

- Work with tangata whenua to find ways to assist them in their kaitiaki or guardianship role (see Objective two).
- Continue to advise, support and work with individuals and groups working to protect and restore the Green Network (see Objective two).
- Protecting and enhancing the City's important landforms, landscapes, range of habitats plants, wildlife and ecosystems in Waitakere and adjoining harbours and oceans (see Objective one).
- Continue to provide education programmes, cleaner production programmes, public information and events. This includes extending community understanding of and support for environmental protection and inspire and support community involvement in Green Network protection and restoration (see Objective two).
- Seek to better control animal pests on Council owned land (see Objective one).
- Amend and update the Council's Regulations and Code of Practice to encourage sustainable management solutions (see Objective three).
- Restoring key 'Green Network' linkages fully -- from the Waitakere Ranges to and along the coast (e.g. through the Twin Streams Project) (see Objective one).

1.4 Purpose of the Animal Pest Control Strategy

This Strategy directs Waitakere City Council's approach to the management of animal pests as an essential component to the restoration of native ecosystems and achievement of Waitakere City Council's vision for the City (as stated in Green Network Strategic Platform). It describes the Council's long-term goal and objectives, and provides a practical framework to guide the Council in carrying out its roles and responsibilities with regard to identifying, prioritising and managing animal pest impacts.

1.5 Using the Animal Pest Control Strategy

This strategy identifies four objectives that contribute to the overarching goal of the protection of Waitakere's natural ecosystems and ecosystem services from the impacts of animal pests. A rationale is given for each objective. Actions that provide the means of achieving the objective are described. Targets are expressed in a measurable form and should be achieved in the specified time period.

2.0 Goal and Objectives

2.1 Goal

The goal of this strategy is for the:

"Protection of the quality, resilience, biodiversity and ecological integrity of Waitakere's natural habitat, ecosystem services and native fauna from the impacts of animal pests".

2.2 Objectives

The following objectives define the Animal Pest Strategy's approach to achieving this goal:

1. Protect priority (high value) areas from the impacts of animal pests.
2. Support and facilitate community understanding and involvement in the management of animal pest impacts.
3. Minimise future costs by adopting Best Practice Guidelines (Section 7).
4. Address legal responsibilities under the Regional Plant Pest Management Strategy (RPMS).

These objectives are vital to achieving the overriding goal of this Strategy.

3.0 Objective 1: Protect Priority Areas

3.1 Site-Led Programmes

Site-led control of animal pests is undertaken to protect Waitakere's significant native vegetation and fauna from animal pest impacts. Sites with the highest ecological values will be the highest priority for animal pest control. This is in line with the draft Parks and Open Space Strategy. Protection and restoration of significant, representative natural habitats and ecosystems is a focus of the draft Parks Strategy and ten-year goals of the Green Network. Protected Natural Areas surveys undertaken for the Waitakere Ranges (Denyer et al. 1993) and the Lowlands (Julian et al. 1998) provide an inventory of ecologically significant sites in Waitakere.

Most of the animal pest species that are of concern in Waitakere are widespread throughout both the City and the wider Auckland Region. Eradication is no longer feasible for these animal pests; however undertaking animal pest control in sites with high ecological values can protect these values from animal pest impacts. This type of animal pest control has been termed "site-led". Site-led control is an ongoing activity requiring a long-term commitment of management effort and resources. Site-led programmes generally involve an initial period of intensive control (e.g., one year) in the site and associated buffer areas (see Section 7.3), followed by a slightly lower level of ongoing control and monitoring for maintenance purposes.

Site led control programmes are undertaken to produce a desired **outcome**, that where possible needs to be easily monitored, such as:

- Protect and improve ecosystems and ecosystem services by reducing the number of animal pest species destroying native vegetation and bird species.
- Increase native seedling regeneration.
- Increase native bird species and numbers in the local area.
- Increase native invertebrates or lizard species and numbers in the reserve.

Killing a proportion or quantity of animal pests is only the first stage of restoration. It can be considered as an objective; however it is not the overall aim of site-led animal pest control. Where control targets (such as achieving a 5% trap catch rate for possums at a specific site) are used as performance indicators, they must only be regarded as de facto measures of success. The true outcomes desired revolve around the restoration of the ecosystem.

3.1.1 Summary of Site-led Approach

IDENTIFY PRIORITY SITES

1. Identify priority sites for animal pest control with significant native vegetation and fauna habitat.

Where possible work towards a long term vision of the Green Network to create 'mainland islands' of low to zero density animal pests where threatened species can be introduced

2. Identify the threat of animal pests to each site.

Evaluate the threat that each animal pest may pose to each site's natural values.

3. Assess the urgency of control.

Judge the immediacy of the threat animal pests pose to ecological values at each site.

5. **Assess practicality of control.**
All else being equal give preference to sites containing low numbers of animal pests.
6. **Consider the social and cultural importance of sites.**
Rank sites according to their importance to iwi and the local community.
7. **Rank sites using a combination of ecological and community values and practicalities of animal pest control operations (i.e. 1-6 above).**
Calculate scores from 1-6 above to create a hierarchy of priority sites.

PLAN ANIMAL PEST CONTROL WITHIN A SITE

1. **Determine priority animal pests for control within the site.**
Consider which animal pest species are priorities for control work at each site.
2. **Delineate boundaries of the control area.**
Identify buffer areas that should be incorporated into the site's animal pest control programme.
3. **Outline objectives for each site.**
Choose and record control objectives (what, where, when and why), including measurable targets.
4. **Plan implementation**
Choose an appropriate methodology for the effective and efficient control of animal pest targets.
5. **Plan a monitoring programme.**
Choose appropriate monitoring methods and approach to assess whether control objectives are being met.
6. **Estimate costs and allocate funds.**
Consider the costs and benefits of all potential site-led programmes prior to allocating funding to each.

IMPLEMENT ANIMAL PEST CONTROL

1. **Commence monitoring.**
Monitor before and after control.
2. **Undertake control.**
Control work should be done using the standard methods of control and taking into account Best Guidelines (Section 7).
3. **Report on effectiveness.**
Monitor and compare with pre-control data to assess programme effectiveness.

3.2 Actions

The following section outlines the approach to choosing, planning, allocating resources and implementing animal pest control projects while working towards the Green Network goal of ensuring the Ranges and West Coast are permanently protected and maintained. This includes the study and implementation programme for the protection of the Waitakere Ranges with consultation and raising landowners' awareness about the Ranges issues.

