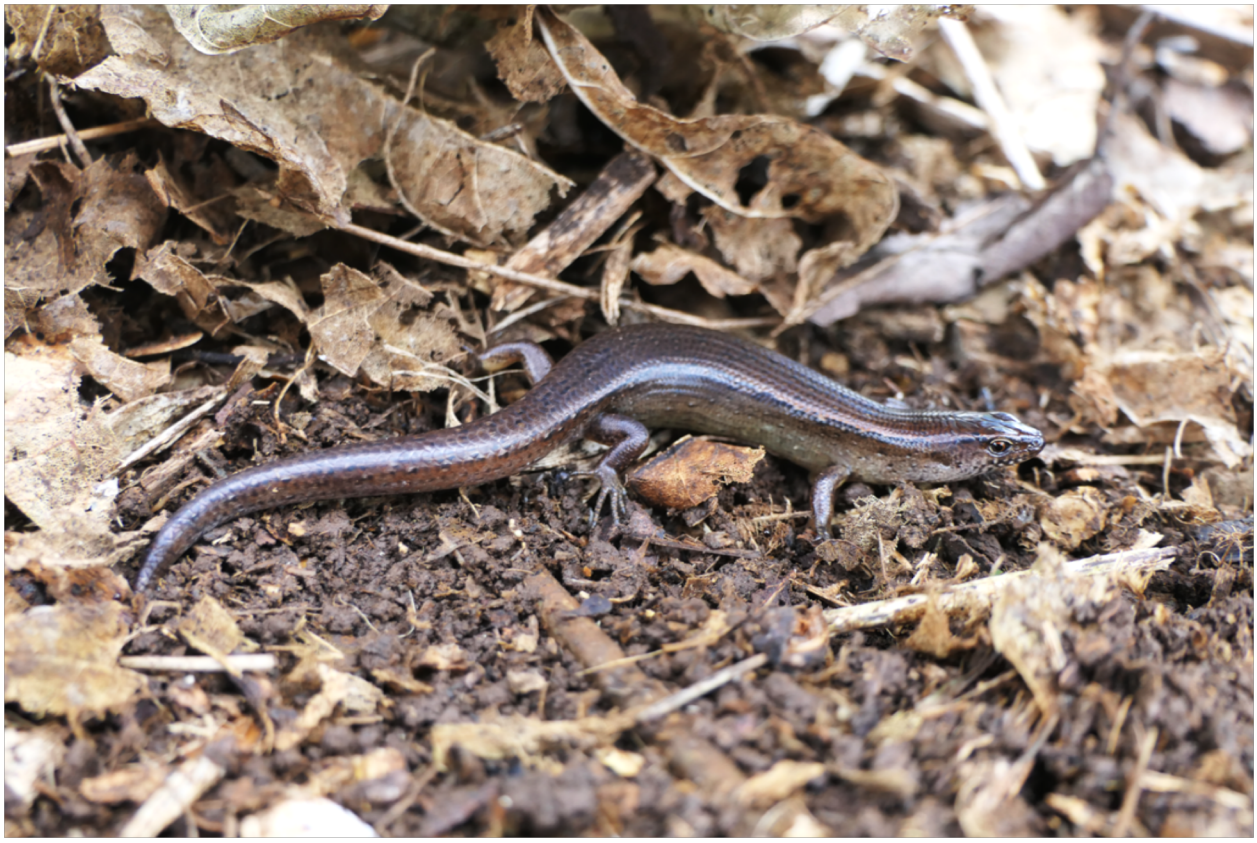
Assessment of Environmental Effects of tree removals and habitat restoration activities on lizards at Ōwairaka / Mt Albert



Trent Bell
EcoGecko Consultants

September 2018

Report information

Prepared for:	Auckland Council
Prepared by:	EcoGecko Consultants Limited 46 Sunrise Boulevard Tawa Wellington 5028 New Zealand
Author:	Trent Bell Principal Herpetologist EcoGecko Consultants
Author correspondence:	trent@ecogecko.co.nz
Date:	23rd September 2018

Cover photograph: [redacted]
Credit: Trent Bell, EcoGecko Consultants.

