Pirongia Te Aroaro o Kahu Restoration Society

Operational Management Plan For The Mangakaraa Pilot Pest Control Area

Department of Conservation
Te Papa Atawhai

ECOFX PEST SOLUTIONS LTD

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ecology & environmental planning

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Executive Summary

An area of indigenous forest of about 240ha within the Department Of Conservation (DoC) managed Pirongia Forest Park, adjacent to the Pirongia Lodge at the end of Grey Road, has been selected for intensive ground-based possum and ship rat control by the Pirongia Te Aroaro O Kahu Restoration Society – **The Mangakaraa Pilot Pest Control Area.** The goals of the pest control programme are to:

1. Measurably improve native bird densities and diversity within the Mangakaraa Pest Control Area.
2. Measurably improve overall forest vegetation condition and diversity within the Mangakaraa Pest Control Area.
3. Assess the success of this project after five years and expand the control area to include the entire Mangakaraa Catchment. This will be the precursor to release birds such as kokako.
4. After five years create suitable, safe habitat for the following bird species to be re-introduced:
    - North Island Kokako
    - North Island Robin
5. Continually review the pest control operation and work towards a toxin free control regime whilst still maintaining target control rates.

The animal pest control programme will target possums and ship rats as these two species are considered to pose the greatest threat in Pirongia Forest Park to native bird breeding and native plant growth and fruiting.

This report provides guidance to the Restoration Society for the:

- Best practice guidelines for the initial and ongoing infrastructure and pest control operations;
- The practicalities of ongoing control of pest populations largely implemented by locally based voluntary labour;
- Pre and post and ongoing pest/ecological health monitoring and target requirements; and
- Legal requirements for the implementation of the operation.

The control operation shall be staged in two main phases:

1. **Initial knockdown control** and establishment of bait station/track infra-structure by a qualified and experienced animal pest control contractor(s); and
2. **Ongoing pulse control** efforts, predominantly by local volunteers. This ongoing control should be targeting these animal pests during key bird breeding periods – i.e. August to February, especially November through to January.

Ongoing control will be carried out by appropriately trained volunteers using approved toxins laid in bait stations and trapping as required.

The initial knockdown control operation cost (including cost to establish and mark 26.3km of track, purchase bait stations and labour) is estimated to be between $70,0000 and $83,000, depending on the type and frequency of bait stations used. Assuming three spring-summer operations per year (with no labour costs, mixing two different poison operations to one trap only operation and traps having a 10 year life span) including initial and ongoing volunteer equipment and training costs, per annum costs are estimated to be $6,500.
All control programmes are required to comply with DoC, Health Department and OSH standards and prior approval is required before any work commences.

Scientifically robust animal pest index and ecological health monitoring is an important aspect of the project.

Pre-control and ongoing consultation with adjacent landowners and tangata whenua is essential.

1 Introduction

1.1 Purpose of the Plan

The Pirongia Te Aroaro o Kahu Restoration Society Inc. was formed in early 2002 with broad aims to restore the native forest communities of Pirongia. The society's main objectives are:

- To acknowledge the special and treasured place Mt Pirongia has in the lives and cultures of the local people,
- To stop the degradation of the forest communities present on the mountain,
- To set in place initiatives to restore and nurture the diversity of the forest life,
- To ensure the physical and spiritual integrity of the mountain in accordance with Maori tikanga, and
- To provide locals with opportunities to participate in conservation projects and to enrich the experience of their natural, cultural and historic heritage relating to Mt Pirongia.

An area of indigenous forest of 242.1ha (Figure 1) within the Department Of Conservation (DoC) managed Pirongia Forest Park, adjacent to the Pirongia Lodge at the end of Grey Road, has been selected for intensive pest control with the ultimate aim of enhancing bird populations – **The Mangakaraa Pilot Pest Control Area.** This project is seen by the Restoration Society as a pilot for further pest control on the mountain with the potential to expand the area to include the entire 1000ha Mangakaraa Catchment. It is also planned to apply the experience gained from the pilot area to as many other areas of the forest as resources permit over time.

The primary objective is the enhancement of native flora and fauna habitat, rather than simply killing large numbers of mammals. In particular the main goals of the pest control programme are to:

1. Measurably improve native bird densities and diversity within the Mangakaraa Pest Control Area. In particular, improve habitat for the following species:
    - Tui
    - Bellbird
    - Kereru
    - Tomtit
    - Rifleman
    - Whitehead
    - NZ Falcon
2. Measurably improve overall forest vegetation condition and diversity within the Mangakaraa Pest Control Area. In particular improve the health and abundance of the following plant species:
    - Kohekohe
    - Kamahi
    - Northern Rata
    - *Alseusmia macrophylla*
    - Tree Fuchsia
    - Native Mistletoe species

- *Dactylanthus taylorii* or Wood Rose

3. Assess the success of this project after five years and expand the control area to include the entire Mangakaraa Catchment. This will be the precursor to release birds such as kokako.
4. After five years create suitable, safe habitat for the following bird species to be re-introduced:
    - North Island Kokako[1]
    - North Island Robin
5. Continually review the pest control operation and work towards a toxin free control regime whilst still maintaining target control rates.

This site was chosen by the Restoration Society because it:

- has good access;
- has only four adjacent properties, two of which are owned by members of the Restoration Society;
- is confined to a portion of one catchment;
- has had a recent, successful possum control operation; and
- contains a high diversity of mature, productive forest types.

This operational management plan is intended to provide information on:

- Baseline assessment of the key animal pest populations;
- Control targets for residual pest populations required to minimize pest impacts within the control area;
- Recommended control methods for initial population knock-down and frequency of control;
- Ongoing pest maintenance programmes;
- Pre and post operational pest and baseline ecological health monitoring;
- Risks to the public associated with any pest control programme;
- Consultation with affected landowners; and
- Assessment of potential environmental effects both positive and negative of pest control options

In effect, this plan provides guidance to the Restoration Society for the:

- Eventual tendering to commercial contractors for the initial infrastructure and pest control operation;
- Ongoing control of pest populations, which would largely be implemented by locally based voluntary labour;
- Pre/Post and ongoing pest/ecological health monitoring; and
- Legal requirements for the implementation of the operation.

1.2 Location

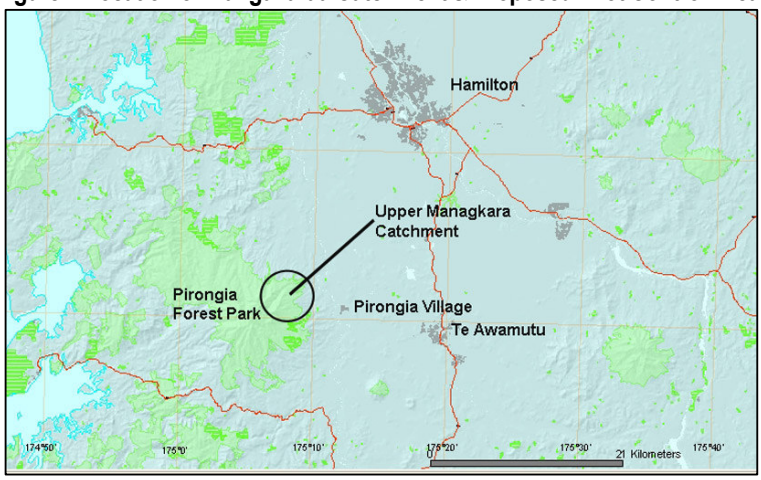
The Mangakaraa Catchment is located on the north east slopes of Pirongia Forest Park, about 8 km north west of Pirongia Village (refer to Figure 1a). The upper catchment of the Mangakaraa Stream, which is a tributary of the Waipa River, ranges in altitude from 950m a.s.l at Mount Pirongia to about 120 m a.s.l at Pirongia Lodge at the end of Grey Road (refer to Figure 2).

[1] It is acknowledged that 240 ha is too small an area for NI kokako and that a minimum area of 500ha is required.

Within the Forest Park, the Mangakaraa Stream is virtually completely enclosed by native forest cover. It is generally a swift flowing, 2-4 metre wide water way with a substrate compromising of large boulders and cobbles in the upper to mid reaches.

Topography within the catchment is very steep with occasional bluffs and drop-off towards the summit of Mount Pirongia. Towards the bush edge, the grade decreases and the ridges are less pronounced and flatter in nature, but still undulating and defined near the stream itself.