3.2.1 Action 1: Identifying Priority Sites

1. Identify sites with significant native vegetation and fauna habitat.

Sites with the highest ecological values should be given priority for animal pest control. Protected natural areas surveys for the Waitakere Ranges and Lowlands (Denyer et al. 1993, Julian et al. 1998) identify Recommended Areas for Protection (RAPs) and Priority Vegetation Sites (PVS). This information has been incorporated into Waitakere City Council's District Plan, which identifies areas of significant vegetation and fauna habitat within the City. In addition, the Plan also identifies areas that are not currently regarded as significant, but which have the potential for restoration or provide an ecological linkage between high value sites. Waitakere Council administers relatively few reserves that comprise of significant natural areas, but many have potential for restoration or provide an ecological linkage between high value sites. This point is recognised by one the long-term goals of the Green Network to restore key 'Green Network' linkages fully – from the Waitakere Ranges to, and along the coast.

The following criteria are adapted from the District Plan methodology to enable sites to be ranked in order of ecological value for the purposes of setting priorities for animal pest control. Such prioritisation will help fulfil a goal of the Green Network to protect and enhance the City's important landforms, landscapes, and a range of habitat's plants, wildlife and ecosystems in Waitakere and adjoining harbours and oceans.

Ecological value criteria

- 3 (High) Identified** as an area of *Outstanding Vegetation/ Outstanding Native Fauna Habitat* in the District Plan; **OR**
 Identified as a *Protected Natural Area* in the District Plan; **OR**
 Contains a threatened vegetation or native fauna community or population; **OR**
 Contains a native vegetation or native fauna community type that is poorly represented in the City's reserve network; **OR**
 Contains a largely unmodified native vegetation and fauna community; **OR**
 Meets *all four* of the following criteria for medium ranked sites.
- 2 (Med)** Contains high biodiversity for its vegetation community type, **AND**
 Shows significant change in community composition along an environmental gradient; **OR**
 Will maintain or has the potential to maintain its ecological viability through its size, shape, health or restoration; **OR**
 Is linked or can be linked to Protected Natural Area sites.
- 1 (Low)** Has potential but only through restoration; **OR**
 Meets only one of the above criteria for medium ranked sites.

2. Identify the threat of animal pest species to each site.

Consider whether or not the animal pest species likely to be present at a site threaten the particular ecological values of the site. Past records could be used when available, otherwise it could be assumed at most sites that a minimum of possums, rats and mice would be present at uncontrolled sites, as they are well established throughout the City.

3. Assess the urgency of control.

The following criteria will assist in judging the immediacy of the threat the specific animal pests pose to ecological values at a particular site (adapted from Shaw 1994).

Urgency of control criteria	
4 (High)	A vegetation community, plant or animal population is known to be, or is very likely to be, threatened with degradation, significant reduction in size, or (local) or national extinction because of the impacts of animal pests.
3	Animal pests pose a major threat to the site's vegetation, habitat values or native fauna in the near future, but so far have caused little or no impact.
2	Animal pests are known or are very likely to have already caused substantial degradation to the site's vegetation, habitat values or native fauna populations, with further damage to these values expected; OR Animal pests pose a medium threat level to the sites vegetation, habitat values or native fauna in the near future, but so far have caused little or no impact.
1 (Low)	The current suite of animal pest species at the site is unlikely to affect its vegetation, habitat values, or resident fauna.

4. Assess the practicality of control.

The following criteria provide a guide to evaluating the practicality of animal pest control. Cost needs to be considered relative to the scale of the operation, i.e., a large site will naturally have a higher cost associated with animal pest control. Costs can also indicate ease of access and conditions on site, which again influences the practicality of control.

Practicality of control criteria	
3 (High)	Control can be achieved at low initial and ongoing annual cost, with work in the first year reducing the infestation to 5% trap catch rate/low impact (i.e. low impact on the native ecosystems).
2 (Med)	Control to reduce animal pest numbers to 5% trap catch rate/low impact requires a large initial investment or medium investment over 2-3 years, and subsequent maintenance can be achieved at low annual cost; OR Control to reduce animal pest numbers to 5% trap catch rate/low impact requires a low initial investment, and subsequent maintenance can be achieved at a moderate annual cost.
1 (Low)	Control to reduce animal pest numbers to 5% trap catch rate/low impact requires a high initial investment, and a high ongoing cost.

Advantages to this approach include:

- Maintaining animal pests at low densities.
- Minimising the resources required for future control work in target sites so that the total area controlled can expand.

5. Assess the importance of a site from the local community's perspective.

Public interest in an area is often hard to quantify therefore can often be overlooked. If it is possible to ascertain scores for all areas requiring prioritisation, public and cultural interests should be included in the final score used to prioritise animal pest control.

Cultural importance can be assessed by determining the location of the area in relation to heritage areas of local iwi. A score may also be given if there is an active community/volunteer group associated with the area. In this way, if the area is considered significant to either iwi or the general public, the area can be given a score of one. If these values are absent the score will remain at 0. Further options are detailed below:

Assessing the importance of the site to the local community	
1.	Is a heritage area of local iwi OR Is maintained by an active community/volunteer group OR Is easily accessed/clearly visible to the general public OR Is deemed an archaeologically significant area
0.	Does not possess any of these qualities.

Including a social and cultural aspect to these animal pest control assessments creates a more holistic approach to prioritisation and helps differentiate areas when all other ecological aspects are similar.

6. Rank sites using a combination of ecological and community values and practicalities of animal pest control operations.

Rank sites according to relative priority for animal pest control by considering ecological value, the urgency of control required, the practicalities and/or cost of animal pest control, and the importance given to the area by iwi and the general public when possible. Adding all the relevant scores together will produce a range of values, where the highest value will become the highest priority for animal pest control.

7. Other considerations.

- Make sure that existing high priority animal pest control programmes are adequately funded, well planned and managed, including long-term, annual maintenance and monitoring (see Section 4.2.2) before funding new programmes.
- Ensure adequate monitoring is in place so that the Council is aware when funding will allow for further areas to be controlled (i.e. once pest populations reach a certain level, the frequency of control visits should reduce therefore resources should be used to commence initial control in another area).
- Ensure that programmes are complementary i.e., they reflect the diversity of community types managed by Waitakere City Council.

