

Chapter 19

Part G

VOLUME 2

# Terrestrial Ecology

## Overview

The Project passes through a landscape that has been highly modified by agriculture, and to a lesser extent horticulture, viticulture and urbanisation. The choice of Expressway alignment has avoided the most significant ecosystems, in particular a significant area of native bush and associated wetland at Mary Crest.

The majority of the Project footprint impacts upon a highly modified landscape supporting little or no indigenous vegetation and no significant habitat of indigenous fauna. The areas of indigenous vegetation and habitats of indigenous fauna impacted by the Project's alignment is the Ōtaki Railway Wetland, that is largely lost to the Project footprint and the edges of several remnants of native bush, with a total area of approximately 0.5ha lost. These are considered to be moderate effects and will require mitigation to compensate for the loss.

The loss of 0.5ha of the Ōtaki Railway Wetland will be offset by the creation of two new areas of indigenous vegetation (total area approximately 1.5ha). The loss of bush habitat will be compensated either by planting new areas of bush or protecting an existing area of bush that is threatened by on-going degradation. Mitigation will achieve the “no-net-loss” in biodiversity objectives contained within the Proposed National Policy Statement on indigenous biodiversity and the NZTA's Environmental Plan.

No threatened or at-risk terrestrial or wetland species of flora or fauna were identified along or immediately adjacent to the Project footprint (whose populations could be materially affected by the Project).

No species-specific mitigation is necessary for threatened or at-risk species. Recommendations have been made concerning minimising impacts on one non-threatened species, peripatus (velvet worm). This has been proposed as a precaution due to the taxonomy of the species being under review, which could result in new species being identified. The risk of material adverse effects on these animals is considered to be negligible.

Overall it is considered that with proposed mitigation measures and offsets undertaken, the effects of the Project on terrestrial ecology will be minimal and acceptable and that “no-net-loss” in ecological values will be achieved.

## 19 Terrestrial Ecology

### 19.1 Introduction

This chapter summarises the effects of the Project on terrestrial, wetland and riparian ecosystems.

This chapter covers the following:

- a description of the terrestrial, wetland and riparian habitats, and their associated flora and fauna;
- an assessment of the ecological values of the habitats and species potentially affected by the Project;
- details of the nature and scale of the Project's actual or potential adverse effects, and the likely significance of those effects; and
- details of such measures that are necessary to avoid, remedy, mitigate or offset effects.

The following methods and sources were used to identify the existing environment and the potential effects of the Project:

- review of existing background information relating to the Project and Project Corridor including: project plans, existing ecological reports and databases, aerial photographs, the operative and proposed KCDPs and the PRPS;
- vegetation survey;
- wetland condition assessment;
- bird survey;
- bat survey;
- reptile survey; and
- invertebrate survey.

A survey for native frog was not undertaken as the Project passes through an area that is located outside the known range of all native frog species.

The summary is based on the following report:

- Peka Peka to Ōtaki Expressway: Terrestrial Ecology (Technical Report 11).

This technical report is included in Volume 3 of this AEE report.

## 19.2 Existing Environment

The Project passes through a landscape that has been highly modified by agriculture, and to a lesser extent horticulture, viticulture and urbanisation. The birdlife found in the Project area is typical of a farmland with fragments of native bush and wetland supporting diverse communities of common native and introduced species. Most of the Project affects areas that support no indigenous vegetation and are likely to be of limited value as habitat for indigenous fauna. There are however a small number of features of ecological significance impacted by the Project, as outlined below.

### 19.2.1 Habitat Features of Recognised Ecological Significance

Part I of the operative KCDP contains the Heritage Register. Table E of the Heritage Register lists ecological sites (areas of significant indigenous vegetation and significant habitat of indigenous fauna). Many of these sites were taken from ecological site surveys and assessments undertaken by Wildland Consultants Limited<sup>39</sup>. The sites are ranked as being of international, national, regional or district significance. Table 19-1 below details the sites listed in the Heritage Register that are affected by the Project and their level of significance.