Recommended citation:
Bell, T. 2018. Assessment of Environmental Effects of tree removals and habitat restoration activities on lizards at Ōwairaka / Mt Albert. Technical report prepared for Auckland Council by EcoGecko Consultants Limited, September 2018.

Contents

1. Introduction

This is a herpetological desktop assessment of environmental effects on removal of exotic trees, and on habitat restoration activities at Ōwairaka / Mt Albert. In 2014, this maunga was returned to the Tāmaki Makaurau collective of mana whenua as part of a Treaty Settlement. This maunga is owned by the Taonga Trust and governed by the Tūpuna Maunga Authority.

2. Project scope

A wide range of tree removal methods are proposed. See Treescape (2018) for details on each method and locations that each method will be used.

A planting programme has been prepared to restore the original native ecosystems of the maunga. The objective is to restore culturally appropriate plant species assemblages, enhance habitat values, and restore representative threatened and rare ecosystem types. The planting plan prepared by Te Ngahere also aims to enhance the quality of habitat for skinks (Mairs *et al.* 2018). These include WF7 Pūriri broadleaf ecosystem type in the inner slope of the quarry and lower growing native species (pōhuehue, harakeke) on the mounds, depending on compatibility with archaeological values and maintenance of historic defensive sightlines.

3. Lizard impact assessment methodology

The Department of Conservation's BioWeb Herpetofauna Database and the Auckland Council Fauna Database were accessed by EcoGecko Consultants Ltd in September 2018 to retrieve lizard records within the immediate vicinity of the maunga. However, when using literature and databases to evaluate the potential presence of lizards at a specific location, it is important to remember that the records accessed do not capture the true extent of lizard distribution, nor do they indicate the full diversity of species that may be present. The database records are heavily reliant on lizard sightings being reported to the Department of Conservation (DOC) and Auckland Council; records may be incomplete due to the lack of lizard sightings being reported.

During September 2018 a site assessment/visit was also undertaken at Ōwairaka to assess the lizard habitat values present on the maunga. ***It is important to note that this visit was not a lizard survey.*** A true assessment of the potential presence of native lizards at any location cannot be made in the absence of a field survey effort using suitable methodology and tools and undertaken by an experienced herpetologist holding an appropriate Department of Conservation Wildlife Act Authorisation.

Note: Within New Zealand, all native lizard species are afforded absolute protection under the Wildlife Act 1953, and it is an offence to disturb or kill native herpetofauna without permission from DOC. Any vegetation clearance potentially poses a threat to resident native lizard populations.

4. Herpetological and habitat values of Ōwairaka

4.1. Lizard records

Neither the DOC database nor the Auckland Council database had any records for lizards on Ōwairaka.

[redacted]

No plague skinks were recorded onsite during the site assessment, but there is one record of multiple plague skinks (*Lampropholis delicata)* on Stillwell Road, less than 270 m from Ōwairaka. This species is considered a pest species; it is classified as an "Unwanted Organism" by MPI Biosecurity, and "Introduced and Naturalised" by DOC's Threat Classification System.

4.2. Habitat values

The major habitat types present and available for native lizards consist of deep kikuyu (*Pennisetum clandestinum*) grasslands, ground cover objects such as fallen trees, branches or scattered scoria bombs throughout Ōwairaka (Fig. 1). These habitats provide protection from predators for terrestrial lizards [redacted]

Ōwairaka has both the attributes of mixed exotic-native tree ngahere (forest) and exotic treeland, much of which will have been deliberately planted. Native species present consist of pōhutukawa (*Metrosideros excelsa*; 19% of all trees), tōtara (*Podocarpus totara;* 17%), and pūriri (*Vitex lucens*; 7%) (Treescape 2018). Mānuka (*Leptospermum scoparium),* ngaio (*Myoporum laetum*), and karaka (*Corynocarpus laevigatus*) are also represented (Treescape 2018). Natives account for 56% (*n*=442) of the trees present at Ōwairaka (Treescape 2018). The 345 exotic trees are represented as either groves of *Prunus* (flowering cherry), *Banksia* or isolated treeland (mainly *Eucalyptus*) in the landscape. The chance that arboreal geckos are present in these exotic trees is considered low.