- Integrate animal pest control with the management of other threats, such as weed control.
- Liaise with other landowners (i.e. Auckland Regional Council parkland) to ensure control efforts are coordinated at neighbouring sites.

8. Action 1 target.

- Waitakere City Council will identify a list of priority sites within a five-year work programme (and associated buffers) for site-led animal pest control.

3.2.2 Action 2: Planning Animal Pest Control Within A Site

1. Determine animal pest species for control within the site.

Consider which animal pests are present and require control work at each site. The presence of animal pests can be ascertained by previous contracts and/or previous records of animal pests within each site. If no records are available, a brief assessment of the site should be undertaken by analysing the site for any signs of foliar browse, animal droppings, actual sightings, records from members of public, or tracking tunnels.

Animal pest species that require control within each site will be ascertained by the known impacts on the natural ecosystem, feasibility of control, cost efficiency of control, previous control undertaken by contractors, and public concern.

Other factors include:

- **Density:** The higher the density of animal pests the higher the costs and amount of time required to reach low densities. The exception is once densities reach very low levels where the cost and effort required to completely eradicate a species is high.
- **Breeding Rates:** Animal pests with relatively low annual reproductive rates will take longer to recover from control efforts (i.e. cost less) than those with high reproductive rates. For example, rat species require ongoing control due to their high reproductive rates, whereas possum control can be reduced to annual control efforts as their reproductive rate is much lower than rats.
- **Food Chain Effects:** Even with the presence of mammalian predators, ecosystems are held in a fine balance. Altering one component of such ecosystems can have negative impacts on native species. A common example is that of prey-switching. Mustelids and cats can switch prey items to native reptiles, birds and invertebrates when rats have been controlled to low numbers. The control of all animal pests is often too costly, so the next priority should be to control top predators to prevent this 'chain reaction' from occurring. In this way, possums are ideal candidates for control as there are no predators of possums present in New Zealand ecosystems.
- **Impact on the environment:** The priority of pest control targets should also follow the perceived impact of each pest on the environment. For example, mynas and magpies currently pose a low threat to native ecosystems, therefore would be given a low control priority.

2. Delineate control boundaries.

Control should not necessarily be restricted to core sites, for example, within Council reserve boundaries. Where appropriate, extend control boundaries to include buffer areas and other adjacent sites that might contain animal pests (see Best Practice Guidelines in Section 7). Connecting these areas will help extend ecological restoration projects beyond parks and into the surrounding neighbourhoods, which in turn will help with the advocacy of the importance in restoring native ecosystems. Figure 3.1 outlines the process for identifying areas that should be included and managed as buffers within an animal pest control programme.

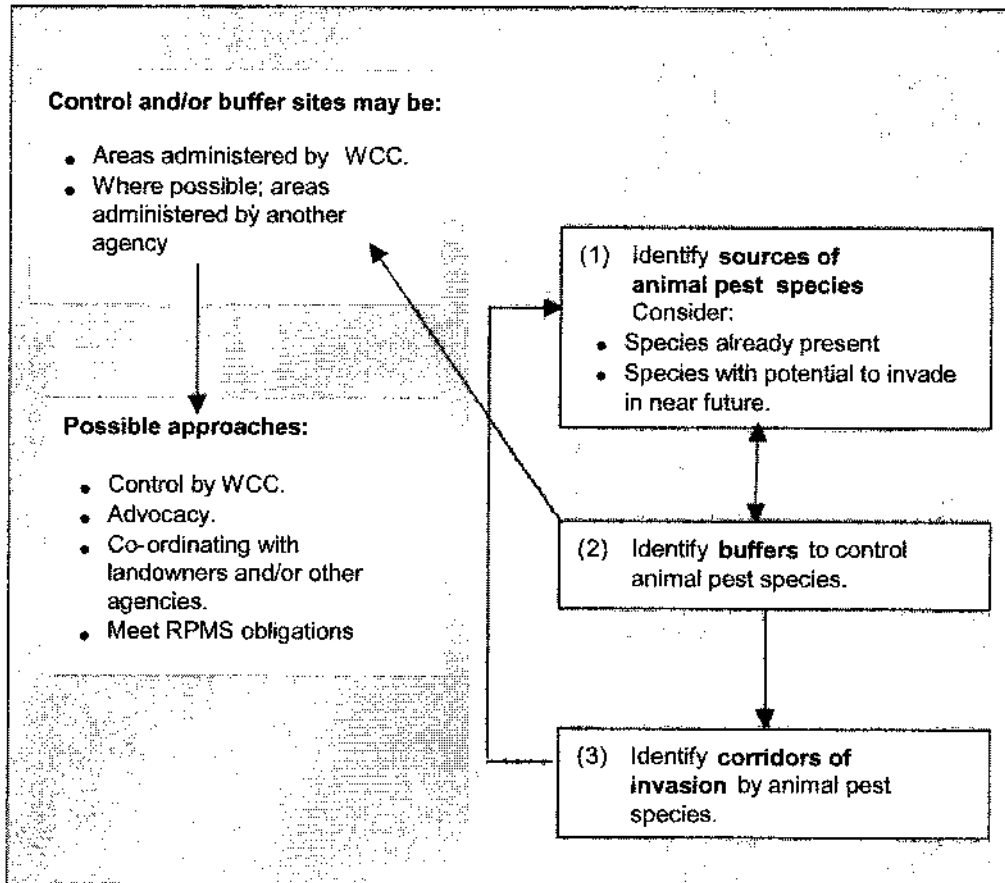


Figure 3.1: Determining buffers for inclusion in an animal pest control programme (adapted from Owen 1998).

3. Outline objectives for each site.

Clear **objectives** are important to accomplish effective control of animal pests

- Objectives are essential in guiding the overall format of animal pest control within a particular site. Objectives should contain the elements what, where, when and why. Typically, objectives are expressed as measurable targets that should be achieved annually. Result targets are useful for setting a benchmark against which progress can be measured (i.e. 5% trap catch rate for possum control).
- Possible parameters to measure the success of animal pest control could include an increase in the number of birds identified within 5-minute bird counts, increased breeding

success of kereru or increased invertebrate abundance and diversity within pitfall trap samples.

- Individual animal pest species can also have separate end objectives. This helps take into account each species unique reproductive rate, ecology and response to control. End objectives can simply indicate the density a species should be at within the site for animal pest control to be deemed successful (e.g. 5% trap catch rate for possum control).
- Objectives also help monitor how effective control has been in achieving the overall goal of ecological restoration. Clear objectives will help to determine what to measure when monitoring. Monitoring should be designed to determine whether or not the objectives for a site are being met.