Figure 1 Location of Mangakaraa Catchment & Proposed Pilot Control Area



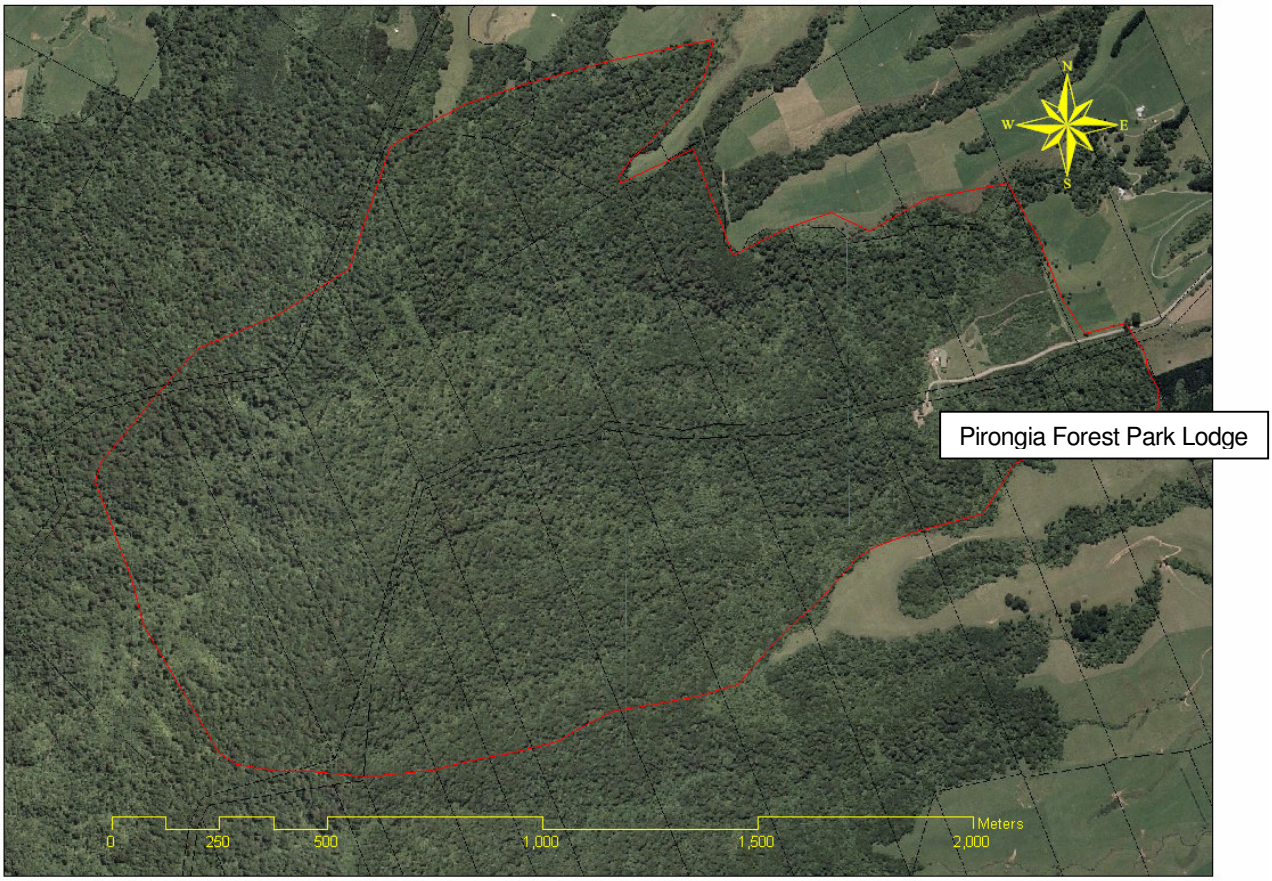


Figure 2 Location of Mangakaraa Catchment & Proposed Pilot Control Area

2 Existing Natural Values & Threats

2.1 Flora and Fauna Values

Mt Pirongia provides a focal point for the largest continuous native forest tract left in the Waikato Basin. At low altitudes such as in the proposed restoration area, the forest is dominated by tawa, some of which are very large. Kamahi, hinau, rewarewa, mangeao, pukatea and kohekohe are all common in the canopy, and although early logging operations have removed much of the original podocarps, some large rimu and kahikatea remain scattered as emergents. Northern rata is now much reduced by possum browsing, as is kohekohe, although kohekohe is still present on the lower east and north slopes in high densities. The understorey contains many tree ferns, mahoe, pigeonwood, nikau and heketara. King ferns were once common in the lowland gullies, but have been much reduced due to pigs and other exotic herbivores. Three cryptic and subterranean species, the wood rose (*Dactylanthus taylorii*), *Thismia rodwayi* and the orchid *Danhatchia australis* are also present (Clarkson *et al,* 2002).

Pirongia retains a good range of indigenous forest birds, including whitehead, rifleman, falcon and bellbird. Kaka does not appear to be present as a breeding species, although they visit occasionally. Kokako were reported from Pirongia at least until the late 1980s, but now appear to be locally extinct. Kiwi has not been recorded for many years and is now likely to be locally extinct (Kessels, 1992). Robins disappeared from Pirongia in the 19th century but very recently individuals of this species have flown the approximately 10km from Mt Kakepuku, where a local restoration group had reintroduced them (L Hoverd, *pers. comm.*).

There have been few records of reptiles from Pirongia. Species known to occur are the copper skink (*Cyclodina aenea*) and green gecko (*Naultinus elegans*) (L. Marshall, *pers. comm.*). Pacific gecko (*Hoplodactylus pacificus*) has been recorded from Mt Karioi and is likely to be present on Pirongia. The forest gecko (*Hoplodactylus granulatus*) and the rare striped skink (*Oligosoma striatum*) may also be present. Surveys for native frogs have not located any species on Pirongia. Nonetheless, given the recent discovery of Hochstetter's frog on nearby Maungatautari, it is now quite likely that this nationally threatened frog may also still persist on Mt. Pirongia.

Pirongia has a good variety of indigenous freshwater fish, including lamprey, koaro, banded kokopu and short-jawed kokopu, which are threatened species (Speirs, 2001).

Long-tailed bats have been recorded from just west and south of the park (Borkin 1999).

2.2 Identification of Threats

Introduced animal pests have serious detrimental effects on natural ecosystem integrity and function, affecting native plants, animals and other organisms, and their habitats.

Browsing of native plants reduces the general condition or 'health' of a plant community and can significantly prevent or limit bush regeneration.

This is of particular concern when the plants being browsed are already threatened or rare, for example king fern, *Thismia rodwayi,* and wood rose.

Arguably the most significant impact of animal pests on Pirongia is the removal of canopy foliage[2] and canopy species seedlings and saplings which, if left unchecked, may trigger complete canopy collapse and destruction of all structural tiers of a plant community (i.e., canopy, sub-canopy etc.). Damage is not limited to leaves—fruit, seeds and seedlings of plants are also eaten.

[2] Canopy foliage is the leaves of trees which form the uppermost level of a forest

Introduced animal pests prey upon birds, reptiles and invertebrates, and have undoubtedly caused the localised reduction and complete local extinction of many species, particularly birds, lizards and insects.

The nest success of mainland forest birds with no predator management show (using data from 21 studies with 11 species from 1975 -2001) the following statistics[3];

- Mean nesting success – 19%
- Mean failure due to predation – 70%
- Mean failure due to desertion – 8%

Introduced animal pests may gradually degrade habitat through direct trampling and through removal of, or damage to, vegetation. These forms of degradation may accelerate soil erosion directly, limit the recovery of slips through preventing or slowing regeneration of these areas, or may damage the habitat of indigenous organisms causing localised population decline or extinction (e.g. pig rooting destroying habitat that supports ground-dwelling invertebrate communities).

No areas within Pirongia Forest Park remain unaffected by introduced animal pests. There is now no baseline left to illustrate what the forest may have looked like in the absence of animal pests.

2.3 Possums

Possums are widespread throughout Pirongia. Through selective browsing on palatable plant species they are responsible for serious declines in forest species abundance and diversity. Forest tree species such as rata, totara and kohekohe, as well as a range of species more typical of regenerating forest such as pate and five-finger, are all heavily targeted by possums seasonally. A range of more cryptic flora such as the native mistletoes and wood rose, which are also extremely palatable and sought-after by possums, have been virtually or entirely eliminated from Pirongia since possums became established early last century.

In addition to defoliation, possums harvest large proportions of flower, fruit and seed production within the forest environment, reducing regenerative capacity of the forest and removing resources vital to the survival of native organisms.

Possums are also opportunist predators of birds' eggs, nestlings and invertebrates.

As predators, competitors and habitat modifiers, possums are one of the most important pests for which sustained control must be considered.

Possums are also a threat to New Zealand agriculture as they can carry bovine tuberculosis and consume considerable quantities of foliage from pasture adjacent to the forest.

2.4 Rodents

Ship rats and mice are all present in Pirongia in high numbers, as they are in most mainland native forests throughout New Zealand. Rodent numbers tend to fluctuate wildly from season to season according to prevailing environmental conditions. These animals, like possums, are both competitors and predators of native animals and plants. They harvest large quantities of fruits and seeds from the forest and when conditions are right (for example, after a heavy fruit or seed year), they can occur in very high densities. Ship rats, in particular, because they are extremely good climbers, can be devastating predators of forest birds, invertebrates, frogs and lizards. They are in fact the main predator of species such as robins, tomtits, kereru and kokako in modern New Zealand forests. Rodents also act as a driving factor in the ecology of larger predators such as ferrets, stoats and cats in New Zealand native forests. When rodent numbers are high other predators are able to thrive, increasing their impacts on native animals. Then when rodent numbers inevitably crash, these other predators switch their attention to native species, causing even greater destruction.

[3] John Innes, Landcare Research, *pers comm.*

Rodents – particularly ship rats – are one of the most important animal pests for which sustained control must be considered.

2.5 Cats

Cats are likely to occur at low densities. Both domestic cats and truly wild feral cats will have home ranges that include the habitats of the Pirongia Forest Park. Their very large home ranges will include areas both within and adjoining the bush itself. While rodents and rabbits are the principal diet of cats, a range of other prey items such as lizards, birds and invertebrates seasonally make up significant proportions of their diet.

However, cats are not considered to be significant predators of the native bird species that the Restoration Society wishes to protect within the Mangakaraa catchment, and thus control of feral cats is not recommended at this stage.

2.6 Ferrets

Ferrets are mainly hunters of open country where they target rabbits, rodents and birds. However, seasonally, especially during dispersal of young animals (January and February) they can be found well inside forested areas. Because ferrets cannot climb, they pose less of a risk to most tree dwelling forest birds than some other predators.

2.7 Stoats

Stoats are a deep forest predator in modern New Zealand forests, but generally they are only key predators of large non-flying native birds species, such as kiwi. However, they are agile climbers, excellent swimmers, and thrive in the New Zealand forest environment, especially when rodent numbers are high. While their diet is primarily rodents, they also take significant proportions of other prey items such as lizards, birds, invertebrates, crustaceans and fish. They are one of the most significant predators of juvenile kiwi.

As there are no kiwi or other ground-dwelling birds left in Pirongia, we consider that stoat and other mustelid consider is not necessary for this first stage of the restoration project. In fact stoats actually predate on ship rats, so may assist in rat population reduction.

2.8 Weasels

Weasels are the least common species of introduced predator in New Zealand. Their populations tend to be suppressed by the larger predators, probably as a result of both competition and predation. They prey on a range of small rodents, invertebrates and birds. When effective predator control regimes are initially imposed on a forest environment, weasels are often one of the animals to be affected.

2.9 Hedgehogs

Hedgehogs are widespread within the forest and pasture lands of Pirongia. They feed primarily on invertebrates, but will take lizards, bird eggs and nestlings and potentially amphibians as well. While their conservation impact is not well understood, they contribute to the general decline in species abundance and diversity through functions of both predation and competition.

2.10 Goats

Goats are actively controlled within Pirongia Forest Park (see Section2.3), but persist in low numbers. Goats are browsers of the forest, targeting forest margins, clearings, river banks, bluffs and other open areas. Goats eat any palatable leaves they can, from ground level to 2m high and will also strip bark. They will damage stems and branches by eating bark and twigs. They are also agile enough to extend this reach by walking up the sloping trunks of favoured trees. They will often camp in heavy cover and, especially during winter when pickings are lean in the open, they will strip under-stories and ring bark adult trees within forested areas. Their selective browsing

and sedentary lifestyle creates intensive localised impact, reduces the regenerative capacity of forests and causes the compaction of the forest litter layer.

Gudex (1955) described toropapa (*Alseuosmia macrophylla*) as one of the "chief components" of the understorey on Pirongia, which it is no longer. This can probably be attributed to browsing by goats.

Grove (2001) found that in the ground and shrub tiers, native plant species diversity was weighted towards species less preferred by browsers. Fifty-five percent of tagged seedlings of goat-preferred seedlings had recent goat browse on their stems.

Goats browse plants up to 2m in height. This, in combination with intensive browsing of the canopy by possums, is likely to be one of the key limiting factors affecting regeneration of key forest tree species such as kohekohe.

2.11 Pigs

Pig numbers are relatively high in Pirongia, though less so on the eastern side where there is more human activity. Occasional illegal releases by hunters are probably ongoing. Pigs turn over the forest litter layer looking for invertebrates and fruit, and in doing so, disturb regenerating seedlings; they also have a major impact on king fern. Their conservation impact is difficult to quantify but their high breeding rate when environmental conditions allow, combined with their omnivorous diet and nomadic lifestyle mean their numbers should be kept in check to allow for the restoration vision to be achieved. The impact of pigs is very noticeable in some locations.

2.12 Domestic Stock

Much of the area surrounding Mt Pirongia is grazing land; stock trespass is an ongoing problem. Sheep and dairy cows pose limited risk to restoration values due to the fact that they will not push deep into heavy cover. However, beef cattle, goats and deer are more problematic as they will establish feral herds given a chance. Ongoing liaison with neighbouring land owners over issues of stock access to the forest will be an important component of restoring Mt. Pirongia.

