

ECOLOGICAL INPUT FOR THE KEPA BUSH INTEGRATED PLAN



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Intermittent stream habitat in Kēpa Bush.

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1. INTRODUCTION

Community Parks and Places (Auckland Council) is developing an integrated plan for Kepa Bush, Mission Bay. Kepa Bush is the largest area of indigenous vegetation remaining on the Auckland isthmus and has very high ecological values in terms of providing a reservoir of local biodiversity. Given the ecological values of Kepa Bush within a largely urban landscape, an integrated plan is proposed to improve the ecological functioning of the reserve. This will be achieved through increasing connectivity to other areas of ecological value within the wider landscape on both public and privately-owned land.

To this end, Auckland Council commissioned Wildland Consultants Ltd to undertake an ecological review of the Kepa Bush Integrated Plan ('the Plan') and provide further recommendations for inclusion in the Plan that includes:

- Mapping and descriptions of vegetation and habitats present.
- Ecological values of vegetation and habitats.
- Opportunities to enhance ecological functioning and connectivity of Kepa Bush.

2. ECOLOGICAL CONTEXT

2.1 Overview

The site is located in the suburb of Ōrākei within the Tāmaki Ecological District. This Ecological District encompasses the heavily urbanised Auckland isthmus between the Manukau and Waitemata harbours, the former North Shore City, and the lowlands of Waitakere.

2.2 Soils

The underlying geology in the area is composed of sandstones of the Waitemata Group. Soils are largely clay and are likely to be nutrient poor and podzolised on ridges where kauri (*Agathis australis*) once dominated. Damp, shaded gullies are likely to have richer soils due to litter deposition by abundant broadleaved species.

2.3 Pre-human vegetation

Prior to human settlement, the Tamaki Ecological District would have been almost entirely forested. Coastal areas would have been covered with forest dominated by pōhutukawa (*Metrosideros excelsa*), in association with species such as karaka (*Corynocarpus laevigatus*), rewarewa (*Knightia excelsa*), kohekohe (*Dysoxylum spectabile*), and pūriri (*Vitex lucens*). Wetter areas, such as swamps formed by the damming of streams by lava flows, would have supported freshwater wetlands dominated by raupō (*Typha orientalis*), with areas of swamp forest dominated by pukatea (*Laurelia novae-zelandiae*) and kahikatea (*Dacrycarpus dacrydioides*). Recently-disturbed areas would have been dominated by mānuka, (*Leptospermum scoparium*) and kānuka (*Kunzea robusta*), with harakeke (flax; *Phormium tenax*) common on the most exposed slopes. Recently formed volcanic surfaces would have

been the only terrestrial habitats relatively bare of vegetation, and grassland and terrestrial herbfield would have been very rare, if present at all.

2.4 Remaining indigenous vegetation

Currently, only 6.9 percent of the Tamaki Ecological District remains in indigenous vegetation cover (Lindsay *et al.* 2009). The project area is situated in an ‘At Risk’ Land Environment, i.e. 20-30 percent indigenous vegetation cover remaining at a national scale (Walker *et al.* 2007).

2.5 Fauna

Indigenous forest remnants and suburban gardens in the Tamaki Ecological District provide habitat for common bird species such as ririoriro (grey warbler; *Gerygone igata*), tauhou (silvereeye; *Zosterops lateralis*) and pīwakawaka (North Island fantail; *Rhipidura fuliginosa placabilis*). Species such as tūī (*Prosthemadera novaeseelandiae*) and kererū (*Hemiphaga novaeseelandiae*) are more common in larger forest remnants. Ruru (morepork; *Ninox novaeseelandiae*) occurs in indigenous and exotic forest, and in open country or suburban gardens with areas of mature trees (Heather & Robertson 2000).

2.6 Local context

Surrounding Kepa Bush are private residences and several public reserves including Ōrākei Basin, Pourewa Creek and Tahapa Reserve East. The Pourewa Creek estuary also comprises mangrove (*Avicennia marina subsp. australasica*) forest and shrubland, which are part of a sequence that includes coastal forest to estuarine vegetation. The ecological importance of this area of habitat is recognised as a Significant Ecological Area (SEA) and a ‘Tranche 2 Biodiversity Focus Area’.