4. Plan a monitoring programme to monitor the effectiveness of control operations in achieving objectives.

Monitoring is a useful tool to evaluate whether or not a control programme is effective, the contractor has met the targets set, and control objectives are being achieved. Monitoring should measure targets set out in the objectives, and is usually undertaken before and after control.

Monitoring methods to use are:

- Trap catch rates where applicable of specific animal pest species. A 5% trap catch rate will be indicative of successful pest control.
- Evidence of browse and/or signs using tracking tunnels or wax sticks etc.
- Rates of bait take. 15% bait take or less is indicative of successful pest control.
- Five –minute bird counts.
- Invertebrate pitfall traps.
- Native seedling regeneration.

Monitoring should follow the Waitakere City Biodiversity Monitoring Programme (Chapman and Alexander, 2005) as a guideline. Monitoring methods included five minute bird counts, distance sampling of tui and kereru, rapid vegetation and phenology assessments, invertebrate pitfall trapping and lizard spot-lighting night surveys.

5. Estimate costs and allocate funds.

It is essential to consider the costs associated with all the potential site-led programmes prior to allocating funding to each. Refer to Best Practice Guidelines in Section 7 for a discussion on letting contracts and estimating costs.

The cost of the work at priority sites has to be balanced against the return:

- Will a small investment significantly enhance the native ecosystem?
- Will a moderate to large investment reduce future costs if animal pest control is adequately followed up and maintained?
- Will the animal pest control help to meet other goals, such as the involvement of community groups?

Compare all possible site-led programmes before making a final decision on funding allocation. The prospect of long-term animal pest control must at all times be considered when allocating funding. Funds need to be long term to accomplish successful ecological restoration and ensure animal pests are maintained at a low level. If funding is not sustained, it can mean that costly initial control becomes ineffective and expensive with no long-term benefit to the environment. Long-term monitoring must also be adequately funded, to enable the success of the programme to be measured.

6. Action 2 target

- Assess the "outcomes" of each programme every 2 years, including whether the objectives and control targets for each species were met.

3.2.3 Action 3: Implementing Site-Led Animal Pest Control

1. Commence monitoring.

To ensure the effectiveness of animal pest control can be measured, monitoring should always be carried out before, during and after control (see Section 3.2.2-4).

- Five-minute bird counts, invertebrate pitfall trapping and tracking tunnels should be carried out before control is commenced and conducted twice a year during control operations.
- Trap catch rates and bait take should be recorded for each trap and bait station during all control operations.

2. Undertake control.

Control work should be executed using standard control methods and should take into account Best Practice Guidelines (refer to Section 7).

As described in Section 7, long-term maintenance is required after any initial control. This means animal pest control must be well planned and environmentally sensitive to ensure any possible negative impacts of control is mitigated. In most circumstances animal pest control requires trained professionals to ensure the most efficient means of control is employed.

Reporting is an important component of animal pest control to assist with monitoring/auditing purposes and ensure control methodologies used are effective. Diaries should be completed daily including the methodology used, sites controlled, hours taken per site, number of traps set out and trap catch rates. Refer to Appendix one for an example of a reporting template.

3. Report on effectiveness.

After control the site needs to be re-monitored and the effectiveness of the control programme assessed in terms of bird and invertebrate diversity and abundance (i.e. five minute bird counts and invertebrate pitfall trapping) and pest densities. Document the trap catch rate, techniques used and their success in achieving the programmes objectives.

If regular reporting is undertaken (as mentioned above and detailed in Section 7), it could be incorporated into a form of monitoring/self-auditing system.

Reports should include details of sites visited, number of animal pests caught per trap, frequency of control visits and methodologies used. The relevant results of appropriate

monitoring techniques should also be reported (i.e. results of five-minute bird counts and invertebrate pitfall trapping).

4. Action 3 target

- All animal pest control programmes will achieve low densities of animal pest species (e.g. 5% trap catch rate).

4.0 Objective 2: Support and Facilitate Community Involvement

4.1 Issues

Animal pest management initiatives are more likely to succeed if they have the support of the local community. Understanding and awareness are essential to ensure that animal pests are regarded as a priority issue that can, and must be, addressed. Better information and improved public awareness are fundamental to controlling animal pests. During this process the outcomes sought need to be clearly articulated and widely supported.

In a similar manner, relationships can be forged between experienced contractors and community groups to enhance the outcome for both parties. The assistance from experienced animal pest control technician's means volunteers should not become overwhelmed with large animal pest management projects, and can be assisted with tasks requiring significant hours of work. In turn, this should create a positive, educational environment for volunteers to work in whilst successfully restoring an area.

Objective two helps achieve a number of long term goals of the Green Network including working with tangata whenua to find ways to assist them in their kaitiaki or guardianship role, working with other individuals and groups to protect and restore the Green Network.

4.2 Actions

1. Develop advocacy measures.

- Identify and encourage specific interests and roles of relevant sectors of the community with respect to animal pest issues. Target groups include (but are not limited to):
 - General public.
 - Private landowners.
 - Community groups (e.g., Weedfree Waitakere Trust, Waitakere Ranges Protection Society, Keep Waitakere Beautiful, Toxin Action Group, Royal New Zealand Forest & Bird Society).
 - Schools.
 - Tangata whenua.
- Work with tangata whenua to find ways to assist them in their kaitiaki or guardianship role.
- Develop specific communication strategies for each target group, and provide them with appropriate information and recommended actions.
- Ensure current and accurate information is easily accessible and widely available via a range of media, including electronic form, manuals, databases, technical documents and popular publications.
- Promote Best Practice Guidelines (described in Section 7).
- Promote the formation of 'Friends of' groups to work in reserves identified as high conservation value.

2. Provide non-regulatory approaches to minimise threats from animal pests on privately owned land.

In addition to raising public awareness, the most effective measure to facilitate animal pest management by private landowners is the provision of free or low-cost assistance by the Council. Non-regulatory initiatives should be offered under the banner of the Green Network Community Assistance Programme. These include:

- Provision of traps (e.g. Timms traps for possum control and Snap-e traps for rat control).
- Provision of information and advice on animal pest control issues.
- Working with community groups to supply poison and bait stations where appropriate at the discretion of the Council (i.e. ensure poison is only used by adequately trained and informed personnel).

