

Appendix 16: Pest Management Plan

Pest Management Operations Plan

Whitehall Quarry Expansion
Prepared for Winstone Aggregates

31 July 2025





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1.0 Background

Whitehall Quarry is an existing greywacke hard rock quarry operation situated some 9 km east of Cambridge in the Waikato region of New Zealand. Winstone Aggregates propose an expansion of Whitehall Quarry to meet the current and projected demand for supply of aggregate.

Winstone Aggregates propose to extend the pit in a westerly direction by approximately 15.5 ha in area. The pit expansion to the west will extend marginally beyond the Significant Mineral Extraction Zone and into Rural zoned land. The pit expansion will also result in the removal of 5.46 ha of vegetation within Significant Natural Areas (District Plan reference SNA WP527 and SNA WP 530).

The purpose of the Pest Management proposed is to strengthen the protective measures for local populations of indigenous vegetation and indigenous fauna, including habitat for refuge, foraging, breeding and rearing to contribute to a broader Waikato regional strategy for indigenous biodiversity and ecosystems.

Pest animal management has been identified as a key component of the overall effects management for the proposed expansion works. A Pest Management Operations Plan (PMOP) is therefore proposed which includes operational detail in relation to pest control and ongoing pest monitoring.

A baseline pest monitoring programme has been initiated, which will inform the pest species present, and their abundance, the identified pests will need to be suppressed to the target levels identified in this plan to protect the indigenous flora and fauna values within the project site, so that the residual species and those returning have a greater likelihood to successfully survive and breed.

2.0 Purpose of this plan

2.1 Purpose

The purpose of this PMOP is to provide the operational detail required to deliver successful pest management throughout the Whitehall Quarry project area. Best practice pest monitoring and control methodologies, guidelines, schedules, equipment required and specific detail has been provided to guide those delivering the pest management activities at Whitehall Quarry.

The Assessment of Terrestrial Ecological Effects (Boffa Miskell 2025) identified the Significant Natural Areas (SNAs) as having very high ecological values due to the vegetation type and presence of habitat and roosts for long-tailed bats. Accordingly, these SNAs meet the criteria for an area of significant indigenous biodiversity as defined in the Waikato Regional Council, Operative Regional Policy Statement ('WRC RPS').

The effects management recommended for the loss of habitat includes a comprehensive pest and weed management programme for a replanted enhancement area and for the remaining SNAs (Map 1). Well-targeted pest control will contribute to successful rehabilitation of the enhancement planting area, and to enhanced habitat for refuge, foraging, breeding and rearing of indigenous flora and fauna.

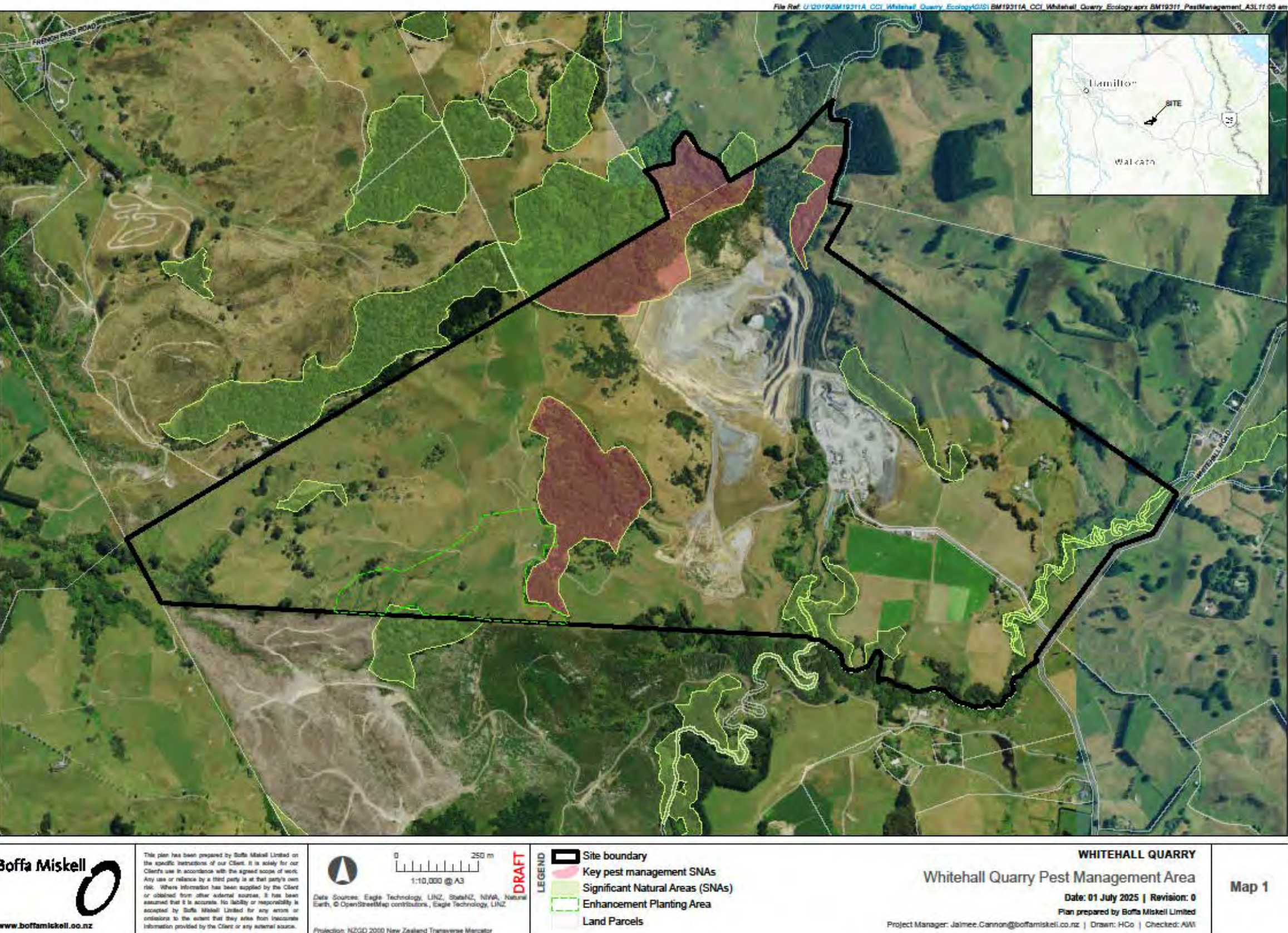
2.2 Objective

The objective of this Pest Management Operational Plan is:

- Suppress target pest species to acceptable levels for the protection benefit of indigenous flora and fauna within SNAs and enhancement planting areas of the Whitehall Quarry boundary.

3.0 Pest Management Area

Map 1: Whitehall Quarry expansion - pest management areas.



4.0 Target pest animal species

The species of pests for target is shown in Table 1.

Table 1: Target pest animal characteristics and behaviours.

Possums (<i>Trichosurus vulpecula</i>)	Possums are found in a diverse range of habitats, with highest densities in native podocarp-broadleaf forests. Possums heavily browse on native vegetation and can eat bird eggs, chicks and invertebrates, negatively impacting the ecosystem. Home range size is strongly influenced by habitat. In native forests, typical home ranges are 1-2 ha, but ranges can be much larger in in pine forest fragments (6-12 ha), and at dryland sites (22-60 ha). Home ranges of males are usually larger than those of females.
Rats (<i>Rattus spp.</i>)	Both Ship rats (<i>Rattus rattus</i>) and Norway rats (<i>Rattus norvegicus</i>) feed on native vegetation, especially seeds in mast events, negatively impacting forest health. They are known predators of invertebrates, herpetofauna, and native bird eggs, chicks, fledglings, and adults and have caused several local population losses and contributed to the extinction of some native species. Home range size is inversely related to population density. At typical density of 2-9 rats/ha in podocarp-broadleaf forest, average ship rat home range size is 0.1-1.0 ha, while in low-density beech forest home ranges can be much larger at up to 11 ha. Norway rats occupy larger home ranges of approximately 0.8-21 ha in size.
Feral cats (<i>Felis catus</i>)	Feral cats are one of the most successful predators in Aotearoa. They are capable of predating on adult kiwi, as well as their eggs and chicks. Their diet typically consists of small mammals such as rabbits, hares and rodents, birds and their eggs, and, to a lesser extent, lizards and invertebrates. Feral cats are usually solitary and sparsely distributed, impacting native species across a wide landscape. Measured home ranges are highly variable and can range from less than 20 ha to more than 2000 ha. Males typically have larger home ranges than females.
Mustelids (<i>Mustela spp.</i>)	Stoats (<i>Mustela erminea</i>) are the most common and destructive mustelid in New Zealand. Stoats are found in all ecosystems, and breed once a year, however, can produce up to ten young per litter, multiplying to uncontrollable levels quickly. Stoats seriously impact native avifauna, especially ground dwelling/feeding birds, such as kiwi and saddleback. Ferrets (<i>Mustela furo</i>) inhabit more open areas such as coastal habitats, pastoral lands and forest margins, consuming a diet predominantly of rabbits and hares. Ferrets can produce up to two litters per season. Like weasels and stoats, ferrets can cause devastating impacts to native wildlife populations and have large home ranges meaning that they can disperse to new accessible areas relatively easily. Weasels (<i>Mustela nivalis</i>) can easily be displaced by stoats and because of this, are present in most New Zealand ecosystems, but not all, in low numbers. Even at low densities, weasels are known to impact native wildlife, including invertebrates herpetofauna, and birds. They produce two to three litters a season, with four to six young per litter.
Feral Goats (<i>Capra hircus</i>) and Feral Deer (<i>cervus sp.</i> , <i>Dama Dama</i>)	New Zealand's native plants are particularly vulnerable to damage from introduced mammalian browsing. Herding browsers such as goats and wild deer cause two-fold damage by eating native plants and by trampling large areas of vegetation and compactable soils. Goats and deer will also strip bark off trees and by eating young seedlings they effectively put a stop to forest regeneration. This takes vital food and shelter from native animals and can worsen the effects of climate change.
Feral pigs (<i>Sus scrofa</i>)	Feral pigs eat a wide variety of food including grasses, roots, seeds and other plant material as well as carrion, invertebrates (e.g. snails) and ground-nesting birds. They damage forests by uprooting trees and saplings and eating native plants and invertebrates. They also eat pasture and crops and are known to be carriers of bovine tuberculosis and leptospirosis. Feral pigs breed throughout the year. Each litter comprises 6-10 piglets but only 3-6 are likely to survive. Newborn piglets stay within or near the nest for first 2-3 weeks, wean at 2-4 months and stay with the sow until the next litter is due. Feral pigs can act as a vector for kauri dieback disease.
German wasps and Common wasps (<i>Vespula spp.</i>)	Wasps also eat huge numbers of native insects and have even been seen killing newly hatched birds. Social wasps live as colonies in nests of honeycomb-like cells. They form complex social groups and all members of a colony help raise the young. Seasonally in some beech forests there are an estimated 12 nests, or 10,000 worker wasps, per hectare.
Rabbits (<i>Oryctolagus cuniculus</i>) and Hares (<i>Lepus europaeus occidentalis</i>)	Rabbits breed rapidly and populations can recover quickly after being reduced by disease, control pressures or environmental changes. They eat a variety of plant matter including grasses seedlings of trees and crops. Rabbits can breed rapidly. Females may be pregnant for 70% of a year and can produce a total of 20 – 50 young each. Some wild rabbits may live up to seven years but life spans are generally much shorter. Hares cause damage to new tree plantings and horticultural crops, amenity plantings and shelter belts by eating tree bark and young shoots.