**Table 19-1: Ecological Sites Listed in the KCDC Heritage Register**

Site Name	Description	Ranking
K134 – Ōtaki Railway Wetland (see Map 1)	Small wetland. Grazed in part. <i>Raupo Typha orientalis</i> abundant. Threatened by plant pests.	District significance
K038 – Hautere Bush F (see Map 2)	Totara-matai forest. Grazed beneath and lacking an understorey.	District significance

<sup>39</sup> Wildland Consultants Ltd., 2003. Kāpiti Coast District Council: 2002-2003 Ecological Site Surveys. Contract Report No. 662.

Site Name	Description	Ranking
K037 – Cottle's Bush (see Map 2)	Totara-titoki-matai forest. Recovering from grazing.	District significance

### 19.2.2 Proposed Kāpiti Coast District Plan

The proposed KCDP was notified in November 2012.

In addition to sites listed in the operative KCDP Heritage Register, areas supporting native flora and fauna present along the alignment have been added to the Heritage Register of the proposed KCDP, being:

- An area of indigenous forest on the Steven's Property (48 Old Hautere Road) - a significant and relatively species-rich under-represented habitat. The bush covers a small area but is fenced and supports a well developed sub-canopy.
- An area of indigenous forest and wetland at Mary Crest has also been included in the proposed KCDP. This would have been significantly impacted by the alignment as it was originally proposed in the early stages of the Project, however the road was subsequently re-aligned to avoid this area.

### 19.2.3 Unregistered Sites Supporting Indigenous Vegetation

Additional areas supporting native flora and fauna present along the alignment have also been identified that are not listed under the operative or proposed KCDPs, as described below:

- An area of damp pasture to the south of the Mary Crest bush-blocks supports some native plant species; however, given the high degree of modification and the general dominance of exotic species these pastures are not considered to be of ecological significance.
- Native trees in the paddocks immediately to the south of Ōtaki Gorge Road and immediately to the north of Te Kowhai Road will be directly affected. The trees are of some interest in the context of the local landscape given the general low incidence of mature native trees. However, these trees are not part of functioning ecosystems and cannot be considered to represent significant indigenous vegetation or significant habitat of indigenous fauna.

Table 19-2 below contains an assessment of the significance of these unregistered sites. Their significance has been assessed using the criteria set out in the PRPS and section 8.3(c) of the operative KCDP.

**Table 19-2: Assessment of Unregistered Ecological Sites**

Site	Significance	Reasons
Mature native trees within pasture situated between Hautere Bush F and Cottle's Bush	Not significant	Significantly degraded ecosystem that will continue to decline without protection. No sub-canopy and pasture beneath canopy. Not a functioning or sustainable ecosystem. However, mature native trees take generations to replace and therefore they still have modest ecological value in the context of the local landscape.
Mature native trees dispersed through pasture adjacent to Cottle's Bush	Not significant	As above.

The locations of the registered and non-registered sites within the Project area are included in Technical Report 11 and shown on the plan set in Volume 5.

The inclusion of sites in the Heritage Register does not change the assessment of values, effects or the proposals for mitigation.

Ōtaki Railway Wetland, Hautere Bush F and Cottle's Bush are all examples of under-represented habitats i.e. <30% of their original extent remains, and are sufficiently intact to be considered examples of significant indigenous vegetation. This assessment therefore concurs with the original assessment made by Wildland Consultants Ltd that these sites are significant. However, while they meet the test of significance, the values of all these habitats have been impacted by human activity. In particular, the integrity of Hautere Bush F has been historically impacted and continues to be impacted by grazing. Cottle's Bush, while having a more developed sub-canopy, also shows signs of historic grazing pressure i.e. discontinuous age structure. In the case of the Ōtaki Railway Wetland, while it is dominated by native wetland plants, its current state has been substantially influenced by the interventions of man.

#### 19.2.4 Riparian Vegetation

Riparian vegetation consists predominantly of grazed grass and willows. There is almost no naturally occurring native vegetation along any of the waterways where they are crossed by the Expressway, apart from the native species that have been planted along the edge of the Mangapouri Stream where it passes through the Pare-o-Matangi reserve in Ōtaki. None of the riparian vegetation encountered along the alignment is considered to be significant indigenous vegetation or significant habitat of indigenous fauna.

