

# Key Native Ecosystem Operational Plan for the East Harbour Northern Forest

2021-2026





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## 1. Purpose

The purpose of the five-year Key Native Ecosystem (KNE) Operational Plan for East Harbour Northern Forest KNE site is to:

- Identify the parties involved
- Summarise the ecological values and identify the threats to those values
- Outline the vision and objectives to guide management decision-making
- Describe operational activities to improve ecological condition (eg, ecological weed control) that will be undertaken, who will undertake the activities and the allocated budget

KNE Operational Plans are reviewed every five years to ensure the activities undertaken to protect and restore the KNE site are informed by experience and improved knowledge about the site.

This KNE Operational Plan is aligned to key policy documents that are outlined below (in Section 2).

## 2. Policy Context

Regional councils have responsibility for maintaining indigenous biodiversity, as well as protecting significant vegetation and habitats of threatened species, under the Resource Management Act 1991 (RMA)<sup>1</sup>.

Plans and Strategies that guide the delivery of the KNE Programme are:

### **Greater Wellington Long Term Plan**

The Long Term Plan (2018-2028)<sup>2</sup> outlines the long term direction of the Greater Wellington Regional Council (Greater Wellington) and includes information on all our major projects, activities and programmes for the next 10 years and how they will be paid for. This document outlines that Greater Wellington will actively manage selected high value biodiversity sites. Most of this work is undertaken as part of the KNE Programme.

### **Proposed Natural Resources Plan**

The Proposed Natural Resources Plan for the Wellington Region (PNRP)<sup>3</sup> provides the high level strategic framework which sets out how Greater Wellington, Mana whenua partners and the community work together and includes

- Guiding Principles that underpin the overall management approach of the plan (eg, Kaitiakitanga)
- Sites with significant indigenous biodiversity values
- Sites of significance to mana whenua (refer Schedules B, C, Schedule D)

### **Parks Network Plan**

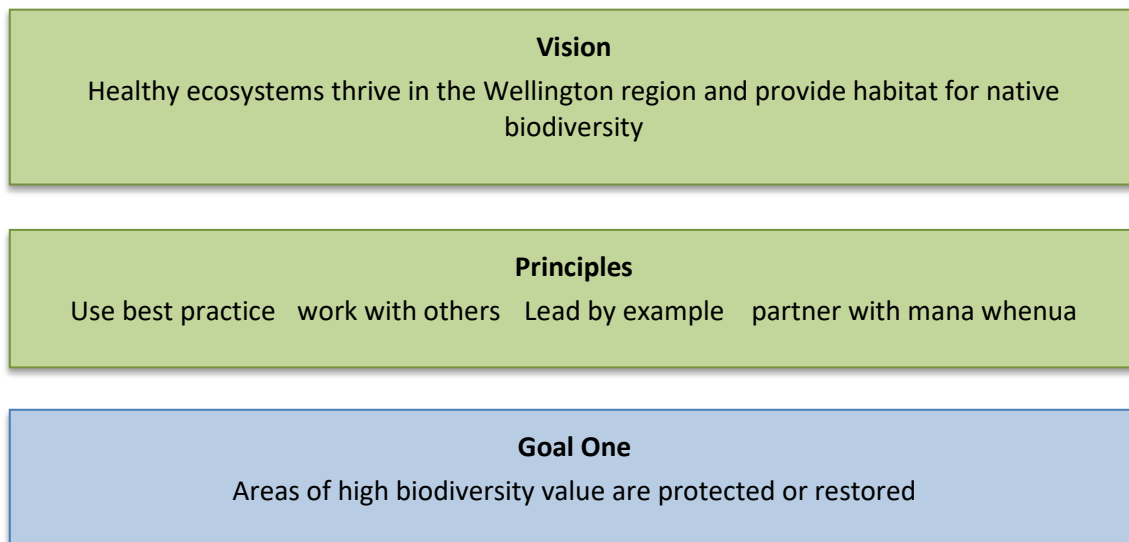
Management of East Harbour Regional Park as a whole is guided by the Greater Wellington Parks Network Plan (PNP)<sup>4</sup>. This plan guides the recreational and amenity uses of East Harbour Regional Park as well as identifying opportunities to protect biodiversity values.

### **Greater Wellington Regional Pest Management Plan 2019-2039**

The Regional Pest Management Plan<sup>5</sup> is an important driver for managing many of the pests that are prioritised in this KNE Operational Plan. Without active management of KNE sites, many native plants and animals in these ecosystems would struggle to thrive. The KNE programme aims to provide protection to maintain or restore the ecological function of these ecosystems as well as the native plants and animals they support. This is done mainly by managing threats such as harmful pests or introduced plants and animals.

### **Greater Wellington Biodiversity Strategy**

The Greater Wellington Biodiversity Strategy<sup>6</sup> (the Strategy) is an internal document that sets a framework that guides how Greater Wellington protects and manages biodiversity in the Wellington region to work towards the Vision.



## **3. The Key Native Ecosystem Programme**

The KNE Programme is a voluntary programme of work. There is no statutory obligation for Greater Wellington to do this work. Greater Wellington invites selected landowners to discuss whether they would like to be involved in the programme. When work is done on private land, it is at the discretion of landowners, and their involvement in the programme is entirely voluntary. Involvement may just mean allowing work to be undertaken on that land.

The programme seeks to protect some of the best examples of original (pre-human) ecosystem types in the Wellington region by managing, reducing, or removing threats to their ecological values. Sites with the highest biodiversity values have been identified and prioritised for management. Sites are identified as of high biodiversity

value for the purposes of the KNE Programme by applying the four ecological significance criteria described below.

Representativeness	Rarity/ distinctiveness	Diversity	Ecological context
The extent to which ecosystems and habitats represent those that were once typical in the region but are no longer common place	Whether ecosystems contain Threatened/At Risk species, or species at their geographic limit, or whether rare or uncommon ecosystems are present	The levels of natural ecosystem diversity present, ie, two or more original ecosystem types present	Whether the site provides important core habitat, has high species diversity, or includes an ecosystem identified as a national priority for protection

A site must be identified as ecologically significant using the above criteria and be considered “sustainable” for management in order to be considered for inclusion in the KNE Programme. “Sustainable” for the purposes of the KNE Programme is defined as: a site where the key ecological processes remain intact or continue to influence the site and resilience of the ecosystem is likely under some realistic level of management.

KNE sites can be located on private or publicly owned land. However, land managed by the Department of Conservation (DOC) is generally excluded from this programme.

KNE sites are managed in accordance with five-year KNE plans prepared by Greater Wellington’s Biodiversity department. Greater Wellington works with the landowners, mana whenua and other operational delivery providers to achieve mutually beneficial goals.

#### 4. East Harbour Northern Forest Key Native Ecosystem site

East Harbour Northern Forest KNE site (1,647 ha) forms part of the scenic backdrop of the Wellington Harbour and covers the steep hills between Eastbourne and Wainuiomata (see Appendix 1, Map 1).

East Harbour Northern Forest KNE site is one of the most significant forest ecosystems in the Wellington Region and is highly representative of the Tararua Ecological District. It is large, still relatively intact and covered in regenerating beech/rātā forest. The valley floors contain lush lowland podocarp/broadleaf forest which are home to a number of threatened species.

Most of this KNE site (except for three small privately owned areas) has been managed by Greater Wellington as part of the East Harbour Regional Park since 2004. A 400 ha area within the KNE site has been managed intensively by Greater Wellington and volunteer group Mainland Island Restoration Operation (MIRO) as a Mainland Island since 2005. The Mainland Island is a concept adopted by agencies to focus intensive conservation and pest control efforts at ecosystem restoration sites.

## 5. Parties involved

There are many organisations, groups and individuals that play important roles in the care of the KNE site.

### 5.1. Landowners

The KNE site includes areas of public and private land. Most of the KNE site is legally protected as Scenic Reserve, Recreation Reserve and one area is protected with a Queen Elizabeth II National Trust (QEII) Open Space Covenant.

The public landowners are Greater Wellington, Hutt City Council (HCC) and the Department of Conservation (DOC). However, these areas have been vested with Greater Wellington who are responsible for its management under the Reserves Act. Greater Wellington Parks Network Plan (PNP) guides the management of the East Harbour Regional Park. This KNE Plan is consistent with the wider objectives and policies of the PNP.