Litter-forming species such as mahoe, pigeonwood and hangehange are heavily browsed or absent on stock-accessible stream banks on private land; grasses, gorse, kanuka and manuka commonly predominate. Stock and/or goats are likely to be key animals preventing healthy regeneration of forest seedlings.

2.13 Weeds

Weed issues within the forest on Pirongia are minor, and largely confined to the margins. Weeds are considered to be beyond the scope of this management plan, which is primarily concerned with animal pest management.

2.14 Pest Control History

The New Zealand Forest Service began controlling goats on Pirongia in 1969, with sporadic culling operations until 1979 (Hurst & de Monchy, 2000). Between 1979 and 1985 hunting effort was described as "relatively sustained", but in 1985 a change in management priorities led to goat culling operations being suspended, at which time goat numbers were reported to be low.

Pirongia Forest Park has been ranked relatively highly among DoC managed public land, and has thus been allocated funds for sustained possum control in the past. In 1996 control of possums was undertaken throughout Pirongia Forest Park (Hurst & de Monchy, 2000). In the south-east sodium monofluoroacetate (1080) baits were distributed by helicopter over approximately 8000 ha. The north-western half of the park was treated using 1080 baits in bait stations as part of a paired trial to compare the costs and relative performance of ground and aerial possum control. Both operations successfully reduced possum populations to target levels (less than 5% trap-catch rate). A successful combined aerial and ground-based (trapping) possum control operation was again undertaken in the winter of 2002, which is discussed in greater detail in Section 3.3.3.

In early 1998 the Dept of Conservation (DoC) allocated funds for sustained goat control. This is likely to continue indefinitely, with a target kill rate of less than one goat shot per day of hunting In 1999 1465 goats were culled from the south-eastern half of the park, involving 574 person-days of hunting and three hours helicopter hunting, over 8000ha (Patterson, 1999).

Other introduced mammals, such as pigs, rodents, mustelids and cats are not currently targeted for control. A few red and fallow deer exist in the park, and these are co-targeted as part of the ongoing goat control operation (Hurst & de Monchy, 2000).

3 Recommended Pest Control Operations

3.1 Determination of Most Appropriate Control Methods

There are a number of factors that must be taken into account when selecting the methodology to reduce and maintain possum populations at very low levels within the pilot area. In conventional control programmes undertaken on a cyclic basis, control is based on achieving performance targets using the most effective and cost efficient methodologies available. Normally this would include undertaking aerial baiting application techniques, using biodegradable acute toxins or one-off trapping regimes.

The Mangakaraa pilot area has extra requirements, in that after initial control is undertaken and performance targets have been achieved, ongoing maintenance will be undertaken by volunteers within the society. Some of the volunteers will have minimal bush navigation skills and will have had previously had little exposure to use pesticides for possum control. There is a requirement on the part of any contractor that a sound foundation for ongoing possum control is developed prior to any work being undertaken by the volunteer group. This foundation should be developed on the basis that volunteers will have low levels of technical skill and by default, need systems and infrastructures to ensure ongoing success in the long-term.

The accepted convention in this circumstance is to establish a network of suitable bait stations serviced by a series of interconnected marked access tracks. Topography is a major driver in determining whether bait stations will be laid out on a set grid, use ridges and spurs, contour lines or a combination of these methods.

It is recommended that for the Mangakaraa pilot area the bait station infrastructure be set out based on a combination of following contour lines and on ridges and spurs. This recommendation is based on the assumption that it would be prohibitive and more labour-intensive to establish bait stations on a set grid that transected the entire valley system including steep escarpments (see Figure 2).

The other important factor is establishing what animal pest species actually require control to achieve the objectives of the Restoration Society. Given that the objectives are to enhance native bird breeding success and improve the health of the key forest tree and scrub species, animal pest control should be targeting those species causing the most damage – possums and ship rats.

3.2 Pest Control Goals

The main goals of the Mangakaraa pest control programme are to:

1. Measurably improve native bird densities and diversity within the Mangakaraa Pest Control Area.
2. Measurably improve overall forest vegetation condition and diversity within the Mangakaraa Pest Control Area.
3. Continually review the pest control operation and work towards a toxin free control regime whilst still maintaining target control rates.

It is impractical and cost prohibitive to expect that a sustained control of animal pests will be able to be carried out on an ongoing basis. Thus, efforts will need to focus on targeting those animal pests considered to have the greatest impact on the forest's native fauna and flora and that baiting and trapping will be pulsed in order to target those species at key times of the year. The key animal pests to be targeted are:

- Possums; and
- Rodents (principally ship rats).

The control operation shall be staged in two main phases:

3. **Initial knockdown control** and establishment of bait station/trap infra-structure by a qualified and experienced animal pest control contractor(s); and
4. **Ongoing pulse control** efforts, predominantly by local volunteers. This ongoing control should be targeting these animal pests during key bird breeding periods – i.e. August to February, especially November through to January.

Monitoring of performance targets will be required pre and post the initial knockdown control efforts and on a regular basis during the ongoing control operations.

3.3 Initial Control Operations

3.3.1 Objectives

Initial animal pest control operations are intended to establish the infrastructure for future pest control and to reduce pest populations to low levels which can be maintained by ongoing pest management by the local community. Partially because of community concerns over aerial applications of poison baits, these operations are to be entirely ground-based.

3.3.2 Positioning of Traps and Bait Stations

Three public walking tracks enter the proposed control area. While these provide easy access for pest control operations, they impose constraints on the placing of traps and bait stations.

DoC staff have specified that bait stations, tracks and markers are to be placed out of sight of any walkways and should be no closer than 50m to a public track.

The first task of the contractor will be to set up a track infrastructure. A proposed layout for control tracks is shown in Figure 2. It is estimated that 26.5km of tracks will be required. Lines would run approximately parallel to public walking tracks, along contour lines. A good track infrastructure is important and each bait station will be numbered for ease of relocation and data collection. This reduces the risk of missing bait stations during checking and allows data collected to be related to bait stations.

The tracks themselves will only involve some minor slashing of vegetation to a maximum width of 1.5m and the use of DoC approved marker tape at regular spacing. No benching or earth works are proposed.

Location of traps and/or bait stations is dependant on the animal pest being targeted, the performance standard target for final population density and the toxin/trap used. In summary bait stations for rodents will be placed at 75m spacings and possum bait station at 150m spacings, with the provisions of closer spacings if RTC targets are not being met.

Control methods are covered in greater detail in the following sections.

3.3.3 Initial Possum Control Operation and Setup of Bait Stations

Mangakaraa has previously been exposed to a trapping regime undertaken in the winter of 2002 by a local hunter as part of a larger 600 hectare area. After this control operation, the area had an indicative possum population of 3% residual trap catch (RTC). Given that the whole Pirongia Forest Park area was controlled at the same time it is believed that re-infestation from surrounding

bush land will have been minimal at this point in time, and this has been verified by observation of the amount of plant browsing and scat sign (G Kessels, *pers obs*). Given the rate of normal breeding within the pilot area of 250 hectares it is estimated that current populations are still at low to moderate levels (probably 10% -- 15% RTC, allowing for natural population increases through breeding and an element of reinvasion from adjacent farmland).

The following proposed methodology options are based on the assumption that possum densities are low to moderate at this point in time and thus should adopt the following main components:

- Philproof® mini permanent bait stations (Approximately 500);
- RS5 0.15% 1080 Pellets;
- Feratox® encapsulated cyanide in biodegradable bags;
- Feratox® encapsulated cyanide;
- Trapping using Victor no.1 leg hold traps; and
- Trapping using permanently set kill traps with long life extruded baits (Warrior ®Kill Trap).

The primary method of control proposed for this operation is the use of a suitable/ safe toxin in Philproof® mini permanent bait stations along a track infrastructure at 150m intervals (approximately 500). The bait stations will need to be erected in such a way as to ensure they are not visible from any walking tracks. Ideal bait station placement is 30 – 40cm off the ground.

The toxin to be used in the bait stations is to be at the discretion of the contractor as long as it is approved for use by DOC, ERMA and the Medical Officer of Health.

Consultation with adjoining landowners will also be undertaken in order to determine the preferred use and application of toxin.

However, the recommended toxin for the initial control effort is RS5 0.15% 1080 Pellets. 1080 in this form is considered to have low toxicity, long life, and the added benefit of targeting rodents as well as possums. Its main advantage is that it causes rapid knockdown of multiple species, including predators. Pre-feeding is required for maximum efficacy. The pre-feed will ensure possums become acquainted with the bait stations and identify it as a reliable food source. It is recommended that the stations be initially fed with pre-feed RS5 pellets.

Three to four Feratox® encapsulated cyanide pellets should also be placed in the entrance of the bait stations. This ensures that any territorially dominant possums are killed immediately thus allowing others to locate and feed on the bait in the stations.

The bait stations should then be pulse fed as per the initial application 2 -3 weeks after the first baiting.

These bait stations would be supplemented by the use of Feratox® encapsulated cyanide in biodegradable bags (1000 bags ,2 Feratox® in paste) in between the stations if required.

An infrastructure of permanent Philproof® mini bait stations can also be used to hold other bait types. These could include cyanide paste; Feratox® encapsulated cyanide pellets, prefeed pellets and also rodent baits.

As new formulations of extruded baits are developed, tested and approved, they can also be placed in this bait station infrastructure as alternatives to the current toxins proposed. For more detail on alternative toxins refer to Thomas (2005).

The bait stations or traps will become an excellent point of reference for possum control within the treatment area. Possum activity can be gauged by the amount of bait taken and scratching in and around each station or trap. Bait stations become a centre of activity with faeces also evident around this food source.

Kill traps, such as the Warrior® kill trap, can be set on a similar grid to that proposed for the Philproof® mini bait stations. The traps require some degree of technical expertise to set, but can be left set for extended periods. The wax coated extruded long life baits will ensure possums will be attracted to the traps and will activate the trigger mechanism.

Traps have the advantage in that no toxins are being used and very little bait needs to be carried by volunteers. Traps can be set to target both rats and possums although it will probably not be adequate for effectively controlling rats all year round. During periods of high rat activity rat baits in the form of Racumin (Coumatetralyl), Feracol (Cholecalciferol) or Diphacinone in biodegradable bags can be stapled next to the traps.

Performance Standard for Initial Possum Control Operation

Initially, a Residual Trap Count (RTC) percentage target of at least less than 5% should be set for possum densities within the control area. Ideally, a 2% RTC should be the target for an intensively managed site such as this.

3.3.4 Initial Rat Control and Bait Station Infrastructure Setup

To control rats, at least initially, toxins in bait-stations are strongly recommended as opposed to trapping. There are several toxins which have been proven to be effective. Two options for initial rodent knockdown are recommended based on discussions with experienced operators and ease of obtaining the necessary permits from DoC, ERMA and the Department of Health:

1. Racumin **(Coumatetralyl)**. This first-generation anticoagulant is slow to produce bait shyness problems (though resistance can develop over time), and does not generate persistent residues as do second-generation anticoagulants (eg Brodifacoum – Eason *et al*, 2001). Rat bait stations, which are not accessible by possums, have to be used. As an added bonus, using Racumin appears to result in considerable reductions in mouse numbers (L. Hoverd, *pers. comm*[4].).
2. **1080 Cereal Pellets.** Placed within Philproof bait-stations, ground-based application of 1080 cereal pellets appears to be effective and has DoC approval. It does have the added benefit of controlling possums and rodents at the same time, thus resulting in considerable reductions in costs and labour as opposed to using separate rat and possum stations. Ongoing control efforts could then be done using with a combination of trapping and Racumin.