#### 19.2.5 Ōtaki Railway Wetland

Native wetland plant species dominate the vegetation in the Ōtaki Railway Wetland. The wetland also supports a variety of introduced plant species and weed species.

A wetland condition assessment for the Railway Wetland scored 13.3/25 which reflects a high degree of modification. The pressure rating for the wetland scored 25/30 representing a high degree of pressure from sources such as weed invasion, nitrogen inputs and predators. These pressures are highly likely to lead to future degradation in the absence of management.

Wetlands are nationally and regionally under-represented and most remaining wetlands supporting a high proportion of native vegetation still constitute significant indigenous vegetation and indigenous fauna, as does this wetland. However, when considering the effects of the loss of this wetland it must be acknowledged that it has been highly modified and its current state and condition have largely been determined by significant interventions by man, i.e. impeded drainage caused by the NIMT and SH1 embankment. It should also be recognised that it will suffer significant on-going pressure that may lead to further degradation due to the highly modified nature of the catchment and its small size.

#### 19.2.6 Species of Ecological Significance

The following is a summary of the habitat and species survey results within the Project area:

- No threatened plant species were recorded in areas affected by the Project. The effects on populations of individual plant species as a result of the Project are expected to be less than minor.
- No threatened bird species were recorded during the walkover survey, or are likely to be significantly affected by the Project given its location and the paucity of suitable habitats present. Effects on bird populations resulting from the Project are expected to be less than minor.

- No bats were recorded at any of the survey locations along the alignment. While a nil result does not necessarily prove that bats are not present, it is considered that the effects of the Project on bats, if any, will be less than minor.
- No threatened reptile species were recorded during the survey. This result supports the assessment of the habitat potential of the land affected by the Project as being low for threatened reptile species. The effects of the Project on individual reptile species are therefore expected to be less than minor.
- No threatened invertebrate species were recorded by the invertebrate survey. This is not surprising given the modified nature of the habitats affected by the Project. The effect of the Project on the populations of individual species of invertebrates is therefore expected to be less than minor.

### 19.2.7 Māori Perspective on Ecological Values

At a meeting and site visit held on Friday 29<sup>th</sup> July 2011 ecological issues of importance to iwi were discussed. The Railway Wetland in Ōtaki was of significant interest being of importance from an archaeological and cultural perspective, as well as ecological. The possibility of recreating the wetland as mitigation was discussed, as was the possibility of 'capturing' the source of the spring located in the northern part of the wetland.

One solution discussed was to preserve the source of the spring in its current location, creating a wetland or riparian zone alongside the Expressway following the existing "natural" flow path. Rehabilitation and planting this area with wetland plants would then be undertaken along this flow path creating a narrow wetland strip/riparian zone. This treatment is essentially the treatment envisaged for the remnant of the Railway Wetland (Map 5).

To offset the residual loss of the Railway Wetland in Ōtaki one of the options discussed was the incorporation of ecological values into stormwater wetland ponds. This is essentially what is now being proposed in creating the Kennedy Wetland in Ōtaki (Map 5) where a stormwater attenuation pond will be designed to incorporate biodiversity values. An additional area of wetland is to be created adjacent the Mary Crest Bush (Map 6). The primary function of this wetland is biodiversity offset. The design principles to be followed in developing biodiversity values of these wetlands have been included in the draft Ecological Management Plan submitted to the EPA. However, further inputs from iwi will be sought before completion of the final detailed designs.

Bush to the west of the Railway Wetland (beyond the Expressway) was considered very significant and it is understood that iwi are working with Tim Park at GWRC to look at enhancement/fencing opportunities. This area is not impacted by the Project.

Avoiding the bush and wetland at Mary Crest was viewed as a very positive step for the Project to have taken. There was also recognition that the Project has brought the area to the attention of iwi and other stakeholders. Iwi are keen to pursue protection and enhancement of the area with the land owner and other stakeholders. The proposed creation of offset wetland in this area will further enhance the ecological values of this area.

The treatment and water quality enhancement opportunities provided by stormwater wetland ponds are of significant interest to iwi and seen as a positive potential enhancement that the Project can provide.

Iwi also generally support efforts to minimise loss of bush from other sites along the alignment. Where native trees are unavoidably lost, recovery of timber for carving or other traditional uses is advocated.

