August 2026

Alliance Ecology™

Pest Control and Elimination Plan

MACRAES PHASE FOUR PROJECT (MP4)

Prepared for OCEANA GOLD NEW ZEALAND LIMITED

alliance ecology.co.nz

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Executive Summary

This Pest Control and Elimination Plan (PCEP) has been prepared for OceanaGold (New Zealand) Limited to set out the pest animal control, suppression and elimination measures required to support the biodiversity compensation and enhancement programme associated with the Macraes Phase Four Project (MP4).

The PCEP forms part of the wider Residual Effects Management Package and applies to the Murphys Ecological Enhancement Area (MEEA), including the MEEA Predator Exclusion Fence and MEEA 1 km Buffer, together with the Murphys Link, Cranky Jims Link, Mt Highlay Station and stream enhancement planting areas.

Pest management under this Plan will be implemented through three complementary management approaches:

1. Predator elimination within the MEEA Predator Exclusion Fence – A 252 ha full-height predator exclusion fence will be constructed within the MEEA, inside which all target mammalian pest species will be eradicated and maintained at zero density. Target species include mice, rats, mustelids, possums, feral cats, hedgehogs, rabbits, hares, deer, pigs, goats and wallabies.
2. Pest suppression within surrounding biodiversity management areas – Ongoing predator suppression will be undertaken within the MEEA 1 km Buffer, Murphys Link, and Cranky Jims Link to reduce reinvasion pressure on the predator exclusion fence, protect high-value biodiversity assets (particularly indigenous lizards), and provide wider landscape-scale biodiversity benefits.
3. Browser management across restoration and compensation areas – Browsing mammals, including deer, pigs, rabbits, hares and possums, will be managed across the MEEA 1 km Buffer, Murphys Link, Cranky Jims Link, Mt Highlay Station and stream enhancement planting areas to promote vegetation establishment, natural regeneration, habitat quality and long-term ecosystem resilience.

The MEEA Predator Exclusion Fence will provide the highest level of biodiversity protection by creating a secure, predator-free refuge for indigenous lizard populations and other predator-sensitive fauna. Surrounding pest suppression areas will provide an additional layer of protection by reducing reinvasion pressure and extending biodiversity benefits into the wider landscape. Browser management across restoration and compensation sites will complement these measures by protecting restoration plantings, reducing browsing impacts, and improving long-term ecosystem function and ecological connectivity throughout the MP4 biodiversity management network.

This PCEP outlines the methods that will be used to achieve these outcomes, including target pest species, eradication and suppression methodologies, trapping and baiting systems, browser control approaches, monitoring protocols, performance standards, reporting requirements and adaptive management responses.

The MEEA fence will be constructed within five years of consent being issued, with pest eradication occurring during the first winter following construction. Ongoing maintenance

of the fence will be funded by OGLNZ until 2050, aligning with New Zealand's Predator Free 2050 vision. Post 2050, the MEEA, Cranky Jims link and Mt Highlay compensation locations will be transferred to a special purpose trust which will be funded by a closure capitalisation fund set up by OGLNZ.

The MEEA Predator Exclusion Fence is expected to have an operational lifespan of approximately 35–50 years, subject to ongoing inspection, maintenance and repair. Pest management methods and infrastructure will be reviewed periodically and refined where monitoring demonstrates that changes are required to achieve the ecological objectives of the Plan.

1. Introduction

1.1 Project Background

OceanaGold (New Zealand) Limited ("**OGNZL**") currently undertakes open pit and underground gold mining operations at the Macraes Operation located at Golden Point Road, Macraes Flat, East Otago. As part of their ongoing operations, OGNZL continually review the remaining life of the Macraes Operation in light of updated knowledge of the gold resource and the economics of mining.

Reflecting recent exploration success and optimisation work, together with higher gold prices, the Macraes Phase Four Project ("**MP4**" or "**the Project**") seeks to extend the life of mining at the Macraes Operation until at least 2039. The Project, which will enable ongoing gold production at a rate of approximately 130,000 ounces per annum, is identified as a Listed Project in Schedule 2 of the Fast-track Approvals Act 2024 ("**FTAA**") as a project providing significant national or regional benefits.

Ecological assessments undertaken for MP4 have identified a range of residual adverse effects on indigenous biodiversity values (Bioresearches 2026a and 2026f), that cannot be fully avoided, remedied or mitigated through conventional management measures. To address these residual effects, OGNZL has developed a biodiversity compensation package comprising habitat protection, ecological restoration, predator management, browser control, lizard conservation measures and long-term legal protection of key biodiversity sites (Bioresearches 2026l).

This Pest Control and Elimination Plan (PCEP) sets out the framework for implementation of the associated pest management measures across the Macraes landscape. The Plan also consolidates existing management actions (particularly those at the existing Island Block Covenant and existing Cranky Jims Wetland and Shrubland Covenants) into an integrated programme designed to achieve enduring ecological outcomes.

The management package is intended not only to compensate for project effects, but also to improve the ecological condition, resilience and connectivity of indigenous ecosystems across the wider Macraes landscape.

1.2 Ecological Context

OGNZL owns and operates the Macraes Operation at Macraes, approximately 30 km northwest of Palmerston in the Otago Region. The Macraes Operation is the largest gold mine in New Zealand and, since commissioning in 1990, has produced more than 6 million ounces of gold.

Macraes Flat is situated on an elevated plateau at approximately 500 m above sea level. The plateau is flanked by the Taieri Ridge to the northwest, Shag Valley and Horse Range to the east, and the coastal hills and extinct volcanic cones of Palmerston and Waikouaiti to the southeast. Macraes Road provides access to Macraes Flat and the Macraes

Operation, connecting to State Highway 85 to the east and State Highway 87 (SH87, the Middlemarch–Hyde Road) to the west. The environment within and surrounding the Macraes Operation has been shaped by historic and current mining activities, however, the area continues to support significant indigenous biodiversity values, including indigenous lizards, threatened plant species, indigenous birds and representative examples of Otago's distinctive dryland ecosystems.

Several areas within and adjacent to the Macraes Operation are already managed for biodiversity conservation purposes. Of particular significance is the Island Block Ecological Covenant (Fig. 1), which supports indigenous shrubland and forest habitats and is subject to ongoing ecological restoration and pest management. Cranky Jims Link (Fig. 1) will strengthen ecological connectivity between the Cranky Jims Wetland and Shrubland Covenants and the Island Block Ecological Covenant through large-scale grey shrubland restoration and targeted pest management, improving opportunities for the movement of indigenous fauna and increasing the resilience of indigenous vegetation communities.

The Murphys Ecological Enhancement Area (MEEA) forms the cornerstone of the lizard compensation programme. The MEEA has been selected because of its high-quality habitat, proximity to affected lizard populations and capacity to support long-term biodiversity enhancement. Approximately 252 ha of the MEEA will be enclosed by a predator exclusion fence, within which all target mammalian pest species will be eradicated and maintained at zero density. The surrounding MEEA 1 km Buffer will provide a high-intensity pest suppression zone to reduce reinvasion risk while extending biodiversity benefits into the surrounding landscape.

The Murphys Link will provide an important ecological corridor between the MEEA and the Redbank Ecological Covenant, while also serving as the primary lizard release area. Murphys Link has been selected as the primary lizard compensation area to enable robust evaluation of the biodiversity outcomes achieved within the MEEA Predator Exclusion Area (Bioresearches 2026j). Releasing salvaged lizards within the predator-exclusion fence would confound monitoring of the compensation programme, as any increases in lizard abundance could not be distinguished between improvements resulting from predator elimination and habitat protection, and increases resulting from the translocation itself. Establishing the translocation population within Murphys Link allows the ecological benefits of the MEEA Predator Exclusion Area to be assessed independently while providing a large, permanently protected release area managed through intensive predator suppression. In addition to supporting the establishment of translocated lizards, Murphys Link enhances ecological connectivity between the MEEA and the Redbank Ecological Covenant, creating a larger, more resilient network of indigenous tussock, shrubland and rock outcrop habitats for long-term lizard conservation. Targeted pest suppression and browser management within this area will support successful lizard establishment, protect tussock, grey shrubland and rock outcrop habitats, and promote ongoing vegetation recovery.

Additional browser management will be undertaken at Mt Highlay Station, where pest management will support pine removal, tussock restoration, vegetation direct transfer

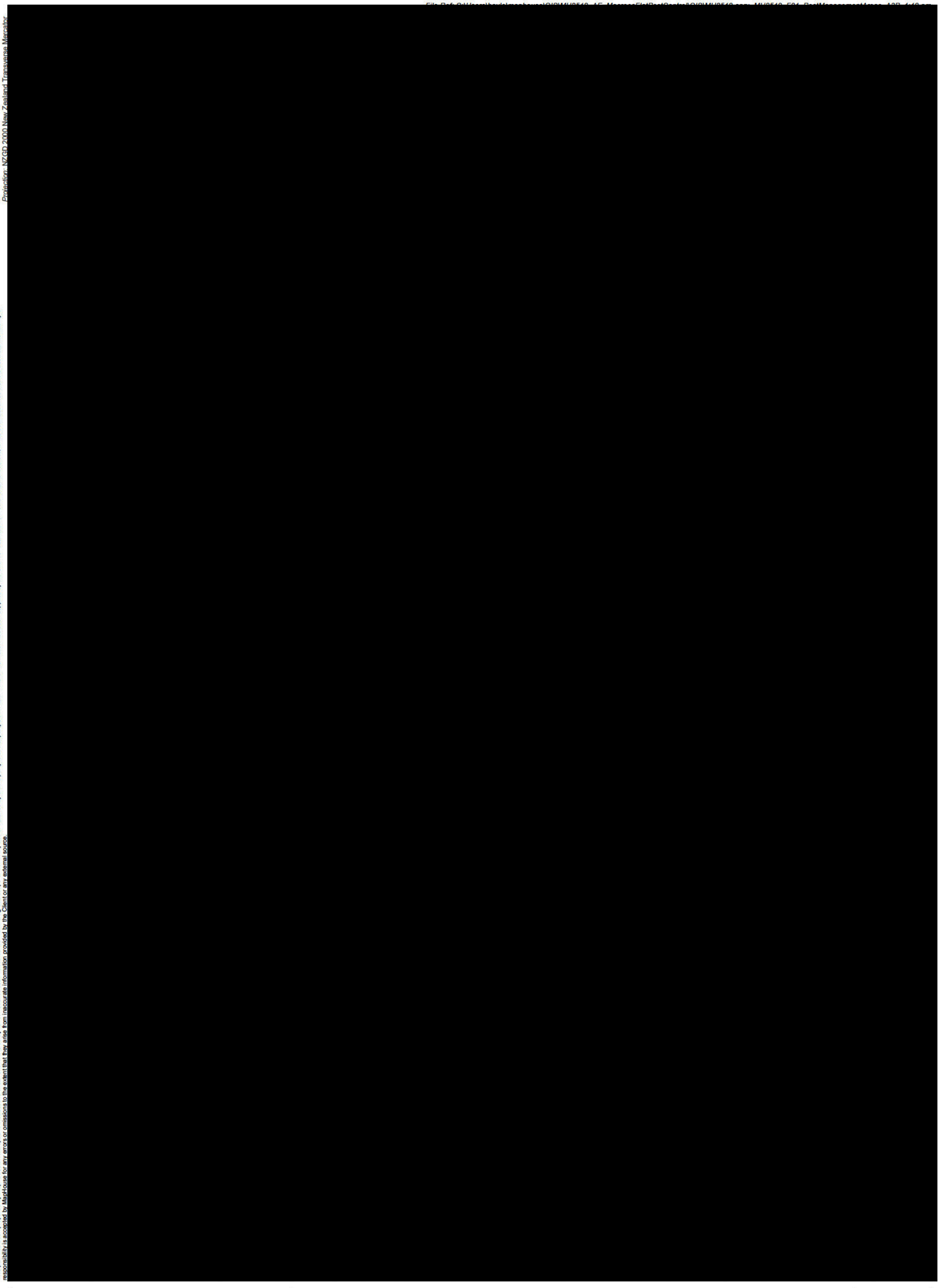
(VDT), and protection of indigenous tussock, grey shrubland and rock outcrop communities, as well as within stream restoration planting areas.

Collectively, these management areas create an interconnected network of protected and restored habitats extending across the Macraes landscape. By integrating predator elimination, predator suppression and browser management, the programme aims to enhance ecological connectivity, improve ecosystem resilience and deliver enduring biodiversity outcomes that extend well beyond the operational life of the mine.

1.3 Pest Management Approach

The PCEP package adopts a landscape-scale approach that combines habitat protection, fencing and pest animal management. The programme includes:

- Construction and long-term management of a predator exclusion area within the MEEA for lizard conservation outcomes;
- Pest suppression within the surrounding buffer areas to reduce reinvasion pressure and enhance biodiversity outcomes beyond the exclusion fence;
- Reduction of key predators in lizard translocation and release areas to maximise translocation success and long-term population persistence;
- Management of browsing mammals, including deer, pigs, rabbits, hares, possums and other ungulates, to promote vegetation establishment, natural regeneration and restoration success;
- Long-term monitoring and adaptive management to evaluate ecological performance and inform future management actions.



Projection: NZGD 2000 New Zealand Transverse Mercator

Location of Pest Management Areas

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- MEEA Predator Exclusion Fence (250ha)
- MEEA 1km buffer
- Murphy's Link
- Indicative Red Bank Covenant
- Otago skink site
- Island Block Covenant
- Cranky Jim's Link / Grey Scrub Restoration Area
- Ecological Covenant
- Mt Highlay Tussock Restoration Area
- Stream enhancement planting

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Data Sources: Bioresearches, Alliance Ecology, Eagle Technology, LINZ

Figure 1

1.4 Purpose and Scope of this PCEP

This Pest Control and Elimination Plan (PCEP) sets out the pest animal management measures that will be implemented to support the biodiversity compensation and enhancement programme associated with the Macraes Phase Four Project (MP4).

The purpose of this Plan is to provide a framework for the control, suppression and, where appropriate, elimination of mammalian pest species within biodiversity management areas established as part of the Project. These measures are intended to protect and enhance indigenous biodiversity values, improve habitat condition, support ecological restoration, and contribute to the long-term ecological objectives of the Murphys Ecological Enhancement Area (MEEA), Cranky Jims restoration area, and other biodiversity management sites associated with MP4.

This PCEP applies to all pest management areas, including:

- **Pest Exclusion Areas:** The MEEA area which will have a 252 ha pest exclusion fence constructed and where all target mammalian pest species will be removed and maintained at zero density;
- **Pest Suppression Areas:** Areas managed for ongoing pest suppression (totalling 1,625 ha), where predator populations will be maintained below defined ecological thresholds to support biodiversity outcomes. This includes the MEEA buffer area, Murphys Link and Cranky Jims Link.
- **Browser Management Areas:** Areas where browsing pest management is required to facilitate vegetation recovery, improve habitat quality, protect restoration plantings and strengthen ecological connectivity across the wider Macraes landscape. As well as the above areas, this includes Mt Highlay, riparian restoration areas, and other restoration or compensation sites established under MP4 (2,232 ha).

Target pest species addressed by this Plan include:

- Rodents (ship rats, Norway rats and mice);
- Mustelids (stoats, ferrets and weasels);
- Possums;
- Feral cats;
- Rabbits;
- Hedgehogs; and
- Browsing mammals, including deer, pigs, hares and other ungulates where these species may adversely affect biodiversity outcomes.

Specifically, this Plan includes:

- Background information on the biodiversity values of the management areas, existing pest management activities, and known pest animal distribution and abundance;
- Information on the ecological impacts of target pest species and the expected biodiversity benefits of pest control and elimination;
- Objectives, performance standards and management targets for each pest management area;
- Pest elimination protocols, surveillance requirements and incursion response procedures for areas managed for eradication;
- Protocols for ongoing pest suppression, including trapping, toxic baiting, shooting and other control methods as appropriate;
- Specifications for pest control devices, deployment spacing, lures, servicing frequencies and operational requirements;
- Pest animal monitoring protocols, including the use of tracking tunnels, chew cards, camera traps and other approved monitoring techniques;
- Thresholds and trigger levels for adaptive management responses where monitoring indicates pest populations exceed target levels;
- Data management, reporting and review requirements; and
- Procedures for ongoing evaluation and adaptive management to ensure pest management remains effective and aligned with the ecological objectives of the Project.

This Plan recognises that pest management requirements may vary between management areas and over time. Accordingly, pest control methods and operational approaches may be refined over time where monitoring results, technological advances or improved management practices demonstrate that alternative approaches can achieve equivalent or improved ecological outcomes.

2. Pest Management and Elimination Areas

Pest management under this Plan will be undertaken across approximately 2,232 ha of the Macraes Phase Four Project Area (Figs. 1 - 2). The programme comprises a Predator Elimination Area, Predator Suppression Areas, and landscape-scale Browser Management undertaken across all management areas where required. The location, extent and management approach for each area reflect the ecological values present, the level of protection required and the role each area plays in supporting long-term biodiversity outcomes.

Predator Elimination Area (approximately 252 ha)

The Murphys Ecological Enhancement Area (MEEA) Predator Exclusion Area (approximately 252 ha, Fig. 1 - 2) is enclosed by a predator exclusion fence and will be managed to achieve and maintain the local elimination of mammalian predators. Initial eradication will be undertaken using aerial and ground-based toxic baiting, followed by intensive surveillance and rapid incursion response using permanent bait stations, kill traps, surveillance cameras, tracking tunnels and chew cards. Browser species will also be eradicated from within the fenced area and excluded through ongoing fence maintenance and surveillance.

Predator Suppression Areas (approximately 1,625 ha)

Predator suppression will be undertaken across approximately 1,625 ha, comprising:

- MEEA Buffer – approximately 1,172 ha
- Murphys Link – approximately 396 ha
- Cranky Jims Link – approximately 57 ha

These areas (Figs. 1- 2) will provide progressive predator suppression surrounding the Predator Exclusion Area and within adjacent restoration areas, reducing reinvasion pressure while improving habitat quality for indigenous fauna. Control will target rodents, possums, mustelids, hedgehogs and feral cats using permanent bait stations and trapping networks, with deployment densities varying according to management priorities and proximity to the predator exclusion fence. The highest control intensity will occur immediately adjacent to the fence, reducing progressively with distance while maintaining effective landscape-scale suppression. Murphys Link will also have a high level of control intensity as it serves as the lizard translocation site.

Within the Cranky Jims Link, predator control will be undertaken at a lower intensity than within the MEEA Buffer and Murphys Link, focusing on suppression of rats, possums, mustelids and feral cats to support grey shrubland restoration and protect indigenous birds and other fauna.

Browser Management (approximately 2,232 ha)

Browser management will be undertaken across all management areas where browsers pose a risk to ecological values, including the Predator Exclusion Area, Predator Suppression Areas, Mt Highlay Station and Stream Enhancement Planting Areas. Control of

deer, pigs, rabbits, hares and, where present, goats will be undertaken using shooting, trapping or other approved methods, with deployment guided by monitoring results, field observations and ecological priorities. Browser management aims to reduce browsing pressure, protect indigenous vegetation, support natural regeneration and maintain the ecological integrity of restoration plantings, wetlands, rock outcrops, grey shrublands and other priority habitats.

The location, extent and management objectives of each management area are shown in Figures 1 - 2 and summarised in Table 1.

***Table 1**: Summary of the management areas addressed by this Pest Control and Elimination Plan (PCEP), including the applicable pest management category, management objectives and target mammalian pest species.*

Management Area	Approx. Area (ha)	Management Category	Primary Objective	Target Mammalian Pest Species	Comments
Murphys Ecological Enhancement Area (MEEA)	1,424	Overall Biodiversity Management Area	Landscape-scale biodiversity enhancement incorporating predator elimination and suppression	See sub-areas below	Comprises the MEEA Predator Exclusion Fence and MEEA 1 km Buffer.
MEEA Predator Exclusion Area (252 ha)	252	**Predator Elimination**	Achieve and maintain a pest-free sanctuary for long-term biodiversity protection	Mice, ship rats, Norway rats, stoats, ferrets, weasels, possums, hedgehogs, feral cats, rabbits, hares, deer, pigs, goats, wallabies.	Complete elimination and ongoing surveillance.
MEEA 1 km Buffer	1,172	**Pest Suppression + Browser Management**	Reduce reinvasion pressure and provide landscape-scale biodiversity benefits	Mice, rats, mustelids, possums, hedgehogs, feral cats, rabbits and browsing mammals where required.	High-intensity suppression immediately adjacent to the fence, reducing with distance.
Murphys Link	396	**Pest Suppression + Browser Management**	Protect lizard release site, restored habitats and ecological connectivity	Mice, rats, mustelids, possums, hedgehogs, feral cats, rabbits and browsing mammals.	In addition to lizards, supports tussock, grey shrubland and rock outcrop protection.
Cranky Jims Link	57	**Pest Suppression + Browser Management**	Restore grey scrub habitat and strengthen connectivity between Cranky Jims and Island Block Covenants	Rats, mustelids, possums, hedgehogs, feral cats, rabbits, deer, pigs and other browsers	Approximately 50 ha of grey scrub restoration planting.
Cranky Jims Ecological Covenant	140.7	Existing Management	Maintain existing covenant values	Existing pest management programme	Existing management.

Management Area	Approx. Area (ha)	Management Category	Primary Objective	Target Mammalian Pest Species	Comments
Mt Highlay Station	355	**Browser Management**	Support tussock restoration, VDT establishment and protection of indigenous habitats	Deer, pigs, rabbits, hares, possums.	Includes pine removal and protection of tussock, scrub and rock outcrop habitats.
Stream Enhancement Planting Areas	Site specific	**Browser Management**	Protect riparian restoration plantings	Rabbits, hares, possums, deer, pigs	Existing or proposed stock fencing with targeted browser control.

Projection: NZGD 2000 New Zealand Transverse Mercator

Morrisons

85

Green Valley

Macraes Flat

Macraes

Moonlight

Pest Management Categories

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Pest Management Category
- Predator Elimination Area
- Predator Suppression Area
- Browser Management Area

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Figure 2

Data Sources: Bioresearches, Alliance Ecology, Eagle Technology, LINZ

2.1 Existing Pest Management

OceanaGold undertakes pest-animal management across a number of ecological management areas within the wider Macraes landscape. These programmes have been developed under different resource consents, Wildlife Act authorities and ecological management plans, and consequently vary in their objectives, target species, spatial extent and intensity.

Historically, pest management within the existing ecological covenants has focused principally on mammalian herbivores, particularly deer, pigs, rabbits and possums. Management generally comprises periodic monitoring and responsive control to maintain consented or recommended pest-abundance targets. More recently, pest management planning has expanded to include integrated predator suppression targeting rodents, mustelids, hedgehogs, possums and feral cats where this is required to protect indigenous fauna.

