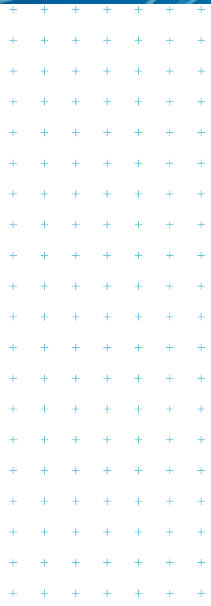




**Assessment of Ecological
Effects - Ōtāhuhu/Mount
Richmond Restoration**

Prepared for
Tūpuna Maunga Authority
Prepared by
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1 Introduction

The Tūpuna Maunga Authority has engaged Tonkin & Taylor Ltd (T+T) to prepare an ecological assessment of Ōtāhuhu/Mount Richmond (Ōtāhuhu) to accompany an Assessment of Environmental Effects to support a Resource Consent Application for the removal of exotic trees and re-vegetation on the maunga.

This report provides an assessment of ecological effects associated with the proposed cultural restoration of Ōtāhuhu, Auckland. This report has three objectives, namely:

- Assess the ecological values of current vegetation and habitats present on Ōtāhuhu;
- Assess potential effects on these ecological values from proposed removal of exotic trees from Ōtāhuhu; and
- Recommend mitigation measures that will allow any potential negative effects on the ecological values to be avoided, remedied, or mitigated.

This Assessment of Ecological Effects report has been prepared in accordance with our services agreement dated 1 August 2018.

1.1 Site description

Ōtāhuhu (the 'site') is a volcano situated within the Mt Richmond Domain, an approximately 23 ha reserve, Ōtāhuhu, Auckland. Ōtāhuhu is predominantly covered by an Auckland Council Outstanding Natural Features Overlay (Mt Richmond/Ōtāhuhu, ID 111), part of which is also covered by a Historic Heritage Overlay (Ōtāhuhu Pa Site). This volcanic cone was returned to Māori in a 2014 Treaty settlement and is governed by the Tūpuna Maunga Authority under a co-governance arrangement legislated under the Ngā Mana Whenua o Tāmaki Makaurau Collective Redress Act 2014.

Ōtāhuhu has a geology typical of other basalt volcanic cones in the Auckland Volcanic Field, with basaltic rock outcrops, craters, scoria, and rock bombs present. It has been extensively quarried in the past.

The site is dominated by grassland, with a variety of native plant species in small patches, and large mature native and exotic trees present across the maunga.

The diverse geology and flora onsite provides habitat and flora for a variety of native and introduced fauna species, but of particular note, native birds and lizards.

1.2 Proposed project

The applicant is applying to remove approximately 422 exotic trees over three metres in height within Ōtāhuhu. The approximate species break down of these exotic trees proposed to be removed is presented in Table 1.1.

