

**Otaki to North of Levin  
SH1-SH57 Connection - SH57 Intersections  
Options Assessment Report**

Prepared for NZ Transport Agency

February 2015



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1	17/12/14	Final for Website	Phil Peet	Sylvia Allan	Sylvia Allan	Phil Peet
2	15/02/15	Update for Website	Phil Peet			Phil Peet

# NZ Transport Agency

## Otaki to North of Levin

### SH1-SH57 Connection - SH57 Intersections

#### Options Assessment Report

### CONTENTS

1	Introduction.....	1
2	Options for Analysis.....	2
2.1	Option Identification - Location .....	2
2.2	Option Identification – Intersection Form .....	3
2.3	Description of Options .....	3
2.3.1	Kimberley Road Alternatives.....	3
2.3.1.1	Queen Street.....	3
2.3.2	Muhunoa Road East Intersection.....	4
3	Multi-Criteria Analysis Method.....	5
3.1	Background.....	5
3.2	Methodology .....	6
3.3	Decision-making in the Multi-criteria Framework.....	6
4	Information.....	8
4.2	Investigations/Reports .....	8
4.2	Workshop Discussion .....	8
5	Application of the Multi-Criteria Analysis .....	10
5.1	Choice of Attributes or Criteria .....	10
5.2	Description of Criteria .....	10
5.3	Scoring System.....	11
5.4	Decision Process .....	12
6	Analysis and Outcomes .....	13
6.1	Scoring Process.....	13
6.2	Weighting.....	17
6.3	Analysis .....	19
6.4	Discussion .....	20
6.5	Findings from Analysis.....	21
7	Conclusion.....	22
7.1	Post Assessment Design Modification.....	22

### LIST OF TABLES

Table 2-1:	Description of Kimberley Road Alternatives .....	3
Table 2-2:	Description of Muhunoa East Road Alternatives .....	4

Table 6-1: Scoring of Alternatives – Kimberley Road .....	13
Table 6-2: Scoring of Alternatives – Kimberley Road Grade Separation vs Queen Street Grade Separation.....	15
Table 6-3: Scoring of Alternatives – Muhunua East Road Alternatives .....	16
Table 6-4: Weighting of aspects .....	17
Table 6-5: Analysis of Kimberley Alternatives (scores x weights for different weighting systems) .....	19
Table 6-6: Analysis of Kimberley/Queen Street Grade Separation Alternatives (scores x weights for different weighting systems) .....	19
Table 6-7: Analysis of Muhunua Alternatives (scores x weights for different weighting systems) .....	20
Table C-1: Kimberley Road Weighting .....	
Table C-2: Kimberley vs Queen Weighting .....	
Table C-3: Muhunua East Road Weighting.....	

## LIST OF FIGURES

Figure 3-1: MCA Process.....	5
Figure 3-2: Multi-criteria Analysis Scoring and Weighting .....	7
Figure C-1: Kimberley Road Scores .....	
Figure C-2: Kimberley vs Queen Scores.....	
Figure C-3: Muhunua East Road Scores .....	

## APPENDICES

Appendix A	Plan of Options
Appendix B	Workshop Background
Appendix C	Weighting Systems
Appendix D	Preferred Layout Plan



# 1 Introduction

The New Zealand Transport Agency (the Agency) has been investigating a package of improvements to the existing state highways between Otaki and north of Levin as part of its strategic approach to achieving safety and efficiency benefits in the short to medium term, while retaining a long-term option to achieve a four lane highway in the project area.

Since 2011 the project has proceeded through investigation of the opportunities and constraints of an expressway within the wider project area, to investigations to identify feasible targeted improvement projects, and through several stages of consultation. Some of the specific projects have required further consideration following consultation in 2013.

Following consultation in 2013 the Agency identified preferred options for proposed improvements to the state highway between Manakau and Levin in May 2014. The preferred options included a new off-line highway to the west of the North Island Main Trunk railway line from south of the Waikawa Stream to just north of the Ohau River. At this point the new road would bifurcate to link both to the existing state highway to the north and to provide a new proposed two lane connection heading north east to link with SH57 at Arapaepae Road. Details of this option can be found in SH1-SH57 Connection Scoping Report (November 2013).

Feedback from the consultation process (see Supplementary Consultation Report: Consultation Stage 4 (April 2014)) suggested that additional consideration of intersections was needed to provide for better community access, reduce effects on businesses and reduce severance effects. The Agency instructed that an assessment of intersection options on the new SH57 link be undertaken.

This report describes the intersections that have been considered and assessed in response to the community feedback.

This report explains the basis and outcomes of the analyses undertaken into the different potential intersection options. The method applied is known as multi-criteria analysis or MCA, which is an accepted method when a number of options with a wide range of impacts, benefits and costs need to be evaluated. The methodology follows a series of process steps which are fully explained in this report.

The identification and consideration of options is an important component of investigations which lead to notices of requirement for designations under the Resource Management Act (the RMA), so the process set out in this report, and its findings, will contribute to future statutory processes to secure the preferred route and gain RMA approvals.

This report will become an appendix to the SH1-SH57 Connection Detailed Business Case. The structure of the remainder of this report is, as follows:

- a description of the area and the options for evaluation (section 2)
- a description of the multi-criteria analysis method and approach to analysis (section 3)
- background reports and data used (section 4)
- application of the multi-criteria analysis (section 5)
- analysis and outcome from the multi-criteria process (section 6)
- conclusions (section 7).

## 2 Options for Analysis

### 2.1 Option Identification - Location

The area for evaluation encompasses the locations where the new SH57 link would cross a local road. These are:

Muhunoa East Road;  
Mcleavey Road; and  
Kimberley Road.

These three roads all intersect with the future SH57 at approximately 1km intervals.

Consideration was given to providing access at one, two or all three locations. However, the initial thinking of the project team was that one access point would provide the best safety outcome by limiting the number of conflict points. Mcleavey Road was considered unsuitable for this intersection due to its topography, ground conditions and safety of the intersections at either end of Mcleavey Road. Whilst intersections could feasibly be provided at either Muhunoa East Road or Kimberley Road, Muhunoa East Road was considered the preferred location as it provided access from the east to the local services of Ohau including the school, café, garage, childcare centre and playing fields.

In November 2013, when the project team originally consulted on Option 5A as being the preferred option, this included an at-grade staggered-T intersection at Muhunoa East Road and no access on or off the highway at Mcleavey or Kimberley Roads. There was significant adverse community reaction, particularly from those living inland of the proposed route of the new SH57, to this suggestion, with submissions, letters, phone calls and discussions at open days requesting the project team to provide access at Kimberley Road. The arguments for providing a connection at Kimberley Road included the need to provide adequate emergency service access, to allow movements to and from Levin for employment and services (including schools) and recreation, to reduce community severance and to reduce impacts on agribusiness through increased transport costs.

Based on the layout of the road network, the location of local services and the feedback from the different consultation phases, the project team understands that there are two key movements for which the project should aim to provide. The first is access to and from Ohau for local services and the second is access to and from Levin for employment and emergency services.

The two kilometre distance between the two intersection locations can result in up to a four kilometre diversion for traffic and it is considered that this is at the upper limit of acceptability. The only way to efficiently provide for both these movements, without this diversion, is to have intersections in both locations.

Nevertheless, considering intersection treatments at both locations does not mean that intersections at both locations are required. For example, it would not be appropriate to provide two grade separated interchanges within 2km of each other, particularly for such low volume roads. Furthermore, if a grade separated option is preferred, then this would need to be considered against a wider strategy for grade separated intersections and potential future four laning for the entire corridor. Further discussion on these aspects is presented later in the report (See Section 6.4).

No specific consideration has been given to changing the current intersection layouts at Tararua Road or any other intersection to the north of Kimberley Road at this point in time as this project is not altering SH57 past these locations. Tararua Road and Queen Street would need separate consideration as they access the main industrial and commercial areas of Levin respectively.

Current modelling suggests that there is no need, from a traffic and transport point of view, for a Levin Bypass or four laning of SH57 within the 30 year modelling horizon. Nevertheless, in recognition that in the long term a 4 lane bypass of Levin might be developed (which would probably be aligned with SH57 between Kimberley Road and Rolsyn/ Heatherlea East Road), a grade separated option at Queen Street was assessed against a grade separated option at Kimberley Road. This was done to check if a Queen Street grade separated intersection might be worth developing now, instead of providing grade separation at Kimberley Road. This specific assessment does not provide a conclusion as to a preferred location of a grade separated intersection, should one be needed in the future.



## 2.2 Option Identification – Intersection Form

A number of grade separated and at-grade options were investigated for each of the intersections at Kimberley Road and Muhunoa East Road. These options were developed by the project team in order to provide the movements required as discussed above.

Some intersection forms were not considered in any detail. These, and the reasons why they were not pursued, are:

**Traffic signals.** These are inappropriate on high-speed rural roads as they are not consistent with the speed environment.

**Roundabouts.** These have not been considered as they impart significant delay to state highway traffic, and are only appropriate when there are high volumes of side road traffic. A previous investigation determined that a roundabout could not even be justified at the higher volume Queen Street intersection<sup>1</sup>.

**Standard cross-roads intersection.** In keeping with the Agency's "safe system" philosophy, options that allow right turn movements onto the highway have not been investigated. This movement type often results in a high crash rate and high serious injury rate.

**Parallel service roads.** Providing for local road options parallel to SH57 which would connect the local roads up to Tararua Road or Queen Street were not considered as these would simply put more traffic onto an intersection which does not meet NZTA's safe system philosophy.

## 2.3 Description of Options

Plans of the options are presented in Appendix A.

For the grade separated options, the local roads would be on bridges over the state highway, rather than the state highway being raised over the local roads as this requires a smaller structure and better ramp connections. This then results in less impact and less cost.

### 2.3.1 Kimberley Road Alternatives

The table below outlines the key characteristics of the intersection alternatives at Kimberley Road.

**Table 2-1: Description of Kimberley Road Alternatives**

Alternatives	Description and Key Features
Kimberley Flyover	This comprises a local road overbridge over the state highway to connect Kimberley Road east to west. No connections to or from the highway would be provided by this layout.
Kimberley Grade Separation	In addition to a local road overbridge this alternative also includes north facing ramps to facilitate the movements between Kimberley Road east and Levin. The southbound off-ramp utilises the existing Arapaepae Road alignment, whilst the northbound on-ramp is through properties.
At Grade	This alternative allows for all movements without grade separation. It has been formulated with a safe system philosophy in mind by not allowing right turn movements onto the highway.

#### 2.3.1.1 Queen Street

Although not specifically investigated for intersection improvements (as described above), a Grade Separated interchange at Queen Street was considered against the Grade Separated interchange at Kimberley Road.

<sup>1</sup> Queen Street Intersection Project Feasibility Report, MWH, 2013

This alternative provides a parallel local road from Kimberley Road to Queen Street East sufficiently separated from Arapaepae Road to allow for full grade separation at Queen Street East, to safely allow drivers to access Levin. There would be no access to the highway at Kimberley Road.

### 2.3.2 Muhunoa Road East Intersection

The table below outlines the key characteristics of the intersection alternatives for Muhunoa East Road.

