

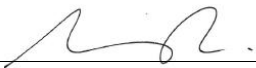
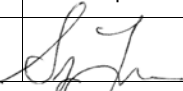
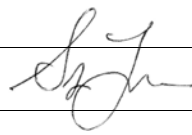
# EMP Attachment 1: Indigenous Vegetation and Habitat Monitoring and Management Plan (excluding wetlands)

17 June 2013

## Revision History

Revision N <sup>o</sup>	Prepared By	Description	Date
A	Matiu Park	Draft for Alliance Review	10 April 2013
B	Matiu Park	Draft incorporating KCDC & GWRC review comment for internal review	1 May 2013
C	Matiu Park	Final Draft	3 May 2013
D	Matiu Park	Final following GWRC, NZTA and Alliance Review	17 June 2013

## Document Acceptance

Action	Name	Signed	Date
Prepared by	Matiu Park	Final Report 	17 June 2013
Reviewed by	Stephen Fuller		17 June 2013
Approved by	Stephen Fuller		
on behalf of	MacKays Peka Peka Expressway Alliance		

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# 1 INTRODUCTION

This indigenous vegetation and habitat monitoring and mitigation plan provides the technical details to support the general information and summaries contained in the EMP.

Information from the Ecological Impact Assessment (Technical Report 26) and Ecological Technical Report 1: Terrestrial Vegetation and Habitats (including wetlands) (Technical Report 27) have informed the methodology.

## 1.1 Consent Conditions

The key resource consent conditions that relate to the protection of valued terrestrial vegetation are G.34 (what the EMP shall include) and G.41 which lists the sites of valued vegetation and the objectives of this plan. In summary the requirements require:

- Information on how loss of valued vegetation and habitat will be minimised (G.34 b) i))
- Information on how elements of valued vegetation and habitat will be salvaged if loss cannot be avoided (G.34 m))
- The mapping of identified valued vegetation and habitat with information on their relative value and protection requirements (G.41 a))
- The maps to be used during development of the EMP and other relevant management plans to raise awareness and any design issues (G.41 b)i))
- The maps to be used during construction and operational work to inform staff and ensure protection (G.41 b)ii))
- The extent of adverse effects to be minimised by:
  - Avoiding or minimising extent of loss through detailed design (G.41 d)i)
  - Developing mechanisms to ensure areas that do not need to be lost are avoided (G.41 d) ii)).
  - Developing mechanisms where complete loss is not required to reduce impacts on those areas that remain (G.41 d) iii))

Conditions	Body Text
G.27	a) The Consent Holder shall submit a draft Erosion and Sediment Control Management Plan (ESCP) to the Manager at least 30 working days prior to Work commencing. The final ESCP will be submitted to the Manager for certification at least 15 working days prior to commencement of Work. The ESCP shall be submitted with the CEMP as an appendix. The purpose of the ESCP is to describe the methods and practices to be implemented to ensure the effects of sediment generation and yield on the aquatic receiving environments associated with the Project will be appropriately managed. In addition, the ESCP shall:

Conditions	Body Text
	iii) Ensure construction and maintenance activities avoid, remedy or mitigate effects of soil erosion, sediment run-off and sediment deposition on valued ecological areas/habitat;
G.34	The Consent Holder shall submit a draft Ecological Management Plan (EMP) to the Manager at least 30 working days prior to Work commencing. The final EMP will be submitted for certification, and a copy provided to KCDC, at least 15 working days prior to Work commencing. The EMP shall be submitted with the CEMP as an appendix. The purpose of the EMP is to:
	The EMP shall include, but need not be limited to, information required in other conditions of this consent and details of the following:
	b) Information on how the following outcomes will be achieved:
	i) Minimise loss of valued vegetation and habitats identified in condition G.41;
	m) The salvage of elements of any valued habitat of indigenous flora and fauna identified in condition G.41 that is being lost as a result of the Project where practicable, including provision for transfer of elements of the affected habitat to ecological mitigation sites. This should include as a minimum: felled logs, Carex, Baumea and associated soils;
G.41	a) The Consent Holder shall engage a suitably qualified ecologist to prepare detailed maps identifying all those areas that contain indigenous vegetation or indigenous habitats, including those listed in (c) below, with information on their relative values and protection requirements.
	b) The maps shall be used as follows:
	i) During development of the EMP and other relevant management plans, to raise awareness of the ecological implications (including mitigation and consenting requirements) of any design changes; and
	ii) During construction and operational work to inform staff and contractors of the purpose and mechanisms for ensuring the protection of sites of ecological value.
	c) For the purposes of this condition, areas of indigenous vegetation and habitats of indigenous flora and fauna are:
	i) Valued terrestrial vegetation and habitats:
	1. Raumati Kanuka (comprising kanuka forest and mahoe on elevated dunes south of Raumati Road);
	2. Mahoe vegetation along Drain 7;
	3. Otaihanga Mahoe (comprising dry vegetation in Otaihanga);
	4. Otaihanga Kanuka (Kanuka Forest west of Southern Otaihanga Wetland);
	5. Waikanae River riparian vegetation;
	6. Tuku Rakau Forest (regenerating broadleaved low forest east of Takamore Urupa);

Conditions	Body Text
	7. Ngarara Mahoe (regenerating broadleaved low forest on Ngarara Farm between Te Moana Road and Ngarara Road); and
	8. Kakariki Stream riparian vegetation.
	d) The extent of adverse effects shall be minimised by, as a minimum:
	i) Developing detailed designs which avoid or minimise the extent of effect on areas identified under (c) above as far as practicable;
	ii) Developing mechanisms to ensure that the areas, or parts of areas beyond the Project Footprint, but within the designation, as identified under (c) above, to be avoided, are clearly marked on the ground (e.g. through fences) and that contractors are required to avoid them; and
	iii) For those areas which cannot be avoided, but where complete loss of the ecosystem, vegetation or habitat is not required, developing mechanisms to reduce the impact on the area as far as practicable.

The Designation Condition DC.54 d)iv) also requires the LMP to include specific information on the retention of areas of indigenous vegetation as far as can be achieved, including minimising effects of the CWB through the Otaihanga Kanuka Forest (for example through the use of boardwalks).

The areas of valued terrestrial vegetation and habitats identified in condition G.41 are as follows:

*Table 1 – Valued Terrestrial Vegetation and Habitats*

Site Name	Chainage
1. <b>Raumati Kanuka</b> (along dry dunes south of Raumati Road)	Between 3900 & 4400
2. <b>Drain 7 Mahoe</b> (lower slopes of dry dunes and along Drain 7 west of Rata Road)	Between 4800 & 5000
3. <b>Otaihanga Mahoe</b> (comprising dry vegetation in Otaihanga)	Between 8800 & 8850
4. <b>Otaihanga Kanuka</b> (kanuka forest west of Southern Otaihanga Wetland)	Between 9050 & 9150
5. <b>Waikanae River riparian vegetation</b> (riparian vegetation on south side of river)	Between 10550 & 10650
6. <b>Tuku Rakau Forest</b> (regenerating broadleaved low forest east of Takamore Urupa)	Between 11300 & 11400
7. <b>Ngarara Mahoe</b> (regenerating broadleaved low forest on Ngarara Farm between Te Moana Road and Ngarara Road)	Between 12300 & 12550
8. <b>Kakariki Stream riparian vegetation</b> (planted riparian vegetation on both sides)	Between 13800 & 14050

These conditions are provided in full in Appendix 1.

## 1.2 Objectives

In summary there are six primary requirements for this plan. They are:

1. To map all valued vegetation within the designation;
2. To ensure detailed design will avoid or minimise effects as far as practicable;
3. To raise awareness of each of the areas during construction and operation;
4. To provide mechanisms that will protect areas of valued habitat that lie within the Project Footprint and designation, but which do not need to be cleared;
5. To provide mechanisms that minimise the impact on areas of valued habitat where complete loss is not required.
6. To provide mechanisms for the salvage of elements of valued vegetation and habitats where they are to be cleared.

## 1.3 Integration between Ecology, Landscape and Stormwater

Conditions relating to the monitoring and protection of extant terrestrial vegetation span two disciplines and require close integration between the EMP and Landscape Management Plan and coordination between the project ecologist and project landscape architect.

The LMP and more detailed SSLMPs (which have to be prepared for the entire route) are responsible for developing, designing and implementing the landscape mitigation measures as set out in conditions. This involves retention of extant vegetation, final contouring of earthworks, input into the shaping and final form of wetlands, plant selection and trialing to determine suitable species, developing suitable soil mixes utilising peat extracted from the site and setting criteria for contract management and supervision of site establishment and planting. The project landscape architect will act as an adviser to the project construction team on the successful delivery of the planting contracts for all ecological, landscape, stormwater and urban design mitigation planting (See conditions DC53 to DC.58 and G.42C).

The EMP and more detailed SSEMPs (which will be prepared for six specific mitigation sites) are responsible for developing baseline information on extant terrestrial vegetation, for monitoring health, for establishing objectives for revegetation and triggers for success of mitigation and remedial works. The project ecologist is responsible for construction and post construction monitoring of extant terrestrial vegetation, the analysis of any changes to vegetation and liaising with the project landscape architect on a regular basis (G.33B to G.42C).

## **2 BASELINE METHODOLOGY**

The vegetation survey and mapping carried out for the Assessment of Effects provides a baseline which will inform detailed design and construction management of valued terrestrial vegetation and habitats as required by Conditions G.34 and G.41. The methods used to obtain this baseline data are as follows (Refer to Technical Reports 26 & 27).

### **2.1 Vegetation Mapping and Survey**

#### **2.1.1 Fieldwork Timing and Effort**

The botanical fieldwork for the plant species lists was undertaken during October 2010, November 2010 and January 2011. Following on from the spring/summer field work, and more detailed refinement of the Expressway Alignment, more detailed field mapping was undertaken during March and April 2011. For the vegetation study the entire Expressway Alignment was either walked or driven to ensure all mapped vegetation was observed. Incidental botanical observations were also added during other ecological investigations.

Further site visits were undertaken during April, May and July 2011 to refine the vegetation mapping and species descriptions and to visit areas where further information was required. Specific Wetland Condition Assessments were undertaken in July 2011 following the final Expressway Alignment and Designation extent being confirmed.

#### **2.1.2 Vegetation Mapping**

Vegetation patterns were mapped in the field onto high resolution colour aerial photographs overlaid with proposed Designation boundaries. This work was undertaken through March and April 2011, prior to the final Expressway Alignment being confirmed. To ensure all potentially affected vegetation communities were included within this assessment a corridor extending 100 m to either side of the centreline of the alignment was mapped. Following confirmation of the preferred Designation route, this vegetation was trimmed back to include the Construction Designation. Vegetation shown on maps outside this corridor is based on the LDCBII national dataset.

During the ecological survey particular attention was paid to vegetation communities known to be reduced from their former extent in the Wellington Ecological District (e.g. wetlands, dunes and coastal forest) or vegetation with potentially rare or uncommon species present. Where these sites fell within the Designation or where these sites were considered to be potentially affected through indirect effects (e.g. hydrological changes), they were individually visited to check for presence of rare or threatened plant species (refer discussion below).

#### **2.1.3 Botanical Surveys**

Desktop studies and discussions with local botanical experts determined the location of key habitats where rare or uncommon plants, known to occur locally, were most likely to occur



within close proximity to the Project. Botanical surveys and lists of vascular plants were compiled for 10 indigenous habitats within these locations. Habitats where these surveys were conducted included manuka-dominated wetlands, sedgeland and rushland wetlands, wet dune depressions in pasture, mature shrublands and areas of advanced regeneration.

To maximise botanical effort during seasonal flowering, botanical surveys were undertaken in key habitats identified as potentially at risk during the initial project scoping phase (when a number of alternative route options were still being considered). While this approach has meant that some areas surveyed are now not affected by the Project, the botanical information gathered has provided some useful comparative information on species and composition of wetlands in close proximity. For example, the survey included detail on a number of wetland and forest communities now located some distance from the Expressway Alignment (e.g. Poplar Ave Peatlands, 131 Raumati South Peatlands). Following the final route confirmation (7 July 2011), more detailed Wetland Condition Assessments were undertaken in those immediately affected habitats.

Botanical survey work was undertaken during October 2010, November 2010, January 2011 and July 2011 by Pat Enright and Matiu Park.

### **3 BASELINE SURVEY RESULTS**

#### **3.1 Vegetation Mapping**

As part of the baseline, Condition 41 requires the preparation of detailed maps that identify all areas of indigenous vegetation or indigenous terrestrial habitats. These Valued Vegetation Maps are provided in the main EMP report.

#### **3.2 Relative Values and Protection Requirements**

Condition G.41 also requires information on the relative values of indigenous vegetation. The following table describes the eight sites of continuous native vegetation (excluding individual trees and treelands) found within the designation, describes them and provides an assessment of their ecological value.

Table 2 – Description of indigenous vegetation

Site Name	Size (ha)	Description	Existing site management/fencing	Value
1. Raumati Kanuka	0.4	A small area of kanuka forest and treeland with scattered mahoe on the raised dunes south of Raumati Road.	These areas of forest and scattered trees and treeland are all unfenced and are grazed by horses and occasional stock. Regeneration is largely absent as a result of grazing pressures. Large areas of blackberry and gorse encroaching on site, with a number of understorey and canopy weed species, including a number of exotic trees and shrubs present.	M
2. Mahoe vegetation along Drain 7	0.83	This area consists of a long area of mahoe on the lower slopes of a series of dry dunes north of Raumati Road to Drain 7.	This area is unfenced and grazed by horses and occasional stock. Regeneration is largely absent as a result of grazing pressures. Large areas of blackberry and other weeds encroaching.	M
3. Otaihanga Mahoe	0.1	This area consists of a small stand of indigenous bush dominated by one large remnant matai tree surrounded by regenerating mahoe and the northern Otaihanga Wetland.	The area is unfenced, but is surrounded to the north, west and south by the Southern Otaihanga Wetland. Pine plantation surrounds the area to the east, which will be removed as part of the Expressway construction. Some weeds present within this area, including blackberry, gorse.	M
4. Otaihanga Kanuka	0.5	This site consists of an area of old growth kanuka forest located on top of an elevated sand dune. While the kanuka forest canopy remains largely intact, the understorey has been highly modified by introduced pasture grasses and there only limited indigenous flora present. Mountain bike tracks and associated structures traverse this small remnant.	The area is unfenced, with no stock pressures, being within KDC land and adjacent to managed pine forest. Loss of pine plantation as part of Expressway construction will result in some edge effects. No natural regeneration occurring, primarily as a result of dominance by Veldt grass and other exotic pasture grasses. Reduced pressures associated with removal of mountain-biking tracks and equipment in this area.	M
5. Waikanae River riparian vegetation	0.5	Part of a larger area of willow riparian-planted edge with scattered native riparian and flood plain plantings comprising ribbonwood, flax, cabbage trees and occasional karamu and other shrubs, including wetland plantings. Some kanuka and	This area is unfenced, but stock are excluded from this area. Some maintenance of riverside willows observed. Otherwise, all other indigenous riparian plantings have been planted and maintained for approximately 5 – 7 years.	M

Site Name	Size (ha)	Description	Existing site management/fencing	Value
		manuka plantings on raised slopes.		
6. Tuku Rakau Forest	0.9	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.	This area is fenced from stock and is undergoing a natural transformation from gorse to broadleaved forest, with gorse more dominant on the edges. Limited natural regeneration occurring within a mahoe-monoculture.	M
7. Ngarara Mahoe	4.2	A large area of advanced mahoe regenerating from gorse on the raised dunes of Ngarara Farm, in close proximity to Ti Kouka wetland.	Unfenced from stock. However, most stock have been excluded by gorse and blackberry surrounding these areas. Limited natural regeneration occurring within a mahoe-monoculture.	M
8. Kakariki Stream riparian vegetation	n/a	Part of a larger area of planted riparian vegetation with large areas of Carex geminata. Some weeds present, including convolvulus and blackberry.	Fenced from stock. Limited natural regeneration other than Carex geminata.	L

A further 1.85 ha of indigenous vegetation that will be removed or modified comprises seven very small areas of indigenous vegetation consisting of scattered individual trees or small clusters of trees considered to be of low value. They are found at the following locations:

- Just north of the Raumati Manuka Wetland (approximately 15 mahoe trees);
- The raised dunes west of Rata Road (between 30 and 60 scattered or individual mahoe trees within blackberry and gorse);
- Scattered cabbage trees south of Takamore Urupa (approximately 5 trees);
- Roadside mahoe trees in the vicinity of the over-bridge embankments north of Otaihanga Road (approximately 10 – 20 mahoe trees);
- Scattered kanuka trees north of Otaihanga Road ROW (approximately 15 trees);
- Scattered mahoe trees on the raised dunes adjacent to Ngarara Wetland (approximately 10 trees); and
- Scattered kanuka and manuka trees in farmland north of Smithfield Road (approximately 10– 20 trees).

