BLUEPRINT ECOLOGY

18 November 2025

Lizard Management Plan
Mt Welcome, Pukerua Bay

PREPARED FOR PUKERUA PROPERTY GROUP LIMITED PARTNERSHIP

PREPARED FOR:

Pukerua Property Group Limited Partnership

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1.0 Introduction

1.1 Background

The Mt Welcome, Pukerua Bay, Porirua project is to construct a staged residential subdivision to create 950 lots including associated infrastructure at 422 State Highway 59, Pukerua Bay, Porirua (the site) (**Figure 1**). The 'project' involves:

- a 949 residential allotments
- A commercial centre;
- Associated infrastructure including wastewater (including wastewater storage facilities), stormwater, water reticulation, roading, and pedestrian and cycling trails;
- Earthworks to establish the required finished surface levels for building platforms, roading, parks and drainage;
- Landscaping; and
- New intersection with State Highway 59.

Pukerua Property Group Limited Partnership is applying for resource consents to develop the Mt Welcome Project under the Fast-track Approvals Act 2024 (FTAA).

All native lizards are protected under the Wildlife Act 1953. The FTAA provides for Wildlife Approvals which are an authority for an act or omission that would otherwise be an offence against specified provisions of the Wildlife Act 1953 including where native lizards may be harmed or killed during the course of a site's development. A Wildlife Approval may grant permission to relocate native lizards, and the killing or injury of lizards not caught or relocated from a site.

A pre-development lizard survey assessing habitat quality and condition was undertaken to assist with the management of effects based on the land use change at the site. This survey identified 19 areas of habitat which included rough pasture, vegetation margins, ornamental garden, woody debris totalling 0.65 ha (6,476 m^2). These habitats either surrounding houses or are within a rural landscape that has been shortly grazed. The habitats are all low value. They are small, fragmented "islands" which are exotic dominant (e.g., rank grass, agapanthus) and overall, highly degraded. There is also one 0.19 ha (1,858 m^2) area of seral broadleaved forest adjacent to SH1 which is of moderate value. The total area of lizard habitat impacted is 0.83 ha (8,332 m^2) (**Figure 2**). These 20 areas are the focus of this Lizard Management Plan (LMP).

This LMP seeks to result in an improvement in lizard values by protecting and enhancing a 6,700 m^2 of grassland across five areas for northern grass skink (*Oligosoma polychroma*) and undertaking 1,880 m^2 of native forest planting (**Figure 2**).

The northern grass skink release sites are larger, more contiguous areas of habitat that will be restored. The grass at these release sites is currently grazed, and when it is retired it will quickly develop into excellent habitat for skinks, particularly northern grass skink. The release site will be enhanced with a minimum of two 5 x 5 m log stacks and predator control (e.g., rodents). If ≥20 lizards of any single species are recorded, post-release monitoring will be undertaken for three years. Additional log stacks surrounded by predator

control will be created for every 10 lizards that are captured (i.e., 20 lizards = 2 log stacks, >30 lizards = 3 log stacks) – a sliding scale of management relative to the effect to lizards.

1.2 Purpose and Scope

The purpose of this LMP is to describe the methodological approach to the salvage of lizard populations across all habitat types within the proposed earthworks and vegetation clearance footprint prior to, and during earthworks and vegetation clearance.

The objective of this LMP is to mitigate actual or potential adverse effects on native lizard populations within the works footprint to ensure a protective benefit to lizards is achieved. This LMP provides the relevant information to salvage lizard populations across all habitat types within the development site, the relocation of these lizards to a suitable release site, the management of this development site and release site thereafter, and details for compensation to redress potential residual adverse effects to lizards.

1.3 Key Principles for Lizard Salvage and Transfer in New Zealand

DOC has prepared a guidance document (DOC 2019) which describes nine principles that should be adhered to when applying for lizard salvage and transfer resulting from a proposed development project (DOC's principles). It covers the mitigation practice of lizard salvage and transfer and addresses the entire process including:

1. Assessments of the impacts of proposed developments on lizards and exploration of alternatives (e.g. avoidance of lizard habitat).
2. Planning of salvage operations and assessment and approval of these proposals from the appropriate authorities.
3. Preparing habitat at release sites, capturing lizards at impact sites, temporary captivity (if required), data collection, transport to and release at receiving sites.
4. Post-release monitoring, contingency implementation as appropriate, and reporting to the Department of Conservation (DOC) (and/or other consent authorities).

A summary of the nine principles and how they have been addressed in this Plan is provided in **Table 1**.

Table 1. Assessment of DOC's Nine Principles for Lizard Salvage.

Principle for Lizard Salvage	Summary of Assessment of Principle
1. Lizard species' values and site significance must be assessed at both the impact (development) and receiving sites.	Lizard species' values, and site significance has been assessed at the development site based a pre-clearance survey of available habitats via Artificial Cover Objects. The significance of the habitat at the impact site for lizards has been assessed based on the size, quality and species values. Lizard values at the receiving site have been assessed by an experienced herpetologist using expert judgement.
2. Actual and potential development-related effects and their significance must be assessed.	The actual and potential development related effects and their significance have been assessed based on the Environment Institute of Australia and New Zealand (EIANZ) Ecological Impact Assessment guidelines (Roper-Lindsay, et al. 2018) (hereinafter referred to as the EIANZ Guidelines). Only a small number of northern grass skink or copper skink are expected on site, and the overall ecological effect after compensation has been applied is Negligible.
3. Alternatives to moving lizards must be considered.	We have been advised by the Applicant that the current layout encompasses all areas and values for lizards that can be avoided to the extent feasible. There are no alternatives to moving lizards.
4. Threatened lizard species require more careful consideration than less-threatened species.	No lizard species listed as Threatened (Hitchmough et al. 2021) are known on the mainland within the Wellington Ecological District. No Threatened lizard species are applicable to this LMP.
5. Lizard salvage, transfer and release must use the best available methodology.	Lizard salvage methodology includes the best available approach for lizard salvage. For terrestrial lizards, this includes an extensive grid of ACO's and pitfall traps at c. 5 m spacings within habitat shown in **Figure 2**. The effort allocated to lizard salvage will include a minimum of three checks and then continue to occur until 90% of the lizards present have been captured, or at least two consecutive days of no lizards being detected. For arboreal lizards, this includes two nights of spotlight search and one day of supervised tree felling. The transfer of lizards will be undertaken in the most appropriate way to minimise stress on lizards (cloth bags, terrarium) and lizards will be relocated the same day. The release site will be enhanced with log stacks and predator control to provide immediate protection.
6. Receiving sites and their carrying capacities must be suitable in the long term.	The forest lizard receiving site is Karehana Bay Scenic Reserve which is a large area of mature native forest with suitable habitat for the relevant species. This release site will allow for population growth and secondary spread and provide suitable habitat resources to cater for the carrying capacity in the long-term for all forest-dwelling species of lizard potentially at Mt Welcome. The northern grass skink release sites are within the Mt Welcome site and include five areas of retired farmland. The lizard release sites will have better-quality habitat in relation to the development site. The lack of existing habitat in these locations means that the long-term carrying capacity is suitable.
7. Monitoring is required to evaluate the salvage operation.	If >20 lizards of any species are salvaged post-release monitoring will be undertaken for three years.
8. Reporting is required to communicate outcomes of salvage operations and facilitate process improvements.	Reporting of the outcomes of the lizard salvage will be provided to DOC. In addition, reporting of post-release monitoring will be provided annually for three years, if required.
9. Contingency actions are required when lizard salvage and transfer activities fail.	For species unlikely to occur on site (forest-dwelling species), we have taken a precautionary approach and included a pre-determined release site that caters to all possible species that could be encountered. We have provided a sliding scale of habitat enhancement and predator control relative to the number of northern grass skink recorded.

