5 LIZARD MANAGEMENT PLAN

5.1 Introduction

This Lizard Management Plan (LMP) has been prepared for Stevenson Aggregates Limited to minimise potential effects on native lizards (skinks and geckos) prior to and during removal of their identified and potential habitats at the proposed Sutton Pit, Drury Quarry (Figure 3). The Project supports a total of 19.34 ha of non-pasture vegetation cover, comprised of a mixture of native (16.78 ha) and exotic (2.47 ha) vegetation that may support indigenous lizards within and around the edges of their extents. Figure 3 has mapped an additional conservative buffer to previously mapped habitats as a precaution given that habitat stability is unpredictable over the 50-year life of the quarry.

The ecological effects assessment (E2:9 EcIA) identified that the habitat suitability for lizards is considered moderate (high-value copper skinks are known to be present, but low apparent diversity and heavily degraded habitats due to extensive grazing). Habitats within the Sutton Block pit are highly fragmented but are surrounded by an extensive area of indigenous vegetation comprised of kānuka, broadleaved and podocarp forest. All of this forest which falls within SAL landholdings (108.35 ha) will be protected by a covenant and enhanced through pest management, buffer planting, and contiguous offset revegetation (63 ha) as part of the overall ecological package.

The purpose of this Lizard Management Plan (LMP) is to detail the management measures required to avoid and minimise adverse effects on native lizards associated with vegetation/ habitat clearance within the Project footprint. Actions required to manage adverse effects on individuals within the quarry expansion zone are: capture and relocation, release site protection/ enhancement, and post-translocation monitoring (if triggered).