Within the area identified for the Plan, there are 56 public reserves varying in size, composition and ecological values. Some reserves comprise predominantly recreational grassland (e.g. Ōrākei Domain B) whereas others comprise a complete cover of indigenous vegetation (e.g. St Johns Bush). Of the reserves within the project area, eight are classified by Auckland Council as ‘high-value’. The total area covered by the high-value parks is *c.*57 hectares; however, not all of that comprises indigenous ecosystems. This high-value status means the reserves receive both pest plant and pest animal control as per the Auckland Council Contract 16 specifications. In addition, funding is available for revegetation planting if this is considered likely to provide ecological benefits to the reserve.

There are four main naturally occurring indigenous ecosystem types present within the subject area: ‘WF4’ pōhutukawa, pūriri, podocarp forest, ‘CL1’ pōhutukawa treeland/flaxland/rockland, ‘SA1’ mangrove scrub and forest, and ‘VS5’ broadleaved species scrub forest. Of these, WF4 is the most common and forms large areas within the coastal zone in various states of modification. Some areas are relatively intact (e.g. Kepa Bush Reserve) while others are negatively impacted by pest plants (e.g. Ngapipi Reserve). One site, Waiatarua Reserve, supports extensive areas of wetland vegetation.

The areas identified as priorities for enhancing ecological function within the project area are those contiguous with, or adjacent to Kepa Bush. These areas include Areas A–E (described below) and high-value parks within the project area.

3. SITE DESCRIPTIONS

3.1 High-value parks

3.1.1 Kepa Bush Reserve

Kepa Bush Reserve covers *c.*13.3 hectares and is the largest remnant of indigenous forest on the Auckland Isthmus. The reserve is situated on a south-facing hillslope with an almost complete cover of indigenous vegetation. Much of the vegetation comprises kohekohe (*Dysoxylum spectabile*)-karaka (*Corynocarpus laevigatus*)-pūriri (*Vitex lucens*) forest classified as ‘WF4’ pōhutukawa, pūriri, podocarp forest, which is classified as ‘Endangered’ as per Singers *et al.* (2016). Two gullies dominated by ponga (*Cyathea dealbata*)-mamaku (*C. medullaris*) treefernland support watercourses *c.*350 metres long that empty into the upper estuarine reaches of the Pourewa Creek. The watercourses are of high quality and support indigenous fish species such as banded kōkopu (*Galaxias fasciatus*), shortfin eel (*Anguilla australis*) and bullies (*Gobiomorphus* spp.).

Indigenous birds are common throughout the reserve, including tūī (*Prosthemadera novaeseelandiae*), kererū (*Hemiphaga novaeseelandiae*), riroriro/grey warbler (*Gerygone igata*), tauhou/silvereye (*Zosterops lateralis*), kōtare/kingfisher (*Todiramphus sanctus*), and pīwakawaka/fantail (*Rhipidura fuliginosa*). Exotic birds including blackbird (*Turdus merula*), song thrush (*Turdus philomelos*), chaffinch (*Fringilla coelebs*) and house sparrow (*Passer domesticus*) also occur. Pest plant abundance is low throughout the reserve and restoration opportunities are considered to be limited. The ‘Friends of Kepa Bush’ community group currently undertakes rat and possum control within the reserve.

3.1.2 Ōrākei Basin

Ōrākei Basin comprises *c.*5.7 hectares of coastal margin vegetation and grassed recreational areas with walking tracks. The vegetation is currently classified as ‘EF’ exotic forest; however, much of the vegetation is planted indigenous revegetation is characterised by the following types:

- Ngaio (*Myoporum laetum*)-māhoe (*Melicytus ramiflorus*)-pōhutukawa (*Metrosideros excelsa*)-karamu (*Coprosma robusta*)-tarata (*Pittosporum eugenioides*) forest with several emergent coral and loquat (*Eriobotrya japonica*) trees on the western coastal fringe.
- Tree privet (*Ligustrum lucidum*)-ngaio-karo (*Pittosporum crassifolium*)-māhoe scrub with several emergent pine (*Pinus* spp.) and poplar (*Populus* sp.) west of the coastal fringe.