### 3.3 Protection Requirements

Condition G.41 also requires information on the protection requirements for all identified areas of indigenous vegetation. This information is provided in the following table.

Table 3 – Protection requirements for valued vegetation

Site Name	Protection Requirements
1. Raumati Kanuka	Only a small proportion will not be affected.
2. Drain 7 Mahoe	Loss of 0.35 ha of 0.85 ha. Remainder to be avoided and/or effects remedied.
3. Otaihanga Mahoe	To be avoided.
4. Otaihanga Kanuka	Loss of 0.17 ha of 0.5 ha. Remainder to be avoided and/or effects remedied.
5. Waikanae River riparian vegetation.	Loss of 0.13 ha of a wider area of restoration planting in the Waikanae River area. Remainder to be avoided and/or effects remedied.
6. Tuku Rakau Forest	Loss of 0.25 ha of 0.9 ha. Remainder to be avoided and/or effects remedied.
7. Ngarara Mahoe	Loss of 0.86 ha of 4.2 ha. Remainder to be avoided and/or effects remedied.
8. Kakariki Stream riparian vegetation.	Loss of 0.18 ha of a larger area of planted streamside vegetation along the Kakariki Stream. Remainder to be avoided and/or effects remedied.

Table 4 outlines the consented totals of each vegetation community within the Project Footprint.

Table 4 – Consented area of indigenous vegetation communities (excluding wetlands) lost or modified under the Project Footprint:

DESCRIPTION (listed South to North)	Amount Lost (ha)
Regenerating kanuka forest	0.83
Regenerating broadleaved scrub and low forest	2.50
Riparian margins in regenerating scrub	0.48
Mature or maturing indigenous forest	0.01
<b>TOTAL</b>	<b>3.8</b>

## 4 MONITORING

Condition G.34 f), requires the ongoing construction and post-construction monitoring of the eight areas of valued indigenous vegetation and habitat to determine whether those areas to be avoided have been, to identify any changes in condition arising from the Project that have not been consented and ensure the outcomes sought have been achieved. Monitoring shall be carried out as follows:

### 4.1 Introduction

There are three scenarios of potential adverse effects on extant valued indigenous vegetation, each requiring a different monitoring and management approach. They are

- Areas of valued indigenous vegetation within the designation that can be avoided (outside project footprint). Various mechanisms and monitoring and management will be used to confirm there have been no adverse effects.
- Areas of valued indigenous vegetation which will be cleared entirely. Mitigation is already provided for this and not additional monitoring or management is required.
- Areas of valued vegetation that will be cleared in part. These areas will need to be subject to detailed monitoring during and post construction.

In addition monitoring is required for ecological mitigation sites post construction to determine success. The following sections outline the monitoring and management requirements under these scenarios.

### 4.2 Construction Monitoring

#### Observation of Vegetation Clearance

Immediately following vegetation clearance observation of the cut margin of the vegetation will be carried out to:

- Confirm the extent of clearance has been carried out in accordance with the demarked area.
- Determine if any remedial work is required (e.g.)
  - buffer planting to protect from edge effects
  - clearance of earth-worked material entering and/or smothering areas of vegetation during construction;
  - managing bank collapse leading to instability of vegetation, including exposing root structures
- Identify any existing weeds for monitoring and potential control.

The results of the survey and any remedial work will be included in the required quarterly reports.

## Bi-Annual Surveys

Surveys of all sites of indigenous vegetation clearance will be carried out twice per year in mid spring (October) and mid Autumn (April) to:

- Determine if there has been consequent die-back beyond the demarked area as a result of edge effects such as
  - Removal of plantation pine forest leading to drying out or loss of vegetation outside of the demarked area/Project Footprint;
- Determine if there has been an increase in invasive weeds within the area of retained indigenous vegetation
- Determine if additional remedial work is required to further protect the vegetation (e.g. buffer planting).

The results of the survey and any remedial work will be included in the required quarterly reports.

*NOTE: these surveys are of extant indigenous vegetation only and not of revegetation areas which will undergo surveys for weeds and browsing pests as part of the contract for planting (managed under the SSLMP or relevant SSEMP).*

## 4.3 Post Construction Monitoring

### Valued Vegetation

In accordance with Condition G.38 c), bi-annual monitoring of valued indigenous vegetation will continue for 2 years following completion of vegetation clearance as follows

- The Project Ecologist will survey all areas of indigenous vegetation outside of the Project Footprint and within the Designation and prepare a report outlining whether there have been any adverse effects or changes to vegetation and/or ecological functioning when compared with the pre-construction state of these areas.
- Should any Project-related changes in the condition and extent of indigenous vegetation be determined during post-construction monitoring, the adaptive management processes outlined in Section 5 needs to be implemented in conjunction with the Manager (See condition G.34 k).
- If any adaptive management and/or additional mitigation be required as a consequence of post-construction monitoring, monitoring is required to continue for a further 5-years (As per Condition G.40)
- The results of the survey and any remedial work will be included in the required quarterly reports.

## Mitigation Success Monitoring

Monitoring of the success of mitigation planting of indigenous vegetation will be undertaken in coordination with the project Landscape Architect to ensure ecological remedial and mitigation works meet the project outcomes and objectives specified in condition G.34.

- The timing and methodology of this monitoring will be detailed in the maintenance schedules to be developed for each of the SSEMP / SSLMP areas, as will any requirements for remedial work necessary to ensure mitigation success is achieved.
- The ecological component of sign-off will involve the relevant specialist ecologists involved in determining the specific mitigation requirements for each site (e.g. avi-fauna, herpetofauna, freshwater, wetland).
- Mitigation requirements will be specified within each SSEMP.

Measures of success that will be monitored are:

- Total area of planted or restored terrestrial vegetation.
- Survival of a minimum of 80% of plant species.
- Indigenous canopy closure of a minimum of 80% within the planted areas.
- Invasive terrestrial weed species successfully controlled, including all species listed in the GWRC Regional Pest Management Plan 2010.
- Natural colonisation by other non-planted indigenous species.

## 5 ADAPTIVE MANAGEMENT

The intention of the adaptive management approach is to

- Respond in the event that effects are greater than predicted in valued indigenous vegetation.
- Respond in the event that mitigation planting does not achieve the mitigation objectives / outcomes.

### 5.1 Management triggers

Section 4 Monitoring identifies the range of parameters that require monitoring to ensure success of protection and mitigation and to detect adverse effects at the earliest opportunity so that adaptive management can be quickly commenced.

Management triggers are separated into those relating to the monitoring of vegetation clearance and those relating to mitigation success monitoring.

- The triggers for monitoring vegetation clearance relate specifically to conditions for consented area of vegetation loss and management.
- The triggers for mitigation success monitoring relate both to specific conditions for the area of mitigation planting required and the accepted standards for achievement of successful plant establishment.

In summary, these result in the following management triggers.

Table 5 – Monitoring and management triggers for indigenous vegetation (excluding wetlands)

Attribute	Measure	Management Trigger
<b>Extant valued vegetation (G.41)</b>		
Total vegetation community area	The project clears more extant indigenous vegetation than consents allow (G.42)	> 3.8 ha of valued terrestrial vegetation lost or modified
Specific weed threats	Weeds currently not present in each area are introduced to the site or clearance encourages increase in invasive weed presence	Increase in either weed extent or diversity in response to vegetation clearance
Domestic stock access	Presence of stock and effect of grazing on extant vegetation.	Increase in browse damage.
<b>Mitigation planting (G.43)</b>		
Total area of planted or restored terrestrial vegetation.	Area of revegetation does not meet consent requirements (G.42)	< 7.6 ha of terrestrial mitigation planting achieved
Plant survival	Survival of a minimum of 80% of plant species.	>20% loss of plants at 4 years
Canopy closure	Canopy closure of a minimum of 80% within the planted areas.	< 80% canopy closure at 4 years
Invasive weeds	Weeds currently not present in each area are introduced to the site or clearance encourages increase in invasive weed presence	Increase in either weed extent or diversity in response to vegetation clearance
Natural processes	Natural colonisation by other non-planted indigenous species.	Absence of colonisation of native species.

## 5.2 Process if adverse effects

In the event that one or more of the above management triggers is exceeded an adaptive management processes will be implemented in consultation with the Manager as follows:

### Alert and Notification

In the event that there is any indigenous vegetation or habitat clearance that triggers an management response:

- The Project Ecologist will be contacted within 24 hours to visit the site and review any construction-related effects against the baseline ecological condition of the site.



- A report will be prepared for the Manager, including outlining any response management and monitoring requirements, as outlined in section 6 (adaptive management) in accordance with Condition G.40.
- Prior to undertaking any adaptive management interventions the written consent of Greater Wellington Regional Council and Kāpiti Coast District Council will be required in accordance with Condition G.40 b) iii).

Consistent with Condition G.34 l) and G.40 c), the following sections outline a range of potential adaptive management options that could be undertaken by the Contractor to remedy or mitigate Project-related effects on the following indigenous vegetation communities: regenerating kanuka forest (Vegetation Community 3.03); regenerating broadleaved scrub and low forest (Vegetation Community 3.04); riparian margins in regenerating scrub (Vegetation Community 3.05); and mature or maturing indigenous forest (Vegetation Community 4.01).

### **5.3 Options for Adaptive Management**

The potential options to remedy effects will be determined on a case-by-case basis depending on the type of effect, its severity, and the specifics of the site. Options may include but are not limited to:

- For deposition of earthworks within indigenous vegetation, careful hand-removal of debris could be undertaken as soon as practicable with ecological supervision.
- For control of invasive weed species that have established as a result of edge effects and reduced grazing pressures, targeted control of any invasive weed species as listed in the GWRC Regional Pest Management Plan 2010 or other weed species determined by the Project Ecologist.
- For die-back of indigenous vegetation, replanting of any areas of die-back with appropriate indigenous species consistent with affected vegetation or development of an expanded area of buffer planting surrounding the vegetation lost to assist with mitigation planting.
- Additional mitigation opportunities at other areas of indigenous vegetation or within landscape and amenity plantings within the designation (in conjunction with the Project Landscape Architect), such as the incorporation of plant species lost or an increased allowance for interplanting of primary forest species.

In the event of any additional project-related indigenous vegetation habitat loss or arising during or post-construction, mitigation may be required as outlined in the subsequent section.

### **5.4 Additional Mitigation**

If effects caused during construction cannot be remedied, or if mitigation success monitoring shows that mitigation targets have not been achieved, additional mitigation may be required. The quantum of additional mitigation that must be undertaken are specified

by Condition G.34 k) which identifies the Environmental Compensation Ratios for indigenous vegetation and habitat loss as follows:

*Table 6 – Mitigation Ratios*

Vegetation Community	Area consented for removal (Condition G.42 b i))	Landscaped and planted indigenous vegetation (Condition G.42 b i))	Other areas of terrestrial vegetation within SSEMP areas	Mitigation Ratio
Indigenous terrestrial habitat: Kanuka forest and / or regenerating broadleaf scrub and low forest (including riparian margins)	3.8 ha	7.6 ha	TBC through SSEMP	X 2

Any additional mitigation requirements will be recommended by the Project Ecologist. As far as practicable, that mitigation will reflect the Indigenous habitat types and ecological functioning that has been affected (Condition G.42A).

A number of opportunities exist if additional mitigation works are required. These include but are not limited to:

- Interplanting within the large areas of gorse surrounding Raumati Manuka Wetland and Drain 7;
- Creation of additional habitat linkages with other areas of indigenous vegetation or habitat to facilitate bird movement (e.g. additional planting between Ngarara Wetland and the Kakariki / Smithfield SSEMP area); or
- Waikanae Oxidation Ponds.

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## 7 APPENDICES:

### Appendix 1: Resource Consent Conditions

Conditions	Body Text
G.27	a) The Consent Holder shall submit a draft Erosion and Sediment Control Management Plan (ESCP) to the Manager at least 30 working days prior to Work commencing. The final ESCP will be submitted to the Manager for certification at least 15 working days prior to commencement of Work. The ESCP shall be submitted with the CEMP as an appendix. The purpose of the ESCP is to describe the methods and practices to be implemented to ensure the effects of sediment generation and yield on the aquatic receiving environments associated with the Project will be appropriately managed. In addition, the ESCP shall:
	iii) Ensure construction and maintenance activities avoid, remedy or mitigate effects of soil erosion, sediment run-off and sediment deposition on valued ecological areas/habitat;
G.34	The Consent Holder shall submit a draft Ecological Management Plan (EMP) to the Manager at least 30 working days prior to Work commencing. The final EMP will be submitted for certification, and a copy provided to KCDC, at least 15 working days prior to Work commencing. The EMP shall be submitted with the CEMP as an appendix. The purpose of the EMP is to:
	The EMP shall include, but need not be limited to, information required in other conditions of this consent and details of the following:
	b) Information on how the following outcomes will be achieved:
	i) Minimise loss of valued vegetation and habitats identified in condition G.41;
G.41	m) The salvage of elements of any valued habitat of indigenous flora and fauna identified in condition G.41 that is being lost as a result of the Project where practicable, including provision for transfer of elements of the affected habitat to ecological mitigation sites. This should include as a minimum: felled logs, Carex, Baumea and associated soils;
	a) The Consent Holder shall engage a suitably qualified ecologist to prepare detailed maps identifying all those areas that contain indigenous vegetation or indigenous habitats, including those listed in (c) below, with information on their relative values and protection requirements.
G.41	b) The maps shall be used as follows:
	i) During development of the EMP and other relevant management plans, to raise awareness of the ecological implications (including mitigation and consenting requirements) of any design changes; and
	ii) During construction and operational work to inform staff and contractors of the purpose and mechanisms for ensuring the protection of sites of ecological value.
	c) For the purposes of this condition, areas of indigenous vegetation and habitats of indigenous flora and fauna are:
	i) Valued terrestrial vegetation and habitats:
	1. Raumati Kanuka (comprising kanuka forest and mahoe on elevated dunes south of Raumati Road);
2. Mahoe vegetation along Drain 7;	

Conditions	Body Text
	3. Otaihanga Mahoe (comprising dry vegetation in Otaihanga);
	4. Otaihanga Kanuka (Kanuka Forest west of Southern Otaihanga Wetland);
	5. Waikanae River riparian vegetation;
	6. Tuku Rakau Forest (regenerating broadleaved low forest east of Takamore Urupa);
	7. Ngarara Mahoe (regenerating broadleaved low forest on Ngarara Farm between Te Moana Road and Ngarara Road); and
	8. Kakariki Stream riparian vegetation.
	d) The extent of adverse effects shall be minimised by, as a minimum:
	i) Developing detailed designs which avoid or minimise the extent of effect on areas identified under (c) above as far as practicable;
	ii) Developing mechanisms to ensure that the areas, or parts of areas beyond the Project Footprint, but within the designation, as identified under (c) above, to be avoided, are clearly marked on the ground (e.g. through fences) and that contractors are required to avoid them; and
	iii) For those areas which cannot be avoided, but where complete loss of the ecosystem, vegetation or habitat is not required, developing mechanisms to reduce the impact on the area as far as practicable.