### 19.2.8 Summary of Existing Environment

Most of the Project footprint affects a highly modified landscape supporting little or no indigenous vegetation and no significant habitat of indigenous fauna. There are however a few areas of indigenous vegetation and habitats of indigenous fauna impacted by the alignment. There is one significant area of wetland located in Ōtaki (the Railway Wetland) that is largely lost to the Project footprint. In addition, the edges of several remnants of native bush will also be impacted by the footprint with a total area of approximately 0.5ha lost. One significant area of bush (and a nearby wetland) at Mary Crest would have been significantly impacted by the alignment as it was originally proposed in the early stages of the Project, however the road was subsequently re-aligned to avoid this area of bush and wetland.

## 19.3 Assessment of Effects on Terrestrial Ecology

### 19.3.1 Positive Effects

While it is often possible to avoid sites of ecological significance by designing alignments to bypass certain habitats, net positive gains that are a direct consequence of building a road are rare. It is, however, possible to achieve “no-net-loss” of habitat and associated ecological values by avoiding, remedying and mitigating adverse effects.

The Expressway was initially designed to pass through the Mary Crest bush and wetland, however the route has been refined and this significant area has been avoided. While the avoidance of Mary Crest is not in itself a positive benefit of building the Project, the need to consider the effects of the Project on this site has highlighted the ecological importance of an area that was previously not recognised in the District Plan Heritage Register and was largely unknown by local people. The increased knowledge of the ecological characteristics and values of Mary Crest is a positive benefit that has occurred as a result of the studies undertaken to support the designation of the Expressway.

### 19.3.2 Habitat Loss

Table 19-3 below specifies the habitat losses to the Project footprint from ecological features along the alignment and also describes the significance of the effect. As there is no significant indigenous vegetation along the riparian margins of rivers and streams, and no “at risk” or “threatened” terrestrial species that have significant associations with the affected riparian margins, the effects on riparian habitat are considered to be negligible.

**Table 19-3: Summary of Habitat Losses and Significance of Effect**

Site	Habitat Loss	Significance of Effect
K134 – Railway wetland (adj. railway Ōtaki)	Most of wetland (0.5ha or 0.8ha in total) lost to the footprint.	Habitat has been determined as significant in terms of section 6(c) of the RMA and Policy 22 of the PRPS.  More than minor effect due to large scale of loss. An effect of moderate rather than major significance given the modified condition of the wetland.
Mature native trees in paddock adjacent to south of Ōtaki Gorge Road.	Small number of mature native trees lost.	Less than minor effect. Not significant indigenous vegetation or habitat of indigenous fauna and small number of trees involved.
K038 – Hautere Bush F	Between 40 and 60 mature native trees lost from the	Vegetation has been determined as significant in terms of section 6(c) of the

Site	Habitat Loss	Significance of Effect
	western edge of the bush.	RMA and Policy 22 of the PRPS. More than minor effect due to number of trees lost. An effect of moderate significance due to the modified condition of the habitat and the fact only a small proportion of the site is impacted.
Mature native trees situated between Hautere Bush F and Cottle's Bush	Approximately 20 mature trees lost from the edge.	Minor effect due to relatively low value of the stand of trees and scale of effect.
Mature native trees adjacent to Cottle's Bush.	Approximately 12 native mature trees lost to footprint.	Minor due to relatively low value of the stand of trees.
K037 - Cottle's Bush	A few mature trees lost from extreme western edge.	Vegetation has been determined as significant in terms of section 6(c) of the RMA and Policy 22 of the PRPS. Minor due to very small scale of effect.
Indigenous forest and wetland at Mary Crest	Road realigned to avoid. No habitat loss.	Effects avoided.
Indigenous forest on the Steven's Property (48 Old Hautere Road)	Approximately 15% of the bush lost from the eastern edge	Vegetation has been determined as significant in terms of section 6(c) of the RMA and Policy 22 of the PRPS. Alignment modification has reduced loss of habitat. More than minor effect due to relatively high value of site. Effect of moderate significance.
Mature kahikatea in paddock to north of Te Kowhai Road.	Four mature kahikatea trees lost.	Less than minor effect. Not significant indigenous vegetation or habitat of indigenous fauna and small number of trees involved.