Table 1.1: Exotic tree species on Ōtāhuhu to be removed

| Exotic tree species | No. removed |
|---|-------------|
| <i>Cedrus atlantica</i> - Atlas cedar, blue | 4 |
| <i>Fraxinus excelsior</i> - european ash, common ash | 8 |
| <i>Populus nigra</i> - Lombardy poplar, black poplar | 21 |
| <i>Tilia</i> sp. - lime, linden, basswood | 1 |
| <i>Araucaria heterophylla</i> - Norfolk Island pine | 1 |
| <i>Betula pendula</i> - silver birch | 5 |
| <i>Castanea sativa</i> - European chestnut | 3 |
| <i>Casuarina</i> sp. - she oak | 3 |
| <i>Cinnamomum camphora</i> - camphor laurel | 4 |
| <i>Crataegus laevigata</i> - English hawthorn | 24 |
| <i>Cryptomeria japonica</i> - Japanese cedar | 5 |
| <i>Cupressus macrocarpa</i> - Monterey cypress | 16 |
| <i>Cupressus sempervirens</i> - Italian cypress | 3 |
| <i>Cupressus x leylandii</i> - Leyland cypress | 1 |
| <i>Eucalyptus</i> sp. | 4 |
| <i>Fagus sylvatica</i> -european beech | 5 |
| <i>Ficus macrophylla</i> -Morton Bay fig | 26 |
| <i>Ginkgo biloba</i> | 1 |
| <i>Grevillea robusta</i> - silky oak | 6 |
| <i>Ilex</i> sp. - holly | 4 |
| <i>Liriodendron tulipifera</i> - tulip tree | 1 |
| <i>Magnolia soulangeana</i> x - Asian magnolia | 2 |
| <i>Olea</i> sp. - olive | 101 |
| <i>Phoenix canariensis</i> -phoenix palm | 5 |
| <i>Pinus radiata</i> - Monterey pine | 23 |
| <i>Pinus</i> sp. | 4 |
| <i>Platanus x acerifolia</i> - London Plane tree | 25 |
| <i>Populus deltoides</i> - cottonwood | 14 |
| <i>Populus x euramericana</i> - hybrid poplar <i>P. nigra</i> x <i>P. deltoides</i> | 4 |
| <i>Prunus</i> sp.-flowering cherry | 1 |
| <i>Quercus ilex</i> - holm oak | 13 |
| <i>Quercus palustris</i> - pin oak | 8 |
| <i>Quercus robur</i> - English oak | 9 |
| <i>Schinus mole</i> - Peruvian pepper tree | 1 |
| <i>Sequoia sempervirens</i> | 1 |
| <i>Ulmus glabra</i> - Scots wych elm | 25 |
| <i>Ulmus</i> sp. | 2 |
| <i>Washingtonia filifera</i> - fan palm | 10 |

| | |
|--|------------|
| Acmena smithii, Syzygium - Lilly Pilly, monkey apple | 15 |
| Magnolia grandiflora - N Am evergreen magnolia | 1 |
| Unknown species | 1 |
| Camellia sp. | 3 |
| Liquidambar styraciflua - sweetgum | 2 |
| Chamaecyparis lawsoniana - Port Orford cedar, Lawson cypress | 2 |
| Eriobotrya japonica - loquat | 2 |
| Hymenosporum flavum -Australian frangipani | 1 |
| Laurus nobilis - Bay laurel | 1 |
| Grand Total | 422 |

Three species identified on site are listed as pests in the regional pest management strategy (RPMS): Acmena/monkey apple (*Syzygium smithii*) is classified as an unwanted organism, English hawthorn (*Crataegus laevigata*) and Phoenix palm (*Phoenix canariensis*) are classified as Surveillance Pest Plants.

The exotic trees will be removed using a variety of methods to safely protect values present at the site, and be processed in flat areas¹. The exotic trees proposed to be removed, and their methods of felling, can be seen in Figure 1-1.

