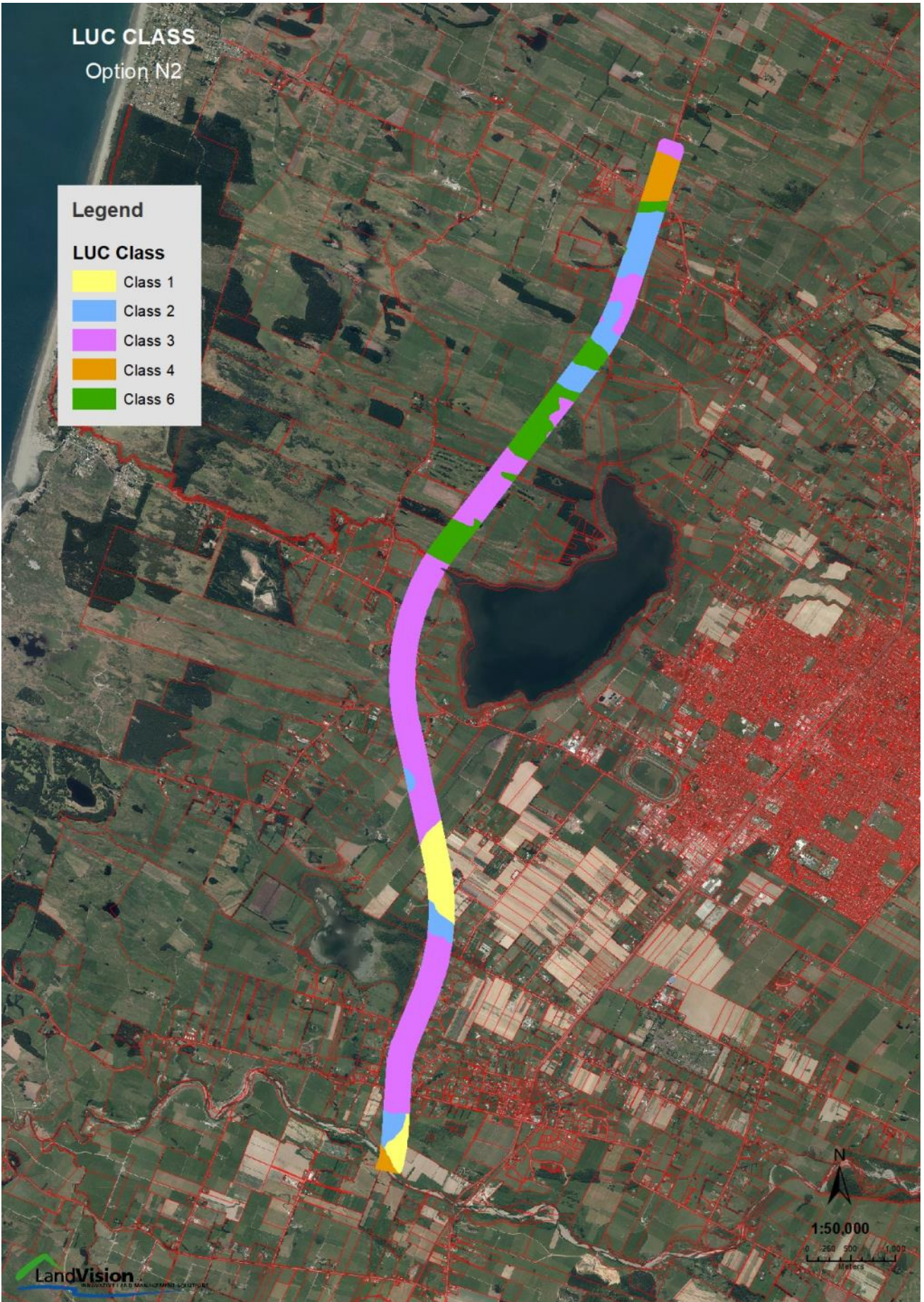


LUC CLASS
Option N2

Legend

LUC Class

- Class 1
- Class 2
- Class 3
- Class 4
- Class 6



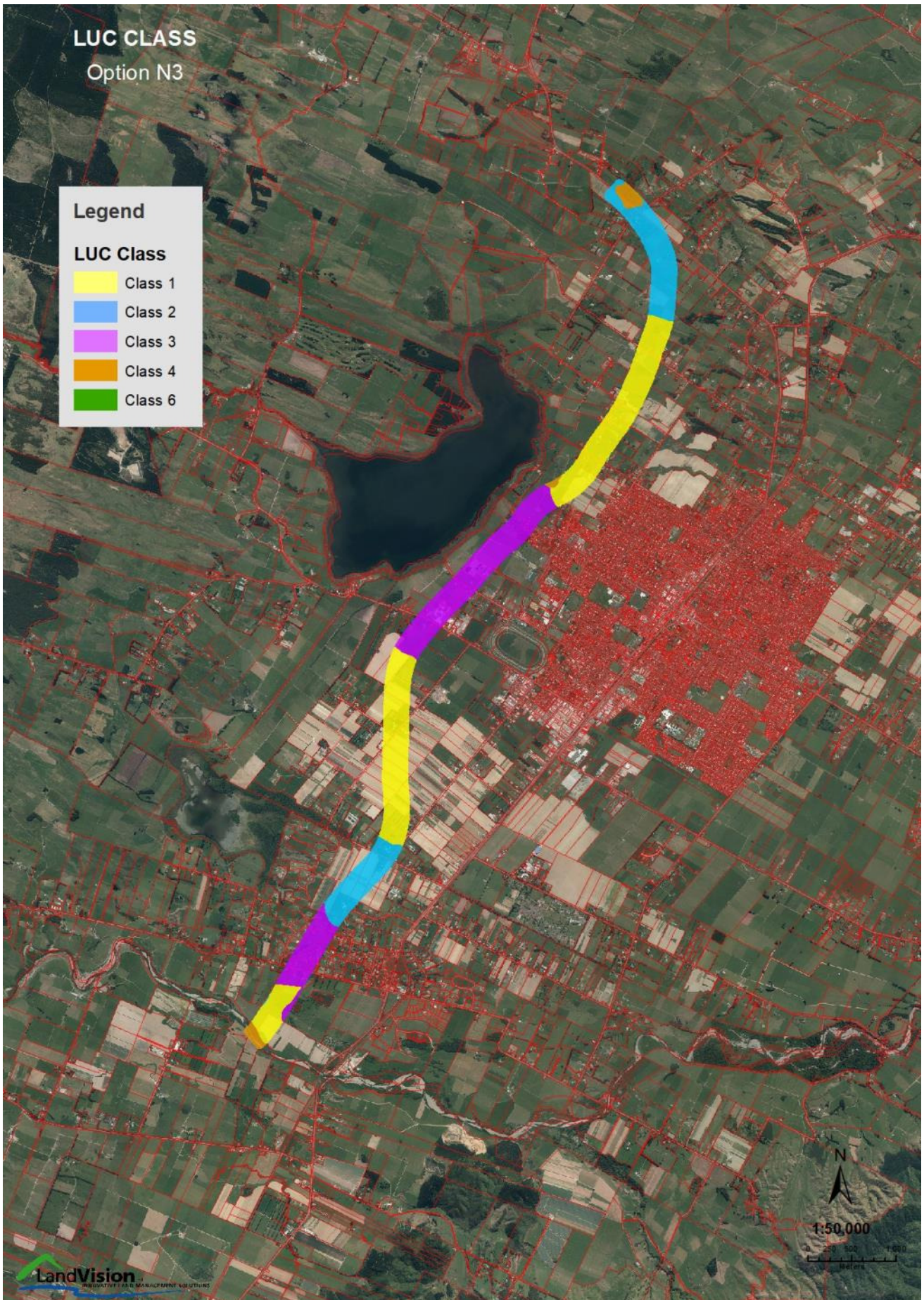
LUC CLASS

Option N3

Legend

LUC Class

- Class 1
- Class 2
- Class 3
- Class 4
- Class 6



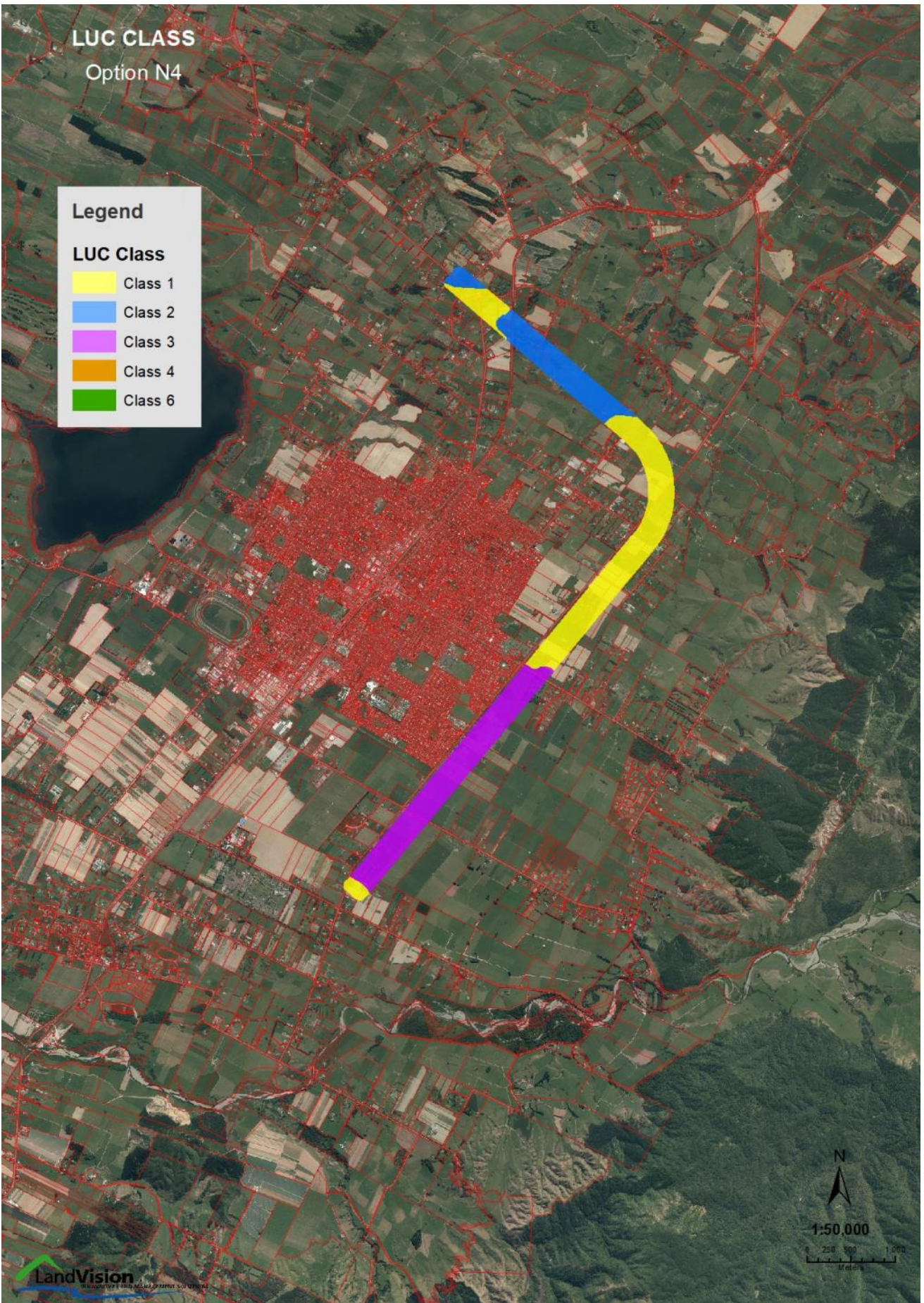
LUC CLASS

Option N4

Legend

LUC Class

- Class 1
- Class 2
- Class 3
- Class 4
- Class 6



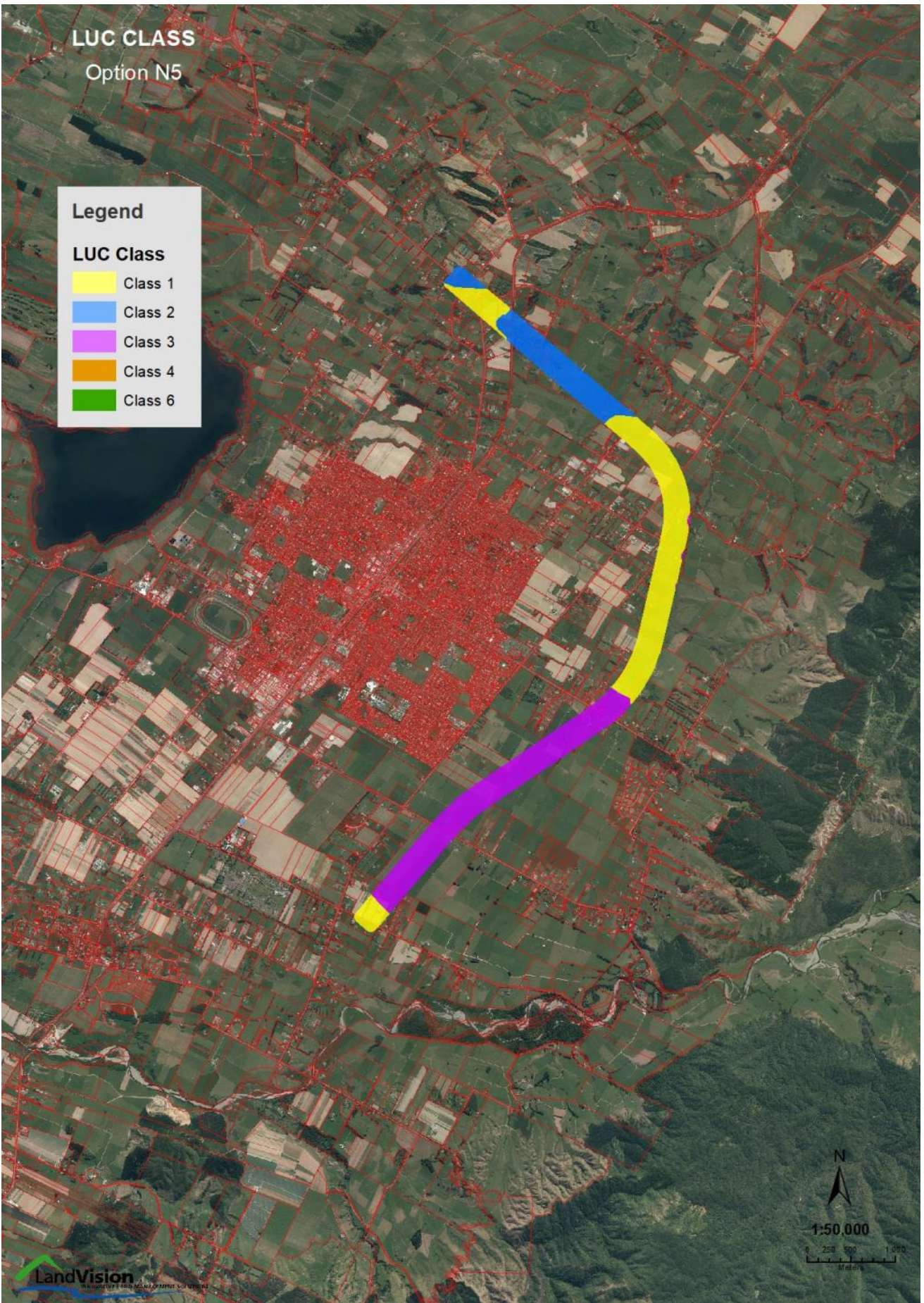
LUC CLASS

Option N5

Legend

LUC Class

- Class 1
- Class 2
- Class 3
- Class 4
- Class 6

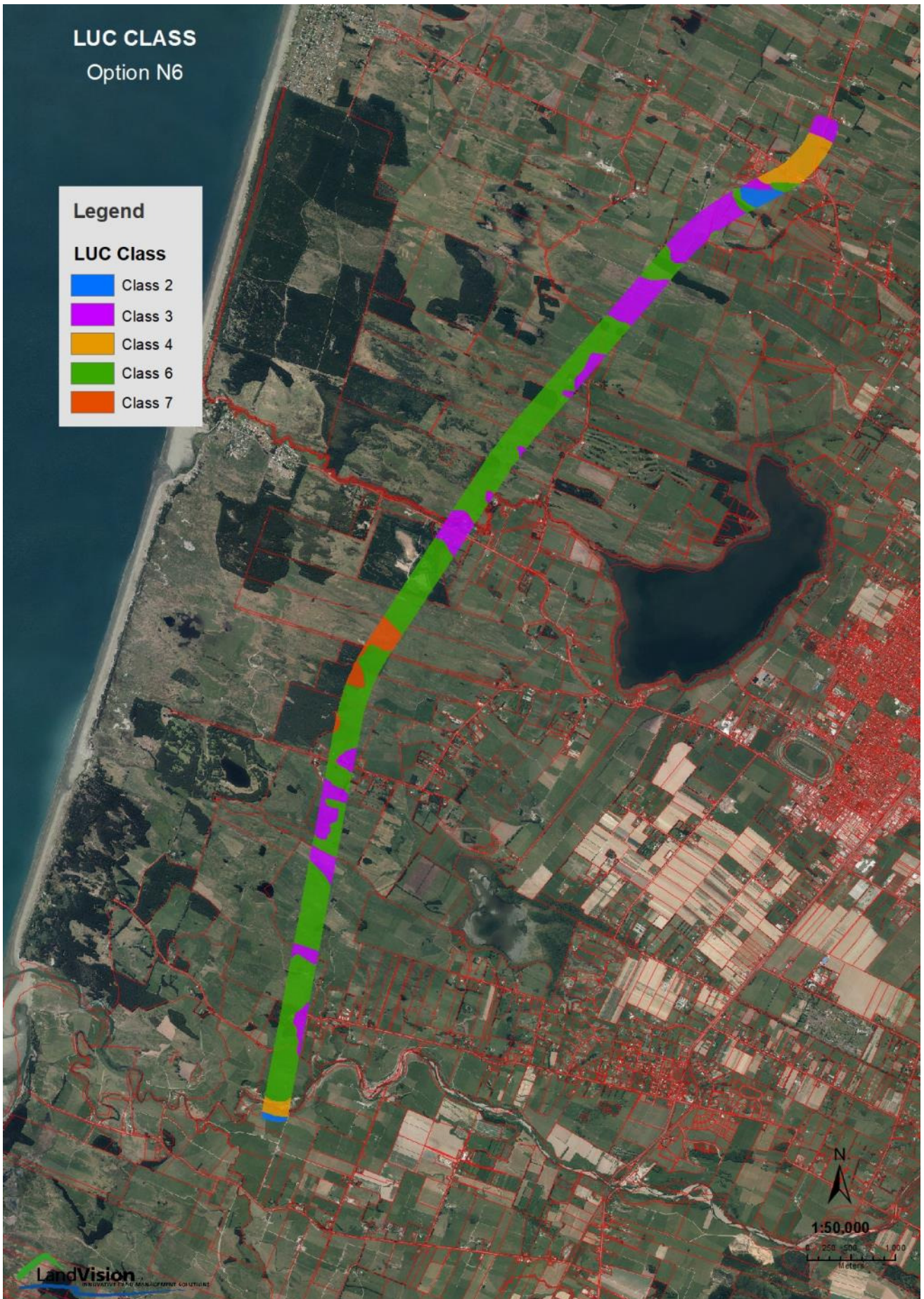


LUC CLASS
Option N6

Legend

LUC Class

-  Class 2
-  Class 3
-  Class 4
-  Class 6
-  Class 7

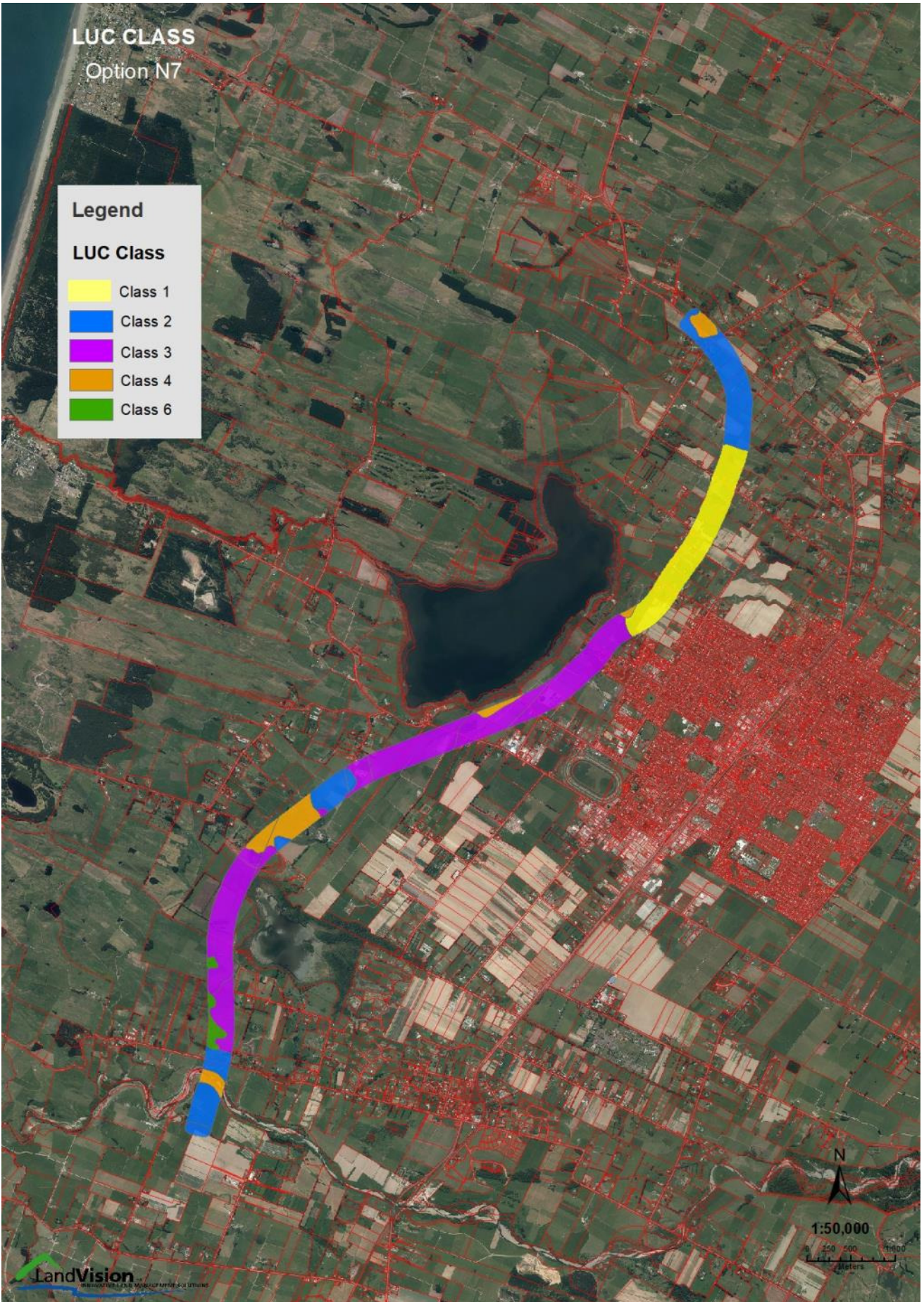


LUC CLASS
Option N7

Legend

LUC Class

- Class 1
- Class 2
- Class 3
- Class 4
- Class 6

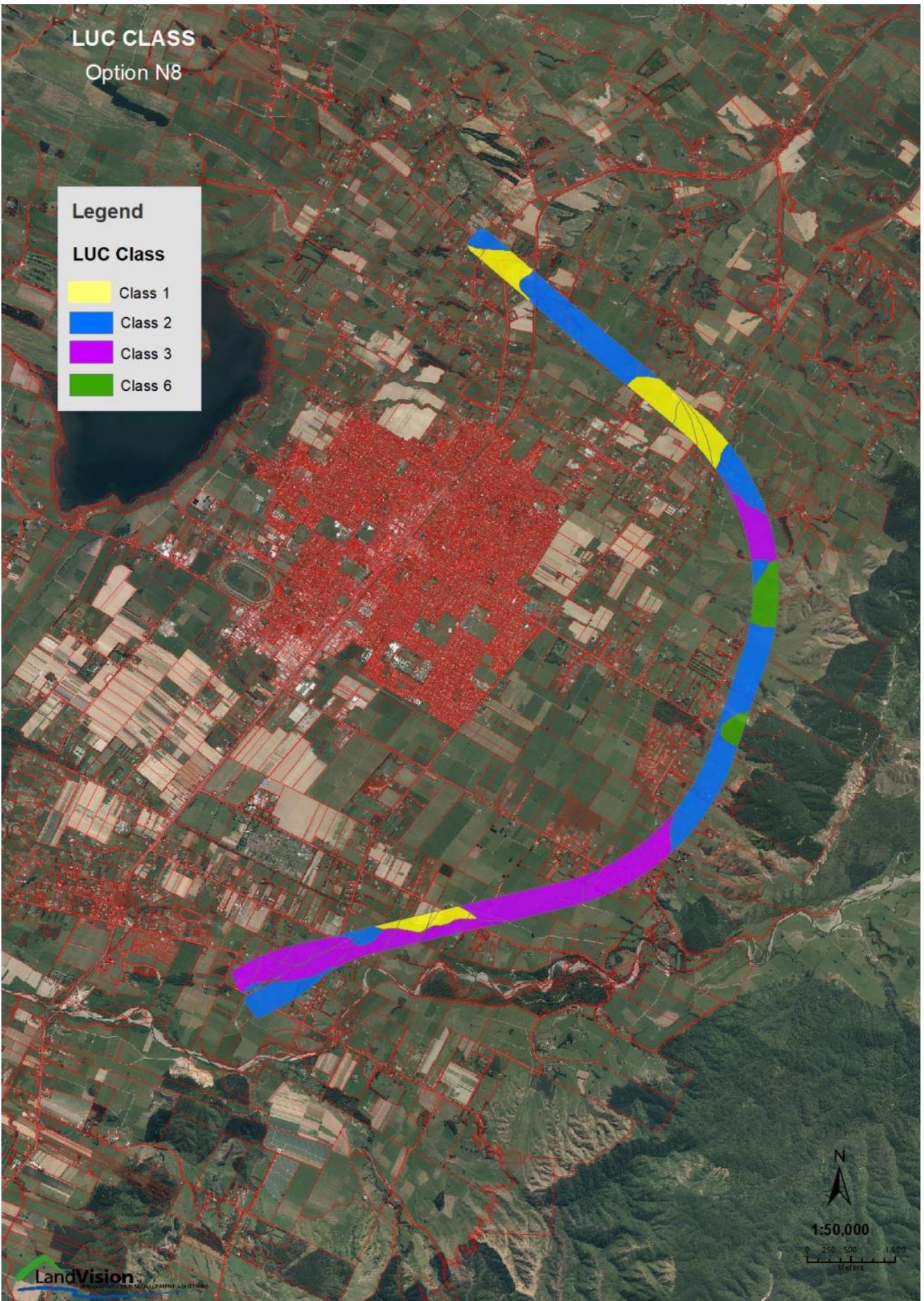


LUC CLASS
Option N8

Legend

LUC Class

- Class 1
- Class 2
- Class 3
- Class 6

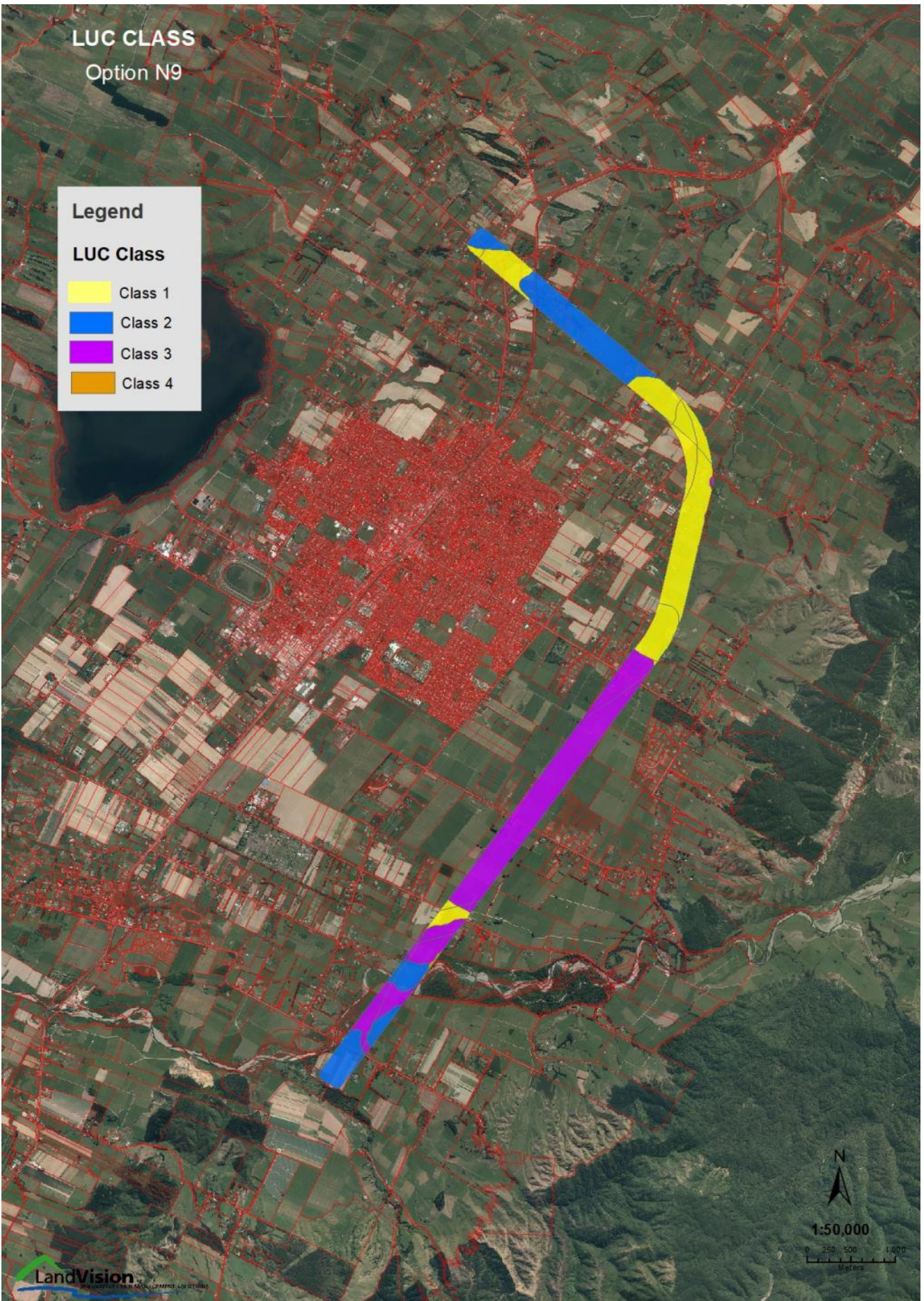


LUC CLASS
Option N9

Legend

LUC Class

-  Class 1
-  Class 2
-  Class 3
-  Class 4



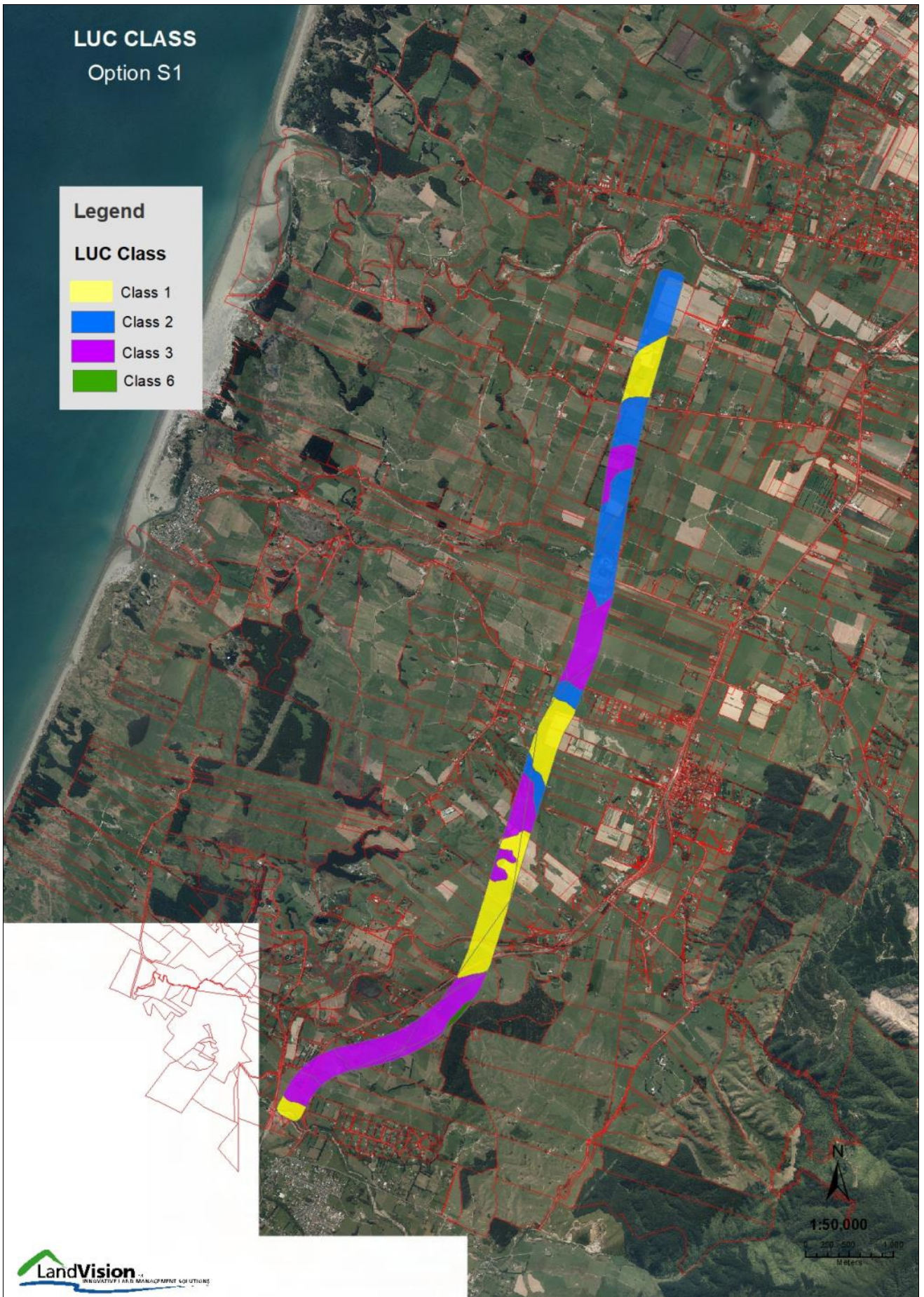
LUC CLASS

Option S1

Legend

LUC Class

- Class 1
- Class 2
- Class 3
- Class 6

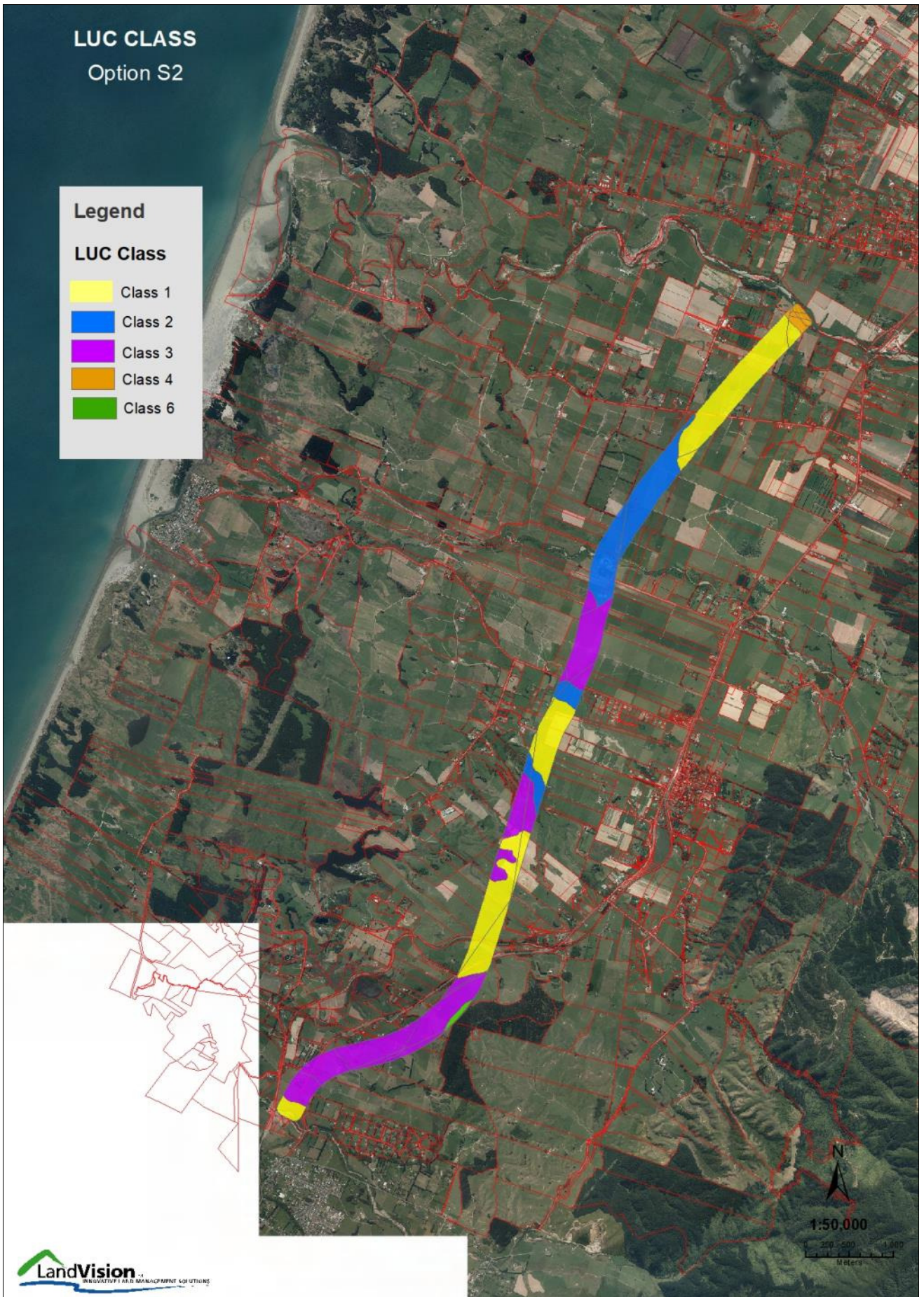


LUC CLASS
Option S2

Legend

LUC Class

-  Class 1
-  Class 2
-  Class 3
-  Class 4
-  Class 6

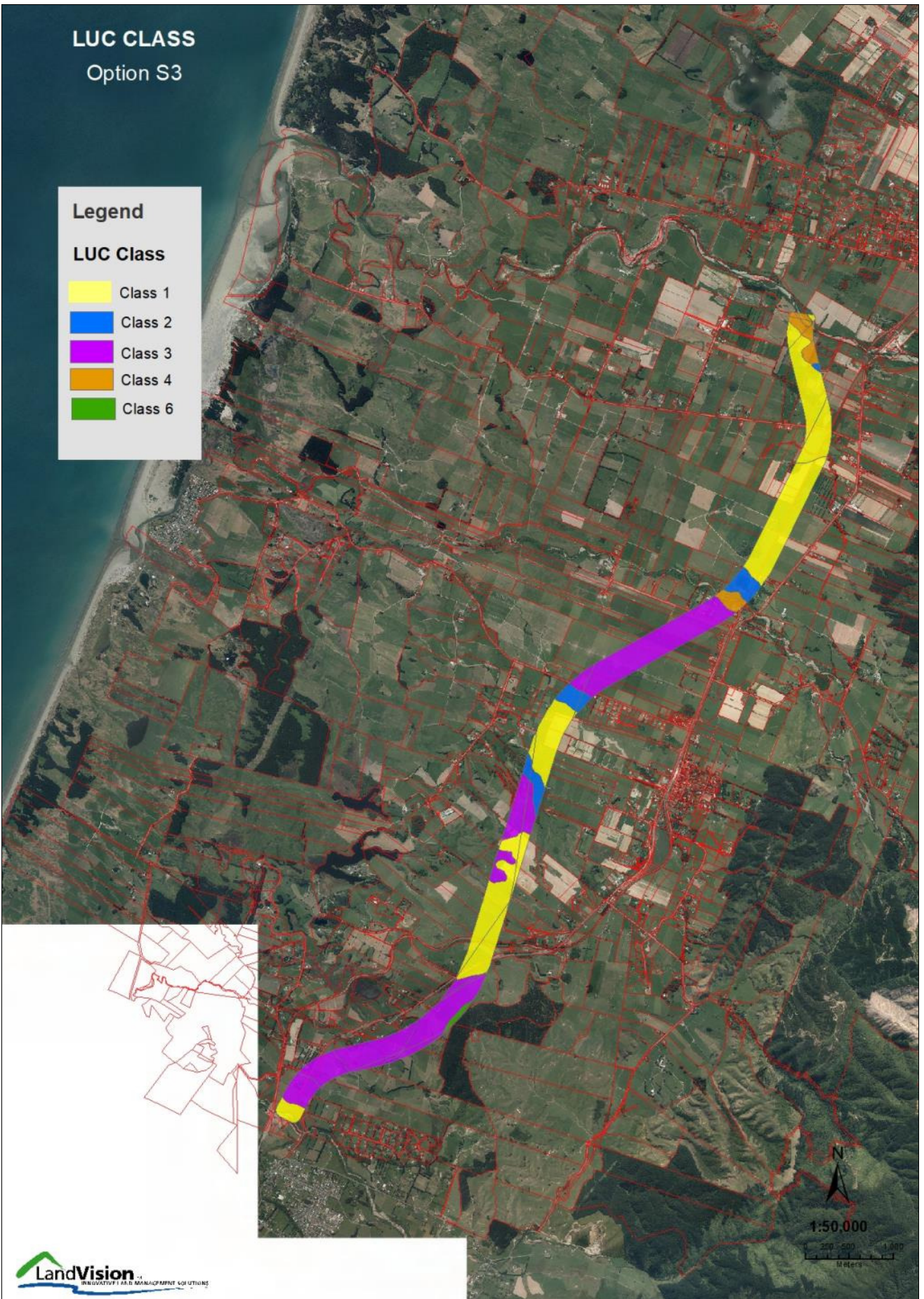


LUC CLASS
Option S3

Legend

LUC Class

-  Class 1
-  Class 2
-  Class 3
-  Class 4
-  Class 6



LUC CLASS
Option S4

Legend

LUC Class

-  Class 1
-  Class 2
-  Class 3
-  Class 4
-  Class 6



LUC CLASS
Option S5

Legend

LUC Class

-  Class 1
-  Class 2
-  Class 3
-  Class 4
-  Class 6

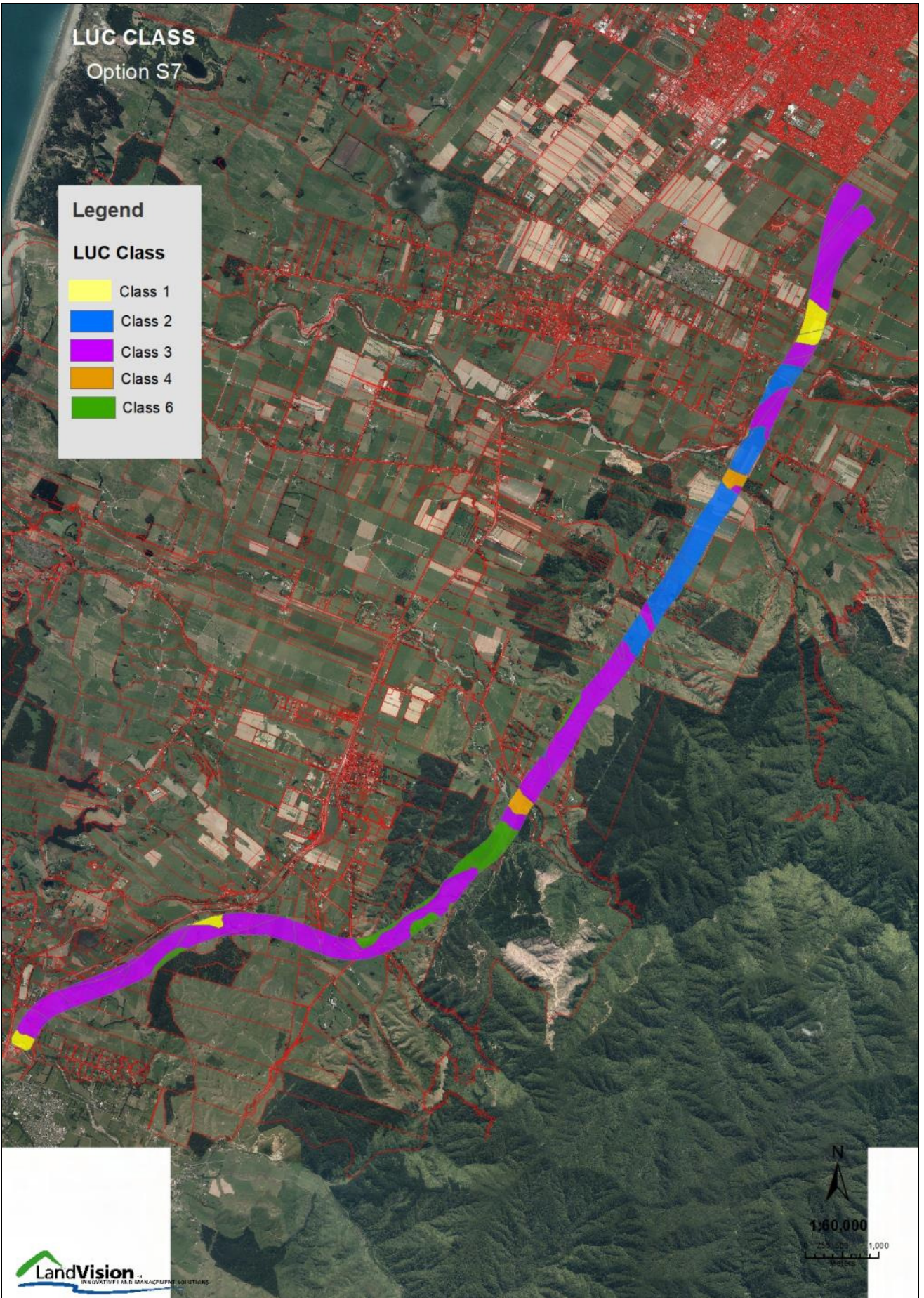


LUC CLASS
Option S7

Legend

LUC Class

-  Class 1
-  Class 2
-  Class 3
-  Class 4
-  Class 6

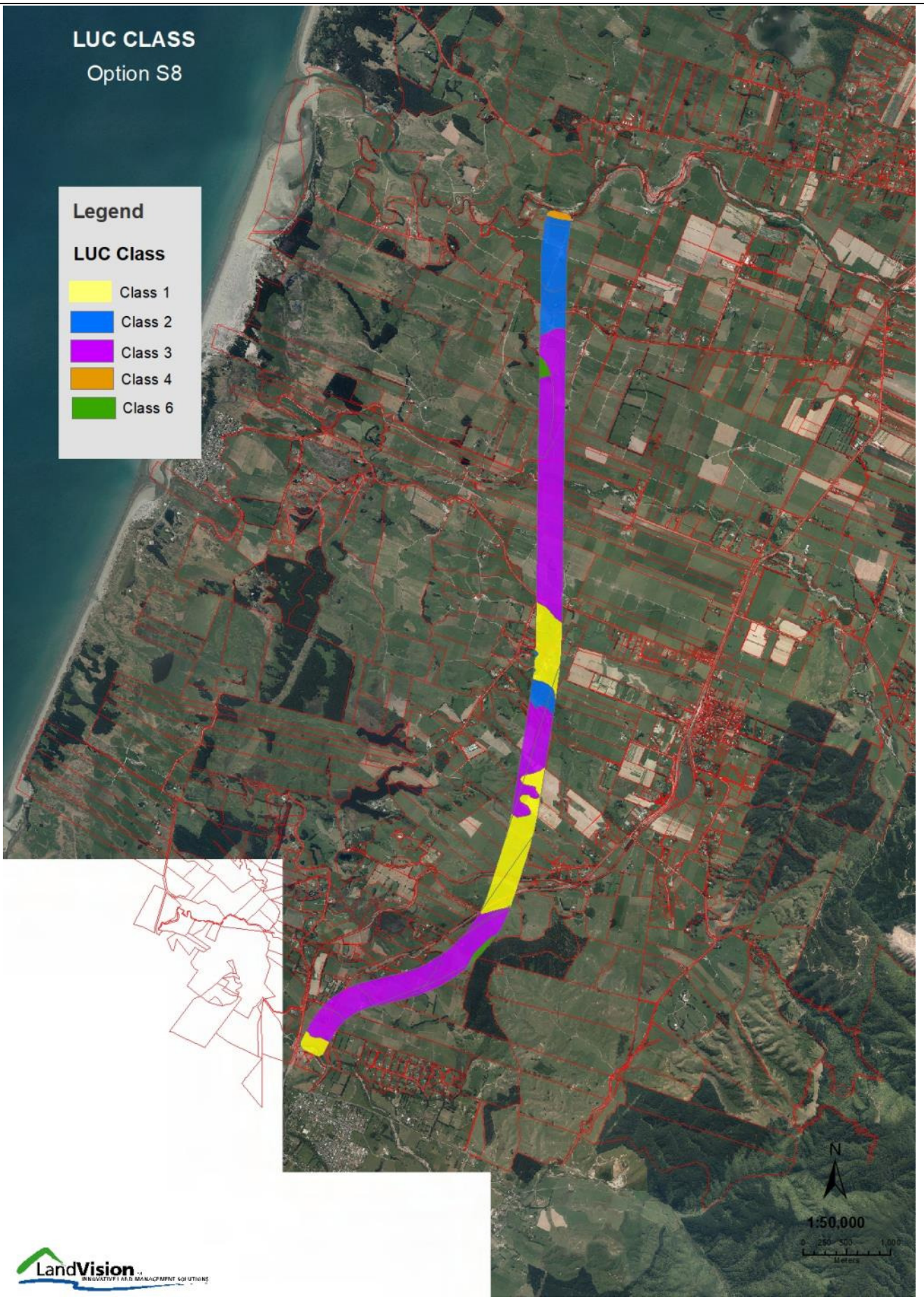


LUC CLASS
Option S8

Legend

LUC Class

-  Class 1
-  Class 2
-  Class 3
-  Class 4
-  Class 6



13 APPENDIX 3: LAND RESOURCES LEGEND

13.1 Rock Types

The following table names the different rock types shown on the Rock Map in Appendix 1.

Rock Symbol	Name
Lo	Loess
Al/Gr	Alluvium over gravels
Al	Alluvium
Lo/Us	Loess over unconsolidated sandstone
Us	Unconsolidated sandstone

13.2 Soil Resources

The following table names the soils shown on the soils map in Appendix 1.

Soil Symbols	Name
1, 1c, M3, M4	Manawatu silt loam, Manawatu sandy loam
2a	Kairanga silt loam
24	Koputaroa sandy loam
35bH	Korokoro soil
75b	Takapau soil
76, Le, Ls	Levin silt loam
76a	Kiwitea silt loam
76ah	Kiwitea silt loam, hill soil
78b	Kopua stony loam
122	Makara soil
Az	Ashhurst soil

Kp2	Kopua series
Oh, 12	Ohakea silt loam
Sh	Shannon soil
Hah	Halcombe hill soil
Te	Te Arakura silt loam
Mk	Makuri series

This was extracted from the NZLRI survey and the original soil mapping was undertaken at a scale of 1 inch to 4 miles (Soil Bureau Bulletin No. 5). Consequently the accuracy of this information is questionable and it is scientifically inappropriate to decrease the scale of this map to the farm scale level. More accurate information would require resurveying at a smaller scale.

13.3 Slope Classes

The definitions of the slope classes mapped on the Land Resources Map are shown in the tables below, along with a summary of the various slope classes found on the property.


Slope class	Degrees	Slope description	Access suitability
A	0-3°	Flat to gentle undulating	Tractor
B	4-7°	Undulating	Tractor
C	8-15°	Rolling	Tractor
D	16-20°	Strongly rolling	Some tractor, four-wheel bike
E	21-25°	Moderately steep	Two-wheel bike
F	26-35°	Steep	Walking and some two-wheel bike
G	>35	Very steep	Walking
+	<i>Indicates a compound slope</i>		
/	<i>Indicates average slope is borderline between two slope classes</i>		
'	<i>Indicates a dissected slope</i>		


Option	Flat to undulating (0-7o)		Rolling to strongly rolling (8-20o)		Hill country (>20o)		Total
	(ha)	%	(ha)	%	(ha)	%	
N1	290.7	77%	84.8	23%	0.0	0%	375.6
N2	265.1	69%	117.3	31%	0.0	0%	382.4
N3	321.1	92%	27.0	8%	0.0	0%	348.1
N4	281.8	100%	0.0	0%	0.0	0%	281.8
N5	300.9	100%	0.5	0%	0.0	0%	301.4
N6	145.0	36%	247.8	61%	15.4	4%	408.3
N7	346.7	92%	29.7	8%	0.0	0%	376.4
N8	378.5	86%	36.2	8%	26.3	6%	441.0
N9	361.2	99%	2.1	1%	0.0	0%	363.3
S1	304.1	90%	30.1	9%	2.3	1%	336.6
S2	312.6	91%	30.1	9%	2.3	1%	345.0
S3	325.9	91%	30.1	8%	2.3	1%	358.4
S4	470.2	90%	49.5	9%	2.3	0%	522.0
S5	446.2	89%	52.3	10%	4.0	1%	502.4
S6	429.8	84%	72.1	14%	7.8	2%	509.8
S7	388.1	69%	144.4	26%	27.1	5%	559.6
S8	292.8	89%	32.3	10%	2.3	1%	327.4

14 APPENDIX 4: LAND USE CAPABILITY



This section details the Land Use Capability units found in the general area of the different scenarios and that within the vineyard property.

14.1 General Area Land Use Capability

LUC description	Parent material	Soil	Slope (°)	Strengths	Limitations
<p>Ic1 Flat to gently undulating, high and medium-height terraces with a mantle of loess and minor tephra. The soils are deep, fertile and well drained. The terraces typically occur between 10-60 m a.s.l. where rainfall is 1000-1200 mm p.a. Occurs between Shannon and Otaki.</p> 	Loess and minor tephra.	Levin silt loam Kiwitea silt loam	0-3	Contour. Access. Deep, fertile soils. Good natural drainage.	Potential to dry out slightly in the summer.
<p>Is1 Is1 Flat, low river terraces and levees of the floodplains with fine-textured alluvial soils. The soils are deep, fertile and well drained, although they dry out slightly in summer. Typically occurs near Manawatu, Ohau and Otaki Rivers.</p>	Fine-grained alluvium.	Manawatu silt loam Karapoti silt loam	0-3	Contour. Access. Deep, fertile soils. Good natural drainage.	Potential to dry out slightly in the summer.

LUC description	Parent material	Soil	Slope (°)	Strengths	Limitations
<p>lle1 Undulating high and medium-height terraces with a mantle of loess and minor tephra. The soils are deep, fertile and well drained. There is a potential for slight sheet and rill erosion when cultivated. Occurs in the Levin district.</p> 	Loess and minor tephra.	Kiwitea Levin silt loam	4-7	Contour. Access. Deep, fertile soils. Good natural drainage.	Potential for slight sheet and rill erosion when cultivated.
<p>llw1 Flat, low river terraces and floodplains with fine-textured alluvial soils. The soils are deep, fertile and imperfectly drained with a slight wetness limitation. Occurs on the Manawatu, Ohau, Otaki and Waikanae floodplains.</p>	Fine-grained alluvium.	Kairanga	0-3	Contour. Access. Deep fertile soils.	Potential for pugging and treading damage from heavy cattle during wet periods. Potential for compaction from machinery when soils are wet.
<p>lls1 Flat, low river terraces and levees of the floodplains with alluvial soils. The soils are sandy in texture and moderately deep overlying gravels. They are fertile and well drained although they tend to dry out in summer. Occurs on Manawatu, Ohau and Waikanae floodplains.</p>	Fine-grained alluvium.	Manawatu	0-3	Contour. Access. Deep, fertile soils. Good natural drainage.	Potential to dry out slightly in the summer. Potential for slight streambank erosion where adjacent to a stream.
<p>lls2 Flat to undulating medium-height terraces overlain by slightly consolidated Aeolian sands. Soils are sandy in texture and well drained, tending to dry out in summer.</p>	Weakly to unconsolidated sands.	Koputaroa	0-7	Contour. Access. Good natural drainage.	Potential to dry out in the summer. Potential for slight wind erosion when cultivated.

LUC description	Parent material	Soil	Slope (°)	Strengths	Limitations
<p>IIIs3</p> <p>Flat, medium-height alluvial terraces with well drained, moderately deep soils overlying gravel. Soils dry out in summer.</p>	Fine-grained alluvium over gravels.	Hz Te Awakura H	0-3	Contour. Access. Good natural drainage.	Dries out in the summer.
<p>IIc1</p> <p>Flat to gently undulating, high terraces with a mantle of loess and minor tephra. The soils are deep, fertile and well drained. Slight frosts and cool temperatures limit cropping versatility.</p>	Loess and minor tephra.	Levin Kiwitea	0-3	Contour. Access. Deep, fertile soils. Good natural drainage.	Slight frosts and cool temperatures limit cropping versatility.
<p>IIle1</p> <p>Dissected terrace land formed from unconsolidated sands and conglomerate. Soils are intergrades between yellow-brown earths and yellow-brown loams developed from loess and minor tephra. Potential for moderate sheet and rill erosion when cultivated.</p>	Loess and minor tephra.	Levin Kiwitea	4-15	Contour. Access. Good natural drainage.	Potential for moderate sheet and rill erosion when cultivated.
<p>IIle3</p> <p>Rolling dissected terrace land and fans with a mantle of loess over sands conglomerate and colluvium.</p>	Loess or loess over colluvium	Shannon Wu Tokomaru Ko	4-15	The soil texture and topsoil depth, allow soil to hold on longer under drought conditions than free draining soils. Good natural fertility (unless gleyed). This unit can be used to finish stock.	Often easily pugged with heavy cattle following prolonged wet periods. Cropping versatility is restricted by wetness that can delay planting. Lacking shade and shelter.

LUC description	Parent material	Soil	Slope (°)	Strengths	Limitations
<p>IIIs2 Flat, medium height alluvial terraces with somewhat excessively drained soils developed from stony alluvium.</p> 	Alluvium over gravels. (Al/Gr)	Kopua	0-3 (A)	Contour. Access. Good drainage.	May dry out in summer.
<p>IIIs4 Flat to gently undulating high terraces with a mantle of loess. The presence of a subsoil pan causes perching of water. Soils are poorly drained in winter but subject to summer soil moisture deficiencies.</p> 	Loess	Tokomaru Ohakea Shannon Halcombe	3-7		
<p>IVs1 Flat low river terraces with shallow, sandy to stony soils. Soils are somewhat excessively drained and subject to seasonal moisture deficiencies.</p>	Gravels Patchy alluvium over gravels.	Rangitikei	0-3	Contour. Holds on longer during dry periods.	Poor drainage due to high water table. Highly prone to pugging damage from cattle.

LUC description	Parent material	Soil	Slope (°)	Strengths	Limitations
<p>Vle1</p> <p>Moderately steep to steep short terrace scarps of the high terrace lands. The scarps have a shallow mantle of loess and tephra over unconsolidated sands and conglomerate.</p>	<p>Loess and colluvium over unconsolidated to moderately consolidated sands and conglomerates.</p>	<p>Halcombe Kiwitea hill soil</p>	<p>20-35</p>	<p>Reasonable natural drainage. Reasonable natural fertility.</p>	<p>Potential for moderate soil slip and sheet erosion.</p>
<p>Vle6</p> <p>Moderately steep to steep greywacke hill country in areas with moderate rainfall (1140-1270mm p.a) with soil moisture deficiencies. There is potential for moderate soil slip erosion.</p>	<p>Patchy loess over greywacke. Greywacke</p>		<p>21-35</p>	<p>Reasonably well drained. More stability with shorter slopes. Erosion scars heal quickly. Good natural fertility.</p>	<p>Potential for moderate soil slip. Easily pugged by heavy cattle following prolonged wet periods. Not suitable for cultivation. Access limitations. Seasonal moisture deficit.</p>

**Appendix I Social/Community/Recreation Workshop
Background Notes**

|

NOTES ON SOCIAL/COMMUNITY/RECREATIONAL IMPACTS

These notes were prepared as background for the MCA scoring process for the criterion described below:

“Social/Community/Recreation Impacts – this incorporates a range of considerations such as severance, general amenity (including exposure of communities to noise), recreation impacts, and impacts during the construction phase.”

Definitions/Meanings that Apply:

Severance	Division by cutting or slicing
Community severance	Interruptions of physical and social cohesion – usually associated with roading projects
Amenity values ¹ that	Those natural or physical qualities and characteristics of an area contribute to people’s appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes
Recreation	Opportunities for active and passive leisure pursuits

In preparing these notes, it was assumed that this criterion would be of considerable significance to the community, and that those taking part in the MCA process would be providing considerable input to the discussion and scoring, due to their own expertise as local residents or other stakeholders. Thus these notes are brief, as they were intended to “kick off” discussion rather than form a comprehensive assessment on their own.

SOUTHERN SECTIONS				
Option	Severance	Amenity	Recreation	Overall
S1	Low Very sparse rural community except around Kuku Beach Road. Avoids new subdivision to east at Waikawa Beach Road	Low Because low population and no specialist character	Low	2
S2	Low Slightly less impact at Kuku Road	Low	Low	2
S3	Low Some impact near SH1 railway overbridge north Kuku Beach Road	Low	Low	2
S4	Low But affects some people south of Ohau Road and as approaching Kimberly Road	More than low Because close to several clusters of dwellings , areas of high amenity (e.g. Bishops Vineyard)	Low	3
S5	Moderate Cuts off two parts of Manakau – already severed, but this is	Moderate/high Manakau	More than low – Manakau Domain severed	4

¹ For the purposes of the scoring, construction impacts were included within amenity values, and it was acknowledged that the construction impacts would be short term, but could be severe.

	worse			
S6	Moderate – south Manakau	Moderate Manakau	More than Low	4
S7	Low	Low	Low	1
S8	Low Couple of dwellings Takapau Road/Kuku Beach Road	Low No special qualities or characteristics	Low	1
NORTHERN SECTIONS				
Options	Severance	Amenity	Recreation	Overall
N1	Low Houses Waitarere Beach Road	Low	Moderate Golf course and Lake Papaitonga	3
N2	Low/Moderate Ohau extension	Low/Moderate	Moderate Golf course and Lake Papaitonga	3/4
N3	High? Cutting off lake – is the lake an essential part of Levin? Ohau extension	High	High Lake Horowhenua plus recreational facilities	5
N4	Moderate But SH already severs	Moderate	Low	4
N5	Moderate Similar to N4 but Wakefield/Redwood cul-de-sac development not severed	Low/Moderate Less people directly affected	Low	3/4
N6	Low Houses Waitarere Beach Road	Low	Low	2
N7	High Same as N3, except for Ohau	High	High As for N3	5
N8	Moderate Gladstone Community	Moderate Foothills area	Moderate	4
N9	Low/Moderate	Low/Moderate	Moderate (very close to Kimberley Reserve)	3/4

At the workshop a number of changes were made:

- S4** Amenity impact was increased to moderate. This did not change the score.
- S5 and S6** Scores were raised up to 5 for each. This was primarily on the basis of severance and amenity values, both of which were increased to moderate.
- S7** Score was increased to 2, primarily on the basis of recreational impact, which was increased to moderate.
- N8** Recreational values were changed to high impact because of access to tracks and facilities in the Tararua foothills but the overall score remained unchanged.
- N9** The severance value was changed to low/moderate but the overall score remained unchanged.

Author comment:

This was a key criterion for the community, and one of two which could broadly be said to encompass social impact (the other being direct impact on dwellings).

I do not agree with the revised scoring for the southern sections, particularly Manakau. I consider that the severance effects do not justify a score of 5 for S5 and S6. At present SH1 severs Manakau and amenity is reduced because of this. S5 would continue this effect although it would be greater because of the nature of the physical structures involved – hence the adverse score of 4. S6 would reduce the existing severance by rerouting most traffic to the east and around the settlement, but would sever part of the lifestyle area to the south. Adverse amenity effects would be transferred to a different part of the community – provided for in the adverse score of 4.

In my opinion, the severance/loss of amenity/recreational impacts associated with N3 and N7 (relating to Levin and the relationship with Lake Horowhenua) is more significant, so to award S5 and S6 the equivalent would be disproportionate.

The increase to S7 was on the basis of direct effects on the access to the Tararua Forest Park. Approximately half of the current route is interrupted by a thin spur of Forest Park land, albeit an entry point and a very attractive and well-used area. Direct effects on this area can be avoided so the change was not justified. A route would change the nature of the existing recreational area but not necessarily negatively.

In some cases I had proposed two scores, expecting the community to choose one. Where this did not happen, I am comfortable that both scores were tested in the analysis.

Sylvia Allan

6th September 2017

**Appendix J Dwellings and Property Workshop
Background Notes**

NORTH OTAKI TO NORTH OF LEVIN
MULTI CRITERIA ANALYSIS SUMMARY REPORT



Prepared by: Mitchell Bray
Property Consultant

Reviewed by: Kris Connell
Principal Consultant

August 2017

1. EXECUTIVE SUMMARY

1.1 Project Summary

The Property Group Limited (“TPG”) has been instructed by the NZ Transport Agency (“the Transport Agency”) to provide background information in the form of notes on property issues for the proposed SH1 North Otaki to North of Levin RONS Project (“the Project/O2NL”). This report summarises TPG’s presentation to the community MCA workshop on 29 August 2017.

The Transport Agency is investigating potential route options for a new road, split into 17 Northern and Southern sections.

1.2 Purpose and Assumptions

The Transport Agency has commissioned the MCA process for O2NL in order to share the considerable amount of information that has been collected in the wider study area and involve the wide community and iwi in the decision making process.

We have made the following assumptions in relation to the project:

- It is important to note that the findings in this report are based on indicative route options only at this stage, and these will be subject to change as design for the chosen option is progressed.
- This is a desktop assessment only and is prepared for the purpose of assisting the MCA attendees and the O2NL project team to determine the likely property effects of all options and identify high level risks.
- It is expected that a Property Acquisition and Disposal Strategy will be prepared once the final alignment has been identified. This will identify and seek to mitigate risks in relation to individual properties affected by the alignment adopted.
- The findings in this report are drawn from the summary spreadsheet attached which has been informed by our knowledge of property risks identified on other large State Highway Projects in the Wellington region.
- The alignments have been considered on the basis of a 300 metre corridor. This is expected to reduce once the final alignment is identified. As such, the effects on property are likely to be reduced as the options for O2NL are refined. This report incorporates two MCA criteria; impacts on dwellings and property degree of difficulty.

1.3 Proposed Routes

The Transport Agency is investigating 17 different options to improve the safety and travel times along State Highway 1 between Otaki and north of Levin. The options being investigated are identified as:

Southern Routes:	S1	S2	S3	S4	S5	S6	S7	S8	
Northern Routes:	N1	N2	N3	N4	N5	N6	N7	N8	N9

2.0 Affected Dwellings

As part of the MCA process TPG has been asked to assess the effects each alignment has on affected dwellings.

Number of dwellings to be removed

The total number of dwellings to be removed as a result of the different project alignments is shown in the spreadsheet attached. The alignment with the greatest number of dwellings to be removed is N3 with 89 dwellings. The alignment with the fewest number of dwellings to be removed is N1 with 13 dwellings.

We have also investigated dwellings that while not under the footprint of the alignment are considered to be potentially affected to the extent that they may need to be acquired. These are noted under the heading Number of Dwellings Directly Affected, and are in addition to the dwellings that have been identified to be removed.

It is noted that there are a number of properties where it is presently unclear if they are directly affected. It is considered that the number of properties directly affected for all alignments will reduce once the design is finalised due to the width of the footprint (300 metres). It is important to note that the findings in this report are based on indicative plans only at this stage, and therefore subject to change as design for the chosen option is progressed.

The MCA scoring has been assessed on the basis that all options are considered to have negative effects on individual properties. All options affect a number of dwellings and it was considered that scores of 1 or 2 were not justified for any route section. The scoring used is based on the following ranges of dwellings impacted: up to 30 was scored as 3; 31-50 scored as 4; and more than 50 scored as 5. For the purposes of scoring, only the number of dwellings removed has been used, but all sections had dwellings nearby which could be directly affected.

2.1 Impacts on Dwellings Scoring – Southern Alignments

Alignment	Number of Dwellings Removed	Number of Dwellings Directly Affected	MCA Score
S1	21	5	3
S2	18	5	3
S3	29	4	3
S4	69	12	5
S5	73	16	5
S6	81	26	5
S7	44	13	4
S8	15	7	3

2.2 Impacts on Dwellings Scoring – Northern Alignments

Alignment	Number of Dwellings Removed	Number of Dwellings Directly Affected	MCA Score
N1	13	1	3
N2	47	15	4
N3	89	22	5
N4	67	15	5
N5	58	18	5
N6	15	4	3
N7	49	10	4
N8	82	24	5
N9	56	18	5

3.0 Property Degree of Difficulty

The degree of difficulty assessment for each alignment has been considered on the basis of a number of factors, listed below.

1. Effects on property configuration and large farming severances
2. Affected large commercial businesses
3. Effects on farming and market garden holdings (productive land)
4. Effects on areas of lifestyle holdings
5. Effects on Maori Freehold Land and associated easement interests.

Each expressway project has a unique set of constraints that provide challenges from an acquisition perspective. The Horowhenua lifestyle and rural markets make up the majority of affected land on the project. These markets have been strong of late and continue to show signs of improvement with demand putting increased pressure on prices. Development in the townships on the eastern side of Levin is continuing with subdivision of productive lands into uneconomic lifestyle properties. Productive land

is a matter considered in isolation in the Multi Criteria Analysis; however it should be noted that the identification of the productive land itself does not necessarily provide a full picture of the overall effect on property land use.

To generalise, the Western options will sever larger farming operations while the Eastern options are likely to have a notable effect on the lifestyle market. Our high level assessments have identified a number of commercial assets that will be affected by the project and may require either relocation or redevelopment on their current sites; however these are not considered significant in complexity when compared with Maori Land issues identified below.

Number of Parcels Affected

The following numbers relate to the number of parcels intersected by each alignment. These may become either partial or full purchases depending on the effect of the required land taking. Our comments above in respect to the 300 metre corridor being ultimately reduced apply here also.

It is noted the each affected title may contain more than one parcel, so the number of owners affected on each Option will be less than the number of parcels affected.

