Key Native Ecosystem Operational Plan for Whitireia Coast (inc Rocky Bay)

2019-2024

KNE
KEY NATIVE ECOSYSTEM

poriruacity

TE RŪNANGA O TOA RANGATIRA

greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

Contents

1. Purpose

The purpose of the five-year Key Native Ecosystem (KNE) Operational Plan for Whitireia Coast KNE site is to:

- Identify the parties involved
- Summarise the ecological values and identify the threats to those values
- Outline the objectives to improve ecological condition
- Describe operational activities (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)[1].

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

Greater Wellington Long Term Plan

The Long Term Plan (2018-2028)[2] 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 (PNRP) 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)

Greater Wellington Regional Pest Management Plan 2019-2039

The KNE programme 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.

Whitireia Park Management Plan

The majority of the Whitireia Coast KNE site lies within Whitireia Park. Management of Whitireia Park as a whole is guided by the Whitireia Park Management Plan and Whitireia Park Bylaws 2016[3]. This plan guides the recreational and amenity uses of Whitireia Park as well as identifying opportunities to protect biodiversity values.

Greater Wellington Biodiversity Strategy

The Greater Wellington Biodiversity Strategy[4] (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.

Vision

Healthy ecosystems thrive in the Wellington region and provide habitat for native biodiversity

The Strategy provides a common focus across Greater Wellington's departments and guides activities relating to biodiversity. The Vision is underpinned by four operating principles and three strategic goals. Goal One drives the delivery of the KNE Programme.

Goal One

Areas of high biodiversity value are protected or restored

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. Whitireia Coast Key Native Ecosystem site

The Whitireia Coast KNE site (122 ha) is located on Whitireia peninsula adjacent to the suburban community of Tītahi Bay north of the Porirua CBD. It is comprised of mostly coastal land running in a rough semi-circle around the Whitireia peninsula, from the northern end of Tītahi Bay on the coastal side to beyond Te Onepoto Bay inside Te Awarua-o-Porirua Harbour on the inland side (see Appendix 1, Map 1).

The Whitireia Coast KNE site consists mostly of the areas of land within Whitireia Park that have high biodiversity values. Also contained within the KNE site is a short stretch of coastline adjoining Whitireia Park to the south-west, which includes the bay known as Rocky Bay and cliffs and bays between Rocky Bay and the Titahi Bay beach. This area was previously managed as a separate KNE site named Rocky Bay, but is now incorporated in the Whitireia Coast KNE site.

The Whitireia Coast KNE site is ranked as one of the highest value coastal sites in the Wellington region[5] and encompasses a variety of ecosystem and habitat types including estuary, coastal turf, sand dune, coastal escarpment, wetland, riparian and coastal forest.

The KNE site encompasses over half the length of the western shore of Te Awarua-o-Porirua Harbour, which is an important ecological site as it was once rich in native aquatic flora and fauna, and birdlife. The Whitireia peninsula and Te Awarua-o-Porirua Harbour are significant areas of cultural and spiritual importance within the rohe of

Ngāti Toa Rangatira. The intensive occupation of Whitireia by various Māori groups over centuries is reflected in the presence of numerous wāhi tapu and other cultural sites over the peninsula. Over one hundred archaeological sites have been recorded in the area. Further descriptions of historical and cultural aspects of the KNE site can be found in the Whitireia Park Management Plan[6].

5. Parties involved

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

5.1. Landowners/Land Managers

The Whitireia Park portion of the KNE site is owned by several land owners (see Appendix 1, Map 2). The majority of the land is owned by the Crown and is classified as recreational reserve. Two small portions of land owned by Radio New Zealand are leased to the Crown and are also classified as recreation reserve. Toa Rangatira Trust owns three parcels of land. These are Onehunga Bay Historic Reserve (two parcels) and Te Onepoto Bay Recreation Reserve.

Management responsibility for all of the land within the Whitireia Park portion of the KNE site has been transferred to, or the land has been vested in, the Whitireia Park Board. The Whitireia Park Board is composed of members appointed by Greater Wellington and Toa Rangatira Trust, and management of Whitireia Park as a whole is guided by the Whitireia Park Management Plan[7]. Greater Wellington is tasked with the day to day management of the Park. This KNE operational plan is consistent with the objectives and policies of the Whitireia Park Management Plan.

The land within the KNE site beyond Whitireia Park; the south-western bays and cliffs known as Rocky Bay and the coastline south of Te Onepoto Bay on the eastern side of the KNE site, are owned by Porirua City Council (PCC) and these land parcels are classified as recreation or road reserve. These reserves are subject to management plans prepared by PCC which provide for the protection and enhancement of heritage, natural and recreation values[8, 9].

5.2. Operational delivery

Within Greater Wellington, the Biodiversity, Biosecurity and Parks departments are responsible for delivering the KNE operational plan. The Biodiversity department is the overarching lead department for Greater Wellington on the coordination of biodiversity management activities and advice within the KNE site. The Biosecurity department coordinates and carries out pest control activities. The Parks department manages recreational access and supports and facilitates restoration activities within the Whitireia Park portion of the KNE site.

The Whitireia Park Restoration Group (WPRG) arranges and undertakes restoration planting, pest animal control and ecological weed control in the KNE site. It also runs predator control projects aimed at protecting lizards living on the coastal escarpment and the remnant forest.

PCC is an external management partner at the site, contributing funding to environmental weed control operations.

5.3. Mana whenua partner

As well as being an owner of land within the Whitireia Coast KNE site, Ngāti Toa Rangatira is also Greater Wellington's mana whenua partner in the KNE site. Areas of the KNE site that have significance to Ngāti Toa Rangatira are listed in Table 1 below along with the values that each of these areas holds. Greater Wellington is committed to identifying ways in which kaitiakitanga can be strengthened by exploring opportunities on how Ngāti Toa Rangatira wish to be involved in the plan development or operational delivery of the KNE site.

Table 1: Ngāti Toa Rangatira sites of significance in Whitireia Coast KNE site[10]

Sites of significance	Mana whenua values
Te Onepoto Bay (PNRP, Schedule D2)	Te Onepoto Bay, located on the Whitireia Peninsula, was a site of Ngāti Toa Rangatira settlement. The Whitireia peninsula is of historical and cultural importance to Ngāti Toa Rangatira as it contains numerous wāhi tapu and sites of significance, including urupa, kainga, pa, middens, pits, terraces and tauranga waka. There were numerous settlements along the coast at Te Onepoto, Te Kahikatoa, Te Neke, Kaiaua, Onehunga and Kaitawa. The coast of the peninsula remains an important area for the gathering of kaimoana. Originally reserved under the 1847 Porirua Deed, the land at Whitireia was gifted to the Crown on the premise that an Anglican Mission school would be established to educate the children of Ngāti Toa Rangatira. In 1850 the Crown granted the land to the Bishop of Wellington for the purpose of a school. When no school was established at Whitireia, the Crown grant was challenged by Ngāti Toa Rangatira in 1877 in Wi Parata v Bishop of Wellington. The Supreme Court held that Ngāti Toa Rangatira native title to the land was extinguished through the Crown grant, in a decision criticised and challenged by subsequent judgements. The Whitireia Case highlights the unique historical significance of Whitireia to Ngāti Toa Rangatira, including Te Onepoto Bay. The settlement at Te Onepoto was located at the western side of the entrance to the Porirua harbour, a site which had always been recognised by Maori as having considerable strategic importance. The Porirua Harbour is the northern shore of the shortest crossing of Cook Strait from the West Coast. It also lay astride the main route to Wellington. Te Rauparaha is reputed to have told Governor Grey that whoever held Paremata and Porirua Harbour controlled the northern approaches to Wellington. Ngāti Toa Rangatira almost exclusively utilised the harbour and its kaimoana resources such as cockles, mussels and finfish up until the 1950s when the government commenced large scale housing developments in the area. The harbour experienced huge development pressure from reclamation for what is now the city centre. Over the following decades, the effects of intensified land use, contamination and siltation have resulted in poor water quality and an inability to harvest kaimoana.

Onepoto Stream (PNRP, Schedule C3)	pā (fortified village), urupā (burial ground), mara kai (garden), wai māori (fresh water), wai ora (water utilised for healing), kai awa (freshwater foods), nohoanga (sitting place), kāinga (home), ara waka (traditional canoe route), tauranga waka (canoe landing place)
Punga o Matahorua - Kupe's anchor stone (PNRP, Schedule C3)	wāhi tapu (sacred place), Te Ara o Kupe (the path of Kupe)
Whitireia (PNRP, Schedule C3)	papa kāinga (original home), kāinga (home), pā (fortified village), mahinga kai (customary gathering of food and natural materials), taunga ika (fishing ground), wāhi tapu (sacred place), urupā (burial ground), Te Ara o Kupe (the path of Kupe), tohu whenua (marker), wāhi whakariti (place of organising, kai moana (food harvested from the sea), mahinga mataiatai (customary seafood gathering site), mara kai (garden)
Te Pā o Kapo	Located on a promontory overlooking Rocky Bay is the historic site of Te Pā o Kapo. This pā was occupied by Ngāti Ira until the 1820s when Ngāti Toa arrived in the district[11]. The pā is registered on the PCC District Plan as HHS002: Te Pā o Kapo – Off Terrace Road, Titahi Bay[12]

Greater Wellington recognises the value and importance of working with mana whenua in their roles as kaitiaki in areas within the KNE site. The KNE operational plan activities will:

- make a small but valuable contribution to the overall expected PNRP outcomes including mahinga kai (food gathering)
- ensure people working in KNE sites understand the requirements of the Accidental Discovery Protocol
- endeavour to ensure that Ngāti Toa Rangatira values for the site are protected

In addition, Greater Wellington will work on initiatives to achieve mutual benefit including the Internship monitoring programme of the cultural health and wellbeing of KNE sites.

5.4. Stakeholders

Organisations that are considered stakeholders in the Whitireia KNE site are the Whitireia Park Restoration Group and Titahi Bay Residents Association.

The Whitireia Park Restoration Group (WPRG), formerly the Onehunga Bay Restoration Group, has been involved in the KNE site since 2005. They have undertaken restoration planting at a number of sites, obtaining grants from funding bodies to allow them to accelerate their planting progress. Planting was initially focused on wetland and dune areas in Onehunga Bay but the scope has now spread to include many of the high value areas of the KNE site. In 2013 WPRG took on the task of servicing predator traps and bait stations located across Whitireia Park and in 2015 they set up and continue to run a predator control project aimed at protecting lizards living on the coast escarpment.