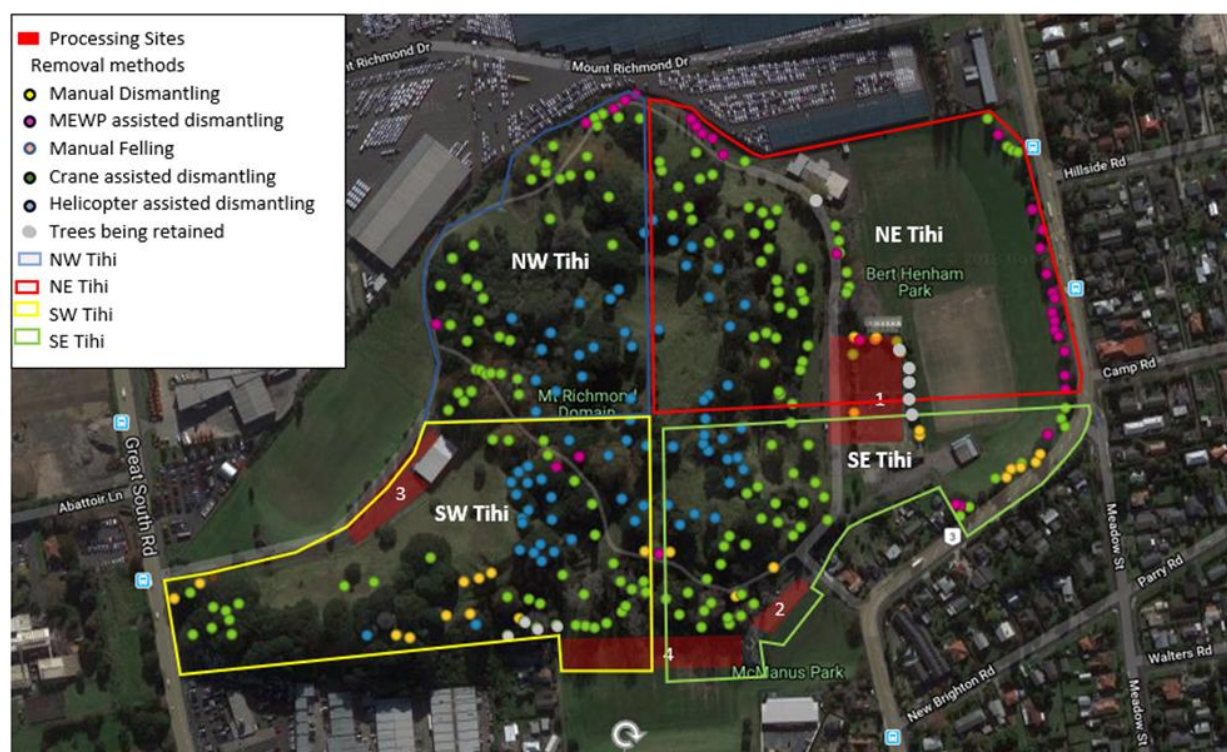


Figure 1-1: Proposed trees to be removed and the removal methods at Ōtāhuhu

The removal of the approximately 422 exotic trees from Ōtāhuhu is part of a project to restore cultural values and historic Māori defensive sightlines, protect archaeological values, and restore ecological values to the maunga. No native species are proposed to be removed from site.

¹ Treescape Arboriculture Consultants 2018. Ōtāhuhu - Richmond Mountain Arboriculture Operations Plan

1.3 Scope and methodology

The scope of this report is to present all ecological values considered relevant to this application, including biodiversity values, as well as to outline the potential magnitude of ecological effects (both positive and negative) associated with the proposed restoration project.

This report excludes the following assessments, as these will be dealt with by experts in those fields:

- Cultural values (e.g. cultural sites present);
- Historic values; and
- Landscape values (e.g. the visual value of the exotic trees proposed for removal).

The ecological assessment was conducted using the following methodologies:

- A desktop assessment of ecological data available from Auckland Council, Department Of Conservation, and other publicly available information;
- Site visits on the 3rd of September and the 8th of October 2018 to walkover Ōtāhuhu; and
- A review of site assessment reports prepared by other specialists, including arborist, herpetofauna, bats, and draft planting plans.

2 Ecological assessment

This section provides an assessment of the ecological values present at Ōtāhuhu.

2.1 Terrestrial flora values

2.1.1 Pre-human

Much of the Auckland isthmus, including Ōtāhuhu, would originally have been covered in what is classified as the WF7 puriri forest ecosystem type prior to human arrival².

The entire WF7 puriri Forest has a regional IUCN threat status of 'critically endangered', with some sub-habitats of this ecosystem type, specifically WF 7.2 'rock forest' present on basaltic volcanoes being even rarer.

2.1.2 Māori occupation

Examinations of pollen in sediment cores in a nearby volcano³ indicate that the increase in light demanding/tolerant plant species is evidence of Polynesian arrival and modification of the maunga in Auckland. While WF7 forest continued to be the dominant vegetation, cutting and burning to ensure sight and defensive lines from the maunga, as well as terracing and gardens occurred.

2.1.3 European occupation

European settlement saw introduced exotic species become dominant on the maunga of Auckland, particularly pasture grasses associated with farming land use. A number of exotic timber, hedging, ornamental and food species arrive with European farming methods. Pine pollen has been used as an indicator of European arrival³ and is observed in Auckland volcano cores.

² Singers, N.; Osborne, B.; Lovegrove, T.; Jamieson, A.; Boow, J.; Sawyer, J.; Hill, K.; Andrews, J.; Hill, S. and Webb, C. 2017. Indigenous terrestrial and wetland ecosystems of Auckland.

