

Before a Board of Inquiry
MacKays to Peka Peka Expressway Proposal

under: the Resource Management Act 1991

in the matter of: Notice of requirement for designation and resource consent applications by the NZ Transport Agency for the MacKays to Peka Peka Expressway Proposal

applicant: **NZ Transport Agency**
Requiring Authority

Statement of evidence of **Matiu Park** (terrestrial ecology and herpetofauna) for the NZ Transport Agency

Dated: 5 September 2012

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STATEMENT OF EVIDENCE OF MATIU PARK FOR THE NZ TRANSPORT AGENCY

QUALIFICATIONS AND EXPERIENCE

- 1 My full name is Matiu Corrigan Park.
- 2 I am currently an Associate Principal and Senior Ecologist / Planner of Boffa Miskell Limited (*BML*) in Wellington. I hold a Bachelor of Science in Ecology from Otago University, and a Masters in Environmental and Resource Planning from Massey University.
- 3 I have worked in the fields of ecology, planning, research and environmental policy for 14 years. From 1997 to 2000, I was self employed in a range of ecological roles, including field survey and site inventories, restoration planning, research and assessment of effects. From 2002 to 2006, I was a policy advisor in the Environment Group of the Ministry of Transport, where I was the Ministry's primary advisor on Resource Management Act 1991 (*RMA*) matters from 2004 to 2006. I joined BML in January 2007.
- 4 I have undertaken a range of ecological assessments across the North Island, ranging from small-scale residential property development, through to large-scale subdivisions and major infrastructure projects. This work has involved biological and ecological surveys, descriptions of natural values, assessments of ecological significance, water quality monitoring and the evaluation of environmental effects on terrestrial and freshwater ecology.
- 5 My professional memberships include the New Zealand Planning Institute (graduate) and the New Zealand Ecological Society.
- 6 My relevant experience includes:
 - 6.1 Assisting with the vegetation survey, field mapping components, project scoping and ecological constraints of the Transmission Gully Project.
 - 6.2 Assisting with the development of ecological impact assessments for various large-scale Plan Changes and residential subdivisions on the Kāpiti Coast, a number of which are close to, or traversed by the MacKays to Peka Peka Expressway Proposal (*the Project*), including Ngarara Plan Change (PC80), Waikanae North Plan Change (PC79), Meadows Precinct Plan Change (PC83) and the Bristed Block subdivision. I have also worked on a number of ecological restoration plans on the Kāpiti Coast, including plans for the Waikanae River and the Wharemauku Stream for Kāpiti Coast District Council / Kapakapanui Environmental Group and Paraparaumu Airport Limited.

- 6.3 Working on a number of other large-scale construction projects in the Wellington Region, including the Project West Wind Windfarm for Meridian Energy where I assisted with and reported on construction and post-construction monitoring. This work involved assisting with monitoring and reporting on construction effects on freshwater systems.
- 7 My evidence is given in support of the Notice of Requirement (*NoR*) and applications for resource consent lodged with the Environmental Protection Authority (*EPA*) by the NZ Transport Agency (*NZTA*) for the construction, maintenance and operation of the Project.
- 8 I am familiar with the area that the Project covers and the State highway and local roading network in the vicinity of the Project.
- 9 I am the Project Ecologist and ecology team leader. I have been involved with the Project since the initial scoping and design phase.
- 10 I was the primary author of the Ecological Impact Assessment (*EIA*),¹ the Terrestrial Vegetation and Habitats (including Wetlands) report² and the draft Ecological Management Plan (*EMP*),³ all of which form part of the Assessment of Environmental Effects (*AEE*) lodged in support of the Project.
- 11 I have read the Code of Conduct for Expert Witnesses as contained in the Environment Court Consolidated Practice Note (2011), and I agree to comply with it as if this Inquiry were before the Environment Court. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

- 12 My evidence will deal with the following:
- 12.1 Executive Summary;
- 12.2 Background and role;
- 12.3 Activities since lodgement;
- 12.4 Summary of methodologies and field work;

¹ Technical Report 26.

² Technical Report 27.

³ Appendix M to the Construction Environmental Management Plan (*CEMP*).

- 12.5 Summary description of the existing environment and survey results;
 - 12.6 Explanation of the project shaping process;
 - 12.7 Assessment of effects on ecological values;
 - 12.8 Proposed mitigation;
 - 12.9 Proposed conditions and the draft EMP;
 - 12.10 Response to section 149G(3) key issues reports;
 - 12.11 Response to submissions; and
 - 12.12 Conclusions.
- 13 In addition to outlining the overall flora and wetland values of the Project area and how the actual or potential adverse effects of the Project on these values will be avoided or mitigated, my terrestrial ecological evidence draws upon and summarises the results of the herpetofauna assessment undertaken by Mr Jonathan Ruffell. In conjunction with the peer reviewer (Mr Simon Chapman of BML), I approved the Herpetofauna Technical Report⁴ for release, providing inputs from both a strategic overview and technical perspective. I assisted with the fieldwork for the Project and have assisted and carried out herpetofauna studies in the past.
- 14 I note that my statement closely relates to the other ecology evidence of **Mr Stephen Fuller** and **Drs Leigh Bull, Vaughan Keesing** and **Sharon De Luca** prepared for this Inquiry.

EXECUTIVE SUMMARY

- 15 Being the Project Ecologist, I have been involved in the design and assessment of the Project since 2009. Combined with my local knowledge of the ecological conditions of the Kāpiti Coast environment through which the Project traverses, I consider that I have a comprehensive understanding of the ecology along the alignment, the physical effects that construction of the route is likely to have on the ecology, and the efforts that have been undertaken to minimise these ecological impacts.
- 16 The considerable Project shaping that has occurred in the design and assessment phases has focused primarily on the avoidance of adverse effects on important ecological values where that could reasonably be achieved. The proposed alignment is, in my view, a considerable improvement in ecological terms over the current

⁴ Technical Report 28.

Western Link Road designation. Considering the property, geotechnical and hydrological constraints involved, I am confident that all practicable opportunities for the avoidance of ecological effects have been fully explored.

- 17 A range of standard methodologies were used to identify and describe terrestrial vegetation, flora, fauna and their habitats. These methodologies and the general approach to our terrestrial investigations were discussed with a number of statutory agencies, including the Department of Conservation (*DOC*), Greater Wellington Regional Council (*GWRC*) and Kāpiti Coast District Council (*KCDC*).
- 18 I am confident that all indigenous plant communities (including wetlands) and all common species of sensitive indigenous fauna likely to occur within the alignment have been identified and described. However, given the ephemeral nature of many of the wetlands traversed by the Project, I acknowledge that some individual species of cryptic flora and fauna may be present but were either dormant at the time of survey, or in such low numbers that standard sampling techniques will not record them. Best attempts to locate these species were made, including seasonal investigations focused on preferred habitats.
- 19 In those few locations where the alignment could not avoid areas of ecological value or potentially important habitats for flora and fauna due to property and other design constraints, I believe all reasonable efforts have been made to minimise the extent of loss, and to identify further opportunities for minimising ecological effects through the detailed design process and through further understanding of the habitats of these individual species.
- 20 Overall, I consider that the avoidance or minimisation of ecological effects through the Project shaping and design phases has reduced the scale of effects on valued terrestrial flora and fauna to the point that they can be appropriately mitigated. In particular:
 - 20.1 With a small number of exceptions, the proposed alignment is almost entirely located within a modified pastoral environment with limited habitat value for indigenous flora and fauna.
 - 20.2 As a result of the Project shaping process, all remnant forest and high value wetlands have been avoided.
 - 20.3 Within the 164 ha Project footprint,⁵ only 5.6 ha of indigenous vegetation requires clearance, of which 3.8 ha is

⁵ The Project footprint refers to the earthworks extent for the road including the road surface and associated cuts and fills and permanent stormwater treatment devices, but does not include temporary works such as site offices, laydown and storage areas and construction sediment devices.

kanuka forest or regenerating broadleaved forest or low scrub. The remaining 1.8 ha is modified indigenous wetland vegetation. In terms of the Foxton Ecological District (with an area of 103,764 ha), this amounts to 0.005% of loss.

- 20.4 In those locations where areas of ecological value will be lost or modified by the Project, the scale of adverse ecological effect has been quantified and appropriate levels of mitigation determined based on the value of each site.
- 20.5 Mitigation has been designed in discussion with the DOC, KCDC and GWRC to reflect the historical vegetation patterns of the Kāpiti Coast. Appropriate sites for mitigation have been identified within and adjacent to the proposed designation, and methods for protection of fauna and reinstatement of habitat, where appropriate, have been described.
- 20.6 Outside the Project footprint (and potentially beyond the designation boundaries in the case of some wetland areas) there is some risk that additional vegetation and habitat may be affected as a result of hydrological changes associated with construction earthworks. Although these potential effects have been quantified, as much as possible, through hydrological and groundwater modelling and monitoring, uncertainty remains. As a result, an adaptive management framework is recommended to identify and manage any potential effects.
- 20.7 A draft EMP was prepared to describe the methods to be used to manage the site during construction to ensure potential effects are appropriately monitored and controlled. The EMP also outlines the areas of ecological value along the route and the potential effects - as well as the type of monitoring required before, during and after construction. This Plan is still in draft form and requires completion and certification by GWRC before construction commences.
- 20.8 The ecological team has also assisted in the development of a broad range of consent conditions to give effect to the recommendations in the EIA⁶ and the EMP.
- 21 There will be some short term ecological effects associated with vegetation clearance and habitat disturbance through the construction phase. However, the retirement and re-vegetation that is proposed for ecological and landscape mitigation, as well as the treatment proposals associated with hydrological and stormwater

⁶ Technical Report 26.

management, will, in my opinion, result in long-term ecological benefits for the ecology of the Kāpiti Coast District.

- 22 I have reviewed submissions lodged on the Project in relation to terrestrial ecology and herpetofauna. Nothing raised in those submissions causes me to depart from the conclusions reached in my technical assessments of the Project.

BACKGROUND AND ROLE

- 23 As noted earlier, I am the Project Ecologist and ecology team leader. In addition to my specific areas of expertise, I have also taken a lead role in the other ecological investigations and reporting undertaken, including coordinating input from freshwater, marine, herpetofauna, and avifauna ecologists into the EIA. The ecology team consists of:
- 23.1 Mr Stephen Fuller: ecological oversight and peer review;
 - 23.2 Mr Pat Enright: rare plants (botanical species lists in Technical Report 27);
 - 23.3 Mr Jonathan Ruffell: herpetofauna (Technical Report 28);
 - 23.4 Dr Leigh Bull: avifauna studies (Technical Report 29);
 - 23.5 Dr Vaughan Keesing: freshwater and aquatic (Technical Report 30); and
 - 23.6 Dr Sharon De Luca: coastal and marine (Technical Report 31).
- 24 Technical Reports 27-31 detail and discuss the results of the desktop and field studies and assessments of values for each ecological component. The findings of these Reports are then drawn together in an overarching EIA (Technical Report 26).
- 25 As Project Ecologist, I was the author of the initial scoping study which set out the ecological constraints. I assisted with much of the fieldwork, discussed research methods and fieldwork results, and reviewed the analysis for the ecological technical reports. I was directly responsible for development of Technical Report 27 (Terrestrial Vegetation and Habitats including Wetlands), and was the lead author of the EIA (working with Mr Fuller and Drs Keesing, De Luca and Bull), and of the draft EMP (Appendix M to the Construction Environmental Management Plan (*CEMP*)).
- 26 Through my involvement in the Project, I have been involved in regular site visits, as well as numerous meetings with and presentations to stakeholders, including DOC, GWRC, the Queen Elizabeth II Trust, KCDC, and Friends of Waikanae River.

- 27 I have also consulted with Te Ati Awa ki Whakarongotai on the potential ecological effects of the Project. Their involvement influenced the proposed mitigation and restoration within areas of cultural importance.
- 28 I was present at several public open days where I discussed the ecological aspects of the Project with affected residents, members of interest groups and the wider community.
- 29 I have been fully involved with the wider Alliance team during the Project shaping and design process, including the review of alternatives, and the Multi-Criteria Assessment (MCA) process used to determine the preferred alignment of the proposed Expressway.
- 30 I also coordinated a number of meetings with GWRC, DOC and KCDC staff on opportunities and approaches in relation to ecological mitigation to ensure the proposed approach to mitigation is consistent with the objectives of those agencies.
- 31 I have been involved in the development of proposed consent conditions for the ecological components of the Project.

ACTIVITIES SINCE LODGEMENT

- 32 Since lodgement, some errors have been identified in the Technical Reports and I have provided the necessary corrections as follows (missing text shown underlined):
- 32.1 Section 2.3.2 of Technical Report 27 should read as follows: "The locations of each of these botanical surveys are shown in Figure 2 and detailed lists of vascular plants at each location are included in Appendix 27.J Combined plant species list for MacKays to Peka Peka and surrounds."
- 32.2 Section 2.3.3 of Technical Report 27 should read as follows: "The locations of each of these wetland condition assessments are shown in Figure 2 and each wetland plot sheet is attached as Appendix 27.H: Wetland Condition Monitoring Sheets."
- 32.3 Appendix 27.H Wetland Condition Monitoring Sheets was missing from Technical Report 27, which instead illustrated a number of site photographs (which included wetland monitoring locations). The correct Appendix 27.H is now attached as **Annexure E** to this evidence.

SUMMARY OF METHODOLOGIES AND FIELD WORK

- 33 The specific methodologies for each component of the ecological investigations are described in detail in the relevant Technical

Reports (listed previously), and are summarised in the Ecological Impact Assessment (Technical Report 26).⁷ I will outline the key points of the methods used in the investigation, analysis and assessment of the terrestrial ecology and herpetofauna components, and in the overall EIA.

Scoping and study area definition

- 34 At the start of the Project a scoping phase was used to determine the extent of matters that would have to be covered in the ecological assessments.
- 35 Scoping of the statutory context was carried out in conjunction with the planning team to determine the statutory framework against which the Project would be judged.
- 36 The full ecology team then identified the range and scale of activities involved in the construction and operation of the proposed Expressway that could affect the environment. This included considering the activities which might have direct or indirect effects on ecological values.
- 37 The Project's "zone of influence", was then identified to determine the area over which ecological investigations were to be carried out. The "study area" for ecological investigations encompassed all land, water bodies and receiving environments that could potentially be affected by the Project and included all catchments that are crossed by the proposed Alignment. The Ecological Study Area has a total area of 10,808 ha.⁸

Terrestrial vegetation investigations⁹

- 38 An initial desktop review of relevant literature was carried out and used to produce maps of historical and current vegetation cover and to identify the potential occurrence of rare or threatened plant communities or species within the study area. Discussions were undertaken with relevant experts, including DOC, GWRC and KCDC officers as well as local botanists as part of this initial process. Field investigations were then carried out to confirm the desktop information and to fill in gaps.
- 39 Vegetation was mapped along the existing Western Link Road corridor and within other areas of route options associated with the proposed alignment. Maps of vegetation types were initially prepared on high-resolution aerial photography before field investigation confirmed and described each community.

⁷ Sections 1, 2 and 3 of Technical Report 26.

⁸ A map showing the Study Area is contained in Technical Report 27 (Figure 3, page 25), and is provided as **Annexure B** for ease of reference.

⁹ Further detail on methodology is contained in Technical Report 27 at Sections 2.1 to 2.5.

- 40 Vegetation within the proposed designation was described in terms of dominant canopy species, height and structure of vegetation. Following more detailed route selection, wetland condition monitoring plots¹⁰ were developed and surveyed in all wetland habitats identified as potentially at risk from vegetation clearance or hydrological changes. These monitoring plots were used to refine the wetland descriptions and provide background monitoring information.
- 41 A number of botanical surveys were undertaken for plant species of conservation interest at key areas of indigenous vegetation or habitat identified during desktop surveys. Botanical surveys were undertaken over a range of seasons to ensure seasonal species were picked up, particularly within wetlands within the alignment.
- 42 Identified plant communities were assessed and mapped as having high, medium or low value or significance with reference to various matters including:
- 42.1 The Land Environments of New Zealand (*LENZ*) threat classes for indigenous vegetation and habitats;
 - 42.2 Priority habitats described in the Wellington Conservancy Conservation Management Strategy (*CMS*); and
 - 42.3 National Priorities for Protecting Rare and Threatened Indigenous Biodiversity (MFE 2007).¹¹
- 43 I am confident that the indigenous plant communities (including wetlands) and common species of sensitive indigenous fauna likely to occur within the alignment have been identified and described. However, given the ephemeral nature of many of the wetlands traversed by the Project, I acknowledge that some individual species of cryptic flora and fauna may be present but were either dormant at the time of survey, or in such low numbers that standard sampling techniques will not record them. Best attempts to locate these species were made, including seasonal investigations focused on preferred habitats.
- Herpetofauna investigations**
- 44 As described in Technical Report 28,¹² DOC's herpetofauna database was searched for all records of herpetofauna detected within 10 km of the proposed alignment since 1980. This was supplemented by a

¹⁰ Refer Section 2.3.3 and Appendix 27.H in Technical Report 27.

¹¹ The National Policy Statement on Indigenous Biodiversity, the NZTA's Environmental Plan (June 2008) and recent case law on criteria for assessing significance were also considered. See Section 2.5 of Technical Report 27.

¹² Refer Section 3 of Technical Report 28.

review of high resolution aerial imagery and preliminary vegetation maps to identify likely habitat areas for field investigations.

- 45 On-site investigations comprised a review of all areas of potential habitat, a drive-through to assess herpetofauna habitat quality, nocturnal searches for arboreal geckos in potential habitats along bush, wetland and shrubland edges and areas of scattered treeland using spotlights in the evening, and use of artificial refuges in areas of good lizard habitat.
- 46 Observations of terrestrial macroinvertebrate communities/habitats were also recorded opportunistically during other fieldwork (e.g., logs and other debris were searched for any fauna present).
- 47 Analysis of herpetofauna data involved description (including threat status) and mapping of species found, identification of the species relative abundance in relation to the habitats which they utilise or are reliant upon, and their sensitivity to potential Project impacts.
- 48 Three sampling methods were used over a period of 5 months between late September 2010 and mid-February 2011. Diurnal searches were undertaken in scrub and shrubland edges, grasslands and debris such as logs and corrugated iron which could be lifted by hand. Nocturnal searches using spotlights for arboreal geckos were conducted in all areas identified as providing habitat along and in general proximity of the Alignment during the evening over 8 spring and summer nights. Spotlighting was targeted towards areas where woody vegetation (especially native shrubland or forest) was present. Two hundred and twenty artificial refuges were also distributed across the study area in areas that were considered to represent the best of the lizard habitat present within the Alignment (rank grassland, forest, shrubland-grassland interfaces).

Ecological value

- 49 The overall ecological value of sites and habitats was assessed taking into account terrestrial vegetation, abundance and distribution of species, and assessments of habitat value. The methods for this valuation are summarised in Section 3.6 of Technical Report 26.¹³

Ecological impact assessment

- 50 The Institute of Ecology and Environmental Management (UK) guidelines for assessment of ecological impacts were used as the basis of our assessment.¹⁴ This assessment took into account:

50.1 Whether an impact would be adverse or beneficial;

¹³ Different methods were used for the different ecological components.

¹⁴ IEEM. (2006). Guidelines for Ecological Impact Assessment in the United Kingdom. Institute of Ecology and Environmental Management.

- 50.2 The extent of the impact (that is, its scale);
 - 50.3 The duration of the impact (whether permanent, long-term or short-term);
 - 50.4 The sensitivity of the receptor or receiving environment; and
 - 50.5 Comparison with legal requirements, policies and standards and significance assessment.
- 51 Together these matters provided a scale of magnitude of impact. The significance of the impact on a site or species was then derived from the assessment of impact magnitude combined with the assessment of ecological value.¹⁵
- 52 Based on this analysis, the acceptability of the predicted impacts and the necessity to remedy or mitigate was then considered.

Project Shaping

- 53 The Project shaping process was based on the use of MCA, a decision-making tool that is described in more detail in the evidence of **Dr Bentley** and **Mr Schofield**.
- 54 Project shaping was an iterative process, commencing with analysing a wide range of alignment and design options and continuing through the design phase.
- 55 A number of key decisions were made through Project shaping that led to avoidance or a significant reduction of a number of potential ecological effects. The ecological input into that process is described in more detail later in my evidence.

Impact Mitigation

- 56 Once Project shaping had identified the preferred alignment and design, the Project ecologists worked with the Project team to consider various opportunities to remedy or mitigate effects through detailed design and site management, and identifying necessary mitigation for residual effects.
- 57 The extent of mitigation was calculated conservatively, based on all vegetation within the Project footprint being lost, though some areas may be avoided once detailed design is complete.
- 58 Identification of mitigation opportunities for terrestrial ecology was carried out with the wider ecology team, as well as other disciplines within the Project team, to enable an integrated package of

¹⁵ This is summarised in Section 3.7, Section 8 and Section 9 of Technical Report 26.

mitigation measures to be developed. A number of stakeholders¹⁶ were involved in discussions around mitigation options for terrestrial vegetation and wetland loss.

- 59 After mitigation measures had been developed and integrated into the Project design, the residual adverse effects of Project on sites or places were assessed.

Development of construction and post construction monitoring

- 60 A monitoring programme was then developed to enable an assessment to be made for the success of the mitigation necessary during and post construction.
- 61 This monitoring is described in the draft EMP. However, since lodgement additional work has been undertaken (refer **Dr Keesing's** evidence), and further work will be required to finalise this plan before commencement of work. This is discussed later in my evidence and in the evidence of **Mr Fuller**.

THE EXISTING ENVIRONMENT AND ECOLOGICAL EVALUATION

- 62 The Project is located within the Foxton Ecological District, which is defined by the dune topography and associated vegetation.¹⁷ Wind is a dominating feature of the climate, with strong north-westerly winds common, affecting the dune landscape, vegetation and land uses. Historically, a great part of the Foxton Ecological District would have been swamp forest dominated by kahikatea and pukatea with rimu and swamp maire. These original forests are now reduced to several small remnants, less than 5% of the surface area is predominantly indigenous vegetation.
- 63 The Ecological District historically contained extensive dune wetlands and lakes, and connecting waterways. Major drainage works for farming has resulted in the loss of most of these natural lakes and wetland systems throughout the area, and many streams have been channelised. Dune lakes and peat swamps now account for only a small part of the Ecological District.¹⁸

¹⁶ Kāpiti Coast District Council, Greater Wellington Regional Council and the Department of Conservation.

¹⁷ Section 3 of Technical Report 27 provides further detail on the ecological context of the Kāpiti Coast, relevant climate, geology and topography, waterbodies (3.4), wetlands (3.5), and groundwater and hydrology.

¹⁸ Ravine, D.A. 1992: Foxton Ecological District, Survey report for the Protected Natural Areas Programme. Published by the Department of Conservation, Wanganui.