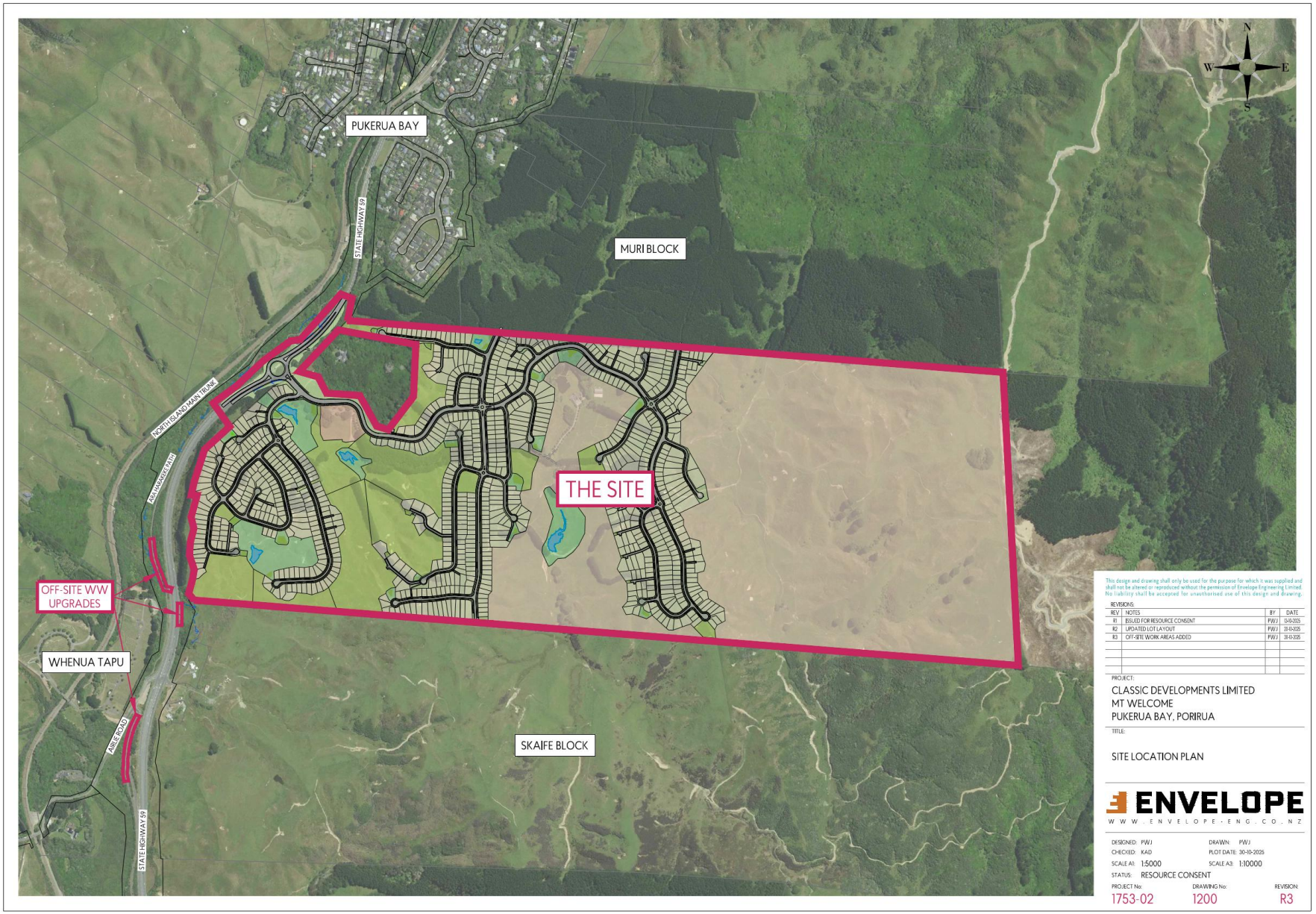

Figure 1. The Mt Welcome Project site.

Figure 2. Potential lizard habitat (red), northern grass skink release sites (yellow), native forest planting (green), earthworks footprint (white).

1.4 Potential Lizard Habitats

There are two potential lizard habitat types on site, these are:

1. Rank grassland, weedland, vegetation margins, debris which total 0.65 ha.
2. Seral broadleaved forest which total 0.18 ha.

A search of the Department of Conservation's (DoC) Bioweb Herpetofauna database revealed no herpetofauna records within the development footprint.

