Key Native Ecosystem Operational Plan for Keith George Memorial Park

2020-2025

Contents

1. Purpose

The purpose of the five-year Key Native Ecosystem (KNE) Operational Plan for Keith George Memorial Park 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 Biodiversity Strategy

The Greater Wellington Biodiversity Strategy[3] (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. Keith George Memorial Park Key Native Ecosystem site

The Keith George Memorial Park KNE site (150 ha) includes the reserves known as Keith George Memorial Park and Silverstream Scenic Reserve, and an adjacent area of privately owned land. The KNE site contains forest remnants, native bush and regenerating scrub. The forest remnants, within which the greatest biodiversity values lie, consists predominately of tawa (*Beilschmiedia tawa*) and beech (*Fuscospora* spp.) forest with scattered podocarps.

The KNE site is located on southeast-facing slopes above Te Awa Kairangi/Hutt River, north of the junction of SH2 and SH58 in Upper Hutt City (see Appendix 1, Map 1). The KNE site lies within a largely contiguous belt of indigenous forest stretching along the western slopes of the Te Awa Kairangi/Hutt River valley. Also included in this belt are Belmont – Dry Creek KNE site, Trentham Scenic Reserve and Akatawara Forest KNE site.

5. Parties involved

There are several organisations that play important roles in the care of the KNE site.

5.1. Landowners

Keith George Memorial Park and Silverstream Scenic Reserve which comprise most of the KNE site are owned and managed by the Upper Hutt City Council (UHCC). Both of these areas are gazetted as scenic reserve. UHCC has collaborated with Greater Wellington in planning and funding biodiversity management at the KNE site since 1998.

The remainder of the KNE site (approx. 20 ha) is privately owned by the animal welfare organisation Helping You Help Animals Trust (HUHA). HUHA has agreed for this area of its land to be included in the KNE site and permit Greater Wellington to carry out pest animal and ecological weed control. Plantation pine forest was harvested from small sections of this land in 2016. HUHA plans to allow these areas to regenerate naturally with native vegetation.

Land ownership boundaries are shown on Map 2 in Appendix 1.

5.2. Operational delivery

Within Greater Wellington, two departments are responsible for delivering the KNE operational plan.

- The Biodiversity department is the overarching lead department on the longer term planning and coordination of biodiversity management activities and the provision of biodiversity management advice within the KNE site
- The Biosecurity department implements the planned pest control measures with funding provided by the Biodiversity department and UHCC

Greater Wellington's Environmental Science department manages bird monitoring at the KNE site on behalf of UHCC.

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 1, below, lists ecological designations at all or part of the Keith George Memorial Park KNE site.

Table 1: Designations at the Keith George Memorial Park KNE site

Designation level	Type of designation
National	Most of the KNE site is gazetted as Scenic Reserve: • Keith George Memorial Park • Silverstream Scenic Reserve
District	Most of the KNE site is identified by DOC as a Designated Ecological Site: • Silverstream Bush

6.2. Ecological significance

The Keith George Memorial Park 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 indigenous plant, bird and freshwater fish species

Representativeness

The Singers and Rogers (2014)[4] classification of pre-human vegetation indicates the KNE site would have originally comprised mostly two forest types; tawa, kamahi, podocarp forest (MF7) and kamahi, broadleaved, podocarp forest (MF8). Areas of mature forest that are representative of these forest types persist in the KNE site although no old growth forest remains. Only 22% of the pre-human extent of the MF7 forest type

remains in the Wellington region making it a regionally At Risk ecosystem type. The MF8 forest type is not threatened regionally with 85% of the original extent remaining in the region[5] (see Appendix 1, Map 3).

The Threatened Environment Classification system[6] indicates that small areas on the periphery of this KNE site are classified as Acutely Threatened. However, this is not considered representative of the KNE site as a whole, which predominately consists of habitat that is either At Risk or Less Reduced and Better Protected (see Appendix 1, Map 4).

Rarity/distinctiveness

New Zealand's national threat classification system[7] lists fifteen plant, three bird and two freshwater fish species found in the KNE site as nationally Threatened or At Risk. Four plant species found in the KNE site have been listed as regionally Threatened or At Risk. Nationally and regionally Threatened and At Risk species are listed in Appendices 2 and 3 respectively.

Ecological context

The KNE site is part of an ecological corridor that stretches from the Tararua Ranges in the north to the town belt reserves of Wellington City in the south. This corridor is important for native bird dispersal and breeding in this part of the region. The KNE site may be an important connection point for birdlife crossing the Hutt River valley due to the valley narrowing at this point.

6.3. Ecological features

The KNE site lies within the Wellington Ecological District[8] which is characterised by steep, strongly faulted hills and ranges and the large Hutt River valley. The climate is wet and windy, with warm summers and mild winters.

Vegetation communities and plants

The Keith George Memorial Park KNE site contains remnants of the original forests amongst regenerating native bush and scrub. The vegetation of the remnant forest predominantly comprises a canopy of tawa (*Beilschmiedia tawa*) and beech with scattered podocarps. The forest is considered to be in a modified condition having previously been logged in the 19th century. However, mature rimu (*Dacrydium cupressinum*), tōtara (*Podocarpus totara*), kahikatea (*Dacrycarpus dacrydioides*), mataī (*Prumnopitys taxifolia*), miro (*P. ferruginea*) and northern rātā (*Metrosideros robusta*) are still present[9]. Stands of black beech (*Fuscospora solandri*) and hard beech (*F. truncata*) are found within the remnant forest. The KNE site is near the southern limit for beech on the western side of the Hutt Valley.

Well-established regenerating forest cover is found in the steeply incised gullies that are tributaries of Te Awa Kairangi/Hutt River. Here the understory is dominated by māhoe (*Melicytus ramiflorus*) and kāmahi (*Weinmannia racemosa*). Native scrub regenerating in areas where radiata pine plantations have previously been harvested provide habitat diversity.