Terrestrial Vegetation and Habitats

- 64 Table 6 in Technical Report 27 summarises the vegetation recorded within the proposed designation and the Project footprint.¹⁹ The great majority of the Project footprint lies in a highly modified pastoral landscape (70%), with plantation forestry or exotic forest and trees (16%). Approximately 9% of the proposed alignment is in pioneer shrublands, scrub and low forest and 4% of the proposed designation is classed as urban.
- 65 Regenerating indigenous forest makes up less than 0.5% of the vegetation communities potentially affected, and indigenous wetlands comprise approximately 1.2% of the Project footprint. No forest remnants are contained within the Project footprint. Figures 9 a – d of Technical Report 27 show the distribution of vegetation communities within the proposed designation.
- 66 Only one plant species that has a national threat classification was found in close proximity to the proposed designation – this was *Korthalsella salicornioides*, which was found within a modified manuka wetland just north of Ngarara Road.²⁰
- 67 The overall ecological value of sites and habitats was assessed taking into account terrestrial vegetation, abundance and distribution of species, and assessments of habitat value. The methods for this valuation are summarised in Section 3.6 of Technical Report 26.²¹
- 68 Table 10 in Technical Report 27 lists the assessed rank of each of the major vegetation communities in close proximity to the alignment in terms of negligible, low, moderate, or high value. In summary:
- 68.1 5 terrestrial sites (including wetlands) are scored as having high ecological value;²²
- 68.2 15 sites of terrestrial vegetation and habitat of moderate value;²³ and

¹⁹ The proposed designation has an area of 316ha and defines the maximum extent of direct ecological effects. The Project footprint has an area of 164ha and refers to the earthworks extent for the road including both the road surface, associated cuts and fills and permanent stormwater treatment devices (but does not include temporary works such as site offices, laydown and storage areas and construction sediment devices).

²⁰ Refer section 3.11 of Technical Report 27.

²¹ Different methods were used for the different ecological components.

²² From south to north these are: Waikanae Estuary Scientific Reserve, Te Harakeke/Kawakahia Wetland; Kawakahia Swamp Forest; Nga Manu Nature Reserve; and Ngarara Bush.

²³ 131 Raumati South Peatlands; Raumati Wetland; Sovereign Way/Crown Hill Ecosite; Southern Otaihanga Wetland; Northern Otaihanga Wetland; El Rancho Wetland (Weggery); El Rancho Wetland (West); El Rancho Wetland (Takamore); Osbournes

- 68.3 11 sites or areas of vegetation are of low ecological value including modified wetlands, regenerating shrublands and riparian margins.²⁴
- 69 A number of sites within close proximity to the Project have some degree of protection through reserve or covenant status. In addition, following a significant natural area survey, KCDC identified a number of high/moderate value sites, which are managed under the rules of the District Plan.²⁵
- 70 Tables 4 and 5 of Technical Report 27 list all the above sites which are currently protected or listed in Regional and District Plans and which are crossed or lie in close proximity to the proposed alignment. Table 5 of Technical Report 27 also includes a number of sites of ecological value based on our personal observations that were not identified in earlier DOC or council inventories. In total 11 protected natural areas (*PNA*s) are listed in Table 4, and a further 21 sites of ecological value (but without formal protection) (*SN*A)s are listed in Table 5.
- 71 Table 10 then combines all protected natural areas, identified sites of significant vegetation, habitats of indigenous flora and fauna, and plant communities, and provides a significance assessment for each.²⁶ In total, 32 sites are identified. Their position in relation to the proposed designation is shown in Figures 12a – 12d.²⁷
- 72 I have set out descriptions (including photographs) of the terrestrial and wetland environments potentially affected by the Project as **Annexure A.**
- Herpetofauna**
- 73 Section 4 of Technical Report 28 discusses the lizard habitat species present along the proposed alignment.
- 74 Table 1 of Technical Report 28 lists the five species of endemic lizard that could potentially occur along the proposed alignment. Of these species only the common skink was recorded by our surveys. It was recorded at almost all sites where long, thick grass was present, and not seen in any other sampled habitats. No geckos were found

Swamp (West); Ti Kouka Wetland; Ngarara Wetland; Raumati Road Kanuka; Otaihanga Landfill Mahoe; Otaihanga Landfill Kanuka; and Ngarara Farm Mahoe.

²⁴ Queen Elizabeth Park peatlands, Kiwi Pond, Andrews Pond Scientific Reserve, Meadows Trust Carex Wetland, Middle Otaihanga Wetland, Open water and Juncus south of Waikanae River, Tuku Rakau Wetland, Osbournes Swamp, Ngarara Dune Depressions, Waikanae River Riparian and Tuku Rakau Forest.

²⁵ Refer Part I Heritage Register: Table E: Ecological Sites (areas of significant indigenous vegetation and significant habitats of indigenous flora).

²⁶ Pages 65-67.

²⁷ Technical Report 27.

during the survey and there were no observations of gecko skin sloughs.

- 75 Native frogs are locally extinct. A wide variety of common terrestrial invertebrates were detected during various ecological investigations, though none of conservation concern.²⁸

PROJECT SHAPING

- 76 The Project shaping process is described in Technical Report 26, (Section 7). The process was carried out as part of the Project design to identify, among other things, opportunities to avoid or reduce adverse ecological effects. The base scenario for the Expressway alignment was the existing Western Link Road designation, a route with potentially significant ecological impacts. The Project shaping process identified many opportunities to avoid significant wetland and terrestrial vegetation habitats including 11 ecological sites scheduled in the Kāpiti Coast District Plan, as well as a number of waterbodies²⁹ and areas of terrestrial habitat.³⁰ In summary this work resulted in:

- 76.1 A considerable reduction in the number of wetlands and wetland habitat traversed by the proposed alignment, and avoidance of all wetlands with high ecological value;
- 76.2 The majority of the Raumati Manuka Wetland and El Rancho Wetland (Weggery) (KCDC Ecosite K170) were avoided and the design footprint was reduced to minimise vegetation loss through the Southern and Northern Otaihanga Wetlands;
- 76.3 Large areas of Queen Elizabeth (Regional) Park identified as having ecological restoration potential were avoided, ensuring that GWRC's goals for the future restoration of that part of the Park can be attained; and
- 76.4 Reductions in the amount of dryland indigenous vegetation potentially affected in a number of key areas.

²⁸ One specimen of *Peripatus novae-zelandiae* was located in the compacted sand under a recently fallen pine tree within the Otaihanga Mountain Bike Area. While this species does not currently have a threat status, its taxonomy is under review.

²⁹ Including ten ecologically significant wetlands located within the existing WLR designation: Poplar Avenue Wetlands; Raumati South Peatlands; Raumati Manuka Wetland; El Rancho Wetland (West); El Rancho Wetland (Takamore); Osbourne Swamp West wetland; Osbourne's Swamp (QEII covenant); Kawakahia/Te Harakeke Wetland (QE II covenant); Ti Kouka wetland (QEII covenant); and Ngarara Wetland east of Ngarara Road.

³⁰ These areas include Raumati Road Kanuka; Otaihanga Kanuka forest; Waikanae River Riparian; Tuku Rakau Forest; Ngarara Farm Mahoe; and Kakariki Stream riparian vegetation.

- 77 Later phases of the Project shaping process focused on the design of the proposed Expressway. My involvement with these phases focused on the following aspects:
- 77.1 The design and location of stormwater treatment wetlands, flood storage areas and landscape and visual mitigation were developed in accordance with good ecological design practices to ensure that there will be good quality water treatment combined with, where appropriate, ecological potential as habitat for indigenous flora and fauna;
 - 77.2 Bridges were the preferred form of crossings over the main waterways as opposed to culverts, to address flood flows and ensure optimal ecological connections and promote riparian vegetation; and
 - 77.3 Ecological input being provided into the landscape and visual mitigation design to seek to maintain and improve existing ecological areas as far as possible through restoration planting and edge buffering.³¹
- 78 A detailed summary of the design decisions providing ecological benefit are outlined in Technical Report 26, Table 23.
- 79 Further avoidance or reduction of adverse effects may be possible in some locations during the detailed design stage – or through site management – where areas of high or moderate value vegetation and habitats lie within the Project footprint and designation boundaries. For example, a reduction in the clearance of the wetland vegetation and kanuka forest at Otaihanga may be achieved through detailed design.

ASSESSMENT OF THE EFFECTS ON ECOLOGICAL VALUES

- 80 In this section of my evidence, I summarise the key potential and actual ecological effects of the Project on terrestrial vegetation, habitats, and plant and animal species where total avoidance could not be achieved. These effects are discussed in detail in Section 8 (Construction Impacts) and Section 9 (Operational Impacts) of Technical Report 26.³²
- 81 I note that a number of key decisions were made through Project shaping that led to avoidance or a significant reduction of a number of potential ecological effects.

³¹ For example, landscape planting that takes into account areas of high bird movement in the vicinity of Nga Manu Nature Reserve and Te Harakeke/Kawakahia Wetland.

³² The criteria used to assess the magnitude and significance of an effect on a site or place are set out in Section 8 (page 97) and Section 3.7.

Direct Construction Effects
Terrestrial vegetation and habitat

- 82 The potential direct impacts of construction include:
- 82.1 Permanent loss of terrestrial habitat, including wetlands and species beneath the Project footprint;
 - 82.2 Temporary disturbance of terrestrial vegetation through related construction activities;
 - 82.3 Loss and modification of aquatic habitat through culverting and diversions of streams; and
 - 82.4 Disturbance and displacement of terrestrial fauna through construction activities.
- 83 Table 25 presents the assessment of the magnitude of impact to potentially affected vegetation as a percentage of the total vegetation loss at each site.³³ Table 26 then combines the assessment of ecological value with magnitude of effect to assess impact significance (without mitigation).³⁴
- 84 In summary, 5.6 ha of indigenous vegetation (excluding blackberry and gorse shrubland and *Juncus*-dominated wet pasture) lies beneath the Project footprint and would be permanently removed at the construction stage. This includes potential loss of:
- 84.1 Two sites which comprise kanuka forest (totalling 0.52 ha), for which the potential loss is of "very high" significance;
 - 84.2 0.53 ha of wetland vegetation at the Northern Otaihanga Wetland which is of "high" significance;
 - 84.3 0.55 ha of the Southern Otaihanga Wetland and 0.86 ha of the Ngarara Mahoe Forest which is of "moderate" significance.³⁵
- 85 I consider that mitigation is required for these losses, and I discuss this later in my evidence.
- 86 For all other sites or vegetation communities, the effects were assessed to be neutral, low or very low. Despite this assessment, I consider that some mitigation is necessary in some cases, particularly where the vegetation comprised indigenous wetland habitat or habitat for native fauna or rare native plants. Mitigation is not recommended for the loss of wet pasture, or for loss of pioneer

³³ Page 104 of Technical Report 26.

³⁴ Pages 104-105.

³⁵ Table 26, Page 116.

shrubland and scrub communities dominated by exotic weed species (gorse and blackberry).

Rare Plants

- 87 Only one rare plant species was recorded during the study. The uncommon dwarf mistletoe *Korthalsella salicornioides* grows in an area of wetland vegetation immediately adjacent to the proposed designation.³⁶ The dozen or so scattered manuka trees on which this parasitic species grows are considered to be a sufficient distance (approximately 80 m) from construction that adverse effects can be avoided. This can be achieved by marking the locations to be avoided prior to vegetation clearance, and educating contractors.³⁷ Therefore, no additional mitigation is required.

Lizards and invertebrates

- 88 The common skink was relatively common in areas of rank pasture that will be reduced by the proposed earthworks. There is also the possibility that other cryptic species of lizard are present but at levels that prevent observation.
- 89 No threatened or at risk species of macro-invertebrates were recorded during the study. One invertebrate species of scientific interest, *Peripatus novae-zelandiae*, was observed at one location within the proposed alignment.
- 90 Overall, the Project will have a relatively large adverse effect on the abundance of common skinks in the short-term, but is unlikely to impact on populations within the Kāpiti District generally. The new habitat created as part of the Project through landscaping, combined with increased areas of rank grassland, is expected to provide equivalent areas of suitable habitat for lizard and invertebrate species to re-populate in the short to medium term.
- 91 While construction effects on residual lizard populations could be reduced by trapping and relocation of lizards prior to construction (as initially recommended in the EMP), there are insufficient ecological grounds as well as a number of risks associated with capture and relocation.³⁸ I consider the most practical and cost-effective approach would be to create new lizard and invertebrate habitat through ecological and landscape planting and provision of micro-

³⁶ Refer further detail in section 3.11 of Technical Report 27, section 8.1.3 of Technical Report 26.

³⁷ This is provided for in the EMP (Table 5) which recommends the demarcation of high value vegetation prior to construction.

³⁸ Refer Technical Report 28, section 6.

habitat³⁹ (such as cut kanuka discs) in key areas to encourage repopulation through immigration from neighbouring habitats.

Indirect Construction Effects

Dust, fire and invasive weeds

- 92 The potential indirect effects of construction on vegetation and habitats include dust, fire and issues related to weed introduction, either via vehicles or with topsoil and aggregates.
- 93 The risk level associated with these potential effects cannot be quantified, but can be managed through industry accepted construction methods. Given the propensity of invasive weed growth on the Kāpiti Coast, guidelines for weed management have been incorporated in the EMP and Landscape Management Plan. As much of the Project construction is within sand and peat, there is a low risk of dust to indigenous vegetation and habitats.

Groundwater take⁴⁰

- 94 A total maximum groundwater take of less than 900,000 m³ is proposed from bores in the deeper Parata aquifer at various locations along the length of the proposed Expressway.
- 95 The groundwater team has advised that changes to the groundwater budget are unlikely to be discernible with groundwater levels expected to recover to 80% of pre-construction levels within 1 day of ceasing pumping.⁴¹ This is discussed in the evidence of **Ms Williams**.
- 96 On that basis I am comfortable that there will not be adverse effects of groundwater take on wetlands. However, potential changes to wetlands resulting from construction should be considered and then addressed during any monitoring of wetland hydrology that is carried out.⁴²

Groundwater recharge

- 97 The groundwater team has estimated that the groundwater contribution to rivers and streams may reduce by up to 1.5% peak as a result of the construction water take over the limited period of that take (a number of months).⁴³ This assessment however assumed that the bores were pumping 24 hours per day and

³⁹ Refer Anderson, P, Bell, T, Chapman, S & Corbett K. 2012. SRARNZ New Zealand Lizards Conservation Toolkit. A resource for conservation management of the lizards of New Zealand.

⁴⁰ Refer Section 8.2.2 of Technical Report 26.

⁴¹ Technical Report 21, sections 5.4 and 5.5.

⁴² Refer Section of CEMP Appendix I and Condition G.29 (Groundwater (Level) Management Plan) and proposed Conditions G.34 (Environmental Management Plan), G.38 and G.40 (Ecological Monitoring – General).

⁴³ Refer section 5.5 of Technical Report 21, Assessment of Groundwater Effects.

therefore did not consider recovery that occurs during periods of lesser (during or following rainfall) or no pumping (at night).⁴⁴ It is my understanding that the actual reduction during construction is therefore likely to be about half of this.⁴⁵

- 98 The groundwater team concludes that overall river and stream flows will not be significantly affected. This is because the groundwater that would have discharged directly to the water body will still be discharged to that same water body after interception and treatment of water in stormwater ponds or swales.

Sediment discharge

- 99 Sediment discharge is discussed in Section 8.2.4 of Technical Report 26. The potential ecological effects associated with sediment discharge on freshwater and marine ecosystems from the Project are addressed in the evidence of **Drs Keesing and De Luca**. However, the Project also has some potential for sediment discharge to impact on wetland vegetation and habitat.
- 100 The Erosion and Sediment Control Plan⁴⁶ and the CEMP recognise the generally flat nature of the Project area, which comprises predominantly sand and peat with high infiltration rates and groundwater levels. I understand that these factors mean that the sediment generation and eventual sediment yields will be low.
- 101 However, the ecology team has concluded that there is a small potential risk of sediment entering and accumulating in Te Harakeke/Kawakahia wetland via the Ngarara streams.⁴⁷ Infilling of stream beds could lead to flooding and dispersal of sediments beyond the stream banks which may impact on wetland vegetation.
- 102 While I consider the risk of adverse effects to be small, construction monitoring and adaptive management are recommended. I discuss these mechanisms later in my evidence.

Indigenous vegetation outside of the Project footprint

- 103 In addition to the loss of approximately 5.6 ha of indigenous vegetation within the Project footprint, I have also considered the potential loss of modification to a further 7.4 ha of similar vegetation arising from earthworks and construction activities within the designation.
- 104 While much of this 7.4 ha is unlikely to be affected (as it only arises as a result of the proposed designation following property boundaries

⁴⁴ Refer section 5.5 of Technical Report 21, Assessment of Groundwater Effects.

⁴⁵ From discussion with Ms Williams.

⁴⁶ Appendix H to the CEMP.

⁴⁷ Refer Section 8.2.4 of Technical Report 26.

which include larger areas of indigenous vegetation – e.g. Otaihangā Kanuka Forest), following detailed design, some additional mitigation may be required for any loss of indigenous vegetation outside the Project footprint consistent with the mitigation outlined in Technical Report 26.

Operational Effects

- 105 The potential effects on terrestrial ecology of the proposed Expressway once in operation relate to potential effects on wetland hydrology and groundwater recharge.⁴⁸

Drawdown or damming

- 106 There is potential for significant adverse effects on wetland hydrology where surface and groundwater flows are impeded by impermeability of road foundations to overland or subsurface flows, leading to either a drawdown or damming of groundwater. There is also potential for reduced inflows of water to wetlands through the capture and transport of rainfall away from wetlands by stormwater drains, and the effect of formation of stormwater and flood detention ponds along the alignment on groundwater levels.
- 107 The Assessment of Groundwater Effects⁴⁹ concludes that actual effects on water levels in wetlands overlying the peat as a result of these drawdowns are anticipated to be negligible.⁵⁰
- 108 The assessment also concludes that groundwater drawdown, caused by construction of the Expressway and stormwater devices, can be expected to result in a negligible reduction in the volume of groundwater discharging to surface water bodies and/or a negligible increase in the amount of water in surface water bodies that is lost through their beds to the groundwater system.⁵¹
- 109 However, even small changes in wetland hydrology can have an effect on species presence and distribution and so this remains a concern. This has been discussed at length with the hydrology and civil engineering teams to explore design options that will reduce or eliminate this risk. As uncertainty remains over the extent and magnitude of potential hydrological effects, a monitoring and adaptive management approach is recommended in relation to these effects, this is discussed further in my evidence.

⁴⁸ Refer Section 9.1 of Technical Report 26.

⁴⁹ Technical Report 21.

⁵⁰ Technical Report 21 at Sections 5.1 – 5.3. The assessment focussed specifically on 6 ecologically valued wetlands that lie in close proximity to the proposed alignment.

⁵¹ Ibid at Section 5.5.

Summary

- 110 In summary, the key adverse effects on terrestrial ecological values requiring mitigation or monitoring are:
- 110.1 The permanent loss of 5.6 ha of indigenous vegetation within the Project Footprint;
 - 110.2 The potential short term loss of sedentary species (e.g. lizards) when their habitat is removed;
 - 110.3 The potential sedimentation effects on Te Harakeke/ Kawakahia wetland associated with earthworks during the construction phase;
 - 110.4 The potential effects on wetland hydrology associated with road construction impeding or disrupting groundwater flows; and
 - 110.5 The potential loss or modification to a further 7.4 ha of indigenous vegetation within the designation due to earthworks and construction activities.

MITIGATION, MONITORING AND MANAGEMENT OF ADVERSE EFFECTS

- 111 A detailed discussion of mitigation proposed for potential direct and indirect impacts of the construction and operation phases of the Project is presented in Section 11 of Technical Report 26 and in Appendix M.B of the EMP.
- 112 Overall, with the exception of those potential effects that cannot yet be quantified (e.g. wetland hydrology), I consider that the potential adverse ecological effects of the Project will be reduced to neutral after all of the proposed ecological mitigation is carried out.
- 113 As discussed further below, an adaptive management approach is proposed as mitigation for a number of potential adverse effects in relation to terrestrial ecology. The concept of adaptive management is discussed generally in the evidence of **Mr Schofield** and more specifically in relation to ecology by **Mr Fuller**. Adaptive management is also described in section 11.7.1 of Technical Report 26, and more specifically in section 4.2 of the EMP.
- 114 When the additional ecological benefits associated with the landscape and amenity planting are taken into account, I consider the Project will result in long term positive benefits to the ecology of the Kāpiti Coast.

115 In this section of my evidence, I will summarise the mitigation proposed in relation to:

115.1 Terrestrial and wetland vegetation;

115.2 Wetland hydrology;

115.3 Sediment discharge to Te Harakeke/Kawakahia wetland;
and

115.4 Lizards and macroinvertebrates.

Terrestrial and Wetland Vegetation⁵²

116 When determining the extent of adverse effects of the Project, it was assumed that all vegetation within the Project footprint would be lost, even though some of it may not be affected. Provision was also made for potential effects on wetland vegetation outside the Project footprint (including outside the designation) associated with potential hydrological changes resulting from construction and operation.

117 There is no national standard or guideline for calculating mitigation for vegetation loss, although it is generally recognised that 1 for 1 revegetation is not sufficient where high value plant communities are lost. Based on the results of the ecological investigations undertaken and our knowledge of the indigenous ecosystems of the Foxton Ecological District, the following "environmental compensation ratios" (*ECR*) were developed (in consultation with DOC, GWRC and KCDC) to calculate an appropriate level of mitigation for terrestrial vegetation loss:

117.1 Kanuka forest (x 2);

117.2 Regenerating broadleaf scrub and low forest (including riparian margins) (x 2);

117.3 Mature indigenous forest (x 3); and

117.4 Indigenous wetlands (x 3).

118 To ensure in-situ, measurable conservation outcomes that can reasonably be expected to result in no net loss (and preferably a net gain of biodiversity), larger areas of vegetation should be planted for those communities that are less common (e.g. indigenous wetlands), and which will take longer to reach their existing condition or maturity (e.g. mature forest).