The most comprehensive of these newer programmes is within the Island Block Ecological Covenant to support the Coronation North Stage 5 (CN5) lizard salvage and relocation programme (Alliance ecology 2025). This programme applies differing levels of predator management across an intensive lizard release area, a surrounding suppression area and an outer buffer, and incorporates permanent trapping and bait-station networks, quarterly pest monitoring, performance targets and adaptive responses where thresholds are exceeded.

Existing and committed pest-management programmes relevant to the MP4 PCEP are summarised in Table 2. These programmes provide a useful contribution to pest suppression across the wider Macraes landscape; however, they have been developed for separate projects and do not replace the management required within the MP4 management areas. The MP4 Predator Exclusion Area, associated suppression buffers and browser management areas proposed under this PCEP represent a substantial expansion in both the spatial extent and intensity of ecological management compared with current management arrangements.

Table 2. *Existing and committed pest animal management programmes within the wider Macraes landscape relevant to the MP4 Pest Control and Elimination Plan (PCEP).*

Existing management area	Area	Existing animal-pest management and monitoring	Relationship to this PCEP
Cranky Jims Shrubland Covenant	47.2 ha	Pigs and deer managed to zero density, with quarterly sign surveys and control following detection. Annual possum RTC monitoring, with control if RTC exceeds 4%; annual rabbit MMS monitoring, with control if MMS exceeds 2. Seven wire stock exclusion fence.	Adjoins the proposed Cranky Jims Link area and provides an existing browser-management framework that can be coordinated with MP4 predator suppression.

Existing management area	Area	Existing animal-pest management and monitoring	Relationship to this PCEP
Cranky Jims Wetland Covenant	93.5 ha	Same consent targets and monitoring framework as Cranky Jims Shrubland. Existing records indicate intermittent deer and pig use; possum and rabbit indices were below control thresholds in 2024–2025. Seven wire stock exclusion fence.	Management should be coordinated with Cranky Jims Shrubland and the proposed Crankys Link programme.
Highlay Creek	16.9 ha	Pigs and deer managed to zero density; quarterly surveys. Annual possum RTC and rabbit MMS monitoring, with threshold-triggered control. Seven wire stock exclusion fence.	Existing covenant management continues separately but provides relevant surveillance information and operational experience relevant to MP4.
Highlay Hill Covenant	83.2 ha	No consent requirement for animal-pest control. Six-monthly pig and deer monitoring is recommended, with pig control where more than two locations of fresh sign are found. Rabbits and possums are recorded opportunistically.	Overlaps the wider Mt Highlay landscape and should be integrated with the MP4 browser-management programme.
Island Block Covenant	291 ha covenant; 82.5 ha managed area	Integrated suppression of rodents, possums, mustelids, hedgehogs and feral cats across a 20.7 ha intensive release area, 19.5 ha suppression area and 42.3 ha outer buffer. Permanent baiting and trapping are supported by quarterly tracking-tunnel, chew-card and camera monitoring and adaptive response thresholds.	An intensive predator-control programme designed to benefit lizards.
Redbank Ecological Enhancement Area	51 ha	Deer exclusion fence (to be installed). Browser management targeting deer and other browsing mammals to protect restoration plantings and indigenous vegetation.	Future ecological management area adjoining the Murphys Link, providing complementary browser management and strengthening ecological connectivity.
Deepdell Ecological Covenant	110.11	Rabbit-proof perimeter fencing. Historically managed under an intensive predator-control programme as part of a lizard research project, together with rabbit and possum control and zero-density targets for deer and pigs. Current management is limited due to land ownership changes and restricted site access, although consent obligations remain.	Legacy consent area established under the Coronation Project. Not directly integrated with the MP4 programme but remains relevant to existing consent obligations.

2.2 Baseline pest presence and relative activity

In order to get a background understanding of existing pest activity levels at the site, two rounds of pest monitoring were undertaken in December 2025 and March 2026 to determine pest presence/absence, and obtain a coarse indication of relative abundance, of rats, mice, possums, mustelids, hedgehogs, feral cats, and ungulates across the MEEA and surrounding habitat.

Understanding the current activity of pest species is important when considering proposed pest management approaches, as this data can:

- Determine whether the proposed pest management actions will have a positive benefit on biodiversity, and that the benefits of the proposed management approaches are additional to the current scenario;
- Customise any pest management actions to best control current pest species and their densities to achieve the optimal biodiversity outcomes quickly; and
- Allow comparison of ongoing pest animal monitoring once the project has commenced to a pre-control baseline, facilitating adaptive management to achieve the best biodiversity outcomes.

2.2.1 Pest monitoring methodology

An assessment of current pest animal activity was conducted using chew cards and lured camera traps deployed across the MEEA and immediately surrounding area (see Fig. 3). Line locations were randomly allocated across the area, with minor adjustments made to placement based on topography and accessibility by contractors on site. Monitoring was focused within the MEEA area given this is the primary focus of proposed pest control activities. Chew cards were selected for use over tracking tunnels for rodents as they provide simultaneous rat, mouse and possum monitoring.

Two monitoring rounds were conducted three months apart, one in December 2025 and one in March 2026. Undertaking two monitors three months apart enabled a comparison of potential seasonal changes from early summer through to autumn. Two further monitors are planned (so that a full year's baseline can be obtained), however, these monitors had not been undertaken at the time of writing of this report.

It should be noted both chew cards and camera traps only provide a relative index of population abundance, not a measure of the actual pest abundance. However, these techniques are still useful for determining the presence of pest species in an area and their approximate densities. The use of camera traps for pest monitoring is still a relatively new methodology but provides the advantage of increased detection probability (i.e. a higher chance that pests present in the landscape will actually be detected), versus chew cards and tracking tunnels.

Camera traps are also widely regarded as one of the most effective tools for detecting medium- to large-bodied mammalian predators in New Zealand, including mustelids, feral cats, and ungulates. These species typically occur at low densities, are highly mobile, and are often trap-shy or nocturnal, making traditional detection methods such as tracking tunnels or chew cards less reliable for consistent detection (Glen et al., 2013; Gillies & Williams, 2013). Camera traps provide continuous, non-invasive monitoring, generate verifiable photographic evidence, and have high detection probabilities for mustelids and cats when deployed systematically along movement corridors or baited stations (O'Donnell et al., 2017).

2.2.1.1 Chew cards

Thirteen lines of chew cards (pre-filled with peanut lure from Connovation Ltd) were placed in the locations shown in Fig. 3. Each line comprised 10 chew cards spaced at 20 m intervals along a 200 m line, as per standard best practice. Cards were labelled in permanent marker with the location, line number, card number, date of deployment and date of retrieval, and were nailed to tree trunks/posts 30 cm above the ground. After being deployed for seven nights, cards were collected and analysed for bite marks of the target pests. Chew card methods and analysis were as per standard best-practice methods (National Pest Control Agencies, 2020).

2.2.1.2 Trail Cameras

Camera trap monitoring methods followed the DOC's interim camera trapping protocol (Gillies, 2021). Cameras were set out for 21-nights and programmed to take a three-photo 'burst' every time the camera was triggered, with a 5-minute forced delay between triggers. Upon collection, photos were individually viewed, and any presence of a target animal recorded.

Four lines of camera traps were deployed, see Fig. 3. Each line consisted of 4 cameras at 200 metre spacings, with a trail camera mounted on either vegetation or a post focused on the lure area.

Projection: NZGD 2000 New Zealand Transverse Mercator

H1 H10 I10 I1 J10 J1 CC1 CC2 CC3 CC4 A1 AC1 A10 AC2 AC3 AC4 K10 K1 L1 L10 C10 C1 C7 DC1 B10 B1 DC2 DC3 F10 F1 M10 M1 DC4 D1 D10 BC4 E10 E1 G1 G10 BC3 BC2 BC1

Existing Pest Monitoring Network

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MEEA Predator Exclusion Fence (250ha)

MEEA 1km buffer

Chew card

Trail camera

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Data Sources: Bioresearches, Alliance Ecology, Eagle Technology, LINZ

Figure 3

2.2.2 Results

2.2.2.1 Chew cards

Chew card monitoring confirmed the presence of multiple mammalian pest species known to adversely affect indigenous lizards and other biodiversity values within the MEEA and surrounding landscape (Tables 3 and 4). Rats, mice, possums and hedgehogs were all detected during monitoring, although relative abundance varied between survey periods and locations.

Possums were consistently the most widespread species detected, with mean detection rates increasing from 13.9% in Monitor 1 to 21.5% in Monitor 2. Several locations recorded particularly high possum activity, including Lines G (90%), J (80%) and M (70%). At these levels of activity, possums have the potential to affect lizard habitat through modification of vegetation structure and competition for food resources, including fruit and nectar utilised by skinks and geckos (Nugent et al., 2000).

Rat detections increased substantially between monitoring periods, from a mean chew card index of 0.8% in Monitor 1 to 10.8% in Monitor 2. Localised hotspots were recorded on Lines F (60%), M (50%) and I (30%), indicating that rat populations can rapidly increase in some areas. Rats are known predators of lizards, eggs and juvenile reptiles, and have been linked to declines in indigenous lizard populations throughout New Zealand (Towns et al., 2001; Hoare et al., 2007).

Hedgehogs were absent during Monitor 1 but increased to a mean detection rate of 12.3% during Monitor 2. Hedgehog detections were widespread across the site and were concentrated in several areas of suitable lizard habitat. Hedgehogs are recognised predators of indigenous lizards and can exert significant predation pressure on skinks and geckos, particularly in dryland ecosystems (Reardon et al., 2012; Norbury et al., 2014).

Although house mouse detections declined between monitoring periods, mice remained present across the site. Seasonal fluctuations in mouse abundance are common within dryland ecosystems and populations can increase rapidly in response to favourable environmental conditions.

Overall, the results indicate that mammalian predators are widely distributed throughout the MEEA and surrounding landscape, supporting the need for both predator elimination within the fenced area and predator suppression within surrounding management areas.

***Table 3**: Results of monitor 1 (December 2025 - summer) chew-card monitoring conducted in the MEEA and buffer area. The % detection per line refers to the mean chew card index score (CCI).*

Line	Rat %	Mouse %	Possum %	Hedgehog %
A	0	0	0	0
B	0	10	0	0
C	0	10	10	0
D	0	20	10	0
E	0	20	20	0
F	0	0	30	0
G	0	0	40	0
H	0	10	0	0
I	0	10	20	0
J	0	0	20	0
K	0	0	10	0
L	0	10	0	0
M	10	10	20	0
Mean % tracking	0.8	7.7	13.9	0

***Table 4**: Results of monitor 2 (March 2026 - autumn) chew card monitoring conducted in the MEEA and buffer area. The % detection per line refers to the mean chew card index score (CCI).*

Line	Rat %	Mouse %	Possum %	Hedgehog %
A	0	0	0	10
B	0	0	0	30
C	0	0	0	20
D	0	20	0	0
E	0	0	0	10
F	60	0	0	20
G	0	0	90	30
H	0	0	0	0
I	30	0	0	10
J	0	0	80	10
K	0	0	10	10
L	0	0	30	0
M	50	0	70	0
Mean % tracking	**10.8**	**1.5**	**21.5**	**12.3**

2.2.2.2 Camera traps

Camera trap monitoring detected a broader range of pest species than chew card monitoring and confirmed the presence of all key predator and browser species relevant to biodiversity management objectives (Tables 5 and 6).

Figure 4: A harrier hawk removing the rabbit lure shortly after deployment during the camera surveys.

However, despite being securely pegged to the ground and in wire cages (Fig. 4), the meat based lure was frequently rapidly removed or consumed by harrier hawks (Fig. 4) frequently within 24 hours of deployment, leaving no pest attractant for the remainder of the 21-day monitoring period. This was especially problematic during the second survey, when hawks removed 50% of the rabbit lures within 24 – 47 hours of deployment. Ferrets also removed lures from two stations. There was also significant interference from cows at several camera stations. The high level of interference and impact on pest interactions meant that it was difficult to analyse the cameras for more than pest presence and absence, which is what has been focused on in these results. Future monitoring will use inedible lure blocks or automated lure dispensers (e.g. EzyLures), to reduce raptor interference while maintaining mammalian access.

Despite a high level of interference, across both monitoring periods, camera traps recorded possums, rats, mice, hedgehogs, ferrets, feral cats, pigs, deer and rabbits/hares. Importantly, several of these species are of particular concern for lizard conservation (especially ferrets, feral cats and hedgehogs). Hedgehogs were the most frequently detected predator during both monitoring periods, with detections increasing substantially during the second survey (Tables 5 and 6). Possums and ferrets were also regularly recorded, while feral cats were detected across multiple camera stations during both surveys. However, raw image counts are presented descriptively and must not be interpreted as an abundance index because consecutive images may represent repeated photographs of the same individual or visit.

These results indicate that a diverse predator community is present within the project area and that multiple predator species are likely contributing to predation pressure on indigenous fauna.

Camera trap monitoring also confirmed the presence of browsing mammals, including deer, pigs and rabbits/hares. Although detections of deer and pigs were relatively infrequent, their presence demonstrates that browsing mammals continue to utilise the area and may affect restoration plantings and natural regeneration if left unmanaged.

The camera trap results support the conclusion that mammalian predators and browsers remain widespread throughout the project area and provide strong justification for the implementation of both predator elimination and predator suppression programmes under this Plan.

***Table 5**: Results from the trial camera monitor conducted in December 2025 (Monitor one), expressed as the number of pictures collected on each pest species at each camera station and the percentage of camera stations which detected each pest.*

Station	Possum	Ship Rat	ferret	Mice	Hedgehog	Cat	pig	deer	rabbit/hare
A1	6								19
A2			27		2				
A3			12		1				
A4									20
B1					3				6
B2					15				3
B3					12				6
B4	3		10		32				14
C1	3			44	3	1			19
C2					24				9
C3	8				21		3		12
C4						183			3
D1	43	147				3		3	3
D2	18	3	6		12				
D3	13	20					2		
D4	2				14		2	1	
totals	**96**	**170**	**55**	**44**	**139**	**187**	**7**	**4**	**114**
% cams	50.0	18.8	25.0	6.3	68.8	18.8	18.8	12.5	68.8

Table 6: *Results from the trial camera monitor conducted in March 2026 (Monitor two), expressed as the number of pictures collected on each pest species at each camera station. One camera A4, failed after deployment and did not collect any images.*

Station	Possum	Ship Rat	ferret	Mice	Hedgehog	Cat	pig	deer	Rabbit / hare
A1	12				43	7			9
A2					30	3			
A3				3	18				
A4	n/a								
B1				34	26				
B2						3			
B3					30	3			3
B4			3		30		3		3
C1	1				12				18
C2						3			
C3			`1		4	2			
C4						3			
D2	9	4	33		6				
D3	12		12	4	6				
D4	82	3	36	3	102	3		3	
totals	**116**	**7**	**84**	**44**	**307**	**27**	**3**	**3**	
% cams	33.3	13.3	33.3	26.6	73.3	53.3	6.6	6.6	26.6

2.3 Summary of baseline presence and existing activity

Combined chew card and camera trap monitoring demonstrated that the project area supports a diverse assemblage of mammalian pest species, including all major predator groups known to adversely affect indigenous lizards.

Rodents, possums, hedgehogs, ferrets and feral cats were all detected within or adjacent to the proposed Murphys Ecological Enhancement Area. Browser species including rabbits, hares, deer and pigs were also recorded (Figs. 5 – 6). Several species, particularly possums and hedgehogs, were widespread across the monitoring network, while rats exhibited localised areas of elevated abundance.

The presence of multiple predator species across the project area indicates that lizards are currently exposed to ongoing predation pressure. The results also demonstrate that browsers capable of affecting restoration plantings and indigenous vegetation are present throughout the wider landscape.

Overall, the monitoring results confirm that the proposed pest management programme is expected to provide substantial biodiversity benefits. The diversity and distribution of pest species detected support the need for predator elimination within the MEEA predator exclusion area, predator suppression within surrounding management areas, and coordinated browser management across restoration and enhancement sites.

Figure 5: Pest species detected during camera surveys including rats, ferrets, pigs and possums.

Figure 6: Pest species detected during camera surveys including feral cats, ferrets, hedgehogs and deer.

3. Target pest species

The pest species targeted by this programme have well-documented, compounding impacts on native biodiversity, acting through predation, browsing, competition, and habitat modification. Together, these species account for the majority of ongoing pressure on threatened birds, lizards, invertebrates, and vegetation, and their integrated management is central to achieving durable biodiversity gains.

3.1 Rats

Ship rats (*Rattus rattus*) and Norway rats (*R. norvegicus*) are both present in New Zealand and are among the country's most damaging introduced mammalian predators. Rats are omnivorous and prey on seeds, invertebrates, reptiles, birds and their eggs, while also competing with native fauna for food resources. Ship rats are particularly effective climbers and are significant predators in forest habitats, whereas Norway rats are more commonly associated with waterways and open habitats. Both species reproduce rapidly and readily reinvade managed areas if ongoing control is not maintained (Innes et al. 2010; King & Forsyth 2021).

Rats will be eliminated within the Pest Exclusion Fenced Area primarily through the use of brodifacoum during the initial eradication phase. Populations in the Pest Suppression Areas will be maintained at low densities using a combination of bait stations and trapping. Rat activity will be monitored using tracking tunnels, chew cards and camera surveillance to detect incursions and assess the effectiveness of control.

3.2 Mice

House mice (*Mus musculus*) are widespread throughout New Zealand and can occur at very high densities following predator removal or periods of abundant food availability. Although much smaller than rats, mice are significant predators of invertebrates, lizards and the eggs and young of some native birds, and they may suppress recovery of native fauna where they remain abundant (Ruscoe & Murphy 2005; Norbury et al. 2014).

Mice will be eliminated within the Pest Exclusion Fenced Area using brodifacoum toxic baits during the eradication programme. Ongoing control will also occur within the Pest Suppression Area, in particular within the Murphys Link. Monitoring will be undertaken using tracking tunnels, chew cards and camera surveillance.

3.3 Possums

The brushtail possum (*Trichosurus vulpecula*) is one of New Zealand's most significant browsing mammals and also preys opportunistically on native birds, eggs, reptiles and invertebrates. Heavy browsing by possums can alter forest composition, reduce flowering and fruit production, and limit natural regeneration. Possums are also the principal wildlife vector of bovine tuberculosis in New Zealand (Payton 2000; King & Forsyth 2021).

Possums will be eliminated within the Pest Exclusion Fenced Area using brodifacoum during the eradication phase and maintained at low densities in the Pest Suppression and

Browsing Management Area using trapping and toxic bait stations. Possum activity will be monitored using chew cards.

3.4 Mustelids

Stoats (*Mustela erminea*), ferrets (*M. furo*) and weasels (*M. nivalis vulgaris*) occur in New Zealand and are efficient predators of native birds, reptiles and invertebrates. Stoats are widely recognised as one of the principal causes of decline in many threatened bird species, while ferrets also prey on larger birds and reptiles. Weasels are less well understood but are capable predators of small vertebrates. Their large home ranges and mobility require sustained landscape-scale trapping to reduce reinvasion (King & Murphy 2005; King & Forsyth 2021).

Mustelids will be eliminated within the Pest Exclusion Fenced Area primarily through secondary poisoning associated with the eradication programme. Populations within the Pest Suppression Areas will be controlled using trap networks. Trail cameras will be used to monitor mustelid activity.

3.5 Hedgehogs

European hedgehogs (*Erinaceus europaeus*) are widespread throughout New Zealand and are key predators of native invertebrates, reptiles and the eggs of ground-nesting birds. Although primarily insectivorous, they are opportunistic predators and can significantly affect native fauna in dryland and grassland ecosystems (Jones et al. 2005; DOC 2021).

Hedgehogs will be eliminated within the Pest Exclusion Fenced Area primarily through trapping and may also be affected by toxic baiting during eradication operations. Within the Pest Suppression Areas, they will be removed opportunistically through the trap network. No routine monitoring programme is proposed specifically for hedgehogs (there is no standard practice developed for hedgehog monitoring or recognised targets for their control).

3.6 Feral cats

Feral cats (*Felis catus*) are generalist predators capable of hunting birds, reptiles, small mammals and invertebrates across a wide range of habitats. They are highly mobile, occupy large home ranges and can rapidly recolonise controlled areas. Cats also compete with native predators and can transmit diseases such as toxoplasmosis (Medina et al. 2011; King & Forsyth 2021).

Feral cats will be eliminated within the Pest Exclusion Fenced Area and controlled in the Pest Suppression Area primarily using trapping. Camera surveillance will assist with detection and confirmation of successful removal.

3.7 Rabbits and hares

European rabbits (*Oryctolagus cuniculus*) and brown hares (*Lepus europaeus*) are significant herbivores that can suppress native vegetation regeneration and compromise

restoration plantings through grazing pressure. Rabbits also support elevated predator populations by providing a reliable prey resource, particularly for ferrets and cats (Norbury 2001; King & Forsyth 2021).

Rabbits and hares will be eradicated from within the Pest Exclusion Fenced Area. Total removal in this area is necessary because rabbit burrowing can compromise fence integrity and create potential entry points for smaller mammalian pests. Surviving animals will be targeted using thermal imaging and shooting. Where required, pindone baiting may be used to achieve complete eradication. The fence design includes an outward-facing buried skirt to prevent rabbits and hares entering from surrounding areas. Rabbits will also be controlled in the Pest Suppression and Browser control areas.

3.8 Ungulates

Browsing mammals, including red deer (*Cervus elaphus*), fallow deer (*Dama dama*), feral pigs (*Sus scrofa*) and, where present, feral goats (*Capra hircus*), can have substantial impacts on indigenous ecosystems by suppressing natural regeneration, reducing survival of planted seedlings, altering vegetation composition and disturbing soils. These impacts are particularly significant within restoration areas, where browsing can compromise revegetation success and reduce long-term habitat quality. Feral pigs may also directly disturb lizard habitat through rooting and can damage wetlands, riparian margins and fragile dryland ecosystems (Forsyth et al., 2013; Nugent et al., 2001; King & Forsyth, 2021).

Ungulates will be eliminated from within the Pest Exclusion Fenced Area during the initial eradication programme and will be maintained at zero density through ongoing surveillance and rapid incursion response. Across the wider Browser Management Areas, populations will be controlled through a combination of aerial control, ground-based hunting (where appropriate), with camera surveillance and routine inspections used to detect incursions and assess the effectiveness of management.

4. Summary of Control Methods in Each Area

The proposed pest management programme is spatially structured, with different tools applied at varying intensities across the three management areas. Table 7 outlines how control methods are deployed in each of these areas to achieve complementary outcomes, ranging from complete eradication within pest exclusion fenced areas to sustained suppression in the wider landscape. This tiered approach is designed to reduce pest reinvasion and maximise biodiversity benefits through a coordinated control framework.

In the MEEA buffer area, control intensity decreases with distance from the fence but remains sufficient to suppress predator populations and reduce reinvasion pressure across the wider 1 km buffer. Control will be implemented throughout those portions of the 1 km buffer over which OGNZL has legal authority or secured landowner access.