The Department of Conservation's ecological site inventory for the Silverstream Scenic Reserve part of the KNE site[10] describes the dominant vegetation communities present as:

- Tawa
- Hard beech/black beech
- Beech-tawa-kāmahi
- Kamahi scrub and low forest
- Māhoe
- Māhoe/mixed broadleaf
- Māhoe/tutu/koromiko/rangiora
- Mānuka/gorse scrub

Species

Birds

The KNE site is part of an important network of bush reserves in Te Awa Kairangi/Hutt River valley providing significant habitat for a range of forest bird species. Species recorded at the KNE site include the New Zealand falcon (*Falco novaeseelandiae*), red-crowned parakeet (*Cyanoramphus novaezelandiae novaezelandiae*), tomtit (*Petroica macrocephala*), bellbird (*Anthornis melanura*), kererū (*Hemiphaga novaeseelandiae*), tūī (*Prosthemadera novaeseelandiae*), grey warbler (*Gerygone igata*)[11] and whitehead (*Mohoua albicilla*)[12].

Reptiles

While there are no records for reptiles within the site, barking gecko (*Naultinus punctatus*) and ngahere gecko (*Mokopirirakau* 'southern North Island') might be present as these species have been recorded in the vicinity[13] and suitable habitat for these species is present in the KNE site.

Fish

The KNE site contains several streams that flow into Te Awa Kairangi/Hutt River. These streams might support a variety of native freshwater fish and aquatic invertebrates. Four species of native freshwater fish have been recorded in one of the streams. These are longfin eel (*Anguilla dieffenbachia*), giant kōkopu (*Galaxias argenteus*), banded kōkopu (*Galaxias fasciatus*) and common bully (*Gobiomorphus cotidianus*).

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 primary threats to the ecological values of the KNE site are from the impacts of ecological weeds and pest animals.

Ecological weeds are widespread throughout the KNE site and range from mature wilding pine trees to ground-covering plant species. Infestations are concentrated and more dense on the outer edges of the KNE site and on the edges of stream courses and tracks within the KNE site. Appendix 4 contains a list of ecological weed species recorded in the KNE site and Table 2 below identifies the species having the most impact at the KNE site.

The pest animal species that pose the greatest threat to the KNE site are possums (*Trichosurus vulpecula*), rats (*Rattus* spp.) and mustelids (*Mustela* spp.). Ongoing control means that these species are currently having little impact; however, residual and surrounding populations mean that they continue to pose a threat. Other pest animal species that pose a threat are feral goats (*Capra hircus*), which intermittently range through the KNE site, and hedgehogs (*Erinaceus europeaeus*).

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 2 presents a summary of all known threats to the Keith George Memorial Park 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 2: Summary of all threats to ecological values present at the Keith George Memorial Park 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 in the KNE site include tradescantia (*Tradescantia fluminensis*), selaginella (*Selaginella kraussiana*) and montbretia (*Crocosmia* × *crocosmiiflora*), (see full list in Appendix 4)	Forest edges, stream and track edges
EW-2	Woody ecological weeds displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key woody ecological weed species for control in the KNE site include buddleia (*Buddleja davidii*), Spanish heath (*Erica lusitanica*), Darwin's barberry (*Berberis darwinii*) and broom (*Cytisus scoparius*), (see full list in Appendix 4)	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
EW-3	Climbing ecological weeds 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 in the KNE site include old man's beard (*Clematis vitalba*), cathedral bells (*Cobaea scandens*), banana passionfruit (*Passiflora tripartita* var. *mollissima*), German ivy (*Hedera helix* subsp. *helix*), Japanese honeysuckle (*Lonicera japonica*) and jasmine (*Jasminum polyanthum*), (see full list in Appendix 4)	Entire KNE site
Pest animals		
PA-1	Possums (*Trichosurus vulpecula*) browse palatable canopy vegetation until it can no longer recover[14,15]. This destroys the forest's structure, diversity and function. Possums may also prey on native birds and invertebrates[16]	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[17,18]	Entire KNE site
PA-3	Mustelids (stoats[19,20] (*Mustela erminea*), ferrets[21,22] (*M. furo*) and weasels[23,24] (*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[25], lizards[26] and the eggs[27] and chicks of ground-nesting birds[28]	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[29,30]	Entire KNE site
PA-6*	Pest and domestic cats (*Felis catus*) prey on native birds[31], lizards[32] and invertebrates[33], reducing native fauna breeding success and potentially causing local extinctions[34]	Entire KNE site
PA-7*	Wasps (*Vespula* spp.) adversely impact native invertebrates and birds through predation and competition for food resources. They also affect nutrient cycles in beech forests[35]	Entire KNE site
PA-8*	Feral pigs (*Sus scrofa*) root up the soil and eat roots, invertebrates, seeds and native plants preventing forest regeneration[36]	Entire KNE site
PA-9	Goats (*Capra hircus*) 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[37]	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
PA-10*	Eastern rosella (*Platycercus eximius*) parakeets are known to out-compete native red-crowned parakeets for nest-sites and are a vector of avian diseases. The continued presence of eastern rosella in the KNE site could limit the ability of red crowned parakeets to establish functional populations[38,39]	Entire KNE site
Human activities		
HA-1*	Garden waste dumping often leads to ecological weed invasions into natural areas	KNE site boundary
HA-2*	Recreational use such as tramping and mountain biking, and the building of tracks for these activities can damage and disturb the native ecosystem and introduce ecological weeds	Entire KNE site
HA-5*	Poor water quality affects a range of species in the streams. High nutrient levels and contaminants within watercourses are often caused by upstream land management practices and pollution events including development practices, forestry and agricultural practices, road run-off and storm water entering the watercourse, and sceptic tank leakages	All streams
HA-6*	Dogs (*Canis lupus familiaris*), if uncontrolled/unleashed can disturb or kill nesting birds and chicks, and lizards within the KNE site, particularly in close proximity to walking tracks[40]	Entire KNE site
Other threats		
OT-1*	A lack of legal protection can leave a site at risk of future development or destruction and resources invested in the site may be wasted. Part of this KNE site is private property and uncovenanted, having no protection status	Private land parcels

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

8. Vision and objectives

8.1. Vision

The entire Keith George Memorial Park KNE site resembles the forest ecosystem originally present and supports increasingly diverse and successfully breeding populations of native birds, lizards, invertebrates and fish.

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 Keith George Memorial Park KNE site.

1. **Protect the areas of mature native forest**
2. **Improve the regeneration and native dominance of plant communities in the rest of the KNE site**
3. **Improve the habitat for terrestrial native fauna and protect them from predation**
4. **Improve the habitat for native freshwater fish**

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 3).

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.

9.1. Ecological weed control

The aims of ecological weed control at the KNE site are to protect the areas of mature native forest within the KNE site from infestation by ecological weeds and improve the regeneration and native dominance of the plant communities in other areas of the KNE site by reducing the impacts of ecological weeds in those areas.