Terrestrial lizard species often occur on bush margins and also use complex ground cover vegetation such as scrambling weedland and leaf litter within forest and scrub communities. In the Wellington region, these areas can provide potential habitat for northern grass skink (*Oligo soma polychroma*), raukawa gecko (*Woodworthia maculata*), copper skink (*Oligosoma aeneum*) and glossy brown skink (*Oligosoma zelandicum*). Raukawa gecko, copper skink, as well as the more regionally rare 'At Risk' ornate skink (*Oligosoma ornatum*) also occur in forest habitats including seral broadleaved forest. Trees in the seral broadleaved forest provide habitat for barking gecko (*Naultinus punctatus*), ngahere gecko (*Mokopirirakau* "southern North Island") and raukawa gecko.

Lizards that occur within the Wellington Ecological District and which are listed in the DOC bioweb database are provided in **Table 2** below. Applicable habitat has been sourced from van Winkel *et al*., 2018.

Table 2. Lizard species of the Wellington region and likelihood of occupying the applicable habitat on site.

Scientific name	Common name	Threat Status (Hitchmough et al., 2021)	Regional Threat Status (Crisp et al., 2023)[1]	Likelihood of occupying the site	Applicable habitat (van Winkel et al., 2018)
Naultinus punctatus	Barking gecko	At Risk- Declining	Threatened – Regionally Vulnerable	Very low	Seral broadleaved forest
Mokopirirakau "southern North Island"	Ngahere gecko	At Risk- Declining	At Risk - Declining	Very low	Seral broadleaved forest
Oligosoma ornatum	Ornate skink	At Risk- Declining	Threatened – Regionally Vulnerable	Very low	Seral broadleaved forest. Edges of scrub and rank grassland/ weedland.
Oligosoma zelandicum	Glossy brown skink	At Risk- Declining	At Risk - Declining	Very low	Edges of scrub and rank grassland/ weedland.
Oligosoma aeneum	Copper skink	At Risk- Declining	Threatened – Regionally Vulnerable	Low	Seral broadleaved forest. Edges of scrub and rank grassland/ weedland.
Oligosoma polychroma	Northern grass skink	Not threatened	Not threatened	High	Edges of scrub and rank grassland/ weedland.

[1]Conservation Status Wellington Mainland

Scientific name	Common name	Threat Status (Hitchmough et al., 2021)	Regional Threat Status (Crisp et al., 2023)[1]	Likelihood of occupying the site	Applicable habitat (van Winkel et al., 2018)
Woodworthia maculata	Raukawa gecko	Not threatened	Not threatened	Very low	Seral broadleaved forest. Edges of scrub and rank grassland/ weedland.

1.5 Lizard Habitat Quality

A survey of the development site was undertaken by Blueprint Ecology Ltd on 24 September 2025 to determine habitat quality and determine the likelihood of the presence or absence of the species listed in Section 1.4 across all potential habitat types at the site.

A summary description of the habitats on site and local lizard characteristics is provided in **Table 2**. Habitat quality has been assessed as:

- No effective habitat. Areas are excluded from mapping.
- Low quality habitat. Where very few lizards are expected and/ or no At Risk species are likely to occur. Includes Rough pasture, weedland, scrub margins, gorse, ornamental gardens, debris piles.
- Moderate quality habitat. Not threatened species (e.g., northern grass skink) are common or At Risk species are expected to be recorded at least infrequently and may include more than one species. Includes seral broadleaved forest.
- High quality habitat. Includes mature forest with numerous preferred habitat values (e.g., forest with lianes, perched epiphytes, and higher diversity through forest tiers). Provides high quality habitat for multiple At Risk lizard species. There is no high quality habitat.

Table 3. Lizard habitat summary.

Label	Type	Quality	Size (m^2)
1	Rough pasture, weedland, scrub margin	Low	373
2	Gorse and rough pasture	Low	59
3	Gorse and rough pasture	Low	188
4	Rough pasture, scrub margin	Low	668
5	Rough pasture	Low	83
6	Farm debris	Low	27
7	Woody debris	Low	145
8	Rough pasture	Low	384
9	Rough pasture, weedland, scrub margin	Low	772

Label	Type	Quality	Size (m^2)
10	Rough pasture, weedland, scrub margin	Low	689
11	Ornamental garden	Low	145
12	Ornamental garden	Low	281
13	Rough pasture, weedland, scrub margin	Low	149
14	Ornamental garden	Low	758
15	Ornamental garden	Low	618
16	Ornamental garden	Low	910
17	Ornamental garden	Low	157
18	Ornamental garden	Low	15
19	Ornamental garden	Low	52
20	Seral broadleaved forest	Moderate	1858
		Total	**8,332**
Release site	Grazed pasture, forest margin		8,651

Plate 1. The Mt Welcome project site is largely characterised by grazed pasture.

Plate 2. Rough pasture margin that provides potential habitat for northern grass skink (Area 4)

Plate 3. Seral broadleaved forest that provides potential habitat for arboreal lizards (Area 20)

1.6 Avoidance and Minimisation

The earthworks design and functional requirements of the Mt Welcome Project layout mean that the potential adverse effects on lizard habitats cannot be completely avoided. We have been advised that the current layout encompasses all areas and values for lizards that can be avoided to the extent feasible.

The clearance of vegetation on site has the potential to disturb, injure and/ or kill lizards that are if they are residing within the site. The most suitable habitats are shown on **Figure 2** and cover approximately 1.01 ha.

To minimise adverse effects to lizards a lizard salvage is proposed. The lizard salvage will relocate native lizards away from locations which will be impacted by physical works and vegetation clearance.

Lizards will be released into a pre-determined release sites, which satisfies all habitat requirements (food, water, cover, space) of the relocated lizards (**Figure 2, Section 3**). If lizards are placed into habitats where resident lizards are currently present in high numbers, or are relocated into habitat without adequate refuges, individuals may become displaced and are then vulnerable to predation.

Creation and enhancement of habitat at the release site in combination with predator control are critical tools to reduce mortality after a lizard salvage. These considerations have been included in this LMP.

Overall, the lizard salvage will minimise most adverse effects to lizards associated with disturbance, accidental harm or killing. Avoidance and minimisation measures cannot result in no-net-loss of lizards from the development area. Therefore, compensation measures are proposed to achieve a no-net-loss in lizard values and an overall protective benefit to lizards.