119 The ECRs developed for the Project are consistent with the mitigation ratios recommended for similar types of vegetation and habitat in

⁵² Refer Sections 11.1 and 11.2 of Technical Report 26.

the Foxton Ecological District affected by the adjacent Transmission Gully Project.⁵³

- 120 Using the ECRs above, 7.6 ha of re-vegetation is required to compensate for the 3.8 ha of dryland vegetation that will be lost within the Project footprint.⁵⁴ In addition, 5.4 ha of wetland restoration is required to compensate for the loss of 1.8 ha of wetland vegetation within the Project Footprint.⁵⁵
- 121 Because the extent and location of these areas may change as a result of detailed design, some additional mitigation may be required for any additional loss of indigenous vegetation not allowed for in our calculations. The EMP sets out measures to minimise any additional loss or modification. However, I also consider a consent condition is needed to ensure the mitigation calculations are reviewed in the event of additional vegetation loss. This is shown in (new) proposed Condition G.34c)x.; see **Annexure C** of my evidence.
- 122 The ecology team in conjunction with other experts⁵⁶ has also identified the locations where the ecological mitigation should be carried out and how the sites should be managed. In consultation with KCDC, DOC and GWRC, a number of potential sites for terrestrial mitigation were considered and assessed in terms of their existing values and the potential benefits of such mitigation at those sites. It was agreed that there was a preference to focus mitigation for terrestrial vegetation and wetland loss and modification within the Study Area in areas that currently lack formal protection.⁵⁷ Wherever possible, the mitigation proposed for new wetland planting or restoration will incorporate the transplanting of existing wetland plants from affected adjacent wetlands.
- 123 This has resulted in a focus on wetland restoration work at the following sites adjacent to the proposed Expressway:
- 123.1 Raumati Manuka Wetland;
- 123.2 Otaihanga wetlands;

⁵³ Refer paragraphs 458 – 464 of the TGP Decision.

⁵⁴ Refer Table 45 in Technical Report 26 (page 134).

⁵⁵ Refer Table 46 in Technical Report 26 (page 136).

⁵⁶ Including Alliance landscape architects, hydrological and stormwater engineers, geo-technical and groundwater engineers and property specialists.

⁵⁷ All of the proposed terrestrial vegetation mitigation will occur within the proposed designation footprint, except for the mitigation proposed at the Waikanae Oxidation Ponds.

- 123.3 El Rancho wetlands⁵⁸;
- 123.4 Ngarara Wetland.⁵⁹
- 124 In addition, wetland mitigation is proposed at the decommissioned Waikanae Oxidation Ponds to support planned restoration of these ponds.⁶⁰
- 125 The total area of the proposed terrestrial and wetland ecological mitigation is 13 ha (comprising 5.4 ha of wetland planting⁶¹ and 7.6 ha of dryland planting⁶²). These areas are identified in Figures 10a – 10d of Technical Report 26 and shown in Figures 2 – 6 within Appendix 7.A of Technical Report 7. **Annexure F** of my evidence illustrates the terrestrial mitigation areas proposed.
- 126 In addition, the inclusion of several existing wetlands and areas of terrestrial vegetation within the permanent designation is proposed. These areas are: the Raumati Manuka Wetland, the residual areas of the Otaihanga Southern, Central and Northern wetlands⁶³ and the Otaihanga Mahoe and Kanuka Forest areas.
- 127 In addition to the 13 ha of planting required as terrestrial ecological mitigation above, I note that an additional 65.3 ha of indigenous vegetation planting is proposed along the Expressway alignment for landscape mitigation or stormwater management. This planting has not been included in my calculations of ecological mitigation, but will provide additional ecological benefit. It comprises:
- 127.1 12.6 ha of mass indigenous planted flood storage areas;⁶⁴

⁵⁸ The wider El Rancho wetland area, a registered wāhi tapu, is the subject of a proposed Historic Reserve Designation (Reserves Act 1977). Wetland enhancement and revegetation is proposed in this area as part of this designation, though this does not form part of the ecological mitigation outlined in Technical Report 26. The restoration of this area is addressed in the evidence of **Mr Kamo** and **Mr Schofield**.

⁵⁹ The mitigation treatments proposed for each wetland are described in Section 11.2.4 of Technical Report 26; Tables 5, 7 and 8 of the EMP (Appendix M to the Construction Environmental Management Plan (CEMP)); and in Condition G.34 [Ecological Management Plan].

⁶⁰ Restoration of this area involves importing approximately 76,000 m³ and 114,000 m³ of peat from the construction earthworks along the Expressway Alignment to raise the bed of the ponds (currently 2-3m deep) and create islands and shallows which would then be planted as wetland habitat.

⁶¹ Based on 0.4 ha at Otaihanga Central Wetland, 1.2 ha at WWTP wetland and 3.8 ha at the decommissioned Waikanae Oxidation Ponds.

⁶² Based on mass indigenous planting and mass indigenous planting with tree enrichment in specific areas of the landscape and visual mitigation planting within the Designation.

⁶³ Refer sections 3.7.2, 7.3, 7.6, 11.2.4 of Technical Report 26.

⁶⁴ Refer to the Assessment of Hydrological and Stormwater Effects - Technical Report 22, and to the evidence of **Mr Graham Levy** and to the Assessment of

- 127.2 2.5 ha of indigenous wetland planted stormwater treatment wetlands;⁶⁵ and
- 127.3 50.2 ha of mass indigenous planted and tree enrichment terrestrial planting areas (landscape and visual).⁶⁶
- 128 Mitigation planting and management will be guided by the principles set out in the draft EMP and Landscape Management Plan⁶⁷ and Conditions G.34 and G.38 and the development of more detailed planting plans for each area of mitigation. The development of the site specific ecological restoration plans is discussed by **Mr Fuller**.
- 129 In summary, direct mitigation for adverse effects on terrestrial ecological values is proposed at a small discrete number of locations, using a range of different restoration treatments.⁶⁸

Potential changes to wetland hydrology

- 130 As discussed earlier, maintaining groundwater flows during and after construction and providing for the continuation of seasonal fluctuations will be critical to ensuring the ongoing health and functioning of the wetlands within and in close proximity to the Project. This is particularly important in areas where wetlands are located within more extensive and connected areas of peat.
- 131 While the Assessment of Groundwater Effects (Technical Report 21) has established that any adverse hydrological effects on wetlands will diminish rapidly with distance and will be negligible beyond 100m, I consider there may be some measurable adverse effects on the hydrology of wetlands that abut or are severed by the Project. Because the scale and extent of these effects cannot be precisely defined, I recommended an adaptive management approach.⁶⁹ The adaptive management framework will include the identification of appropriate management triggers as well as a range of potential mechanisms to remedy potential changes in wetland hydrology.
- 132 In relation to wetlands, the primary focus of adaptive management is to ensure that any potential hydrological changes on these wetlands will be adequately monitored to detect any negative changes. This

Landscape and Visual Effects – Technical Report 7, and to the evidence of **Mr Boyden Evans**.

⁶⁵ Ibid.

⁶⁶ As discussed by **Mr Boyden Evans**.

⁶⁷ Refer sections 3.3.2, 3.3.3 and 4.3 of the EMP.

⁶⁸ These sites are listed in Figures 10a – 10d of Technical Report 26 and shown in Figures 2 - 6 of Technical Report 7 (Landscape and Visual Assessment), and shown in **Annexure F** of my evidence.

⁶⁹ Adaptive management is described generally in section 11.7.1 of Technical Report 26 and section 4.2 of the draft EMP.

will enable remedial action can be taken, preferably at the earliest opportunity.

- 133 In conjunction with the Assessment of Groundwater Effects (Technical Report 21) and the draft Groundwater (Level) Management Plan (CEMP Appendix I), I have recommended the use of piezometers and an adaptive management framework at the following wetlands:
- 133.1 Raumati Manuka Wetlands;
 - 133.2 Crown Hill and other small wetlands;
 - 133.3 Otaihanga Wetlands;
 - 133.4 El Rancho Wetland;
 - 133.5 Te Harakeke/Kawakahia Wetland; and
 - 133.6 Te Kouka Wetland and Nga Manu Nature Reserve.
- 134 Further detail on the adaptive management options for each of these wetlands is outlined in Technical Report 26, in section 11.4 and is also discussed more generally in section 4.3 of the EMP. I note that proposed condition G.40 provides for the adaptive management approach in relation to potential ecological effects, and proposed condition G.29 incorporates the Groundwater (Level) Management Plan.

Sediment discharge to Te Harakeke/Kawakahia Wetland

- 135 As noted earlier, it is not possible to predict the scale and extent of effects of the possible sediment discharge to the Te Harakeke/Kawakahia Wetland. I therefore recommend that an adaptive management regime be implemented to ensure construction sediment entering Te Harakeke/Kawakahia Wetland is minimised.⁷⁰

Lizards and macroinvertebrates

- 136 I recommend that prior to any construction in the vicinity of the El Rancho wetland, a series of tracks should be cut through the scrub within the Project footprint to allow the area to be searched for arboreal lizards. Consistent with good practice, any arboreal lizards will be translocated to the adjacent El Rancho Wetland (Takamore). Permits to trap and translocate lizards will be required from DOC under the Wildlife Act 1953 prior to construction.
- 137 I do not believe any further mitigation is required. However, I note that the proposed landscape and amenity planting will result in the

⁷⁰ More detail on the adaptive management approach for this Wetland is outlined in Technical Report 26, Section 11.5.

creation of habitat suitable for lizards in a number of locations⁷¹ including a number of open environments with abundant refuges on the edge of plantings and the incorporation of ground tier species appropriate for lizard species. Provision of micro-habitat (such as cut kanuka discs) within some planted areas will provide basking and refugia for lizard species.

Potential positive effects/benefits

- 138 Overall, in considering the scale of ecological mitigation and landscape planting proposed for the Project, I consider the actions that will be undertaken within the designation boundaries will result in a range of positive effects on ecological values.
- 139 The planted stormwater treatment wetlands and flood storage areas will provide additional benefit for native flora and fauna by improving connections with adjacent waterbodies and by contributing to the long-term maintenance of wetland values consistent with historical vegetation patterns of the Kāpiti Coast.
- 140 The retirement of areas, combined with the restoration and revegetation of other areas, along sections of the Alignment (as part of a combination of ecological, hydrological, landscape, amenity, and acoustic mitigation) will, in the longer term, result in a vegetated habitat located within a recognised wildlife corridor.
- 141 Further, the extensive studies carried out as part of the Project investigations have improved knowledge and understanding of the local flora, fauna and habitats. This knowledge and science can be fed directly into management of adjoining areas under control of other agencies and community groups.

PROPOSED CONDITIONS AND ECOLOGICAL MANAGEMENT PLAN

- 142 The Project application contained a set of proposed consent conditions.⁷² A number of the proposed conditions relate to the mitigation and management of potential effects on terrestrial flora, fauna and habitats. Overall, I consider that the issues identified in my assessment of effects on terrestrial flora, fauna and habitats have been covered appropriately and adequately by these proposed conditions.
- 143 In this section of my evidence, I will address those conditions relevant to my areas of expertise. A full list of the terrestrial ecology-related conditions is appended to this statement as **Annexure C**.

⁷¹ Refer Assessment of Landscape and Visual Effects – Technical Report 7, Volume 3.

⁷² Refer Chapters 32 and 33 of the AEE.

Wetland hydrology

- 144 Provision is provided for the maintenance and protection of wetland hydrology through proposed conditions G.14, G.20 - G.26, G.29, G.34(c) and G.38 which ensure background information is gathered, sets out monitoring requirements (as outlined in **Annexure C**). In addition, proposed Condition G.39 requires all ecological monitoring required under the EMP to be managed by a suitably qualified and experienced ecologist and to be provided to DOC and KCDC for information. Proposed Condition G.40 establishes the adaptive management approach to responding to ecological effects on wetland hydrology and other components.

Effects on terrestrial vegetation (including wetlands)

- 145 As stated earlier in my evidence, no adverse effects on terrestrial vegetation outside the Project are anticipated. Potential adverse effects on vegetation outside the Project footprint are therefore managed through Condition G.7 which provides for a review of conditions to deal with any unanticipated adverse effects on the environment and to review the adequacy of any monitoring plans. I have also proposed an amendment to Condition G.34 to require that the EMP specify ECRs to provide mitigation should there be any adverse effects on indigenous vegetation outside the Project footprint.
- 146 Proposed Condition G.11 requires contractors to be briefed on the values of any significant areas of vegetation and the methods used to protect them during construction. Similarly, proposed Conditions G.20 to G.26 outline the avoidance, remediation and mitigation of adverse effects on terrestrial vegetation associated with construction. Finally, proposed Condition E.9 requires ecological involvement in the event of a failure of erosion and sediment control devices or during storm events.

Mitigation planting (including wetlands)

- 147 To ensure the terrestrial mitigation (including wetlands) will be undertaken, proposed Conditions G.15 to G.18 require all works to be carried out in general accordance with the EMP. Proposed Condition G.34 ensures that mitigation requirements are undertaken and monitored to ensure success is achieved consistent with the objectives. Proposed Condition G.35 requires that a suitably qualified and experienced ecologist shall prepare the EMP in a manner that implements the principles and outcomes sought by the EIA. Proposed Condition G.38 also requires that ecological monitoring is to be carried out in accordance with the EMP, including baseline information on vegetation and wetlands.
- 148 The landscape and visual and other planting is addressed in the evidence of **Mr Evans**.

Lizards

- 149 Re-establishing affected lizard habitat and minimising lizard mortality resulting from construction is also addressed by the EMP under proposed Condition G.34.

Ecological Management Plan (EMP)

- 150 The proposed consent conditions require the preparation of a number of management plans. They provide guidance on what the plans are to cover and the standards that management of the issues covered by the plans needs to achieve. The key plan for the management of adverse effects on terrestrial ecology is the EMP. The EMP and other related environmental management plans are discussed in the evidence of **Mr Fuller**. The adaptive management related conditions are discussed by **Mr Fuller** and **Mr Schofield**.

RESPONSE TO SECTION 149G(3) KEY ISSUES REPORTS

- 151 The Key Issues Reports prepared by KCDC and GWRC raised several issues relating to terrestrial ecological which I will address in this section of my evidence.

KCDC Key Issues Report

- 152 At pages 8-9, the KCDC Report states that:

"Many of the 30+ ecologically significant areas within or immediately adjacent to the proposed Expressway will be adversely affected to some degree, particularly by earthworks during the construction phase."

- 153 This is incorrect. As outlined earlier in my evidence and in Technical Report 26, a total of 32 areas of indigenous vegetation were identified within or in close proximity to the Project that were considered to have ecological value (PNAs and SNAs). Of these 32 areas of ecological value, the Project would avoid all 4 areas of high ecological value, as well as avoid 8 of the 15 sites of moderate ecological value.⁷³ Most notably, of the 25 identified indigenous wetlands of ecological value located within or in close proximity to the Project footprint, all but 4 have been avoided (all of which are of medium value).
- 154 KCDC also raise an issue regarding the assumptions around effects on groundwater and the potential for irreversible impacts on naturally occurring wetlands (page 9). As noted in my assessment, and in the Assessment of Groundwater Effects,⁷⁴ monitoring the impact on groundwater after construction of the proposed Expressway is a key issue in terms of potential ecological effects.⁷⁵

⁷³ Refer Sections 6.9.1 and 6.9.5 of Technical Report 26.

⁷⁴ Technical Report 21.

⁷⁵ Refer Sections 9.1 and 11,7.1 of Technical Report 26.

The proposed conditions in relation to monitoring and adaptive management through the EMP and Groundwater [Level] Management Plan⁷⁶ specifically deal with this issue for the wetlands most closely linked with the Project.

GWRC Key Issues Report

Possible further resource consents required

- 155 The GWRC Key Issues Report noted that additional resource consents may be required for the restoration-related works in the following wetlands:⁷⁷
- 155.1 In the case of the Ngarara Wetland, the proposed planting is outside of the physical wetland area and is limited to edge planting and landscape treatment to buffer the wetland core and minimise potential edge effects on North Island fernbird.⁷⁸ I understand no resource consent will be required for the intended work.⁷⁹
- 155.2 Similarly, the proposed restoration of the Otaihanga Central Wetland is intended to improve the values of an existing highly modified low-value wetland by re-using wetland plants that would otherwise be lost from the adjacent Otaihanga Southern and Northern wetlands. I understand no resource consent will be required for the intended work.
- 155.3 In terms of the decommissioned Waikanae Oxidation Ponds, the mitigation works proposed here provide an opportunity to dispose of large quantities of peat quite close to the northern section of the alignment. Ecologically, it is an excellent option as it was the missing section of the largest remaining dune lake wetland in the lower North Island (Te Harakeke/Kawakahia Wetland) and it was located within a recognised 'ecological corridor' – in the area between the coast and Nga Manu Nature Reserve. KCDC has recently approved a management plan for this area⁸⁰ which was consistent with the infilling of the oxidation ponds. The work proposed is in accordance with the KCDC approved management plan and will be carried out in an artificially created concrete pond. The Project team therefore do not consider that resource consent will be required for the proposed works.

⁷⁶ Refer Conditions G.29 (Groundwater [Level] Management Plan), G.34 (Ecological Management Plan) and G.40 (Adaptive Management).

⁷⁷ Refer paragraphs 132 and 218 of GWRC Key Issues Report.

⁷⁸ Refer section 11.2.4 of Technical Report 26.

⁷⁹ See evidence of **Mr Schofield**.

⁸⁰ Pharazyn Reserve Landscape and Ecological Restoration Plan, Wildlands Consultants. 2011 Contract Report No. 2527, prepared for Kāpiti Coast District Council, June 2011.

Protection of the Te Harakeke/Kawakahia Wetland

- 156 At paragraph 194 of its Key Issues Report, GWRC stated that the protection of the ecological values of the Te Harakeke / Kawakahia Wetland, the Waikanae Estuary and the adjacent marine reserve is a key issue. As I have outlined throughout my evidence and assessment, ensuring the protection of these particular areas of high ecological value has been an important component of ecological involvement and Project design.
- 157 In terms of the Te Harakeke / Kawakahia Wetland, substantial attention has gone into the design of stormwater management in the catchment upstream of this wetland, including the provision of additional tertiary treatment devices (wet treatment swales and stormwater wetlands) as well as additional erosion and sediment control devices through the construction phase. The evidence of **Mr Ridley** outlines the additional protection mechanisms proposed in this area. **Dr De Luca** and **Mr Ridley** discuss the protection of the Waikanae Estuary environment.

Reclamation of Wetlands

- 158 Paragraphs 213-216 of the GWRC Key Issues Report identify that the partial reclamation of four wetlands associated with the Expressway, as well as potential hydrological effects on wetlands, are a key issue for GWRC.
- 159 I agree that the partial reclamation of these wetlands is a key issue and as a result a range of mitigation measures are proposed for this loss, including restoration planting outside of the designation at the former Waikanae Oxidation Ponds as outlined in **Annexure F** of my evidence.
- 160 I note that in paragraph 214, the GWRC Report incorrectly states that 0.35 ha of kanuka will be lost as part of the approximately 2 ha Raumati Manuka Wetland. In total, only 0.03 ha of this wetland will be lost as part of Expressway construction, and this may be minimised further through detailed design of the cycleway through this area.

Mitigation for loss of wetland and freshwater habitat

- 161 GWRC raises an issue regarding the mitigation for loss of wetland habitat.⁸¹ GWRC states that the rationale behind the proposed mitigation ratio used is not clear, and seeks that the amount of mitigation for wetland loss should be determined in a manner consistent with the Board of Inquiry decision for Transmission Gully.
- 162 As I have outlined earlier in my evidence, there is no national standard or guideline for calculating mitigation for vegetation loss. Accordingly, the ratio proposed to mitigate for wetland loss for this

⁸¹ Paragraph 217 of Key Issues Report.

Project is the same as that used for the Transmission Gully Project - i.e. a mitigation ratio of 3 for 1. This means a total of 5.4 ha of wetland restoration for the loss of 1.8 ha of wetland vegetation. The mitigation proposed is also related directly to the wetland values affected by an activity, which includes the transplanting of wetland plants from affected areas.

- 163 As outlined earlier in my evidence (paragraph 127 above), an additional 65.3 ha of indigenous vegetation planting is also proposed along the Expressway alignment that will also provide some ecological benefit. Of this 65.3 ha, approximately 15.1 ha will comprise wetland planting.⁸² This scale of wetland planting significantly exceeds our calculated requirements for ecological mitigation.

Review of planting success

- 164 Paragraph 234 of the GWRC Key Issues Report raises an issue that the Landscape Management Plan (LMP) should include a review of success of the wetland and riparian mitigation planting. The matter of success of landscape planting has been the subject of discussions between the landscape and ecological teams to ensure it meets the needs of the ecological mitigation requirements. This is addressed by **Mr Evans** and I am in agreement with his approach.

RESPONSE TO SUBMISSIONS

General opposition

- 165 A number of submitters have opposed the Project on general environmental grounds, citing adverse impacts on the environment and flora and fauna but without further detail.⁸³ I consider that Technical Report 26 and my evidence provides detailed information responsive to these more general submissions and consequently do not propose to address each individually.
- 166 In terms of more substantive terrestrial matters raised by submitters, I will firstly address the stakeholder submissions (including submissions from DOC, GWRC and KCDC). I have then addressed the more general matters of opposition.

Department of Conservation (DOC)

- 167 DOC's submission, while neutral on the application, supported the approach taken by NZTA in deciding the location of the Project to avoid areas of significant wetlands and indigenous vegetation on the Kāpiti Coast.

⁸² This 35ha comprises approximately 18.9 ha of planted flood storage areas, 2.1 ha of planted stormwater treatment wetlands and 14 ha of planted wet swales.

⁸³ For example, Submitter 016 [Jamie Bull], Submitter 0124 [Vicki Schlieder Bunch], Submitter 0172 [Mr Krzysztof Zajaczkowski and Ms Aleka Beaumont], Submitter 0398 [Martin Cooke-Willis] and Submitter 0404 [Rachel Mackay].

- 168 Relevant to my area of expertise, DOC raises concerns regarding:
- 168.1 The potential effects on significant freshwater habitats and species, in particular the potential effects on groundwater flows to wetland and surface water ecosystems; and
 - 168.2 The adequacy of proposed conditions and management plans for wetland and surface water monitoring and mitigation.⁸⁴
- 169 I consider that DOC's concerns are broadly consistent with the concerns outlined in my assessment in relation to wetland hydrology and my recommended approach to adaptive management. I also agree with DOC that, given the uncertainty regarding potential effects and the high ecological values of the adjacent wetlands, very careful attention needs to be given to the ongoing management of potential effects and mitigation success.
- 170 DOC identified the following five wetlands as being of particular concern due to their high value:
- 170.1 the Waikanae River Mouth and Waimanu Lagoons;
 - 170.2 Te Harakeke/Kawakahia Wetland;
 - 170.3 Kawakahia Swamp Forest;
 - 170.4 Nga Manu Nature Reserve; and
 - 170.5 Ngarara Bush.
- 171 DOC suggested that a greater focus of effort on monitoring these wetlands should be incorporated into the conditions.
- 172 I have discussed these concerns with **Ms Williams** who has advised that these wetlands are not at risk of changes to groundwater levels (most are far from the works⁸⁵). While I do not consider that mitigation or ecological monitoring is required in relation to potential hydrogeological effects in these wetlands, I note that monitoring will take place close to the Expressway between the Expressway and the wetlands.⁸⁶

⁸⁴ DOC submission, Attachment 1.

⁸⁵ Refer Technical Report 26, Section 21 Wetland Hydrology.