The Titahi Bay Residents Association is concerned that management activities, particularly ecological weed control, are undertaken in ways that don't adversely

impact the lives of local residents. The association is consulted annually on ecological weed control actions planned to be undertaken in coastal bays and cliffs between Rocky Bay and Titahi Bay on the western side of the KNE site. Further detail of how ecological weed control is managed safely in this area in contained in Section 9.1.

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 Whitireia Coast KNE site.

Table 2: Designations at the Whitireia Coast KNE site

Designation level	Type of designation
Regional	Parts of the Whitireia Coast KNE site are designated under Greater Wellington's Proposed Natural Resources Plan (PNRP) as: • Significant habitat for indigenous birds in the coastal marine area (Schedule F2c): Te Awarua-o-Porirua Harbour, Onepoto Arm • Significant Natural Wetland (Schedule F3): Te Onepoto wetland and Te Awarua-o-Porirua Harbour (Onepoto Arm) – Tidal flats.
District	Parts of the KNE site are designated as Recreation Reserve. The coastal cliffs from Titahi Bay to Onehunga Bay, including the salt turf in Rocky Bay, are identified as Eco-site 120 in the Inventory of Ecological Sites in Porirua City.
Other	Part of the KNE site is designated a Historic Reserve: • Onehunga Bay Historic Reserve

6.2. Ecological significance

The Whitireia Coast KNE site is considered to be of regional importance because:

- It contains highly **representative** ecosystems that were once typical or commonplace in the region but are no longer common place
- It contains ecological features that are **rare or distinctive** in the region
- It contains high levels of ecosystem **diversity**, with several ecosystem types represented within the KNE site, including several naturally uncommon ecosystems
- Its **ecological context** is valuable at the landscape scale as it contains a variety of inter-connected habitats and, provides core habitat for a threatened indigenous plant species.

Representativeness

The Singers and Rogers (2014)[13] classification of pre-human vegetation indicates that the KNE site would have originally contained two forest types; MF6 Kohekohe/Tawa forest and CL3 Coprosma, Muehlenbeckia shrubland/herbfield/rockland. The forest ecosystem type MF6 is considered regionally threatened, as it is estimated that there is now only about 15% of the pre-human extent of this forest type remaining in the Wellington region[14]. CL3 is a coastal cliff ecosystem type that would have been present on the coastal escarpment in the KNE site. Although heavily modified, aspects of the original vegetation types remain within the KNE site and provide valuable foundations for natural and assisted regeneration of ecosystems with similar characteristics to the original ones. Although less than a hectare in size, the forest remnant behind Onehunga Bay is important in that it maintains representative aspects of the original MF6 type and it is one of few forest remnants in the region within 100m of the ocean.

The Threatened Environment Classification system[15] indicates that various parts of the Whitireia Coast KNE are ranked as Acutely Threatened, Chronically Threatened, At Risk or Critically Underprotected environments (see Appendix 1, Map 3). Across New Zealand these environment classes have less than 10%, 10-20%, 20-30%, and greater than 30% (but less 10% protected) of their original indigenous vegetation cover remaining respectively[16].

Rarity/distinctiveness

New Zealand's national threat classification system[17] lists 22 plant, five bird and two freshwater fish species recorded within the KNE site as Nationally Threatened or At Risk. Sixteen plant species present have been listed as regionally threatened. Nationally threatened species are listed in Appendix 2 and regionally threatened species in Appendix 3.

Diversity

The KNE site contains a diverse range of ecosystems types including coastal cliffs and escarpments, rocky shore, salt marsh, dunelands, coastal forest, wetlands including an estuary, and stream ecosystems. Some ecosystems in the KNE are naturally uncommon in New Zealand[18] and have been classified according to their threat status[19]. Those present include coastal turf (Nationally Critical); active sand dunes (Nationally Endangered); shingle beach (Nationally Endangered); seepages and flushes (Nationally Endangered), and estuary (Nationally Vulnerable). Wetlands are considered an uncommon habitat type in the Wellington Region with less than 3% remaining of their original extent[20].

Ecological context

Several ecosystems present are considered a national priority for conservation as an ecosystem type that has become uncommon on a national scale primarily due to human activity[21], this includes active sand dunes and wetlands. The KNE site provides core habitat for the Nationally Critical species pygmy button daisy (*Leptinella nana*) – the KNE site is one of only three sites nationally where this species is found.

Sited on a peninsula, the KNE site is surrounded by ocean on three sides and therefore has natural barriers to pest invasion. It is currently considered possum and hare free. It is adjacent to Te Awarua-o-Porirua Harbour and close enough to other areas of native

ecosystems such as the Porirua Western Forests and Karehana Bay Bush KNE sites and Mana Island Scenic Reserve for there to be linkages across the landscape for native birds and plants.

6.3. Ecological features

The Whitireia Coast KNE site is situated where the Cook Strait and Wellington Ecological Districts (EDs) meet. The KNE site is more closely aligned to the Cook Strait ED on its northern side with its steep, exposed cliffs and headland, whereas the southern side with its more sheltered hills and estuary is representative of the Wellington ED.

Habitats (inc. vegetation communities and notable plants)

The KNE site contains elements of what were once rich and dynamic coastal ecosystems that have been substantially modified by human land use and activities. Original native vegetation communities remain only in highly modified forms within the KNE site and many native species that were once common are no longer present.

The natural environment is characterised by strong and abrasive salt-laden winds and wave action on the rocky shore. This is particularly pronounced on the western cliffs where, along with poor soils, the exposed conditions create habitat for specially adapted native plants and animals.

The areas of the KNE site that contain the higher biodiversity values fall into one of several habitat types. These are:

Coastal escarpments and cliffs

The majority of the KNE site is formed of coastal escarpments and steep cliff faces. Prior to human settlement, the vegetation of the coastal escarpment would have comprised a *Coprosma*, *Muehlenbeckia* shrubland/herbfield/rockland[22]. This ecosystem type is described as coastal rockland and colluvial slopes, with mosaics of wind-shorn low-lying scrub dominated by divaricating shrubs, including species of *Coprosma*, *Muehlenbeckia* and *Melicytus*, whahariki, tauhinu, taupata and *Hebe elliptica*, and locally tussocks (eg, *Chionochloa beddiei* and silver tussock) and halophytic herbs.

These vegetation types are still represented in the vegetation communities on the coastal escarpment. Regenerating grey scrub is developing across large parts of the coastal escarpment typically including mānuka (*Leptospermum scoparium*), mingimingi (*Leucopogon fasciculatus*) and tauhinu (*Ozothamnus leptophyllus*), with communities of taupata (*Coprosma repens*), koromiko (*Hebe stricta* var. *atkinsonii*), pōhuehue (*Muehlenbeckia complexa*), whahariki (*Phormium cookianum* subsp. *Cookianum* and *P.* subsp. *hookeri*), thick-leaved māhoe (*Melicytus crassifolius*), speargrass (*Aciphylla squarrosa* var. *squarrosa*) and *Coprosma propinqua* growing on the more vertical cliff faces. Taller trees such as taupata (*Coprosma repens*), ngaio (*Myoporum laetum*) and akiraho (*Olearia paniculata*) are found in more sheltered areas. Typical non-woody species present include Mercury Bay weed (*Dichondra repens*), rauhuia (*Linum monogynum* var. *monogynum*), silver tussock (*Poa cita*), wīwī (*Ficinia nodosa*), and native ice plant (*Disphyma australe* subsp. *australe*).

Amongst the native species present are also a number of invasive ecological weeds that threaten the continued regeneration of these species assemblages. Boneseed (*Chrysanthemoides monilifera*) and karo (*Pittosporum crassifolium*) are dominant in some areas with boxthorn (*Lycium ferocissimum*) and Cape ivy (*Scenecio angulatus*) also locally abundant.

The Southern escarpment area comprises a different vegetation mix to that described above. This escarpment faces south-east and is protected from the strong salt influence found in the northern and western areas. The vegetative cover present is therefore lusher and less stunted by coastal forces. Most of the vegetation north of Te Onepoto Bay was destroyed by the large scrub fire of 2010 and the vegetation to the south is currently dominated by māhoe (*Melicytus ramiflorus*). It is possible that the escarpment vegetation will regenerate towards the kohekohe/tawa forest type that was historically present here. This forest type consisted of abundant kohekohe (*Dysoxylum spectabile*) and frequent tawa (*Beilschmiedia tawa*), occasional titoki (Alectryon excelsus), māhoe (*Melicytus ramiflorus*), porokaiwhiri (*Hedycarya arborea*) and nīkau (*Rhopalostylis sapida*), and scattered emergent rimu (*Dacrydium cupressinum*), pukatea (*Laurelia novae-zealandiae*) and northern rātā (*Metrosideros robusta*). How well this original ecosystem will regenerate will depend on the seed bank available and continued pest control activities.

Notable species found along the coastal escarpment and cliffs include:

- Pygmy button daisy (*Leptinella nana*); Nationally Critical, one of only three locations nationally where this species is found, found in two locations on the western scarp
- Cook Strait melicytus (*Melicytus orarius*); Nationally At Risk - Declining and Regionally Threatened
- *Trisetum antarcticum*; Nationally At Risk – Declining, an endemic coastal grass, found in open areas of the cliffs
- Shore pūhā (*Sonchus kirkii*); Nationally At Risk – Declining, found where water seeps out of rocks at the bottom of the escarpment
- Kōkōmuka (*Veronica elliptica*); the only two populations of kōkōmuka on the mainland in the Wellington region, located on the western cliffs
- *Carex* "Raotest"; an un-described species thought to be a natural hybrid of *C. raoulii* and *C. testacea*.
- *Pimelia cryptica*
- Pinatoro (*Pimelia prostrata* var. *seismica*)
- Scabweed (*Raoulia hookeri* subsp. *hookeri*)
- Woollyhead (*Craspedia uniflora* var. *maritima*).

