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Ecological Management Plan

for: Rangitoopuni Developments Limited Partnerships

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Reviewer(s)	[redacted] Ecologist	
	[redacted] Senior Ecologist	
	[redacted] Ecology Manager	

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1 INTRODUCTION

This Ecological Management Plan (EMP) has been prepared for Rangitoopuni Developments Limited Partnership on behalf of Ta Kawerau Iwi Settlement Trust. The project involves the staged development and operation of a countryside living development and retirement village covering a cumulative 377 ha on the southern portion of Rangitoopuni-Riverhead Forest.

The EMP encompasses a suite of management plans that set out how actual and potential adverse ecological effects associated with this project will be addressed.

1.1 Purpose and Objectives of the EMP

This EMP encompasses a suite of management plans which will come into effect in the event of Rangitoopuni Developments Limited Partnership obtaining resource consents through a Fast Track application whilst carrying out the works identified to have a potential adverse impact on indigenous fauna. The purpose of this plan is to avoid and minimise the potential effects on native biodiversity during the expansion of the Project Area.

Under the legislative framework (both the National Policy Statement for Indigenous Biodiversity, 2023, and the National Policy Statement for Freshwater, 2024), effects are required to be managed under the effects management hierarchy (Figure 1):

> **effects management hierarchy** means an approach to managing the adverse effects of an activity on indigenous biodiversity that requires that:
>
> (a) adverse effects are avoided where practicable; then
>
> (b) where adverse effects cannot be avoided, they are minimised where practicable; then
>
> (c) where adverse effects cannot be minimised, they are remedied where practicable; then
>
> (d) where more than minor residual adverse effects cannot be avoided, minimised, or remedied, biodiversity offsetting is provided where possible; then
>
> (e) where biodiversity offsetting of more than minor residual adverse effects is not possible, biodiversity compensation is provided; then
>
> (f) if biodiversity compensation is not appropriate, the activity itself is avoided.

Figure 1. Effects management hierarchy under the National Policy Statement for Indigenous Biodiversity.

This EMP has been prepared to direct how the project will mitigate adverse effects on the ecological fauna values of the land within the project's footprint and its surroundings. The EMP focuses on terrestrial and aquatic fauna. Management of flora, including pest plant and animal control, and revegetation has been addressed in the Landscape Management Plan, prepared by Boffa Miskell (2025). The EMP sets out procedures for how Rangitoopuni Developments Limited Partnership will minimise and manage adverse effects on ecological values, by including:

- An Avifauna Management Plan;
- A Bat Management Plan;
- A Lizard Management Plan; and
- A Freshwater Fish Management Plan.

Pest animal management is required in relation to Lizards. This requirement is described generally within the Landscape Management Plan (Boffa Miskell, 2025).

1.2 Responsibilities and Competencies

1.2.1 Key Personnel (SQEP)

This EMP, and each section, is required to be implemented by a SQEP (Suitably Qualified and Experienced Person(s)), in close coordination with Rangitoopuni Developments Limited Partnership (Table 1). As of 2025, the following ecological leads are identified as responsible for the implementation of the EMP:

Table 1. Identification of SQEP as required by the draft resource consent conditions.

EMP Section	Biodiversity Value	SQEP responsible
Section 4	Avifauna	Michael Anderson
Section 5	Bats	Alisha Hart
Section 6	Lizards	Chris Wedding
Section 7	Native freshwater fauna	Laura Drummond

1.2.2 Staff Induction Procedures

Prior to the implementation of the development, all SQEP and any personnel working or assisting with ecological management in accordance with this Plan, shall hold a prestart meeting to discuss the location and extent of any works required, the required ecological management actions in accordance with actions identified in this Plan, and any lead in times required to complete pre-vegetation clearance management actions.

1.3 EMP Structure

1.3.1 Linked Documents

This document has been prepared to direct actions to minimise ecological effects within and adjacent to Rangitoopuni Developments Limited Partnership; however, it should be read in conjunction with the documents presented in Table 2.

Table 2. Linked documents that should be read in conjunction with the Ecological Management Plan.

Title	Author	Date	Publication
Ecological Impact Assessment	Bioresearches	2025	Bioresearches (2025). Ecological Management Plan. Report for Rangitoopuni Developments Limited Partnerships pp 61.
Planting Plan	Boffa Miskell	2025	Boffa Miskell 2025. Rangitoopuni: Landscape Management Plan. Report prepared by Boffa Miskell for Avant.
Landscape Management Plan	Boffa Miskell	2025	Boffa Miskell 2025. Rangitoopuni: Lot 1 and Lot 2 Landscape Concept. Report prepared by Boffa Miskell for Avant.

1.4 Draft Resource Consent Conditions

The Ecological Management Plan has been drafted to meet the requirements of the following recommended consent conditions. These conditions are provided to ensure appropriate ecological management and offset actions are applied to minimise adverse ecological effects:

Ecological Management Plan

*No less than ten working days prior to the commencement of any vegetation removal works, the consent holder must submit to Auckland Council for certification an Ecological Management Plan (**EMP**) prepared by a suitably qualified and experienced ecologist. The objective of the EMP is to minimise the loss of ecological values prior to and during vegetation removal. The EMP must include the following:*

(a) *State the timing for implementation of the program that will be undertaken in suitable seasonal and climatic conditions;*

(b) *Describe the measures to minimise adverse effects on bats, nesting birds, lizards (and a copy of the appropriate wildlife permit if required); and*

(c) *State the ecologist(s) and their contact details to manage the implementation of the program; and*

(d) *Describe where any captured fauna are to be relocated to, including the locality and nature of any habitat to be created (if applicable), and any follow up monitoring/management as required to ensure success of translocation; if required, the nature of any fauna protective fencing when and where it is to be erected.*

(e) *Provide a planting and pest control plan and maintenance schedule for all newly created edges where vegetation removal will occur. The planting plan must be consistent with Auckland Council's Restoration Planting Guidelines.*

2 ECOLOGICAL VALUES AND EFFECTS SUMMARY

2.1 Site Overview

The entire site is a commercial pine plantation, and management would respond to ecological values that are associated with a post-harvest baseline (e.g. Figure 3). Within this environment, bulk earthworks will generally be confined to infrastructure (e.g. roads) and building platforms within Lots 1 and 2. The remainder of the site will be permanently restored with indigenous vegetation (Figure 2).

At Risk (high value) copper skinks are considered to potentially be present; At Risk New Zealand pipit were recorded, and Threatened (Very High Value) long-tailed bats are known to be present. Further, the site supports a network of watercourses and wetlands, all of which would be protected and enhanced as a result of the development.

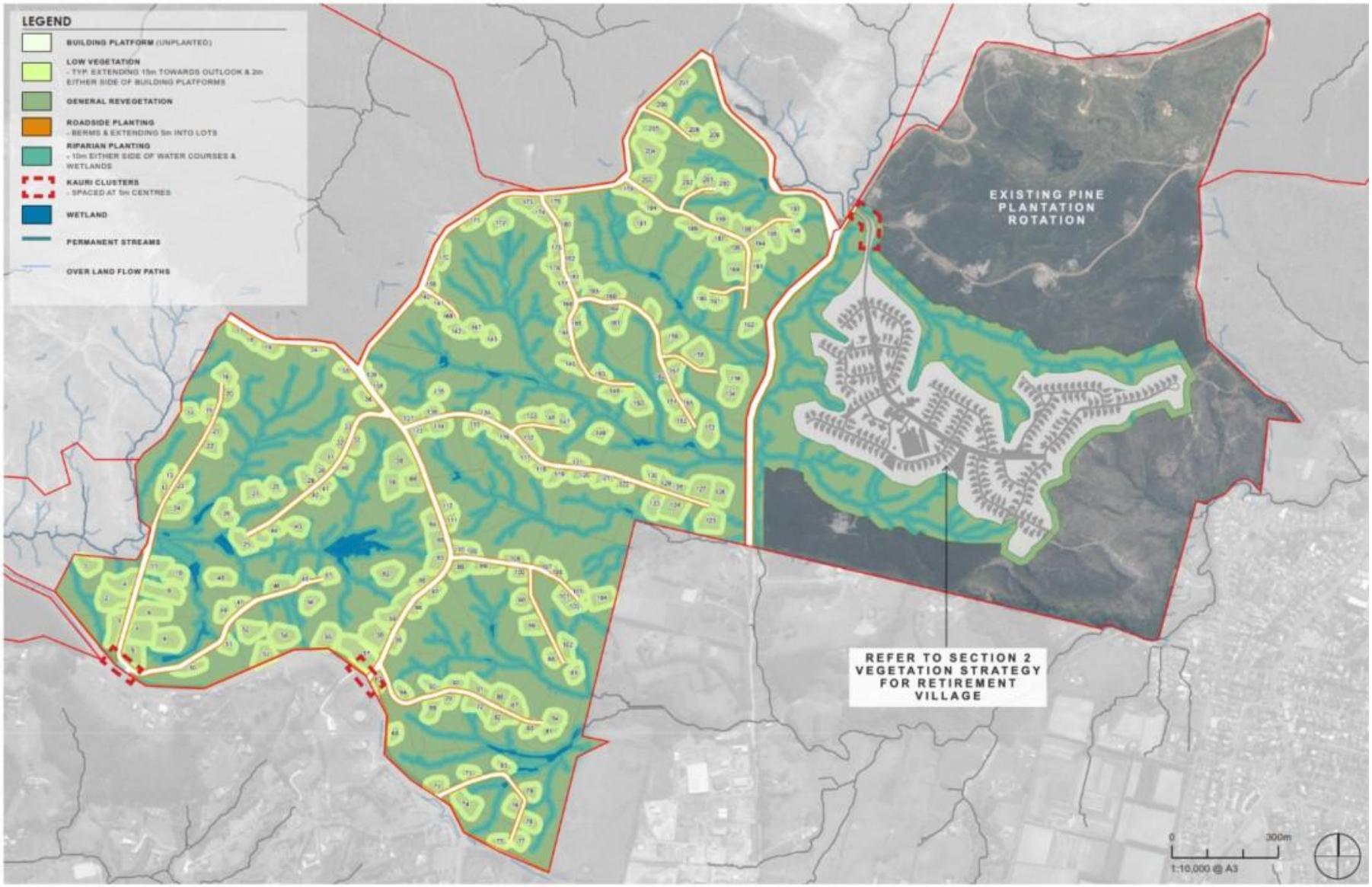


Figure 2. Rangitoopuni-Riverhead Forest Countryside living proposal showing large areas of restoration around localised building platforms and infrastructure. Image courtesy of Boffa Miskell (2025).

Figure 3. Rangitoopuni-Riverhead Forest baseline condition post-harvest.

2.1.1 Terrestrial Ecological Values

Vegetation within the Project area is a mixture of Deforested exotic scrub, Riparian margins, Mature exotic forest, and Immature exotic forest (Figure 4). The ecological values of these habitats range from Negligible to Moderate (Table 3) and were identified as supporting a range of Threatened or At Risk (TAR) native fauna, including:

2.1.1.1 At Risk Copper Skink (High ecological value)

Copper skinks have not been recorded but are assumed to be present because they have been reported within or around the edges of other pine plantations and are widespread within the Auckland Region, including within young weedy vegetation such as rough roadside grasses. It is considered that their abundance throughout a harvested pine environment is likely to be very low, on the basis that their populations may persist within and around the edges of rotational harvest, however are unlikely to be abundant in these highly disturbed environments, particularly in the presence of a full suite of predators (birds, rats, mice, hedgehogs and mustelids). Some population expansion may occur as the forest matures, however, copper skinks are generally considered to be in gradual decline throughout their range (Hitchmough et al. 2021) and in Auckland (Melzer et al. 2022).

2.1.1.2 At Risk New Zealand Pipit (High ecological value)

New Zealand pipit were observed within recently felled areas, and are known to use open, clear-felled pine elsewhere in New Zealand (Beauchamp 2013). This species is otherwise not associated with forest vegetation cover, and as such is considered to have benefited from forest clearance for pasture (Beauchamp, 2013). Pipits require long grasses for breeding, which are found along the edges of riparian margins at the Site, and therefore may be present breeding within these areas.

2.1.1.3 Threatened - Nationally Critical long-tailed bats (very high ecological value).

Long-tailed bats are known to inhabit Riverhead Forest and are therefore considered likely to interact with the Project area, either flying over or around clear-felled environments, or roosting within riparian margins, where large trees have been identified and would be protected from forestry operations as part of this application.

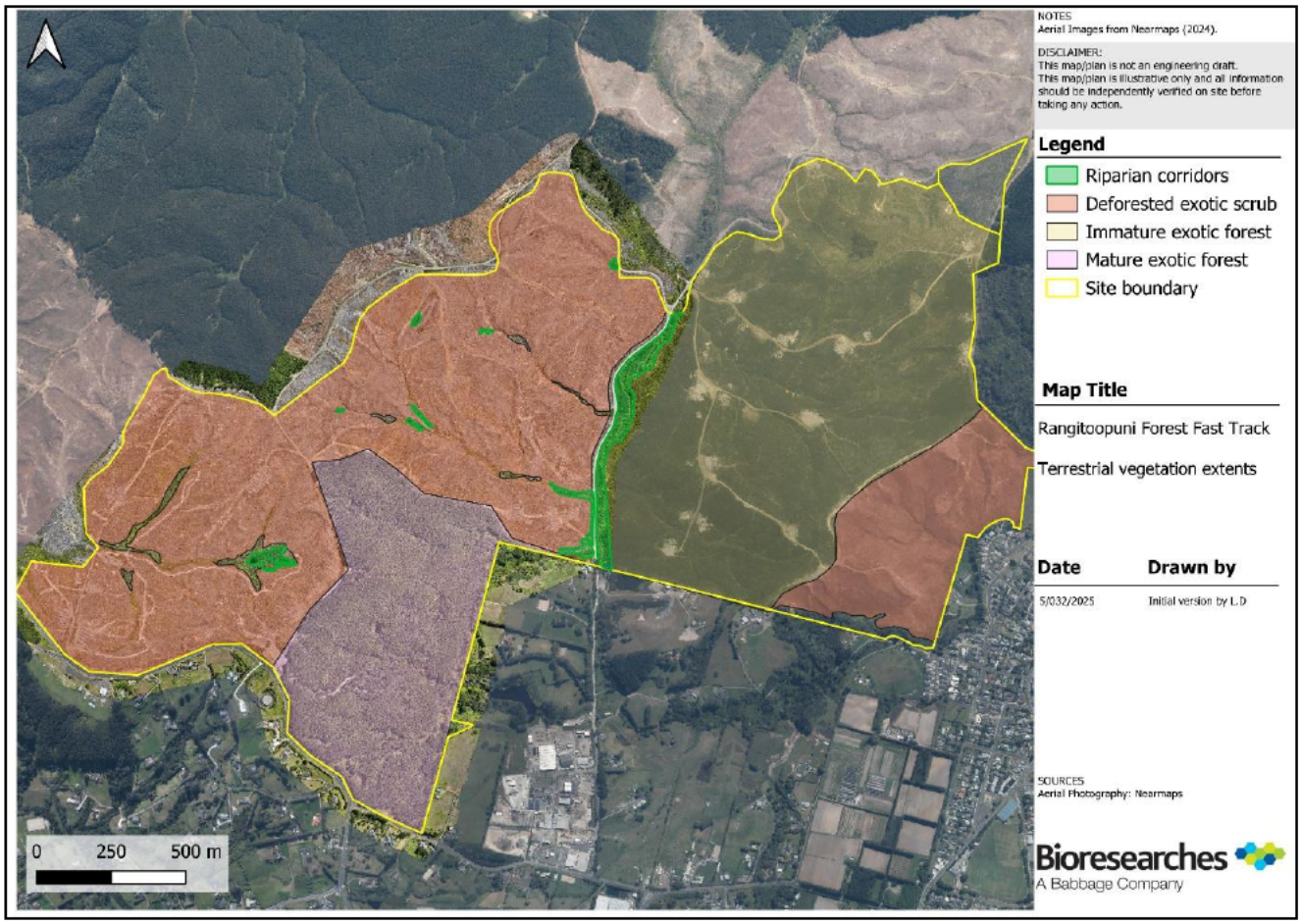


Figure 4. Identified terrestrial vegetation types within the Project Area.