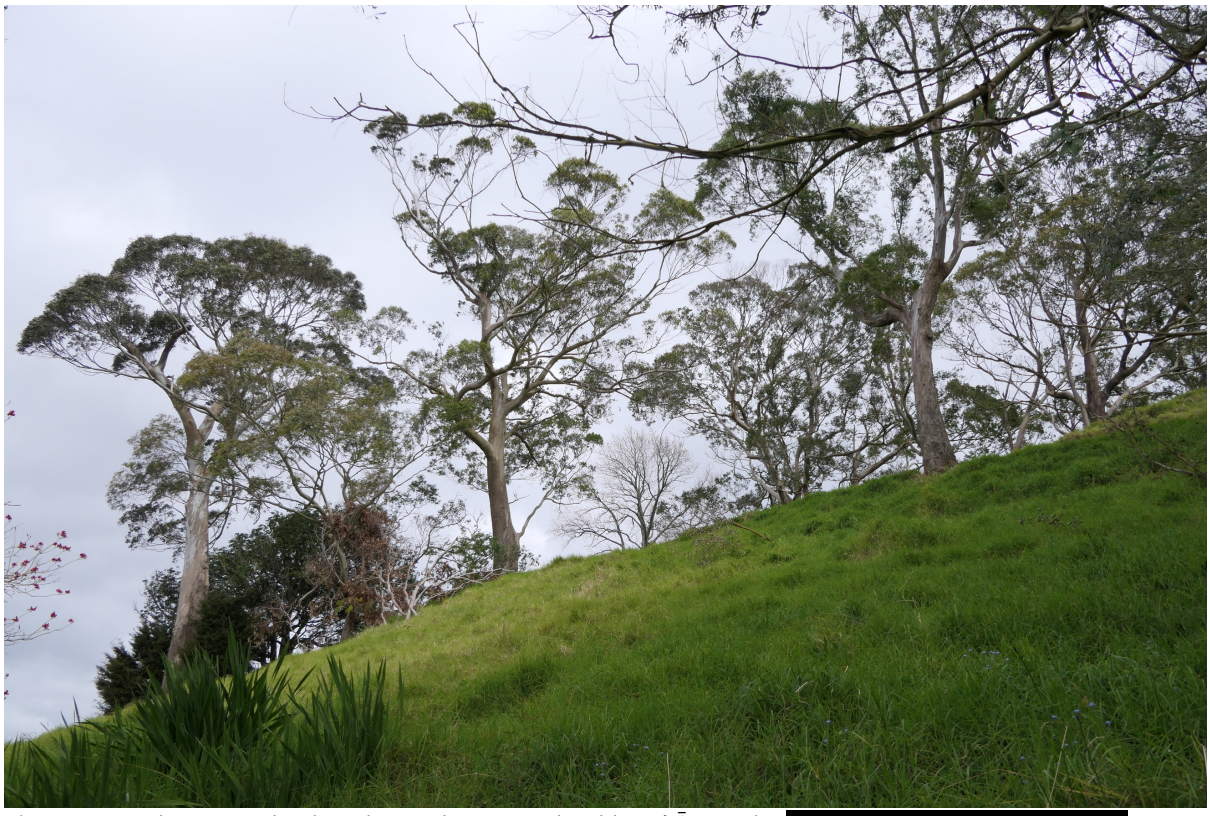


Figure 1. Eucalyptus treeland on the north-eastern shoulder of Ōwairaka. [redacted]