Forest remnant

The forest remnant at Onehunga Bay area is one of few forest remnants in the region within 100m of the ocean. This site is a remnant of the kohekohe/tawa forest ecosystem type (MF6) that would have once dominated the local landscape. Although less than a hectare in size, it has a representative assemblage of native species[23] with

the predominant forest cover comprising kanuka (*Kunzea robusta*), kohekohe (*Dysloxylum spectabile*), tītoki (*Alectyron excelsus*) and ngaio (*Myoporum laetum*). Notable species present in this remnant are the locally rare rasp fern (*Blechnum parrisiae*) and the nationally threatened turepo/large-leaved milk tree (*Streblus banksii*).

Dunelands

Dunelands are uncommon in the Porirua District and the best examples are now located within the Whitireia Coast KNE site. Dunelands are present at Onehunga Bay and Kaiaua Bay and have been subject to several years of restoration activities by the WPRG. This has included re-establishing the key native sand-binding species such as pīngao (*Ficinia spiralis*) and spinifex (*Spinifex sericeus*).

A range of backdune plant species have also been re-introduced into the Onehunga Bay area, including sand coprosma (*Coprosma acerosa*), sea spurge (*Euphorbia glauca*) and sand daphne (*Pimelea cryptica*).

Wetland seepages enter through the duneland areas. These seepages are ecologically important as they provide water for coastal turfs and habitat for native reeds and rushes making the area very diverse and complex.

Te Onepoto Estuary and Te Onepoto Stream

Located on the western edge of the Onepoto arm of the Te Awarua-o-Porirua Harbour, Te Onepoto Estuary is part of the wider Porirua Harbour ecosystem, which is the largest estuary in the lower North Island[24]. Te Onepoto Estuary is home to salt marsh with the predominant species being remuremu (*Selliera radicans*), sea rush (*Juncus kraussii subsp. australiensis*), oioi (*Apodasmia similis*) and salt marsh ribbonwood (*Plagianthus divaricartus*). This is an important habitat for wading birds such as variable oystercatcher (*Haematopus unicolor*), royal spoonbill (*Platalea regia*), white-faced heron (*Egretta novaehollandiae*) and pied stilt (*Himantopus himantopus*).

Te Onepoto Stream is the most intact stream flowing into the Onepoto arm of the Te Awarua-o-Porirua Harbour. The stream and associated wetland supports a well-established native sedge-reed plant community. The predominant species here are rautahi (*Carex geminata*) and raupō (*Typha orientalis*), while giant umbrella sedge (*Cyperus ustulatus*) and lake club rush (*Schoenoplectus tabernaemontani*) are also present.

Wetlands

Several wetlands occur in the KNE site. Two of them; the tidal flats on the western shoreline (Te Awarua-o-Porirua Harbour (Western Arm) – Tidal Flats) and the swamp associated with Onepoto Stream described above (Te Onepoto Wetland) are classified as significant natural wetlands in the PNRP.

Two other wetlands in the KNE site; the swamp in Onehunga Bay and the marsh on the coast on the western side of the KNE site, were highly modified prior to restoration planting being undertaken in them by WPRG.

A small area of less modified salt-marsh and swamp exists in shallow peat on the rocky coastal platform at Rocky Bay. Found in this swamp is a rushland-reedland, comprised of oioi (*Apodasmia similis*), three-square (*Schoenoplectus pungens*), giant umbrella

sedge (*Cyperus ustualtus*) and harakeke (*Phormium tenax*). This is one of the locations in the KNE site that the Nationally Threatened species shore pūhā is found.

Coastal turfs

Small patches of coastal turf occur in the KNE site primarily located on rocky platforms. The most significant area of coastal turf is found at Rocky Bay, where instead of there being a shingle beach, peat has formed on top of the coastal platform which is covered by coastal turf plants. This low-growing coastal turf plant community consists of a thick thatch of remuremu (*Selliera radicans*), shore lobelia (*Lobelia anceps*), sea primrose (*Samolus repens*), Mercury Bay weed (*Dichondra repens*), arrow grass (*Triglochin striatum*), glasswort (*Sarcocornia quinqueflora* subsp. *quinqueflora*), slender clubrush (*Isolepis cernua* var. *cernua*) and New Zealand celery (*Apium prostratum* subsp. *prostratum v*ar. *filiforme*).

Species

Birds

The KNE site supports a range of coastal birds, including white-faced heron (*Ardea novaehollandiae*), little shag (*Phalacrocorax melanoleucas*), pied shag (*Phalacrocorax varius*), Australasian gannet (*Morus serrator*), pied stilt (*Himantopus himantopus*), Caspian tern (*Sterna caspia*), white-fronted tern (*Sterna striata*), black-billed gull (*Larus bulleri*) and red-billed gull (*Larus novaehollandiae*)[25].

Red-billed gull and white-fronted tern roost in large numbers on the rocky platform at Rocky Bay[26]. The salt marsh at Te Onepoto estuary is important habitat for wading birds such as variable oystercatcher, red-billed gull and Nationally Critical black-billed gull. Little penguin (*Eudyptula minor*) are often sighted in the water around the coast[27] and use the bays of the KNE site for nesting and moulting[28].

Naturally Uncommon royal spoonbill (*Platalea regia*) are visitors to the KNE site and there have been sightings of the Nationally Critical species white heron (*Ardea modesta*) and shore plover (*Thinornis novaeseelandiae*). A list of threatened species found at the KNE site is provided in Appendix 2.

Common forest birds such as tūī (*Prosthoderma novaeseelandiae*), pīwakawaka/fantail (*Rhipidura fuliginosa*), riroriro/grey warbler (*Gerygone igata*), tauhou/silvereye (*Zosterops lateralis*), kererū/New Zealand pigeon (*Hemiphaga novaeseelandiae*) and ruru/morepork (*Ninox novaeseelandiae*) are found in the remnant forest.

Reptiles (herpetofauna)

Three species of native lizard are found in the KNE site; northern grass skink (*Oligosoma polychroma*), copper skink (*O. aeneum*) and Raukawa gecko (*Woodworthia maculatus*)[29]. Other species may be present as there are historic records of spotted skink (*O. lineoocellatum*) in nearby Titahi Bay, and glossy brown skink (*O. zelandicum*) and Whitaker's skink (*O. whitakeri*) at Pukerua Bay[30].

Fish

The streams and wetland environments in the KNE site provides habitat for native fish including longfin (*Anguilla dieffenbachii*) and shortfin eels (*A. australis*), inanga (*Galaxias maculatus*) and banded kōkopu (*G. fasciatus*)[31].

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.

7.1. Key threats

The main threats to the ecological values of Whitireia Coast KNE site are ecological weeds and a typical suite of introduced mammalian browsers and predators. Recreational activities are a threat in sensitive coastal areas and the dumping of garden waste could lead to weed invasions. There is also a high risk of fire occurring and causing damage in the KNE site.

There are many ecological weeds present which are threatening native plant species and the natural character of the KNE site. The range of woody weeds includes boxthorn (*Lycium ferocissimum*), boneseed (*Chrysanthemoides monilifera*), Spanish heath (*Erica lusitanica*) and gorse (*Ulex europaeus*), as well as some non-local native species such as karo (*Pittosporum crassifolium*) and pōhutukawa (*Metrosideros excelsa*) which are dominating the plant communities and altering the natural ecosystems. Ground covering weeds such as kikuyu (*Pennisetum clandestinum*), pampas (*Cortaderia selloana*), pigs ear (*Cotyledon orbiculata*) and *Aoenium* spp, and climbing weeds such as cape ivy (*Senecio angulatus*), and Japanese honeysuckle (*Lonicera japonica*) are also impacting the natural plant communities.

The small discrete ecosystems within the KNE site are at particular risk of inundation and subsequent transformation by ecological weeds. The coastal turf at Rocky Bay is impacted by Buck's horn plantain (*Plantago coronopus*) and orache (*Atriplex prostrata*) and a small infestation of *Carex otrubae* is present in the wetland in the same area. Marram grass poses a threat to dune ecosystems and blackberry is impacting the plant community in the Onepoto estuary. Kikuyu poses a threat to areas of the wetland at Rocky Bay, backdune areas at Onehunga Bay and Kaiaua Bay and grey scrub areas around the coast.

Many garden plants such as stock (*Matthiola incana* subsp. *incana*), agapanthus (*Agapanthus praecox*) and alyssum (*Lobularia maritima*) have spread through parts of the KNE site from garden waste dumped banks and cliff faces.

Possums (*Trichosurus vulpecula*) were eradicated from Whitireia Park in 2002-03. However as several possums have been found in the Whitireia Park part of the KNE site in recent years it appears that possums may still be present in the adjacent suburban area or have the ability to migrate to the KNE site from further afield. Mustelids (*Mustela* spp.), hedgehogs (*Erinaceus europaeus*) and rats (*Rattus* spp.) are all present in the KNE site but are likely to be in low numbers due to control being undertaken. The grass dominated habitat appears to favour mice (*Mus musculus*) as they are present in high numbers. Domestic cats (*Felis catus*) and dogs (*Canis lupus familiaris*) are frequently observed roamimg un-controlled in the KNE site and adjacent parts of Whitireia Park.

Plant and animal communities, particularly those on the coast such as the coastal turf, dunes, estuary and tidal flats are particularly vulnerable to damage and disturbance by people. Trampling damages plants and creates disturbed areas that are vulnerable to weed invasion and people and their dogs disturb roosting and nesting birds. Nesting and moulting little penguin are particularly vulnerable to being attacked by dogs.

The lighting of open fires is not permitted in any part of the KNE site, however open fires are sometimes lit on beaches within the KNE site. Due to the abundance of rank grass across much of the KNE site, these fires are at risk of spreading very readily if not controlled. Severe damage to plant and animal communities has been caused by out of control fires at the KNE site in the past and the threat of a damaging fire occurring again is high.

While the key threats discussed in this section are recognised as the most significant, a number of other threats to the KNE site's values have also been identified. Table 3 presents a summary of all known threats to the Whitireia Coast KNE site (including those discussed above), detailing which operational areas they affect, how each threat impacts on ecological values, and whether they will be addressed by operational activities.