For rat control the following guidelines apply for the positioning of bait stations when using 1st generation anticoagulants:

- Bait stations should be no greater than 75m apart in forest habitats on a contour track system. If budget permits, setting stations at 50m apart would be ideal. There should be at least one bait station within each rat's home range. Home ranges are generally reported by length. Ship rats have an average range length of 100-200m during the breeding season. Non-breeding ship rats have larger home ranges. Norway rat home ranges are between 218-916m in length.

- While stations should ideally be laid out on grids by compass bearing, given the rough terrain, it is proposed to set stations along tracks placed on contours – as shown in Figure 2. Figure 2 indicates that virtually all of the control area would be covered using this regime. Spacing should be established as precisely as possible using compass and hip chain. Inaccurate location of lines will cause gaps in coverage where pockets of high rat numbers can persist.

There are three options for bait stations for rat control:

1 Use of a separate bait/trap station in addition to the possums stations;

2 Use of an additional base with spikes on the Mini Philproof stations; or

3 A combination of both station types.

[4] Kakapuku Restoration Trust

Option 1

We recommend the use of the 'Aegis' Modular bait station if the society wishes to use separate stations (refer to Figure 3). While initial capital cost is high (c.f. $39 per trap), they have a number of advantages over conventional bait stations including:

- The station can contain a bait tray for loose bait, a rod for securing bait blocks or a rat kill trap.
- The tunnel baffle can be removed to allow the placement of a tracking board for monitoring.
- The station is lockable and hence tamper-resistant.
- The station is very resistant to entry by non-target species.

Option 2

A cheaper option would be to use an adopted 'spiked' base plate on the Mini Philproof station, so that they could be used to hold rodent toxin blocks. The advantages of this option are:

- Approximate cost savings of $10,000 over Option 1;
- Blocks are waterproof and cannot be removed by animals or accessed by most native birds, which allows for rodent bait to be placed in a waterproof container resistant to entry by non-target species.

However, the stations would be able to be accessed by people and would not have the ability to house a rodent trap if ever required. Nonetheless, if the stations were situated well off public tracks this risk would be reduced.

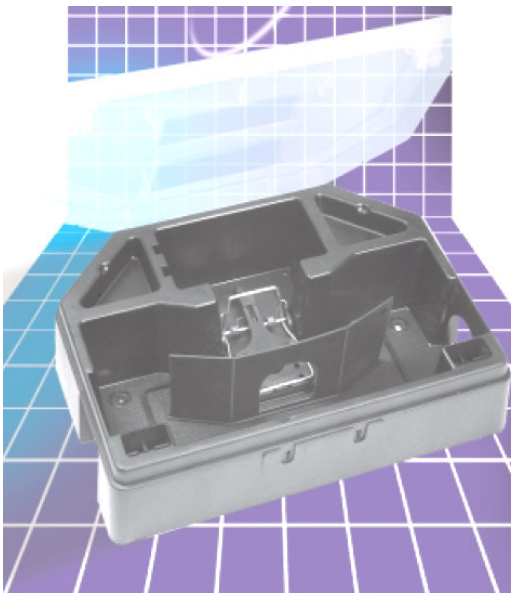
Option 3

A combination of Aegis stations and Phil-proof - using the Aegis near public tracks and Philproof further inside the control areas, where the risk of tampering by people is less likely to occur.

Performance Target

After each cyclic control programme, tracking tunnels should have no more than a 5% print rate.

Figure 3 Aegis Modular Rodent Bait Station



3.4 Budget Estimate for Initial Control and Infrastructure Set-up

1 Track Construction

Cost to establish 26.3km of track. This includes cutting basic track, marking every 15m with pink triangular tag and pink flagging tape in between:

$26,000.00

2 Initial Possum & Rodent Control Operation

Tasks: Possum/ Rat Control: Reach target of 5%RTC for possums; Setup infrastructure for possums and rats; Philproofs and Aegis Rat stations filled with pre-feed followed by 1080 2 weeks later; Feratox in Biobags placed 25m apart on bait station lines:

$57,000.00

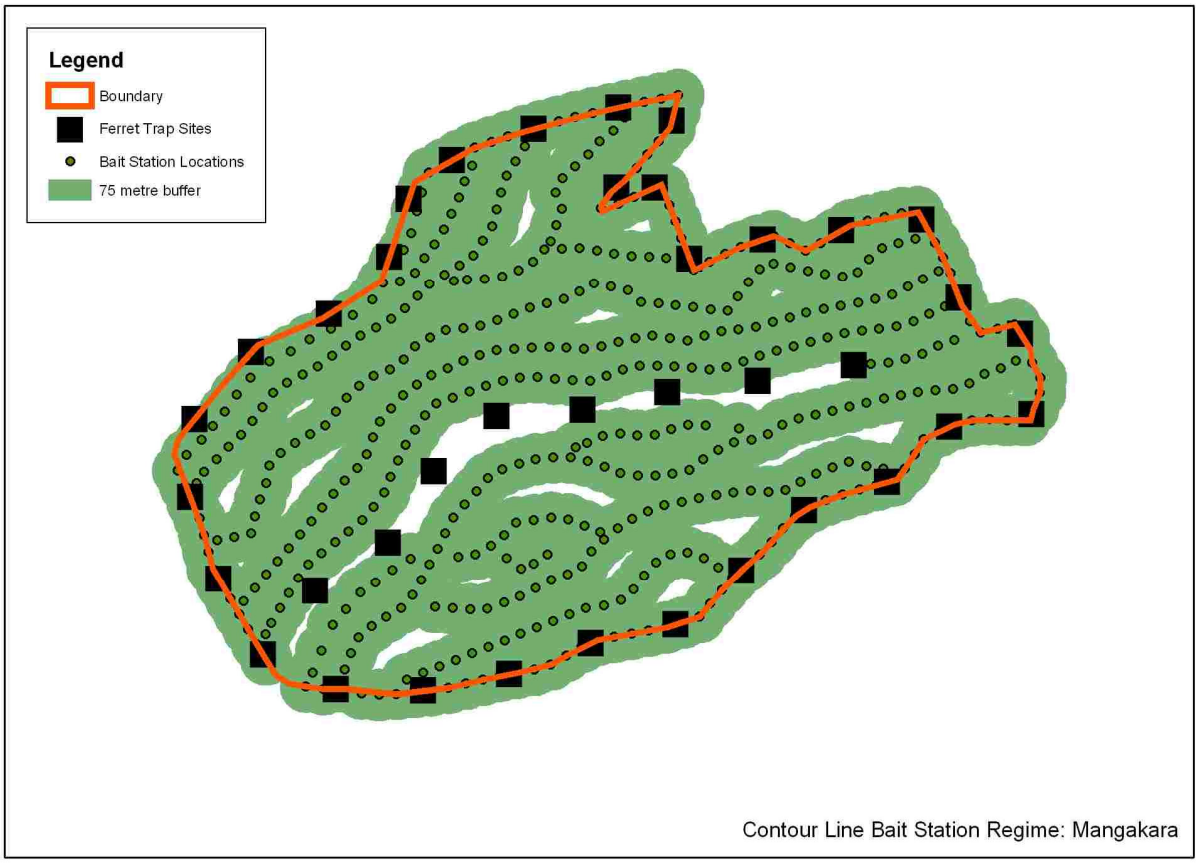
3 Total Estimated Cost for Setting up Infrastructure and Conducting First Control Operation

Please note that this estimate may vary from the final tendered price from the successful contractor:

Option 1: Using combination of Philproof and Aegis stations **$83,000 (incl. GST)**

Option 2: Using Mini Philproof station only **$70,000 (incl. GST)**

Figure 4 Proposed Track and Bait Station Infrastructure Location



3.5 Ongoing Control Operations

3.5.1 Objectives

The low pest populations established by initial control operations are to be maintained by using approved trapping and toxin application by volunteers on an ongoing basis, with success assessed by ongoing scientifically robust and comparable animal pest and ecological health monitoring (see Section 4).

There are important points to consider when planning a successful ongoing pest control operation regardless of the control method used. These are:

- Control timing is critical and depends on what is being protected. For ecosystem management, timing should be related to monitoring indicators – e.g. RTC percentages for possums and tracking indices for rats. For native bird protection, timing is dependant on when the species being protected is most vulnerable - e.g. to protect keruru during the breeding season, rat indices must be low while the birds are on the nest until the chicks fledge. To protect invertebrates and skinks, rats should be controlled year round.
- Pre and post operation monitoring is ***essential*** to judge effectiveness of the control programme.
- Control operations are useless unless the conservation outcomes (performance targets) are achieved.
- Build into costing provision for replacement of lost/damaged bait stations and track maintenance.
- Alternating bait types, toxins, lures and techniques are important in ongoing control programmes. Continuous use of a single method is not recommended.
- Careful recording of the amount of toxin used and retrieved can allow better estimates of future needs.

We recommend a programme of three 'pulse' operations per year during the critical spring breeding months between August and February targeting possums and ship rats in each operation. However, after the first two years of control, these pulse operations could be reduced to two operations if monitoring can support this reduction in intensity.

Target pests can become bait shy. Thus it is also recommended that different toxins are used from year to year if monitoring shows toxin effectiveness to be declining, and that trapping be considered if more than two types of toxin are becoming ineffective.

3.5.2 Voluntary Labour Requirements

Ground based pest operations of this size are estimated to require a minimum of 30 people for each control operation - assuming a minimum team size of 2.

Volunteers will require training in the correct and safe use of toxins and traps, bushcraft and first aid techniques in compliance with OSH standards, and at least one person will require certification as a licensed operator if toxins are being used. In the case of use of controlled toxins, such as 1080 and cyanide, all handlers would need to be within line of site of a supervisor or would need to be certified approved handlers. In effect, this realistically means that in dense bush at least one person in each team handling controlled toxins would need to be certified approved handlers. This equates to at least 15 certified handlers being required for each control operation.

The Society recognises that finding and training these volunteers will require ongoing efforts and are developing strategies to achieve this. The Society will focus recruitment of volunteers using local people as well as those from the nearby urban communities of Te Awamutu and Hamilton.

As a minimum level of safety each team would require the following equipment: mobile phone; pack; compass; maps; and first aid kit.

3.5.3 Ongoing Possum Control

Possums reproduce relatively slowly, however reinvasion from neighbouring areas is likely to be an ongoing management issue, given the relatively long perimeter of the proposed control area with over three quarters of these fronts being bush. It is recommended that possum control operations be carried out twice annually, unless monitoring shows that numbers are acceptably low. Constant monitoring will be required to assess whether or not animals are becoming bait shy and if a change in control technique is required.