## Appendix 2: Baseline Results

Development of an assessment of ecological effects for the Project involved ecological investigations of all the areas of indigenous vegetation that will be either be traversed by the project and a number in close proximity within the Designation. All sampling was carried out as per the methods provided in the earlier sections. The sample site locations and details are as follows:

*Table 7 – Detail of each of the eight areas of indigenous vegetation or habitat (listed south to north)*

	Size of area (ha)	Area of vegetation affected
Raumati Kanuka (comprising kanuka forest and mahoe on elevated dunes south of Raumati Road);	0.4	0.35
Mahoe vegetation along Drain 7	0.83	0.35
Otaihanga Mahoe (comprising dry vegetation in Otaihanga)	0.1	n/a
Otaihanga Kanuka (Kanuka Forest west of Southern Otaihanga Wetland)	0.5	0.17
Waikanae River riparian vegetation	2.0	0.13
Tuku Rakau Forest (regenerating broadleaved low forest east of Takamore Urupa)	0.9	0.25
Ngarara Mahoe (regenerating broadleaved low forest on Ngarara Farm between Te Moana Road and Ngarara Road)	4.2	0.86
Kakariki Stream riparian vegetation	n/a	0.18

Sampling type used in each area of indigenous vegetation and habitat is presented in Table 8.

*Table 8 – Sampling methods used in each area of indigenous vegetation*

Name	Vegetation community mapping	Botanical Survey	Photographs
Raumati Kanuka (comprising kanuka forest and mahoe on elevated dunes south of Raumati Road);	✓	✓	✓
Mahoe vegetation along Drain 7	✓	✓	✓
Otaihanga Mahoe (comprising dry vegetation in Otaihanga)	✓	✓	✓
Otaihanga Kanuka (Kanuka Forest west of Southern Otaihanga Wetland)	✓	✓	✓
Waikanae River riparian vegetation	✓		✓
Tuku Rakau Forest (regenerating broadleaved low forest east of Takamore Urupa)	✓		
Ngarara Mahoe (regenerating broadleaved low forest on Ngarara Farm between Te Moana Road and Ngarara Road)	✓	✓	
Kakariki Stream riparian vegetation	✓		

Appendix 3 provides a summary of the values of each of the 8 areas of indigenous vegetation and habitat. More information on these values, including botanical assessments where applicable, are included in Technical Report 27.

## Appendix 3: Summary Sheets for Each Area of Indigenous Vegetation/ Habitat

### Raumati Road Kanuka

#### a. 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.

#### b. Values

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

#### c. General Description

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

#### d. Scale of works

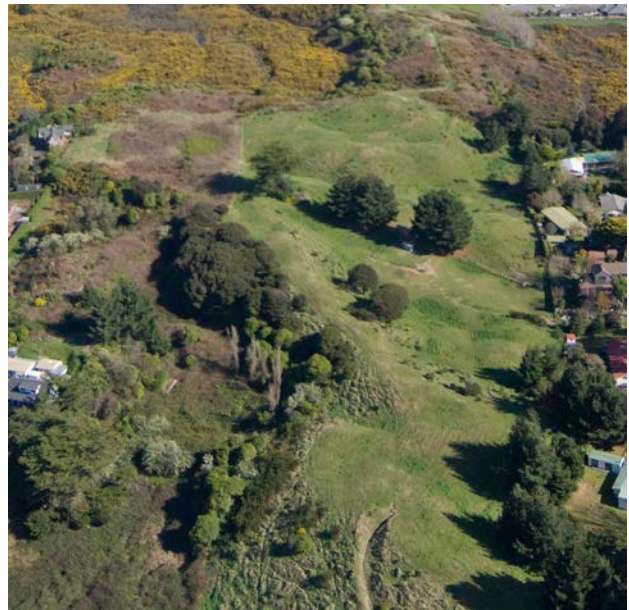
- Almost all the kanuka forest and scattered trees in this area would be removed as part of the site works in this location (approximately 0.35 ha).

#### e. Works Monitoring

- Monitor vegetation clearance to minimise impacts.

#### f. Mitigation Monitoring

- No mitigation works proposed in this location.





## Mahoe vegetation along Drain 7

### g. Characteristics

- A long area of mahoe forest and with scattered tree lucerne on the eastern side of the raised dunes north of Raumati Road beside Rata Road.
- Grazed understory, with large areas of blackberry and other adventives weed species present.
- Approximately 0.83 ha in size.



### h. Values

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

### i. General Description

- The ecological value of the regenerating mahoe forest is assessed as Moderate.

### j. Scale of works

- Approximately 0.35 ha of the regenerating mahoe forest in this area would be removed as part of the site works in this location.

### k. Works Monitoring

- Monitor vegetation clearance to minimise impacts.

### l. Mitigation Monitoring

- No mitigation works proposed in this location.

## Otaihanga Mahoe

### m. 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.

### n. Values

- KDC-owned land.
- Not listed in District Plan. Identified in KDC 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.



### o. General Description

- The ecological value of the forest is assessed as Medium.

### p. Scale of works

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

### q. Works Monitoring

- Ongoing.

### r. Mitigation Monitoring

- No terrestrial mitigation works proposed in this location.

## Otaihanga Kanuka

### s. Characteristics

- A small area of kanuka forest on an elevated sand dune south of Otaihanga Northern Wetland.
- 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.



### t. 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.

### u. General Description

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

### v. 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.

### w. Works Monitoring

- Monitor vegetation clearance to minimise impacts.

### x. Mitigation Monitoring

- No mitigation works proposed in this location.

## Waikanae River Riparian

### y. 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 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.



### z. 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.
- The ecological value of the forest is assessed as Low.

### aa. General Description

- nil

### bb. 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 Muaupoko Stream. Predominantly willow will be lost on the northern side, mostly as a result of river channel transition being undertaken by the Project.

### cc. Works Monitoring

- Monitor vegetation clearance to minimise impacts.

### dd. Mitigation Monitoring

- No mitigation works proposed in this location.

## Tuku Rakau Forest

### ee. 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.



### ff. 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.
- The ecological value of the forest is assessed as Low.

### gg. General Description

- nil

### hh. 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.

### ii. Works Monitoring

- Monitor vegetation clearance to minimise impacts.

### jj. Mitigation Monitoring

- No mitigation works proposed in this location.

## Ngarara Mahoe Forest

### kk. 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.

### ll. 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.



### mm. General Description

- The ecological value of the forest is assessed as Medium.

### nn. 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.

### oo. Works Monitoring

- Monitor vegetation clearance to minimise impacts.

### pp. Mitigation Monitoring

- No mitigation works proposed in this location.

## Kakariki Stream Riparian

### qq. Characteristics

- The riparian vegetation in this section of the Kakariki Stream consists of a thin strip of older riparian planting and larger areas of *Carex geminata* on both sides. But predominantly on the northern side.
- On the northern side, the vegetation is dominated by rank pasture, weedlands with some areas of *Carex geminata* and other early successional shrubs and trees.

### rr. Values

- KDCD-administered land (flood protection) along the Nga Manu Nature Reserve Right-of-Way.
- Not listed in District Plan as having ecological values.
- Significant undertaking by volunteer planting and restoration groups (Nga Manu Nature Reserve) and ongoing weed and plant maintenance.



### ss. General Description

- The ecological value of the forest is assessed as Low.

### tt. Scale of works

- The Kakariki Stream will be diverted within the Designation, and three road and one cycleway bridge structures installed (with associated rip rap and stream protection works).
- Stream will be diverted as part of the construction of the Kakariki Stream Expressway bridge.
- Approximately 0.18 ha of the riparian planting on the both sides of the stream will be lost as part of stream diversion, bridge construction, abutments and construction of riprap and flood protection.

### uu. Works Monitoring

- Monitor vegetation clearance to minimise impacts.

### vv. Mitigation Monitoring

- No mitigation works proposed in this location.

# EMP Attachment 2: Lizard Management Plan



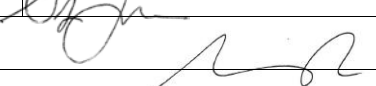
17 June 2013



## Revision History

Revision N°	Prepared By	Description	Date
A	Jonathan Ruffell	Draft for NZTA Review	23 March 2013
B	Matiu Park	Draft incorporating KCDC & GWRC review comment for internal review	17 April 2013
C	Matiu Park	Draft final report	3 May 2013
D	Matiu Park	Final Report after NZTA, KCDC and GWRC Certification Review	17 Jun 2013

## Document Acceptance

Action	Name	Signed	Date
Prepared by	Matiu Park	Final Report 	10 June 2013
Reviewed by	Stephen Fuller		17 June 2013
Approved by	Matiu Park		
on behalf of	McKay to Peka Peka Alliance		

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# 1 INTRODUCTION

This section outlines the proposed Lizard Management Plan for the Project. It specifies the approach that will be taken to manage the effects of the Project construction on native arboreal lizards and their habitats

## 1.1 Consent conditions

The only consent condition relating to herpetofauna is G.34c) as follows:

Conditions	Body Text
G.34	The Consent Holder shall submit a draft Ecological Management Plan (EMP) to the Manager at least 30 working days prior to Work commencing. The final EMP will be submitted for certification, and a copy provided to KCDC, at least 15 working days prior to Work commencing.
	The EMP shall include, but need not be limited to, information required in other conditions of this consent and details of the following:
	c) A Lizard Management Plan that shall include:
	i) Details of searching methods to be implemented within the Project Footprint for identifying arboreal lizards prior to any construction in the vicinity of the El Rancho Wetland,
	ii) The mechanisms to capture and move lizards from the El Rancho Wetland area, including obtaining the necessary Wildlife Act 1953 permits, as well as mechanisms for re-establishing affected lizard habitat and minimising lizard mortality resulting from construction of the Project;

## 1.2 Objectives

Based on these conditions there are three primary objectives for this lizard management plan:

- Using best endeavours to capture from vegetation on the margins of El Rancho Wetland (Weggerly) before vegetation clearance commences – and translocate any lizards captured to other wetlands in the El Rancho Wetland complex in accordance with the DOC permit.
- Providing mitigation for loss of lizard habitat and lizard mortality through inclusion of habitat features in landscape planting within the SSEMPs, and
- Obtaining the necessary permits from the Department of Conservation.

## 1.3 Integration between Ecology and Landscape

Conditions relating to the creation of lizard habitat as mitigation for habitat loss span two disciplines and require close integration between the SSEMP and SSLMP and coordination between the project ecologist and project landscape architect.

The detailed SSEMPs and SSLMPs (which have to be prepared for the entire route) are responsible for developing, designing and implementing the landscape mitigation measures

as set out in conditions. This involves retention of extant vegetation and inclusion in appropriate areas of specific modifications to optimize habitat quality for terrestrial and arboreal lizards. The project landscape architect will liaise with the project ecologist with regard to the locations and forms of these habitat features and act as an adviser to the project construction team on the successful delivery of the planting contracts including this habitat formation. (See conditions DC53 to DC.58 and G.42C).

## **2 BASELINE SURVEY METHODOLOGY**

The lizard survey and mapping of habitat requirements carried out for the Assessment of Effects provides a baseline which has informed consent conditions and will inform construction management of herpetofauna as required by Condition G.34.

The assessment included a search of the Department of Conservation's (DoC's) BioWeb Herpetofauna Database, an assessment of the suitability of habitat onsite, and active searches for terrestrial and arboreal lizards. These methods are described in more detail below.

### **2.1 Herpetofauna Database Search**

The purpose of the Herpetofauna Database search was to determine which species occur in the wider area, and to determine whether any species had previously been located onsite. The Database was searched for all records within a 10km radius of the works footprint.

### **2.2 Habitat Assessment**

In conjunction with the active searches (see below), the quality of habitat onsite was assessed to help determine the probable distribution of herpetofaunal communities. We determined the nature and extent of habitat onsite using aerial imagery and the Land Cover Database 2 (LCDB2). We also viewed the majority of habitat while selecting the active survey sites (see Section 3.3).

The quality of terrestrial lizard habitat was assessed primarily on the basis of refuge availability and openness, whereas arboreal lizard quality was assessed primarily on the availability of native shrubs and trees, and in particular kanuka. Native frog habitat was assessed on the availability of well-shaded, hard-bottomed streams bordered by native bush.

### **2.3 Lizard Surveys**

#### **Terrestrial Lizard Survey**

Terrestrial lizards were surveyed using Artificial Retreats (ARs), each of which consisted of an approximately 500mm x 500mm Onduline roofing tile. A total of 220 ARs were distributed

across the site in 22 groups of 10 (see Map 1 for sampling locations and Appendix 1 for greater methodological detail). Note that 24 sites were initially established, but two of these (16 and 22) were discontinued due to their being disturbed by the public. We chose the locations of these sites on the basis of representativeness of habitat types, geographic distribution and accessibility. ARs were checked for lizard occupancy two or three times over the course of the survey, with a minimum of four weeks left between checks (see Appendix 1).

Most lizard surveys also incorporate a search of existing terrestrial refugia (e.g. pieces of deadwood, stones etc) present onsite. In the present study, the vast majority of suitable habitat consisted of thick ground tier vegetation which could not be easily searched. Thus, while existing refugia were searched where encountered, this method contributed only minimally to the overall search effort.

Because a variety of habitat types were present onsite which terrestrial lizards could potentially inhabit (e.g. grasslands, pine forest, kanuka), we assessed habitat preferences by comparing lizard abundance between habitats. This was done by grouping each AR and captured skink into one of the below habitat categories, then calculating the number of skinks caught per AR within each group.

- Dense grass with or without other ground tier species, no trees,
- Sparse grass beneath trees, or
- Pines.

Note that to avoid pseudoreplication (i.e. counting the same individual multiple times), we restricted the dataset to the maximum number of skinks captured per survey site at any one time.

### **Arboreal Lizard Survey**

Survey sites for arboreal lizards were determined during the habitat assessment (refer original technical report). Lizards were searched for at night using powerful spotlights. A car battery-powered spotlight was used in road-accessible areas, whereas hand-held 'Dolphin' or head-mounted 'LED Lenser' spotlights were otherwise used. The trunks, branches and foliage of suitable vegetation (specifically native trees and shrubs) were scanned for lizards. See Map 1 and Appendix 2 for search locations and Appendix 3 for greater methodological detail.

### 3 BASELINE SURVEY RESULTS

Comprehensive surveys of the wider Project area have revealed that the common skink (*Oligosoma polychroma*) is widespread and abundant in the rank grasslands that cover much of the site (Technical Report 26 and 28). This species is protected under the Wildlife Act (1953), but is not threatened (Hitchmough et al 2010). Four other native lizard species have previously been located in close proximity to ( $\leq 3$ km), although not within, the alignment (Department of Conservation 2011). These species are the Wellington green gecko (*Naultinus elegans punctatus*), the common gecko (*Woodworthia maculata*), the ornate skink (*O. ornatum*), and the copper skink (*O. aeneum*). The Wellington green gecko and ornate skink are listed as At Risk–Declining (Hitchmough et al 2010), whilst the common gecko and copper skink are protected but not threatened (Hitchmough et al 2010).

Notwithstanding the above, Technical Reports 26 and 28 concluded that native lizards other than the common skink are likely to be either absent from the alignment or to occur only at low densities. The only exception was that the El Rancho Wetland (Weggery) has not been comprehensively surveyed for arboreal lizards because the thickness of the understorey vegetation prevented access to the wetland’s interior. Thus the status of arboreal lizard populations in this specific area is unclear.

Additionally, the nocturnal component of the herpetofauna survey (Technical Report 28) failed to detect lizards at this site (Technical Report 28). While the thickness of the vegetation prevented a comprehensive search, the fact that no lizards were detected indicates that, if present, they do not occur in the El Rancho Wetland (Weggery) area at high densities. This is desirable in terms of ensuring sufficient space and resources are available for any released animals. Further, overcrowding is unlikely to be an issue because arboreal lizards tend to occur in low-density populations (Jonathan Ruffell pers. obs).