Note: Proposed spacings are indicative and may be refined during detailed implementation to account for topography, habitat, access, monitoring results and operational experience. Multi-species devices (e.g. multi-species capable traps) should be used where they provide control of multiple target pest species with a single device. Infrastructure will be preferentially located along likely animal movement corridors, including ridgelines, gullies, fence lines, waterways and habitat edges, rather than strictly adhering to a uniform grid. The spacing outlined in Table 7 are therefore indicative only and should be refined during deployments to be situated in the most likely area to intercept target species.

***Table 7**: Pest management infrastructure across the Macraes Phase Four pest management areas.*

Management area	Infrastructure type	Maximum indicative density/spacing	Purpose
MEEA Predator Exclusion Area (approximately 252 ha)	Aerial and/or ground-based toxic bait deployment	Whole fenced area, in accordance with the site-specific eradication plan	Initial eradication of rodents and possums and contribution to removal of other susceptible mammalian pests.
	Permanent bait stations	Approximately 150 × 150 m internal grid, with additional stations deployed where required	Eradication support, mop-up, incursion response and targeted control of rodents and possums.
	Multi-species-capable kill traps	Approximately 300 × 300 m internal grid, supplemented at likely movement pathways and detection locations	Detection and removal of surviving or invading rodents, mustelids, hedgehogs, possums and feral cats.
	Permanent surveillance cameras	Approximately one camera per 10 ha, refined to likely movement corridors and high-risk entry locations	Continuous or near-continuous surveillance and early detection of incursions.
	Tracking tunnels and chew cards	Permanent monitoring network assessed four times per year and following suspected incursions	Proof of absence, detection of rodents and possums, and evaluation of eradication and incursion-response outcomes.
MEEA fence perimeter	Rodent- and mouse-capable traps	Maximum 50 m spacing	Intensive interception of rodents approaching or moving along the predator-exclusion fence.
	Permanent rodent/possum bait stations	Maximum 50 m spacing, integrated with the rodent perimeter network	Interception and suppression of rodents and possums near the fence and support for rapid response following detections.
	Possum-capable traps	Maximum 100 m spacing	Interception of possums before they interact with or challenge the fence.

Management area	Infrastructure type	Maximum indicative density/spacing	Purpose
	Mustelid- and hedgehog-capable traps	Maximum 200 m spacing	Interception of mustelids and hedgehogs approaching or moving along the fence.
	Feral-cat-capable traps	Maximum 400 m spacing, with additional devices at identified movement routes	Interception of feral cats before they reach or interact with the fence.
MEEA inner buffer: 0–250 m from the fence	Rodent- and mouse-capable traps and permanent bait stations	Maximum 100 m spacing	Highest-intensity suppression immediately surrounding the fence to minimise reinvasion pressure.
	Possum-capable traps and/or bait stations	Maximum 200 m spacing	Intensive possum suppression adjacent to the fence.
	Mustelid- and hedgehog-capable traps	Maximum 200 m spacing	Intensive suppression of mustelids and hedgehogs adjacent to the fence.
	Feral-cat-capable traps	Maximum 400 m spacing	Feral-cat suppression within the highest-priority defensive zone.
MEEA outer buffer: 250 m–1 km from the fence	Rodent- and mouse-capable traps and permanent bait stations	Maximum 200 m spacing	Landscape-scale rodent suppression and reduction of reinvasion pressure across the wider buffer.
	Possum-capable traps and/or bait stations	Maximum 400 m spacing	Landscape-scale possum suppression.
	Mustelid- and hedgehog-capable traps	Maximum 400 m spacing	Landscape-scale suppression of mustelids and hedgehogs.
	Feral-cat-capable traps	Maximum 800 m spacing, targeted to movement corridors	Feral-cat suppression across the wider buffer.

Management area	Infrastructure type	Maximum indicative density/spacing	Purpose
Murphys Link	Rodent- and mouse-capable traps and permanent bait stations	Maximum 100 m spacing	Intensive predator suppression to protect the lizard-release area and support successful establishment of translocated lizards.
	Possum-capable traps and/or bait stations	Maximum 200 m spacing	Possum suppression to protect lizards, vegetation and habitat resources.
	Mustelid- and hedgehog-capable traps	Maximum 200 m spacing	Suppression of larger mammalian predators affecting indigenous fauna.
	Feral-cat-capable traps	Maximum 400 m spacing	Feral-cat suppression focused on lizards and other indigenous fauna.
Cranky Jims Link	Permanent rodent/possum bait stations	Maximum 100 m spacing	Rat and possum suppression to protect indigenous birds, improve habitat condition and support grey shrubland restoration.
	Mustelid- and hedgehog-capable traps	Maximum 200 m spacing	Suppression of mustelids and incidental control of hedgehogs.
	Feral-cat-capable traps	Maximum 400 m spacing	Feral-cat suppression to protect indigenous fauna and restoration values.
	Rabbit control	Targeted, where activity or browse impacts are detected	Protection of restoration plantings and naturally regenerating vegetation.
Mt Highlay Station	Browser control, including shooting, trapping or other approved methods	Targeted according to monitoring results and field sign	Reduce browsing and disturbance of indigenous vegetation, VDT areas, rock outcrops and restoration plantings.
Stream Enhancement Planting Areas	Browser control, including shooting, trapping or other approved methods	Targeted according to monitoring results and field sign	Protect riparian restoration plantings from browsing, trampling and rooting damage.

5. Eradication methodology

5.1 Pest Fence Design and Construction

A full height pest exclusion fence is a fence designed and built to exclude the full range of introduced predators and browsers (typically including mice, rats, mustelids, possums, feral cats, hedgehogs, rabbits, hares, deer, pigs and goats). Full exclusion fence designs have been refined over the years, with substantial learnings from earlier fences contributing to optimisation of current designs.

New Zealand now has an extensive network of full-height predator exclusion sanctuaries. Existing full-height, predator exclusion sanctuaries (i.e. fences that completely enclose an area, as proposed for the MEEA) are now well established throughout New Zealand and include Maungatautari Ecological Island (approximately 3,400 ha), Brook Waimārama Sanctuary (690 ha), Orokonui Ecosanctuary (370 ha), Zealandia Te Māra a Tāne (225 ha), Rotokare Scenic Reserve (230 ha), Wairakei Golf + Sanctuary (180 ha), Bushy Park Tarapuruhi (98 ha), Lake Opouahi Kiwi Crèche (40 ha), Warrenheip (16 ha), Mokomoko Dryland Sanctuary (14 ha), Driving Creek Wildlife Sanctuary (1.5 ha), together with numerous smaller predator-proof enclosures established specifically for threatened species recovery, including grand skinks, Otago skinks, spotted skinks and the critically endangered Alborn skink.

Specifications and design details for the fences proposed here are provided in the Fence Feasibility Plan (Pestproof Fences Ltd, 2026), provided as **Appendix A**. A brief summary is provided in this section.

A full height pest exclusion fence will be constructed on the proposed route presented in Fig. 7. Note that minor alterations to the location of the fence lines may be required during the building process, but these are expected to be minimal and Pestproof Fences Ltd have walked the proposed fenceline location to ensure the fenceline is able to be constructed (**see Appendix A**).

Figure 8: A full height pest exclusion fence (as constructed by Pestproof Fences Ltd).

The current 'best practice' design for these fences consists of a fence height of 1.9 - 2 m off the ground (see Fig. 8. Wire mesh is attached to wooden posts and a wide horizontal mesh skirt facing outwards, extending no less than 400 mm from the base of the fence, is pinned 50–100 mm underground. A folded and/or rolled sheet steel hood is mounted on top of the mesh, which extends 250–350 mm horizontally

towards the outside of the protected area. These specifications are beyond the jumping ability of medium to large mammals (such as feral cats and possums) and also prevent animals from digging or burrowing under it. As mice are also being excluded, the aperture size of the mesh must be 6 mm or less across one dimension (the smallest aperture any adult or juvenile mouse can fit through: Bell, 2014).

Earthworks will be required to clear a path for the fence and provide a solid foundation and vehicle access for inspection and maintenance. At least 5 m of open ground on the outside of the fence is also required to ensure predators are unable to jump inside with the aid of surrounding vegetation. The fenceline proposed for the MEEA is naturally open without high vegetation cover and as such little vegetation clearance is expected.

5.1.1 Fence construction and associated environmental effects

Construction of the MEEA Predator Exclusion Fence will involve establishment of a narrow fence platform, installation of fence posts, mesh, gates and culvert structures, and limited earthworks where required to achieve a continuous predator-proof barrier. As described by Pestproof Fences Ltd (2026), most of the proposed fence alignment traverses open tussock grassland and rocky terrain that is considered relatively straightforward to construct. More substantial earthworks will be required only at a limited number of steep gullies, stream crossings and culvert locations where engineering constraints necessitate localised benching or filling.

As outlined in the Ecological Impact Assessment: Pest-proof Fence Construction (Bioresearches 2026P); construction activities have the potential to result in temporary environmental effects including:

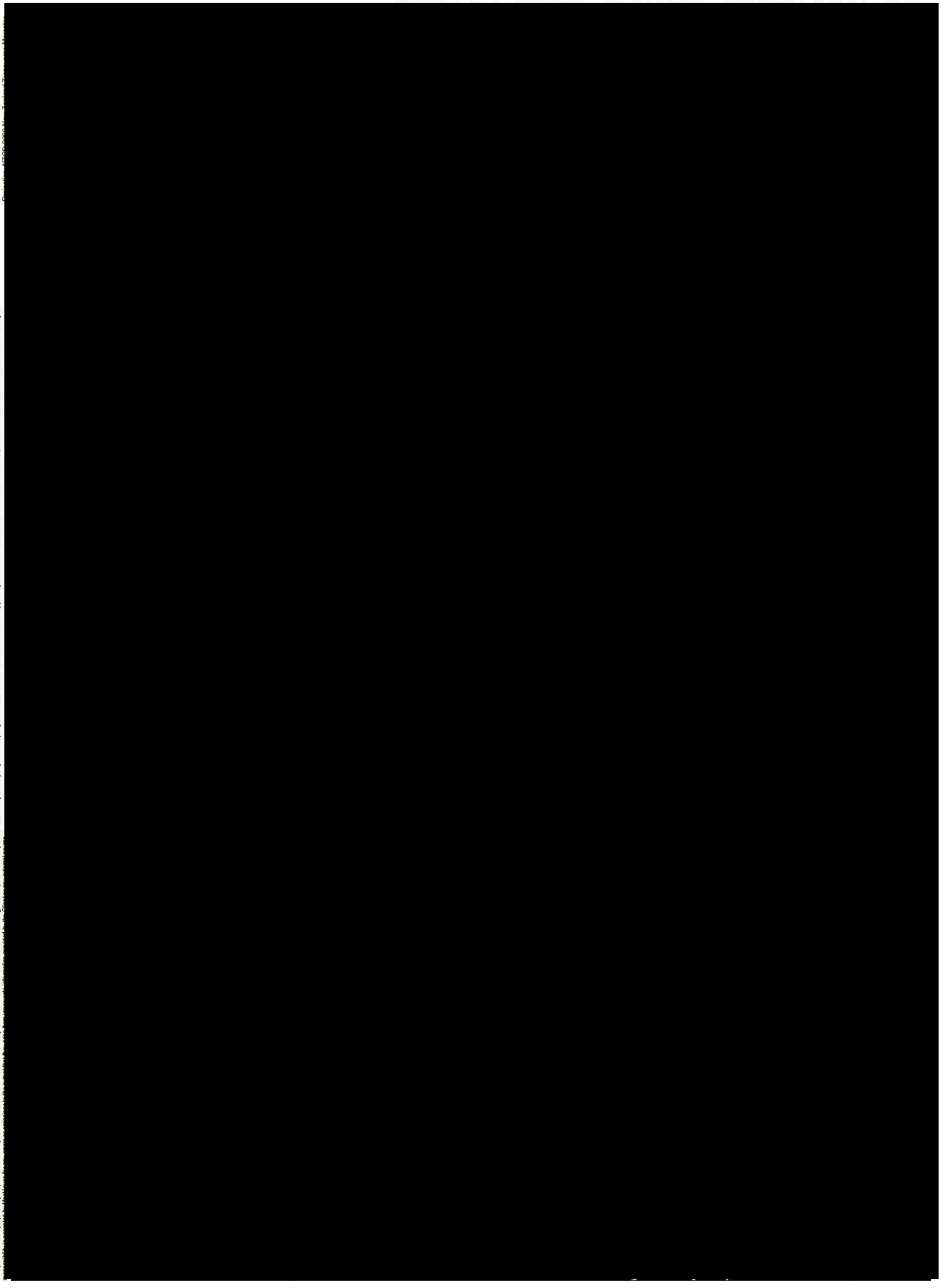
- disturbance of soils during fence platform preparation and post installation;
- temporary increases in sediment mobilisation associated with earthworks and stream crossing construction;
- localised disturbance of indigenous vegetation within the narrow construction corridor;
- temporary disturbance to wildlife through construction noise, machinery and increased human activity;
- short-term visual effects associated with construction activities; and
- temporary vehicle movements associated with transporting materials and construction personnel.

Given the predominantly open and previously modified nature of the proposed fence alignment, these effects are expected to be highly localised and temporary. The majority of the route passes through grazed tussock grassland and rocky outcrops with relatively little woody vegetation requiring removal. The fence alignment has also been selected to avoid unnecessary disturbance of significant habitats where practicable while remaining technically suitable for long-term maintenance.

Construction will be undertaken using best-practice erosion and sediment control measures appropriate to the scale of the works. Earthworks will be confined to the

minimum area necessary for fence construction, disturbed areas will be stabilised as soon as practicable, and vegetation clearance will be restricted to that required for construction and ongoing fence maintenance. Stream crossings and culvert installations will be undertaken in accordance with all relevant statutory approvals and consent conditions, including measures to maintain stream function and minimise sediment discharge.

Although construction will result in temporary disturbance along the fence corridor, these effects are expected to be minor in extent and duration when compared with the long-term biodiversity benefits arising from permanent exclusion of invasive mammalian predators. Once construction is complete, the fence footprint will be limited to a narrow maintained corridor, with only periodic access required for routine inspections and maintenance.



MEEEA Predator Exclusion Fence

MACRAES FLAT PEST CONTROL

Plan prepared for Alliance Ecology | 29 July 2026

Alliance Ecology™ MapHouse

- Access alternative
- MEEA Predator Exclusion Fence (250ha)
- MEEA 1km buffer
- Murphy's Link
- Otago skink site
- Proposed culvert

0 200 m

1:20,000 @ A3

Figure 7

Data Sources: Bioresearches, Alliance Ecology, Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors., Eagle Technology, LINZ

5.2 Eradication methodology

Following fence construction, eradication of all target species will occur. The methodology outlined in this section presents the currently recommended regime for eradication based on other successful projects, however, it is possible the specifics of these methods may vary following further consultation once the Project has commenced.

5.2.1 Pre eradication requirements

Before undertaking eradications inside the fenced area, a formal pre-eradication planning and approvals phase consistent with New Zealand Hazardous Substances and New Organisms Act (HSNO) and Environmental Protection Authority (EPA) requirements will occur. In New Zealand, brodifacoum cereal bait for eradication (e.g., Pestoff Rodent Bait 20R) can only be applied in accordance with Operating Plan 63 (OP-63), which is a Ministry of Primary Industry (MPI) -approved operational framework that sets the legal and technical conditions for aerial or hand-broadcast brodifacoum use in eradication programmes. EPA approval conditions specify that any use of Pestoff 20R must follow OP-63 at all times (including bait preparation, pre-feed requirements, application method, sowing rates, carcass/non-target mitigation, signage, monitoring, and reporting).

Accordingly, prior to eradication the following will be prepared:

(1) a site-specific eradication plan that explicitly references OP-63 and adapts its requirements to each fenced cell (including biosecurity layout, baiting method, timing window, monitoring design, non-target risk mitigation, carcass search/management, and contingency response);

(2) secure all required permissions to lay vertebrate toxic agents (animal-pest-control permission/permit and adherence to DOC National Performance Standards for Pest Operations and signage/public-notification rules); and

(3) complete a documented risk assessment under HSNO and health-and-safety frameworks, including exposure pathways for non-targets (relevant non-target fauna, including indigenous raptors, other ground-feeding or scavenging birds, reptiles, domestic animals and livestock where exposure pathways exist), bait-spillage prevention, and waste/carcass disposal.

Finally, OP-63 eradications are expected to be supported by a robust pre-eradication baseline and readiness check. This includes confirming the pest suite present (rodents, possums, mustelids, cats, pigs/ungulates if relevant), establishing pre-operation monitoring indices, and ensuring fence integrity and incursion-response capacity are in place before toxins are deployed. Because brodifacoum is highly effective but environmentally persistent, DOC and national reviews emphasise that its mainland use should be tightly planned, time-limited, and justified by eradication objectives rather than routine maintenance—making OP-63 alignment and strong pre-eradication preparation especially important in fenced sanctuaries.

5.2.2 Eradication sequence

The eradication programme will be implemented using a staged approach to maximise the likelihood of achieving complete removal of all target mammalian pest species while minimising reinvasion risk. The sequence will generally comprise:

1. **Pre-eradication preparation**, including completion of the predator exclusion fence, verification of fence integrity, establishment of surveillance infrastructure and reduction of pest abundance through trapping where appropriate.
2. **Initial eradication operation**, comprising aerial and/or ground deployment of toxic bait targeting rodents and possums in accordance with the approved operational prescription, together with complementary control of other target pest species where required.
3. **Mop-up operations**, using targeted trapping, shooting, surveillance technologies, detector dogs and, where appropriate, localised toxic control to locate and eliminate any surviving individuals or reinvading animals.
4. **Proof-of-absence monitoring**, using a combination of surveillance cameras, tracking tunnels, chew cards, live-capture devices and other appropriate monitoring methods to demonstrate that no target pest species remain within the fenced area.
5. **Transition to ongoing biosecurity management**, including permanent surveillance, routine fence inspections, rapid incursion response capability and long-term monitoring to maintain predator-free status.

The precise sequence, timing and methods used may be refined through detailed operational planning provided the overall objective of complete eradication and long-term exclusion of target mammalian pest species is maintained.

5.2.3 Toxin use

Brodifacoum is the toxicant most commonly used for rodent eradications in New Zealand and has been central to the majority of successful mouse eradication programmes undertaken on offshore islands and within mainland predator-fenced sanctuaries (Broome et al., 2017). Broome et al. (2017) reported that all 12 aerial brodifacoum eradication operations undertaken in accordance with Department of Conservation best-practice standards successfully eradicated the target mammalian pest species, including mice. Successful eradications have been achieved across a range of site sizes, including Enderby Island (710 ha) and the Maungatautari Ecological Island northern and southern enclosures (approximately 35 ha and 60 ha). Rotokare Scenic Reserve (230 ha), which is enclosed by an 8.2 km predator exclusion fence, also successfully completed an initial eradication programme and demonstrates the effectiveness of combining aerial brodifacoum with predator exclusion fencing and intensive surveillance. Although Rotokare has subsequently experienced periodic mouse incursions, these have been rapidly detected and removed through intensive monitoring and targeted response operations, with the sanctuary repeatedly returned to mouse-free conditions.

As per current DOC best practice (Broome et al., 2017), and per the protocol which was successful for the pest mammal eradications on Motutapu/Rangitoto (Griffiths et al., 2014; Griffiths & Towns, 2008), toxic bait will be applied in up to three separate applications at least 14 days apart, at a rate of 8 kg/ha. Baits will be applied in late winter/early spring (between 1 June and 1 November) when bait uptake by rodents is highest (Speedy et al., 2007).

The bait proposed for use is 10 mm (2 g) Pestoff 20R rodent bait containing brodifacoum at 20 parts per million (ppm). If aerial techniques are used, bait will be applied along parallel flight lines guided by GPS and spaced to 50% of the effective swath width produced by the sowing bucket (i.e. swath overlaps of 50%). The orientation of flight lines will be different for each application.

The aerial bait applications will be accompanied by hand-spread baits immediately inside the fence to ensure complete coverage, along with trapping, and ground-based bait stations where necessary. There is likely to be at least a 10 m buffer inside the fence boundary where aerial bait application will not be targeted to minimise the bait that falls outside of the fence. A follow-up on-the-ground hand operation will occur to a) hand-sow baits along the inside boundary of the fence where aerial bait application did not achieve the required application rate, and b) to collect bait that landed on the outside of the fence.

5.2.4 Declaration of eradication

The eradication operation will not be considered complete until there is sufficient evidence that all target mammalian pest species have been removed from within the MEEA Predator Exclusion Area.

Following completion of eradication and any required mop-up operations, an intensive proof-of-absence monitoring programme will be undertaken using an appropriate combination of surveillance cameras, tracking tunnels, chew cards, live-capture devices, kill traps and any other suitable detection methods. Detector dogs may also be used where considered appropriate.

Eradication will only be declared once:

- all planned eradication and mop-up operations have been completed;
- the predator exclusion fence has been demonstrated to be secure and fully operational;
- intensive surveillance has been undertaken for a minimum of three months following completion of the final control operation;
- no detections or evidence of any target mammalian pest species have been recorded during this period; and
- the Project Ecologist is satisfied that the monitoring programme has provided sufficient confidence that eradication has been achieved.

Where any target mammalian pest is detected during the proof-of-absence period, the incursion response procedures described in Section 5.10 will be implemented and the proof-of-absence period for the species detected will recommence following completion of the associated response operation, unless the Project Ecologist determines that the nature of the detection or likely entry pathway requires the proof-of-absence assessment to be restarted for additional target species.

5.3 Potential non-target impacts

A detailed non-target risk assessment for the pest exclusion fenced area will be undertaken as part of the OP-63 approval process. Brodifacoum is a second-generation anticoagulant with known persistence in vertebrate tissues, and its environmental behaviour has been extensively studied in New Zealand, particularly following island eradication programmes (Eason et al., 2002; Fisher et al., 2011).

The primary non-target risks associated with brodifacoum relate to secondary poisoning of non-target vertebrates, particularly scavenging or predatory species that consume contaminated rodents. In New Zealand, documented non-target impacts have most commonly involved raptors (e.g. harrier hawks) and omnivorous birds, rather than insectivorous species, reflecting exposure pathways via contaminated carcasses rather than invertebrate prey (Eason et al., 2002; Fisher et al., 2011). Secondary exposure risk is therefore greatest immediately following bait application, when poisoned rodents are most available.

Anticoagulant rodenticides are not generally considered acutely toxic to invertebrates through the same coagulation pathway as vertebrates; however, invertebrates may consume bait and retain residues, creating potential exposure pathways for insectivorous and omnivorous vertebrates. Empirical studies in New Zealand have shown that these residues are generally low, transient, and decline over time, and that population-level impacts on invertebrates or insectivorous birds are rarely observed when best-practice application methods are followed (Hoare & Hare, 2006; Fisher et al., 2011). This is particularly relevant in the context of fenced eradication operations, where bait application is time-limited and spatially contained, reducing long-term exposure pathways.