Alignment	Parcels Affected	Alignment	Parcels Affected
N1	119	S1	100
N2	168	S2	104
N3	202	S3	124
N4	143	S4	214
N5	132	S5	210
N6	94	S6	211
N7	145	S7	154
N8	201	S8	89
N9	142		

3.1 Severance and Access Issues

There are a significant number of parcels which become severed as a result of the different State Highway alignments. If these Owners are not able to directly access the State Highway then a new access road or underpass will need to be provided in order to give owners access to their otherwise severed or land locked land. Alternatively, these landlocked areas will need to be acquired in full and disposed of/amalgamated as and where possible.

3.2 Affected Commercial Businesses

Notable directly affected commercial enterprises affected by the alignments include Allied Concrete (Option S4), Levin Estates Limited/Ohau Vineyards Holdings Limited

(Option S4), and Alliance Group Limited's processing plant (Option N3). A golf course is affected by Options N1 and N2. Tatum Park Wedding and Conference Centre is affected by Option S3. It should be noted that this list is not exhaustive and is limited by the desktop nature of this assessment; however, these affected businesses are considered to add to the complexity for these alignments.

3.3 Farm/Market Garden/Lifestyle Properties

The wider Horowhenua area has had substantial lifestyle development over the past decade with further subdivision anticipated to eastern side of SH 57. This area contains areas of productive land that have been split into smaller uneconomic lots. Generally the western routes affect larger productive farms and fewer parcels overall.

3.4 Public Infrastructure

Route sections N3 and N6 potentially impact key infrastructure being the wastewater treatment plant and the rubbish dump.

3.5 Effects on Maori Freehold Land

The acquisition of Maori Freehold Land is significantly more complicated than the acquisition of land held in fee simple title. This is due to a combination of factors; including the potential need to appoint agents or trustees in the event that the land is not held in trust; the fact that the trustees will act for the benefit of multiple owners (and quite commonly a large number of beneficial owners); the fact that owners are likely to attach special significance to the land that introduces factors outside of standard commercial negotiations; and the fact that the land will ultimately need to be confirmed to be alienated by order of the Maori Land Court following agreement. Our analysis relates to the legal process of purchasing Maori Freehold land, and does not address the cultural effects of land acquisition.

Our experience from previous Horowhenua projects and research in the area has confirmed a significant amount of Maori Freehold Land is located within the project catchment area. Due to the number of parcels affected, and the need to check each title to confirm the Maori Freehold status we have relied on data from previous investigations and a Maori land data layer provided by CoreLogic to identify any possible Maori Land holdings.

There are also a number of additional Maori freehold parcels indirectly affected by historic Maori right of way easements on alignments S1, S2, S3, S4, S5 and S8 which would significantly add to the complexity of acquiring land for these options. For this reason, these options have been scored a 5. This is because the number of negotiations increases according to the number of additional easement rights that need to be surrendered. The surrender of these easement rights of way is also likely to have an additional impact due to the potential severing of access between Maori Freehold Land blocks.

In general, our investigations have shown that Maori Freehold Land is more significantly affected on the western alignments, both as a result of the direct effects on Maori Freehold Land, as well as indirect effects on appurtenant rights of way.

3.6 Affected Easements

We are not aware of any significant Transpower Transmission Lines issues with the route options. There are potentially local transmission lines that will need to be relocated as a result of the ultimate alignment. This will be considered as part of the property acquisition strategy to assess whether there are any Seaton issues (under which Supreme Court decision the Transport Agency is unable to acquire easement interests for a third party).

We are similarly unaware at this stage of any main water supply or gas pipeline issues that may be encountered. Again, these will be considered as part of the property acquisition strategy to assess whether there are any Seaton issues here.

3.7 Degree of Difficulty Scoring – Southern Alignments

Alignment	MCA Score
S1	5
S2	5
S3	5
S4	5
S5	5
S6	4
S7	4
S8	5

3.7 Degree of Difficulty Scoring – Northern Alignments

Alignment	MCA Score
N1	4
N2	4
N3	5
N4	3
N5	3
N6	4
N7	4
N8	3
N9	3

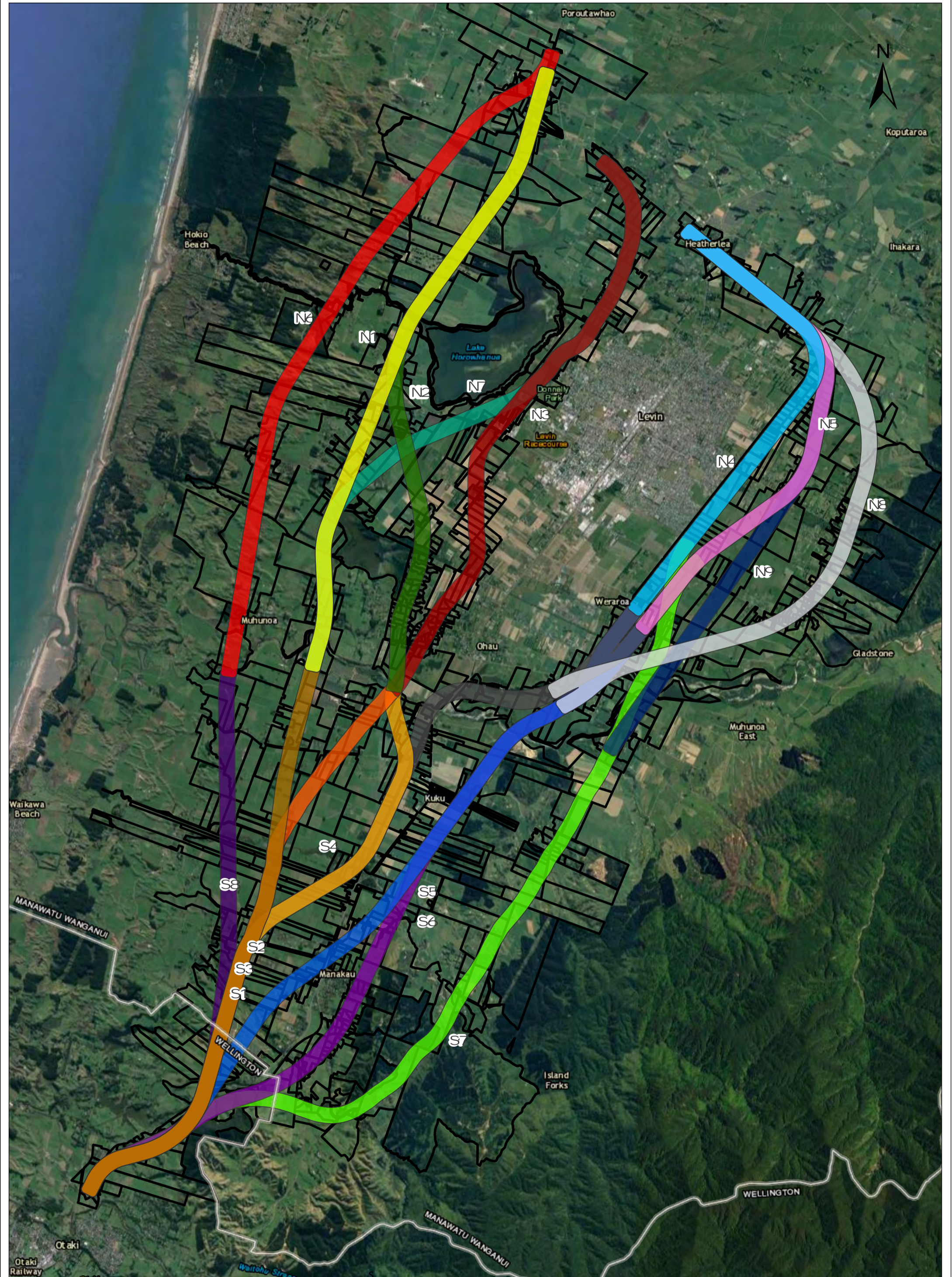
Attachments

- 1 Breakdown of Parcels affected by route options (300m width)
- 2 Property Alignment Plan

Breakdown of Parcels affected by route options (300m width)

August O2NL MCA Property Totals - N Alignments									
	N1	N2	N3	N4	N5	N6	N7	N8	N9
Total Parcels	119	168	202	143	132	94	145	201	142
Confirmed Maori	11	11	2	0	0	10	6	0	0
Possible MFL	22	11	16	0	0	5	25	0	0
Total MFL	33	22	18	0	0	15	31	0	0
Dwelling Removed	13	47	89	67	58	15	49	82	56
Dwelling Directly affected	1	15	22	15	18	4	10	24	18
Residential	7	31	63	38	35	21	41	55	31
Lifestyle	37	82	61	72	63	21	36	96	69
Farmland	62	48	24	14	22	50	45	41	27
Market Garden	1	3	32	15	6	1	7	5	5
Commerical	10	4	20	3	5	2	13	2	7
Complexity Ranking	4	4	5	3	3	4	4	3	3
August O2NL MCA Property Totals - S Alignments									
	S1	S2	S3	S4	S5	S6	S7	S8	
Total Parcels	100	104	124	214	210	211	154	89	
Confirmed MFL	6	9	13	19	13	9	6	5	
Possible MFL	17	17	9	10	4	3	4	7	
Total MFL	23	26	22	29	17	12	10	12	
Dwelling Removed	21	18	29	69	73	81	44	15	
Dwelling Directly affected	5	5	4	12	16	26	13	7	
Residential	7	7	15	41	32	23	23	2	
Lifestyle	25	27	32	69	80	124	65	27	
Farmland	52	56	53	58	53	36	49	48	
Market Garden	9	7	11	16	25	16	4	4	
Commerical	2	2	8	19	12	8	10	2	
Complexity Ranking	5	5	5	5	5	4	4	5	

1. MFL = Maori Freehold Land
2. Confirmed MFL = Title verified to confirm status of Land
3. Possible MFL = Appellation or memorials contain references to suggest land may be MFL (Not yet verified).
4. Expected Land use based on Property Guru data



**Appendix K District Development Workshop
Background Notes**

O2NL MCA - District Development Criterion Notes

Notes Prepared by Richard Peterson

Introduction

The District Development criterion includes the assessment of two related matters:

- Impacts on current district plan provisions
- Impacts on 'likely future growth areas'.

The scoring approach for the MCA requires consideration of:

- Difficulty / effect of each option in relation to the criterion
- Reasonable mitigation proposals
- Benefits

By its nature the assessment of this criterion has focussed on the difficulties/effects that may result from each option, specifically the impacts resulting from:

- The extent of area (zoned or likely future) lost to the corridor
- Severance of future development areas from existing urban areas and services.

It is noted however that structure planning of growth areas is likely to enable some of the effects of the corridors to be mitigated. However the detail of how this could be achieved would have to be worked through once more information on the options is available, including interchange details.

For this criterion the focus has been on the residential, rural residential and industrial development potential in the District Plan Zones. It is recognised that there are numerous other District Plan provisions (e.g. relating to open spaces, landscape and heritage features). Impacts on these provisions are captured under other criteria and to avoid double dipping have not been covered under 'District Development'.

Council's growth strategy is currently under the initial stages of review. Therefore there is some uncertainty about what the 'likely future growth areas' are in Horowhenua District. The assessment against this aspect of the criterion is based on the information provided by Council officers, based on their best knowledge at the time.

The scoring approach used for the MCA is set out below:

Table 1: Basis for scoring used in the O2NL MCA

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.

Criteria assessment

As a general comment it is noted that the southern options are generally less complex than the northern options. That is the northern options have more significant impacts on development Zones or 'likely future growth areas' than the southern options do.

It is also noted that no scores of 5 have been awarded. This is considered appropriate given that while the corridors do have impacts on the Horowhenua's development potential, there would still be opportunities to mitigate these effects through good structure planning and urban design. Therefore it is considered that there are no options that would create 'extreme' difficulties for the District's development and therefore that warrant a score of 5.

The following table lists each option and provides a brief assessment of it in relation to the criterion.

Option	Discussion points	Score
S1	Impacts Rural Zone land only – land based productive effects covered elsewhere.	1
S2	Impacts Rural Zone land only – land based productive effects covered elsewhere.	1
S3	Impacts Rural Zone land only – land based productive effects covered elsewhere.	1
S4	Impacts on the Ohau Greenbelt Residential area. An existing development, which is mainly subdivided. There is not a significant amount of development potential remaining. Effects on the existing houses / community are covered under other criteria. Therefore it is considered that this option will only have a minor effect on development potential.	2
S5	This option clips the north-eastern corner of Manakau, through the school. This social impact will be addressed in other criteria. A growth area, to the north of Manakau, is being considered by Council as part of its strategy review. This will be impacted by the option. The area is not expected to have large development potential, therefore the impact is less extensive than e.g. the Gladstone area.	3
S6	Impacts on rural residential subdivision south east of Manakau. These social effects covered under other criteria. A growth area, to the north of Manakau, is being considered by Council as part of its strategy review. This will be impacted by the option. The area is not expected to have large development potential, therefore the impact is less extensive than e.g. the Gladstone area.	3
S7	Impacts Rural Zone land only – land based productive effects covered elsewhere.	1
S8	Impacts Rural Zone land only – land based productive effects covered elsewhere.	1
N1	Impacts mainly on Rural Zone land – land based productive effects covered elsewhere. Impact on golf course covered in social / community / recreation criteria.	1
N2	Impacts on existing rural residential subdivision north west of Ohau. These effects are covered under the social criteria. Otherwise impacts Rural Zone land only – land based productive effects covered elsewhere.	1
N3	Impacts the western edge of Ohau Greenbelt Residential area. Also and more significantly impacts industrial (important) and residential areas located west of Levin. Impact not as extensive as in Gladstone area, but impact on industrial land is important for District development.	4

	Note the option impacts the wastewater treatment plant – expect this issue is covered by the property degree of difficulty.	
N4	Impacts the western edge of the Gladstone greenbelt residential area, for its entire length. Aligns with corridor shown in the structure plan. Notwithstanding the effects would be extensive. In addition Council is considering whether residential development should be pursued in this part of the District. This alignment would reduce the residential development potential and separate the residual area from Levin.	4
N5	This option would split the Gladstone greenbelt residential area, severing the two residual areas from each other. The diagonal alignment cut across grid layout, which would reduce the subdivision efficiency. Effects considered to be extensive. In addition Council is considering whether residential development should be pursued in this part of the District. N5 would have potentially have less effect in terms of this future development than N4 as it may provide an appropriate eastern edge to the spread of residential activity. Notwithstanding it is considered that the impact of this option would be extensive.	4
N6	Impacts on rubbish dump – (considered to be a property matter). Otherwise impacts Rural Zone land only – land based productive effects covered elsewhere.	1
N7	Impacts industrial (important) and residential areas on west of Levin. Impact not as extensive as in Gladstone area, but impact on industrial land is important for District development. Note impacts the wastewater treatment plant – (considered to be a property matter).	4
N8	Impacts on the eastern edge of the Gladstone Greenbelt area. Mainly developed. Less potential impacts, as on the eastern edge.	3
N9	Splits Gladstone greenbelt residential area. Impacts or close to the future local commercial area shown on structure plan. In addition Council is considering whether residential development should be pursued in this part of the District. N9 would have potentially have less effect in terms of this future development than N4 as it may provide an appropriate eastern edge to the spread of residential activity. Notwithstanding, it is considered that the impact of this option would be extensive.	4

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Rev. No.	Date	Description	Prepared By	Checked By	Reviewed By	Approved By
1	8//9/17	Draft	RP			
2	14/12/17	Final	RP	SA	SA	PP

**Appendix L Project Objectives Workshop Background
Notes**

O2NL MCA – Project Objectives Criterion Report

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Rev. No.	Date	Description	Prepared By	Checked By	Reviewed By	Approved By
1	29/9/17	Draft	PP	RP	RP	PP
2	13/11/17	2 nd Draft	PP		SA	PP
3	21/12/17	Final	PP			PP

Introduction

These notes were prepared as a summary of the background and MCA scoring process for the **Fit to Project Objectives** criterion for the Otaki to North of Levin MCA process in August 2017.

The Fit to Project Objectives criterion includes the assessment of the project objectives:

- Reduce **travel times** on the state highway network
- Reduce **deaths and serious injuries** on the state highway network
- Enhance the **resilience** of the state highway network
- Provide **appropriate connections** that integrate the state highway and local road networks to serve urban areas

This criterion can only be assessed by consideration of the combined whole-of-route corridors as consideration of entire journeys is needed to understand how the options meet the project objectives.

Travel Time

The first of the objectives relates to the time taken to travel on key routes through the study area. As traffic modelling has not been undertaken on the long list of options, a first principles approach has been adopted. This needs to consider the key journeys, the number of vehicles undertaking these journeys and the time taken to make these journeys.

The first step in this approach is to determine the key journeys within, to, from and through the study area. The major routes and the estimated daily traffic volumes using these routes are shown on the diagrams below.

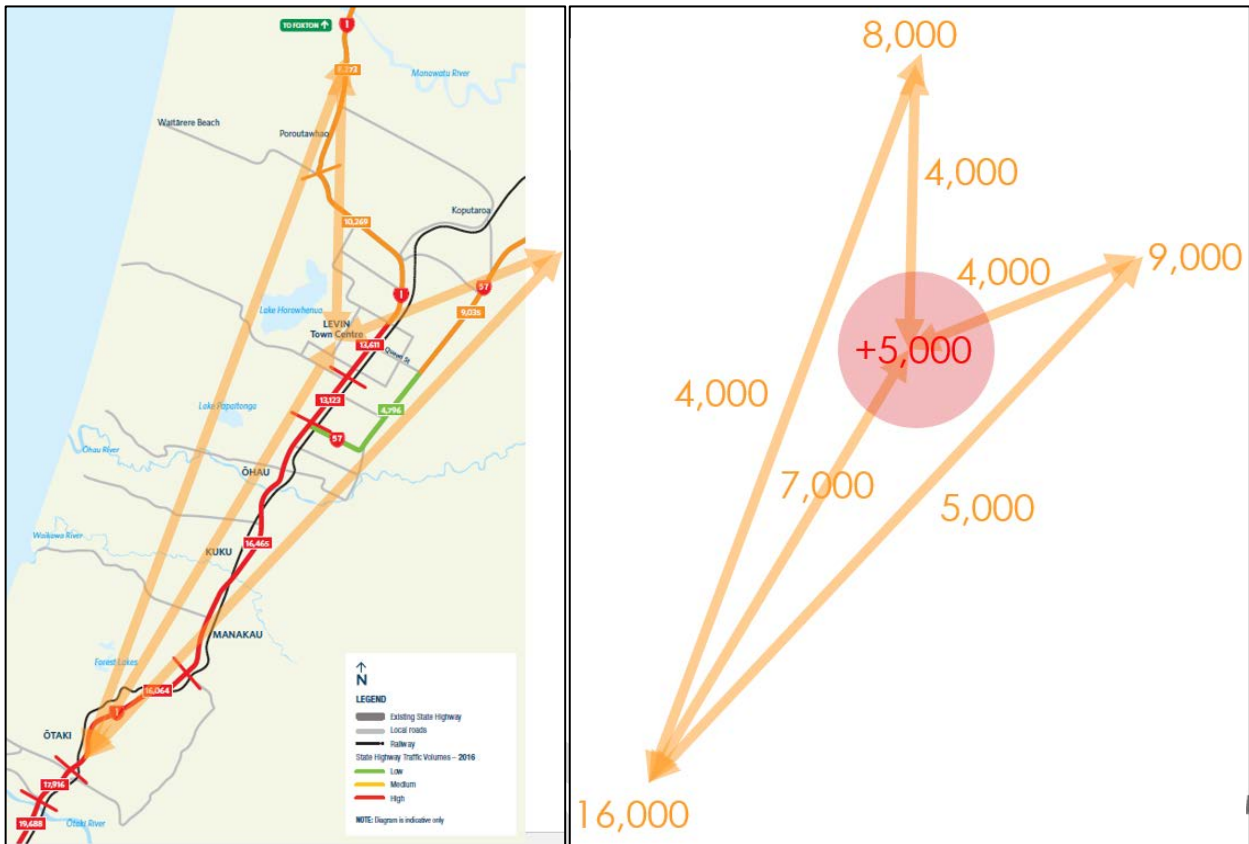


Figure 1: Key Routes and Rounded Annual Average Daily Traffic Volumes (vehicles per day in 2016)

From the above it is noted that the trips between SH1 north (e.g. Manawatu River, Foxton) and Levin, and between SH57 north (e.g. Potts Hill, Shannon) and Levin are unlikely to be affected by any of the options and therefore do not need to be considered further in this high level analysis. This is because the options being considered to not improve or impact the connections between these origins and destinations

This then leaves the key journeys of:

- SH1 south to/from SH1 north (Otaki to Manawatu River)
- SH1 south to/from Levin (Otaki to Levin)
- SH1 south to/from SH57 north (Otaki to Potts Hill)

Of interest is that the SH1 through journey is actually the journey with the lowest traffic volumes of the three, but all three are considered key and have therefore been given equal consideration and weighting for this assessment.

Now that the key journeys and number of vehicles undertaking the journeys have been identified, the next step is to determine the likely travel time. As no modelling has been undertaken, length is being used as a proxy for travel time. This is considered appropriate as we are comparing expressway options where speeds will be the same across all options.

For the Otaki to Levin journey, this analysis has assumed that there would be an interchange on the expressway at approximately Hokio Beach Road (for Western Options) or Taranua Road (Eastern Options).

The lengths that vehicles would be required to travel on each of the routes identified above was calculated and reported in the table below.

Routes that have a reduction in length, or up to 2.5km increase, are coloured green as it is assumed that even with a 2.5km increase in length many trips will still be attracted onto the expressway. Routes between 2.5km

and 4km longer are coloured yellow and routes longer than 4km are coloured red as it is expected that these trips will not transfer onto the expressway and therefore there will be no travel time benefits. These figures will need to be checked with detailed transport modelling for the shortlisted options.

Table 1: Length of key journeys using the combined routes

South	North	Otaki to Manawatu River Length	Otaki to Potts Hill Length	Otaki to Levin Length	Score
Existing	SH1	32.5	26.1	18.7	n/a
S8	N6	-2.8	7.2	5.4	3
S1	N1	-3.4	6.1	3.5	3
S1	N7	-1	4	2.6	3
S2	N2	-3	6.5	3.6	3
S2	N3	-1.7	3.3	1.7	1
S3	N2	-2.5	7	4.1	3
S3	N3	-1.2	3.8	2.2	1
S4	N4	2.9	-1.1	2.8	2
S4	N5	3.3	-0.8	3.2	2
S4	N8	4.5	0.3	5.8	3
S4	N9	3.1	-1	3.8	2
S5	N4	1.8	-2.2	1.7	1
S5	N5	2.2	-1.9	2.1	1
S5	N8	3.4	-0.8	4.7	3
S5	N9	2	-2.1	2.7	1
S6	N4	2.1	-1.9	2	1
S6	N5	2.5	-1.6	2.4	1
S6	N8	3.7	-0.5	5	3
S6	N9	2.3	-1.8	3	1
S7	N4	3.1	-0.9	3	2
S7	N5	3.5	-0.6	3.4	2
S7	N8	4.7	0.5	6	3
S7	N9	3.3	-0.8	4	3

Any option which have an increase of more than 4km on any route have been scored a 3 as this means that the expressway is not being used for at least one of the three key journeys and therefore no travel time benefits are provided for a third of trips. Any remaining options which have at least 2 routes which are likely to get full transfer were given a 1. All other routes were given a 2 as whilst still providing some benefit they have at least two routes which don't provide significant benefits.

No routes were given a score greater than 3 as if the trips via the expressway are unattractive, then it is expected that drivers would just use the current network with no overall dis-benefit compared to the existing situation.

Safety

The second of the objectives relates to the numbers of fatal and serious crashes which are likely to be saved through implementation of the expressway.

All expressway options will have a similar and very good safety performance as they will be designed to the same standards. However, there will be significant differences between the options depending on how many vehicles continue to travel on the old high-risk route, and the local road network, rather than the new low-risk expressway.

Accordingly, the difference between options will be the volume of traffic the expressway attracts from the current road network. None of the options will result in a safety dis-benefit overall, although there will be some parts of the local road network which will perform worse due to increased traffic volumes at locations close to on and off ramps, analysis and mitigation of these will occur at later stages of project development.

Overall, the safety scores for the options will mirror the travel time scores as this reflects the volume of traffic attracted onto the low risk highway.

Resilience

The major issue with resilience along the current SH1 is that there is no alternate north south route. If a crash or incident occurs on the current highway, in many places traffic cannot be diverted to another route. All the expressway options create a new route and would retain the existing SH1 as an alternate route which is a benefit to all options.

The only difference between options is S7 in that it is located in a valley that may be more susceptible to slips and earthquakes in comparison to the other options.

For this objective, all options would score a 1, with the exception of S7 which would score a 3.

Local connectivity

Local connectivity has been based on the ease of access into Levin. At a later stage of analysis, when the full interchange strategy is being developed, further origins and destinations can be considered, but at this stage only access into Levin is able to be assessed.

As mentioned above, trips to Levin from the north will not be affected by the expressway. Trips to Levin from local destinations cannot be determined until the local connectivity strategy has been determined for the preferred option(s).

Accordingly, this scores for this criterion are based on the Otaki to Levin journey in the table above.

Final Scores

A summary of all the scores from the above sections are presented in the table below. An average of the scores is also presented as a basis for an overall score.

Table 2: Scores for full routes

Route	Travel Time	Safety	Resilience	Local Connectivity	Average
S8N6	3	3	1	3	2.50
S1N1	3	3	1	2	2.25
S1N7	3	3	1	2	2.25
S2N2	3	3	1	2	2.25

S2N3	1	1	1	1	1.00
S3N2	3	3	1	3	2.50
S3N3	1	1	1	1	1.00
S4N4	2	2	1	2	1.75
S4N5	2	2	1	2	1.75
S4N8	3	3	1	3	2.50
S4N9	2	2	1	2	1.75
S5N4	1	1	1	1	1.00
S5N5	1	1	1	1	1.00
S5N8	3	3	1	3	2.50
S5N9	1	1	1	2	1.25
S6N4	1	1	1	1	1.00
S6N5	1	1	1	1	1.00
S6N8	3	3	1	3	2.50
S6N9	1	1	1	2	1.25
S7N4	2	2	3	2	2.25
S7N5	2	2	3	2	2.25
S7N8	3	3	3	3	3.00
S7N9	3	3	3	3	3.00

To fit in with the MCA process, the overall scores have to be disaggregated back into northern and southern routes. The score given to each of the southern and northern sections was based the best performing whole-of-route option of which it forms part. If the best performing route scored between 1 and 1.5, the options was given an MCA score of 1. If it scored from 1.5 and up to 2.25 it scored a 2. If it scored from 2.25 to 3 (inclusive) it was scored a 3.

Table 2: MCA scores for options

Option	Best Average	MCA Score
S1	2.25	3
S2	1.00	1
S3	1.00	1
S4	1.75	2
S5	1.00	1
S6	1.00	1
S7	2.25	3
S8	2.50	3

Option	Best Average	Score
N1	2.25	3
N2	2.25	3
N3	1.00	1
N4	1.00	1
N5	1.00	1
N6	2.50	3
N7	2.25	3
N8	2.50	3
N9	1.25	1

There was no change to my suggested scores during the workshop process.

Appendix M Engineering Degree of Difficulty and Cost Workshop Background Notes

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O2NL MCA Process - Aug 2017

Engineering Degree of Difficulty & Cost

This report has been prepared for the benefit of NZ Transport Agency. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person.

Rev. No.	Date	Description	Prepared By	Checked By	Reviewed By	Approved By
1	30/08/2017	Initial Draft	Jamie Povall	Andrew Mott	-	
2	13/11/2017	2 nd Draft	JP			
3	26/01/2018	3 rd Draft	JP	AM	PP	PP

This note records the process that I (Jamie Povall) followed in terms of scoring for the Otaki to North Levin MCA workshop that was undertaken on Tuesday 29 August 2017, in Te Takere (Levin) Library between 1-930pm.

I was personally responsible for leading the scoring for the following two criteria:

1. Engineering Considerations
2. Cost

1. Engineering Considerations

This category has been termed by some within the project as 'Engineering Degree of Difficulty' – in my interpretation the two can be considered as one and the same as the engineering considerations relate to expected or potential difficulty.

For this criteria I included 4 sub-attributes, all of which have a bearing on overall engineering considerations and constructability. I have intentionally approached this as looking at the expected issues and challenges with each corridor but have not taken the assessment far enough to be able to quantify likely costs or solutions – in light of the high-level only nature of each of the corridor options, including in respect of design information. Nevertheless, I am comfortable that the assessment is robust and repeatable, with a quantifiable basis.

The 4 sub-attributes used are as follows:

1. Structures: Relates to the total area of structures on the route (deck area) and is included as this creates a long term maintenance and resilience consideration for NZTA, and also create project risk meaning that minimising structures is preferable. Cost of structures is not considered as this is within Cost Criteria.
2. Geometry: Relates to the 'standard' of the route and considers number of curves 800-1100mR (lower standard) and curves 1100-1500mR (mid range). Scoring focused on the lower range with 820mR being the absolute minimum horizontal radius for expressway standard projects and 1100mR being the desirable minimum. This criteria is included to ensure a higher standard alignment with fewer low standard horizontal curves.
3. Geology / Geotechnical: Using existing data such as previous geotechnical testing and relevant reporting and geological and topographical maps, together with geomorphological features to estimate the expected geological / geotech challenges. The geology and geomorphological features have been assigned a value relating to anticipated significant engineering properties for a particular

alignment. This sub-attribute scoring was completed by Andrew Mott (Stantec – Hamilton Office) base on 23 years of working on engineering geology and geotechnical engineering projects.

4. Flooding: Uses the provision of historical info from Horizons Regional Council to consider the flooding risk and considers how much (linear length) of the route is within the risk areas¹.

It is recognized that there are other ‘engineering’ considerations that could have been included but that these 4 items were of most importance for the O2NL project at this stage.

Further, I intentionally tried to keep cost and engineering considerations separate (as best as could be done with two closely linked criteria) – with engineering focused on the likely challenges or issues rather than direct costs.

I also recognized that each of the four sub-attributes were arguably of varying levels of importance. Therefore in my assessment I provided a weighting of my sub-attributes in consultation with Andrew Mott. The chosen weighting was:

- Structures: 10%
- Geometrics: 20%
- Geology: 50%
- Flood Risk: 20%

Recognizing that the weightings are subjective we also tested a variety of different weightings as a sensitivity test, along with using no weighting (i.e. the average score of the 4 attributes).

The preferred weighting included geology as 50% of the total score on the basis that this could have such a significant bearing on overall constructability and cost and was still subject to many unknowns. Structures would have been higher but an estimate of structural cost was already used in the cost assessment – with structures within this category focused solely on the long term maintenance and resilience effects of more structures (hence a lower weighting). Geometrics and flood risk were both considered to be of greater importance than structures but can either be managed and mitigated through design (such as constructing the road on a raised embankment), or are subject to minimum standards for this type of highway, hence a 20% weighting.

The overall ‘Engineering Considerations’ scores are provided at the end of this technical note. As engineering inputs can generally be quantifiable, the following ranking ranges were used for the sub-attribute categories:

DECK AREA	GEOMETRY (horiz.)		GEOLOGY	LINEAR KM FLOOD RISK	
Zero area	1 Zero800-1500mR	1	Almost no challenges (or none)	1 No flood risk areas	1
up to 2000m2	2 Up to 1 8to11mR	2	minimal expected challenges	2 Little flood risk (up to around 1km)	2
2000-5000m2	3 2 8to11mR	3	moderate exopected challenges	3 1-3.5km of flood risk	3
5000-8000m2	4 3 8to11mR	4	Fairly major challenges expected	4 3.5km-6km	4
8000m2+	5 3+ 8to11mR	5	extremely problematic	5 Over 6km	5

This allowed all sub-attributes to be scored out of 5. It is noted that the sub-attribute scoring range descriptions has been provided by Sylvia Allan to the specialists. This approach is reflective of that range but adapted to better reflect this criteria. I deem that acceptable as these are sub-attributes and also because Sylvia’s scoring is very much for the ‘effect’ based criteria and engineering is somewhat different.

¹ Also received extra info from Horizons John Foxall (29/8/17) but this was not used in the initial scoring of options (given it was only received on the day of the MCA workshop). Flood risk scoring was solely based on the historical Horizons flooding information. This additional information was later considered but as it is not quantifiable (but rather anecdotal) it has not been included in the scoring.

For the Geology sub-attribute, following discussions at the workshop and comments by HDC staff, Andrew Mott decided to change the score given to N2 and N7 given the presence of peat material. While he was aware of this prior to the workshop, the council information regarding the challenges was such that he decided that his score should be increased from a 3 to a 4 for these routes. This was significant because it changed the overall Engineering score for both of these routes from a 3 to a 4.

2. Cost

The cost criteria was assessed using only the limited information available. To produce a very rough order cost I have produced per kilometre rates for 'standard' construction and 'complex' construction. To do this we draw up a typical cross section and then calculate the rate of this cross section over a full kilometre length. Similarly the same is done for a 'complex' cross section that includes more challenging works such as more significant earthworks, ground stabilization and greater pavement depths (i.e. to account for poorer subgrade material).

Each route is then assessed visually (using Google Earth) and the entire length is split between standard and complex construction and the appropriate rate applied. This is a coarse method of estimation that has limitations but considered reasonable given the limited information available and multitude of routes being considered. Using two different per km rates recognizes the different construction costs / complexity that I believe is important to include even at this early stage (for clarity the 'complex' rate is around 25% more costly than the standard rate).

In addition to the length based costing, I have also included an expected structural cost for each route. No structural design is available so it is very much a rough order estimate considering the locations where potential structures are needed and the likely span and width. This provides the expected deck area and this is then multiplied with a standard square metre rate for structural deck.

The route structure cost is added to the route length (i.e. complex rate length + standard rate length) cost to give a final cost.

It is essential to note that I do not provide absolute dollar figures because this is misleading and can create unrealistic expectations around cost when we are not able to do so at this stage. Instead I look at the relative difference between the options using the cost estimation methodology described above to assign a score. Cost is very different to the effects based 1-5 ranking and so I base the difference in scoring on the range between options.

The cost range for the northern section was a 60% difference between least and most cost options, whereas for the southern section the difference was 37%.

To provide a score of between 1 and 5, I developed a range of costs linked to each score and then allocated a score to each route based upon which band the cost sat. The banding is highly subjective, but my approach was to try and get a spread of scores (rather than all options sitting within a single band).

It is important to reiterate that this methodology to cost estimate comparison is a relative rather than absolute scoring methodology.

The cost scores are shown below:

Route Number	SCORE
S1	2
S2	2
S3	2
S4	4
S5	4
S6	3
S7	4
S8	2
N1	2
N2	3
N3	2
N4	1
N5	1
N6	4
N7	2
N8	2
N9	2

AUTHORS NOTE

Engineering

For the southern options I gave a score of 3 for S5. I noted that this was right on the cusp of 2 or 3, with a weighted average of 2.5 being rounded to a 3. Given this was the process I used throughout, my overall score of 3 remains. I note the wider workshop preference was to award a score of 2 for this option and sensitivity test for a score of 3.

For the northern options I changed my N2 score of 3 to a 4 after the workshop given further consideration of geotechnical information, with a change in the sub-attribute score changing the overall engineering score to a 4. This is noted in the main body of this note, and my score of 4 remains. I note the wider workshop preference was to award a score of 3 for this option and sensitivity test for a score of 4.

For N3, I gave a score of 3 but noted this was on the cusp of a 2/3. Given this was the process I used throughout, my overall score of 3 remains. I note the wider workshop preference was to award a score of 2 for this option and sensitivity test for a score of 3.

For N6, I gave a score of 4 but noted this was on the cusp of a 3/4. Given this was the process I used throughout, my overall score of 4 remains. I note the wider workshop preference was to award a score of 3 for this option and sensitivity test for a score of 4.