- Mānuka (*Leptospermum scoparium*)-tī kōuka (*Cordyline australis*) scrub with several emergent coral tree (*Erythrina ×sykesii*) and Phoenix palm (*Phoenix canariensis*) to the south.
- Tree privet-karo-ngaio-māhoe forest to the west.

Similar vegetation is found on contiguous private property and nearby Macpherson Reserve. Copper skink (*Oligosoma aeneum*) has been previously recorded in the reserve. Tūī, black shag, and pied shag (*Phalacrocorax varius varius*; ‘At Risk-Recovering’; Robertson *et al.* 2016) are present in the reserve. Eels (*Anguilla* spp.) and parore (*Girella tricuspidata*) use the shallows of the basin as foraging habitat.

Ōrākei Basin comprises and is contiguous with several SEAs.

3.1.3 Apirana Reserve

Apirana Reserve comprises *c.*5.5 hectares of grazed pasture and *c.*2.3 hectares of mixed exotic-indigenous vegetation. A cycleway runs along the western boundary of the reserve. There is a range of vegetation types in the reserve including: tree privet-Chinese privet-māhoe scrub with emergent tī kōuka (‘ES’ exotic scrub), tree privet forest (‘EF’ exotic forest), karamū-karaka scrub (‘VS5’ broadleaved species scrub/forest) with locally common tree privet establishing in planted indigenous vegetation (‘PL’ - planted vegetation), karaka-karamū-tarata treeland with emergent oak (*Quercus* sp.), kānuka and tī kōuka (‘TL1’ native-dominated treeland). Banded kōkopu and shortfin eel have been previously observed at this site. Tūī, fantail and pūkeko (*Porphyrio melanotus melanotus*) were common throughout the site. Apirana Reserve is in close proximity to Glen Atkinson Reserve A.

3.1.4 St Johns Bush

St Johns Bush is within an SEA and comprises *c.*4.2 hectares dominated by indigenous vegetation. The eastern gully consists of gully tree fern (*Cyathea cunninghamii*)-whēkī (*Dicksonia squarrosa*)-ponga-māpou (*Myrsine australis*) scrub and forest (‘VS5’ broadleaved species scrub/forest) with several emergent kānuka (*Kunzea robusta*). The western gully is characterised by mature kohekohe-pōhutukawa-pūriri forest with an emergent kauri (*Agathis australis*; ‘WF11’ kauri, podocarp, broadleaved forest) and several emergent kānuka, pōhutukawa, and pine. Grey warbler and tūī are common throughout this site.

The reserve is relatively isolated and surrounded by residential properties, although it is contiguous with similar vegetation on private property on the southern boundary. Despite its relative isolation, St Johns Bush is an attractive site for indigenous bird species because it provides food resources and is within flying distance of larger indigenous bush areas. Friends of St Johns Bush undertake rodent and possum trapping from March to June and August to December. St Johns Bush is classified as a ‘high-value’ reserve.

3.1.5 Paritai Reserve

Paritai Reserve is a long strip comprising *c.*4.3 hectares of mature pōhutukawa-karaka-pūriri broadleaved species with locally common mature tree privet (‘WF4’ pōhutukawa, pūriri, broadleaved forest). Several emergent pōhutukawa are present together with scattered emergent coral tree and Phoenix palm. Tūi and monarch butterfly (*Danaus plexippus*) are common at this site. The reserve is contiguous with similar vegetation on private property, which forms a corridor to Ngapipi Reserve to the south. Within a landscape context, the reserve forms part of a larger network of coastal forest along Tamaki Drive.