5. Potential impacts of the project on lizards

5.1. Positive effects

The proposed planting programme to revegetate both the mound and the inner slopes of the modified quarry will increase the habitat values and complexity for native lizards. The establishment of a WF7 Pūriri Ngahere (forest) will restore original habitat values for lizards on site. The plant species in the Ōwairaka/Te Ahi-kā-a-Rakataura Planting Plan prepared by Te Ngahere (Mairs et al. 2018) include harakeke, *Phormium tenax;* kānuka, *Kunzea robusta*; karamū, *Coprosma* spp.; māhoe, *Melicytus ramiflorus*; mānuka; māpou, *Myrsine australis*; karaka; kohekohe, *Dysoxylum spectabile*; pōhuehue, pūriri; rasp fern/pukupuku, *Doodia australis*; tītoki, *Alectryon excelsus*; toetoe, *Austroderia fulvida*; tōtara, and whararikī, *P. cookianum* spp. *hookeri*. In addition to the above, further lower plants and ground ferns are to be included in the W7 Pūriri Ngahere (forest) restoration with specific intention to develop highly complex terrestrial lizard habitats, particularly around the ngahere edges and understorey. For specific details on the restoration programme, see the Ōwairaka/Te Ahi-kā-a-Rakataura Planting Plan prepared by Te Ngahere (Mairs *et al.* 2018).

5.2. Negative effects

Tree felling by manual dismantling (i.e. tree removal not undertaken using helicopter or crane removal) may cause injuries or deaths to individual lizards in the drop zones. However, the proposed felling methodology is likely to have limited impacts on native lizard populations. Adverse effects on lizards will at the individual level, not at the population level. Staging the tree works is unlikely to have significant effects on lizard values.

5.3. Plague skinks

If plague skinks are present on the maunga, any adverse effects due to the work programme on the species is considered inconsequential. This is because the species is not protected by law and is also classified as an Unwanted Organism.

Due to their possible absence from the maunga, in order to reduce the chances of introducing plague skinks to this site during this project, the following actions are recommended:

- Plants to be inspected for plague skinks and their eggs prior to transport to site.
- No mulch from off-site is to be introduced onto the site.

6. Recommendations

The ecological restoration programme has the intent of retaining and increasing native herpetological values at a population level. The implementation of the following actions is recommended when aiming for a net positive effect on native lizards at Ōwairaka:

- Develop a lizard management plan (LMP) for Ōwairaka.
- Establish lower plants and ferns such as pukupuku in W7 Pūriri Ngahere (forest) forest edges and understoreys, as well as the tihi.
- Cut logs on-site to leave as permanent lizard habitat in appropriate locations, where possible.
- Mulch on-site debris to create immediate terrestrial forest edge and understorey habitat, and relocate this mulch to W7 Pūriri Ngahere (forest) restoration sites, where possible.
- Implement a holistic predator / pest control programme.
- Implement a lizard survey.

Further details are provided in the sections below.

6.1. Develop a lizard management plan for Ōwairaka

It is strongly recommended that a lizard management plan is prepared for Ōwairaka. An LMP will clearly describe the sites and specifications for establishing lower plants and ferns, based Te Ngahere's Planting Plan (Mairs *et al.* 2018), and also incorporate debris processing methodologies recommended by Treescape (2018) to develop immediate protective lizard habitat while the W7 Pūriri Ngahere and lower plants take time to establish. A predator /pest control programme will need to be developed to protect the lizard values of the maunga now and into the future. A comprehensive lizard survey should be undertaken to inform this LMP.

6.2. Establishing lower plants and ferns in W7 Pūriri Ngahere and tihi

The establishment of lower plant species, such as pōhuehue, harakeke, pukupuku or similar species within W7 Pūriri Ngahere forest edges and understorey is strongly recommended to increase habitat complexity necessary for the survival and persistence of terrestrial lizards (see Figs. 2a & b for indication of suitable densities of lower plants). Approximately 700 pukupuku or similar fern species should be established throughout the maunga, including all areas of ngahere with exposed understoreys in the A1 - South Eastern and A2 - North Eastern Shoulder, subject to archaeological approval (see Treescape 2018 for a map of the identified sites).

In summary, to establish highly valuable protective habitat for lizards, the following is recommended:

- Low planting of pōhuehue, harakeke, pukupuku and similar lower plants around forest edges to establish complex, basking habitat for terrestrial skinks. Sites identified: All.
- Mound planting of pōhuehue, flax, toetoe and pukupuku in open sites around the maunga, subject to archaeological approval. Sites identified: E – Tihi.
- Dense planting of ground cover plants such as ferns is strongly recommended to establish a thick understorey for lizard populations to establish within the W7 Pūriri Ngahere (forest).

Further detail on planting habitat suitable for terrestrial lizard species on the maunga is provided in Te Ngahere's Planting Plan (Mairs *et al.* 2018).