For N7, we altered our score of 3 to a 4 after the workshop given further consideration of geotechnical information, with a change in the sub-attribute score changing the overall engineering score to a 4. This is noted in the main body of this note. I note the wider workshop preference was to award a score of 3 for this option and sensitivity test for a score of 4.

Cost

My original scores did not change through the workshop process.

Northern Routes Scoring:

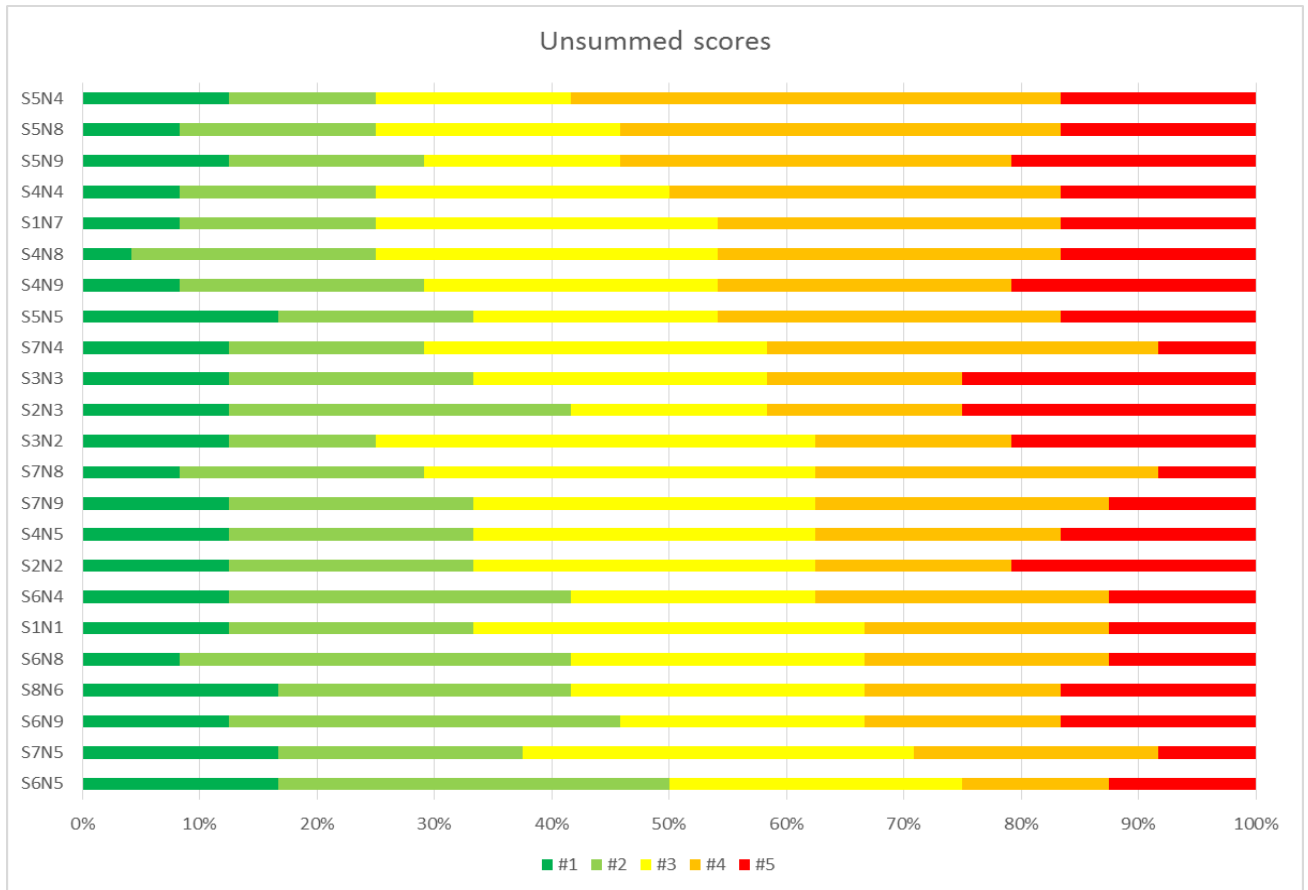
											SENSITIVITY WEIGHTINGS				
											Structures	0.1	0.1	0.05	0.1
											Geometrics	0.1	0.2	0.1	0.2
											Geology	0.5	0.5	0.5	0.3
											Flooding	0.3	0.2	0.35	0.4
Weighting	Length	Structures 0.1	Geometrics 0.2	Geology/Geotech 0.5	Flooding risk 0.2			Average score	Weighted average	SCORE					
Ohau River to SH1															
N1 (YELLOW)	11.4	Hokio Stream Br 3120m2	R800-R1100: 0 R1101-R1500: 1 3 R1501+: 3	2	Soft ground around lakes and dunes	3	4km of flood risk	4	3.00	3.00	3.00	3.20	3.00	3.25	3.20
N2 (DARK GREEN)	12.2	Hokio Stream Br 3120m3	R800-R1100: 1 R1101-R1500: 1 3 R1501+: 3	2	Soft ground around lakes and dunes	4	4km of flood risk	4	3.25	3.50	4.00	3.20	3.00	3.25	3.20
N3 (BROWN)	11.3	NONE	R800-R1100: 4 R1101-R1500: 1 1 R1501+: 1	5	Older beach and alluvial deposits.	2	Minimal flood risk areas	2	2.50	2.50	3.00	2.20	2.50	2.25	2.50
N4 (LIGHT BLUE)	9.3	NIMT railway overpass 1200m2	R800-R1100: 1 R1101-R1500: 0 2 R1501+:1	2	Older beach and alluvial gravels	2	Zero areas of flood risk on corridor	1	1.75	1.80	2.00	1.70	1.80	1.65	1.60
N5 (RED / PINK)	9.7	NIMT railway overpass 1200m3	R800-R1100: 1 R1101-R1500: 1 2 R1501+: 2	2	Older beach and alluvial gravels	2	Zero areas of flood risk on corridor	1	1.75	1.80	2.00	1.70	1.80	1.65	1.60
N6 (PINK)	13.4	Hokio Stream Br 2640m2	R800-R1100: 1 R1101-R1500: 0 3 R1501+: 3	2	Recent aeolian dune deposits, loose, earthworks,	4	Over 5km length in flood risk	4	3.25	3.50	4.00	3.70	3.50	3.75	3.50
N7 (BIEGE)	11.6	NONE	R800-R1100: 2 R1101-R1500: 2 1 R1501+: 3	4	Soft ground southern half of route	4	Around 3km of flood risk	3	3.00	3.50	4.00	2.90	3.00	3.00	3.00
N8 (LIGHT GREEN)	10.9	Stream Bridge 1200m2 NIMT Rail overpass 1200m2	R800-R1100: 0 R1101-R1500: 0 3 R1501+: 3	1	Older beach and alluvial gravels	2	Some risk at N&S extents	2	2.00	1.90	2.00	2.00	1.90	1.95	1.90
N9 (BROWNY)	9.5	NIMT Rail overpass 1200m2	R800-R1100: 1 R1101-R1500: 1 2 R1501+: 0	2	Older beach and alluvial gravels	2	Minimal risk only near Ohau River	2	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Southern Routes Scoring

											SENSITIVITY WEIGHTINGS					
											Structures	0.1	0.1	0.05	0.1	
											Geometrics	0.1	0.2	0.1	0.2	
											Geology	0.5	0.5	0.5	0.3	
											Flooding	0.3	0.2	0.35	0.4	
Weighting	Length	Structures 0.1	Geometrics 0.2		Geology/Geotech 0.5	Flooding risk 0.2			Average score	Weighted average	SCORE					
Ohau Rivier to SH1																
S1 (BLUE)	11.8	4no. 9960m2	R800-R1100: 1 R1101-R1500: 0 5 R1501+:4	2	Crosses recent alluvial deposits	Multiple locations along alignment of flood risk (incl. Ohau River)	3		3.25	3.00	3.00		3.10	3.00	3.00	3.00
S2 (RED)	11.4	4no. 10680m2	R800-R1100: 1 R1101-R1500: 0 5 R1501+:3	2	Crosses recent alluvial deposits	Multiple locations along alignment of flood risk (incl. Ohau River)	3		3.25	3.00	3.00		3.10	3.00	3.00	3.00
S3 (ORANGE)	11.9	4no. 11160m2	R800-R1100: 3 R1101-R1500: 0 5 R1501+:3	4	crosses incised recent gullies in south	1.5km in DP flood area at Ohau River	3		3.75	3.40	3.00		3.30	3.40	3.20	3.40
S4 (ORANGE)	16	5no. 11640m2	R800-R1100: 2 R1101-R1500: 0 5 R1501+:5	3	crosses incised recent gullies in south	Various locations of flood risk	3		3.50	3.20	3.00		3.20	3.20	3.10	3.20
S5 (BLACK)	14.9	4no. 10920m2	R800-R1100: 1 R1101-R1500: 0 5 R1501+: 5	2	Generally older deposits	1.5km in DP flood area at Ohau River	3		3.00	2.50	3.00		2.60	2.50	2.50	2.70
S6 (LIME)	15.2	3no. 7680m2	R800-R1100: 1 R1101-R1500: 0 4 R1501+: 5	2	Generally older deposits	1.5km in DP flood area at Ohau River	3		2.75	2.40	2.00		2.50	2.40	2.45	2.60
S7 (NAVY)	16.2	3no. 5640m2	R800-R1100: 2 R1101-R1500: 0 4 R1501+: 5	3	Earthworks particularly in mid section of route	Minimal length within DP flood risk areas	2		3.00	2.90	3.00		2.80	2.90	2.70	2.70
S8 (WHITE)	10.9	4no. 10680m2	R800-R1100: 2 R1101-R1500: 0 5 R1501+: 7	3	Crosses recent alluvial deposits	Significant portion of length within flood risk area (and close to tsunami risk area)	4		3.75	3.40	3.00		3.50	3.40	3.45	3.60

Appendix N Notes on Combined Route Sections

Route Combination Analysis



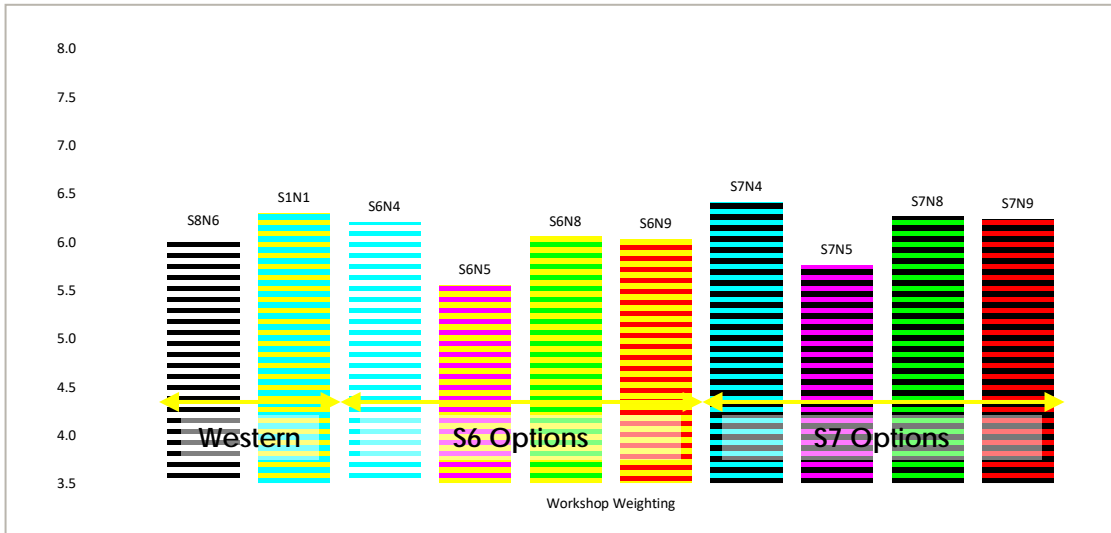
The figure above shows a listing of all possible combinations of northern and southern route options. Note that not all northern and southern section options are able to be linked.

For each of these combined options, the numbers of scores 1 to 5 have been combined (for all of the 12 criteria for the southern and northern sections), and then converted to a percentage. The options have then been ranked with the largest percentage of scores of 4s and 5s shown at the top of the figure and the smallest percentage of scores of 4s and 5s (i.e. those likely to have the most associated difficulties in implementing) at the bottom.

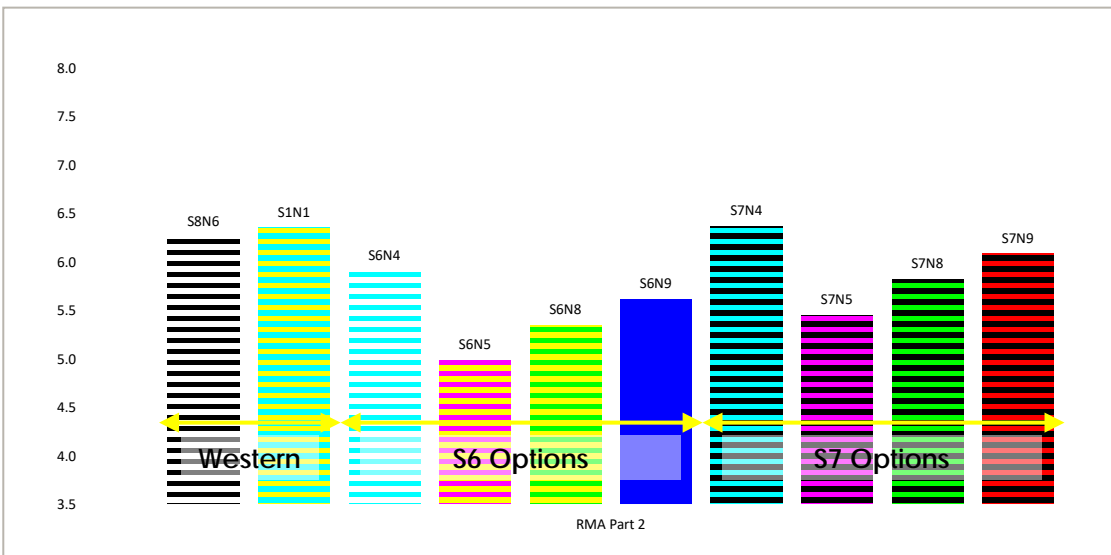
This analysis has limitations, as route sections with significant difficulties (even potential fatal flaws) when linked with a well-performing option elsewhere, may be found in the middle of the rankings, with its overall difficulty concealed by this combination. The depiction also does not include any weighting or address the fact that the workshop considered that the raw scores did not comprise a "base case" and that weighting was needed.

However, the order of priority shown in this figure does tend to confirm that combinations which include Options S4, S5, N2, N3 and N7 are higher in the figure and should be removed from further analysis.

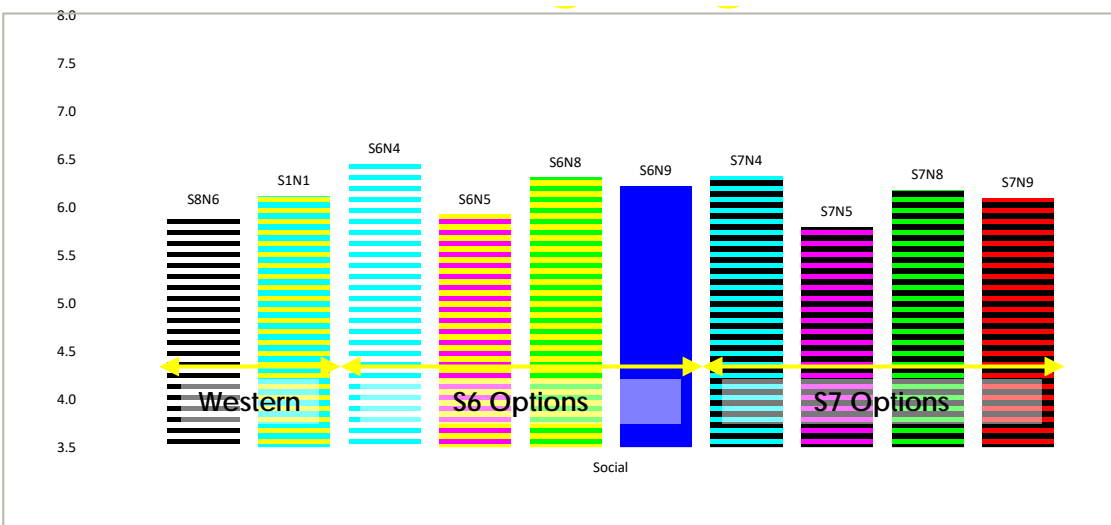
Appendix O Graphs showing order of favourability of combined route options under different weighting systems



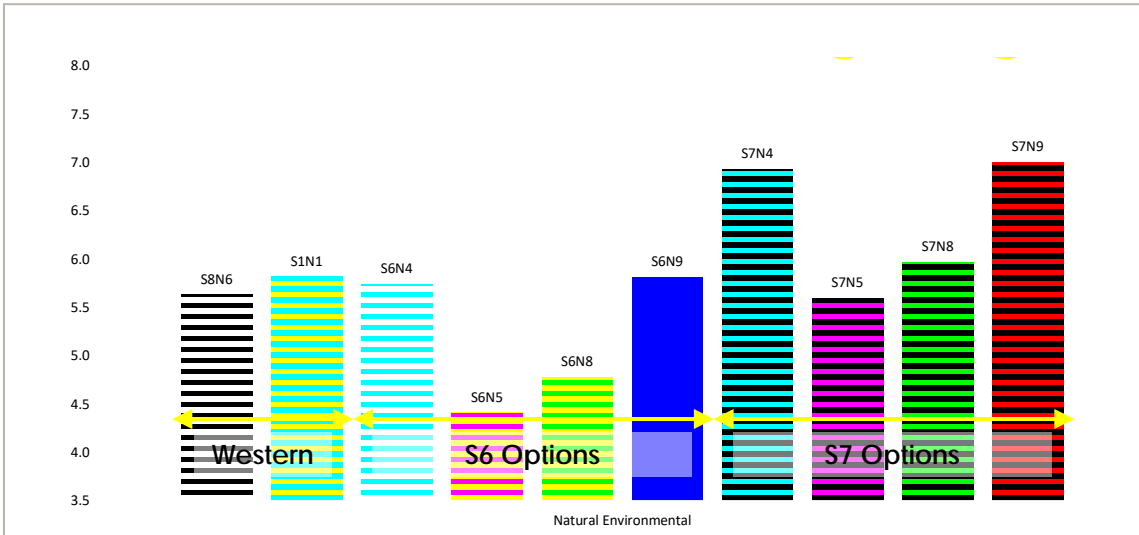
Workshop Weighting



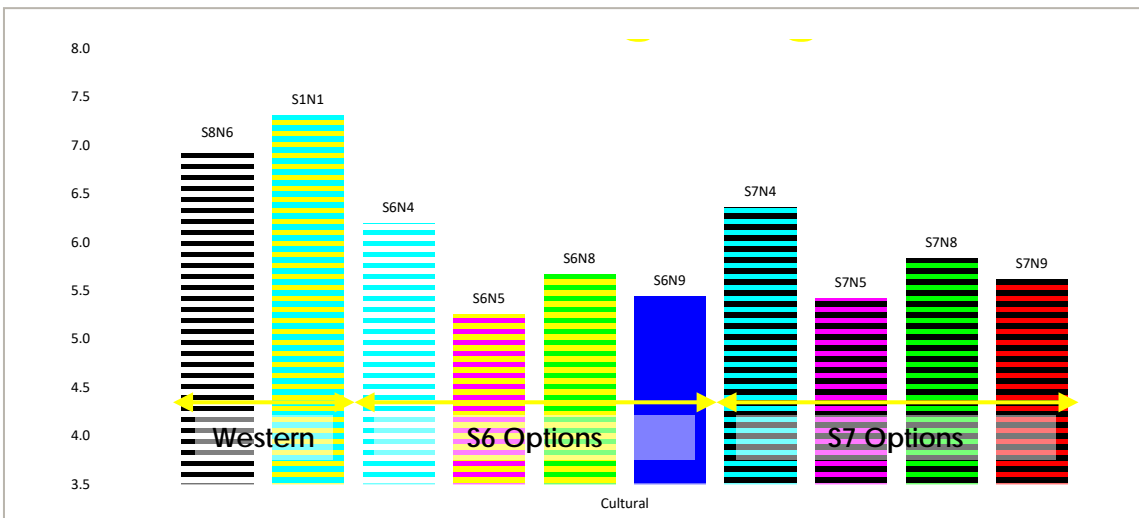
FRMA Part 2 Weighting



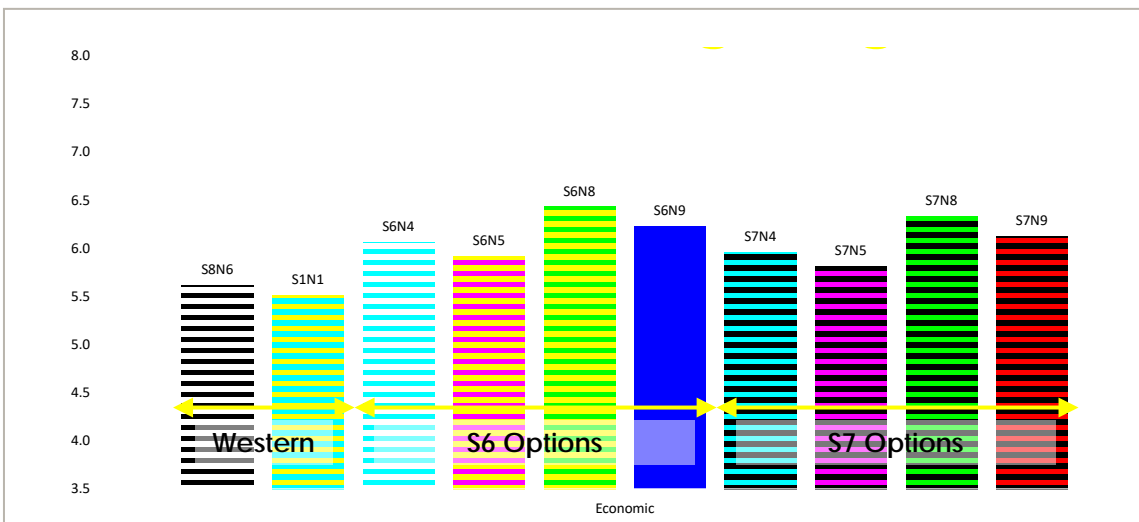
QBL: Social Weighting



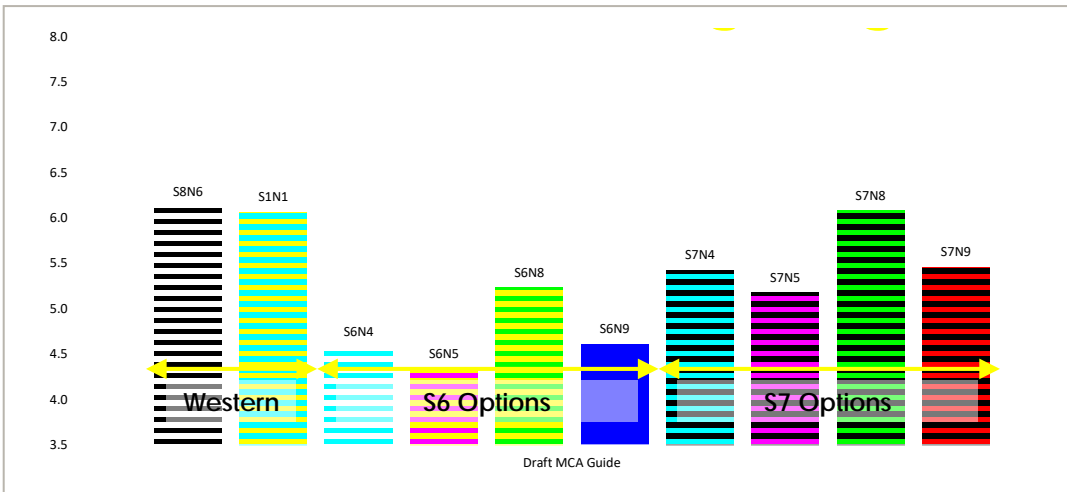
QBL: Environmental Weighting



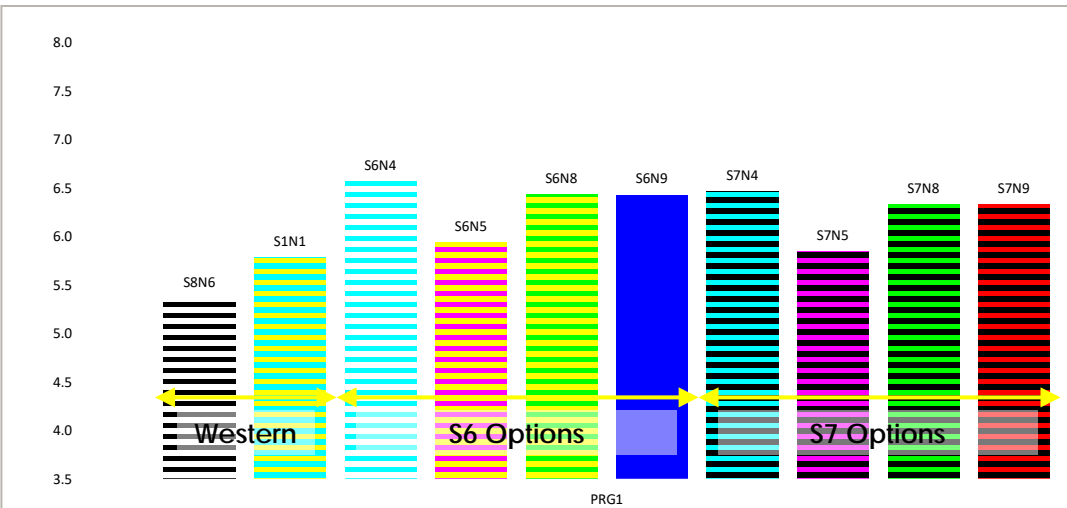
QBL: Cultural Weighting



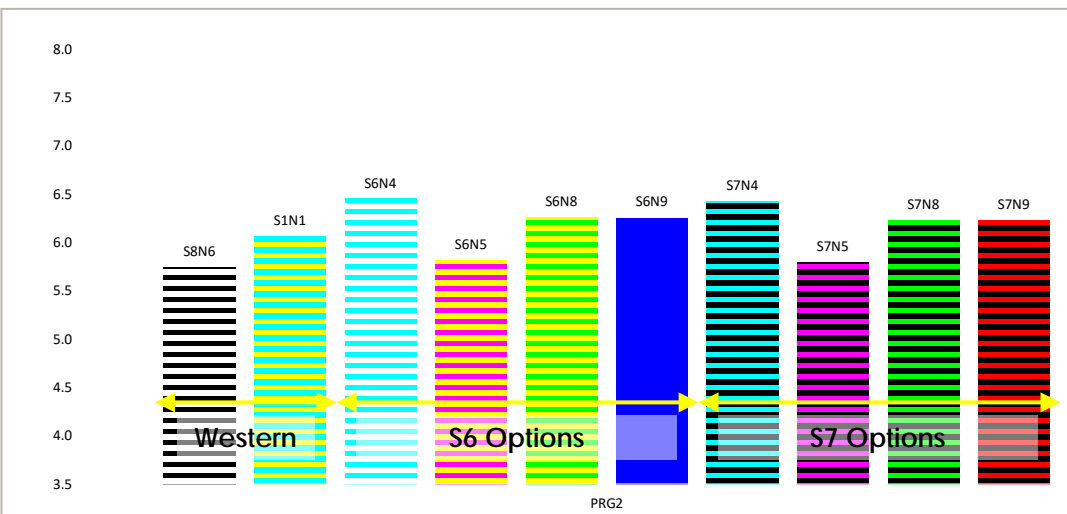
QBL: Economic Weighting



Draft MCA Guide Weighting



PRG1 Weighting



PRG2 Weighting

Appendix P Review of Productive Land Criterion

REVIEW OF MCA OUTCOMES FOLLOWING MODIFIED PRODUCTIVE LAND SCORES

As explained in the report, the NZ Transport Agency sought a review of the MCA outcomes taking into account changes to the scoring for the productive land criterion. This was based on concerns that some of the more versatile land within the route sections was no longer productive due to it having been fragmented into lifestyle-sized parcels, or due to it being zoned for non-productive uses. The implication was that, in some cases, the scoring of effects on productive land would have been more adverse than was, in reality, justifiable.

LandVision Ltd was asked to undertake a further exercise of reviewing the land involved and revising the scoring. How this was done, and the revised scores, is explained in the report which is appended. This also sets out the modified scoring which has been the basis of a further analysis (see Table 8 of the appended report).

When the revised scores are applied to the various weighting systems, some minor changes result, as outlined below.

Northern Route Options:

The revised scores resulted in slight changes in all but Option N1 of the northern options. These changes are generally minor and insufficient to cause a change in order of preference overall, although, as might be expected, the modifications made all options marginally more favourable (except for the cultural weighting, which did not incorporate any weight to the productive land criterion). Under the Workshop Weighting, Option N2 replaced Option N3 as the second most adverse option (see Table 4.11 in the main report for the Workshop Analysis findings), but otherwise the identification of the “worst” sections remains the same. This does not alter the overall conclusion that Option N7 consistently scores most adversely, with either Option N2 or N3 the next most adverse. Similarly, it does not alter the conclusion that Options N2, N3 and N7 should be discounted, even though the productive land criterion scoring is more favourable for those sections (in the case of Option N3 by two score points).

Southern Route Options:

The review modified only the scores for Options S4, S6 and S7, and thus resulted in slight changes in the weighted analysis for those options. The analysis made section S4 slightly more favoured under all but the cultural weighting. However, this was insufficient to change the order of preference, and S4 remains one of the two least preferred under all weighting systems. A similar pattern emerged with Options S6 and S7, but again this did not change the identification of the worst performing options. The review does not change the proposal that Options S4 and S5 should be discounted.

Combined Options:

Tables A and B below relate to the combined route options which have been analysed in section 4.6.2 of the main report. The same analysis has been performed, but with the revised scores for the productive land criterion.

Table A: Analysis of Combined Route Options (with revised scores for Productive Land)

Combined Options	Workshop Weighting	RMA Part 2	Social	Natural Environment	Cultural	Economic	Draft MCA	PRG1	PRG2
S8N6	6.0	6.2	5.9	5.5	7.0	5.5*	6.1	5.2*	5.6*
S1N1	6.3	6.4	6.1	5.8	7.3	5.5*	6.1	5.8	6.1
S6N4	5.9	5.8	6.3	5.4	6.2	5.8	4.5*	6.2	6.1
S6N5	5.4*	4.9*	5.8*	4.2*	5.3*	5.7	4.3*	5.7	5.6*
S6N8	5.9	5.3*	6.2	4.6*	5.7	6.2	5.2	6.2	6.0
S6N9	5.8	5.5	6.1	5.5	5.4*	5.9	4.5*	6.1	5.9
S7N4	6.2	6.3	6.2	6.6	6.4	5.7	5.3	6.1	6.1
S7N5	5.6*	5.4	5.7*	5.4	5.4*	5.6	5.1	5.6*	5.6*
S7N8	6.1	5.8	6.1	5.7	5.8	6.1	6.0	6.1	6.0
S7N9	6.0	6.0	6.0	6.7	5.6	5.8	5.3	6.0	5.9

Table B: Summary of rankings (with revised scores for Productive Land)

Combined Option	Workshop Weighting	RMA Part 2	Social	Natural Environment	Cultural	Economic	Draft MCA	PRG1	PRG2
S8N6	6=	8	3	5=	9	1=	9=	1	1=
S1N1	10	10	5=	8	10	1=	9=	4	8=
S6N4	4=	5=	10	3=	7	6=	2=	9=	8=
S6N5	1	1	2	1	1	4=	1	3	1=
S6N8	4=	2	8=	2	5	10	5	9=	6=
S6N9	3	4	5=	5=	2=	8	2=	6=	3
S7N4	9	9	8=	9	8	4=	6=	6=	8=
S7N5	2	3	1	3=	2=	3	4	2	1=
S7N8	8	5=	5=	7	6	9	8	6=	6=
S7N9	6	7	4	10	4	6	6	5	5

By comparing Table A and B with Tables 4-12 and 4-13 in the main report, it can be seen that the revised scores have had some effect in the overall scores awarded under the various weighting systems, and thus the order of preference has changed slightly. Generally this has not affected the top two preferences under any weighting system, except as follows:

- Under the economic weighting system, Option S8N6 has an equal score to S1N1 (as most favoured), with Option S7N5 remaining in third place.
- Under the PRG1 weighting analysis, Option S1N1 (which was second favoured) has dropped to fourth place. Second favoured under this analysis is S7N5 with the revised scores.
- Under the PRG2 weighting analysis, Options S8N6, S6N5 and S7N5 are all equally favoured with the revised productive land scores. This modifies the position in the main report where Option S8N6 was marginally favoured above the other two.

There are small changes in the order of the remaining rankings (particularly in relation to the lower-ranking options) but these are not of such significance that they would modify the overall identification of the better-performing options.

Sylvia Allan

21st November 2017



Appendix

Otaki to North of Levin Expressway

Route Options

Assessment of productive land values when lifestyle & zoned land is excluded

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WANGANUI II

1 CONCLUSIONS

This analysis looks at the effects on the scoring of the productive land criterion when lifestyle blocks and land already zoned for non-productive purposes is removed from the analysis.

There is a strong argument that once a property becomes a lifestyle property then the productive capability of the land is lost. When lifestyle blocks, ie blocks of less than 10 ha in size, are removed from the analysis there is generally a significant impact on the scoring of the criteria for productive land for some of the options. Where the area of lifestyle blocks is greater, then the impact on productive land within the corridor is generally reduced.

As a result, the scoring for options N2, N3, N4, N5, N6, N8, N9, S4, and S6 all improved (ie moved to a smaller number) from when all property sizes were incorporated into the analysis. Overall those northerly options with the best score from a productive land perspective are options N2, N3, N4 and N6 and for the southerly options S8. All of these options head west.

When HDC zoning is added to the equation, it really only influenced options N7 and N9 for the final scoring. Although adding the zoning to the analysis for properties over 10 ha did reduce the impact on productive land for a further six options it was not considered large enough to influence the final score. This was because the reduction was all class III land and the score for the option prior to adding the zoning to the equation was already low.

Despite these preferred options from a productive land perspective above, if any of the other options were chosen, the difference between the area of productive land from the preferred options and any other option is in reality insignificant. It would probably be less than the area of half an economic dairy unit.

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3 PURPOSE

At the public consultation there was discussion as to the impact of block or property size on productive land. The purpose of this report is to reassess the impact from the different options when both block size and zoned areas for rural residential are taken into consideration.

4 THE PROCESS USED

A desktop analysis was undertaken in two parts:

1. The assessment of the impact from just removing the existing lifestyle blocks.
2. The assessment of excluding both the existing lifestyle blocks and the areas where the Horowhenua District Council (HDC) has zoned the land making it easy for subdivision below 10 ha (including residential and industrial land or which is reserve).

The analysis was undertaken using GIS and the 1:50,000 scale NZLRI, property boundaries, and the HDC zoning boundaries.

5 RESULTS

The results from the GIS analysis are shown in the following tables.

Table 1. The impact on land classes for each option from all property sizes.