Exact land parcel ownership and designation status details of the public lands within the East Harbour Northern Forest KNE site can be found in Appendix 6 of the PNP.

The private landowner properties are indicated in Appendix 1, Map 1.

### 5.2. Operational delivery

Within Greater Wellington, three departments are responsible for delivering the KNE operational plan:

- The Biodiversity department is the overarching lead department for Greater Wellington on the longer term planning and coordination of biodiversity management activities and advice within the KNE site. The Biodiversity department's KNE budget funds the Biosecurity department to coordinate and carry out pest control activities.
- The Biosecurity department coordinates and implements all pest control measures at the KNE site.
- The Parks department primarily manages recreational access and maintains assets such as roads, tracks and amenity areas within the KNE site. However, the Parks department funds ecological restoration work within the KNE site by making available on an annual basis an Environmental Restoration budget for use by volunteer groups within the Regional Park. The purpose and use of this fund is jointly agreed by the Park Ranger and the volunteer group. The Park Ranger is the primary contact for volunteers or contractors.

MIRO is an entirely volunteer organisation, working in partnership with Greater Wellington to restore the forest and lake ecosystems in East Harbour Regional Park. MIRO volunteers work in the Northern Forest, at the Parangarahu Lakes, the Gracefield Tree Nursery, and the Eastbourne foreshore and residential area. In the Northern Forest, MIRO has focussed for 20 years on controlling possums, which were damaging our native trees, especially northern rātā. Monitoring shows that possum



numbers are being kept at consistently low levels, so attention has now shifted to the control of stoats and weasels, which prey on our native birds. About 50 MIRO volunteers service about 650 traps every month, while others assist with quarterly rodent monitoring and annual 5-minute bird counts.

### 5.3. Mana whenua partners

The East Harbour Northern Forest KNE site has been identified under the Proposed Natural Resources Plan (PNRP)<sup>7</sup> under Schedule B: Ngā taonga Nui a Kiwa (see table 1). This identifies that the site is significant to Taranaki Whānui ki te Ika a Maui, represented by Port Nicholson Block Settlement Trust; who are one of six mana whenua partners with Greater Wellington.

Greater Wellington is committed to identifying ways in which kaitiakitanga can be strengthened by exploring opportunities on how mana whenua partners wish to be involved in the KNE plan development or operational delivery of the KNE site.

**Table 1: Taranaki Whānui ki te Ika a Maui sites of significance in East Harbour Northern Forest KNE site<sup>8</sup>**

Sites of significance	Mana whenua values
Parangarahu Lakes including all catchments (inc. Gollans Stream)	<b>Schedule B: Ngā taonga Nui a Kiwa</b> - Ngā Mahi a ngā Tūpuna, Te Mahi Kai, Wāhi Whakarite, Te Mana o te Tangata, Te Manawaroa o Te Wai, Te Mana o te Wai, Wāhi Mahara

## 6. Ecological values

This section describes the various ecological components and attributes that make the KNE site important. These factors determine the site's value at a regional scale and how managing it contributes to the maintenance of regional biodiversity.

### 6.1. Ecological designations

Table 2, below, lists ecological designations at all or part of the East Harbour Northern Forest KNE site.

**Table 2: Designations at the East Harbour Northern Forest KNE site**

Designation level	Type of designation
National	<p>Parts of the KNE site are designated as Scenic Reserve:</p> <ul style="list-style-type: none"> <li>• East Harbour Scenic Reserve</li> <li>• 'Unnamed' Scenic Reserve</li> </ul> <p>Parts of the KNE site are identified by DOC as a Designated Ecological Site:</p> <ul style="list-style-type: none"> <li>• Mt Hawtrey Bush</li> </ul>
Regional	<p>Parts of the KNE site are designated under GW's Proposed Natural Resources Plan (PNRP):</p> <ul style="list-style-type: none"> <li>• Days Bay Stream and tributaries (Threatened or At-Risk fish habitat, Schedule F1)</li> <li>• Days Bay Stream and tributaries (Migratory fish habitat, Schedule F1)</li> <li>• Gollans Stream (High macroinvertebrate community health, Schedule F1)</li> <li>• Gollans Stream (Threatened or At-Risk fish habitat, Schedule F1)</li> <li>• Gollans Stream (migratory fish habitat, Schedule F1)</li> </ul>
District	<p>HCC has designated the KNE site in its District Plan as a:</p> <ul style="list-style-type: none"> <li>• Significant Natural Area</li> </ul>
Other	<p>Part of the KNE site has a:</p> <ul style="list-style-type: none"> <li>• QEII Trust Covenant (5-07-238)</li> </ul> <p>Parts of the KNE site are designated as:</p> <ul style="list-style-type: none"> <li>• Recreation Reserve</li> </ul>

### 6.2. Ecological significance

The East Harbour Northern Forest KNE site is considered to be of regional importance because:

- It contains highly **representative** ecosystems that were once typical or commonplace in the region
- It contains ecological features that are **rare or distinctive** in the region
- Its **ecological context** is valuable at the landscape scale as it contains a variety of inter-connected habitats and, provides core/seasonal habitat for threatened species within the KNE site

### *Representativeness*

The Singers and Rogers<sup>9</sup> classification of pre-human forest vegetation indicates the KNE site would likely have comprised of ecosystem type MF20 – hard beech forest: a forest type comprising beech forest and beech, podocarp, broadleaved forest. The dominant species of this forest type would have included hard beech (*Fuscospora truncata*), black beech (*Fuscospora solandri*), kamahi (*Weinmannia racemosa*), rimu (*Dacrydium cupressinum*), northern rātā (*Metrosideros robusta*), hīnau (*Elaeocarpus dentatus* var. *dentatus*) and rewarewa (*Knightia excelsa*). Only 26% of the original extent of this forest type remains in the Wellington Region<sup>10</sup>. Although the forest is modified having experienced selective logging, hunting and clearances, much of the KNE site is still representative of this original ecosystem type.

The Threatened Environment Classification system<sup>11</sup> indicates that the Gollans Stream and Butterfly Creek watercourses are classified as “Chronically Threatened” because there is only 10-20% native vegetation remaining on these types of land in New Zealand.

### *Rarity/distinctiveness*

New Zealand’s national threat classification system<sup>12</sup> lists many nationally ‘Threatened’ or ‘At Risk’ plant, bird, fish, lizard and invertebrate species within the KNE site. Appendix 2 and 3 contain lists of nationally and regionally threatened species found within the KNE site.

### *Ecological context*

East Harbour Northern Forest is regionally important not only because it has a large and relatively intact forest ecosystem, but also because of the diversity of native plant and animal species that are present (see section 6.3 below).

The forest is species-rich with 264 species of native vascular plants recorded. Thirty-three species of native orchid have been recorded meaning that the site has one of the richest orchid floras (terrestrial and epiphytic) for any area of an equivalent size in the region. Eighty-six species of moss have been recorded in Butterfly Creek area and 105 species of fungi in the park as a whole<sup>13</sup>.

The KNE site also contains an important ‘Mainland Island’ style approach to pest management where rats are also intensively controlled resulting in the area being deemed suitable for species reintroductions (see section 9.2).

## **6.3. Ecological features**

The East Harbour Northern Forest KNE site covers hilly topography from close to sea level near Eastbourne to the top of Mt Lowry (372 m). It includes several ridgelines and deep incised valleys with healthy streams running through them.

### **Vegetation communities and plants**

The Northern Forest comprises predominantly lowland beech forest. Northern rātā is found throughout the hills with mature rimu (*Dacrydium cupressinum*), miro (*Pectinopitys ferruginea*), matai (*Prumnopitys taxifolia*), kahikatea (*Dacrycarpus dacrydiodes*) and Pukatea (*Laurelia novae-zelandiae*) common emergent species.

The dry and less fertile ridges and hill faces are covered in open forest dominated by kāmahī, black beech and hard beech with patches of northern rātā and an understory of mingimingi (*Leucopogon fasciculatus*) and prickly mingimingi (*Leptecophylla juniperina*). The northern rātā growing in this area are unique because most of the trees have a terrestrial form in contrast to the more common epiphytic growth form. Northern rātā would have once been a more abundant and widespread component of this forest but its range has been reduced by possum browsing and selective logging<sup>14</sup>.

The wetter and more fertile valleys contain lush lowland podocarp/broadleaf forest dominated by large miro, mataī, kahikatea, pukatea and rimu. In the past some of the edges of this KNE site were cleared by burning<sup>15</sup> and are now covered in regenerating kāmahī, mānuka (*Leptospermum scoparium* var. *scoparium*) and gorse (*Ulex europaeus*).