## **4 MONITORING AND ADAPTIVE MANAGEMENT**

### **4.1 General approach of this Lizard Management Plan**

The approach of this plan is to determine whether arboreal lizards inhabit the El Rancho Wetland (Weggery) through a comprehensive survey (and to relocate any individuals that are found); and to offset the loss of herpetofaunal habitat and lizard mortality resulting from construction of the Project.

The arboreal lizard relocation will be performed under Department of Conservation permit "Wildlife Act Permit Application 36119-FAU".

The approach we detail is in accordance with the principles and methodologies specified by Anderson et al (2012) (the document which sets the currently accepted standards for the conservation management of New Zealand lizards).

### **4.2 Timing of the capture and relocation**

The arboreal lizard capture and relocation will be performed immediately prior to vegetation clearance in the El Rancho Wetland (Weggery). This will minimize the risk of relocated lizards (or those inhabiting the boundary of the Project Footprint) dispersing back into the clearance zone. The precise timeframe will depend on the works schedule (estimated to be September 2013 – September 2015) and weather forecast (see below), but will be undertaken over a period of approximately two weeks prior to vegetation clearance or any associated earthworks in the El Rancho Wetland (Weggery) area. More generally, the capture and relocation will be performed outside of winter months and only during mild/warm weather in accordance with the Department of Conservation permit.

### **4.3 Search methods**

In conjunction with the Project Ecologist, the Construction team will clear a series of walkable transects through the area of El Rancho Wetland (Weggery) affected by works (mapped in Appendix 1). These transects will be spaced at approximately 6m intervals to allow comprehensive search coverage. Each transect will be searched by experienced herpetologist(s) on at least three occasions during appropriate weather as specified in Section 3.1.1. These searches will involve slowly walking each of the transects and abutting habitat at night whilst scanning foliage for lizards using powerful spotlight(s). Attempts will be made to comprehensively search all accessible foliage.

In addition, one transect will be cut on the boundary of the works footprint. This will allow the comprehensive searching of retained habitat immediately abutting (within ~10m of) the Project Footprint. Any lizards captured here will also be relocated with those from within the Project Footprint. The purpose here is to minimise the risk of lizard dispersal into the Project

Footprint between the cessation of the surveys and vegetation removal. This risk will be further reduced by conducting the surveys immediately prior to clearance, as discussed in Section 3.1.1. These two measures, coupled with the low motility of arboreal lizards, make it unlikely that any lizards inhabiting the boundary of the works footprint will be harmed by Project construction.

#### **4.4 Capture methods**

Any lizards seen will be captured by hand by experienced herpetologist(s). If lizards occur in excessively high foliage, the herpetologist will endeavour to bend the occupied branch over to a point where it can be reached from the ground; or alternatively, the branch will be cut and (where practicable) carefully lowered to the ground.

#### **4.5 Transfer methods**

Captured lizards will be immediately translocated (within 15 minutes) to their chosen release site (see Section 3.1.5 for details) in large plastic ziplock bag(s) or plastic terrariums. Suitable foliage will be added to the transport vessel so as to minimise stress.

#### **4.6 Release sites**

Potential release sites are mapped in Appendix 1. Site 2 is currently the preferred release site as it has been surveyed by a herpetologist (Jonathan Ruffell) and the habitat has been confirmed as optimal for arboreal lizards (manuka scrub). Because this area is contiguous with the vegetation to be cleared within the Project Footprint, the vegetation and habitat will be appropriate for any lizards inhabiting that zone.

Sites 1 and 3 also comprise suitable habitat for arboreal lizards being manuka wetlands with similar habitat characteristics as Site 2 and the area of vegetation being cleared within the Project Footprint. Sites 1 and 3 have been included in this plan as potential back-up release sites, in the event that there are large numbers of lizards captured that require relocation. Given the quality of Site 2, coupled with its other advantages discussed above, it is unlikely that Site's 1 or 3 will be utilised.



## 5 MITIGATION

Construction of the Project will result in the loss of terrestrial and arboreal lizard habitats (although many of these habitats appear to be unoccupied) and may result in lizard mortality. This loss of habitat and associated lizard mortality will be addressed through the development of large areas of ecological, landscape and visual mitigation planting, most notably through specific modifications to planting areas to optimize habitat quality for terrestrial and arboreal lizards as outlined in Technical Report 26:

*“Terrestrial lizards prefer open environments with abundant refuges, and the edges of plantings are conducive to these characteristics because they are naturally open and promote the growth of a thick ground tier. We recommend designating and managing such edges as lizard habitat, and planting appropriate ground tier species such as toe toe (*Austroderia toetoe*, *A. fulvida*), meadow rice grass (*Microlaena stipoides*), blueberry grass (*Dianella nigra*) and flax (*Phormium tenax*). Optimal arboreal lizard habitat consists of native shrubs and trees, and particularly kanuka (*Kunzea ericoides*).”*

To ensure their implementation, the SSEMP planting plans (and a number of the SSLMP planting plans) will be reviewed by a suitably-qualified herpetologist to confirm that the quality and extent of plantings will be sufficient to offset the loss of lizard habitats incurred by the project (prior to certification). Consistent with the recommendation in Technical Report 7, the edge of walkways, cycleways and wetland areas could be suitable for this purpose. The distribution of thin (~5–10cm) cross-sections of logs from vegetation removed within the Project Footprint in areas of created lizard habitat will also be a requirement of the SSEMPs to increase the abundance of refuges. The location and distribution of log disks in these areas will be determined by a qualified herpetologist during the development of detailed planting plans for SSEMPs and SSLMPs (as appropriate) based on the nature of the intended ground tier vegetation.

## 6 SUMMARY

This plan involves attempting to capture and relocate any lizards inhabiting the El Rancho Wetland (Weggerly) area into appropriate habitat adjacent to the habitat being lost; and offsetting the loss of any herpetofaunal habitats and associated lizard mortality resulting from construction of the Project by the ecological and landscape and visual mitigation plantings proposed.

As part of the capture and relocation programme, attempts will be made to capture arboreal lizards by cutting transects through the thick undergrowth during daylight hours and scanning foliage for lizards, including through the use of powerful spotlights during night. Any lizards detected will be transferred to safe and suitable adjoining habitat immediately following capture.

Regarding the loss of herpetofaunal habitat and associated lizard mortality resulting from construction of the Project, this will be offset by the ecological, landscape and visual mitigation plantings intended for the project (to be developed through SSEMPs and SSLMPs). A qualified herpetologist will review planting plans prior to their implementation to ensure these confer a sufficient extent of lizard-friendly habitats.

## 7 REFERENCES

Anderson, P., Bell, T., Chapman, S., and Corbett, K. 2012. New Zealand Lizards Conservation Toolkit: a Resource for Conservation Management of the Lizards of New Zealand. SRARNZ Miscellaneous Publication. 69p.

Ruffell, J. 2011. Ecological Technical Report 2: Herpetofauna: Technical Report 28, Volume 3 of the MacKays to Peka Peka Expressway Project AEE.. 25p.

Evans, B & Faulkner, B. 2011. Assessment of Landscape and Visual Effects: Technical Report 7, Volume 3 of the MacKays to Peka Peka Expressway Project AEE.166p.

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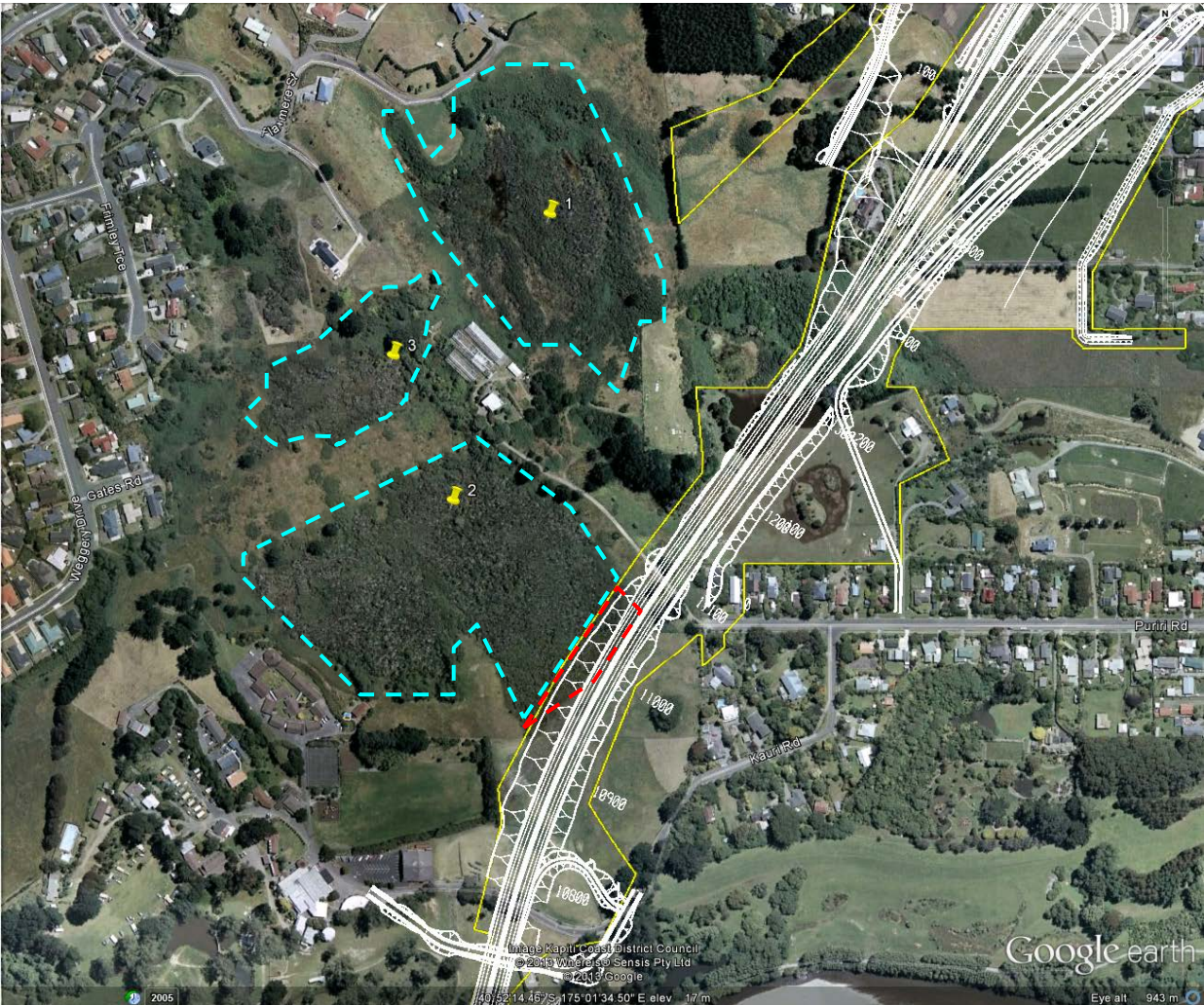
Department of Conservation. 2011. Bioweb: Herpetofauna.

Hitchmough, R.A., Hoare, J.M., Jamieson, H., Newman, D., Tocher, M.D., Anderson, P.J., Lettink, M., and Whitaker, A.H. 2010. Conservation status of New Zealand reptiles, 2009. New Zealand Journal of Zoology 37(3): 203–224

## 8 APPENDICES

### Appendix 1. Affected lizard habitats in and abutting the El Rancho Wetland, and potential release sites

Note: Red and blue dashed lines encompass the approximate extents of affected arboreal lizard habitats and potential release sites, respectively. The solid yellow line gives the extent of the Project Footprint.



**Appendix 2. Department of Conservation Lizard Permit (Wildlife Act 1953)**

Craig Nicholson



Department of Conservation  
*Te Papa Atawhai*



**28 March 2013**

**MacKay's to PekaPeka Project Alliance  
Level 2, 19-21 Whitmore Street  
WELLINGTON.**

**Re: WILDLIFE ACT AUTHORITY APPLICATION 36119 - FAU APPROVAL**

I am pleased to advise you that your application for a Wildlife Act Authority has been approved and I am now able to offer you an authority outlining the terms and conditions of this approval. Please find the authority enclosed.

This document contains all the terms and conditions of your authorisation to operate on non public conservation land and represents the formal agreement between the Department and New Zealand Transport Agency.

**Payment of Processing Fees**

Thank you, your payment of \$110 + GST covered the cost of processing your application.

Kind regards,

Jessie Mason  
Permissions Advisor  
Private Bag 3072  
Hamilton 3240



Department of Conservation  
Te Papa Atawhai

**Wildlife Act Authority for wildlife not  
located on public conservation land**

Permission Number: 36119 - FAU

**THIS AUTHORITY** is made this 27 day of March 2013

**PARTIES:**

**The Director General of Conservation** (the Grantor)

New Zealand Transport Agency (the Authority Holder)

**BACKGROUND**

- A. The Director General of Conservation is empowered to issue authorisations under the Wildlife Act 1953.
- B. The Authority Holder wishes to exercise the authorisation on the Land subject to the terms and conditions of this Authority.

**OPERATIVE PARTS**

In exercise of the Grantor's powers under the Conservation legislation the Grantor **AUTHORISES** the Authority Holder under Section 53/54 (~~delete the section that is not applicable~~) of the Wildlife Act 1953 subject to the terms and conditions contained in this Authority and its Schedules.

**SIGNED** on behalf of the Grantor

by Rob Stone

Kapiti Wellington Area Manager

acting under delegated authority  
in the presence of:

Witness Signature: \_\_\_\_\_  
 Witness Name: Greg Lancelotti  
 Witness Occupation: Kapiti  
 Witness Address: The Marden Quay Wgtn

A copy of the Instrument of Delegation may be inspected at the Director-General's office at 18-22 Manners Street, Wellington

**SCHEDULE 1**

<p>1.</p>	<p><b>Authorised activity of and</b> <b>(including approved quantities wildlife collection methods).</b> <i>(clause 2)</i></p>	<p>The purpose of the activity is to attempt to relocate any herpetofauna which occur within the construction footprint associated with the MacKay's to Peka Peka Expressway to safe habitat.</p> <table border="1"> <thead> <tr> <th>Common name</th> <th>Scientific name</th> <th>Threat Classification</th> </tr> </thead> <tbody> <tr> <td>Wellington green gecko</td> <td><i>Naultinus elegans punctatus</i></td> <td>Threatened (At Risk, declining)</td> </tr> <tr> <td>Common gecko</td> <td><i>Woodworthia maculatus</i></td> <td>Protected, not threatened</td> </tr> <tr> <td>Common skink</td> <td><i>Oligosoma polychroma</i></td> <td>Protected, not threatened</td> </tr> <tr> <td>Ornate skink</td> <td><i>Oligosoma ornatum</i></td> <td>Threatened (At Risk, declining)</td> </tr> <tr> <td>Copper skink</td> <td><i>Oligosoma aeneum</i></td> <td>Protected, not threatened</td> </tr> </tbody> </table> <p>Catch and handle wildlife on site Kill wildlife Other – specify: Move herpetofauna from capture location (within a construction footprint) to safe and similar habitat within 500m of the capture site. Unknown quantity – depends on capture results.</p>	Common name	Scientific name	Threat Classification	Wellington green gecko	<i>Naultinus elegans punctatus</i>	Threatened (At Risk, declining)	Common gecko	<i>Woodworthia maculatus</i>	Protected, not threatened	Common skink	<i>Oligosoma polychroma</i>	Protected, not threatened	Ornate skink	<i>Oligosoma ornatum</i>	Threatened (At Risk, declining)	Copper skink	<i>Oligosoma aeneum</i>	Protected, not threatened
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Copper skink	<i>Oligosoma aeneum</i>	Protected, not threatened																		
<p>2.</p>	<p><b>The Location</b> <i>(clause 2)</i></p>	<p>The land to be accessed comprises of land owned by Kāpiti Coast District Council and the New Zealand Transport Agency within the MacKay's to PekaPeka Expressway Designation.</p>																		
<p>3.</p>	<p><b>Authorised Personnel</b> <i>(clause 3)</i></p>	<p>Simon Chapman Jonathan Ruffell Matiu Park Leigh Bull Rachel Turner</p>																		
<p>4.</p>	<p><b>Term</b> <i>(clause 4)</i></p>	<p>Commencing on and including 1 September 2013 and ending on and including 31 December 2017</p>																		
<p>5.</p>	<p><b>Authority Holder's address for notices</b> <i>(clause 8)</i></p>	<p>The Authority Holders address in New Zealand is: MacKay's to PekaPeka Project Alliance Level 2, 19-21 Whitmore Street WELLINGTON. Email: <a href="mailto:matiu.park@boffamiskell.co.nz">matiu.park@boffamiskell.co.nz</a></p>																		



## **SCHEDULE 2**

### **STANDARD TERMS AND CONDITIONS OF THE AUTHORITY**

#### **1. Interpretation**

- 1.1 The Authority Holder is responsible for the acts and omissions of its employees, contractors or agents. The Authority Holder is liable under this Authority for any breach of the terms of the Authority by its employees, contractors or agents as if the breach had been committed by the Authority Holder.
- 1.2 Where obligations bind more than one person, those obligations bind those persons jointly and separately.