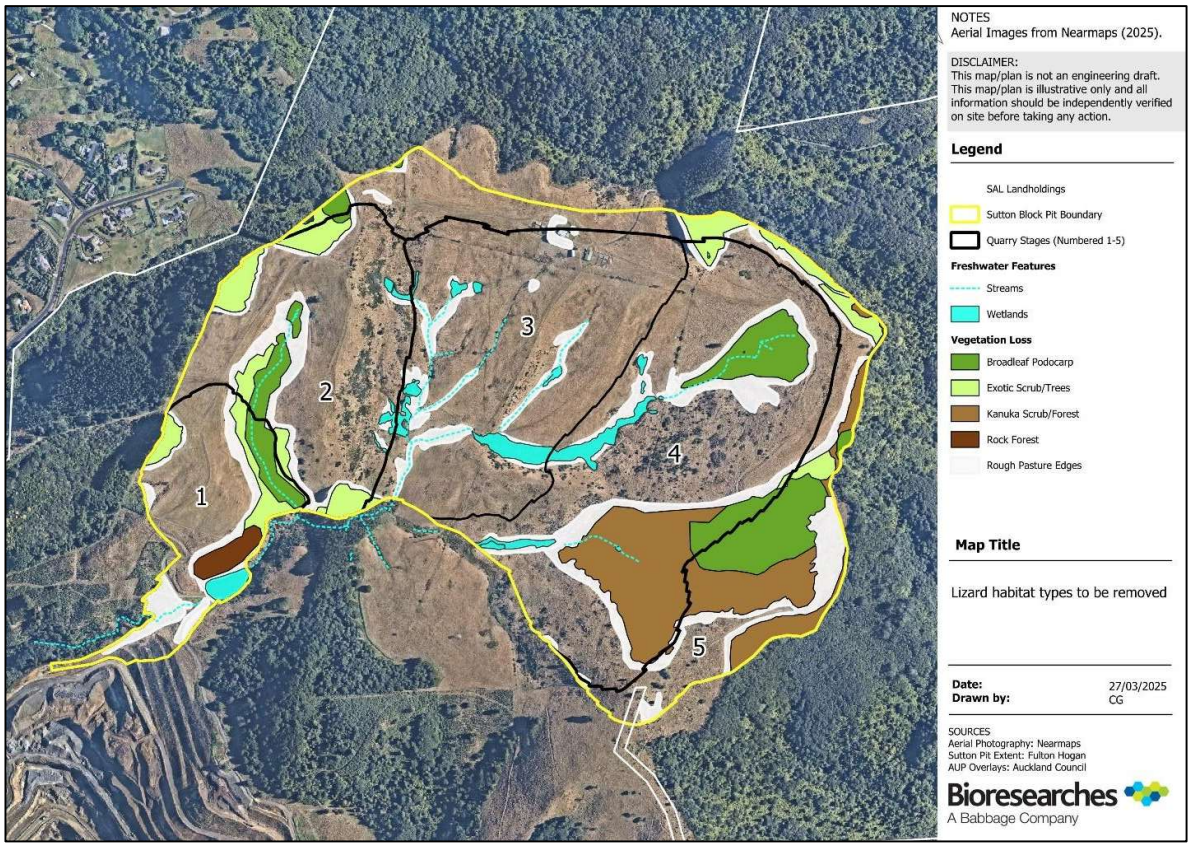

Figure 3: The vegetation marked for removal at Drury Quarry – Sutton Block.

5.1.1 Objectives

The objectives of the LMP are to set out measures to minimise potential adverse effects on native lizards within the construction footprint by way of capturing and relocating any indigenous lizards prior to and during vegetation removal, and providing habitat enhancement and pest control. Further, this LMP aims to achieve the following:

- The population of each species of native lizard present on the site at which vegetation clearance is to occur (impact site) shall be maintained or enhanced, at an appropriate alternative site; and
- The habitat(s) that lizards are transferred to (release site) will support viable populations for all species present pre-clearance.

These objectives will be achieved by:

a. Using current best practice to capture native lizards from vegetation in the footprint prior to and during vegetation clearance and relocating any captured individuals to safe and suitable habitats;
b. Applying recognised surveying and monitoring protocols that are to be followed, using the Department of Conservation's (DOC) Natural Heritage Management System's Herpetofauna Inventory & Monitoring Toolbox and / or using new advances in tools and techniques not yet incorporated into the toolbox;
c. Meeting requirements of the Wildlife Act (WA 1953) and Resource Management Act (1991).

This LMP addresses the following:

- A summary of the affected habitat and species covered by the plan;
- Capture and relocation procedures;
- Details of the recommended release site;
- Post works management and monitoring (where required).

5.1.2 Statutory Context

Native reptiles are legally protected under the Wildlife Act 1953 (and subsequent amendments), and vegetation and other features that provide habitat for these species are recognised by the Resource Management Act 1991.

Lizards comprise a significant component of New Zealand's terrestrial fauna and 124 taxa are currently recognised (Hitchmough *et al*. 2021). Of these, 96% are classified as 'Threatened', 'At Risk' or 'Data Deficient' under the New Zealand Threat Classification System (Townsend *et al*. 2008; Hitchmough *et al*. 2021).

Statutory obligations require management of populations of protected species where they or their habitats are threatened by land use changes. This LMP has been prepared or reviewed by a Department of Conservation ("DOC")[1] -authorised herpetologist (Table 8) and a checklist of the important components of this Plan is provided in Table 6

Table 5. Details of Project Herpetologist.

Credentials and Contact Details of Project Herpetologist	
Project Ecologist / Herpetologist	Chris Wedding
Credentials	M.Sc.; 18 years herpetological experience
Wildlife Authority	Subject to FTAA Wildlife Approval
Email	Chris.wedding@bioresearches.co.nz
Contact Number	0274795418

Table 6. Lizard Management Plan Checklist

Project start-up	Required of:	Completed
Lizard Management Plan Approval	Auckland Council	
Approved Lizard Released Sites	Stevenson Aggregates/ mana whenua	
Demarcation of works footprint	Surveyor/ vegetation clearance contractor	
Pre-works management (minimum 7 days prior to staged vegetation clearance)		
Pre-works lizard capture and site preparation	Herpetologist / Ecologist	
Works lizard management		
Machine assisted habitat searches	Herpetologist, clearance contractor	
Post Works		
Completion report (per stage) to client, Auckland council. ARDs Records to Auckland Council, DOC	Herpetologist	

[1] The project specific WAA is currently being processed by DOC and has not been issued.