## Species

### Birds

All of the native forest bird species that have survived naturally on the mainland in the lower North Island (with most also breeding here) are present in the KNE site including: tūī (*Prothemadera novaeseelandiae*), bellbird (korimako, *Anthornis melanura*), rifleman (titipounamu, *Acanthisitta chloris granti*), NZ kingfisher (kotare, *Halcyon sancta vagans*), NZ pigeon (kereru, *Hemiphaga novaeseelandiae*), morepork (ruru, *Ninox novaeseelandiae*), whitehead (popokatea, *Mohoua albicilla*), fantail (piwakawaka), and shining and long-tailed cuckoos (pipiwharauoa, *Chrysococcyx lucidus* and koekoea, *Eudynamis taitensis*). Less common species known to the site also include New Zealand falcon (kārearea, *Falco novaeseelandiae*), kākā (*Nestor meridionalis septentrionalis*), and yellow-crowned parakeet (kākāriki, *Cyanoramphus auriceps*).

The KNE site was the location for a North Island robin / toutouwai (*Petroica longipes*) translocation between 2008 and 2012, however the translocated population is now likely to be locally extinct.

### Reptiles

Five species of reptile have been recorded within the KNE site, making it one of the most species rich forest sites for lizards within the KNE programme. Species known from the site are ngahere gecko (*Mokopirirakau* 'southern North Island'), barking gecko (*Naultinus punctatus*), Raukawa gecko (*Woodworthia maculata*), copper skink (*Oligosoma aeneum*) and northern grass skink (*Oligosoma polychroma*)<sup>16</sup>.

### Fish and Koura

The watercourses within the KNE site are generally healthy, well shaded, with cobbled substrate. They are known to contain a number of native freshwater species including giant kōkopu (*Galaxias argenteus*), longfin eel (*Anguilla dieffenbachia*), shortfin eel (*Anguilla australis*), common bully (*Gobiomorphus cotidianus*), banded kōkopu (*Galaxias fasciatus*) and kōura (*Paranephrops planifrons*)<sup>17</sup>.

Gollans Stream, Butterfly Creek and Days Bay stream have been identified within the Greater Wellington's PNRP as important watercourses for threatened and migratory fish.

### *Invertebrates*

A variety of invertebrates were recorded in the forest behind Days Bay in 1926. Species of flatworms, earthworms, amphipods, isopods, centipedes, millipedes, springtails, earwigs, cockroaches, moths, ant, two-winged flies, true bugs, beetles, spiders and wētā were noted<sup>18</sup>.

Other invertebrates recorded include the predatory land-snail (*Wainuia urnula*), bush slug (*Pseudoneita papillatus*), peripatus (*Peripatoides novaezelandiae*), glow-worm (*Arachnocampa luminosa*) and large dragonfly (*Uropetala carovei*)<sup>19</sup>.

The forest ringlet butterfly (*Dodonidia helmsii*) population in the forest was subject to a study between 2001 and 2016, which recorded a dramatic and worrying decline in larvae occurrence<sup>20</sup>.

## 7. Threats to ecological values at the KNE site

Ecological values can be threatened by human activities, and by introduced animals and plants that change ecosystem dynamics. The key to protecting and restoring biodiversity as part of the KNE Programme is to manage threats to the ecological values at each KNE site.

While the key threats discussed in this section are recognised as the most significant, Appendix 4 presents a summary of all known threats to the KNE.

### 7.1. Key threats

The main threats to the ecological values of the East Harbour Northern Forest KNE site are ecological weeds, and a suite of introduced mammalian browsers and predators typical of many sites in New Zealand.

Ecological weeds are prevalent and widespread throughout the northern half of the KNE site, with the densest known infestations concentrated in discrete locations. Climbing asparagus (*Asparagus scandens*) is arguably the most ecologically damaging weed in the KNE site as it smothers native vegetation, affecting both the forest floor and the understory up to a height of about four meters. Once established, it can prevent the growth and regeneration of native species and can also strangle and kill some tree species.

There are a number of pest animal species known to exist within the KNE site. The species considered to pose the greatest threat to the ecological values of the KNE site are rats (*Rattus* spp.), stoats (*Mustela erminea*), possums (*Trichosurus vulpecula*), feral goats (*Capra hircus*) and red deer (*Cervus elaphus*).

Possums are generally present in very low numbers due to ongoing control regimes. If possum control is not ongoing it is likely that they will increase in numbers over time to levels that will significantly impact on forest health and regeneration.

Feral goats and deer also affect the natural regeneration of the forest by browsing on palatable plant species. Both goats and deer are thought to be present in low to moderate numbers as a result of control programmes that have been ongoing since 2005. However, reinvasion of goats and deer from adjacent private land where they are currently uncontrolled is ongoing.

Some park management and recreational activities have the potential to impact the ecological values of the KNE site if not undertaken in environmentally sensitive ways. Vehicle and walking tracks within the site require maintenance from time to time, which could impact native plant and animal communities if not carried out in an appropriate manner.

## **8. Vision and objectives**

### **8.1. Vision**

Protect and restore the KNE site's terrestrial and freshwater ecosystem health and enhance indigenous biodiversity.

### **8.2. Objectives**

Objectives help to ensure that operational activities carried out are actually contributing to improvements in the ecological condition of the site.

The following objectives will guide the operational activities at the East Harbour Northern Forest KNE site.

- 1. Protect and enhance the integrity of the core forest areas and indigenous forest cover**
- 2. Protect indigenous threatened species, particularly forest birds**
- 3. Protect the KNE site's freshwater ecosystems**
- 4. Support MIRO in their restoration aspirations**

## 9. Operational activities

Operational activities are targeted to work towards the objectives above (Section 8). The broad approach to operational activities is described briefly below, and specific actions, with budget figures attached, are set out in the operational delivery schedule (Table 3).

### 9.1. Ecological weed control

The aim of ecological weed control at the KNE site is to protect the Mainland Island from weed incursions and reduce the density and spread of ecological weeds into the remainder of the core forested areas of the KNE site.

Ecological weed control has been undertaken in a coordinated approach since 2005 when a pest plant control plan was developed<sup>21</sup> to guide ecological weed control efforts in the KNE site. Since this time, good progress has been made in reducing the density of weed infestations; however, follow up control is required at all historic control sites to ensure that ecological weeds do not regenerate and spread.

Ecological weeds will be targeted for control by Greater Wellington annually in two main operations (see Appendix 1, Map 2 for operational area locations):

- Control climbing asparagus in the south-western corner of the KNE site to prevent its spread further into the Mainland Island and reduce its overall density. Control will be undertaken annually within the larger operational area; however, the area is currently sub-divided into 8 smaller sections which receive control on a cyclical-rotation. During the course of controlling climbing asparagus the weed team may encounter other invasive weed species, if so these will be controlled if possible.
- Control a wide variety of ecological weeds at historical control sites to prevent further incursion into the core forested areas of the KNE site.

During the course of this KNE operational plan eDNA sampling of the watercourses will be undertaken. This multi-species detection approach may indicate the presence of aquatic invasive weeds within the watercourses. Should any highly invasive aquatic weeds be detected during the eDNA sampling Greater Wellington will review the need and capability for managing them.

### 9.2. Pest animal control

The primary aim of the pest animal control regime is to maintain the overall ecosystem functionality and flora diversity across the whole KNE site, while the additional rat control in Mainland Island ensures that native forest dwelling animals can thrive in this area of the KNE site (see Appendix 1, Map 3 for pest animal control network).

#### Mainland Island approach

The 400 ha Mainland Island was created in 2006 around the Butterfly Creek / Gollans Stream area where more intensive pest control targeting possums, rats, and mustelids is undertaken primarily, to improve bird breeding success.



Possoms and mustelids are controlled using a combination of DOC 200 predator kill traps and Possum Master kill-traps. Mustelid traps spaced at 300 m intervals and possum traps at 150 m around the boundary of the Mainland Island and on the main internal ridgeline. MIRO Volunteers service the traps monthly.

Rats are controlled using bait stations, the southern half on a 100 m x 150 m grid and the northern half on a 50 m x 150 m grid. Bait stations are serviced up to six times a year by Greater Wellington, which is determined by bait take, monitoring results or Mast year predictions.