⁸⁶ A number of KCDC's public water supply wells currently abstract water close to these areas identified by DOC, for example KB5 and KB6 adjacent to Ngarara Bush. Ms Williams informs me that the variation in groundwater level resulting from these takes would mask the small changes anticipated from the Project.

- 173 I also note that hydrogeological and ecological monitoring is being carried out at a number of wetlands not identified by DOC, but which are in closer proximity to the Project and which also have ecological value. This monitoring requirement is summarised in the draft EMP (Table 7) and detailed in the Groundwater (Level) Management Plan.⁸⁷ I note that any changes to the high value wetlands identified by DOC would be monitored through the large number of monitoring bores in this wider area.
- 174 DOC seeks the establishment of a "Hydrology and Wetland Ecology Review Panel". I consider that this is unnecessary as I have already largely carried out the reviews that DOC suggests such a panel would carry out. Further, the review of data suggested by DOC would add an additional layer of complexity into the environmental management process set out in the Groundwater (Level) Management Plan and the EMP. In accordance with proposed Conditions G.29 and G.34, these Plans are to be lodged with GWRC for certification prior to commencement of construction. Prior to lodgement of the EMP (and CEMP), comment from KCDC must be sought and either of these parties will have the opportunity to seek advice from any other party.⁸⁸ Proposed condition GD.5⁸⁹ identifies that groundwater level monitoring data be reviewed by both a hydrogeologist and an ecologist and I consider that this would provide for sufficient consideration of potential effects.
- 175 DOC also submitted that the proposed pre and post-construction monitoring for wetland and surface water monitoring was of insufficient duration to establish a baseline and to determine whether or not effects associated with the Project become evident and are attributable to the Project. The proposed groundwater monitoring conditions currently provide for 3 years post-construction monitoring.⁹⁰ However I support DOC's submission to extend the wetland hydrogeology post-construction monitoring to 5 years following construction to ensure any Project-related effects are suitably addressed, given the sensitivity of these wetland environments.
- 176 Based on the advice of **Ms Williams**, I do not consider that an additional 12 months of pre-construction monitoring, as sought in DOC's submission, is required. Proposed Condition G.38(a) provides for 1 year of pre-construction monitoring and as most of the proposed groundwater level monitoring piezometers are already installed, a longer record will be achieved for many sites.

⁸⁷ CEMP Appendix 1 Groundwater (Level) Management Plan.

⁸⁸ Proposed Conditions G.37 and G.23.

⁸⁹ Set out in Annexure B of **Ms Williams'** evidence.

⁹⁰ Condition GD.7 set out in Annexure B of **Ms Williams'** evidence.

- 177 DOC has also requested a number of conditions related to groundwater level monitoring. I have discussed my response to these above, and with **Ms Williams**. I am in agreement with **Ms Williams'** response to DOC on these issues and support the amended conditions outlined in **Annexure B** of her evidence.
- 178 Finally, I note that I agree with DOC's submission⁹¹ that the von Post Index is a useful tool to assist with wetland hydrology monitoring. I can confirm that this Index has been used as part of the wetland condition monitoring⁹² already undertaken as part of the Project to assist baseline wetland hydrological monitoring in the potentially affected wetlands.⁹³

Greater Wellington Regional Council

- 179 GWRC⁹⁴ generally supported the proposal, raising only a small number of issues relating to terrestrial ecology. GWRC's submission was very broad and I understood that it was to be read in conjunction with the GWRC's earlier Key Issues Report. I have addressed the issues raised by that Report earlier in my evidence.
- 180 On 22 August 2012, the GWRC produced a without prejudice Discussion Document to provide further detail on the matters raised in its submission. I will next address matters in that Document relevant to my area of expertise.

Criteria for assessment of ecological significance / significance of wetlands

- 181 GWRC raised an issue that the criteria for assessment of ecological significance do not appear to match Policy 22 of the proposed RPS, and do not reflect national priorities outlined in the National Priorities for Protecting Rare and Threatened Native Biodiversity of Private Land.⁹⁵ I disagree with this statement.
- 182 As outlined in my overview of the methodology by which the ecology team undertook the assessments of ecological significance in Technical Report 27⁹⁶ and Technical Report 26, Policy 22 of the proposed RPS formed the basis for our assessment, as did the National Priorities for Protecting Rare and Threatened Native Biodiversity on Private Land and recent and developing case law.⁹⁷ I

⁹¹ Attachment 1, page 3.

⁹² Refer Clarkson, B.R, Sorrell, B.K, Reeves, P.N, Champion, P.D., Partridge, T.R, & Clarkson, B.E. 2003. Handbook for Monitoring Wetland Condition. A Ministry for the Environment Sustainable Management Fund Project (5105).

⁹³ As highlighted earlier, I note that wetland condition monitoring sheets undertaken were not included in the lodged version of Technical Report 27.

⁹⁴ Submitter 0684.

⁹⁵ Refer section 8 of GWRC Discussion Document.

⁹⁶ Refer section 2.5.1 Assessment of Ecological Significance.

⁹⁷ Ibid.

also note that my assessment was being undertaken at the time **Mr Fuller** and I were assisting GWRC on developing a list of regionally significant wetlands for the Wellington Region. That also informed our assessment of ecological value for the wetlands in the Project study area.

183 GWRC states that the assessment of ecological value in the application includes "*consideration of level of habitat modification and condition*" and goes on to state that this "*is not consistent with the interpretation of Policy 22, which identifies all remaining wetlands as being significant, regardless of condition*".⁹⁸ This is incorrect. Firstly, the level of habitat modification or condition did not form part of my assessment of ecological significance as outlined in Section 4 of Technical Report 27 (particularly Table 10) and in Section 3.6 of Technical Report 26 (Table 2). Secondly, I do not consider Policy 22 of the proposed RPS identifies all remaining wetlands as being significant. For ease of reference, a copy of Policy 22 is attached in **Annexure D**.

184 Similarly, I disagree with GWRC's submission that the proposal may have failed to identify all areas of significant ecological value. As illustrated in the ecological technical reports, the investigations undertaken as part of developing the ecological assessment were substantial, particularly for wetlands - given the likelihood of rare or threatened species in these areas. I have personally viewed each area of terrestrial vegetation (including wetlands) either traversed by or located in close proximity to the Project, some of which I have visited on numerous occasions. Many of these visits took place with specialist ecologists over multiple seasons - and also included observations during other projects the ecological team had been involved in. Further, the extensive consultation with statutory agencies, including GWRC, was aimed at ensuring no areas of potential ecological value were avoided during these investigations.⁹⁹

Other consents – wetland restoration

185 In Section 15.2, GWRC refers to the potential need for additional consents to restore various wetlands associated with mitigation for wetland loss. In particular, it states:

"The need for consents will be dependent on the detail associated with the works. If this mitigation forms an integral part of the proposal, the necessary consents should be applied for concurrently so that there is certainty that this scope/nature and scale of the mitigation proposed can be implemented.

⁹⁸ Refer section 8 of GWRC Discussion Document.

⁹⁹ I note that GWRC has raised issues in relation to mitigation and offsetting (Section 9). For completeness, this matter is addressed in the evidence of **Mr Fuller**.

Further information is sought to clarify the scope and nature of the mitigation works, the consents required for the works and alternative options for mitigation should the remediation of oxidation ponds not be a feasible option."

186 I have addressed this matter in paragraph 155 of my statement.

Kāpiti Coast District Council

187 KCDC¹⁰⁰ generally supported the avoidance of wetland and indigenous vegetation and habitat as part of the Project development. KCDC also supports the use of stormwater treatment wetlands, although not as mitigation for the effects on natural wetlands. KCDC has raised a number of matters relating to terrestrial ecology, many of which reiterated those matters which I have already addressed in response to KCDC's Key Issues Report above. I will now address what I consider to be KCDC's outstanding concerns relating to terrestrial ecology, as raised in its submission.¹⁰¹

Ecological significance of wetlands and vegetation

188 At paragraph 22 of its submission, KCDC submits that the AEE downplays the ecological significance of wetlands and indigenous vegetation affected by the Project. I disagree with this statement. Technical Reports 26 and 27 provide a consistent – and indeed cautious – approach to quantifying the ecological values and significance of these areas.

189 KCDC also states in its submission that "*...the decision and conditions need to reflect the more conservative findings and views of the ecological impact assessment...*" The work undertaken for the Project used a best practice combination of existing ecological information, statements of government priorities for the habitats potentially affected and detailed information gathered from field assessments and surveys.

190 I also disagree with KCDC's statement (in paragraph 23) that the Raumati Manuka Wetland, the southern and northern Otaihangā wetlands and El Rancho wetland are each of regional ecological significance.

191 Of these wetlands, only the El Rancho Wetland (Weggerly) was identified and scheduled in the Kāpiti Coast District Plan (KCDC K170) as being of regional importance. Neither the Otaihangā Southern Wetland, Otaihangā Northern Wetland nor the Raumati Manuka Wetland were identified in KCDC's ecological survey.¹⁰²

¹⁰⁰ Submitter number 0682.

¹⁰¹ In particular, Section 4 (paras 16-43).

¹⁰² Refer *Wildlands Consultants. 2003. Kapiti Coast District Council 2002-2003 Ecological Sites Survey. Contact Report No.662. Prepared for Kāpiti Coast District Council.*

- 192 As I have noted earlier, in 2011 **Mr Fuller** and I undertook work for GWRC to update the schedule of wetlands to be protected in the upcoming revision of the Regional Freshwater Plan. In considering all the values of the wetlands identified in the Wellington Region, only the El Rancho wetland was considered to meet the agreed criteria as being regionally significant.
- 193 KCDC noted that 'artificial stormwater wetlands' are not a replacement of the destruction of naturally formed wetlands and should not be used as mitigation for the effects on natural wetlands.¹⁰³ I disagree with this statement.
- 193.1 Firstly, in our assessment we have not relied on stormwater treatment wetlands in our calculations of ecological mitigation.
- 193.2 Secondly, KCDC does not make a distinction between 'stormwater treatment wetlands' and 'planted flood storage areas' in its statement. The ecological assessment has relied on the use of a small number of planted flood storage areas as ecological mitigation sites which we believe is appropriate.
- 193.3 Thirdly, it is our view that with appropriate design and management, both of these created systems can provide ecological benefit in terms of habitat for a range of flora and fauna. However, I acknowledge that care must be taken when considering these systems as part of a mitigation package.
- 194 I note, in particular, that aerial photos of the Raumati Manuka Wetland indicate the entire wetland was modified by earthworks over its full extent in 1987.

Ecological offset ratios

- 195 KCDC raises concerns in relation to the 'offset ratios' proposed to arrive at the total area of re-vegetation and restoration, noting that these are less than used elsewhere in New Zealand and are not consistent with international practice.¹⁰⁴ This matter is addressed in the evidence of **Mr Fuller** (who disagrees with KCDC).
- 196 I note in particular that KCDC claims that it has adopted an offset model in its own consenting processes with the methodology requiring a significantly higher offset ratio than NZTA proposes to use for this Project.¹⁰⁵ During the development of the Project, we have discussed the proposed quantity of mitigation with KCDC on

¹⁰³ Refer paragraph 18 of Submission 0682.

¹⁰⁴ Refer paragraphs 25-28 of Submission 0682.

¹⁰⁵ Refer paragraph 26 of Submission 0682.

numerous occasions. It is disappointing that we were never informed of the KCDC offset model, nor were any issues raised by KCDC with the ratios we have used to determine the proposed mitigation. I have discussed the justification for the offset ratios used for the Project earlier in my evidence (paragraphs 116 to 121 above).

Hydrological impacts on wetlands

- 197 KCDC notes that the construction of the Project is likely to have adverse effects on water levels and the hydrology of the wetlands along the route, citing potential effects on the Raumati Manuka Wetland, the Otaihanga wetlands and the Ngarara Wetland as being of particular concern.¹⁰⁶ As outlined in Technical Report 26, I agree with KCDC and the many other submitters that the long-term hydraulic effects on wetlands located in close proximity to the Project remain uncertain. I have responded to this in response to DOC's submission above.

Additional protection and restoration of wetlands

- 198 KCDC also seeks a condition that NZTA provide additional protection and restoration of wetlands and buffers both within and outside of the designation.¹⁰⁷ KCDC's submission does not provide detail on this condition, nor identify appropriate mechanisms and/or locations.
- 199 I agree that additional conditions are required to ensure the long-term protection and management of these mitigation sites. **Mr Fuller** sets out these proposed conditions in his evidence.

Effects on indigenous flora and fauna

- 200 KCDC submits that impacts on indigenous fauna (e.g. native lizard populations) and flora (e.g. dwarf mistletoe) have not been adequately considered and need to be addressed through consent conditions.¹⁰⁸ I disagree with this statement.
- 201 Firstly, the only lizard species detected through substantial search effort was the common skink, a common species of lizard that was abundant along the alignment, particularly in areas of rank pasture. While there is a possibility that other cryptic species of lizard are present (but at levels that prevent observation), other than within the manuka vegetation at the El Rancho Wetland (Weggery), I do not consider additional conditions or mitigation responses are necessary for lizards.
- 202 In terms of KCDC's concerns regarding indigenous flora (i.e. dwarf mistletoe), I consider that potential effects on this 'At risk' species is sufficiently addressed by the requirement to avoid this area of

¹⁰⁶ Refer paragraph 30 of submission 0682.

¹⁰⁷ Refer paragraph 36(b) of submission 0682.

¹⁰⁸ Refer paragraphs 37 and 39 of submission 0682.

vegetation. As outlined in my assessment¹⁰⁹ and paragraph 87 of my evidence, this particular population of *Korthalsella salicornioides* (dwarf mistletoe) is located 100m from the edge of the Project footprint within the privately-owned Ngarara Wetland. The avoidance of this species through the identification of the location of this population, education of contractors and the planting of buffering vegetation is specifically set out my assessment¹¹⁰ and the EMP. Adaptive management is also proposed in the Ngarara Wetland to ensure any potential adverse effects are established and addressed through adaptive management.¹¹¹

Pest control for ecological and restoration plantings

- 203 The control of animal and plant pests¹¹² is addressed in the evidence of **Mr Evans**, as it is a standard requirement of planting maintenance.

Groundwater

- 204 KCDC's submission highlighted the close linkages between the groundwater and ecological sections of the AEE and largely supported the proposed water level monitoring pre-project and post-construction. However, KCDC sought that the processes and methodologies for mitigation and monitoring of hydrological/hydro-geological disturbance of wetland systems require refinement and expansion.¹¹³ KCDC also seeks refinement of the monitoring methodologies proposed, in particular more intensive proactive monitoring in vulnerable areas is required – and for a longer time period.
- 205 As outlined above, I agree with KCDC that surface water, groundwater and ecological matters are closely linked. I note that the condition GD.5 proposed by Ms Williams requires review of groundwater level monitoring data by both a hydrogeologist and an ecologist allowing for the integrated consideration of effects sought by both DOC and KCDC. As set out in **Ms Williams'** evidence, a group of the conditions she had proposed for monitoring of groundwater (conditions GD.1 to GD.8) had been inadvertently left out of the lodged conditions, but are now attached to her evidence at Annexure B. I consider the conditions proposed satisfactorily address the matters sought by KCDC and DOC and ensure a better alignment between the EMP and GMP. I agree further that cross-referencing between the GMP and EMP should be made.

¹⁰⁹ Refer paragraph 5.2.3 of Technical Report 26.

¹¹⁰ Refer paragraph 8.13 of Technical Report 26.

¹¹¹ Refer section 9.1 of Technical Report 26.

¹¹² Refer paragraph 39(b) and 40 of Submission 0682. This matter was also raised by Submitter 0707 [Raumati South Residents Association Inc].

¹¹³ Refer paragraphs 61 – 66 of Submission 0682.

Sediment control and erosion

- 206 KCDC supports the areas identified for particular attention in relation to sediment control and erosion, but seek that several wetlands of value warrant closer attention, including El Rancho Takamore Trust Wetland, Raumati Manuka Wetland and the Otaihanga Wetland.¹¹⁴ KCDC's concerns in relation to sediment control and erosion are discussed in the evidence of **Mr Graeme Ridley**.

Nga Manu Nature Reserve

- 207 The submission from Nga Manu Nature Reserve (Nga Manu) (Submitter 0090) supported the application in part, subject to a number of concerns being satisfied. Ruth McKenzie, the adjacent landowner beside Nga Manu, also submitted in support of Nga Manu's submission and raised similar issues (submission 0046).
- 208 Firstly, in terms of stormwater management, Nga Manu and Ms McKenzie were concerned about the ongoing management of the large flood storage areas proposed to ensure these areas do not deteriorate into weed-infested stagnant ponds. I agree with Nga Manu and Ms McKenzie that the long-term management of these areas is essential to their success. This is addressed in the six months of defects and liability and four years of plant maintenance outlined in Technical Report 7¹¹⁵ and in the evidence of **Mr Evans**.¹¹⁶ Given their excellent knowledge and interest in wetland and riparian planting, I support Nga Manu being involved in an advisory role in the long-term management of these areas, and I consider that this should be provided for in the EMP before it is sent to GWRC for certification.
- 209 A number of other submitters raised concerns regarding potential effects of the Project on Nga Manu.¹¹⁷ I consider that my assessment and the associated ecological technical reports adequately consider and address potential ecological effects on Nga Manu.

El Rancho

- 210 El Rancho (Submitter 477) opposed those consents relating to vegetation clearance, reclamation of wetlands and construction on bore holes as well as the water permits. El Rancho also raised a

¹¹⁵ Refer section 7.22 of Technical Report 7.

¹¹⁶ I note that 5 years is the length of time noted by Submitter 0059 [Friends of the Waikanae River] that new plantings will require maintenance. I note the conditions as lodged referred to a three year maintenance period, however the maintenance periods proposed are for two years maintenance for terrestrial planting and four years for wetlands, see conditions DC.57 and WS.5 discussed further in the evidence of **Mr Evans**.

¹¹⁷ Including Submitter 0357 [Catherine Keno], Submitter 0496 [Wendy Frost], Submitter 0293 [Dr Joy Anderton and Ms Jill Abigail] and Submitter 0669 [Bianca Begovich].

number of ecological issues relating to wetland hydrology, including in regard to the El Rancho Wetland (Weggerly) (KCDC Ecosite K170).

- 211 Through the Project shaping and MCA process, considerable attention was given to avoiding and minimising potential adverse effects on the El Rancho wetland complex and wāhi tapu area. As illustrated in Figure 9D of Technical Report 26, the Project will result in approximately 10% loss of the 3.9 ha El Rancho Wetland (Weggerly). While I assessed this as a moderate effect, when all other physical and property constraints were taken into account, I consider this loss to be a vast improvement ecologically when compared with the Western Link Road designation which would have resulted in the loss of at least 50% of this wetland, as well as the loss of the other El Rancho and adjacent Osbournes wetlands (all of which have been avoided by the Project).
- 212 As addressed in relation to DOC's submission, I consider the matter of potential effects on wetland hydrology associated with the Project can be suitably addressed through the proposed conditions and adaptive management.

Takamore Trust and Te Runanga o Ati Awa ki Whararongotai

- 213 The Takamore Trust (Submitter 0703) opposed the application in part, citing general environmental and ecological impacts through the "Takamore waahi tapu precinct".¹¹⁸ Takamore also raised general mitigation considerations in relation to environmental rehabilitation that are addressed in the statements of **Mr Evans** and **Mr Kamo**.
- 214 Te Runanga o Ati Awa ki Whararongotai (Submitter 0708) submitted more generally that the Runanga's preference would be for an alternative expressway route that reduces the environmental effects on the natural environment. I have addressed these more general matters raised in my response to other submissions.

Raumati South Residents Association Inc.¹¹⁹

- 215 The Association raises a number of matters relating to terrestrial ecology, including concerns regarding the destruction of the Raumati Manuka Wetland; the creation of a stormwater wetland in place of the existing natural wetland; and the 'offset' ratios proposed. Many of these concerns duplicate those made by KCDC's submission which I have addressed earlier in my evidence.
- 216 In terms of the Association's more specific concerns, I reiterate that the Raumati Manuka Wetland will not be 'destroyed' by the Project – in fact only approximately 0.03 ha (15%) will be affected. As

¹¹⁸ Refer section 5.3 of The Takamore Trust Cultural Impact Assessment appended to Submission 0703.

¹¹⁹ Submitter 707.

illustrated in Figure 9A in Technical Report 26, much of this loss relates to the requirement for a cycleway/walkway through this area. This may be able to be minimised through the use of boardwalks through detailed design.

- 217 In terms of the Association's concerns regarding the creation of stormwater wetlands in place of existing wetland, while unclear, I have assumed that this relates to either proposed flood storage area OB adjacent to the Raumati Manuka Wetland to the north of the Project or proposed flood storage area OC adjacent to the south of this wetland. Both these areas are for the sole purpose of flood storage capacity and have been designed to minimise potential effects on the Raumati Manuka Wetland. These areas are addressed in more detail in the evidence of **Mr Levy**. **Mr Fuller** addresses the matter of 'offset' ratios in his evidence.
- 218 The Association also raises loss of kanuka forest as a concern, including at Raumati Road. As noted in Technical Report 26, we have ascribed a high ecological value for kanuka forest and recommended a 3:1 mitigation ration for the loss of this vegetation community. With the exception of the Otaihanga Kanuka Forest, it is notable all dryland vegetation affected by the Project has regenerated since 1966 (based on historic aerial photos of this area).
- 219 I have addressed those matters relating to wetland hydrology earlier in my evidence in response to DOC's submission. However, in response to the Association's concerns regarding an absence of hydrological monitoring proposed in the Poplar Ave Wetland, I can confirm that I based my assessment of this risk on the results of groundwater modelling, discussions with the Groundwater Team and Technical Report 21.¹²⁰ Based on this assessment and the approximately 800m distance between this wetland and the Project, I did not consider this wetland to be at risk of hydrological changes from the Project.

Western Link Road (WLR) comparison

- 220 A number of submitters¹²¹ have expressed their preference for the WLR over the Project as having less ecological impacts. I disagree with these submissions. As I outlined in Technical Report 26,¹²² the Project is considered to have substantially reduced ecological impacts on terrestrial ecology when compared with the designated

¹²⁰ Assessment of Groundwater Effects.

¹²¹ Including Submitter 0008 [Kathleen Hunter], Submitter 0477 [El Rancho], Submitter 0328 [Mrs Prue Sisarich], Submitter 0329 [Dr Christine Lenk], Submitter 0337 [Mrs Elizabeth Laing], Submitter 0340 [Te Ra School], Submitter 0354 [Dr April Walker], Submitter 0372 [Suzanne Vere-Jones], Submitter 0389 [Steven and Kathleen Ransley], Submitter 0492 [Brent Cherry], Submitter 0510 [Stacey Gasson], Submitter 0572 [Alliance for a Sustainable Kaptiti], Submitter 0589 [Richard Starke] and Submitter 0676 [Roger Brittain].

¹²² Refer sections 7.2 and 7.3 of Technical Report 26.