3. Prioritise and manage response to animal pest management issues raised by members of the public.

Ad hoc animal pest control needs to continue to meet the concerns of the public, particularly in cases where members of the community draw attention to issues that match the priorities set out in this Strategy. In some instances it is worthwhile to provide a "one-off" response, for example, to meet good neighbour responsibilities, or to provide a positive response to a public awareness campaign. Such work is however not generally regarded as strategic, hence the level of resources allocated to unplanned animal pest control should be limited, and costs should be weighed against the likely long-term benefits. Actions include:

- Setting an annual budget for responses to public concerns that cannot appropriately be incorporated into site-led initiatives as detailed in Objectives 1 and 4.
- Target concerns that contribute to this Strategy's goals for animal pest management. Consider whether requested actions:
 - Contribute to Green Network objectives.
 - Will facilitate restoration of the surrounding area.
 - Are located within or adjacent to areas of high ecological value.
 - Have a high public profile and hence are useful for education and public awareness.
 - Can be incorporated into an existing or proposed community project.
- Record concerns raised by members of the public in a database for audit and surveillance purposes. If the budget allows, the database could be used to follow-up previous control efforts. This would also help increase public awareness of the importance of ongoing animal pest control, while increasing the value of one-off attempts.

4. Prioritise and implement community projects and education initiatives.

There is considerable value in facilitating the involvement of community groups in animal pest control projects. Such groups can contribute enormous resources and long-term commitment to projects, and these projects can have substantial benefits, both in terms of ecological benefit and public awareness. In developing strategic partnerships with community groups however, Waitakere City Council must retain the ability to make funding and strategic decisions. In

particular, the Council's core work priorities should not be redirected solely on the basis of a group's willingness to contribute to the management of a particular area.

In cases where it is considered appropriate for community groups to undertake Waitakere City Council's priority animal pest control work, the aim must remain for the cost effective management of animal pests. Where animal pest control is undertaken by community groups and funded by Waitakere City Council, any ongoing funding should still be dependent on performance and the achievement of the Strategy's objectives.

It is useful to differentiate (and separately fund) projects undertaken primarily for protection of natural values from projects that aim to raise public support and awareness. These latter projects can include quite different objectives, such as the involvement of a target number of local residents.

As previously mentioned, it is important for community groups to have professionals supporting their work, i.e. how to set out traps correctly, when is the best time to trap and when expert advice is needed.

- Retain an annual budget for community and other animal pest control projects that do not form part of core priorities detailed in Objectives 1 & 4.
- Give preference to projects that:
 - Have clear objectives.
 - Will help maintain essential ecosystem services of the surrounding environment.
 - Have strong, long term community support.
 - Have a high public profile and hence are useful for education and public awareness.
 - Contribute to Green Network objectives.
 - Provide benefits to sites of significance, i.e., support the Council's existing animal pest control programmes.
 - Have professional contractors already working towards the restoration of the site.
 - Can obtain financial support from other agencies (e.g., industry).
 - Outline a robust monitoring programme to demonstrate their effectiveness.

5. Develop and maintain supportive partnerships with stakeholders.

Supportive partnerships are a key aspect of animal pest management in Waitakere, as most significant natural areas are owned or managed by agencies other than Waitakere City Council. Many animal pests occur on land not administered by the Council.

In particular, the following organisations or groups are stakeholders in animal pest management initiatives:

- Community groups.
- Auckland Regional Council.
- DOC.
- Watercare.
- Transit New Zealand.
- ONTRACK.
- Te Kawerau a Maki

- Ngati Whatua

For each of these agencies:

- Develop effective communication and facilitate exchange of information between agencies, including easy access to databases and documentation of animal pest management initiatives undertaken by Waitakere City Council.
- Develop stakeholder agreements to clarify relationships and work programmes. Identify common goals and responsibilities (e.g., RPMS), and complementary skills and resources.
- Promote adoption of Best Practice Guidelines (as described in Section 7).
- Facilitate and participate in cooperative initiatives to undertake animal pest control.

4.3 Targets

- Develop stakeholder agreements with other agencies (years 1 and 2).
- Meet with tangata whenua to discuss any assistance required to facilitate their guardianship role.
- Establish funds for community projects involving animal pest control.
- Lobby stakeholders to contribute to the ecological restoration of land adjacent to high priority sites through animal pest control.
- Continue to provide education programmes, public information and events regarding animal pest control.
- Monitor all pest control programmes to ensure goals and objectives are being achieved (see Section 7.7).

5.0 Objective 3: Minimise Future Costs

5.1 Best Practice for Animal Pest Management in Council Operations.

5.1.1 Issues

Effective animal pest management extends beyond control initiatives. Though sites of high ecological value are the highest priority for animal pest control, a large number of animal pests within Waitakere occur outside these sites (i.e. residential properties). In order to restore native ecosystems throughout the entire City, as per the Green Network vision, all pest control efforts need to be coordinated.

Several operational sections of the Council coordinate and undertake animal pest control for reasons other than the protection of ecological values, such as for health, safety, public concerns or amenity reasons. In addition, a number of Council-managed operations, mainly subdivisions, are not specifically concerned with animal pest control, but can still influence the potential distribution and rate of spread of specific animal pests. All animal pest control operations need to be co-ordinated so that the end result of all control operations is the ecological restoration of the surrounding environment.

Promoting awareness of animal pest issues and commitment to Best Practice Guidelines (refer Section 7) throughout the Council will contribute significantly to effective management of animal pests within the City. In order to facilitate this, wherever appropriate in the Code of Practice, reference should be made to the Best Practice Guidelines and this Animal Pest Strategy. In particular, key operational areas that can adopt Best Practice Guidelines pertaining to animal pest control include:

- Co-ordination of restoration and other community projects.
- Parks maintenance.
- Rubbish collection and disposal.
- Coordination of educational material.
- Coordination and approval of subdivision, creation of new parks and other developments.

Best Practise Methodologies need to be utilised while undertaking animal pest control operations to help minimise future costs. Operations have to be timed within optimal seasons, and carried out efficiently and effectively using the 'Best Practise' methodology to allow for long-term management that maintains animal pest levels to a low density. With regular maintenance control, costs will be kept low at a site.

5.1.2 Targets

- Ensure that all staff working in operational and contractual areas that have involvement with animal pest control work is familiar with Best Practice Guidelines.
- Communicate with the Ministry of Agriculture and Forestry to determine any biosecurity risks early
- Include in the Code of Practice reference to this Animal Pest Strategy and the Best Practice Guidelines contained in it.
- Ensure long term planning and budgeting is maintained for animal pest control/restoration projects.