³ M. Horrocks, S. L. Nichol, D. M. D'Costa, P. Shane & C. Prior (2005) Palaeoenvironment and human impact in modifying vegetation at Mt St John, Auckland Isthmus, New Zealand, New Zealand Journal of Botany, 43:1, 211-221.

2.1.4 Current vegetation extent on Ōtāhuhu

The current vegetation on site is dominated by grassland, some of which is mown, although rank grass and weeds occur on boulder fields, quarried areas and steeper slopes. Specimen trees occur across Ōtāhuhu, with plantings concentrated around the road edge, slopes, and playing field edges.

Pines (*Pinus* sp.) and Moreton Bay fig (*Ficus macrophylla*) are a dominant landscape feature, being the largest trees present on the volcano flanks and near the tihi, although olives (*Olea* sp.) are the most numerous tree on the maunga (Figure 2-1). Mature native trees present include puriri (*Vitex lucens*), pohutukawa (*Metrosideros excelsa*), totara (*Podocarpus totara*), kohekohe (*Dysoxylum spectabile*) and karaka (*Corynocarpus laevigatus*), these being consistent with the WF7 ecosystem type – note that no native species are proposed to be removed from the maunga.

Pohuehue (*Muehlenbeckia* sp.) is present around some basalt rocks on the maunga. Karamu (*Coprosma* sp.) and kawakawa (*Piper excelsum*) are also present across the site.

Five sub-populations of the 'At Risk – Declining' species of *Pellaea falcata* are currently present on site. This species is 'Regionally Acutely Threatened – Regionally Critical' in Auckland, and is present around basalt boulders and cliffs where it has been protected from browsing and invasive exotic plant pressures.



Figure 2-1: Vegetation types on Ōtāhuhu

2.2 Terrestrial fauna values

2.2.1 Herpetofauna

A desktop and habitat assessment⁴ of Ōtāhuhu herpetofauna values was conducted by EcoGecko, no formal survey for lizards was undertaken. The assessments carried out have found that:

- Copper skink (*Oligosoma aeneum*) a 'Not Threatened' native species, confirmed present within 0.5 km of the site and habitat onsite is suitable to support this species;
- Ornate skink (*Oligosoma ornatum*) an 'At Risk – declining' species, confirmed present within 0.5 km site and habitat on site is suitable to support this species;
- Plague skink (*Lampropholis delicata*) a widespread introduced pest species are likely to be present; and
- No native gecko species are thought to be present on the site due to habitat unsuitability.

Skink habitats are present across the site, with the best examples around the basalt crags, rock bombs, scoria, old quarries, fallen logs, and dense low-structure vegetation and rank grass. Figure 2-2 provides an example of some of the skink habitat that is present in locations across the site.



Figure 2-2: Example of skink habitat present on site

⁴ Bell, T. 2018. Assessment of Environmental Effects of tree removals and habitat restoration activities on lizards at Ōtāhuhu. Technical report prepared for Auckland Council by EcoGecko Consultants Limited, January 2019.

2.2.2 Birds

Native birds encountered during the site walkover included at least three pairs of tui (*Prothemadera novaeseelandiae*), black-backed gull (*Larus dominicanus*), and grey warbler/riroriro (*Gerygone igata*) were heard. Pukeko (*Porphyrio melanotus*) and paradise ducks (*Tadorna variegata*) were observed near the wet retired sports field area. Common introduced suburban species of birds such as blackbirds (*Turdus merula*) and house sparrows (*Passer domesticus*) were also seen on site.

Based on previous bird surveys at other maunga in Auckland⁵ and habitat characteristics observed during the site walkover, other native avian species likely to be present on site include: silvereyes (*Zosterops lateralis*), sacred kingfishers (*Todiramphus sanctus*), New Zealand fantail (*Rhipidura fuliginosa*), and kererū (*Hemiphaga novaeseelandiae*).

Both the mature exotic and native trees are likely to be providing roosting, nesting and feeding habitat on site.

2.2.3 Bats

It is considered unlikely that either of the extant species of native bats are present on this site, based on modelled predictions of long tailed bat presence across Auckland⁶.