Table 3. Vegetation type value and quantity within the Rangitoopuni development.

Vegetation composition	Quantity	Botanical value
Deforested exotic scrub	181 ha	Negligible
Riparian margins	5.9 ha	Moderate
Mature exotic forest*	59 ha	Negligible
Immature exotic forest	125 ha	Low

** the 'Mature exotic forest' will be felled prior to the development implementation, resulting in a baseline consistent with the 'Deforested exotic scrub' ecosystem*

2.1.2 Freshwater Ecological Values

Within the project area, 28.8 km of intermittent and permanent stream was. These streams have been assigned low to high ecological value (Bioresearches, 2025). These streams were found to provide habitat for a range of freshwater fish species, including At Risk species. Four natural inland wetlands were observed within the Project Area and have the potential to provide habitat for native fish and avifauna.

2.2 Ecological Management Framework

2.2.1 Measures to avoid or minimise potential effects

Measures to avoid or minimise potential effects are described in full within the Ecological Impact Assessment (Bioresearches, 2025), however, those that relate to fauna are summarised below.

2.2.1.1 Adverse effects that are avoided, where practicable.

- The protection of native avifauna should be achieved by avoiding vegetation clearance during the bird breeding season (August to March, inclusive), as far as practicable, or where not achievable, conducting a pre-vegetation clearance bird nesting survey and associated nest protection measures where required.
- Except for culvert upgrades and installation, the avoidance of streams and wetlands by the development has been undertaken.

2.2.1.2 Adverse effects that are minimised, where practicable.

- Adverse effects on lizards will be minimised through the implementation of a lizard management plan.
- Adverse effects on bats will be minimised through the implementation of a bat management plan.
- Adverse effects on fish will be minimised through the implementation of a fish management plan.
- Effects on fauna are minimised by implementing pest control, sensitive luminary designs within the development, and domestic animal restrictions.
- Adverse effects from sedimentation are minimised through the implementation of an Erosion and Sediment Control Plan before works commence.
- Infringement into the riparian yard has been minimised as far as practicable.

2.2.1.3 Adverse effects that are remediated, where practicable

- Vegetation removal of up to 38% of the riparian yard will be remedied through the remaining 90% riparian yard being restored with indigenous vegetation, resulting in an overall net gain.
- Inclusion of culverts and impacts to in-stream connectivity remediated through fish-friendly design and provision of fish passage through the culvert.

2.2.2 Level of Effect following Management Actions

The level of effects on habitats and species, without management, ranges from Very Low to Moderate (Table 4). In accordance with EIANZ guidelines, any level of effect of moderate or above requires effects management. Effects management, including fauna controls on vegetation removal, relocation, and ongoing remediation

throughout the life of the development, is expected to substantially reduce effects on fauna and loss of their habitats to no more than moderate, and temporary (> 20 years).

Table 4. Magnitude and level of effect of the proposed works to terrestrial habitats and fauna – with and without effects management measures.

Ecological component	Ecological Value	Magnitude of effect	Level of effect (without management)	Level of effect (with management)
Deforested – Exotic Scrub	Negligible	Negligible	Very Low	Very Low
Riparian corridors	Moderate	Negligible	Very Low	Very Low
Mature Exotic Forest	Moderate	Low	Low	Low
Immature Exotic Forest	Low	Negligible	Very Low	Very Low
Avifauna	Low	Negligible	Very Low	Very Low
NZ pipit	High	Low	Low	Low
Herpetofauna	High	Low	Low	Low
Bats*	Very High	Low (mature pine trees to be felled independent of the development)	Moderate	Low

*Proposal provides for permanent forestation with indigenous species which may improve long-term habitat values for bats.

2.3 EMP Staging and Timeframes

2.3.1 Activities Prior to Vegetation Removal

A summary of the timing for management actions, in accordance with this EMP, are summarised in Table 5.

Table 5. General timing for management actions required by the EMP.

EMP Section	Management Action	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AMP	Pre-felling nest surveys												
BMP	Bat surveys and removal of high-risk trees if applicable*												
LMP	Lizard salvage												
FFMP	Fish removal and relocation												

Note: Baseline conditions not expected to support any roost trees..

The following activities are to be completed before any vegetation removal can take place as part of the project works:

Avifauna Management Plan

- Nest surveys, including ground-based and tree-based, to be undertaken from September 1 to February (inclusive) prior to vegetation clearance.
- If active nests of native birds are located, a 10 m buffer around the nest is required until the chicks naturally leave the natal area or the nest fails.

Bat Management Plan

- Local iwi representatives are to be notified and provided opportunities for involvement in the bat survey and monitoring.
- Prior to each extent of tree removal (within 6 months of felling), all trees within the removal area are to be assessed by a DOC-accredited bat ecologist (C 3.3) to catalogue all trees that have the potential to support roosting bats (High-risk trees). High-risk trees may only be felled from October to April (inclusive), and only once DOC Bat Roost Protocols have been followed to ensure no bats are actively roosting in the tree at the time of felling.
- Precautionary Artificial Roost Boxes (ARBs) are to be provided in nearby pest-controlled habitat prior to any vegetation clearance, 6 months in advance of high-risk tree removal.

Lizard Management Plan

- Local iwi representatives are to be notified and provided opportunities for involvement in all aspects of capture, relocation, translocation of skinks and geckos, as well as any ongoing monitoring.
- Lizard salvage is required prior to vegetation removal within potential lizard habitat October 1st to April 31st.
- May 1st to May 31st –vegetation clearance and lizard salvage within potentially suitable lizard habitat is dependent on approval from Auckland Council during this time.
- No clearance of vegetation is permitted from June to September within potential lizard habitat.
- Release site occurs in an appropriate site approved by the herpetologist near the Site.

Freshwater Fish Management Plan

- Local iwi representatives are to be notified and provided opportunities for involvement in all aspects of capture and relocation of freshwater fauna.
- Fish removal from impacted streams and relocation will take place no more than one week prior to instream works.

2.3.2 Activities During and Immediately Post-Vegetation Clearance

Bat Management Plan

- High-risk trees must be assessed by a DOC-accredited bat ecologist using at least one of three methods (acoustic pre-felling survey, cavity checks, and/or roost watches) immediately prior to felling to confirm that they do not contain active roosts.

- High-risk trees must be checked post-felling by a DOC-accredited bat ecologist for any bat sign.
- Where roost trees (active or inactive) are confirmed and cannot be retained, additional ARBs will be deployed in suitable pest-controlled habitat nearby as directed by the DOC-accredited bat ecologist.

Lizard Management Plan

- Destructive searches for lizards will take place as vegetation is being cleared within potentially suitable lizard habitat.
- All felled trees will be stacked aside and remain in situ for at last one month to allow for further searches of canopy vegetation.

2.3.3 Monitoring and maintenance

A summary of the monitoring and maintenance elements of this EMP are identified here. Reporting requirements would be detailed in a single report, to be produced at the end of each stage of the project.

Ecological Management Plan

- Adaptive Management: This EMP should be reviewed and updated every 5 years, to ensure best practice is adhered to and the most up-to-date and effective techniques are being used.

Lizard Management Plan

- Monitoring reports will be produced for lizard salvage outcomes per earthworks stage
- Five annual lizard monitoring surveys will be undertaken at release site locations where 20 or more lizards are captured and relocated.

Bat Management Plan

- A completion report will detail all High-risk trees identified, and method and results of activity assessment.
- All ARBs and anti-predator bands (where installed) are to be maintained and monitored for a minimum of 5 years. If any boxes have bat sign, then, all boxes are to be maintained for the life of the development. Inspection and maintenance for ARBs must be conducted annually between March and September (inclusive).
- Anti-predator tree bands installed on trees with ARBs will be checked and maintained on a six-monthly basis for a minimum of 15 years.
- An annual ARB maintenance report detailing inspection results and maintenance carried out must be submitted to Auckland Council within 30 days of inspection, and any maintenance/ replacement is required to be undertaken within 60 days of inspection.

3 MANAGEMENT OF VEGETATION REMOVAL

Vegetation removal from the Site is proposed to be carried out in multiple stages, and the vegetation type identified as 'Mature Exotic Forest' is scheduled to be felled over October 2025 – March 2026 as commercial forestry, prior to the implementation of the development (Figure 5). Because all mature pine forest will be removed from the site prior to the project commencing, and as part of a separate project, vegetation to be felled/removed consists of exotic gorse and shrubs, slash, and 6-year-old plantation pine, with works within the riparian margins highly minimised. The removal of taller, mature trees has been largely avoided, however, this EMP has been conservatively prepared with the potential for the felling of roost (bat and avifauna) trees.

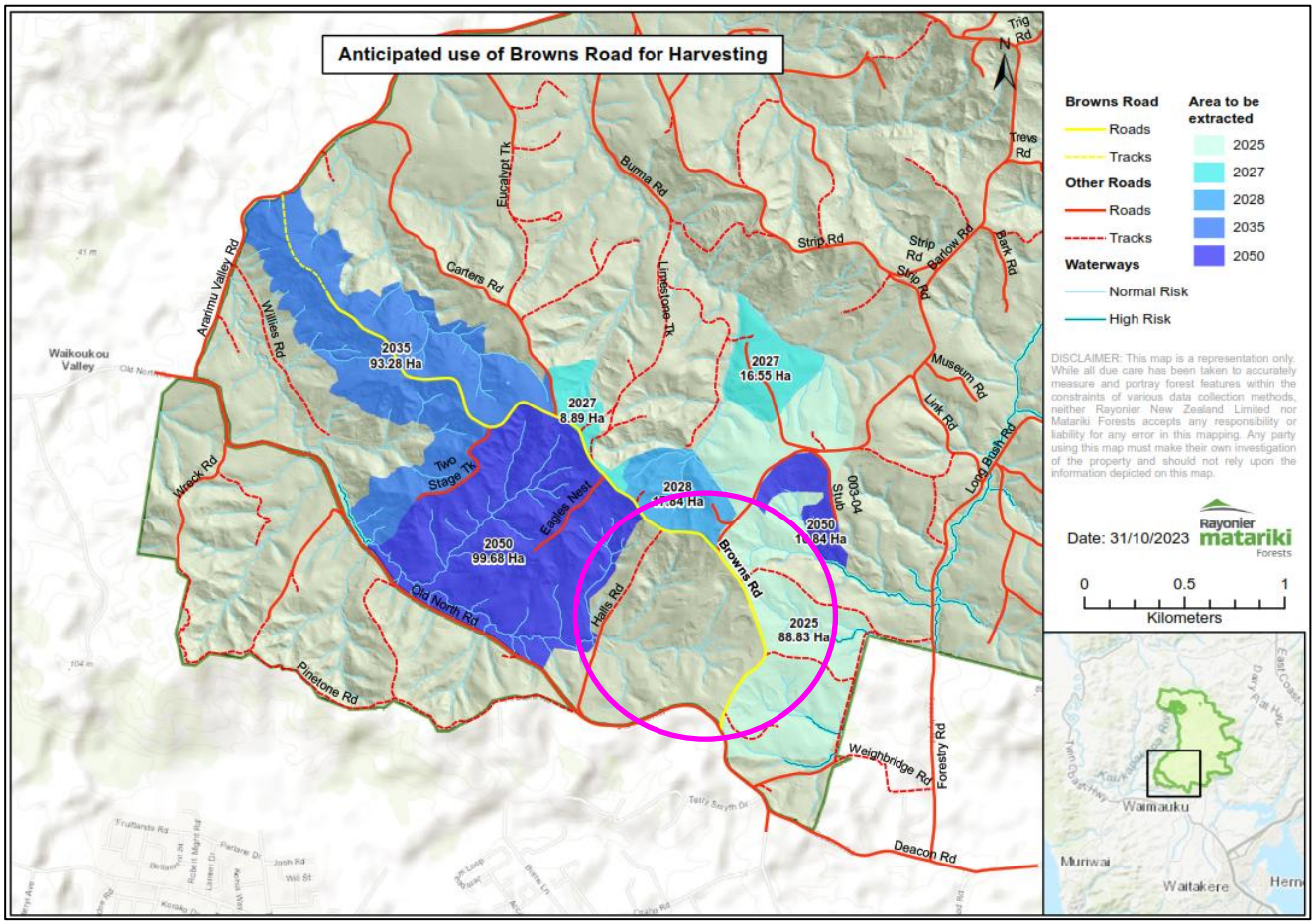


Figure 5. Commercial Forest Harvest Schedule within the Rangitoopuni Development. Magenta circle indicates 'Mature Exotic Forest' Vegetation.