#### **2. What is being authorised?**

- 2.1 The Authority Holder is only allowed to carry out the Authorised Activity in the Location(s) described in Schedule 1, Item 2.
- 2.2 The Authority Holder must contact the Department of Conservation's local Area Manager(s) prior to carrying out the Authorised Activity in the Area.
- 2.3 The Authority Holder must obtain land owner approval before exercising this Authority
- 2.4 The Authority Holder and Authorised Personnel must carry a copy of this Authority with them at all times while carrying out the Authorised Activity.
- 2.5 Unless expressly authorised by the Grantor in writing, the Authority Holder must not donate, sell or otherwise transfer to any third party any material, including any genetic material, or any material propagated or cloned from such material, collected under this Authority. Notwithstanding the preceding constraint, the Authority Holder may publish authorised research results.
- 2.6 The Authority Holder must lodge holotype specimens and a voucher specimen with a recognised national collection any taxon, which is new to science. The Authority Holder must immediately notify the Grantor of any such finds.

#### **3. Who is authorised?**

- 3.1 Only the Authority Holder and the Authorised Personnel described in Schedule 1, Item 3 may be involved in carrying out the Authorised Activity, unless otherwise agreed in writing by the Grantor.

#### **4. How long is the Authority for - the Term?**

- 4.1 This Authority commences and ends on the dates set out in Schedule 1, Item 4.

#### **5. What are the liabilities?**

- 5.1 The Authority Holder agrees to exercise the Authority at the Authority Holder's own risk and releases to the full extent permitted by law the Grantor and the Grantor's employees and agents from all claims and demands of any kind and from all liability which may arise in respect of any accident, damage or injury occurring to any person or property arising from the Authority Holder's exercise of the Authorised Activity.
- 5.2 The Authority Holder must indemnify the Grantor against all claims, actions, losses and expenses of any nature which the Grantor may suffer or incur or for which the Grantor may become liable arising from the Authority Holder's exercise of the Authorised Activity.

5.3 This indemnity is to continue after the expiry or termination of this Authority in respect of any acts or omissions occurring or arising before its expiry or termination.

**6. What about compliance with legislation and Grantor's notices and directions?**

6.1 The Authority Holder must comply with all statutes, bylaws and regulations, and all notices and requisitions of any competent Authority relating to the conduct of the Authorised Activity. Without limitation, this includes the Conservation Act and the Acts listed in the First Schedule of that Act and the Health and Safety in Employment Act.

6.2 The Authority Holder must comply with all reasonable notices and directions of the Grantor relating to the conduct of the Authorised Activity.

**7. When can the Authority be terminated?**

7.1 The Grantor may terminate this Authority at any time in respect of the whole or any part of the Land if:

- (a) The Authority Holder breaches any of the conditions of this Authority; or
- (b) in the Grantor's opinion, the carrying out of the Authorised Activity causes or is likely to cause any unforeseen or unacceptable effects

7.2 If the Grantor intends to terminate this Authority, the Grantor must give the Authority Holder either:

- (a) one calendar month's notice in writing; or
- (b) such other time period which in the sole opinion of the Grantor appears reasonable and necessary

**8. How are notices sent and when are they received?**

8.1 Any notice to be given under this Authority by the Grantor is to be in writing and made by personal delivery, fax, by pre paid post or email to the Authority Holder at the address, fax number or email address specified in Schedule 1, Item 5. Any such notice is to be deemed to have been received:

- (a) in the case of personal delivery, on the date of delivery;
- (b) in the case of fax, on the date of dispatch;
- (c) in the case of post, on the 3rd working day after posting;
- (d) in the case of email, on the date receipt of the email is acknowledged by the addressee by return email or otherwise in writing.

8.2 If the Authorised Holder's details specified in Schedule 1, Item 5 change then the Authorised Holder must notify the Grantor within 5 working days of such change.

**9. What about the payment of costs?**

9.1 The Authorised Holder must pay the standard Department of Conservation charge-out rates for any staff time and mileage required to monitor compliance with this Authority and to investigate any alleged breaches of the terms and conditions of it

**10. Are there any Special Conditions?**

10.1 Special conditions are specified in Schedule 3. If there is a conflict between this Schedule 2 and the Special Conditions in Schedule 3, the Special Conditions shall prevail.

## SCHEDULE 3

### SPECIAL CONDITIONS.

#### 1. Reporting requirements

The Authority Holder must report on all surveys for species named in this authority to the Kapiti Wellington Area Office at the conclusion of each survey.

The information provided must include:

- survey area/location (including a map)
- general description of the vegetation in the survey area
- size of area surveyed
- dates and times of survey
- location of transects/survey tracks
- total time spent on the survey
- personnel involved (the number of people involved and the names of personnel)
- number of *[insert name]* found, and the GPS coordinates for each of these
- weather conditions during the survey

#### 2. Collection constraint

The Authority Holder must ensure material is collected away from tracks, huts, picnic areas or areas of high public use and as far as practicable, out of sight of the public. The Authority Holder must not exclude or impede the public from accessing any sites, tracks or facilities.

#### 3. Collection methods

Lizards will be searched for during night-time spotlight surveys. Specifically, experienced researcher(s) will scan suitable foliage with powerful torches. Any lizards seen will be captured by hand. This will be done with the utmost care and by experienced herpetologist(s) (see below for further details). If lizards occur in excessively high foliage, we will try in the first instance to bend the occupied branch over to a point where it can be reached from the ground; or failing this, the branch will be cut and (where practicable) carefully lowered to the ground.

#### 4. Holding conditions

Lizards must be transported in ventilated containers, with moist towels and foliage.

#### 5. Public Information

If approached by members of the public while carrying out the Authorised Activity, the Authority Holder must provide an appropriate explanation why the Authorised Activity is taking place.

## Appendix 3. Greater Wellington Regional Council Lizard Identification Guides (skink and gecko)

# Skinks of the Wellington region

**Common Skink**



**Brown Skink**



**Ornate Skink**



**Copper Skink**



**Spotted Skink**



## Wellington Region – Skink Identification Card

ID feature	Common skink <i>Oligosoma polychroma</i>	Brown skink <i>Oligosoma zelandicum</i>	Ornate skink <i>Oligosoma ornatum</i>	Copper skink <i>Oligosoma aeneum</i>	Spotted skink <i>Oligosoma lineocellatum</i>
Maximum SVL (snout-to-vent length) “Vent” = anal opening	77mm	73mm	80mm	62mm	111mm
Jaws rimmed with brown and white pattern	No	Yes	Yes	Yes	No
Lower margin of the eye has a “teardrop”	No	No	Yes	No	No
Back	Brown. Has prominent stripes and often highly speckled.  (occasionally dark brown/almost black)	Brown. Back is a lighter brown than the sides.  (some shoreline populations black)	Brown. Has large pale blotches along top and sides of tail extending on to the back.	Brown. May be speckled. Often has a bright copper stripe at the edges especially above the forelimbs.	Brown or green. Has distinctive pale spots edged in black.
Underside or stomach	Grey to yellowish; usually unspotted.  Never orange or red.	Belly grey/straw coloured or suffused with orange or red; sometimes spotted.  Throat usually spotted.	Yellowish often with red tinges; may be spotted.	Belly creamy to yellow; unspotted.  Throat paler than stomach; usually spotted.	Belly pink or red; may be spotted.  Throat grey with black spots.
Tail	Re-grown tail may be reddish above and below.	Underside often flushed with orange / red.		Especially the underside may be flushed with red.	
Forelimbs with continuous stripe down outer surface	Yes	Yes	No	No	No
Soles of feet	Grey to yellowish	Dark brown to black			
Colour of iris	Yellow	Red	Red	Red	Yellow

### References:

- Gill, BJ & Whitaker, AH 2001, *New Zealand Frogs and Reptiles*. David Bateman Ltd, Auckland, NZ
- Towns, DR, 1988, A field guide to the lizards of New Zealand, *New Zealand Wildlife Service Occasional Publication No. 7*
- Photos by Richard Romijn (unless otherwise stated)

# Geckos of the Wellington region

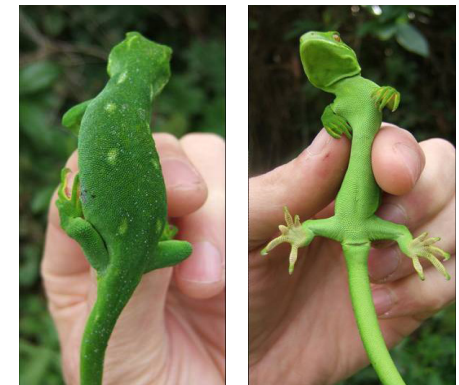
## Forest Gecko



## Common Gecko



## Green Gecko



## Wellington Region: Gecko Identification Card

ID feature	Forest gecko <i>Mokopirirakau</i> 'southern North Island forest gecko'	Common gecko <i>Woodworthia maculata</i>	Green gecko <i>Naultinus punctatus</i>
Maximum SVL (snout-to-vent length) "Vent" = anal opening	89mm	82mm	95mm
Scales on flat upper part of snout noticeably larger than body scales	No	No	Yes
Head	Thin dark V shape on head between the eyes; white bands from eye to ear; much white around mouth edges.		
Inside mouth	Inside of mouth orange or yellow. Tongue yellow sometimes with a pink tip.	Inside of mouth and tongue whitish to pale pinkish.	Inside of mouth and tongue dark blue.
Back	Brightly coloured in grey, brown or reddish brown with lots of black and white and sometimes yellowish patches. Pattern is a series of large irregular blotches usually without stripes.	Mainly grey or brown with markings that may include patches of black, white, yellow orange and olive green. Irregular markings usually run across the body but some have longitudinal stripes.	Bright green. Often with yellow, white or pale green patches on either side along the edge of the back.
Underside or stomach	Blotched/mottled.	Pale usually unspotted.	Pale green.
Tail	Slender and able to grip well.	Thick and unable to grip well. Often regrown.	Slender and able to grip well. Seldom shed.
Toes	Narrow and tapering toes with expanded pads.	Broadly expanded pads.	Narrow and tapering toes with slightly expanded pads.

### References:

- Gill, B.J. & Whitaker, A.H. 2001. New Zealand frogs and reptiles. David Bateman Ltd. Auckland, NZ
- Towns, D.R. 1988. A field guide to the lizards of New Zealand. *New Zealand Wildlife Service Occasional Publication No. 7*
- Photos by Richard Romijn (unless otherwise stated)



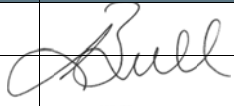
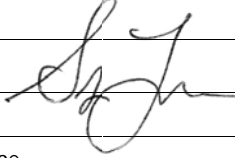
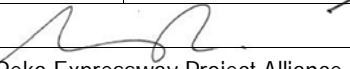
# EMP Attachment 3: Avifauna Monitoring and Management Plan

12 June 2013

## Revision History

Revision N°	Prepared By	Description	Date
A	Dr Leigh Bull	Draft for Council Review	5 April 2013
B	Dr Leigh Bull	Draft incorporating KCDC and GWRC review comments for internal review	6 May 2013
C	Dr Leigh Bull	Final draft based on review comments	6 May 2013
D	Dr Leigh Bull	Revised following further GWRC comments	12 June 2013

## Document Acceptance

Action	Name	Signed	Date
Prepared by	Dr Leigh Bull		12 June 2013
Reviewed by	Stephen Fuller		12 June 2013
Approved by	Matiu Park		
on behalf of	MacKays to Peka Peka Expressway Project Alliance		

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# 1 INTRODUCTION

The resource consent conditions for the Mackays to Peka Peka expressway contain a number of conditions pertaining to *At Risk* and *Threatened* avifauna, particularly North Island fernbird. A summary of these consent conditions in the context of the EMP are outlined in Table 1. This document sets out the process and methodologies that will be used to manage and monitor for construction and operation effects of the Project on *Threatened* and *At Risk* birds.

## 1.1 Consent Conditions

There are seven consent conditions that relate to the management of avifauna. One condition relates to avifauna generally, all other conditions relate specifically to North Island fernbird. They are summarised below.

**Table 1: Summary of Consent Conditions relating to avifauna**

Condition	Summary
DC.53C	a) iv) The avoidance of adverse effects on fernbird habitat arising from vegetation clearance.
DC.57	f) v) Specific fernbird habitat to be created as part of the development of vegetation planting as mitigation for the loss of fernbird habitat.
G.34	Requires the Ecological Management Plan (EMP) to include details regarding: <ul style="list-style-type: none"> <li>v) Avoiding disturbance of nationally threatened or at-risk birds (as listed by the most up to date DOC threat classification lists) during breeding periods;</li> <li>i) How adverse effects on the fernbird population will be avoided during construction and operation of the Project.</li> </ul>
G.38	Requires monitoring of fernbird including: <ul style="list-style-type: none"> <li>a) Collection of baseline information for 1 year prior to commencement of work to aid development of EMP and management triggers;</li> <li>b) Monitor fernbird for the entire duration of construction work to identify changes in condition arising from the Project;</li> <li>d) Undertake fernbird monitoring for a minimum of 2 years post-construction, and the results reviewed in consultation with the Director General of Conservation;</li> </ul>
G.40	b) Requires implementation of an Adaptive Management approach which shall: <ul style="list-style-type: none"> <li>i) Establish baseline information on pre-construction distribution of fernbird in order to develop management trigger levels (where practicable);</li> </ul>
G.41	e) Where practicable, avoid areas of fernbird habitat as confirmed by pre-construction habitat monitoring between the breeding period months of August and February. Where it is not practicable to avoid these areas, submit a report to the Manager detailing why this is not practicable, propose measures to remedy or mitigate the effects on fernbird and fernbird habitat, and shall obtain the Manager's certification of any necessary amendments to the EMP prior to undertaking works in those areas.
G.41 A	Requires avoidance as far as practicable areas of fernbird habitat as confirmed by pre-construction habitat monitoring. If habitat to be cleared: <ul style="list-style-type: none"> <li>a) First check for the presence of fernbird;</li> <li>b) If fernbird are found outside the breeding season (i.e. from March to July inclusive), a trap and transfer programme must be initiated to remove the birds from the area and move them to a suitable habitat in consultation with the Director-General of Conservation;</li> <li>c) If fernbird are found breeding (e.g. nest or juveniles observed) in habitat proposed to be cleared during breeding season (i.e., between August and February inclusive), vegetation removal is not to occur in that area of habitat until the end of the breeding season;</li> <li>d) If non-breeding Fernbird are found in habitat proposed to be cleared during breeding season (i.e., between August and February), a trap and transfer programme must be initiated to remove the birds from the area and move them to a suitable habitat in consultation with the Department of Conservation.</li> </ul>

## 1.2 Objectives

In summary, the resource consent and designation requirements listed above require the following monitoring and management of avifauna:

### Fernbird

- A baseline habitat survey will be undertaken prior to construction.
- The distribution of fernbird will be monitored through construction.
- Potential fernbird habitat will not be cleared until surveyed by the Project Ecologist.
- Potential fernbird habitats will not be cleared or modified if fernbird are breeding there (between August and February inclusive).
- Mitigation will be provided for loss of fernbird habitat.