5.0 Performance Standards for Pest Control

5.1 Pest Animal Targets and Thresholds

Management targets in pest control relate to the “maximum allowable residual pest abundance” which allow native species to recover (Brown et al., 2015). That is, the management target for each species is the ideal goal that the control actions aim to achieve, and to meet the objective as set out above.

The proposed management targets for rats, possums, mustelids, feral cats, wild pigs as well as the thresholds for initiating additional control measures, are based on the Chew Card Index (CCI), or camera trapping index for each target species. We recommend the use of the CCI over Tracking Tunnel Index (TTI) as it provides a single measure for mice, rats and possums. Additionally, CCI is more sensitive to the detection of mice at low densities than TTI. Mice are not a targeted control species in this project at this stage, however chew card monitoring for rats and possums will coincidentally provide data on mice absence/presence and abundance which may be valuable information into the future. We note that the camera trapping index is still in development by DOC, and as such targets and thresholds for mustelids and feral cats may need to be updated as new information becomes available.

The proposed management targets for each species, as well as the thresholds for initiating additional control measures (based on the monitoring results for each species), are provided in Table 2. If monitoring identifies that the targets are not met on any single monitor, this will trigger a requirement for further control (as per section 5.2).

Table 2. Summary of management targets, thresholds for initiating additional control and monitoring frequency for each target pest species within the pest management area.

Pest Species	Management Target	Threshold	Monitoring frequency (as per section 6.0)
Rats	<5% CCI (year-round)	≥10% CCI (year-round)	CCI – x3 checks per annum in May, August & December
Possums	<5% CCI	≥10% CCI	
Mustelids	5 detections per 2000 CH ¹	>10 detections per 2000 CH ¹	Ongoing monitoring via paired trail cameras.
Feral Cats ²	5 detections per 2000 CH ¹	>10 detections per 2000 CH ¹	
Wild Pigs	Zero detections per 2000 CH (Initial elimination, then zero ongoing detections in the fenced areas)	≥1 wild pig detected at any given time	Any observation/sign initiate response
Feral Goats and Deer	0% Density. (Initial elimination, then zero ongoing detections in the fenced areas)	0% Density	Any observation/sign initiate response
Wasps (Vespula sp.)	≥80% reduction in wasp nest flight counts.	<80% reduction in wasp nest flight counts.	Once per annum in summer using wasp nest flight counts

¹ These numbers are based on the draft DOC best-practice guidelines for targets and thresholds for mustelids and feral cats using camera trap indices. The completion of the new DOC best practice guidelines is still in progress.

² Cat targets and thresholds must represent at least 2 different individual feral cats (if distinguishable by markings)

5.2 Response to exceedance of thresholds

The use of thresholds facilitates adaptive management and ensures that pest populations are continuously and effectively suppressed. If monitoring identifies that the thresholds for control targets have not been achieved, this will trigger a requirement for further control.

If the threshold is exceeded for rats and possums:

- Up to two additional ground based toxic control operations targeting rats and/or possums (depending on monitoring results) will be repeated per year, as per the methods outlined in this PMOP. The initial toxin round shall be conducted within two weeks of the threshold being exceeded.
- Trap checks and rebaiting of traps needs to increase to once every two weeks, if not already at this interval.
- A follow-up monitor 4 weeks after the start of any additional toxic control operations needs to occur to determine whether the rat and/or possum population has been successfully reduced to below the threshold. If the threshold falls below the management target, then additional monitoring will not be required.

If the threshold is exceeded for mustelids and feral cats:

- Trap checks and rebaiting needs to increase to every two weeks, if not already. Lures in traps suitable for mustelids or feral cats should be switched to fresh rabbit if available, or salted rabbit if fresh rabbit is not available. Multiple lures can be used in each trap if necessary.
- A follow-up monitor 4 weeks later will occur to determine whether the mustelid population has been successfully reduced to below the threshold.
- If increased trap checks and rebaiting does not return the desired mustelid or feral cat indices below the threshold, other methods will need to be investigated such as the use of remote reporting, self-luring, auto resetting Ai traps (these devices will be available to purchase or rent in 2025).

5.3 Intensive pest animal suppression – best practice

Intensive suppression of pest animals is the ongoing control of introduced pest animals using a range of tools and techniques to decrease (and hold) population densities to low levels. Over large landscapes pests can generally be suppressed to low population densities, but without concentrated ongoing efforts to defend against reinvasion, pests will quickly reinvade, re-establish, and re-populate these areas. Pest animal population suppression requires ongoing and sustained pest control activities to keep population densities low enough for biodiversity protection, survival and breeding.

Throughout the project it will also be vital to monitor the target pest's responses to control activities and the associated outcomes. Monitoring will utilise standardised protocols and guidelines within all areas of this plan. This will result in a valuable dataset, which project managers can use to track the success of the programme and determine where adaptive management is required.

6.0 Pest Animal Monitoring

6.1 Overview

Ongoing monitoring and adaptive responses are key to effective pest animal management. Within the pest management site well-established monitoring tools will be used to monitor pest presence and abundance against the intended targets, and to initiate further control if thresholds are exceeded (as stated in Section 5.2).

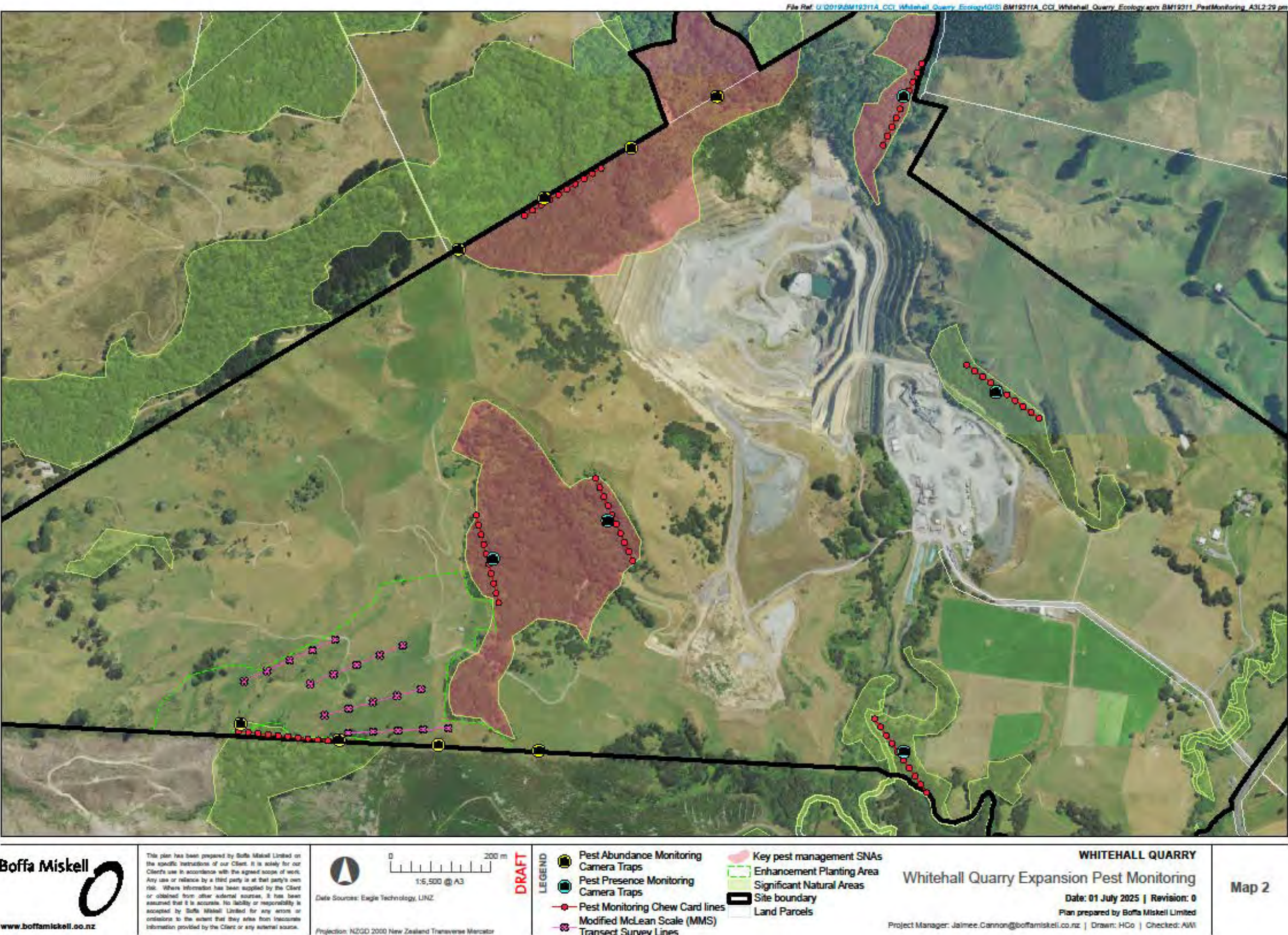
A separate baseline pest monitoring plan has been developed and implemented for this project and will help to inform baseline pest presence/absence, the relative abundance of those pest present, and the targets set within this pest management operations plan. The ongoing pest monitoring programme will use the existing baseline pest monitoring lines and survey points, saving significant additional monitoring setup labour costs. A copy of the baseline pest monitoring plan is included as Appendix 2.

This section outlines the monitoring methods and protocols that intend to guide pest management personnel, namely for chew cards, camera traps, observational monitoring and the potential use of new monitoring technology (Table 2).

Table 3: Pest monitoring protocols/guidelines

Pest Species	Protocol/guideline	Distribution	Frequency
Possums & Rats Map 2 Section 6.2	Chew card index (CCI) Possum Population Monitoring	10 Chew cards per line, cards spaced 20 m apart along lines; 200 m between lines. Up to 6 lines in suitable habitat	Conduct chew card monitor after toxin pulse in June and October in year one, and October from year 2 onwards. Within 4 weeks after toxin control CCI – Seven-night monitor, pre lured cards.
Feral Cats and Mustelids, (and ungulates). Map 2 Section 6.3	Trail Camera with Ezylure or meat lure Predator Detect using Camera Guide	Lines of 4 cameras spaced 200 m apart along a camera trap line. Up to 2 lines in suitable habitat Follow Interim DOC trail camera guide v1.1.1.	SD card from 'Home' Cuddelink camera shall be recovered and replaced at every monthly trap check round. Analyse data and record on TrapNZ
Ungulates Map 4 Section 6.4	Contractors must be highly experienced, have current firearms license(s) and follow the firearms rules. All stakeholders must be notified of ground-based hunting at least 24hrs prior (e.g. NZ Police, Whitehall Quarry managers, boundary property owners etc)	Full systematic survey in fenced areas once pest deterrent fences have been installed. Observational surveying over the entire project area during routine pest control..	Project area outside fenced areas – during routine pest control activity and in spring and autumn annually ongoing. Enhancement planting area – full survey once deterrent fence has been installed. Every spring and autumn years 1-5. Fenced SNAs - full survey once deterrent fence has been installed. during routine pest control activity and in spring and autumn annually ongoing.
Vespula Spp. Wasps Sections 6.1 and 7.4	DoC standard Wasp Nest Flight Count Monitoring Method (DOC-2597036).	Surveys to be conducted within the two key SNA areas.	Pre operation monitoring should occur as close to the wasp control operation (Vespex operation) annually ongoing Post operation monitoring should be at least 10 days after the wasp control has occurred (Vespex operation) annually ongoing
	Vespex pre control monitoring Vespex Wasp Control guide	Two survey sites to be chosen on pasture-bush edge next to the two key SNAs. 20 monitoring devices (jar lids) spaced 5m apart on a straight transect line.	Pre operation wasp activity survey in February/March. Survey at noon on a fine warm day. Vespex monitor again in April if wasp observations detect persistent high wasp activity.
Rabbits and hares Map 4 Section 6.2	A5 Pest rabbits guidelines A7 Pest hares guidelines	Enhancement planting area – modified McClean scale (MMS) survey once deterrent fence has been installed.	Every spring and autumn years 1-5.