Table 3: Summary of all threats to ecological values present at the Whitireia Coast 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 kikuyu grass (*Pennisetum clandestinium*), marram (*Ammophila arenaria*), tall fescue (*Festuca arundinacea*), agapanthus (*Agapanthus praecox*), montbretia (*Crocosmia* x *crocosmifolia*), arum lily (*Zantedeschia aethiopica*), wandering willy (*Tradescantia fluminensi*) and periwinkle (*Vinca major*)	Entire KNE site
EW-2	Woody ecological weed species displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key woody ecological weed species for control include boneseed (*Chrysanthenemoides monilifera*), boxthorn (*Lycium ferocissimum*), karo (*Pittosporum crassifolium*), pōhutukawa (*Metrosideros excelsa*), Spanish heath (*Erica lusitanica*), broom (*Cytisus scoparium*), gorse (*Ulex europaeus*), brush wattle (*Paraserianthes lophantha*), cherry (*Prunus* sp.) and willow (*Salix* sp.)	Entire KNE site
EW-3	Climbing ecological weed species smother and displace native vegetation often causing canopy collapse, inhibit indigenous regeneration, and alter vegetation structure and composition. Key climbing ecological weed species for control include cape ivy (*Senecio angulatus*), Japanese honeysuckle (*Lonicera japonica*), blue passionflower (*Passiflora caerulea*) and climbing asparagus (*Asparagus scandens*)	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
Pest animals		
PA-1	Possums (*Trichosurus vulpecula*) browse palatable canopy vegetation until it can no longer recover[32,33]. This destroys the forest's structure, diversity and function. Possums may also prey on native birds[34] and invertebrates	Entire KNE site
PA-2	Rats (*Rattus* 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[35,36]	Entire KNE site
PA-3	Mustelids (stoats[37,38] (*Mustela erminea*), ferrets[39,40] (*M. furo*) and weasels[41,42] (*M. nivalis*)) prey on native birds, lizards and invertebrates, reducing their breeding success and potentially causing local extinctions	Entire KNE site
PA-4	Hedgehogs (*Erinaceus europaeus*) prey on native invertebrates[43], lizards[44] and the eggs[45] and chicks of ground-nesting birds[46]	Entire KNE site
PA-5	House mice (*Mus musculus)* 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[47,48]	Entire KNE site
PA-6*	Feral and domestic cats (*Felis catus*) prey on native birds[49], lizards[50] and invertebrates[51], reducing native fauna breeding success and potentially causing local extinctions[52]	Entire KNE site
PA-7	Rabbits (*Oryctolagus cuniculus*) and hares (*Lepus europaeus*) graze on palatable native vegetation and prevent natural regeneration in some environments[53]. Rabbits are particularly damaging in sand dune environments where they graze native sand binding plants and restoration plantings	Entire KNE site
Human activities		
HA-1	Garden waste dumping often leads to ecological weed invasions into natural areas. Weed species at this KNE site that are likely to have been introduced from garden waste include stock (*Matthiola incana* subsp. *incana*), agapanthus (*Agapanthus praecox*), alyssum (*Lobularia maritima*) and *Aoenium* spp.	Residential boundaries
HA-2	Recreational use such as walking, 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	Entire KNE site
HA-3	A barrier to native fish passage present in Onepoto Stream is likely to be limiting some migrating fish from completing their life-cycle in this stream	Onepoto Stream
HA-4	Dogs (*Canis lupus familiaris*), if uncontrolled/unleashed can disturb or kill roosting and nesting birds and chicks, and lizards within the KNE site, particularly in close proximity to walking tracks[54]	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
HA-5	Management activities such as structure installation, road and track maintenance, pest control and ecological monitoring can cause the accidental introduction of weed species through the carriage of seeds and plant fragments on machinery, equipment and clothing, and cause damage to native vegetation	Entire KNE site
HA-6	Recreational vehicles such as 4WDs and motorbikes can cause damage to coastal turf and dune systems and disturbance of the native ecosystem	Entire KNE site
HA-7	Un-controlled fires can destroy native vegetation and kill native birds, lizards and invertebrates, potentially causing local extinctions, exposing soils to run-off and allowing aggressive ecological weed invasion to occur	Entire KNE site
Other threats		
OT-1*	Spring tides combined with an increasing number of storm events and sea-level rise resulting from climate change damage coastal ecosystems such as coastal turf, wetlands, and estuaries. Warmer temperatures resulting from climate change may allow faster and more widespread colonisation of invasive exotic plant species	Entire KNE site
OT-2*	Small forest remnants are effected by environmental impacts on their edges such as: changing environmental conditions (eg, soil moisture or temperature levels), changing physical environment (eg, different plant assemblages compared to the interior) and changing species interactions (eg, increased predation by invasive species) [55,56]	Forest remnant and other small patches of regenerating forest

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

8. Vision and objectives

8.1. Vision

The native floral and faunal communities of the diverse array of ecosystems found at Whitireia Coast KNE site are self-sustaining and thriving with native floral communities regenerating, threatened plant species spreading their ranges and native fauna breeding successfully.

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 Whitireia Coast KNE site.

1. **To improve the condition, dominance and functioning of the native plant communities**

2. **To protect and improve the habitat for native birds and lizards; to induce increases in the sizes of populations of native birds and lizards, and the number of native bird species present**
3. **To protect and expand the distribution of threatened native plant species such as *Leptinella nana*, *Melicytus orarius* and *Veronica elliptica***
4. **To revegetate threatened and uncommon habitats with appropriate native vegetation**
5. **To remediate the barrier to fish passage present in Onepoto Stream**

9. Operational activities

Operational activities are targeted to work towards the objectives above (Section 8) by responding to the threats outlined in Section 7. 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 4, Section 10).

It is important to note that not all threats identified in Section 7 can be adequately addressed. This can be for a number of reasons including financial, legal, or capacity restrictions.

The primary management activities undertaken in the KNE site are ecological weed control, pest animal control and revegetation. Some community engagement with neighbouring residents is also undertaken.

9.1. Ecological weed control

The aim of ecological weed control at the Whitireia Coast KNE site is to reduce the density and distribution of ecological weeds in the KNE site in order to increase the dominance and improve the regeneration of native plants.

Significant progress has been made in recent years on reducing the density of the following ecological weeds:

- Spanish heath
- boneseed, boxthorn and gorse in Onehunga Bay and surrounding cliffs
- marram grass in the dunes in Onehunga Bay
- a variety of woody weeds and succulents on the western escarpments and Rocky Bay.

Some sound work has also been achieved in removing ecological weeds impacting revegetation sites and threatened native plant species.

A multi-faceted strategic approach is used in undertaking ecological weed control at the KNE site in order to achieve gains across a number of issues requiring attention. The Whitireia Park Pest Plant Control Plan (2007-12)[57] contains a list of ecological weed species recorded in the KNE site and distribution and location data current at the time of the preparation of that plan for all species listed. This information is useful for guiding current and future ecological weed control at the KNE site.

The strategic approach can be separated in to four streams of work:

1. Broad scale weed control along the coastal escarpments and bays targeting areas of high biodiversity value (see Appendix 1, Map 5, operational area B). The species that are controlled in this area are those that if not controlled would overtop and dominate the low stature native shrubs or would densely colonise the ground preventing regeneration of native plant species. These weed species include boneseed, boxthorn, wattle, pampas and a variety of succulents. The non-local native species karo is also targeted here as it is very dominating in this environment with the potential to significantly modify the native ecosystem. Its control is a priority for PCC on their land to prevent its reintroduction to Mana Island. On the steep and high escarpments this work usually involves aerial spraying from a helicopter.
2. Control of ecological weeds impacting other uncommon ecosystems. These ecosystems include the dunes, wetlands, coastal turf, estuary and remnant forest (see Appendix 1, Map 5, operational area C). In the remnant forest saplings of the non-local species karaka are amongst species that are controlled due to this species' dominance and potential to significantly modify this ecosystem[58].
3. Elimination of weed species that are currently fairly sparse in the KNE site but could have a large impact if allowed to establish and spread. These species currently include Spanish heath, liquorice plant (*Helichrysum petiolare*), tree mallow (*Malva arboea*), Himalayan honeysuckle (*Leycesteria Formosa*), broom and English ivy (*Hedera helix*). There may be other species present that fit in to this category but haven't been discovered as yet or are yet to turn up at the KNE site.
4. Control of ecological weeds surrounding individual specimens of threatened and uncommon plant species. This involves careful and fine scale work in order to consider the needs of the particular threatened species and to avoid damaging the plants.

Ecological weeds are also controlled in areas where revegetation is undertaken. This work is described in Section 9.3 below.

Most of the ecological weed control at the KNE site is undertaken by contractors managed by Greater Wellington Biosecurity staff. However some weed control on the western escarpment and around threatened species is undertaken by WPRG.

Protection of sensitive environments while undertaking ecological weed control

There are a number of sensitive environments and features within and adjacent to the KNE site that are considered carefully when planning and undertaking ecological weed control. These include adjacent residential homes, areas frequented by the public, waterways, native vegetation (particularly threatened or uncommon plant species), native fauna such as lizards, and socially valued vegetation such as puha plants (*Sonchus oleraceus*) and mature pohutakawa and karaka (*Corynocarpus laevigatus*) trees. In consideration to the risk of people sustaining serious injuries, no ecological weed control is undertaken on the cliffs adjacent to Terrace Road at the south-western end of the KNE site (see Appendix 1, Map 4 and 5, operational area A). The current

vegetation cover in this area, including exotic species, is maintained to provide a barrier on the cliff edge and protection on the cliff face in the circumstance that someone does fall from the cliff edge. In other areas care is taken to avoid causing adverse impacts to puha plants, as the leaves of this species are often collected by local residents for eating.

Surveillance for garden waste dumping on the edges of the KNE site will be undertaken to gauge the ongoing extent of this problem. Garden waste dumping can lead to the establishment and spread of ecological weeds and it is likely that many of the environmental weeds in the KNE site originated through this means. To curb this behaviour if found to be prevalent, Greater Wellington will undertake a letter-box drop to surrounding residents to highlight the threat posed to the KNE site by the dumping of garden waste and outline the biodiversity values of the KNE site.

9.2. Pest animal control

The aims of pest animal control at Whitireia Coast KNE site are to control a range of browsing and predatory pest animal species in order to reduce browsing of native vegetation, encourage natural regeneration of plant communities, and protect populations of native birds, lizards and invertebrates from predation by introduced animal species.

The following pest animals are controlled at the KNE site through a range of means: mustelids (weasels and stoats), hedgehogs, rats, possums, rabbits and mice. To control mustelids and hedgehogs, a comprehensive network of traps is in place across the KNE site and surrounding areas of Whitireia Park. These traps together with bait stations located in some of the more mature patches of bush are also used to control rats. Additional traps and bait stations may be added in the future to better control rats across the landscape or better protect specific habitats. The traps and bait stations are serviced about every month by members of WPRG. The network of traps and bait stations is shown on Map 6 in Appendix 1.