Non-target risks to reptiles and amphibians are considered low, with limited evidence of direct toxic effects; however, indirect exposure pathways (e.g. ingestion of contaminated invertebrates) remain a consideration and are addressed through monitoring and mitigation (Fisher et al., 2011). Similarly, risks to aquatic environments are generally low where bait is applied according to best practice, although care is required to avoid contamination of waterways, particularly in sensitive wetland environments.

Importantly, the proposed use of brodifacoum within the fenced area is limited to a short-term eradication phase, followed by long-term biosecurity surveillance and targeted response, rather than repeated broadcast application. This approach substantially reduces cumulative environmental exposure compared with ongoing suppression regimes, which can result in repeated toxin inputs over time (Eason et al., 2002).

When considered in an ecological context, the risks associated with controlled brodifacoum use must be weighed against the well-documented impacts of introduced mammalian predators. The temporary and managed risks associated with a single eradication operation are considered proportionate to the substantial and enduring biodiversity gains achieved through predator removal.

A suite of mitigation measures (see following section) will be implemented to minimise non-target impacts. These measures, combined with the one-off nature of the eradication phase, are expected to reduce non-target risks to a low and acceptable level.

5.4 Risk Mitigation

To address potential persistence and secondary exposure pathways, the following mitigation measures will be implemented:

Eradication Design

Brodifacoum will be used as part of a defined eradication phase within fenced areas, rather than as a recurring control tool. Limiting application to a one-off eradication substantially reduces cumulative environmental loading and long-term residue presence (Eason et al., 2002).

Application Timing

Operations will be timed outside peak breeding seasons for sensitive non-target species where practicable, reducing potential demographic impacts from any short-term exposure.

Carcass Monitoring and Removal

Where feasible, carcasses of target species will be monitored and removed in high-use areas to reduce secondary exposure pathways, particularly for scavenging birds.

Bait Formulation and Placement Controls

Approved bait formulations and application methods consistent with current New Zealand best practice will be used to optimise target uptake and minimise bait availability to non-target fauna (Eason & Spurr, 1995).

Post-Operation Monitoring

Monitoring will include:

- Residual pest detection
- Opportunistic monitoring of non-target mortality
- Assessment of key indicator species

New Zealand eradication programmes have consistently demonstrated recovery of invertebrate and bird communities following short-term post-application effects, with no

evidence of sustained population-level declines in insectivorous birds where operations were conducted according to best practice (Fisher et al., 2011; Hoare & Hare, 2006).

5.5 Trapping grids

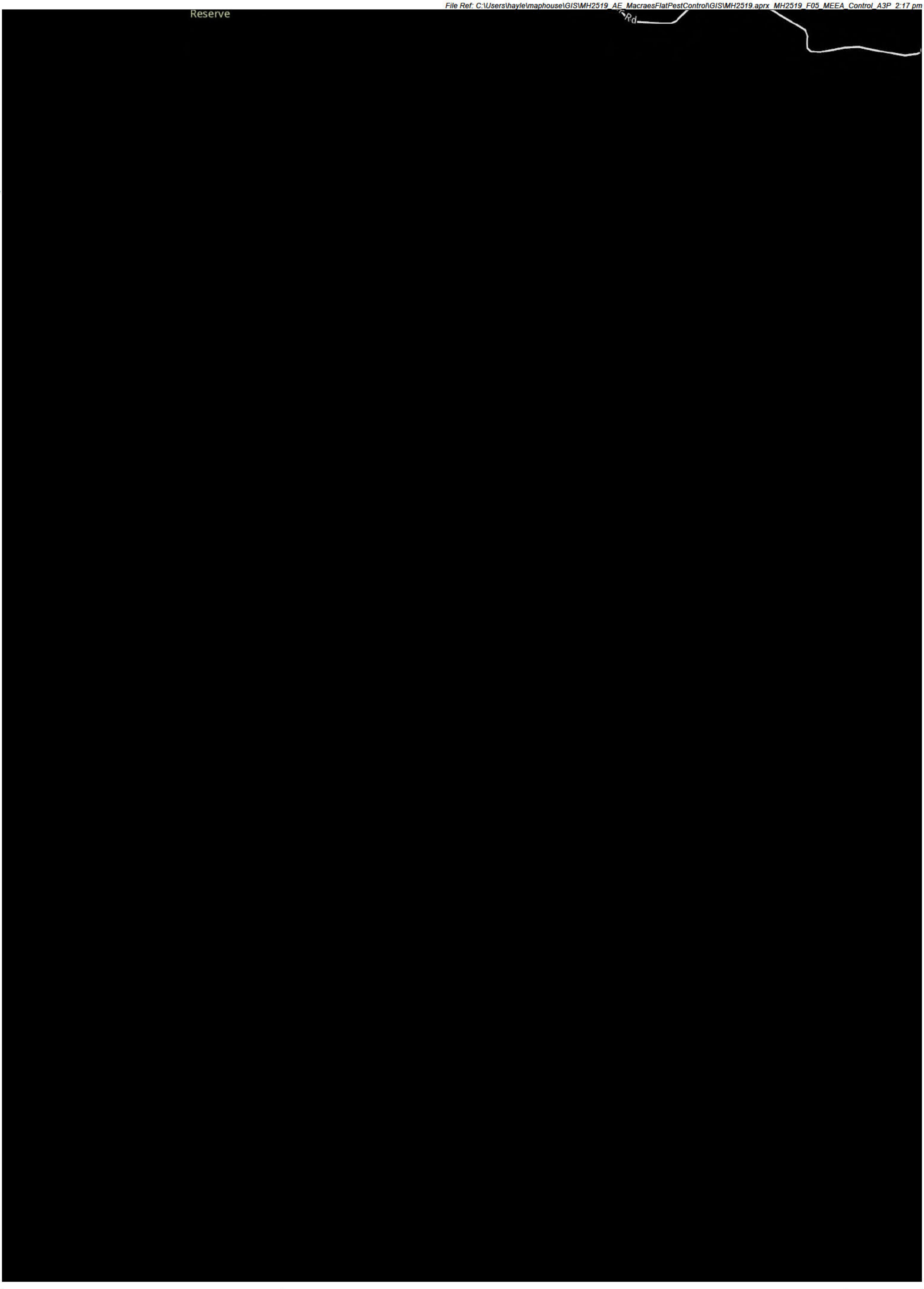
A permanent trapping grid will be established within and surrounding the fenced area (see Fig. 9 and Table 7 for a summary of spacing) prior to the bait application occurring. This grid will serve two purposes: firstly, to help with the eradication efforts, and secondly to provide for a permanent control infrastructure which can be left in place for monitoring and incursion response purposes. Traps will also be placed on the outside perimeter of the fences (Fig. 9) to intercept pests which may approach the fence and run along the fenceline looking for entry points. Suitable trap types are outlined in Section 6.2.

Commencing with the first application of bait, the internal trapping grid will be activated and run for at least three months. The trapping grid for rats, mustelids and hedgehogs will use a variety of trap types to account for the phobic behaviour some individuals may have towards a certain trap type. This will include DOC 200 and 250 traps in wooden tunnels (both run through and single set), or new resetting traps with remote notifications (e.g. AT220, CSL Multi-trap). If possums and feral cats need to be targeted, this will be via live-capture or kill-traps (e.g. SA Kat traps, Flipping Timmy traps or CSL Multi-traps, AT220 for possums only). Some traps are capable of capturing the full range of target species including mice (e.g. the CSL Multi-trap). In sites containing lizards it is also important to avoid using rodent traps (e.g. snap traps), which may put lizards at risk.

A variety of lures will be used in traps that are appropriate for the target species, and the lure type swapped regularly. Lure types include:

- For resetting traps (e.g. AT220 and CSL Mult-trap), these come with auto-dispensing lure systems;
- Standalone lure dispensing systems (e.g. EzyLure or ZIP lures) can be fitted to any other traps to allow for constant lure refreshment;
- For rats: fresh hens' eggs (as a visual cue, to be combined with a food scent), peanut butter, fresh rabbit, salted rabbit, chocolate, macadamia nuts, Eggsellent lure;
- For stoats: fresh hens' eggs (as a visual cue, to be combined with a food scent), fresh rabbit, salted rabbit, fresh stoat bedding, Eggsellent lure;
- For possums: apple, cinnamon, possum dough, 'smooth in a tube' , Eggsellent lure, a white blaze of flour and icing sugar beneath tree-mounted traps (as a visual cue); and
- For cats: fresh rabbit, cat biscuits, fish, Eggsellent lure.

All traps will be checked weekly during the first three months post eradication, including resetting traps as required and refreshing any fresh food based lure on each trap check. After three months (including a month of no pest captures), the trap checks can be reduced to monthly as part of ongoing surveillance (see Table 8).



Projection: NZGD 2000 New Zealand Transverse Mercator

Pest Control Infrastructure - MEEA

MACRAES FLAT PEST CONTROL

Plan prepared for Alliance Ecology | 29 July 2026

Alliance Ecology™ MapHouse

MEEA Predator Exclusion Fence (250ha)
MEEA 1km buffer
Murphy's Link
Bait station
Trap station

0 200 m
1:10,000 @ A3

Figure 9

Data Sources: Bioresearches, Alliance Ecology, Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors., Eagle Technology, LINZ

5.6 Mop-up phase

In the mop-up phase, eradication survivors will be detected via an intensive monitoring regime, including chew cards (for rodents and possums), tracking tunnels (for rats, mice, and hedgehogs), and camera traps (for rodents, possums, mustelids, cats, and ungulates). The locations of monitoring devices are shown in Fig. 10.

Any surviving cats, possums and or rabbits/hares can also be shot during spotlighting operations. Thermal scopes will be used to assist with locating any survivors. Detection dogs may be used following brodifacoum operations; however, their deployment will be subject to an appropriate stand-down period to minimise the risk of primary or secondary poisoning. Dogs will not be used while bait remains in the field or where carcasses are likely to be present, and any use will be undertaken in accordance with Department of Conservation best-practice guidelines for working dogs in toxin-treated areas.

Detection of any remaining pests will initiate a targeted response. The removal techniques used will depend on the species and will be selected from a wide repertoire of options depending on the species, the location/habitat type, and the other methods previously utilised. Options include live-capture traps, intensive trapping, toxic bait pulses at a high device density, shooting (including using thermal scopes), and pest detection dogs. For example, if a mouse or rat is detected a 15 × 15 m grid of bait stations will be activated, covering a 200 × 200 m area around the location of the detection, as per the methods of Watts et al (2022). Incursion responses are detailed in Section 5.10.

5.7 Ongoing Maintenance and Detection

Monitoring within the Predator Exclusion Area is designed to provide early detection of any pest mammal incursions while demonstrating the ongoing effectiveness of the predator-exclusion fence and associated management programme. Monitoring comprises four complementary components:

- routine fence inspection and maintenance;
- permanent external surveillance and trap network;
- internal pest monitoring using tracking tunnels, chew cards and trail cameras; and
- continuous automated surveillance using advanced detection technologies.

Collectively, these components provide multiple independent layers of detection to maximise the likelihood of identifying pest incursions before populations become established.

5.7.1 Fence inspections

Maintaining the integrity of the predator-exclusion fence is fundamental to the long-term success of the Predator Exclusion Area. Although modern predator-exclusion fences are constructed from durable materials with long service lives, regular inspection and maintenance are required to ensure the fence continues to exclude all target pest species (Day & MacGibbon, 2007). Most documented pest incursions into mainland fenced

sanctuaries have resulted from physical fence damage or infrastructure failure, such as fallen trees, flood debris obstructing culvert gates, or deterioration of fence components, rather than deficiencies in the fence design itself (Bell, 2014).

Accordingly, the entire fence perimeter will be inspected at least monthly, and following any event that could reasonably compromise fence integrity, including storms, high winds, flooding or fallen trees. Vegetation surrounding the fence will also be maintained to prevent plants compromising fence performance or facilitating pest access. An automated battery operated fence alarm system will be installed to provide immediate notification of significant breaches, including impacts from fallen trees or failures of culvert gates, enabling rapid operational response.

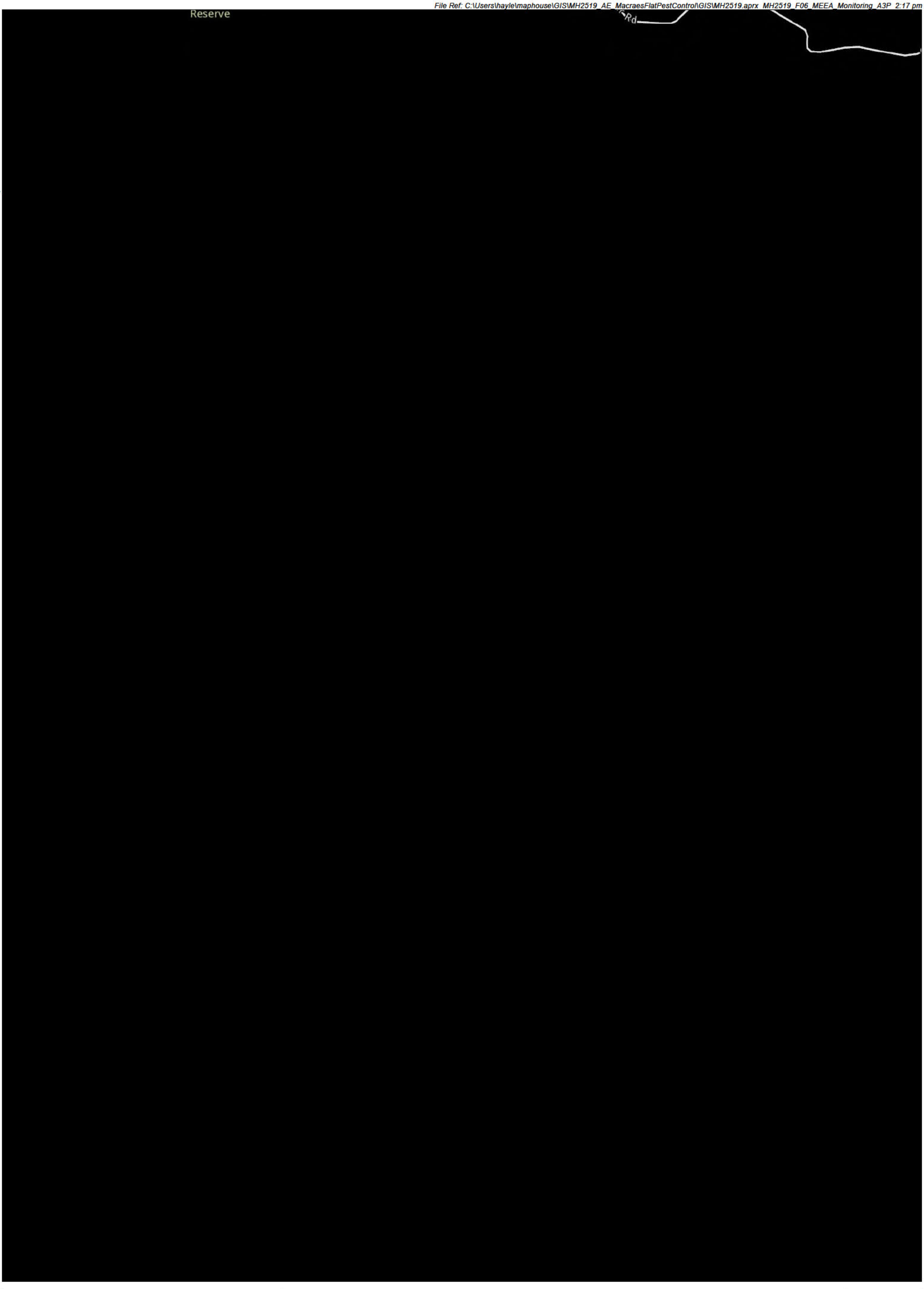
5.7.2 External surveillance

A permanent network of traps and bait stations (Fig. 9, Table 8), will be maintained around the external perimeter of the fence to intercept invading pests before they reach the fence and to provide an additional means of detecting elevated pest activity adjacent to the Predator Exclusion Area. External control devices will be inspected in conjunction with routine fence inspections, with lures replenished at least monthly unless long-life lure systems are being used.

5.7.3 Internal pest monitoring

Routine pest monitoring will be undertaken within the Predator Exclusion Area to verify that pest mammals remain absent following eradication and to provide early detection of any reinvasion events. Conventional monitoring tools such as tracking tunnels will primarily be used for rodent surveillance to maintain consistency with national monitoring standards, while chew cards and camera traps will provide complementary surveillance for rodents, possums and other mammalian pests. Trail cameras deployed every 10 hectares on a permanent grid (Fig. 10). will monitor mustelids and feral cats.

Routine monitoring will be undertaken quarterly following successful eradication. Any confirmed pest detection, or evidence suggesting a potential incursion, will immediately trigger the Incident Response Plan (Section 5.10), including intensified surveillance, additional monitoring infrastructure and targeted eradication actions until the Predator Exclusion Area is confirmed pest free.



Projection: NZGD 2000 New Zealand Transverse Mercator

Pest Monitoring Infrastructure - MEEA

MACRAES FLAT PEST CONTROL

Plan prepared for Alliance Ecology | 29 July 2026

Alliance Ecology™ MapHouse

- MEEA Predator Exclusion Fence (250ha)
- MEEA 1km buffer
- Murphy's Link
- Trail camera
- Chew card
- Tracking tunnel

0 200 m

1:10,000 @ A3

Data Sources: Bioresearches, Alliance Ecology, Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors., Eagle Technology, LINZ

Figure 10

Table 8: *Operational monitoring, surveillance and maintenance programme for the Predator Exclusion Area.*

Monitoring component	Target	Frequency	Purpose
Fence inspection	Fence integrity	Monthly and after storm events	Detect breaches
External trap network	Pest mammals	Monthly	Intercept invading pests
Tracking tunnels	Rodents	Quarterly	Detect rodent incursions
Chew cards	Rodents and possums	Quarterly	Detect rodent and possum incursions
Trail cameras	Mustelids, feral cats	Continuous	Detect predator incursions
Automated surveillance	All target mammals	Continuous	Real-time breach detection
Vegetation maintenance	Fence line	Monthly/as required	Maintain fence effectiveness

5.8 Advanced surveillance technologies

Significant investment has recently been directed toward the development and deployment of new wildlife monitoring technologies in New Zealand, particularly thermal imaging systems, artificial-intelligence-enabled camera traps, and automated monitoring platforms. These technologies are being actively developed and trialled as part of national predator control programmes such as Predator Free 2050, which funds research and innovation aimed at improving detection and management of invasive predators (Department of Conservation, 2024). Camera traps and associated artificial-intelligence tools are now widely used in New Zealand conservation monitoring to detect pest species and assess predator control outcomes, while new thermal and machine-vision cameras are capable of detecting predators more sensitively than conventional trail cameras (Manaaki Whenua – Landcare Research, 2023; Predator Free NZ Trust, 2024). In parallel, conservation groups are increasingly trialling smart trap networks and remote monitoring systems that transmit real-time data from traps and sensors, reflecting growing investment in technology-driven predator management across the country (Radio New Zealand, 2024).

Many of these more advanced technologies have higher rates of detection than conventional tools (Blackie et al. in press), and if they are deployed with their associated communications network provide for real-time surveillance. For example, trials in New Zealand have demonstrated that thermal (heat) camera systems can achieve substantially higher detection rates (being 3 – 3.5 times more sensitive) than conventional motion-triggered trail cameras, particularly for cryptic and fast-moving predators. (Ross & Ryan, 2019).

Tools such as CritterPic™ and OWL™ cameras (Fig. 11), have the advantage of operating continuously for longer periods (3 – 6 months) while providing real-time image updates of smaller species, including rodents and lizards. These newer tools should be integrated as part of an adaptive management surveillance plan to account for faster detections of pest incursions and allow for more rapid management actions to address them. The surveillance network will progressively transition towards AI-assisted remote detection technologies as these technologies become operationally proven and cost-effective.

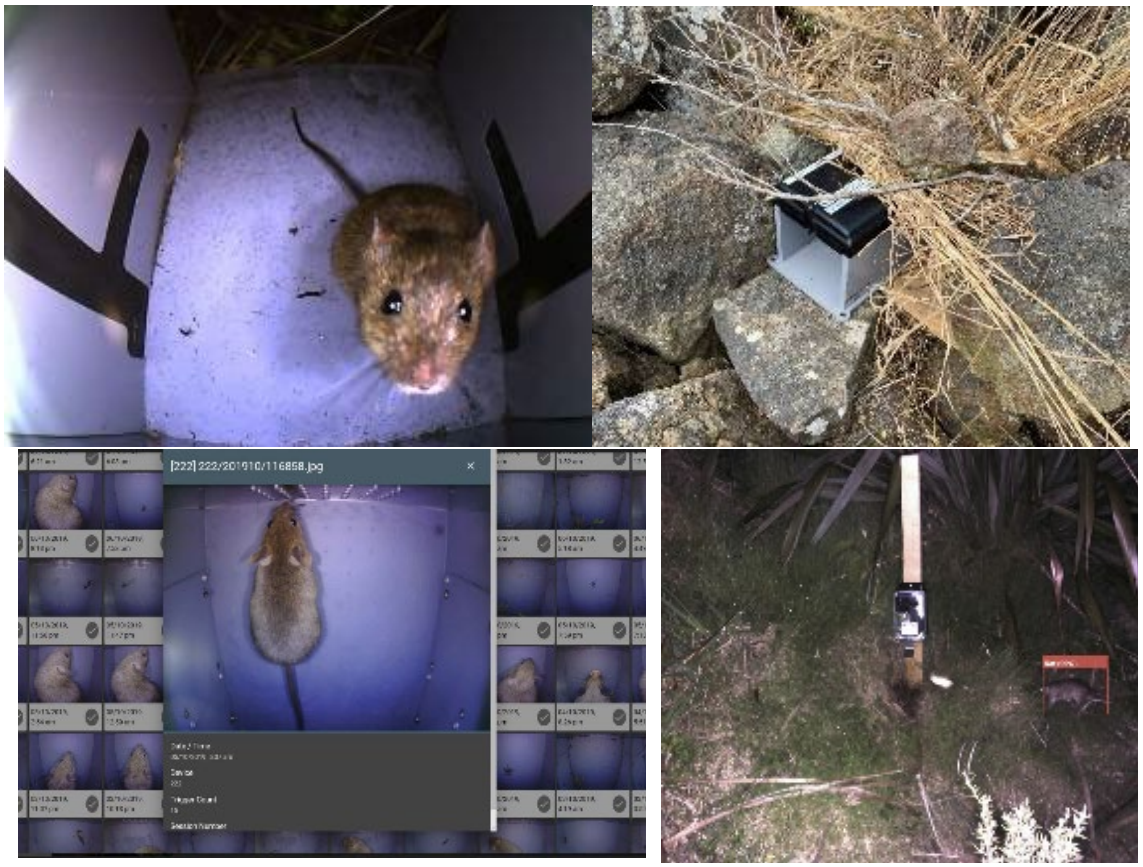


Figure 11: Newer pest detection and surveillance tools should be considered for use as part of adaptive management as they provide for more rapid pest detection and responses. Example images of mice detection from CritterPic™ units (top two rows of images) deployed in the field, and real-time rat detections (bottom images, see detection and identification in red boxes) from thermally triggered OWL™ cameras during landscape elimination projects.