3.1 Pre-Clearance

Prior to vegetation removal in each staged area, the following needs to be undertaken:

1. Accurate survey of the clearance area and clear visual demarcation of the edges.
2. Fauna management as set out in the AMP, LMP, and the BMP.
3. Freshwater fish management as set out in the FFMP.
4. Identification by the project ecologist of forest natural resources to be salvaged as set out in this section.
5. Notification of local iwi that vegetation clearance is scheduled to be undertaken and opportunity provided for a representative to identify forest resources they may wish to have salvaged for their own purposes, including native logs, vegetation, and soils.

Sufficient time needs to be allowed for these tasks to be undertaken at appropriate times of the year to ensure their success. Discussion should take place between the ecologists and the project manager as to what methods are to be used to clear the vegetation and how damage to native vegetation or fauna outside the clearance footprint can be minimised. Agreement needs to be reached with the project manager as to which forest resources can feasibly be salvaged during vegetation clearance and where resources will be placed or stored.

3.2 Pre-start meeting and staff induction.

Immediately prior to vegetation clearance, a pre-start meeting is to be held to explain to contractors the ecological requirements associated with the vegetation clearance. Attendees should include:

- Project manager;
- Project environmental manager;
- Machine operators;
- Subcontractor representatives;
- Project ecologists; and
- Local iwi representatives.

The project managers should explain the methods to be used to clear the vegetation, and any practical or technical precautions to be taken to minimise damage to native vegetation or fauna outside the clearance footprint. It will be explained which forest resources or taonga are to be salvaged and how this is to be achieved. The project ecologist and local iwi representatives will provide any additional information to subcontractors as necessary to ensure salvaged material is appropriately managed to retain its ecological viability.

4 AVIFAUNA MANAGEMENT PLAN

4.1 Introduction

This Avifauna Management Plan (AMP) has been prepared for Rangitoopuni Developments Limited Partnership to minimise potential effects on native birds prior to and during the removal of their potential habitats as part of the construction of the development.

The EcIA identified a suite of non-threatened indigenous bird species on site. In addition, one At Risk – declining species (New Zealand pipit) was identified as potentially present on site as they inhabit rough, open habitats, including farmland, and could be expected to use recently felled areas for foraging. The removal of their habitats may result in injury and/or mortality if such species are nesting at the time of removal.

4.1.1 Plan purpose

The objectives of the AMP are to avoid (mortality) and minimise (disturbance) potential adverse effects on native avifauna associated with the construction of the proposed development at Rangitoopuni (Table 6). This would be achieved by identifying any active nests of native birds prior to works (habitat removal), so that nesting can be completed, and chicks can naturally fledge.

Table 6. Purpose, specific objectives, performance measures and monitoring relevant to the AMP.

Criteria	Explanation
Purpose	This AMP has been prepared for Rangitoopuni Developments Limited Partnership to minimise potential effects on native birds prior to and during the removal of their potential habitats as part of the construction of the proposed development. The purpose of this AMP is to detail the management measures required to minimise adverse effects on native birds associated with vegetation/habitat clearance.
Specific Objectives	The objectives of the AMP are to avoid (mortality) and minimise (disturbance) potential adverse effects on native avifauna associated with the construction of the proposed development at Rangitoopuni. This would be achieved by identifying any active nests of native birds prior to works (habitat removal), so that nesting can be completed, and chicks can naturally fledge.
Performance Outcomes	This AMP includes provisions for forest and wetland bird breeding protection and effects minimisation, including: (a) Seasonal constraints on felling in proximity to habitats that are likely to have high bird values to avoid or minimise harm to eggs and chicks; (b) A process for ensuring no nesting birds are present within vegetation to be cleared if works are required during peak breeding season (September to February - inclusive).
Monitoring	Compliance monitoring and biodiversity outcome monitoring to better understand the response of birds to the proposed residual effects management package. This includes verification of predicted likely Net Gain outcomes and adaptive management response.
Reporting	A pre-clearance compliance monitoring report will be provided to Auckland Council, no later than 30 working days prior to commencement of construction activities. Incident based reporting will be provided to Auckland Council within five working days of an unforeseen event occurring.

4.1.2 Statutory context

Almost all native birds 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. Thus, statutory obligations require that management of native birds be undertaken where they or their habitats are threatened by land disturbance or development.

The New Zealand Threat Classification System lists 491 avian taxa (Robertson *et al.,* 2021), of which 241 are classed as non-vagrant and native species. Of these, 74% are listed as either 'Threatened', 'At Risk', or 'Data Deficient' under the New Zealand Threat Classification System (Townsend *et al.* 2008). All native birds are afforded protection except for two species: Spur-winged plovers (*Vanellus miles*) and black-backed gulls (*Larus dominicanus*).

4.1.3 Responsibilities and competencies

Table 7 sets out the roles and responsibilities to the AMP. Rangitoopuni Developments Limited Partnership Manager holds the overall accountability for the implementation of and compliance with this plan.

The project Ornithologist will implement this AMP and various phases of bird-related work on the Project. The project ornithologist will liaise when appropriate with arborists, vegetation clearance teams and site engineers.

Table 7. Details of Project Ornithologist.

Credentials and Contact Details of Project Ornithologist	
Project Ornithologist	Michael Anderson
Credentials	PhD; 21 years of ornithological experience
Email	Michael.Anderson@bioresearches.co.nz
Contact Number	0210677453

4.2 Summary of avifauna values and effects

4.2.1 Avifauna Species present, and potentially present within the project's footprint

A full desktop survey and site investigations were carried out as part of the EcIA (Bioresearches, 2025). A summary of the species detected, and likely present are found in Table 8. More details are provided in Section 4.2.2 for Threatened and At-Risk species that are potentially present.

Table 8. Birds recorded as present or potentially present within the Site from the EcIA (Bioresearches, 2025).

Common name	Scientific name	New Zealand Threat Classification (Robertson *et al.*,2011)	Auckland Region Threat Classification (Woolly *et al.*, 2024)	Potential to occur on site based on habitat suitability
Bellbird	*Anthornis melanura*	Not Threatened	At Risk – Regionally Recovering	✓
Fantail	*Rhipidura fuliginosa*	Not Threatened	Not Threatened	✓
Grey warbler	*Greygone igata*	Not Threatened	Not Threatened	✓
Kererū	*Hemiphaga novaeseelandiae*	Not Threatened	Not Threatened	✓
Miromiro (New Zealand Tomtit)	*Petroica macrocephala*	Not Threatened	Not Threatened	✓
Morepork	*Ninox novaeseelandiae*	Not Threatened	Not Threatened	✓
New Zealand pipit	*Anthus novaeseelandiae*	At Risk - Declining	Threatened – Regionally Vulnerable	✓
Pūkeko	*Porphyrio melanotus*	Not Threatened	Not Threatened	✓
Sacred kingfisher	*Todiramphus sanctus*	Not Threatened	Not Threatened	✓
Shining cuckoo	*Chalcites lucidus*	Not Threatened	Not Threatened	✓
Silvereye	*Zosterops lateralis*	Not Threatened	Not Threatened	✓
Swamp harrier	*Circus approximans*	Not Threatened	Not Threatened	✓
Tūī	*Prosthemadera novaeseelandiae*	Not Threatened	Not Threatened	✓
Welcome Swallow	*Hirundo neoxena*	Not Threatened	Not Threatened	✓

4.2.2 Threatened and At Risk Species

The Ecological Impact Assessment (Bioresearches, 2025) determined that many of the Threatened or At Risk bird species recorded near the site during the desktop study, may be present within the site except for three species of waterfowl; grey duck, grey teal and royal spoonbill, for which the habitats on site are not considered suitable. Based on the outcomes of the EcIA, only one of At Risk - Declining species has the potential to utilise the existing habitats on site (New Zealand pipit).

4.2.3 Breeding season of native species recorded on Site

Sixteen native species have the potential to be present on the site. All of these are non-threatened native species except for New Zealand pipit (Nationally At Risk – Declining; Threatened – Regionally Vulnerable) and bellbird (nationally Not Threatened; but considered At Risk – Regionally Recovering under Auckland Regional Threat Classification (Woolly *et al.*, 2024)). All of these species are afforded protection by the Wildlife Act 1953, and as such, direct harm to these species, their nests, eggs, and nestlings, needs to be avoided.

Table 9 outlines the breeding season timelines for these species, indicating that the spring/summer months are the main breeding months for most species. On-site vegetation clearance should therefore be avoided during key parts of their breeding season from September to February (inclusive).

Table 9. Breeding seasons of birds recorded within the Site from the EcIA (Bioresearches, 2025). Indicative breeding months are from New Zealand Birds online (nzbirdsonline.org.nz) and includes both egg-laying and nestling dates.

Common name	Breeding Season											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Korimako / Bellbird												
Piwakawaka / Fantail												
Riroriro / Grey warbler												
Kererū												
Miromiro (New Zealand tomtit)												
Ruru / Morepork												
Pīhoihoi / New Zealand pipit												
Pūtangitangi / Paradise shelduck												
Pūkeko												
Kotare / Sacred kingfisher												
Pīpīwharauroa / Shining cuckoo												
Tauhou / Silvereye												
Kahu / Swamp harrier												
Tūī												
Warou / Welcome Swallow												
Matuku moana / White Faced Heron												

4.2.4 Effects on avifauna

All ecosystems within the project's footprint will be directly affected, and there is potential for some ongoing effects to native avifauna residing within the vicinity of the project.

Potential immediate effects on avifauna during the construction phase include:

- Destruction of nests and/or mortality of nest contents (eggs/chicks).
- Removal of habitat used for foraging or nesting.
- The creation of habitat edge effects.
- Sediment runoff to wetlands and watercourses affects wetland bird habitat.
- Light disturbance.

Potential ongoing effects after the project is finished include:

- Effect of vehicle noise and disturbance on birds.
    - Resident birds in the surrounding habitat are most significantly affected during the breeding season, when noise may impact communication between conspecifics, potentially reducing breeding success.
- Mortality or injury with vehicles.
    - Reduced potential due to low-speed vehicle movement within the developed area.
- Increase in exotic bird populations due to increased habitat modification.
- Cat prohibition and dogs' confinement to property boundaries or leash.

4.3 Management of Effects

4.3.1 Deterrence

New Zealand Pipits breed during August to March, with the nest a "sizable cup" of woven grass under tussocks and grasses, and may be partially or fully covered with vegetation. The best practice method in regards to the management of pipit breeding is through deterring pipit from nesting on the site using at least one of the potential methods:

- Disruptive site walkovers, potentially with a leashed dog, at the onset of the breeding season; or
- Installing streamers or tapes which flutter and flap in breeding habitats to deter nesting, however, this is not considered a long-term solution; or
- Parking of heavy machinery in the upcoming staged area and starting the engine; however, movement of the machinery is not undertaken.

4.3.2 Vegetation Clearance

All vegetation clearance should occur outside the main native bird nesting season (September to February inclusive) to minimise any risk of disturbance that vegetation removal would have on nesting birds. If this is unavoidable, a nesting survey will be required prior to any felling. Note that by restricting vegetation clearance to outside the main native bird breeding season, the risk of disturbing nesting forest birds is significantly

reduced (but not entirely eliminated); therefore, vegetation should still be checked for obvious signs of nesting activity prior to clearance works being undertaken.

Vegetation clearance should not commence until approval has been received from the project ecologist/ornithologist. If active nests are located, habitat clearance should be delayed until after chicks have both fledged from the nest and are sufficiently independent to leave the natal territory with or without the parents. The nestlings of many forest bird species will fledge from the nest but will remain poor flyers and dependent on their parents to feed them for an extended period of time. This period varies by species and may require on-site evaluation by a suitably qualified and experienced person.

4.3.3 Nest Surveys

If vegetation clearance is unavoidable during the main native bird nesting season, an approved and experienced ecologist or ornithologist must visually inspect all trees and shrubs proposed for removal within 24 hours of felling to identify any active nests. This includes checking cavities and hollows for nesting birds (e.g., morepork, kingfisher, etc).

4.3.4 Nest Management

Should any nesting be observed, a 10-metre buffer of vegetation shall be required to remain around the nest site until an approved and experienced ecologist or ornithologist has confirmed that the nest has naturally failed, or the chicks have hatched and naturally left the natal site. Following inspection and confirmation of the absence of nesting birds, the consent holder must submit a completion report to the council for approval within 30 working days.

4.3.5 Accidental harm to birds during vegetation clearance

In the event of finding a dead or injured native bird during works associated with the project, the following procedures will be implemented:

- Injured native birds will be taken immediately to a vet approved by DOC for assessment.
- Birds will be placed in a cool, dark, material-lined box/bag by or under the direction of a Project ecologist to ensure the bird is handled appropriately.
- The local DOC office or DOC hotline (if after hours) will be contacted no longer than two hours after the injured or dead bird is found. The DOC hotline is 0800 DOCHOTLINE (0800 362 468).
- The name of the contact information for the approved contact in the event of native bird injury or mortality shall be provided by DOC.
- DOC and veterinary advice shall be sought in conjunction with a suitably trained Project ecologist when considering the rehabilitation requirements of any injured native birds (for example, legislative requirements will need to be considered).
- Once the vet has made an assessment, the project ornithologist will, considering the advice from the vet, determine any rehabilitation action required and the longer-term future for the bird/s. If the bird is dead or euthanised by the vet, it must be taken to the local DOC office as soon as practicable.

4.3.6 Adaptive Management and pre-works monitoring

Prior to works occurring, pre-works surveys shall be undertaken to identify areas used by TAR birds not identified within the desktop assessment, however have the potential to be present within the site. These species, at the time of this EMP preparation, include Australasian bittern (*Botaurus poiciloptilus*), fernbird (*Poodytes punctatus*), and spotless crake (*Zaporina tabuensis*). If these species, or additional species, are confirmed to be on site, adaptive management of these species will be implemented, dependent upon the staging of works and location of avifauna species.

- Management of bittern will initially focus on monitoring to confirm their presence and their proximity to the mining area. If required, management would involve the use of setbacks or sequencing/timing and/or the use of screening to avoid adverse effects on bitterns.
- Management of fernbird will involve call playback surveys to determine whether they are present or not. If fernbirds are detected, management would involve the use of setbacks or sequencing/timing and/or the use of dense screening vegetation to avoid adverse effects.
- Management to protect spotless crake will involve an additional survey to determine their proximity to the earthworks/vegetation clearance staging area and the use of setbacks or sequencing/timing, and/or the use of dense screening vegetation to avoid adverse effects.