Map 2 – Whitehall Quarry expansion - approximate pest monitoring device and survey point locations



6.2 Monitoring for Possum, Rats and Mice: Chew cards

Chew cards 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, mice, and possums. Chew cards, rather than wax tags, have been found to be more effective at attracting possums and rodents, and are recommended by DOC in their National Biodiversity Monitoring and Reporting Framework (Forsyth et al., 2018).

Chew cards will be deployed along six monitoring lines (Map 2) in June and October in Year one, and in October from year 2 onwards (or as required if exceedance of threshold occurs) to align with toxin pulses, seasonal pest abundance variations, and pre/post native bird breeding seasons. Chew cards will be deployed for seven nights, then collected and analysed for pest animal identification and to calculate the CCI for each species. Pest control contractors for this project shall use the following protocol for chew card monitoring and management; [Possum Population Monitoring](#). Refer to table 3 and section 11 for protocol, guidelines and scheduling details.

6.3 Monitoring for Mustelids, Feral Cats and Wild Pigs: Camera Traps

Camera traps have become an increasingly used tool in the past five years (e.g. (Gillies & Brady, 2018; Glen et al., 2013, 2014). Cameras are much more effective for detecting the larger pest species (cats, ferrets and stoats) (Norbury et al., 2017), including in comparison to standard tracking tunnels (Department of Conservation, 2020; Smith & Weston, 2017; Dilks et al., 2020). This success of camera traps is likely in part due to the reduction of a neophobic response (the avoidance of new objects in the environment such as tracking tunnels) with this passive method (Smith & Weston, 2017).¹

Trail cameras will be utilised to monitor for pests within the two key SNA areas within the wider Whitehall Quarry property as identified in Map 3. The camera traps may also detect the presence of native species (e.g. Kiwi) within the site or moving along the ungulate deterrent fence line. Cameras will be deployed and active all year round and shall be checked (as well as the lure replaced) during the monthly checks via the “home” camera.

Camera trap data will be analysed, and a relative camera trap abundance index (RCTI) will be calculated for feral cats, mustelids, possums and rats. The guideline for using camera traps can be found via the following link: [DOC Interim Trail Camera Guide v1.1.1](#).

Due to the relatively small size of the project, and the tight guideline protocols for camera trap separation distances for abundance indexing, the ongoing camera trap pest monitoring for Whitehall Quarry will be split into two distinct operations.

1. Permanent camera traps for ongoing relative abundance indexing:

Two lines (600m long) each with four Cuddelink® cameras paired to an automated Ezylure® luring device at 200m spacing along each line on the property boundary, within/near the key SNAs which are located to the North and Southwest of the quarry pit. These monitoring lines are to be no less than 1km apart. These eight cameras and eight auto dispensing Ezylures® will be deployed and remain active all year round. All camera traps will be checked/serviced as per table 9.

¹ Note: DOC's best practice guidelines for camera trapping (and potential indices from camera trap data for key target species) is currently under development and expected to be completed in 2024. Camera trap methods and targets outlined in this document are based on the draft recommendations (Gillies, 2021) and should be updated based on the final guidelines as they become available

The continuous 24/7 monitoring ability of the Cuddelink® cameras paired to an auto dispensing lure will provide a high level of intel on re-invading pests into the key pest management SNA areas, and significantly reduce labour servicing costs.

2. Permanent pest absence/presence camera traps for ongoing pest monitoring:

Two Cuddelink® cameras paired with Ezylure® devices will be used in the isolated key SNA area immediately to the West of the quarry pit and provide absence/presence pest monitoring data as well as possible pest reinvasion evidence. The cameras and associated lure dispenser shall be no less than 200m apart and be placed approximately halfway along the relative chew card lines.

Therefore, a total of 10 Cuddelink® Trail cameras will be purchased at cost to the project for the baseline pest monitor and ongoing pest management programme.



Figure 1. Cuddelink Camera system – Up to 10 cameras send images via ‘daisy chain’ link to ‘home’ camera, the cell ‘home’ camera delivers images from all Cuddelink cameras to user via LTE.

It is recommended that this project use the Cuddelink cameras to reduce contractor check frequency costs, improve efficiency and provide real time data for immediate response capability to pest incursions (such as feral cats, wild pigs, goats and deer). Refer to table 3 and section 11 for protocol, guidelines and scheduling details.

6.4 Monitoring for Ungulates

Ongoing monitoring for ungulates will be conducted in the pest management areas and over the specific areas surrounding the pest management and enhancement planting areas as detailed in Map 4. Monitoring for ungulates will require a mix of observational surveying whilst conducting routine pest control and/or incidental images of feral deer and/or goats from camera traps targeting other pests.

Faecal pellets are widely recognised as a useful method of monitoring the presence wild pigs. Faecal pellets are usually dark, flattened, roughly oval pellets joined in a large cylinder. For wild pigs, survey using established pest control and monitoring lines looking for disturbance / rooting is also recommended. Damage caused by feral ungulates may also include uprooted seedlings, digging up of earth (in the case of pigs), and chewed bark, leaves or branches (Greater Wellington Regional Council, 2012).

Camera traps will be deployed within the pest management areas for monitoring predators and may also detect wild pigs and other ungulates. Any detection of ungulates on camera traps within the fenced areas will initiate **immediate** ground-based hunting control to remove them from the fenced area. Detection of other ungulates within the overall project site **but outside** the fenced pest management areas will be mitigated through the planned ground-based hunting twice per annum, or if

deemed necessary, through a response ground-based hunt as soon as is possible after the detection. Refer to table 3 and section 11 for protocol, guidelines and scheduling details.

6.5 Monitoring for wasps

Wasp nests will be monitored both before and after treatment with wasp specific toxin to determine success of the operation as per the standard Wasp Nest Flight Count Monitoring Method (DOC-2597036).

If wasp activity threshold increases within one year, wasp control should remain in place for one more season.

Vespula spp. wasps will also be monitored prior to each Vespex toxin operation to determine if the threshold of 10 wasps per 20 monitoring stations per hour is met, allowing for the Vespex toxin operation to be implemented. Refer to table 3 and section 11 for protocol, guidelines and scheduling details.

6.6 Monitoring for rabbits and hares

Monitoring for rabbits and hares will be restricted to the enhancement planting area over years 1-5 from establishment for the protection of seedlings from browsing. By year 5 it is anticipated the plants will be large enough to withstand browsing pressure from these pests. Monitoring will involve the use of the Modified McLean Scale (MMS) to determine rabbit and hare population levels. Refer to table 3 and section 11 for protocol, guidelines and scheduling details.

6.7 'Smart' monitoring technology

In addition, new real-time, remote reporting, species recognition monitoring/control technology (e.g. Ai CritterPic™, AT510Ai trap, Critter Solutions Ai Trap) may be incorporated into the project as it becomes available, which will allow for instant (real-time) detection of pests and tracking of populations. New technologies also have the advantage of higher detections of all pest species, but particularly smaller species such as rats and mice. This greatly enhances management approaches and cost efficiencies by significantly reducing field labour and allowing rapid responses to pest increases. In addition, the 'set-and-forget' nature of these technologies also reduces human impact associated with frequent monitoring which has the potential to disturb / kill sensitive ground based native fauna. Real time AI monitoring tools can also be used to detect the presence of larger predators e.g., feral cats and ungulates.

7.0 Pest Animal Control

7.1 Overview

Pest animal control will be applied over the entire pest management area, specifically within the SNAs and enhancement planting area of the Whitehall Quarry property. The pest animal control is proposed to be operational for 30 years.

Control methodologies will include an adaptive and integrated approach using approved kill traps (manual and self-resetting/self-luring), the use of vertebrate toxin agents (VTAs), ungulate deterrent fence and ground-based rabbit, hare and ungulate hunting/fumigation techniques.

7.2 Initial pest knockdown

An initial rodent and possum² knockdown pulse using Vertebrate Toxin Agents (VTAs) through all bait stations shall be implemented prior to the removal of any habitat associated with the quarry expansion. All proposed traps shall be installed, loaded with lure and set at this time also, and will target mustelids, possums, rodents and feral cats. At least two fortnightly checks of the perimeter and internal lines' single set kill traps shall be carried out prior to the removal of any quarry expansion habitat.

The objective of this knockdown is to significantly reduce the abundance of key pests/predators in the expansion and surrounding habitats to improve the abundance indigenous fauna through greater protection. The knockdown of key pests prior to habitat removal is likely to increase the chance of indigenous species breeding and recruitment success (especially long-tailed bats) in the season prior to the habitat loss. Sections 7.3, 7.4 and 11 provide the operational details for the initial trap and VTA knockdown.

Table 4: Control method/s employed for each species within this predator control plan.

Target Species	Control Method/s
Possum	Vertebrate toxic agents/kill traps
Ship Rat	Vertebrate toxic agents/kill traps
Norway Rat	Vertebrate toxic agents/kill traps
Ungulates	Contractor Hunting
Feral Cats	Vertebrate toxic agents (Secondary)/kill traps
Mustelids	Vertebrate toxic agents (Secondary)/kill traps
Hedgehog	Kill traps
Rabbits and Hares	Contractor Hunting
Vespula Wasps	Toxic control (Vespex)

Note: Mice are not directly targeted in this plan but will be a by-kill result of VTA and kill trap operations.

² (including mustelids and feral cats if secondary toxin is used)

7.3 Pest Animal Trapping

Trapping is a very effective way of targeting pest species across the landscape. There are many factors that need to be considered to create an efficient trapping network, such as the behaviour of the target predator, efficacy of the trap, the type of habitat and landscape that is being trapped, and the labour capacity and skills. Trapping needs to be a dynamic process whereby predators are monitored over time and trapping efforts amended to reflect any changes to predator populations.

As outlined in section 7.2, all planned traps shall be installed, lured and set for **at least** two fortnightly check rounds prior to the removal of any quarry expansion habitat.

The recommended pest/predator control trap types for this intensive pest suppression programme are described throughout the following sections, including the required distribution, frequency of checks, lure required and other key considerations (Table 5). Links to current best practice guidelines are also included in the table and shall be used by all pest control managers and personnel to deliver all pest management activities.

Table 5: Predator/Pest trapping guidelines including devices and specific guidelines/protocols, distribution of control devices, frequency of checks, lures required and other important considerations. This table will form a practical template upon which the operational team will be able to effectively deliver this control programme. The number of devices required has been accounted for in the equipment/devices required Table 9.