WLR. Most notably, the Project avoids 10 ecologically significant wetlands that would have been significantly affected by the WLR (9 of these wetlands being ecological sites scheduled in the Kāpiti Coast District Plan). The Project also minimises vegetation and habitat loss at a number of areas of dryland vegetation that would have been lost as part of the WLR.

- 221 In addition to minimising as far as practicable impacts on areas of terrestrial vegetation, the Project also sought to minimise effects on areas of ecological restoration potential, such as Queen Elizabeth Park. Further, as outlined in my assessment, the proposed landscape and visual planting and other planted areas will contribute to, and ultimately enhance, the biodiversity of the Kāpiti Coast.

Importance of wetlands

- 222 Various submitters¹²³ opposed consents for water permits to divert groundwater from wetlands adjacent to the Project, land use consent for the partial reclamation of wetlands in the vicinity of the Project and land use consent to remove vegetation in the beds of various watercourses and wetlands, citing the importance of wetlands and maintaining the natural ecology. Other submitters suggested that insufficient investigations as to the ecological values of wetlands had been undertaken.¹²⁴ Similarly, other submitters sought that potential effects on wetlands be kept to a minimum and appropriately monitored through consent conditions.¹²⁵ Submitter 0735¹²⁶ noted that the construction of new wetlands cannot replace the complex ecosystems which have evolved over a long period of time in the original swampy areas.
- 223 As outlined in Technical Report 26, the Project has sought to minimise wetland habitat loss and associated effects on these areas through the design process,¹²⁷ and this is reflected through the mitigation proposed. In addition, a number of consent conditions are proposed¹²⁸ to ensure any potential adverse effects on wetlands and habitat are picked up by monitoring during and for some period after construction.

¹²³ Including Submitter 016 [Ms Jamie Bull], Submitter 0150 [Dr Kelly Hare], Submitter 0270 [Mr Bob Gregory], Submitter 0309 [Ms Loretta Pomare], Submitter 0318 [Charles Richard], Submitter 0536 [Kathleen Pivac], Submitter 0611 [Kent Duston].

¹²⁴ Including Submitter 0251 [Mr William Mansfield].

¹²⁵ Including Submitter 0256 [Mr James Dryburgh] and Submitter 0289 [Maria Gyles].

¹²⁶ Jenny Scott.

¹²⁷ Submitter 0656 [Anna Carter] was one of a number of submitters who acknowledged that the Project had largely avoided a number of wetlands that would have been compromised by the WLR.

¹²⁸ These conditions are discussed in paragraph 144 earlier.

- 224 Other submitters raised concerns regarding the mitigation for loss of wetlands.¹²⁹ I have addressed mitigation for loss of wetlands earlier in my evidence and this matter is discussed further in the evidence of **Mr Fuller**.
- 225 Submitter 0718 [Derek Schulz] raised concern regarding the lack of consideration to the ecological values given in the assessment of Kiwi Pond (which the submitter refers to as the Raumati Beach Dune Lake), a seasonally flooded area just south of the Wharemauku Stream.¹³⁰ I reiterate my assessment in Technical Report 27 that Kiwi Pond was included in my assessment as a 'large area of seasonally wet pasture that provides occasional wildlife habitat'.¹³¹ This approximately 1.8ha pond was also assessed for its ecological significance and scored low overall. These low value sites were still acknowledged as providing ecological benefits.¹³²
- 226 Mr Schulz states that Kiwi Pond is a dune lake that has "*survived the considerable land transformations that have occurred in this area and that it continues to function as it must have done over the millennia*". I disagree with this statement. A review of 1956, 1966 and 1987 aerial photos of this area demonstrate that there was no wetland or pond present in the current location of Kiwi Pond, even during wet periods – confirming that this pond was created by flood embankments for the Wharemauku Stream post-1987.¹³³ However, it is important to note that this large area (approximately 5.3 ha) is proposed to comprise planted flood storage area with predominantly wetland plants and areas of open water. This will provide improved habitat.
- 227 Mr Schulz also questioned the methodology of the ecological investigations, stating the ecology team relied on earlier reports commissioned for KCDC. I disagree with this statement and I consider the ecology team's approach was robust and consistent with best practice. The Wildlands Reports referred to by Mr Schulz (and the basis for KCDC's scheduled sites) were an important part of our assessment.

Wetland hydrology

- 228 A number of submitters raised concerns at the potential impacts on wetlands adjacent to the Project resulting from construction and

¹²⁹ Including Submitter 0327 [Neil Saxby and Barbara Moutier].

¹³⁰ Similarly, Submitter 0470 [Ruth Love], Submitter 0606 [Wayne Love], Submitter 0607 [Kath Saint], Submitter 709 [Errelyn Jone] raised similar issues.

¹³¹ Refer Table 5 of Technical Report 27.

¹³² Refer section 4.7.3 of Technical Report 27.

¹³³ Attached to my evidence as **Annexure G**.

groundwater diversion.¹³⁴ I agree with many of these submitters that the hydrology of these wetlands and the associated groundwater interactions is complex - and this is reflected in my assessment and the proposed consent conditions.¹³⁵ I have addressed this matter in some detail in response to DOC's submission earlier in my evidence.

Effects on other areas of ecological value

- 229 A number of submitters raised general concerns that the Project would adversely affect the many restoration projects undertaken in the Kāpiti District.¹³⁶ For example, Submitter 0662¹³⁷ was concerned that the Project would impact on the wetland restoration partnerships close to Poplar Ave wetland and future restoration projects in this area. As discussed earlier in my evidence, and in the evidence of **Mr Evans**, the scale of landscaping mitigation planting and the incorporation of Raumati Manuka Wetland and other wetlands within the designation will go some way to ensuring the long-term health and functioning of these wetlands consistent with the long-term restoration objectives of the wider community.
- 230 Other submitters raised more specific issues about potential adverse effects on areas of ecological value near the Project. For example, Mr David Hare¹³⁸ raised particular concerns regarding the potential effects on the QEII covenanted remnant swamp forest of Ngarara Bush. As outlined in Technical Report 26, Ngarara Bush was identified as having high ecological value and was assessed on this basis. I note that a number of KCDC's public water supply wells currently abstract water close to Ngarara Bush (KB5 and KB6). **Ms Williams** advises that the variation in groundwater level resulting from these takes would mask the small changes anticipated from the Expressway.
- 231 Save Kapiti Incorporated¹³⁹ raised a concern regarding the loss or compromising of the relatively few remnant indigenous vegetation areas remaining on the Kapiti Coast, among other general ecological concerns. As has already been noted, no remnant indigenous vegetation is located within the Project footprint.

¹³⁴ Including Submitter 072 [Ms Dinah Hawkin], Submitter 0293 [Dr Joy Anderton and Ms Jill Abigail], Submitter 0350 [Ms Marion Sherley], Submitter 0656 [Anna Carter] and Submitter 0347 [Alan and Mrs Ann Parsonage].

¹³⁵ Refer Proposed Conditions G29, G34, G38 and G40 in relation to the GWMP and EMP and adaptive management.

¹³⁶ Including Submitter 0293 [Dr Joy Anderton and Ms Jill Abigail], Submitter 0346 [John Downie,], Submitter 0354 [Dr April Walker], Submitter 0496 [Wendy Frost], Submitter 0616 [Dr Diane Connal], Submitter 0699 [Joanna Davies] and Submitter 0712 [Pam Strike].

¹³⁷ Ms Eleanor Staple.

¹³⁸ Submitter 0207.

¹³⁹ Submitter 0505.

232 A number of submitters also raised concerns regarding the loss of exotic flora and fauna, including the loss of established gardens, a rare orchard¹⁴⁰ and effects on honey bees and monarch butterflies.¹⁴¹ I have considered significant areas of indigenous vegetation and habitat for indigenous fauna as required under section 6(c) RMA. I note that Mr Evans has identified established areas of exotic vegetation in conjunction with my field mapping to be retained along the Project.

Ecological values in and around Poplar Ave, Raumati South

233 A number of submitters¹⁴² stated that the ecological value and significance of the area at the southern end of the Project have not been investigated by NZTA – citing that this is an area of unique biodiversity, of native trees, plants and magnificent stands of mature trees up to 100 years old. I can confirm that I visited this area, including walking through much of this area with residents and **Dr Bentley**. While there are a number of scattered native trees present, my site visit and a review of historical aerial photographs confirms all the trees present today have established since residential housing in this area post-1950s. My field assessment and mapping of this area did not identify any vegetation or habitat I considered to comprise significant indigenous vegetation.

234 Related to this matter and those submitters supporting the WLR as having reduced ecological effects, a number of submitters suggested the Project would have reduced ecological effects if located further west along Poplar Ave.¹⁴³ As outlined in Technical Reports 26 and 27, this area contains a large, ecologically significant wetland – the Raumati South Peatlands. This 11.1 ha manuka-dominated wetland is considered to comprise significant indigenous vegetation under section 6(a) RMA and it was considered accordingly during the MCA process.¹⁴⁴ In addition to being a KCDC District Plan scheduled Ecosite (K131), this wetland also provides habitat for locally uncommon plant species, including species at the southern limit of the Wellington Conservancy.

¹⁴⁰ Submitter 0621 [Nicola Easthope].

¹⁴¹ Including Submitter 0309 [Ms Loretta Pomare], Submitter 0542 [Highway Occupants Group], Submitter 0437 [Andrew and Lynnette Pritchard], Submitter 0622 [Ms Beth Lindsay] and Submitter 0659 [Christopher Benge].

¹⁴² Including Submitter 0542 [Highway Occupants Group], Submitter 0609 [Diane Benge] and Submitter 0622 [Ms Beth Lindsay].

¹⁴³ Including Submitter 0230 [Fourways Enterprises], Submitter 0542 [Highway Occupants Group], Submitter 0390 [Graham McCall], Submitter 0437 [Andrew and Lynnette Pritchard], Submitter 0650 [Tony Brown] and Submitter 0654 [Brent McKay and Ms Tordis Flath].

¹⁴⁴ This decision-making tool is described in more detail in the evidence of **Dr Bentley** and **Mr Schofield**.

Flood storage areas and stormwater treatment wetlands

- 235 A number of submitters raise concerns around the ecological benefits and long-term management of the flood storage areas and stormwater treatment wetlands.¹⁴⁵ In terms of the management of these areas, ecological input into the design and long-term maintenance of these areas will reduce the risks of stagnant water and odours.
- 236 Anna Carter¹⁴⁶ submitted that even without the Project, the restoration of the Waikanae River and the former Waikanae Oxidation Ponds would have occurred, given these areas have restoration plans. Ms Carter stated that the mitigation works proposed are not new works and therefore cannot be considered mitigation. I disagree with this statement, particularly in light of KCDC's submission that the management plan for the former Waikanae Oxidation Ponds is currently under review.

Management Plans and adaptive management

- 237 A number of submitters raised general concerns regarding the management plans and the concept of adaptive management,¹⁴⁷ stating a lack of confidence in these plans working. These issues are covered in the evidence of **Mr Fuller**.

CONCLUSIONS

- 238 Expert ecological involvement has formed an important component of the proposed Expressway design and alignment. As a result, the most ecologically significant areas have either been avoided or the potential scale of effects on these areas minimised as far as possible. There have also been a large number of other smaller changes of alignment or design that have all contributed to an improved environmental result.
- 239 Most notably, the Project avoids a large number of statutorily recognised or ecologically significant wetlands and areas of indigenous vegetation and habitat along its length.
- 240 Where the alignment could not avoid areas of ecological value or important habitats for flora and fauna, all reasonable efforts have been made to minimise the extent of loss, and to identify further opportunities for minimising effects through the detailed design process that will follow.

¹⁴⁵ Including Submitter 0293 [Dr Joy Anderton and Ms Jill Abigail] and Submitter 0309 [Ms Loretta Pomare], Submitter 0656 [Anna Carter], Submitter 0682 [KCDC], Submitter 0621 [Nicola Easthope], Submitter 0662 [Ms Eleanor Staple], Submitter 0675 [Dr Marie O'Sullivan] and Submitter 0725 [Rachel Elizabeth Palmer].

¹⁴⁶ Submitter 0656.

¹⁴⁷ Including Submitter 0309 [Ms Loretta Pomare].

- 241 The nature of the study area has meant that some areas of indigenous vegetation and wetland will be lost beneath the Expressway or will be affected by other construction activities. These activities will lead, at least in the short term, to significant and unavoidable impacts on terrestrial habitats and their associated fauna.
- 242 I have considered the magnitude and significance of these residual impacts and recommended a number of mitigation measures to address these effects. As a result of the mitigation now proposed, there are anticipated to be some long-term ecological benefits in a number of locations on the Kāpiti Coast. A number of areas of significant indigenous vegetation will also be enhanced and assured permanent protection within the final designation. Overall, assuming the proposed mitigation is established, most ecological effects are considered to be minor.
- 243 To ensure these benefits will occur, ecologists were involved in the development of the Ecological Management Plan that describes the methods for monitoring and managing the effects of construction.

A handwritten signature in black ink, appearing to be 'M. Park', written in a cursive style.

Matiu Park
5 September 2012

**ANNEXURE A: DETAILED DESCRIPTIONS OF TERRESTRIAL AND
WETLAND ENVIRONMENTS POTENTIALLY AFFECTED**

1. Raumati Manuka Wetland

Characteristics

- This moderate wetland comprises a manuka dominated wetland with *Sphagnum* with large areas of open water and *Isolepis prolifa*.
- Some areas of *Carex* sedgeland, open water and areas of *Baumea* rushland around the wetland margins.
- This wetland has large ephemeral edges dominated by *Baumea*, gorse and fern and wetland species.
- Assumed this wetland is modified from its former extent as a result of historical vegetation clearance and drainage associated with Drain 7, a tributary of the Wharemauku Stream.
- A seasonally wet dune depression with no direct hydrological linkages. Wetland levels presumed to be driven by water levels in Drain 7 – as this is located within the same bed of peat.
- Approximately 2 ha in size.

Values

- Not listed as a KCDC Ecosite in District Plan.
- Wetland interior relatively weed free, but surrounded by a large buffer of gorse and blackberry.
- *Nertera scapanoides* an uncommon herb in the Wellington Conservancy is a dominant ground cover in large wet areas.
- *Baumea teretifolia* which is at its southern limit in the conservancy.
- *Gleichenia dicarpa* / *G. microphylla* hybrid also somewhat uncommon in the conservancy.

General Description

The ecological value of the wetland is assessed as Medium.



Scale of works

- Limited wetland vegetation clearance on northern margins as part of Expressway embankment construction (0.03 ha loss).

Works Monitoring

- Wetland Condition Monitoring (pre and post-construction).
- 3 Piezometers (pre, during and post-construction) – up to twice-weekly through active construction phase (when works are located within 200m of the section).

Mitigation Monitoring

- No mitigation works proposed.

2. Sovereign Way / Crown Hill Eco-Site

Characteristics

- A small manuka transitional wetland that has been subject to some recent edge restoration planting.
- Located in a low-lying inter-dunal depression and water levels subject to localised rainfall in surface water table.
- Surrounded by residential development to north, south and west and future flood storage ponds associated with the Meadows Trust Plan Change.
- No direct freshwater connections with other waterbodies – but potential to link as part of Meadows Trust Plan Change.
- Approximately 0.6 ha in size.

Values

- Protected by KDCDC Recreation Reserve (E183), KDCDC Ecosite (E92).
- The reserve is set within a small peat dune depression and contains good manuka habitat with a number of older kahikatea trees.
- There has been substantial restoration undertaken around the perimeter of the reserve, with plantings of rimu and kahikatea.
- Moderate prevalence of weed species in parts.

General Description

An isolated manuka transitional wetland set amongst residential dwellings within a small peat dune depression, the site contains good manuka habitat with a number of older kahikatea and rimu trees.

The ecological value of the wetland is assessed as Medium.



Scale of works

- No effects, wetland is located approximately 125 m from Expressway.

Works Monitoring

- 1 piezometer (pre, during and post-construction) – up to twice-weekly through active construction phase (when works are located within 200m of the section).

Mitigation Monitoring

- No mitigation works proposed.

3. Southern Otaihanga Wetland

Characteristics

- A large purei sedgeland (*Carex secta* and *Carex virgata*) with large areas of open water, *Baumea* rushland and scattered manuka (mostly dead or dying).
- The northern extent of this wetland adjoins a small remnant of dry vegetation with a large matai.
- Standing water through winter and spring dries out over summer months.
- A seasonally wet dune depression with no direct hydrological linkages.
- Manuka die-back, current wetland species composition and scale of land use change in adjacent Otaihanga Landfill suggest altered water tables from historic levels.
- Potential water quality issues with close proximity to Otaihanga Landfill.
- Approximately 1.4 ha in size.

Values

- KCDC-owned land, no formal protection.
- Not identified as a KCDC Ecosite, but identified in KCDC areas assessed for ecological values.
- Predominantly *Carex secta*, but a large area of *Baumea teretifolia*.
- Wetland interior relatively weed free, but surrounded by a large buffer of plantation pine and blackberry on margins. Scattered gorse in some dryer areas of wetland interior.

General Description

The ecological value of the wetland is assessed as Medium.



Scale of works

- Approximately 0.55 ha of vegetation clearance through southern half of this wetland as part of Expressway embankment and cycleway construction.

Works Monitoring

- Wetland Condition Monitoring (pre and post-construction).
- 3 piezometers (pre, during and post-construction) to ensure hydrology in residual area of wetland is maintained.

Mitigation Monitoring

- No mitigation works proposed.

4. Northern Otaihanga Wetland

Characteristics

- A moderately sized manuka and Carex wetland situated between two high sand dunes.
- A seasonally wet dune depression with no direct hydrological linkages. Standing water of approximately 0.5m deep disappearing during summer months.
- A road has separated the two wetland components and impeded drainage, modifying the vegetation from historical extent.
- Manuka die-back, current wetland species composition and scale of land use change in adjacent Otaihanga Landfill suggest altered water tables from historic levels.
- Potential water quality issues with close proximity to Otaihanga Landfill.
- Plantation pine surrounding wetland has been recently cleared.
- Approximately 1.0 ha in size.

Values

- KCDC-owned land, no formal protection.
- Not identified as a KCDC Ecosite, but identified in KCDC areas assessed for ecological values.
- Predominantly *Carex secta* and *Carex virgata* with manuka on raised hummocks within wetland.
- Wetland interior relatively weed free, but surrounded by a large buffer of plantation pine and blackberry on margins. Scattered gorse and blackberry in some dryer areas of wetland interior.

General Description

The ecological value of the wetland is assessed as Medium.



Scale of works

- Approximately 0.53 ha of vegetation clearance through southern half of this wetland as part of road embankment and cycleway construction.

Works Monitoring

- Wetland Condition Monitoring (pre and post-construction).
- 2 piezometers (pre, during and post-construction) to ensure hydrology in residual area of wetland is maintained.

Mitigation Monitoring

- No mitigation works proposed.

5. El Rancho Wetland (Weggery)

Characteristics

- A large area of manuka dominated wetland with some open water.
- A small number of remnant kahikatea present and showing a high biodiversity of wetland species present.
- Wetland interior remains relatively intact and weed free, although buffer has large components of gorse and blackberry.
- A seasonally wet dune depression with no direct hydrological linkages.
- Drainage in recent years has modified historical Sphagnum wetland values.
- Some restoration planting taking place on outer edge by El Rancho.
- Approximately 3.9 ha in size.

Values

- Privately owned land.
- KCDC Ecosite (K170), identified in KCDC areas assessed for ecological values.
- Nationally vulnerable *Ophiglossum petiolatum* (stalked adders tongue fern) has been recorded in this wetland in 1981, although it has not been recorded since.
- El Rancho Wetland (Weggery) forms part of the wider El Rancho/Takamore wetlands and when considered together have an SSBI (Site of Significant Biological Interest) ranking of “moderate-high”.
- Wetland interior relatively weed free, but surrounded by a large buffer of pasture and gorse and blackberry.

General Description

The ecological value of the wetland is assessed as Medium.



Scale of works

- Approximately 0.38 ha of vegetation clearance through southern half of this wetland as part of road embankment construction.

Works Monitoring

- Wetland Condition Monitoring (pre and post-construction).
- 4 piezometers (pre, during and post-construction) to ensure hydrology in residual area of wetland and other El Rancho wetlands is maintained.

Mitigation Monitoring

- No mitigation works proposed.

6. Te Harakeke / Kawakahia Wetland

Characteristics

- Ultimate receiving environment of the Paetawa, Kakariki, Ngarara Creek and Ngarara Streams.
- Approximately 58 ha in size.
- Catchment mainly pastureland, with some urban land-use.
- Water quality in most upstream areas affected by agricultural runoff and urban contaminants.

Values

- Protected by QEII Covenants, KCDC Ecosite (K066), RAP (PNAP).
- Recognised as nationally significant and included in Kāpiti Coast District Plan 9.
- One of the largest wetlands in the Wellington Region.
- The largest dune swale wetland remaining in a relatively natural state on the coastal plain of the Foxton Ecological District.
- Home to a number of nationally threatened bird species, including bittern and fernbird.
- High biodiversity values.
- Moderate prevalence of weed species in parts.
- Likely to provide a key role in freshwater fish habitat, particularly diadromous species.

General Description

The wetland discharges to the Ngarara / Waimeha stream, before entering a high energy open sandy beach to the Tasman Sea at Ngarara / Waimeha Estuary.

The Te Harakeke/Kawakahia Wetland is subject to a number of long-term hydrological and ecological monitoring programmes (GWRC), including weed control and restoration.

The ecological value of the wetland is assessed as High.



Scale of works

- Indirect effects only – receiving sediment and treated runoff during construction and operation of Expressway.

Works Monitoring

- Sediment monitoring within Te Harakeke / Kawakahia Wetland and Ngarara Stream.
- 2 piezometers (pre, during and post-construction) to ensure hydrology in residual area of wetland and other El Rancho wetlands is maintained.

Mitigation Monitoring

- No mitigation works proposed.

7. Kawakahia Swamp Forest

Characteristics

- A small area of kahikatea dominated semi-coastal remnant swamp forest.
- One of very few remnants of swamp forest left in the Kāpiti Coast District.
- Approximately 0.8 ha in size.
- Catchment mainly pastureland, with some urban landuse and scattered areas of indigenous vegetation and wetland.

Values

- Protected by KCDC Ecosite (K066), QEII Covenants, DOC RAP (PNAP). Forms part of a 20.8ha QEII Covenant (the Ngarara Covenant 5/07/240B).
- Considered as part of the adjacent nationally significant Te Harakeke / Kawakahia Wetland.
- Likely to provide habitat for a number of nationally threatened bird species.
- High biodiversity values, including presence of remnant swamp forest.
- Largely weed free
- Likely to provide a key role in freshwater fish habitat, particularly diadromous species (eel, galaaxids) upstream to Ngarara Creek and Bristed Bush / Nga Manu Bush.

General Description

The ecological value of the wetland is assessed as high.