1.7 Compensation

To provide compensation for the loss of 0.65 ha of poor quality terrestrial lizard habitat, 0.18 ha of moderate quality arboreal lizard habitat, as well as any lizard not captured during the lizard salvage, 6,700 m^2 of better quality terrestrial lizard habitat on site will be protected in perpetuity and enhanced with log stacks, native planting, and predator control over two years (see Section 3). In addition, 1,880 m^2 of native planting adjacent to existing forest will be undertaken, which will provide habitat for arboreal lizards in the long term.

2.0 Lizard Salvage

2.1 Approach

The approach for this lizard management plan is guided by DOC's Principles, consultation with relevant stakeholders, findings of the development site survey and nearby records, the history of the development site, and the known preferred habitats for lizards. The mosaic of modified vegetation and the uneven distribution of lizards at the site requires a targeted salvage approach with the salvage effort focused on areas where lizards have been confirmed within the site or likely to be present.

The habitat size and quality recorded during the pre-development lizard survey indicates that there would only be a very small population at the site. Based on these results as well as our understanding of the local populations in the surrounding area, we estimate a low number of animals will be recorded (10 to 20) due to the poor quality, fragmented habitat.

It is most likely that only northern grass skink will be recorded, and possibly copper skink. It is highly unlikely that any other lizard species will be encountered. This is due to the poor quality of the habitat.

2.2 Timing

All lizard salvage will be undertaken during the active season for lizards once a Wildlife Act Authority has been granted. Lizard capture, handling and relocation will be undertaken at a suitable time of year, between the months of October and April inclusive, in weather conditions suitable for lizard salvage. For the avoidance of doubt, that is only temperatures of 12°C and above, with no more than light winds and <5 mm rain. These conditions must be forecast for a period of time long enough to allow for the salvage and post release settling in period of lizards.

2.3 Salvage Method

The following methods will be used to salvage lizards at the site:

1. Artificial Cover Objects (ACOs): A c. 5 x 5 m grid network of triple-stacked ACO's will be set in the best areas of suitable habitat within the area identified in **Figure 2**.
   ACOs will be installed and left to "bed in" for at least five weeks prior to the salvage in any area.
   ACOs will be checked (and any lizards present captured) a minimum of three times during suitable weather conditions.
   The effort allocated to ACO checks will follow the decreasing catch per unit effort method described by the Hayne's method, wherein trap catch over time will be plotted against the total number previously caught to estimate when 90% of the lizards present have been captured. Or at least two consecutive days of no lizards being recorded.
2. Pitfall traps: Trapping using pitfall traps will be used to supplement ACO's. Pitfall traps will include a 4L bucket dug flush with the ground and covered by an ACO. Each pitfall trap will be baited with pear (or similar), have a moist, clean sponge, and vegetation for cover and to minimise stress of captured animals. A trapping programme involving traps set under every second ACO for multiple days within the development site will be undertaken concurrently with ACO checks. Traps will be checked daily for at least three days. If mice are recorded in pitfall traps, traps will be removed immediately and trapping using pitfalls will cease.

3. Spotlight search: A spotlight search will be undertaken where vegetation clearance is proposed in the seral forest. The spotlight search for arboreal geckos will include:
    a. A minimum of two nights of spotlighting will be undertaken, unless arboreal geckos are seen, in which case an additional spotlight survey will be undertaken across the same habitat until arboreal geckos are not detected.
    b. A suitably qualified herpetologist will walk through the potential habitat beginning 30 minutes after sunset using head-mounted spotlights to detect body shape or reflected eye-shine of geckos.
    c. Searches will be undertaken on calm, mild nights (>12 ºC) i.e. avoiding cooler nights when geckos will be less active and therefore more difficult to detect.
    d. Searches will include systematic, grid-searches of all suitable habitat within the clearance area (with reasonable, safe access).
    e. If a gecko is sighted, safe capture will be attempted using poles with a soft end for lizards to grasp (lizards are not harmed when using this technique). If geckos are not able to be salvaged during spotlighting, the tree will be marked and the herpetologist and an arborist will work together to firstly fell or limb the tree and the branches and foliage will be systematically searched.
4. Supervised tree felling: Tree felling within the seral forest will be undertaken via chainsaw under the supervision of a herpetologist. Larger trees within the seral forest will have the trunks, cavities and canopy systematically searched.

2.4 Development Site Management

Prior to vegetation clearance and earthworks commencing the project herpetologist will have a toolbox meeting with contractors to describe the process if any lizards are accidentally encountered during construction. If any lizards are accidentally encountered during construction, works will cease immediately, and the project herpetologist will be contacted.

The project herpetologist for this project is Tony Payne:

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It is usual practice after a salvage operation to remove the habitat or to fence it off in order to prevent lizards from adjacent areas re-colonising the salvage area. The lizard salvage at this site will include clearing vegetation and habitat in one operation during and following salvage, thereby removing the need to install lizard-proof fencing.

2.5 Lizard Handling and Processing

The relocation will be undertaken in the most appropriate way to minimise stress on lizards. In order to ensure the welfare of animals during relocation and to maximise the chance of a successful relocation outcome; all staff will be suitably trained and experienced in the capture, handling, holding and release techniques that will be used. Lizard handling will be kept to a minimum and will only be carried out by trained and experienced staff. Handling will be limited to capture, morphometric measurement, and photography.

Captured lizards will be relocated to the identified release sites and will be released as soon as practicable into the release site (within 1 hour). Lizards will be released directly into enhanced habitats (e.g. log stacks).

Lizards will be held in individual breathable cloth bags. Each cloth bag will have a small amount of damp grass from the capture site and a wetted sponge will be placed inside with the lizards to prevent dehydration. All lizards within cloth bags will be temporarily stored in ventilated, hard-sided terrariums (to prevent accidental crushing). Terrariums will be placed in secure, shaded locations (ideally where the internal temperature is kept below 10°C) until they can be transported to the release site.

2.6 Data collection

The following data will be recorded on pre-prepared field datasheets:

- Date and time of monitoring;
- Weather conditions (wind, overhead conditions) and ambient air temprature at the start and finish of the survey;
- Species of lizard;
- Sex;
- Morphometric measurements, including snout–vent length (SVL) and weight
- Age class (adult, sub-adult, juvenile);
- Monitoring device where captured individuals are recorded.