Option	LUC Class						Total Area (ha)	Total area for LUC classes 1-3 (ha)	Total area for LUC classes 1-2 (ha)
	1	2	3	4	6	7			
N1	0	68.1	192.1	44.1	64.1	0	368.4	260.2	68.1
N2	37.7	61.7	202.0	15.9	54.7	0	372.0	301.4	99.4
N3	151.6	75.9	99.5	7.3	0	0	334.2	326.9	227.5
N4	122.0	56.6	95.0	0	0	0	273.6	273.6	178.6
N5	127.4	56.6	109.5	0	0	0	293.5	293.5	184.0
N6		9.0	106.4	24.8	245.8	15.4	401.3	115.3	9.0
N7	70.1	84.6	167.9	34.4	7.9	0	364.9	322.6	154.7
N8	66.1	176.9	162.4	0	26.3	0	431.7	405.4	243.0
N9	124.3	89.5	138.8	0.4	0		353.0	352.6	213.8
S1	92.7	95.0	141.2	0	2.3	0	331.2	328.9	187.7
S2	130.9	71.7	128.7	3.0	2.3	0	336.7	331.3	202.6
S3	154.9	21.8	154.3	12.5	2.3	0	345.8	330.9	176.6
S4	194.6	48.6	244.6	10.0	2.3	0	500.1	487.8	243.2
S5	204.6	96.5	165.5	24.6	4.0	0	495.2	466.6	301.2
S6	127.1	80.3	268.5	26.0	7.8	0	509.8	475.9	207.3
S7	26.8	104.0	360.0	14.5	47.2	0	552.5	490.8	130.8
S8	69.4	46.1	200.2	1.5	4.5	0	321.7	315.7	115.5

Table 2. The number of properties affected for the different size categories for each option.

Option	Number of properties	Total area (ha)	Average size (ha)	Largest size (ha)	Number of properties			
					<4000 m2	4000 m2 to 5 ha	>5 ha to 10 ha	>10 ha
N1	107.0	1,549.4	14.5	119.4	8	44	19	36
N2	152.0	1,397.4	9.2	119.4	12	93	17	30
N3	194.0	765.5	3.9	40.9	37	101	37	19
N4	143.0	576.4	4.0	55.6	27	83	23	10
N5	132.0	813.8	6.2	56.8	19	72	24	17
N6	84.0	2,270.0	27.0	179.4	10	29	11	34
N7	134.0	1,010.6	7.5	108.7	25	56	26	27
N8	198.0	1,441.3	7.3	143.2	25	109	34	30
N9	140.0	934.0	6.7	56.8	17	72	28	23
S1	97.0	1,324.8	13.7	74.6	6	18	27	46
S2	101.0	1,380.4	13.7	74.6	6	20	28	47
S3	117.0	1,236.3	10.6	74.6	12	35	31	39
S4	195.0	1,472.2	7.5	74.6	32	79	42	42
S5	201.0	1,416.0	7.0	58.5	36	86	37	42
S6	205.0	1,395.9	6.8	79.6	25	107	34	39
S7	147.0	1,675.4	11.4	162.6	9	64	27	47
S8	87.0	1,225.4	14.1	62.2	2	22	19	44

Note: these figures are based on property title. Roads, hydro, and rail have been excluded along with those parcels that had no title.

Table 3. A breakdown of the total and average areas of properties within each option.

Option	Total area of properties				Average area of properties			
	<4000 m2	4000 m2 to 5 ha	>5 ha to 10 ha	>10 ha	<4000 m2	4000 m2 to 5 ha	>5 ha to 10 ha	>10 ha
N1	1.5	103.4	123.8	1,320.8	0.19	2.35	6.52	36.69
N2	2.9	179.8	117.5	1,097.2	0.24	1.93	6.91	36.57
N3	7.1	169.0	241.1	348.3	0.19	1.67	6.52	18.33
N4	6.1	186.0	151.5	232.8	0.23	2.24	6.59	23.28
N5	4.5	162.9	159.5	486.8	0.24	2.26	6.65	28.64
N6	2.5	52.7	76.8	2,138.0	0.25	1.82	6.98	62.88
N7	4.9	104.9	182.4	718.3	0.20	1.87	7.02	26.60
N8	5.7	189.5	200.5	1,045.6	0.23	1.74	5.90	34.85
N9	4.1	159.9	192.6	577.4	0.24	2.22	6.88	25.10
S1	0.8	36.3	196.0	1,091.7	0.14	2.02	7.26	23.73
S2	0.8	44.4	197.1	1,138.0	0.14	2.22	7.04	24.21
S3	2.2	73.1	221.2	939.8	0.18	2.09	7.14	24.10
S4	6.4	160.0	279.6	1,026.3	0.20	2.03	6.66	24.44
S5	6.6	184.4	251.3	973.6	0.18	2.14	6.79	23.18
S6	5.2	198.6	229.1	963.1	0.21	1.86	6.74	24.69
S7	2.1	116.4	197.5	1,359.3	0.23	1.82	7.32	28.92
S8	0.3	44.3	132.4	1,048.4	0.13	2.01	6.97	23.83

Note: these figures are based on property title. Roads, hydro, and rail have been excluded along with those parcels that had no title.

Table 4. The LUC class distribution of the effected land for properties greater than 10 ha for each of the options.

Option	LUC Class						Total Area (ha)	Total area for LUC classes 1-3 (ha)	Total area for LUC classes 1-2 (ha)
	1	2	3	4	6	7			
N1	0	34.6	140.1	48.8	57.0	0	280.7	174.7	34.6
N2	30.0	23.6	91.3	16.0	50.4	0	211.5	144.9	53.6
N3	56.9	7.1	37.6	1.9	0	0	103.5	101.6	64.0
N4	14.9	20.0	49.3	0	0	0	84.2	84.2	34.9
N5	43.2	20.0	70.6	0	0	0	133.9	133.9	63.3
N6	0	8.6	81.0	17.2	221.4	15.3	343.6	89.6	8.6
N7	30.3	40.2	133.8	20.1	6.5	0	231.0	204.4	70.6
N8	19.8	102.6	93.6	0	23.6	0	239.5	216.0	122.4
N9	47.8	30.0	107.9	0.3	0	0	186.0	185.7	77.8
S1	53.2	72.4	104.7	0	0.6	0	230.9	230.2	125.6
S2	81.7	53.3	92.2	3.0	0.6	0	230.9	227.2	135.0
S3	103.2	11.3	115.3	6.2	0.6	0	236.5	229.7	114.4
S4	96.4	15.0	165.7	2.2	0.6	0	280.0	277.1	111.4
S5	93.9	51.3	102.6	19.7	2.3	0	269.8	247.8	145.2
S6	43.8	48.7	133.4	24.0	6.1	0	256.0	225.9	92.5
S7	12.0	70.1	269.4	10.0	44.1	0	405.6	351.5	82.1
S8	46.3	41.6	163.0	1.5	2.8	0	255.2	251.0	87.9

Note: these figures are based on property title. Roads, hydro, and rail have been excluded along with those parcels that had no title.

Table 5. The LUC distribution of the affected areas for properties greater than 10 ha and the HDC 'zoned land' is excluded.

Option	LUC Class						Total Area (ha)	Total area for LUC classes 1-3 (ha)	Total area for LUC classes 1-2 (ha)
	1	2	3	4	6	7			
N1	0	34.6	129.1	48.8	56.0	0	268.7	163.7	34.6
N2	29.6	23.6	80.3	16.0	49.3	0	199.0	133.5	53.2
N3	42.5	7.1	14.2	1.9	0	0	65.6	63.8	49.6
N4	14.9	20.0	5.1	0	0	0	39.9	39.9	34.9
N5	43.2	20.0	31.5	0	0	0	94.7	94.7	63.3
N6	0	8.6	81.0	17.2	221.4	15.3	343.6	89.6	8.6
N7	22.1	40.2	112.7	20.1	6.5	0	201.7	175.0	62.3
N8	19.8	102.6	93.6	0	23.6	0	239.5	216.0	122.4
N9	47.8	30.0	56.9	0	0	0	134.6	134.6	77.8
S1	53.2	72.4	104.7	0	0.6	0	230.9	230.2	125.6
S2	81.7	53.3	92.2	3.0	0.6	0	230.9	227.2	135.0
S3	103.2	11.3	115.3	6.2	0.6	0	236.5	229.7	114.4
S4	96.3	15.0	144.9	1.6	0.6	0	258.5	256.2	111.3
S5	93.9	51.3	102.6	19.7	2.3	0	269.8	247.8	145.2
S6	43.8	48.7	133.4	24.0	6.1	0	256.0	225.9	92.5
S7	12.0	70.1	248.8	10.0	44.1	0	385.0	330.9	82.1
S8	46.3	41.6	163.0	1.5	2.8	0	255.2	251.0	87.9

Note: these figures are based on property title. Roads, hydro, and rail have been excluded along with those parcels that had no title.

Table 6. Summary table showing the impact from the different options.

Option	Area (ha) for all LUC classes			Area for LUC classes 1-3 (ha)			Area for LUC classes 1-2 (ha)		
	All properties	Includes only properties greater than 10 ha	Properties greater than 10 and zoned	All properties	Includes only properties greater than 10 ha	Properties greater than 10 and zoned	All properties	Includes only properties greater than 10 ha	Properties greater than 10 and zoned
N1	368.4	280.7	268.7	260.2	174.7	163.7	68.1	34.6	34.6
N2	372.0	211.5	199.0	301.4	144.9	133.5	99.4	53.6	53.2
N3	334.2	103.5	65.6	326.9	101.6	63.8	227.5	64.0	49.6
N4	273.6	84.2	39.9	273.6	84.2	39.9	178.6	34.9	34.9
N5	293.5	133.9	94.7	293.5	133.9	94.7	184.0	63.3	63.3
N6	401.3	343.6	343.6	115.3	89.6	89.6	9.0	8.6	8.6
N7	364.9	231.0	201.7	322.6	204.4	175.0	154.7	70.6	62.3
N8	431.7	239.5	239.5	405.4	216.0	216.0	243.0	122.4	122.4
N9	353.0	186.0	134.6	352.6	185.7	134.6	213.8	77.8	77.8
S1	331.2	230.9	230.9	328.9	230.2	230.2	187.7	125.6	125.6
S2	336.7	230.9	230.9	331.3	227.2	227.2	202.6	135.0	135.0
S3	345.8	236.5	236.5	330.9	229.7	229.7	176.6	114.4	114.4
S4	500.1	280.0	258.5	487.8	277.1	256.2	243.2	111.4	111.3
S5	495.2	269.8	269.8	466.6	247.8	247.8	301.2	145.2	145.2
S6	509.8	256.0	256.0	475.9	225.9	225.9	207.3	92.5	92.5
S7	552.5	405.6	385.0	490.8	351.5	330.9	130.8	82.1	82.1
S8	321.7	255.2	255.2	315.7	251.0	251.0	115.5	87.9	87.9

Note: these figures are based on property title. Roads, hydro, and rail have been excluded along with those parcels that had no title.

6 DISCUSSION

There is a strong argument that once a property becomes a lifestyle property then the productive capability of the land is lost. This is the reason why some district councils seek to prohibit the subdivision of highly versatile or productive land (ie LUC classes I and II or I to III).

In the Horowhenua District, the Horowhenua District Council has restricted subdivision on highly versatile land (ie LUC class I and II land). For these areas 'lifestyle sites' can be created around an existing dwelling under a controlled activity status provided 10 ha remain. The lifestyle site has to be between 0.5 and 1 ha in size. If the applicant cannot comply with this, then it is a restricted discretionary activity.

If the 'lifestyle' blocks, ie the properties less than 10 ha in size, are omitted in the assessment due to a loss of production capability, then tables 1 to 6 shows the following:

1. Southern options heading west of Levin (S1, S2, S3, & S8)

- There is very little difference in the total areas between the different options. Option S8 has the greatest area (255 ha) whilst Options S1 and S2 has the least area (231 ha)
 - There is very little difference between the options for land that has been classified as classes I to III land – 230 ha for S3 to 251 ha for option S8.
 - If just the LUC classes I and II are considered then option S8 (88 ha) has significantly less highly versatile land affected compared with the other three options (114 ha for option S3 through to 135 ha for Option S2).
2. Southern options heading east of Levin (S4, S5, S6 & S7)
- There is a significant difference between options for the total area affected. Option S5 is the least affected with 270 ha whilst Option S7 is the most affected with 406 ha.
 - The area of LUC class I to III land also varies significantly between the different options from 226 ha (S6) through to 352 ha (S7).
 - The area of classes I and II land shows a different trend with Option S7 having the least (82 ha) through to Option S5 having the most (145 ha).
 - The Options S4 and S5 have significantly more class I land compared with the other options. Option S7 has significantly more class III land compared with the other options.
3. Northern options heading west of Levin (N1, N2, N3, N6 & N7)
- The total area of land affected varies significantly from 104 ha (N3) through to 344 ha (N6). This reflects the greater number of lifestyle blocks in Option N3.
 - The area of land with LUC classes I to III also vary significantly. Option N6 has the least at 90 ha whilst Option N9 has the most at 204 ha. This reflects that N6 is the most western option running through a large area of lower quality sand country. Considering just classes I and II shows the same pattern.
4. Northern options heading to the east of Levin (N4, N5, N8, & N9)
- For the properties greater than 10 ha the option with the most impact on all classes of land is option N8 (240 ha) It also has the highest amount of highly productive or versatile land affected.
 - Option N4 is the least impactful on both the highly productive or versatile land and all land classes. This is because lifestyle blocks make up nearly 70% of the option corridor land.

When the HDC planning zones are incorporated into the analysis for properties greater than 10 ha the following points are noted:

- For the southern options there is a slight reduction in the area of productive land affected for options S7 and S4 but this reduction is only for the LUC class III land. Overall these reductions are insignificant. There is no change for the other southern options.
- For of the five northern options heading west had a reduction in classes I to III land. The largest of these 29 ha for N7 and 38 ha for N3. Both of these options also had a reduction in the area of classes I and II land affected (14 ha for N3 and 8 ha for N7).
- For the northern options heading east there is a significant reduction in the LUC class I to III land affected for options N4 (44 ha), N5 (39 ha), and N9 (51 ha). All of this reduction is LUC class III land as there was no change to the class I and II land.

7 OPTION SCORING

The scoring system used to assess the options is shown in the following table.

Table 7. *The scoring system.*

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.

Each option was assessed using the above criteria and the results of this are shown in the Table 8 below. In undertaking the assessment the scoring of the options when the property sizes were not taken into consideration were used as the bench mark. Where the area of productive land was reduced significantly in both LUC classes I to II or I to III land as a result of the 'greater than 10 ha' criterion, the score was adjusted accordingly. The table above also notes that for a scoring of 1 or 2 there would be some benefit as a result of undertaking that option. In reality, apart from potential access, this is considered not probable and ignored as part of the scoring.

Table 8. Option scoring.

Option	MCA scoring		
	All properties included	Only properties greater than 10 ha included	Properties greater than 10 ha with HDC zones excluded
N1	2	2	2
N2	2	1	1
N3	3	1	1
N4	3	1	1
N5	3	2	2
N6	2	1	1
N7	3	3	2
N8	4	3	3
N9	4	3	2
S1	3	3	3
S2	3	3	3
S3	3	3	3
S4	4	3	3
S5	4	4	4
S6	4	3	3
S7	3/4*	3	3
S8	2	2	2

[Authors comment: The agreed workshop scoring was 4 and the score recommended by the author at the workshop was 3. In review of this the author feels it could be a 3 or a 4.]*

Table 8 above shows the following for when the options are re-scored:







1. That the least impactful southern option is S8 and the most impactful is S5. There is very little difference between the remaining southern options.
2. On the northern side options N2, N3, N4 and N6 have the least impact on productive land when properties less than 10 ha are excluded whilst options N7, N8 and N9 are the most impactful.
3. On the northern side when both the HDC zones and those properties less than 10 ha are excluded the least impactful options are still N2, N3, N4 and N6.