6.0 Objective 4: Address Legal Responsibilities Under The Regional Plant Pest Management Strategy

6.1 Issues

Auckland Regional Council (ARC) has developed an Auckland Regional Pest Management Strategy, 2002-2007 (RPMS). The RPMS is currently undergoing a review process so that a new strategy will be operative by July 2007. The purpose of the current RPMS is to *'provide a strategic and statutory framework for efficient and effective management of plant and animal pests in the Auckland region.'*

The RPMS is not purely an ecological document, but is based on political, economic and social issues and incorporates the protection of recreational, scenic, social, historic, agricultural, health and safety values, as well as natural values. Under the RPMS, Auckland Regional Council is responsible for all strategic animal pest management decisions in the Auckland Region. Provisions of the RPMS bind Waitakere City Council in that it has occupier responsibility to control animal pests on land it administers "in the manner and to the standards prescribed in the RPMS".

Waitakere City Council is currently not obliged to control any animal pests under the RPMS. The document *"Protecting our Natural Environment: a discussion document for pest management in the Auckland Region"* (ARC, 2006) proposes changes to pest animal management, including implementing a landowner obligation rule to maintain low levels after Auckland Regional Council programmes have concluded. Considering current contracts, it is likely that Waitakere City Council will be able to fulfil their obligations if this proposal is incorporated into this Strategy.

6.2 Actions to be maintained

1. Liaise with Auckland Regional Council to determine their priority concerns, and negotiate reasonable control targets that will contribute to achieving the purpose of the RPMS if landowner obligations arise from the review of the current RPMS (i.e. July 2007).
2. Coordinate animal pest control efforts with Auckland Regional Council to help ensure the management of buffers and reserves for the most efficient management of the environment.
3. Advocate adoption of Best Practice Guidelines (Section 7) into future RPMS strategies.

6.3 Targets

- Maintain communication and coordination of priorities and work programmes with Auckland Regional Council and clarify roles and responsibilities.

7.0 Best Practice Guidelines

7.1 Initial control of animal pests

To achieve effective and efficient control, works must be undertaken following reliable theory. Such theory suggest that an initial intensive phase of pest control is required before a less frequent, ongoing maintenance phase of control is undertaken, with an aim of reducing numbers to below target levels, and where applicable, eradicating target animal pest species from the site.

Initial control must be undertaken on a regular basis in the first year to ensure animal numbers are reduced to a minimum or target level (e.g. possum numbers in a site to be reduced to a 5% trap catch rate). Once this is achieved, ongoing maintenance control must be undertaken to ensure minimum numbers of animal pests are maintained, if not reduced, further or eradicated. Once a site is at a maintenance control level, the amount of resources required for control will reduce therefore, resources can then be put into other sites/reserves of priority for initial control.

7.1.1 Principles of reducing the density and/or eradication of animal pests

- Effective and efficient methodologies following the Best Practice Guidelines.
- Long-term maintenance control is required.
- Eradication of an animal pest is to be ecologically feasible and have the necessary financial and political commitment to be completed.
- Lack of scientific or economic certainty about the implications of a potential animal pest should not be used as a reason for postponing eradication, containment or other control measures.
- The capacity to take rapid action against new animal pests provides the key to successful and cost-effective control of animal pests.

7.2 Maintenance control of animal pests

The Best Practise Methodologies illustrate how on-going effort and investment is required for any animal pest control programme to ensure the protection of ecological values from the impacts of animal pests. To achieve the objectives in this Strategy, continual animal pest maintenance control is required.

Animal pest control is an ongoing process due to the 'vacuum effect' where animal pests invade from neighbouring properties. If there is bush surrounding around a site, or a natural corridor of vegetation, movement of animals will occur. Surrounding areas, regardless of ownership, should be included in a long-term control programme to achieve efficient and effective results.

Timing of animal pest control should consider seasonal events such as fruiting, bird migration and breeding seasons of resident native fauna. For example, rat control is beneficial if carried out during winter before the breeding season of a number of native species.

If followed, Best Practice Guidelines should increase the effectiveness of animal pest control; therefore over time costs should reduce in some areas, allowing additional work to be completed in new priority parks. It should be noted however, that in a number of urban parks,

the continual reinvasion of animal pest species would mean that a low density is difficult to maintain.

7.3 Buffers

Controlling animal pests in buffers is an important part of animal pest control. Buffers are areas of vegetation surrounding core high-value sites that are not necessarily of high value themselves. A well-maintained buffer protects the core site by controlling the surrounding animal pest population and reducing re-invasion rates into the controlled site. A poorly maintained buffer however is a liability, as it can harbour an animal pest source in close proximity to the high value site.

Buffers include populations on neighbouring properties or natural corridors that connect to the core site. These animal populations might be on land administered by the Council, other agencies or privately owned land, therefore coordination of the relevant stakeholders is required. Buffer areas are likely to include roadsides, railway lines, vegetation corridors, private property, and adjacent parks of lower priority. Control in such buffer areas can reduce the cost of ongoing maintenance control.

The size of a buffer will largely depend on the site, ownership of the adjacent land; if it is contiguous with the core site and whether current animal pest threats are observed. Cooperation between all possible landowners is essential (see Section 4.0).

7.4 Best Practise Methodologies

A number of methods are currently available for animal pest control. When selecting the appropriate method for each site, it is essential that all methodologies follow Best Practice Guidelines, including establishing a monitoring regime, and the most efficient equipment is utilised.

Different sites will require different methodologies depending on cost effectiveness, size, access, terrain, public access and usage, and the size of the buffer zone from residential areas. Refer to the 5-Year Work Programme for specific methodologies for prioritised sites.

Ongoing monitoring of current control programmes assist in predicting when a site will be restored to relatively low animal pest densities (i.e. 5% trap catch rates or <15% bait take), therefore reduced costs. In turn this will allow for the addition of new sites to the control programme within the same budget.

7.4.1 Trapping

The traps used will depend on the target animal pest species for control. Suitable traps include:

- Timms traps – possum.
- DOC 150 traps – stoats, weasels, ferrets.
- Snap-e traps – rats.

As with determining the optimal methodology for pest control, the placement of traps depends on parameters within each animal pest control site including size, accessibility, terrain, public access and usage, and the size of any buffer to residential areas.