5.1.3 Tangata whenua as kaitiaki

This Plan recognises the role of tangata whenua as kaitiaki of rerenga rauropi (indigenous biodiversity) and integrates tikanga Māori into its approach to management and monitoring. SAL maintains partnerships with iwi and will provide for participation in implementation of this Lizard Management Plan. Opportunities will be provided, including knowledge sharing, for all aspects of capture, holding, release, and monitoring of native lizards.

5.1.4 Lizard species covered by plan

Five species have been identified within 5 km of the project site (Table 7), including copper skink (*Oligosoma aeneum),* ornate skink (*Oligosoma ornatum*); forest gecko (*Mokopirirakau granulatus*), and elegant gecko (*Naultinus elegans*). A sixth species, the striped skink, has very few records in the Auckland Region, but recent eDNA analyses detected this species in the Hunua Ranges. It is associated with older growth forest where they have been found in dense epiphytic vegetation, under loose bark and fallen logs. This species therefore also has potential to be present.

Table 7. Threat status and habitat preferences of potential lizard species present on site. Threat status as per Hitchmough et al. (2021)

Common name	Species name	Threat status	Ground cover	Trees and shrubs	Epiphytes	Recorded from Drury
Copper skink	*Oligosoma aeneum*	At Risk- declining	✓			✓
Ornate skink	*Oligosoma ornatum*	At Risk- declining	✓			
Striped skink	*Oligosoma striatum*	At Risk- declining	✓	✓	✓	
Forest gecko	*Mokopirirakau granulatus*	At Risk- declining	✓	✓	✓	
Elegant gecko	*Naultinus elegans*	At Risk- declining		✓		
Pacific gecko	*Dactylocnemis pacificus*	Not Threatened*	✓	✓	✓	

Note: * Pacific gecko has a Regional Threat status of 'At Risk- declining'.

5.2 Lizard salvage and relocation protocols

The lizard management would be implemented as two Phases, including pre-works systematic searches and trapping, and works-assisted destructive searches. Further, release site monitoring would be implemented where triggered by sufficient numbers of lizards relocated under this plan. Activities undertaken during these phases are detailed below. A summary of the LMP activities have been provided as a checklist in Table 9.

This Plan requires pre-clearance trapping and destructive habitat searches prior to and during vegetation removal. All relocated native lizards will be released into habitats that are enhanced to the satisfaction of the Project herpetologist. To increase carrying capacity of the release site, shelter / refuge provision will be provided with all lizards relocated.

5.2.1 Timing of the salvage and relocation

Indicative staging of the proposed Pit is shown in Figure 2, whereby operations are anticipated at years 3, 15, 30 and 50 of the quarry life. Timing of lizard management would therefore be repeated per stage, requiring preclearance trapping, followed by destructive searches during vegetation removal.

This Plan may only be enacted between October 1 and April 30, and during fine, settled weather, when native lizards in the Auckland Region are most active.

5.2.2 Phase 1: pre-clearance salvage of native lizards

Prior to the commencement of any vegetation clearance or earthworks, a herpetologist(s) will undertake trapping and active searches for lizards in all identified habitats within the indicative stage, or other demarcated area of vegetation that requires removal (Figure 3 and Figure 1). These searches will be carried out over two to four weeks preceding the scheduled vegetation clearance date(s) and will target all native reptile species using the described methods; the use of artificial retreats (Figure 4), systematically searching potential habitats and night searches (spot lighting).
Phase 1 efforts would include:

a. Systematic habitat searching;
b. A minimum 2 weeks of ground trapping (including installation /repeated 24h inspections) using banana baited Gee's Minnow funnel traps; and,
c. Nocturnal spotlight searching.

All captured lizards would be processed (measured, weighed, and photographed, where appropriate) and relocated to the identified relocation site (refer Section 5.3).