The cumulative area of native forest that will be lost from sites determined to be significant in terms of section 6(c) of the RMA and Policy 22 of the PRPS (Hautere Bush F, Cottle's Bush and bush on the Steven's Property) is approximately 0.5ha.

More than half (c.0.5ha) of the Ōtaki Railway Wetland (total area c.0.8ha) will be permanently lost to the footprint. The remaining area of wetland (c.0.3ha) is at risk of significant disturbance during the construction period. However, the modified nature and pressures from weed species that already exist along the remaining edge mean that intervention would be required to create a higher quality habitat than already exists regardless of how much impact the road construction has.

Outside of the areas determined to be significant in terms of section 6(c) of the RMA and Policy 22 of the PRPS mature native trees will be lost from a number of locations along the Expressway. The cumulative total number of mature trees lost from these areas will be about 40.

### 19.3.3 Hydrological Effects on Mary Crest Bush and Wetland

Wet pasture occurs to the south of the Mary Crest bush and wetland. There is also a drain that flows from east to west along the southern edge of the bush/wetland. This drain then converges with a stream that flows west through the wet pasture. Observations of



the surface drainage within the pasture indicate that there is no surface connection between the pasture and the bush/wetland. There are likely to be ground water connections between the wet pasture, surface drainage within the pasture and wet areas within the Mary Crest bush area. While the Expressway construction will involve a diversion of the Edwin Stream the surface water flow volumes into the wet pasture area are expected to be similar post-construction to those that exist at the present time. With regard to the impact of the Expressway on ground water levels to the west of the new road, it is not expected that there will be any significant long-term effects that may be detrimental to the Mary Crest wetland and swamp forest i.e. permanent lowering of ground water levels.

#### 19.3.4 Habitat Fragmentation

It is considered that very little habitat fragmentation, i.e. the effects of breaking areas of habitat into smaller areas principally by severance, will result from the proposed alignment.

#### 19.3.5 Edge Effects Resulting from Tree Removal from the Edges of Bush Habitat

Where trees and shrubs are cleared from the edge of areas of bush, the exposed trees can be more prone to wind-throw. Further, where a sub-canopy or ground cover is present this is likely to be more prone to desiccation. This is particularly the case in exposed coastal areas. The magnitude of edge effects is difficult to predict given the variability in the resilience of vegetation in a given location to wind effects and the variable nature of weather patterns.

A number of locations along the Expressway will require removal of mature vegetation from the edge of stands of bush assessed as being significant (Hautere Bush F, Cottle's Bush and bush on the Steven's Property) thus exposing trees that may be more susceptible to wind damage. Trees will be removed from the western edges of Hautere Bush F and Cottle's exposing them to prevailing winds. In the case of Hautere Bush F the main concern is wind-throw of remaining mature trees. Effects on the sub-canopy and ground cover are not a significant concern as grazing by cattle has largely removed these layers. It is important to note that in the context of this location edge effects are much less of a threat to the remaining habitat than the on-going grazing pressure.

In the case of Cottle's Bush, although the sub-canopy and ground cover layers are sparsely vegetated there is some regeneration occurring in this habitat. Desiccation effects on sub-canopy and ground cover species could therefore be an issue in addition to the risk of wind-throw of mature trees. However, the length of exposed edge in this location will be a maximum of 40m, which is a small proportion of the total edge seaward facing edge of the bush.

The exposed edge of bush on the Steven's Property will be facing east, away from the prevailing winds and therefore edge effects should be less than those associated with a west facing edges. However, there are still risks of wind-throw and desiccation which could compound the habitat loss effects in these locations. Furthermore, species such as *peripatus* are highly susceptible to desiccation.

Overall, edge effects at these locations are unlikely to be major issues but there are risks of some additional damage to the remaining habitat. Measures to minimise these effects will be incorporated into the design, e.g. planting a wind break of fast growing, wind-tolerant species.

### 19.3.6 Effects on Individual Plant Species

No populations of individual species of plants are expected to be significantly impacted by the Project. No avoidance, remediation or mitigation is therefore necessary for individual plant species.