3.1.6 Tāmaki Drive (Kohimarama)

Tamaki Drive (Kohimarama) is a small reserve (*c.*0.3 hectare) that contains a patch of pūriri-karaka-Phoenix palm-kohekohe treeland (‘TL’ treeland) with a regenerating understorey. There are several pest plant species present including tradescantia (*Tradescantia fluminensis*) and Madeira vine (*Anredera cordifolia*). The eastern portion of the reserve comprises a narrow strip of vegetation defined by pampas (*Cortaderia selloana*), Italian evergreen buckthorn (*Rhamnus alaternus*) and boneseed (*Chrysanthemoides monilifera*) with mature pōhutukawa common on the cliffside which borders private property. Tūi and silvereye are common within the reserve. The reserve is part of a larger network of coastal forest on Tamaki Drive.

3.1.7 Dingle Dell Reserve

Dingle Dell Reserve is an SEA that covers *c.*8 hectares of mostly indigenous vegetation. There is an unnamed natural stream that drains the site and then flows through a pipe to its discharge point at St Heliers beach. The vegetation is modified but may represent a component of ‘WF7’ pūriri forest or ‘WF4’ pōhutukawa, pūriri, broadleaved forest. The central gully comprises the riparian zone with nīkau (*Rhopalostylis sapida*)-kahikatea (*Dacrycarpus dacrydioides*)-mamaku-ponga forest, and locally common gahnia (*Gahnia* spp.) in the understorey. The eastern side of the reserve comprises kohekohe-karaka-pūriri-māhoe forest with several emergent kānuka and pōhutukawa. The western side of the reserve comprises tōtara (*Podocarpus totara*)-pōhutukawa-tītoki (*Alectryon excelsum*)-pūriri-mānuka forest and scrub with several emergent kauri, rimu (*Dacrydium cupressinum*) and kānuka. There are many large exotic tree species throughout the site, including English oak (*Quercus robur*) and pines.

The indigenous fern *Christella dentata* (‘At Risk-Naturally Uncommon’; de Lange *et al.* 2013), shortfin eel, and banded kōkopu have previously been observed at this site. However, *Christella dentata* is likely to have been planted or naturalised from a horticultural source. Tūi and fantail are common throughout the reserve. Indigenous vegetation in the reserve is largely isolated within an urban landscape except for a small strip of similar vegetation on an adjacent private property. Although relatively isolated from other areas of indigenous vegetation, Dingle Dell is within flying distance from Kepa Bush for many indigenous bird species.

3.1.8 Glen Atkinson Reserve A

This small reserve is an SEA that covers c.0.8 hectares and is almost completely covered with forest vegetation comprising māhoe-ponga-māpou forest with scattered emergent kānuka ('VS5' broadleaved species scrub/forest), remnant kahikatea-karakapukatea forest ('WF8' kahikatea, pukatea forest) on the stream margins, and karakakānuka forest ('VS2' kanuka scrub/forest). An unnamed stream runs through the reserve. Fantail and tūi are common throughout. The reserve is contiguous with similar vegetation on private property to the south. Apirana Reserve is in close proximity to site. Tradescantia is abundant throughout the reserve.

3.2 Sites contiguous with or adjacent to Kepa Bush

3.2.1 Area A

Area A is a c.4.5-hectare narrow strip of tree privet forest and scrub on the southern side of Pourewa Creek, adjacent to Kepa Bush in the north and Ōrākei Basin to the south. This area forms part of the riparian margin for the creek and the mangroves along the estuary (Plate 1). Hawthorn (*Crataegus monogyna*) occurs occasionally in the canopy, while kahili ginger (*Hedychium gardnerianum*) and pampas occur occasionally along the banks of the creek. The vegetation grades into mangrove scrub at the estuary edge. Īnanga (*Galaxias maculatus*; 'At Risk-Declining'; Goodman *et al.* 2013) and flounder (*Rhombosolea* sp.) are present within the tidal reaches of the creek. This vegetation forms an important buffer to the estuary and a linkage between Kepa Bush and Ōrākei Basin.