4.4 Monitoring and reporting

4.4.1 Reporting

Following inspection and confirmation of the absence of nesting birds the project ornithologist/ecologist will report to the consent holder. The consent holder will then submit a completion report to the council for approval within 30 working days. The report should detail the number of active nests located and their management until nest failure or fledging, and dispersal of chicks from the natal territory. The report would also detail whether any follow up pest control or monitoring is required and the timing for this. The works completion report would be submitted to Auckland Council Ecological Advice Team, Natural Environment Design, Environmental Services.

5 BAT MANAGEMENT PLAN

5.1 Introduction

This Bat Management Plan (BMP) has been prepared for Rangitoopuni Developments Limited Partnership to avoid and minimise potential effects on native bats because of the proposed work at the Site. Riverhead Forest is known to support a population of long-tailed bats, and a desktop review (Bioresearches, 2025) reported long-tailed bat (LTBs; *Chalinolobus tuberculatus*) records both directly within, and within 500 m of the project area, to the north and east of the boundary (Figure 6). Bats are assumed to be present at the Site, and an acoustic survey is currently underway to determine level of activity and any hotspots.

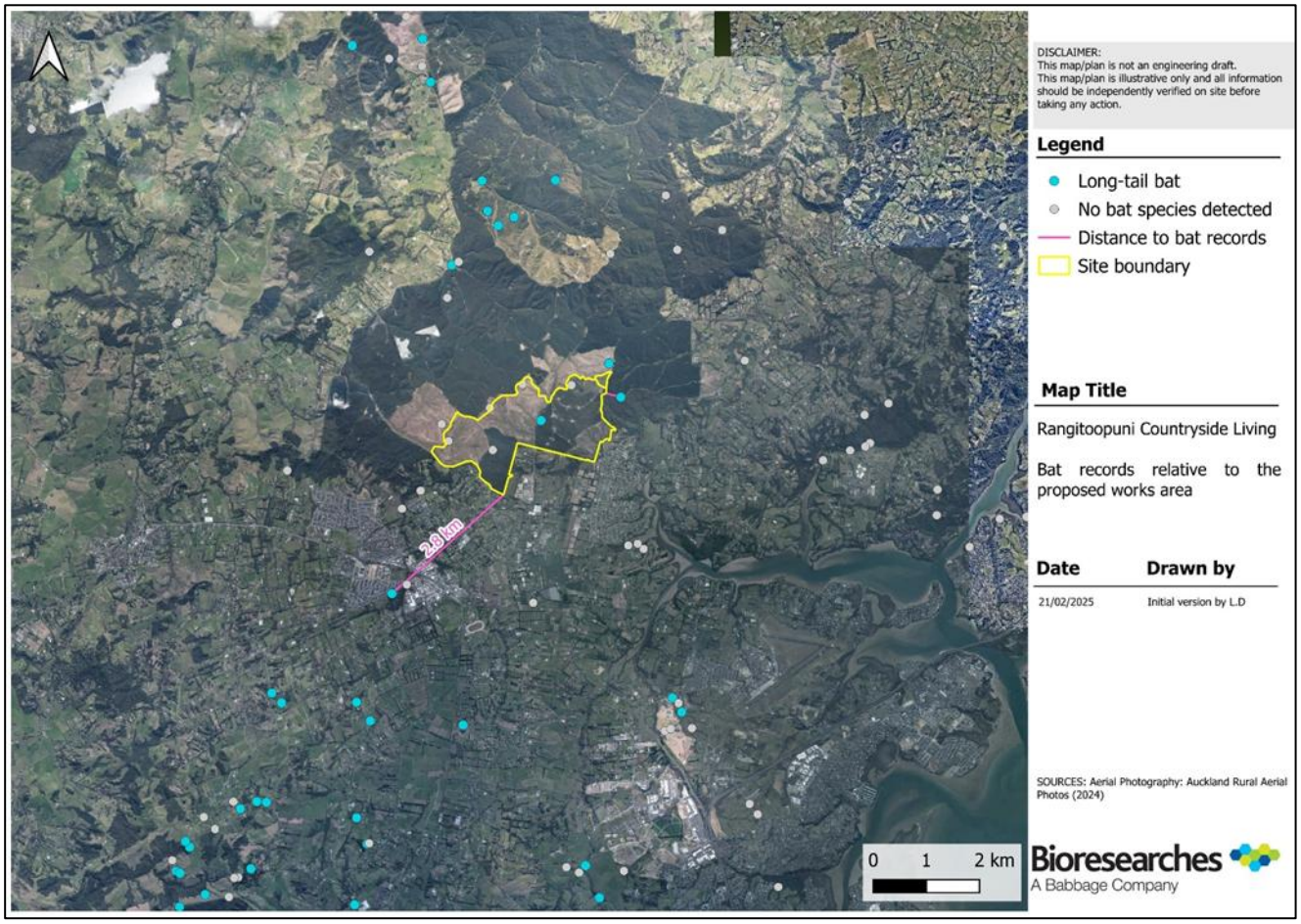


Figure 6. Long-tailed bat records, within the site and the surrounding area.

5.1.1 Purpose of this Plan

The purpose of this Bat Management Plan is to set out procedures to:

1. Minimise the risk of harming bats during potential tree removal within the Project area, adopting current best practice standards as set by the Department of Conservation's (DOC) Bat Roost Protocols for

minimising the risk of felling occupied bat roosts (BRP, version 4, 2024);

2. Provide alternative, suitable artificial roost habitat for bats where an active or inactive roost is identified during implementation of Bat Roost Protocols;
3. Where artificial roost provision is triggered, provide for multiple artificial roost designs, placement, and monitoring to support robust research into artificial roost use by bats; and
4. Manage effects on commuting, foraging, and potential roosting habitat and LTB behaviour from the proposal including from:
   4.1. Direct loss or alteration of habitat
   4.2. Artificial light
   4.3. Noise and vibration
   4.4. Predator pressure associated with development

5.1.2 Long-tailed bat ecology

Long-tailed bats are found throughout the North Island and are classified as a 'Nationally Critical' threatened species under the New Zealand Threat Classification System (O'Donnell *et al*., 2023). LTBs typically use forest edges and riparian areas for foraging and commuting (O'Donnell, 2000). They are highly mobile and have extensive home ranges that have been recorded to stretch 19 km and cover over 50 km^2, with individuals capable of moving tens of kilometres in one night (O'Donnell, 2001). Roosts are often in tree cavities, epiphytes, or under loose bark (Borkin & Parsons, 2009; Griffiths, 1996) and change frequently, often on a nightly basis (Sedgeley, 2001). However, roost fidelity can be high on a year-to-year basis (Sedgeley & O'Donnell, 1999). Communal roosts (2+ bats) require habitat features that are mostly supported by larger trees and are carefully selected for thermal properties that are still not well understood (Department of Conservation, 2023; Sedgeley, 2001). Thus, they are challenging to artificially replicate. Roost trees, particularly those that are used for maternity roosting (communal roosts of breeding females and juveniles), are therefore considered a valuable and limited resource for LTBs.

A summary of the New Zealand bat reproductive cycle is included below (Figure 7), to provide context to the requirements and procedures outlined in this document.

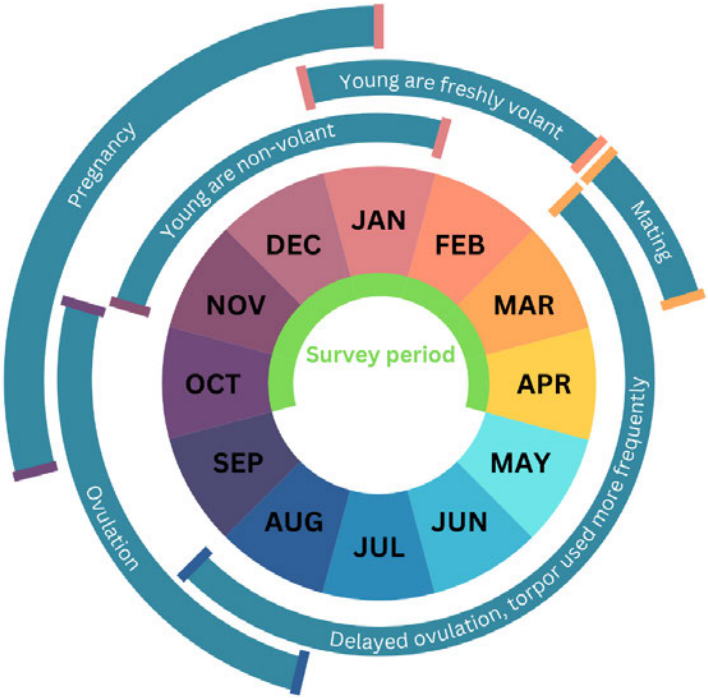


Figure 7. Visual representation of the key stages of the reproductive cycle of native bats.

5.2 Bat habitat at Rangitoopuni

A summary of the high-level assessment of bat habitat within the project area footprint area is provided here. Further details, including details about site investigations and methods used are provided in the Ecological Impact Assessment (Bioresearches, 2025), which should be read in conjunction with this report.

At the time of lodgement, a bat survey utilising Automatic Bat Monitors (ABMs) has been deployed throughout the project area to assist in determining the frequency and spread of bat activity within the site. The results of the bat survey will identify sensitive areas and inform appropriate management protocols, such as location and density of artificial roosts and post-construction/operational management measures.

5.2.1 Bat records near the Project Area

A summary of the assessment of bat records in proximity to the Site's footprint area is provided here.

5.2.1.1 Desktop assessment

Department of Conservation bat records were accessed within and around the vicinity of the Site (Figure 6). Multiple other local LTB records are present in the local landscape, including:

- Within the project area, and
- 150 m north of the project area; and

- 290 m east of the project area; and
- 4 km east-north-east of the project area.

Multiple other records are also present further to the north and south of the project area, within a 5 km buffer. Riverhead Forest supports a known population of LTBs.

Short-tailed bats (STB; *Mystacina tuberculata*) are absent from the Auckland Region with the exception of Hauturu/Little Barrier Island, 71 km from the project area. The closest mainland records are within the Coromandel Ranges, over 100 km away. They are considered highly unlikely to be present at the site, even on an intermittent basis.

5.2.1.2 Site investigations: ABM surveys

Automatic Bat Monitors (ABMs) were deployed on March 13, 2025. The results of the ABM survey will be provided upon completion, once sufficient deployment time has been achieved.

5.2.2 Site description and potential habitat

The proposed project area comprises 181 ha of deforested pine plantation, 125 ha of immature pine plantation (~6 years old), 5.9 ha of riparian margins, and 59 ha of mature pine forestry (26 years old) which is scheduled for harvest in October independently of the proposal. Small patches of degraded native vegetation remain across approximately 2% of the Site, mostly associated with riparian margins. Very few indigenous trees in these fragments are > 15 cm DBH.

Long-tailed bats have been recorded utilising pine forestry at a number of locations. They are largely associated with forest edges and clearings/ forestry roads, and have been known to roost within forestry blocks, especially in retained snags or old-crop pine (60-80 years) (Borkin & Parsons, 2010). The ecological baseline for the proposed development is predominantly clear felled pine and immature (~6 year old) pine plantation, with a limited number of isolated trees that may potentially support roosting bats. One large radiata pine by Wetland 1 was noted during site visits as having the potential to support communal roosts.

While potential roosting habitat across the Site is minimal, LTBs are known to forage over open areas, farmland, and urban areas (O'Donnell *et al.,* 2013). The wetlands and small waterways present (notably Deacon Stream) could provide foraging habitat for bats, and the degrading pine slash may also support insect prey populations.

Given their very high threat status, areas that provide habitat to long-tailed bats are considered to be significant habitats under s 6(c) RMA 1991. Vegetation and other features that provide significant habitat for native bats are specifically recognised in the National Policy Statement for Indigenous Biodiversity 2023 (NPS-IB). LTBs and all three subspecies of STB are listed as 'Specified Highly Mobile Fauna' in Appendix 2 of the NPS-IB.

Short-tailed bats are associated with extensive areas of old-growth native forest (Lloyd, 2001). There are no modern records of them on the mainland within the Auckland region, and the Site does not contain their preferred habitat. We consider this species is highly unlikely to be present.

5.2.3 Ecological value

In accordance with the EIANZ Guidelines, any species with a 'Threatened' conservation status is considered to have a 'Very High' ecological value. Given the presence of long-tailed bats within the site, the project area is considered to have a **Very High** ecological value for bats.

5.3 Effects of the proposal on long-tailed bats

Long-tailed bats are likely to be impacted by the project development both directly and indirectly. Effects include:

- Non-permanent loss of potential commuting, foraging, and roosting habitat;
- Permanent loss of Very High value existing roost trees that may be present;
- Direct harm to bats via felling of occupied roost trees;
- Potential negative physiological/behavioural impacts of work/ ongoing operational light, noise, and vibration; and,
- Increased predation pressure associated with the development.

5.3.1 Management of effects

The following measures are proposed to avoid, minimise, and remedy the potential effects of the proposal on long-tailed bats:

- Minimise the risk of direct harm to bats by following DOC Bat Roost Protocols during vegetation clearance;
- Minimise roost tree loss through avoiding or relocating identified roost trees/roost features where practicable;
- Minimise potential disturbance from noise, light, and vibration by avoiding construction works overnight or within 1 hour of sunset/after sunrise;
- Minimise disturbance from artificial lighting by placing controls to minimise light spill and production of blue light wavelengths;
- Minimise risk of increased predation pressure associated with the development through a ban on cat ownership within the site and widespread pest control targeting feral cats, rats, mustelids, and hedgehogs;
- Remedy habitat loss from vegetation clearance/ habitat alteration by 222 ha of native revegetation across the site. Planting mix to include native tree species known to be utilised by long-tailed bats for roosting as per Landscape Concept Plan by Boffa Miskell (2025).
- Remedy loss of any confirmed roost trees (active or inactive) through the provision of additional artificial roosts in the surrounding landscape at a ratio of 6 artificial roosts to every 1 confirmed roost tree lost.

No significant residual effects on bats are anticipated; rather, onsite management of impacts will be undertaken. However, the overall residual effects management package will provide positive effects through extensive indigenous revegetation, providing a significant increase in indigenous biodiversity values and terrestrial fauna habitat as detailed in the EcIA (Bioresearches, 2025), including control of mammalian predators.

5.4 Tree Removal Protocols

This section details procedures to be followed to give effect to the DOC protocols for removing trees that have the potential to support bat roosts. Note that where new versions of the DOC Bat Roost Protocols are released throughout the life of consent, the latest version will take precedence over the version (Version 4, 2024) detailed in this section for any remaining vegetation clearance.