Although the site could theoretically contain the 'Threatened – Nationally Critical' long tailed bats (*Chalinolobus tuberculatus*), it is considered unlikely they are present. The nearest known populations of long tailed bats in urban areas are approximately 27 km west of this site in vegetated areas in urban park and woodland areas near the edge of the Waitakere Ranges.

There is a limited range of tree specimens on site which are large enough and sufficiently mature to provide specialised cavities suitable for the roosts required for long tailed bats. Long tailed bats are known to have very large home ranges, but the sparse availability of foraging and roosting sites between Ōtāhuhu and known populations make their presence highly unlikely.

2.3 Terrestrial ecological value

The ecological value of the terrestrial habitats is assessed using criteria described in the Ecological Impact Assessment guidelines (EclA) produced by the Environment Institute of Australia and New Zealand (EIANZ 2018)⁷ (Table 2.1). These include representativeness, rarity or distinctiveness, diversity and patterns, and ecological context of the native plants and ecosystem on site. Ecological values are assigned a level on the scale of Low, Moderate, High or Very High based on the values of species, communities, and habitats identified. Table 2.1 characterises the ecological values of vegetation of the site for each assessment criteria.

⁵ Landers et al, 2018. Avian biodiversity across Auckland's volcanic cone reserves.

⁶ K Crewther 2016. Report on modelled distributions of long-tailed bats across Auckland, for Auckland Council.

⁷ Environment Institute of Australia and New Zealand Inc. (EIANZ). 2018. Ecological Impact Assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems.

Table 2.1: Terrestrial ecological valuation

| Criteria for assessment | Description for exotic trees on site | Score |
|-------------------------|---|----------|
| Representativeness | Exotic species proposed for removal are represented widely across the landscape. | Low |
| Rarity/distinctiveness | The exotic species scheduled to be removed are neither rare nor distinctive. | Low |
| Diversity and pattern | The exotic species proposed to be removed are of a low diversity, being dominated by olive. The pattern is driven mostly by European planting. | Low |
| Ecological context | While exotic, the 422 trees proposed to be removed provide important ecological functions such as habitat for birds, and stepping stones to other habitats across the wider area. They also provide necessary ecosystem services such as slope stability and soil erosion protection, reducing air pollution, and taking up CO ₂ and producing oxygen. | Moderate |

The terrestrial ecological value found for the 44 exotic trees proposed to be removed from the site is described overall as **Low**.

2.4 Assessment of magnitude of ecological effects

The second step in the assessment of ecological effects is to determine the magnitude of the effect that the project has on ecological values and is rated from positive, negligible, low, moderate, high to very high (EIANZ 2018). The magnitude of the proposed vegetation clearance are described in Table 2.2.

Table 2.2: Assessment of magnitude of ecological effects

| Proposed works | Ecological effects | Magnitude of effect |
|----------------------|--|---|
| Vegetation clearance | Loss of trees (direct and permanent effect) | The loss of 422 exotic trees from the site will have a moderate magnitude of effect due to the loss of bird habitat and ecosystem services. Conversely, removing the exotic trees from site will also have a positive magnitude of effect due to removing unwanted plants and their seed sources from the site (although this positive effect is limited due to the presence of exotic species in close proximity). |
| | Loss of habitat for native birds (direct and permanent effect) | The loss of habitat for native birds is assessed as having a low magnitude of effect due to the proportion of large trees being removed from site. |
| | Loss of stepping-stone function to SEAs and other habitats in wider area (indirect and permanent effect) | The loss of stepping-stone function is assessed as having a low magnitude of effect as mature native trees will be retained on site. |
| | Noise from felling and processing (indirect, temporary effect) | While the noise of exotic tree removal operations is likely to impact native species on site, this will be only temporary and at a small scale, therefore the magnitude of effect is assessed to be low. |

The overall magnitude of effects for exotic tree removal without mitigation is **Moderate**. This is based on a conservative threshold approach where a moderate magnitude of effects has been triggered, leading to the effects being described as moderate, although low and positive effects are also assessed.

2.5 Assessment of level of effects

The overall level of effect is assessed using a matrix presented in Table 2.3 based on the ecological value of the site (Table 2.1) and magnitude of ecological effects (Table 2.2). The level of effects will be used further to determine if mitigation measurements are required to mitigate any residual effects.