3.0 Lizard Release Site

A range of factors need to be considered for the suitability of a release site, including:

- The site must be ecologically appropriate and suited to the species being salvaged.
- Have long-term protection and be suitable through time for the lizard species being salvaged.
- It must provide protection from predators.

Two suitable release sites have been identified. A terrestrial lizard site within the Mt Welcome Project area for northern grass skink and a forest species lizard site at Karehana Bay Scenic Reserve for barking gecko, ngahere gecko, raukawa gecko, copper skink, ornate skink, and glossy brown skink.

When assessing the potential for the lizard release site to support lizards, the following considerations were made:

- Vegetation type and cover: These species prefer sunny areas of complex groundcover but also inhabit a wide range of other habitats. The release sites consist of mature forest or rough pasture, and forest margins, both are north facing, and have numerous micro-habitats ideal for lizards.
- Potential for soil to maintain reasonable moisture levels: Efforts were made to locate a site that would have some protection from the elements. The release site is within log stacks that is protected by the elements and support less drying of the soil layer.
- Access to site: Ease of access to the release site was considered an important criterion. This is to aid in translocation success. The less time that lizards are held in transportation containers and the ease of transfer to the new site can have direct bearing on the mortality of the species, as the less time in transit means less chance of death from high levels of stress. Preference was given to a nearby site that could be accessed with a short walk from a vehicle.
- Habitat complexity: It is preferable to have dense, complex ground cover and adjacent forest vegetation. This vegetation is present throughout the release sites.
- Surrounding landscape: The wider links to nearby suitable habitat to allow for population growth and secondary spread was considered, including identifying a release site with extensive habitat for lizards to naturally disperse into.

Release site suitable is summarised in **Table 4**.

Table 4. Release site suitability summary

Criteria	Northern grass skink release sites	Arboreal lizard release site
Suitability of existing habitat	The grassland will be retired which will provide excellent habitat for northern grass skink. The log stacks will provide immediate refuge and food resource.	This includes c. 16 ha reserve with mature coastal tawa kohekohe forest and kānuka and mānuka scrub that is suitable for forest dwelling species.
Proximity of the site from the salvage	Is within the same development site.	The Karehana Bay Scenic Reserve is a 5 min drive from the site.
Long-term protection of the site	The proposed release sites will be protected in perpetuity.	The proposed release site is part of Karehana Bay Scenic Reserve which is a Crown Derived Reserve and will be protected in perpetuity under the Reserves Act 1977.
Accessibility for release	There is nearby vehicle access to allow for the log stacks to be constructed and easy access when releasing lizards and monitoring.	Has nearby walking tracks to allow for easy access when releasing lizards and monitoring.
Size of the release site and its connectivity to other habitat	The release site is larger than the impact sites and will form dense grassland which provides ample suitable habitat for skinks.	Is part of a 16 ha reserve that provides connection to a wide variety of habitats.
Existing lizard populations	Given the small number of lizards expected to be salvaged and the extensive amount of habitat that will be created at the release site, the proposed salvage will have no measurable influence on existing lizard populations.	Ngahere gecko are present. Other forest dwelling species could be present.
Habitat enhancement opportunities	Log stacks will be created, and native planting will be undertaken	Closed Cell Foam Covers (CCFC) will be provided and log stacks will be created.
Existing predator control or opportunities to enhance predator control	Predator control will be undertaken for over two years.	Existing predator control is undertaken by Predator Free Plimmerton. Additional predator control will be provided by the Applicant, if required.

3.1 Northern Grass Skink Release Sites

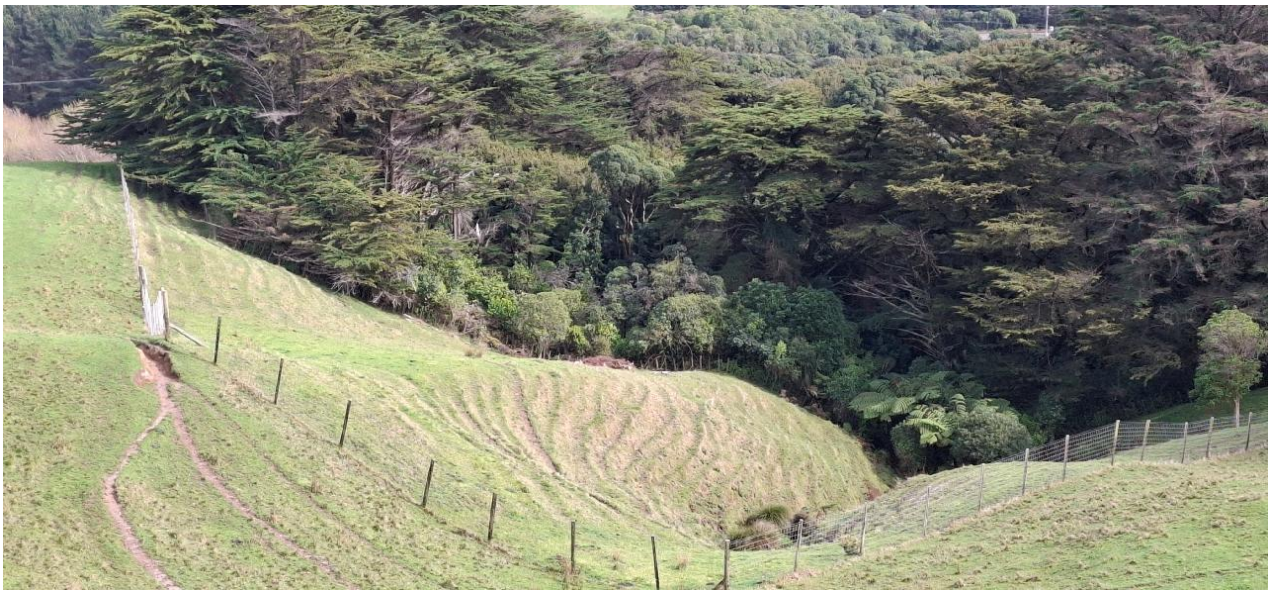

Plate 4. Grazed pasture within the release site R1.