5.2.2.1 Environmental conditions

Lizard capture would only be undertaken during favourable weather conditions, specifically: when temperatures are above 10 °C , it is precipitation-free or with light precipitation (i.e. light drizzle), and ideally with wind speed < 15 km/hr to ensure lizard detection probability is maximised.

5.2.2.2 Trapping

- A minimum of 100 traps per ha (approx. 1 per 100 m^2) would be set through all potential lizard habitats within each indicative stage.
- A minimum 10 days intensive trapping period would be undertaken per indicative stage or other demarcated area of vegetation that requires removal.
- All traps shall be embedded in, and furnished with vegetation to protect any captured lizards from heat and exposure during confinement.
- Pitfall traps and ARs shall be installed at least three weeks prior to the minimum 10-day trapping period.

- When not in use, all pitfall traps shall be sealed closed (so that no lizards can be captured), or furnished to the upper rim so that lizards may escape.
- All traps shall be checked no more than 24 hourly while active.
- If a lizard is captured within the last three days of the trapping period, trapping must continue beyond the ten-day period until three trap days are achieved without lizard capture.
- All native lizards shall be released at the designated release site immediately upon capture (refer Section 5.3).
- During trap checks, the Project Herpetologist (or a suitably experienced ecologist nominated by the project herpetologist) shall hand search all vegetation, logs and debris to capture lizards and to identify important areas that should be targeted for machine searching.


Figure 4: Artificial retreat (L); Pitfall trap with AR cover (R).

5.2.2.3 Systematic searches

Systematic searches would be undertaken through all potential and searchable habitats between traps. during trap checks and vegetation removal, with coordination and in cooperation with the vegetation clearance contractor. Systematic searches shall:

- Involve searching through all potential habitats including logs, rocks, fallen epiphytes and other ground cover;
- Searching would degrade surrounding habitats such that they:
    - Increase detection within traps,
    - Decrease likelihood of lizards remaining within habitats.

Any lizards captured would be released to the approved relocation site (detailed in Section 5.3; see Figure 7) as determined by the Project ecologist.

5.2.2.4 Nocturnal spotlight searches

- Nocturnal spotlight searches will be undertaken along all affected vegetation edges within each stage.

- A minimum three nights of spotlight searches would be undertaken per area of vegetation prior to any vegetation clearance.
- If a gecko is sighted and cannot be captured (e.g. due to height), then the affected tree shall be marked / taped and the Project herpetologist (or a suitably experienced ecologist nominated by the project herpetologist) shall undertake a targeted search of that tree during vegetation tree felling (Phase 2 works management).
- If a gecko is sighted within affected vegetation within the three nights of night searching, then a further night search will be undertaken, and repeated until a night search does not identify any new geckos (excluding which are identified within marked vegetation (above) within the affected vegetation.
- All native lizards shall be released at the designated release site(s) immediately upon capture.

5.2.3 Phase 2: works management

Phase 2 may be commenced once the Project Herpetologist is satisfied that all lizard habitat has been effectively trapped and systematically searched, and night-searched, such that no further lizards are likely to be captured using the methods as determined by Phase 1 trapping and searches.

Phase 2 will involve the recovery of lizards by a herpetologist(s) during vegetation removal activities.

5.2.3.1 Searches of felled tree vegetation

Felled vegetation will not be mulched in situ (i.e lowering a mulch-head directly onto standing vegetation), unless approved by the project herpetologist. In some instances, approval to mulch discrete areas of poor-quality vegetation (e.g., areas of young gorse or blackberry and other similar areas not considered to support native lizards) may be given by the project herpetologist.

All standing native vegetation (e.g., established trees/ shrubs > 40 mm diameter at breast height) will be felled using hand saws (e.g. chainsaws) and trees > 5 m tall sectioned (deconstructed). The project herpetologist will supervise the felling of trees/ shrubs and search the foliage and branches/ trunks at their discretion to recover lizards.

- Note that this material may be required to be recycled for use at restoration locations (refer Section 3).