During mast year events (when climatic conditions trigger an abundance of fruit-fall), rat populations numbers can spike significantly. During these events Greater Wellington will continue to monitor the rat population and further action may be required to bring the numbers down. This may be achieved by servicing the bait stations more frequently or changing the toxin. During the last mast year event in 2019 the baiting regime was amended to a short pulse of Feracol striker bait stations throughout the Mainland Island. This was successful in bringing the rat population numbers under control.

Rats are effectively controlled inside the Mainland Island and MIRO would like to extend the area to provide greater benefits for bird breeding. During the course of this operational plan, MIRO will trial low-cost rat traps and radio links to extend the Mainland Island. This will largely be funded by utilization of the Environmental Restoration budget provided by Parks and managed by MIRO.

### **KNE-wide approach**

Possoms are controlled throughout the remainder of the KNE site using 430 Possum Master and Timms kill-traps spaced at 150 m intervals along main ridges and gullies and by utilising official and unofficial tracks. Poison bait stations are positioned at each trap site to reduce the consumption of lure in the kill-traps by rodents, ensuring maximum engagement with traps by possums.

All possum traps have recently been fixed to trees so that they are kiwi-safe, in preparation for any potential kiwi migrating into the Northern Forest from the nearby Remutaka Forest Park.

Mustelids and, hedgehogs are similarly targeted for control across the KNE site with DOC 200 predator kill traps installed at every-other possum trap location (~200 traps).

Feral cats are also targeted using a network of 30 kill traps set well back from the urban areas.

MIRO Volunteers service all of these traps monthly.

### **OSPRI's TBfree programme**

OSPRI commenced their control operations targeting possums in the KNE site and surrounding area in May 2017. Possum control operations involve a combination of aerially-sown 1080 and ground-based trapping and poisoning and are generally carried out at five-yearly intervals.

This programme is part of a national strategy aiming to eradicate bovine tuberculosis from New Zealand, possums being the main vector of bovine tuberculosis. Although

the objectives of the TBfree programme are somewhat different to the biodiversity objectives of this plan, the possum control carried out under the TBfree programme is expected to deliver positive biodiversity outcomes. This work is funded by OSPRI.

## **Ungulate management**

### *Deer control*

Red deer are controlled in the KNE site to minimize their impact on the ecological values of the forest, as heavy browsing of favored plant species by deer can eliminate individual native species from an area resulting in the loss of diversity and functionality of the original native forest ecosystem. Deer control operations (undertaken in spring and autumn to maximize the potential for detecting deer), focus on the northern and western parts of the KNE site, which deer occupy most, and where tracking and browsing of native plants has been observed most frequently.

Professional hunters are used by Greater Wellington to shoot all wild deer observed, if safe to do so. The control operations are generally focused on areas of higher deer presence throughout the park and are sometimes in higher risk areas, often closer to residential properties and the most popular walking tracks and picnic areas, where recreational hunters are not permitted to access during the balloted recreational hunting period.

During the course of this KNE plan, deer impact and management will be reviewed to inform the ongoing management of deer. This review will aim to answer the following two key questions:

1. What is the deer population in the Northern Forest and how is it distributed?
2. What is the damage being done to key plant species that are preferred by deer?

In order to answer these questions (identified by MIRO) a number of potential methods will be utilized including eDNA analysis across the forest, linking up with research students, camera trap surveys and reviewing old hunting reports.

### *Other ungulate control*

Feral goats and pigs are occasionally sighted within the KNE site, mainly around the southern boundary adjacent to private land. Greater Wellington will maintain control of these pest species as needed in response to sightings and field signs.

### *Recreational hunting*

Recreational hunting is permitted within the Regional Park and is managed by the Parks department. Recreational deer hunting is only permitted with the designated area and permits are allocated by an annual ballot. Recreational deer hunting may have a positive effect on the biodiversity values in the KNE site. Recreational pig hunting does not have a ballot system, but runs on a permit system available for six months of the year.

## 9.3. Monitoring

### Mammal monitoring

Greater Wellington, assisted by MIRO, undertake small mammal monitoring (quarterly for rodents and six-monthly for mustelids/hedgehogs) in the KNE site. The Tracking Tunnel Index (TTI) method is used to monitor the presence of small mammal species. The results of this monitoring provide an indication of the effectiveness of the pest animal control network and are reported in the KNE programme's Small Mammal Monitoring report.

### Bird monitoring

MIRO undertake five-minute bird counts (5MBC) annually in spring to assess trends in abundance, diversity and distribution of native birds across the KNE site and to provide an indication of the effectiveness of the pest animal control.

### Acoustic recording

MIRO also undertakes acoustic bird recording (using 10 x DOC AR4 recorders) to monitor and measure the dawn chorus and the presence or absence of kiwi that may self-introduce into the KNE site from nearby Remutaka Forest Park. For the dawn chorus measurements, 20 of the 5MBC sites are monitored each spring for a period of 2–3 weeks. These data are a baseline measurements and will be analysed in future as a 5MBC equivalent and, when suitable techniques are developed, a measure of the strength of the dawn chorus. For kiwi detection 10 sites (soon to be increased to 20) are monitored each winter. The kiwi detection sites are located on the east of the Northern Forest and in Gollans Valley, adjacent to the areas where kiwi have been detected in Remutaka Forest Park. The kiwi data are analysed by manually inspecting spectrograms of the acoustic data.

## 10. Future opportunities

### Lizard surveys

Relatively little is known about the Northern Forest's lizard populations. During the course of this operational plan Greater Wellington may review the need for undertaking lizard surveys in the KNE site.

### Forest ringlet butterfly surveys

During the course of this operational plan a forest ringlet butterfly survey may be undertaken by Greater Wellington. Previous surveys showed a continual decline of the population and they are now expected to be locally extinct. Should forest ringlet butterflies be confirmed as present, additional management is likely to be required to maintain this population. This is likely to involve targeted control of wasps in key areas or the use of the wasp mite biocontrol agent.

### **Fish passage remediation**

Greater Wellington and HCC are undertaking a programme of mapping and prioritising fish passage barriers throughout the HCC territorial authority area. Once mapping and prioritisation of barriers for remediation is complete, Greater Wellington aim to implement remediation of any medium/high barriers located within Greater Wellington managed lands including within the East Harbour Northern Forest KNE site.

## 11. Operational delivery schedule

The operational delivery schedule shows the actions planned to achieve the stated objectives for the East Harbour Northern Forest KNE site, and their timing and cost over the five-year period from 1 July 2021 to 30 June 2026. The budget for years 2022/23 to 2025/26 are indicative only and subject to change.

**Table 3: Five-year operational plan for the East Harbour Northern Forest KNE site**

Objective	Activity/Actions	Operational area	Intended outcome	Implementing party	Timetable and resourcing where allocated				
					2021/22	2022/23	2023/24	2024/25	2025/26
1	Climbing asparagus control	See map 2	Reduction in density of the weed species to protect the Mainland Island and improvement in forest structure	Greater Wellington	✓ \$40,000	✓ \$46,000	✓ \$46,000	✓ \$46,000	✓ \$46,000
1	Historic site weed control	See map 2	Prevention of target weed species incursion beyond known distribution	Greater Wellington	✓ \$20,000	✓ \$20,000	✓ \$20,000	✓ \$20,000	✓ \$20,000
1, 2	Kill trap servicing monthly site wide	Site-wide	Possums, hedgehogs, feral cats and mustelids maintained to low levels (<5% RTC or <5% TTI)	MIRO	✓ Volunteer time	✓ Volunteer time	✓ Volunteer time	✓ Volunteer time	✓ Volunteer time
4	Bait provision for kill-traps	Site-wide	Support volunteer trapping	Greater Wellington	✓ \$12,000	✓ \$12,000	✓ \$12,000	✓ \$12,000	✓ \$12,000
1, 2, 4	Bait station servicing in MLI	Mainland Island	Possums and rats maintained to low levels (<5% RTC or TTI)	Greater Wellington	✓ \$36,000	✓ \$36,000	✓ \$36,000	✓ \$36,000	✓ \$36,000
1, 2	Annual expansion of rat control across KNE site	Site-wide excluding MLI	Rats maintained to low levels <5% TTI across the controlled area	MIRO	✓ ##	✓ ##	✓ ##	✓ ##	✓ ##