Target Species	Control device and guidelines	Distribution	Frequency	Lure (Switch out lures based on seasonality food sources).	Other considerations
Possum, rats,	AT220 Predator Free 2050 – A practical guide to trapping	Traps placed on perimeter and central internal lines only. One trap every 200m on the central pest control lines (to reduce servicing frequency on these lines).	Traps checked monthly to ensure: - traps are working correctly (green light showing). - remove any jammed carcasses - battery power is good - lure is dispensing - the recording of any carcasses below the trap	Auto Self-luring for 4-6months (one lure pouch comes with trap). Add possum 'blaze' on ramp and tree/post	Wooden ramp access Place trap at height above pigs/deer/goats reach.
Possum, feral cats	SA2 Kat trap Predator Free 2050 – A practical guide to trapping	Traps placed on perimeter and central internal lines only. One trap every 200m.	Trap check fortnightly to remove any catches and rebait/reset. Each visit – If not sprung set off trap and reset to keep trap in good working order Record catches and sprung traps	Apple and Blaze lure (if targeting possums) Fresh or tinned Fish Fresh rabbit for feral cats plus either: Smooth in a tube (possums) Peanut Butter and cat biscuits (Fish flavoured). Poa uku (Mustelid) can be laced through back of trap. ALD (egg mayo) or Ezylure option	Wooden ramp access Could add ALD into back of SA2 Drill holes in wooden base plate for applying soft lures Change lure depending on target species
Stoat Weasel rat	DOC200 double-set Predator Free 2050 – A practical guide to trapping DOC Skillable video	One trap every 200 m along control lines 200 m apart.	Trap check fortnightly to remove any catches and rebait/reset. Each visit – If not sprung set off trap and reset to keep trap in good working order Record catches and sprung traps Calibration service/check every 6 months	Salted rabbit (preferred option) Hen eggs or plastic eggs (preferably uncleaned) during winter months Poa uku long life lure (mustelid). Connovation Eggsellent Fresh fish Auto dispensing lures ALD (egg mayo) or Ezylure Connovation Lure it Salmon on trails between traps	Calibration - every 6 months Can add ALD or Ezylure to roof of trap. Has potential to also capture Hedgehogs, Norway rats, Ship rats
Ferret	DOC250 single set Predator Free 2050 – A practical guide to trapping	One trap every 200 m along control lines 200 m apart.	Trap check fortnightly to remove any catches and rebait/reset. Each visit – If not sprung set off trap and reset to keep trap in good working order Record catches and sprung traps Calibration service/check every 6 months	Salted rabbit (preferred option) Hen eggs or plastic eggs (preferably uncleaned) during winter months Poa uku long life lure (mustelid). Connovation Eggsellent Fresh fish Auto dispensing lures ALD (egg mayo) or Ezylure Connovation Lure it Salmon on trails between traps	Calibration - every 6 months Can add ALD or Ezylure to roof of trap.
Norway rat Ship rat	D-Rat trap (Supervisor) I & M Toolbox - Animal pests - DOC snap trap guide v1.3	Every 50m along the intensive barrier lines perimeter lines, interspersed evenly by the toxin bait stations.	Trap check fortnightly to remove any catches and rebait/reset. Each visit – If not sprung set off trap and reset to keep trap in good working order Record catches and sprung traps	Peanut Butter White chocolate buttons PCR Rat and Possum lure Connovation Erayz Connovation Eggsellent	Set trap to rat mode.

All traps need to be regularly checked, reset and re-baited when required, and always maintained to a high standard to ensure that:

1. Lures remain attractive to target pests and do not become depleted or rotten;
2. The trap is regularly tested to ensure it is mechanically sound including checking for worn pivots and weakened springs and that its set to the correct trigger weight;
3. Access to traps remains open i.e. the trap has not become overgrown, and if so, any obstructing vegetation is either sprayed or cut back;
4. Traps are secured to prevent disturbance and removal by pigs and possums; and
5. Traps are clean and free of algal growth or other substances/debris that may make it unattractive to the target animal.

During routine trap checks, triggered traps should be cleared, reset, and rebaited with fresh bait. Untriggered traps should be set off, reset, and rebaited with fresh bait. Once per year in spring, all traps must be audited, comprising a full clean (e.g. with a wire brush to remove mould, fur and other debris), calibrated and 'warrant of fitness' test according to the checklist in Appendix 1.

7.4 Vertebrate Toxin Agent (VTA) baiting protocols for pest animals

7.4.1 Bait station locations

Best practice vertebrate pest animal control in New Zealand utilises vertebrate toxin agents (VTAs) which are used to compliment trapping. For this project specific VTAs will be made available to target species (rodents and possums) via ground based open mouthed bait stations

A permanent bait station network will be installed and maintained in SNAs across the pest management site targeting rodents and possums which will supplement the permanent possum/mustelid/rat/feral cat trap network (DOC200s/AT220s/SA2s). VTA bait stations will be spaced 50 m apart on lines separated by 100m, and 50m spacing along the entire intensive control perimeter line of each SNA. Recommended bait station locations are shown in Map 3.

7.4.2 Bait type and target species

The rodent toxin programme shall be split into two separate loading, top up/servicing regimes, both with unique servicing frequencies per annum.

1. 1st Generation (1st gen) Anticoagulant VTA – Continuous VTA availability **(Choose one of the recommended ‘1st gen’ VTAs for each period).**
 - a. The INTERNAL pest management lines (i.e. those bait stations not located on the perimeter/intensive barrier control lines) shall be loaded/topped up with a 1st generation VTA option and serviced once every 3 months (except for during the annual pulsed VTA operation in spring each year).
 - b. Toxin bait stations on the PERIMETER AND BARRIER control lines shall be loaded/topped up and serviced during the regular monthly trap and monitoring checks (at every second fortnight trapping check).
2. Pulsed VTA - **(Choose one of the recommended ‘pulsed’ VTAs for each period based on desired outcome and last pulse VTA used).**

To remove any potentially toxin shy rodents or possums (and any trap shy mustelids or feral cats if using secondary kill toxins) it is recommended that specific VTAs are ‘pulsed’ through the entire bait station network:

- a. Two pulsed VTA operations occur in Year 1 (Autumn and Spring).

NOTE: A pulsed VTA round shall be carried out first in Year One prior to any 1st gen VTA round or removal of habitat, this is to reduce the number of possums in the control areas consuming large amounts of 1st gen VTAs and leaving low amounts for rodents. This activity also aims to ‘knockdown’ key pest abundance prior to habitat removal to improve indigenous species breeding and recruitment as described in section 7.2.

- b. One pulsed VTA operation to occur once per annum in spring from Year 2 onward.

At the end of each pulse operation the chosen VTA shall be removed (and disposed of according to the product label) and one of the 1st gen anticoagulant VTA options added **back** into the empty bait station network to the amount recommended in Table 6.

Table 6: The following list of toxins provides options for the VTA pest control programme:

Continuous use VTA options		'Pulsed' VTA options	
1st generation, non-secondary poison risk VTA options.		2 nd generation, low secondary poison risk VTA option	2 nd generation, high secondary poison risk VTA option
Ratabate Paste (Diphacinone 0.05g/kg)	Pindone Pellets (Pindone 0.05g/kg)	Double Tap (Diphacinone 0.05g/kg and Cholecalciferol 0.60g/kg)	Brodifacoum Pellets (Brodifacoum 0.02g/kg)
Ratabate paste is a slow acting first-generation anti-coagulant that is used for rodent control. Rodents will consume the toxin at the base station.	Pindone pellets are a slow acting first-generation anti-coagulant that is used for rodent control. Rats will remove Pindone pellets from bait stations and cache for later consumption. Consequently, mice will consume the pellets at the bait station leaving a powdery residue in the base of the bait station.	Double Tap is an acute acting toxin (due to the second-generation toxin cholecalciferol) and must therefore only be used in pulsed operations (not made continuously available for more than 4 weeks). Double Tap has very low risk of secondary poisoning.	Brodifacoum is a highly palatable anti-coagulant, effective on rodents and possums. High risk of secondary, and tertiary poisoning if poisoned carcasses are eaten. No CSL required.
Ratabate paste does not need to be pre-fed (but toxin stations should be installed and allowed to 'weather in' for at least two weeks prior to the first loading to reduce rodent neophobia)	Pindone pellets do not need to be pre-fed (but toxin stations should be installed and allowed to 'weather in' for at least two weeks prior to the first loading to reduce rodent neophobia)	Double Tap pulse operations must be pre-fed (Double Tap prefeed) for two weeks prior to Double Tap toxin install.	It is recommended that brodifacoum is pre-fed.
Ratabate can be used continuously to suppress rodent populations effectively all year round (if capacity and resourcing allows).	Pindone can be used continuously to suppress rodent populations effectively all year round (if capacity and resourcing allows).	All Double Tap toxin must be removed after 4 weeks from install.	Use in bait stations where low – moderate possum populations exist

If at any time rodent or possum abundance thresholds are exceeded (see Section 5.2), and bait stations are empty (and/or toxin is in poor condition) then the appropriate toxin chosen from the list above can rapidly be deployed in these stations to reduce rodent and/or possum numbers until monitoring proves them to be below the acceptable abundance threshold.

Table 7: List of recommended toxin options and the key targets animals, descriptions of each toxin, quantities required and timing of each stage:

Toxin and guidelines	Target species	Description	Quantity of Toxin required (Per station).			Timing of toxin pulses and/or top ups
			Pre- feed	Pulse operations	Ongoing	
1 st gen VTA option 1: Pindone Pellets (0.05g/kg Pindone) Pindone Pellets Possums & Rats	Possum and Rats	1st Generation anticoagulant. Low risk of secondary poisoning to dogs. Low risk to non-targets and native wildlife. Antidote - Vitamin K. Very effective on rats, less effective on mice.	n/a	n/a	Intensive perimeter barrier line bait stations: 200g per initial load & per monthly top up (in clear, tied plastic freezer bag). All other stations: 500g per station after pulse VTA round and each 3-month top up (in clear, tied plastic freezer bag).	n/a
1 st gen VTA option 2: Ratabate Paste (0.05g/kg Diphacinone) Ratabate paste guide		1st Generation anticoagulant Low risk of secondary poisoning Prevents target animals hiding and storing it (bait caching). Antidote is Vitamin K. No CSL required. Minimal risk to native birds and non-target species. Very effective on rats and mice.	n/a	n/a	Intensive perimeter barrier line bait stations: 200g per initial load & per monthly top up (in clear, tied plastic freezer bag). All other stations 500g per station after pulse VTA round and each 3-month top up (in clear, tied plastic freezer bag).	n/a
Pulse VTA option 1: Double Tap (0.05g/kg Diphacinone & 0.60g/kg Cholecalciferol) Double Tap Guide	Possum and Rats	1st Generation anticoagulant diphacinone and cholecalciferol (a non-anticoagulant toxin). Low secondary poisoning risk to non- targets. Effective toxin to switch out with 1 st Gen VTAs every 6-12 months to reduce toxin shyness.	All bait stations Year 1 and Year 2 onward pre-feeds 336 g per station (24x12gm pellets).	All bait stations Year 1 initial load and top ups 336g per station, per pulse (12x28 g blocks). Year 2 onward initial load and top ups 118g per station, per pulse (6x28g blocks)	n/a	Year one: - Initial knockdown prior to habitat removal. - One pulse round in Autumn or Spring (which is ever left after initial knockdown). Year Two onwards: One pulse round every spring During load - Remove any other toxins from stations. Prefeed – weekly for 2 weeks (initial load plus 1 top-up after 7 days). Toxin – DT toxin in all stations, top up after week 2 and week 6, leave out for 8 weeks from initial VTA load then remove. If the post VTA pulse operation monitoring results: - Are above the threshold for rats– conduct another full VTA pulse - Are below the threshold target for rats then return to ongoing 1st gen toxin control.
Pulse VTA option 2: Pestoff (0.02g/kg Brodifacoum) Pest off Guide	Possum, Rats	2nd Generation anticoagulant toxin, secondary toxin transfer potential (targets and non-targets). High risk of accidental poisoning to roaming dogs. Very effective in secondary removal of mustelids and feral cats.	n/a	All bait stations All years - initial load and top ups 250g per station, per pulse.	n/a	Year one: - Initial knockdown prior to habitat removal. - One pulse round in Autumn or Spring (which is ever left after initial knockdown). Year Two onwards: One pulse round every spring During load - Remove any other toxins from stations. Toxin – Brodifacoum toxin in all stations, top up after week 2 and week 6, leave out for 8 weeks from initial VTA load then remove. If the post VTA pulse operation monitoring results: - Are above the threshold for rats– conduct another full VTA pulse - Are below the threshold target for rats then return to ongoing 1st gen toxin control.