5.9 Mouse eradication and reinvasion management

Mice are widely recognised as the most challenging mammalian pest species to exclude from predator-proof fences due to their small body size, high reproductive capacity, and ability to exploit very small defects or breaches. Consequently, they are often considered the species most likely to reinvade fenced sanctuaries. However, more than two decades of experience from New Zealand pest-exclusion projects demonstrates that mouse incursions do not necessarily compromise the effectiveness of fenced sanctuaries, and in many instances mouse reinvasions can rapidly be addressed before any impact on biodiversity (Turner & Norbury, 2023). Modern predator-exclusion fences are designed to operate as part of an integrated biosecurity system incorporating surveillance, rapid-response capability, and ongoing maintenance. Under this approach, incursions are treated as manageable biosecurity events rather than evidence of fence failure, and can be detected and eradicated before populations become established or cause significant biodiversity impacts.

The Mokomoko fenced sanctuary provides one of New Zealand's strongest contemporary examples of successful long-term mouse exclusion. In June 2026 the sanctuary reported that it had remained mouse-free for more than four years, despite high mouse pressure in surrounding habitats, with ongoing surveillance continuing to detect no evidence of mouse presence (Central Otago Ecological Trust, 2026).

While mice remain the most technically challenging mammalian pest species to exclude from fenced sanctuaries, the available New Zealand evidence demonstrates that long-term exclusion is achievable and that occasional incursions can be effectively detected and eradicated before they become established (Innes et al., 2012; Burns et al., 2012, Turner & Norbury, 2023). The risk of mouse reinvasion therefore does not undermine the ecological value of pest-exclusion fencing; rather, it reinforces the importance of robust surveillance, maintenance, and rapid-response protocols as core components of fence management. Experience from sites such as Mokomoko demonstrates that well-managed predator-exclusion fences can maintain zero predator abundance over extended periods, providing levels of protection for highly predator-sensitive taxa that are difficult or impossible to achieve through conventional suppression alone.

The objective of the Predator Exclusion Area is to maintain the site free of established populations of all target pest mammals. While the predator-exclusion fence is expected to substantially reduce reinvasion risk, no exclusion system can realistically guarantee that occasional pest incursions will never occur. Incidental detections of individual pest animals, particularly highly mobile species such as mice, should therefore be viewed as expected biosecurity events rather than evidence of management failure. The effectiveness of the Predator Exclusion Area will instead be measured by the ability of the integrated surveillance, monitoring and response programme to rapidly detect incursions, implement an immediate eradication response, and prevent reinvading animals from establishing breeding populations or causing significant ecological impacts.

Accordingly, the monitoring programme has been designed around multiple independent layers of surveillance, including routine fence inspections, external trap networks, tracking tunnels, trail cameras and real-time automated surveillance technologies. Together these complementary methods maximise the probability of early detection and enable rapid management intervention before incursions compromise the ecological integrity of the Predator Exclusion Area.

5.10 Incursion response

A detailed incursion response plan will be developed for the fenced area during the Ops63 process. The response plan will contain the names and contact details of the key personnel to be alerted following a breach or suspected breach, where all the equipment is located, and the steps to follow. A copy of the response plan will be kept on site.

A breach may be detected during routine pest monitoring inside the fence (e.g. on camera or on chew cards), or via observation of any sign of target pests (e.g. prints or scat). A suspected breach may occur if the fence is damaged (e.g. following a storm, tree fall, or blocked water gate). The incursion response plan will therefore be based on the following steps:

1. **Ensure all key personnel are alerted and initiate these response protocols;**
2. **Determine the target pest(s) present, the number of individuals, and their approximate location within the fenced area.** This may involve deploying cameras, chew cards, tracking tunnels, live capture traps, and smart surveillance technology (e.g. Artificially Intelligent (AI) traps and smart AI cameras) throughout the fenced area. Species-specific detector dogs may also be used to locate and kill the invading target individual(s)
3. **Determine the location of breach/pathway of entry, and immediately fix any breaches in the fence (simultaneously with Step 2).** This will involve a detailed inspection of the fence, including all access gates and water gates, proximity of surrounding trees to the fence (e.g. overhanging branches or fallen trees), potential burrows or erosion around the base of the fence, holes in the fence mesh, and any damage to the top wire and hood of the fence. The automated alert system will also be reviewed for locations of any breaches;
4. **Deploy a variety of control tools, appropriate to the target species and the number of individuals suspected to be present**. Ongoing monitoring (initiated in Step 1) will help pinpoint effective locations for control efforts. Live-capture traps (and lures) will be checked daily, and kill traps (and lures) will be checked every 3 days. All traps will be GPS recorded, and good data management and recording practices in place. Control devices/techniques may include:

- Rats – Live capture traps, appropriate kill traps, rodent detection dogs, localised toxic control;
- Mice – Mouse capable traps at very high density (e.g. a 25 x 25 m grid) within a localised area (defined based on monitoring results), and lured with a range of lure types). Note that these traps must be low risk to non-targets (including lizards) Toxic control if appropriate (noting substantial monitoring efforts will be required to determine if the target individual is still present);
- Possums – Live capture traps, appropriate kill traps, possum detection dogs, night shooting (spotlighting);
- Hedgehogs – Live capture traps, kill traps;
- Mustelids – Live capture traps, kill traps (with a wide variety of lure types), mustelid detection dogs;
- Feral cats – Live capture traps, kill traps (e.g. SA2 Kat traps, SA Coni Traps, Timms traps), night shooting;
- Rabbits/Hares – Night shooting operations (spotlighting).

5. **Monitor to ensure all invading individuals have been eliminated.** Monitor for up to one month once all individuals are believed to have been eliminated (e.g. confirmed via carcasses in traps or following shooting) and no further sign has been observed. Monitor for at least three months if toxic methods have been used (i.e. 3 months since the last known sign was observed); and
6. **Report the results, and any lessons learned** (i.e. the cause of the breach, what was successful and unsuccessful, and any improvements to pest management practices).

Once an incursion has been detected or is suspected, these steps and an on-the-ground response initiated within 48 hours. Sufficient control tools, equipment and personnel resources must be in place to allow a rapid response (e.g. unset traps and monitoring equipment either deployed inside the fence or in storage nearby, contacts for suitably qualified contractors or personnel capable of conducting shooting operations).

5.11 Targets and Thresholds Pest Exclusion Area

Management targets in pest control relate to the "maximum allowable residual pest abundance targets" which allow native species to recover. That is, the management target for each species is the ideal goal that the control actions aim to achieve. The target pest densities within the full-height pest exclusion areas are 0% (Table 9). If at any stage a reinvasion or survivor is detected the incursion response plan will be initiated (see previous section).

***Table 9**: Pest targets and thresholds within the Full Height Exclusion Fenced areas of the MEEA.*

Pest Species	Management Target	Threshold	Monitoring frequency
MEEA Pest Exclusion Fenced Area			
All targets (rats, mice, weasels, stoats, ferrets, possums, cats, hedgehogs, rabbits, hares and ungulates)	All target species: 0% density	Any detection initiate control	Ongoing and continuous via cameras. Monthly via trap check. Four times per year using a range of detection devices including but not limited to chew cards, tracking tunnels, kill and live capture traps. Additional monitoring must also occur immediately following events that could cause a breach, and following any suspected incursion.

5.12 Pest control and monitoring calendar

The 12-month calendar in Table 10 outlines management and monitoring activities within the pest exclusion fenced areas (post eradication and mop up phase). Tasks are designed to maintain biosecurity, ensure fence integrity and sustain predator-free status.

During the monthly full fence inspection (of the entire perimeter) the fence should be checked for vegetation clearance and any required fence repairs. Vegetation encroaching on the fenceline should be trimmed. There should also be an internal track and gate inspection to ensure double-door entry systems (if fitted) are functioning. All fence skirts should be assessed for erosion, animal diggings, and flood damage. Check flood gates and drainage points after heavy rain events. Carry out fence integrity audit before winter storms; repair wire strain and mesh damage. Check culverts, floodgates, and drains to ensure free flow. An annual full-fence integrity inspection and sign-off should be completed by a suitably experienced professional with knowledge of pest exclusion fence builds.

Table 10: MEEA Pest Exclusion fenced area activity calendar.

Task / Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Fence inspection & maintenance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Surveillance cameras	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Trap checks	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Task / Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Tracking tunnel monitoring		✓			✓			✓			✓	
Chew card monitoring		✓			✓			✓			✓	
Mop-up response (if detection occurs)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fence and Biosecurity audit & reporting.												✓

6. Pest Suppression Areas

6.1 Overview

Pest suppression will be undertaken across the MEEA 1 km Buffer, Murphys Link and Cranky Jims Link to reduce predator abundance, minimise reinvasion risk to the MEEA Predator Exclusion Area and protect high-value biodiversity assets (Figures 12–14). Together, these areas provide landscape-scale biodiversity benefits while supporting the long-term effectiveness of the predator elimination programme.

The MEEA Buffer forms the primary defensive zone surrounding the predator exclusion fence, reducing the likelihood of mammalian pests reaching or challenging the fence. Murphys Link protects the lizard release area while enhancing ecological connectivity between the MEEA and the Redbank Ecological Covenant. Cranky Jims Link strengthens connectivity between the Cranky Jims and Island Block Ecological Covenants and supports large-scale grey shrubland restoration.

Pest suppression will target rodents, mustelids, hedgehogs, possums, feral cats and rabbits using an integrated programme of trapping, toxic baiting and surveillance. Control intensity has been matched to the ecological objectives and reinvasion risk of each management area, with the highest density of control devices located along the MEEA fence perimeter, within the inner 250 m of the MEEA Buffer and throughout Murphys Link. Device density reduces progressively across the outer MEEA Buffer, while Cranky Jims Link will receive lower-intensity predator suppression appropriate to its restoration objectives. Indicative control device types, maximum deployment densities and monitoring infrastructure are summarised in Table 11 and Figures 11–13. Final device locations will be micro-sited during implementation to account for topography, habitat features, target-species movement, access and monitoring results.

6.2 Control methods – kill traps

Kill traps used under this Plan will be legally approved for use in New Zealand and, where applicable, will have demonstrated humane performance through testing undertaken in accordance with National Animal Welfare Advisory Committee (NAWAC) guidelines. An up-to-date list of approved trap performance assessments is available through Bionet (https://www.bionet.nz/rules/performance-traps). A mixture of trap types for each species is generally the best approach as individual animals will respond differently to different trap types and there will always be some animals that will avoid one trap type but may go into another.

Table 11 outlines kill traps which are recommended for each target species, and it is recommended that traps are selected from this list. Figures 12–14 show the indicative layout of the trap and bait station network in the Suppression Areas, including the MEEA buffer area, the Murphys Link and Cranky Jims Link. However, each trap location will need to be micro-placed upon deployment (i.e. refined on a fine scale within several metres in

the field, based on the broad-scale locations in Figures 12 - 14. This ensures each trap is placed within suitable micro-habitat for the target species to maximise capture success.

Most of the target predators are attracted to cover, so traps should be placed under cover, such as under trees or shrubs (where available). The trap entrance needs to remain clear, so any vegetation around it needs to be cleared. Rats and mustelids also tend to move along waterways and linear features such along habitat boundaries, tracks, and fence lines.

Table 11: *Indicative control devices and deployment densities for target mammalian pest species within the Pest Suppression Areas.* Equivalent NAWAC-approved devices may be substituted where they provide equal or superior efficacy for the target species.

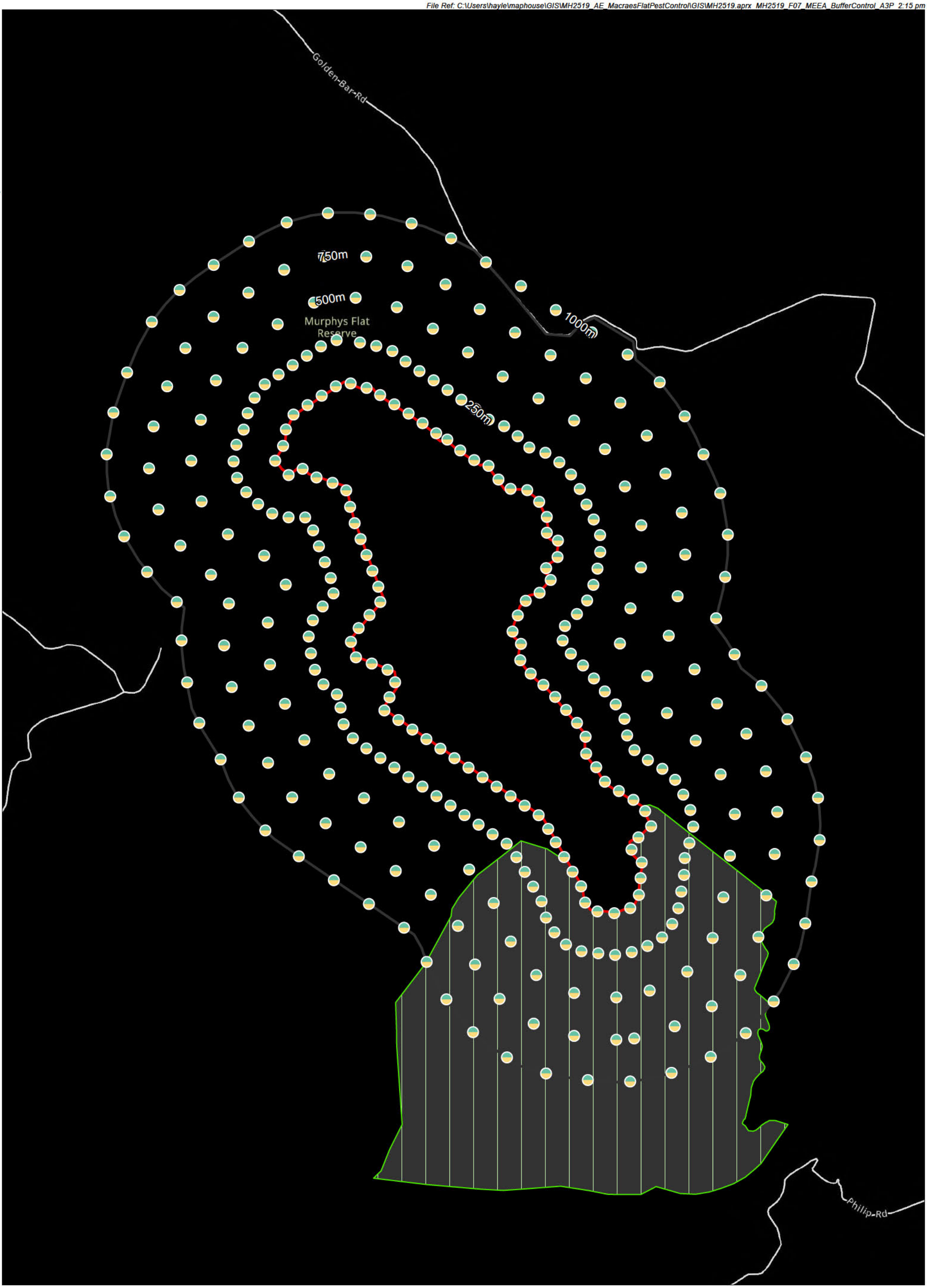
Target pest species	Examples of suitable devices or methods	MEEA inner buffer and Murphys LInk — intensive suppression	MEEA outer buffer — landscape suppression	Cranky Jims Link — restoration suppression
Rats	DOC 200, DOC 250, double-set DOC 200, approved resetting or multi-species-capable traps; covered bait stations	Rodent-capable traps and permanent bait stations at a maximum indicative spacing of 100 m. Fence-perimeter infrastructure at a maximum spacing of 50 m.	Rodent-capable traps and permanent bait stations at a maximum indicative spacing of 200 m.	Permanent bait stations only, at a maximum indicative spacing of 100 m.
Mice	Mouse-capable approved traps and covered toxic-bait stations	Mouse-capable traps and/or bait stations integrated with the rodent network at a maximum indicative spacing of 100 m. Fence-perimeter infrastructure at a maximum spacing of 50 m.	Mouse control integrated with the rodent network at a maximum indicative spacing of 200 m, where required to reduce fence reinvasion pressure.	Not routinely controlled. Targeted control may be undertaken where monitoring identifies a specific ecological or operational need.
Possums	SA2 Kat Trap, Flipping Timmy, approved resetting or multi-species-capable traps; covered bait stations	Possum-capable traps and/or bait stations at a maximum indicative spacing of 200 m. Fence-perimeter possum infrastructure at a maximum spacing of 100 m.	Possum-capable traps and/or bait stations at a maximum indicative spacing of 400 m.	Controlled through the permanent 100 m rodent/possum bait-station network. Additional targeted control may be undertaken where monitoring identifies elevated activity or browse impacts.
Mustelids	DOC 200, DOC 250, double-set DOC 200, approved	Mustelid-capable traps at a maximum indicative spacing of 200 m. Fence-	Mustelid-capable traps at a maximum indicative spacing of 400 m.	Mustelid-capable traps at a maximum indicative spacing of 200 m.

Target pest species	Examples of suitable devices or methods	MEEA inner buffer and Murphys LInk — intensive suppression	MEEA outer buffer — landscape suppression	Cranky Jims Link — restoration suppression
	resetting or multi-species-capable traps	perimeter infrastructure at a maximum spacing of 200 m.		
Hedgehogs	DOC 200, DOC 250, double-set DOC 200, approved resetting or multi-species-capable traps	Controlled through the 200 m mustelid-capable trapping network, with additional targeted devices where monitoring identifies elevated activity.	Controlled through the 400 m mustelid-capable trapping network, supplemented where required.	Controlled through the 200 m mustelid-capable trapping network.
Feral cats	Approved live-capture or kill traps, including cat-capable multi-species devices; thermal-assisted shooting where appropriate	Cat-capable traps at a maximum indicative spacing of 400 m. Fence-perimeter infrastructure at a maximum spacing of 400 m.	Cat-capable traps at a maximum indicative spacing of 800 m, targeted to ridgelines, gullies, tracks and other movement corridors.	Cat-capable traps at a maximum indicative spacing of 400 m.
Rabbits and hares	Shooting, thermal-assisted shooting, pindone or another approved control method	Targeted control where monitoring, burrowing, browse impacts or operational observations indicate that control is required.	Targeted control where monitoring or field observations indicate that control is required.	Targeted control where rabbit or hare activity is affecting restoration outcomes.

*Denotes a resetting trap (as opposed to a single-set trap).

Notes: Where a single device is demonstrably capable of controlling more than one target species, it may contribute to the required network for each of those species, provided the resulting deployment meets the maximum spacing and operational requirements applicable to each target species.

Projection: NZGD 2000 New Zealand Transverse Mercator



Pest Control Buffer Area

MACRAES FLAT PEST CONTROL

Plan prepared for Alliance Ecology | 29 July 2026

Alliance Ecology™ MapHouse

MEEA Predator Exclusion Fence (250ha)
MEEA 1km buffer
Murphy's Link
Bait station
Trap station

0 200 m
1:20,000 @ A3

Data Sources: Bioresearches, Alliance Ecology, Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors., Eagle Technology, LINZ

Figure 12

Projection: NZGD 2000 New Zealand Transverse Mercator

Murphys Vegetation & Lizard Release Area

MACRAES FLAT PEST CONTROL

Plan prepared for Alliance Ecology | 29 July 2026

Alliance Ecology™ MapHouse

MEEA Predator Exclusion Fence (250ha)

MEEA 1km buffer

Murphy's Link

Bait station

Trap station

0 200 m

1:10,000 @ A3

Data Sources: Bioresearches, Alliance Ecology, Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors., Eagle Technology, LINZ

Figure 13

Projection: NZGD 2000 New Zealand Transverse Mercator

CRANKY JIMS CREEK ECOLOGY COVENANT

CRANKY JIMS WETLAND OPEN SPACE COVENANT

Cranky Jim's Restoration Area

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Plan prepared for Alliance Ecology | 29 July 2026

Alliance Ecology™ MapHouse

Ecological Covenant
Cranky Jim's Link / Grey Scrub Restoration Area
Bait station
Trap station

0 100 m
1:5,000 @ A3

Data Sources: Bioresearches, Alliance Ecology, Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors., Eagle Technology, LINZ

Figure 14

6.3 Control methods – toxins

A permanent bait-station network will be established across the Pest Suppression Areas as shown in Figures 12–14. Toxic baiting will be undertaken as discrete pulse operations, with the toxicant, bait formulation, timing and servicing regime selected according to the target species, management area, monitoring results, previous operational performance and applicable product-label and regulatory requirements.

Rats and possums will ordinarily be targeted using tree- or post-mounted Philproof or functionally equivalent covered bait stations. Preferred toxicants are diphacinone–cholecalciferol bait, currently marketed as DoubleTap, and registered cholecalciferol bait products. These products do not currently require a controlled-substance licence and have comparatively low persistence and secondary-poisoning risk relative to persistent second-generation anticoagulants. Cholecalciferol bait will be preceded by non-toxic pre-feeding where required by the product label or operational prescription.

Alternative registered vertebrate toxic agents may be used where monitoring, operational experience, product availability or advances in best practice indicate that they would provide equivalent or improved outcomes. Selection of an alternative toxicant will consider efficacy against the target species, animal welfare, environmental persistence, non-target exposure, secondary-poisoning risk, bait avoidance and all applicable approval, notification, signage and handling requirements.

During each operation, bait stations will be inspected and replenished at the intervals specified by the product label and operation-specific prescription. Servicing frequency will be increased where bait uptake is high to ensure that sufficient bait remains available for target animals to consume an effective dose. Operations will continue until the specified operational endpoints have been achieved, which may include bait uptake declining to negligible levels and/or post-control monitoring demonstrating that management targets have been met.

At the conclusion of each pulse operation, remaining toxic bait will be removed and disposed of in accordance with the product label, unless an operation-specific risk assessment and approved product instructions provide for an alternative approach. Toxicant or bait formulation may be varied between operations where appropriate to address bait avoidance or declining efficacy.

If monitoring indicates that mouse, rat or possum abundance exceeds the thresholds in Table 12 (based on the monitoring infrastructure in Fig. 15), or if elevated pest activity is identified near the MEEA Predator Exclusion Fence or other high-value biodiversity assets, an additional control operation will be initiated.

6.4 Rabbit control

Rabbits will be controlled where browse, burrows, faecal sign, monitoring or operational observations indicate that control is required. Control may include pindone bait deployed in approved covered bait stations, shooting, or another legally approved method appropriate to the site and level of rabbit activity.