Ecological weed control is mainly undertaken in three operational areas; operational areas A-C (see Appendix 1, Map 5). Control is undertaken in these areas to either control ecological weeds that are having significant impacts in the area or to eliminate a weed species that could spread widely and have significant impact if not controlled now. The main focus of ecological weed control in each operational area is:

- Operational Area A – to control old man's beard on steep faces above SH2, and control tradescantia and selaginella on stream and swale edges
- Operational Area B – to control highly invasive ecological weed species on the bush edge that aren't currently wide spread
- Operational Area C – to control selaginella, tradescantia and climbers through the main stream corridor

Further detail of the approaches taken in each operational area follows.

<u>Operational area A</u>

Operational area A is a steep escarpment with areas of stream and swale at its base. Large concentrated infestations of old man's beard have been present here for many years and although control in recent years has been effective, continued control of old man's beard is likely to be required for many years to come. Access to most of the escarpment is difficult. Therefore old man's beard control in this area is undertaken utilising abseil contractors to cut vine stems and administer herbicide gel to the

remaining stumps. Foliar spraying using a drone may be trialled and may be used for control if proven more efficient and effective than abseiling. Control of old man's beard plants immediately beyond the KNE site boundary is undertaken to reduce seed spreading in to the KNE site.

Widespread infestations of tradescantia are present on the edges of the stream and swale, and creeping a considerable distance up the escarpment in places. Selaginella is present to a much lesser extent. Control of these species in this area has been successful with some areas being kept clear of plants. The priorities here are to eliminate selaginella from this area completely, prevent tradescantia from spreading into the forest and reduce tradescantia infestations in the rest of the area. Control is undertaken working progressively from the south, where less plants are present, to the north where dense infestations are present.

Operational area B

Operational area B contains extensive and dense infestations of a range of ecological weed species. Despite a lot of effort having gone into control operations in this area in the last several years, these infestations still exist and appear to be spreading. To make the best use of resources, a very strategic approach must be taken in this area. Rather than continuing with past approaches that haven't delivered desired results, a change has been made to focus on only controlling species that are highly invasive and impacting, and are in infestations small enough that elimination or significant reductions in size of the infestations can be achieved within a few years. Species identified as priority 1 in Table 8 are being targeted in this way. The approach to ecological weed control in this area may be adapted again in the future if good gains are made and resources allow additional species or more wide spread control to be undertaken.

Operational area C

The first focus of ecological weed control in operational area C is to eliminate selaginella from the main stream corridor. Only small patches of selaginella are now present following good results of several years' control work. As resources are freed up from this work, consideration will be made of targeting tradescantia in the stream corridor. However, tradescantia is widespread through the stream corridor and found well upstream of the KNE site so control of it may not be possible. The second focus of control in operational area C is to control the mostly climbing and woody ecological weeds that are progressively invading open areas of the stream corridor.

All the above ecological weed control is coordinated by Greater Wellington but jointly funded by Greater Wellington and UHCC.

Additional to the above actions, Greater Wellington's Biosecurity staff are continuing to monitor the effects of the biological control agent buddleia leaf weevil (*Cleopus japonicas*) on buddleia plants within the KNE site. Buddleia leaf weevils were released on the edge of the KNE site in 2013 and again in 2016. To date, the leaf weevil has had some impact on the health of buddleia plants in the KNE site, defoliating and reducing the vigour of plants to varying degrees. This might lead to less dispersal and fewer plants of the species. However, the weevil is unlikely to eliminate the need for some amount of conventional control of buddleia to be undertaken.

9.2. Pest animal control

The aims of pest animal control at the KNE site are to protect the areas of mature native forest, to improve native regeneration throughout the KNE site, and to protect native fauna such as native birds, lizards and invertebrates. This means controlling mammalian browsers that impact native forest and its ability to regenerate, and controlling predators of native fauna. The pest animal species that are controlled in the KNE site are possums, rats, mustelids (stoats and weasels), hedgehogs and goats.

Possums, rats and mustelids are kept at low levels throughout the KNE site through the operation of a network of bait stations and traps. Bait stations containing toxic bait are used to target possums and rats, while DOC200 style traps are used to target mustelids. A small number of bait stations and traps are located on private properties outside the KNE boundary to reduce the migration of possums into the KNE site. Currently all bait stations and traps are serviced every three months by contractors managed by Greater Wellington's Biosecurity department. Map 6 in Appendix 1 shows the locations of all bait stations and traps.

No monitoring of pest animal populations is undertaken in the KNE site; however the control methods being used are known to keep possum, rat and mustelid numbers to low levels most of the time.

Hedgehogs are also known to be present. It is likely that their numbers are being reduced somewhat by individuals being caught in the mustelid traps, but control of hedgehogs isn't comprehensive.

Feral goats are known to move through the KNE site occasionally. They are controlled when Biosecurity staff are able to respond at the time of observations.

9.3. Fish passage assessment

The aim of undertaking fish passage assessments is to improve the availability of suitable habitat for as many species of fresh water fish as possible.

During the timeframe of this operational plan an assessment of any structures found within the streams of the KNE site and downstream as far as Te Awa Kairangi/Hutt River will be undertaken. Where structures are identified as a barrier to fish passage, ways of alleviating the barriers will be explored and implemented if possible. This work will be undertaken by Biodiversity staff.

9.4. Bird monitoring

UHCC funds bird monitoring in a number of reserves in Upper Hutt, including at Keith George Memorial Park KNE site. Five-minute bird counts are undertaken annually to assess trends in abundance, diversity and distribution of native birds across UHCC parks and reserves. Data collected at the KNE site is used to indicate the success of the management activities undertaken here.

10. Operational delivery schedule

The operational delivery schedule shows the actions planned to achieve the stated objectives for the Keith George Memorial Park KNE site, and their annual cost. The budget is subject to change for years 2021/22 to 2024/25. Maps showing operational areas can be found in Appendix 1 (see Map 5 and 6).