Because possums who have received a sub-lethal dose of Feratox rapidly become bait-shy, consideration needs to be given to the use of other baits in ongoing possum control operations. **Cholecalciferol** (eg FeraCol®) is one option, which has the advantage of not requiring licensed operators, although it is more expensive and does not appear to be as effective on possums (Thomas, 2005).

1080 cereal bait is proven to be effective used in bait stations, and has the advantage of targeting rodents at the same time.

Pindone is the only first-generation anticoagulant registered for possum control in New Zealand. Pindone has a very low persistence in rat liver and thus likely to pose a low secondary poisoning risk to non-target species. Conclusions from previous studies are that while not particularly efficient as an initial knock-down toxin, Pindone appears to be effective in maintaining a low-density possum population after initial control (Thomas, 2005). However, Pindone is presently prohibited for use on DoC administered land.

Another first-generation anticoagulant which may be suitable is **Diphacinone**. Diphacinone is currently registered for rodent and ferret control only by the Agricultural Compounds and Veterinary Medicines group (ACVM) – the regulatory body for the certification of all pesticides products. We understand that Craig Gillies of the Department of Conservation is currently trialling Diphacinone with a view to obtain certification for use on possums in due course.

Where possums are at low densities kill traps may be an option. The most pressing issues with traps are setting them effectively and ensuring they are checked daily. Consequently, trapping for possums using volunteers on an ongoing basis may not be achievable given the large scale and ongoing effort required.

Kill traps, such as the Warrior® kill trap, can be set on a similar grid to that proposed for the Philproof® mini bait stations. The traps needs a little bit of technical expertise to set, but can be left set for extended periods using the wax coated extruded long life baits.

Traps have the advantage that no toxins are being used and very little bait needs to be carried by volunteers. Some traps can be set to target both rats and possums although it will probably not be adequate for effectively controlling rats all year round. During periods of high rat activity rat baits in the form of Racumin (Coumatetralyl) in biodegradable bags could be stapled next to the traps.

Performance Target

A Residual Trap Count (RTC) percentage target of less than 5%, and preferably 2%, should be set for possum densities within the control area.

3.5.4 Ongoing Rodent Control

Rats are serious nest predators, and control of rats needs to be especially stringent through the nesting period. Three cycles of bait laying annually are recommended:

- the first in August (i.e. just before most bird species start breeding);
- the second in November, and

- the third in January (when many young fledglings will hopefully be present, and adults may still be busy with second nesting).

Baits are unlikely to be of much benefit going into winter, when many rats will die off anyway, although if food is sufficient they will continue to breed during winter.

Racumin paste is used with good success at Waipapa (near Waitomo) and by the Kakepuku Restoration Society (L. Hoverd, *pers comm*). No approved handler certificate is required to use Racumin paste and these baits are registered (and approved by DoC) for use in bait stations and bait bags. However, rodents need to be feeding on the paste for 4-5 consecutive days so stations need to be filled up constantly during feeding and must not become empty during this period (refer to guidelines in Appendix I).

As outlined in Section 3.3.4, **1080 cereal baits** laid in bait stations are another currently approved option, and guidelines for application are contained in Appendix II. Operators need to be certified approved handlers for 1080 or must be under direct supervision (line of sight) of an approved handler. There is a significant cost and labour advantage with 1080 baits as both possums and rats can be targeted at the same time and there is secondary poisoning of predators that scavenge carcasses.

Rats are expected to become bait shy quite quickly and changing toxins once or even twice a year may be required. DoC and ERMA approved second generation Anti-coagulants are very effective as are some of the first generation anti-coagulants, such as **Diphacinone** (presently only registered under the trade name of Ditrac All Weather Rodent Blocks®) contained in separate rodent bait stations, or biobags (imported by Pest Management Services). Diphacinone is currently registered only in this form for rodents and ferret control[5]. However, based on bait effectiveness trials run by Craig Gillies of DoC, a recommendation has been made to Connovation to register their diphacinone lased Sentinel® baits for use on rodents.

A trial of FeraCol® paste (0.1% **Cholecalciferol**, Feral Control – Auckland) was conducted at Boundary Stream Mainland Island and was found to be effective. FeraCol® is currently not registered for use on rodents (only the greater strength (8g/kg) possum bait is registered). In the long term FeraCol® will most likely be registered for rats and this product may also be a safe and easy to apply alternative, although field life is limited in its present formulation (A Fairweather, *pers comm*).

Snap trapping can be very effective as shown by various successful control operations around NZ (Gillies, 2002). However, generally speaking initial densities have to low to begin with, which does imply that at least initially, toxins should be used for the first knockdown, or that the option of using toxins in bait stations should be factored (and costed) into any rat control programme should the performance targets not be able to be reached. In other words if rat numbers increase to quickly then traps will become ineffective and a switch back to toxins may be required until densities are back down below an acceptable level.

Advantages of trapping over the use of toxins include:

- Allows greater community involvement pest control projects;
- Few detrimental and off-site, non-target impacts;
- Mustelids are often caught as a by-catch in rat traps;
- Monitoring is easy as all rat and non-target kills are known; and
- Rats can be used to investigate aspects of rodent biology and ecology.

Disadvantages of trapping are:

- It is labour intensive;

[5] www.nzfa.govt.nz/acvm/registers-lists/pesticides/index.htm

- A risk of non-target species (eg robin) being caught;
- Baits often degraded between trap checks; and
- Re-setting trapping can expose operators to human health risks, such as leptospirosis.

Detailed guidelines and procedure for trapping is outlined in Appendix II.

Performance Target

After each cyclic control programme, tracking tunnels should have no more than a 5% print rate.

3.5.5 Other Species

Other exotic mammals are likely to be impacted by these control operations, although they will not be specifically targeted. In particular mice are likely to be reduced by the use of Racumin; although at the trap spacing used full control is unlikely to be achieved.

It is understood that DoC have an ongoing goat control programme for Pirongia, although it is recommended that the Restoration Society volunteers be trained in recognising goat browsing sign and faeces – skills which can be used to gauge any increases in goat numbers while setting traps or re-filling bait stations.

3.6 Cost Estimates for Ongoing Control

Cost of Refilling Bait Stations

Cost per refill, excluding labour:

Possums using 1080 and pre-feed:	$629.30
Possums using Feracol and pre-feed:	$1,100.20
Rats using Racumin:	$654.60

Cost of Additional Traps

Warrior traps for possums – 158 traps:	$3,950.00
Rat Traps – 345 traps:	$3,105.00

Cost of Volunteer Training and Equipment Purchase

Initial equipment purchase costs	$15,000.00
Initial cost for training and recruitment:	$10,000.00
Annual equipment/ replacement /recruitment costs:	$1000.00

Estimated Annual Operating Costs

Assume three operations per year with no labour costs, mixing two different poison operations to one trap only operation and traps having a 10 year life span, including initial and ongoing volunteer equipment and training costs:

$6,500.00 per annum

4 Monitoring

4.1 Monitoring is Essential

Monitoring is considered to be a non-negotiable item for the success of this control operation - pre and post for both initial and ongoing control.

Monitoring needs to incorporate methods which measure both performance target requirements for each animal pest species, as well as measure ongoing changes in ecosystem health, such as canopy cover condition and native bird populations and diversity.

4.2 Possum & Ship Rat Monitoring

4.2.1 Independence of Monitoring Regime

It is important to note that possum and ship rat monitoring must be independent of poison tunnel lines, i.e. don't put tracking cards in the Aegis stations.

4.2.2 Possum Indexing Rates

Monitoring for possums should follow the National Possum Control Agencies (NPCA) Residual Trap Catch (RTC) protocol. This expresses the number of animals caught per 100 trap nights and is used as an assessment of relative population densities[6]. DoC have identified an RTC for possums of less than five percent as being necessary for the successful nesting of threatened ground dwelling and arboreal species (eg kiwi, kereru) and the efficient re-establishment of notable indigenous flora species (eg mistletoes, rata). They have also noted that an RTC rate less than two percent is necessary for some species, such as kokako, *Dactylanthus* and some mistletoes.

4.2.3 Ship Rat Monitoring

Monitoring of ship rats is by using tracking tunnels placed on randomly selected lines throughout the area. When an animal walks through a tunnel and over an ink pad it leaves footprints on paper which can be identified.

Hanford (2000) suggests employing 10 randomly placed lines of 10 tracking tunnels each in the treatment area and another 10 lines in the non-treatment area for comparison. Tunnels should be spaced at 50m intervals, with lines being at least 200m apart, when monitoring rodents. If lines are being used to assess mustelid (which in this context mostly means stoat) abundance, they need to be at least 1km apart. For combined rodent and mustelid monitoring, tunnels should be left out for one fine night baited with a blob of peanut butter, then cleared and in every second tunnel install new papers and re-bait with a small (2-3 cm^3) chunk of skinned rabbit meat. This is left out for three fine nights.

After each cyclic control programme, tracking tunnels should have no more than a 5% print rate.

4.2.4 Monitoring Frequency & Timing

Pre-control monitoring should be undertaken before the first control operation and thereafter before each August operation.

After this initial monitoring run, only ship rats would need to be monitored (and indexed) through the spring-summer control operation period – at about every 6 to 8 weeks intervals.

Poisoning would not resume unless the pre-determined RTC and print rate percentage was exceeded.

[6] The protocol is described by Hanford (2000[6]) (pp. 77-78); greater detail can be obtained from the NPCA, PO Box 11461 Wellington, phone 04 499 7559.

4.3 Goat/Deer Monitoring

While not specifically targeted by the Restoration Society for control, ongoing monitoring of goats and occasional deer is required as these two species can quickly increase in population and have significant impacts on ground cover and understorey regeneration.

The number of animals killed per hunting day gives a measure of relative abundance. Increased reliability can be obtained by recording numbers of animals seen, and also hours hunted per day. The indices obtained in this way can be affected by variations in hunter skill and wariness of animals (due to variations in exposure to hunting pressure), but are probably more reliable than other methods such as faecal pellet counts, and can be obtained in the course of ongoing control operations. Landcare Research have designed a modified/improved faecal pellet index for measuring a relative abundance of ungulates that is said to provide a more reliable estimate than the kill/hunter/day method, although it has yet to be publicly released.

4.4 Vegetation Monitoring

Changes to vegetation as the project develops can be assessed using 20mX20m vegetation plots. The Formak Forest Monitoring Manual recommends five plots, each 20m x 20m, to be laid out at 100m intervals along a transect. The line of the transect should be chosen from an easily accessed point, running up into the forest without going up and down out of individual gullies. Plots need to be well clear of walking tracks. Full details of the assessments to be carried out are described in the Formak manual. Each plot should take two to three hours, and monitoring should be repeated every two years.

4.5 Bird Monitoring

The most widely used monitoring technique for birds in New Zealand is the five-minute bird count. This involves counting, for a period of five minutes, all birds heard or seen at each of a series of marked listening stations. For a block of this size, 10 listening stations would be adequate. Each year the counts should be conducted three times within a month during the period when birds are most conspicuous, from September to November, on fine, calm mornings. Full details of methodology are provided in the Formak Forest Monitoring Manual.

When bird abundance increases during the control efforts, a more quantitative measure of relative abundance, such as distance sampling or site occupancy methods, could be employed.