Objective	Activity/Actions	Operational area	Intended outcome	Implementing party	Timetable and resourcing where allocated				
					2021/22	2022/23	2023/24	2024/25	2025/26
1, 2	Rolling replacement of Possum Master traps control across KNE site	Site-wide	Possums maintained to low levels <5% RTC across the KNE site and all possum traps meet NAWAC standards	MIRO	✓ ##	✓ ##	✓ ##	✓ ##	✓ ##
1, 4	Deer control undertaken in spring and autumn (20 days allocated)	Determined annually	Maintain deer population to low levels	Greater Wellington	✓ \$8,500	✓ \$8,500	✓ \$8,500	✓ \$8,500	✓ \$8,500
1, 4	Ungulate control (pigs and goats) as needed in response to sightings	Determined annually	Maintain ungulates to low levels	Greater Wellington	✓ \$1,000	✓ \$1,000	✓ \$1,000	✓ \$1,000	✓ \$1,000
1, 4	Deer management review project	N/A	Determine if the current approach is effective in maintaining its objective of maintaining deer to low population levels	Greater Wellington	✓ Staff time	✓ Staff time			
1, 3	4 X eDNA sampling events of watercourses in spring, winter, autumn and summer.	site-wide	Identify the distribution of deer across the KNE site. Monitor for unknown incursions of aquatic weeds and presence of native freshwater fish and invertebrates	Greater Wellington	✓ \$6,000				
1, 2, 4	Small mammal monitoring	Site-wide		Greater Wellington	✓ \$22,000	✓ \$22,000	✓ \$22,000	✓ \$22,000	✓ \$22,000
2	5 minute bird count monitoring	Site-wide	Complete and report on annual 5MBC	MIRO	✓ Volunteer time	✓ Volunteer time	✓ Volunteer time	✓ Volunteer time	✓ Volunteer time

Objective	Activity/Actions	Operational area	Intended outcome	Implementing party	Timetable and resourcing where allocated				
					2021/22	2022/23	2023/24	2024/25	2025/26
2	Acoustic recording monitoring for kiwi	Site-wide	Complete and report on annual kiwi search	MIRO	✓ Volunteer time	✓ Volunteer time	✓ Volunteer time	✓ Volunteer time	✓ Volunteer time
3	Fish passage remediation of medium/high barriers	Site-wide	Improved passage for freshwater fish throughout the natural range within the KNE site	Greater Wellington		✓ ¥	✓ ¥		
2	Review need for (yr1) and implement forest ringlet surveys (yr2)	Site-wide	Management requirements for forest ringlets in the northern forest KNE site determined	Greater Wellington	✓ Staff time	✓ Staff time			

\*RTC = Residual Trap Catch. The control regime has been designed to control possums to this level but monitoring will not be undertaken. Experience in the use of this control method indicates this target will be met

\*\*TTI = Tracking Tunnel Index.

## funded primarily by MIRO using the Parks' restoration budget or other external funding sources.

¥ funded through MfE's freshwater improvement fund and/or Greater Wellington's Freshwater Fish Programme. Unconfirmed to date.

## 12. Funding contributions

### 12.1. Budget allocated by Greater Wellington

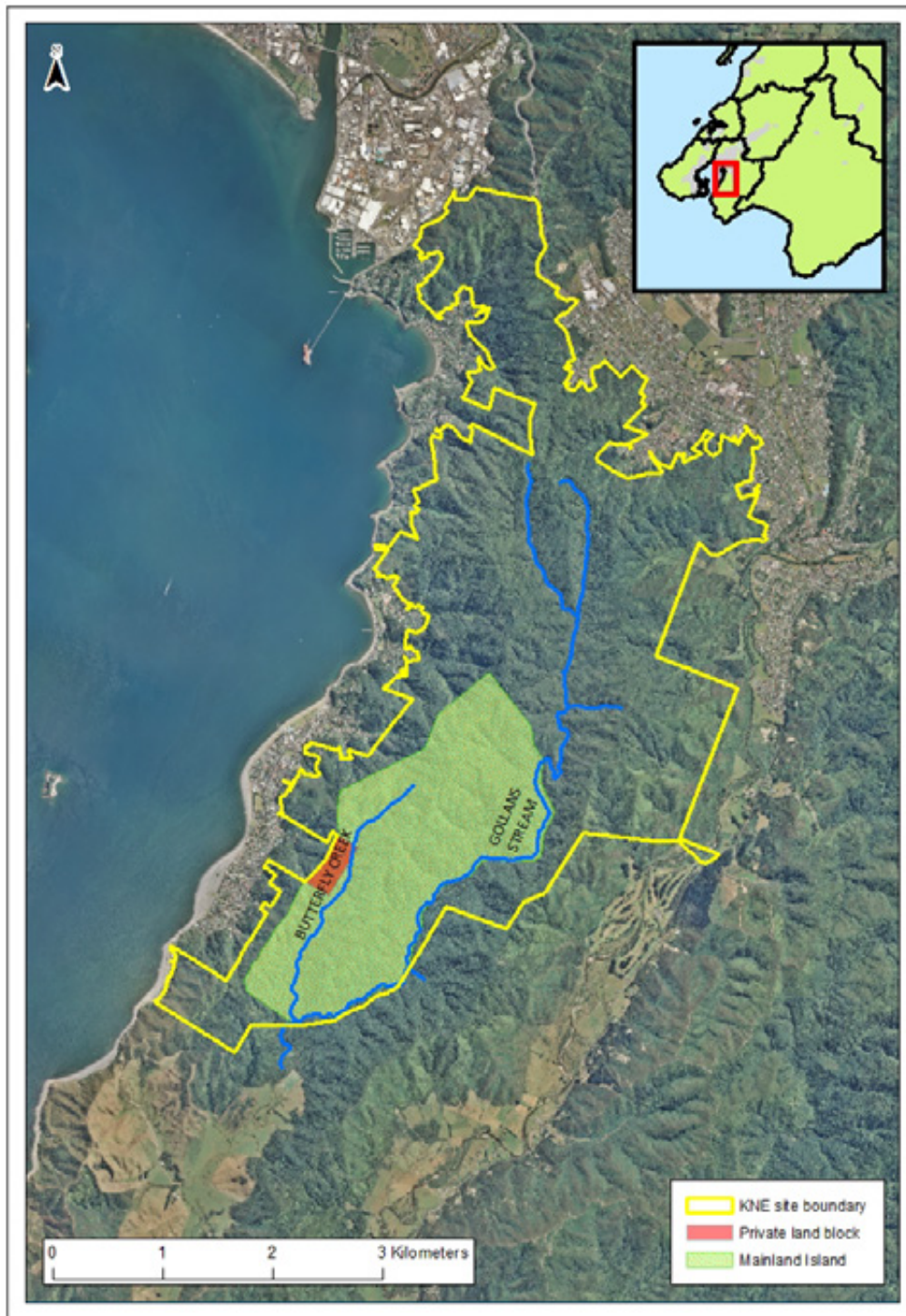
The budget for the years 2022/23 to 2025/26 are indicative only and subject to change.