Table 3: Five-year operational plan for the Keith George Memorial Park KNE site

Objective	Activity	Operational area	Action	Intended outcome	Implementing party	Annual funding
1, 2	Ecological weed control	A	Control old man's beard using an abseil or drone operating contractor	The forest canopy is free of major old man's beard infestations	Greater Wellington Biosecurity dept	$5,500
1, 2	Ecological weed control	A	Control selaginella and tradescantia	Selaginella and tradescantia are eliminated from enclosed areas of forest	Greater Wellington Biosecurity dept	$500
1, 2	Ecological weed control	B	Control discrete infestations of highly impacting ecological weeds (listed as high priority in Appendix 4)	Targeted infestations are eliminated or significantly reduced in size	Greater Wellington Biosecurity dept	$3,000
1, 2	Ecological weed control	C	Control selaginella, and tradescantia if resources allow	Selaginella is eliminated, the extent of tradescantia is reduced	Greater Wellington Biosecurity dept	$1,000
1, 2	Ecological weed control	C	Control climber and woody ecological weed species listed as priority 1 in Appendix 4	No major impacts from climber and woody ecological weeds in the stream corridor	Greater Wellington Biosecurity dept	$3,000
3	Pest animal control – possums, rats & mustelids	Entire KNE site	Check and re-bait bait stations and traps every three months	Minimal browsing of native vegetation, and predation of native fauna, by target pest species is occurring. The possum population is kept to below 5%RTC*, and the rat population is kept to below 5%TTI**.	Greater Wellington Biosecurity dept	$9,000
1, 2	Pest animal control – feral goats	Entire KNE site	Control goats when they are observed in the KNE site and staff resources are available	Minimal browsing of native vegetation by goats	Greater Wellington Biosecurity dept	$1,000

Objective	Activity	Operational area	Action	Intended outcome	Implementing party	Annual funding
4	Fish passage	Streams within and downstream of KNE site	Survey streams for structures posing barriers to native fish passage and exlore ways of alleviating barriers found	Most native fresh water fish can move freely into and through the KNE site	Greater Wellington Biodiversity dept	0†
3	Bird monitoring	UHCC land	Undertake five-minute bird counts annually as part of UHCC'c reserve wide bird monitoring programme	Data collected is used to inform future management	Upper Hutt City Council and Greater Wellington Environmental Science dept	$3,097††
					Total	**$26,097**

*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. The control regime has been designed to control rats/mustelids to this level but monitoring will not be undertaken. Experience in the use of this control method indicates this target will be met.
†Only staff time required for survey and exploration of barrier solutions. Funding may be sought for implementation of solutions.
†† Not funded through the KNE programme. This amount has been calculated as a relative proportion of the total cost of the UHCC reserves bird monitoring programme.

11. Funding contributions

11.1. Budget allocated by Greater Wellington

Table 4: Greater Wellington allocated budget for the Keith George Memorial Park KNE site

Management activity	Annual budget
Ecological weed control	$6,500
Pest animal control	$8,000
Fish passage	0†
Total	**$14,500**

†Only staff time required for survey and exploration of barrier solutions. Funding may be sought for the implementation of solutions.

11.2. Budget allocated by Upper Hutt City Council

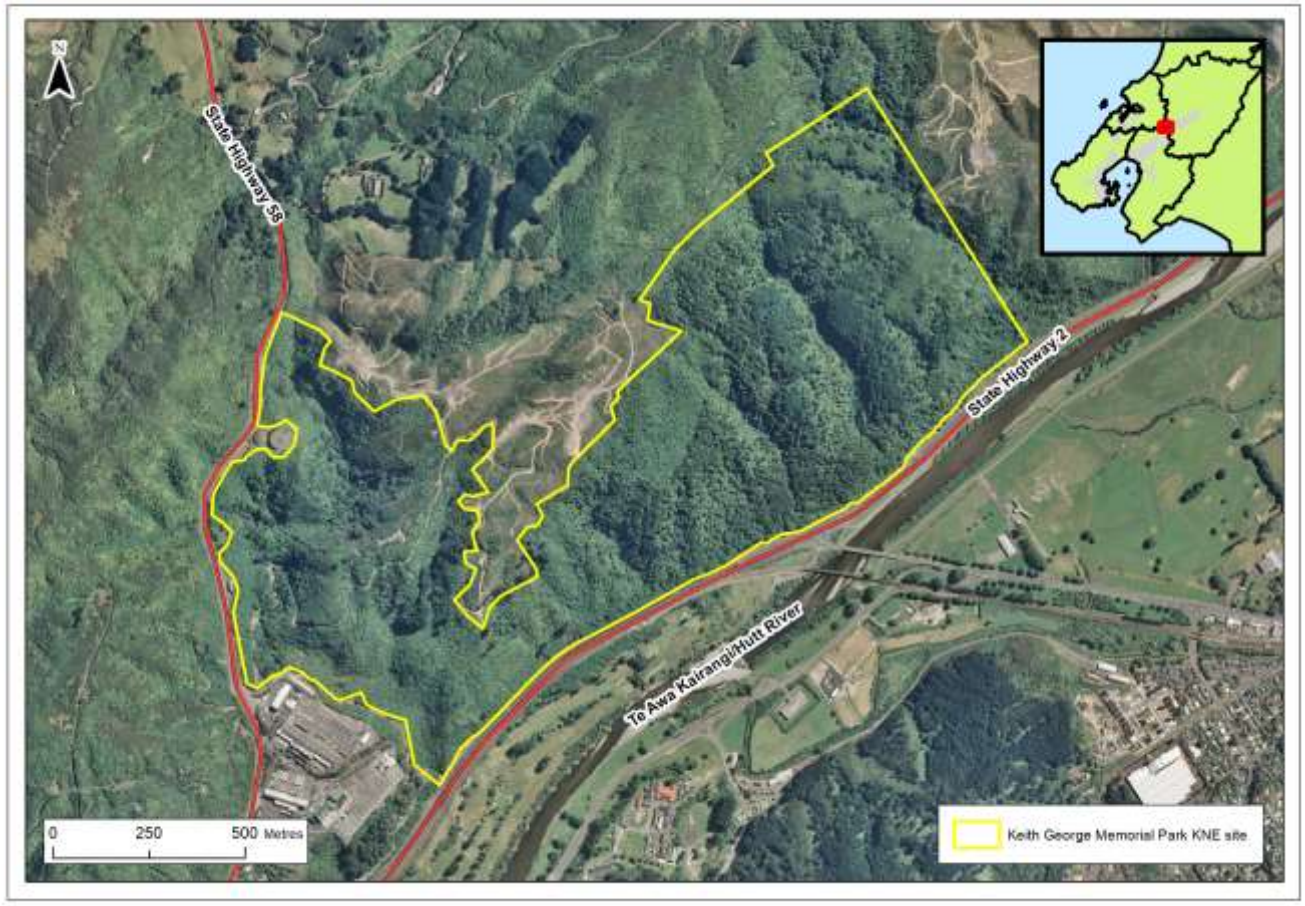
The budget is subject to confirmation through the Upper Hutt City Council long term planning process.