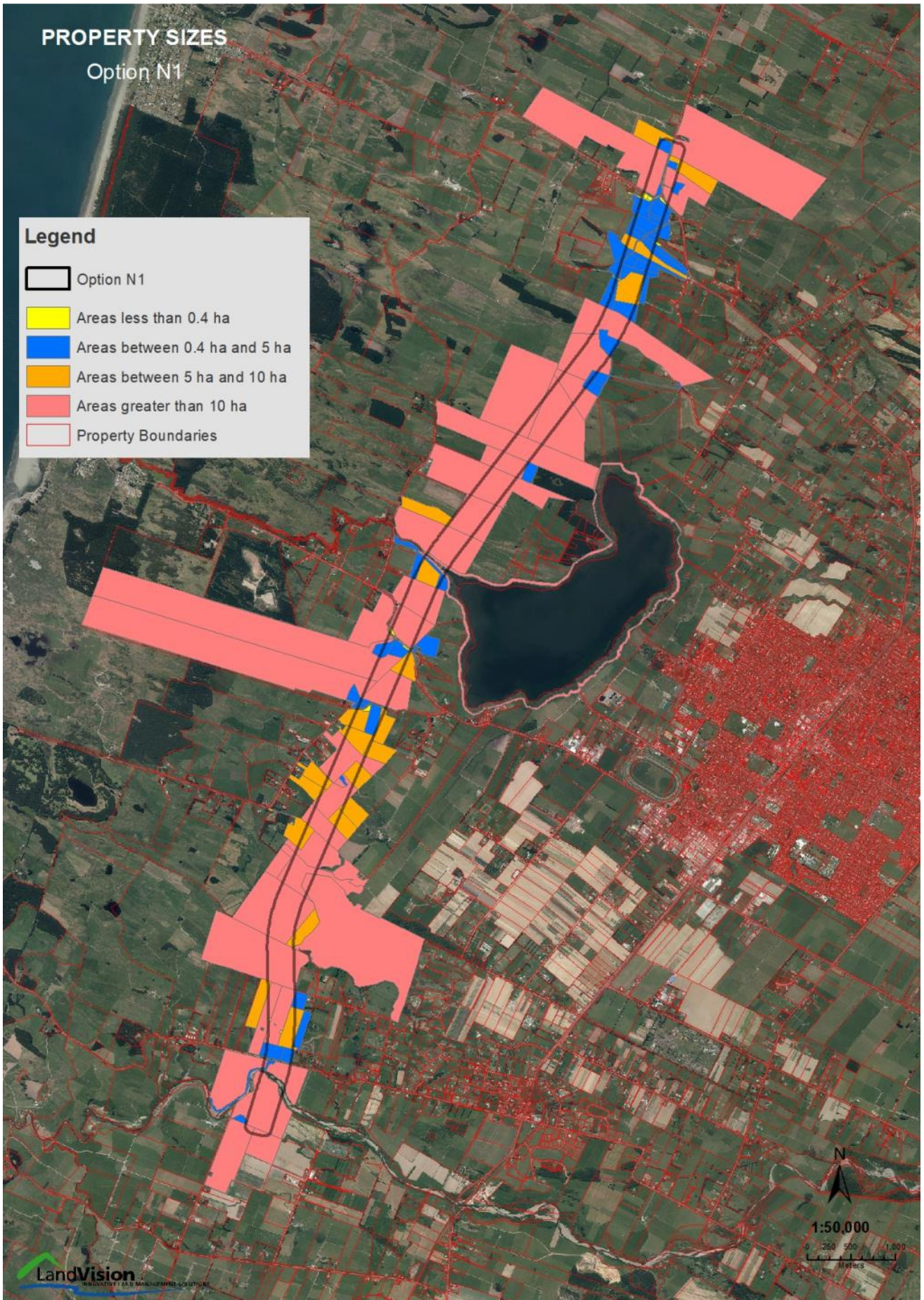
8 APPENDIX 1: AFFECTED PROPERTY MAPS

PROPERTY SIZES

Option N1

Legend







-  Option N1
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries

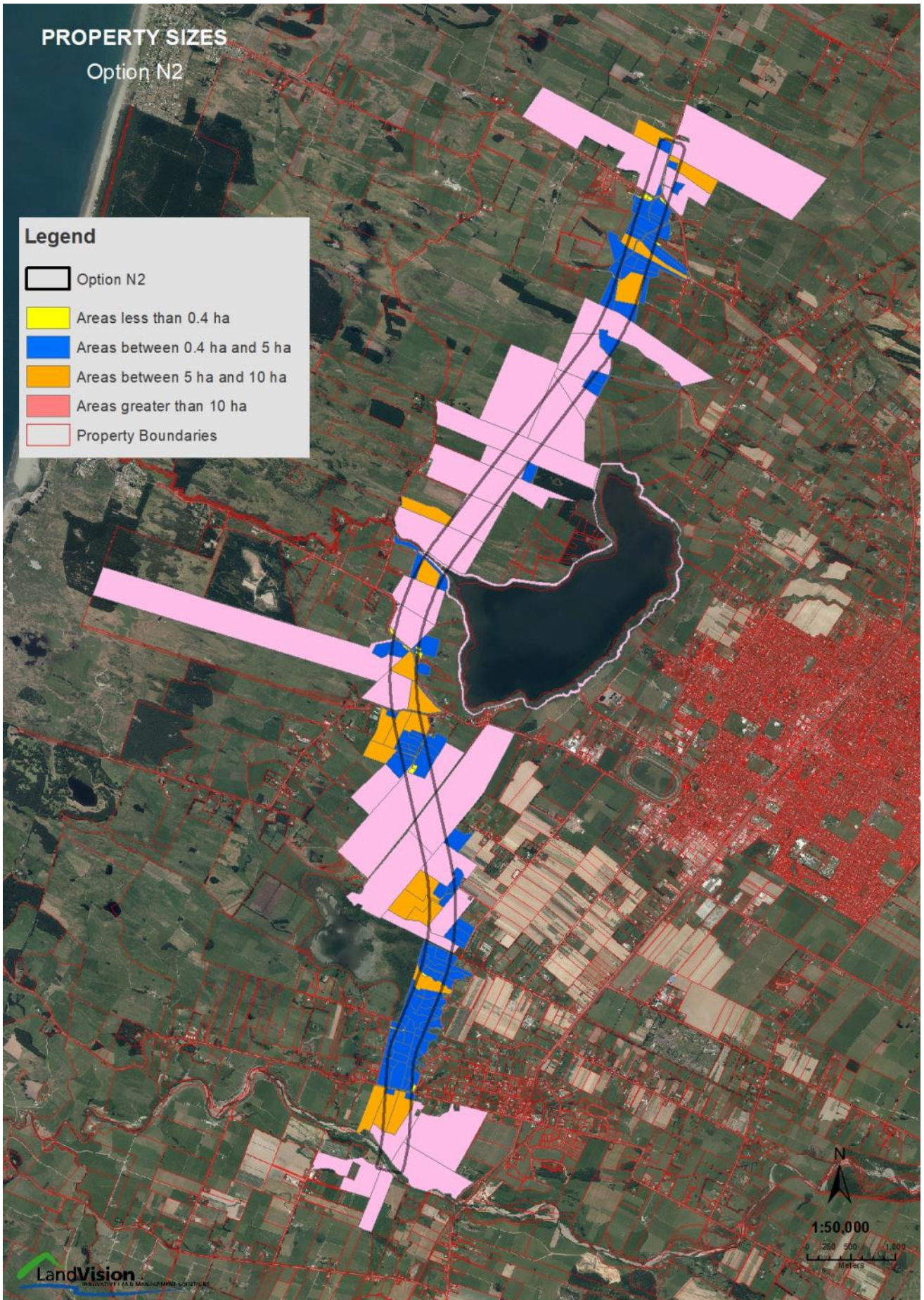


PROPERTY SIZES

Option N2

Legend







-  Option N2
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries

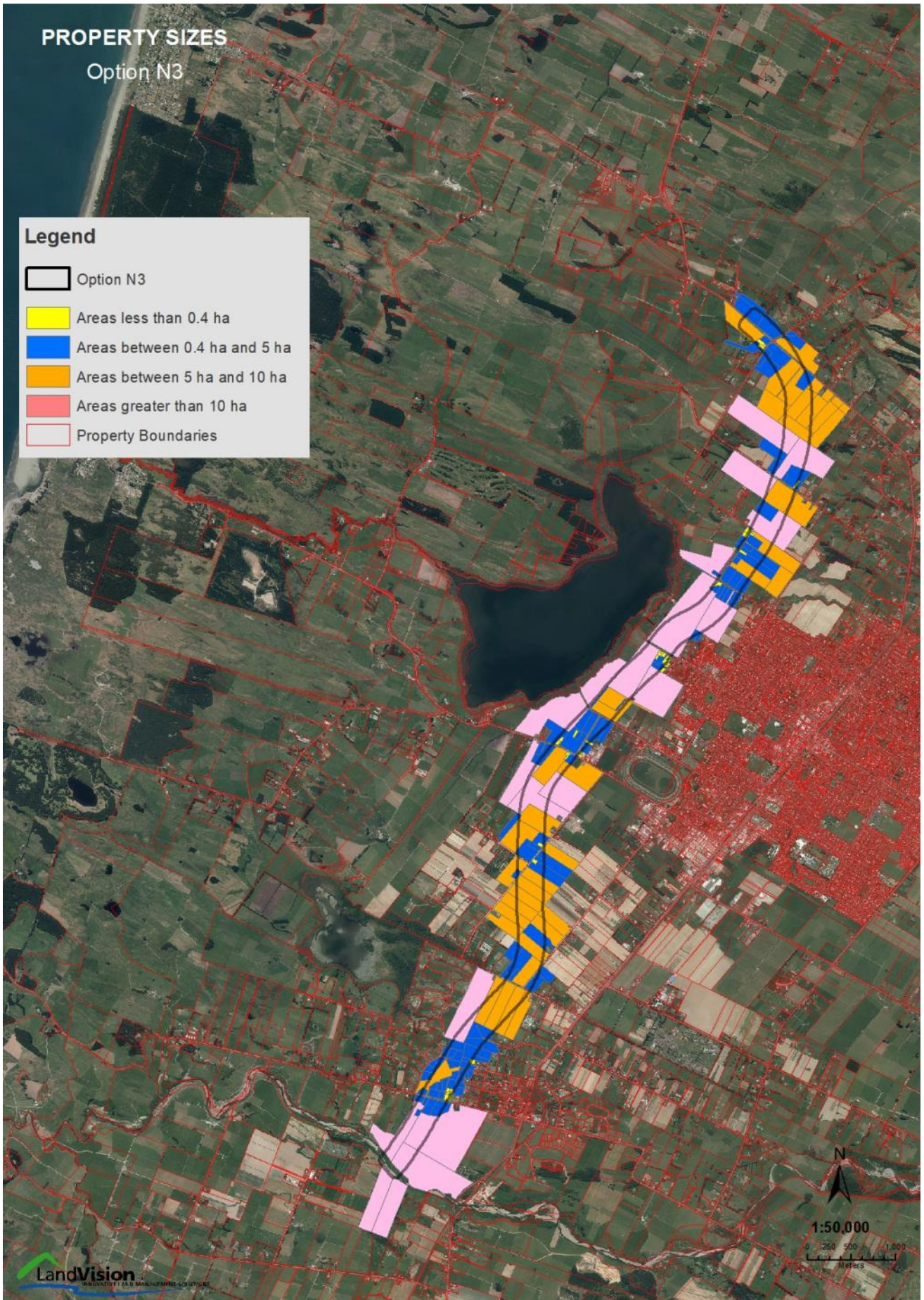


PROPERTY SIZES

Option N3

Legend







-  Option N3
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries

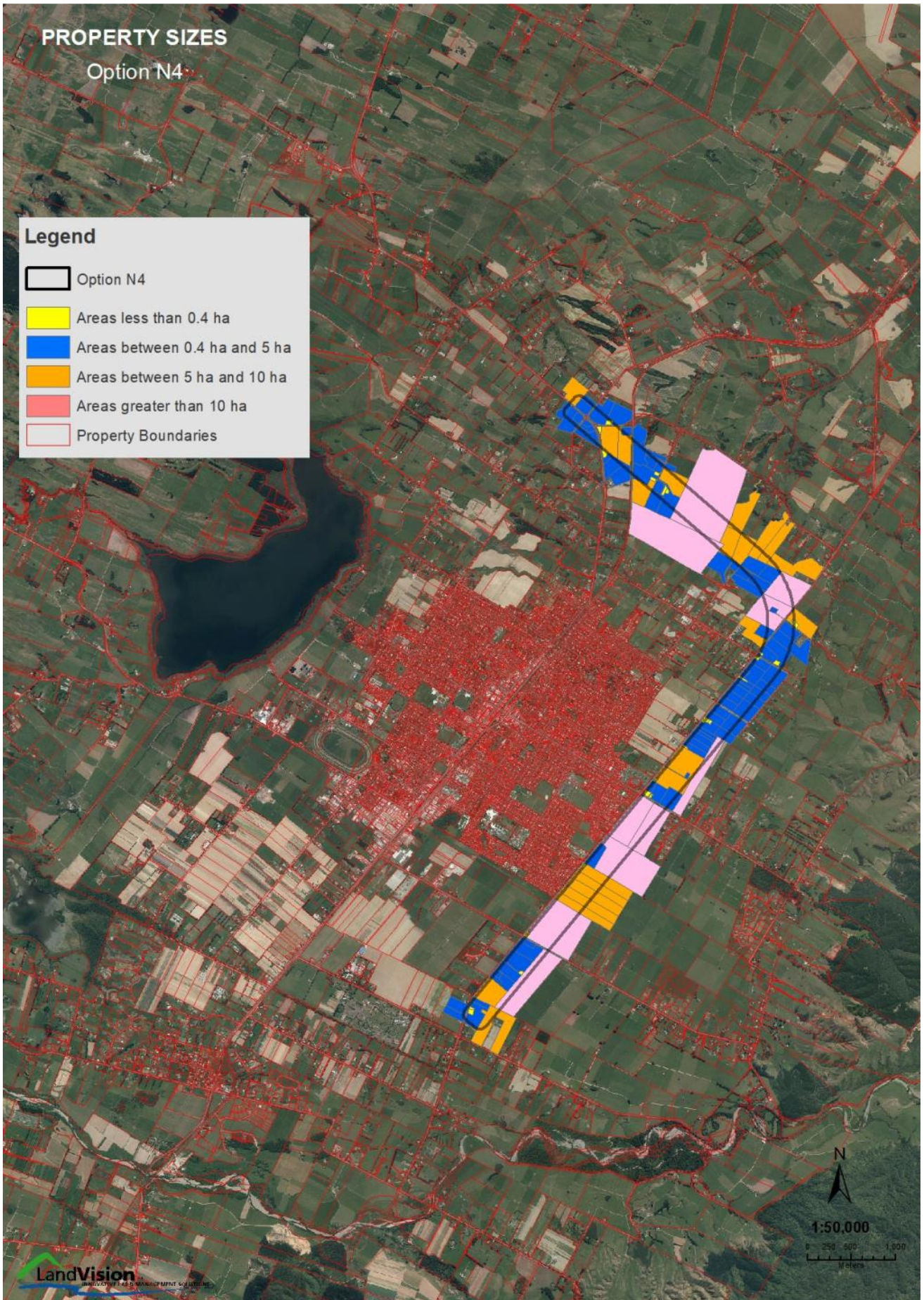


PROPERTY SIZES

Option N4

Legend







-  Option N4
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries

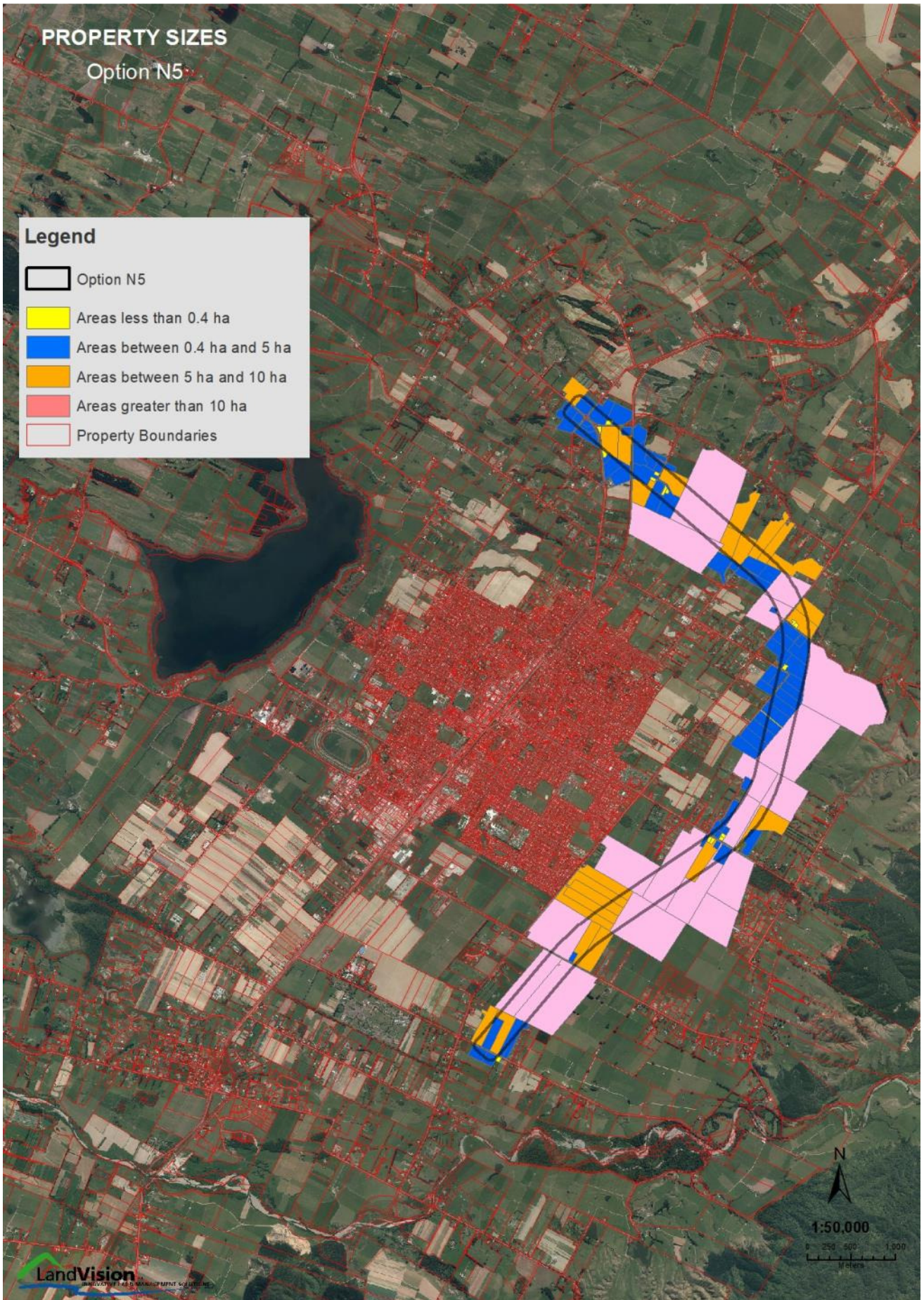


PROPERTY SIZES

Option N5

Legend







-  Option N5
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries

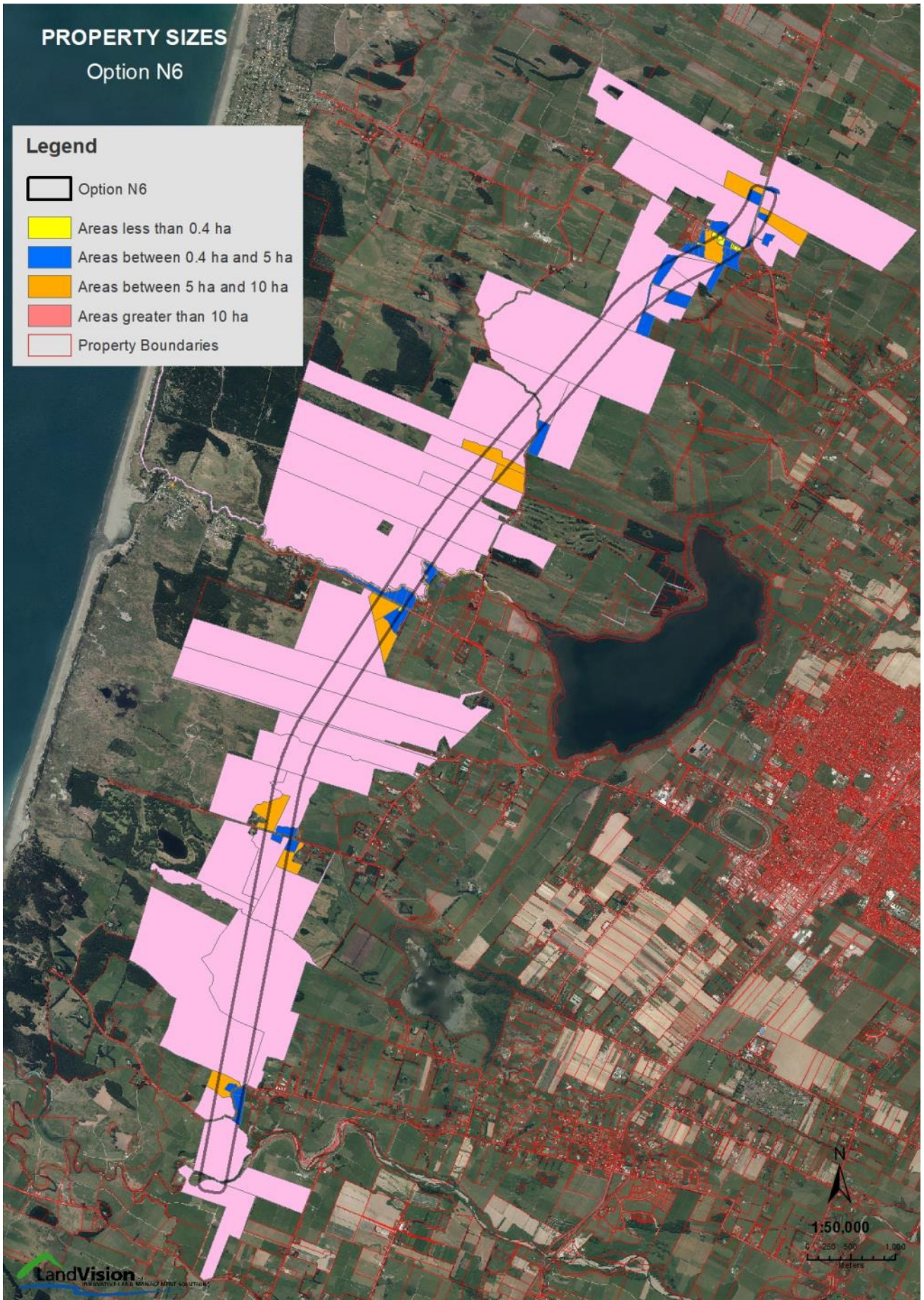


PROPERTY SIZES

Option N6

Legend







-  Option N6
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries

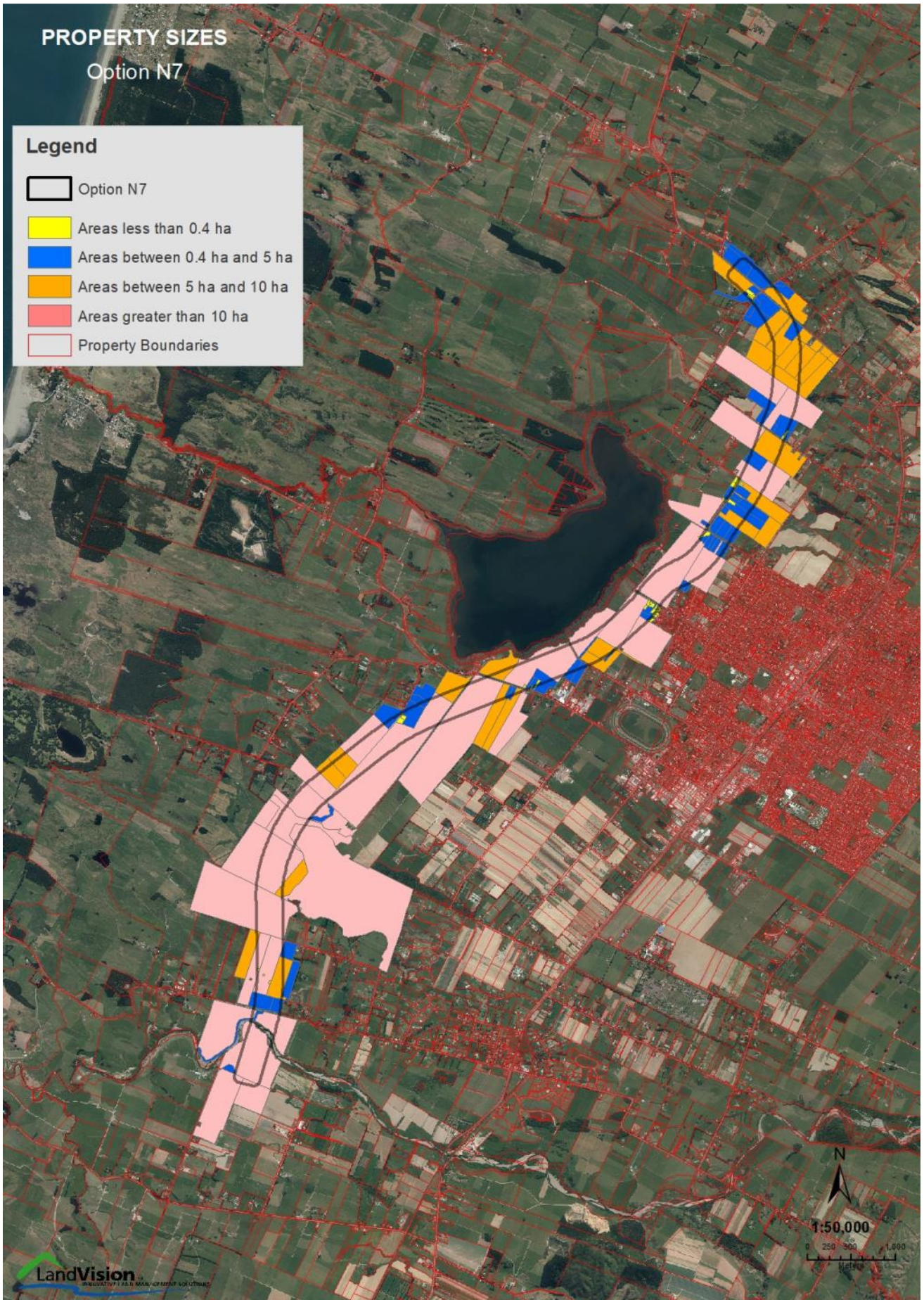


PROPERTY SIZES

Option N7

Legend







-  Option N7
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries

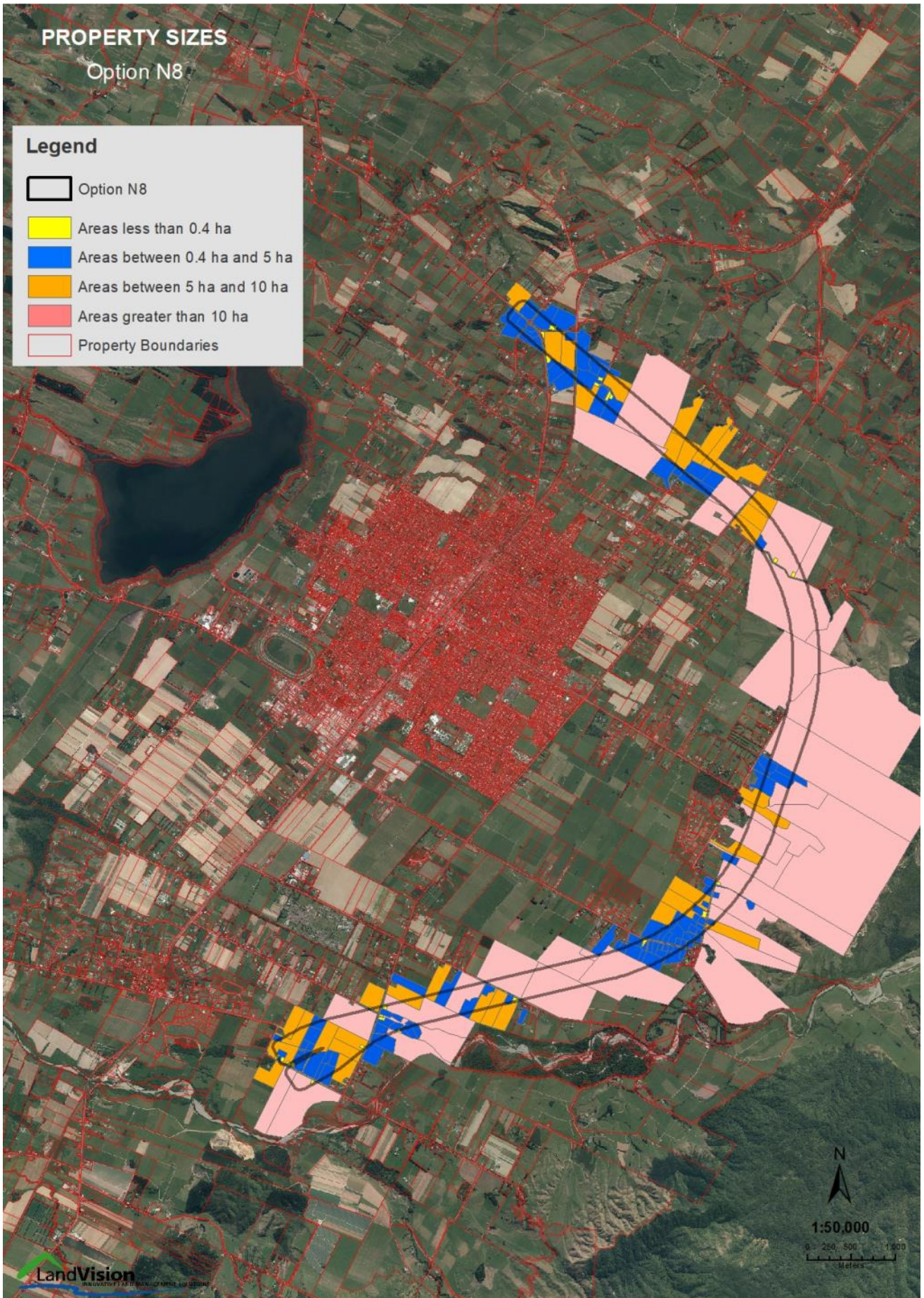


PROPERTY SIZES

Option N8

Legend







-  Option N8
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries

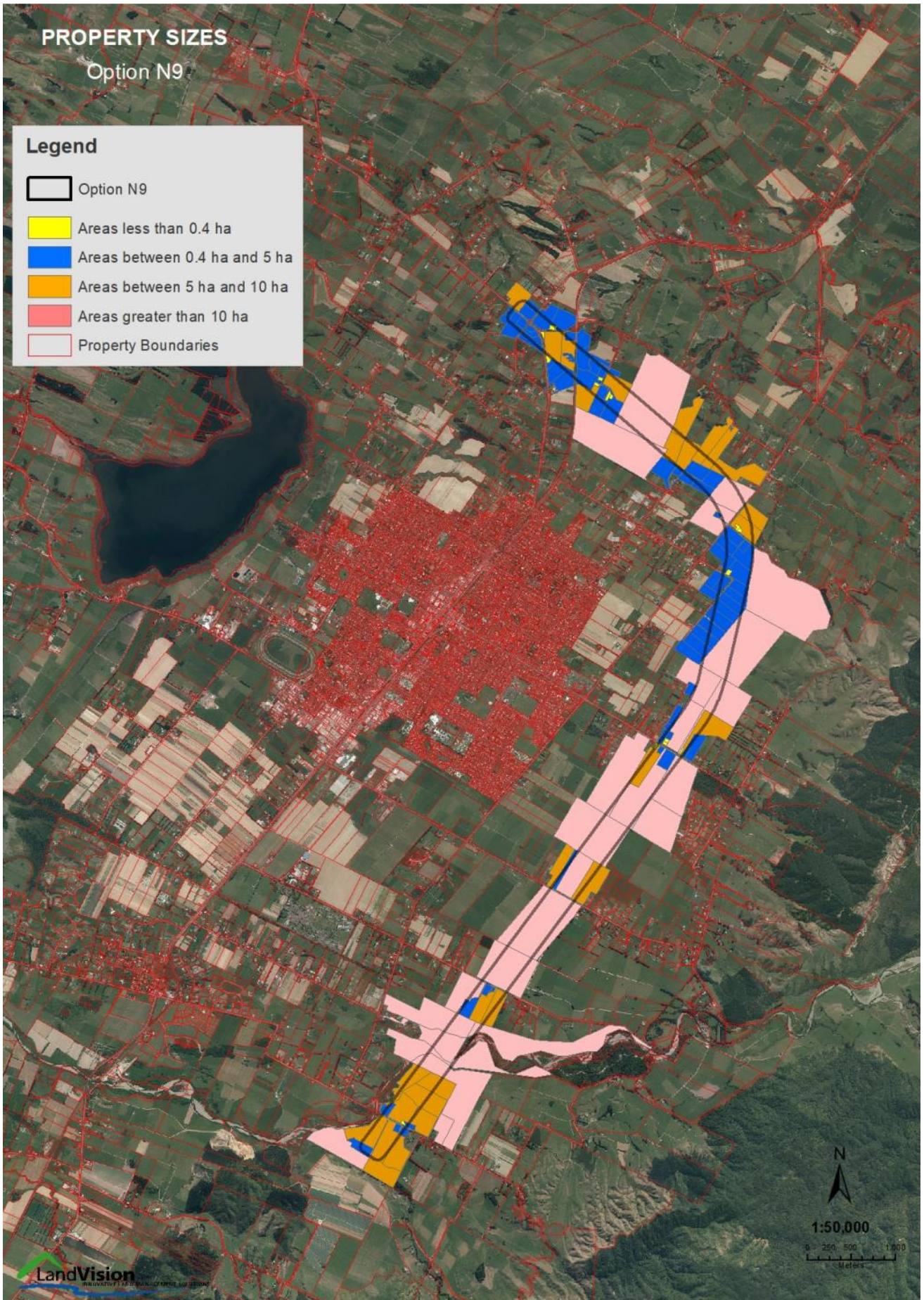


PROPERTY SIZES

Option N9

Legend







-  Option N9
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries

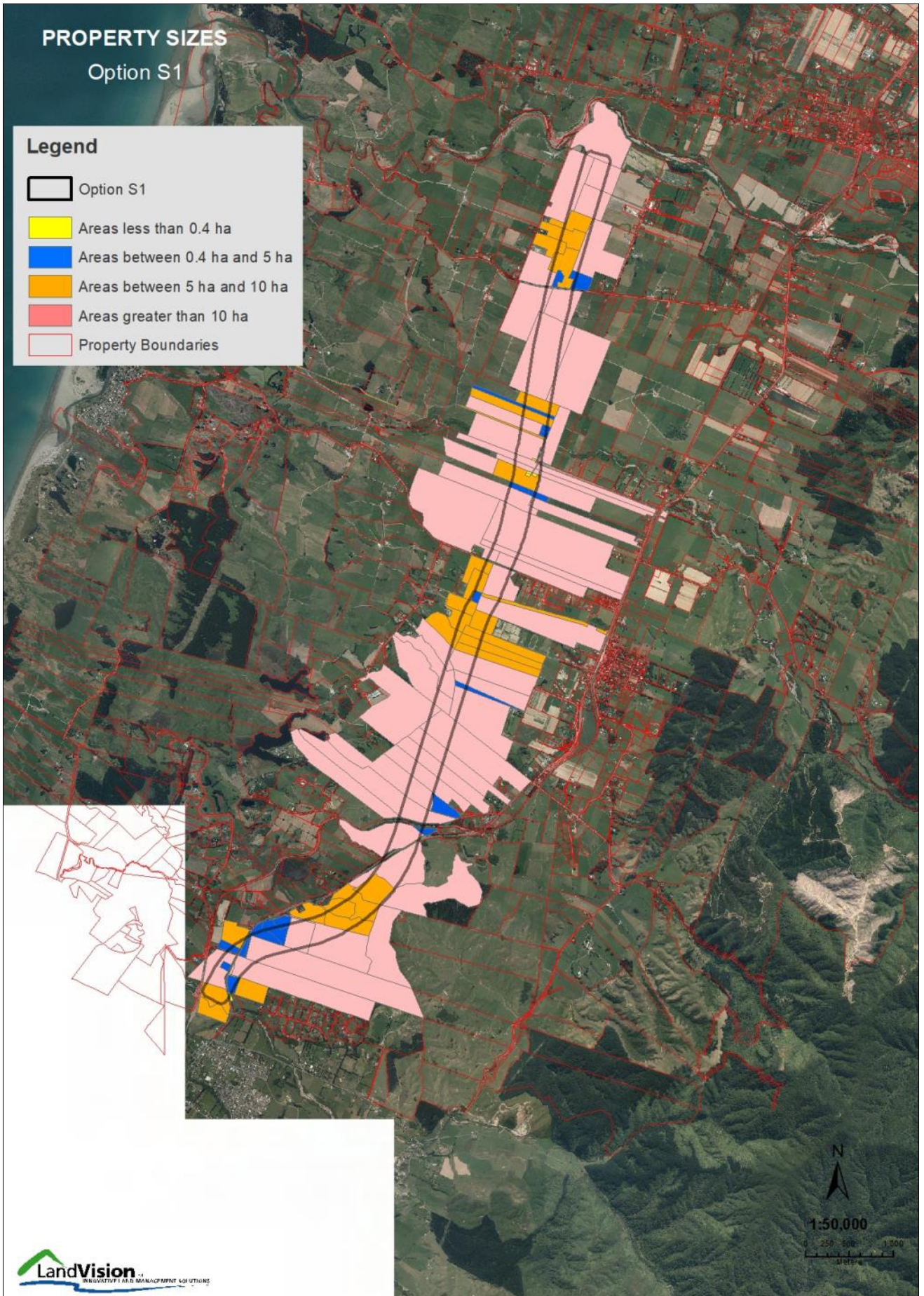


PROPERTY SIZES

Option S1

Legend







-  Option S1
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries

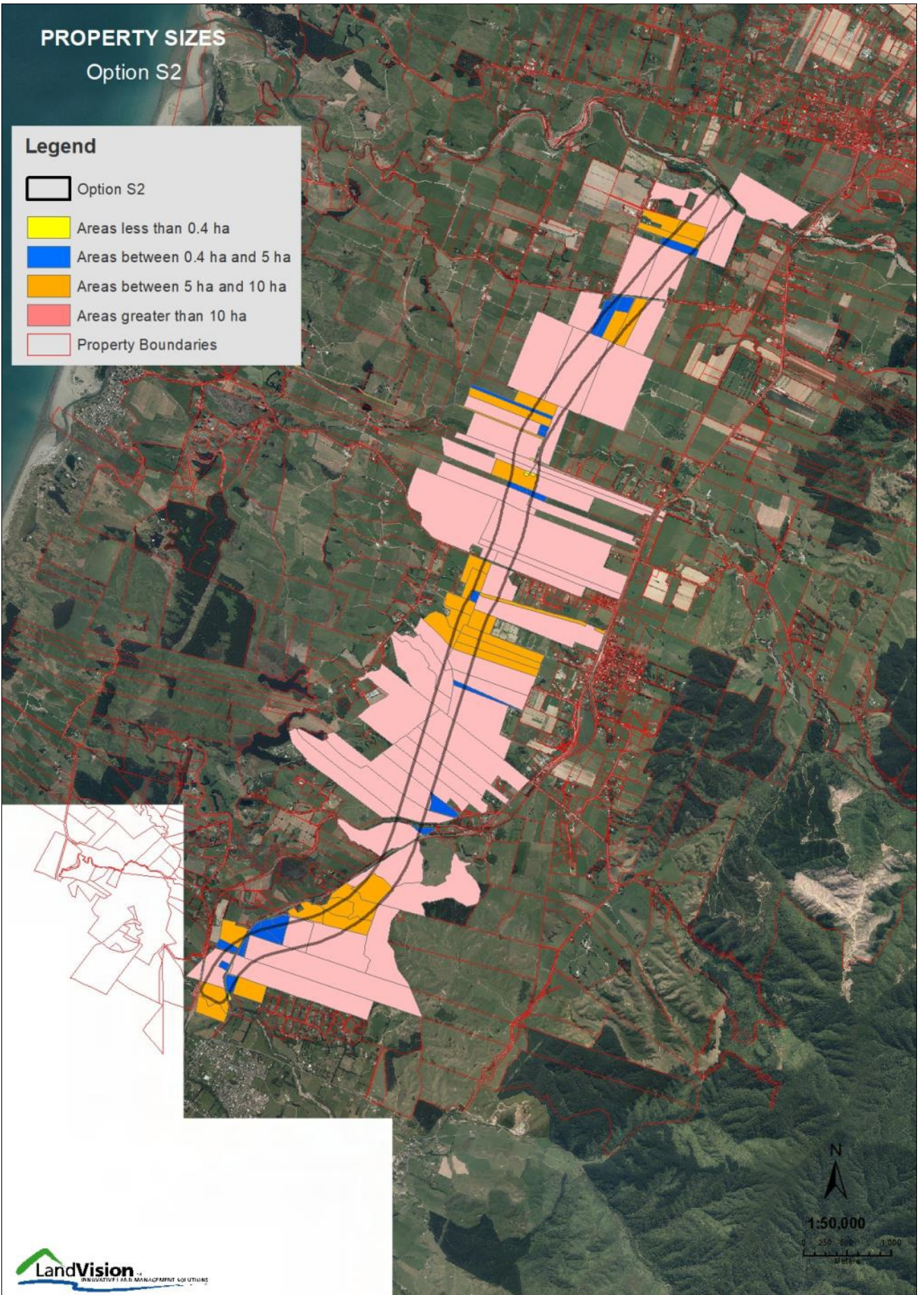


PROPERTY SIZES

Option S2

Legend







-  Option S2
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries

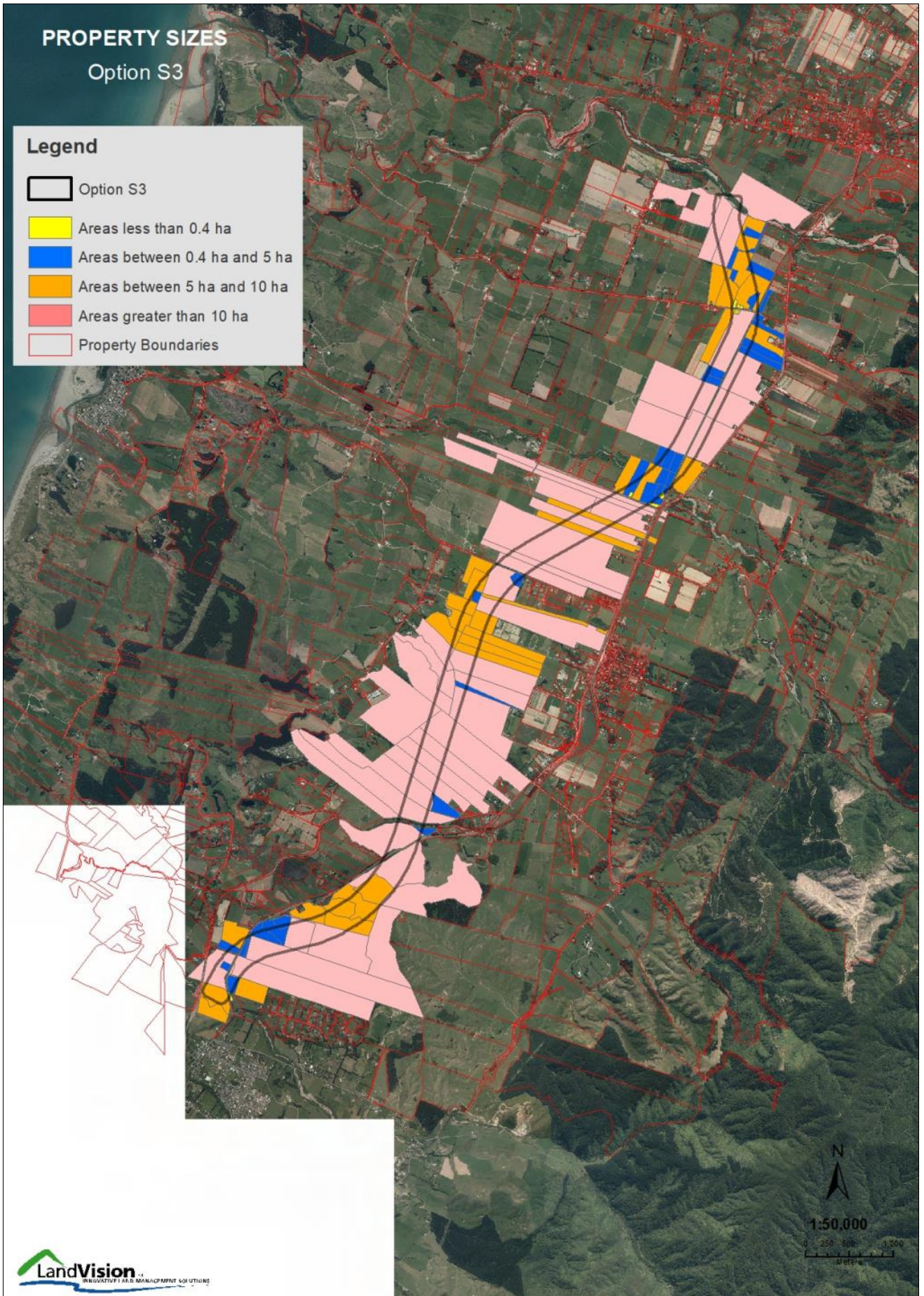


PROPERTY SIZES

Option S3

Legend







-  Option S3
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries

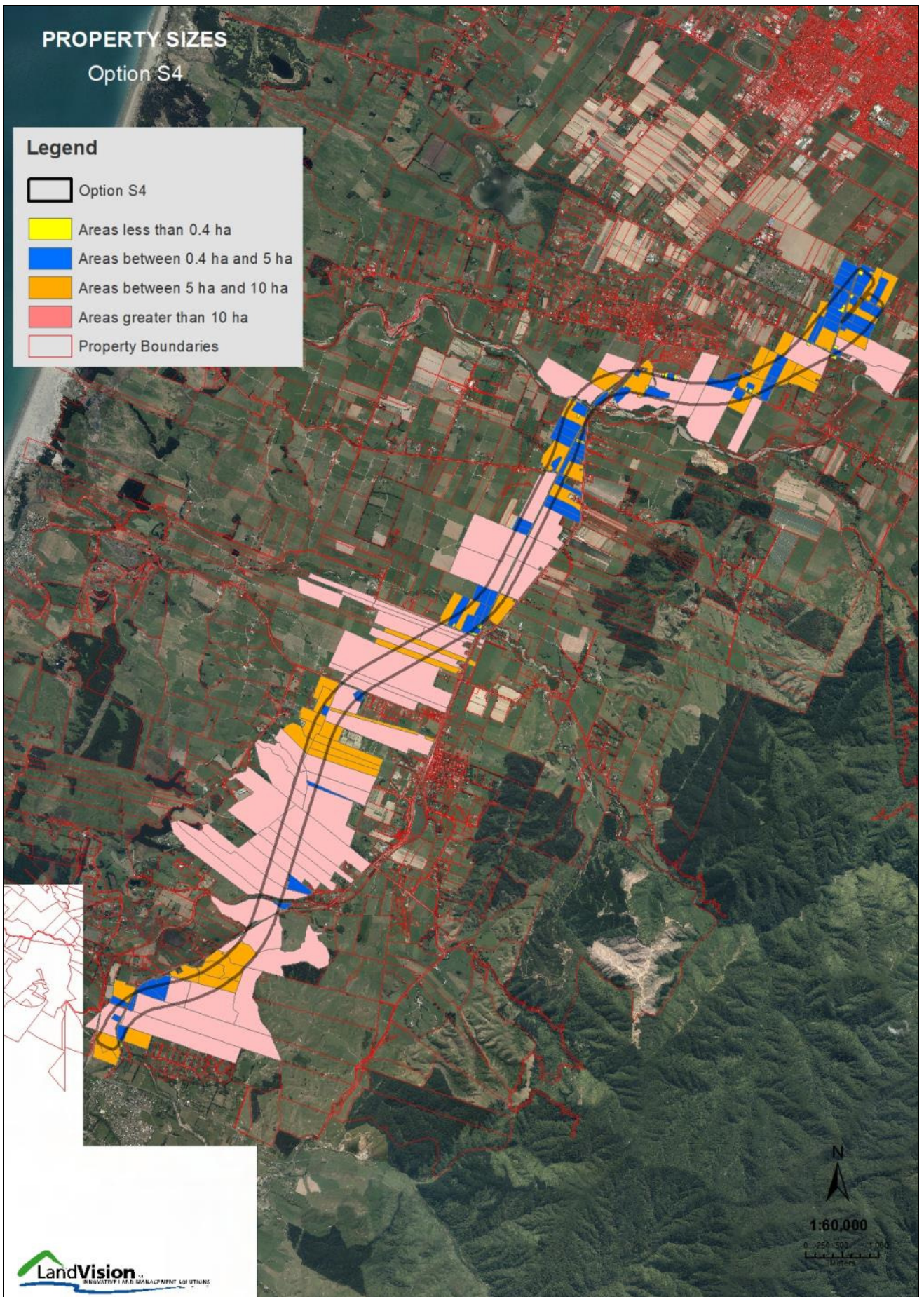


PROPERTY SIZES

Option S4

Legend







-  Option S4