Phase 2 nocturnal spotlight searches

Nocturnal searching would be undertaken by experienced herpetologists, using powerful headlamps and aided by binoculars. Searches would target:

- Standing vegetation, prior to felling.
- Stacked vegetation, where it would be stockpiled on a flat surface.
- Felled vegetation will be stacked and remain in situ for no less than two weeks, so that canopy foliage and other habitats (e.g. epiphytes) of trees can be accessed during searches (e.g. Figure 5).

Figure 5. 'At Risk' elegant gecko on kānuka, approximately 1 week after felling (refer red circle and inset image).

5.2.3.2 Machine-assisted destructive searches

Machine-assisted destructive searches require the vegetation removal contractor to work with experienced herpetologists to search through vegetation as it is removed. This involves scraping back of surface vegetation (Figure 6), as well as lifting heavy objects (e.g., large logs) so that lizards hiding beneath can be captured. An excavator with a toothed bucket or root-rake attachment will be required.

- Some vegetation (tree foliage, epiphytes) may need to be stockpiled for future searching (e.g. night search canopy foliage (refer Section 5.2.2.3).
- Recoverable leaf litter substrate, woody debris and potential shelter structures (e.g., logs, rocks) will be collected and transferred to the lizard relocation site(s) by the herpetologist.
- Note that this material may be required to be recycled for use at restoration locations (refer Section 3).

Figure 6. Machine-assisted lizard searches. Herpetologist supervising the scraping of terrestrial vegetation.

5.2.3.3 Lizard capture

Native lizards will be captured and handled by a DOC-authorised herpetologist, or by a suitably qualified and experienced person working under their supervision. All native lizards captured prior to and during vegetation clearance operations will be placed immediately into containment boxes and held temporarily for release. Captured lizards will be measured, sexed, weighed and photographed, and released at the designated release site the same day where possible. The retention of lizards in captivity for periods longer than one day should be avoided as far as practicable.

5.2.3.4 Incidental discovery

In the very unlikely event that a native lizard is found in the footprint that is not covered by this Plan, the species will be retained in temporary captive management and the Department of Conservation will be notified. Note that incidental discoveries would be notable because they are likely to include species outside their known range, and/or are threatened species and not expected to occur within the Project area, therefore are not covered in this plan.

5.3 Release site

Direct transfer of salvaged lizards from the impact site to a receiving site is preferred wherever possible, and the selection of an appropriate lizard relocation site is crucial to ensuring the best possible outcome for lizard salvage-relocation programmes.

The Department of Conservation's key principles for lizard salvage and transfer guidelines require consideration of the following components when selecting a receiving site(s):

1. The site must be ecologically appropriate and have long-term security;
2. The habitat at the site must be suitable for the salvaged species;

3. The site must provide protection from predators; and
4. The site must be protected from future human disturbance.

5.3.1 Release site description

In consideration of the above principles, the proposed Sutton Pit ecological package provides for a 108.35 ha area (Figure 7) to the immediate east and north of the proposed pit where lizards may be released. This area supports low copper skink abundance, as determined from surveys supporting the EcIA, however the vegetation has the potential to support other skink and gecko species as identified in Table 7. The habitat values of this area, including capacity to support lizards, are expected to improve as part of the offset and compensation package (Bioresearches & JS Ecology, 2024).

This is a significant tract of recovering and regenerating indigenous forest, largely comprised of a mosaic of regenerating kānuka forest (VS2) and taraire, tawa and podocarp forest (WF9). It contains very similar vegetation to that within the project area. These areas are largely already fenced to exclude stock, but currently receive no other biodiversity management. There are also some fragments (5.35 ha) of unfenced rock forest to the southeast of the SAL landholdings.

These areas are proposed to be legally protected by way of covenant, and enhanced from Stage 1 through:

- Control of pest predators including possums, rats, and mustelids,
- Control of ungulate browsers including deer, goats, and pigs,
- Pest plant control; and,
- Fencing of the rock forest remnant patches.