**Table 2-2: Description of Muhunoa East Road Alternatives**

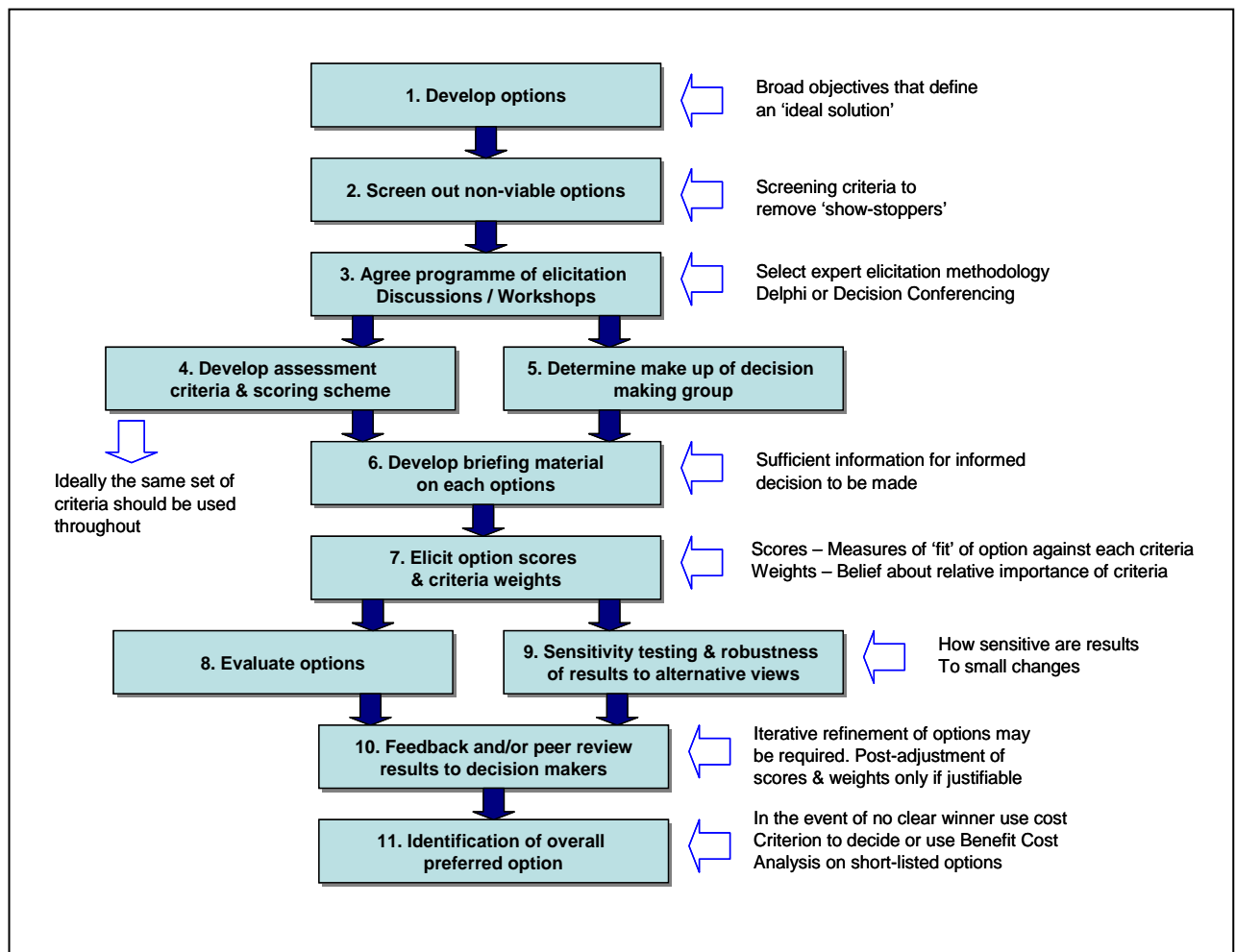
Route Option	Description and Key Features
Grade Separation 1	This alternative provides a local road overbridge plus south facing ramps to facilitate the movements between Muhunoa East Road and destinations to the south. The new alignment for Muhunoa East Road runs east from Ohau then deviates to the south, behind the DoC Private Scenic Reserve, then connects straight into the eastern part of Muhunoa East Road.
Grade Separation 2	This alternative is the same functional layout as Grade Separation 1, but Muhunoa East Road would not deviate quite as far south. Its alignment crosses approximately halfway down the north-south section of the current Muhunoa East Road before connecting back into the local road 500m east of the bends.
Grade Separation 3	Similar to the previous two options, the alignment for Muhunoa East Road continues east from the eastern part of the current road, past the first bend, then deviates south to connect back into Muhunoa East Road approximately 800m east of the bends.
Grade Separation 4	Again similar in layout, this option is the southern-most alignment which was developed to reduce impact on the existing dwellings. It deviates the furthest away from the existing alignment, taking off immediately east of the consented subdivision and tying back into Muhunoa East Road approximately 800m east of the bends.
At Grade 1	This layout provides for all movements at grade under the safe system philosophy by removing right turns onto the highway. It is centred around where the proposed SH57 would cross Muhunoa East Road at the eastern bend.
At Grade 2	The same layout as At Grade 1, this layout is centred further north-east to reduce impact on the bush and provide a better alignment for Muhunoa East Road.

## 3 Multi-Criteria Analysis Method

### 3.1 Background

Figure 3-1 sets out a schematic representation of the context within which multi-criteria analysis is applied, particularly in relation to significant infrastructure projects.

Steps 1 and 2 in Figure 1 for this analysis had been developed as discussed in Section 2 above, producing a short-list of options that were considered able to contribute to the achievement of NZTA's objectives for the Otaki to North of Levin RoNS project. These two steps set the scene for the remainder of the steps set out in Figure 3-1.



**Figure 3-1: MCA Process**

## 3.2 Methodology

The multi-criteria analysis methodology is a key element of analysis and a useful aid to decision-making. Multi-criteria analysis is particularly applicable when there are several options to choose between and where there are numerous complex considerations involved. Multi-criteria analysis is thus commonly used in assessments of options for infrastructure. It is a useful tool for evaluations, including those under the RMA and Local Government Act (LGA), to compare and assess alternative proposals or parts of projects where there are multiple objectives and where there are a range of diverse potential adverse and beneficial effects affecting different areas and/or communities<sup>2</sup>. The range of attributes that are relevant to a decision between options can be numerous and varied, and it is necessary in such circumstances to bring together the information in a reliable and credible way.

Figure 3-2 shows how multi-criteria analysis is applied. Key aspects to be taken into account in the decision are identified, defined and scored on a consistent basis. Once scored, they can then be weighted as appropriate and combined into a single option score. In multi-criteria analysis processes, the scores can be seen as surrogates for measures of value for an aspect, allowing for the effects of diverse criteria, with different units, to be combined. The weights represent beliefs or assumptions about what is important in a particular situation or to a particular group of decision makers.

It is possible to strengthen the analysis by applying a range of different weightings to see whether the preference changes due to weighting systems. It is also appropriate to test the sensitivity of the process by carefully reviewing the scoring and identifying the extent to which scoring would need to change to result in a difference preference.

## 3.3 Decision-making in the Multi-criteria Framework

Decisions on criteria, scoring and weighting are ideally made by a group of informed people through a process that allows for testing through discussion, questions and answers. When the criteria are diverse and areas of specialist judgment are called-for, the preferred method is through a “decision conference” or facilitated workshop session, at which a participating group of specialists and generalists share information and work through the issues, finally deciding on the score for each criterion<sup>3</sup>. Ideally consensus is reached on the scores.

This reduces individual bias and keeps the process transparent<sup>4</sup>.

The benefits of multi-criteria analysis through decision conferencing include drawing out the detail of the various assessments through discussion and questioning, and the involvement of project leaders who are particularly familiar with the project and the area, as well as examination and testing of the information through the shared scoring process.

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<sup>2</sup> The use of multi-criteria analysis is recommended by the NAMS (the New Zealand National Asset Managers Support organisation) and is a key element of the Optimised Decision Making Guidelines promoted by that organisation. It also finds favour (used in conjunction with CBA) in “Decision-making on Mega-projects: Cost-benefit Analysis, Planning and Innovation”, Priemus, H; Flybrjerg, B and van Wee, I, Eds – 2008.

<sup>3</sup> The method is based on the demonstrated hypothesis (from international research in the early 1990s on roading projects) that groups of people, given the same information and the opportunity to test the information, will make similar decisions on preferences, regardless of their backgrounds.

<sup>4</sup> An alternative method which can be used is the Delphi method, where criteria are scored by individual technical and specialist experts and combined by an individual generalist who, at the same time, checks the robustness of the assessment. The Delphi method is an accepted method, but lacks some of the benefits of the decision conference method. It was not used in this analysis.

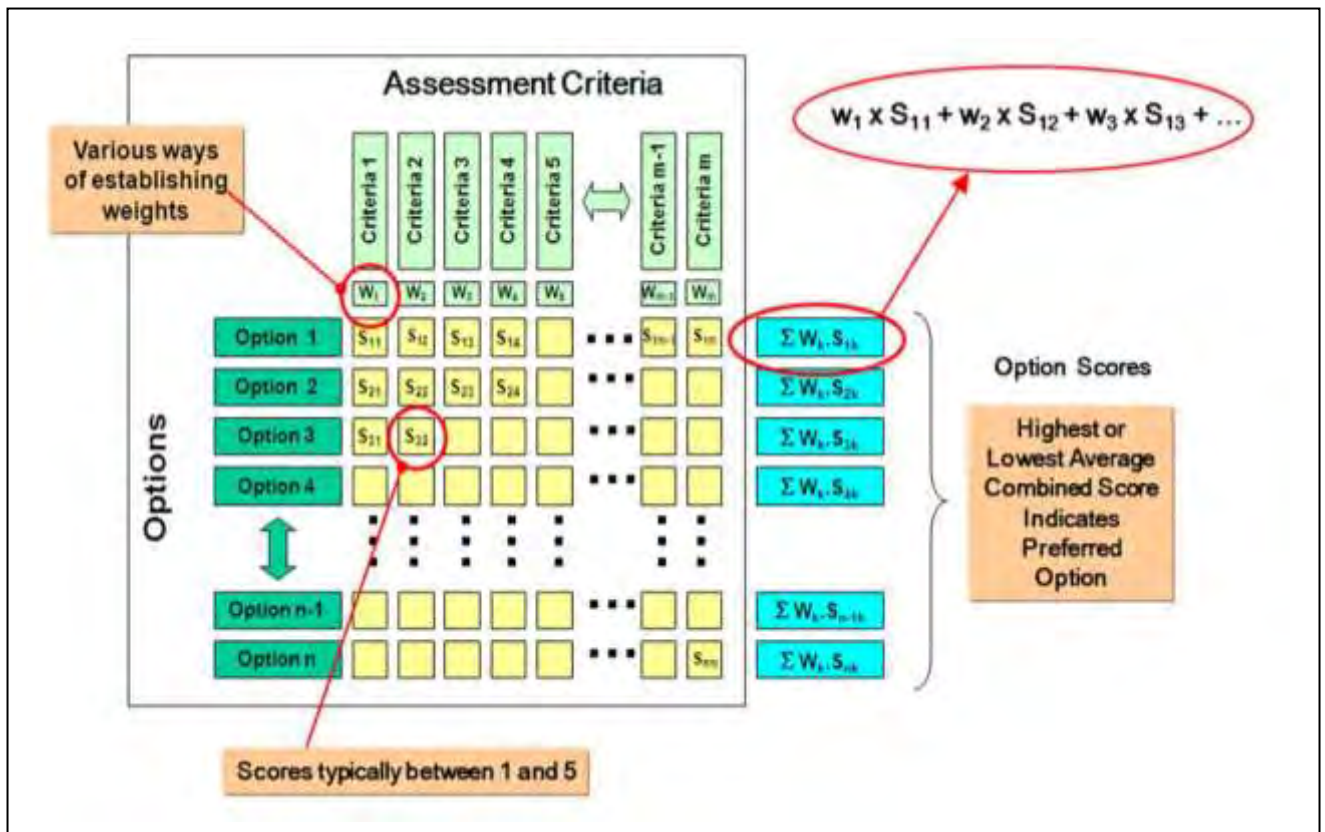


Figure 3-2: Multi-criteria Analysis Scoring and Weighting

## 4 Information

### 4.2 Investigations/Reports

No additional information was sought to undertake this MCA process; it was progressed based on previous investigations undertaken for this project and with the knowledge and experience of the project team.

Background information referred to included:

Otaki to North of Levin Scoping Report, MWH, July 2012

- Particular consideration was given to the constraint maps as Appendix D to the Scoping Report

Landscape and Urban Design Baseline Report, Isthmus, April 2011.

Otaki to North of Levin PFRs (Reports 1 to 12), MWH, February 2013

Otaki to North of Levin SH1 - SH57 Connection Scoping Report, MWH, November 2013

- Particular consideration was given to the MCA Report including specialist reports as Appendix J to the Scoping Report

### 4.2 Workshop Discussion

At the start of the workshop there was a period for general discussion. The matters discussed and the main points covered are outlined below.

1. **Relationship between O2L and RoNS.** The O2L project, although one of the RoNS, is not expected to meet the usual RoNS expressway design guidance, at least for the foreseeable future<sup>5</sup>. While a four lane expressway is being considered as far as the future junction of SH1 and SH57, no decision has yet been made as to the protection of four lane route. Similarly, a decision has not yet been made as to the need for, or desirability of, protecting a four lane route further north, for example along the new SH1/SH57 connection section. A decision will need to be confirmed by NZTA prior to seeking a designation. The possibility of a future Levin bypass would influence the decision, and would support protecting a four lane route.
2. **Implications for intersections on the SH1/SH57 connection.** NZTA has confirmed that there is no definite policy for this section as to whether grade separated connections are needed. It was suggested by NZTA<sup>6</sup> that grade separation should be considered at 6000vpd and above, but this would be subject to budget constraints, i.e. not all roads with this or greater volumes are able to be provided with grade separated interchanges due to overall demand placed on budget. Further, provision of grade-separated intersections on state highways with lower traffic volumes could create an inconsistency in approach across the network and in the immediate vicinity. An appropriately safe at-grade design solution is likely to be available and thence preferred.
3. **Other design considerations.** Increasing use of continuous wire rope median barriers adds complexity for intersection designs at grade. Cross-flow traffic volumes need to be considered.
4. **Intersection separation distance.** It was noted that at-grade intersections could be closer together because they do not need the same acceleration/deceleration lanes and are generally cheaper. However, there are disbenefits including safety and speed. It was noted that with a four lane expressway (i.e. south of SH1/SH57 bifurcation), intersections would be further apart. For two lane design (as on new SH57 section at least initially) they could be closer.
5. **Discussion on specific aspects of local area:**  
If only bridges were provided at Muhunua East Road and/or Kimberley Road there would need to be upgrades to existing roads and SH1 intersections

<sup>5</sup> All other RoNS are four lane expressways.

<sup>6</sup> Phil Peet reported on discussions with Graham Taylor and James Hughes (geometry and optimisation experts) at NZTA prior to the workshop.