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries

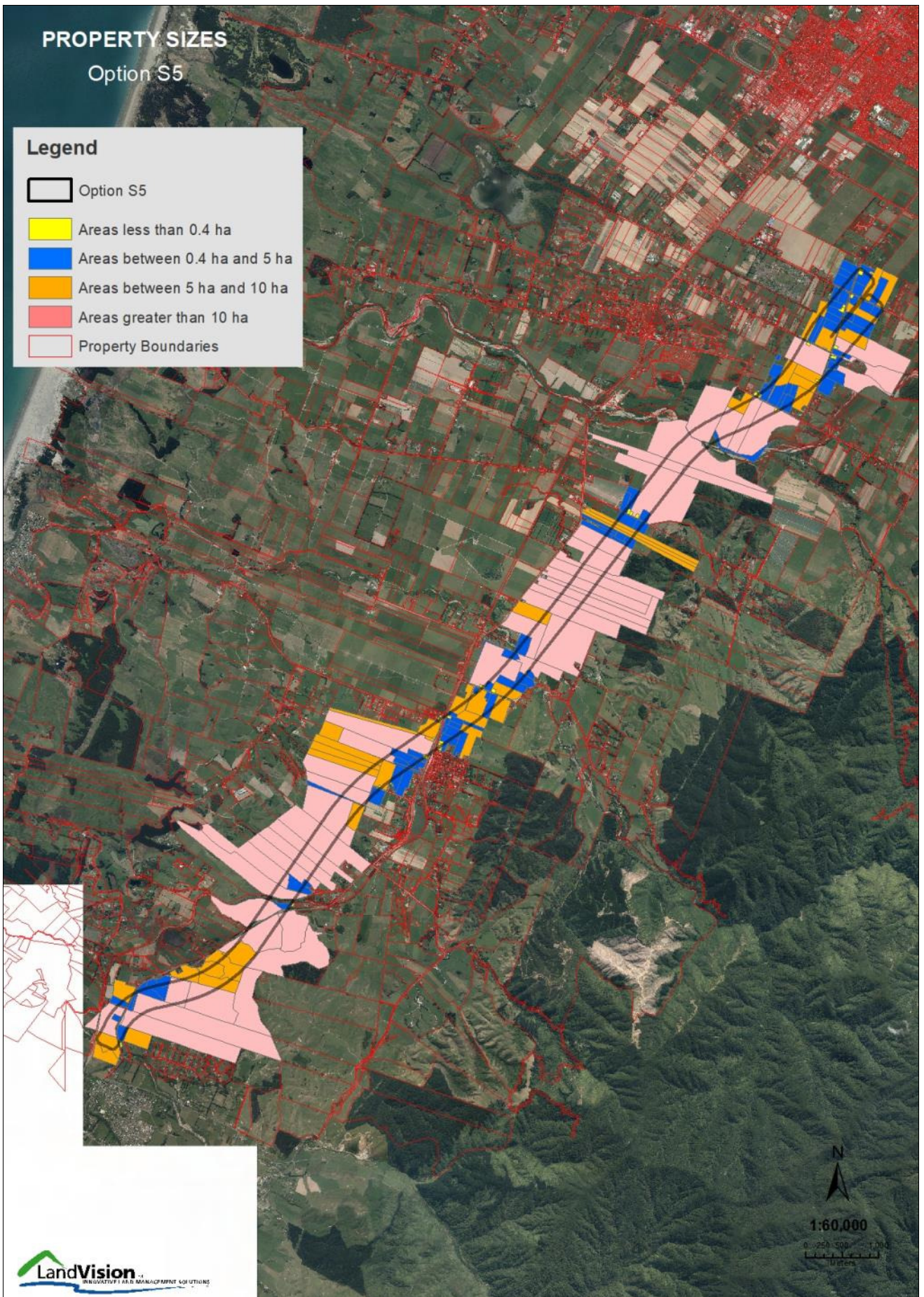


PROPERTY SIZES

Option S5

Legend







-  Option S5
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries

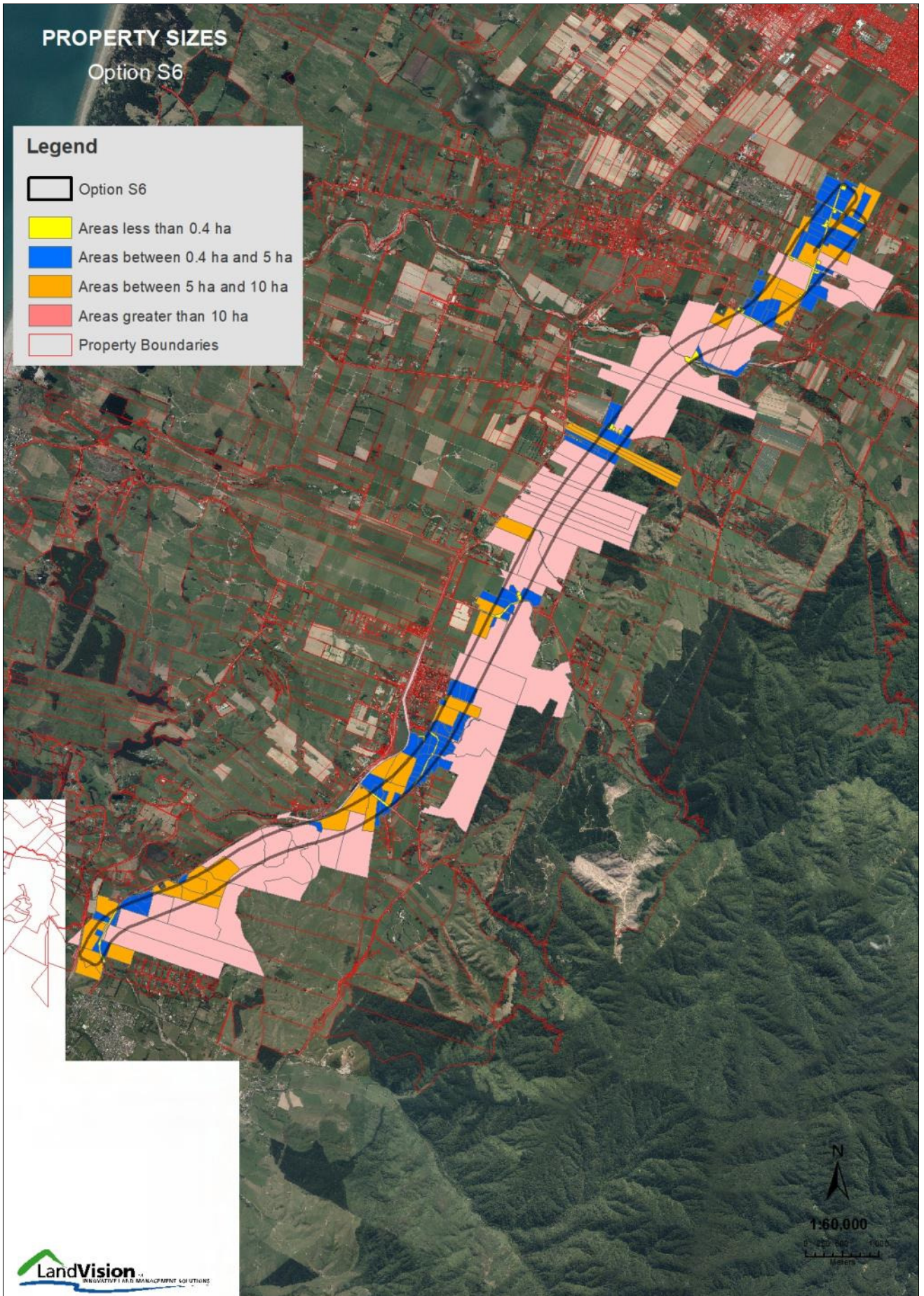


PROPERTY SIZES

Option S6

Legend







-  Option S6
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries

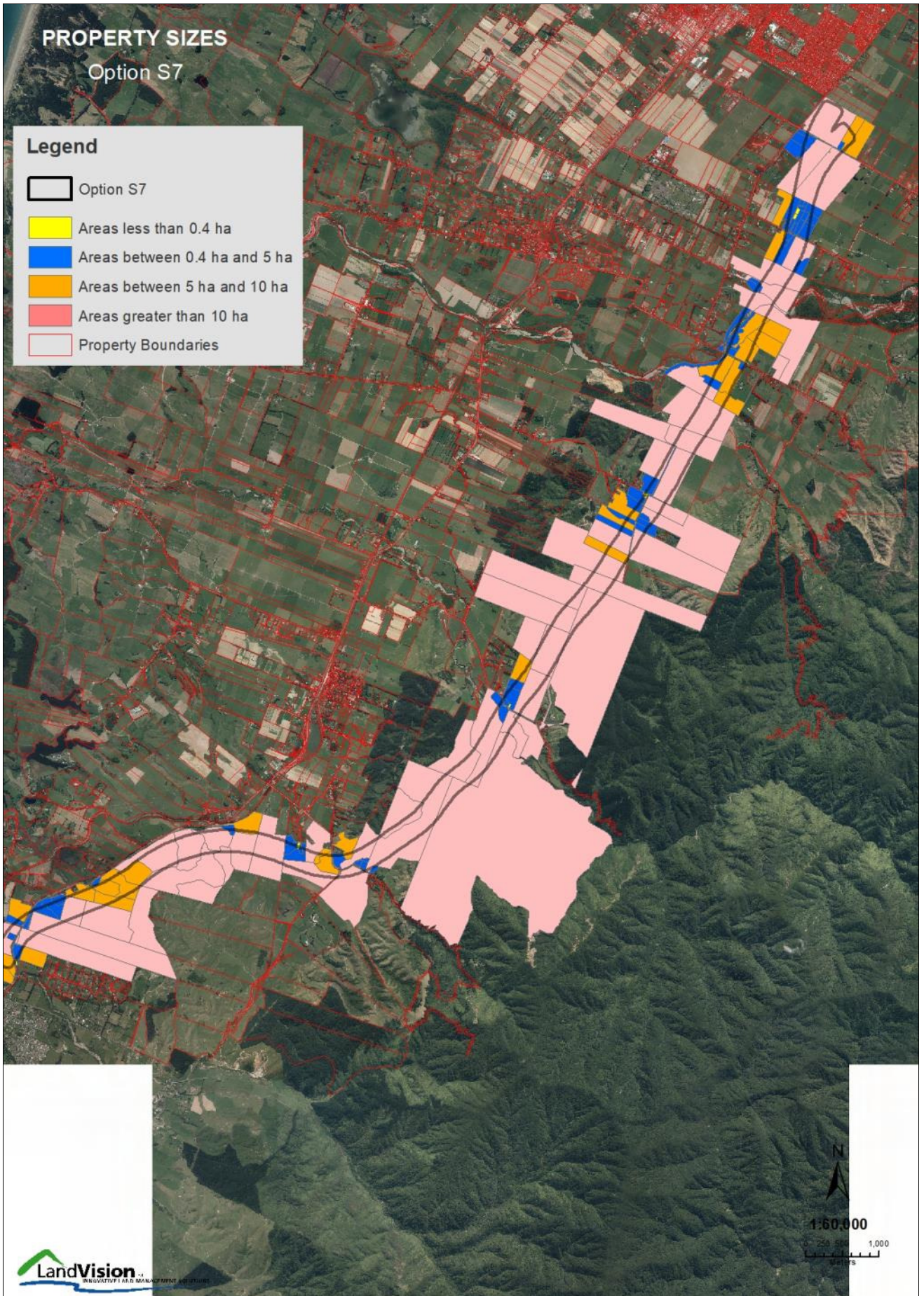


PROPERTY SIZES

Option S7

Legend







-  Option S7
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries

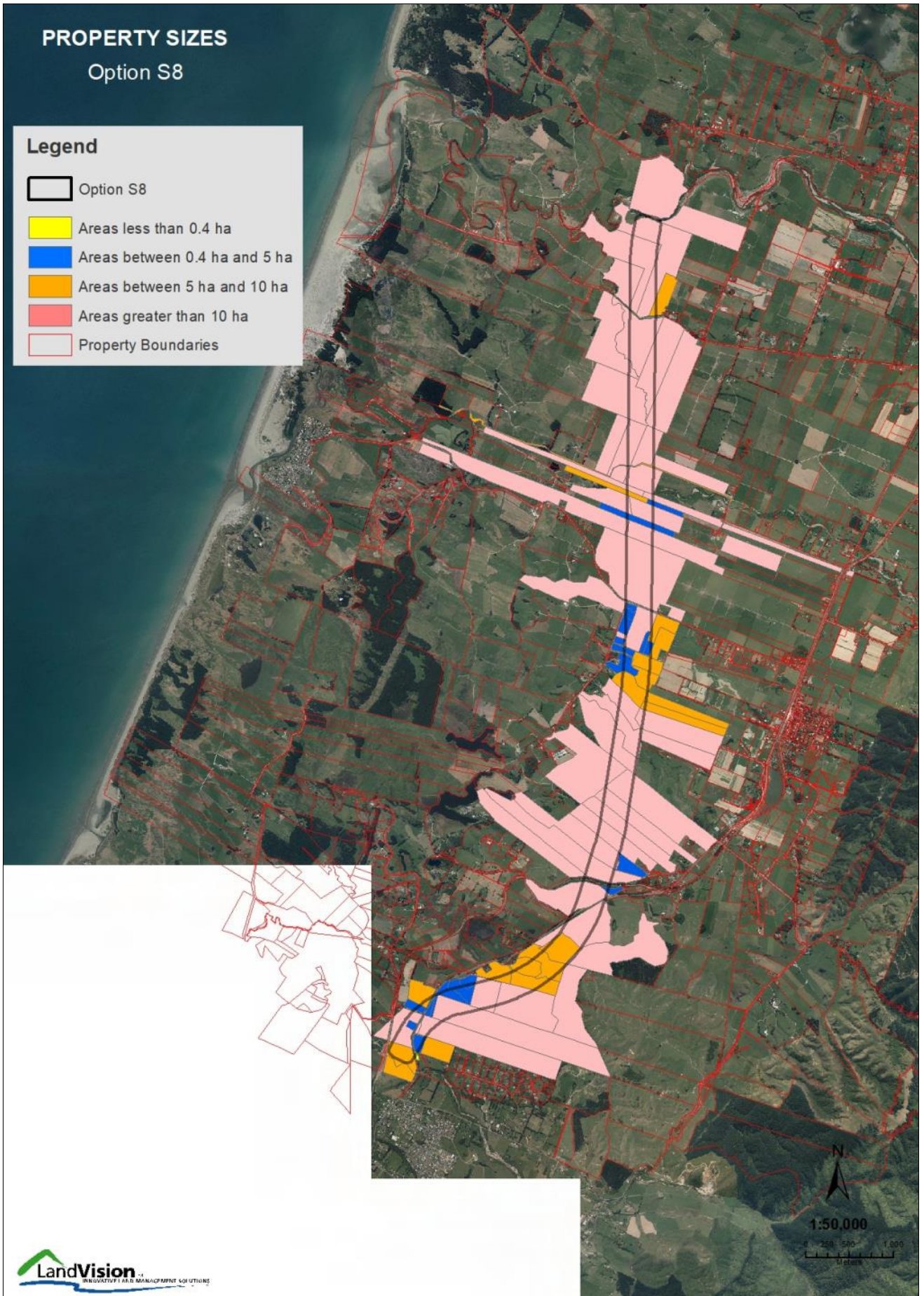


PROPERTY SIZES

Option S8

Legend

-  Option S8
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries










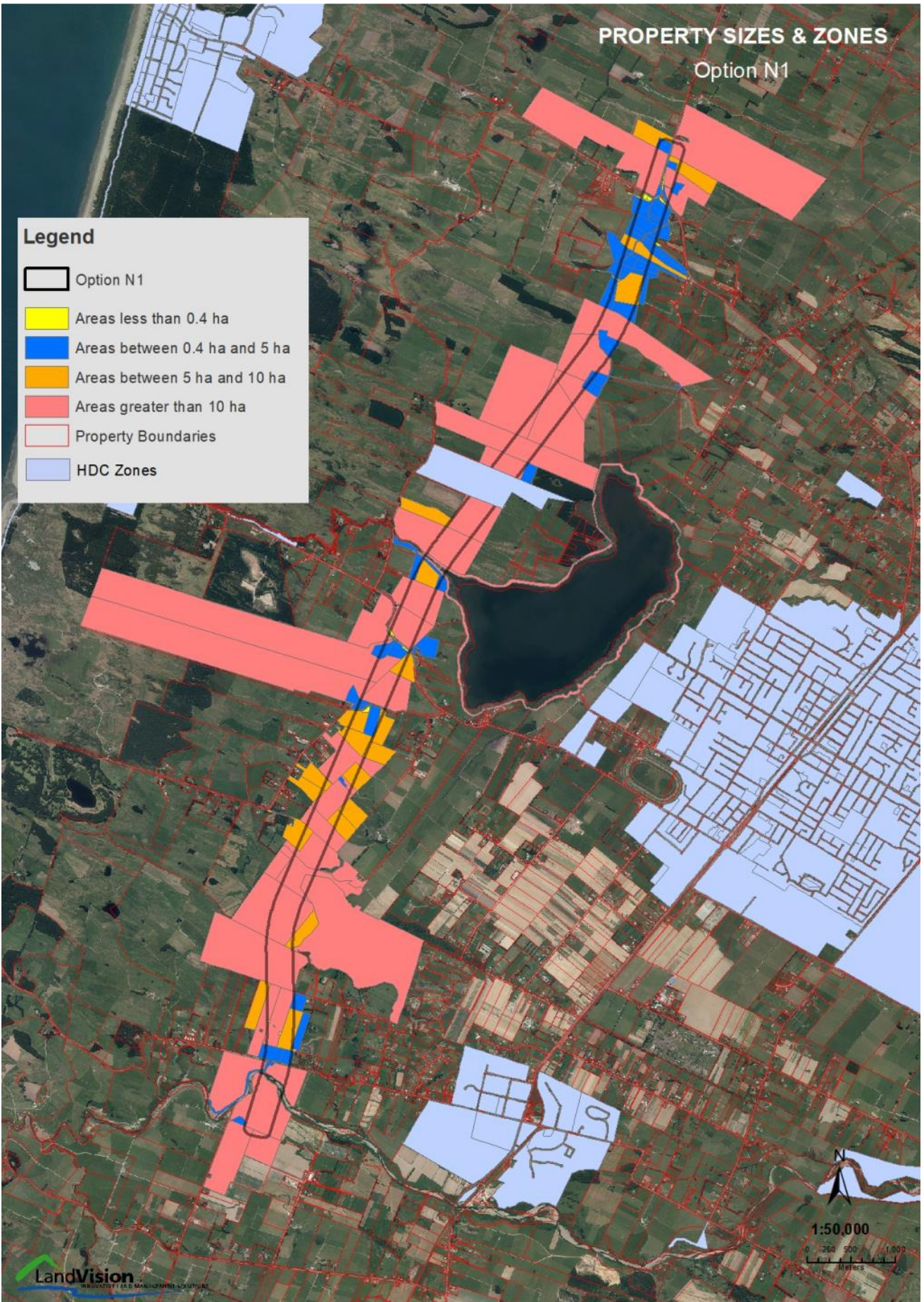
9 APPENDIX 2: PROPERTY AND ZONE MAPS

PROPERTY SIZES & ZONES

Option N1

Legend

-  Option N1
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries
-  HDC Zones

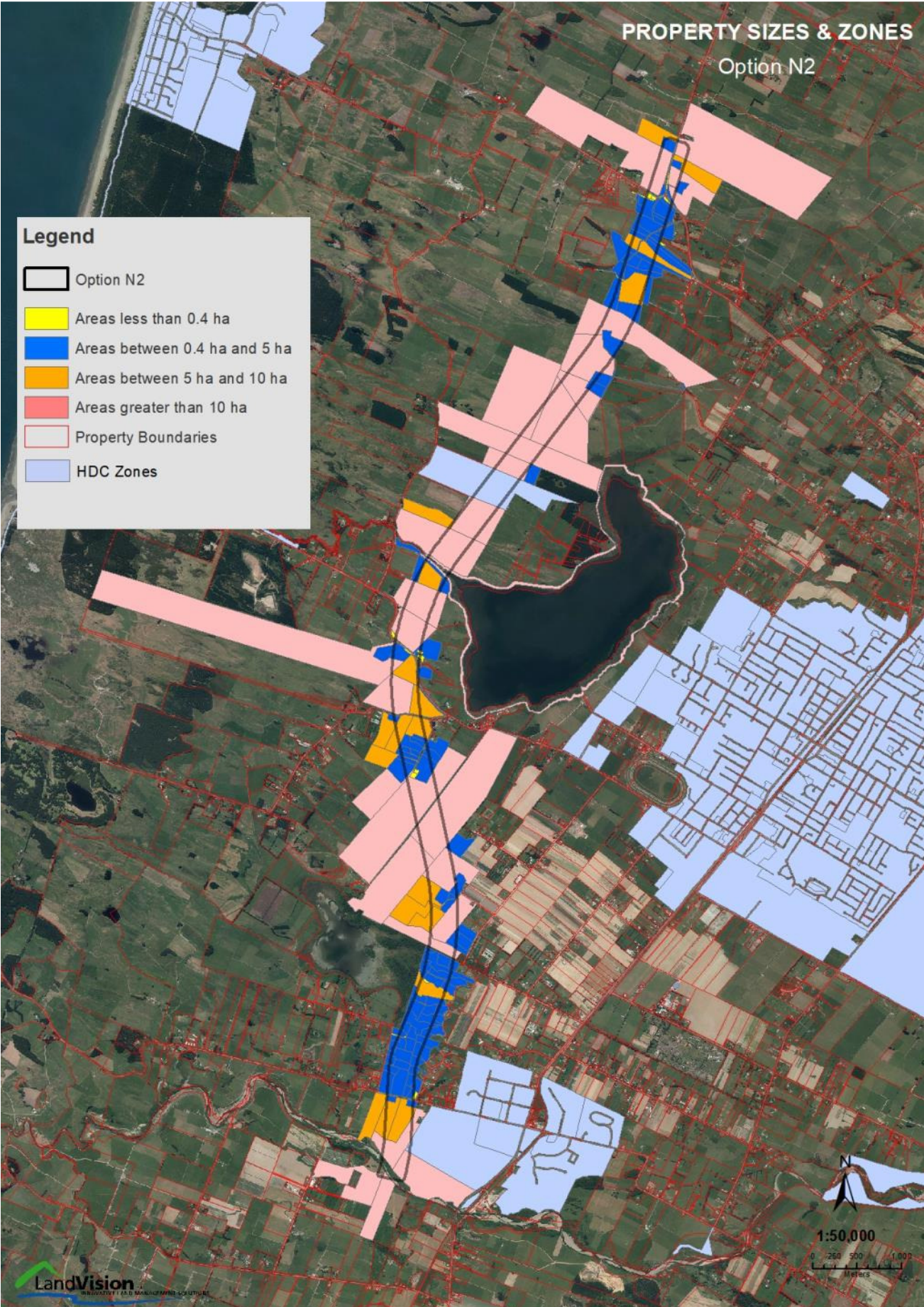


PROPERTY SIZES & ZONES

Option N2

Legend








- Option N2
- Areas less than 0.4 ha
- Areas between 0.4 ha and 5 ha
- Areas between 5 ha and 10 ha
- Areas greater than 10 ha
- Property Boundaries
- HDC Zones

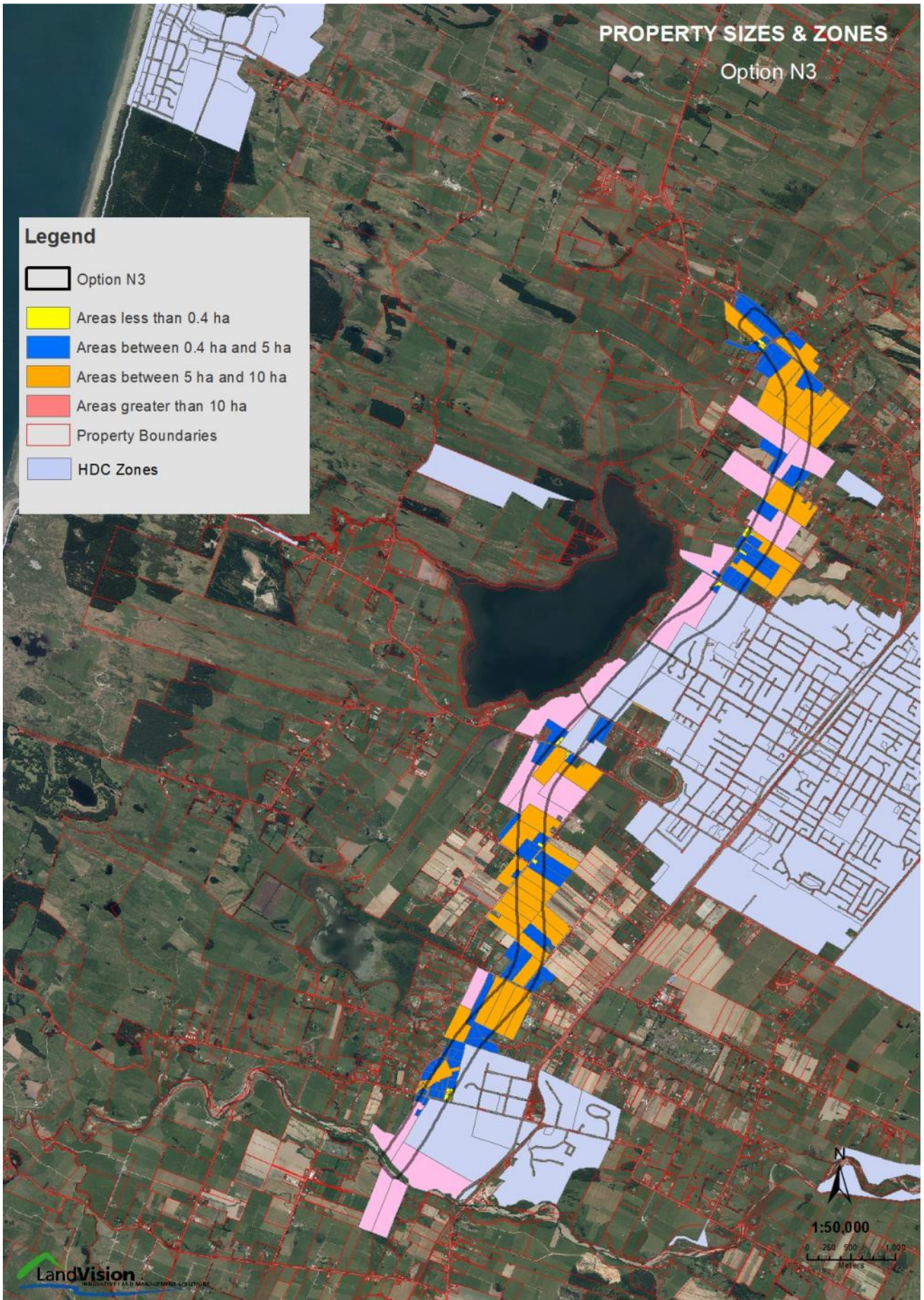


PROPERTY SIZES & ZONES

Option N3

Legend








-  Option N3
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries
-  HDC Zones

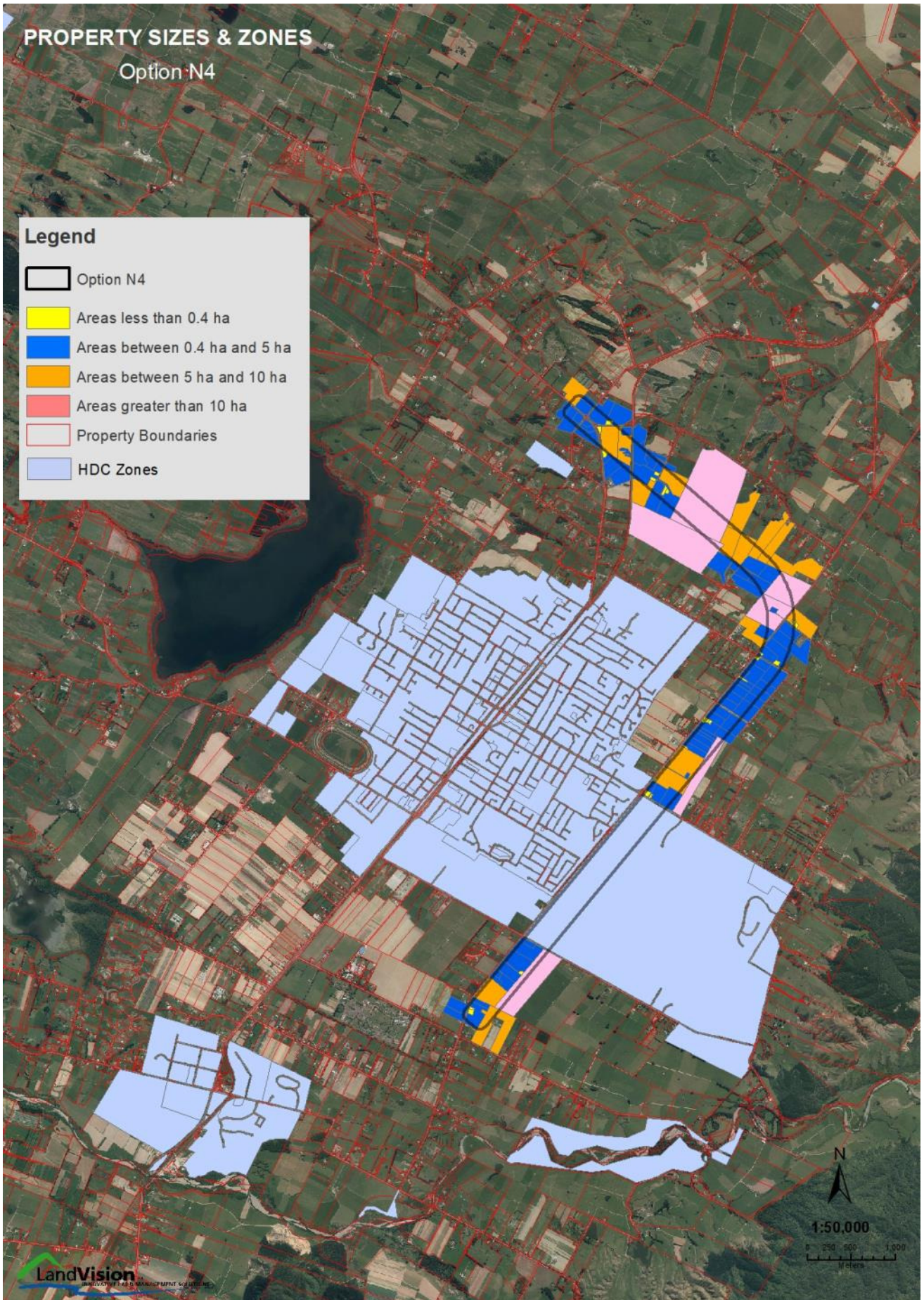


PROPERTY SIZES & ZONES

Option N4

Legend








-  Option N4
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries
-  HDC Zones

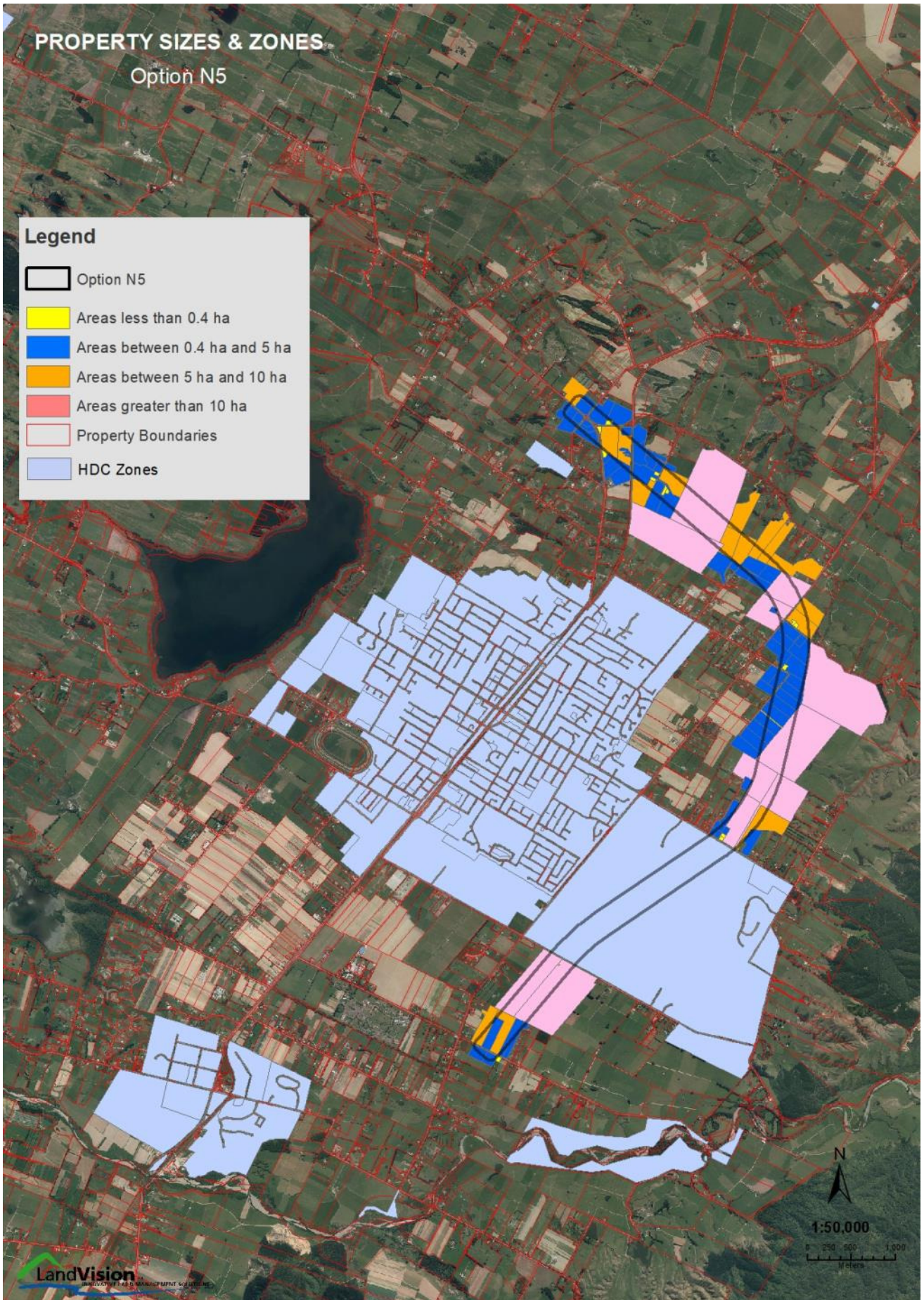


PROPERTY SIZES & ZONES

Option N5

Legend








-  Option N5
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries
-  HDC Zones

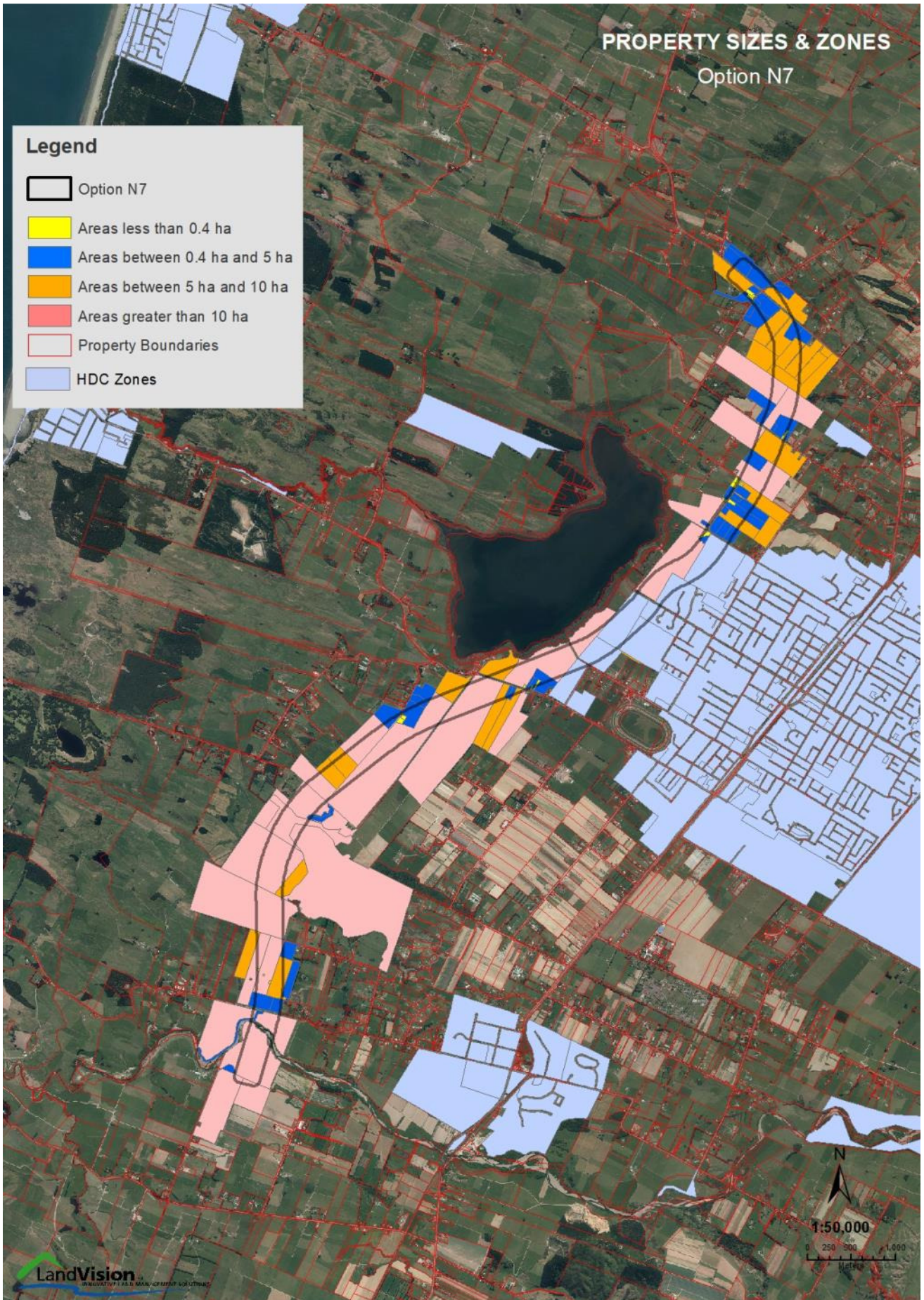


PROPERTY SIZES & ZONES

Option N7

Legend








-  Option N7
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries
-  HDC Zones

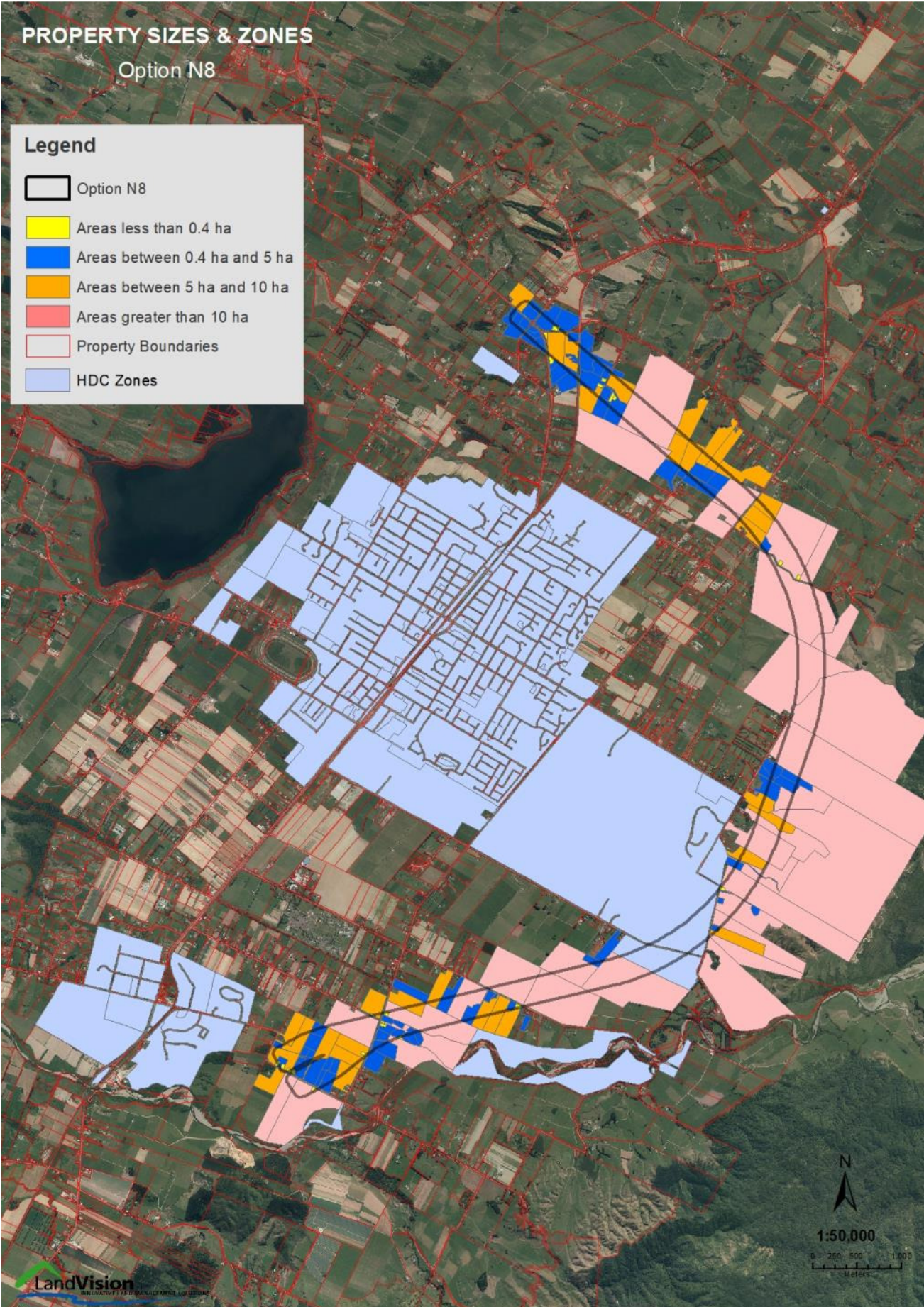


PROPERTY SIZES & ZONES

Option N8

Legend








-  Option N8
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries
-  HDC Zones