The timing of trapping should also be considered. Traps should operate so as to maximise the benefit of lower pest numbers during breeding season, fruiting and seeding periods.

Trap catch rates must be at a minimal level of 5% by the end of the first year of control.

Trap catch rates

Trap catch rates are calculated using trap nights. Trap nights must be recorded for the duration of the trapping period, and are based on species caught and the setting of the traps per night.

One trap night is when:

- a target pest is caught; or
- the trap is still set

Half a trap night occurs when:

- a non-target animal is caught; or
- the trap is set off and nothing is caught

The total 'trap nights' for each trap in the reserve then becomes the total trap catch for the day. For previous day(s) that traps were not checked, assume trap nights are the same.

The following formula is then used to calculate the trap catch rate:

$$\frac{\text{Total number of animal pests caught} \times 100}{\text{Total trap nights}} = \text{Trap catch rate}$$

Targets

A 5% trap catch rate for all animal pest control should be the set target to achieve within the first year of initial control. Monitoring (i.e. recording catches per trap) should be undertaken during all operations to determine if this target is being achieved. Adaptive management will then be required to either increase or decrease the trapping frequency and trap placement within each reserve, depending on yearly trap catch results.

7.4.2 Bait stations and poison

Bait stations are generally more effective than trapping methods in a large area. The use of poison targets a greater number of pest species and individuals simultaneously, whereas trapping only controls one animal at a time. Bait stations are also less labour intensive than trapping, as bait only needs to be replaced when bait stations are empty, or after a set period of time required for a second 'pulse'. Poisoning also prevents animal pests becoming trap shy.

Despite greater efficiency at controlling animal pests, the perceptions and effects of poison use on the environment need to be considered. Issues to consider when using poison include:

- Bioaccumulation of poisons in the environment, soils and other animals.
- The risk of effecting non-target species (e.g. dogs, cats, birds and invertebrates).
- Public risk and perceptions.
- Pest becoming bait shy.

For these reasons, poison must only be used in reserves that have limited public access, no neighbouring residential areas, and a vegetation buffer around all reserve boundaries. Further precautionary measure to be taken include:

- Use bait stations.

- Display appropriate signage at reserve entrances (include dates and duration of the control programme).
- Place bait stations away from public areas (i.e. minimise harm to humans and other non-target animals).
- Use bait station designs that minimise the likelihood of secondary poisoning.
- Use green dye to repel birds and other non-target animals.
- Take advantage of animal behaviour to reduce the probability of people or non-target animals coming into contact with dead animals (e.g. possums frequently die in their dens when using brodifacoum).
- Position bait stations at a height that non-target species (e.g. pukeko) cannot access.

When using poison, 'pulses' will be required once every three months for the first year. A pulse involves the initial filling of bait stations with poison, followed by a refill approximately two weeks later. The percentage take of each bait station needs to be recorded during every visit.

Target

All control operations using bait stations and poison must aim for a percentage take of 15% or less in all the bait stations. Once this has been achieved, the frequency of control can reduce to annual visits.

Poison options for bait stations

When considering the use of poison it is important to assess all available options.

Cyanide paste and Feratox are not considered appropriate for use within any Council Parks, despite its use by Auckland Regional Council, due to the following reasons (source Auckland Regional Council):

1. Their classification as deadly poisons (requiring licensed operators)
2. The need to close public land where cyanide is to be laid,
3. The need for permission to be sought from the Medical Officer of Health,
4. The need for the project to be publicly advertised.

Brodifacoum is effective in controlling most animal pests to low densities for sustained periods, and has a comparatively low risk to the public and pets when compared with Feratox, cyanide and 1080. These factors, combined with the general acceptance of Brodifacoum throughout the animal pest management industry as an effective and comparatively safe poison, mean that Brodifacoum is the preferred poison for use during possum control within suitable priority parks (as per North Shore City Council possum control 2001-ongoing).

Campaign is more toxic than brodifacoum, therefore is less appropriate than brodifacoum as the preferred poison for animal pest control.

7.4.3 Biological Control

Biological control (or biocontrol) is the "control or regulation of pest populations by natural enemies". Successful biocontrol operates at the population level, not the individual level, so biocontrol agents (species) must be able to regulate populations of a pest.

Biological control is beyond the scope of the Animal Pest Strategy; however Waitakere City Council should be supportive of research into this field.

7.4.4 Prioritising control targets

Animal pest control is a costly exercise; therefore control targets need to be prioritised. A significant factor when considering species to prioritise is cost. Other factors include:

- **Density:** The higher the density of animal pests the higher the costs and amount of time required to reach low densities. The exception is once densities reach very low levels, the cost and effort required to completely eradicate a species is high.
- **Breeding Rates:** Animal pests with relatively low annual reproductive rates will take longer to recover from control efforts (i.e. cost less) than those with high reproductive rates. For example rat species require ongoing control due to their high reproductive rates, whereas possum control can be reduced down to annual control efforts.
- **Food Chain Effects:** Even with the presence of mammalian predators, ecosystems are held in a fine balance. Altering one component of such ecosystems can have negative impacts on native species. A common example is that of prey-switching. Mustelids and cats can switch prey items to native reptiles, birds and invertebrates when rats have been controlled to low numbers. The control of all animal pests is often too costly, so the next priority should be to control top predators to prevent this 'chain reaction' from occurring. In this way, possums are ideal candidates for control as there are no predators of possums present in New Zealand ecosystems.
- **Impact on the environment:** The priority of pest control targets should also follow the perceived impact of each pest on the environment. For example, mynas and magpies currently pose a low threat to native ecosystems, therefore would be given a low control priority.

7.5 Recording

To make the most of valuable information, daily records should be kept in a database. Data recorded should include:

- Animal pest species sighted alive
- Animal pest species controlled (i.e. killed)
- Trap catch rates (if applicable)
- Bait take per station (if applicable)
- Hours spent in each area/ per phase

This is a simple way to assimilate a range of extremely useful information. For example, when recording the animal pest controlled and catch rates, it would soon become apparent if numbers were reduced to a minimal level (i.e. 5% trap catch rates).

7.6 Monitoring

Monitoring involves the measurement of change in animal pest abundance and environmental indicators following animal pest control. It is useful in any evaluation of the effectiveness of individual animal pest control programmes and of this Strategy. Fundamentally a field exercise,

monitoring costs time and money, but without it, it is hard to justify and evaluate ongoing investment into animal pest control.