Figures 2a (top) & 2b (bottom). Contrast in terrestrial ground cover underneath native forest, both photographs taken at Ōwairaka (A2 – North Eastern Shoulder). Fig. 2a shows a degraded forest understorey, where it is difficult for native lizards to persist in the presence of predatory mammals such as rats. Fig. 2b shows a very complex terrestrial habitat which significantly assists in retaining and increasing local lizard values. Pukupuku is a fern species that may be suitable for establishing the necessary complex ground habitat.

6.3. Cutting logs on-site

In addition to the habitat restoration programme, it is strongly recommended that wood from the felled exotic trees is utilised to create lizard habitat during the debris processing stage. The utilisation of wood increases the habitat complexity necessary for survival and establishment of terrestrial lizards.

Where possible, instead of removing trees from the site, logs should be cut on-site and left *in situ* in rank kikuyu grasslands to create highly suitable lizard habitat. [redacted] Decaying wood provides protective refugia for lizards, creates a damp microclimate and attracts arthropods, insects, and spiders on which the lizards feed on. Cuttings should be systematically placed throughout to establish intermediate lizard habitat until habitat underplanting in the W7 Pūriri Ngahere (forest) sites has established, and a deep leaf litter has accumulated. This should be established both in habitat edges and throughout the forest understorey. Cutting logs on-site is recommended for two particular areas: A1 – South Eastern Shoulder, D – Central Rises, with some cuttings also relocated to A2 – North Eastern Shoulder (Treescape 2018).

6.4. Mulching on-site

Where possible, coarsely mulching logs and branches on-site and spreading this mulch around the W7 Pūriri Ngahere forest edges and understorey would immediately create a more complex understorey in the short term, while the lower plants and ground ferns take time (several years) to establish a suitably complex understorey for lizard survival and persistence. As the large mulch decays over time and the ground plant cover increases, the two factors combined will create a deeper and richer soil hummus, which also attracts arthropods, insects and spiders on which the lizards can feed. This mulch would need to be very coarse (each piece a minimum of 10 cm x 20 cm x 5 cm) to be of utility for lizards as habitat. EcoGecko Consultants encourage the placement of coarse mulch along forest habitat edges and throughout the forest understorey. Sites identified are: A1 – South Eastern Shoulder, A2 – North Eastern Shoulder, D – Central Rises (Treescape 2018).

6.5. Predator / pest control plan

A key management tool to strengthen the viability of lizard populations is predator control. Key predators are rats (*Rattus rattus*, *R. norvegicus),* mice (*Mus muscula*), feral cats (*Felix catus*), hedgehogs (*Erinaceus europaeus*) and mustelids (*Mustelea* spp.: ferrets, stoats, weasels). Holistic predator control is considered essential for the recovery of lizard populations. Control of mesopredator/prey species, such as mice (also a lizard predator) or rabbits, reduces the carrying capacity for higher predators on the maunga, such as rats and mustelids (see Appendix 1).

A pest management plan should be prepared that includes control of predatory mammals. The plan should target high value lizard habitat, which is at present mainly rank kikuyu grassland and native forest, but should eventually include new lizard habitat through the establishment of edge and understorey habitats (created through the use of cut logs, coarse mulch, and establishment of lower plants and ferns) in the W7 Pūriri Ngahere forest.

The pest control programme requires careful consideration on the strategy used to manage rats and mice on site, with recommendations for (a) continued/press suppression of rats, and (b) periodic/pulse suppression of mice during an optimal time period to be defined for maximum effectiveness (either summer or autumn).

Due to the high public use of the maunga, along with the urban setting, careful consideration of the pest management programme and how it is to be implemented is also needed. It is recommended that consent conditions on pest control should be set for rats only, while an investigation is undertaken on safe methodologies for other pest species, such as mice and hedgehogs.

6.6. Lizard survey

Ōwairaka has moderate to high lizard values, [redacted] It is possible but highly unlikely that arboreal geckos such as forest gecko (*Mokopirirakau granulatus*) or elegant geckos (*Naultinus elegans*) are present. Plague skinks do not appear to be present at Ōwairaka. It is recommended that a lizard survey is undertaken at Ōwairaka to understand these lizard values and to provide recommendations for their longer-term conservation management. A lizard survey should target arboreal geckos and terrestrial skinks across the maunga, utilising suitable survey and trapping methodologies. This may include night spotlighting for geckos and pitfall or g-minnow trapping for skinks.