7.5 Control Method – Vespula Wasps

7.5.1 Overview

Introduced *Vespula* wasps have been known to kill native New Zealand bats, and other small native birds, lizards and invertebrates, the latter being an important food source for bats. Control of wasps is limited to poisoning nests, toxic baiting and biological control (Potter-Craven et al., 2018). For large-scale operations, sustained control toxic baiting is most effective. Fipronil (Vespex) is highly effective at reducing wasp numbers while having low non-target species risks and is endorsed by DOC. One treatment of Vespex has shown to reduce wasp numbers by 80% within 100m of the control line in an area with over 5 nests per hectare (Harper et al., 2016). Consequently, an aim to reduce at least 80% of the wasp numbers within the Whitehall Quarry pest management project area is expected to better protect native bats and support invertebrate populations from the threat of *Vespula* wasps.



Figure 2. Application of Vespex wasp bait in Wasptek bait stations.

A licence is required to use Vespex, which is delivered via specialist Wasptek wasp bait stations that are attached to a tree at least 70 cm above the ground (*Figure 2*). The bait is left out for 3 - 8 days and then removed. As per the Vespex protocol, bait stations will be located **every 50m on every pest control line and in the same location as the VTA bait stations.**

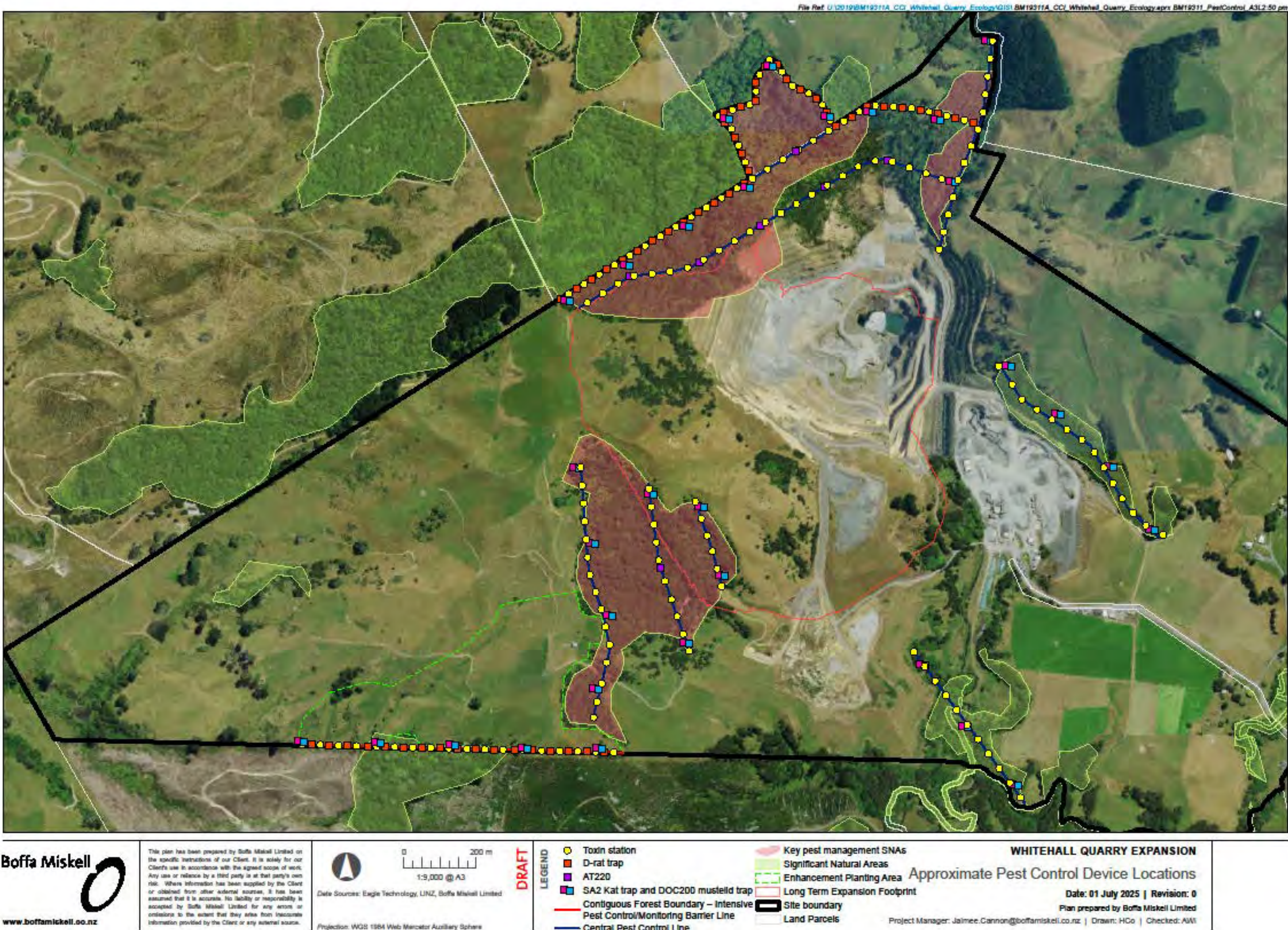
7.5.2 Timing and Frequency of Wasp Control

Vespula wasp control will occur between late-January and late-March. Control can be repeated annually or twice annually to include control in early April or four weeks after first application if high wasp activity persists. The guideline (see the link in table 7 below) for licenced users of Vespex outlines monitoring that must be conducted prior to any control to ensure wasps have fully switched to protein food sources. A threshold on the number of wasps per hour to visit monitoring stations must be met or exceeded before any toxin is delivered into the bait stations.

Table 8: Vespex wasp control application methodology and guidelines.

Toxin and guidelines	Target species	Description/Distribution	Frequency
Vespex Wasp Toxin Contains 0.1% w/w fipronil in the form of a bait. Vespex Information Merchanto	German and Common wasps (<i>Vespula spp.</i>)	Vespex® is not attractive to bees, and is of very low risk to birds, pets and people. 1 Wasptek station to be located permanently at each VTA bait station location (every 50m along VTA lines). 25g/station	Once per annum (Feb/March) when Vespula wasps switch to protein food sources.

Map 3: Whitehall Quarry expansion – Approximate pest control device locations (rodents, possums, mustelids, feral cats).



8.0 Rabbit, hare and ungulate hunting

A suitably qualified, certified and experienced hunting contractor will be contracted to carry out ground-based hunting for leporids (rabbits and hares) and ungulates over the Whitehall Quarry property for an initial removal hunt in fenced areas (once fences are installed), and in autumn and in late spring annually.

The approved contractor(s) will need to advise, plan and deliver effective ground-based hunting based on experience hunting ungulates in the Waikato region. Locations of hunting areas and the schedule for the timing of these activities are provided for in Map 4 and section 11. The initial and ongoing ground-based hunting programme for Whitehall Quarry is split into four activities:

1. **Ground based hunting areas** - Contractors will be required to survey and control any ungulates found over the identified ground-based hunting areas in autumn and late spring ongoing every year.
2. **Enhancement planting area** - Contractors will be required to survey and control for rabbits and hares through the enhancement planting area during the autumn and late spring ground-based hunting rounds for the first five years from being planted.
3. **Within the fenced SNAs and enhancement planting areas:**
 - a. Contractors will be required to conduct a systematic survey and kill all remaining ungulates within the fenced SNA and enhancement planting areas once the ungulate deterrent fences have been erected and proven secure.
 - b. If ungulates are detected within the fenced areas at any time after the initial removal hunt (by trail camera or observations) then contractors will be required to re-survey and kill all ungulates found during this survey. This activity will be carried out at any time one or more ungulates are detected within the fenced areas.
4. Pest control contractors conducting the ongoing, routine trap and toxin services will conduct observational surveys as they move along control lines through the forested pest management areas, as well as when moving between the forested pest management areas.

These activities will require an effective communications plan with quarry managers and other key stakeholders outlining all responsibilities (including notifications) when conducting ground-based hunting using firearms. The contractor **must be pre-qualified** and prepare and maintain a **Site-Specific Safety Plan (SSSP)** for all operational activities. Appropriate, clear and detailed **signage must be installed** at the locations specified in the SSSP prior to and during ground-based hunting on the property.

Effort hours, observations, kill results and missed animals must be recorded and sent electronically to the pest management project manager as soon as possible (but no longer than 48 hours) after each hunting round.

Carcasses of any wild pigs killed will not be allowed for on-sale, or human consumption at any time (due to the potential risk of secondary poisoning).

9.0 Ungulate Deterrent Fence

Winstone Aggregate will fund the design, purchase, install and ongoing maintenance/repair of an appropriate ungulate (feral deer, goat and pig) deterrent fence around the perimeter of the planting enhancement area and the key SNA sites. These will become 'ungulate free' areas with initial elimination and ongoing zero detection the target for ungulates in these areas.

The exact location and design of the fence(s) will be planned by the pest management project manager(s), fencing contractors, other stakeholders (potentially with private boundary landowners) and with advice from Boffa Miskell. A perimeter ungulate deterrent fence will be constructed around the bush/pasture edge of the SNA to the West of the quarry pit and the enhancement planting area that connects to this SNAs. There are two options for an ungulate deterrent fence around the key SNA immediately to the North of the quarry pit. Both options would have a fence line installed along the top of the quarry terraces along the Southern edge of this SNA:

1. **Option one** is for a perimeter fence line to be constructed along the back boundary of the Whitehall property, through the existing native forest. This would require time consuming hand construction of posts/poles, some vegetation trimming but with **no** removal of any native flora permissible.
2. **Option two** is for the western edge of the perimeter fence to extend through the forest using the existing deer fence to the private properties behind the quarry and travel along the Northern and Eastern bush/pasture edge of the SNA area, looping back to the Southern edge fence line. This could use efficient machinery to ram the posts/poles required and would require no removal of native flora.

Map 4 provides an approximate location for the fenced areas including the options in the Northern SNA.

A fence repair/maintenance plan/guideline with an appropriate maintenance/check schedule will need to be prepared for Winstone Aggregates and the Whitehall Quarry once the fence design has been confirmed. Any existing ungulate or stock fencing around the remainder of the pest control areas will need any holes/damage repaired.

A guideline to the recommended ungulate deterrent fencing is provided for via the following link [DOC Deer fencing guideline](#) (especially the diagram illustrating the fencing requirements). If feasible, an electrified bottom wire shall be installed on appropriate outriggers around the entire perimeter of the ungulate deterrent fences to further deter pigs from pushing under the fence. An appropriate size solar powered unit(s) can be used to deliver the electrical pulse if no mains power is available.