Table 5: Upper Hutt City Council allocated budget for the Keith George Memorial Park KNE site

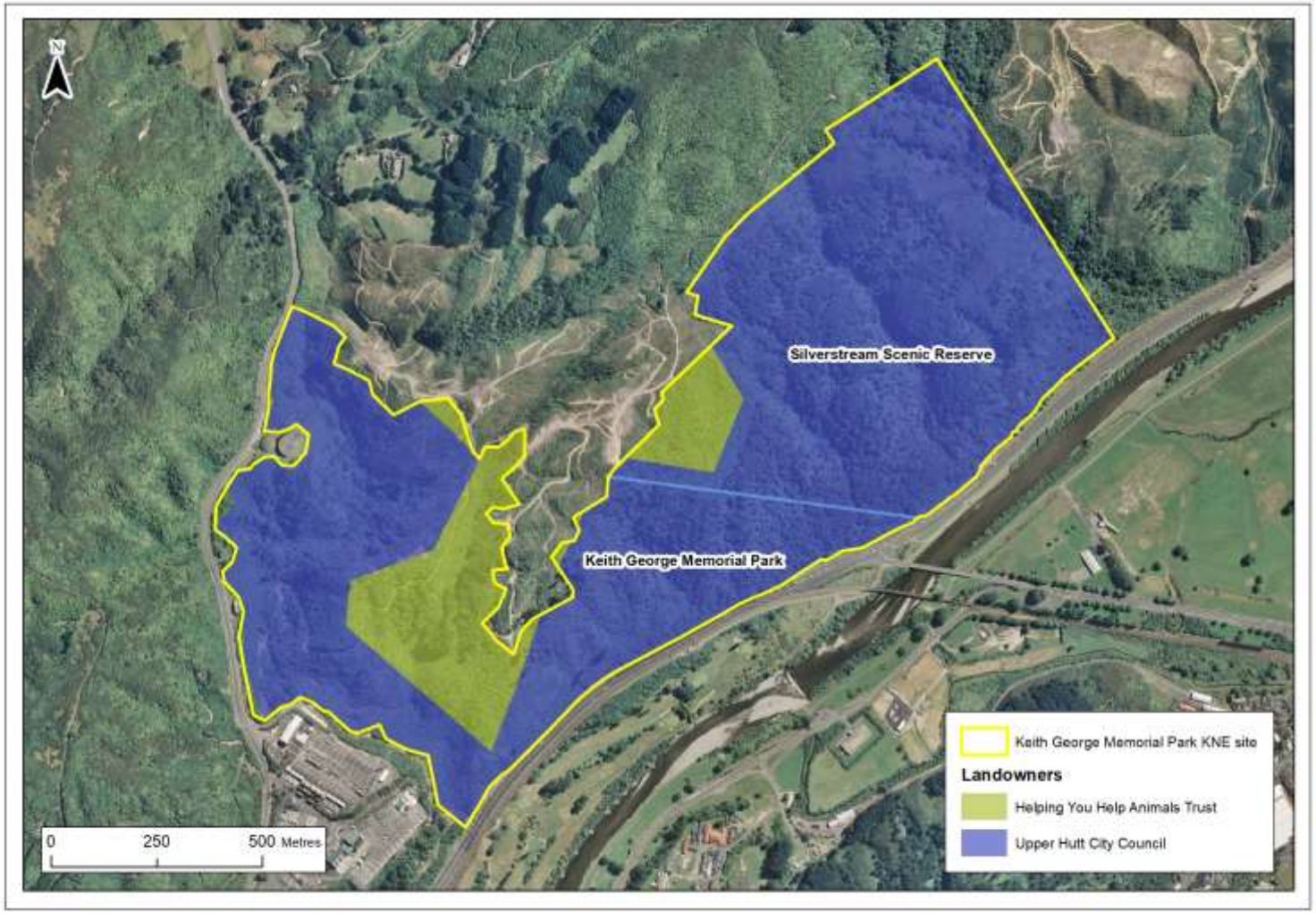
Management activity	Annual budget
Ecological weed control	$6,500
Pest animal control	$2,000
Bird monitoring	$3,097††
Total	**$11,597**

†† Not funded through the KNE programme; part of UHCC's reserves bird monitoring programme.