### Other Avifauna

- Avoiding disturbance of nationally *Threatened* or *At Risk* birds during breeding periods.

## 1.3 Integration between Ecology and Landscape

Conditions relating to the creation of fernbird habitat as mitigation for habitat loss span two disciplines and require close integration between the SSEMP and SSLMP and therefore coordination between the Project Ecologist and Project Landscape Architect.

The integrated SSEMPs and SSLMPs are responsible for developing, designing and implementing the mitigation measures as set out in conditions. This involves retention of extant vegetation and inclusion in appropriate areas of specific modifications to optimize habitat quality for fernbird. The Project Landscape Architect will liaise with the project ecologist with regard to the locations and forms of these habitat features and act as an adviser to the Project Construction Team on the successful delivery of the planting contracts including this habitat formation. (See **conditions DC.53 to DC.58 and G.42C**).

## 2 BASELINE METHODOLOGY

The avifauna survey carried out for the Assessment of Effects was used to provide a baseline for informing this management plan. It also informed the methodology for additional North Island fernbird baseline studies required by **condition G.38** and which have since been completed (refer to Appendix 1 for methodology and results).

### 2.1 Avifauna Survey

A combination of desktop investigations and three field-based methods (described below) were used to assess the ecological value and composition of the avifauna communities and habitats within and adjacent to the proposed Alignment. A summary of the survey effort along the proposed Alignment and weather conditions during the survey periods are provided in Table 2. The time periods shown in this table include travel time between sites, during which incidental observations were made.

**Table 2:** Summary of avifauna survey effort and weather conditions

DATE	TIME PERIOD	SURVEY METHOD			DAILY WEATHER CONDITIONS
		Playback Sites	Waterbird Count Sites	5-minute Count Sites	
20/9/10	06:08 – 07:10	4			Cool (6-10°C) with moderate SW breeze.
	07:19 – 09:25			7	Cool with moderate SW breeze.
21/9/10	05:58 – 06:45	2			Cool with moderate SW breeze.
	06:58 – 16:40		9	15	Mild (11-15°C) with light-moderate SW breeze.
	17:08 – 18:35	4			Cool with moderate SW breeze.
22/9/10	06:00 – 06:55	3			Cool with moderate SW breeze.
	07:20 – 17:10			17	Mild with light-moderate SW breeze.
	17:44 – 18:35	3	6		Cool with moderate SW breeze.
23/9/10	06:00 – 06:35	2			Cool with moderate NW breeze.
	06:42 – 10:20		3	7	Mild with light NW breeze.
31/1/11	06:25 – 07:45	4			Cool with moderate NW breeze.
	08:30 – 16:25		2	18	Warm (16-22°C) with moderate NW breeze.
	19:24 – 20:40	4			Cool with moderate NW breeze.
1/2/11	06:25 – 07:14	3			Cool and calm conditions.
	07:17 – 17:20		10	20	Mild – warm with a light breeze.
	19:10 – 20:15	3			Cool with moderate NW breeze.
3/2/11	06:34 – 07:05	2			Cool and calm conditions.
	07:30 – 16:45		6	8	Mild – warm with a light breeze.
	19:40 – 20:06	2			Cool with moderate NW breeze.

## 2.2 Desktop

Data from the most recent Ornithological Society of New Zealand's (OSNZ) atlas (Robertson et al. 2007) was collated from the five 10 km x 10 km grid squares (267,602; 267,603; 268,602; 268,603; 268,604) which encompass the Expressway Designation and surrounding area. The primary habitat for each of the species recorded within these grid squares was obtained from Heather & Robertson (2000), along with each species' New Zealand threat status according to Miskelly et al. (2008).

The species list obtained from the OSNZ atlas served as a baseline of species previously recorded in the wider area and therefore potentially present at or near the Alignment. However, this list was viewed in the context of which the data were collected: over a five-year period (1999–2004) with no standardised effort, and from an area of 500 km<sup>2</sup> encompassing a number of sites and habitats that may not be represented along the Expressway Alignment.

Further literature (published and unpublished) and website searches were undertaken to obtain additional information regarding bird species known to occur at the estuaries along the Kāpiti Coast (including Waikanae) and within the various reserves.

## 2.3 Site Selection and Species of Interest

The avifauna survey sites selected along and adjacent to the proposed Alignment were chosen based on their providing representative avifauna habitats that occur along the length of the Alignment including: wetlands; streams, rivers and wetlands; pasture; native regenerating shrublands; rural / residential gardens; exotic plantation forest. A summary of species of interest and the methodologies adopted are provided in Table 3, with further details provided in the following sections. For the purposes of this investigation, species of interest were defined as those having either *Threatened* or *At Risk* threat classifications (according to Miskelly *et al.* 2008).

## 2.4 5–Minute Point Counts

An objective of the 5–minute point count sampling was to describe the range of species utilising the site by sampling the full diversity of habitats present (e.g. dune, stream, lake, bush, plantation, pasture) across the entire proposed Alignment.

Five–minute point counts, whereby all avifauna species seen and heard during the count period were recorded (Dawson & Bull 1975) were undertaken at 23 locations not less than 250 m apart along and adjacent to the proposed Alignment.

Counts began no earlier than sunrise, and ended no later than dusk. Each count lasted five minutes and was preceded by a five–minute stand down period to allow activity to settle following observer arrival. During the stand–down period the observer recorded time, visibility, temperature, wind direction, and speed, precipitation, cloud cover, and visibility.

**Table 3: MacKay's to Peka Peka Expressway avifauna survey methods and key species**

METHOD	KEY SPECIES	THREAT CLASSIFICATION <sup>1</sup>
Waterbird counts	Black shag <i>Phalacrocorax carbo novaehollandiae</i>	Naturally Uncommon <sup>SO Sp</sup>
	Little black shag <i>Phalacrocorax sulcirostris</i>	Naturally Uncommon <sup>RR</sup>
	Little shag <i>Phalacrocorax melanoleucos brevirostris</i>	Naturally Uncommon <sup>Inc</sup>
	Dabchick <i>Poliiocephalus rufopectus</i>	Nationally Vulnerable
	Brown teal <i>Anas chlorotis "North Island"</i>	Recovering <sup>CD RR</sup>
Grey duck <i>Anas superciliosa superciliosa</i>	Nationally Critical	
Cryptic marshbird playbacks	Australasian bittern <i>Botaurus poiciloptilus</i>	Nationally Endangered <sup>Sp TO</sup>
	Marsh crake <i>Porzana pusilla affinis</i>	Relict <sup>DP SO</sup>
	Spotless crake <i>Porzana tabuensis plumbea</i>	Relict
	Fernbird <i>Bowdleria punctata vealeae</i>	Declining <sup>RR St</sup>
5-minute point counts	Kereru <i>Hemiphaga novaeseelandiae</i>	Not Threatened <sup>CD Inc</sup>
	New Zealand pipit <i>Anthus novaeseelandiae novaeseelandiae</i>	Declining
	Shining cuckoo <i>Chrysococcyx lucidus lucidus</i>	Not Threatened <sup>DP</sup>

Two survey sessions were conducted; one in spring (20–23 September 2010) and another in summer (31 January – 3 February 2011). During each session, counts were undertaken twice at each of the 23 count sites; once before midday (morning) and once after midday (afternoon). Thus, a total of 92 5-minute point counts were conducted over spring and summer survey periods (see Table 2).

## 2.5 Waterbird Counts

Given the close proximity of the Alignment to a number of freshwater habitats (e.g. lakes, ponds, wetlands, streams) a survey of waterbird species diversity and abundance was undertaken. The objectives of the waterbird counts were to:

- Provide an assessment of the importance of nearby waterbodies, wetlands, and waterways for key non-cryptic waterbirds.
- Indicate the position and likely movement pathways of non-cryptic waterbirds around and potentially across the site.

At each location, the observer scanned the waterbodies and recorded all waterbirds seen floating on their surface. Recent New Zealand research (Kissling 2004) has shown that time of day is not a significant determinant of species number or diversity recorded during wetland counts of typical conspicuous species. However, observer elevation has been

<sup>1</sup> Miskelly *et al.* (2008) with qualifiers: CD=Conservation Dependent; DP=Data Poor; Inc=Increasing; RR=Range Restricted; SO=Secure Overseas; Sp=Sparse; TO=Threatened Overseas.



recognised as a key determinant of these counts: higher observer elevation resulted in significantly better results in terms of number of birds seen and diversity recorded. Consequently, all counts were conducted from suitably elevated sites in which the observer had the best possible visual coverage of the waterbodies.

Each count took approximately 20 minutes and was preceded by a 5-minute stand-down period, during which the observer recorded the climatic conditions. These counts were undertaken during the spring (20–23 September 2010) and summer (31 January – 3 February 2011) survey sessions. During each session, counts were undertaken twice at each of the nine sites; once before midday (morning) and once after midday (afternoon). Thus, a total of 36 water counts were conducted over the spring and summer survey periods.

## 2.6 Fernbird Baseline Studies

Following the identification of potential fernbird habitat along and outside of the Project designation, a total of 14 Department of Conservation bio-acoustic recording devices (version B.2) were deployed from early September 2012 to late November 2012 (refer to Table 4, Maps 1 and 2 in Appendix 2).

**Table 4:** Location of bioacoustic devices during 2012 baseline monitoring

Bioacoustic monitoring unit	Proximity to designation	General location
1	Outside	Te Harakeke/Kawakahia Wetland/ Ngarara farm
2	Outside	Kakariki Stream
3	Along	Kakariki Stream
4	Along	Kakariki Stream
5	Outside	Te Harakeke/Kawakahia Wetland/ Ngarara farm
6	Outside	Te Harakeke/Kawakahia Wetland/ Ngarara farm
7	Along	Te Harakeke/Kawakahia Wetland/ Ngarara farm
8	Along	Nga Manu Nature Reserve / Ngarara farm
9	Outside	Nga Manu Nature Reserve / Ngarara farm
10	Outside	Nga Manu Nature Reserve
11	Outside	El Rancho Wetland (Weggery)
12	Along	El Rancho Wetland (Weggery)
13	Outside	Raumati South Peatlands
14	Outside	Raumati South Peatlands

A control (outside designation) – impact (along designation) design has been applied to the layout of the devices to allow:

- A pre-construction comparison between all sites to determine the distribution of fernbird in the area;
- A comparison of the monitoring data collected pre-construction, during and post-construction from sites outside of the designation.

Deployment of the devices coincided with the peak period during which territorial disputes occur (and call rates increase) and they were set to activate recording each morning from 06:30 – 10:30, a period during which fernbird are generally more active. The devices were checked each month to retrieve the data, change the batteries, and check functioning.

Prior to the analysis of the data collected from the bioacoustic devices, sonic prints of fernbird calls were viewed by the data analyst and reviewer. The recorded data was then analysed using the Raven Pro™ software to search for calls of fernbird and other At Risk or Threatened avifauna to enable the distribution (but not population size) of fernbird within these areas to be determined.

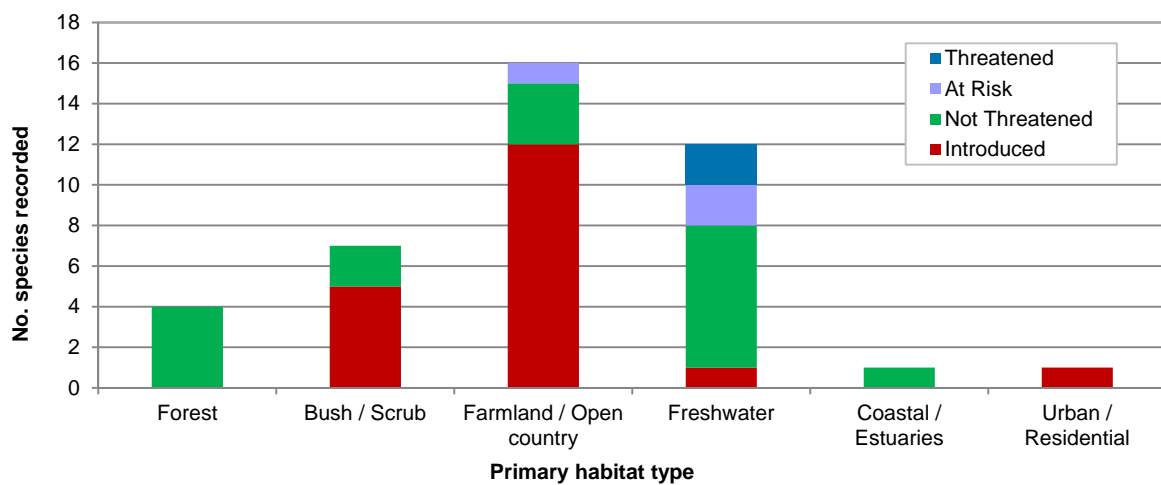
The results of this study are summarised in Section 3 and provided in detail in Appendix 1.

### 3 BASELINE SURVEY RESULTS

#### 3.1 Habitat Utilisation

Figure 1 illustrates the primary habitat<sup>2</sup> utilised by, and threat classification<sup>3</sup> of, avifauna species recorded during the pre-construction avifauna investigations along and adjacent to the Project designation (BML 2011). Of the five *Threatened* and *At Risk* avifauna species recorded, farmland / open country was the primary habitat of one species and freshwater environments (including wetlands) the primary habitat of the other four species.

**Figure 1:** Primary habitat and threat classification of avifauna species recorded during pre-construction investigations



The habitat along and adjacent to the Project designation is highly modified comprising:

- 70% pasture and grasslands;
- 16 % plantation forestry or other exotic forest and trees;
- 9% pioneer shrublands, scrub and low forest;
- 4% urban.

This combined information regarding primary habitat of *Threatened* and *At Risk* species and the proportion and location of these habitat types along the designation, provides some guidance on the relative value of the areas of habitat in which these species might be located during construction.

<sup>2</sup> Primary habitat (based on Heather & Robertson 2000) refers to the habitat type in which a species spends most of its time but is not confined to.

<sup>3</sup> Miskelly *et al.* (2008)

### 3.2 Identification of Key Species

Based on the initial avifauna investigations undertaken to inform the Mackays to Peka Peka Ecological Impact Assessment (BML 2012), *Threatened* or *At Risk* species for which breeding habitat occurs along the designation include:

- North Island fernbird (*Bowdleria punctata vealeae*) – a cryptic bird that generally remains hidden in thick vegetation;
- New Zealand pipit (*Anthus n. novaeseelandiae*) – an insect-feeding bird that lives in open country throughout New Zealand;
- Grey duck (*Anas platyrhynchos*) – extensive hybridisation with mallards has resulted in very few pure-bred grey duck remaining (Muller 2008).

The timing of potential breeding activity for each of these species (based on Heather & Robertson 2000) is indicated by the areas of green shading in the chart below. It is during these months that efforts should be made to avoid disturbance to breeding birds. Details regarding the methods to avoid and minimise disturbance to fernbird during the breeding (and non-breeding) season are provided in Section 4.2 of this document.

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Fernbird												
NZ pipit												
Grey duck												

### 3.3 Fernbird Distribution

Based on 1680 hours of data analysed by an qualified ornithologist with expertise in the field of bioacoustic analysis, the presence of fernbird were confirmed by a total of three recordings obtained at two of the 14 locations surveyed (refer to Appendix 1 for further details). Two of the three recordings were detected at the location (Site 8) of the original 2012 fernbird sighting. The third fernbird detection (a single call) was obtained at Site 7, which is approximately 400 m to the southwest in an area of felled pines adjacent to Te Harakeke / Kawakahia Wetland. Both Site 7 and Site 8 are located along the designation (refer to Map 3 in Appendix 2 for confirmed fernbird habitat).

No fernbird were detected at the Raumati South Peatlands or El Rancho Wetland (Weggery) monitoring sites.