The KNE site along with the rest of Whitireia Park is regarded as being free of possums and hares – the result of an eradication programme undertaken in 2002-03. However it is possible that individual possums may move into the KNE site from surrounding suburbs or further afield - several individuals have been found in the KNE site in recent years. To ensure the KNE site remains free of possums, night-time surveillances are undertaken by Greater Wellington Biosecurity staff every three months to search for possums and cull any found. The bait stations mentioned above that are used for rat control also serve as a secondary measure to control infiltrating possums that aren't picked up during night-time surveillances. Unlike possums, it is very unlikely that hares will re-appear in the KNE site as it is very unlikely that they are present in surrounding suburbs or would travel through them from further afield.

During night-time surveillances for possums, rabbits are also searched for with particular focus made on areas where they have damaged restoration plantings. Rabbit traps may be installed in these areas as an additional control approach.

Lizard protection projects

WPRG undertakes a lizard protection project at the northern end of the coastal escarpment, started in 2015 (see Appendix 1, Map 6). The project aims at protecting populations of northern grass skink, copper skink and Raukawa gecko by controlling mice, a predator of lizards. The project is seeking to understand whether localised mouse control improves outcomes for populations of lizards. The approach utilises two treatment sites, and one control site to understand population movements in the absence of localised mouse control. Important components of the project are monthly monitoring of mouse population levels and biannual monitoring of lizard population levels.

WPRG also undertake mouse trapping in the forest remnant to protect lizards that may be resident there, and also in an area where a large number of northern grass skinks were released following their salvage from a residential housing development in Whitby in 2018. WPRG undertake all aspects of these projects with some funding provided by Greater Wellington but most from other funding bodies and businesses.

9.3. Revegetation

WPRG plans and undertakes most of the revegetation work in the KNE site. They have considerable expertise and experience of revegetation at the KNE site within their membership. WPRG's first plantings at the KNE site were undertaken in 2006 and they have achieved particularly good results in restoring areas of dune, wetland, coastal escarpment and riparian margins.

The aims of revegetation work at Whitireia Coast KNE site are to:

- help restore native plant communities in uncommon and degraded ecosystems found in the KNE site, ie, dunes, wetlands, estuary and riparian margins, and coastal escarpments
- connect areas of high value habitat with vegetated corridors
- protect coastal edges from erosion and sea level rise, and buffer the estuary from human activities and dogs
- increase the distribution of threatened plant species and re-introduce missing plant species
- provide food sources for native fauna such as birds, lizards and butterflies.

Particular areas of focus for revegetation for WPRG over the five years of this plan are:

- to supplementary plant already established restoration areas (see Appendix 1, Map 7, revegetation areas A)
- to undertake mass planting to assist the regeneration of native forest in the valley and on the slopes that form the catchment of Onehunga Bay (see Appendix 1, Map 7, revegetation area B). This will connect the remnant forest to other existing patches of native vegetation within the catchment and Onehunga Stream, and extend and strengthen the vegetated corridor extending up the Onehunga Stream valley towards the top of the Onepoto Stream valley. A restoration plan for this area is being developed by WPRG

(draft Whitireia Park Forest Restoration Plan 2019[59]). This restoration plan will guide this area of revegetation work

- to plant areas of degraded coastal habitat (see Appendix 1, Map 7, revegetation areas C).

WPRG aims to plant about 2,000 plants per year. Some funding for this is provided on an ongoing basis by Greater Wellington, while WPRG may seek additional funding from other sources. WPRG were awarded a grant from Te Awarua-o-Porirua Harbour Catchment Community Restoration Fund in 2018 to support revegetation work that they are undertaking in areas of the KNE site that are within the Te Awarua-o-Porirua Harbour catchment. This grant will fund the maintenance of these revegetation sites during the first year of this plan.

Protection of sensitive cultural and archaeological sites in Whitireia Park

When undertaking revegetation activities, care is taken to prevent any disturbance of sensitive cultural and archaeological sites. In order to do this effectively, archaeological assessments will be undertaken of areas planned to be revegetated during the period of this plan and appropriate exclusion areas within them will be defined. If required an archaeological authority will be obtained from Heritage NZ and revegetation activities will follow conditions required by the authority. The Greater Wellington Parks department will arrange and fund this work during 2019-20. Additionally, if new archaeological sites or individual artefacts are accidently exposed during revegetation work, the accidental discovery protocol[60] aimed at guiding the preservation of such sites and artefacts will be followed. Given the historical significance of the site to Ngāti Toa, an iwi monitor may also be present during revegetation activities.

Note that the revegetation areas shown on Map 7 in Appendix 1 don't exclude known archaeological sites that are located within them. Recorded archaeological sites are shown on Map 8 in Appendix 1.

Some planting may be undertaken in Rocky Bay and adjacent bays (see Appendix 1, Map 7, revegetation area D) by Greater Wellington or PCC to increase the diversity of native plant species and replace ecological weeds following their control in this area.

To increase the abundance and distribution of some threatened and uncommon plant species found at the KNE site, plants of some of these species will be grown from seed or cuttings sourced from within the KNE site and the resulting plants planted at appropriate locations in the KNE site. Species that are most suitable for this approach, due to them being relatively easy to propagate and likely to survive well in the KNE site, include pīngao (*Ficinia spiralis*), Carex 'raotest', kōkōmuka (*Veronica elliptica*), thick-leaved māhoe (*Melicytus crassifolius*), Cook Straight melicytus (*Melicytus orarius*), large-leaved milk tree (*Streblus banksii*) and pygmy button daisy (*Leptinella nana*). Appropriate habitat will be created for planting pygmy button daisy into and the habitat will be maintained to assist its survival.

Appendix 4 provides a full list of plants appropriate for revegetation at the KNE site and the type of habitat most suitable for them. This is not an all-inclusive list, there may be species not included on this list that are also appropriate for planting.

An important part of revegetation is controlling ecological weeds in areas where revegetation is undertaken. This control protects plantings from inundation by weeds allowing them to survive and grow strongly. Control is undertaken before and after planting and includes spot spraying of grasses.

9.4. Community engagement

The purpose of Greater Wellington's community engagement regarding the KNE site is to increase the interest in, and the value placed on native biodiversity at the KNE site by the public.

An important part of Greater Wellington's community engagement is to support WPRG in its undertaking of restoration activities in the KNE site, including finding ways to increase the number of volunteers that participate in restoration activities.

Greater Wellington also engages with members of the public and informs them of the ecological values and the management undertaken through the KNE programme by the following means:

- Public events
- Signage
- Occasional press articles

9.5. Park management

Greater Wellington undertakes biodiversity operational activities at the KNE site. This includes using best practice methods when undertaking ecological weed and pest animal control, and undertaking the following activities that help to control the natural resources of the site.

Dog control

Dog control policies for Whitireia Park help to protect some nesting and roosting birds in the KNE site. The policies require owners to keep dogs on leads in areas of the coast where little penguin are likely to nest.

Environmental care

Greater Wellington operational staff follow procedures to identify and avoid damage to biodiversity values such as plant and animal communities. Procedures may include undertaking assessments of environmental effects of planned works. This will limit risks to these values that could occur while carrying out the construction and maintenance of assets, and when permitting the use of the KNE site by other users.

Research and the collection of natural materials

Research activities and the collection of native plants and animals within the Whitireia Park part of the KNE site is managed by a permit system run by Greater Wellington's Environmental Science department. The Whitireia Park Ranger keeps a look out for unauthorised activities of this sort while carrying out normal duties within the Park.

9.6. Exploring remediation of fish passage

Biodiversity staff will explore the degree to which a natural drop off in Onepoto Stream near its mouth creates a barrier to the passage of fish up this stream. If it does form more than a minor barrier, practical options for improving the passage of native fish over or around the drop off will be considered. The first step of this will consist of just scoping and enquiry but if the implementation of a practical solution is sought as a result then funding may be sought from the Greater Wellington Freshwater Fish programme or another budget to fund its implementation.

10. Operational delivery schedule

The operational delivery schedule shows the actions planned to achieve the stated objectives for the Whitireia Coast KNE site, and their annual timing. The budget is subject to change. Maps of operational areas can be found in Appendix 1 (see Maps 4, 5 and 6).

Table 4: Five-year operational plan for the Whitireia Coast KNE site

Objective	Management activity	Operational area	The actions: description/detail/comments	Intended 5 year outcome	Implementing party	Annual funding
1, 2	Ecological weed control	B (Western escarpments and bays)	Control a range of woody, climbing and ground covering ecological weeds including succulents and pampas, primarily by aerial spraying	Ecological weed species are reduced to being only a very minor component of the plant community in the southern half of the operational area	Greater Wellington Biosecurity department	$16,350
1, 2	Ecological weed control	C (Uncommon ecosystems including dunes, wetlands, turfs, estuary and remnant forest)	Control a range of ecological weeds impacting the native ecology	Ecological weeds are having negligible impact of the ecology of the ecosystems	Greater Wellington Biosecurity department	$1,000
1, 2	Ecological weed control	Whole KNE site	Control ecological weeds that could potentially have a large impact on the native ecology but are currently sparse in density	New potentially severely impacting ecological weeds have been prevented from establishing	Greater Wellington Biosecurity department	$3,000
3	Ecological weed control	B (Sites of threatened and uncommon plants on Western escarpments and bays)	Control ecological weeds surrounding individual specimens of threatened and uncommon plant species	Ecological weeds are having no impact on specimens of threatened and uncommon native plant species	Greater Wellington Biosecurity department and WPRG	$500