Where pindone is used, bait placement, pre-feeding where applicable, quantities, replenishment intervals, notification, signage and removal will comply with the current product label and an operation-specific prescription. Bait stations will be positioned in areas of active rabbit use while avoiding locations where vegetation, stock, public access or non-target risks would compromise safe or effective deployment.

6.5 Control frequency & timing

Control infrastructure will remain in place year-round. Trapping will generally operate continuously, while toxic baiting will be undertaken as discrete pulse operations. The timing and frequency of control will be adapted according to management objectives, seasonal pest activity, monitoring results and operational performance.

- Prior to construction and closure of the MEEA Predator Exclusion Fence, trapping will be the principal control method within the proposed fenced area. This will minimise the risk of establishing bait avoidance that could compromise the subsequent eradication operation.
- An initial toxic baiting operation will be undertaken across the Pest Suppression Areas in coordination with the eradication operation inside the completed fence, unless operation-specific planning identifies a more effective sequence.
- Following completion of the eradication operation, routine toxic control will generally be undertaken twice annually, provisionally during autumn and late winter or spring. Final timing will be selected to suppress pest populations before critical indigenous fauna breeding periods and before expected seasonal population increases.
- Additional toxic control operations will be undertaken where monitoring thresholds are exceeded, where rapid reinvasion or population recovery is detected, or where elevated pest activity poses an immediate risk to the predator exclusion fence, the Murphys Link lizard release area or other high-value biodiversity assets.
- The timing, toxicant and formulation used in each operation may be varied in response to seasonal conditions, bait uptake, previous control performance, bait avoidance, product availability and current best practice.
- Trapping will continue between toxic operations. Single-set traps will normally be inspected at least monthly. Self-resetting and remotely reporting traps will be serviced according to manufacturer specifications, remote status information and operational risk, and at least every two months unless a longer interval has been validated and approved through the adaptive-management process.

- Rabbit control will be undertaken when monitoring or field observations identify rabbit activity or unacceptable browse impacts.

6.6 Monitoring within the Pest Suppression Areas

Monitoring within the Pest Suppression Areas will be undertaken using a combination of chew cards and trail cameras (Table 12, Fig. 15) to assess the effectiveness of pest management and determine compliance with the performance targets and adaptive management thresholds presented in Table 13. Chew cards will be used to simultaneously monitor rodents and possums, while trail cameras will be used to monitor mustelids and feral cats. Monitoring will be undertaken four times per year (February, May, August and November), unless additional monitoring is required following elevated pest detections or management interventions.

Chew card monitoring will be undertaken using permanent monitoring lines established throughout each management area. Each monitoring line will comprise ten chew cards spaced at approximately 20 m intervals. Monitoring lines will be distributed to provide representative coverage of the principal habitat types, topographic features and management areas, while ensuring adequate spatial separation between lines to maximise independence of sampling. Final monitoring locations will be micro-sited in the field to account for terrain, vegetation, access, land tenure and operational constraints.

Trail camera monitoring will follow the Department of Conservation Interim Trail Camera Guide v1.1.0 (Gillies, 2021). Each camera monitoring line will comprise four cameras spaced approximately 200 m apart and deployed for a standard 21-night monitoring period. Camera lines will be separated by a minimum of 1,000 m where practicable and distributed to provide representative coverage of the principal habitat types within each management area. Camera lines will not be deliberately aligned along roads, ridgelines, streams, trap lines or bait station lines in order to minimise potential sampling bias. Representative habitat types will be sampled in proportion to their occurrence within each management area, consistent with the interim DOC protocol.

The proposed monitoring network in the suppression area (Fig. 15) comprises 10 chew-card lines and 10 camera lines within the MEEA Buffer, 5 chew-card lines and 7 camera lines within Murphys Link, and 2 chew-card lines and 2 camera lines within Cranky Jims Link (Table 12).

The increased monitoring intensity within the MEEA Buffer and Murphys Link reflects their importance in protecting the MEEA Predator Exclusion Area and supporting the establishment and persistence of the lizard compensation population, respectively. Cranky Jims Link will be monitored using a modified camera-trap design due to its relatively small size, which precludes full implementation of the standard DOC camera monitoring protocol while maintaining the recommended minimum separation between monitoring lines.

Camera monitoring results will be expressed as the mean number of detections per 2,000 camera-hours (CH) for each target species, calculated across all monitoring lines within each management area in accordance with the DOC interim protocol. This provides a

standardised index of relative activity that enables comparisons between management areas and monitoring periods and forms the basis for assessing compliance with the management thresholds specified in Table 13.

Table 12: *Proposed monitoring design for the Pest Suppression Areas, including chew-card and trail camera monitoring effort.*

Management Area	Chew Card Lines	Camera Lines	Purpose
MEEA Buffer	10	10	Protect predator exclusion area
Murphys Link	5	7	Monitor lizard compensation area
Cranky Jims Link	2	2	Monitor ecological linkage

6.7 Pest targets and thresholds

For the suppression area, the proposed management targets for rats, possums, and mustelids as well as the thresholds for initiating additional control measures (based on the monitoring results for each species), are provided in Table 13. Monitoring locations are provided in Fig. 15. Monitoring results will be assessed against these thresholds to determine whether additional pest control is required under the adaptive management framework described below.

The pest management targets adopted in this Plan are based on New Zealand operational practice and published research demonstrating that substantial biodiversity benefits generally require introduced mammalian pests to be maintained at low densities. Intensive suppression of ship rats and possums has been associated with increased reproductive success and population recovery of indigenous birds (Innes et al., 1999; Innes et al., 2015), while reviews of mainland pest management demonstrate that sustained control of rats, possums and stoats can deliver significant conservation benefits (Brown et al., 2015). For ship rats in particular, a residual tracking rate of approximately 5% is commonly used as an operational management target in New Zealand, although ecological responses vary between species, ecosystems and management contexts (Innes et al., 2024). The targets adopted in this Plan therefore represent conservative operational objectives intended to maintain pest activity at low levels, while the higher response thresholds provide clear triggers for additional control before pest populations increase sufficiently to compromise biodiversity outcomes.

Assessment of management thresholds: Monitoring results will be assessed independently for each management area (MEEA Inner Buffer, MEEA Outer Buffer, Murphys Link and Cranky Jims Link) to ensure localised increases in pest activity are identified and responded to appropriately. Results will not be pooled across management areas for the purpose of assessing compliance with the management targets and response thresholds. Where appropriate, individual monitoring lines or camera locations may also be reviewed separately to identify localised incursions or emerging pest hotspots requiring targeted management.

Table 13: *Performance targets and adaptive management response thresholds for the Pest Suppression Area, based off Mean Chew Card Indicies (CCI), and Camera Trap Hours (CH)*

Pest Species	Desired Target	Mandatory trigger response	Monitoring frequency
Pest Suppression Areas			
Mice (Murphys Link only)	<5% CCI	≥10% CCI, or two consecutive results of 5–<10%	Four monitors per year in February, May, August, and November
Rats	<5% CCI	≥10% CCI, or two consecutive results of 5–<10%	
Possums	<5% CCI	≥10% CCI, or two consecutive results of 5–<10%	
Stoats	≤2 detections per 2000 CH	≥3/2,000 CH	
Ferrets	≤2 detections per 2000 CH	≥3/2,000 CH	
Feral cats	≤2 individual cat detections per 2000 CH	≥3 individual detections/2,000 CH	
Weasels	≤2 detections per 2000 CH	≥3/2,000 CH	

Projection: NZGD 2000 New Zealand Transverse Mercator

Pest Monitoring within suppression area

MACRAES FLAT PEST CONTROL

Plan prepared for Alliance Ecology | 29 July 2026

Alliance Ecology™ MapHouse

- MEEA Predator Exclusion Fence (250ha)
- MEEA 1km buffer
- Murphy's Link
- Cranky Jim's Link / Grey Scrub Restoration Area
- Mt Highlay Tussock Restoration Area
- Camera line
- Chew card

Data Sources: Bioresearches, Alliance Ecology, Eagle Technology, LINZ

0 1,000 m

1:55,000 @ A3

Figure 15

6.8 Pest control and monitoring calendar

The 12-month operational calendar in Table 14 outlines the routine pest management and monitoring activities undertaken within the Pest Suppression Areas (MEEA Buffer, Murphys Link and Cranky Jims Link). The programme has been designed to maintain pest populations below the performance targets presented in Table 14 while providing regular monitoring to assess programme effectiveness and identify where additional management is required.

Routine servicing of traps, bait stations and surveillance equipment will be undertaken throughout the year to ensure all devices remain operational and effective. Monitoring using chew cards and trail cameras will be undertaken quarterly (February, May, August and November) to coincide with the performance assessment programme described in Section 6.7. Monitoring results will be compared against the management targets and response thresholds, with additional pest control initiated where thresholds are exceeded or where increasing pest activity is detected. Additional control operations and monitoring may also be undertaken outside the routine schedule where required in response to elevated pest detections, reinvasion events or other operational requirements.

Trap and bait station servicing frequencies will vary according to the device type, lure longevity, seasonal conditions, bait take and monitoring results. As a minimum, all devices will be inspected and serviced at intervals consistent with manufacturer recommendations and operational best practice to ensure they remain functional and effective. Routine pulse baiting will be undertaken twice annually (February and August). Additional baiting may be implemented where monitoring indicates performance thresholds have been exceeded or where elevated pest activity is detected.

Table 14: *Pest Suppression Area operational activity calendar. ✓ represents months when those activities should occur, ✓✓ signals that activity should occur twice a month.*

Task / Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Trap servicing	✓	✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓	✓	✓
Bait station servicing		✓						✓				
Trail camera monitoring		✓			✓			✓			✓	
Chew card monitoring		✓			✓			✓			✓	
Performance assessment against thresholds		✓			✓			✓			✓	
Targeted response control (where required)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Task / Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Annual programme review and reporting												✓

7. Browser Management Area

7.1 Outline

Browser management will be undertaken across those biodiversity management areas where ungulate browsing, trampling, rooting or disturbance has the potential to compromise indigenous vegetation protection, restoration planting, vegetation direct transfer areas or the establishment of ecological connections. The primary target species will be feral deer, goats and pigs.

Possum and rabbit control within the MEEA Buffer, Murphys Link and Cranky Jims Link is addressed through the previous pest suppression programme and is not repeated in this section.

Ungulate management will apply principally to:

- the MEEA and its surrounding buffer;
- Murphys Link;
- Cranky Jims Link;
- Mt Highlay Station, including tussock planting, pine-removal and vegetation direct-transfer areas;
- stream, riparian and other restoration planting areas; and
- any additional compensation or restoration sites identified during detailed design.

The objective of browser management will be to maintain ungulate abundance at levels that do not prevent the establishment, recovery or long-term persistence of indigenous vegetation. Management will focus particularly on recently planted areas, naturally regenerating shrublands and tussocklands, riparian habitats, rock outcrop vegetation and sites supporting palatable or vulnerable indigenous plant species.

Browser management will use an adaptive combination of exclusion, surveillance and targeted control. The intensity of management will vary according to the ecological values present, vulnerability of vegetation, evidence of animal use, accessibility and proximity to adjoining land from which reinvasion may occur.

Although wallabies are not currently not established in the Project area, their potential future establishment is recognised as a biosecurity risk. Any confirmed wallaby detection will trigger targeted control in accordance with the browser management and adaptive management provisions of this Plan.

7.2 Exclusion and preventative management

Where practicable, fencing will be used as the primary means of preventing livestock and larger feral browsers from entering high-value restoration areas.

Existing and proposed fences will be inspected and maintained to ensure that they remain effective for their intended purpose. Fence design will be appropriate to the species and risk being managed and may include:

- conventional stock fencing to exclude domestic livestock;
- upgraded or reinforced fencing where feral pigs, goats or deer present a material risk;
- gates, cattle stops or other access controls at operational entry points; and
- temporary fencing or individual plant protection around newly established restoration areas where permanent fencing is not immediately practicable.

Fencing around riparian or restoration planting areas will be designed to exclude stock and, where practicable, reduce access by feral pigs and other large browsers. However, fencing will not be relied upon as the sole control method where animals are able to enter through waterways, damaged sections, gates or adjoining unfenced habitat.

Any evidence of fence damage, stock ingress or repeated ungulate access will trigger repair and, where necessary, targeted control within and around the affected management area.

7.3 Ungulate control methods

Control of deer, goats and pigs will be undertaken using methods appropriate to the species, terrain, animal abundance and operational context. Methods may include:

- ground-based shooting by suitably experienced or authorised personnel;
- targeted night shooting where lawful and operationally appropriate;
- thermal-assisted detection and shooting;
- aerial shooting where animal abundance, terrain or access limitations make ground control ineffective;
- recreational or contracted hunting where this can be safely integrated with project operations;
- trapping (e.g. pig traps) or other approved methods where suitable for the target species; and
- coordinated control with neighbouring landowners, land managers or wider landscape-scale programmes where this would improve effectiveness.

Control will focus on animals located within management areas (Fig. 16) and on likely entry routes, movement corridors and adjoining habitats that contribute to reinvasion.

The selected method will take account of:

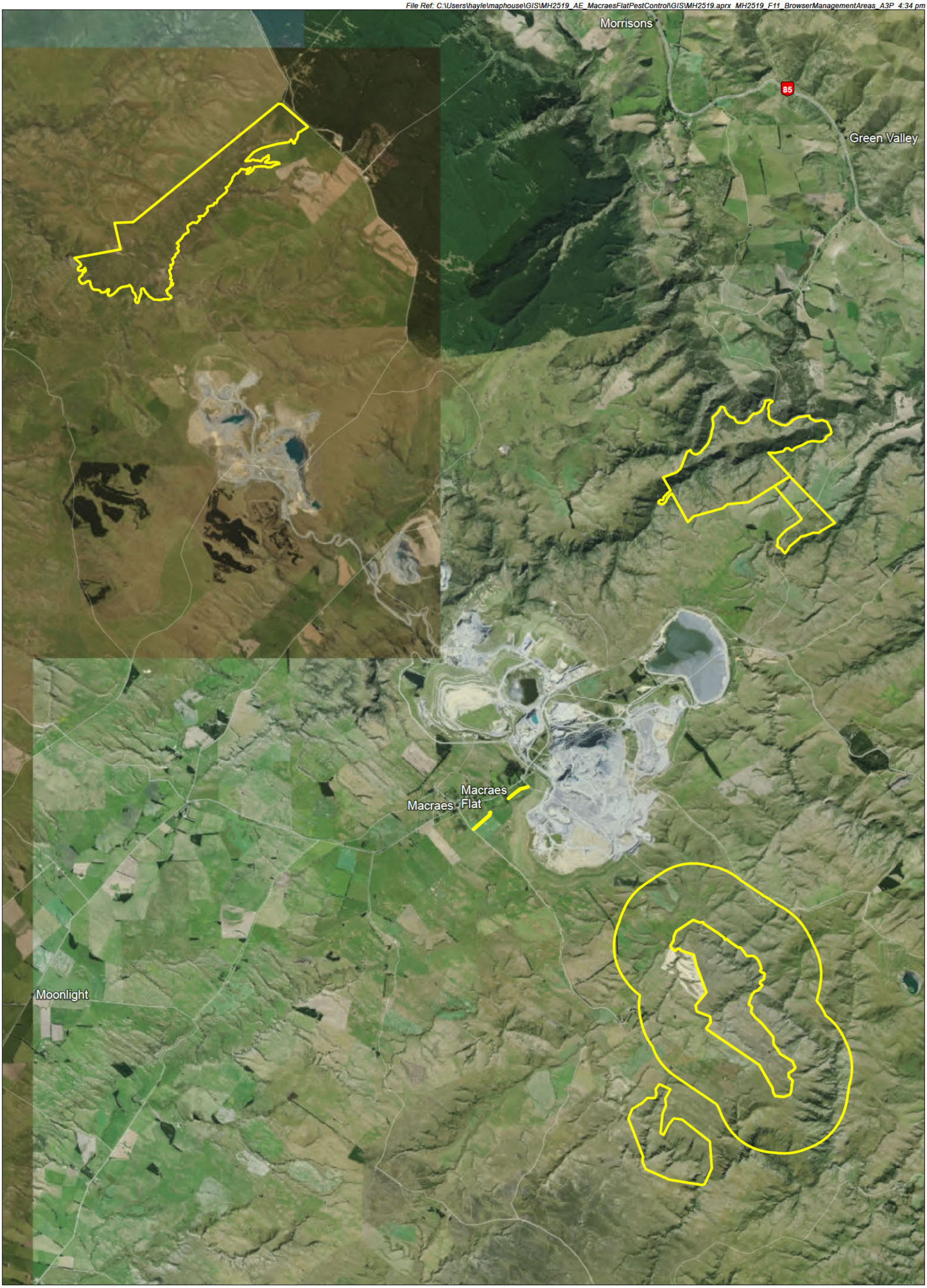
- animal welfare;
- operator and public safety;

- risks associated with mining or other site operations;
- access and terrain;
- proximity to roads, tracks, dwellings and livestock;
- the likelihood of animals becoming increasingly wary following repeated disturbance; and
- the need to minimise impacts on non-target species and restoration activities.

All control will be undertaken in accordance with applicable legal requirements, landowner approvals, health and safety procedures and site access conditions.

Carcasses will be managed according to site circumstances and operational risk. They may be left in situ where this is environmentally and operationally acceptable, but will be removed or relocated where they present a risk to waterways, public or operational areas, monitoring equipment, non-target wildlife or site safety.

Projection: NZGD 2000 New Zealand Transverse Mercator



Browser Management Areas

MACRAES FLAT PEST CONTROL

Plan prepared for Alliance Ecology | 15 July 2026

Alliance Ecology™ MapHouse

Pest management areas

0 1,000 m

1:60,000 @ A3

Data Sources: Bioresearches, Alliance Ecology, Eagle Technology, LINZ

Figure 16

7.4 Surveillance and monitoring

Ungulate activity will be assessed through a combination of routine inspections, camera surveillance and observations made during other ecological or pest-management work.

Indicators may include:

- direct sightings or camera detections;
- footprints, tracks and trails;
- faecal pellets or pig rooting;
- browse damage to indigenous vegetation or restoration plantings;
- bark stripping, antler rubbing or trampling;
- damage to fences, gates or recently planted areas; and
- repeated use of waterways, gullies, ridgelines or other movement corridors.

Four chew card monitoring lines will be undertaken in the Mt Highlay Browser area to provide an indication of population levels, alongside sign and direct browse observations.

Monitoring effort will be greatest in newly planted and high-value restoration areas, where even low numbers of animals may cause disproportionate damage.

Remote cameras established for predator monitoring may also provide information on ungulate presence and movement. Additional cameras or targeted inspections may be deployed where ungulate activity is suspected but not adequately characterised by the routine monitoring network.

Monitoring results will be used to identify priority control locations, evaluate the effectiveness of control and determine whether follow-up operations are required.

7.5 Control frequency and timing

Ungulate control will be undertaken on an adaptive, evidence-based basis rather than according to a fixed annual schedule.

An initial inspection and, where necessary, control operation will be undertaken before or during the early stages of restoration planting, vegetation direct transfer or other habitat establishment. This will reduce the risk of newly established vegetation being damaged before it becomes sufficiently robust.

Thereafter:

- routine inspections will be undertaken during ecological monitoring, fence inspections and pest-control servicing;
- targeted control will be initiated when ungulates are detected within high-value biodiversity areas or where fresh sign or browse damage is recorded;

- follow-up control will be undertaken where monitoring indicates that animals remain present following an operation;
- additional surveillance and control will occur following fence damage, major weather events or changes in adjoining land use that increase the risk of ingress; and
- control may be coordinated seasonally where animal behaviour, vegetation vulnerability or operational access makes particular periods more effective.

Where repeated incursions occur, management may be intensified through increased control frequency, additional surveillance, fence upgrades or coordinated control across adjoining land.

7.6 Management targets and response thresholds

The overall management target will be to maintain ungulate impacts at levels that do not compromise the ecological objectives of the restoration and compensation areas.

Because low numbers of deer, goats or pigs can cause substantial damage to young plantings or vulnerable vegetation, management will generally use an incursion-response approach rather than relying solely on a numerical abundance threshold. Indicative targets and triggers are proposed in Table 15.

***Table 15**: Indicative management targets and response thresholds for ungulates and livestock within the Browser Management Areas.*

Target species or impact	Management target	Trigger for management response
Deer and goats	No sustained occupation of high-value restoration, planting or vegetation direct-transfer areas; no recurring browse damage attributable to ungulates	Confirmed camera detection, direct sighting, fresh sign or browse damage within a priority management area
Feral pigs	No sustained presence or recurring rooting within restoration, riparian or ecologically sensitive areas	Confirmed detection, fresh rooting, tracks, fence damage or repeated evidence of access
Livestock	No unauthorised livestock access to fenced biodiversity management areas	Any livestock ingress or evidence of fence failure
Vegetation condition	Restoration plantings and naturally regenerating vegetation are not being materially constrained by browsing, trampling or rooting	Repeated or increasing damage, poor plant establishment attributable to browsing, or damage to vulnerable plant species

A single detection may be sufficient to trigger control where it occurs within a newly planted area, vegetation direct-transfer site, lizard habitat, riparian restoration area or another location where the potential consequences are high.

7.7 Adaptive management

Browser management methods, effort and spatial coverage may be refined in response to monitoring results, restoration performance, changes in pest distribution, improvements in control technology or changes in land use within the surrounding landscape.

Any substantial change to the management approach will continue to:

- maintain or improve protection of indigenous vegetation;
- prioritise high-value and vulnerable restoration areas;
- use legally approved and humane control methods;
- minimise risks to non-target species and site users; and
- retain clear monitoring and response requirements.

8. Pest Animal Monitoring

Ongoing monitoring and adaptive responses are key to effective predator management. Well-established monitoring tools will be used to monitor pest presence and assess their densities against the intended targets. Further control will be initiated if particular thresholds are exceeded.

8.1 Tracking Tunnels

Tracking tunnels are a common, cost-effective, and sensitive detection and monitoring tool suitable for determining the presence, and provide a coarse index of relative abundance, of a range of pests, including rats and mice. Tracking tunnels are sometimes used to monitor mustelids, however they are not always sensitive to the presence of mustelids when they are present in very low numbers, hence camera traps are preferred for monitoring mustelids (Department of Conservation, 2020; Smith & Weston, 2017; Dilks et al., 2020).

Tracking tunnel lines will contain 10 tunnels spaced 50 m apart (i.e. along 450 m-long lines), as per Gillies & Williams (2013) for monitoring both rats and mice within the MEEA fenced area only (as an additional detection tool for incursions). Tracking tunnel lines must be spaced a minimum of 200 m apart at the closest point. Tracking tunnels are recommended for the MEEA exclusion fenced area only.

Tracking tunnel monitors (of one night each) will be repeated four times per year (simultaneously with camera trap surveys): February, May, August, and November.