It would be very useful to have a control site as well – outside of the managed area.

5 Legal Requirements & Good Practice Guidelines

5.1 Quality Assurance Processes

To ensure continued quality pest control outcomes within the control area, contractors and volunteers will need to comply with full quality assurance processes, including:

- On-going commitment to Occupational Safety and Health by maintaining OSH site manuals, bi-monthly meetings and current employee/volunteer training and accident databases;
- Internal operational audits with monitoring data being supplied to the Pirongia Te Aroaro o Kahu Restoration Society;
- Continuation of all quality assurance systems including;
- Monitoring operations to National Possum Control Agencies protocol;
- Field operator task lists;
- Poison registration systems;

- Using NPCA National Quality Assurance processes, manuals, standard operating procedures, and resource library as they come on line;
- First aid certificate currency;
- Spot audits of compliance with legislative requirements;
- Compliance with Department of Conservation Quality Conservation Management System processes; and
- Regular meetings with Ministry of Health, and local body representatives.

5.2 Certification of Approved Handlers

All use of toxins must be by approved toxin handlers approved by ERMA – Certification can be obtained through NZQA.

5.3 DOC Recreational Use Requirements

DOC have specified the following:

- All tracks must be 50m from a public walking track.
- No track shall be visible from a public track or viewing point.
- Public signage requirements in terms of notification of the use of poison/traps.

5.4 DOC Toxin Use Requirements for Rodent Control

The Department of Conservation have developed performance standards for the delivery of 1st generation anticoagulants and Ceral Bait 1080 to rodents.

The only area where there is an issue with the use of bait stations is that the performance standards sheets that suggest an optional/additional modification which requires reducing access for pigs. One method is to reduce access to possums, which are thought to be the main source of contamination of pigs (A. Styche, *pers comm*.).

See the sheets attached as Appendix IV for further detail.

6 References

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APPENDIX I
GUIDELINES FOR APPLYING 1ST GENERATION ANTI-COAGULANTS IN BAIT STATIONS FOR RODENTS

TECHNIQUE

Bait station placement

- No greater than 100 x 150m apart in forest habitats. Closer where mice are also being targeted.
  There should be at least one bait station within each rat's home range. Home ranges are generally reported by length. Ship rats have an average range length of 100-200m during the breeding season. Non-breeding ship rats have larger home ranges. Norway rat home ranges are between 218-916m in length [1].
- Laid out on grids by compass bearing or, in rough terrain, placed on ridges and spurs with additional lines located on 100 m contours using an altimeter. Spacing should be established as precisely as possible using compass and hip chain.
  Inaccurate location of lines will cause gaps in coverage where pockets of high rat numbers can persist.
- A good track infrastructure is important and each bait station numbered for ease of relocation and data collection.
  Reduces the risk of missing bait stations during checking and allows data collected to be related to bait stations.
- Bait stations should be attached to the dry side of trees and posts with the opening 25 -30 cm above the ground.
  This optimises their use by rats and avoids rain and water splashing off the ground affecting bait quality.

Effective use of 1st generation anticoagulants

- An excess of bait needs to be placed in the bait stations and once rats start feeding on the bait, the bait stations regularly refilled to ensure they are never empty.
  First generation anticoagulants are a multiple feed toxin. Rats must feed on the toxin for at least 5 consecutive days to ensure they receive a lethal dose.
- Assuming rat numbers are high during the initial control; bait consumption will be high and gradually reduce as rat numbers decline.
- At the end of the operation uneaten bait must be collected and removed from operational area.
  This reduces the chance of rats being exposed to poor quality bait (old) and the time toxin is in the environment

EQUIPMENT

BAIT STATIONS

Key elements are: allow rats easy access, limits access by non-targets, protects bait from the elements, limits bait spillage, doesn't get blockages, holds up to 1.5 kg of bait, easy to fill (and transport when establishing the network), be durable and designed for easy attachment.

- An example of one that fits the criteria is the large Philproof bait station.

Bait

- Only freshly manufactured bait should be used. Bait that has previously been in the field must not be reused.
  This ensures high bait palatability, which has a direct influence on success. Old baits are likely to have mould growth and be less palatable.
- If there is any doubt about bait suitability, palatability trials and/or quality control checks (toxin concentration, mould spores, and bait hardness) should be undertaken prior to operation.

SKILLS REQUIRED

- Programme managers/Project managers need a good working knowledge of rat ecology and prey ecology to manage operations effectively.
- Operators need a sound bush navigational skills involving compass and map reading and training in the relevant animal pest SOPs.

SUSTAINING RAT CONTROL OVER THE LONG TERM

- Monitoring conservation outcomes is essential to judge effectiveness of the control programme.
  C*ontrol operations are useless unless outcomes are achieved.*
- Build into costing provision for replacement of lost/damaged bait stations and track maintenance.
- Alternating bait types, toxins, lures and techniques are important in ongoing control programmes. Continuous use of a single toxin to control rats is not recommended.

- Careful recording of the amount of toxin used and retrieved can allow better estimates of future needs.

LIMITATIONS

- Baiting must be continuous over at least five days and bait stations must not be allowed to become empty during this period to ensure rats ingest sufficient toxin to kill them. Overseas, rodents have become resistant to first generation anticoagulants after poor baiting strategies.
- Possum numbers should be reduced prior to controlling rats with this method.
  In areas of high possum numbers, possum competition for toxic bait can reduce availability of bait to rats [2]. Possums are not particularly susceptible to first generation anti-coagulants.
- The method is labour intensive and relatively expensive in the first year because of initial setup of lines and bait stations
- Labour costs increase in difficult terrain.
- Rat populations bounce back within months once control is stopped [1].
- Mouse numbers may increase after rat control.
- A limited range of baits/toxins registered for rat control, means alternating control methods is problematic
- Limited knowledge on preferred baits and lures for rats
- There is a risk to native birds if they feed from the bait stations or if baits are spilt [3].

UNDER DEVELOPMENT

- The effectiveness of different bait types containing diphacinone (Craig Gillies, S & R; Connovations Ltd.).

FURTHER INFORMATION

DOC contacts

Toxin use

- Alastair Fairweather – Pesticides Advisory Group coordinator, Northern Regional Office, VPN 6193

Recommended reading

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APPENDIX II
GUIDELINES FOR APPLYING 1080 CEREAL BAIT IN BAIT STATIONS FOR POSSUMS & RODENTS

TECHNIQUE

Bait station placement

- No greater than 100 x 150m apart in forest habitats. Closer where mice are also being targeted.
  There should be at least one bait station within each rat's home range. Home ranges are generally reported by length. Ship rats have an average range length of 100-200m during the breeding season. Non-breeding ship rats have larger home ranges. Norway rat home ranges are between 218-916m in length [1].
- Laid out on grids by compass bearing or, in rough terrain, placed on ridges and spurs with additional lines located on 100 m contours using an altimeter. Spacing should be established as precisely as possible using compass and hip chain.
  Inaccurate location of lines will cause gaps in coverage where pockets of high rat numbers can persist.
- A good track infrastructure is important and each bait station numbered for ease of relocation and data collection.
  Reduces the risk of missing bait stations during checking and allows data collected to be related to bait stations.
- Bait stations should be attached to the dry side of trees and posts with the opening 25 -30 cm above the ground.
  This optimises their use by rats and avoids rain and water splashing off the ground affecting bait quality.

Effective use of 1080

- Pre-feeding should be undertaken for two weeks. Note: May need to be extended during wet weather
  Pre-feeding significantly increases rat kills.
  Reduces wariness (neophobia) of rats to toxic bait [2].
  Significantly reduces the likelihood of 1080 shyness occurring in rats that have survived 1080 poisoning.
  Ensures rats are conditioned to the stations and are regularly feeding from them.
- 1-1.5kg of pre-feed should be put out initially and should be topped up as bait is eaten to ensure a constant supply of pre-feed is available.
- The quantity of toxic bait needed will depend on numbers of rats and other non-target pests i.e. possums.
  400-500 g of 1080 bait per bait station is sufficient to control low-density rat populations (<20% tracking tunnel index) but if possum numbers are high more bait will be required.
- It is not necessary to leave toxic bait out for more than 7 nights.
  Most 1080 bait will be eaten in the first three nights.
- At the end of the operation uneaten 1080 bait must be collected and removed from operational area.
  This reduces chances of rats being exposed to poor quality bait (old) and time toxin spends in the environment.

EQUIPMENT

BAIT STATIONS

Key elements are: allow rats easy access, limits access by non-targets, protects bait from the elements, limits bait spillage, doesn't get blockages, holds up to 1.5 kg of bait, easy to fill (and transport when establishing the network), be durable and designed for easy attachment.

- An example of one that fits the criteria is the large Philproof bait station.

BAIT

"0.08% 1080 Rodent Pellets" and "0.15% 1080 pellets are registered for rats. Use 0.15% 1080 pellets where targeting both rats and possums.

- Bait should be small-sized pellets (2 g) of RS5 or No. 7 formulations.
  Small baits reduce the amount of spillage and allow the baits to flow to the opening of the bait station
- Only use freshly manufactured bait. Do not store for more than 3 months for Wanganui #7 pellets and 6 months for RS5 pellets [10]. Bait that has previously been in the field must not be reused.
  This ensures high bait palatability, which has a direct influence on success. Old baits are likely to have mould growth and be less palatable[8].
- Bait must be handled with care. Loading and unloading bags of bait should be supervised to ensure correct handling during transportation and bait is not physically damaged.
  Crushing baits can produce many small pieces of bait < 0.5 g (crumbs) that may increase the risk of poisoning native birds [12].
- Bait must be stored in a suitable building i.e. lockable, dry, well ventilated, and with a concrete floor. Shrink wrap around pallets should be removed to prevent the bait sweating.

- If there is any doubt about bait suitability, palatability trials and/or quality control checks (toxin concentration, mould spores, and bait hardness) should be undertaken prior to operation.

SKILLS REQUIRED

- Programme managers/Project managers need a good working knowledge of rat ecology and prey ecology to manage operations effectively
- Operators need a 1080 licence or must be under the supervision of a licence holder
- Operators need sound bush navigational skills involving compass and map reading, and training in the relevant animal pest SOPs.

6.1 SUSTAINING RAT CONTROL OVER THE LONG TERM

- Monitoring conservation outcomes is essential to judge effectiveness of the control programme. C*ontrol operations are useless unless outcomes are achieved.*
- Build into costing provision for replacement of lost/damaged bait stations and track maintenance.
- Alternating bait types, toxins, lures and techniques are important in ongoing control programmes. Continuous use of a single toxin is not recommended.
- Careful recording of the amount of toxin used and retrieved can allow better estimates of future needs.
- Using 1080 as an initial knockdown toxin is recommended but repeat dosing is not advisable. *Incorrect use of 1080 bait can cause bait shyness. Pre-feeding and good quality bait will dictate the success of the current (and potentially subsequent) control operations.*

LIMITATIONS

- In areas of high possum numbers, possum competition for toxic bait can reduce availability of bait to rats [4].
- The method is labour intensive and relatively expensive in the first year because of initial set-up of lines and bait stations.
- The need for pre-feeding increases labour costs.
- Labour costs increase in difficult terrain.
- Rat populations bounce back within months once control is stopped [1].
- Mouse numbers may increase after rat control.
- Native birds are at risk if they feed from the bait stations or if baits are spilt [5].
- Dogs are susceptible to poisoning if they eat bait or carcasses containing 1080 [6].
- All species of rat are initially neophobic (new object reaction), i.e. they avoid unfamiliar objects in a familiar environment. This is why pre-feeding is so important [2].
- Rodents develop acquired aversion to acute toxins, baits and lures if they receive a sublethal dose of the toxin and illness has followed. This can be present for up to 12 months [2].
- A limited range of baits/toxins registered for rat control, means alternating control methods is problematic.
- Limited knowledge on preferred baits and lures for rats.
- Community views on poisoning can vary, effective consultation is required.