Objective	Management activity	Operational area	The actions: description/detail/comments	Intended 5 year outcome	Implementing party	Annual funding
1, 2	Ecological weed control	Residential edges of KNE site	Undertake surveillance for garden waste dumping and if prevalent, undertake a letter-box drop to surrounding residents to highlight the threat posed by the practice	Ecological weed establishment and spread isn't occurring as a result of garden rubbish dumping	Greater Wellington Biodiversity department	Nil*
2	Pest animal control	Whole KNE site	Control mustelids, hedgehogs and rats by checking and re-baiting traps and bait stations about every four weeks	Minimal predation of native birds, lizards and invertebrates by these pest species is occurring	WPRG	$700 (bait and materials only)
2	Pest animal control	Whole KNE site	Audit the trap and bait station network to ensure safe and effective operation	No injuries as a result of operating traps or bait stations occur, and control remains effective	Greater Wellington Biosecurity department	$1,000
1, 2	Pest animal control	Whole KNE site	Keep the KNE site free of possums by undertaking night-time searches every three months and deploying control devices at locations of possum observations in and around the KNE site	The KNE site remains free of possums	Greater Wellington Biosecurity department	$3,200 (combined funding allocation for these two activities)
1	Pest animal control	Whole KNE site	Control rabbits by night-time searches and trapping	Rabbits are having minimal impact on planted or naturally regenerating native plants	Greater Wellington Biosecurity department	
2	Pest animal control	D	Control mice to protect lizard populations by checking and re-baiting traps and bait stations, and monitor mouse and lizard populations	Abundance of lizard populations has increased and knowledge of the effectiveness of mouse control methods has been gained	WPRG	$3,000#

Objective	Management activity	Operational area	The actions: description/detail/comments	Intended 5 year outcome	Implementing party	Annual funding
4	Revegetation	Revegetation areas A, B and C	Undertake cultural and archaeological assessments of planned revegetation areas and follow the Accidental Discovery Protocol during revegetation work	All known cultural and archaeological sites are defined and excluded from revegetation areas, and all new sites or artefacts discovered during revegetation work are protected appropriately	Greater Wellington Parks department and WPRG	##
1, 2, 4	Revegetation	Revegetation areas A, B and C	Plant native seedlings to restore native ecosystems; bolster existing plantings, enhance the forest cover of the Onehunga Stream catchment, establish a vegetated corridor between stream catchments, and re-plant coastal habitats	Plantings are thriving, native ecosystems are functioning more fully and ecological corridors are establishing	WPRG with support from Greater Wellington Biodiversity and Parks departments	$3,000
3	Revegetation	Revegetation area D	Collect propagules of threatened and uncommon native plant species found at the KNE site, grow plants from propagules, and plant resulting plants in suitable locations	Abundance of threatened and uncommon native plant species has increased.	Greater Wellington Biodiversity department, contractors and WPRG	$850
1, 2, 3	Community engagement	Whole KNE site	Support WPRG in its activities and help to build its volunteer base. Promote the biodiversity values of the KNE site to the general public during public events	WPRG are enabled to undertake its activities through strong operational support and volunteer numbers The general public are aware of and respect the biodiversity values of the KNE site	Greater Wellington Parks and Biodiversity departments	Nil*
2	Park management	Coastal areas	Communicate and enforce the dog control policy through signage and surveillance	No disturbance or harm of little penguin or other wildlife by dogs	Greater Wellington Parks department	Nil*

Objective	Management activity	Operational area	The actions: description/detail/comments	Intended 5 year outcome	Implementing party	Annual funding
1, 2, 3	Park management	Whole KNE site	Adhere to Greater Wellington best practice guidelines and policies aimed at protecting the natural environment while undertaking operational activities and managing recreational and commercial activities in the KNE site	Minimal impacts are imposed on biodiversity values by operational, recreational and commercial activities	Greater Wellington Parks, Biodiversity and Biosecurity departments	Nil*
5	Fish barrier assessment	Onepoto Stream	Explore the need and means of improving fish passage past the barrier in Onepoto Stream and implement a practical solution if required.	Solutions are explored and implemented if required.	Greater Wellington Biodiversity department	Nil**
Total						**$32,600**

Funded by Greater Wellington Parks department on annual approval by the Whitireia Park Board.
Archaeological assessments will be funded by Greater Wellington Parks department on approval by the Whitireia Park Board. The cost of this isn't know at this time.
* Staff time only is required to deliver this activity.
** Staff time only is required to deliver the first stage of this activity. Project funding will be sought if it is found that the implementation of a solution is required.

11. Funding contributions

11.1. Budget allocated by Greater Wellington

The budget is subject to change.

Table 5: Greater Wellington allocated annual budget for the Whitireia Coast KNE site

Management activity	Annual budget
Ecological weed control	$18,850
Pest animal control	$7,900[#]
Revegetation	$3,850
Total	**$30,600**

[#] Includes $3,000 funded by Greater Wellington Parks department on annual approval by the Whitireia Park Board

11.2. Budget allocated by Porirua City Council

The funding allocated by PCC is used exclusively on PCC-owned land, ie, at Rocky Bay and the adjacent bays. This budget is subject to confirmation through PCC's ten-year planning process.

Table 6: Porirua City Council allocated annual budget for the Whitireia KNE site

Management activity	Annual budget
Ecological weed control	$2,000
Total	**$2,000**

12. Future opportunities

12.1. Offset revegetation opportunities

Large areas of rural land in Porirua City will likely be developed for housing over the coming years as anticipated by PCC's Growth Strategy[61]. The Whitireia Coast KNE site could provide a location for planting or other measures to offset the ecological impacts of this land development. Areas of Whitireia Park that are currently vegetated in rank grasses or sparse gorse and native shrubs might especially benefit from this. Any biodiversity offsets within the KNE site would need to be considered and approved by the Park Board.

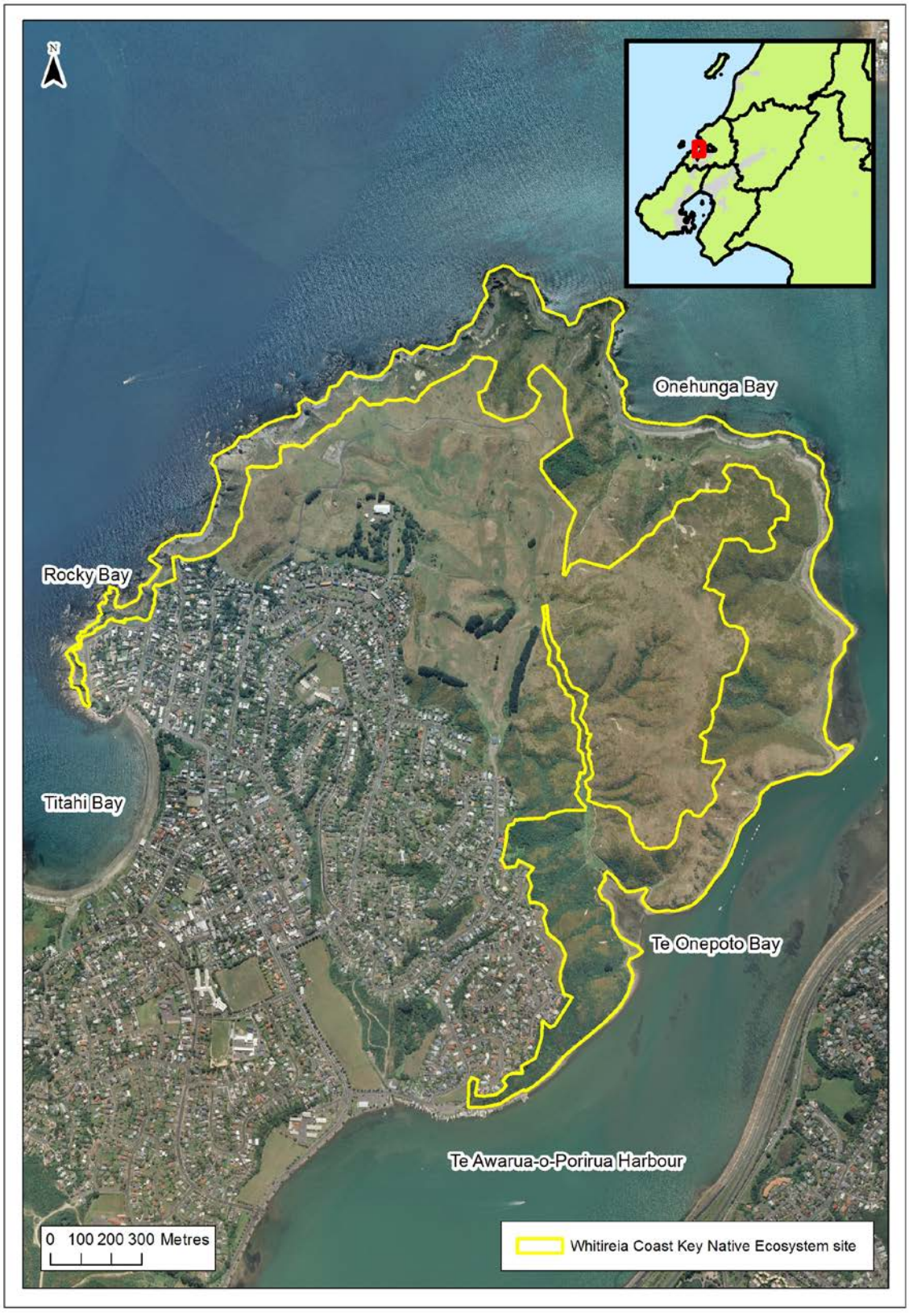
12.2. Translocation of native species

It is possible that Greater Wellington or the Whitireia Park Board may be approached again by property developers seeking to translocate native animal species such as

lizards to the KNE site or other areas of Whitireia Park as a result of them being rescued from land about to be developed. Or WPRG may seek to translocate species to the KNE site or other areas of the Park as a part of ecological restoration.