7. Conclusion

With the implementation of restoration and enhancement of lizard habitat along with a pest control programme, the tree removal of exotic trees on the maunga is considered to have less than minor effects on the lizard fauna. The most direct impact will be injuries and deaths to individual lizards that are within the drop zone, due to tree felling, and the use of heavy machinery, such as cranes, causing crush injuries and deaths if the machinery is allowed to move across rank kikuyu grassland habitats. Avoidance of rank grassland habitat, such as kikuyu, during clearing is key to minimisation of such adverse effects on the resident lizard fauna.

A pest control programme will have a positive effect on the lizard populations, provided mice numbers are also managed, and a habitat enhancement programme through cutting logs, coarse mulching and

establishing lower plant and ferns will also allow lizards to spread and establish in new sites across the maunga.

8. References

Caut, S., Casanovas, J.G., Virgos, E., Lozano, J., Witmer G.W., Courchamp, F. 2007. Rats dying for mice: modelling the competitor release effect. *Austral Ecology* 32(8):858–868.

Courchamp, F., Langlais, M., Sugihara, G. 1999. Cats protecting birds: modelling the mesopredator release effect. *Journal of Animal Ecology* 68(2): 282-292.

Erickson, W., Urban, D. 2004. Potential risks of nine rodenticides to birds and nontarget mammals: a comparative approach. Environmental Fate and Effects Division, Office of Pesticides Programs, United States Environmental Protection Agency. 230 p.

Freeman, A.B., Hickling, G.J., Bannock, C.A. 1996. Response of the skink *Oligosoma maccanni* (Reptilia: Lacertilia) to two vertebrate pest-control baits. *Wildlife Research* 23(4): 511-516.

Goldwater, N., Perry, G.L.W., Clout, M.N. 2012. Responses of house mice to the removal of mammalian predators and competitors. *Austral Ecology* 37:971–979.

Hitchmough, R., Barr, B., Lettink, M., Monks, J., Reardon, J., Tocher, M., Van Winkel, D., Rolfe, J. 2016. Conservation status of New Zealand reptiles, 2015. *New Zealand Threat Classification Series 17.* Department of Conservation, Wellington. 14 p.

Hoare, J.M., Hare, K.M. 2006. The impact of brodifacoum on non-target wildlife: gaps in knowledge. *New Zealand Journal of Ecology* 30(2): 157-167.

Mairs, A., le Grice, J., Floyd, K. 2018. Ōwairaka/Te Ahi-kā-a-Rakataura Planting Plan 2018. Prepared for Tāpuna Maunga Authority by Anna Mairs, Jessica le Grice and Kelvin Floyd. Te Ngahere, Final version dated 20th September 2018.

Marshall, J.E., Jewell, T.R. 2007. Consumption of non-toxic baits by grand (*Oligosoma grande*) and Otago (*O. otagense*) skinks. *Department of Conservation Research and Development Series No. 272*. Science and Technical Publishing, Department of Conservation, Wellington. 11 p.

Nelson, N.J., Romijn, R.L., Dumont, T., Reardon, J.T., Monks, J.M., Hitchmough, R.A., Empson, R., Briskie, J.V. 2016. Lizard conservation in mainland sanctuaries. In Chapple, D.G. (editor) 2016. *New Zealand Lizards* (pp 321-339). Switzerland: Springer International Publishing.

Newman, D.G. 1994. Effects of a mouse, *Mus musculus*, eradication programme and habitat change on lizard populations of Mana Island, New Zealand, with special reference to McGregors skink, *Cyclodina macgregori*. *New Zealand Journal of Zoology* 21(4): 443-456.

Norbury, G., Byrom, A., Pech, R., Smith, J., Clarke, D., Anderson, D., Forrester, G. 2013. Invasive mammals and habitat modification interact to generate unforeseen outcomes for indigenous fauna. *Ecological Applications* 23:1707-1721.