It was noted HDC had purchased land for a new SH1 connection south of Bishops Vineyard to avoid the constrained underpass at Ohau (on Muhunua East Road). However, it is understood that KiwiRail is not allowing any new crossings of the NIMT, which would be an issue for such a connection<sup>7</sup>.

Mcleavey Road was discussed as a connection option. It was noted that community appeared not to be opposed to this being a cul-de-sac, even though the SH1 connection<sup>8</sup> and at-grade rail crossing have some problems. MWH noted that the SH57 end was not a good connection location due to uneven topography and geotechnical conditions. It was noted there are strawberry farms needing access located on Mcleavey Road. It is possible this could be addressed by a future connection through the former Kimberley Hospital site, which is currently in an early stage of redevelopment (to 500 houses over time).

The question was raised as to whether it would be possible to have more than two intersections on the SH1/S57 connection and it was considered two would be the maximum. While there is currently no NZTA standard, 5km to 8km apart was preferred but intersections could be closer if at grade<sup>9</sup>. The speed environment was also relevant. HDC noted the district has a number of dangerous rail crossings (including Mcleavey Road) and any ability to reduce the number would be beneficial.

It was suggested by HDC that if SH1 from Ohau to Levin became an extensive 80km/h zone, this may push more traffic onto the new connection, so future vehicle numbers on this stretch may be under estimated. Future urban growth (east and north of Levin) may also increase traffic on the new connection.

It was clarified that side roads in vicinity of the new road would be 80km/h.

- 6. Timing of new connection.** Construction is expected to start in 2019, so there is a need to progress towards consenting. Decisions have yet to be made on the long-term route option, and are the subject of cultural impact assessments. However, connections at Muhunua East Road and Kimberley Road would not be affected by these future alignment decisions.

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<sup>7</sup> It was noted that MWH had looked at connections with SH1 in detail.

<sup>8</sup> It is noted that SH1 will have less traffic once the SH1-SH57 Connection is in place and therefore the safety risk at this intersection improves.

<sup>9</sup> It was noted that while the former "Green Book" had a clear helpful table, the new NZTA Planning Policy manual does not contain standards for separation distance. The fall-back is to apply the Austroads guidelines.

## 5 Application of the Multi-Criteria Analysis

### 5.1 Choice of Attributes or Criteria

The attributes for assessment, or assessment criteria applied for this analysis were different from those used in the range of earlier multi-criteria assessments undertaken for corridors and route options earlier in the overall Otaki to north of Levin project. This is because of the more limited considerations which need to be applied to the specific intersection locations (which had been chosen partly because they were able to avoid some of the matters of more generic concern<sup>10</sup>, and the broader constraints which had been considered at route choice stage). Criteria were identified following a review of the location, extent and design of the intersection options which were to be evaluated. A preliminary list of criteria was developed on the basis of characteristics of the intersections themselves (such as “readability” and safety) and characteristics of the receiving environment (such as impacts on land, loss of dwellings and effects on the remaining immediate and wider environment). The list, with a brief description of each, was pre-circulated to workshop participants and was discussed early in the workshop itself.

The assessment criteria need to reflect matters that are important within the RMA, and the Land Transport Management Act 2003 and its amendments<sup>11</sup>, taking into account the decision criteria that will eventually be brought to bear through RMA processes. They should also be able to be categorised across all of the “four well-being” considerations – social, environmental, cultural and economic - which are part of the sustainable development principles in the Local Government Act 2002. Given the relatively restricted location, the criteria applied were relatively focussed, but are still able to be applied to these frameworks.

### 5.2 Description of Criteria

1. **Land Take** – The area of land that is required for the intersection and the area of land which is sterilised/made inaccessible as shown in the intersection preliminary design.
2. **Cultural Values** – Takes into account tangata whenua values – in this case, primarily by assessing the impact on Maori owned land as there were no known cultural values affected.
3. **Intersection safety** – Takes into account geometry, “readability”, consistency with other RoNS intersections.
4. **Community connection** – Takes into account additional distance to be travelled for typical trips, taking into account likely frequency (connectivity desire-lines were identified from earlier consultation processes).
5. **Visual impact** – Impact on wider community due to structures and other changes in landscape character.
6. **Noise/visual impacts** – Direct visual and noise effects on nearby households, and noise effects on any other noise-sensitive activities.
7. **Direct loss of dwellings** – Number of houses to be removed.
8. **Ecological risk** – Effects on valued ecological resources (bush, watercourses).

<sup>10</sup> For example, engineering degree of difficulty was not a necessary criterion, as all options could be constructed. In this case, cost would distinguish the difficulty.

<sup>11</sup> The LTMA includes an overall objective and requires that NZTA exhibits a sense of social and environmental responsibility and acts in a transparent manner (section 96), and incorporates the Crown’s responsibility to take appropriate account of the principles of the Treaty of Waitangi (section 4).



9. **Future Proofing** – Takes into account whether the options provides for a long term solution, or is compatible with a long term solution
10. **Resilience** – Whether the option provides alternative routes in the event that another part of the road network is closed.
11. **Cost** – Based on preliminary cost estimates.

In assessing options, reasonable mitigation was taken into account. It was also assumed that all options would include adequate provision for property access.

There are eleven assessment criteria, which is an acceptable number<sup>12</sup>. The number and scope of the criteria were confirmed by the workshop. Three additional criteria were added to the initial pre-circulated list as a result of discussion at the workshop, as follows:–

- (i) tangata whenua values, as it was realised that the Muhunua East Road connections had varying impacts on a large parcel of Maori-owned land;
- (ii) future proofing as a result of the discussion and uncertainty about whether the long-term route in this area would need to be two lanes or four (see earlier discussion in section 4.2 of this report), and
- (iii) resilience, as a result of discussions about alternative routes following a major disruption to either of the state highways in the area.

It was recognised at the workshop that there was some potential for double counting, but that this was relatively limited. It was decided that any potential for double-counting could be addressed during the scoring and weighting discussions. The possibility of removing cost from the analysis and considering it as a separate item was also raised.

It was also recognised that some of the identified criteria were not relevant to both potential intersection locations. Specifically, the tangata whenua values criterion did not apply to any of the Kimberley Road options and, similarly, the ecological risk criterion would only be a relevant consideration for the Kimberley Road options if one of the options in this location included a Queen Street intersection.

## 5.3 Scoring System

For the multi-criteria analysis, the scoring system applied was a five-point numerical system, as set out in Table 5.1.

**Table 5-1: Basis for Scoring Used in the Multi-criteria Analysis**

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.

<sup>12</sup> Eight to twelve criteria is the ideal. With an increasing number of criteria, each criterion reduces in importance and it can become difficult to distinguish between options.

---

Score	Description
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.

---

## 5.4 Decision Process

The structured workshop proceeded in accordance with the process set out in this report. The workshop results and analysis are further outlined in section 6 of this report.

## 6 Analysis and Outcomes

### 6.1 Scoring Process

The scoring process was done on the basis of a structured workshop involving six participants:

Jo Draper, NZTA, Project Manager  
 Greg Lee, NZTA, Principal Planner  
 Caroline Horrox, NZTA, Principal Planning Advisor  
 Gallo Saidy, HDC  
 Kevin Peel, HDC  
 Alan Kerr, Beca, Advisor to HDC  
 Phil Peet, MWH, Team Leader  
 Marten Oppenhuis, MWH, Design Manager  
 Steve Muller, MWH, Geometric Designer  
 Sylvia Allan, sub-consultant to MWH, Planning and Consultation Leader  
 Steve Kerr, MWH, Planner  
 Morrie Love, sub-consultant to MWH, Maori Liaison

The necessary protocols were followed to ensure that the outcome would be as reliable as possible. Where consensus was not reached, both scored were recorded and applied in a sensitivity analysis.

Following preliminary discussion<sup>13</sup>, the Kimberley Road alternatives were scored first, followed by the Muhunua East Road alternatives. For every alternative, each criterion was described and discussed by the team in order to identify issues relating to each option, before agreeing a score. Each option was evaluated for all criteria in turn. This was to avoid having to revisit the design several times during the process.

It was decided by the workshop that the Queen Street option should only be evaluated against the Kimberley Road Grade Separated option, as it was technically not part of the current project. There is no current proposal to four lane SH57 which would trigger the need for Queen Street grade separation

The outcomes of the analyses are presented in Tables 6-1 to 6-3 with key points from the discussions outlined after each table.

**Table 6-1: Scoring of Alternatives – Kimberley Road**

Alternative	Land Take	Cultural Values	Intersection Safety	Community Connections	Visual Impact	Local Noise/ Visual Impact	Dwelling Loss	Ecological Risk	Future Proofing	Resilience	Cost
Kimberley Flyover	2	-	3	3	3	3/4	1	1	1	2	2
Kimberley Grade Separation	3	-	1	1	4	4	2	1	1	1	4
At Grade	1	-	3	2	1	1	1	1	3	1	1

<sup>13</sup> This included an outline of the options proposed, a presentation on the multi-criteria analysis methodology to be applied, and a discussion which confirmed the appropriateness and content of the various criteria.

**Land Take.** The flyover alternative requires a slice of land from either side of the existing Kimberley Road, but overall requires a low amount of land. The Grade Separated alternative would require more land than the flyover because it requires a wider and longer bridge to allow for the on- and off-ramps (this results in a larger area of severed land but it could be used for stormwater retention). The At Grade alternative requires only small amounts of additional land, and that is mostly from properties that will already need to be considered for purchase to allow for the new SH57 alignment.

**Cultural Values.** No Maori owned land, objects, assets or matters were identified as being affected by any of the options.

**Intersection Safety.** The Grade Separated alternative provides the best safety outcomes as it separates all movements on and off the highway. The flyover option scored a 3 as it was considered that this option would increase the amount of local traffic using the existing SH1/Kimberley Road intersection (relative to the full movement options), which has a very poor crash history (although noting that there would also be a reduction in traffic at this intersection overall, as SH57 traffic would no longer use this intersection). The At Grade option also scored a 3 as it still allows some potentially high severity movements, including right turns off the highway and u-turn manoeuvres.

**Community Connection.** Again the Grade Separated alternative provided the best score here as it provides for the desired movements most efficiently. The At Grade option was scored slightly worse, as, while it provided more movements, the right turn out of Kimberley East Road requires these vehicles to give way to other traffic at least three times. The Kimberly Flyover was considered the most restrictive as it requires all movements to and from Levin to be via SH1 which is likely to increase overall trip/journey lengths by local residents.

**Visual Impact.** The At Grade alternative was considered the best here as the layout would have limited impact on the visual landscape. The Kimberley Flyover would have some impact, with the Kimberley Grade Separation impact being greater as it requires a longer wider bridge, with the on-ramp intersection also raised.

**Local Noise / Visual Impact.** It was noted that residents in this location are already subject to high noise due to the existing SH57 Kimberley / Arapaepae Road intersection. Scores in this criterion were determined by considering both the likely extent of impact and also by the number of residents that would be affected (after dwelling loss was taken into account). The At Grade alternative was determined to have almost no impact as there would be limited visual impacts and there would be only one resident in close proximity to be affected by noise. The At Grade option is likely to afford some noise mitigation measures as the land within the turnaround areas will contain an earth bund (to prevent headlamps shining onto the SH) and thus also providing some noise attenuation. The Grade Separated interchange was scored as 4 due to the scale of the bridges that this option would entail. Opinions were split on whether the impacts of Kimberley Flyover, being shorter and narrower, were significantly less than the Grade Separated alternative to warrant a lower score.

**Dwelling Loss.** The Flyover alternative is unlikely to require the demolition/removal of any houses in addition to those already required by the new SH57 alignment. The At Grade alternative would require one house and the Kimberley Grade Separation two houses.

**Ecological Risk.** None of the alternatives impacts on recognised ecological areas or waterways.

**Future Proofing.** The Flyover and Grade Separated options would be suitable for any further upgrade of SH57 in the future; either for a Levin Bypass or for four laning. The At Grade option would not be compatible with four laning, but does not preclude it and the level of redundancy would be very low, i.e. the land required to accommodate the at grade intersection option would be used to accommodate four lanes on the SH.

**Resilience.** All options provide a good level of resilience, with the Flyover option scoring slightly worse as Kimberley Road west would be the only access route for this community.

**Cost.** The At Grade option is estimated to cost \$2M, the Flyover \$6M and the Kimberley Road Grade Separation \$16M, excluding fees, property and funding risk.

**Table 6-2: Scoring of Alternatives – Kimberley Road Grade Separation vs Queen Street Grade Separation**

Alternative	Land Take	Cultural Values	Intersection Safety	Community Connections	Visual Impact	Local Noise/ Visual Impact	Dwelling Loss	Ecological Risk	Future Proofing	Resilience	Cost
Kimberley Grade Separation	3	-	1	1	4	4	2	1	1	1	4
Queen Street Grade Separation	5	-	1	1	5	4	4	5	1	1	5

**Land Take.** Grade Separation of Queen Street requires a very large amount of land both for the interchange (which would be twice as large as the Kimberley Road alternative as it has both north and south facing ramps) and the 3.5km long local road connection to Kimberley Road East.

**Cultural Values.** No Maori owned land, objects, assets or matters were identified as being affected by either of the options.

**Intersection Safety.** Both options provide good safety outcomes as they separate all movements on and off the highway.