5.4.1 Certified Bat Ecologist

DOC requires that only certified personnel (certified bat ecologists) may undertake high-risk activities, such as identifying bat roosts within a tree, including hollow fern trunks, where bats have been identified, and that tree requires removal. When implementing this Plan, bat ecologists must be approved and accredited to the relevant Competency (C) for the activity they are undertaking (as per current BRP; DOC, 2024). Table 10 provides a summary of the accreditation requirements for bat activities required by DOC.

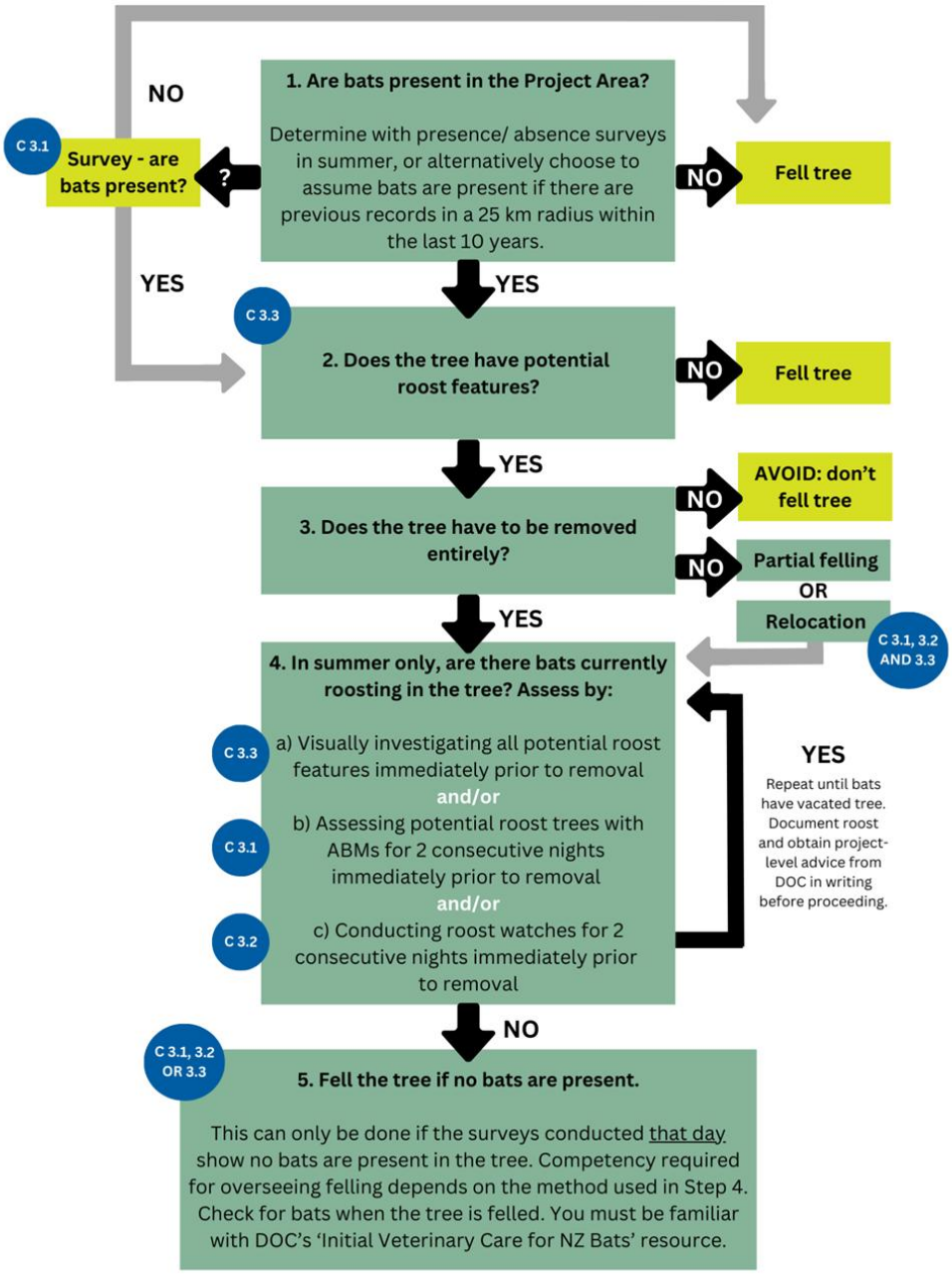
Table 10. Accreditation requirements for bat activities pertaining to tree felling, as per BRP.

Activity	Certification required	Timing of activity
Presence/absence survey to determine if bats are using the Project Area	Must be designed by an approved person accredited with **C 3.1** to determine the presence of trees due to be felled/ habitat available at the site.	Oct – April inclusive, and when weather criteria are met.
Identifying roost characteristics	Initial criteria (tree is ≥15 cm DBH) can be measured by any ecologist. Identification of Potential Roost Features requires accreditation at **C 3.3**.	Any time of year, but within 6 months of final tree felling.
Physical checking of potential roost features	**C 3.3**, or a certified arborist under the direction of a bat ecologist approved at C 3.3.	Oct – April inclusive, and when the sunset temperature of the previous night is a minimum 8° C.
Assessing bat activity around potential roost trees with ABMs	**C 3.1**	Oct – April inclusive, for two consecutive valid nights immediately prior to the planned felling.
Assessing the use of trees by roost watches	**C 3.2**, or under the direct supervision of such during counts requiring multiple watchers.	Oct – April inclusive, for two consecutive valid nights (dusk AND dawn watches required for both) immediately prior to planned felling.
Overseeing tree felling	An approved person accredited with the relevant competency used to determine bat absence **(C 3.1, 3.2, or 3.3)**, and who is: • Familiar with 'Initial Veterinary Care for New Zealand Bats' (Borkin, 2019) • Physically able to check felled trees for bat sign Able to consult with DOC and someone accredited to **C 2.1** if a bat is observed.	Oct – April inclusive, and when pre-felling requirements have been met.

5.4.2 Overview of Bat Roost Protocols

Figure 8 (DOC, 2021) details the decision-making process required for implementing bat roost protocol. As bats have been detected at the Project Area, Bat Roost Protocols will be followed for any vegetation removal. This will involve detailed habitat assessment of vegetation being removed at each stage, and utilisation of at least one method to determine no bats are roosting in trees at the time of felling.

A completion report detailing all High-risk trees identified, and the method and results of activity assessment, must be submitted to Auckland Council within 30 days of completion of each stage of tree felling.



Bioresearches reproduction of 'Tree removal in bat areas flow chart' and associated text from 'Bat roost protocol V4' (Bat Recovery Group, DOC, 2024)

C = Accredited at given Competency number. Note that an activity without a stated Competency may have other requirements

Figure 8. Decision tree for Bat roost protocol (from DOC BRP, version 4, October 2024).

5.4.2.1 Roost Characteristics

Prior to undertaking any vegetation removal, the extent of vegetation being removed in a given stage will be clearly demarcated to provide for detailed roosting habitat assessment. All vegetation will be assessed to identify trees supporting Potential Roost Features (PRFs).

High-risk trees will be qualified as any trees (living or dead) that are ≥15 cm DBH (diameter at breast height) and support PRFs. PRFs include:

- Hollows;
- Cavities;
- Knot holes;
- Cracks;
- Flaking, peeling, or decorticating bark;
- Epiphytes;
- Broken or dead branches/ trunk;
- Shelter, cavities, or hollows formed by multiple trunks/ double leaders;
- Tree ferns that have dense skirts of dead fronds; and
- Artificial roost boxes.

Trees ≥15 cm DBH that cannot be comprehensively assessed for PRFs, for example, due to obscured sightlines or limited access, will be precautionarily classified as High-risk also. Qualifying trees based on size may be conducted by any ecologist capable of measuring DBH, but an approved bat ecologist accredited with **C 3.3** must conduct any identification of PRFs. Where the vegetation is not classified as High-risk as above, the vegetation may be removed (any time of year) without bat roost protocols. Assessment of trees for PRFs is valid for **six months**, unless significant storm/high wind events occur, which could create new roost features, as determined by the accredited ecologist.

High-risk trees are to be individually catalogued with a record kept of:

- Tree location (GPS coordinates);
- Tree species;
- Tree height;
- Tree DBH;
- Potential Roost Feature(s) present and location in the tree (height and bearing); and
- Assigned High-risk tree ID.

All High-risk trees in areas where bats have been confirmed to be present must be assessed to confirm that no bats are currently roosting in them prior to felling. High-risk trees are to be physically marked (e.g., with flagging tape, marker spray paint) with their High-risk tree ID prior to any clearance, to facilitate activity assessment and permission to fell.

5.4.2.2 Bat Activity Assessment (High Risk Trees)

Where bats are confirmed, and affected vegetation supports bat roost characteristics (**High-risk trees**), those trees will be assessed (between 1 October and 30 April) to determine any current activity by an accredited bat ecologist, to ensure no bats are occupying potential roosts at the time of removal. This assessment must be undertaken immediately prior to tree removal by way of at least one of the following methods:

1. Tree climbing for visual inspection of potential roosts, if possible; and/or
2. Pre-felling surveys: minimum two consecutive valid survey nights immediately prior to removal; and/or
3. Roost watches: minimum two consecutive valid nights of roost entry/ exit watches immediately prior to removal.

Where bats are confirmed present, **the tree must not be felled**. This process must be repeated on subsequent days until the bat ecologist confirms absence. Confirmation of an active or inactive roost will trigger Section 5.5 Procedure and Section 5.7 Artificial Roost Provision if the roost cannot be retained.

Tree Climbing

Roost features may be able to be accessed by an experienced tree climber or accredited bat ecologist (**C 3.3**). A non-certified arborist must provide information along with photographs or video footage to the accredited bat ecologist to inform the decision on whether the tree may be felled.

- An endoscopic camera should be available for this step, and every possible corner of each potential roosting feature inspected, i.e., cavity/crack etc. Cracks, holes, and splits may lead to cavities or may be superficial. A cavity may be wet, indicating no/low potential as a bat roost.

Search for tree features should be accompanied by the use of a hand-held bat detector. If bats are present and not in torpor, then detection of presence listening at 25 kHz (for social calls) and 40 kHz (for echolocation calls) may help to determine if long-tailed bats are present.

Pre-Felling Roost ABM Surveys

Each High-risk tree must be surveyed with ABMs for a minimum of two consecutive valid nights immediately prior to felling. This must be undertaken by the accredited bat ecologist (**C 3.1**). At least two consecutive nights are required, as bats can enter or leave a roost without echolocating, or not leave the roost for a night. If any passes are detected, regardless of how many or the time of night, the tree(s) covered by the ABM in question must not be felled that day unless bat absence can be confirmed with another method (i.e., climbing to visually inspect potential roost features). A valid survey night must:

1. Begin one hour before official sunset and end one hour after official sunrise.
2. Have a temperature 8° C or greater for the first four hours after official sunset time for the North Island and 7° C for the South Island
3. Have no to very little precipitation within the first four hours after official sunset, although a light mist or occasional drizzle may be acceptable as assessed by an ecologist accredited with **C 3.1**.
4. No wind, or light wind, within the first four hours after official sunset.

Prior to the commencement of surveys, ABMs must be checked for correct operation at a site where bat activity is known to be regular, or by using the DOC – Bat Recorder Tester (Tussock Innovation Ltd) phone app made for this and available from Google Play Store. Faulty or suspect ABMs must not be deployed, and ABMs must be redeployed if faults occur.

Roost Watches

This must only be undertaken in combination with pre-felling roost ABM surveys (Table 10) and be carried out by a bat ecologist accredited with **C 3.2**. Where multiple personnel are required to cover a potential roost tree, at least one must have the appropriate certification and be present for the entire duration of the watch. Watches must confirm no bat activity for two consecutive valid nights immediately prior to felling. The following weather conditions define a valid night for roost watches:

1. Be undertaken between October 1- April 30 (inclusive).
2. Maintain air temperature >8°C for the entirety of the night.
3. Ideally, no to very little precipitation within the first 4 hours after official sunset, although a light mist or occasional drizzle may be acceptable as assessed by an ecologist accredited with **C 3.1.**
4. Include ABM deployment and data analysis for the same night.
5. No wind, or light wind within the first four hours after official sunset, as determined by an ecologist accredited with **C 3.1**.

Emergence watches

Each tree must be watched from at least ½ hour prior to sunset until it becomes too dark to see by sufficient people to observe all potential exit points. This must be supported using handheld detectors and a night vision aid (e.g., thermal scope, infra-red camera) which can detect bats after dark. Emergence watches aim to identify potential roost locations within the vegetation.

Roost re-entry watches

The time when bats return to roosts can vary based on temperature and time of year.

- Observers must then return the next morning and watch the tree to determine whether bats return to the vegetation.
- Roost re-entry watch timing should be based on patterns of activity recorded onsite with acoustic recorders, i.e., as a guide watch should begin two hours prior to when the last passes were recorded on the ABMs on previous nights and finish one hour after official sunrise time. Where this information is not available, and

at a minimum, watches shall begin two hours prior to official sunrise until one hour after sunrise. Infrared and/or thermal imaging cameras will be a useful tool in this process.

5.5 Procedure if bat roost presence is confirmed

Avoidance of felling bat roost trees should be the first step in any project. If bats are sighted, or sign detected, or a roost (active or inactive) is confirmed, the approved bat ecologist, as soon as possible, shall:

- Reassess the necessity of felling the specific tree with the arborist and project manager. For example:
    - Can the tree be topped/pruned etc., such that any component of the tree that supports roost habitat can be retained?
    - Can the tree or the roost feature be relocated? Note this requires an accredited bat ecologist with all three Level 3 Competencies (**C 3.1, C 3.2, and C.3.3**).
- If the tree and its roost features cannot be avoided, then:
    - Call the tree felling supervisor to inform them which affected tree(s) cannot be felled due to detection of bat sign;
    - Clearly mark and cordon off the tree and a 10 m radius to prevent further disturbance; and
    - Notify the site manager, the relevant Auckland Council contact, and the local DOC office detailing the results of the survey and outlining the measures for protection or relocating the roost tree.
- A record (including photos) of any vegetation containing bat roosts shall be kept detailing the date; size, location and species of tree or other vegetation; roost type, e.g., cavity, peeling bark, broken branch; detail outlining how presence of bats was confirmed; the number of bats present; and species present, if known.
- If an active or inactive roost is confirmed, advice must be obtained at a project level in writing from DOC before felling or otherwise conducting works that will impact the roost tree. If bats are detected during or after tree-felling, this must be managed in accordance with Appendix 2 of the Bat Roost Protocols (Department of Conservation, 2024).