### 19.3.7 Effects on Individual Fauna Species

No populations of individual species of fauna are not expected to be impacted in a major way by the Project. However, there could be some minor effects on the population of peripatus that inhabits the native bush on the Steven's property (Map 4). Peripatus inhabit rotting timber in cool, damp shady environments. Some of the rotting logs where peripatus were found at the Steven's Property are close to the Project footprint where there will be loss of native trees and shrubs along the edge of the bush. As well as loss of shade trees, which could result in desiccation of the logs, it is also possible that the logs may be directly affected.

While individuals of the *Peripatoides novaezealandiae* complex are not classified as threatened or at risk, the taxonomy of peripatus in New Zealand is currently under review.

Currently, five peripatus species from two genera are recognised, however it is possible that there may be as many as 25 separate species amongst those currently classified as five species (Gleeson & Ruhberg, 2010). Given the isolated nature of such remnant populations and the likelihood that a more extensive complex of species may exist than is currently recognised, it is recommended that populations such as at the Steven's property remain in situ (in this case within the remaining area of bush), to maintain genetic integrity until more is known of their taxonomy.

Measures are proposed in section 19.4.2 of this AEE report to minimise the impact on the peripatus in this location. These are the only mitigation measures that are considered necessary for individual species of fauna likely to be affected by the Project.

### 19.3.8 Direct Effects on Wildlife Resulting from Construction Activities and the Provisions of the Wildlife Act 1953

The nature of site clearance activities prior to construction (i.e. vegetation removal and soil stripping) means that there is a risk that some animals to which protections in the Wildlife Act apply could be killed in the process. The groups of animals at risk along the alignment are common non-threatened young native birds (in the nest during the breeding season) and non-threatened reptile species. Even if the construction of the road results in the loss of some individuals from populations, this is likely to be an insignificant proportion of the total populations of species given their population size. Consequently, the effects on the populations of the species potentially impacted are expected to be less than minor.

Given that effects on the populations of these species are insignificant there is no necessity to avoid, remedy or mitigate effects under the provisions of the RMA. However, the provisions of the Wildlife Act still apply to any killing of protected wildlife, even non-threatened species. A permit is therefore likely to be required from the Director-General of Conservation to undertake site clearance works in advance of construction which may kill individuals of a native bird or reptile species. The requirements that will need to be met for the granting of the permit will need to be ascertained from the Director-General of Conservation prior to the start of construction when permits are applied for. It is however expected that Director-General of Conservation will take into account the expected insignificant effects on the populations of the species that could be affected in determining the conditions which may accompany the granting of the permit.

### 19.3.9 Effects of the NIMT Realignment

Since the re-alignment of the NIMT will affect only highly modified habitats i.e. pasture, rush pasture and patches of blackberry with no associated flora and fauna species of conservation significance, it is not expected that it will have any significant ecological effect on terrestrial or wetland ecosystems. Overall, the effect of the NIMT on terrestrial ecology is expected to be insignificant.

## 19.4 Measures to Avoid, Remedy or Mitigate Actual and Potential Adverse Effects

### 19.4.1 Avoidance of Effects

The Expressway design has taken account of the need to minimise effects on features of ecological value along the alignment. In the case of Mary Crest the route has been realigned to avoid the bush thereby avoiding both habitat loss and habitat fragmentation effects. This measure has significantly reduced the overall effect of the alignment on terrestrial ecosystems.

In other locations along the Expressway where the edges of native bush have been impacted, every effort has been made to minimise the intrusion of the footprint into these areas, although some residual loss could not be completely avoided. In the case of the Ōtaki Railway Wetland, this habitat could not be avoided and more than half of the area will be permanently lost. Where loss of habitat could not be avoided offset mitigation has been proposed to compensate for this loss (refer to Section 19.4.2 of the AEE report).

### 19.4.2 Mitigation Measures

#### Protection of Bush Edges from Wind-thrown and Desiccation

Where mature native trees are removed from the existing edges of bush wind breaks should be planted along the edge to provide protection. These should be dense plantings of early succession, wind tolerant species e.g. ngaio, kanuka, wineberry, *Pittosporum tenuifolium* and *Coprosma repens*. It is important that these are locally sourced from the coastal zone to ensure that they are genetically adapted to salt and wind tolerance. Ideally the wind break should be at least 10m wide. Where there is limited room within the designation to plant on the flat the embankments of the road should be planted.