Planting to buffer and connect these areas is additionally proposed. These enhancements are further detailed in the Net Gain Delivery Plan: Pest and Weed Control (document E7:9; JS Ecology Ltd, 2025).

A 20 m buffer edge of enhanced forest is identified in Figure 7 that is expected to receive relocated lizards. Specific receptor locations along this buffer edge have not been identified in maps. This is because the proposal covers five stages over 50 years, and while the habitat suitability across this area is predicted to substantially improve with pest management (e.g., vegetation ground cover, leaf litter depth and dead wood are modelled as fauna habitat indicators, using a BOAM and reported in document E4.6 Residual Effects Analysis Report), these decisions are better informed at the time of relocation and based on:

1. Proximity to the affected stage;
2. Where other lizards have been released following management; and
3. Where microhabitats are determined to be most suitable for the species at the time of management.

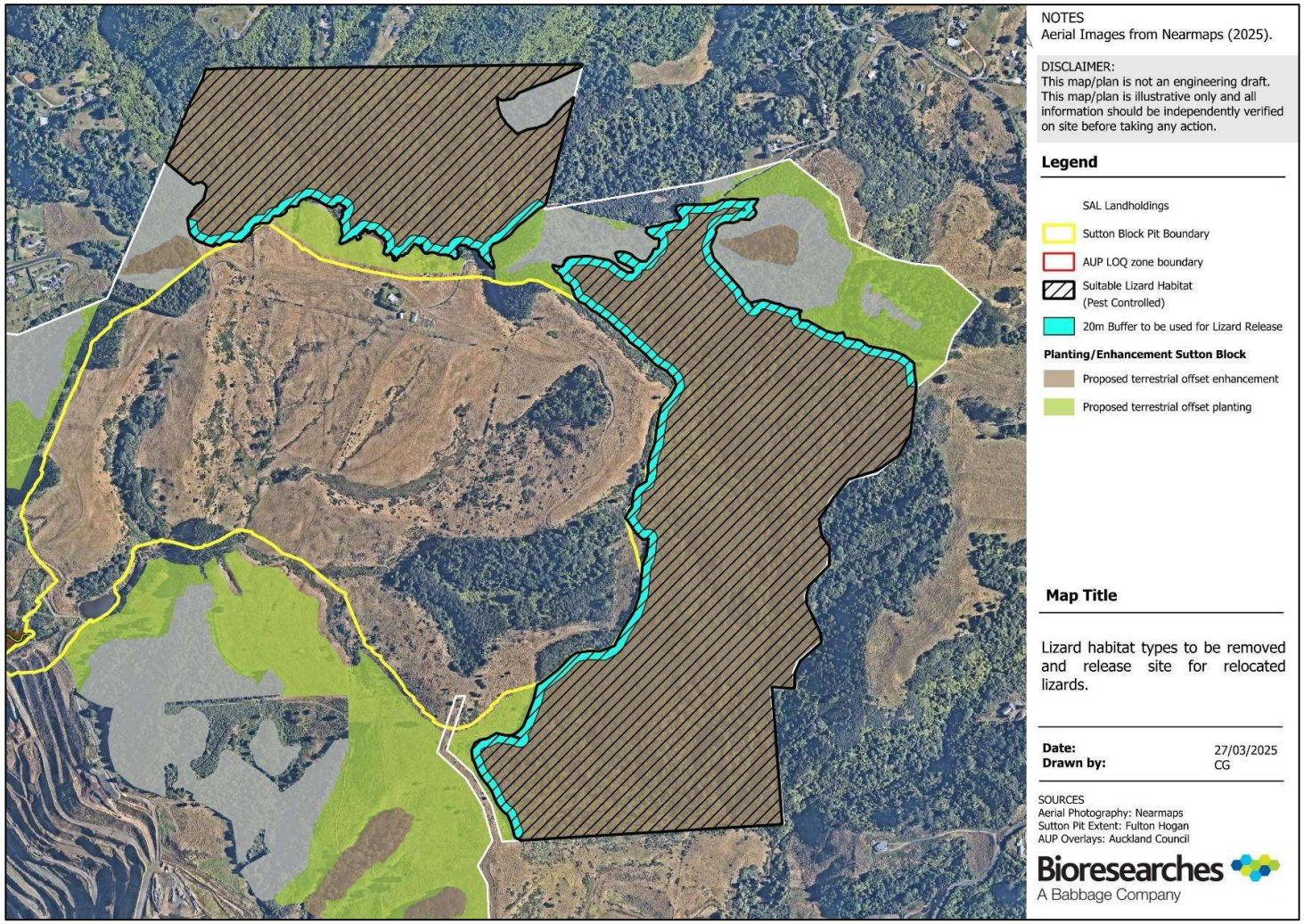

Figure 7. Map showing proposed terrestrial enhancement areas and the proposed release site.

5.3.2 Release site enhancement

This Plan acknowledges that the proposed release site may already support the full suite of lizard species covered under this Plan. Displaced lizards have a lower likelihood of survival where the carrying capacity of adjacent habitats is stressed through increased competition for fewer resources. Further, displaced animals have a higher probability of risk of predation, and a rapid increase in lizard numbers in a given area is likely to result in a corresponding increase in predators. These effects are expected to be reduced at the release site, which will be within an area of targeted pest control as part of a wider ecological package, however provision of additional natural retreats with relocated lizards will be important to maximise successful establishment of transferred lizards.

5.3.2.1 Ecostacks

For the first lizard released and every five lizards thereafter, at least one supplementary refuge (an ecostack or brush pile, Figure 8), comprising of a c. 1m x 1m pile of small, stacked logs and brush or rocks shall be created within the lizard release area. The material used to create these piles will be sourced from the vegetation to be cleared.

To ensure that captured and relocated lizards immediately have habitat available, at least one refuge must be created prior to any lizard management activities commencing, in a location within the release site. If five lizards are caught and released, at least one additional refuge will be installed before any additional lizards are transferred.