5.6 Key contacts

Key contacts corresponding to this BMP (Table 11) must be identified and circulated to the on-site team of ecologists and arborists prior to removal of any High-risk Trees.

Table 11. Bat Management Plan key contacts

Key contacts	Contact information
Project bat ecologists	Alisha Hart, Charlotte Garrett, Chris Wedding
Identified vets in case of injured bat recovery	Massey Wildbase Vet Hospital - 0800 738 363 Auckland Zoo Vets - 09 360 3805
DOC emergency hotline	0800 362 468 (0800 DOC HOT)
Site manager	TBC
Tree felling supervisor	TBC

Note: Key contacts identified/to be identified prior to vegetation clearance

5.7 Artificial Roost Provision

Roost trees, especially those used for communal roosting and specifically maternity roosting, are a valuable resource for LTBs. Therefore, any loss of such habitat is a very high-level effect on the basis of the species' threat status and the probable low availability of suitable roosts in the surrounding landscape. Restoration planting will not replace high-value roosts in the short to medium term (Sedgeley & O'Donnell, 1999), therefore is unsuitable to remediate loss. Therefore, this Plan requires the provision of carved cavity roosts (CCRs) and/or artificial bat roost boxes (ARBs), in accordance with DOC's advisory note for the use of ARBs (Department of Conservation, 2023). Utilisation of DOC's Bat Roost Protocols is expected to identify any active roosts immediately prior to felling. Inactive roosts may be identified from bat sign (guano, urine staining) when cavities are inspected during tree climbing or post-felling by the accredited bat ecologist.

Bat activity may also increase in and around the site over time – for example, due to increased local population, maturing forest, predator control, an increase in edge habitat, or an increase in foraging habitat. Where an active or inactive roost is confirmed during Bat Activity Assessment of the High-Risk Trees in this Plan and is unable to be managed in a way to maintain the roost features (e.g., by avoidance, topping, tree relocation, or relocation of just the trunk/branch section supporting the roost), CCRs and/ or ARBs will be installed in habitat suitable for bat roosting, as directed by the accredited bat ecologist. The number of CCRs or ARBs to be installed in this instance will be a minimum of six per identified roost tree lost.

Artificial roosts will be installed within a nearby area of protected vegetation, where bats have been detected (by survey, records, or other knowledge).

All artificial roosts will (as per advice note on the use of ARBs, Department of Conservation, 2023):

- Be deployed at a minimum height of four metres from the ground;
- Be attached securely/ carved into an appropriate tree, with no clutter within 2m of the roost opening;
- Be 'predator-proofed' where practicable with metal tree bands to prevent access by rats, cats, and possums. Bands will be wrapped around the trunk above and below each artificial roost, provided that non-contiguous vegetation can be maintained between this area and surrounding trees
- Be of multiple designs (in the case of ARBs), of variable orientation and exposure to light; and

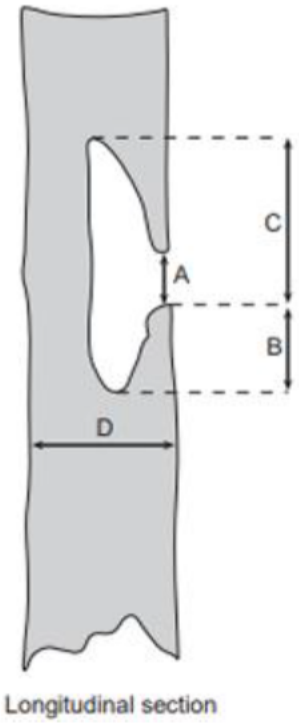
- Be installed near the lost roost tree to facilitate discovery, where practicable and where the location won't be subject to excessive disturbance (e.g., from artificial lighting, noise, vibration, or human curiosity).

5.7.1 Carved Cavity Roosts

Creating CCRs (also known as tree veteranisation) involves carving suitable cavities by hand or with chainsaws into living or dead wood for bats to roost in. This is a very new technique in New Zealand. While it is likely that CCRs offer more thermal stability than ARBs, their attractiveness to bats, ideal dimensions, and long-term efficacy have not been tested. It is therefore proposed that where CCRs are utilised, they do not comprise more than 50% of the artificial roosts provided.

CCR trials in Australia found that all vertical cavities carved into live trees had sealed over with wound-wood within 2 years (Department of Conservation, 2023; Griffiths *et al.*, 2018). Where CCRs are installed in live trees, chainsaw scoring of the tree surface around the entrance is recommended to slow cavity closure and provide a rough landing surface for bats (Griffiths *et al.*, 2018). Carving cavities into live trees may damage them through disease/ pest introduction, interfering with/ stressing biological functions, or compromising structural integrity. These risks must be considered when selecting trees to veteranise; it is recommended that old native trees are not targeted.

A technique involving less maintenance is to carve the cavities into standing dead trees, or into trunk sections (e.g., logs from felled trees), which can then be attached to other trees at an appropriate height. Note that CCRs in logs may not be as thermally stable as those carved directly into standing trees (Griffiths *et al.*, 2018), but are likely an improvement over standard thin-walled wooden ARBs. CCRs are to incorporate average LTB roost dimensions from Sedgeley & O'Donnell (1999) (Figure 9) and any current information available from trials underway.



Cavity characteristics: letter notation following Figure 1	Mean
Distance to nearest vegetation	7 m
Entrance Height from ground	15 m
Entrance area (height x width): A	100 cm^2 (e.g.,10x10 cm. Minimum 5)
Internal cavity depth: B	14 cm
Internal cavity height: C	43 cm
Diameter at cavity height (DCH): D	66 cm
Inside cross section: F	405 cm^2
Wall thickness: G	24 cm
Volume	26731 cm^3

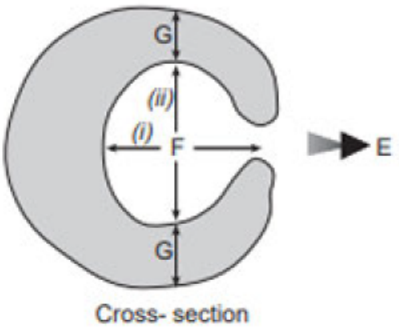


Figure 9. Average long-tailed bat roost dimensions from Sedgeley & O'Donnell (1999).

5.7.2 Artificial Roost Boxes

While information on the effectiveness of ARB designs and optimal installation position for long-tailed bats in New Zealand is limited, Hamilton City now has well over 100 ARBs installed throughout urban parks, with a study tracking use of 74 'Kent' style ARBs for 12 months (2021-2022) observing 32% of them used at some point by LTBs (Robinson *et al.*, 2024). It should be noted that initial screening excluded ARBs that appeared unlikely to be used, however, AECOM (2022) reported that 41% of 80 ARBs installed in association with the Southern Links Project were being used within two years. This was likely facilitated by the Hamilton LTB population having ever-increasing exposure to ARBs beginning over a decade ago, and potentially limited alternative roost options.

In Canterbury, 96 Schwegler ARBs were installed and monitored across 12 years, with signs of LTBs only detected in 10% of boxes (O'Donnell, 2024). As the boxes were concentrated into 24 locations and were checked infrequently (1-5 years), actual rates of use by roosting bats may be underestimated. The effects of ARB use on individual fitness and population have not been studied in Aotearoa.

Various roost box designs have been deployed in New Zealand (Figure 10). Models known to be utilised by LTBs include:

- Various timber 'Kent' bat box designs and similar bespoke inspired designs (e.g., Waikato Regional Council).
- Schwegler 'woodcrete' designs (including models 2F, 2FN, 1FF and 1FD).

Figure 10. Examples of artificial bat roost designs; a) Timber 'Kent' design (source: Treelands); b) Schwegler 2FN design (source: Schwegler); and c) Various Schwegler ARBs, flat 1FF model in front (source: A. Hart).

5.8 Artificial roost monitoring and reporting

Where any CCRs or ARBs are installed, they will be checked annually for a minimum of 15 years by a bat ecologist accredited with **C3.3**. At each inspection, any cobwebs, bird nesting material, or invertebrates will be removed. Each artificial roost will be inspected for signs of bat roosting, such as guano. Additionally, eDNA surveys will be conducted at the 5, 10, and 15 year mark to support detection rates. CCRs in live trees will have the bark and cambium cut back where it is encroaching on the cavity, after confirming that bats are not currently present within. Anti-predator tree bands will be checked at 6-monthly intervals for a minimum of 15 years and maintained to ensure they remain securely attached to the tree. Close inspection and maintenance should occur between May-September (inclusive), to avoid sensitive months for juveniles and breeding females. If bats are determined to be present in the artificial roost, then maintenance must be postponed for a short time until the roost is vacant (e.g., to the following day).

Note that other protected indigenous fauna may utilise artificial bat roosts (O'Donnell, 2024). If a native bird is nesting in an artificial roost, maintenance must be delayed until after the chicks have fledged and left the nest or the nest has failed, after which the nesting material may be removed. Native lizards may not be handled or removed from artificial roosts. During the maintenance period, any damaged Artificial Roosts unable to be maintained (e.g., tree fall, leaking water) are to be replaced. An arborist may need to be engaged for works such as pruning vegetation that compromises the effectiveness of predator bands and maintaining carved cavity entrances. In such cases, these works must be undertaken within 30 days of the triggering inspection, and the accredited bat ecologist must confirm no bats are presently occupying the Artificial Roost immediately prior to works.

Where artificial roosts are installed, an annual report detailing maintenance undertaken, artificial roost and predator band condition, and signs of occupation by indigenous fauna (including bats, birds, lizards, and notable invertebrates such as wētā) is to be sent to Auckland Council for the 15-year minimum maintenance span. If

any artificial roost use is confirmed, details are additionally to be provided to DOC to support ongoing research and technique refinement.

5.9 Management of construction and operational effects

The overall residual effects management package will provide potential benefits through extensive revegetation, including native tree species known to be utilised by roosting bats such as kauri, kahikatea, tōtara, pūriri, and taraire. Management of pest predators is also proposed including rats, mustelids, possums, and feral cats. This is detailed in the Landscape Management Plan (Boffa Miskell Limited, 2025).

There is evidence that noise and artificial light negatively impact long-tailed bats (Hart, 2022; (Schamhart et al., 2024). These effects are to be managed as follows:

- Works must not occur overnight or within one hour of official sunrise or official sunset, to avoid potential effects of noise and vibration during periods of bat activity.
- To minimise negative impacts of artificial lighting on bats luminaires are to be shielded and downlit, with a maximum colour correlated temperature of 3000 K or below (i.e. warm white or warmer).

6 LIZARD MANAGEMENT PLAN

6.1 Introduction

This Lizard Management Plan (LMP) has been prepared for Rangitoopuni Developments Limited Partnership to minimise potential effects on native lizards (skinks and geckos) prior to and during removal of their potential habitats as part of the proposed development. The project area is entirely clear-felled pine, including large areas beyond bulk earthworks that would be protected and revegetated, and which may also support indigenous lizards. Vegetation clearance is proposed to be undertaken as part of standard rotational harvest, and the baseline conditions for lizard management are represented in Figure 3 and below in Figure 11. However, it is anticipated that some stages across the project area will have regenerated prior to proposed earthworks, and therefore some areas may have young (<6 years) regenerating weedy growth. Lizard management will need to be completed prior to each stage of earthworks.

Figure 11. Example of potential lizard habitat in clear-felled pine at Rangitoopuni-Riverhead Forest

6.2 Key Principles for Lizard Salvage and Transfer

The Department of Conservation's *Key principles for lizard salvage and transfer in New Zealand* guidelines require consideration of the following nine guidelines when selecting a receiving site (Table 12).

Table 12. Nine principles for lizard salvage and transfer in New Zealand

Principle #	Principle	Location of information
1	Lizard species' values and site significance must be assessed at both the impact (development) and receiving sites.	Lizard species' value and significance: **Earthworks areas:** Section 6.2.1 **Receiving environments**: Section 6.4.1
2	Actual and potential development-related effects and their significance must be assessed.	Section 5.2 of the **EcIA:** S 5.2.1 Deforested exotic Scrub S 5.2.5 Effects on fauna

3	Alternatives to moving lizards must be considered.	No alternatives, but note that the proposal impacts exotic clear-felled pine forest, most of which will be permanently reforested with indigenous species.
4	Threatened lizard species require more careful consideration than less-threatened species.	No threatened species are assessed as having the potential to be present, however, contingency measures are discussed in Section 6.3.2.4
5	Lizard salvage, transfer and release must use the best available methodology.	**Section 6.3.1 of this LMP** provides brief overview of standard DOC biodiversity toolbox methods for lizards and addresses a two-phase approach to salvage. Release site is pest-managed and restored with indigenous species, resulting in a better long-term outcome for potentially present populations because rotation harvest will no longer impact established habitats.
6	Receiving sites and their carrying capacities must be suitable in the long term.	**Section 6.4 of this LMP** Release site is pest-managed and restored with indigenous species, resulting in a better long-term outcome for potentially present populations because rotation harvest will no longer impact established habitats.
7	Monitoring is required to evaluate the salvage operation.	**Section 6.5.1 of this LMP** identifies monitoring triggers, objectives, and methods.
8	Reporting is required to communicate outcomes of salvage operations and facilitate process improvements.	**Section 6.5.2 of this LMP** provides requirements for reporting salvage outcomes and monitoring.
9	Contingency actions are required when lizard salvage and transfer activities fail.	**Section 6.5.3 of this LMP** provides a discussion of contingency for outcome monitoring, noting that both failure and success are likely to be difficult to determine with a low likelihood of large numbers of lizards to conclude outcomes from.

6.2.1 Lizard species covered by the plan

No native lizards have been recorded within Rangitoopuni-Riverhead Forest, however, a suite of six native lizard species is considered to have some potential to be present within and around potential habitats associated with mature and clear-felled pine environments. Three of these species have been recorded within 5 km of the project, although two of these (Pacific gecko and forest gecko) have strong associations with indigenous forest habitats that are not associated with the proposal.