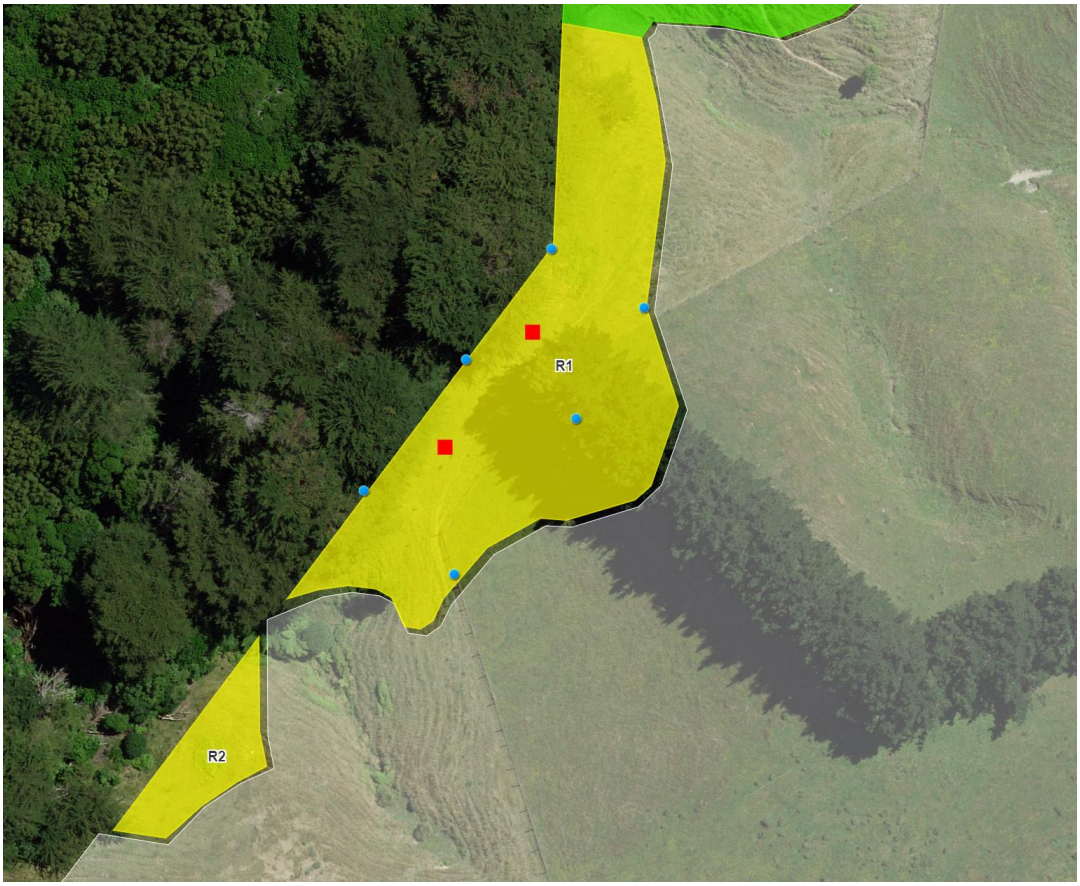

Figure 3. Northern grass skink release sites R1 and R2 (yellow), log stack (red square), predator control device (blue circle).

There are five release sites (R1 to R5) that will be used for the for northern grass skink (**Figure 2, Table 5**). The release sites have a range of ideal habitat types for terrestrial lizards, including north facing pasture which will be left to grow long. In relation to the areas within the development footprint, this constitutes larger, better-quality habitats. Each of the release sites will be enhanced with native planting that provides habitat for lizards in the long-term

A minimum of two log stacks covering a minimum of 5x 5 m each will be constructed at the release site (**Plate 5**). The log stacks will be constructed using a mix of large and small logs (10-20 DBH) with interstitial spaces that provide immediate protective cover and refuge for lizards as well as long-term high-quality habitat. Additional log stacks surrounded by predator control will be created for every 10 lizards that are captured (i.e., 20 lizards = 2 log stacks, >30 lizards = 3 log stacks) – a sliding scale of management relative to the effect to lizards.

Lizards will be evenly distributed between the release sites as per **Table 5**. If more than 90 northern grass skink are captured, additional lizard will be evenly released into release sites R1 and R5.

Table 5. Northern grass skink release site details.

Release site	Size	Animals to be released	Enhancements required if lizards released
R1	2,330 m^2	First 20 captured	2x log stacks 6x predator control devices, 20% of area planted.
R2	300 m^2	Next 10 captured	1x log stacks 4x predator control devices, 20% of area planted.
R3	1,155 m^2	Next 20 captured	2x log stacks 6x predator control devices, 20% of area planted.
R4	800 m^2	Next 10 captured	1x log stacks 6x predator control devices, 20% of area planted.
R5	2,110 m^2	Next 20 captured	2x log stacks 6x predator control devices, 20% of area planted.

Plate 5. An example of a log stack.

A 2 m wide margin around each log stack will be planted with eco-sourced native shrubs including mingimingi (*Coprosma propinqua*) and tauhinu (*Ozothamnus leptophyllus*). This will provide food, shading and a variety of micro-habitats. In addition, patches of these same species and whaririki (*Phormium cookianum* subsp. *hookeri*) will be planted throughout the release sites to over approximately 20% (c. 1350 m^2) of the total area to create a grassland/ shrubland mosaic with greater habitat diversity. The full details are provided in the Landscape Plan prepared for the development.

The planting will create self-sufficient native shrubland community and grass margins that provides ideal habitat for native lizards. Ecological principles that underpin this planting are:

- Plant to create habitats which benefit native lizard species.
- Use indigenous species that are representative of natural local plant communities, and which provide appropriate community structure.
- Source seed and plants locally (eco-sourcing) in order to select strains that are best suited to local environmental conditions and to maintain the integrity of local genetic stocks.
- Plant in late winter to provide the longest possible time for root systems to develop before summer droughts occur.
- Undertake release weeding (spraying) to clear grass before planting. Once root systems have developed (over the first three growing seasons, or as appropriate based on monitoring) plants should readily survive grass and herb competition.