Table 2.3: Assessment of level of effects

| Ecological Value → Magnitude ↓ | Very high | High | Moderate | Low | Negligible |
|-----------------------------------|-----------|-----------|----------|----------|------------|
| Very high | Very high | Very high | High | Moderate | Low |
| High | Very high | Very high | Moderate | Low | Very low |
| Moderate | High | High | Moderate | Low | Very low |
| Low | Moderate | Low | Low | Very low | Very low |
| Negligible | Low | Very low | Very low | Very low | Very low |
| Positive | Net gain | Net gain | Net gain | Net gain | Net gain |

The terrestrial ecological value of exotic trees proposed for removal on site at Ōtāhuhu, has been assessed as **Low** following the EclA guidelines. The level of potential ecological magnitude of effects for the proposed removal of 422 trees at Ōtāhuhu is described as **Moderate**. The overall level of the ecological effect is **Low** based on the ecological values and magnitude of effects.

The residual potential ecological effects require mitigation so that no net loss of biodiversity will result from the proposed development on site. Mitigation measures are proposed in the following chapter.

3 Mitigation and other positive benefits

The proposed project to remove exotic trees over three metres tall on Ōtāhuhu demonstrates avoidance of potential negative effects, as well as other mitigation measures to ensure that no net loss of biodiversity values occur. The project aims to restore cultural values to the maunga, which will in turn have ecological benefits.

3.1 Avoidance – Felling methodology

The proposed tree felling methodology has been devised by arborists to have no drop of felled trees or limbs directly on the ground except for areas previously modified and where there will be no impact on archaeological and ecological values, crash mats may also be used to avoid damage. Outside of these areas limbs will be machine, crane or helicopter assisted before being processed in flat modified areas of little ecological value.

3.1.1 Herpetofauna

The proposed tree felling methodology should avoid crushing injuries and mortality of native lizards during works. The movement of heavy machinery should be restricted to areas of low herpetofauna value, avoiding native skink habitats such as rank grass, as will be determined by the project herpetologist.

3.1.2 Birds

As no native species are being removed from the maunga, the loss of habitat is restricted to the approximately 422 exotic trees proposed to be removed. To avoid impacts on vulnerable nesting native birds and their eggs or chicks, no felling in bird breeding season should occur. If felling is required during bird breeding, trees should be checked for active nests by a suitably qualified ecologist prior to works.

3.1.3 Bats

As the likelihood of bats being present at this site is extremely low (2.2.3), no avoidance or mitigation methods are required to deal with bats at Ōtāhuhu. Given the insufficient quantity and quality of habitat in the area to support a population of long-tailed bats there would be no benefit in undertaking tree felling protocols for bats.

3.2 Mitigation

3.2.1 Native vegetation restoration

The proposed restoration⁸ of a native WF7 puriri forest ecosystem through planting, will help mitigate the loss of approximately 422 exotic trees from Ōtāhuhu while increasing biodiversity values at the site. In areas where sightlines will not be compromised by mature trees and archaeological constraints allow, in future, cultural gardens may be restored to what would have been present during Māori occupation eras, contributing to ecological values. This restoration program will have positive benefits on both flora and fauna values at the site.

The proposed restoration of low stature native plantings around the slopes and quarries will help mitigate for the loss of exotic trees from the maunga as it will provide an increase to biodiversity values, enhance the complexity and diversity of habitat, and provide food sources for native fauna.

The proposed restoration planting areas (Figure 3-1) will have weed management which will provide additional mitigation by removing unwanted plants that compete with native species.

⁸ Ōtāhuhu Mountain Planting Plan, Te Ngahere, October 2018.



Figure 3-1: Proposed restoration planting at Ōtāhuhu

3.2.2 Predator control

The implementation of a comprehensive introduced predator control programme will have a positive effect on both native flora and fauna values at the site.

The herpetology report recommends comprehensive predator control to mitigate for any potential impacts of the exotic tree removal on native lizards. Additionally, the predator control programme currently undertaken on site to control rats (*Rattus sp.*) and possums (*Trichosurus Vulpecula*) will mitigate for potential impacts of the tree removal on birds as competition for food sources and predation pressures will be reduced. Pest control programs are good practice in mitigation packages as removing pest species from a site leads to greater biodiversity gains.