It is considered that native lizard abundance throughout a harvested pine environment is likely to be very low, on the basis that their populations may persist within and around the edges of rotational harvest, however are unlikely to be abundant in these highly disturbed environments, particularly in the presence of a full suite of predators (birds, rats, mice, hedgehogs and mustelids). Some population expansion may occur as the forest matures, however all of these species are assessed as being in gradual decline throughout their range nationally (Hitchmough et al. 2021) and in Auckland (Melzer et al. 2022).

Of these species, **copper skinks (*Oligosoma aeneum*)** have not been recorded but are assumed to be present because they have been reported within or around the edges of other pine plantations and are widespread within the Auckland Region, including within young weedy vegetation such as rough roadside grasses. Copper skink numbers within earthworks areas throughout Lots 1 and 2 **are estimated to be less than 100 individuals**. This estimate considers that no native lizards were identified during onsite searches, and that no copper skinks

or any other native lizards were recorded from systematic searches of pine plantation at Dome Valley, following 11 days of fauna habitat searches over February-March 2025 (Bioresearches, unpublished data).

Other species listed in Table 13 could potentially be expected to be encountered on an incidental basis, if at all. **Less than 20 individuals of other skinks or gecko species** are expected to be encountered within the project area. This estimate considers the above search results, and including that other species are less likely to be represented in any native lizard community at the site.

Table 13. Native herpetofauna potentially present within Rangitoopuni-Riverhead Forest

Common name	Scientific name	New Zealand Threat Classification (Robertson *et al.*, 2011)	Regional Threat Classification (Melzer *et al.*, 2022)	Recorded within 5 km of Project area
Copper skink	*Oligosoma aeneum*	At Risk - Declining	At Risk –Declining	✓
Ornate skink	*Oligosoma ornatum*	At Risk - Declining	At Risk –Declining	
Moko skink	*Oligosoma moco*	At Risk - Relict	At Risk –Relict	
Forest gecko	*Mokopirirakau granulatus*	At Risk – Declining	At Risk – Declining	✓
Elegant gecko	*Naultinus elegans*	At Risk – Declining	At Risk – Declining	
Pacific gecko	*Dactylocnemis pacificus*	Not threatened	At Risk –Declining	✓

6.2.2 Objectives

The objectives of the LMP are 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, where appropriate. Further, this LMP aims to achieve the following:

- The population of each species of native lizard or invertebrate 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 and invertebrates are transferred to (release site) will support viable populations for all species present pre-clearance.

These objectives will be achieved by:

- 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;
- 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; and

- Meeting requirements of the Wildlife Act (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;
- A summary of the recommended release site;

6.2.3 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).

This LMP would be actioned by a suitably experienced herpetologist under a valid Wildlife Act Authority issued by the Department of Conservation[1]. The project herpetologist may be aided by suitably qualified and experienced ecologist, who would assist with aspects of the salvage/relocation.

6.3 Lizard salvage and relocation protocols

6.3.1 Brief method overview

Potential lizard habitats within clear-felled pine forests are highly disturbed environments and exposed to high thermal fluctuations, rainfall, wash-outs, erosion, and sedimentation. These landscapes often feature deep piles of debris, which are challenging to trap using standard devices such as artificial retreats, pit traps, and funnel traps. Given the low abundances of indigenous lizards expected to be present within these environments, capture methods rely on pre-works systematic searches, as well as machine-assisted searches during earthworks.

The lizard salvage would be implemented as two Phases, including pre-works, works, and post-works phases. This would be carried out within each stage of vegetation clearance. Activities undertaken during these phases are detailed below. A summary of the LMP activities has been provided as a checklist in Table 14.

Relocated native lizards will be released immediately into adjacent habitats beyond earthworks areas that will be subject to restoration planting and pest predator control. Capture and release methods are detailed below. Post-work search will involve the searching of cleared land for any remaining lizards.

Table 14. Lizard Management Plan Checklist.

Project start-up	Required of:	Completed
Lizard Management Plan Approval	Department of Conservation	

[1] WAA authorization number 98006-FAU

Approved Released Sites	Landholder / Auckland Council	
Pre-works management (minimum 10 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		
Works completion report to client, council and DOC	Herpetologist	

6.3.2 Timing of the salvage and relocation

The lizard salvage and relocation programme is expected to take place over a 2-6 week period per stage, within the generally accepted North Island 'lizard salvage season' (October to April, inclusive), on days where ambient temperatures range between 12–22°C.

6.3.2.1 Phase 1: Pre-Clearance systematic searches for native lizards

Prior to the commencement of earthworks, a herpetologist(s) will carry out a systematic search-and-salvage operation that will involve active searches for lizards in all identified habitats within the earthworks footprint. These searches will be carried out over a **minimum of two weeks preceding earthworks**, according to the stages/timings of removal.

Phase 1 efforts will only be undertaken on days with suitable weather conditions (i.e., daytime temperatures >12°C, precipitation-free). All captured lizards would be processed (sex, age, and condition should be recorded) and relocated to an identified relocation site.

6.3.2.2 Phase 2: Earthworks Searches

Once the project herpetologist is satisfied that Phase 1 systematic searches have covered all searchable habitats, Phase 2 of the programme will commence. Phase 2 will involve the **salvage of lizards during earthworks** activities.

The implementing herpetologist will work with machine operators to target areas of large and/or deep log piles that could not be searched effectively during phase 1.

Excavators undertaking Phase 2 searches will be fitted with a toothed bucket or root-rake attachment (Figure 12).

Figure 12. Machine-assisted lizard searches. Herpetologist supervising the scraping of terrestrial vegetation.

6.3.2.3 Lizard capture

Native lizards will be captured and handled by / or under the supervision of a DOC-authorised herpetologist only. All native lizards captured prior to and during vegetation clearance operations will be placed immediately into containment boxes or cloth bags for no more than 24 hours before release.

For each native lizard, the following information will be recorded:

- Species, and demography (assessed as male/female/juvenile)
- Date of capture, including method (Phase 1 / 2 search)
- Location of capture
- Location of Release

6.3.2.4 Incidental discovery

In the unlikely event that a native lizard is found that is not identified in Table 13, the implementing herpetologist will **notify the Department of Conservation**. It is noted that species not identified in Table 13 would likely represent threatened species beyond their known range or have other significance within the regional context. While such species are highly unlikely, any such encounters should be able to be accommodated under this Plan because most potential habitats would be protected and enhanced.

6.4 Release site

This Plan requires immediate transfer of salvaged lizards from earthworks areas to receiving areas to minimise handling and ensure 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 and support their capacity.
3. The site must provide exotic predator management, and
4. The site must be protected from future human disturbance.

6.4.1 Release Site Description

All captured lizards will be released into adjacent habitats beyond localised earthworks areas. These areas are generally mapped as 'general revegetation' in Figure 2 and reproduced as Figure 13 below.

The release areas comprise a much larger extent of the same environment, all of which are expected to support low (if any) native lizard numbers (and refer to section 6.2.1 for a discussion of lizard abundance within these areas). Because the proposal would result in a land-use change from rotation pine forest to low-density residential use within a permanently reforested environment (including pest control and domestic cat ban), the resulting habitats are expected to be of much higher quality and capacity.

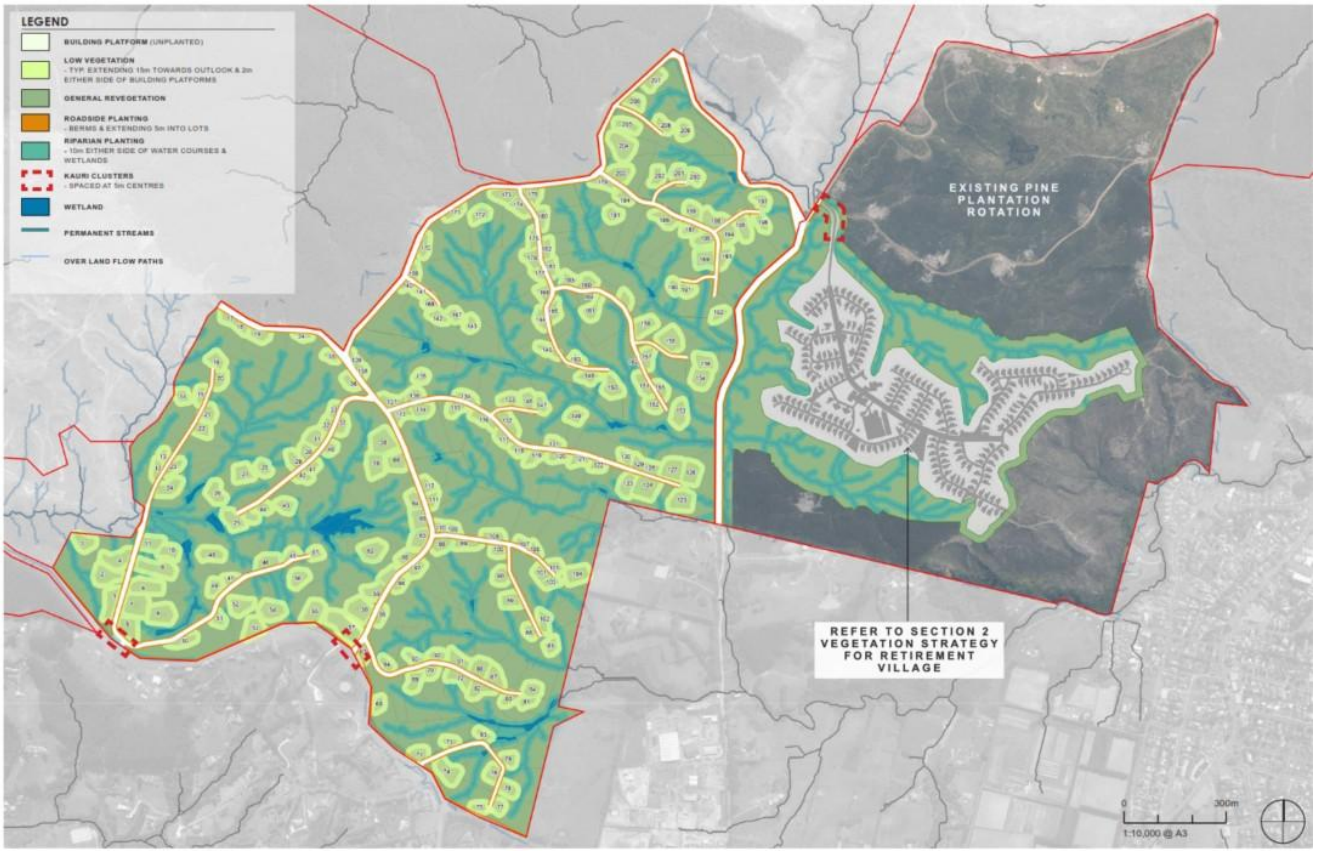


Figure 13. Rangitoopuni-Riverhead Forest Countryside living proposal showing large areas of 'General Revegetation' around localised building platforms and infrastructure. These areas would be restored and pest-controlled, and would support relocated lizards, during staged works. Image courtesy of Boffa Miskell (2025).

6.4.2 Release Site Enhancement

This Plan acknowledges that any potential release site may already support the full suite of 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.

At release sites, any existing native lizards are expected to be in low abundance (recently clear-felled pine), however where such areas are not earthworked, many already support some regenerating canopy cover within riparian margins (e.g., Photo 1, Photo 3, Photo 4). Within these areas, restoration planting will occur directly into slash (e.g. Photo 2), much of which **will support an abundance of refugia. Considering low lizard abundance, these locations are expected to support a very high capacity to receive additional native lizards**. In addition, these areas will also be subject to pest animal control, and future residents will be subject to a domestic cat ban. No other site-specific enhancement is therefore proposed.

Photo 1. Mixed scrub within a protected riparian corridor.

Photo 3. Riparian corridor vegetation on Deacon Stream (protected by development).

Photo 2. Abundant slash following harvest would support lizard refugia.

Photo 4. Intermittent stream reach would protected and could support additional log enhancement as required.

6.5 Monitoring and Reporting

6.5.1 Monitoring

Success monitoring would be initiated whereby 20 or more native lizards are relocated to adjacent habitats within a single stage of earthworks. This approach aligns with the expectation that few, potentially localised areas of native lizards would be relocated to localised release sites across the > 395 ha staged project. However, where localised release areas receive 20 or more native lizards, then five annual lizard monitoring surveys would be triggered (Table 15). **The purpose of the monitoring is to determine lizard population persistence within protected areas**, where lizard values are detected following salvage. This would be achieved by measuring/identifying the presence of native lizards within those receiving environments.

Monitoring would consist of a grid of at least 40 semi-permanent monitoring stations, consisting of pit traps within the relocation area, as defined following reporting outcomes (see Section 6.5.2 below). Locations would provide coverage of both enhanced and planted habitats. Pit traps would be installed at least four weeks before the survey period. The survey period would provide for a minimum of trap checks on fine, non-consecutive days over November-December or March-April, when lizards are most active.

Table 15. Triggers for management and post-release monitoring provisions.

	Trigger	Management provision	Monitoring
A	➢ 20 native lizards per stage	• Immediate relocation	Minimum of 5 annual surveys at release area, following staged earthworks
B	ANY native lizard species not identified in **Table 13**	• Hold lizards and contact the Department of Conservation immediately	Pending the outcome of direction from DOC.

6.5.2 Reporting

Reporting is important for ensuring compliance with plans, promoting transparency and accountability, and identifying areas for improvement. For potentially present lizards within Rangitoopuni-Riverhead Forest, monitoring may also improve understanding of native lizard populations within commercial forests.

The following reports are required for lizard salvage:

1. **Report per staged earthworks**: Outcome of lizard management, including:
    a. For each native lizard, the following information will be recorded:
        i. Species and demography (assessed as male/female/juvenile)
        ii. Date of capture, including method (Phase 1 / 2 search)
        iii. Location of capture
        iv. Location of Release
    b. Recommendations (if any) for improved methods
    c. Where 20 or more native lizards are salvaged, confirmation of the requirement for five annual post-relocation monitoring surveys

2. **Five reports on annual monitor surveys** (if triggered): Reports shall include:
    a. Map of relocation area and survey equipment layout
    b. Survey methodology
    c. Results of survey, including a summary of the previous year's results as appropriate, including:
        i. Species and demography (assessed as male/female/juvenile)
        ii. Recommendations (if any) and outcome of other recommended actions (if any).

6.5.3 Contingency Actions

Contingency actions are required when lizard salvage and transfer activities fail. For the Rangitoopuni project, lizard salvage is generally approached as a precautionary measure, with triggers for reporting and monitoring where sufficient numbers of lizards are salvaged and relocated into localised areas of a larger site. It is acknowledged that lizard mitigation typically suffers from poorly reported results, and where such reporting is present, also reports low levels of success.