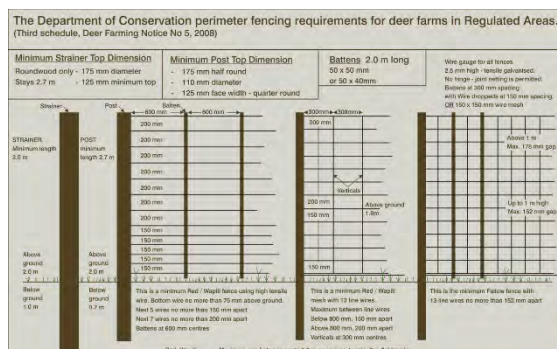
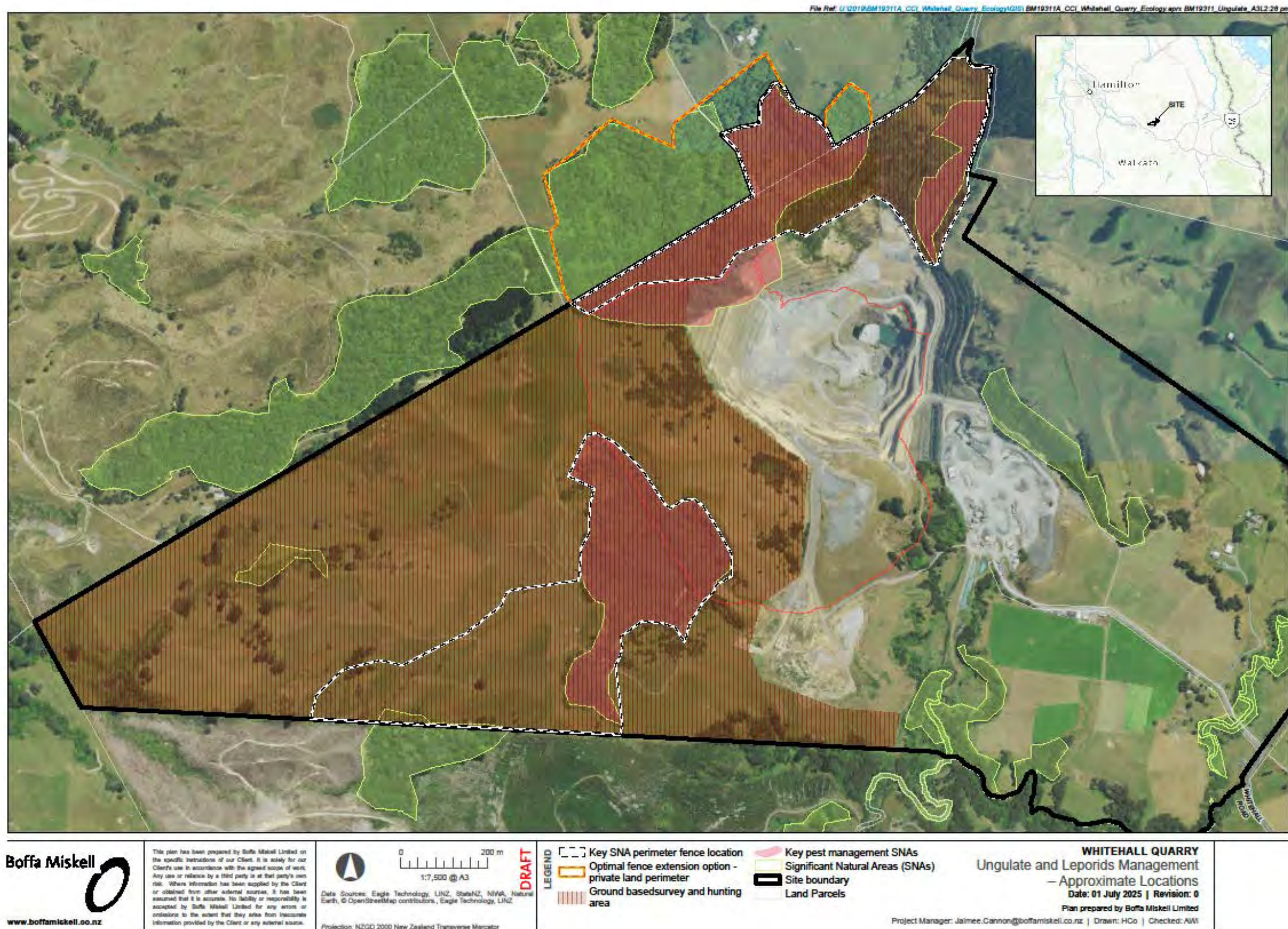


Figure 3: DOC Deer fencing guideline diagram of fence options.

Map 4: Ungulate and leporids management - approximate fenced SNAs/enhancement planting area, and ground-based hunting areas.



10.0 Equipment required

The following is a list of the equipment required for Year 1. Some of the larger items that will need procurement every year from Year 2 onwards are also provided (e.g., Toxins). A 10% replacement cost per annum has been factored into the budget for the capital items purchased in Year 1.

Table 9: List of equipment required for this PMOP

Item	# required (*required annually)
D Rat Supervisor traps	55
Camera batteries (D size)*	80 (two rounds per annum)
Ezylure dispenser batteries	120 (two round per annum)
Pre-lured chew cards*	120 Year 1. 60 Year 2 onwards
AT220 Traps	7
Auto lure syringes*	7
Bait stations	150
Double Tap Pre feed*	100kg
Double Tap Toxin*	100kg
2 nd Gen VTA* (If required)	112kg
1 st Gen Toxin*	Perimeter – 135kg. Internal – 200kg
SA2 traps	31
Wooden Ramps for SA2 traps	31
Flagging Tape	2 Rolls
Mustelid traps (2 per box)	62
Mustelid trap boxes	31
Wasptek stations	150
Vespex toxin*	3 x 1.5kg Pails
VTA warning signs	At each point of public entry.
Lures	As required

11.0 Schedule

The activities detailed in the schedule table will commence in the order listed as soon as is feasible from when consent is granted. Toxin control will start with the first scheduled pulsed VTA operation, after consent is granted, in order to knockdown possum numbers in the pest management areas prior to rodent toxin control. Baseline monitoring is expected to be completed prior to the implementation of this schedule.

Table 10: Schedule of operational activities.

Activity	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sep
Install ungulate deterrent fencing (Year 1)	ASAP after consent has been approved.											
PERIMETER/INENSIVE BARRIER lines: Trap check (fortnightly), rebait (all traps). Mix of meat/egg and poauku.												
INTERNAL lines: Trap check, rebait (fortnightly August to March inclusive). Internal single set kill trap checks - monthly during April to July (incl) due to low pest animal activity at this time.												
INTERNAL trap checks – Self resetting/re luring traps (AT220)												
PERIMETER/INTENSIVE BARRIER lines 1 st Gen Toxin check, top up (during every second fortnight trap check). Install warning signs prior to 1 st toxin load.	Yr2 + only	Yr2 + only					Yr2 + only	Yr2 + only				
ALL BAIT STATIONS: VTA Pulse – (both perimeter/intensive barrier and internal lines). Install warning signs prior to 1 st toxin load. One of the pulses to be an initial knockdown in year 1 prior to habitat removal.							Yr1 only				All years	
Conduct Vespex wasp monitor and control												
Monitoring (cameras). Perimeter and central line												
Monitoring (Chew Cards) – after toxin pulse.												
Sign check (or after damaging weather events)												
Conduct ongoing ground-based hunting of rabbits, hares and ungulates (qualified contractor)												
Conduct a full and systematic ground-based hunt for remaining ungulates in fenced areas once fences are erected and proven secure.	ASAP after fences have been erected and proven secure.											

12.0 Signage

It is a legal requirement when applying VTAs in New Zealand to erect approved VTA warning signage at all known main entrances to the property on which toxin operations are being conducted. Signs must be clear and visible at all times and should be checked regularly by the pest controller conducting VTA operations, especially after damaging weather events.

At minimum the sign must outline the toxin name and concentration, a photo of the toxin bait and/or bait station, the date period the VTA will be in bait stations and any caution period after bait removal (if applicable). VTA warning signs must also provide the best contact number of the pest controller or project manager, as well as any non-target groups (pets, humans etc) that should be supervised and take caution in and around the operational area.

[Brodifacoum warning sign](#)

[Double Tap warning-sign-36.pdf](#)

[Diphacinone warning-sign-17.pdf](#)

[Pindone warning-sign-27.pdf](#)

13.0 Kauri dieback

Pest control contractors must prevent the spread of the pest organism *Phytophthora agathidicida* (commonly known as kauri dieback disease, or PA), to the extent reasonably practicable.

Pest control contractors must ensure that all vehicles and equipment, including clothing, are thoroughly cleaned of all visible soil. Footwear, once cleaned, must be sprayed with SteriGENE solution before entering when moving between, and when leaving areas where there are Kauri.

All vehicles, equipment plant and machinery shall be washed with SteriGENE® 2% solution upon entry into the Project Site(s).

The following links are recommended guidelines for kauri dieback disease management:

[Kauri Dieback best-practice-guides/vehicle-and-heavy-machinery-hygiene/](#)

[Kauri protection - Kauri Dieback hygiene trapping guidelines](#)

14.0 Data management

Maintaining accurate records of both pest control and pest monitoring are crucial to evaluate the success of predator control at each site. Spatial and temporal trends in pest populations and catch rates can be identified in the analysis of this data, which can then inform future pest management decisions.

Therefore, TrapNZ is the recommended data collection and analysis platform, as it is widely used across New Zealand, user friendly, and is able to record spatial distribution of traps and catches, as well as toxin uptake.

The pest controller shall enter all trap catch and toxin data into Trap.NZ. A project will be set up for this purpose within Trap.NZ and training provided to the pest controller (if required). Boffa Miskell staff and/or the pest controller (if desired) will analyse the trap catch and type data as well as the toxin uptake.

All persons undertaking pest control need to record all trapping data on the selected system. Each person/group that needs to access the system, will need an account and be instructed on how to enter the required information correctly.

For each trap check, all data needs to be accurate and complete, as per the minimum information to be recorded below:

- Date of trap servicing & time taken to complete trap/bait station servicing;
- Name of the trap servicer;
- Device location, unique identifier, model type and model name;
- Lure type and whether the lure was refreshed;
- Whether the trap has been triggered (trap status);
- Trap catch (species); and if possible/relevant: sex and age of individual, number of individuals, or record trap catch as zero if nothing is caught;
- Bait type and quantity deployed (for bait stations);
- General comments (e.g. if trap needs fixing or replacing, if bait is gone).

15.0 Review implementation and reporting

This plan will be reviewed, updated (if necessary) and approved annually, prior to the start of the next operational year. Operational budgets shall be adjusted to reflect and changes in the plan, inflation or market price influences. The annual implementation review should also include budget tracking data and any communication reports.

An annual report will also be developed which reports upon the determined objective and targets. Each annual report (submitted by end of June each year) needs to align with consent condition reporting requirements. At a minimum it should include:

- A summary of all pest control (plant and animal) activities undertaken within the project area in the preceding 12 months, detailing dates, and methods of each control activity;
- Progress measured against the purpose, objective and targets of the Pest Management Operations Plan.
- Maps of control devices/area, labelled by type;
- Summaries of trap catch statistics by species (both target and any non-target catch), including by trap type, trap location, lure type as well as CCI of rats, possums, and camera trap rates, with comparison to management targets and thresholds for additional control;
- Summaries of results of toxic control operations, including target species, bait type and bait take;
- Any trends in the data, such as high-catch/high bait-take locations, the main species caught and comparisons to previous years and;
- Any challenges/issues encountered in undertaking control or monitoring, and how these difficulties were overcome or if they remain ongoing.

The recommended annual implementation review and associated report(s) should be shared with all key stakeholders of this project to ensure the objectives and targets are being met.

If pest monitoring analysis reveals ongoing exceedance of thresholds (exceedance for more than two monitoring rounds), then additional improvements may be required to relevant pest control and monitoring activities. Advice on analysis and any subsequent changes shall be sought from suitably qualified biosecurity planning professionals.