**Community Connection.** Both options provide the good outcomes here as they provided for the desired movements efficiently.

**Visual Impact.** The Queen Street Grade Separation would have a greater impact both in terms of scale and location, being immediately adjacent to residential areas.

**Local Noise / Visual Impact.** Both options were scored as 4 due to the scale of the bridges that these options would entail and the increased noise exposure.

**Dwelling Loss.** The Kimberley Grade Separation would require two houses and the Queen Street Grade Separation approximately eight houses.

**Ecological Risk.** The Queen Street Grade Separation option impacts on recognised bush areas due to the necessary position of the parallel local road.

**Future Proofing.** Both Grade Separated options would be suitable for any further upgrade of SH57 in the future; either for a Levin Bypass or for four laning. While the Queen Street option would potentially be a better precursor to developing a Levin Bypass, at this time with no plans for a bypass or four laning, it is not possible to differentiate between the options which both score well for future proofing.

**Resilience.** Both options provide a good level of resilience.

**Cost.** The preliminary cost estimate for the Kimberley Road Grade Separation is \$16M and the Queen Street Grade Separation is \$25M, excluding fees, property and funding risk.

**Table 6-3: Scoring of Alternatives – Muhunoa East Road Alternatives**

Alternative	Land Take	Cultural Values	Intersection Safety	Community Connections	Visual Impact	Local Noise/ Visual Impact	Dwelling Loss	Ecological Risk	Future Proofing	Resilience	Cost
Grade Separation 1	3	3	1	1	4/5	3/4	1	5	1	1	3
Grade Separation 2	3	1	1	1	4	2	4	3	1	1	3
Grade Separation 3	4	1	1	1	4	2	4	4	1	1	4
Grade Separation 4	3	3	1	1	4	2	1	4	1	1	3
At Grade 1	1	1	3	2	1	2	1	4	3	1	1
At Grade 2	2	1	3	2	1	2	2	1	3	1	1

**Land Take.** All Grade Separated options are similar, with alternative 3 scoring worse as it has the greatest area of sterile land created between the ramps. The At Grade options have much smaller footprints and so have less effect. At Grade 2 scored worse than At Grade 1 due to the impact of the realigned Muhunoa East Road either side of the intersection.

**Cultural Values.** Grade Separated alternatives 1 and 3 further divides a large block of Maori owned land that is already affected by the SH57 alignment. The further division would create 2 medium sized and 1 small piece of land that could potentially affect the commercial viability of this piece of land.

**Intersection Safety.** This was scored on a consistent basis with the Kimberley Road alternatives; that being that the grade separated options scored a 1 and the at-grade options scored a 3.

**Community Connection.** All options provide the connectivity for the key demands. The at-grade alternatives scored a 2 rather than a one as although more movements are provided, there is potential for delay, especially with the right turn movements.

**Visual Impact.** All grade separated options were considered to have a significant impact on the landscape character of the area due to the presence of a large local road overbridge in an otherwise flat area. Grade Separation 1 was considered to be worse than the others as it required a large retaining wall immediately adjacent to one of the totara bush areas, although opinion was divided as to whether this was enough of an impact to warrant a 5.

**Local Noise / Visual Impact.** The at-grade options would have little additional impact over and above that which would be present with the new SH57; they were scored a 2 to account for the additional noise in accelerating and decelerating vehicles, noting that this would likely already be happening at the bend in the current situation. The At Grade options are likely to afford some noise mitigation measures as the land within the turnaround areas will contain an earth bund (to prevent headlamps shining onto the SH) and thus also providing some noise attenuation. The grade separated options have a much greater impact. With Grade Separation 2 and 3, many of the houses are being purchased for the scheme, so the impact is only being realised by a few. Grade Separation 1 does not directly affect many houses and the alignment is close to those that remain, therefore this was scored a three, with some participants considering it to be a four. Grade Separation 4 is located further away from the dwellings so the impact is much less.

**Dwelling Loss.** Grade Separation 4 and At Grade 1 do not directly require any houses. Grade Separation 1 requires one house, At Grade 2 requires two houses and Grade Separation 2 and 3 require approximately 7 and 6 respectively.

**Ecological Risk.** The key impact here is on the stands of totara trees. These are recognised areas of ecological importance and affecting these would have a significant impact. Only one option, At Grade 2, avoids the bush / totara stand completely. Grade Separation 2 stays mostly away but may impact on the very edge of the westernmost bush area. The other options all cross across the edges of the bush area so were scored a 4 with Grade Separation 1 scoring a 5 due to the impacts that the high retaining wall would likely have adjacent to the easternmost bush area (this was not considered to be a fatal flaw though, as mitigation options were considered likely to be available).

**Future Proofing.** The Grade Separated options would be suitable for any further upgrade of SH57 in the future; either for a Levin Bypass or for four laning. The At-Grade options would not be compatible with four laning, but they do not preclude it and the level of redundancy would be very low, i.e. the land required to accommodate the At Grade intersection options would be able to be used to accommodate four lanes on SH.

**Resilience.** All options were considered to provide an equally resilient network in this part of the district, in that they helped to provide alternative route options should a part of the SH network fail.

**Cost.** The At Grade options have been estimated at approximately \$2M and the Grade Separated options approximately \$12.5M, \$13M, \$14.5M and \$13.5M for alternatives 1, 2, 3 and 4 respectively. These costs exclude fees, property and funding risk.

## 6.2 Weighting

After reviewing the scoring, the workshop discussed the appropriate weighting of the different criteria. The weights arrived at are presented in the table below. This can be regarded as the agreed view of the key technical and specialist advisors involved in the project. The workshop was aware that additional analyses would be undertaken as a later stage, along with sensitivity analysis applying the different scores elicited at the workshop.

**Table 6-4: Weighting of aspects**

Land Take	Cultural Values	Intersection Safety	Community Connections	Visual Impact	Local Noise/ Visual Impact	Dwelling Loss	Ecological Risk	Future Proofing	Resilience	Cost
2	8	10	9	5	6	2	8	4	5	9

The following considerations led to the agreed workshop weighting:

Land take and dwelling loss was considered to have a relatively low weight because the areas affected were relatively localised and compensation would be provided. Feedback from consultation had indicated that acquisition of dwellings could be considered to be a better outcome than non-acquisition. Safety of the intersection was considered the most important factor.

Both cost and community connections were considered to justify a high weight. Visual impact and local noise/visual impacts were weighted similarly, with slightly greater weighting given to direct effects. The landscape is regarded as a working rural landscape.

Cultural values and ecological risk were both regarded as important. Future proofing and resilience were given a lower weight because of uncertainty and infrequency.



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.

To analyse the route option preferences, a range of weighting systems was developed subsequently. These are shown in Appendix C and are described in general terms below. Note that the first weighting system is the only one subject to discussion by a group. The other systems have been developed by Allan Planning and Research on the basis of understanding a range of possible relevant considerations<sup>14</sup>.

**Workshop Weighting** – this weighting was developed in discussion and agreement at the workshop and could be described as the technical view of the workshop attendees. See above.

**RMA Balanced Weighting** – this weighting system took into account the matters in section 5 of the RMA, emphasising health, safety and well-being in the local environment, but recognising the importance to the significant ecological areas that have the potential to be affected by some of the options. This weighting system included a reasonably high weight for all criteria and was able to be applied to all analyses (compared to the other RMA-based weighting system).

**RMA Section 6 Emphasis Weighting** – this places maximum weight on the only section 6 RMA aspects potentially at play in respect of the intersection options (ecology, and tangata whenua values). Landscape values were given a low weight only as “outstanding” qualities and elements were not identified in the areas affected. All other criteria were set at zero. This weighting system applied only to the analyses which included the Kimberley Road option with the Queen St grade-separated connection, and the Muhunua Road East options. Of these, only Muhunua Road East options include two section 6 criteria.

The remaining 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 LTMA and other national infrastructure policy approaches. It is also pertinent to RMA and LGA considerations.

**Social** – all criteria have a social component, so all are given some weight. The highest weighting is given to safety, community connection, dwelling loss, local amenity and wider landscape implications, and resilience. All other criteria have some social relevance in this productive rural area, with ecological risk 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 a moderate weighting.

**Cultural** – this highly weights tangata whenua cultural values, but also acknowledges a wider cultural significance of other potential local changes. Note that only in the Mununua Road East area do tangata whenua values apply.

**Economic** – this excludes a number of criteria which have little or no direct economic bearing on a decision on a preferred intersection option.. The weighting system emphasises cost and safety, but applies some weighting to other criteria with an economic component<sup>15</sup>.

<sup>14</sup> This type of process has been applied in similar analyses for major infrastructure in the past, to ensure robustness in analysis.

<sup>15</sup> This quadruple bottom-line weighting is a different type of evaluation from the Benefit Cost Ratio (BCR) evaluation normally undertaken by NZTA.



### 6.3 Analysis

The weighting systems have been applied to the workshop scores set out in Section 6.1, and shown numerically in Tables 6-5 to 6-7 below (and graphically in Appendix C). Lowest weighted scores indicate the preferred option.

**Table 6-5: Analysis of Kimberley Alternatives (scores x weights for different weighting systems)**

Option	Workshop	RMA Balanced	Social	Environmental	Cultural	Economic
Kimberley Flyover	2.46	2.27	2.27	2.31	2.29	2.11
Kimberley Grade Separation	2.27	2.27	2.30	2.36	2.15	2.00
At Grade	1.71	1.64	1.55	1.60	1.62	1.78

The Kimberley Road at-grade option is clearly preferred as it provides the best outcome under all weighting scenarios.

**Table 6-6: Analysis of Kimberley/Queen Street Grade Separation Alternatives (scores x weights for different weighting systems)**

Option	Workshop	RMA Balanced	RMA S6	Social	Environmental	Cultural	Economic
Kimberley Grade Separation	2.10	2.10	1.69	2.26	2.10	2.00	2.00
Queen Street Grade Separation	3.00	3.13	5.00	3.00	3.33	3.15	2.67

The table above shows that grade separation at Kimberley is preferred under the multi-criteria analysis over grade separation at Queen Street.

However, the criteria and weighting systems developed for the Kimberley and Muhunua intersection analysis may not be absolutely appropriate for assessing a location for a long term grade separated interchange. This is because they were developed to reflect important characteristics around localised impacts as well as local connectivity and access needs at present. Assessing the future location of an interchange may need a different set of input information such as future demographics, land use changes, traffic modelling, and strategic direction, which have not been assessed here. Accordingly, it is considered that both options should be retained as potential future interchange locations to be assessed at the time that either a Levin Bypass or SH57 four laning, or both, are investigated in more detail.

The preferred option from the Kimberley Road intersection analysis, being at-grade, would neither be inconsistent nor result in untenable redundancy with either long term option. Hence, the Kimberley Road at-grade option can be progressed with confidence.

**Table 6-7: Analysis of Muhunua Alternatives (scores x weights for different weighting systems)**

Option	Workshop	RMA Balanced	RMA S6	Social	Environmental	Cultural	Economic
Grade Separation 1	2.43	2.44	4.00	2.17	2.67	2.45	1.67
Grade Separation 2	1.96	2.07	2.26	2.10	2.16	2.08	2.00
Grade Separation 3	2.24	2.36	2.70	2.29	2.51	2.29	2.33
Grade Separation 4	2.22	2.24	3.57	2.03	2.40	2.29	1.67
At Grade 1	1.99	1.92	2.30	1.68	2.05	1.80	1.78
At Grade 2	1.69	1.71	1.00	1.76	1.65	1.69	2.00

The At Grade 2 option is preferred under all weighting systems except Social, in which AtGrade 1 is slightly preferred (because of the reduced weighting on the ecological impact of At Grade 1), and Economic where two of the Grade Separated options are more preferred (primarily due to the increased focus on Intersection Safety and Future Proofing).

This is a relatively conclusive finding from the MCA process. An inspection of second and third preferences shows that At Grade 1 would be a runner up, but none of the Grade Separated options consistently scored well.

## 6.4 Discussion

The MCA analysis on the two intersections demonstrates a clear preference for at-grade intersections at both locations.

For robustness, the analysis above was performed without the cost scores included. This did not change the preferences in the tables below.

Similarly, a check was undertaken of the dual scoring, where a single score had not been agreed. Again, this did not change the preferences.

The overall outcome does not answer the question as to whether intersections at both locations are required, or whether one will suffice.

Discussion in Section 2 above presented the reasons from the community in regards to the key movements and why the community would be best served by providing for movements at the two intersections. There are business (agri-business), community and social reasons why an additional connection should be provided. However, other considerations also need to be taken into account.

Potential concerns in providing intersections at both locations predominantly relate to cost and safety.

The construction cost of providing two intersections has been compared to the likely benefit that this will provide. On the basis of a basic EEM principles analysis (factoring in likely length of diversion and probable use) the transport benefits will exceed the physical costs.

In terms of safety, there are no concerns in providing at-grade intersections with a 2km spacing; they are sufficiently separated to have no effect on one another. There is likely to be an increase in safety risk in having two intersections rather than one on the highway; however, this will be countered by the alternative of only one intersection which includes an increase in safety risk associated with the additional travel required on the local road network, and the additional turning at the single state highway intersection.