Possums and rats will continue to be controlled across the site, which will greatly benefit ecological values at the site by removing predation pressures on native fauna and allow for native seed regeneration.

Importantly, mice (*Mus musculus*) may be controlled in pulses in targeted high-value skink habitat areas (such as rock bombs, quarries, and rank kikuyu grassland) to ensure that the mouse population doesn't explode after the removal of rats which would have a detrimental effect on native lizards. Hedgehogs (*Erinaceus europaeus*) and mustelids (if present) likewise should also be controlled in targeted areas identified as high value skink habitat to minimise skink predation.

3.2.3 Herpetofauna

While native skinks are unlikely to be impacted at the site due to the works methodology (as above), the proposed restoration and mitigation will have a positive effect on the herpetofauna values present at Ōtāhuhu.

The low stature native restoration plantings will have a positive effect on native skinks present by enhancing habitat complexity and availability, as well as providing increased food sources to support the populations. As part of the habitat enhancement, the boulder fields and suitable native vegetation will be protected to ensure habitats remain favourable to native skinks, with numerous refugia and basking spots. An abundance of suitable skink habitat should help native species co-exist with the introduced plague skink (which there is currently no way of eradicating). Where planting cannot be undertaken around lizard habitat due to archaeological constraints, native low stature plants (such as pohuehue) will be encouraged over time through selective weed control instead.

The pest control to be implemented on the maunga will be of a positive benefit to native skinks by reducing the predation pressure. Importantly, the control of all predators and the targeting of mice in favourable skink habitat will benefit lizards as rat control only can lead to an explosion of the mouse population that can decimate lizards.

Surveys during summer months will allow for the understanding of native populations of native skinks at Ōtāhuhu Mountain. Understanding the population at the site is key for species management, and can help to provide a baseline to monitor the efficacy and benefits of predator control. The project herpetologist will hold a Wildlife Act 1953 permit authority to allow for lizard surveys to be conducted.

3.2.4 Birds

The restoration plantings (both WF7 and low stature) will help mitigate any potential negative effects on native birds by providing improved habitat and food sources for birds. The proposed restoration will have a positive effect on native birds at the site as the habitat diversity will be increased, while the native species proposed to be used provide greater sources of food. The native restoration plantings will aid in increasing stepping stones for birds to other habitats within the wider area.

The pest control programme will mitigate for the loss of tree habitat and have a positive effect on native birds at the site by reducing predation pressure on birds, chicks and eggs.

3.3 Biosecurity

Myrtle rust was discovered within the Auckland region over the last 12 months.

Native Myrtaceae include species such as manuka (*Leptospermum*), kanuka (*Kunzea*), pohutukawa / rata (*Metrosideros*) and ramarama (*Lophomyrtus*).

Exotic Myrtaceae include species such as gum (*Eucalyptus*) and monkey apple (*Acmena* and *Syzygium*). Removal of exotic Myrtaceae species, such as monkey apple, on Ōtāhuhu would remove a potential myrtle rust host on this site, and therefore may assist to slow spread to this site. As myrtle rust is spread by wind, however, any beneficial effects from removing monkey apple on what is a relatively small site (in the context of myrtle rust spread) would be minor.

Equipment used to fell trees should be cleaned prior to use on site to avoid spreading pathogens, including potentially myrtle rust, to Ōtāhuhu via felling equipment. Contractors should also observe standard biosecurity hygiene practices (e.g., vehicles and tyres free of mud, mulch and other debris) used to manage spread of other pathogens, such as kauri dieback.

We strongly recommend the following best practice protocols are implemented when and where plants are sourced:

Prior to any Myrtaceae species being delivered to the site, a signed Myrtle Rust Nursery Management Declaration that certifies that the plan producer has implemented the New Zealand Plan Producers Incorporated (NZPPI) Myrtle Rust Nursery Management Protocol must be obtained.