3.2.2 Area B

Forest/scrub characterised by mixed indigenous-exotic broadleaved species occur to the east, contiguous with Kepa Bush. There is a tributary of Pourewa Creek that flows south over a basalt rock bed. The canopy comprises māhoe, māpou, tree privet and hawthorn. The understorey comprises hangehange (*Geniostoma ligustrifolium*), Chinese privet (*Ligustrum sinense*) and ponga. Indigenous seedlings and saplings are present throughout this area including karaka, pūriri and houpara (*Pseudopanax lessonii*).

There is a small area of macrocarpa (*Cupressus macrocarpa*) forest (c.0.4 hectares) with a canopy up to c.20 metres tall. The lower tiers comprise mixed indigenous-exotic species including māhoe, māpou and tree privet.

Pest plants are common in the ground tier and comprise kahili ginger, tradescantia and climbing asparagus (*Asparagus scandens*) (Plate 2). Pest plants have been controlled in this this area by a community group (Kepa Bush Volunteers).

Indigenous birds are common within this area including grey warbler, silvereye, and tūi. Shortfin eel and banded kōkopu are present in the stream.



3.2.1 Area C

A large area of grassland ('EG' exotic grassland) occurs on the southern side of the upper reaches of Pourewa Creek. The vegetation comprises rank exotic grasses and herbs with locally common patches of pampas (Plate 3). Tree privet, woolly nightshade (*Solanum mauritianum*) and brush wattle (*Paraserianthes lophantha*) occur frequently along the margins with occasional gorse (*Ulex europaeus*). This area is suitable for large-scale revegetation to improve riparian function and improve connectivity between the Kepa Bush extension, Ōrākei Basin and Apirana Reserve.

3.2.2 Area D

A narrow strip of vegetation lines the estuary along the southern border and gullies within Pourewa Creek Reserve. The vegetation is contiguous with Kepa Bush and comprises 'WF4' pōhutukawa, pūriri, podocarp forest. The gullies have exotic components comprising poplar. Large areas of pasture in Pourewa Creek Reserve are currently used for a pony club and grazing.

3.2.3 Area E

Area E comprises part of Pourewa Creek Reserve, together with Ngapipi Reserve and Ngapipi Cliff Reserve. There is a narrow strip of 'CL1' pōhutukawa treeland/flaxland/rockland characterised by locally common tree privet and occasional pōhutukawa. The sub-canopy is absent while the sparse understorey comprises occasional kawakawa (*Piper excelsum*) and houpara. The rest of this area is characterised by mixed exotic-indigenous forest representing a modified component of 'WF4' pōhutukawa, pūriri, podocarp forest. The canopy comprises tree privet, pōhutukawa, karaka, pūriri, flame tree and occasional white poplar (*Populus alba*). The sub-canopy comprises māhoe and houpara over an understorey of kawakawa, hangehange and karamū. Locally common tradescantia forms a dense groundcover throughout the site. Brush wattle and Japanese honeysuckle (*Lonicera japonica*) occur on the forest margins.

4. THREATS

4.1 Pest plants

4.1.1 Tree privet

The most abundant pest plant present in the areas of interest is tree privet. This species forms monotypic stands that outcompete and exclude indigenous species. Tree privet is shade-tolerant with seeds readily dispersed by birds and can thus invade intact forest and regenerate under its own canopy. These traits make tree privet a constant threat to any areas of indigenous vegetation nearby and it is important to control tree privet wherever possible to reduce the threat of invasion.

4.1.2 Tradescantia

Tradescantia is common in areas adjacent to Kepa Bush, where it forms dense mats that prevent indigenous seedling regeneration. It is important to control these infestations to allow natural successional processes to take place.

4.1.3 Kahili ginger

The stream banks of Pourewa Creek and areas adjacent to Kepa Bush support localised patches of kahili ginger. Kahili ginger is a highly shade-tolerant pest plant that forms dense stands with thick, shallow rhizomes. These traits allow kahili ginger to invade indigenous forest and exclude indigenous plant species.

4.1.4 Crack willow

Crack willow (*Salix fragilis*) has become dominant along the stream bank adjacent to the grassland in the upper reaches of Pourewa Creek. These willows have produced dense mats of surface roots that have modified the stream course by damming the water flow and creating pools and areas of boggy floodplain on the stream banks (Plate 4). These boggy areas now support populations of pest plants such as arum lily (*Zantedeschia aethiopica*). The modified stream course provides low-quality habitat for indigenous fish species.