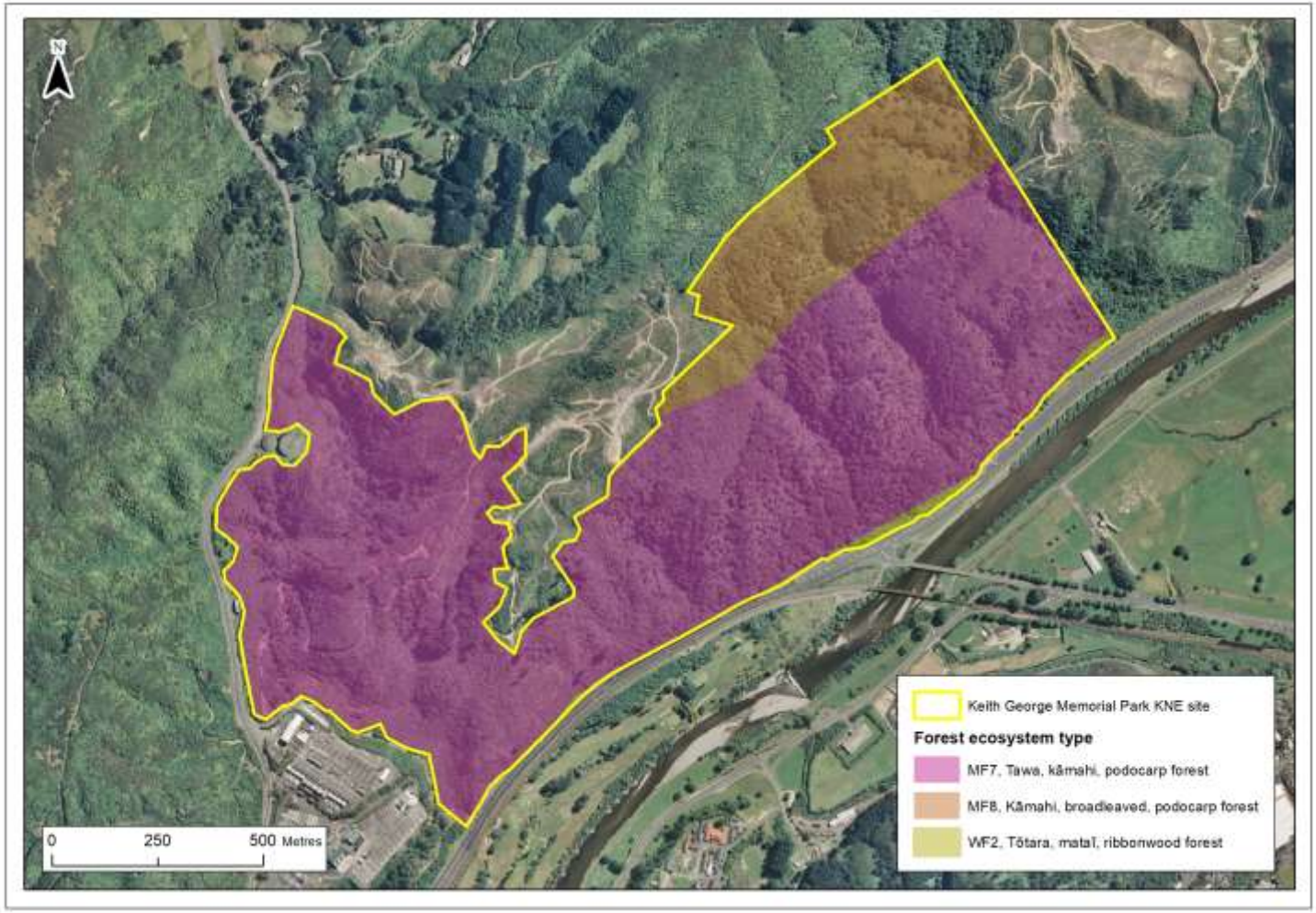
Appendix 1: Site maps



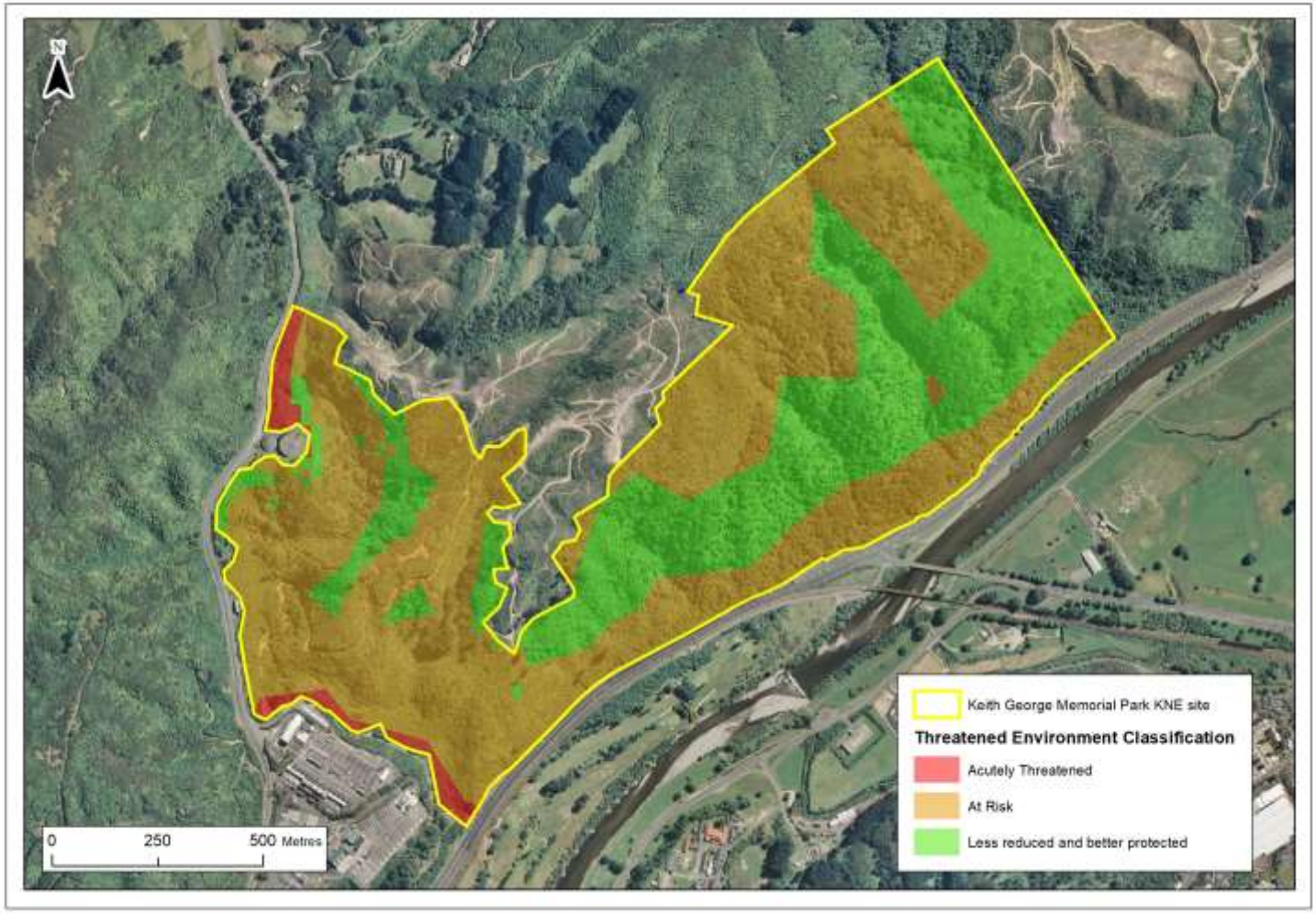
Map 1: The Keith George Memorial Park KNE site boundary