By following the NZPPI protocols industry members will be meeting the requirements set out in MPI's legal direction. This declaration will be proof that any Myrtaceae species have been grown and treated according to best practice protocols to reduce the spread of Myrtle rust.

3.4 Recommendations

The restoration on site and tree felling methodologies to avoid impacts on fauna is proposed as mitigation in order to offset the residual ecological effects of the removal of approximately 422 exotic trees from Ōtāhuhu. The following ecological management actions are recommended:

- 1 All vegetation shall be removed outside of bird breeding season (bird breeding season is September to January inclusive). If vegetation clearance is undertaken within the bird breeding season, woody vegetation must be confirmed clear of nesting birds by a suitably qualified ecologist. This should ensure no nesting birds, eggs, or chicks are harmed.
- 2 A survey to confirm the presence of native lizards, particularly rare 'At Risk' species of skinks, shall be carried out by a suitably qualified and experienced herpetologist. The lizard survey must:
 - Target potential lizard habitat identified during the herpetological assessment, including the quarry and rock bomb areas;
 - Be carried out at a time of year and during weather conditions that will maximise the chance of locating native lizards, including rare and 'At Risk' species potentially present at the site;
 - Utilise no-dig, non-pitfall methodologies suitable for deployment in high value archaeological areas with public access; and
 - Be conducted after the implementation of specific targeted predator control in any areas of high value skink habitat to be surveyed.
- 3 A finalised Adaptive Lizard Management Plan for the site shall be prepared by a suitably qualified herpetologist after surveys have been conducted on site and provided to Auckland Council for approval prior to vegetation clearance commencing. This shall include, but not be limited to, the following:
 - Tree felling and associated works methodologies and restrictions based on the Ecogecko Herpetology report;
 - Project herpetologist and permit details;
 - Specific targeted pest control in any areas identified as high-value skink habitat;
 - Habitat enhancement including any specific weed management and retaining of felled logs in identified high value skink habitat areas; and,
 - Survey outcomes and management methods.
- 4 The finalised planting plan shall be prepared by a suitably qualified ecologist and provided to Auckland Council for approval prior to tree felling, for all restoration areas within the site. The final planting plan shall include, but not be limited to, the following:
 - Plant species, spacing, planting zones (if required), plant numbers and specification on plant size as described in this assessment report;

- Planting methodology including staging (required for the effective control of weeds prior to planting, and enhancement species to be used for infill planting once the initial planting has established) in order to promote a WF7 rock forest habitat type;
 - Plant maintenance and weed management until canopy closure (for a minimum of five years); and
 - Monitoring and reporting.
- 5 A comprehensive predator management plan targeting potential habitat of native lizard and bird species shall be provided to and approved by Auckland Council. The predator control relating to native lizards shall be implemented at sites identified as high-value lizard habitat. The comprehensive predator management plan will mitigate for any residual impacts on native lizards and birds.

With the adoption of the above recommendations, in our opinion the extent of potential adverse ecological effects of the proposed exotic tree removal will be negligible and in turn will provide a positive enhancement of Ōtāhuhu and result in a net gain of biodiversity.

4 Conclusion

The proposed removal of approximately 422 exotic trees over three metres tall from Ōtāhuhu has been based on a minimal-impact approach avoiding negative effects on native flora and fauna. The proposed restoration of the maunga with low-stature native vegetation and with WF7 forest ecosystem on lower areas, and enhanced skink habitat areas will have a positive ecological effect on the site, and in conjunction with a comprehensive pest management programme will produce a net gain of biodiversity values. It is considered that the exotic tree removal and restoration package will result in a net ecological benefit with a greater biodiversity value compared to the site's current state. The above recommendations have been made to manage any adverse ecological effects of the proposed development, and if these recommendations are adhered to, any potential ecological effects will be adequately managed and mitigated.

5 Applicability

This report has been prepared for the exclusive use of our client Tūpuna Maunga Authority, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

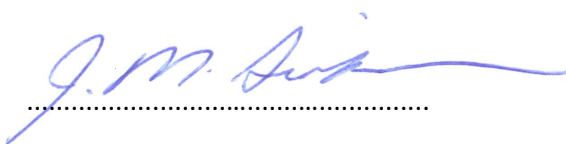
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