The wetland discharges to the adjacent Te Harakeke/Kawakahia Wetland, of which the Kawakahia swamp forest would have historically formed part.



Scale of works

- Indirect effects only – receiving sediment and treated runoff during construction and operation of alignment.

Works Monitoring

- No monitoring proposed.

Mitigation Monitoring

- No mitigation works proposed.

8. Ti Kouka Wetland

Characteristics

- A large area of regenerating kahikatea wetland, with scattered remnant kahikatea surrounded by regenerating secondary broadleaved vegetation dominated by mahoe.
- One swamp maire tree present.
- Wetland and forest margins have been enhanced through restoration planting.
- Large areas of blackberry with gorse dominate the northern component of the wetland. Almost entirely surrounded by pasture and gorse/weedlands after recent pine forest clearance (2009).
- Approximately 3.7 ha in size.
- Ngarara Creek runs through a drain cut through the northern extent.
- Catchment mainly pastureland, with some urban land-use and scattered areas of indigenous vegetation and wetland.
- Vegetation succession (increasing dryland species) suggests a general drying out of this area compared with historical species presence.

Values

- Protected by KCDC Ecosite (K066), QEII Covenants, DOC RAP (PNAP). Forms part of a 20.8ha QEII Covenant (the Ngarara Covenant 5/07/240B).
- Historically, formed part of the adjacent nationally significant Te Harakeke / Kawakahia Wetland.
- High biodiversity values, including presence of remnant swamp forest.
- Aside from the blackberry and gorse, this area is relatively weed-free.
- Ngarara Creek, which runs through the northern extent, is likely to provide a key role in freshwater fish habitat, particularly diadromous species upstream to Ngarara Creek and Bristed Bush / Nga Manu Bush.

General Description

The ecological value of the wetland is assessed as Medium.



Scale of works

- Indirect effects only – receiving sediment and treated runoff during construction and operation of alignment.

Works Monitoring

- Not specifically monitored for ecological purpose, but 2 piezometers installed (pre, during and post-construction) to ensure hydrology is maintained.

Mitigation Monitoring

- No mitigation works proposed.

9. Ngarara Wetland

Characteristics

- A large area of manuka dominated wetland with areas of *Carex* sedgeland and regenerating kahikatea forest east of Ngarara Road.
- Wetland margins surrounding the wetland core are dominated by blackberry.
- Approximately 2.7 ha in size.
- A peat-dominated dune depression, with no hydrological connections to other waterbodies.

Values

- Protected by KCDC Ecosite (K066) (Combined).
- One of the few wetlands on the Kāpiti Coast that still contains the naturally uncommon mistletoe *Korthalsella salicornioides*.
- North Island fernbird observed in the immediate vicinity and Ngarara Wetland and the adjacent Nga Manu Nature Reserve are considered to provide seasonal habitat for this species and potentially other cryptic wetland species.
- Moderate biodiversity values.
- Large weedlands of blackberry and gorse.

General Description

The ecological value of the wetland is assessed as Medium.

Scale of works

- Indirect effects only – limited vegetation clearance adjacent to northern margins of this wetland as part of road embankment construction.



Works Monitoring

- Fernbird population monitoring (pre and post-construction).

Mitigation Monitoring

- No mitigation works proposed.

10. Raumati Road Kanuka

Characteristics

- A small area of kanuka forest and treeland with scattered mahoe on the raised dunes south of Raumati Road.
- Grazed understory, with large areas of blackberry and other adventives weed species present.
- Approximately 0.4 ha in size.

Values

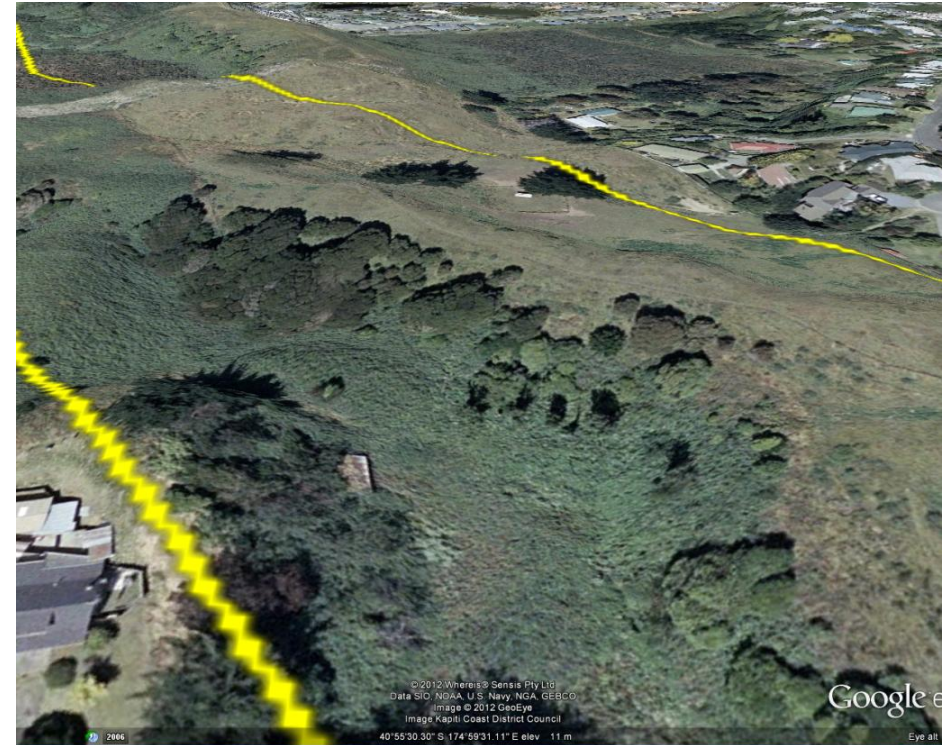
- NZTA-owned land.
- Vegetation not identified in District Plan or any other inventories.
-

General Description

The ecological value of the kanuka forest is assessed as High.

Scale of works

Almost all the kanuka forest and scattered trees in this area would be removed as part of the site works in this location (approximately 0.35 ha or 88% of the vegetation).



Works Monitoring

- None

Mitigation Monitoring

- No mitigation works proposed.

11. Otaihanga Landfill Mahoe

Characteristics

- A small area of regenerating indigenous forest on an elevated sand dune dominated by one large remnant matai tree surrounded by regenerating mahoe and the northern Otaihanga Wetland.
- Approximately 0.1 ha in size.

Values

- KCDC-owned land.
- Not listed in District Plan. Identified in KCDC areas assessed for ecological values
- Relatively weed free and good condition due to a lack of grazing associated with the surrounding forestry and wetland vegetation. However, adjacent pine forest limiting regeneration.

General Description

The ecological value of the forest is assessed as Medium.

Scale of works

- Some distance from extent of physical works and therefore not affected.



Works Monitoring

- No works monitoring proposed.

Mitigation Monitoring

- No mitigation works proposed.

12. Otaihanga Kanuka Forest

Characteristics

- A small area of kanuka forest on an elevated sand dune.
- While the kanuka forest canopy remains largely intact, the under storey has been highly modified by introduced pasture grasses and there is only limited indigenous flora present, typically mahoe, karamu and young Coprosma.
- Mountain bike tracks and associated structures traverse this small remnant.
- Approximately 0.5 ha in size.

Values

- KCDC-owned land.
- Not listed in District Plan. Identified in KCDC areas assessed for ecological values
- Understorey almost entirely dominated by exotic grasses, which are restricting natural regeneration.

General Description

The ecological value of the forest is assessed as High.

Scale of works

- Approximately 0.17 ha of this 0.5 ha remnant (34%) would be lost as part of cycleway embankment construction. There will also be some edge effects following clearance until vegetation establishment.
- There is potential to reduce the scale of vegetation loss in this area through reduced embankments through detailed cycleway design.



Works Monitoring

- Monitor vegetation clearance to minimise impacts.

Mitigation Monitoring

- No mitigation works proposed.

13. Waikanae River Riparian (includes Muaupoko Stream outlet)

Characteristics

- The riparian vegetation in this section of the Waikanae River and Muaupoko Stream outlet consists of a thin strip of willow on the immediate river edge with large areas of indigenous restoration plantings on the southern side.
- There are also large areas of wetland plantings, in the flood-prone flood channels on the flood plain on the southern side of the River.
- On the northern side, almost all the vegetation is willow, with areas of weedland and occasional native regeneration.
- Approximately 0.5 ha in size.

Values

- GWRC-administered land (flood protection).
- Not listed in District Plan as having ecological values.
- Significant undertaking by volunteer planting and restoration groups (Friends of Waikanae River) and ongoing weed and plant maintenance by KCDC.

General Description

The ecological value of the forest is assessed as Low.

Scale of works

- The Waikanae River will be diverted twice as part of the construction of the Waikanae River bridge.
- Approximately 0.13 ha of the riparian planting on the southern side of the River will be lost as part of bridge construction, abutments and construction of riprap, flood protection and a new stream outlet for the Wharemauku Stream. Predominantly willow will be lost on the northern side, mostly as a result of GWRC flood channel widening being undertaken by the Project.



Works Monitoring

- None

Mitigation Monitoring

No mitigation works proposed.

14. Tuku Rakau Forest

Characteristics

- A small area of advanced regenerating mahoe forest with one remnant kohekohe tree.
- Adjacent to a small wetland with scattered manuka, cabbage trees, *Baumea* and *Juncus* species.
- Typically a mahoe-monoculture with little other regeneration, but contiguous aspect with wetland vegetation is relatively unique on the Kāpiti Coast.
- Approximately 0.9 ha in size.

Values

- Privately owned and not identified in the District Plan as having ecological values.
- Forest area is relatively weed-free, although wetland and forest margins are dominated by blackberry, wattle and other exotic plantings. Gorse also prevalent on margins.

General Description

The ecological value of the forest is assessed as Low.

Scale of works

- Approximately 0.25 ha of this 0.9 ha area of regenerating mahoe (approximately 28%) would be lost on the southern slopes as part of the Expressway embankment construction.



Works Monitoring

- None

Mitigation Monitoring

No mitigation works proposed.

15. Ngarara Mahoe Forest

Characteristics

- A large area of advanced mahoe regenerating from gorse on the raised dunes of Ngarara Farm.
- Typically a mahoe-monoculture with little other regeneration.
- Approximately 4.2 ha in size.

Values

- Privately owned, not identified in the District Plan as having ecological values.
- Regenerating mahoe component is relatively weed-free, although forest margins are dominated by blackberry with gorse also prevalent on margins.

General Description

The ecological value of the forest is assessed as Medium.

Scale of works

- Approximately 0.86 ha of this 4.2 ha area of regenerating mahoe (approximately 20%) would be lost as part of the Expressway construction.



Works Monitoring

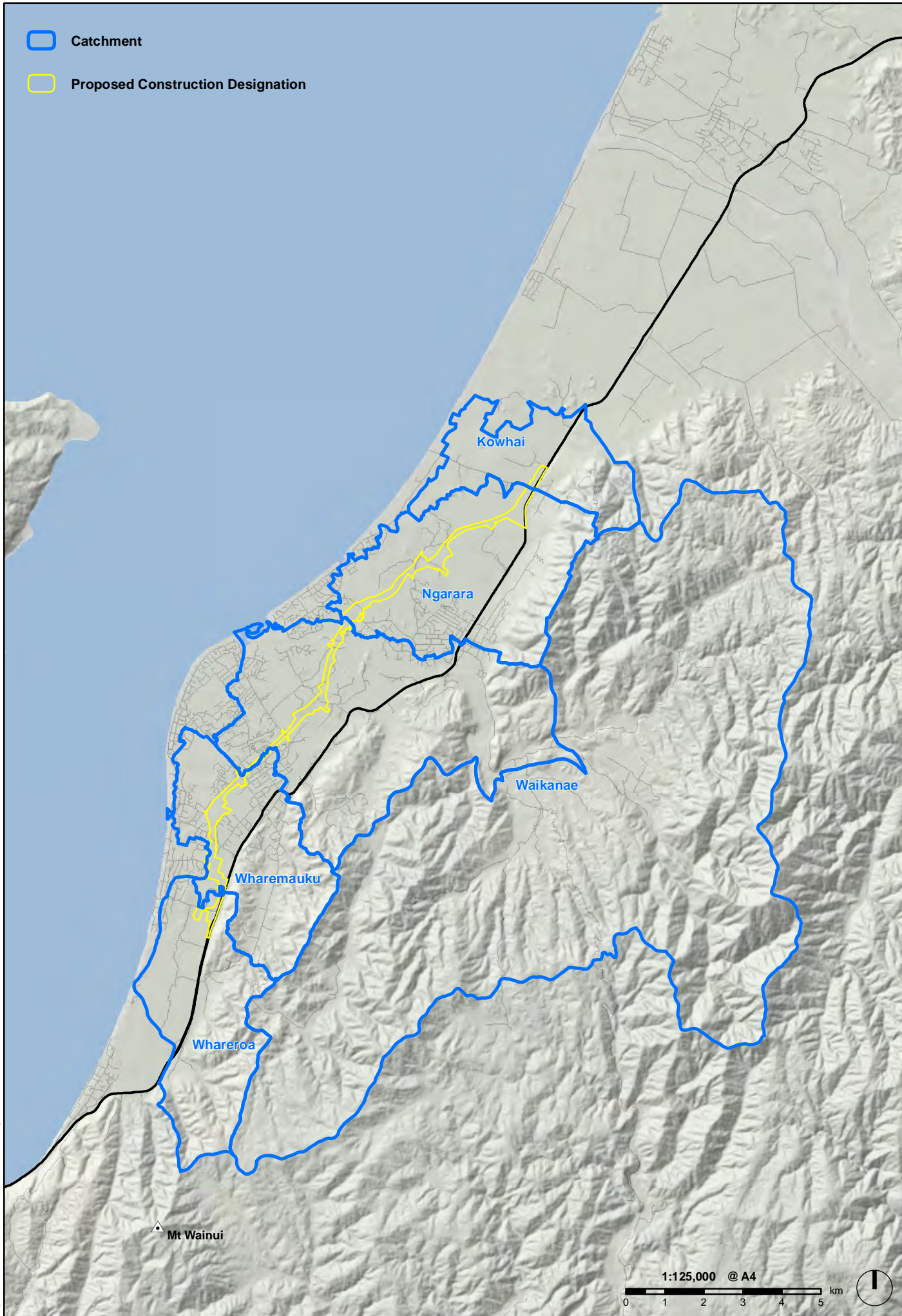
- None

Mitigation Monitoring

No mitigation works proposed.

ANNEXURE B: MAP 1 - STUDY AREA

-  Catchment
-  Proposed Construction Designation



September 4, 2012 W09181E_EVI_StudyArea_A4.mxd

ANNEXURE C: PROPOSED RESOURCE CONSENT CONDITIONS

Proposed general resource consent conditions

Reference	Wording of Draft Conditions
	Review Condition
G.7	<p>The Manager may review any or all conditions of this consent by giving notice of their intention to do so pursuant to Section 128 of the Resource Management Act 1991, at any time within six months of the first, third and fifth anniversaries of the date of commencement of the works authorised by this consent for any of the following purposes:</p> <ol style="list-style-type: none"> a) To deal with any adverse effects on the environment, which may arise from the exercise of this consent, and which it is appropriate to deal with at a later stage; and b) To review the adequacy of any monitoring plans proposed and/or monitoring requirements so as to incorporate into the consent any monitoring or other requirements which may become necessary to deal with any adverse effects on the environment arising from the exercise of this consent.
	Complaints
G.8	<p>During construction Work, the consent holder shall maintain a permanent record of any complaints received alleging adverse effects from, or related to, the exercise of this consent. The record shall include:</p> <ol style="list-style-type: none"> a) the name and address (as far as practicable) of the complainant; b) identification of the nature of the complaint; c) location, date and time of the complaint and of the alleged event; d) weather conditions at the time of the complaint (as far as practicable), including wind direction and approximate wind speed if the complaint relates to air discharges; e) the outcome of the consent holders investigation into the complaint; f) measures taken to respond to the complaint; and g) any other activities in the area, unrelated to the project that may have contributed to the complaint, such as non-project construction, fires, or unusually dusty conditions generally. <p>The consent holder shall also keep a record of any remedial actions undertaken.</p> <p>This record shall be maintained on site and shall be made available to the Manager and the Territorial Authority, upon request. The consent holder shall notify the Manager and the</p>

Reference	Wording of Draft Conditions
	Territorial Authority of any such complaints as soon as practicable after the complaint is received by the consent holder, or any representatives. This notification shall be either by telephone or email, or via an alternative electronic method as agreed with the Manager.
	Incidents
G.10	<p>The consent holder shall, if requested by the Manager in response to a complaint, incident or other reasonable request that relates to managing an adverse effect that is directly related to the construction of the project, carry out a review of any management plan required by these conditions. The consent holder shall submit the reviewed management plan to the Manager for certification that:</p> <ol style="list-style-type: none"> a) The reason(s) for requiring the review have been appropriately addressed; and b) Appropriate actions and a programme for implementation are provided for if required.
	Staff Training
G.11	<p>The consent holder shall ensure that earthworks contractors responsible for supervising site staff shall undergo environmental awareness training, required by the CEMP. This training shall occur at least five working days week prior to the commencement of any earthworks or earthworks stage and shall be given by a suitably qualified and experienced person certified by the Manager to deliver a practical on-site training session. Specifically, contractors shall be briefed as follows:</p> <ol style="list-style-type: none"> a) Contractors likely to be involved in the construction and maintenance of erosion and sediment control devices shall receive training on the performance standards to be achieved by the erosion and sediment control devices; and b) Contractors likely to be involved in the construction of any stream diversions or other in-stream works shall be briefed on the values of the stream, the objectives of stream design, the requirements of native fish for fish passage, and the sensitivity of the receiving environment to sediment discharge. c) Contractors likely to be involved in any works involving vegetation clearance shall be briefed on the values of any significant areas of vegetation that are to be retained, and the methods that shall be used to identify and protect them during construction.
	Annual Report
G.14	The consent holder shall provide to the Manager by the [XXth of XXXX] each year (or on an alternative date as otherwise

Reference	Wording of Draft Conditions
	<p>agreed), an annual monitoring report. The purpose of this report is to provide an overview of the monitoring and reporting work undertaken, and any environmental issues that have arisen during the construction of the Project. As a minimum, this report shall include:</p> <ul style="list-style-type: none"> a) all monitoring data required in accordance with the conditions of this consent; b) any reasons for non-compliance or difficulties in achieving compliance with the conditions of these resource consents; c) any works that have been undertaken to improve the environmental performance of the site or that are proposed to be undertaken in the up-coming year; d) recommendations on alterations to the monitoring required; and e) any other issues considered important by the consent holder.
	Management Plans - General
G.15	All works shall be carried out in general accordance with the management plans required by these conditions.
G.16	Any changes to management plans specified in Condition G.15 that may be sought by the consent holder shall remain consistent with the overall intent of the relevant management plan and shall be submitted to the Manager for certification at least 10 working days prior to any changes taking effect.
G.17	<p>The management plans may not include all details for every stage of works at the time the plan is submitted for certification to the Manager. If further details are to be provided for later stages of construction, the management plan shall specify which stages require further certification at a later date. Further details shall be submitted to the Manager at least 10 working days prior to works commencing in the relevant construction stage. Any changes to the relevant Management Plan that may be required as a result of further design details shall be submitted to be certified by the Manager at least 10 working days prior to works commencing in the relevant construction stage in accordance with the relevant condition(s).</p> <p>The further details submitted shall be consistent with the original purpose and objectives as outlined in the relevant conditions below.</p>
G.18	Where a management plan is required to be prepared in consultation with any third party, the management plan shall demonstrate how the views of that party (or parties) have been incorporated, and where they have not, the reasons

Reference	Wording of Draft Conditions
	why.
G.19	<p>The management of key environmental effects associated with the construction phase of the Project shall be detailed within environmental management plans that are included in the appendices to the CEMP (draft Plans were submitted with the applications). The finalised management plans shall be submitted to the Manager for certification at least 15 working days before the commencement of construction. Works shall not commence until the consent holder has received the Manager's written certification for the management plan(s). This suite of management plans consist of:</p> <ul style="list-style-type: none"> a) Erosion and Sediment Control Plan b) Groundwater (Level) Management Plan c) Settlement Effects Management Plan d) Contaminated Soils and Groundwater Management Plan e) Ecological Management Plan
Construction Environmental Management Plan	
G.20	<p>The consent holder shall update and finalise the draft CEMP submitted with the application (dated XX 2012), which shall include the suite of Management Plans listed under condition G.19. The finalised CEMP shall be submitted to the Manager for certification at least 15 working days before the commencement of construction. Works shall not commence until the consent holder has received the Manager's written certification of the CEMP.</p>
G.21	<p>The certification shall confirm that the CEMP (and its appendices) shall confirm that the CEMP gives effect to the relevant conditions and that includes details of:</p> <ul style="list-style-type: none"> a) Staff and contractors' responsibilities b) Training requirements for employees, sub-contractors and visitors; c) Environmental incident and emergency management (including the procedures required under condition G.9); d) Communication and interface procedures; e) Environmental complaints management (required under Condition G.8); f) Compliance monitoring; g) Environmental reporting; h) Corrective action; i) Environmental auditing; and j) CEMP review. <p>The CEMP shall also confirm construction methodologies and construction timeframes, including staging.</p>

Reference	Wording of Draft Conditions
G.22	The CEMP shall confirm final project details, staging of work, and sufficient engineering design information to ensure that the Project remains within the limits and standards approved under this consent and that the construction activities avoid, remedy or mitigate adverse effects on the environment in accordance with the conditions of this consent. The CEMP shall identify where design information for a particular stage will be submitted at a later stage(s), in accordance with condition G.17.
G.23	At least 15 working days before submitting the CEMP to GWRC for certification the consent holder shall submit a copy of the draft final CEMP required by Condition G.20 to KCDC for comment. Any comments received shall be supplied to the Manager when the CEMP is submitted, along with a clear explanation of where any comments have not been incorporated and the reasons why.
G.24	The CEMP shall be implemented and maintained throughout the entire construction period, and updated if further design information is provided
G.25	A copy of the CEMP shall be held on each construction site at all times and be available for inspection by GWRC.
G.26	If the CEMP (including any of its constituent management plans) required to be revised as a result of any updated or new design information, the changes shall be certified by the Manager in accordance with the relevant condition. The revisions shall be submitted for certification at least 10 working days before the commencement of works in that part of the Project to which the information relates.
Groundwater (Level) Management Plan	
G.29	<p>The consent holder shall finalise, submit and implement through the CEMP, the Groundwater (Level) Management Plan (GMP) to be submitted to the Manager for certification at least 15 working days prior to works commencing. The purpose of the management plan is to address the minimum standards, outline the best practicable options for groundwater management and procedures to minimise the effects on groundwater levels.</p> <p>The GWMP shall include information regarding:</p> <ul style="list-style-type: none"> i. the schedule of groundwater monitoring bores identifying piezometer depth, screen length and geological unit; ii. the locations of groundwater monitoring bores shown on plans; iii. the locations of monitoring stations on the Wharemauku Stream and Drain 5; iv. monitoring frequency;