16.0 References

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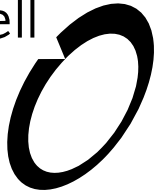
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17.0 Appendices

17.1 Appendix 1: DOC Series Trap Audit Checklist

	Performance Standard	Evidence
1.	Trap is set correctly	a) Correct bait for the current month is positioned in the holder. b) Trigger plate is angled approximately horizontal and as close to the baffle as possible. c) All trap plates move freely when the trap is set (springs are tensioned in a set position) d) The trap box is marked correctly with the trap number.
2.	Trap is secured correctly	a) Trap is secure in within the tunnel and correctly positioned. b) All mesh is securely fixed to the trap box with no gaps other than the opening aperture which shall measure no greater than fifty millimetres square. c) Internal baffle is in line with the trigger plate d) Tunnel lid is secured firmly
3.	Trap functions correctly	a) The trap can be sprung by gently lowering a 100 g weight onto the distal end (end furthest from the hinge) of the trigger plate. b) When it sets off the moving parts do not touch any part of the tunnel or baffles c) Double set traps do not spring off 'sympathetically' i.e. when one trap is sprung by a dummy capture (e.g. rolled newspaper ~40 mm diameter) the other trap remains set. d) All moving parts on non-stainless-steel traps are lubricated with builder's pencil or graphite powder so that they move freely without binding when the trap is actuated.
4.	Trap is sited correctly	a) The trap box is positioned in such a way that it is unlikely to be damaged or accidentally sprung by stock and where located on visitor walking tracks is not obstructing passage. b) The trap box is seated firmly on the ground so that it is stable and does not move in any direction when moderately firm pressure is applied to it (palms placed flat on top of the box at opposite ends). c) Tunnel has been pegged to the ground if specified.
5.	Trap is cleaned correctly	a) The entire trap is substantially free of animal matter (fur, tissue and bone) from previous captures. b) Any uneaten bait and captures have been discarded at least 5m from traps and away from waterways. c) Both ends of the tunnel are clear of vegetation to 300mm. d) Tunnel is in good condition. e) Both ends of the tunnel are clear of vegetation to 300mm. f) Tunnel is in good condition.

17.2 Appendix 2: Baseline Pest Monitoring Plan



Baseline Pest Monitoring Plan

Whitehall Quarry Expansion
Prepared for Winstone Aggregates

11 July 2025





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Cover photograph: Whitehall Quarry face wall with one of the SNA areas in the background (Source: Boffa Miskell).

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1.0 Purpose of Baseline Pest Monitoring Plan

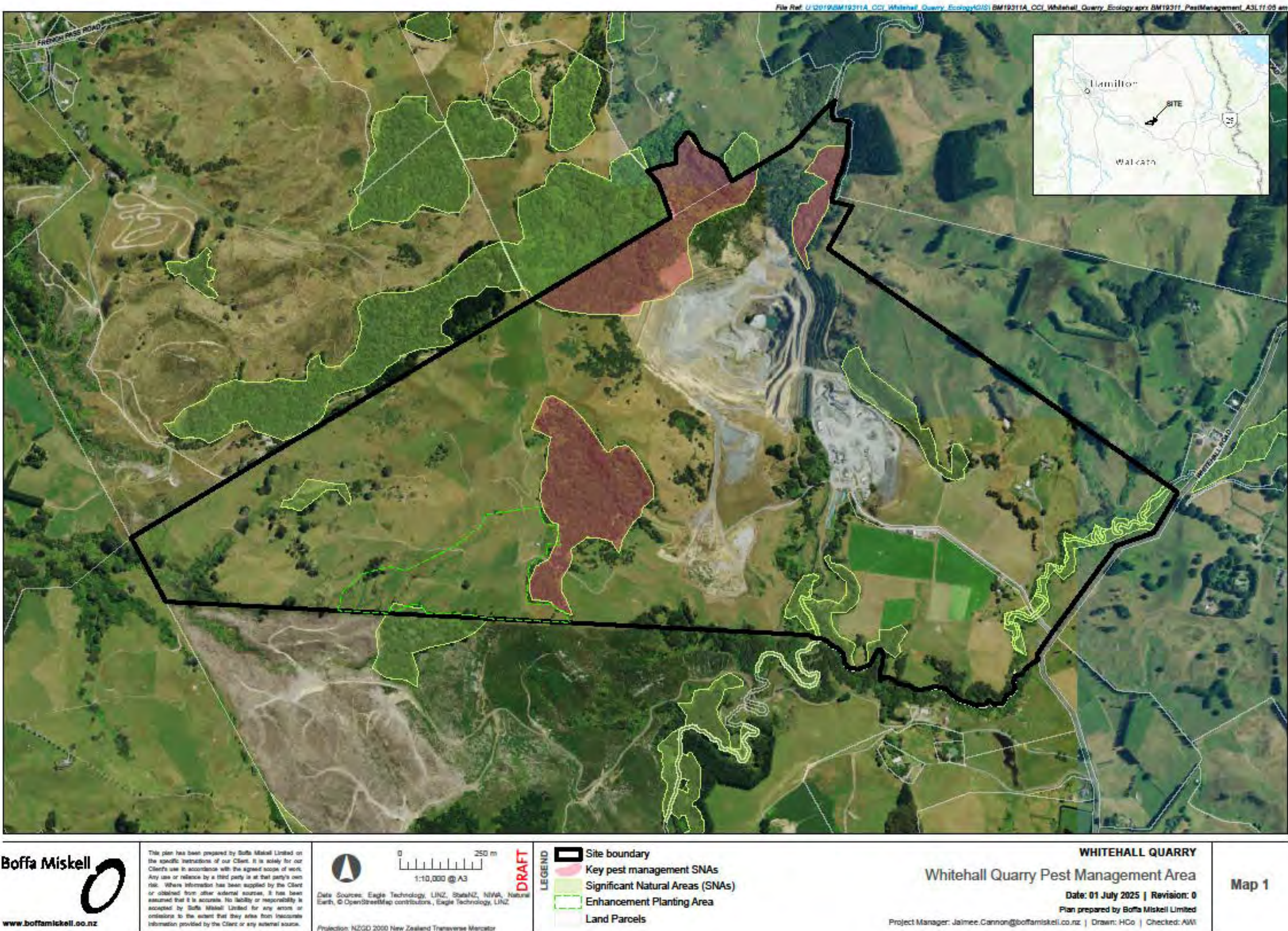
The purpose of this plan is to provide the operational methodology and information required to implement baseline pest monitoring in the identified areas of Whitehall Quarry, in relation to the proposed quarry expansion mitigation. The subsequent baseline pest monitoring data will inform the design and planning of the overarching pest management plan for the effects management response for the Whitehall Quarry expansion, including the development of the pest targets and thresholds. The baseline data will also provide the project with an ability to calculate pest management success and Winstone Aggregate's return on investment in the pest management programme.

2.0 Pest Management Area – Intensive Suppression SNA sites

The Whitehall Quarry pest management area will encompass the entire quarry property, with intensive pest suppression and monitoring to be conducted within several key SNA sites. The pest management programme aims for an intensive suppression of pests to set target levels which aim to mitigate for the proposed quarry expansion works and support improved indigenous species survival, breeding and recovery.

The programme will target baseline and ongoing pest monitoring within the SNA sites and the enhancement planting area, as well as observational pest monitoring over other areas of quarry property as pest management personnel move between SNA sites and the enhancement planting site.

Map1: Whitehall Quarry – pest management area showing intensive pest suppression sites within SNAs and the enhancement planting area of the quarry property.



3.0 Baseline Pest Monitoring

3.1 Overview

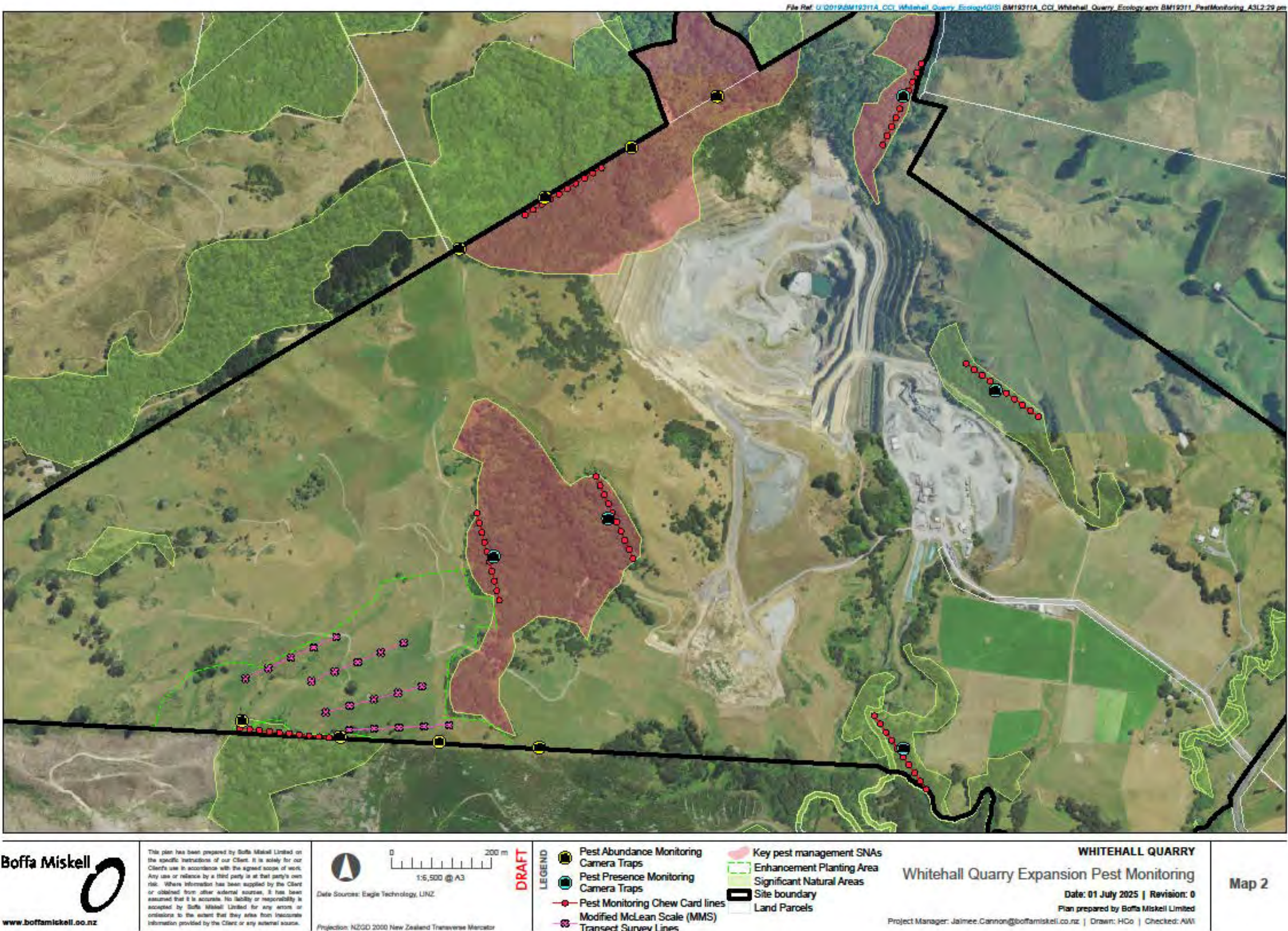
Baseline pest monitoring is a vital requirement to establish pre-activity pest presence, distribution and abundance, which will provide the data to design a more precise overarching Whitehall Quarry expansion pest management plan. Without accurate baseline data inappropriate and unrequired pest management activities may be designed and implemented.

Within the wider Whitehall Quarry pest management area (Map 1) well-established pest monitoring tools with standardised protocols will be used to monitor pest presence and abundance. The monitoring locations will be established within the identified SNAs and the enhancement planting area as per Map 2.

The baseline monitoring in the two key SNA areas will use permanent trail camera and auto lure dispenser devices purchased for the project, which will remain in situ and be used for the ongoing monitoring, providing valuable continuous '24/7' monitoring data on pest reinvasion and pest behaviour. Chew cards will also be used to monitor for specific pests within the SNAs to attain a baseline rodent and possum abundance index.