Figure 8. Example of ecostack / stacked brush pile as a supplementary refuge for relocated lizards.

Table 8. Triggers for management and post-release monitoring provisions.

	Trigger	Required Action	Duration of management
A	1-5 native lizards per stage	Provision of 1 ecostack	At relocation
B	≥ 10 native lizards per stage	Provision of 1 ecostack per 5 lizards	At relocation
C	≥ 20 native lizards per stage	Provision of 1 ecostack per 5 lizards Implement Success Monitoring	Monitoring annually for 5 years following release

5.4 Monitoring and reporting

5.4.1 Monitoring

Success monitoring would be undertaken at release site locations, targeting ecostacks, where lizards are relocated. The purpose of the monitoring is to determine success by measuring / identifying:

1. Occupancy by lizards of ecostacks, as provided for habitat replacement.
2. Identifying any relocated lizards, where photograph ID is used.
3. Recording any trends in numbers and species encountered within the pest managed area.
4. Presence of gravid females or juveniles.

Monitoring would consist of stations of four artificial retreats and / or pitfall traps. Each monitoring station will be set at a minimum of four locations (based on trigger c, Table 8), targeting locations of ecostacks.

Where Artificial Retreats are used, they would be installed at least four weeks prior to the survey period. Pitfall traps may be left in situ between survey years, however, will be neutralised with either an impenetrable cover, or filled to ensure any lizards can climb out.

The survey period would provide for four trap inspections during fine, non-consecutive days over November-December or March-April, when lizards are most active. Artificial Retreat survey/ monitoring would be undertaken in accordance with Lettink (2012).

5.4.2 Reporting

A works-completion report would be prepared by the Project herpetologist within 1 month of completion of all vegetation removal, per indicative stage. The report would detail:

1. The number of lizards and species captured and transferred;
2. The number and location of any ecostacks created;
3. Whether monitoring is triggered from the relocation; and,
4. All information as required of an ARDS report (Amphibian Reptile Distribution Scheme, Department of Conservation).

The works completion report would be submitted to Auckland Council Ecological Advice Team, Natural Environment Design, Environmental Services.