Providing two intersections also has resilience benefits and is not inconsistent with any future upgrade of SH57, although some components may be made redundant. This is at a relatively low cost and it will be many years before cost implications are realised. The best location for a future grade separated interchange can be determined at the time that four laning is needed, but this is currently expected to be well beyond the 30 year (2041) modelling horizon.

Overall, at this stage, and without the benefit of detailed transport modelling, it is considered that providing both at-grade intersections can be supported. The conclusion would be different if even one of the intersections was grade separated, i.e. if one intersection was grade separated then that is likely to preclude any intersection at the other location.

## 6.5 Findings from Analysis

The overall conclusion from the multi-criteria analysis is that at-grade options should be progressed at both the Kimberley Road and Muhunua East Road locations. The at-grade options are preferred in terms of the range of matters that contribute to decisions on route preferences under various legislative requirements.

For the Agency, recognising that multi-criteria analysis is an aid to decision-making, but does not make the decision on behalf of the NZTA, it will provide assistance in determining the preferred option to proceed with.

## 7 Conclusion

This report sets out the basis, process and findings of an analysis of alternative layouts for the intersections on the new SH57 link between south of Ohau and Arapaepae Road.

The process involved identification of options to an extent where their effects could be assessed in a preliminary manner, followed by a multi-criteria analysis process, involving best practice techniques such as decision conferencing through a facilitated workshop at which information about the options was shared and tested. The outcomes have been analysed on the basis of a range of weighting systems, and have also been subject to further sensitivity analysis.

Based on the analyses, at-grade layouts are preferred. Intersections at two locations are also recommended based on consultation feedback, the distance between the intersections, the benefits of providing both connections and the fact that the land required for the intersections would not be surplus (as it could be used for future four laning).

The information this report, and the analysis described above, will help contribute to the overall plan for the SH1-SH57 Connection.

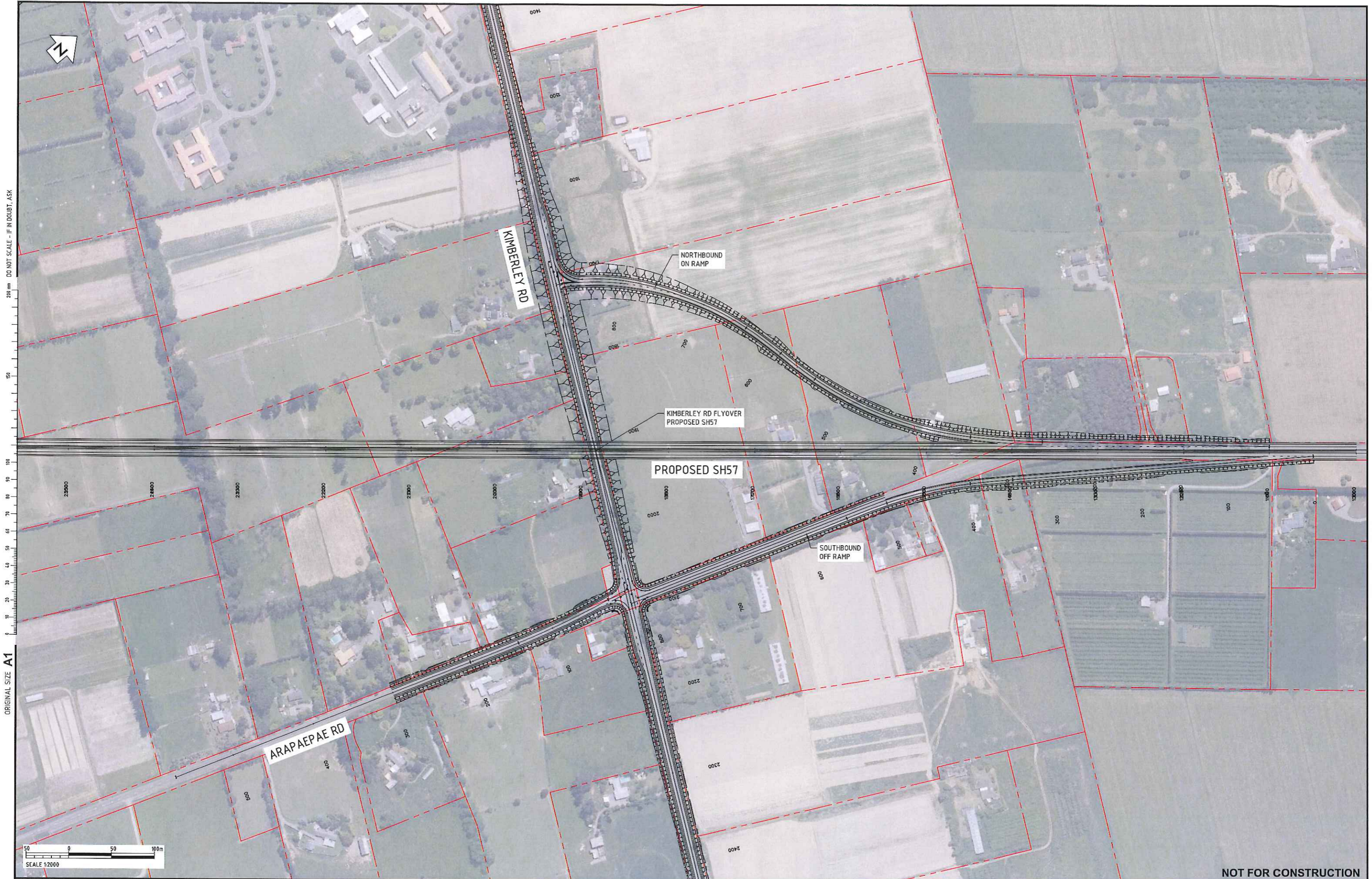
Further work will need to be undertaken on the specific design of the intersection layout to fully confirm their costs and impacts.

### 7.1 Post Assessment Design Modification

Following further consideration by geometric designers and discussions with local land owners, the proposed intersection designs were modified in order to improve their layout and, at SH57 / Kimberley Road, avoid a residential property. The new layouts are shown in Appendix D. The modifications are minor in nature and do not alter the premise and basis for selection of the preferred options. In other words, the option selection process allows for and does not preclude further design refinement of the preferred option.

## Appendix A Plan of Options





ORIGINAL SIZE A1

200mm DO NOT SCALE - IF IN DOUBT, ASK

**NOT FOR CONSTRUCTION**

REV	DESCRIPTION	GC	MO	PP	DATE
A	PRELIMINARY SKETCH				06.11.14
	REVISIONS	DRN	CHK	APP	

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SURVEYED		
DESIGNED	G. CORIN	11/14
DRAWN	G. CORIN	11/14
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED		
PROF REGISTRATION:		



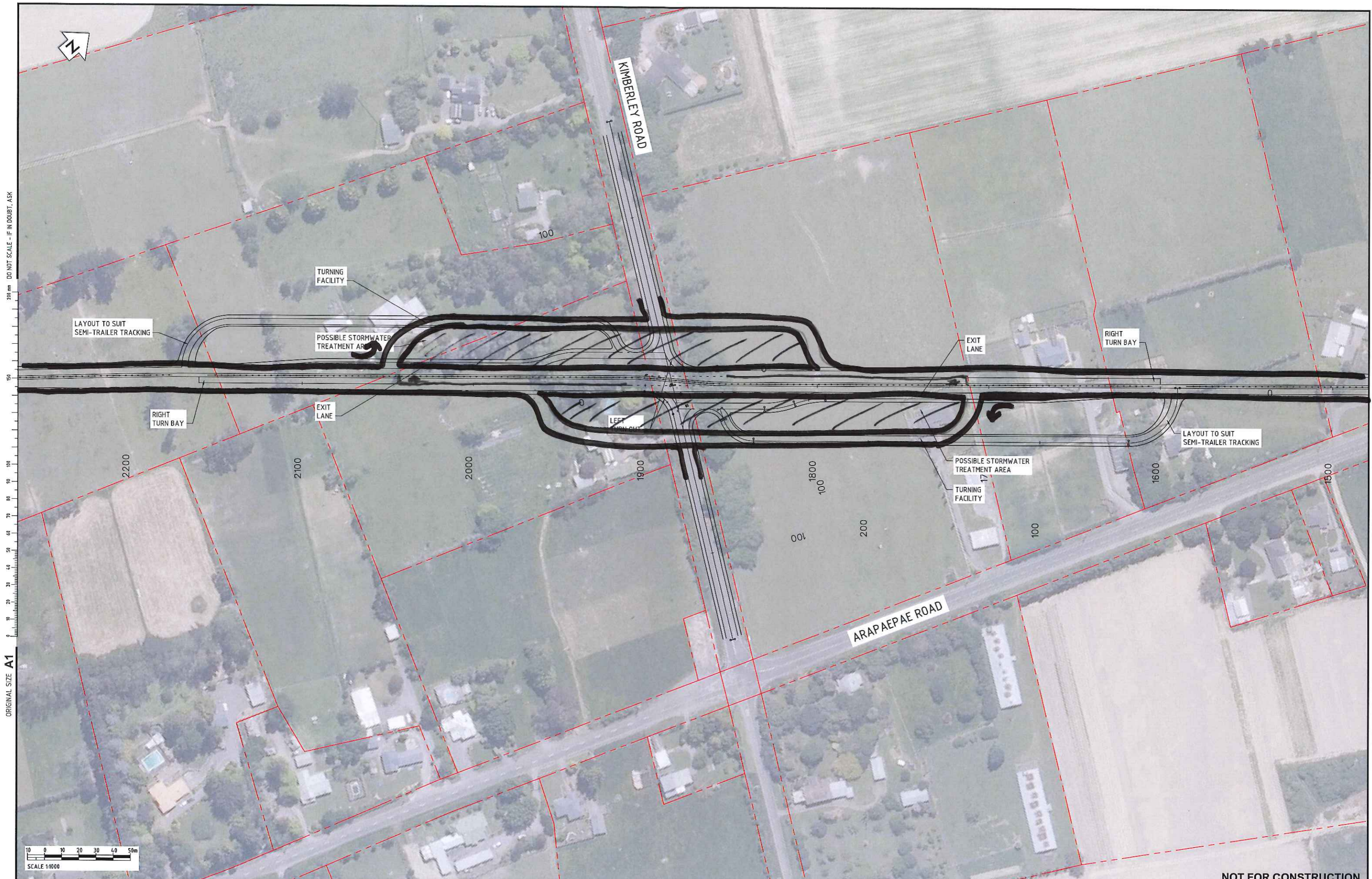
Client:

NZ TRANSPORT AGENCY  
 SH1: OTAKI TO NORTH OF LEVIN RONS PROJECT  
 PROPOSED KIMBERLEY ROAD / SH57 INTERSECTION  
 ALTERNATIVE 1 PLAN **KIMBERLEY GRADE SEP**

Status Stamp	<b>DRAFT FOR REVIEW</b>
Date Stamp	<b>06.11.14</b>
Scales	1:2000 (A1)
Drawing No.	80500902-05-001SK006
Rev.	<b>A</b>

*NOTE KIMBERLEY FLYOVER SIMILAR BUT EXCLUDES RAMPS*





ORIGINAL SIZE A1

SCALE 1:1000

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	APP	CHK	DRN
1	PRELIMINARY SKETCH	05.11.14			

SURVEYED	
DESIGNED	G. CORIN 11/14
DRAWN	G. CORIN 11/14
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	
APPROVED	
PROF REGISTRATION:	



NZ TRANSPORT AGENCY  
 SH1: OTAKI TO NORTH OF LEVIN RONS PROJECT  
 PROPOSED KIMBERLEY ROAD / SH1 INTERSECTION  
**ALTERNATIVE 3 PLAN KIMBERLEY AT GRADE**

Status Stamp	<b>DRAFT FOR REVIEW</b>
Date Stamp	06.11.14
Scale	1 : 1000 (A1)
Drawing No.	0500902-05-001SK007
Rev.	A



ORIGINAL SIZE A1  
200mm DO NOT SCALE - IF IN DOUBT, ASK



100 50 0 100 200m  
SCALE 1:5000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	G. CORIN
DRAWN	G. CORIN
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	
APPROVED	
PROF REGISTRATION:	