The following sub sections of this plan outline the baseline pest monitoring operational information, which will guide the implementation of this activity. The information details the maps, methods protocols, guidelines, equipment, schedule, and data management requirements namely for chew cards, paired camera traps, observational surveying and Modified McLean Scale rabbit and hare surveying.

MAP 2: Whitehall Quarry - Approximate pest monitoring lines, devices and survey point locations.



3.2 Monitoring for Possum, Rats and Mice

3.2.1 Chew cards

Chew cards are a common, cost-effective, and sensitive detection and monitoring tool suitable for determining pest presence and provide a coarse index of relative abundance (CCI), of a range of pests, including rats, mice, and possums. Chew cards, rather than wax tags, have been found to be more effective at attracting possums and rodents, and are recommended by DOC in their National Biodiversity Monitoring and Reporting Framework (Forsyth et al., 2018).

Chew cards will be deployed along seven monitoring lines as per Map 2. Each chew card line 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) and for both rats and mice (Ruffell et al., 2015).

Pre-lured chew cards will be deployed for seven nights, then collected and analysed for pest animal identification and to calculate the CCI for the relevant point in time. The following protocol will be used for chew card monitoring and management; [Possum Population Monitoring](#)

Figure 1: Image of a chew card nailed to a tree base, with no bite marks.



3.3 Monitoring for Mustelids and Feral Cats

3.3.1 Camera Traps

Camera traps have become an increasingly used pest monitoring tool in the past 5 -10 years (Gillies & Brady, 2018; Glen et al., 2013, 2014). Cameras are much more effective for detecting the larger pest species (cats, ferrets and stoats) (Norbury et al., 2017), including in comparison to standard tracking tunnels (Department of Conservation, 2020; Smith & Weston, 2017; Dilks et al., 2020).

Note: Camera trap methods outlined in this document are based on DOC's draft best practice camera trapping recommendations (Gillies, 2021) and should be updated based on the final guidelines as they become available.

DOC Interim Trail Camera Guide v1.1.1

Due to the relatively small size of the project, and the tight guideline protocols for camera trap separation distances for abundance indexing, the camera trap pest monitoring for Whitehall Quarry will be split into two distinct operations as follows:

1. Permanent camera traps for baseline and ongoing relative abundance indexing:

Two lines (600m long) each with four Cuddelink® cameras paired to an automated Eyzylure® luring device at 200m spacing along each line on the property boundary, within/near the key SNAs to the North and Southwest of the quarry pit. These monitoring lines are to be no less than 1km apart. These eight cameras and eight auto dispensing Eyzylures® will be deployed for the baseline monitor and remain active all year round and shall be checked/serviced as per the frequency to be detailed within the Whitehall Quarry expansion pest management plan. The continuous 24/7 monitoring ability of the Cuddelink® cameras paired to an auto dispensing lure will provide a continuous, high level of intel on re-invading pests into the key pest management SNA areas, and significantly reduce labour servicing costs. Eyzylures can dispense lure for up to 4months without servicing, and only the 'home' camera of the Cuddelink® camera network needs visiting to acquire all the image data from all 10 cameras.

2. Camera trap for pest absence/presence:

2.1. Permanent pest absence/presence camera traps for baseline and ongoing pest monitoring:

Two Cuddelink® cameras paired with Eyzylure® devices will be used in the isolated key SNA area immediately to the West of the quarry pit and provide absence/presence pest monitoring data as well as possible pest reinvasion evidence. The cameras and associated lure dispenser shall be no less than 200m apart and be placed approximately halfway along the relative chew card lines.

2.2. 'One-off' baseline pest absence/presence camera traps:

Three Browning Dark Ops Pro Trail cameras (to be supplied under hire by Boffa Miskell) will be used in the other SNA areas to the South, East and Northeast of the quarry pit. These cameras will provide absence/presence pest monitoring data as well as possible pest reinvasion evidence. The cameras and associated lure dispenser shall be no less than 200m apart and be placed approximately halfway along the relative chew card lines. A ground-based meat lure will be used for these camera traps.

Ten Cuddelink® Trail cameras will be purchased at cost to the project for the baseline pest monitor and ongoing pest management programme. Boffa Miskell will supply via hire three trail cameras for the baseline monitoring round only.

The camera traps may also detect the presence of native species (e.g. Kiwi, lizards) within the site. If required, the DOC guideline for using camera traps is available from Boffa Miskell biosecurity staff.



Figure 2. Cuddelink® Camera system – Up to 10 cameras send images via 'daisy chain' link to the 'home' camera.

3.4 Monitoring for Ungulates – all areas

Several monitoring techniques will be used to monitor ungulates throughout the pest management area. Ungulate sign may include uprooted seedlings, chewed bark, leaves or branches, sightings of animals, faecal pellets, incidental camera trap imagery (deer, goats), targeted camera trap imagery (pigs), hoof prints, and pig rooting. Faecal pellets are widely recognised as a useful and efficient method of monitoring wild pigs. Pig droppings are usually dark, flattened, roughly oval pellets joined in a large cylinder.

Active observational pest surveying for the signs listed above will occur at all times when trained pest management personnel move along the pest management lines in the SNA areas, whilst driving/walking between pest management sites and when driving into and out of the wider project management area.

This monitoring will occur during baseline monitoring surveys, ongoing monitoring surveys and whilst conducting pest control over the lifetime of the pest management programme. Binoculars shall be carried at all times by the monitoring and control teams to aid surveying.

Any observational sightings must be recorded in the monitoring section of TrapNZ as per the data management guidelines in section 6.0.

3.5 Monitoring for browsing pests in the enhancement planting area

Pest animals (rats, hares, rabbits, goats, deer, possums) are a direct threat (seed consumption and/or foliar browsing) to the successful planting and survival of indigenous plants within the proposed enhancement planting area (Map 2). The construction and maintenance of the proposed perimeter deer/stock fence (as per section 2.4.2 in the Whitehall Quarry Long-Term Expansion Planting Plan, 2025) around the enhancement planting site will deter ungulates from entering this area. Therefore, baseline monitoring to determine absence/presence of ungulates is not required in the enhancement planting site

Browsing Rabbits and Hares:

As rabbits and hares will not be excluded by the proposed deer/stock deterrent fence around the enhancement planting perimeter, their absence/presence and abundance information is required. Monitoring for rabbits and hares in the enhancement planting area will require using the modified McLean Rabbit Infestation Scale (MMS) survey technique as outlined in section 4 of [A5-Rabbit-guide-minor-revision-2020.pdf](#). The baseline monitoring (and ongoing monitoring annually during years 1-5) will require pest management personnel walking four transect lines through the planting area (Map 2) and surveying for rabbit/ hare sightings and faecal droppings. The Bionet A5 Pest Rabbit monitoring and control guide (link provided above) provides all the surveying methods and data analysis information required to carry out this monitoring. Gloves must be worn when handling faecal matter and binoculars will be used to aid sightings.

Any observational pest sightings of ungulates, rabbits and hares must also be recorded in the monitoring section of TrapNZ as per the data management guidelines in section 5.0.

4.0 Equipment required

The following is a list of the equipment items that would require procurement/hire/supply for the baseline pest monitoring operation.

Device	#
Pre lured Chew Cards (pack of 20)	4
Trail Camera (Cuddelink)	10*
Trail Camera (Browning Dark Ops Pro) Boffa Miskell hire. Batteries and SD cards incl.	3
Camera Batteries – For Cuddelink (D cells)	48
Camera SD Cards – For Cuddelink	20*
Auto lure dispensers	10*
Auto lure syringes	10
Meat lure	1kg
Pink flagging tape rolls	6
Screws for Chew Cards (Hex head 75mm)	Box of 100
Chicken wire mesh for meat lure (Boffa Miskell to supply)	3 sheets
Pins for meat lure mesh (Boffa Miskell to supply)	12
Binoculars	1-2 pairs
Battery Drill with hex driver bits (Boffa Miskell to supply)	2

* Equipment that will be also used long term through the ongoing pest management programme

5.0 Schedule of activities

The following table outlines the estimated baseline monitoring schedule of activities. Week one will require three days onsite to conduct the installs. Weeks two and four involve one day each week for the recovery of monitoring devices. Boffa Miskell staff will conduct the following activities as scheduled:

Week one (BML biosecurity consultant).			Week Two	Week Four
Day 1	Day 2	Day 3	After 7 nights from install	After 21 nights from install
Observational ungulate monitoring at all times during baseline monitoring activities. Record all observations, take photos of ungulates and/or sign (if possible) and locations.				
Mark out lines with flagging tape.	Install Cuddelink® Cameras and Ezylure® dispensers.	Install any remaining trail cameras.	Recover Chew Cards.	Recover the 3 Browning Cameras, mesh and pins.
Install all Chew cards	Install Browning cameras and meat lures.	Record camera and lure locations in TrapNZ mobile app	Inspect Cuddelink® 'Home' Camera. If SD cards are full then recover and replace all SD cards noting change of card and date of card change.	Inspect Cuddelink® 'Home' Camera. Recover and replace all SD cards. Leave Cuddelink cameras in situ for ongoing monitoring.
Record locations and device #s on TrapNZ.	Record camera and lure locations in TrapNZ mobile app	Conduct modified McLean Scale baseline survey in enhancement planting site.	Analyse Chew Cards and calculate pest CCI baseline. Add results to TrapNZ and baseline report.	Replace any low/flat Cuddelink® camera batteries as indicated through "home" camera data.
		Record MMS baseline survey results and report back to pest management project manager.		Inspect working condition of Ezylure devices whilst replacing any Cuddelink® camera batteries.
				BML - Analyse camera data for pest abundance and absence/presence evidence. Add results to TrapNZ and baseline report.

6.0 Data management and reporting

Maintaining accurate and precise records of pest monitoring is crucial to planning and design of pest management plans and to evaluate the success of pest control over time. Spatial and temporal trends in pest populations and catch rates can be identified in the analysis of this data, which can then inform future pest management decisions.

TrapNZ is the recommended pest data collection and analysis platform for this project, as it is widely used across New Zealand. TrapNZ is a freeware, user friendly application that can be used on mobile for data collection and PC for desktop planning and analysis.

Figure 3: Example of TrapNZ desktop editor page with device layout and summary of trap catches.



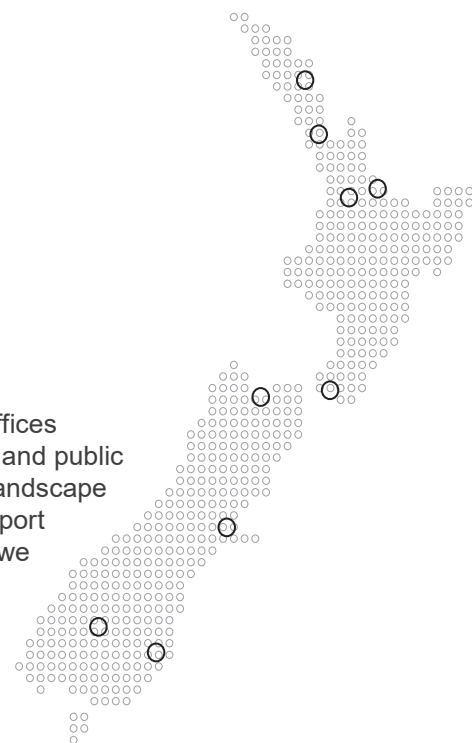
A brief and succinct post baseline monitoring report shall be compiled by Boffa Miskell, which will guide the target species, pest abundance targets and thresholds in the pest management operations plan.

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