#### Peripatus

If the footprint is likely to directly affect logs inhabited by peripatus at the Steven's property, or if the logs are likely to be exposed to desiccation due to the removal of tree cover, these should, with the land owner's permission, be moved further into the bush. In addition, placement of a few sections of wood from trees felled along the Expressway within the remaining bush adjacent to existing rotting timber currently inhabited by peripatus would provide future habitat for the species as they start to decay.

#### Wetland Rehabilitation and Creation

Approximately 0.3ha of the existing Ōtaki Railway Wetland will remain once the Expressway has been constructed (see Map 5). This residual area of wetland will continue to receive water from the catchment during rain events and ground water seepage in the north eastern corner of the wetland which will not be covered by the Project footprint. This remaining wetland is expected to be permanently wet, with water draining out via culvert from its southern extremity. The wetland remnant will be rehabilitated following construction. This rehabilitation will include re-contouring as necessary, removal of weed species and replanting with the species currently found in the wetland.

To offset the loss of wetland habitat it is proposed to create two new areas of wetland. The Kennedy Wetland (c.0.4ha – see Map 5) and a new area of wetland adjacent to the Mary Crest bush (c.0.7ha – see Map 6). The cumulative area of these two wetlands is c.1.1ha. The Kennedy Wetland will receive water from outflow of the remnant of the Ōtaki Railway Wetland. This is expected to provide permanent flow through the Kennedy Wetland and keep this wetland permanently wet.

It is proposed to create the new area of wetland adjacent to the Mary Crest bush in an area that is currently damp pasture. The area is low-lying and the plant species present indicate high water content in the soil. It is proposed to increase the wetness of the area by digging down into the water table. By doing this it is expected that conditions will be created where native wetland plant species can be introduced and wetland habitat created. The area where it is proposed to create the wetland does slope gently from east to west. Consequently a low bund with impermeable lining may be required around the western edge of the wetland to assist in water retention. A weir is likely to be required to control water outflow from the wetland.

Exact replication of the existing vegetation communities within the Ōtaki Railway Wetland within the new wetlands is not a realistic objective due the high degree of variability of composition within the wetland. Nor is it necessarily a desirable objective given substantial influence of human activities in determining the present species and composition of the vegetation within the wetland. A more realistic objective is to create wetland conditions suitable for the key species present in the existing wetland e.g. raupo, *Isolepis prolifera*, spiked rush, *Carex secta*, *Carex virgata* and cabbage tree, and plant these into the new wetland areas. Over a period of time these species will find their own compositional equilibrium. Plant material would be salvaged from the existing wetland prior to construction or obtained from nursery plant stock grown from locally sourced seeds. Inclusion of deeper water zones (1.5m) in the Kennedy Wetland and the wetland proposed at Mary Crest would provide open water areas that would create habitat diversity wetland that would be more attractive to waterfowl.

Given the modified nature of the wetland lost it is expected that the new wetlands will quickly (within 2-3 years) achieve values although not necessarily identical, at least comparable to those lost. On this basis it could be reasonably argued that a compensation ratio of 1:1 could achieve "no-net-loss" within a relatively short timeframe. However, the amount of wetland it is proposed to create for this Project will exceed this ratio i.e. c1.1ha will be created against c0.5ha lost. This is a compensation ratio of over 2:1. The Project should therefore comfortably meet the "no net loss" objectives contained within the Proposed National Policy Statement on Indigenous Biodiversity and NZTA's Environmental Plan with regard to wetland habitat, and is likely to achieve a net gain.

### **Native Bush**

There are two options by which the loss of native bush could be mitigated:

- Protection and enhancement of an existing area of native bush; and/or
- Planting new areas of bush.