**Table 4: Greater Wellington allocated budget for the East Harbour Northern Forest KNE site**

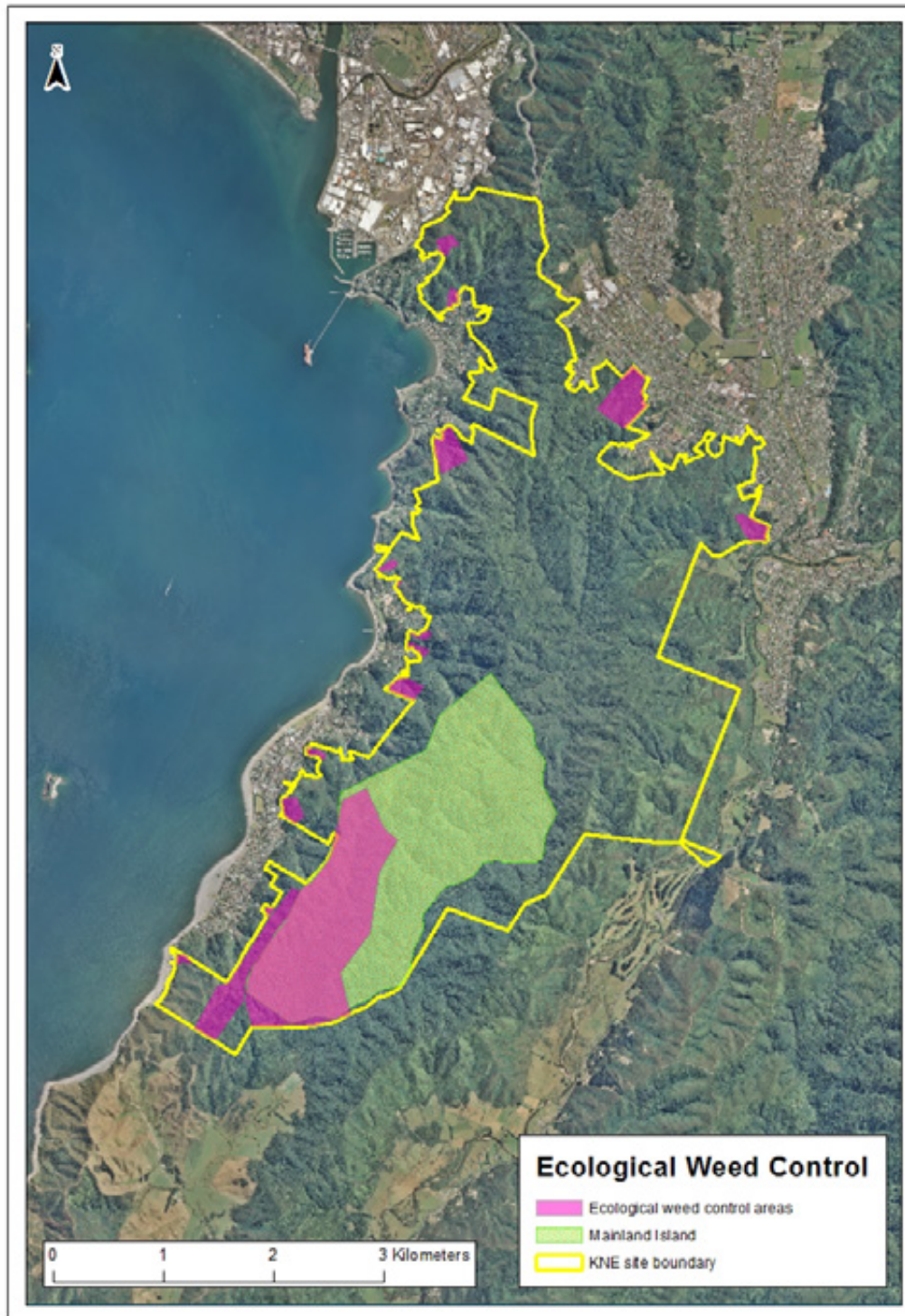
Management activity	Timetable and resourcing				
	2021/2022	2022/23	2023/24	2024/25	2025/26
Ecological weed control	\$60,000	\$66,000	\$66,000	\$66,000	\$66,000
Pest animal control	\$57,500	\$57,500	\$57,500	\$57,500	\$57,500
eDNA project	\$6,000	-	-	-	-
Small Mammal Monitoring	\$22,000	\$22,000	\$22,000	\$22,000	\$22,000
Parks Environment budget	\$6,000	\$6,000	\$6,000	\$6,000	\$6,000
<b>Total</b>	<b>\$151,500</b>	<b>\$151,500</b>	<b>\$151,500</b>	<b>\$151,500</b>	<b>\$151,500</b>



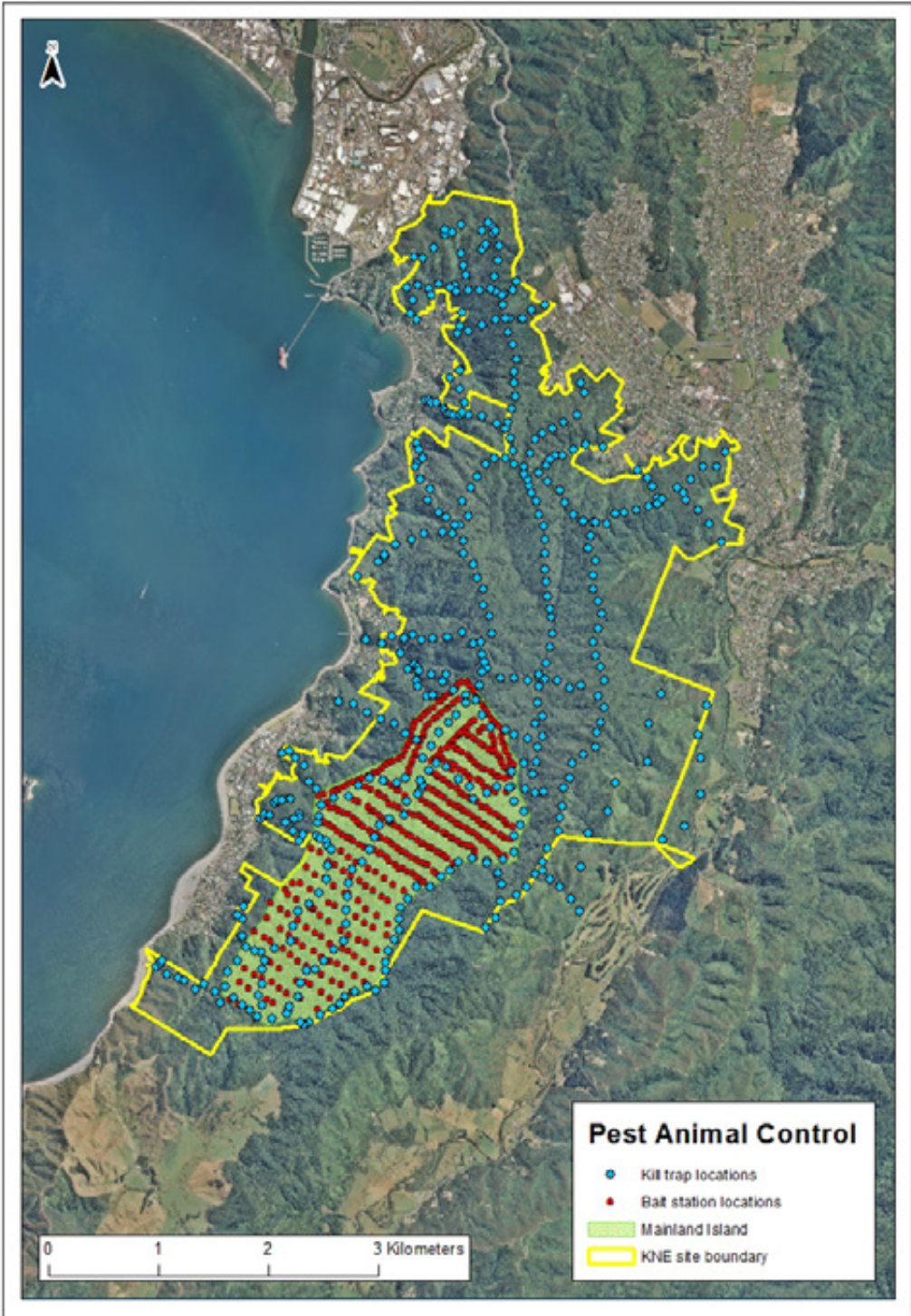
## Appendix 1: Site maps



Map 1: The East Harbour Northern Forest KNE site boundary



Map 2: The East Harbour Northern Forest KNE site weed control operational areas



Map 3: Pest animal control in the East Harbour Northern Forest KNE site

## Appendix 2: Nationally threatened species list

The New Zealand Threat Classification System lists species according to their threat of extinction. The status of each species group (plants, reptiles, etc) is assessed over a five-year cycle<sup>22</sup>. Species are regarded as Threatened if they are classified as Nationally Critical, Nationally Endangered or Nationally Vulnerable. They are regarded as At Risk if they are classified as Declining, Recovering, Relict or Naturally Uncommon. The following table lists Threatened and At Risk species that are resident in, or regular visitors to, the KNE site.