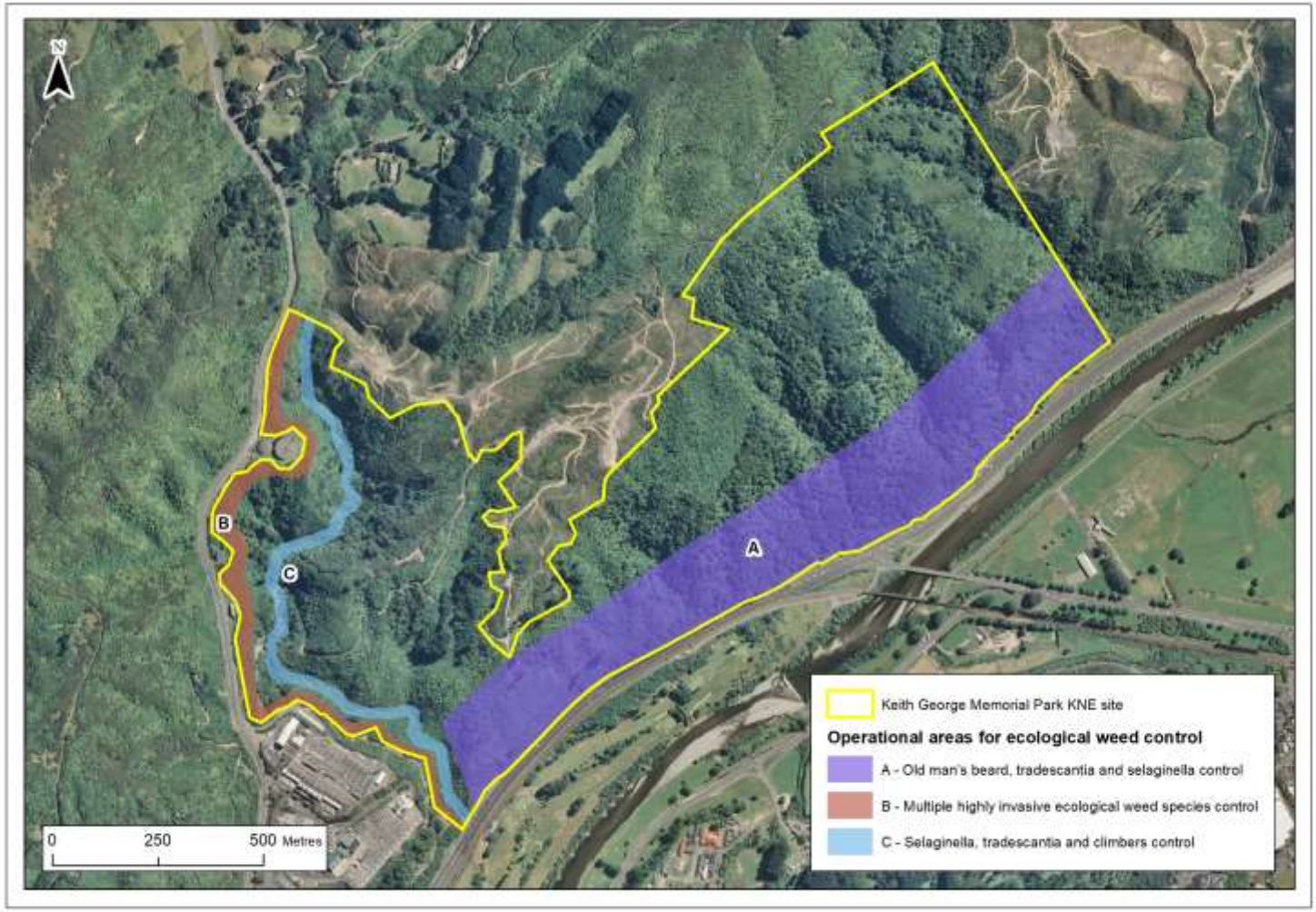
Map 2: Landowners at the Keith George Memorial Park KNE site



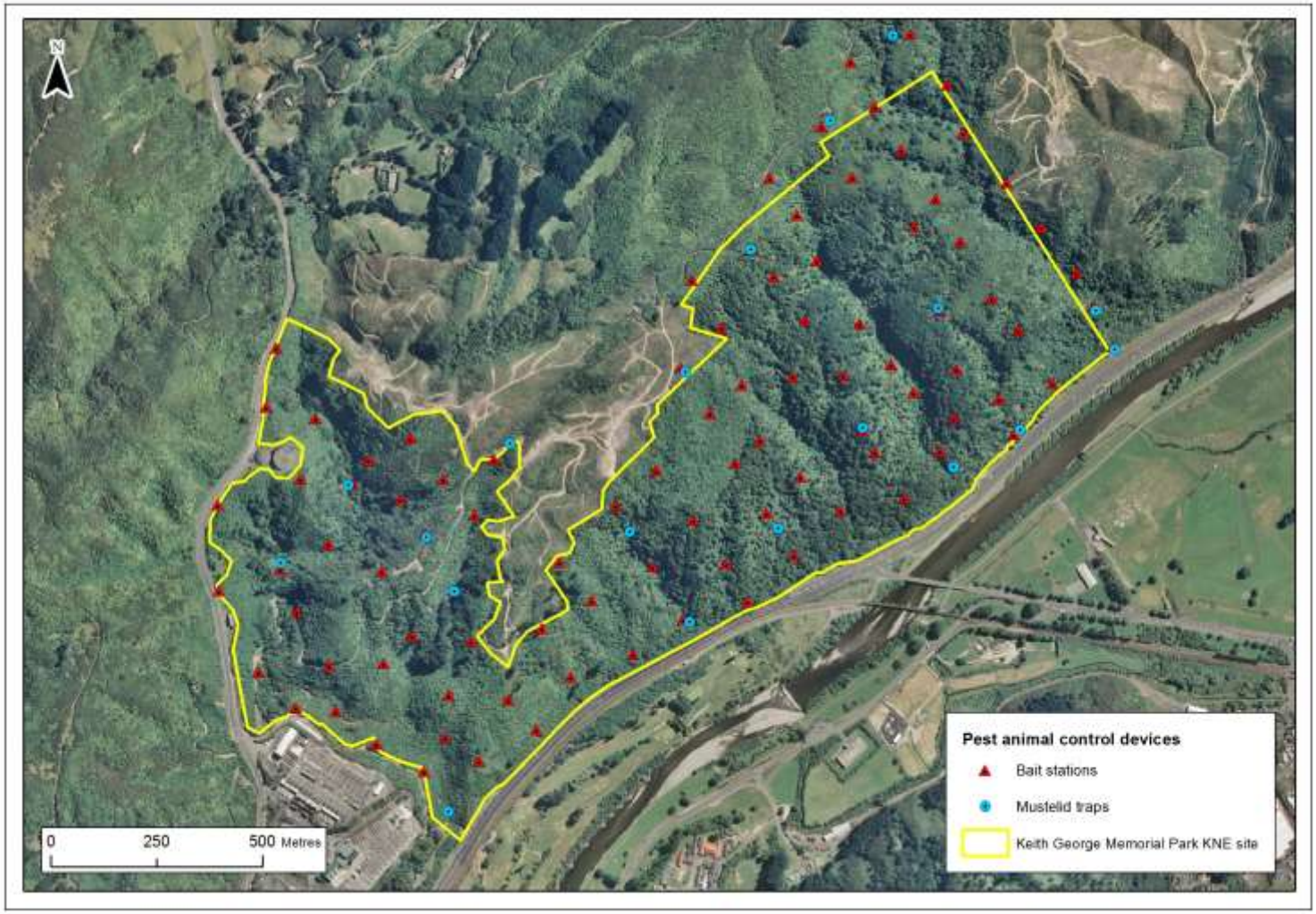
Map 3: Singers and Rogers classification of pre-human forest vegetation types for the Keith George Memorial Park KNE site