UNDER DEVELOPMENT

- Bird repellents (AgResearch Ltd, Hamilton)

6.2 FURTHER INFORMATION

DOC contacts

Toxin use

- Alastair Fairweather – Pesticides Advisory Group Coordinator, Northern Regional Office, VPN 6193

Recommended reading

- Innes, J. G. (1990) Ship Rat. *In* C. M. King (Ed.) The Handbook of New Zealand Mammals, pp. 206-224-206. Oxford University Press, Auckland.
- Innes, J. 2001: Advances in New Zealand Mammalogy 1990-2000: Europeans rats. *Journal of the Royal Society of New Zealand 31*: 111-125

- Moors, P. J. (1990) Norway Rat. *In* C. M. King (Ed.) The Handbook of New Zealand Mammals, pp. 192-206. Oxford University Press, Auckland.

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2. Barnett, S. A. 1988. Exploring, sampling, neophobia, and feeding. Pages 295-319 *in* Prakash, I., editor. *Rodent Pest Management*. CRC Press Inc., Boca Raton, Florida.
3. Henderson, R. J.; and Frampton, C. M. 1999. *Avoiding Bait Shyness in Possums by Improved Bait Standards*. Landcare Research Contract Report LC9899/60, Landcare Research, Lincoln.
4. Gillies, C. A. 2002. *Managing rodents on the New Zealand mainland-what options are currently available? Summary of a workshop session at the Department of Conservation 'mainland island' hui, Omapere, 20-23 August 2001.* DOC Science Internal Series 47, Department of Conservation, Wellington, New Zealand.
5. Spurr, E. B. 1994. Review of the impacts on non-target species of sodium monofluoroacetate (1080) in baits used for brushtail possum control in New Zealand. Pages 124-133 *in* Eason, C. T., editor. *Proceedings of the Science Workshop on 1080*.
6. Meenken, D.; and Booth, L. H. 1997. The risk to dogs of poisoning from sodium monofluoroacetate (1080) residues in possum (*Trichosurus vulpecula*). *New Zealand Journal of Agricultural Research* **40**:573-576.

APPENDIX III
GUIDELINES FOR SETTING RODENT TRAPS

TECHNIQUE

Trap station layout

- Spacing no greater than 100x50m apart with perimeter traps 25m apart.
  There should be at least one trap station within each rat's home range. Home ranges are generally reported by length. Ship rats have an average range length of 100-200m during the breeding season. Non-breeding ship rats have larger home ranges. Norway rat home ranges are between 218-916m in length [1].
  At high rat densities, trap spacing may have to be reduced further to maximise capture rates.
- Laid out on grids by compass bearing or, in rough terrain, placed on ridges and spurs with additional lines located on 100 m contours using an altimeter. Spacing should be established as precisely as possible using compass and hip chain.
  Inaccurate location of lines will cause gaps in coverage where pockets of high rat numbers can persist.
- A good track infrastructure is important and each trap station numbered for ease of relocation and data collection.
  Reduces the risk of missing a trap during checking and allows capture data to be related to each trap site.

Timing of operations

- Timing is critical and depends on what is being protected.
  For ecosystem management, timing should be related to rat tracking indices.
  For species protection, timing is dependant on when the species being protected is most vulnerable. E.g. To protect robins during the breeding season, rat indices must be low while the robins are on the nest until the chicks fledge. To protect invertebrates and skinks, rats should be controlled year round [1]

Effective use of traps

- Initially traps should be checked every 1-2 days. Once catch rate drops (after about 5-10 checks), traps only need to be checked once every 2-3 weeks. When rat numbers increase, the frequency at which traps are checked will also need to increase.
  Traps need to be cleared regularly - frequency is dependant on the density of rodents present. A trap with a dead rat in it is not available to catch others.

EQUIPMENT

Trap type

Key elements are: catch effectively, kill humanely, easy to use and maintain, light weight, portable and cheap.

- Victor professional snapback is recommended.
  This trap has passed the National Animal Welfare Advisory Committee (NAWAC) kill trap guidelines (on Norway rats).
- The Hammer; the Thumper and DOC180 have also passed the NAWAC guidelines and are suitable where mustelids are also being targeted.

Maintenance of traps

New Traps

- Standard Victor professional snapback traps should be treated with a preserving agent (e.g. fence stain) as the wooden base is not treated.
  This will lengthen the life of the trap.

Traps in Use

- Should be cleaned regularly with a wire brush.
  Removes mould, fur and bits of dead animals and allows for identifying what has escaped from an empty sprung trap.
- Regular maintenance is essential, including checking for worn pivots, weakened springs & broken trigger mechanisms. Victor snapback traps require periodic re-treating with preserving agent.
- When checking Victor snapback traps the trapper should carry spare traps, treadles and pegs.
  Treadles may be lost when the traps are sprung.

Tunnel/Cover

Kill traps must be set in a tunnel or under a cover. The tunnel has three functions: i) orientate the animal relative to the trap, ii) disguise and protect the trap and iii) keep out non-target species [2]. It must have the following:

- Minimum of 550mm long.
  Space for trap and prevent non-target animals (e.g. weka) accessing the trap.
- Single entry.
  Rats have access to right end of trap.
- Entry hole of 45mm x 45mm
  A larger entry hole will not exclude non-targets like weka.
- Easy access to check traps.
- Ability to fix to ground with a wire hoop.
  Prevent traps being disturbed by pigs and possums.
- Traps should be kept off ground.
  Keeps trap dryer, extends life of trap.
- Fully enclose the trap and stable, so the trap cannot be dragged out of the cover.

A tunnel with these features is the single entry coreboard tunnel used at Rotoiti Nature Recovery Project. ..

Bait and lures

Key elements are high palatability, field life aligned with the frequency of field checking, doesn't attract non-targets, easy to use and cheap.

- Suitable baits include chunky peanut butter, peanut butter mixed with rolled oats and white chocolate.
  Peanut butter lasts 5-7 days in Te Urewera, peanut butter/rolled oats mix lasts up to 14 days at Rotoiti Mainland Island and white chocolate last up to 5 weeks in Te Urewera.

SKILLS REQUIRED

- Programme managers/Project managers need a good working knowledge of rat ecology and the prey ecology to manage operations effectively.
- Specific on job training of trappers in the use of rat traps and tunnel/covers is recommended.
- Trappers need sound bush navigational skills involving compass and map reading, and training in the relevant animal pest SOPs.

STANDARDS

Animal Welfare Act 1999

- Under the Animal Welfare Act 1999, the NAWAC developed draft guidelines for testing kill traps. It is recommended that only traps that have passed the NAWAC guidelines are used, because other traps that have not passed may be prohibited or restricted [3].

SUSTAINING CONTROL OVER THE LONG TERM

- Monitoring conservation outcomes is essential to judge effectiveness of the control programme.
  Control operations are useless unless outcomes are achieved.
- Rat tracking tunnels should be run concurrently with the trapping operation.
  To identify activity of animals not being trapped.
- Baits/lures may need to be alternated over the duration of control programmes.
- Good data collection helps operations to be more effective and efficient over the long term. What is recorded depends on what the project wants to know. Typical questions are: What trap sites catch most /least? How much trap effort is generally required to achieve the outcome in this block?

LIMITATIONS

- Constant re-invasion and rapid breeding means effective long term control must be ongoing.
  Rat numbers are likely to return to pre-control densities within weeks or months after control stops [1].
- Pig and possum interference with covers can be a problem.
- In beech forests during years with high mouse numbers, mice can make up the majority of captures. This severely reducing the number of traps available for rat control.
- No long life baits available which limits the length of time between checks.
- Very high rat numbers (80%+ TT index) can make initial knock down of the population difficult. More frequent checks have been shown to still obtain rapid reduction in numbers.

- In years of high rat numbers trapping may be time consuming and expensive, so a toxin may have to be used first to reduce rat numbers
- The technique is not good as an annual knockdown tool. It is good for a knockdown and then continuously maintaining low densities.
- Mouse numbers may increase after rat control.

UNDER DEVELOPMENT

- Different cover designs to further reducing non-target captures (Lindsay Wilson – Opotiki AO, and Matt Maitland – St Arnaud AO).
- Alternative baits and long life baits (Lindsay Wilson and Matt Maitland)
- Grid layouts (Lindsay Wilson and Matt Maitland)
- Optimal frequency of checking traps (Lindsay Wilson and Matt Maitland)
- Tree sets with covers (Lindsay Wilson and Graeme Atkins - Te Araroa FC)

INFORMATION

Recommended reading

- Innes, J. G. 1990. Ship Rat. *In* C. M. King (Ed.) The Handbook of New Zealand Mammals, pp. 206-224-206. Oxford University Press, Auckland.
- Innes, J. 2001. Advances in New Zealand Mammalogy 1990-2000: Europeans rats. *Journal of the Royal Society of New Zealand 31*: 111-125
- Moors, P. J. 1990. Norway Rat. *In* C. M. King (Ed.) The Handbook of New Zealand Mammals, pp. 192-206. Oxford University Press, Auckland.

Pest Management Training

- Ecological Management Skills Training Programme - Pest Animal Management

Contacts

- Iain Rayner – Programme Manager, Ecological Management Skills, Central Regional Office, VPN 8273
- Dale Williams – Programme Manager, Ecological Management Skills, Central Regional Office, VPN 8218

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1. Innes, J. G. 2001. Advances in New Zealand Mammalogy 1990-2000: Europeans rats. *Journal of the Royal Society of New Zealand* **31**:111-125.
2. King, C. M.; O'Donnell, C. F. J.; and Phillipson, S. M. 1994. *Monitoring and Control of mustelids on conservation lands. Part 2: Field and workshop guide*. DOC Technical Series 4, Department of Conservation, Wellington.
3. Warburton, B. 2001. Traps and trap-testing. *in* Walker, A., editor. *Proceedings of Mainland Island Hui, Omapere 20-23 August 2001*. Department of Conservation.