**Table 5: Threatened and At Risk species at the East Harbour Northern Forest KNE site**

Scientific name	Common name	Threat status	Source
Plants(vascular) <sup>23</sup>			
<i>Botrychium australe</i>	Parsley fern	At Risk – Naturally Uncommon	Sawyer 2005 <sup>24</sup> (Mt Hawtrey Bush and Butterfly Creek)
<i>Brachyglottis kirkii</i>	Kirk's tree daisy	At Risk – Declining	Sawyer 2005 (Lowry Bay and Mt Hawtrey Bush)
<i>Bulbophyllum tuberculatum</i>	Bulb leaf orchid	At Risk – Naturally Uncommon	Sawyer 2005 (Butterfly Creek)
<i>Chenopodium allanii</i>		At Risk – Naturally Uncommon	Sawyer 2005 (Days Bay)
<i>Corunastylis nuda</i>	Red leek orchid	At Risk – Naturally Uncommon	Sawyer 2005 (Days Bay and Muritai Park)
<i>Drymoanthus flavus</i>	Little spotted moa	At Risk – Declining	Sawyer 2005 (Days Bay, Point Webb and Rona Bay)
<i>Hypolepis dicksonioides</i>	Giant hypolepis	At Risk – Naturally Uncommon	Sawyer 2005 (Mt Hawtrey Bush and Butterfly Creek to Gollans)
<i>Leptospermum scoparium</i> var. <i>scoparium</i>	Mānuka	At Risk – Declining	Sawyer 2005
<i>Melicytus obovatus</i>		At Risk – Relict	Sawyer 2005 (Point Howard)
<i>Metrosideros robusta</i>	Northern rātā	Threatened – Nationally Vulnerable	Sawyer 2005
<i>Peraxilla tetrapetala</i>	Red mistletoe	At Risk – Declining	Sawyer 2005 (Muritai, Eastbourne, Mackenzie track and Butterfly Creek)

Scientific name	Common name	Threat status	Source
<i>Pterostylis puberula</i>	Dwarf greenhood orchid	Threatened – Nationally Vulnerable	Sawyer 2005 (Days Bay)
<i>Pterostylis tasmanica</i>	Plumed greenhood orchid	Threatened – Nationally Vulnerable	Sawyer 2005 (Days Bay – very old record)
<i>Ranunculus macropus</i>	Swamp buttercup	At Risk – Data Deficient	Sawyer 2005 (Mt Hawtrey Bush and Butterfly Creek)
<i>Rorippa divaricata</i>	New Zealand water cress	Threatened – Nationally Vulnerable	Enright pers comm 2014 (specimen from EHNF held in Allan Herbarium, Lincoln)
<i>Streblus banksii</i>	Large-leaved milktree / tūrepo	At Risk – Relict	Sawyer 2005 (Lowry Bay)
<b>Birds<sup>25</sup></b>			
<i>Acanthisitta chloris</i>	North Island rifleman / titipounamu	At Risk – Declining	MacArthur 2021 <sup>26</sup>
<i>Phalacrocorax carbo</i>	Black Shag	At Risk - Naturally Uncommon	MacArthur 2021
<i>Cyanoramphus novaezelandiae</i>	Red crowned parakeet / Kākāriki	At Risk – Relict	MacArthur 2021
<i>Endynamys taitensis</i>	Long-tailed cuckoo / koekoeā	At Risk – Naturally Uncommon	MacArthur 2021
<i>Falco novaeseelandiae</i>	New Zealand falcon / kārearea	At Risk – Recovering	MacArthur 2021
<i>Mohoua albicilla</i>	Whitehead / pōpokatea	At Risk – Declining	MacArthur 2021
<i>Nestor meridionalis</i>	North Island kākā	At Risk – Recovering	MacArthur 2021
<i>Petroica longipes</i>	North Island Robin	At Risk - Declining	MacArthur 2021
<b>Reptiles<sup>27</sup></b>			
<i>Naultinus punctatus</i>	Barking gecko	At Risk – Declining	Romijn, 2021 <sup>28</sup>
<i>Mokopirirakau 'southern North Island'</i>	Ngahere gecko	At Risk Declining	Romijn, 2021
<b>Freshwater fish<sup>29</sup></b>			
<i>Anguilla dieffenbachii</i>	Longfin eel	At Risk – Declining	NIWA National Freshwater Fish Database (December 2012)
<i>Galaxias argenteus</i>	Giant kōkopu	At Risk – Declining	NIWA National Freshwater Fish Database (December 2012)

Scientific name	Common name	Threat status	Source
<i>Galaxias maculatus</i>	Īnanga	At Risk – Declining	NIWA National Freshwater Fish Database (December 2012)
<i>Geotria australis</i>	Lamprey	Threatened – National Vulnerable	NIWA National Freshwater Fish Database (December 2012)
<i>Gobiomorphus huttoni</i>	Redfin bully	At Risk – Declining	NIWA National Freshwater Fish Database (December 2012)
Invertebrates (lepidoptera – butterflies and moths) <sup>30</sup>			
<i>Dodonidia helmsii</i>	Forest ringlet butterfly	At Risk – Relict	Wheatley 2016 <sup>31</sup>

### Appendix 3: Regionally threatened plant species list

The following table lists regionally threatened species that have been recorded in the KNE site.

**Table 6: Regionally threatened species recorded in the East Harbour Northern Forest KNE site**

Scientific name	Common name	Threat status	Source
Plants <sup>32</sup>			
<i>Adelopetalum (Bulbophyllum) tuberculatum</i>	Bulb leaf orchid	Regionally Data Deficient	Sawyer 2005 <sup>33</sup> (Butterfly Creek)
<i>Adiantum diaphanum</i>	Small maidenhair	Locally Rare in Wellington	Sawyer 2005 (Days Bay)
<i>Botrychium australe</i>	Parsley fern	Regionally Critical	Sawyer 2005 (Mt Hawtrey Bush and Butterfly Creek)
<i>Botrychium biforme</i>	Fine-leaved parsley fern	Regionally Susceptible	Sawyer 2005 (Butterfly Creek)
<i>Brachyglottis kirkii</i>	Kirk's tree daisy	Regionally Critical	Sawyer 2005 (Lowry Bay and Mt Hawtrey Bush)
<i>Carex diandra</i>	Sedge	Regionally Data Deficient	Sawyer 2005 (Eastbourne)
<i>Drymoanthus adversus</i>	Drymoanthus	Uncommon in Wellington and the Hutt	Sawyer, 2005 (Eastbourne hills)
<i>Gonocarpus incanus</i>		Regionally Sparse	Sawyer 2005 (Mt Hawtrey and between Days Bay and Eastbourne)
<i>Ichthyostomum pygmaeum</i>	Bulb leaf orchid	Rarely recorded in Wellington region	Sawyer 2005 (Days Bay, Butterfly Creek to Gollans Valley)
<i>Libertia edgariae</i>	Edgars Iris, Edgars Mikoikoi	Regionally Range Restricted	Sawyer 2005 (Eastbourne hills)
<i>Lindsaea linearis</i>	Fern	Locally Rare in Wellington and in decline	Sawyer 2005 (Butterfly Creek, Kowhai St track, Lowry Bay Scenic reserve)
<i>Melicytus obovatus</i>		Regionally Critical	Sawyer 2005 (Point Howard)
<i>Metrosideros robusta</i>	Northern rātā	One of the region's most significant populations of this species	Sawyer 2005 (Eastbourne hills)

Scientific name	Common name	Threat status	Source
<i>Morelotia affinis</i>	Morelotia	Regionally Sparse	Sawyer 2005 (Days Bay and Butterfly Creek)
<i>Nestegis montana</i>	Narrow leaved maire	Very rare in Wellington, one of three known sites	Sawyer 2005 (Muritai)
<i>Pittosporum divaricatum</i>		Widespread throughout the region but never found in abundance	Sawyer 2005 (Eastbourne hills)
<i>Pterostylis cardiostigma</i>	Greenhood orchid	Regionally Sparse	Sawyer 2005 (Lowry Bay, Days Bay and Mt Hawtrey Bush)
<i>Schizaea bifida</i>	Forked comb fern	Regionally Critical	Sawyer 2005 (Days Bay and Eastbourne)
<i>Syzygium maire</i>	Swamp maire, waiwaka	Locally Rare due to destruction and modification of much of the region's wetlands	Sawyer 2005 (Lowry Bay Scenic Reserve, Mt Hawtrey Bush, Butterfly Creek)
<i>Teleoschistes flavicans</i>	Lichen	A rare lichen often found in association with rare native grasses	Sawyer 2005 (York Bay)
<b>Birds<sup>34</sup></b>			
<i>Phalacrocorax melanoleucos</i>	Little Shag	<i>Regionally Vulnerable</i>	MacArthur 2021 <sup>35</sup>
<i>Acanthisitta chloris</i>	North Island rifleman / titipounamu	At Risk – Declining	MacArthur 2021
<i>Phalacrocorax carbo</i>	Black Shag	Regionally critical	MacArthur 2021
<i>Cyanoramphus novaeseelandiae</i>	Red crowned parakeet / Kākāriki	At Risk – Recovering	MacArthur 2021
<i>Cyanoramphus auriceps</i>	Yellow crowned parakeet / Kākāriki	Regionally Endangered	MacArthur 2021
<i>Endynamys taitensis</i>	Long-tailed cuckoo / koekoeā	At Risk – Naturally Uncommon	MacArthur 2021
<i>Falco novaeseelandiae</i>	New Zealand falcon / kārearea	Regionally critical	MacArthur 2021
<i>Mohoua albicilla</i>	Whitehead / pōpokatea	At Risk – Declining	MacArthur 2021
<i>Nestor meridionalis</i>	North Island kākā	At Risk – Recovering	MacArthur 2021
<i>Hemiphaga novaeseelandiae</i>	NZ pigeon	At Risk, Recovering	MacArthur 2021