### **Protection and Enhancement of an Existing Area of Native Bush**

There are a number of existing areas of native bush in the vicinity of the proposed Expressway that are under threat from grazing and/or plant and animal pests. In some cases the remaining areas of bush are unlikely to survive in the long-term without intervention. This is especially true where regular grazing by domestic animals takes place. In these stands of bush, no natural regeneration takes place and as mature trees die they are not replaced. Over time, that bush disappears. By fencing and covenanting such areas to ensure long-term protection, the long-term viability of such areas can be significantly enhanced, particularly when supported by plant pest removal. However,

protecting existing areas of bush will require agreements to be made with landowners and this cannot be guaranteed.

When considering the amount of bush (compensation ratio) that should be protected to compensate for that lost in this case, consideration has been given to the condition of the bush being lost and long-term prognosis for its survival. The greater part of the bush being lost (c.0.35ha out of 0.5ha) has been, and continues to be grazed beneath the canopy, to the extent that there is no forest ground dwelling species, minimal sub-canopy and no regeneration of canopy species. The long-term prognosis for this area in the absence of intervention (protection from grazing as a minimum) is that it will continue to diminish and eventually disappear. Under the circumstances, the loss of this area of bush to the Expressway footprint is accelerating a process that is already occurring, although this process may take many decades to run its course. There is no easily developed formula that can determine what an appropriate compensation ratio is in this case. However, a ratio of 2:1, as a minimum, has been chosen in this case to reflect the compromised condition of the bush and the likelihood of on-going degradation in the absence of intervention. It could be argued that a 1:1 would be appropriate. However a 2:1 ratio takes account of some of the uncertainties concerning the future of the existing bush e.g. it is possible that in the future intervention could occur, and also risks to protected areas of bush in the future such as fires, drought or breaches of fences by stock.

An area of bush, with the potential for long-term protection, has been identified close to the Project corridor that supports habitat very similar in character and condition to much of the area of bush that is being lost to the Project footprint. Negotiations are on-going to try to secure this area of bush for protection. If agreement is secured with the land owner it is proposed to covenant the bush to provide long-term protection. This will ensure that it remains fenced from stock. It is also proposed to undertake planting of suitable edge and sub-canopy tree and shrub species around the edge of the bush and in gaps in the canopy within the bush interior to provide a “kick-start” to the regeneration process. This will be supported by a 3 year weed control programme.

The protection of an existing area of bush is the preferred option to compensate for bush lost due to the fact that mature canopy trees (the element of a forest that takes the longest to develop) are already in place. Furthermore, given the length of time it takes for trees to mature, it makes little sense planting new areas of bush, when an existing bush in the area is in need of protection to prevent its disappearance. The area of bush currently being investigated is c.2.4ha in area. If protection of this area of bush was secured the area protected would be well in excess of the recommended 2:1 compensation ratio. This would be a substantial offset to compensate for the bush lost and would achieve greater than the “no net loss” objectives contained within the Proposed National Policy Statement on Indigenous Biodiversity and NZTA’s Environmental Plan.

### **Landscape Planting**

If the protection of an existing area of bush cannot be achieved, an area has been identified adjacent to the existing Mary Crest bush, and within the designation, where new bush habitat can be established by planting (Map 6). In this case a minimum compensation ratio of 3:1 has been chosen. This takes account of the extended timeframe which is required for the new bush habitat to develop significant ecological values (50 to 100 years), comparable to those being lost. However, the ratio also recognises the fact that areas of bush impacted are not pristine habitat and much of that lost is severely threatened by on-going grazing. The new area of bush by contrast will be within the designation, which will provide long-term protection from adverse effects such as grazing.

Most of the bush lost (>80%) is from Hautere Bush F and Cottle’s Bush which are located on lowland river terrace where the soils are free draining, and prone to summer drought. Totara and titoki which tolerate dry summer conditions are dominant species in this zone.

The bush on the Stevens Property is located seaward of the edge of the river terraces in the lee of the stable coastal dunes.

The compensation ratio of 3:1 requires the creation of a minimum of 1.5ha of new bush adjacent to Mary Crest. The area available within the designation for planting at Mary Crest is c.3.0ha. If 1.5ha. of this area is planted with bush, and other recommended measures are implemented to ensure successful establishment and introduction of late successional species, it is expected that the “no-net-loss” in biodiversity objectives contained within the Proposed National Policy Statement on Indigenous Biodiversity and NZTA’s Environmental Plan will be achieved.