Map 4: Land Environment New Zealand threat classifications for the Keith George Memorial Park KNE site



Map 5: Operational areas in the Keith George Memorial Park KNE site



Map 6: Pest animal control in the Keith George Memorial Park 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[41]. 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 Keith George Memorial Park KNE site.

Table 6: Threatened and At Risk species at the Keith George Memorial Park KNE site

Scientific name	Common name	Threat status	Observation
Plants(vascular)[42]			
Corunastylus nuda	Red leek orchid	At Risk – Naturally Uncommon	New Zealand Plant Conservation Network (NZPCN) online database[43]
Corybas cryptanthus	Hidden spider orchid	At Risk – Naturally Uncommon	NZPCN online database[44]
Hypolepis dicksonioides	Giant hypolepis	At Risk – Naturally Uncommon	NZPCN online database
Kunzea robusta	Kānuka	Threatened – Nationally Vulnerable (myrtle rust)	NZPCN online database
Leptospermun scorparium	Mānuka	At Risk – Declining (myrtle rust)	NZPCN online database
Lophomyrtus bullata	Ramarama	Threatened – Nationally Critical (myrtle rust)	NZPCN online database
Metrosideros colensoi	Rātā	Threatened – Nationally Vulnerable (myrtle rust)	NZPCN online database
Metrosideros diffusa	White climbing rātā	Threatened – Nationally Vulnerable (myrtle rust)	NZPCN online database
Metrosideros fulgens	Climbing rātā	Threatened – Nationally Vulnerable (myrtle rust)	NZPCN online database
Metrosideros perforata	Akatea	Threatened – Nationally Vulnerable (myrtle rust)	NZPCN online database
Metrosideros robusta	Northern rātā	Threatened – Nationally Vulnerable (myrtle rust)	NZPCN online database
Mida salicifolia	Maire	At Risk – Declining	NZPCN online database
Peraxilla tetrapetala	Red Mistletoe	At Risk – Declining	NZPCN online database[45]
Solanum aviculare var. aviculare	Poroporo	Threatened – Nationally Vulnerable	Wassilieff et al. 1986[46]

Scientific name	Common name	Threat status	Observation
Sysygium maire	Maire tawake/swamp maire	Threatened – Nationally Critical (myrtle rust)	NZPCN online database
Birds[47]			
Cyanoramphus novaezelandiae	Red-crowned parakeet	At Risk – Relict	McArthur et al. 2012[48]
Falco novaeseelandiae	New Zealand falcon	At Risk – Recovering	McArthur et al. 2012
Mohua albicilla	Whitehead	At Risk – Declining	Broad K, pers obs. 2019
Freshwater fish[49]			
Anguilla dieffenbachii	Longfin eel	At Risk – Declining	NIWA freshwater fish database
Galaxias argenteus	Giant kōkopu	At Risk – Declining	NIWA freshwater fish database

Appendix 3: Regionally threatened species list

The following table lists regionally Threatened and At Risk species that have been recorded in the Keith George Memorial Park KNE site.

Table 7: Regionally Threatened and At Risk species recorded in the Keith George Memorial Park KNE site

Scientific name	Common name	Threat status	Observation
Plants[50]			
Corunastylus nuda	Red leek orchid	At Risk – Naturally Uncommon	New Zealand Plant Conservation Network (NZPCN) online database[51]
Diplazium australe	None known	Threatened – Vulnerable	Perrie L. pers comm.
Hypolepis dicksonioides	Giant hypolepis	Threatened – Critical	NZPCN online database
Peraxilla tetrapetala	Red Mistletoe	Threatened – Critical	NZPCN online database[52]

Appendix 4: Ecological weed species

The following table lists key ecological weed species that have been recorded in the Keith George Memorial Park KNE site. Species are grouped according to their priority for control at the KNE site. Species that are rated as priority 1 are the focus of current control (grey shading).

Table 8: Ecological weed species recorded in the Keith George Memorial Park KNE site

Scientific name	Common name	Priority
Buddleja davidii	Buddleia	1
Clematis vitalba	Old man's beard	1
Cotoneaster sp.	Cotoneaster	1
Crātāegus monogyna	Hawthorn	1
Hypericum androsaemum	Tutsan	1
Lonicera japonica	Japanese honeysuckle	1
Paraserianthes lophantha	Brush wattle	1
Passiflora spp.	Banana passionfruit	1
Salix sp.	Willow	1
Selaginella kraussiana	Selaginella	1
Senecio angulatus	Cape ivy	1
Senecio mikanioides	German ivy	1
Tradescantia fluminensis	Tradescantia	1
Tropaeolum majus	Nasturtium	1
Vinca major	Periwinkle	1
Convolvulus arvensis	Bindweed	2
Crocosmia × crocosmiiflora	Montbretia	2
Cytisus scoparius	Broom	2
Pinus radiata	Radiata pine	2
Populus alba	White poplar	2
Rubus fruticosus agg.	Blackberry	2
Rumex sagittatus	Climbing dock	2
Eucalyptus sp.	Eucalyptus	2
Cupressus macrocarpa	Macrocarpa	3
Ulex europaeus	Gorse	3

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