Scientific name	Common name	Threat status	Source
Lizards <sup>36</sup>			
<i>Oligosoma aeneum</i>	Copper skink	Threatened – critical	Romijn, 2021 <sup>37</sup>
<i>Mokopirakau</i> 'southern North Island'	Ngahere gecko	At-Risk, Declining	Romijn, 2021
<i>Naultinus punctatus</i>	Barking gecko	Threatened – vulnerable	Romijn, 2021

## Appendix 4: Threat table

Table 7: Threat table in the East Harbour Northern Forest KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
Ecological weeds		
EW-1	Ground covering ecological weeds smother and displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key ground covering ecological weed species for control include tradescantia ( <i>Tradescantia fluminensis</i> ), wild ginger ( <i>Hedychium gardnerianum</i> ) and mile-a-minute ( <i>Dipogon lignosus</i> ) (see full list in Appendix 4).	Historic control sites & Mainland Island
EW-2	Woody weed species displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key woody ecological weed species include holly ( <i>Ilex aquifolium</i> ) and pine species ( <i>Pinus</i> sp.) (see full list in Appendix 4).	Historic control sites & Mainland Island
EW-3	Climbing weeds smother and displace native vegetation often causing canopy collapse, inhibit indigenous regeneration, and alter vegetation structure and composition. Key weed species include climbing asparagus ( <i>Asparagus scandens</i> ), bomarea ( <i>Bomarea caldasii</i> ), Japanese honeysuckle ( <i>Lonicera japonica</i> ), old man's beard ( <i>Clematis vitalba</i> ), banana passionfruit ( <i>Passiflora</i> spp.) and English ivy ( <i>Hedera helix</i> ).	Historic control sites & Mainland Island
Pest animals		
PA-1	Possums ( <i>Trichosurus vulpecula</i> ) browse palatable canopy vegetation until it can no longer recover <sup>38,39</sup> . This destroys the forest's structure, diversity and function. Possums may also prey on native birds and invertebrates <sup>40</sup> .	Whole KNE
PA-2*	Rats ( <i>Rattus</i> spp.) browse native fruit, seeds and vegetation. They compete with native fauna for food and can reduce forest regeneration. They also prey on invertebrates, lizards and native birds <sup>41,42</sup> .	Whole KNE
PA-3	Mustelids (stoats <sup>43,44</sup> ( <i>Mustela erminea</i> ), ferrets <sup>45,46</sup> ( <i>M. furo</i> ) and weasels <sup>47,48</sup> ( <i>M. nivalis</i> )) prey on native birds, lizards and invertebrates, reducing their breeding success and potentially causing local extinctions.	Whole KNE
PA-4	Hedgehogs ( <i>Erinaceus europaeus</i> ) prey on native invertebrates <sup>49</sup> , lizards <sup>50</sup> and the eggs <sup>51</sup> and chicks of ground-nesting birds <sup>52</sup> .	Whole KNE
PA-5*	House mice ( <i>Mus musculus</i> ) browse native fruit, seeds and vegetation, and prey on invertebrates. They compete with native fauna for food and can reduce forest regeneration. They also prey on invertebrates, lizards and small eggs and nestlings <sup>53,54</sup> .	Whole KNE
PA-6	Pest and domestic cats ( <i>Felis catus</i> ) prey on native birds <sup>55</sup> , lizards <sup>56</sup> and invertebrates <sup>57</sup> , reducing native fauna breeding success and potentially causing local extinctions <sup>58</sup> .	Whole KNE

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
PA-7*	Wasps ( <i>Vespa</i> spp.) adversely impact native invertebrates and birds through predation and competition for food resources. They also affect nutrient cycles in beech forests <sup>59</sup> .	Whole KNE
PA-8	Red deer ( <i>Cervus elaphus</i> ) and fallow deer ( <i>Dama dama</i> ) browse the forest understory and can significantly change vegetation composition by preferential browsing and preventing regeneration <sup>60,61,62</sup> .	Whole KNE
PA-9	Feral pigs ( <i>Sus scrofa</i> ) root up the soil and eat roots, invertebrates, seeds and native plants preventing forest regeneration <sup>63</sup> .	Whole KNE
PA-10	Feral goats ( <i>Capra hircus</i> ) browsing affects the composition and biomass of native vegetation in the understory tiers of forest habitats, preventing regeneration of the most palatable understory species and reducing species diversity <sup>64</sup> .	Whole KNE
Human activities		
HA-1*	Garden waste dumping often leads to ecological weed invasions into natural areas.	Whole KNE
HA-2	Recreational use such as tramping, mountain biking and horse riding can cause damage and disturbance of the native ecosystem. It is also likely to disturb native fauna and introduce ecological weeds.	Whole KNE
HA-3	Barriers to native fish passage are present in streams within the KNE site preventing migrating fish from completing their life-cycle.	Whole KNE
HA-4	Dogs ( <i>Canis lupus familiaris</i> ), if uncontrolled/unleashed can disturb or kill nesting birds and chicks, and lizards within the KNE site, particularly in close proximity to walking tracks <sup>65</sup> .	Whole KNE
Other threats		
OT-1	Beech mast years can lead to a significant increase in rodent and predator populations that have a negative impact on native animal populations in the KNE site.	Whole KNE
OT-2*	Pathogens, such as myrtle rust ( <i>Austropuccinia psidii</i> ) could have a devastating effect on native myrtaceae species including mānuka, northern rātā and ramarama.	Whole KNE

\*Threats marked with an asterisk are not addressed by actions in the operational delivery schedule

## Appendix 5: Priority ecological weed species

The following table lists key ecological weed species that have been recorded in the East Harbour Northern Forest KNE site.

The distribution and density of individual species within each operational area is recorded. Three levels of distribution (localised, patchy and widespread) and density (sparse, abundant and dense) are used to describe these aspects of infestations of each species

**Table 8: Ecological weed species recorded in the East Harbour Northern Forest KNE site**

Scientific name	Common name	Level of distribution	Management aim
<i>Asparagus scandens</i>	Climbing asparagus	Widespread and abundant	Suppression
<i>Bomarea</i>	Bomarea	Widespread and sparse	Suppression
<i>Chrysanthemoides monilifera subsp. monilifera</i>	Boneseed	Localised and abundant	Suppression
<i>Clematis vitalba</i>	Old man's beard	Widespread and sparse	Suppression
<i>Cobaea scandens</i>	Cathedral bells	Widespread and sparse	Suppression
<i>Cortaderia selloana</i>	Pampas	Widespread and sparse	Suppression
<i>Cotoneaster coriaceus</i>	Cotoneaster	Widespread and sparse	Suppression
<i>Elaeagnus x reflexa</i>	Eleagnus	Widespread and sparse	Suppression
<i>Hakea salicifolia</i>	Willow-leaved hakea	Widespread and sparse	Suppression
<i>Hakea sericea</i>	Prickly hakea	Widespread and sparse	Suppression
<i>Ilex aquifolium</i>	Holly	Widespread and sparse	Suppression
<i>Lonicera japonica</i>	Japanese honeysuckle	Widespread and sparse	Suppression
<i>Passiflora sp.</i>	Banana Passionfruit	Widespread and sparse	Suppression
<i>Pinus sp.</i>	Pine species	Widespread and sparse	Suppression
<i>Prunus sp.</i>	Cherry	Widespread and sparse	Suppression

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