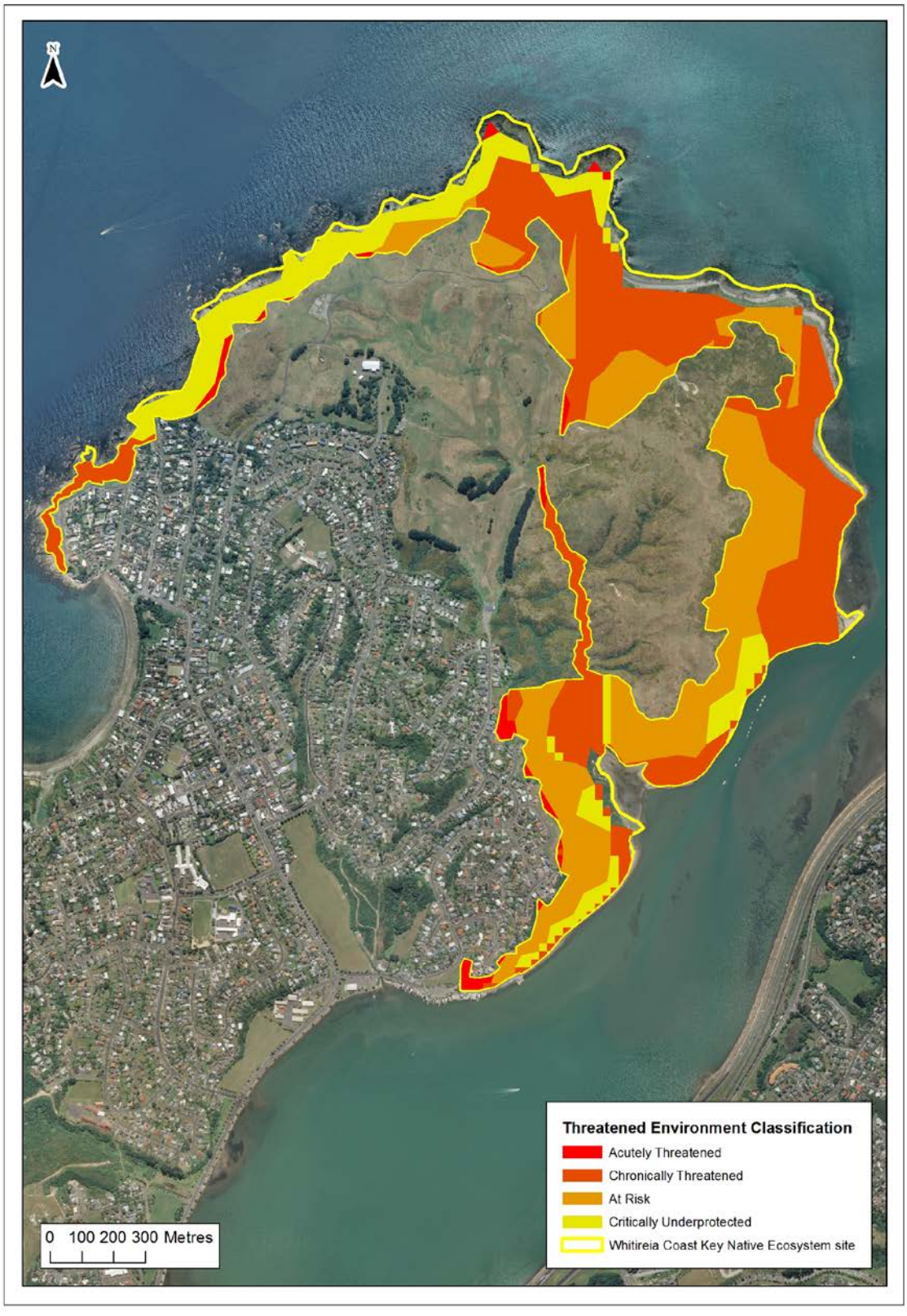
Any application to translocate native species to the KNE site will be managed according to Greater Wellington's internal process developed for the purpose. This process includes an assessment of the appropriateness of the translocation in regards to the benefits or impacts on the local biodiversity of the KNE site, as well as the benefit to the broader landscape and species conservation.

Appendix 1: Site maps

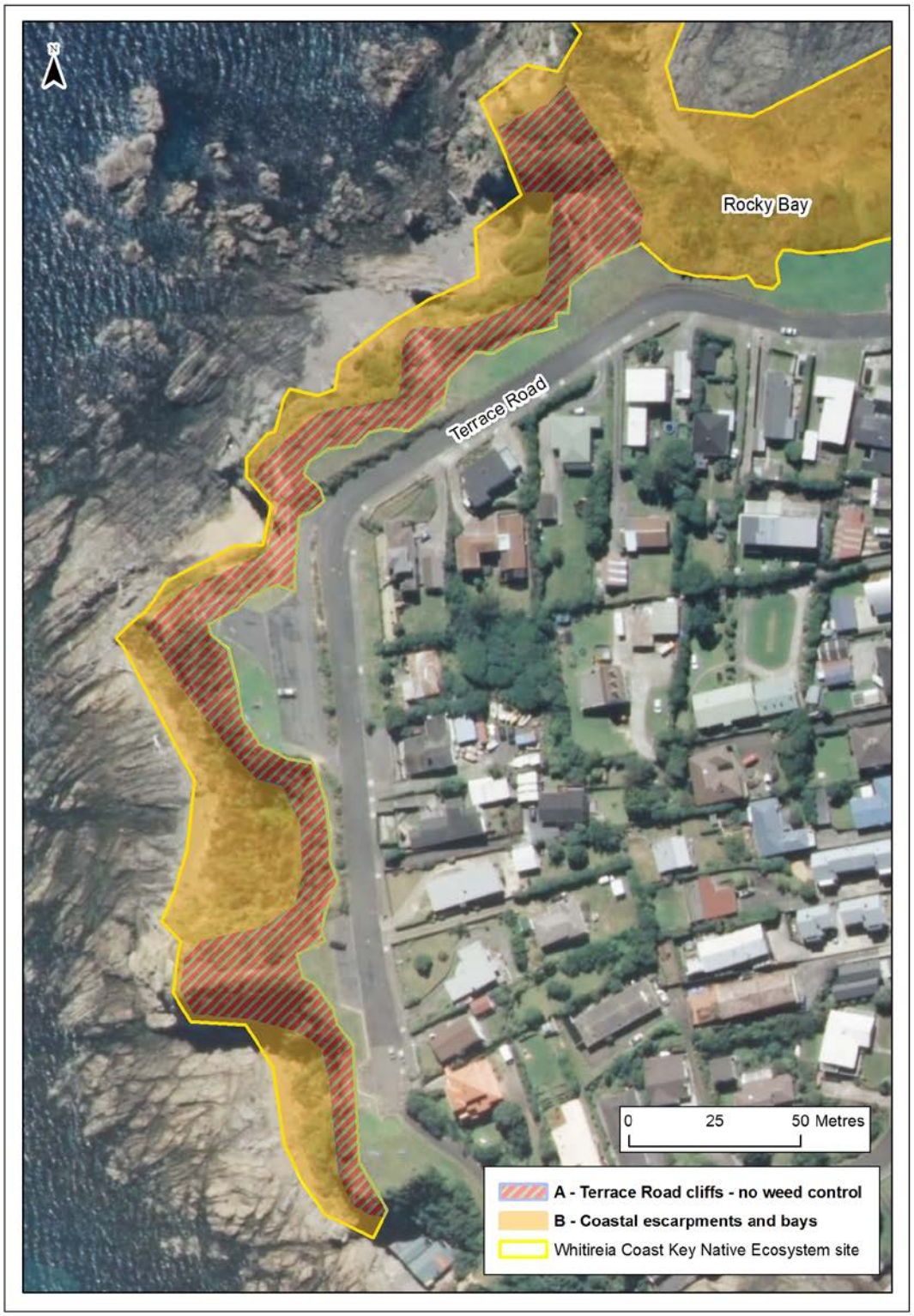


Map 1: The Whitireia Coast KNE site boundary

Map 2: Land parcel ownership in the Whitireia Coast KNE site and the boundary of Whitireia Park



Map 3: Land Environment New Zealand threat classifications for the Whitireia Coast KNE site

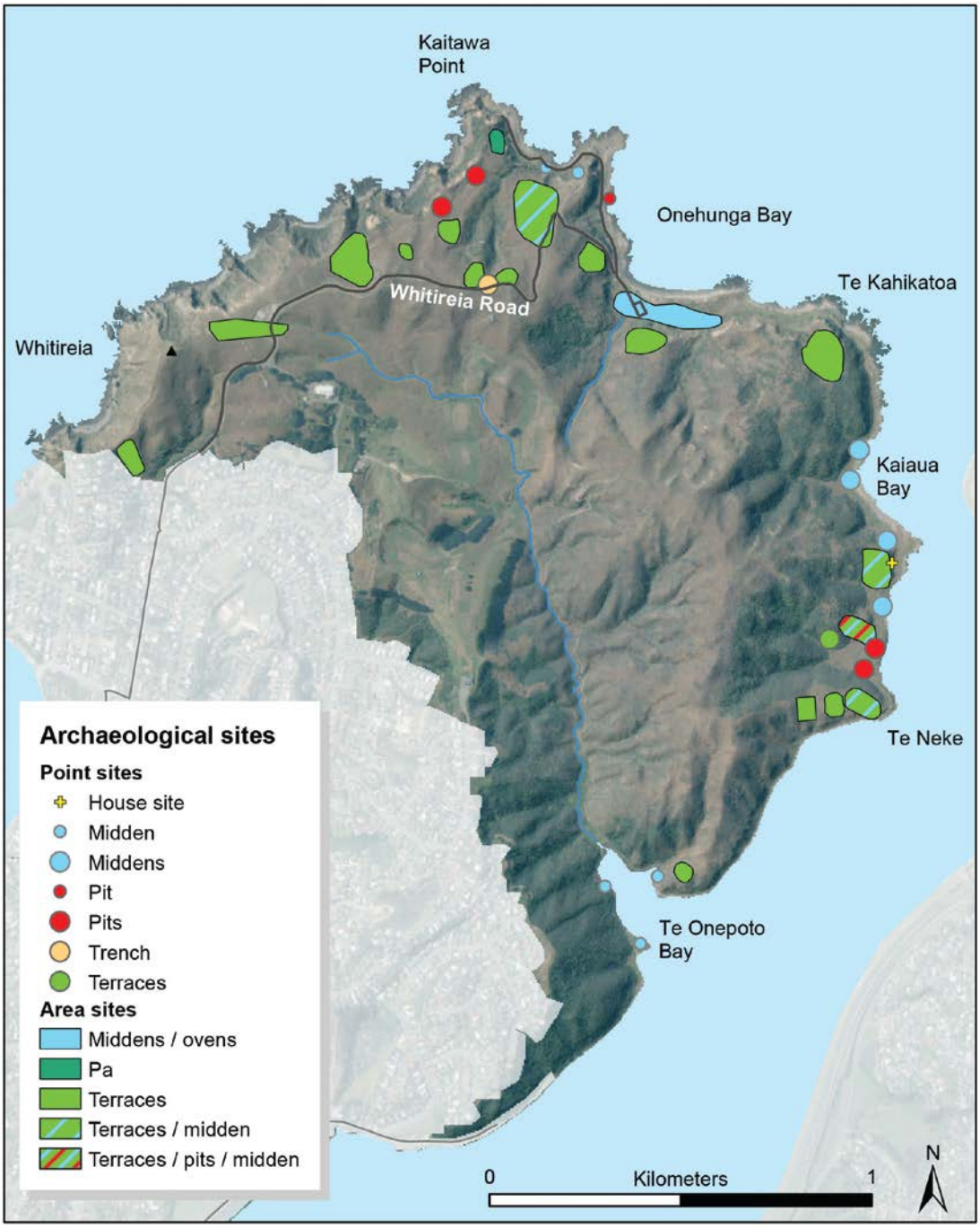


Map 4: Operational areas for ecological weed control in the coastal escarpments and bays adjacent to Terrace Road in the south-western corner of the Whitireia Coast KNE site. No ecological weed control is undertaken in Operational Area A. This operational area consists of the cliff tops and steep faces down to the base of the steep faces

Map 5: All operational areas for ecological weed control in the Whitireia Coast KNE site

Map 6: Locations of traps and bait stations for pest animal control in the Whitireia Coast KNE site. Pest control is also undertaken through night-shooting and survielance

Map 7: Revegetation areas in the Whitireia Coast KNE site



Map 8: Locations of recorded archaeological sites in Whitireia Park. Most of these sites are located within the Whitireia Coast 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[62]. 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 Whitireia Coast KNE site.