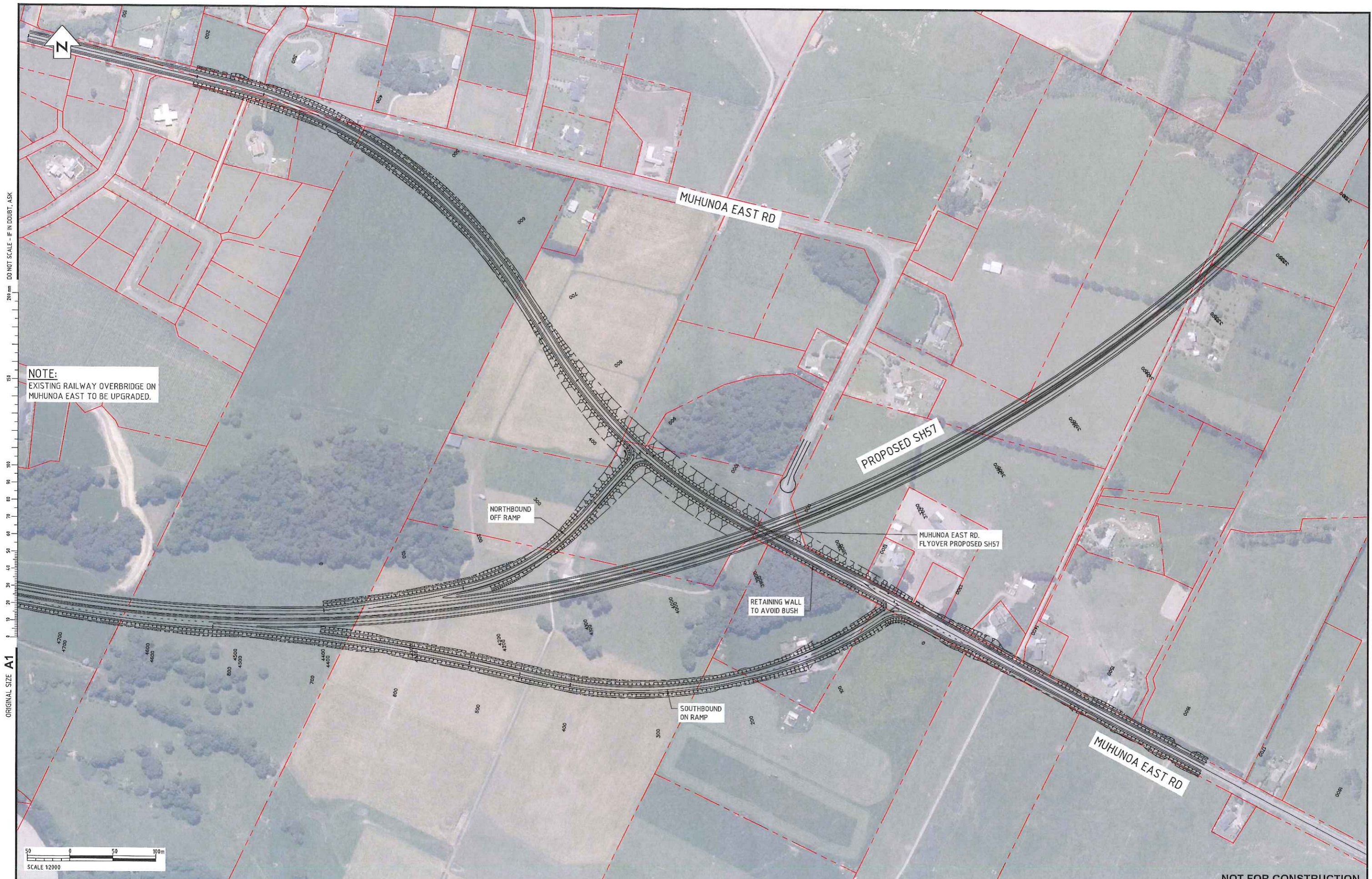


NZ TRANSPORT AGENCY  
SH1: OTAKI TO NORTH OF LEVIN RONS PROJECT

SERVICE ROAD - KIMBERLEY TO QUEEN ST.  
**LAYOUT PLAN QUEEN ST GRADE SEP.**

Status Stamp	WORKING PLOT
Date Stamp	
Scales	1 : 5000
Drawing No.	80500902-05-001SK017
Rev.	A





**NOTE:**  
EXISTING RAILWAY OVERBRIDGE ON MUHUNOA EAST TO BE UPGRADED.

ORIGINAL SIZE A1  
210 mm DO NOT SCALE - IF IN DOUBT, ASK



NOT FOR CONSTRUCTION

REV	DESCRIPTION	GC	MO	PP	DATE
DRN	CHK	APP			
A	PRELIMINARY SKETCH				06.11.14

SURVEYED		
DESIGNED	Graeme Corin	10/14
DRAWN	Graeme Corin	10/14
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED		
PROF REGISTRATION:		

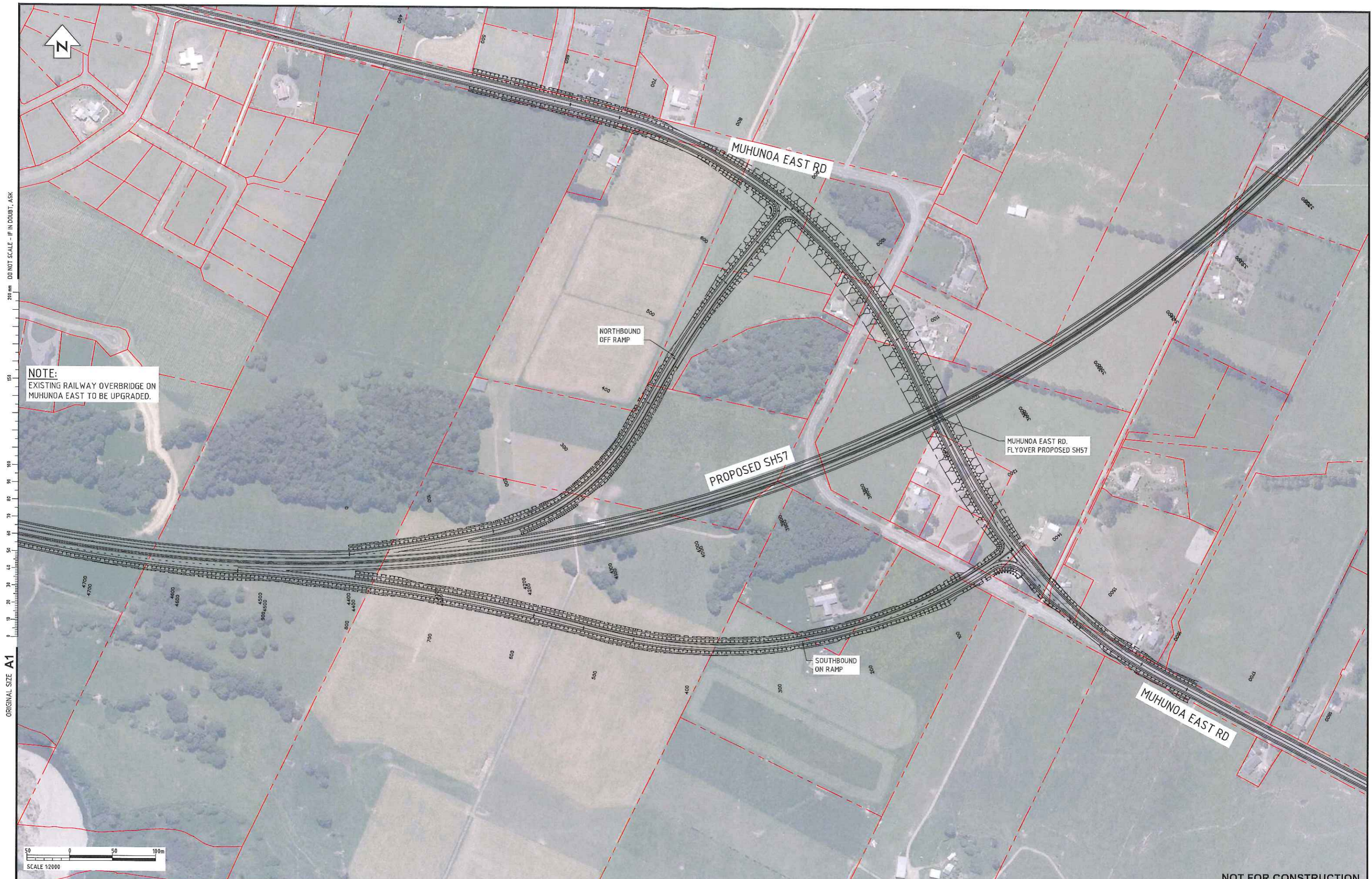


NZ TRANSPORT AGENCY  
SH1: OTAKI TO NORTH OF LEVIN RONS PROJECT

**PROPOSED MUHUNOA EAST ROAD / SH57 INTERSECTION**  
**ALTERNATIVE 1 PLAN GRADE SEP. 1**

Status Stamp	<b>DRAFT FOR REVIEW</b>
Date Stamp	<b>06.11.14</b>
Scales	1: 2000 (A1)
Drawing No.	80500902-05-001SK002
REV	<b>A</b>





ORIGINAL SIZE A1

700 mm DO NOT SCALE - IF IN DOUBT, ASK

**NOTE:**  
EXISTING RAILWAY OVERBRIDGE ON MUHUNOA EAST TO BE UPGRADED.



NOT FOR CONSTRUCTION

REV	DESCRIPTION	GC	MO	PP	DATE
DRN	CHK	APP	DATE		
A	PRELIMINARY SKETCH				06.11.14

SURVEYED		
DESIGNED	Graeme Corin	11/14
DRAWN	Graeme Corin	11/14
CAD REVIEW		
DESIGN CHECK		
APPROVED		
PROF REGISTRATION:		



NZ TRANSPORT AGENCY  
SH1: OTAKI TO NORTH OF LEVIN RONS PROJECT

**PROPOSED MUHUNOA EAST ROAD / SH57 INTERSECTION  
ALTERNATIVE 2 PLAN GRADE SEP 2.**

Status Stamp	<b>DRAFT FOR REVIEW</b>
Date Stamp	<b>06.11.14</b>
Scales	1:2000 (A1)
Drawing No.	80500902-05-001SK003
Rev.	<b>A</b>





**NOTE:**  
EXISTING RAILWAY OVERBRIDGE ON MUHUNOA EAST TO BE UPGRADED.

ORIGINAL SIZE A1  
200 mm DO NOT SCALE - IF IN DOUBT, ASK



**NOT FOR CONSTRUCTION**

REV	DESCRIPTION	GC	MO	PP	DATE
REV	REVISIONS	DRN	CHK	APP	DATE
A	PRELIMINARY SKETCH				06.11.14

SURVEYED		
DESIGNED	Graeme Corin	11/14
DRAWN	Graeme Corin	11/14
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED		
PROF REGISTRATION:		

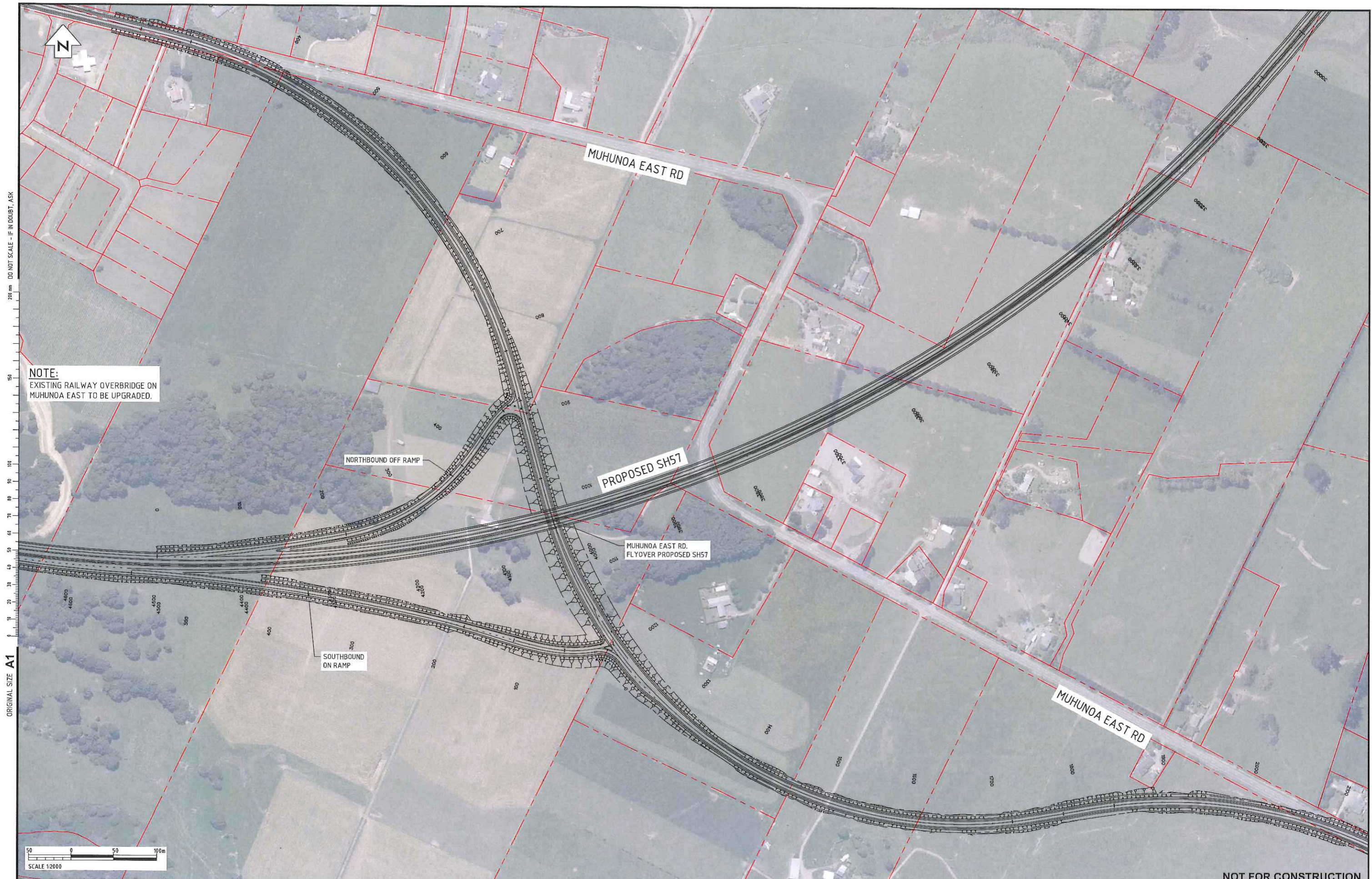


NZ TRANSPORT AGENCY  
SH1: OTAKI TO NORTH OF LEVIN RONS PROJECT

**PROPOSED MUHUNOA EAST ROAD / SH57 INTERSECTION**  
**ALTERNATIVE 3 PLAN - GRADE SEP 3.**

Status Stamp	<b>DRAFT FOR REVIEW</b>
Date Stamp	<b>06.11.14</b>
Scale: 1:2000 (A1)	
Drawing No.	80500902-05-001SK004
Rev.	<b>A</b>