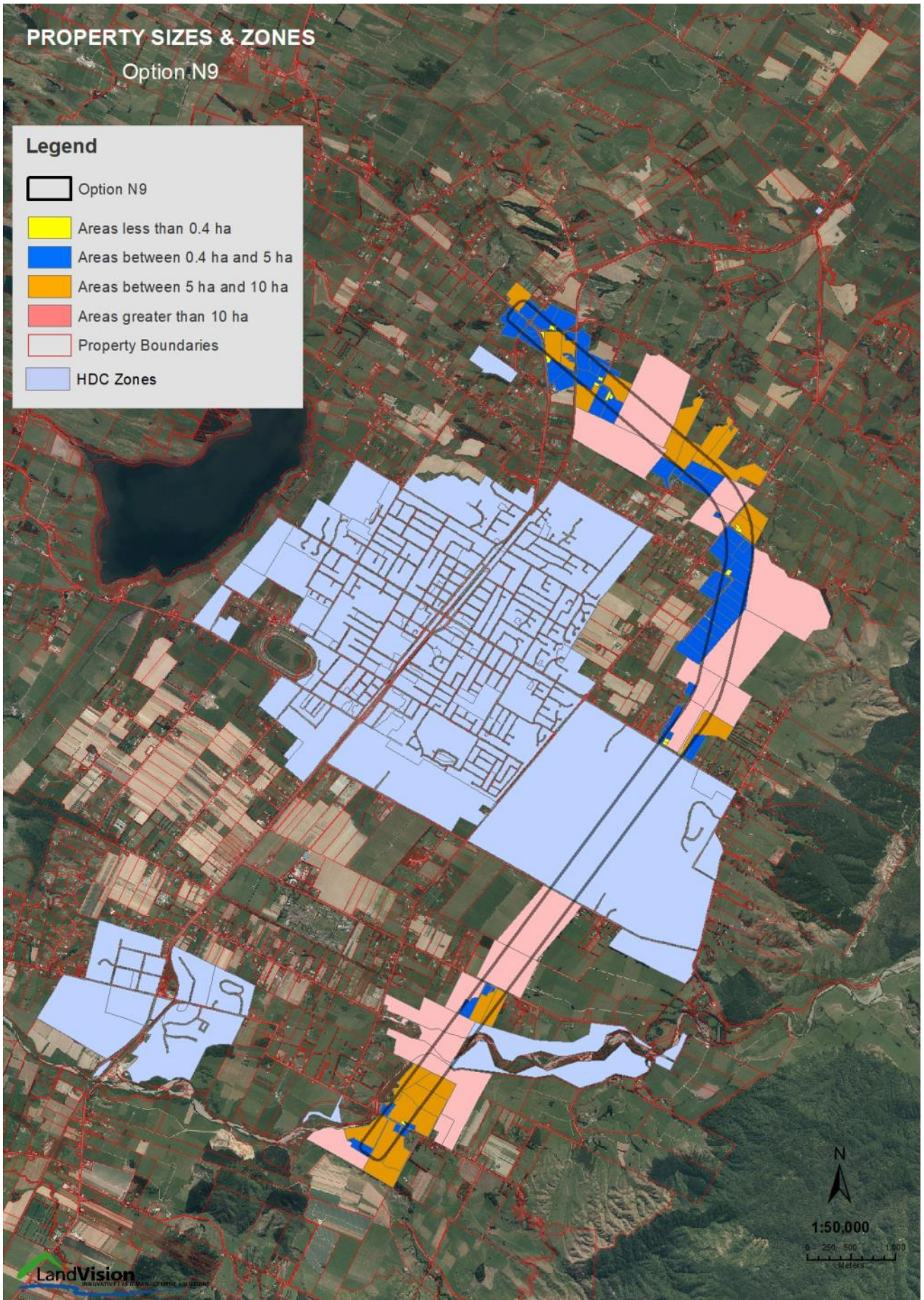


PROPERTY SIZES & ZONES

Option N9

Legend








-  Option N9
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries
-  HDC Zones

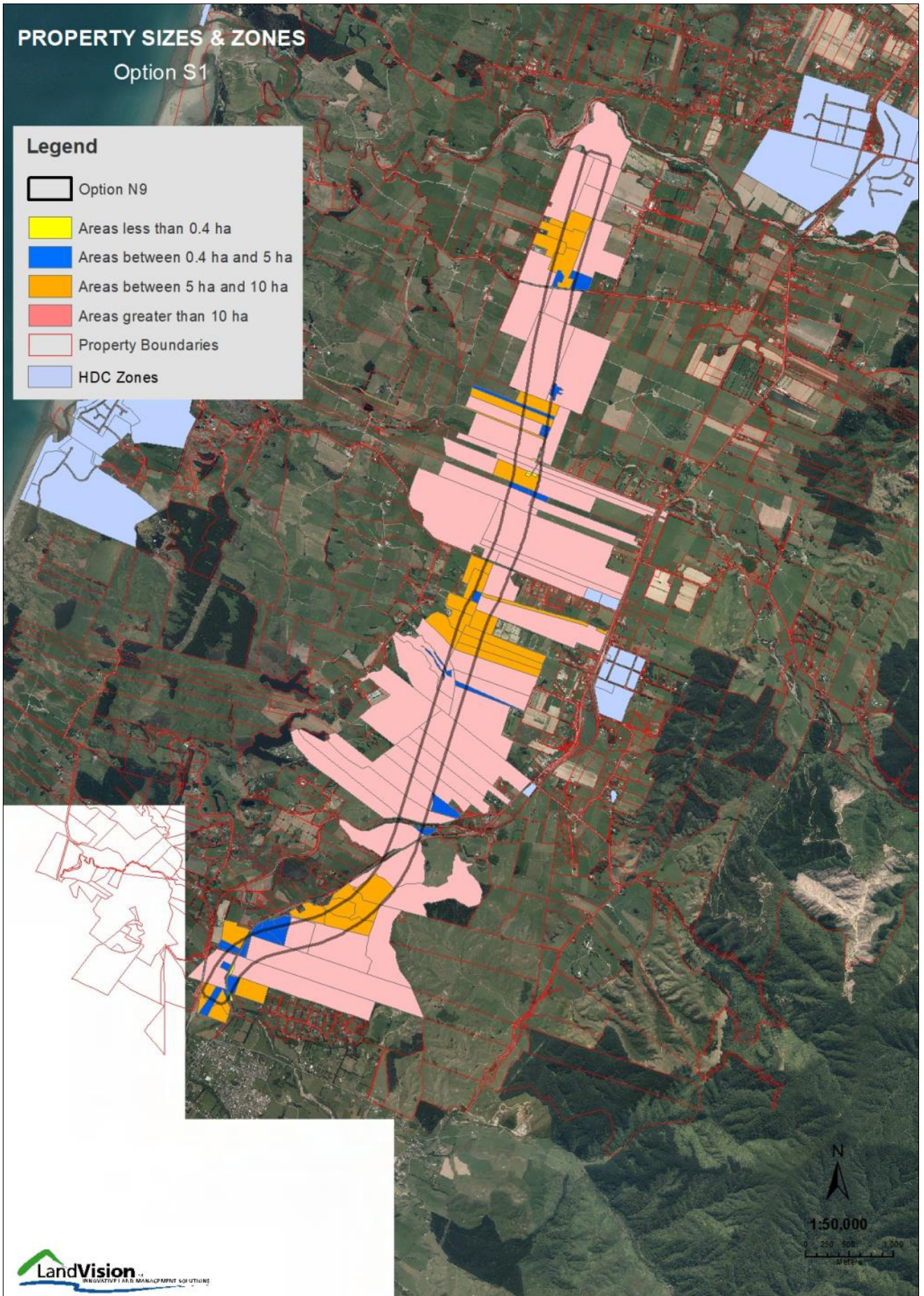


PROPERTY SIZES & ZONES

Option S1

Legend








-  Option N9
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries
-  HDC Zones

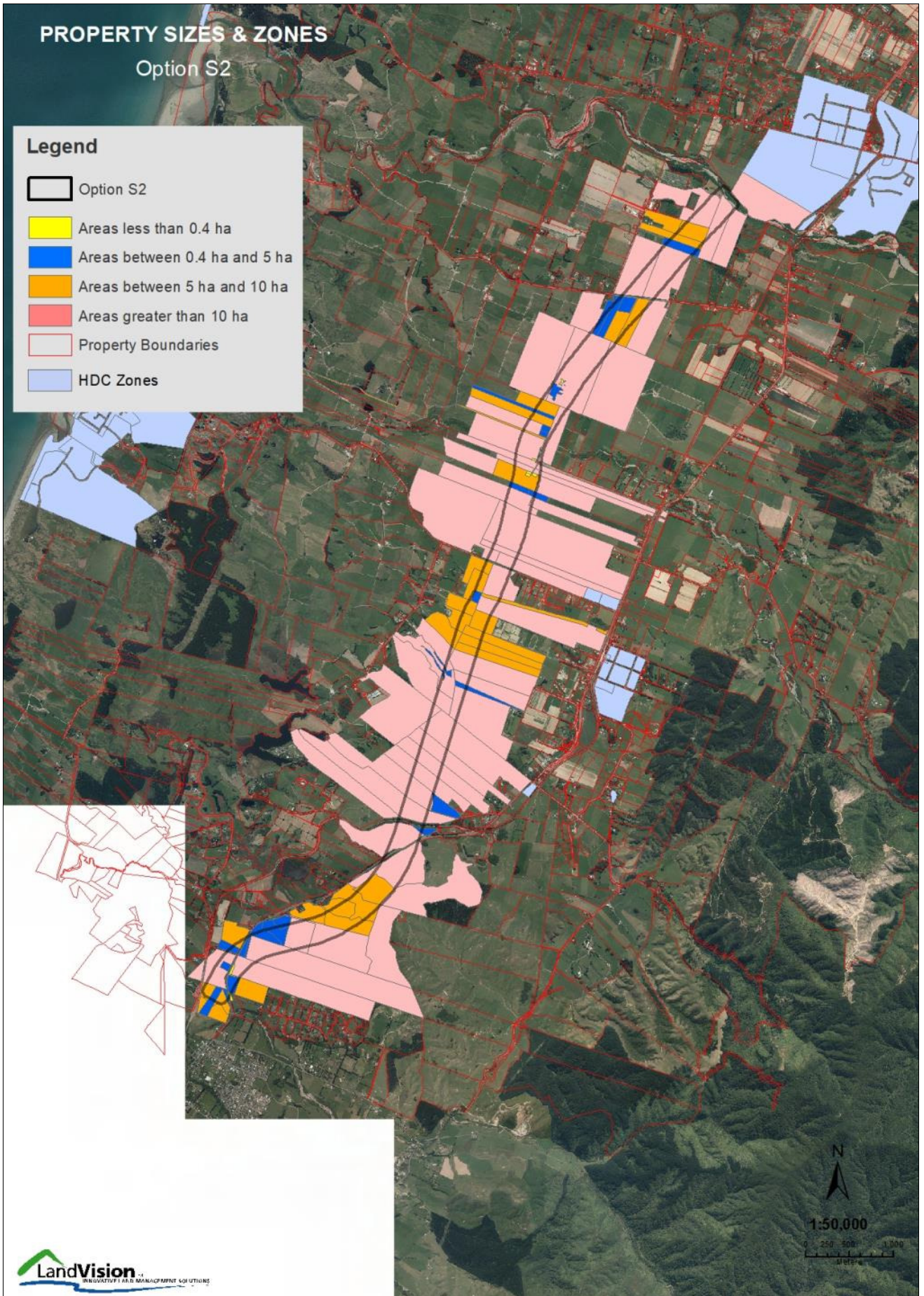


PROPERTY SIZES & ZONES

Option S2

Legend








-  Option S2
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries
-  HDC Zones

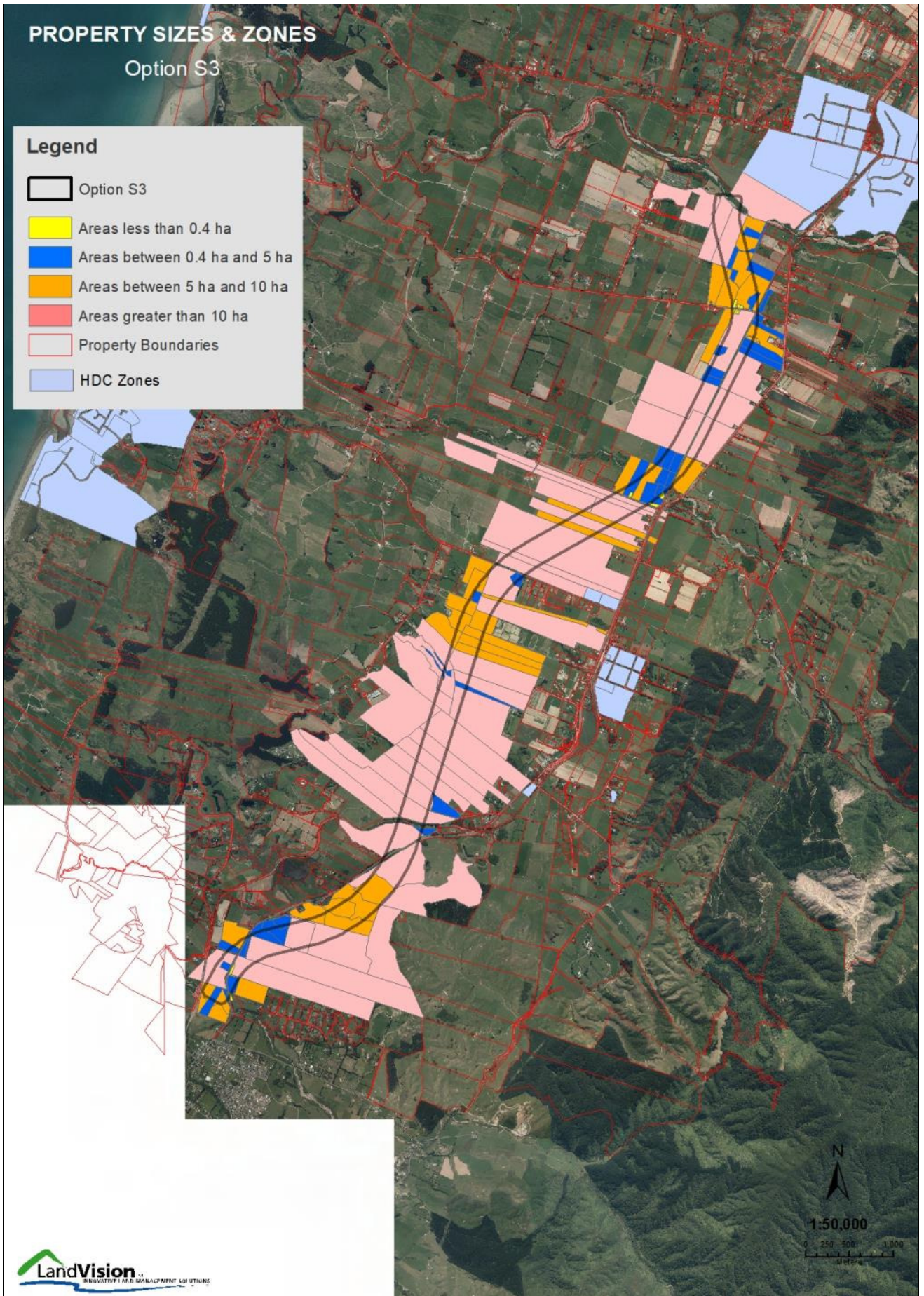


PROPERTY SIZES & ZONES

Option S3

Legend








-  Option S3
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries
-  HDC Zones

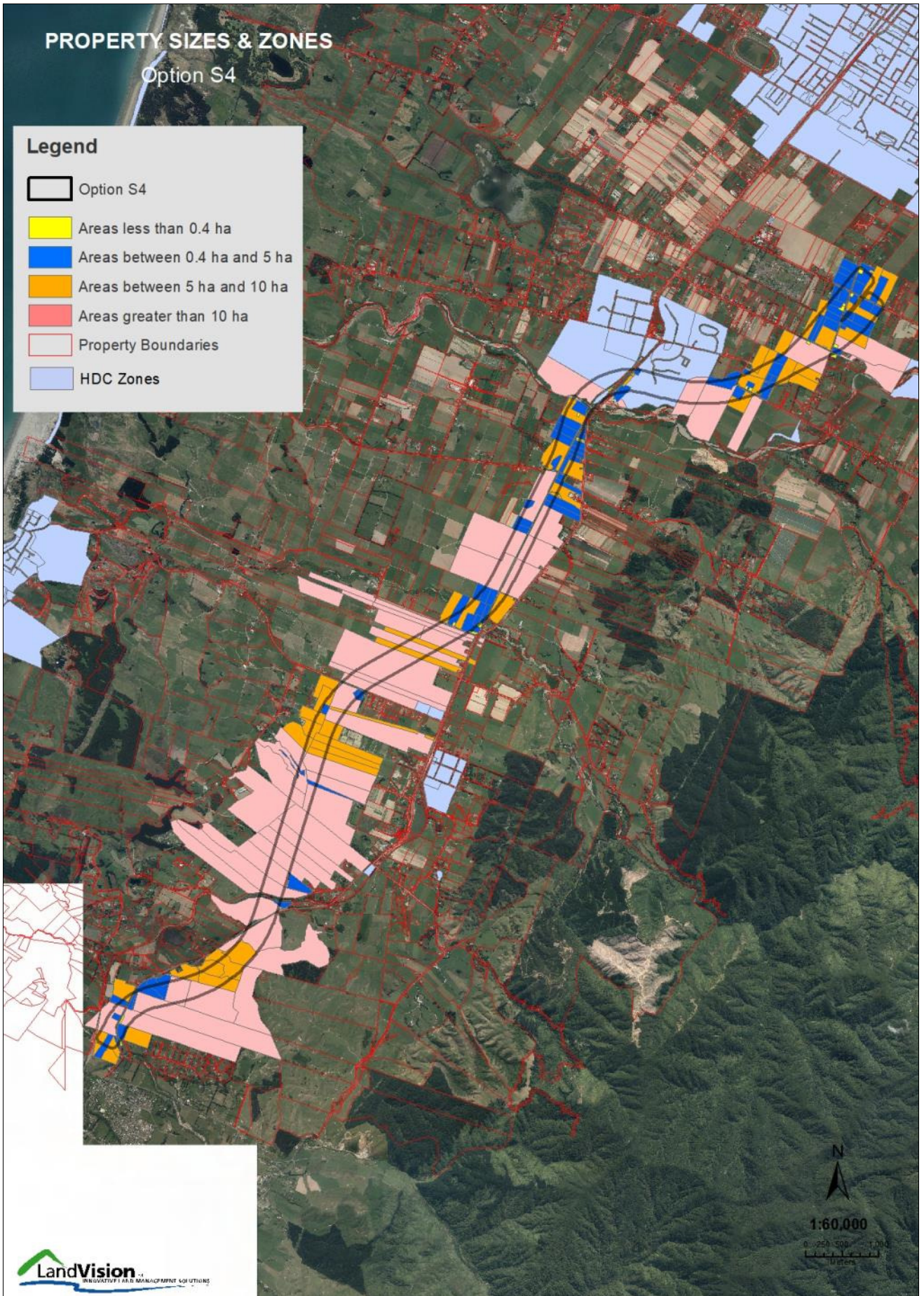


PROPERTY SIZES & ZONES

Option S4

Legend








-  Option S4
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries
-  HDC Zones

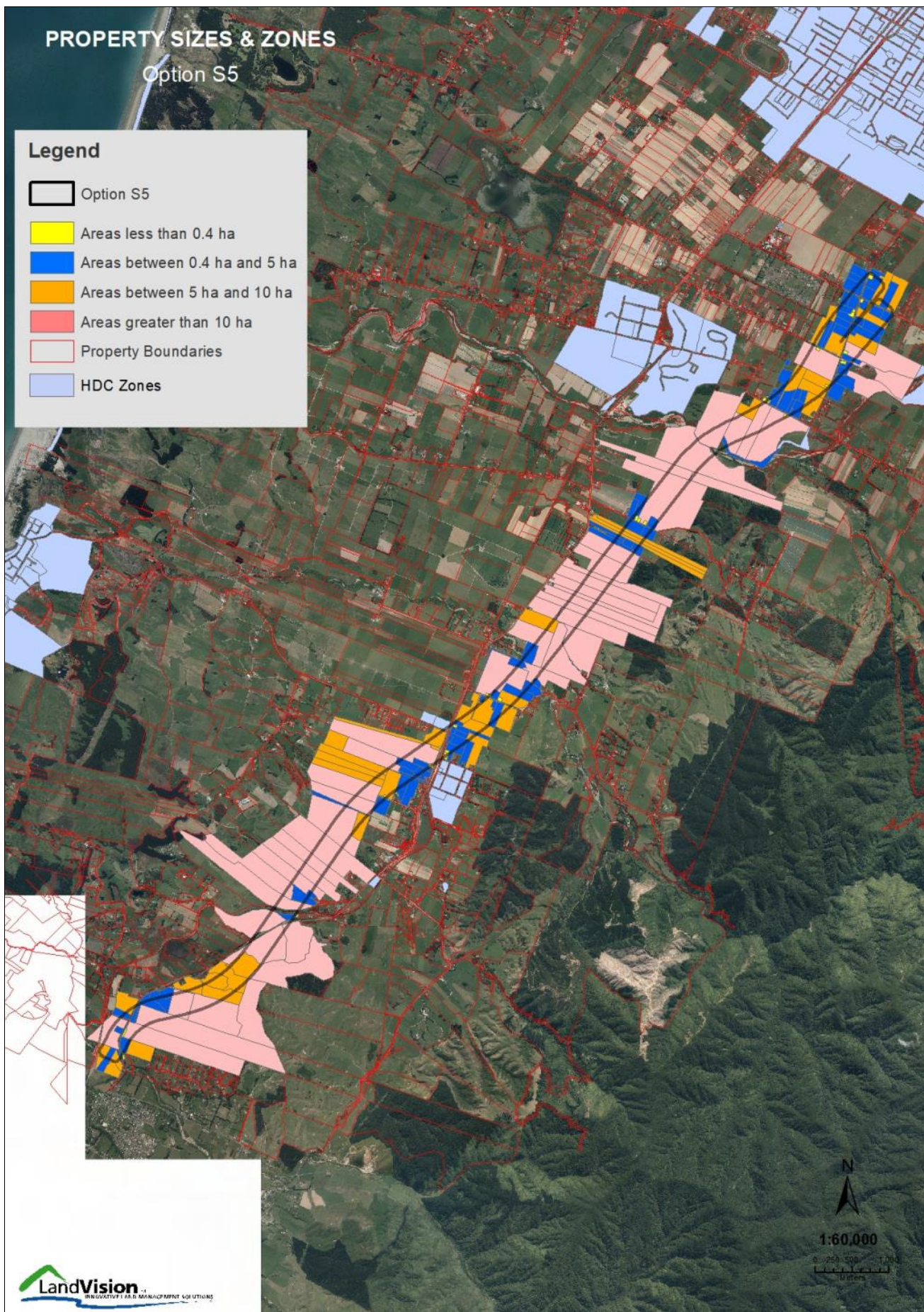


PROPERTY SIZES & ZONES

Option S5

Legend








-  Option S5
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries
-  HDC Zones

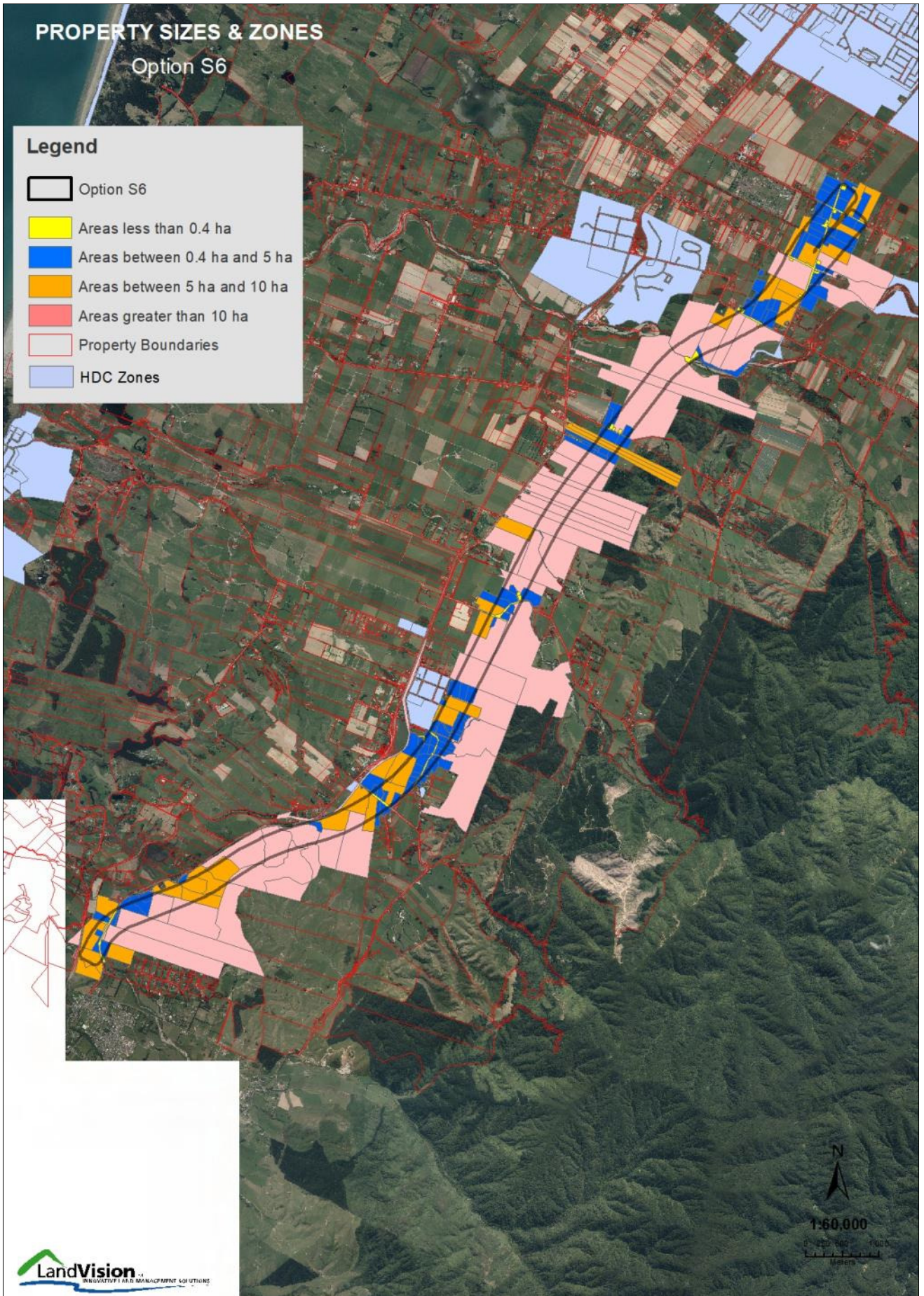


PROPERTY SIZES & ZONES

Option S6

Legend








-  Option S6
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries
-  HDC Zones

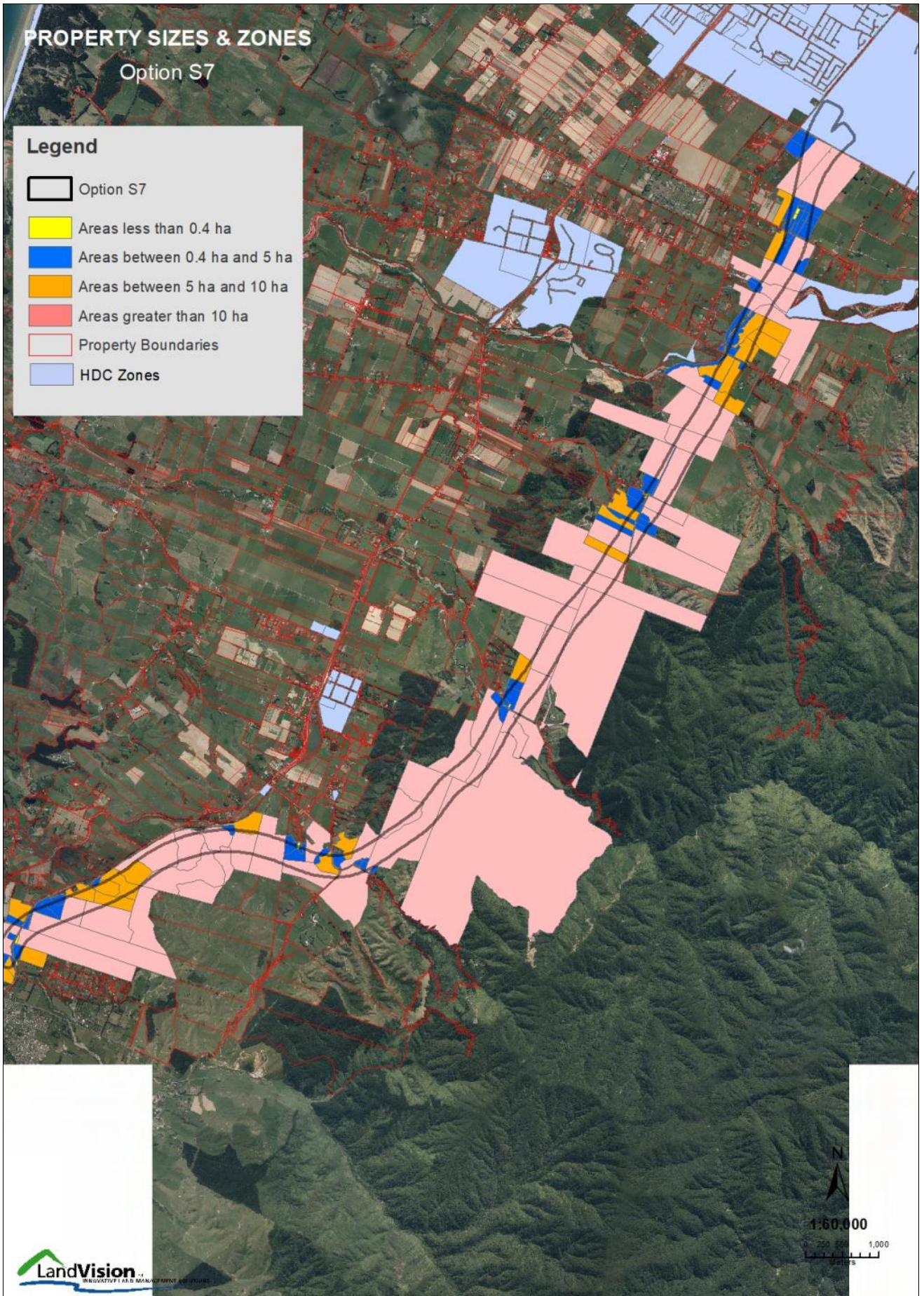


PROPERTY SIZES & ZONES

Option S7

Legend








-  Option S7
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries
-  HDC Zones

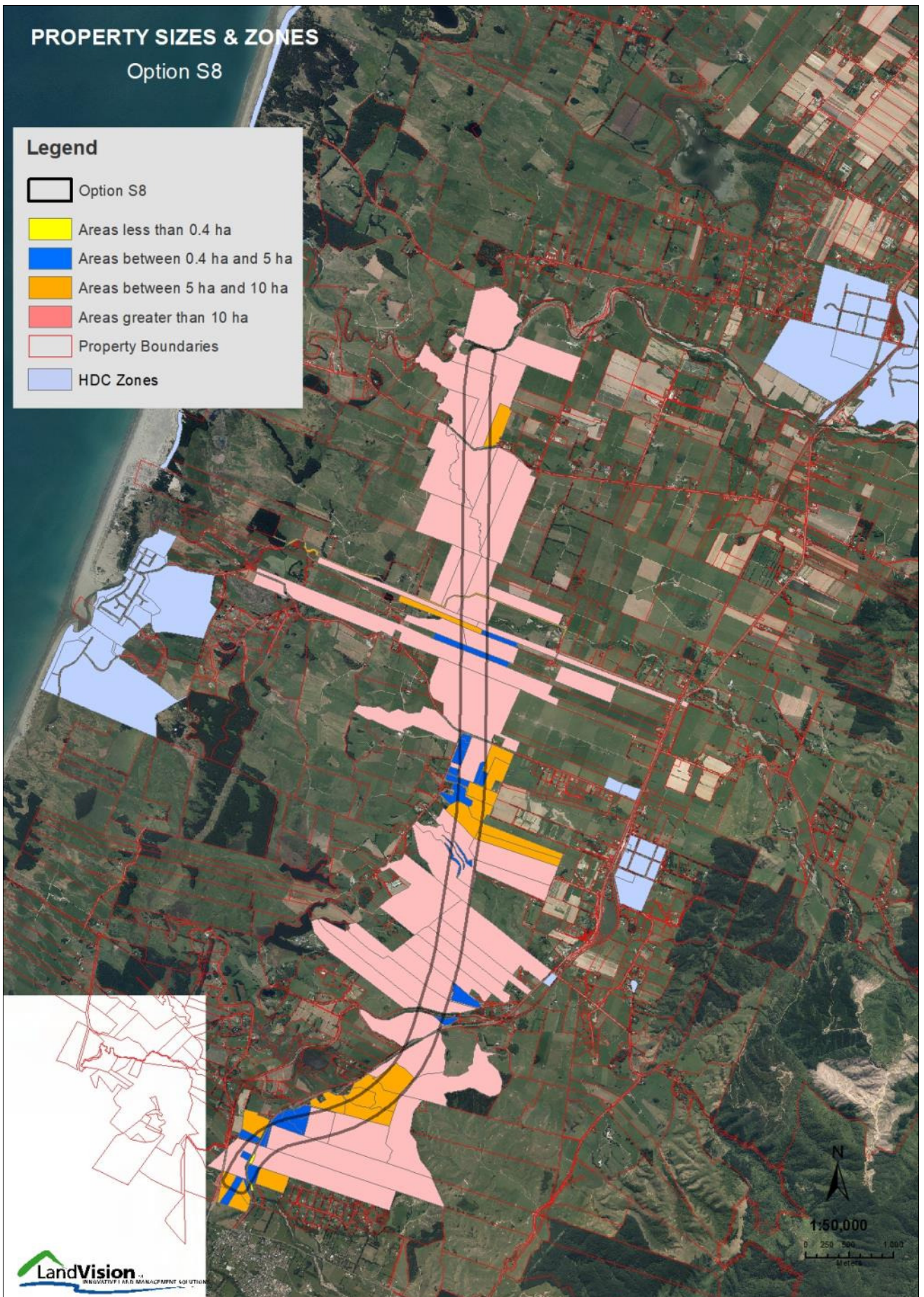


PROPERTY SIZES & ZONES

Option S8

Legend

-  Option S8
-  Areas less than 0.4 ha
-  Areas between 0.4 ha and 5 ha
-  Areas between 5 ha and 10 ha
-  Areas greater than 10 ha
-  Property Boundaries
-  HDC Zones



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