Reference	Wording of Draft Conditions
	<ul style="list-style-type: none"> v. monitoring methods; vi. reporting requirements; vii. alert and action programmes; viii. response management; and ix. review procedures.
	Ecological Management Plan
G.34	<ul style="list-style-type: none"> a) The consent holder shall finalise, submit and implement through the CEMP, the Ecological Management Plan (EMP). The EMP shall be submitted to the Manager for certification at least 15 working days prior to works commencing. The purpose of the Plan is to outline the ecological management programme to protect, reduce and remediate impacts on the environment during the construction phase of the Project. This EMP shall also document the permanent mitigation measures, such as restoration planting, and the mechanisms by which to develop relevant mitigation and restoration plans for terrestrial and freshwater habitat. b) The EMP shall detail the monitoring to be undertaken pre-construction, during construction and post-construction as outlined below in Condition G.38-G.40. c) The EMP shall provide information on how the following outcomes will be achieved: <ul style="list-style-type: none"> i. Minimise loss of valued vegetation and habitats; ii. Minimise construction effects on freshwater and the marine environments; iii. Minimise effects on identified wetlands resulting from hydrological changes to water tables; iv. Minimise effects on fish during stream works; v. Minimise disturbance of nationally threatened or at-risk birds (as listed by the most up to date Department of Conservation threat classification lists) during breeding periods; vi. Re-establish affected lizard habitat and minimise lizard mortality resulting from construction of the Project; vii. Carry out monitoring in a manner that will confirm that adverse effects are as predicted; any exceedance is identified; and appropriate actions are undertaken to rectify; viii. Ensures that mitigation requirements are undertaken and monitored to ensure success is achieved; ix. Carry out monitoring in a manner that confirms that mitigation meets objectives; and

Reference	Wording of Draft Conditions
	<p>x. <u>Ensure that in the event of additional vegetation or habitat loss outside of the Project footprint, mitigation calculations are consistent with the Environmental Compensation Ratios outlined in the EMP.</u></p>
G.35	<p>The EMP shall be prepared by suitably qualified and experienced ecologist, and shall implement the principles and outcomes sought by the Ecological Impact Assessments (Technical Reports 26 – 31). The EMP shall be prepared in accordance with:</p> <ul style="list-style-type: none"> a) NZTA’s Environmental Plan; b) The Conservation Management Strategy for the Wellington Conservancy; and c) The Greater Wellington Pest Management Strategy (2009).
G.36	<p>The EMP shall be consistent with the Landscape Management Plan (LMP) that is required to be certified by KCDC under the designation conditions.</p>
G.37	<p>At least 15 working days before submitting the EMP to GWRC for certification the Consent Holder shall submit a copy of the draft EMP required by Condition G.34 to KCDC for comment. Any comments received shall be supplied to the Manager when the EMP is submitted, along with a clear explanation of where any comments have not been incorporated and the reasons why.</p>
Ecological Monitoring – General	
G.38	<p>Monitoring shall be carried out in accordance with the EMP as required by Condition G.34 in order to:</p> <ul style="list-style-type: none"> a) collect baseline information on vegetation, wetlands, freshwater and marine ecology for 1 year prior to construction work starting; b) collect ecological information on vegetation, wetlands, freshwater and marine ecology during construction work; c) collect ecological information on vegetation, wetlands, freshwater and marine ecology for 2 years post construction works completion.
G.39	<p>All ecological monitoring required under the EMP shall be managed by a suitably qualified and experienced ecologist. The results of all monitoring carried out pursuant to the EMP shall be:</p> <ul style="list-style-type: none"> a) available for inspection during normal office hours where such data is available; b) submitted to the Manager at quarterly intervals for certification that the appropriate monitoring has been undertaken;

Reference	Wording of Draft Conditions
	<ul style="list-style-type: none"> c) submitted to the Director-General of Conservation and KCDC for information; and d) summarised and submitted as part of the annual report required under Condition G.14.
G.40	<p>An Adaptive Management approach shall be taken to responding to ecological effects as outlined in the EMP. The Adaptive Management monitoring shall seek to:</p> <ul style="list-style-type: none"> a) Provide a level of baseline information of pre-construction vegetation, wetlands, freshwater and marine habitats in order to develop 'trigger' levels; b) Undertake monitoring during construction to observe whether 'trigger' levels are exceeded and to determine the effectiveness of the environmental management methods; and c) In the event that trigger levels are exceeded an Adaptive Management approach shall be enlisted that will seek to: <ul style="list-style-type: none"> i. Investigate a plausible cause-effect association with the Project; should the event be linked to the project the following steps will be undertaken: <ul style="list-style-type: none"> A. Identify the on-site practice that is generating the effect; B. Seek to alter the operational measure in consultation with GWRC; C. Undertake further monitoring to assess the effectiveness of the altered on-site practice. ii. If the trigger level exceedance is not attributable to works associated with the Project, the consent holder shall not be held liable for any remediation or mitigation works; iii. Trigger level exceedances during construction should be treated as management triggers and not compliance triggers in the first instance.

Proposed resource consent conditions for earthworks and discharges to land

	Erosion and Sediment Control Monitoring
E.9	<p>In the event of either a failure of erosion and sediment control devices or where a storm event exceeds the design volume of the device, and where the discharge is to a perennial or intermittent freshwater body, wetland or estuarine/marine environment, a suitably qualified ecologist(s) shall be notified within 24 hours, who shall then inspect the relevant area to determine whether significant adverse effects on the affected</p>

	<p>area's ecological values have occurred.</p> <p>The Project's Environmental Manager shall prepare a report on the effects of the failure and any recommended measures that may be required to remedy the effects; the report shall be submitted to the Manager for approval within 5 working days of the event.</p> <p>The remedial measures shall be implemented within 10 working days of the approval of the Manager.</p>
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Proposed resource consent conditions for wetland reclamation and vegetation clearance

Reference	Wording of Draft Conditions
	Conditions – Wetland Reclamation
G.1 – G.40	The effects will be managed under the relevant General Conditions applicable to the proposed wetland reclamation.
	Conditions – Vegetation Clearance
G.1-G.40	The effects will be managed under the relevant General Conditions applicable to the proposed clearance of vegetation.

ANNEXURE D: POLICY 22 OF THE PROPOSED REGIONAL POLICY STATEMENT FOR THE WELLINGTON REGION¹⁴⁸

Policy 22: Identifying indigenous ecosystems and habitats with significant indigenous biodiversity values – district and regional plans

District and regional plans shall identify indigenous ecosystems and habitats with significant indigenous biodiversity values that meet one or more of the following criteria:

(a) Representativeness: high representativeness values are given to particular ecosystems and habitats that were once typical and commonplace in a district or in the region, and:

(i) are no longer commonplace (less than about 30% remaining); or

(ii) are poorly represented in existing protected areas (less than about 20% legally protected).

(h) Rarity: the ecosystem or habitat has biological physical features that are scarce or threatened in a local, regional or national context. This can include individual species, rare and distinctive biological communities and physical features that are unusual or rare.

(c) Diversity: the ecosystem or habitat has a natural diversity of ecological units, ecosystems, species and physical features within an area.

(d) Ecological context of an area: the ecosystem or habitat:

(i) enhances connectivity or otherwise buffers representative, rare or diverse indigenous ecosystems and habitats; or

(ii) provides seasonal or core habitat for protected or threatened indigenous species.

(d) Tangata whenua values: the ecosystem or habitat contains characteristics of special spiritual, historical or cultural significance to tangata whenua, identified in accordance with tikanga Maori.

Explanation

Policy 22 sets out criteria as guidance that must be considered in identifying indigenous ecosystems and habitats with significant biodiversity

¹⁴⁸ Changes shown in underline indicate changes resulting from submissions, dated October 2010.

values. These criteria need to be considered in all assessments but the relevance of each will depend on the individual cases.

Policy 22 will ensure that significant biodiversity values are identified in district and regional plans in a consistent way. Wellington Regional Council, and district and city councils are required to assess indigenous ecosystems and habitats against all the criteria. To be identified as having significant biodiversity values, an indigenous ecosystem or habitat must fit one or more of the listed criteria.

Regional plans will identify indigenous ecosystems and habitats with significant biodiversity values in the coastal marine area, wetlands and the beds of lakes and rivers. District plans will identify indigenous ecosystems and habitats with significant biodiversity values for all land, except the coastal marine area and the beds of lakes and rivers.

**ANNEXURE E: WETLAND CONDITION MONITORING SHEETS
MISSING FROM TECHNICAL REPORT 27**

WETLAND RECORD SHEET

Wetland name: Otaihanga Northern
Region: Wellington
Altitude:

Date: 4 July 2011
GPS/Grid Ref.:
No. of plots sampled: 2

Classification: I System	IA Subsystem	II Wetland Class	IIA Wetland Form
Palustrine	Permanent	Fen	Basin

Field team: Matiu Park, Pat Enright, Tim Park

Indicator	Indicator components	Specify and Comment	Score 0–5 ¹	Mean score
Change in hydrological integrity	Impact of manmade structures	Moderate, culvert over track	3	3.7
	Water table depth	0.5m	4	
	Dryland plant invasion	Occasional gorse and blackberry	4	
Change in physico-chemical parameters	Fire damage	Nil	5	4.0
	Degree of sedimentation/erosion	None, leachate presumed	4	
	Nutrient levels	Elevated from landfill leachate	3	
	Von Post index	Low	4	
Change in ecosystem intactness	Loss in area of original wetland	Old landfill reduced extent	4	3.0
	Connectivity barriers	Culverts and old landfill	2	
Change in browsing, predation & harvesting regimes	Damage by domestic or feral animals	None	5	4.7
	Introduced predator impacts on wildlife	Moderate – residential/landfill	4	
	Harvesting levels	Nil	5	
Change in dominance of native plants	Introduced plant canopy cover	Low, gorse and blackberry	4	4.0
	Introduced plant understorey cover	Low, gorse and blackberry	4	
Total wetland condition index /25				19.3

¹ Assign degree of modification as follows: 5=v. low/ none, 4=low, 3=medium, 2=high, 1=v. high, 0=extreme

Main vegetation types: Manuka over purei (*Carex secta* and *C. virgata*). Manuka on raised moss hummocks.

Native fauna: Tui.

Other comments: High water table, wetland extent to the north edges into landfill. Surrounded on other three sides by pine plantation on elevated dunes.

Pressure	Score ²	Specify and Comment
Modifications to catchment hydrology	3	Water abstraction bores, landfill.
Water quality within the catchment	4	Leachate from adjacent landfill.
Animal access	4	No control observed, intensive land uses and residential.
Key undesirable species	3	Blackberry and other weeds dominate adjacent wetland.
% catchment in introduced vegetation	4	Almost entire catchment in landfill and pine plantation.
Other landuse threats	4	Landfill adjacent and continuing leachates.
Total wetland pressure index /30	22	

² Assign pressure scores as follows: 5=very high, 4=high, 3=medium, 2=low, 1=very low, 0=none

WETLAND PLOT SHEET

Wetland name: Otaihanga North

Date: 4 July 2011

Plot no: 1

Plot size (2m x 2m default): 2x2

Altitude: xxx

GPS/GR: xxx

Field leader: Matiu Park

Structure: Shrubland

Composition: Manuka purei

Canopy (bird's eye view)			Subcanopy			Groundcover		
Species ¹ (or Substrate)	%	H	Species	%	H	Species	%	H
Leptospermum scoparium	70	7	Leptospermum scoparium	40	3	Carex virgata	30	0.3
Gorse*	10	5	Gorse*	10	2	Mosses	10	0.1
Open canopy	20		Carex secta	10	1	Histiopteris incise		
			Carex virgata	10	1	Microsorium pustulatum subsp. pustulatum		
						Isolepis prolifer	10	0.2
						Leptospermum seedlings	5	10
						Sphagnum	10	0.2

¹ % = % cover: total Canopy % cover = 100%; H = maximum height in m; indicate introduced species by *

Additional species in vicinity in same vegetation type: Nertera scapanoides; Coprosma robusta, Muehlenbeckia complexa, *Hydrocotyle novae-zelandiae* (NZ)., Asplenium flaccidum

Comments: Some manuka die-back, remainder manuka relatively uniform age class.

Indicator (use plot data only)	%	Score 0–5 ²	Specify & Comment
Canopy: % cover introduced species	30	3	
Understorey: % cover introduced spp ³	10	4	Low, occasional gorse.
Total species: % number introduced spp	20	4	
Total species: overall stress/dieback	NA	4	Some manuka die-back.
Total /20	NA	15	

²5=0%: none, 4=1–24%: very low, 3=25–49%: low, 2=50–75%: medium, 1=76–99%: high, 0=100%; v. high

³Add subcanopy and groundcover % cover for introduced species

Field measurements:

Water table cm	45	Water conductivity uS (if present)	7mv
Water pH (if present)	4.2	Von Post peat decomposition index	7

Soil core laboratory analysis (2 soil core subsamples): All analyses on the sediment samples were carried out by R J Hill Laboratories in Hamilton

Water content % dry weight		Total C %	22 g/100g
Bulk Density T/m ³		Total N %	1.14 g/110g

pH	5.8	Total P mg/kg	
Conductivity uS			

Foliage laboratory analysis (leaf/culm sample of dominant canopy species):

Species		%N		%P	
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WETLAND PLOT SHEET

Wetland name: Otaihanga North Date: 4 July 2011 Plot no: 2
 Plot size (2m x 2m default): 2x2 Altitude: xxx GPS/GR: xxx
 Field leader: Matiu Park Structure: Shrubland Composition: Manuka Carex

Canopy (bird's eye view)			Subcanopy			Groundcover		
Species ¹ (or Substrate)	%	H	Species	%	H	Species	%	H
Leptospermum scoparium	40	7	Carex secta	40	1	Carex virgata	30	0.3
Gorse*	10	5	Carex virgata	30	1	Mosses	10	0.1
Open canopy	50					Isolepis prolifer	10	0.2
						Leptospermum seedlings	5	10
						Sphagnum	10	0.2

¹ % = % cover: total Canopy % cover = 100%; H = maximum height in m; indicate introduced species by *

Additional species in vicinity in same vegetation type: Nertera scapanoides; Coprosma robusta, Muehlenbeckia complexa, Hydrocotyle novae-zelandiae (NZ), Asplenium flaccidum.

Comments: Some manuka die-back, remainder manuka relatively uniform age class.

Indicator (use plot data only)	%	Score 0–5 ²	Specify & Comment
Canopy: % cover introduced species	10	4	
Understorey: % cover introduced spp ³	0	5	
Total species: % number introduced spp	10	4	
Total species: overall stress/dieback	NA	4	Some manuka die-back.
Total /20	NA	17	

²5=0%: none, 4=1–24%: very low, 3=25–49%: low, 2=50–75%: medium, 1=76–99%: high, 0=100%; v. high

³Add subcanopy and groundcover % cover for introduced species

Field measurements:

Water table cm	45	Water conductivity uS (if present)	7mv
Water pH (if present)	4.2	Von Post peat decomposition index	7

Soil core laboratory analysis (2 soil core subsamples):

Water content % dry weight		Total C %	
Bulk Density T/m ³		Total N %	

pH		Total P mg/kg	
Conductivity uS			

Foliage laboratory analysis (leaf/culm sample of dominant canopy species):

Species		%N		%P	
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WETLAND RECORD SHEET

Wetland name: Otaihanga Southern

Date: 4 July 2011

Region: Wellington

GPS/Grid Ref.:

Altitude:

No. of plots sampled: 3

Classification: I System	IA Subsystem	II Wetland Class	IIA Wetland Form
Palustrine	Permanent	Fen	Basin

Field team: Matiu Park, Pat Enright and Tim Park.

Indicator	Indicator components	Specify and Comment	Score 0–5 ¹	Mean score
Change in hydrological integrity	Impact of manmade structures	Drainage, blockage and landfill	3	3.7
	Water table depth	Some modification	4	
	Dryland plant invasion	Some gorse, BB and pampas	4	
Change in physico-chemical parameters	Fire damage	No evidence	5	4.0
	Degree of sedimentation/erosion	Some from landfill	4	
	Nutrient levels	Elevated from leachate, sewage treatment plant upstream	3	
	Von Post index	Strongly decomposed	4	
Change in ecosystem intactness	Loss in area of original wetland	Some loss to east	4	4.0
	Connectivity barriers	Mostly intact	4	
Change in browsing, predation & harvesting regimes	Damage by domestic or feral animals	Low, Canadian geese present	4	4.3
	Introduced predator impacts on wildlife	Low, surrounded by landfill and sewer treatment	4	
	Harvesting levels	None	5	
Change in dominance of native plants	Introduced plant canopy cover	Low, BB, gorse and pampas	4	4.0
	Introduced plant understorey cover	Low	4	
Total wetland condition index /25				20

¹ Assign degree of modification as follows: 5=v. low/ none, 4=low, 3=medium, 2=high, 1=v. high, 0=extreme

Main vegetation types: *Carex geminata* and *Carex virgata* sedgeland with scattered dying manuka. Some areas of *Baumea* rushland. Scattered *Juncus*.

Native fauna:

Other comments: Manuka dieback, large areas of open water. Water table seemed high. Recently fallen pines in parts.

Pressure	Score ²	Specify and Comment
Modifications to catchment hydrology	4	Water abstraction bores, landfill, sewage treatment.
Water quality within the catchment	4	Leachate from adjacent landfill, sewage leachate, farming.
Animal access	4	No control observed, intensive land uses and sewage plant.
Key undesirable species	3	Blackberry and other weeds dominate adjacent wetland.
% catchment in introduced vegetation	4	Almost entire catchment in landfill and pine plantation.
Other landuse threats	4	Landfill and sewage treatment adjacent: leachates.

Total wetland pressure index /30	23	
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²Assign pressure scores as follows: 5=very high, 4=high, 3=medium, 2=low, 1=very low, 0=none

WETLAND PLOT SHEET

Wetland name: Otaihanga South **Date: 4 July 2011** **Plot no: 1**
Plot size (2m x 2m default): 2x2 **Altitude:** **GPS/GR:**
Field leader: Matiu Park **Structure: Rushland** **Composition: Baumea**

Canopy (bird's eye view)			Subcanopy			Groundcover		
Species ¹ (or Substrate)	%	H	Species	%	H	Species	%	H
Baumea teretifolia	80	1.8	Hypolepis ambigua	30	0.5			
Hypolepis ambigua	10	1.3	Blackberry*	5	0.5			
Blackberry*	10	1.0						

¹ % = % cover: total Canopy % cover = 100%; H = maximum height in m; indicate introduced species by *

Additional species in vicinity in same vegetation type: Austroderia fulvida, Leptospermum scoparium, Carex virgata, Carex secta, blackberry*, gorse*, Pinus radiata*, Isolepis prolifer, Sphagnum.

Comments: Unusually high water table. Manuka die-back observed.

Indicator (use plot data only)	%	Score 0–5 ²	Specify & Comment
Canopy: % cover introduced species	10	4	Blackberry.
Understorey: % cover introduced spp ³	5	4	Blackberry
Total species: % number introduced spp	10	4	
Total species: overall stress/dieback	NA	4	Manuka die-back, open water.
Total /20	NA	16	

²5=0%: none, 4=1–24%: very low, 3=25–49%: low, 2=50–75%: medium, 1=76–99%: high, 0=100%; v. high

³Add subcanopy and groundcover % cover for introduced species

Field measurements:

Water table cm	60	Water conductivity uS (if present)	7MV
Water pH (if present)	4.08	Von Post peat decomposition index	7

Soil core laboratory analysis (2 soil core subsamples): All analyses on the sediment samples were carried out by R J Hill Laboratories in Hamilton

Water content % dry weight		Total C %	25 g / 100g
Bulk Density T/m ³		Total N %	1.16 g / 100g
pH	5.0	Total P mg/kg	
Conductivity uS			

Foliage laboratory analysis (leaf/culm sample of dominant canopy species):

Species		%N		%P	
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WETLAND PLOT SHEET

Wetland name: Otaihanga South
Plot size (2m x 2m default): 2x2
Field leader: Matiu Park

Date: 4 July 2011
Altitude:
Structure: Sedgeland

Plot no: 2
GPS/GR:
Composition: Carex

Canopy (bird's eye view)			Subcanopy			Groundcover		
Species ¹ (or Substrate)	%	H	Species	%	H	Species	%	H
Carex virgata	30	1.5	Hypolepis ambigua	30	0.5			
Carex secta	10	1.5	Isolepis prolifer	10	0.1			
Open water	60							

¹ % = % cover: total Canopy % cover = 100%; H = maximum height in m; indicate introduced species by *

Additional species in vicinity in same vegetation type: Austrodaria fulvida, Leptospermum scoparium, Baumea teretifolia, bracken, blackberry*, gorse*, Pinus radiata*, pampas*, Sphagnum.

Comments: Unusually high water table. Manuka die-back observed. Some dead pines nearby (fallen). Presumed to historically have been manuka over purei prior to water table modification.

Indicator (use plot data only)	%	Score 0–5 ²	Specify & Comment
Canopy: % cover introduced species	0	5	
Understorey: % cover introduced spp ³	0	5	
Total species: % number introduced spp	0	5	
Total species: overall stress/dieback	NA	4	Manuka die-back, open water.
Total /20	NA	19	

²5=0%: none, 4=1–24%: very low, 3=25–49%: low, 2=50–75%: medium, 1=76–99%: high, 0=100%; v. high

³Add subcanopy and groundcover % cover for introduced species

Field measurements:

Water table cm	50	Water conductivity uS (if present)	7MV
Water pH (if present)	4.08	Von Post peat decomposition index	7

Soil core laboratory analysis (2 soil core subsamples):

Water content % dry weight		Total C %	
Bulk Density T/m ³		Total N %	
pH		Total P mg/kg	
Conductivity uS			

Foliage laboratory analysis (leaf/culm sample of dominant canopy species):

Species		%N		%P	
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WETLAND PLOT SHEET

Wetland name: Otaihanga South
Plot size (2m x 2m default): 2x2
Field leader: Matiu Park

Date: 4 July 2011
Altitude:
Structure: Sedgeland

Plot no: 3
GPS/GR:
Composition: Carex

Canopy (bird's eye view)			Subcanopy			Groundcover		
Species ¹ (or Substrate)	%	H	Species	%	H	Species	%	H
Open water	40		Hypolepis ambigua	30	0.5			
Carex virgate	20	1.5	Isolepis prolifer	10	0.1			
Carex secta	40	1.5	Bidens frondosa*	20				
Bidens frondosa*	10	1.2						
Juncus effusus	10	1.2						

¹ % = % cover: total Canopy % cover = 100%; H = maximum height in m; indicate introduced species by *

Additional species in vicinity in same vegetation type: Isolepis prolifer, Persicaria decipiens, blackberry*, Bidens, Juncus pallidus, Juncus edgariae, Yorkshire fog*, Hypolepis ambigua, Azolla filiculoides, gorse*, Leptospermum scoparium, bracken, Pinus radiata*, pampas*, Sphagnum.