4.1.5 Clifftop pest plants

The coastal cliffs along Tāmaki Drive support populations of several pest plants. The highest priority pest plants are Italian evergreen buckthorn, boneseed, and pampas.

4.2 Pest animals

Pest animals pose a significant threat to indigenous flora and fauna. In urban areas with some level of forest cover the most significant pests are likely to be rats (*Rattus* spp.) and possums (*Trichosurus vulpecula*). Other pest animals likely to be present include cats (*Felis catus*), mustelids including stoats (*Mustela erminea*), weasels (*M. nivalis*) and ferrets (*M. furo*), and hedgehogs (*Erinaceus europaeus*).

Possums pose a significant threat to the ecosystems within the project site due to their omnivorous diet. Possums browse on leaves as well as other parts of trees such as buds and flowers, as well as bird eggs, chicks, and land snails. Possums have preferences for some of the important tree species within the project area including pōhutukawa, pūriri, kōwhai (*Sophora chathamica*) and kohekohe. Selective browsing of those species by possums can lead to substantial changes in forest composition and potentially local extinctions.

Rats are also omnivores and are threat to indigenous birds, lizards, and invertebrates. They will also predate on seeds of species such as karaka, an important canopy tree within the project area.

5. RECOMMENDATIONS TO ENHANCE ECOLOGICAL FUNCTIONING

5.1 Pest plant control

5.1.1 Tree privet

Areas that are dominated by tree privet such as Area A require large-scale control and replanting (see 'Revegetation planting' below). Areas where tree privet is common but not dominant require staged removal. Staged removal is recommended to be undertaken at c.25 percent per annum over four years. Tree privet control can be achieved via several methods such as basal spraying or drill-and-inject for large trees and saplings, and foliar spray or hand pulling for seedlings. Basal spraying may be the most effective method for covering large areas because trees can be treated rapidly. Follow-up control will be required to remove seedlings that come up and control any trees that may not have died from the first herbicide application.

5.1.2 Tradescantia

Foliar spraying with herbicide is the most effective method of controlling tradescantia. Tradescantia is a persistent pest plant able to regenerate from small fragments and it is therefore important to undertake follow-up visits to respray areas that may have regenerated.

5.1.3 Kahili ginger

The most effective way to control patches of kahili ginger is by cutting and painting the stems with herbicide to prevent rhizomes resprouting. Follow up control will be required for seedlings that come up. Follow up control can be achieved with foliar spraying.

5.1.4 Crack willow

Given the high freshwater habitat values within the other tributaries of the project area, it would be ecologically beneficial to control willows to restore stream hydrology and morphology. Staged removal is recommended for large areas such as this to avoid sudden large canopy-gaps and possible stream bank instability. Large light gaps will promote reinvasion by pest plants and reduce stream shading. Willow control can be achieved using the drill and fill method or by basal spraying.

5.1.5 Clifftop pest plants

Pest plants on coastal cliffs and along clifftops include pampas, Italian evergreen buckthorn, and boneseed. These plants currently perform some role in erosion control; however, they typically have shallow roots and do not offer complete protection. Nonetheless, it is important to retain some plant cover along coastal cliffs. These areas would require a combined approach of pest plant control and replanting. Replanting as close to cliff edges as possible with effective indigenous soil binders such as pōhutukawa will provide some shade and reduce the abundance of shade-intolerant

pest plants. It is important to replace the pest plants with shallow and medium rooting indigenous shrubs and herbs such as kakaha/coastal astelia (*Astelia banksii*), pōhuehue (*Muehlenbeckia complexa*), taupata (*Coprosma repens*) and harakeke/NZ flax (*Phormium tenax*).