Norbury, G., Van den Munckhof , M., Neitzel, S., Hutcheon, A. Reardon, J., Ludwig, K. 2014. Impacts of invasive house mice on post-release survival of translocated lizards. *New Zealand Journal of Ecology* 38(2): 322-327.

Norbury, G. 2017. The case for 'bottom-up' pest management. *New Zealand Journal of Ecology* 41(2): 271-277.

Pickard, C.R. 1984. The population ecology of the house mouse (*Mus musculus*) on Mana Island. Unpublished MSc thesis, Victoria University of Wellington. 234 p + appendices.

Tompkins, D.M., Veltman, C.J. 2006. Unexpected consequences of vertebrate pest control: predictions from a four-species community model. *Ecological Applications* 16(3): 1050-1061.

Treescape 2018. Owairaka / Mt Albert Tree Removal Methodology - 27 Summit Drive, Mt Albert, Auckland 1025. Client: Tūpuna Maunga Authority. Prepared by: Treescape Arboriculture Consultants (Treescape Ltd), August 2018**.**

Wedding, C.J. 2007. Aspects of the impacts of mouse (*Mus musculus*) control on skinks in Auckland, New Zealand. Unpublished MSc thesis, Massey University, Auckland.

Wedding, C.J., Ji, W., Brunton, D.H. 2010. Implications of visitation by shore skinks *Oligosoma smithi* to bait stations containing brodifacoum in a dune system in New Zealand. *Pacific Conservation Biology* 16: 86–91.

Weir, S.M., Yu, S., Knox, A., Talent, L.G., Monks, J.M., Salice, C.J. 2016. Acute toxicity and risk to lizards of rodenticides and herbicides commonly used in New Zealand. *New Zealand Journal of Ecology* 40(3): 342-350.

Appendix 1

Notes on pest management:

- Rodent control to reduce numbers of ship rats (*Rattus rattus*) and Norway rats (*Rattus norvegicus*) could potentially cause increased mice (*Mus musculus*) numbers, as rats predate on, and compete with, mice for resources. This could have with unforeseen outcomes for indigenous fauna, such as lizards (Courchamp *et al.* 1999, Tompkins & Veltman 2006, Caut *et al* 2007, Goldwater *et al.* 2012, Norbury *et al.* 2013, Norbury 2017). Mice are a known lizard predator in New Zealand (Pickard 1984, Newman 1994, Wedding 2007, Norbury *et al.* 2014, Nelson *et al.* 2016). Being small, mice may access lizard retreats, and become a threat to lizards, particularly during the autumn and winter months when the weather is cooler and lizards are more susceptible to predation. Controlling mesopredators such as mice (and rabbits) also reduce the carrying capacity of the environment for higher order predators such as rats, mustelids and cats. This activity is known as "bottom-up" pest management (Norbury 2017). Therefore, mice should ideally be included in the pest management programme.

- The use of anticoagulant rodenticides (e.g. brodifacoum, bromadiolone, diphacinone) in bait stations is not expected to have a negative (lethal) impact on lizards (except for pindone), although research into sub-lethal effects is required (Weir *et al.* 2016). There is some evidence that lizards will ingest bait (Freeman *et al.* 1996, Hoare & Hare 2006, Marshall & Jewell 2007, Wedding *et al.* 2010), and there is also likely to be a secondary poisoning pathway through the consumption of affected invertebrate prey (Erickson & Urban 2004). However, to achieve acute toxicity (mortality) by pesticide would require consumption of a quantity of bait that a lizard is not likely able to accommodate in its stomach (Weir *et al.* 2016).

- The use of kill traps baited with peanut butter (or similar) is also not expected to have a major negative effect on lizards, although some larger lizards may occasionally set off traps, and be killed in the process.

- However, the number of lizards with sublethal effects from poisoning, or killed in predator traps is probably lower than the number killed by predatory pests themselves – in other words, the positive aspects of a pest control programme is likely to outweigh the potential risks of by-kill of lizards.

- There are some considerations relating to the high public access of maunga that make developing effective and efficient pest management programmes difficult. These should be considered in time, and expert advice will be necessary.