## 4 MONITORING AND ADAPTIVE MANAGEMENT

### 4.1 Avoiding Disturbance to Threatened or At Risk Species

Consent condition G.34 b) v) requires avoiding disturbance of nationally *Threatened* or *At Risk* birds during breeding periods. Thus, in the context of this plan and the consent condition, “disturbance” relates only to the direct disturbance associated with the removal of habitat during the breeding season. Given the mobile nature of avian species and the modified nature of the habitat (including existing presence of humans, dogs and predators) occurring along the designation and the presence of other development activities in the area, any indirect disturbance associated with noise of construction activities is not considered.

#### 4.1.1 New Zealand pipit

New Zealand pipit is a ground-nesting species, with the nest generally being located in a well-hidden space at the bottom of a clump of grass, bracken fern, scrub, or the side of a bank (Heather & Robertson 2000). Before European colonisation, the New Zealand pipit was likely confined to alpine and lowland tussock areas, riverbeds and coastal zones, but the subsequent extensive conversion of forests to pasture undoubtedly benefited New Zealand pipit by providing more of the open habitat to which it appears best-adapted (Garrick 1981). More recently, New Zealand pipit numbers began to decrease as once-rough pasture became more intensively managed, leaving little cover for nests (Beauchamp 1995, 2009). Despite these changes, pipit is still widespread throughout New Zealand and is likely to be more common than in pre-European times (Beauchamp 1995). Heather & Robertson (2000) describe this species as widespread and locally common in open country.

Beauchamp’s (1995) survey of New Zealand pipit in the Wellington region recorded this species utilising the following habitats: gravel and dirt roads and tracks, coastal cliffs, sand and gravel beaches, mixed shrubland and pasture with rock or exposed banks, pasture near shrublands with significant exposed soil, lowland tussock grasslands, young pine plantations, and river margins. Highest densities were found in habitat predominantly covered in rough open pasture, shrubland, tauhinu, and tussock grasslands (Beauchamp 1995).

As described in Section 2.4, the baseline avifauna surveys included 23 point count sites (sampled on four occasions from September 2010 to February 2011) distributed along and adjacent to the designation in a range of representative habitat types; pipit was a target species for the survey (see Table 3). A total of four New Zealand pipit were recorded at three survey points on Ngarara Farm outside of the designation during the baseline survey (refer to Map 4 in Appendix 2); no pipit were recorded along the designation.

The nesting habit of this species, and the extent to which such habitat occurs within the designation (some 79%), makes it unfeasible to avoid these areas during the pipit breeding season. Furthermore, it should be noted that unlike the case of fernbird, there is an

abundance of pipit habitat available in the wider landscape outside of the designation and this was where pipit were recorded during the baseline survey.

The baseline records of pipit were all within the Ngarara Farm area (see Map 4 in Appendix 2), and as such this will be the focus area for avoiding potential impacts on New Zealand pipit during the breeding season. If initial vegetation clearance in the form of rough pastoral habitat is to occur between chainage 13600 and 15200 during the pipit breeding season, then this area will be grazed during the non-breeding season prior to works in that area. This area of pipit habitat management is identified in Map 4 (refer to Appendix 2). The lower stature pasture resulting from this action will result unsuitable pipit nesting habitat. However, if works are to occur in this area outside of the pipit breeding season, then no such management actions are required.

#### **4.1.2 Grey duck**

Grey duck inhabit shallow wetlands and fresh water streams, as well as agricultural and urban habitats (Muller 2008). The *Threatened* status assigned to grey duck is largely due to the rapid decrease in numbers of genetically pure grey ducks as a result of ongoing hybridization with the introduced mallard (Miskelly *et al.* 2008). Muller (2008) concluded that the grey duck is likely to become extinct as a separate species in New Zealand in the near future.

With regard to grey duck, if vegetation is to be cleared from the Kiwi Pond (south of the Wharemauku Stream – refer Map 5 in Appendix 2) during the breeding season (i.e. August to January), then a qualified ornithologist will first check for the presence of breeding grey duck in that area immediately prior (i.e. day before) to the proposed clearance. The extensive hybridisation with mallard makes it difficult to identify a pure grey duck based on its phenotypic characteristics alone, and therefore it is necessary that this check be undertaken by a suitably qualified ornithologist to increase the likelihood of differentiating between mallard x grey hybrids and purebred grey ducks. This process will involve walking around an area of approximately 3 ha checking for the presence of nesting grey duck in the appropriate habitat.

Should an active nest be found, then vegetation clearance in that area will be postponed to a later date when no breeding activity is observed.

Should vegetation clearance in this area be scheduled outside of the breeding season (i.e. February to July), then no such nest checks will be required.

## **4.2 North Island Fernbird**

Figure 2 and Figure 3 provide the key supporting information regarding the management and monitoring regime that will be applied to fernbird:

- 1 In order to minimise any potential effects on fernbird, Figure 2 outlines a decision tree process that will be applied to determine if vegetation clearance can occur based on

the presence or absence of fernbird and the time of the year (during or outside of breeding season) (see **Conditions G.40** and **G.41**); and

- 2 Figure 3 sets out the location and construction stages during which the different monitoring techniques (required as part of the adaptive management approach) will be used (see **Conditions G.38, G.40** and **G.41**).

The following sections of this document provide detailed methodologies for each of the techniques outlined in these figures. There are a suite of techniques which may be employed through this process to customise to the situation; thus, not all the techniques will necessarily be required. In addition, monitoring methods and timing will differ according to the stage of the project (i.e. pre-construction, during and post-construction) and the location of works (i.e. existing fernbird habitat outside and along designation, as well as created fernbird habitat and transfer sites).

We note that the potential areas of fernbird habitat outside and along the Designation have already been identified and the baseline monitoring of these sites completed (as required by **Conditions G.38 a)** and **G.40 b) i)**). The methods, results, and recommendations based on these investigations are provided in Appendix 1.

Figure 2 should be consulted prior to the removal of any areas of confirmed fernbird habitat. In terms of fernbird monitoring during construction, the key decision will be in regard to whether or not vegetation clearance must occur within the areas of confirmed fernbird habitat (identified from the baseline study, see Appendix 1 and Map 3 in Appendix 2) during the breeding season (i.e. August through February).

- If no clearance of fernbird habitat is required during that period, then no monitoring is required during the breeding season; this will result in a significantly reduce fernbird monitoring effort. However, we note that a minimum requirement will be that playback surveys be undertaken immediately prior to vegetation clearance within the locations of confirmed habitat (identified in Map 3 located in Appendix 2) at any time of the year.
- If however, vegetation clearance is required during the fernbird breeding season, this will result in a significant increase in monitoring effort required to confirm whether fernbird are breeding in the area of proposed vegetation clearance.
- Furthermore, if breeding is confirmed, vegetation clearance cannot proceed.

For further clarification, this process is outlined as a decision tree in Figure 2.

**Figure 2:** Adaptive management process for minimising effects on fernbird during vegetation clearance

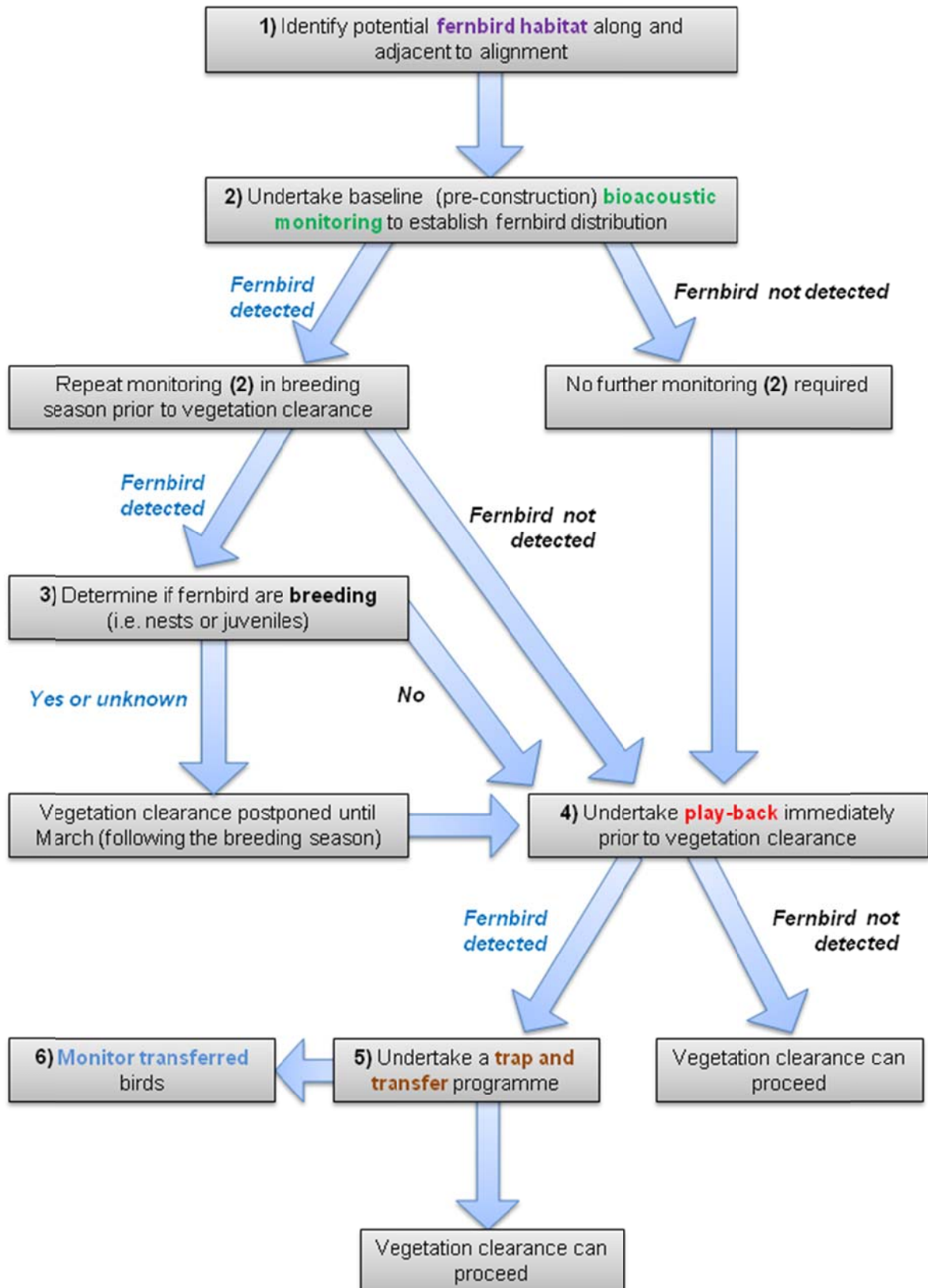




Figure 3: Location, construction stages and fernbird monitoring techniques

	Adjacent to alignment	FERNBIRD HABITAT Under alignment	Fernbird transfer sites
Baseline (pre-construction)	<ul style="list-style-type: none"> <li>Identify potential <b>fernbird habitat</b>.</li> <li>Undertake <b>bioacoustic monitoring</b> during one breeding season to establish fernbird distribution.</li> </ul>	<ul style="list-style-type: none"> <li>Identify potential <b>fernbird habitat</b>.</li> <li>Undertake <b>bioacoustic monitoring</b> during one breeding season to establish fernbird distribution.</li> <li>At sites where fernbird found to be present during baseline monitoring, undertake additional <b>bioacoustic monitoring</b> during the breeding season immediately prior to vegetation clearance.</li> <li>If detected, determine if <b>fernbird breeding</b>.</li> </ul>	
During construction	<ul style="list-style-type: none"> <li>In areas adjacent to where fernbird have been detected during the baseline monitoring, undertake <b>bioacoustic monitoring</b> during each breeding season when construction is occurring in those areas.</li> </ul>	<ul style="list-style-type: none"> <li>Undertake <b>playbacks</b> in areas where fernbird were detected in previous monitoring.</li> <li>Initiate <b>trap and transfer programme</b> if birds detected. Deploy transmitters on transferred birds.</li> </ul>	<ul style="list-style-type: none"> <li><b>Monitoring transferred</b> birds for duration of construction, or for the life of the transmitter.</li> </ul>
Post-construction	<ul style="list-style-type: none"> <li>Undertake <b>bioacoustic monitoring</b> during two breeding seasons following the completion of construction.</li> </ul>		<ul style="list-style-type: none"> <li>Undertake <b>bioacoustic monitoring</b> during two breeding seasons following the completion of construction.</li> </ul>

### 4.3 Identifying potential fernbird habitat

In order to determine the baseline distribution of fernbird (**Condition G.40 b)i**) along and outside of the Designation, it is first necessary to identify areas of potential fernbird habitat.

Fernbird habitat is often characterised by a particular structure, with a preference for a low dense understory with an uneven vegetation profile broken by emergent shrubs and trees (Blackburn, 1967; Elliot, 1978; Best, 1979; Barlow, 1983; Harris, 1987; Andrews, 1995; Parker 2002). Typically such habitats include swamps, saltmarshes, pakihi and dry scrub, rush and tussock-covered frost flats, fernlands (e.g. bracken *Pteridium esculentum* and umbrella fern *Gleichenia spp.*), gorse (*Ulex europaeus*) and kiekie (*Freycinetia banksii*) thickets. Consequently, fernbird are often found in what is viewed as marginal habitat; such areas are fragmented along the designation due to the mix of urbanisation and rural land use in the area.

Previous records of fernbird on the Kāpiti Coast include in wetland, blackberry and riparian vegetation in the wider Te Harakeke / Kawakahia wetland / Nga Manu Nature Reserve area (Wildland 2002; BML 2011), as well in Otaihanga Oxbow vegetation at Waikanae Estuary. These records provided point locations of where the birds are known to occur. Areas of potential fernbird habitat occurring along and outside of the designation have been identified and are shown in Maps 1 and 2 (refer to Appendix 2). These areas include the kanuka-gorse scrub around the Raumati South Peatlands, El Rancho Wetland (Weggery), Te Harakeke / Kawakahia Wetland and the wider Nga Manu Nature Reserve area (including the Ngarara Wetland and Kakariki Stream).

These areas were investigated for the presence of fernbird (as a requirement of the baseline monitoring – **Condition G.38 a**)), which confirmed their distribution as being restricted to the Te Harakeke / Kawakahia Wetland / Nga Manu Nature Reserve area (refer to Appendix 1 for details of baseline monitoring).

### 4.4 Bioacoustic monitoring

Consent **Condition G.38** requires that fernbird be monitored pre-construction (to establish baseline distribution), during and post-construction (for 2 years following completion). Behavioural characteristics of fernbird dictates the optimal time for monitoring their presence; that being during the morning and evening periods over the spring months when there is a peak in territorial calls and disputes.

Playback calls can be used to elicit a response of a resident bird and therefore establish their presence, however Parker (2002) noted that fernbird became habituated to lure calls and did not respond to playbacks. As such, given the long-term monitoring requirement of fernbird associated with this project, bioacoustic monitoring devices are the most appropriate tool to monitor the distribution of this species; this passive method of data collection will avoid the possible issue of fernbird habituation.

To date, bioacoustic monitoring has been undertaken to establish baseline information on the pre-construction distribution of fernbird along and outside of the designation (see Appendix 1). This monitoring confirmed that fernbird appear to be restricted to the Te Harakeke / Kawakahia wetland / Nga Manu Nature Reserve area. As such, subsequent fernbird monitoring (during and post-construction) will be concentrated in these areas.

The requirement, timing, and frequency of the bioacoustic monitoring proposed are outlined in Figure 2 and Figure 3. The same monitoring technique used during the baseline investigation will be applied to all subsequent bioacoustic monitoring as follows:

- Department of Conservation bio-acoustic recording devices (version B.2) will be deployed at specified sites (see Table 5 and Map 3 in Appendix 2) from early September to late November;
- Bioacoustic devices will be set to activate recording each morning from 06:30–10:30 hrs (period of peak fernbird activity);
- Each bioacoustic device will be visited at approximately 4 week intervals to retrieve the data, check functioning and change the batteries; and
- The data collected will be analysed for the detection of fernbird calls using Raven Pro™ software by a suitably qualified ornithologist.