For the MEEA Predator Exclusion Area, an additional tracking tunnel monitor will be undertaken whenever a rodent incursion is detected or suspected. The follow-up monitoring should commence approximately four weeks after completion of the response operation and will be used to determine whether any further evidence of the target species remains. Monitoring will continue, together with any additional response actions required, until the proof-of-absence requirements are obtained.

8.2 Chew Cards

For rodents and possums, chew cards are a common, cost-effective, and sensitive detection and monitoring tool suitable for providing a coarse index of relative abundance of a range of pests, including rats, mice, and possums. Protocols for the use of chew cards (as per National Pest Control Agencies, 2015), will be followed including:

- Chew card lines will contain 10 chew cards spaced 20 m apart (i.e. along 180 m-long lines), as per best practice for possums (National Pest Control Agencies, 2015).
- The same chew card lines are to be used year to year to enable trend monitoring and comparisons. However, lines may be repositioned in future if, for example, access becomes difficult.
- Chew card monitors (of three nights each) will be repeated four times per year (simultaneously with camera trap surveys): in February, May, August, and

November. The three-night monitoring period is as recommended by Ruffell et al. (2015) for monitoring both rats and possums, and also matches the best practice monitoring for possums (National Pest Control Agencies, 2015).

- Any bite marks recorded on the chew cards need to be identified to species level. Chew card results will be expressed as the Chew Card Index (CCI), being the percentage of deployed chew cards showing evidence of chewing by the target species.

8.3 Camera Traps

Camera traps have become an increasingly used tool in the past five years, particularly as cameras are much more effective for detecting the larger pest species (cats, ferrets and stoats) (Norbury et al., 2017). DOC's best practice guidelines for camera trapping (and potential indices from camera trap data for key target species) are currently under development and expected to be completed in the near future. Camera trap methods and targets outlined in this document are based on the draft recommendations and should be updated based on the final guidelines as they become available.

- For monitoring feral cats and mustelids, four cameras should be deployed along lines with each camera spaced 200 m apart in areas of preferred habitat for cats and mustelids.
- In the MEEA camera placement will be a camera per 10 hectares, and these cameras can be run continuously to check for pest presence, with footage reviewed every 3 weeks if remote communications is not use.
- Timing and frequency: Camera trapping along each line should occur four times each year, in February, May, August, and November. This information will help to determine pest presence and assist with determining where to focus control efforts (i.e. location of additional efforts).
- On each instance, cameras should be deployed for 21 nights when fine weather is forecast.
- All camera images need to be manually viewed and scanned for appearances of target predator species (in particular stoats, ferrets, and feral cats). Cameras should be set to take three rapid-fire still photos per trigger event to increase the likelihood of capturing a clear, identifiable image. As such, animals captured in one or more image within the photo burst should only be counted as a single capture during analysis.
- The camera trap index of relative abundance for feral cats and mustelids is expressed as the mean number of detections per 2000 camera hours (2000 CH) per camera trap line (Department of Conservation, 2023). Calculations are available in the DOC camera protocol guidelines (Department of Conservation, 2023).

9. Data management & reporting

All pest-control, surveillance and monitoring data associated with the Predator Elimination Area, Pest Suppression Areas and Browser Management Areas will be recorded within a single, cohesive data-management system as soon as practicable following completion of fieldwork.

TrapNZ is the preferred platform because it is widely used for pest-management projects in New Zealand, is relatively user-friendly, and can record the spatial distribution, servicing history and results associated with traps, bait stations and monitoring devices. However, an alternative system may be used where it provides equivalent or improved functionality, data security, spatial capability, reporting and long-term accessibility.

The data-management system will be established before substantive control or monitoring operations commence. The ground-truthed location of every control and monitoring device will be recorded using GPS and entered into the system. This will include all existing devices retained for use and all new devices installed under this Plan.

Each device will be assigned a unique identifier linked to, as applicable:

- device type, make and model;
- target species;
- management area;
- installation date;
- GPS coordinates;
- operational status;
- servicing requirements; and
- maintenance or replacement history.

All contractors, staff and other persons undertaking pest control or monitoring will be required to record their field data in the selected system. Users will be provided with appropriate access and instructed in the required data-entry standards to ensure that information is recorded consistently and accurately.

9.1 Minimum control data requirements

For each trap or control-device service, the following information will be recorded where applicable:

- date and time of servicing;
- name or identifier of the person undertaking the service;
- device location and unique identifier;
- device type, make and model;
- operational status of the device;

- whether the device had been triggered or activated;
- target and non-target catch, including species and number of animals;
- sex and approximate age class, where practicable and relevant;
- lure type, condition and whether it was replaced or refreshed;
- trap counter or activation count for self-resetting devices;
- battery, communications and other functional status for remotely reporting devices;
- carcass condition and disposal, where relevant;
- repairs, maintenance or replacement required; and
- any other relevant observations.

A zero catch or zero activation result will be recorded where a functioning trap has been checked and no animal has been captured.

For bait stations and toxic-control operations, the following information will be recorded where applicable:

- bait-station location and unique identifier;
- date of deployment and servicing;
- toxicant and bait formulation;
- product name and batch number, where available;
- quantity of bait deployed;
- quantity remaining or consumed;
- evidence of target or non-target bait interference;
- date and quantity of any bait replenishment;
- quantity of bait recovered at the conclusion of the operation;
- station condition and maintenance requirements; and
- any relevant operational observations.

Control-effort information will also be retained so that catch rates, bait uptake and other indices can be calculated consistently. This will include trap nights, device nights, camera-operating hours and the number of functioning monitoring devices, as applicable.

9.2 Monitoring data

Monitoring data will be entered into the same system or linked database and associated with the relevant management area, monitoring location, method and monitoring occasion.

Records will include:

- monitoring method;
- device or monitor identifier;
- monitoring dates;
- number of effective monitoring nights or hours;
- lure or bait used;
- target and non-target detections;
- chew-card or tracking-tunnel results;
- camera images or validated detection records;
- device failures or lost monitoring effort; and
- relevant environmental or operational observations.

Maintaining complete and accurate pest-control and monitoring records is necessary to assess whether management targets are being achieved. Analysis of these data will allow spatial and temporal patterns in pest activity, catches, bait uptake and incursions to be identified and used to guide future control effort and adaptive management.

9.3 Annual reporting

An annual pest-management report will be prepared and provided to the relevant consent authority or authorities and other nominated stakeholders by the date required under the applicable consent conditions.

Each annual report will include, as a minimum:

- a summary of all pest-control, surveillance and monitoring activities undertaken during the preceding reporting period;
- dates, locations, target species and methods associated with each control operation;
- maps showing the location and type of control and monitoring devices;
- a summary of operational effort, including trap nights, device nights, monitoring nights and camera-operating hours;
- target and non-target catch results, summarised by species, management area, device type and, where informative, lure type;
- monitoring results for each target species, including the applicable monitoring indices;
- comparison of monitoring results with the management targets and response thresholds specified in this Plan;
- results of toxic-control operations, including toxicant, bait formulation, quantity deployed, bait uptake and bait recovery;

- records of ungulate detections, browse damage and control undertaken within Browser Management Areas;
- identification of spatial or temporal patterns, including areas of consistently high catch, bait uptake, detection or reinvasion;
- comparison with previous reporting periods;
- any control or monitoring thresholds exceeded and the management response undertaken;
- fence breaches, incursions, device failures or other significant operational incidents;
- difficulties encountered in implementing control or monitoring and the measures taken to address them;
- an assessment of whether the ecological and pest-management objectives of the Plan are being achieved; and
- recommendations for changes to control, monitoring or surveillance during the following reporting period.

9.4 Review of tools and technology

Pest-control and monitoring tools are developing rapidly, including advances in remote reporting, artificial-intelligence-assisted species recognition, self-resetting traps, automated surveillance and lower-residue control methods.

A review of relevant emerging tools and technologies will be undertaken as part of the annual management review. New or improved tools may be incorporated where they:

- are approved for the intended use;
- have demonstrated efficacy for the target species;
- meet applicable animal-welfare requirements;
- provide equivalent or improved non-target protection;
- are compatible with the ecological objectives of the management area;
- improve operational efficiency, surveillance or data quality; and
- do not reduce the effectiveness of the wider control network.

The devices and methods identified in this Plan reflect those available at the time of preparation. They may be supplemented or replaced by equivalent or improved approved tools where this is supported by evidence and consistent with the objectives, targets and performance requirements of the Plan.

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11. Applicability

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

Report prepared by:

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Dr Helen Blackie
Principal Ecologist/ Director
Alliance Ecology Ltd

Appendix A: Fence Feasibility Report

Pest exclusion fencing feasibility report # 2

Macraes

Waitaki District, Otago

Site of proposed pest exclusion fence, Macraes, Otago.

Prepared for Alliance Ecology, Auckland

By

Nigel Broadbridge and John McLennan

pestproof fences

June 2026

Contents

John McLennan, Ph.D QSM
Director, Pestproof Fences Ltd, Havelock North

[redacted]

Summary

The feasibility of building an approximately 9-10 km long, full-height pest exclusion fence around the upper end of a large stream catchment at Macraes, Otago, was assessed by Nigel Broadbridge and John McLennan, representatives of Pestproof Fences Ltd, in June, 2026. Parts of the proposed route had been inspected by Nigel Broadbridge a year earlier, as part of a preliminary investigation of several smaller enclosure sites in the same general area. The 2026 investigations focused mainly on those parts of the proposed route that had not been examined before.

The proposed route of the 'long' fence was chosen by [redacted] of *OceaniaGold*, using a combination of map studies and local knowledge. The route aimed to enclose a minimum area of 250 ha, including some steep rock outcrops still inhabited by threatened skinks. At the same time, the route avoided gold reserves that might be mined in future. The purpose of the site visit was to determine whether it was indeed possible to construct a fence along the mapped route.

The site visit indicated it would be theoretically possible to build a fence along the mapped route, but exceptionally expensive and difficult to do so. In some places, the fence would have to be hand-built up near vertical hill faces. However, the visit showed that with some relatively minor deviations, a fence could be constructed on or near most of the mapped route. These deviations and the reasons for their selection are the main topics of this report. None of the recommended deviations impinge on known gold reserves or compromise ecological objectives.

The estimated length of the fence with the recommended route adjustments and a 5% contingency is 9660 metres, a figure that may well change slightly with accurate mapping. After fence platform establishment, all parts of it will be accessible by motorbike, an important requirement for routine maintenance inspections. The proposed route straddles several waterways with culverts that will require checking after storm events.

The indicative cost of the fence is $5,376,385 + GST. The figure accurately reflects current circumstances, but is sensitive to exchange rate fluctuations and changes in the costs of freight and fuel. The fence would take 4 people about two years to build. In the Macrae's environment, with its favourable atmosphere (salt-free) and substrates (near neutral Ph) the fence should last at least 50-70 years. More importantly it should perform well, in the way virtually identical exclusion fences have in comparable landscapes elsewhere in Otago.

1 Introduction and brief

This report describes the feasibility, technical considerations, and costs of building a 9-10 km km long full-height pest exclusion fence at Macraes, Otago. It follows on from an earlier report prepared a year ago for Alliance Ecology, which assessed the feasibility of building several smaller enclosures is the same general location (Broadbridge and McLennan, 2025).

The 2025 report included general descriptions of the site and full height pest exclusion fences which wont be repeated here. The information on costs is presented again, updated to reflect current currency exchange rates, and the actual features of the proposed route of the 'long fence' itself. This route differs in several respects from those of the shorter fences investigated previously.

The proposed route of the 'long' fence was inspected by Nigel Broadbridge and John McLennan on June 5, 2026. The route had been selected by [redacted] of *OceaniaGold,* based on map studies and detailed local knowledge of the site. It included sections that had been assessed in 2025, and new ones that had not been examined before. The proposed route encircles about 250 ha of mixed terrain with rocky substrates. It avoids gold deposits that might be mined in future, but includes significant reptile habitats, some still inhabited by threatened skinks.

The purpose of the site visit was to assess whether it was indeed possible to build a full- height, long-lasting, pest exclusion fence along the proposed route. Most of the day was spent checking potential waterway crossings and a series of deeply dissected gullies on those parts of the proposed route that had not been inspected before. The easier parts were viewed from a vehicle (thanks Scott) and the steeper parts were walked. The findings and conclusions are presented below.

2 The proposed route

The route examined during the site visit is shown in Fig.1. It straddles the upper section of a steep-sided catchment containing a permanent stream. The terrain along the way varies from flat to steep and the substrate is rocky. Most of the proposed route is 'easy' to fence, and about 30% is not. Some of the difficult sections are exceptionally difficult to fence - though still technically feasible if there were no acceptable alternative routes. The most challenging sections would have to be hand-built at the outset, then walked thereafter during routine maintenance inspections, substantially increasing costs. We therefore considered ways to avoid the very difficult sections during the site visit, and present our recommendations below.

Fig. 1: *Route of the proposed fence, as identified from map studies.*

2.1 Upper catchment, south-western corner

The stream that flows through the proposed enclosure enters it in the south-western corner via several small tributaries (Fig. 2). The mapped route (white line in Fig. 2) crosses the main tributary in a location that is not ideal for culvert establishment. A better location for the crossing exists further upstream (Fig. 2) in the place indicated by the red line. This location also provides a more gradual exit from the culvert up to the road, and then eventually along the road back to the mapped route.

Four inflow culverts (where the water passing through the culvert flows into the sanctuary) are required along this part of the recommended route (Fig. 2, blue arrows). The existing culvert under the road in the main tributary would require replacement. Two of the culverts are small (requiring 200 mm-300mm pipes) and two are of medium size (approximately 530- 600 mm pipes).

The proposed route change in the south-western corner adds another 85 linear metres of fencing to the enclosure perimeter and another 4.8 ha to its total area.

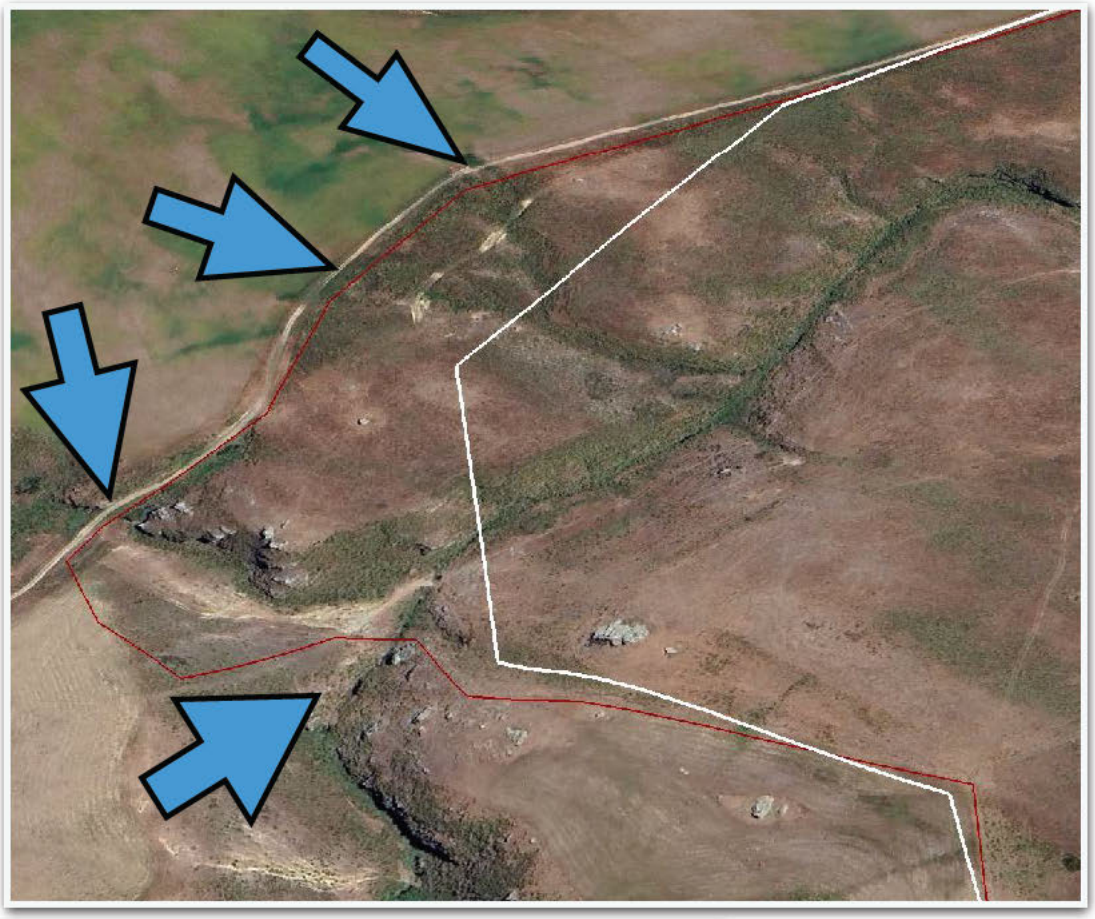


Fig. 2: *Proposed route change (red line) south-western corner, where the stream flows into the proposed enclosure. There are four inflow culverts in this area (blue arrows) all with ephemeral flows that probably dry up altogether in summer. The main inflow (lower photograph) is steep sided but narrow. Culvert establishment here, in the position indicated by the red line, would be straightforward.*

2.2 Southern boundary

The preferred route here is virtually identical to the mapped one, with the only recommended variations being small extensions to two corners Fig. 3. These extensions add approximately 156 metres to total perimeter length.

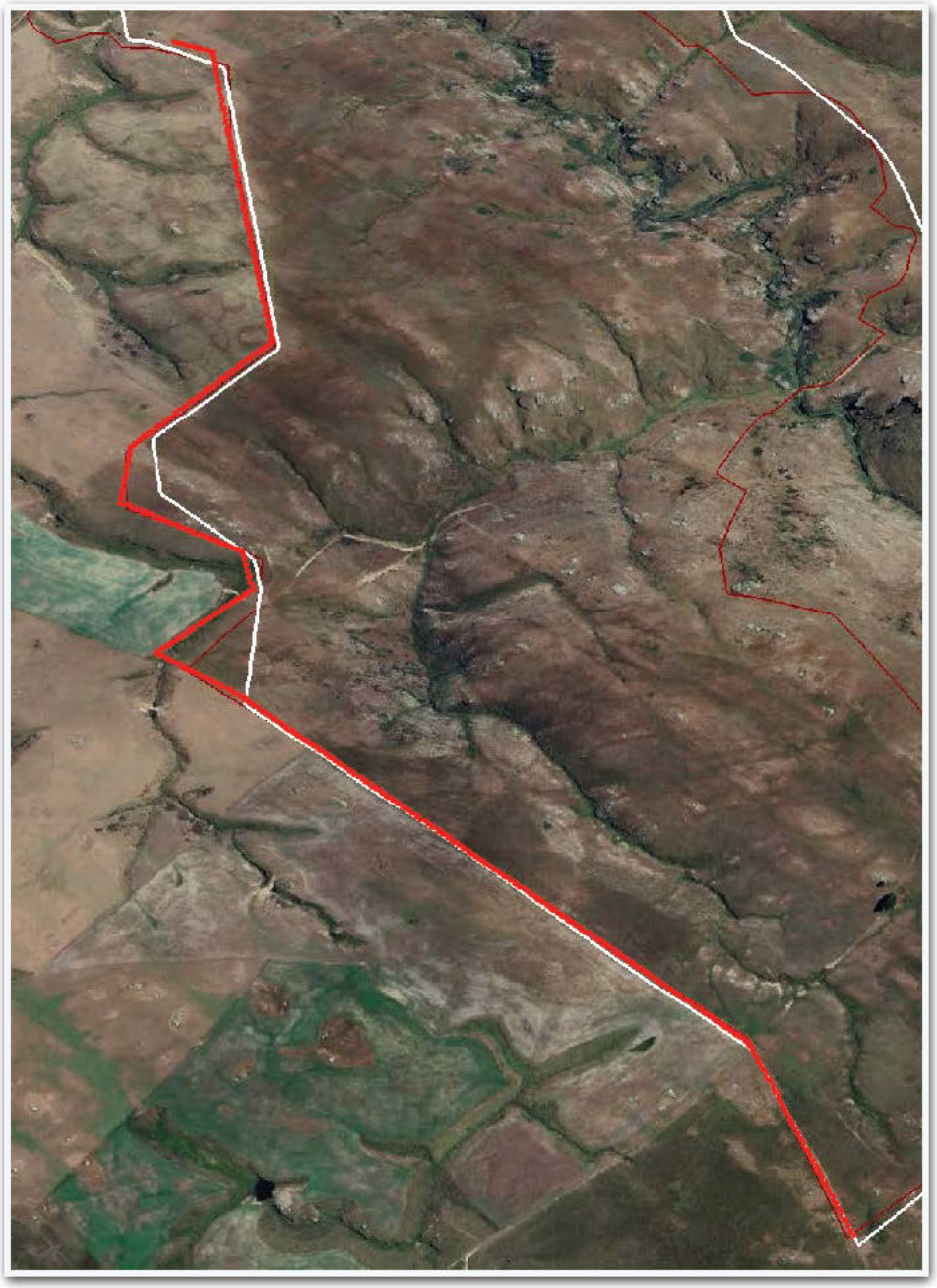


Fig. 3: *Recommended fence route, southern boundary.*

2.3 Eastern end

The preferred route at the eastern end is identical to the mapped route. There is potential to move this boundary further eastwards, if required (see 3.0).

Fig. 4: *Recommended fence route, eastern boundary.*

2.4 North eastern corner to stream crossing

The part of the route between the green arrows is problematic (Fig. 5). The mapped route angles down a steep hillside, traversing some large rock outcrops along the way, before crossing the stream and climbing almost vertically up a steep face to the crest of a hill on the true left bank. Fortunately there are easier route options both above and below it, so it does not have to be used. These easier options are described in Figs. 6 and 7.