**NOTE:**  
EXISTING RAILWAY OVERBRIDGE ON MUHUNOA EAST TO BE UPGRADED.

ORIGINAL SIZE A1  
200mm DO NOT SCALE - IF IN DOUBT, ASK

NOT FOR CONSTRUCTION

REV	DESCRIPTION	GC	MO	PP	DATE
DRN	CHK	APP			
A	PRELIMINARY SKETCH				06.11.14
	REVISIONS				

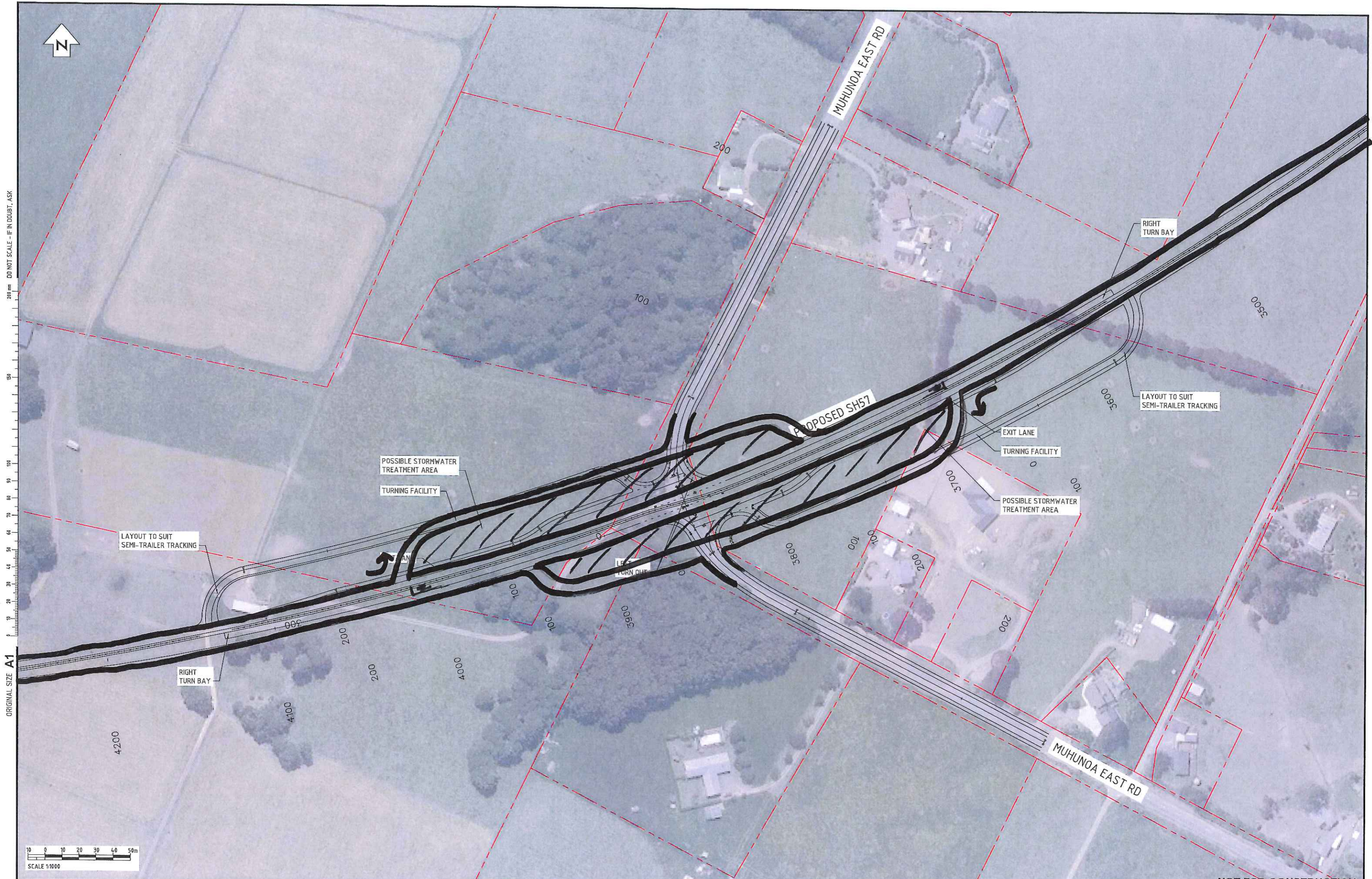
SURVEYED		
DESIGNED	Graeme Corin	11/14
DRAWN	Graeme Corin	11/14
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED		
PROF REGISTRATION:		



Client:  
 NZ TRANSPORT AGENCY  
 SH1: OTAKI TO NORTH OF LEVIN RONS PROJECT  
 PROPOSED MUHUNOA EAST ROAD / SH57 INTERSECTION  
 ALTERNATIVE 4 PLAN GRADE SEP 4.

Status Stamp	<b>DRAFT FOR REVIEW</b>
Date Stamp	06.11.14
Scales	1:2000 (A1)
Drawing No.	80500902-05-001SK005
Rev.	A





ORIGINAL SIZE A1  
200 mm DO NOT SCALE - IF IN DOUBT, ASK

NOT FOR CONSTRUCTION

REV	DESCRIPTION	GC	MD	APP	DATE
A	PRELIMINARY SKETCH				

SURVEYED	
DESIGNED	G. CORIN 11/14
DRAWN	G. CORIN 11/14
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	
APPROVED	

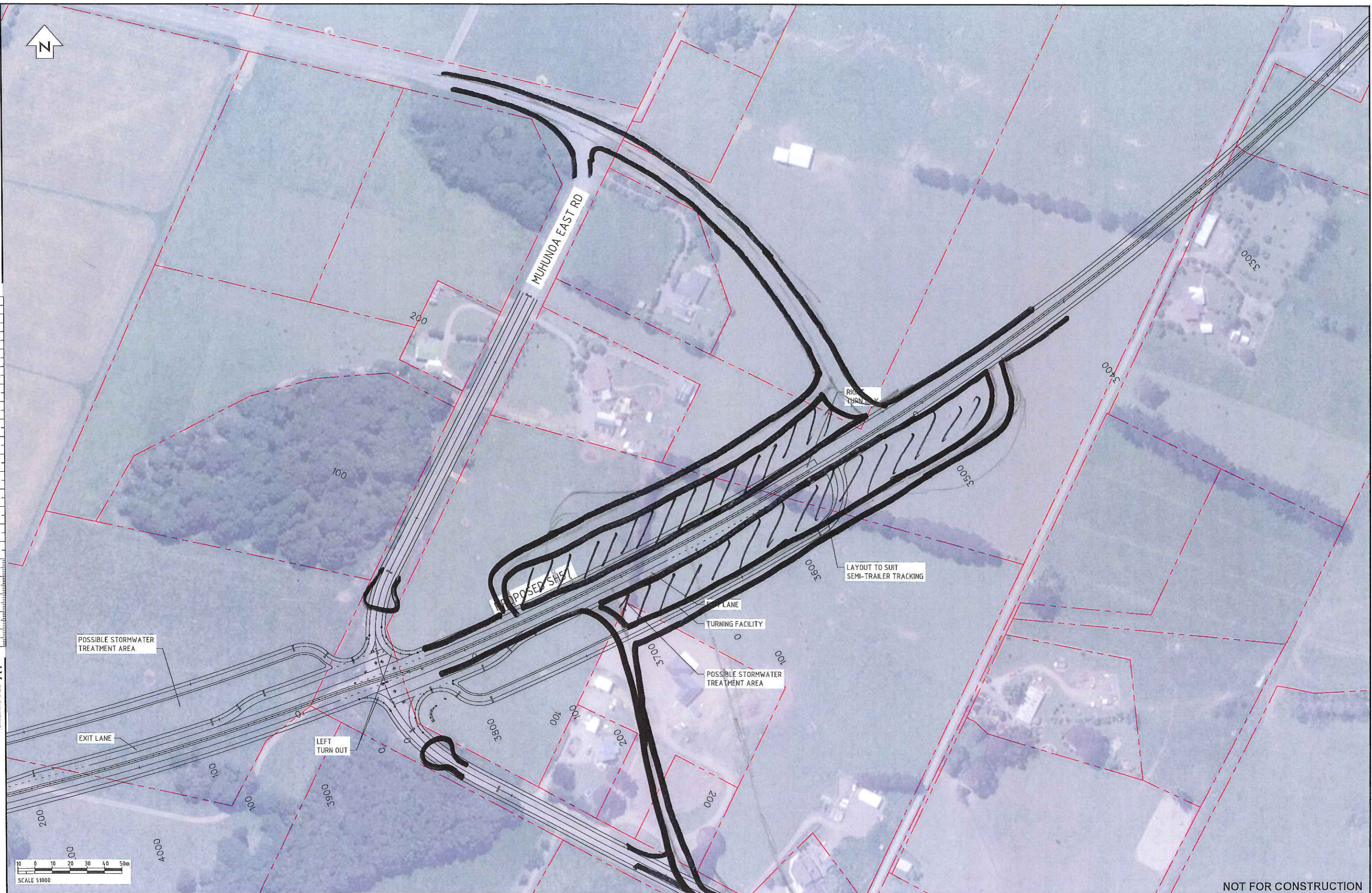


NZ TRANSPORT AGENCY  
SH1: OTAKI TO NORTH OF LEVIN RONS PROJECT  
PROPOSED MUHUNUA EAST ROAD / SH57 INTERSECTION  
**ALTERNATIVE 6 PLAN AT GRADE 1.**

Status Stamp	<b>DRAFT FOR REVIEW</b>
Date Stamp	06.11.14
Scales	1:1000 (A1)
Drawing No.	80500902-05-001SK008
Rev.	A



ORIGINAL SIZE A1  
200 mm  
DO NOT SCALE - IF IN DOUBT, ASK



NOT FOR CONSTRUCTION

REV	DESCRIPTION	GC	MO	PP	DATE
DRN	CHK	APP			
A	PRELIMINARY SKETCH				06.11.14
	REVISIONS				

SURVEYED		
DESIGNED	G. CORIN	11/14
DRAWN	G. CORIN	11/14
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED		
PROF REGISTRATION:		




NZ TRANSPORT AGENCY  
SH1: OTAKI TO NORTH OF LEVIN RONS PROJECT

PROPOSED MUHUNOA EAST ROAD / SH57 INTERSECTION  
**ALTERNATIVE PLAN AT CRANE 2.**

Status Stamp	<b>DRAFT FOR REVIEW</b>
Date Stamp	06.11.14
Scales	1 : 1000 (A1)
Drawing No.	80500902-05-001SK008
Rev.	A



## **Appendix B Workshop Background**

OTAKI TO NORTH OF LEVIN RoNS  
WORKSHOP ON ACCESS OPTIONS – SH1-SH57 CONNECTION

Monday 10<sup>th</sup> November 2014  
11am-3pm  
NZTA

DRAFT AGENDA

1. General Discussion

background, RoNS context, decisions to date, questions raised regarding broader project  
confirm criteria and scoring  
confirm options (anything missing?)  
feedback from National Office (design criteria)  
at-grade vs grade separated solutions.

2. MCA and Scoring (Plans of Options to be sent out in advance)

Muhunua East Road – 6 options (4 grade separated, 2 at-grade)  
Kimberley Road – 3 options (1 grade separated, 2 at-grade).

3. Weightings

4. General Discussion



## BACKGROUND NOTES FOR WORKSHOP

### Criteria – General

The draft criteria (table below) differ from previous criteria applied in this project. This is because we are looking at “point” intersections, rather than corridors or route options which pass through the landscape. We are also looking at a finer level of detail.

In addition, some of the considerations at earlier stages have already been avoided in the locations chosen.

Previous criteria are being incorporated where they are still relevant (although with slightly different descriptors) e.g. landscape and visual impact, social and community impacts.

Some criteria are refinements of previous criteria – e.g. fit with project objectives has been replaced with intersection safety, community convenience, criteria.

Where there are no known issues, criteria have not been included – e.g. district plan, specific landuses, cultural values.

### Proposed Criteria for this Analysis

Based on a broad review of the options, the criteria in the table below are proposed.