Table 6. Release site lizard enhancement specifications

Task	Description
Enhancement area	Release sites shown in **Figure 2** and log stacks shown on **Figure 3**.
Revegetation objective	Plant native species to provide lizard habitat around log stacks and throughout release sites.
Existing vegetation	Pasture grass and gorse.
Site Preparation	Single spray treatment of existing pasture grass and gorse two weeks prior to planting.
Planting	Planting at 1 m centers for pohuehue and 1.5 m for all other species, as appropriate.
Monitoring	Assess plant survival/ health/ cover annually in Years 1 to 3 following completion of the planting programme. Monitor ecological weeds and animal pest damage.
Maintenance (up to two years)	Release grass and control weeds twice a year for first two years. Infill planting as required to replace losses over two years.

3.2 Forest Lizards

Karehana Bay Scenic Reserve is c. 17 ha and includes a series of valleys and hills behind Karehana Bay with several remnants of tawa (*Beilschmiedia tawa*) and kohekohe (*Didymocheton spectabilis*) forest, some of which have emergent podocarps and pukatea (*Laurelia novae-zelandiae*) (**Figure 4**). The remnants are adjoined and often buffered by areas of kānuka-mānuka scrub. Areas of coastal lowland forest in this location are characterised by species such as kaikōmako (*Pennantia corymbosa*), kawakawa (*Piper excelsum* subsp. *excelsum*), kohekohe, ngaio (*Myoporum laetum*), taupata (*Coprosma repens*) and rangiora (*Brachyglottis repanda*) (**Plate 6**). This reserve falls within areas designated as Key Native Ecosystems (KNEs) by GWRC. GWRC describes the KNE Programme as a non-regulatory voluntary programme that 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.

This PCC reserve was chosen based on the high-quality lizard habitat for forest dwelling species, a pre-release lizard survey has been undertaken which recorded four ngāhere gecko during spotlighting (33 geckos/100 PHs) in kānuka/mānuka scrub and no terrestrial skink species (Wildlands 2021) and there is an active community conservation group involved in the restoration of the reserve (Pest Free Plimmerton).

Pest Free Plimmerton have 444 traps within the wider Plimmerton area which target rats, hedgehogs, mustelids and possums. There are 6 DOC 200's at approximately 50 m spacings within and surrounding the proposed released site. The traps in the Karehana Reserve were installed when Pest Free Plimmerton started in 2016/2017. The Volunteers aim to check the trap lines at least once monthly and all traps are regularly checked and maintained.

There have been thousands of records over the past eight years. Pest Free Plimmerton has been active for 8 years now and they do not see that changing in the foreseeable future. There are also poison bait stations targeting possums within the proposed release site which are maintained by GWRC, and these are likely to have also killed rats in the area.

Ngahere geckos are mainly arboreal and are usually found on vegetation. When using vegetation, most individuals are mainly observed on the trunks and branches of shrubs and trees, unlike arboreal Naultinus geckos which prefer foliage and stems. Raukawa gecko use a range of habitat and are found on the trunks and branches of shrubs and trees and beneath suitable ground cover. As such, any raukawa geckos and/or ngāhere geckos salvaged will be relocated into individual closed-cell foam covers (artificial arboreal refugia) attached to kānuka or tawa trees. These will provide immediate retreats for geckos following relocation, granting them interim protection from predators and exposure before dispersing further into the coastal forest. Barking gecko will be released directly into kānuka foliage. Any copper skink, glossy brown skink or ornate skink will be released directly into log stacks within forest.

The threshold to initiate any additional pest control is one lizard species. Pukerua Property Group Limited Partnership will pay $2,000 to Pest Free Plimmerton to assist in their predator control efforts and/or improvements to lizard habitat.

The pest control will include a minimum of 15 rodent traps in a 20 x 20 grid in the surrounding area where the lizard(s) are released. Pest control will aim to be undertaken monthly and go for many years as part of Pest Free Plimmerton's existing control program.

Figure 4. Forest lizard release site (red line).

Plate 6. Mature native forest at the arboreal lizard release site.

3.2.1 Predator Control

The purpose of the predator control programme for this LMP is primarily to assist in the survival of relocated lizards and to increase the abundance of existing lizard populations at the release site.

Predator control will include four toxic bait stations at 50 m spacings and one DOC200 within the release site adjacent to the log stacks (**Figure 4**). Predator control will be undertaken for two months prior to lizards being released and for two years after the final year of lizards being released.

Control will be pulse management three times per year, consisting of a 7-week period through September to October, January to February, and May to June (**Table 7**). The frequency of checks and rebaiting within these periods will be as per the recommendation of a qualified animal control expert to ensure that baits are adequately replenished.

Table 7. Pulse periods (3 per annum) for predator control.

	Jan Feb	Mar Apr	May Jun	Jul Aug	Sep Oct	Nov Dec
Pulse period	Refill baits		Refill baits		Refill baits	

The predator control will focus on rodents using toxins. Toxins rely on the target species ingesting bait as a food source eliciting a feeding response that results in death. Because of this, interaction rates tend to be higher with toxins than with traps.

Using a toxin that is safe, effective, and will not bioaccumulate in the environment thus endangering non-target species, is key to the execution of a successful toxin operation. It is recommended that a first-generation anticoagulant such as diphacinone or pindone is used. These toxins have a short life so they do not bioaccumulate and are ideal for targeting rodents.

Rodents, particularly rats, are known to remove toxic baits from bait stations and cache these which can result in non-target species being exposed to these baits when removed from bait stations. Potential solutions to reduce this risk involve wiring pellet baits into bait stations or the use of bait station designs that make this caching behaviour difficult, e.g. the pied piper bait station. The pied piper bait station is a run through station with small openings in the underside of the tunnel roof that require rodents to access and eat bait through a grided bait basket (**Figure 6**). It is recommended that the toxic baits are delivered in pellet form in pied piper bait stations (or similar) to minimise the risk to non-target animals from toxic baits being removed from bait stations during toxic control operations.

Figure 5. The Pied Piper bait station, rodents cannot remove baits and are forced to eat bait within the stations.

3.2.2 Post-Release Monitoring

The small number of lizards expected to be relocated in conjunction with the abundance of complex habitat at the release sites means that meaningful post-release monitoring is unlikely to be possible.

A post-release monitoring programme will only be required if >20 individual animals of any species are salvaged.