Fig 5: *Mapped route, descent from north-eastern corner to the stream, then beyond to the crest of a hill.*

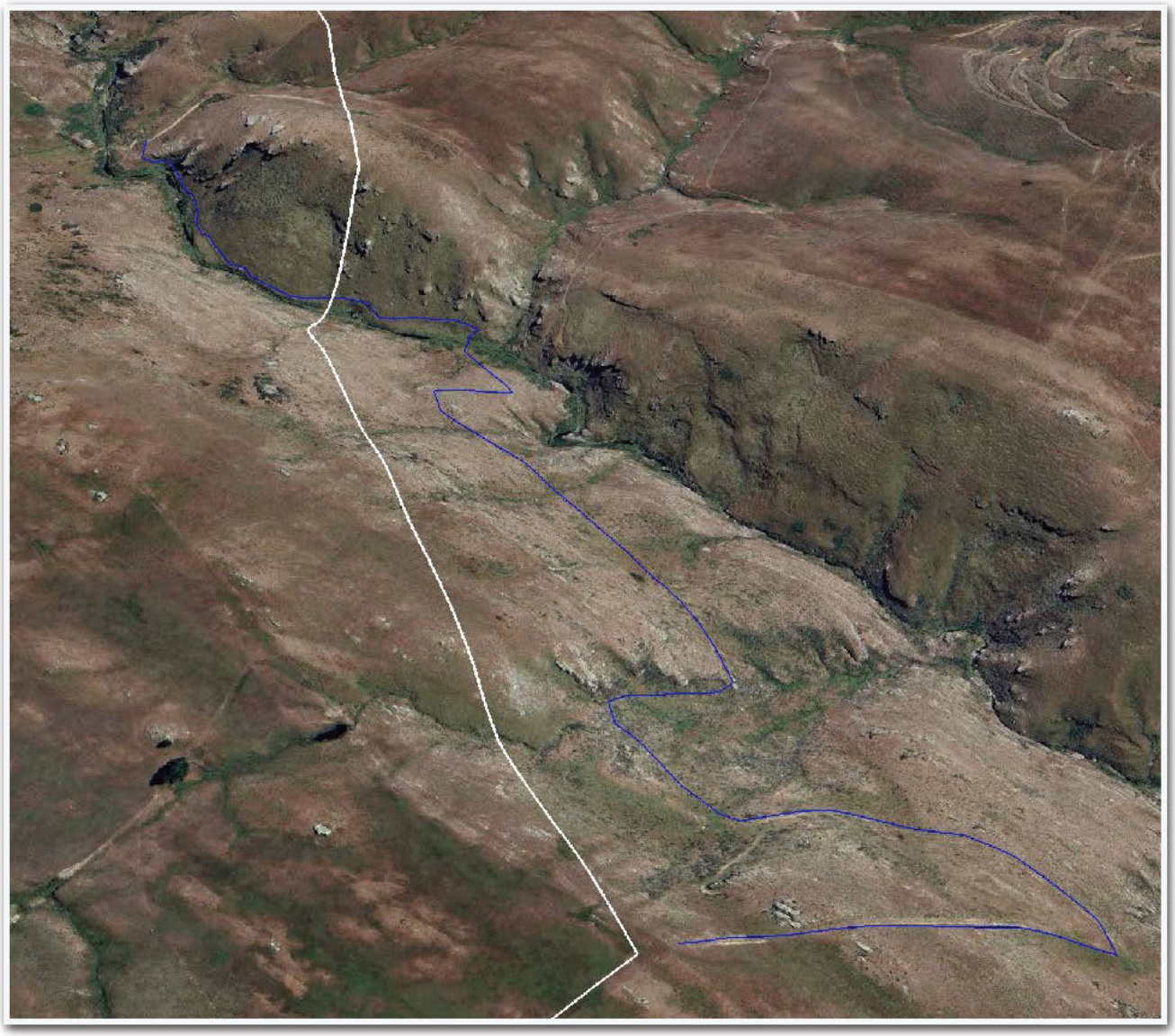


Fig. 6a: *Blue route option, below the mapped line.*

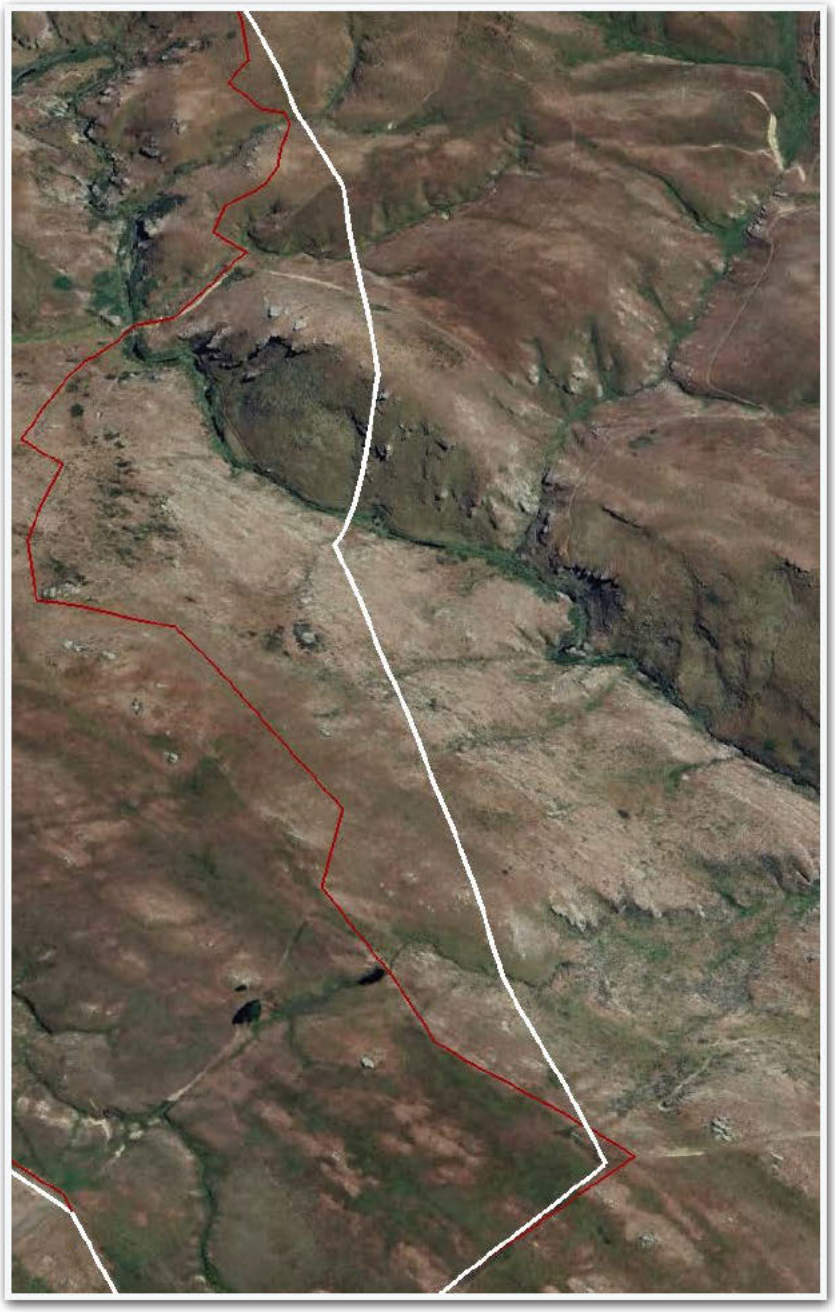
Fig. 6a shows the blue-route option below the mapped route. It picks its way round various obstacles and across a steep gully before running across a toe slope towards the stream. Most of this route is steep and strewn with rocks (Fig. 6b) requiring significant bench cuts to establish a fencing platform. The final 50 m descent into the stream is also steep, but the stream crossing itself is relatively narrow and suitable for the establishment of an outflow culvert. Once across the stream, the route makes use of a historic water race (presumably built by Chinese miners) that sidles just above stream level around the base of the hill (Fig. 6c). The race itself would have to be widened significantly to convert it into a fence platform, destroying its historic value, but it would remove the need to build up the steep face behind it - a formidable technical challenge. The blue route terminates at the road crossing in the top left corner of Fig. 6a.

Fig. 6b: *Typical terrain on the descent down to the stream, blue route option.*

Fig. 6c: *Historic water race running across the hillside on the true left bank of the stream. The photograph also clearly shows the almost sheer face of the hill behind.*

The blue route option would add about 1050 m to the fence, and 20 ha to the enclosed area. It is important to note that the blue route would require extensive earthworks, substantially increasing costs, and a consent to widen the historic water race may not be granted. It therefore is better than the mapped line but still challenging.

The “up hill’ alternative route (red line) shown in Figure. 7 is significantly better than both the blue and mapped routes; and it is the one we recommend. It presents no significant technical challenges, but would require extensive earthworks in some places. Its disadvantage is that it reduces the size of the enclosure by about 40 ha.



Culvert establishment in the location indicated by the red line would be straightforward. A significant structure, similar to the one in Fig. 8a, is required to cope with peak flows. The structure would need to be mounted on a concrete platform, requiring stream diversion for establishment. The stream here appears to be permanent (Fig. 8b) so fish passes would also be required. The culvert would be an “outflow’ type, which have fewer maintenance requirements than ‘inflow’ models.

Fig. 7: *Recommended route (red line) for the descent down to the stream.*

Fig. 8a. *Example of a large inflow culvert, mounted on a concrete foundation, appropriate for the site.*

Fig. 8b: *Stream topography in the vicinity of the proposed crossing location*

2.5 Left bank of stream crossing, up to mapped route

This section, from the stream up to the mapped line, is about 400 m long (Fig. 9). It includes a short but very steep ascent, indicated by the green arrow, but is otherwise routine. A zig-zag would have to built here to provide motorbike access. A small inflow culvert is required in the gully (blue arrow).

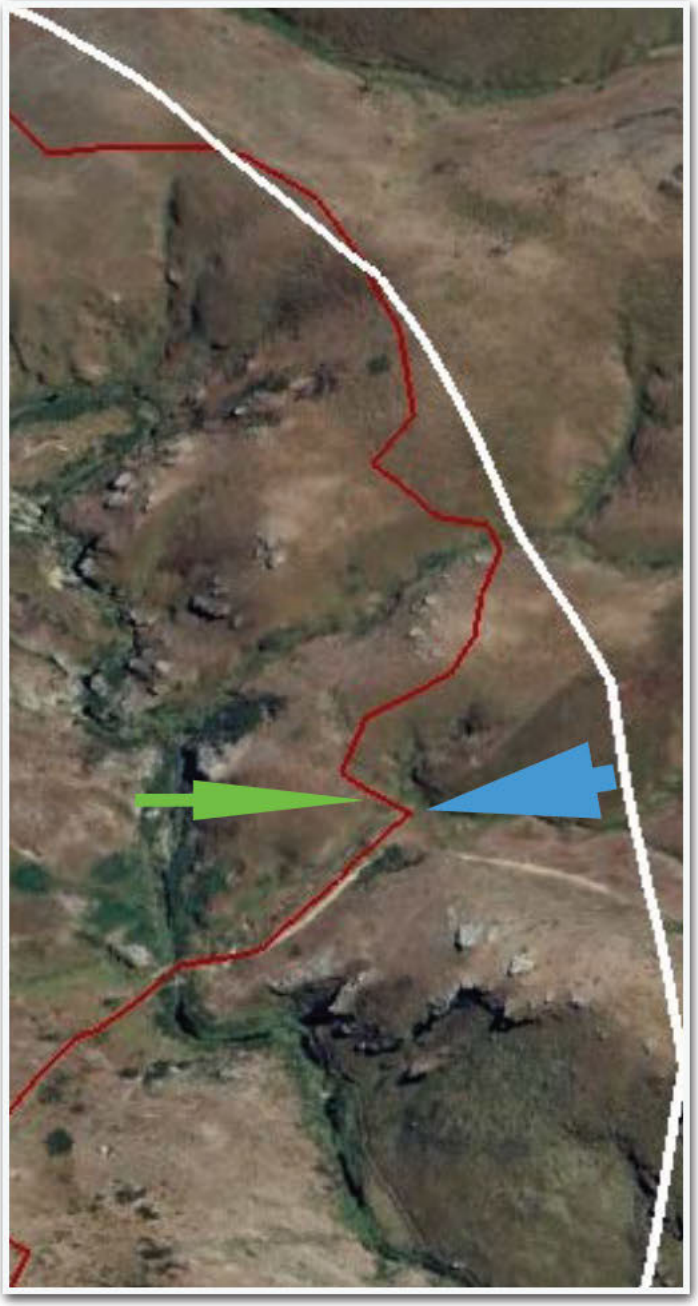


Fig. 9: *Ascent from the stream crossing up to the mapped line.*

2.6 Remainder of the route

For the remainder of the route - about1730 m - the mapped line can be followed more-or-less exactly. We recommend some minor departures (Fig. 10) to take advantage of favourable waterway crossings, but these are optional. A series of inflow culverts (at least 5) are required along this section, some relatively large. In some cases, the crossings are wide (Fig. 11) requiring considerable quantities of fill to bridge them. Extensive earthworks will also be required to establish a building platform in some steep-sided gullies.

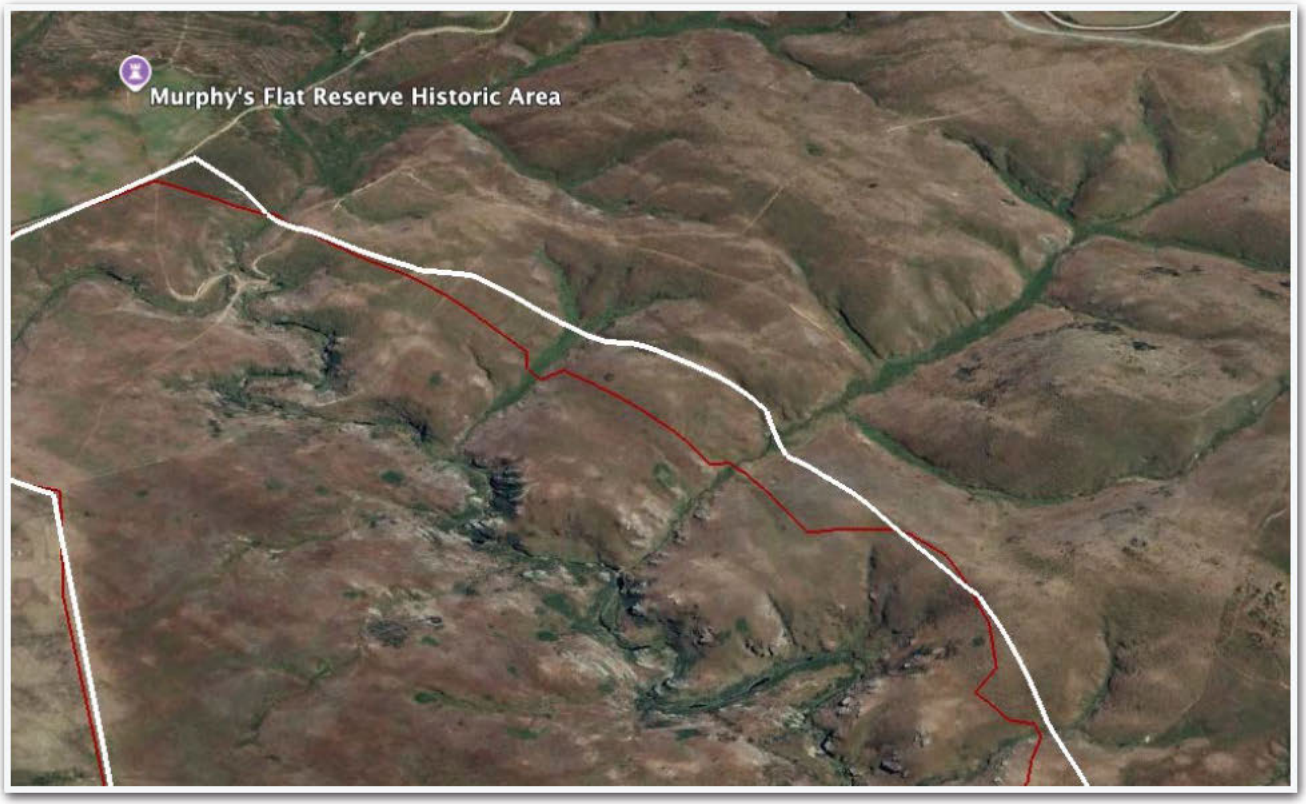


Fig. 10: *Recommended route along the true left bank of the stream. The fence along this section can follow the mapped route exactly, if required.*

Fig. 11: *The proposed route along the northern side of the enclosure traverses a series of gullies, each requiring an inflow culvert and extensive earthworks on the culvert approaches. The one shown here is representative of all of them. The landforms between the gullies are flat or undulating, highly favourable for fence construction.*

3.0 Enclosure size with recommended route changes

If all of the recommended route changes are adopted, the enclosed area will be approximately 235 ha, some 15 ha less than required. The easiest way to make good the shortfall is to move the eastern boundary further east; one possibility is shown in Figure. 12. This route was not 'ground truthed' during our visit but appears to 'fenceable'.

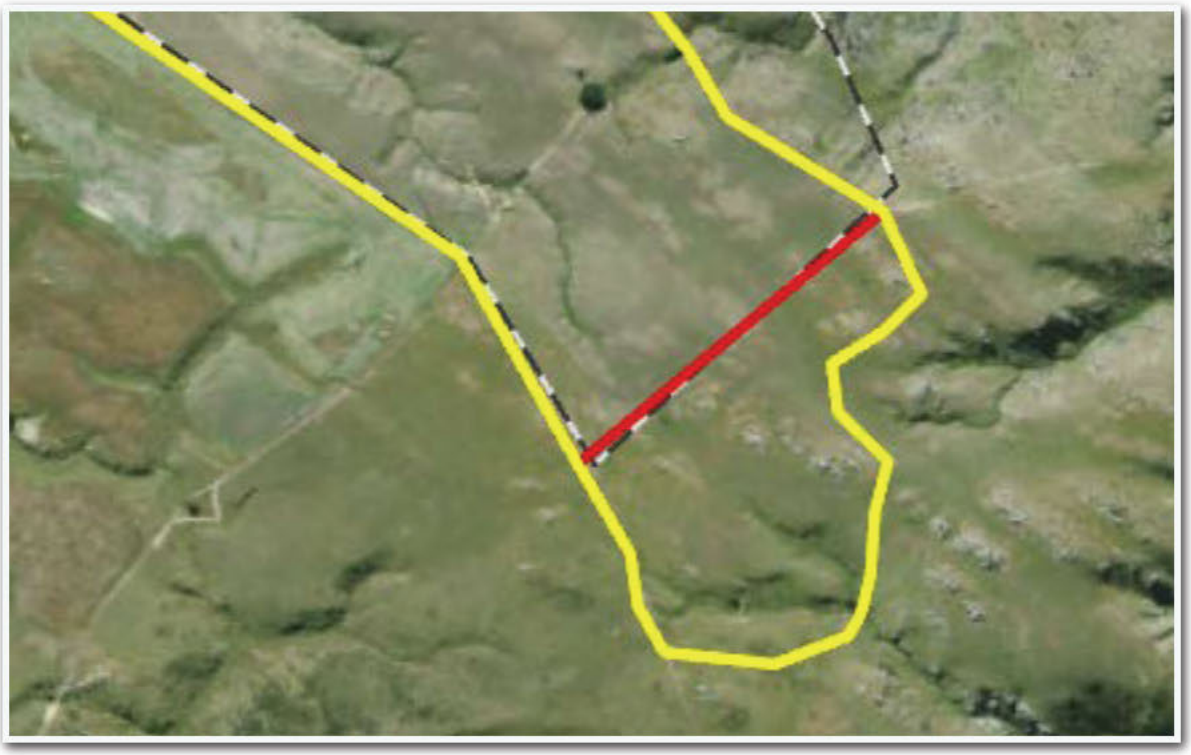


Fig. 12: *Possible extension to the eastern end of the mapped route to offset area losses resulting from route changes elsewhere round the perimeter. Map kindly supplied by Helen Blackie.*

4.0 Indicative costs

In the 2025 report, we indicated the base cost of a full-height mouse-proof exclusion fence was **$465+ GST/** linear metre. This indicative price included all on-site costs (materials, labour, machine costs, insurance) for a full height exclusion fence constructed of galvanised metal components and wooden posts. It did not include staff accommodation costs (if applicable), the costs of transporting people and materials to site (variable) and some minor administration and overhead expenses. It also did not include culverts, gates, and the cost of additional earthworks, (over and above standard earthworks) in those places where they would be required.

Over the last 12 months, the base cost has increased to **$471 + GST/ m,** due mainly to exchange rate movements and increases in diesel and shipping costs. The medium and large inflow culverts have been re-designed to include overflow features which will protect the fence during extreme floods; these additional features have slightly increased their costs. Otherwise all other costs remain unchanged.

The indicative cost of the' long' fence is **$5,376,385+ GST** (Table 1). The figure assumes a total length of **9660 m,** with 53% of the build on easy terrain, 16% on medium terrain, and 31% on steep or very steep slopes. The estimated length includes a 5% provision for undulations and fine-scale route adjustments during construction.

This estimate is not a quote, but is accurate as possible. It includes everything. The 'extras' comprise estimated freight and travel and accommodation costs for the construction crew - costs

that will be determined exactly when a construction plan is developed. With a team of four, the build would take approximately two years. Accommodation and travel costs will therefore depend on the composition of the team and where they are based. Similarly, freight costs will be those that prevail at the time.

The estimate assumes the mesh is galvanised, with no colour coat. An example of it is shown in Fig. 2 in the 2025 report. In our view, it is appropriate and the best choice for the proposed site.It is long-lasting and visually compatible with the surrounding landscape. . Alternatives are available, at additional cost. By way of example, a black galvanised product with exceptional durability would add $38.47/ m.

Item	Quantity	Cost	Total
Fence including 5% contingency	9,660 metres	$471/m	$4,549, 860
Earthworks: additional expense for medium terrain	1545 metres	$13.50/m	$20,875.50
Earthworks: additional expense for steep terrain	2995 metres	$50/m	$149,750
Small inflow culverts	4	$6300	$25,200
Medium inflow culverts	3	$26,600	$79,800
Large inflow culverts	4	$47,400	$189,600
Very large outflow culvert	1	$125,000	$125,000
Pedestrian gate (closed cell with frame)	1	$25,300	$25,300
Vehicle gate, 3.6 m wide on concrete footing	3	$19,800	$59,400
Pedestrian gate, single door with lock	3	$7,200	$21600
Estimated ‘Extras’	1	$130,000	$130,000
Total			**$5,376, 385 + GST**

Table 1: *Indicative cost of the proposed fence, constructed on the route recommended in this report.*

5.0 Overall summary and conclusions

The proposed fence is completely 'doable' with the route variations recommended in this report. The build itself would still have a number of technical challenges, but none new. They are similar to ones we have encountered previously in builds near Queenstown and Alexandra - both in steep rocky terrain with deeply incised stream channels. The proposed build is notable for its unusually large number of water crossings, in part due to the need to avoid gold reserves. If this restraint was removed, the fence route along the northern boundary could be shifted further north to avoid some gully crossings. This would increase fence length but simplify the build and reduce overall costs. As noted in the 2025 report, the larger culverts probably require resource consents to install.

The exclusion fence priced here has a proven track record for both durability and performance. A virtually identical one at Aldinga near Alexandra has produced outstanding outcomes for skinks and geckos, summarised in a recent newsletter (Norbury, 2026). It has effectively excluded predators for many years, most notably mice. It provides proof of concept - that total pest exclusion is achievable in steep rocky Otago landscapes that might at first glance appear 'unfencable'. This suggests strongly the 'Aldinga outcome' is also completely achievable at Macraes - in a larger but otherwise geographically similar site.

John McLennan
Nigel Broadbridge

pestproof fences

June 2026

Reference

Norbury, Grant: 2026: Mokomoko Newsletter, No. 24, June 2026. Central Otago Ecological Trust, Alexandra.

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