Comments: Unusually high water table. Manuka die-back. Some dead pines nearby (fallen).

Indicator (use plot data only)	%	Score 0–5 ²	Specify & Comment
Canopy: % cover introduced species	10	4	
Understorey: % cover introduced spp ³	10	4	Bidens, but BB nearby.
Total species: % number introduced spp	10	4	
Total species: overall stress/dieback	NA	4	Manuka die-back, open water.
Total /20	NA	16	

² 5=0%: none, 4=1–24%: very low, 3=25–49%: low, 2=50–75%: medium, 1=76–99%: high, 0=100%: v. high

³ Add subcanopy and groundcover % cover for introduced species

Field measurements:

Water table cm	30	Water conductivity uS (if present)	7MV
Water pH (if present)	4.08	Von Post peat decomposition index	7

Soil core laboratory analysis (2 soil core subsamples):

Water content % dry weight		Total C %	
Bulk Density T/m ³		Total N %	
pH		Total P mg/kg	
Conductivity uS			

Foliage laboratory analysis (leaf/culm sample of dominant canopy species):

Species		%N		%P	
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WETLAND RECORD SHEET

Wetland name: Otaihanga Central

Date: 4 July 2011

Region: Wellington

GPS/Grid Ref.:

Altitude:

No. of plots sampled: 1

Classification: I System	IA Subsystem	II Wetland Class	IIA Wetland Form
Palustrine	Permanent	Fen	Basin

Field team: Matiu Park, Pat Enright, Tim Park.

Indicator	Indicator components	Specify and Comment	Score 0–5 ¹	Mean score
Change in hydrological integrity	Impact of manmade structures	Culvert and landfill and sediment	1	0.7
	Water table depth	Major changes	1	
	Dryland plant invasion	High, throughout	0	
Change in physico-chemical parameters	Fire damage	None	5	1.8
	Degree of sedimentation/erosion	High	1	
	Nutrient levels	High – landfill leachate throughout	0	
	Von Post index	Fine silts and muds	1	
Change in ecosystem intactness	Loss in area of original wetland	Substantial area lost beneath landfill	3	2.5
	Connectivity barriers	Very low (landfill, pines, houses)	2	
Change in browsing, predation & harvesting regimes	Damage by domestic or feral animals	Low, Canadian geese, possum	4	4.0
	Introduced predator impacts on wildlife	Moderate – residential, landfill	3	
	Harvesting levels	None	5	
Change in dominance of native plants	Introduced plant canopy cover	Dominated by exotic species	1	1.0
	Introduced plant understorey cover	Dominated by exotic species	1	
Total wetland condition index /25				9.9

¹ Assign degree of modification as follows: 5=v. low/ none, 4=low, 3=medium, 2=high, 1=v. high, 0=extreme

Main vegetation types: Blackberry* and inkweed* with mahoe and occasional Carex secta.

Native fauna: NIL

Other comments: Highly modified from landfill leachate, modified drainage and sedimentation. Dryer plant species becoming established in weedland (mahoe, Dicksonia, Muehlenbeckia). Green goddess lily* (invasive)

Pressure	Score ²	Specify and Comment
Modifications to catchment hydrology	5	Water abstraction
Water quality within the catchment	5	Leachate from adjacent landfill exits to wetland
Animal access	4	No control observed, intensive land uses and sewage plant.
Key undesirable species	3	Blackberry and other weeds dominate adjacent wetland.
% catchment in introduced vegetation	4	Almost entire catchment in landfill and pine plantation.

Other landuse threats	4	Landfill leachate, contaminated stream feeding wetland.
Total wetland pressure index /30	25	

²Assign pressure scores as follows: 5=very high, 4=high, 3=medium, 2=low, 1=very low, 0=none

WETLAND PLOT SHEET

Wetland name: Otaihanga Central Date: 4 July 2011

Plot no: 1

Plot size (2m x 2m default): 2x2

Altitude:

GPS/GR:

Field leader: Matiu Park

Structure: Scrub

Composition: Blackberry

Canopy (bird's eye view)			Subcanopy			Groundcover		
Species ¹ (or Substrate)	%	H	Species	%	H	Species	%	H
Blackberry	40	1.5	Asplenium oblongifolium	4	0.4	Ranunculus repens	70	0. 2
Muehlenbeckia complexa	30	1.5	Mahoe	10	0.6	Apium nodiflorum*	5	0. 2
Carex virgata	10	1.5	Histiopteris incisa	10	0.7	Asplenium oblongifolium		
Solanum chenopodioides*	20	1.2	Solanum chenopodioides*	10	0.8	Histiopteris incisa		
			Bare ground	50		Moss		

¹ % = % cover: total Canopy % cover = 100%; H = maximum height in m; indicate introduced species by *

Additional species in vicinity in same vegetation type: Green goddess*, Dicksonia squarrosa, inkweed*, Pinus radiata*, gorse*, Galium aparine*, climbing dock*, Ranunculus sceleratus* and Solanum nigrum*.

Comments: Landfill leachate obvious, water discoloured and anoxic odour prevalent. Water table modified with no standing water present other than small stream.

Indicator (use plot data only)	%	Score 0-5 ²	Specify & Comment
Canopy: % cover introduced species	80	1	
Understorey: % cover introduced spp ³	70	2	
Total species: % number introduced spp	70	2	
Total species: overall stress/dieback	NA	1	
Total /20	NA	6	

²5=0%: none, 4=1-24%: very low, 3=25-49%: low, 2=50-75%: medium, 1=76-99%: high, 0=100%; v. high

³Add subcanopy and groundcover % cover for introduced species

Field measurements:

Water table cm	Ground level	Water conductivity uS (if present)	10MV
Water pH (if present)	7.32	Von Post peat decomposition index	8

Soil core laboratory analysis (2 soil core subsamples): All analyses on the sediment samples were carried out by R J Hill Laboratories in Hamilton

Water content % dry weight		Total C %	17.5g / 100g
Bulk Density T/m ³		Total N %	1.46g / 100g
pH	7.5	Total P mg/kg	
Conductivity uS			

Foliage laboratory analysis (leaf/culm sample of dominant canopy species):

Species		%N		%P	
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WETLAND RECORD SHEET

Wetland name: El Rancho Wetland

Date: 4 July 2011

Region: Wellington

GPS/Grid Ref.:

Altitude:

No. of plots sampled: 2

Classification: I System	IA Subsystem	II Wetland Class	IIA Wetland Form
Palustrine	Permanent	Fen	Basin

Field team: Matiu Park, Pat Enright, Tim Park

Indicator	Indicator components	Specify and Comment	Score 0–5 ¹	Mean score
Change in hydrological integrity	Impact of manmade structures	Drains cut through interior of wetland.	3	3.0
	Water table depth	Altered through drainage, and evidence of lowering of water levels.	2	
	Dryland plant invasion	Gorse and blackberry and other weeds common.	4	
Change in physico-chemical parameters	Fire damage	None	5	4.8
	Degree of sedimentation/erosion	None	5	
	Nutrient levels	None	5	
	Von Post index	Dark water with some peat escape.	4	
Change in ecosystem intactness	Loss in area of original wetland	Some loss of historical wetlands extent in this location	4	3.0
	Connectivity barriers	Some connectivity barriers, with loss of vegetation and weeds dominant.	2	
Change in browsing, predation & harvesting regimes	Damage by domestic or feral animals	Some browsing on edge of wetland by stock.	3	3.7
	Introduced predator impacts on wildlife	Low, but adjacent to residential areas	4	
	Harvesting levels	Some mowing and grazing in southern edge.	4	
Change in dominance of native plants	Introduced plant canopy cover	Low	4	4.0
	Introduced plant understorey cover	Low, some blackberry and gorse.	4	
Total wetland condition index /25				18.4

¹ Assign degree of modification as follows: 5=v. low/ none, 4=low, 3=medium, 2=high, 1=v. high, 0=extreme

Main vegetation types: First plot in vicinity of Expressway Alignment was mossfield and artificially induced moss and exotic grassland. Second plot, in main wetland was a manuka wetland.

Native fauna:

Other comments: Heavily grazed by cattle and sheep. Low water table with artificial drain in

vicinity of wetland. No visible water. A large area of wetland edge adjacent to Plot 1 had recently been sprayed as part of gas pipeline maintenance.

Pressure	Score²	Specify and Comment
Modifications to catchment hydrology	2	Evidence of reducing water tables over years across El Rancho wetlands. Main wetland and surrounds historically drained (and more recently?).
Water quality within the catchment	1	Some pressures from El Rancho stock and residential areas.
Animal access	4	Currently heavily grazed in this location.
Key undesirable species	3	Catchment has a high number of undesirable species present, including close proximity to weedy Waikanae River corridor.
% catchment in introduced vegetation	4	Most of the catchment modified and in pasture or blackberry and gorse.
Other landuse threats	3	Gas pipeline, access from El Rancho etc.
Total wetland pressure index /30	17	

²Assign pressure scores as follows: 5=very high, 4=high, 3=medium, 2=low, 1=very low, 0=none

WETLAND PLOT SHEET

Wetland name: El Rancho Weggery Date: 4 July 2011

Plot no: 1

Plot size (2m x 2m default): 2x2

Altitude:

GPS/GR:

Field leader: Matiu Park

Structure: Mossfield

Composition:

Canopy (bird's eye view)			Subcanopy			Groundcover		
Species ¹ (or Substrate)	%	H	Species	%	H	Species	%	H
Creeping bent	40	.20						
Leptostigma setulosa	10	.20						
Eleocharis gracilis	15	.20						
Euchiton involucratus	5							
Gonocarpus micranthus	5							
Paspalum dilatatum*	5							
Leptospermum scoparium	5							
Centella uniflora	5							

¹ % = % cover: total Canopy % cover = 100%; H = maximum height in m; indicate introduced species by *

Additional species in vicinity in same vegetation type: Juncus edgariae, Calluna vulgaris, manuka, gorse, Lotus pedunculatus, Luzula picta var. picta, Galium*, Juncus sarophorus, Baumea teretifolia.

Comments: Heavily grazed and drained. Mossfields, Carex sedgeland and Baumea rushland observed to be induced by stock pressures. Risk that removal of stock would revert back to exotic pastures or blackberry, similar to adjacent stock-free perimeters of surrounding wetlands.

Indicator (use plot data only)	%	Score 0–5 ²	Specify & Comment
Canopy: % cover introduced species	50	2	Mostly mosses and grazed pasture grass.
Understorey: % cover introduced spp ³	50	2	As above
Total species: % number introduced spp	50	2	
Total species: overall stress/dieback	NA	3	Grazing
Total /20	NA	9	

²5=0%: none, 4=1–24%: very low, 3=25–49%: low, 2=50–75%: medium, 1=76–99%: high, 0=100%; v. high

³Add subcanopy and groundcover % cover for introduced species

Field measurements:

Water table cm	Groundwater	Water conductivity uS (if present)	12 MV
Water pH (if present)	6.37 (in drain)	Von Post peat decomposition index	7

Soil core laboratory analysis (2 soil core subsamples):

Water content % dry weight		Total C %	
Bulk Density T/m ³		Total N %	
pH		Total P mg/kg	
Conductivity uS			

Foliage laboratory analysis (leaf/culm sample of dominant canopy species):

Species		%N		%P	
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WETLAND PLOT SHEET

Wetland name: El Rancho
 Plot size (2m x 2m default): 2x2
 Field leader: Matiu Park

Date: 4 July 2011
 Altitude:
 Structure: Shrubland

Plot no: 2
 GPS/GR:
 Composition: Manuka

Canopy (bird's eye view)			Subcanopy			Groundcover		
Species ¹ (or Substrate)	%	H	Species	%	H	Species	%	H
Manuka	90	4.5m	Manuka	60	.60	Leaf litter	60	
			Blackberry	10	.5	Centella uniflora	30	0.0 1
						Mahoe		0.2
						Lemonwood		.02
						Blackberry	5	.2
						Geniostoma ligustrifolium var. ligustrifolium	5	.3
						Schoenus masculinus	5	.2

¹ % = % cover: total Canopy % cover = 100%; H = maximum height in m; indicate introduced species by *

Additional species in vicinity in same vegetation type: Schoenus masculinus, Nertera scapanoides, mahoe, Geniostoma rupestre, kahikatea (seedlings), Dichondra brevifolia, Eleocharis gracilis, Coprosma tenuifolia, Pseudopanax hybrid, Dicksonia squarrosa, Carex dipsacea.

Comments: Some grazing observed, tracks cut and some drainage observed. Historic evidence of sphagnum dominant under manuka. However, none observed during field work in this area.

Indicator (use plot data only)	%	Score 0–5 ²	Specify & Comment
Canopy: % cover introduced species	0	5	None observed
Understorey: % cover introduced spp ³	10	4	Blackberry and climbing asparagus.
Total species: % number introduced spp	10	4	
Total species: overall stress/dieback	NA	4	Even aged manuka and remnant kahikatea suggest historic changes with drainage?
Total /20	NA	17	

²5=0%: none, 4=1–24%: very low, 3=25–49%: low, 2=50–75%: medium, 1=76–99%: high, 0=100%; v. high

³Add subcanopy and groundcover % cover for introduced species

Field measurements:

Water table cm	Groundwater	Water conductivity uS (if present)	12 MV
Water pH (if present)	6.37 (in drain)	Von Post peat decomposition index	7

Soil core laboratory analysis (2 soil core subsamples):

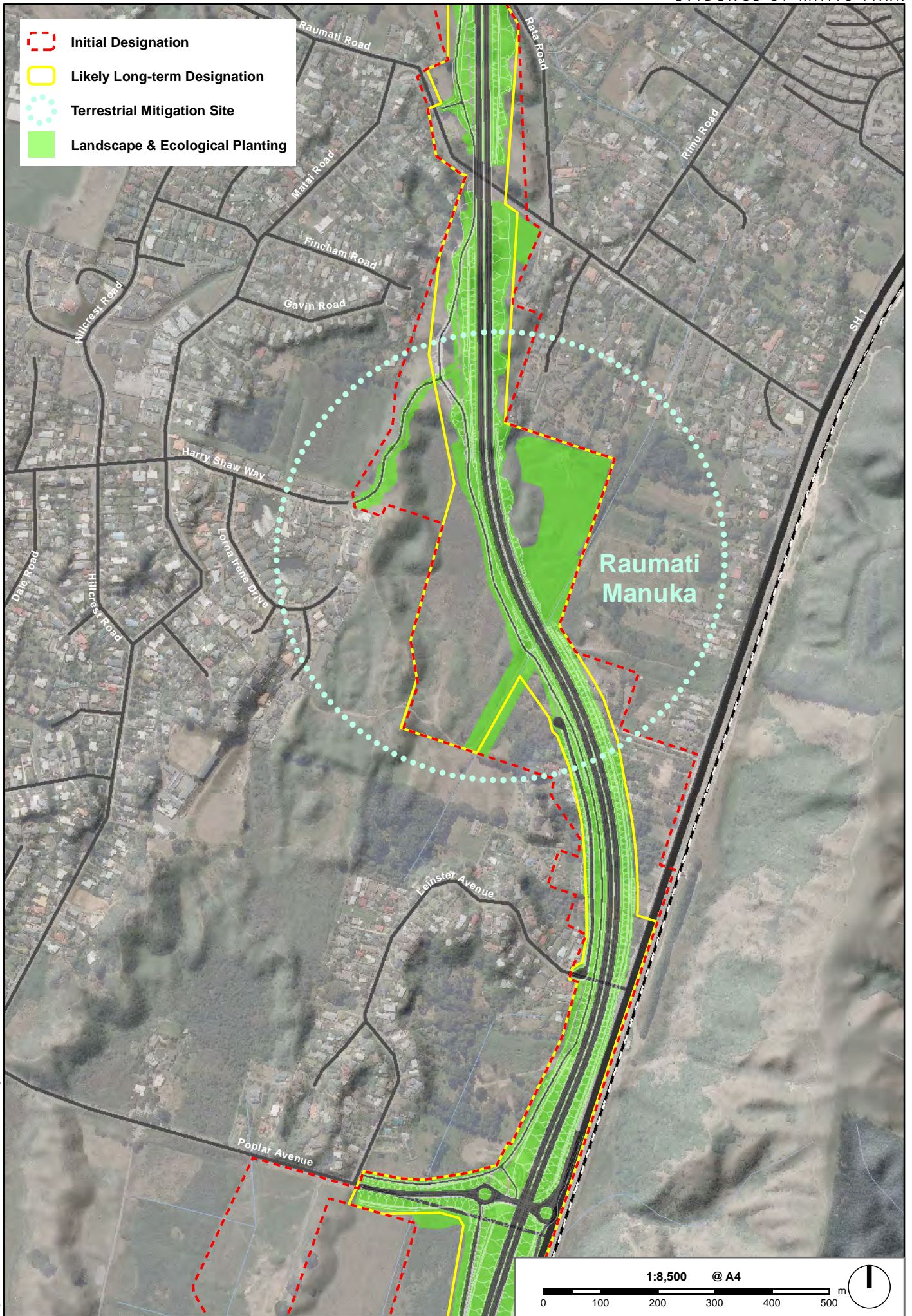
Water content % dry weight		Total C %	
Bulk Density T/m ³		Total N %	
pH		Total P mg/kg	
Conductivity uS			

Foliage laboratory analysis (leaf/culm sample of dominant canopy species):





Species		%N		%P	
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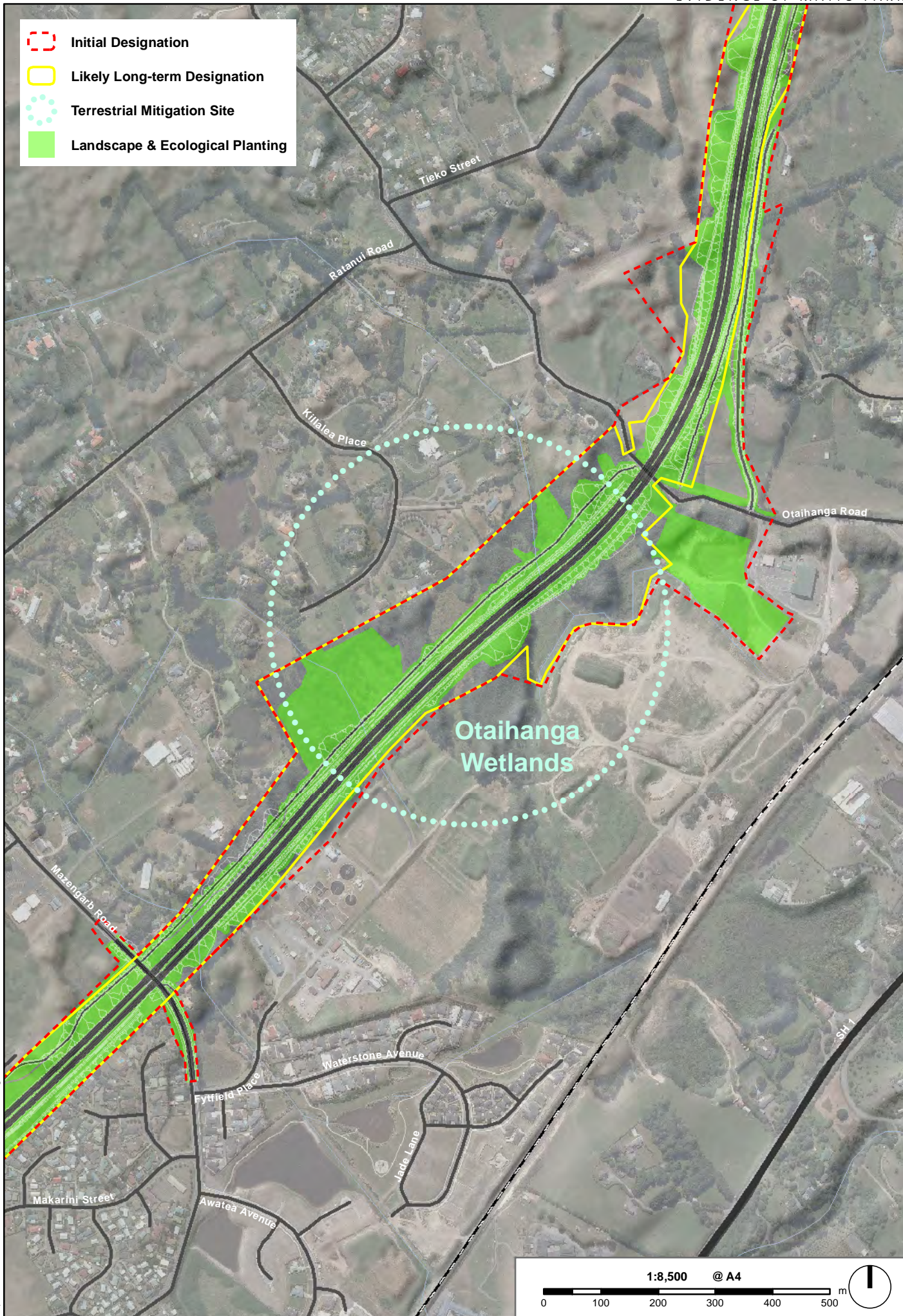
ANNEXURE F: PROPOSED AREAS OF WETLAND MITIGATION

-  Initial Designation
-  Likely Long-term Designation
-  Terrestrial Mitigation Site
-  Landscape & Ecological Planting







September 4, 2012 W09181E_EVI_TerrestrialMitigation_A4mb.mxd

-  Initial Designation
-  Likely Long-term Designation
-  Terrestrial Mitigation Site
-  Landscape & Ecological Planting



September 4, 2012 W09181E_EVI_TerrestrialMitigation_A4mb.mxd

-  Initial Designation
-  Likely Long-term Designation
-  Terrestrial Mitigation Site
-  Landscape & Ecological Planting

Former Waikanae Oxidation Ponds

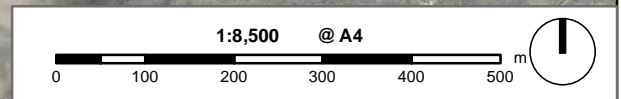
Kakariki / Smithfield

End Farm Road

Smithfield Road

Ngarara Road

September 4, 2012 W09181E_EVI_TerrestrialMitigation_A4mb.mxd



**ANNEXURE G: AERIAL PHOTOGRAPH OF KIWI POND LOCATION
DATED 1987**

(Source: New Zealand Aerial Mapping O/N: 25783; Survey Number: 8790;
Flying Date: 20 Nov 1987 & 2 Jan 1988; Original Neg Scale: 1:25000).



Kiwi Street

Kiwi Pond
(current location)

Wharemauku Stream