Often, this is a consequence of large numbers of mitigation projects that report on reinforcement relocations (moving species into environments where their populations already occur) of small numbers of lizards, for which monitoring results in limited ability to determine outcomes with confidence.

This Project, monitoring aims to determine lizard population persistence within retained and protected habitats, within the context of a wider landscape that is considered to have poor lizard habitat values. Where 20+ lizards are relocated during lizard management, it is envisaged that, with restoration and pest management, sufficient lizard numbers will be present following salvage to confirm population persistence in the following years. If lizards are not able to be detected from triggered monitoring, the outcome of the salvage would be considered inconclusive, acknowledging that the wider restoration initiatives are likely to have longer-term benefits.

7 FRESHWATER FISH MANAGEMENT PLAN

7.1 Introduction

This Freshwater Fish Management Plan (FFMP) forms part of the overall ecological management for the Rangitoopuni Developments Limited Partnership proposal. Desktop reviews showed the surrounding streams

and catchment support a diverse range of indigenous fish. Records show shortfin eels (*Anguilla australis*), redfin bully (*Gobiomorphus huttoni*), common bully (*Gobiomorphus cotidianus*), īnanga (*Galaxias maculatus*), and torrentfish (*Cheimarrichthys fosteri*) have been recorded within proximity to the site. Of the eight fish species identified, three species have a conservation status of 'At Risk – Declining' (Dunn *et al*., 2017) at a national scale, whilst four species are considered 'At Risk' at a regional scale, and one species is considered 'Threatened' (Bloxham *et al.,* 2023) (Table 16).

Table 16. Native freshwater fish species recorded within 5 km of the project area from the New Zealand Freshwater Fish Database, and the corresponding threat status.

Scientific name	Common name	New Zealand Threat Classification (Dunn *et al*., 2017)	Regional Threat Classification (Bloxham *et al*., 2023)
Anguilla australis	Shortfin eel	Not Threatened	Not Threatened
Anguilla dieffenbachii	Longfin eel	At Risk – Declining	At Risk – Regionally declining
Cheimarrichthys fosteri	Torrentfish	At Risk – Declining	Threatened – Regionally vulnerable
Galaxias fasciatus	Banded kokopu	Not Threatened	Not Threatened
Galaxias maculatus	Inanga	At Risk – Declining	At Risk – Regionally declining
Gobiomorphus basalis	Cran's bully	Not Threatened	A Risk Declining
Gobiomorphus cotidianus	Common bully	Not Threatened	Not Threatened
Gobiomorphus huttoni	Redfin bully	Not Threatened	At Risk – Regionally declining
Paranephrops sp.	Koura	Not Threatened*	Not Threatened

Note: * = freshwater invertebrate conservation statuses from Grainger *et al.* (2018).

7.2 Methodology

7.2.1 Commencement of Recovery Plan

Fish removal and relocation will be undertaken in the days immediately prior to the commencement of any instream or where significant changes in stream hydrology are expected due to the proposed works. The fish recovery may be carried out in stages, depending upon the infringement of earthworks into recognised aquatic habitat.

7.2.2 Exclusion Screens

Prior to capturing fish, a barrier (exclusion screens) to fish movement shall be placed at the upstream and downstream areas of the potential aquatic habitats in which earthworks would be performed to prevent fish from recolonising the impacted areas. Exclusion screens will be constructed from steel warratahs and shade cloth Figure 14. The shade cloth allows water to continue to flow downstream while preventing fish passage. The exclusion screen will extend 1 m past the wetted widths of the aquatic habitat and will be embedded into the dry ground or the banks.

Warratahs will be securely hammered into the ground and evenly spaced across the aquatic habitat to effectively support the shade cloth. Where extra support is considered necessary, wire will be threaded horizontally across the warratahs to further support the shade cloth. Shade cloth will then be fastened to the warratahs and wire supports (where applicable) using zip ties. The shade cloth will extend above the water level to an approximate height of 0.5 m. Along the stream bed, the shade cloth will either be embedded and pinned, or an apron of the shade cloth will be formed and pinned.

Figure 14. Example of fish exclusion screens.

7.2.3 Fish Capture Methodology

The *New Zealand Freshwater Fish Sampling Protocols* (Joy et al., 2013) will be followed unless specified within this plan. Setting of Gee-minnow traps will also be in general accordance with *A Revised Methodology to Survey and Monitor New Zealand Mudfish Species* (Ling *et al.,* 2013). Preferably, stream works will occur during the warmer, drier months were water levels within the intermittent streams would naturally recede. Suitably qualified freshwater ecologists shall conduct the fish relocation. These ecologists will be two of:

- Treffery Barnett, M.Sc (Hons), Senior Freshwater Ecologist
- Kate Feickert, PG.Dip.Sc, Senior Ecologist
- Christel du Preez, M.Sc (Hons), Senior Ecologist
- Laura Drummond, M.Sc (Hons), Ecologist

All ecologists listed have conducted multiple successful freshwater fish relocations and have electric fishing licences and have extensive experience in freshwater fish handling and ecology. At least one of them will be present on site during the relocation.

Native fish present shall be captured over at least two days using a combination of netting/trapping and electric fishing. Water levels permitting, baited Gee-minnow traps and fyke nets will be placed at intervals over the stream works area and left in place overnight. Fine meshed fykes with a separator grill will be used. All nets and traps will be set with an airspace to provide trapped fish access to atmospheric oxygen and will be set in general accordance with the *New Zealand Freshwater Fish Sampling Protocols* (Joy *et al.* 2013), with small buoys placed

in the fyke nets if required. It is proposed that trap densities will be set at one fyke net and two Gee-minnow traps for every 10 m of stream length. The intermittent streams will likely contain insufficient space/water depth for the setting of fyke nets, and as such, the density of Gee-minnow traps will be increased. The traps will be checked the following morning, before 9 am, with any captured fish recovered.

A minimum of two electric fishing runs within the areas will be carried out over the trapping period. One electric fishing run will be undertaken prior to setting any traps or nets and another electric fishing run will be undertaken post the last occasion of retrieving the traps or nets. Electric fishing shall be undertaken using an electric fishing machine (EFM 300). When used correctly, the EFM 300 temporarily stuns the fish, allowing them to be caught without damage.

7.2.4 Performance Standards

As a minimum performance for trapping if more than ten native fish (excluding juvenile shortfin eels) are caught during a single trapping effort within the staged area of the site then trapping will continue until numbers are depleted to the satisfaction of the project ecologist (using an 80% removal rate as a target, based on the Hayne's (1949) regression method). A single trapping effort is considered to be one night of trapping. In relation to juvenile shortfin eels (<350 mm), fishing will continue until a 50% removal rate is achieved (based on Hayne's (1949) regression method).
Dewatering will commence provided that the electric fishing minimum performance standards have been met. Native fish, such as eels (*Anguilla* spp.), will burrow into silt substrates when they are disturbed or as water levels decrease. As a result of this, during the dewatering stage, a freshwater ecologist will be present to search through the drained habitat, rocks/debris, remaining pools or thick sediment for any remaining fish. Once dewatering is completed, an excavator will be used to carefully scrape out any thick layers of sediment. Any sediment removed from an aquatic habitat will also be hand-checked by the freshwater ecologist.

7.2.5 Fish Handling and Relocation

Fish handling will be in accordance with Section 3.9 of the *New Zealand Freshwater Fish Sampling Protocols* (Joy *et al.* 2013) and the Bioresearches MPI Special Permit 689. All native fish captured will be relocated on the day of capture to a suitable alternative habitat. Ideally, fish are relocated to suitable, similar habitat types within the same catchment where suitable shaded permanent water is present. Stream information obtained from the Auckland Council GIS viewer and onsite assessments revealed suitable habitats (e.g., high shading and sufficient water levels) to be present within the Deacon Stream or east of Lot 1, dependent upon the catchment, subject to the FFMP

Following capture, fish will be transferred into lidded containers of an appropriate volume for the number of fish caught and kept cool. Battery-powered oxygen bubblers will be placed within each of the transfer bins to provide high dissolved oxygen into the water and reduce further stress. A water conditioner (such as API Stress coat) will be added to the water to reduce further stress and restore the mucous coat of fish. Whilst the contained fish will be monitored, and water will be changed every hour. If any individual captured fish shows signs of stress (loss of righting response, exuding excessive mucus, gulping air, and or mouth gaping), the water will be changed to provide more oxygen, or the fish will be moved to the relocation site immediately. Fish will be visually examined for general health (visual skin lesions or heavy fungal burdens), and if considered

unhealthy by an appropriately qualified freshwater ecologist, they will be humanely euthanized in accordance with Section 20-27 of the MPI Special Permit (872).

Large eels (> 500 mm) will be contained individually to avoid injury to other smaller captured fish. Koura, if present, will also be separated into their own containers. Captured fish will be securely transported to the relocation site and gently transferred into the downstream reach within two hours of being captured. If large numbers of fish are captured, they will be distributed across multiple release points in the general area to avoid short-term overstocking and predation risks.

7.2.6 Timing of Works

The initial works required by the FFRP will be undertaken no more than one week prior to any stream works commencing within the specified area, or if works outside of watercourses result in the reduction of stream flows. Ongoing maintenance of the temporary fish barriers will be undertaken until streamworks are complete within the area.

7.2.7 Biosecurity

All equipment will be thoroughly cleaned and dried prior to use. Equipment includes but not limited to; electric fishing machine, waders, fyke nets, gee minnow traps and transfer buckets. Any pest fish caught will be humanely euthanized and all euthanized pest fish will be disposed of in a bio secure manner to land, in accordance with MPI Special Permit 872.

7.2.8 Adaptive Management

Due to the high level of intrinsic variability in any fish recovery and relocation, this plan may be slightly modified by an appropriately qualified freshwater ecologist to ensure fish are recovered in a safe and professional manner, as well as in accordance with the New Zealand Freshwater Fish Sampling Protocols (Joy *et al*., 2013).

7.3 Reporting and Permits

Following the relocation, a short report will be prepared detailing the fish captured (species and number of fish) during the recovery, as well as details on the relocation site. The Auckland Council shall be provided with a copy of the report within five days of completion of dewatering. Fish records will also be sent to NIWA to be included in the New Zealand Freshwater Fish Database.

Bioresearches hold an MPI Special Permit (872) that allows persons or agencies to take aquatic life and relocate it to a suitable habitat where this is necessary or required to mitigate adverse effects of habitat modification on the aquatic life. Since the capture and relocation sites are not within a conservation area, and the fact that any fish captured will be relocated within the same catchment, no other permits are considered necessary.

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APPLICABILITY AND LIMITATIONS

Restrictions of Intended Purpose

This report has been prepared solely for the benefit of Rangitoopuni Developments Limited Partnerships as our client with respect to the brief. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such party's sole risk.

Legal Interpretation

Opinions and judgements expressed herein are based on our understanding and interpretation of current regulatory standards and should not be construed as legal opinions. Where opinions or judgements are to be relied on, they should be independently verified with appropriate legal advice.

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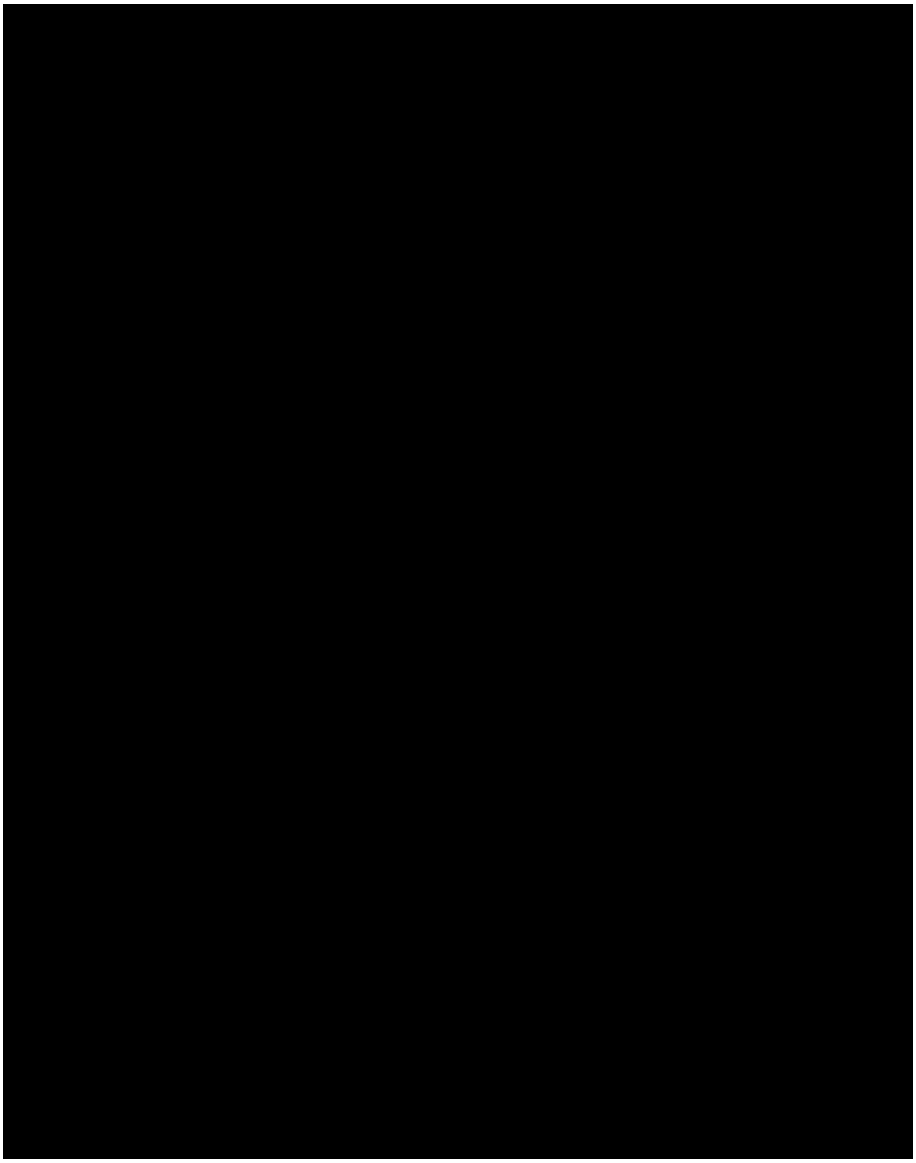

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