**Table 5:** Locations of bioacoustic monitoring sites during and post-construction

Bioacoustic unit	Proximity to designation	General location	Monitoring	
			Construction phase	Post-construction
1	Outside	Te Harakeke Wetland / Ngarara farm	During breeding seasons throughout construction	Two breeding seasons post-construction
2	Outside	Kakariki Stream	During breeding seasons throughout construction	Two breeding seasons post-construction
3	Along	Kakariki Stream	During breeding season prior to vegetation clearance	-
4	Along	Kakariki Stream	During breeding season prior to vegetation clearance	-
5	Outside	Te Harakeke Wetland / Ngarara farm	During breeding seasons throughout construction	Two breeding seasons post-construction
6	Outside	Te Harakeke Wetland / Ngarara farm	During breeding seasons throughout construction	Two breeding seasons post-construction
7	Along	Te Harakeke Wetland / Ngarara farm	During breeding season prior to vegetation clearance	-
8	Along	Nga Manu Nature Reserve / Ngarara farm	During breeding seasons throughout construction	-
9	Outside	Nga Manu Nature Reserve / Ngarara farm	During breeding season prior to vegetation clearance	Two breeding seasons post-construction
10	Outside	Nga Manu Nature Reserve	During breeding season prior to vegetation clearance	Two breeding seasons post-construction

## 4.5 Investigating breeding activity

**Consent Condition G.41A** and Figure 2 specifically outline the process that must be undertaken in areas of fernbird habitat proposed to be cleared during the breeding season.

If fernbird are confirmed to be present (via the bioacoustic monitoring outlined above) in such areas during the breeding season immediately prior to the proposed vegetation clearance, the breeding status of these birds must first be established before works can proceed (**Condition G.41A c**).

Fernbird nests are generally a concealed deep tightly woven cup and situated most frequently a few inches above the ground, thus making them difficult to easily locate (particularly without causing significant damage to surrounding vegetation). Consequently, Parker (2002) used behavioural observations of fernbird to obtain an indication of breeding activity; while most fernbird behaviour occurs under thick cover; breeding birds fly to and from the nest via a launching and landing post within one to four metres of the nest. The birds often alarm call as they fly from the nest, and birds with chicks (later in the season) make frequent visits to and from nests with invertebrates and faecal sacs (Parker 2002).

As such, observational monitoring will be conducted (in those areas of fernbird habitat in which birds were detected) by a suitably qualified ornithologist as a method for addressing **Condition G.41A c**. First, attempts will be made to establish the territorial boundaries of any birds present in the area to be cleared using playback calls (see Section 4.6 for playback methodology). Based on the results of the playback calls, vantage points (the number of which will be dependent on the proposed area to be cleared) will be established and observations undertaken using binoculars. In territories where the vegetation is thick and greater than one metre high, an A-frame ladder will be used for the observation period.

A minimum of 4 hours of observation per day (preferably during the morning) for 10 consecutive days will be undertaken in order to determine if breeding activity is possibly occurring in the area of proposed vegetation clearance as outlined in Map 3 (refer to Appendix 2).

Following this observation period, if breeding activity is confirmed or could not be determined, vegetation clearance will be postponed until after the breeding seasons; at which time, playback surveys (see Section 4.6) must be undertaken prior to the vegetation clearance. However, if during the observation period it is confirmed that any fernbird present are not breeding, then a trap and transfer programme will be initiated (see Section 4.7) prior to the vegetation clearance.

In all instances, if vegetation clearance is to occur in areas of identified fernbird habitat (see Map 3 in Appendix 2) during the breeding season, then it should be undertaken using hand-machinery in the presence of a qualified ornithologist.

## 4.6 Playback survey

Playback surveys will be undertaken immediately prior to any clearance of fernbird habitat (outlined in Map 3 located in Appendix 2), both during and outside of the breeding season (as per **Condition G.41A a**). This method will be used as the last tool to detect the possible presence of fernbird in that habitat, and will be carried out by a suitably qualified ornithologist. The Alliance will liaise with a suitably qualified ornithologist at least 7 days prior to any areas of fernbird habitat clearance in order to organise the necessary timing of the playback survey.

Fernbird are most responsive to lure calls in the first two hours after dawn; attempts to draw silent birds in the middle of the day are generally unsuccessful and may in fact be counterproductive as birds become habituated to the lure calls (Parker 2002). In all instances, a minimum of one dusk and dawn playback session will be conducted on the evening prior and morning of the day of the clearance operation. During the playback survey, the ornithologist will be positioned on the edge of the habitat to be cleared to entice birds into viewing range. Fernbird calls will be broadcast using an iPod and Philips SBD4000 portable speakers, aimed into the centre of the habitat. The calls will be played in 4 x 30 second intervals, with each call punctuated by a minute silence to listen for a response.

The results of the playback survey will determine if vegetation clearance may occur as well as any possible further monitoring requirements in that area (refer to Figure 2).

## 4.7 Trap and transfer programme

There are several instances in which a trap and transfer operation will be required (see Figure 2 and Figure 3), if:

- Outside of the breeding season, playback surveys detect the presence of fernbird in areas of habitat (identified in Map 3 located in Appendix 2) proposed to be removed (see Section 4.6); and
- During the breeding season fernbird have been recorded (either via bioacoustics or playback) within the vegetation to be cleared but no evidence of breeding activity or behaviour was detected during the observational monitoring (as described in Section 4.5).

Techniques for capturing and transferring fernbird have been developed and refined (Parker 2002). The methodologies used by Parker (2002) (and outlined below) will likely form the basis of any such operations for the Project; however all trap and transfer methodologies, including release locations, will be prepared and undertaken in consultation with the Department of Conservation (as outlined in **Condition G.41A b & d**). Consequently, all relevant DOC permits will be obtained and protocols followed accordingly.

It is proposed that territorial birds will be located and then captured using low set mist nets and lure calls. Birds will be individually held in insulated translocation boxes heavily

lined with vegetation and will be provided with water and live invertebrates. Transportation to release sites should occur within 6 hours of capture for hard release.

Prior to release, all transfer fernbird will be fitted with miniature transmitters; DOC has successfully used the BD2A radio transmitters (Holohil Systems Ltd) for fernbird (van Klink *et al.* 2011). These transmitters have an average battery life of 21 days and average weight of 0.62g. The transmitters can be tail-mounted by tying on to the upper side of the two longest tail feathers with dental floss and glued with Loctite® superglue gel. This mounting method allows for the transmitters to be shed during the following moult.

Specific trap and transfer methodologies will be developed in consultation with DOC as required. DOC and relevant landowners will also be consulted regarding the identification of appropriate release sites, which may include Te Harakeke / Kawakahia Wetland and Otaihangā Oxbow (both locations known to be utilised by the Kāpiti fernbird population).

#### **4.8 Monitoring transferred birds**

Consent **Condition G.38 b)** requires the monitoring of fernbird for the entire duration of the construction work. This will include any translocated fernbird, which will be fitted with transmitters for radio tracking.

The frequency and intensity of monitoring of translocated fernbird will depend on the battery life of the fitted transmitters and the translocation sites. DOC will be consulted regarding any monitoring requirements for translocated fernbird.

## 5 MITIGATION

### 5.1 Habitat Creation

Consent **Condition DC.57 f) v)**, requires specific fernbird habitat to be created as part of the development of vegetation planting as mitigation for the loss of fernbird habitat. This condition relates to the Landscape Management Plan. The details of this habitat creation will be detailed during development of the SSEMP and SSLMP. In summary, this mitigation for habitat loss will involve:

- A focus on detailed design and revegetation of the Kakariki Ecological Mitigation Area (EMA), the only confirmed location of fernbird within the project designation.
- Retention of as much extant vegetation within this EMA as possible through:
  - involvement and review by the Project Ecologist of any detailed design changes; and
  - monitoring of clearance of potential habitat (as described above).
- Involvement of the Project Ecologist in the development of the SSEMP / SSLMP for the Kakariki EMA including:
  - Identification of ideal sites for habitat development within this EMA; and
  - Selection of the range of plants necessary to create favoured habitat.

As described in earlier sections favoured habitat has the following characteristics:

- Fernbird habitat is often characterised by a particular structure, with a preference for a low dense understory with an uneven vegetation profile broken by emergent shrubs and trees;
- Typically such habitats include swamps, saltmarshes, pakihī and dry scrub, rush and tussock-covered frost flats, fernlands (e.g. bracken *Pteridium esculentum* and umbrella fern *Gleichenia spp.*), gorse (*Ulex europaeus*) and kiekie (*Freycinetia banksii*) thickets;
- Consequently, fernbird are often found in what is viewed as marginal habitat; such areas are fragmented along the designation due to the mix of urbanisation and rural land use in the area.

### 5.2 Mitigation Success Monitoring

Given the very small estimated population size of fernbird, its limited distribution and the cryptic nature of this species, use of population size and distribution as a measure of mitigation success is considered to be unfeasible.

In consultation with GWRC it has been agreed that for this reason, habitat can be used as a proxy with post-construction success monitoring focusing on the successful development of vegetation communities that provide preferred habitat for fernbird.

Monitoring of the success of mitigation planting of indigenous vegetation will be undertaken in coordination with the project Landscape Architect to ensure ecological remedial and mitigation works meet the requirement of condition DC.57.

The timing and methodology of this monitoring will be detailed in the maintenance schedules to be developed for each of the SSEMP / SSLMP areas, as will any requirements for remedial work necessary to ensure mitigation success is achieved.

The Project Landscape Architect will liaise with the Project Ecologist with regard to the locations and forms of these habitat features and act as an adviser to the Project Construction Team on the successful delivery of the planting contracts including this habitat formation (see **conditions DC.53 to DC.58 and G.42C**).



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## APPENDIX 1: Fernbird Baseline Distribution Monitoring

### CONTEXT

The following two consents require the pre-construction monitoring of fernbird:

- **Condition G.38 a)** requires the collection of baseline information for 1 year prior to the commencement of work to aid development of EMP and management triggers.
- **Condition G.40 b)i)** requires implementation of an adaptive management approach which shall include baseline information on pre-construction distribution of fernbird in order to develop management trigger levels (where practicable).

Outlined below are the methods used to undertake the investigations, followed by the results of this baseline study and recommendations based on its findings and how these align with the relevant consent conditions.

### METHOD

Following the identification of potential fernbird habitat along and outside of the Project designation, a total of 14 Department of Conservation bio-acoustic recording devices (version B.2) were deployed from early September 2012 to late November 2012 (refer to Table 6 Maps 1 and 2 in Appendix 2). A control (outside designation) – impact (along designation) design has been applied to the layout of the devices to allow:

- a pre-construction comparison between all sites to determine the distribution of fernbird in the area;
- a comparison of the monitoring data collected pre-construction, during and post-construction from sites outside of the designation.

Deployment of the devices coincided with the peak period during which territorial disputes occur (and call rates increase) and they were set to activate recording each morning from 06:30 – 10:30, a period during which fernbird are generally more active. The devices were checked each month to retrieve the data, change the batteries and check functioning.

Prior to the analysis of the data collected from the bioacoustic devices, sonic prints of fernbird calls were viewed by the data analyst and reviewer. The recorded data was then analysed using the Raven Pro™ software to search for calls of fernbird and other *At Risk* or *Threatened* avifauna to enable the distribution (but not population size) of fernbird within these areas to be determined.

## RESULTS

Based on 1680 hours of data analysed by an ornithologist with expertise in the field of bioacoustic analysis, the presence of fernbird were confirmed by a total of three recordings obtained at two of the 14 locations surveyed. Both locations were within the Project designation. Two of the three recordings were detected at the location (Site 8) of the original 2012 fernbird sighting. The third fernbird detection (a single call) was obtained at Site 7, which is approximately 400 m to the southwest in an area of felled pines adjacent to Te Harakeke / Kawakahia Wetland. Both Site 7 and Site 8 are located along the designation. No fernbird were detected at the Raumatī South Peatlands or El Rancho Wetland (Weggery) monitoring sites.

**Table 6:** Location of bioacoustic devices during 2012 baseline monitoring

Bioacoustic monitoring unit	Proximity to designation	General location
1	Outside	Te Harakeke/Kawakahia Wetland/ Ngarara farm
2	Outside	Kakariki Stream
3	Along	Kakariki Stream
4	Along	Kakariki Stream
5	Outside	Te Harakeke/Kawakahia Wetland/ Ngarara farm
6	Outside	Te Harakeke/Kawakahia Wetland/ Ngarara farm
7	Along	Te Harakeke/Kawakahia Wetland/ Ngarara farm
8	Along	Nga Manu Nature Reserve / Ngarara farm
9	Outside	Nga Manu Nature Reserve / Ngarara farm
10	Outside	Nga Manu Nature Reserve
11	Outside	El Rancho Wetland (Weggery)
12	Along	El Rancho Wetland (Weggery)
13	Outside	Raumatī South Peatlands
14	Outside	Raumatī South Peatlands

## CONCLUSIONS

The results of the baseline study confirm that fernbird distribution is restricted to the wider Te Harakeke / Kawakahia Wetland / Nga Manu Nature Reserve area (which encompasses the Ngarara Wetland). This area provides the most suitable fernbird habitat along and adjacent to the Project designation, having a low dense understory (including blackberry, fern and flax) broken by emergent shrubs and trees.

The acoustic detection of three calls at two locations (in relative close proximity) from 1680 hours of recordings is indicative of a very small fernbird population with limited distribution, and confirms the results of the original field observations undertaken as part

of the AEE. While the bioacoustic monitoring did not detect fernbird along the Kakariki Stream, this area is considered as confirmed fernbird habitat given that a fernbird was sighted there during other ecological investigations associated with the Project. Map 3 (refer to Appendix 2) illustrates the areas that have been confirmed as providing habitat for fernbird.

Based on these results it is not practicable (or possible) to establish an adaptive management trigger level based on fernbird numbers because:

- The detectable fernbird population size is too small to formulate a meaningful adaptive management trigger (i.e. the trigger would be zero detections); and
- In formulating an adaptive management trigger (i.e. zero detection) the maximum adverse effect is likely to already have been reached and adaptive management would not be possible.

As such a management trigger will be set in terms of the extent of fernbird habitat available; that is, there will be an increase in fernbird habitat following the Project construction. This will take into consideration the area of fernbird habitat removed during construction and the area of habitat created in accordance with Consent **Condition DC.57 f)v**).

A total area of approximately 2.5 ha of confirmed fernbird habitat will be removed in association with the project. This area comprises 0.7 ha around monitoring Site 7, 0.2 ha at Site 8 and 1.6 ha along the Kakariki Stream (see Map 3 located in Appendix 2). Consequently, the management trigger will be that a minimum of 2.5 ha of fernbird habitat is created.

## RECOMMENDATIONS

Monitoring for effects on fernbird should be concentrated in the wider Te Harakeke / Kawakahia Wetland / Nga Manu Nature Reserve area (and encompassing Ngarara Wetland).

- Because of the low numbers, restricted distribution, and difficulty in detecting this cryptic species, it is not possible to formulate an adaptive management trigger level relating to fernbird detections. Rather, all possible efforts should be made to avoid removing vegetation from areas of likely fernbird habitat within the wider Te Harakeke / Kawakahia Wetland / Nga Manu Nature Reserve area (and encompassing Ngarara Wetland and Kakariki Stream) during the breeding season.
- A management trigger level will be set around the extent of fernbird habitat available. Based on the confirmed fernbird habitat to be removed through the Project, a minimum of 2.5 ha of habitat must be created to replace that lost. Due to the proximity of the existing fernbird population and habitat, some of the replacement habitat should be incorporated into the Kakariki Ecological Mitigation Area.

- If it is not possible to avoid fernbird habitat removal during the breeding season, it must be assumed that this will be likely have a significant adverse effect on the fernbird population given the low observed numbers of this species.