APPENDIX IV
DOC Performance Standard Sheets for Use of Rodent Toxin

♦ INCLUDE ONE SHEET PER PESTICIDE USE ♦ COMPLETE SHADED AREAS ♦

PESTICIDE USE #56	SODIUM FLUOROACETATE 1.5G/KG CEREAL PELLET BAIT STATIONS (0.15% 1080 PELLET)	TARGET PESTS: RODENTS

DOC/AHB* OPERATION	CAUTION PERIOD
[INSERT NAME OF TREATMENT BLOCK(S)/AREA HERE]	*[INSERT CAUTION PERIOD FOR THIS OPERATION – CONSULT PUBLIC NOTIFICATION SOP]*

* DELETE THE ONE THAT IS NOT APPLICABLE

DOC	AHB	**DOC SOPs & Policies Shall Be Followed**
		Public Notification for Pesticide Operations SOP, including Warning Signs (hamro-93976) Safe Handling of Pesticides SOP (AHB operations apply clean up & disposal chapter only) (hamro-95527) Storage and Disposal of Hazardous Substances SOP (wgnho-83176) Standard for the Transportation of Hazardous Substances (wgnho-81352) Operational Reporting SOP (hamro-70771) Consultation Policy and Guidelines (wgnho-10803) Identifying Boundaries for Pesticide Operations SOP (hamro-95867)

Performance Standards

*Compulsory for **all** operations*

4 This pesticide must not be used, stored or prepared, with any prefeed, bait or attractant which is likely to lead any person to believe that the substance is intended for human consumption.

4 Unless in approved container supplied by the manufacturer, this pesticide must not be used in any culinary utensil or other container which is likely to lead any person to believe the contents are intended for human consumption, regardless of any modification or other warning labels attached.

4 Consent providers must be given at least 24 hours notice before the pesticide is applied and a close liaison will be maintained throughout the operation.

4 Bait stations will be removed or made pesticide-free at the completion of the operation.

4 The baits must be dyed green.

4 = *Compulsory for this operation*

☑ *[Add further standards as required, using extra pages if needed. Attach conditions from other consents as separate pages.]*

Information Needs

*Compulsory for **all** operations*

4 Caution Period Monitoring: Monitoring physical breakdown of carcasses is required. See Public Notification SOP Appendix 4.

4 = *Compulsory for this operation*

☐ Monitoring: Monitor for native non-target animals in operational area, send samples for residue testing (VPRD) and report search effort and results in operational report.

Operational Planning & Design Considerations

- Current Agreed Best Practice – Rat Control – Bait Stations Using 1080 Cereal Baits

My approval dated *[date]* is subject to these performance standards being met. Compliance monitoring may occur.

_____.

[Name] Area Manager

♦ INCLUDE ONE SHEET PER PESTICIDE USE ♦ COMPLETE SHADED AREAS ♦

PESTICIDE USE #62	COUMATETRALYL 0.5G/KG BLOCK BAIT STATIONS (NO RATS AND MICE)	TARGET PESTS: RODENTS

DOC/AHB* OPERATION	CAUTION PERIOD
[INSERT NAME OF TREATMENT BLOCK(S)/AREA HERE]	*[INSERT CAUTION PERIOD FOR THIS OPERATION – CONSULT PUBLIC NOTIFICATION SOP]*

* DELETE THE ONE THAT IS NOT APPLICABLE

D0C	AHB	DOC SOPs & Policies Shall Be Followed
		Public Notification for Pesticide Operations SOP, including Warning Signs (hamro-93976)
		Safe Handling of Pesticides SOP (AHB operations apply clean up & disposal chapter only) (hamro-95527)
		Storage and Disposal of Hazardous Substances SOP (wgnho-83176)
		Standard for the Transportation of Hazardous Substances (wgnho-81352)
		Operational Reporting SOP (hamro-70771)
		Consultation Policy and Guidelines (wgnho-10803)
		Identifying Boundaries for Pesticide Operations SOP (hamro-95867)

Performance Standards

*Compulsory for **all** operations*

4 This pesticide must not be used, stored or prepared, with any prefeed, bait or attractant which is likely to lead any person to believe that the substance is intended for human consumption.

4 Unless in approved container supplied by the manufacturer, this pesticide must not be used in any culinary utensil or other container which is likely to lead any person to believe the contents are intended for human consumption, regardless of any modification or other warning labels attached.

4 Consent providers must be given at least 24 hours notice before the pesticide is applied and a close liaison will be maintained throughout the operation.

4 Bait stations will be removed or made pesticide-free at the completion of the operation.

4 = *Compulsory for this operation*

☐ Do not use where pigs are present/reduce pig numbers prior to operation; or

☐ Place bait out of reach of pigs to prevent primary poisoning, and reduce possum numbers exclude possums from baitstations) to help reduce the risk of secondary poisoning of pigs

☑ *[Add further standards as required, using extra pages if needed. Attach conditions from other consents as separate pages.]*

Information Needs

*Compulsory for **all** operations*

4 Monitoring: Residue test shot samples of feral animals in operational areas, especially pigs and report results in operational report.

4 Caution Period Monitoring: Monitoring physical breakdown of carcasses is required. See Public Notification SOP Appendix 4.

4 = *Compulsory for this operation*

☐ Monitoring: Monitor for native non-target animals in operational area, send samples for res testing (VPRD) and report search effort and results in operational report.

☐ Monitoring: Monitor coumatetralyl residues in carcasses of animals killed. Cage several carcasses and periodically send samples with time since poisoning for residue testing (VI and report results in operational report.

Operational Planning & Design Considerations

- Current Agreed Best Practice – Rat Control – 1st Generation Anti-Coagulants in Bait Stations

My approval dated *[date]* is subject to these performance standards being met. Compliance monitoring may occur.

_____.

[Name] Area Manager

♦ INCLUDE ONE SHEET PER PESTICIDE USE ♦ COMPLETE SHADED AREAS ♦

PESTICIDE USE #61	DIPHACINONE 0.05G/KG BLOCK BAIT STATIONS (DITRAC ALL WEATHER RODENT BLOCKS)	TARGET PESTS: RODENTS

DOC/AHB* OPERATION	CAUTION PERIOD
[INSERT NAME OF TREATMENT BLOCK(S)/AREA HERE]	*[INSERT CAUTION PERIOD FOR THIS OPERATION – CONSULT PUBLIC NOTIFICATION SOP]*

* DELETE THE ONE THAT IS NOT APPLICABLE

DOC	AHB	**DOC SOPs & Policies Shall Be Followed**
		Public Notification for Pesticide Operations SOP, including Warning Signs (hamro-93976) Safe Handling of Pesticides SOP (AHB operations apply clean up & disposal chapter only) (hamro-95527) Storage and Disposal of Hazardous Substances SOP (wgnho-83176) Standard for the Transportation of Hazardous Substances (wgnho-81352) Operational Reporting SOP (hamro-70771) Consultation Policy and Guidelines (wgnho-10803) Identifying Boundaries for Pesticide Operations SOP (hamro-95867)

Performance Standards

*Compulsory for **all** operations*

4 This pesticide must not be used, stored or prepared, with any prefeed, bait or attractant which is likely to lead any person to believe that the substance is intended for human consumption.

4 Unless in approved container supplied by the manufacturer, this pesticide must not be used in any culinary utensil or other container which is likely to lead any person to believe the contents are intended for human consumption, regardless of any modification or other warning labels attached.

4 Consent providers must be given at least 24 hours notice before the pesticide is applied and a close liaison will be maintained throughout the operation.

4 Bait stations will be removed or made pesticide-free at the completion of the operation.

4 = *Compulsory for this operation*

☐ Do not use where pigs are present/reduce pig numbers prior to operation; or

☐ Place bait out of reach of pigs to prevent primary poisoning, and reduce possum numbers exclude possums from baitstations) to help reduce the risk of secondary poisoning of pigs

☑ *[Add further standards as required, using extra pages if needed. Attach conditions from other consents as separate pages.]*

Information Needs

*Compulsory for **all** operations*

4 Monitoring: Residue test shot samples of feral animals in operational areas, especially pigs and report results in operational report.

4 Caution Period Monitoring: Monitoring physical breakdown of carcasses is required. See Public Notification SOP Appendix 4.

4 = *Compulsory for this operation*

☐ Monitoring: Monitor diphacinone residues in carcasses of animals killed. Cage several ca and periodically send samples with time since poisoning for residue testing (VPRD) and r results in operational report.

Operational Planning & Design Considerations

- Current Agreed Best Practice – Rat Control – 1st Generation Anti-Coagulants in Bait Stations

My approval dated *[date]* is subject to these performance standards being met. Compliance monitoring may occur.

_____.

[Name] Area Manager

♦ INCLUDE ONE SHEET PER PESTICIDE USE ♦ COMPLETE SHADED AREAS ♦

PESTICIDE USE #65	COUMATETRALYL 0.38G/KG PASTE BAIT STATIONS (RACUMIN PASTE)	TARGET PESTS: RODENTS

DOC/AHB* OPERATION	CAUTION PERIO
[INSERT NAME OF TREATMENT BLOCK(S)/AREA HERE]	*[INSERT CAUTION PERIOD FOR THIS OPERATION – CONSULT PUBLIC NOTIFICATION SOP]*

* DELETE THE ONE THAT IS NOT APPLICABLE

D0C	AHB	DOC SOPs & Policies Shall Be Followed
		Public Notification for Pesticide Operations SOP, including Warning Signs (hamro-93976) Safe Handling of Pesticides SOP (AHB operations apply clean up & disposal chapter only) (hamro-95527) Storage and Disposal of Hazardous Substances SOP (wgnho-83176) Standard for the Transportation of Hazardous Substances (wgnho-81352) Operational Reporting SOP (hamro-70771) Consultation Policy and Guidelines (wgnho-10803) Identifying Boundaries for Pesticide Operations SOP (hamro-95867)

Performance Standards

*Compulsory for **all** operations*

4 This pesticide must not be used, stored or prepared, with any prefeed, bait or attractant which is likely to lead any person to believe that the substance is intended for human consumption.

4 Unless in approved container supplied by the manufacturer, this pesticide must not be used in any culinary utensil or other container which is likely to lead any person to believe the contents are intended for human consumption, regardless of any modification or other warning labels attached.

4 Consent providers must be given at least 24 hours notice before the pesticide is applied and a close liaison will be maintained throughout the operation.

4 Bait stations will be removed or made pesticide-free at the completion of the operation.

4 = *Compulsory for this operation*

☐ Do not use where pigs are present/reduce pig numbers prior to operation; or

☐ Place bait out of reach of pigs to prevent primary poisoning, and reduce possum numbers exclude possums from baitstations) to help reduce the risk of secondary poisoning of pigs

☑ *[Add further standards as required, using extra pages if needed. Attach conditions from other consents as separate pages.]*

Information Needs

*Compulsory for **all** operations*

4 Monitoring: Residue test shot samples of feral animals in operational areas, especially pigs and report results in operational report.

4 Caution Period Monitoring: Monitoring physical breakdown of carcasses is required. See Public Notification SOP Appendix 4.

4 = *Compulsory for this operation*

☐ Monitoring: Monitor for native non-target animals in operational area, send samples for res testing (VPRD) and report search effort and results in operational report.

☐ Monitoring: Monitor coumatetralyl residues in carcasses of animals killed. Cage several carcasses and periodically send samples with time since poisoning for residue testing (V and report results in operational report.

Operational Planning & Design Considerations

- Current Agreed Best Practice – Rat Control – 1st Generation Anti-Coagulants in Bait Stations

My approval dated *[date]* is subject to these performance standards being met. Compliance monitoring may occur.

_____.

[Name] Area Manager