Table 7: Threatened and At Risk species at the Whitireia Coast KNE site

Scientific name	Common name	Threat status	Observation
Plants(vascular)[63]			
Aciphylla squarrosa	Spaniard	At Risk - Declining	Robyn Smith, pers comm 2019
*Atriplex cinerea**	Grey saltmarsh	Nationally Critical	Robyn Smith, pers comm 2019
*Coprosma acerosa**	Sand coprosma	At Risk - Declining	Robyn Smith, pers comm 2019
Craspedia uniflora var. *maritima*	Woollyhead	At Risk - Declining	Robyn Smith, pers comm 2019
*Discaria toumatou**	Matagouri	At Risk - Declining	Robyn Smith, pers comm 2019
*Euphorbia glauca**	Waiu-atua/sea spurge	At Risk - Declining	Robyn Smith, pers comm 2019
*Ficinia spiralis**	Pingao/golden sand sedge	At Risk - Declining	Robyn Smith, pers comm 2019
Kunzea robusta	Kanuka	Threatened – Nationally Vulnerable	Robyn Smith, pers comm 2019
Leptinella nana	Pygmy button daisy	Threatened - Nationally Critical	Robyn Smith, pers comm 2019
Leptospermum scoparium	Manuka	At Risk - declining	Robyn Smith, pers comm 2019
Lophomyrtus bullata	Ramarama	Threatened – Nationally Critical	Robyn Smith, pers comm 2019
Linum monogynum var. *monogynum*	Rauhuia	At Risk - Declining	Robyn Smith, pers comm 2019
Melicytus crassifolius	Thick-leafed māhoe	At Risk - Declining	Robyn Smith, pers comm 2019
Melicytus orarius	None known	At Risk - Declining	Robyn Smith, pers comm 2019
Metrosideros diffusa	White rata	Threatened – Nationally Vulnerable	Robyn Smith, pers comm 2019

Scientific name	Common name	Threat status	Observation
Metrosideros perforata	Akatea	Threatened – Nationally Vulnerable	Robyn Smith, pers comm 2019
Metrosideros robusta	Northern rata	Threatened – Nationally Vulnerable	Robyn Smith, pers comm 2019
Pimelea cryptica	Pimelea	Data Deficient	Robyn Smith, pers comm 2019
*Poa billardierei**	Hinarepe/sand tussock	At Risk - Declining	Robyn Smith, pers comm 2019
Sonchus kirkii	Shore pūhā	At Risk - Declining	Robyn Smith, pers comm 2019
Streblus banksii	Turepo/large-leaved milk tree	At Risk - Relict	Enright P. and John O. 2000[64]
Trisetum antarcticum	None known – native grass species	At Risk - Declining	Robyn Smith, pers comm 2019
Birds[65]			
Anthus novaeseelandiae novae seelandiae	NZ pipit	At Risk - Declining	New Zealand ebird website (accessed 22/01/2014)
Eudyptula minor	Kororā/little penguin	At Risk - Declining	B. Thomas, pers obs 2018
Haematopus unicolor	Variable oystercatcher	At Risk - Recovering	New Zealand ebird website (accessed 22/01/2014)
Larus novaehollandiae	Tarāpunga/red-billed gull	At Risk - Declining	New Zealand ebird website (accessed 22/01/2014)
Phalacrocorax varius	Pied shag	Threatened - Nationally Vulnerable	New Zealand ebird website (accessed 22/01/2014)
Sterna striata	Tara/white-fronted tern	At Risk - Declining	New Zealand ebird website (accessed 22/01/2014)
Freshwater fish[66]			
Anguilla dieffenbachii	Longfin eel	At Risk - Declining	New Zealand Freshwater Fish Database[67]
Galaxias maculatus	Inanga	At Risk - Declining	New Zealand Freshwater Fish Database

*species naturally occurring at the KNE site as a result of the species being re-introduced.

Appendix 3: Regionally threatened plant species list

The following table lists regionally threatened species that have been recorded in the Whitireia Coast KNE site. Native plant species have been identified in the Plant Conservation Strategy, Wellington Conservancy 2004-2010[68].

Table 8: Regionally threatened plant species recorded in the Whitireia Coast KNE site

Scientific name	Common name	Threat status	Observation
Vascular plants			
Aciphylla squarrosa	Spaniard	Regionally Vulnerable	Robyn Smith, pers comm 2019
*Anthosachne solandri (*syn. *Elymus solandri)*	Blue wheatgrass	Data Deficient	Robyn Smith, pers comm 2019
Asplenium obtusatum	Shore spleenwort	Regionally Critical	Robyn Smith, pers comm 2019
Atriplex cinerea	Grey saltmarsh	Extinct in wild	Robyn Smith, pers comm 2019
Coprosma acerosa	Sand coprosma	Gradual Decline	Robyn Smith, pers comm 2019
Discaria toumatou	Matagouri	Serious Decline	Robyn Smith, pers comm 2019
Craspedia uniflora var. maritima	Woollyhead	Regionally vulnerable	Robyn Smith, pers comm 2019
Euphorbia glauca	Waiu-atua/sea spurge	Regionally Critical	Robyn Smith, pers comm 2019
Leptinella nana	Pygmy button daisy	Regionally Critical	Robyn Smith, pers comm 2019
Melicytus crassifolius	Thick-leafed māhoe	Gradual Decline	Robyn Smith, pers comm 2019
Melicytus orarius	Cook Strait Melicytus	Regionally Critical	Robyn Smith, pers comm 2019
Raoulia aff. *Hookeri* (AK 239529; “coast”)	Scabweed	Gradual Decline	Robyn Smith, pers comm 2019
Sonchus kirkii	Shore pūhā	Sparse	Robyn Smith, pers comm 2019
Streblus banksii	Turepo/large-leaved milk tree	Regionally Endangered	Robyn Smith, pers comm 2019
Trisetum antarcticum	None known – native grass species	Gradual Decline	Robyn Smith, pers comm 2019
Veronica elliptica	Kōkōmuka/shore hebe	Range Restricted	Robyn Smith, pers comm 2019

Appendix 4: Revegetation plant list

Plants from the following table may be used in revegetation planting as per Section 9.3.

Table 9: Revegetation plant list for use within the Whitireia Coast KNE site

Scientific name	Common name
Estuarine habitats	
Apodasmia similis	Oioi / jointed wire rush
Austroderia toetoe	Toetoe
Carex testacea	Speckled sedge
Ficinia nodosa	Wiwi / knobby club rush
Juncus kraussii	Sea rush
Phormium tenax	Harakeke / flax
Plagianthus divaricatus	Saltmarsh ribbonwood
Wetland habitats	
Apodasmia similis	Oioi / jointed wire rush
Austroderia toetoe	Toetoe
Carex maorica	Māori sedge
Carex secta	Purei
Coprosma robusta	Karamū
Coprosma tenuicaulis	Hukihuki / swamp coprosma
Cordyline australis	Ti kouka / cabbage tree
Cyperus ustulatus	Giant umbrella sedge
Machaerina rubiginosa	Baumea
Phormium tenax	Harakeke / swamp flax
Schoenoplectus tabernaemontani	Kuāwa
Coastal habitats	
Acaena pallida	Piripiri / sand bidibid
Aciphylla squarrosa var *squarrosa*	Taramea
Atriplex cinerea	Grey saltbush
Austroderia fulvida	Toetoe
Austroderia toetoe	Toetoe
Carex flagellifera	Glen Murry tussock
Carex “raotest”	No common name known
Carmichaelia australis	NZ common broom
Clematis forsteri	Forster’s clematis

Scientific name	Common name
Coprosma acerosa	Sand coprosma
Coprosma propinqua	Mingimingi
Cordyline australis	Ti kouka / cabbage tree
Discaria toumatou	Matagouri
Euphorbia glauca	Waiu-atua / shore spurge
Ficinia spiralis	Pingao / golden sand sedge
Lepidium oleraceum	Nau / Cooks scurvy grass
Melicytus aff. *obovatus*	Cook Strait Melicytus
Melicytus crassifolius	Thick-leaved māhoe
Muehlenbeckia astonii	Shrubby toraro
Muehlenbeckia complexa	Pōhuehue
Myoporum laetum	Ngaio
Olearia paniculata	Akiraho / golden akeake
Olearia solandri	Coastal tree daisy
Ozothamnus leptophyllus	Tauhini / cottonwood
Phormium cookianum subsp. *cookianum*	Whararikī / mountain flax
Phormium cookianum subsp. *hookeri*	Whararikī / mountain flax
Pimelea arenaria	No common name known
Pimelea cryptica	Pimelea
Pimelea prostrata	Pinātoro / New Zealand daphne
Poa billardierei	Hinarepe / sand tussock
Poa cita	Silver tussock
Sonchus kirkii	Pūhā / New Zealand sow thistle
Spinifex sericeus	Kowhangatara / spinifex
Tetragonia implexicoma	Native spinach
Tetragonia tetragonioides	Kokihi / New Zealand spinach
Veronica elliptica	Kōkōmuka / shore hebe
Veronica stricta	Koromiko / hebe

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