5.2 Planting

5.2.1 Revegetation planting

The large area of grassland (Area C) on the southern side of the upper reaches of Pourewa Creek is suitable for large-scale revegetation. Revegetation will improve riparian functioning and improve connectivity between Kepa Bush and the scrub to the west of Kepa Bush. The site would require the preliminary treatment of pest plants and rank grasses. Species composition should be similar to that of Kepa Bush (i.e. 'WF4' pōhutukawa, pūriri, podocarp forest). An indicative planting schedule is presented in Table 1.

The gullies within Pourewa Creek Reserve are moderately vegetated and include some exotic species. Given that the streams within Kepa Bush support indigenous fish species, it is likely that the streams with Pourewa Creek Reserve will support those species too. Expanding the riparian margin and planting with indigenous species will enhance the freshwater values of Pourewa Creek Reserve and result in a higher value catchment.

Apirana Reserve is currently classified as a high-value reserve; however, large areas presently comprise pasture. It would be beneficial to revegetate at least part of this reserve, particularly along the watercourse.

Table 1: Indicative planting schedule for revegetation areas.

Species	Common Name	Grade	Spacing (m)
<i>Carex flagellifera</i> ²		0.5L	1.4
<i>Coprosma macrocarpa</i> subsp. <i>macrocarpa</i> ²	Coastal karamū	0.5L	1.4
<i>Cordyline australis</i> ¹	Tī kōuka	0.5L	1.4
<i>Entelea arborescens</i> ³	Whau	2L	5
<i>Hebe stricta</i> ²	Hebe	0.5L	1.4
<i>Kunzea robusta</i>	Kānuka	0.5L	1.4
<i>Melicytus ramiflorus</i> subsp. <i>ramiflorus</i> ³	Māhoe	2L	1.4
<i>Metrosideros excelsa</i> ³	Pōhutukawa	2L	5
<i>Myoporum laetum</i> ³	Ngaio	0.5L	3
<i>Pittosporum crassifolium</i> ³	Karo	0.5L	1.4
<i>Plagianthus divaricatus</i> ¹	Saltmarsh ribbonwood	0.5L	1.4
<i>Pseudopanax lessonii</i> ³	Houpara	0.5L	1.4
<i>Sophora chathamica</i> ³	Kōwhai	2L	5
<i>Vitex lucens</i> ²	Pūriri	2L	5

¹ Plant along the lower coastal margin.

² Plant along the upper banks.

³ Plant along the mid-slopes.

5.2.2 Enrichment planting

Enrichment planting may be required in areas that comprise high numbers of pest plants but also indigenous species. This should be undertaken following the control of pest plants (e.g. staged privet removal). Priority areas for enrichment planting include Area B and Area E following the control of tree privet and large exotic trees.

5.3 Pest animal control

5.3.1 Possums

Possum control is restricted to a few reserves (e.g. Kēpa Bush and Ōrākei Basin), and it is unlikely to take place in small areas of bush on private land. Extended possum control within the project area, including reserves and private land, will have a positive ecological benefit. Possum control over large areas can be achieved with an initial knockdown using toxic baits followed by ongoing control using kill traps (e.g. Timms traps). In general, one Timms trap per hectare is sufficient to control possums.

5.3.2 Rats

Rat numbers can be kept low by baiting in pulses four times per annum. In larger areas a grid of bait stations placed at 50 metre spacings is effective for controlling rats. It would be beneficial to encourage private land owners to maintain a baiting regime on their properties to prevent reinvasions from those sites into the larger neighbouring bush areas.

5.3.3 Mustelids

Mustelids (stoats, ferrets and weasels) can be controlled using kill traps (e.g. DOC200). Mustelids have large home ranges and can be challenging to control in fragmented landscapes. It is best to place kill traps along tracks and bush margins given that mustelids favour these areas when moving between sites

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SITE PHOTOGRAPHS



Plate 1: Tree privet forest in Area A (background) with mangrove shrubland in the foreground. 15 February 2018.



Plate 2: Ginger and tradescantia infestation in Area B. 15 February 2018.



Plate 3: Exotic grassland in Area C with frequent pampas. 15 February 2018.



Plate 4: Crack willow within Area B causing partial damming of the watercourse. 15 February 2018.



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