Name	Description
Land take	The area of land that is required for the intersection and the area of land which is sterilised/made inaccessible as shown in the intersection preliminary design.
Intersection safety	Takes into account geometry, “readability”, consistency with other RoNS intersections.
Community convenience	Additional distance to be travelled for typical trips, taking into account likely frequency.
Visual impact	Impact on wider community due to structures.
Noise/visual impacts	Effects on nearby households and any other noise-sensitive activities.
Direct loss of dwellings	Number of houses to be removed.
Ecological risk	Effects on valued ecological resources (bush, watercourses).
Cost	Comparative, based on preliminary costings

Other?	To confirm any other specific or special features or qualities of the locality.
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## Scoring System

It is proposed to use the same 1 to 5 scoring system as in previous MCAs, as set out below.

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

## Appendix C Weighting Systems

### Kimberley Road (without Queen St Grade-Separated Option)

Table C-1: Kimberley Road Weighting

Alternative	Land Take	Intersection Safety	Community Connections	Visual Impact	Local Noise/ Visual Impact	Dwelling Loss	Future Proofing	Resilience	Cost
Workshop	2	10	9	5	6	2	4	5	9
RMA Balanced	7	10	7	7	7	5	8	8	8
Social	7	10	10	10	10	10	8	10	8
Environmental	5	5	5	5	5	2	5	5	5
Cultural	5	5	5	5	3	5	3	3	0
Economic	5	10	5	0	0	5	5	5	10

(Note: Tangata Whenua Values and Ecological Risk removed as not applicable in this location)

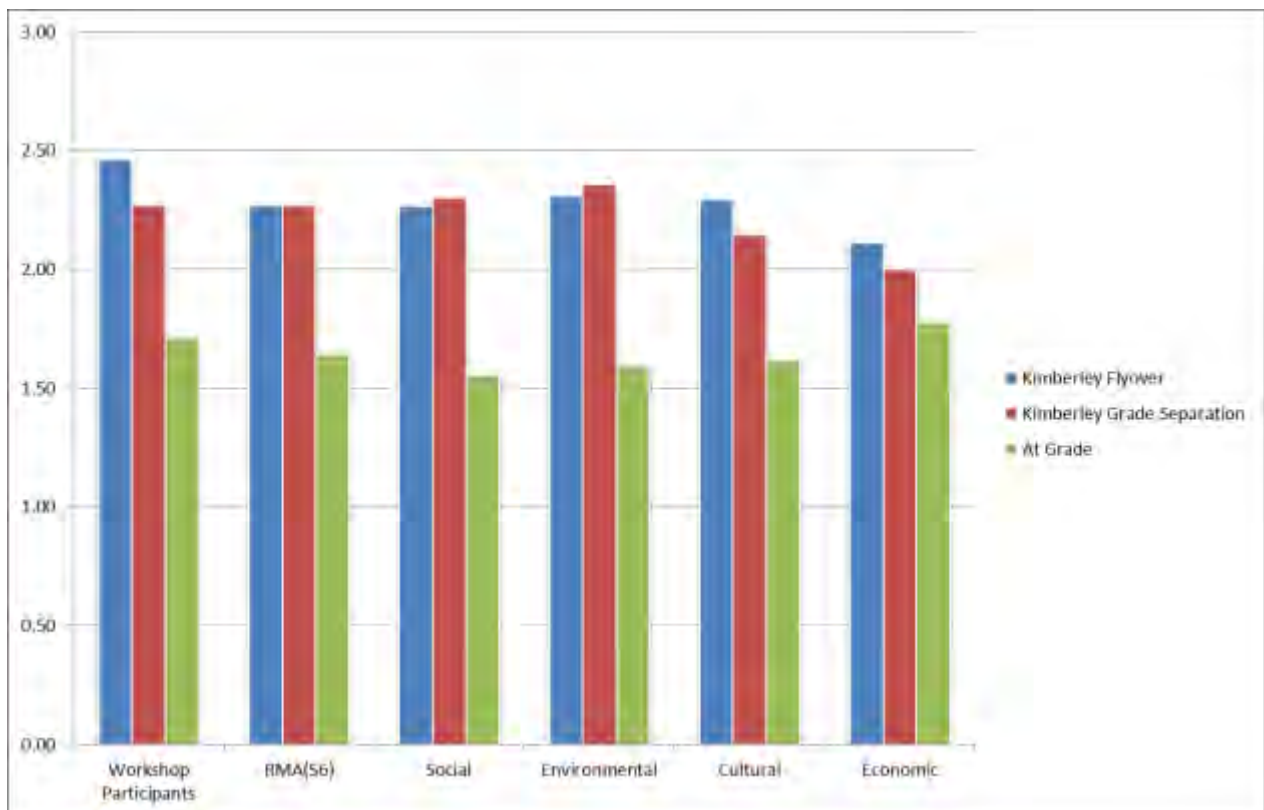


Figure C-1: Kimberley Road Scores

### Kimberley Road (with Queen St Grade-Separated Option)

Table C-2: Kimberley vs Queen Weighting

Alternative	Land Take	Intersection Safety	Community Connections	Visual Impact	Local Noise/ Visual Impact	Dwelling Loss	Ecological Risk	Future Proofing	Resilience	Cost
Workshop	2	10	9	5	6	2	8	4	5	9
RMA Balanced	7	10	7	7	7	5	10	8	8	8
RMA S6 Focus	0	0	0	3	0	0	10	0	0	0
Social	7	10	10	10	10	10	3	8	10	8
Environmental	5	5	5	5	5	2	10	5	5	5
Cultural (ex TW)	5	5	5	5	3	5	5	3	3	0
Economic	5	10	5	0	0	5	0	5	5	10

(Note: Tangata Whenua Values removed as not applicable in this location)

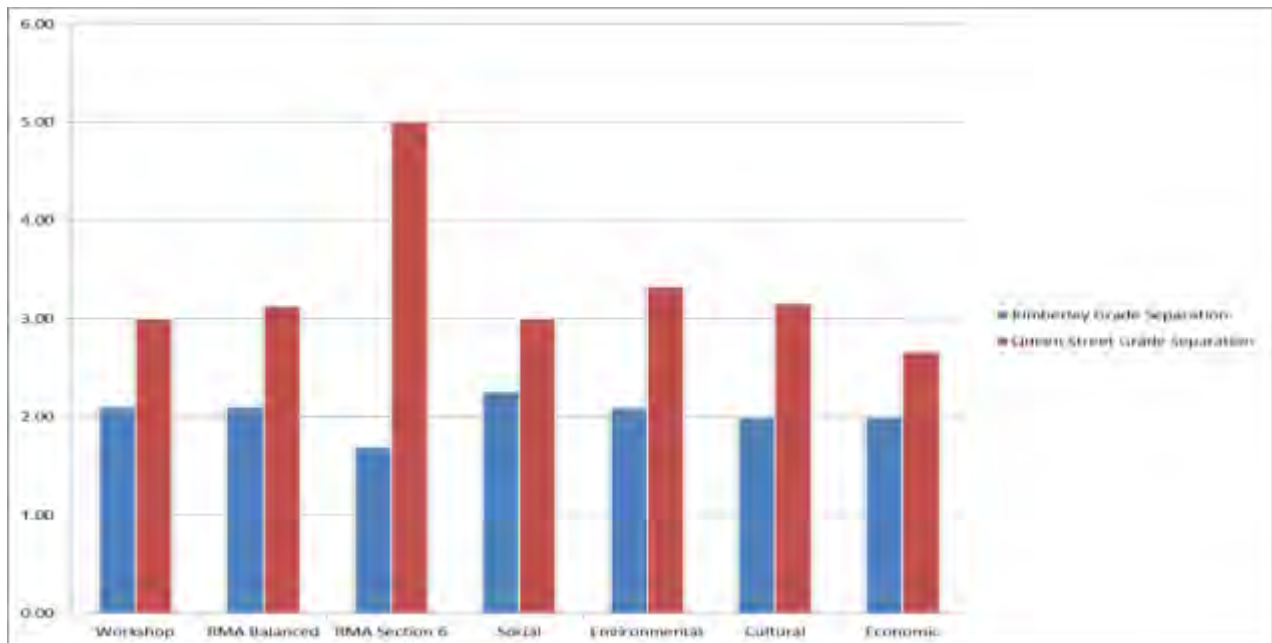
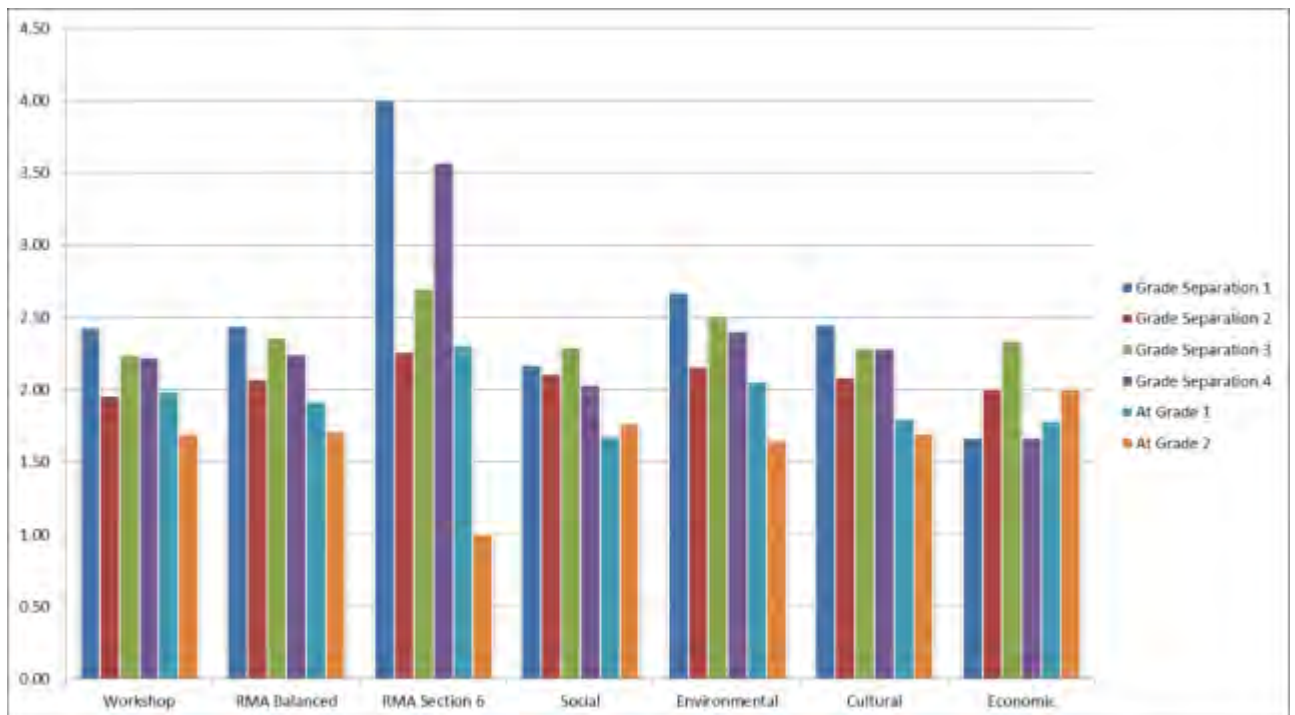


Figure C-2: Kimberley vs Queen Scores

## Muhunoa East Road

**Table C-3: Muhunoa East Road Weighting**

Alternative	Land Take	Cultural Values	Intersection Safety	Community Connections	Visual Impact	Local Noise/ Visual Impact	Dwelling Loss	Ecological Risk	Future Proofing	Resilience	Cost
Workshop	2	8	10	9	5	6	2	8	4	5	9
RMA Balanced	7	10	10	7	7	7	5	10	8	8	8
RMA S6 Focus	0	10	0	0	3	0	0	10	0	0	0
Social	7	10	10	10	10	10	10	3	8	10	8
Environmental	5	5	5	5	5	5	2	10	5	5	5
Cultural	5	10	5	5	5	3	5	5	3	3	0
Economic	5	0	10	5	0	0	5	0	5	5	10



**Figure C-3: Muhunoa East Road Scores**

## Appendix D Preferred Layout Plan



NOTE, PLAN SHOWS ROAD AREA, NOT TOTAL LAND REQUIRED FOR THE PROJECT. THIS IS YET TO BE DETERMINED.



ORIGINAL SIZE A1  
200 mm DO NOT SCALE - IF IN DOUBT, ASK

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DRN	CHK	APP	DATE
B	CONCEPTUAL				
A	CONCEPTUAL	GC	SM	PP	16.12.14

SURVEYED	DESIGNED	DRAWN	CAD REVIEW	DESIGN CHECK	DESIGN REVIEW	APPROVED
	G. CORIN	G. CORIN	S. MULLER	S. MULLER		P. PEET



Client:  
 NZ TRANSPORT AGENCY  
 SH1: OTAKI TO NORTH OF LEVIN RONS PROJECT  
 MUHUNOA EAST AND KIMBERLEY ROAD  
 LAYOUT PLAN

Status Stamp	CONCEPTUAL
Date Stamp	16.12.14
Scales	NTS
Drawing No.	80500902-05-001SK009
Rev.	B