To determine whether lizards use the lizard garden as per this proposed design, and to inform strategies for future translocations, the post-release monitoring programme for the terrestrial lizards will include a three-year post-release monitoring programme as follows:

a) Set up: four pitfall traps surrounding and four triple-stacked ACOs will be setup surrounding the log stacks.

b) Monitoring effort: Devices will be left for a minimum of 6 weeks during warm weather, and checked four times consecutively in mid to late March annually for three years.

c) A report detailing the outcomes of the monitoring will be provided to DOC at the end of the monitoring period.

The following data will be recorded on pre-prepared field datasheets:

- Date and time of monitoring;
- Weather conditions (wind, overhead conditions) and ambient air temprature at the start and finish of the survey;
- Species of lizard;
- Sex;
- Morphometric measurements, including snout–vent length (SVL) and weight
- Age class (adult, sub-adult, juvenile);
- Monitoring device where captured individuals are recorded;
- Presence of lizards observed but not captured;
- Unique numbered on the ventral surface using a non-toxic (Xylene-free) pen.

If <20 individuals of any species are relocated, there will be no post-release monitoring programme.

4.0 Roles and Responsibilities

Project implementation, project management and performance monitoring will be managed internally by the Wildlife Act Authority holder with fieldwork delivered mainly by the project herpetologist and contractors. Details of roles and responsibilities associated with this management plan are provided in **Table 8**.

Table 8. Roles and responsibilities associated with this Management Plan.

Position	Accountable Task
Pukerua Property Group Limited Partnership (Wildlife Act Authority Holder)	• Provide adequate resources for the implementation of this Plan and ensure it is implemented in accordance with Wildlife Act Authority requirements; • Report the results of the works to DOC in accordance with the monitoring and reporting requirements of this Plan; • Organise annual work programme as described in the relevant parts of this Plan; • Facilitate any monitoring required as part of this Plan; • Ensure the instruction of workers, implementation and overseeing of the requirements of this Plan, including monitoring the effectiveness of the methods set out in this Plan; • Ensure monitoring is conducted, recorded and communicated as per the requirements of this plan; and • Ensure payment of $2,000 to Pest Free Plimmerton, if arboreal lizards are recorded.
Blueprint Ecology Ltd (Project herpetologist)	• Provide technical advice, including on-site assistance (e.g., lizard salvage, monitoring, and technical reporting) as required by this Plan and by Pukerua Property Group Limited Partnership

5.0 Contingency

A precautionary approach has been undertaken for this LMP, which includes identifying a pre-determined release site suitable for all possible species that could be encountered, and multiple release sites for northern grass skink well beyond what is expected to be recorded. The need to include this as part of lizard management is to ensure contingency measures have been appropriately considered.

6.0 Reporting

Following all lizard salvage activities, a compliance report will be prepared which includes details of all individual lizards salvaged and transferred to the release sites. This compliance report will be made available to DOC by 30 June. The report will detail:

- Locations searched or trapped;
- The number of lizards salvaged and where they were released;
- Data collected as described in Section 2.6; and
- ARDS card provided to DOC.

7.0 Credentials and Permitting

This LMP has been prepared by Tony Payne who is an expert herpetologist.

Sectors include national highways, renewable energy (solar farms and wind farms), quarries, and urban development. Spanning Northland to Otago, providing lizard management advice, lizard presence/ absence surveys, Lizard Management Plans, Wildlife Act Authority applications, salvage programs, monitoring, mitigation habitat design (constructed habitats, plantings) and specific predator control plans. Over the past 10 years he has been involved with the survey and salvage of over 4,000 lizards.

Examples of relevant projects:

- **Lincolnshire Farm, Wellington (2022-2025).** Three seasons of lizard salvage. Prepared and implemented LMP, coordinated onsite works, provided training to Te Rūnanga O Toa Rangatira, salvaged over 1,500 native lizards.
- **Shelly Bay, Wellington (2020-2023).** Two seasons of lizard salvage. Prepared and implemented LMP, coordinated onsite works, provided training to Jobs for Nature staff and Victoria University students, salvaged over 300 native lizards.
- **Mt Cass Windfarm, Canterbury (2020-2022).** Two seasons of lizard survey and salvage. Salvage and relocation of Waitaha geckos and southern grass skinks from windfarm areas. Over 100 lizards relocated.
- **LPC Gollans Bay Quarry, Lyttleton (2019).** Salvage and relocation of Waitaha geckos and southern grass skinks from quarry areas. Over 150 lizards relocated.
- **Adventure Drive, Whitby (2017).** Two seasons of lizard salvage. Prepared LMP and implemented parts of the LMP, coordinated on site works, salvage included over 2,500 northern grass skink.
- **Transmission Gully, Wellington (2015-2016).** 2 years of lizard salvage under permit held by TG constructor. Prepared 15 site specific LMPs and undertook lizard salvages in boulder fields, grassland, kanuka forest and mature broadleaved forest.
- **Approx. 20 x lizard survey and salvage projects** in Auckland and Wellington region during 2019-2025 from consented developments. LMP preparation, survey, salvage, relocation, report writing. Tasks included designing salvage setup, setting/ checking ACOs, g-minnow traps, undertaking manual search, spotlighting, lizard handling, lizard measurement/ weighting/ data recording, lizard transfer to predetermined release site.
- **Research:** Northern grass skink (*Oligosoma polychroma*) utilisation of Artificial Cover Objects (ACO) over a one-year period, and the implications for monitoring and management (2021). This included longitudinal research of northern grass skink in Nelson, New Zealand. Research was presented at the 2021 New Zealand Ecological Society Conference.

Current a previous authorities held:

National survey: 118461-FAU.

Auckland salvage: 62230-FAU, 66672-FAU, 70820-FAU.

Wellington salvage: 81670-FAU, 91371-FAU, 93616-FAU, 102442-FAU, 111140-FAU, 117207-FAU, 117925-FAU, 120108-FAU.

Wellington/ Nelson survey: 91417-FAU, 107412-FAU.

Nelson salvage: 118355-FAU

Waikato survey: 117601-FAU.

Canterbury salvage: 98153-FAU.

8.0 References

Department of Conservation Lizard Technical Advisory Group. 2019. Key principles for lizard salvage and transfer in New Zealand. Department of Conservation, Wellington. 19 p

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Report prepared by:

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