7.6.1 Purpose of Monitoring

Monitoring should be undertaken before, during and after control to assess the effectiveness of best practise methodologies, and to ascertain that target objectives are being met, including objectives of this Strategy.

Monitoring methods include a variety of measures using data that will already have been collected during animal pest control operations. These include:

- Trap catch rates
 - Costs per hectare
 - Time spent per hectare
 - Species controlled
- Further monitoring measures include:
 - Five-minute bird counts
 - Invertebrate pitfall sampling
 - Tracking tunnels
 - Vegetation plots
 - Photopoints of susceptible/sensitive plant species (e.g. Auckland Regional Council monitor possum control by retaking photos of the same Northern rata (*Metrosideros robusta*) to assess damage and/or recovery of palatable foliage)

Monitoring results such as trap catch rates can be compared to the control efforts of Auckland Regional Council to help ascertain similarities or disparities between results. These measures will help determine if current methodologies are helping restore the control sites to functioning native ecosystems.

7.7 Estimating Costs for Control and Letting Contracts

Consistent adherence to a set of standards and a pre-defined process for letting contracts is useful in order to minimise risks and enable effective evaluation of results. The following key points should be considered in the development of a standard process for letting animal pest control contracts and estimating costs:

- Provide the contractor with the most accurate information possible on which to base their tender. To ensure objectives are clear, reasonable targets (e.g. 5% trap catch rates by Year 2) and timeframes should also be provided.
- Outline how they will be monitored or measured (e.g. trap catch rates, percentage bait take, five-minute bird counts and/or vegetation plots) and the relevance of meeting these targets in terms of payment. This should include retention of a bond to be paid on successful completion of work e.g. 5% trap catch rate by the second year of control.
- Inform the local community that work is being undertaken.
- Close supervision of contracts will ensure that:
 - Health and safety obligations are met.
 - Contractors meet their expectations.
- Other considerations:

- Market rates and the relative value that different contractors provide including their experience, training and ability to carry out animal pest control in sensitive environments.
- The ability of contractors to follow best practise methodologies.
- Costs of traps, poisons and other materials.
- Accessibility of the site and how this might impact costs.
- Appropriate methodologies for control of the animal pest species present and how this might affect the time taken to complete the work.

7.8 Minimising the introduction and spread of animal pests

The following measures should be encouraged to prevent human activities facilitating the introduction and spread of animal pests, particularly those species yet to establish throughout the City such as rainbow skinks:

- Continue to improve public awareness of animal pests.
- Continue to involve the community in animal pest control programmes where appropriate and encourage on-going maintenance control.
- Provide incentives to private landowners to control animal pests on their property.
- Educate the public of the conservation value of our natural ecosystems and their services.

8.0 Funding Allocation and Priorities

Priority should be given to animal pest control that directly supports the goal of this Strategy:

"Protection of the quality, resilience, biodiversity and ecological integrity of Waitakere's natural habitat, ecosystem services and native fauna from the impacts of animal pests."

This is best achieved by:

1. Using a site-led approach to animal pest control.
2. Ensuring that the public understands how animal pests spread and become established, how they impact the environment, and what they might do about them.
3. Ongoing public support is essential.

The Council must ensure all work adheres to Best Practice Guidelines so as to maximise the value of all operations in achieving the goal of this Strategy. These are designed to minimise wasted effort by targeting control in high priority sites. In addition, setting targets and monitoring animal pest control activity will allow the Council to report on their effectiveness, while relating pest control achievements back to the objectives and goal of the Strategy. Without adherence to "best practice", animal pest control will not be effective in the long-term.

9.0 Definitions

ARC	Auckland Regional Council
Biodiversity	Refers to the numbers of species and the variety of vegetation and habitat types in a community, as well as the amount of genetic variation within a single species.
Buffer	An area, not necessarily of high natural value, from which animal pests may invade the core high value site that is the focus of a site-led programme. Control is undertaken in the buffer area to lessen the probability of reinfestation of the core site.
Containment	Limiting the spread of an animal pest allowing it to be contained within defined geographical boundaries.
DOC	Department of Conservation
Eradication	The complete removal of a species from New Zealand, a large region, or from the city. Eradication is one of the possible objectives of a pest-led control programme.
Monitoring	The measurement of change. In terms of this strategy, it relates to measuring change in the abundance and condition of and native plant populations over time as a result of control.
Outcome objective	Expressed in terms of the values that one is trying to protect by doing control (e.g., why you are doing the control: to protect biodiversity). It describes the objective of the control as a measurable target that must be met in order to demonstrate efficacy. Outcomes targets can only be set and measured in site-led control programmes.
Practicality	Describes whether it is practical to achieve containment or eradication in a reasonable time and cost.
Programme objective	Describes measurable result and outcome targets for a control programme.
Result objective	Expressed in terms of the target (s) , it describes the objective of the control and a measurable target that must be met in order to demonstrate efficacy. These objectives and targets are used in the context of monitoring the means by which the outcomes are achieved. For -led programmes we are only interested in results.
Urgency	Relates to the immediacy of the threat posed by (s) to a site and its values, however, at an early stage of invasion the practicality of control may mean that despite a small immediate threat, control now would reduce any future threat. Criteria for assessing urgency are given under Objective 1 (site-led control).
WCC	Waitakere City Council

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Appendix one: Data sheet for recording daily animal pest control information.

Animal pest control data sheet.

Operator:		Location:	
Project I.D.	Trapping Period:		TO
Job I.D.	Area (ha):		

Date	Weather	Traps	Trap Nights	Possums			Rat			Mustelids	Birds	Hedgehogs	Other	Hours	Kilometres
				Male	Juvenile	Female	Male	Juvenile	Female						
TOTALS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Approx Trap Nights / Ha	#DIV/0!
Trap Nights	0.00
Total Possums	0.00
Possums/100 trap nights	#DIV/0!
Total Rats	0.00
Rats/100 trap nights	#DIV/0!
Total hours	0.00 \$0
Total Kilometres	0.00 \$0
Total Expenses (Bait etc.)	#####
Cost / Trap Night	#####
Cost / Pest	#####
Cost / Kill	#####



Te Ngahere Native Forest Management

Waitakere Animal Pest Management Strategy

July 2006



Te Ngahere

A199

Waitakere Five Year Animal Pest Control Work Programme

July 2006

Prepared for:
Waitakere City Council

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1.0 Animal Pest Issues in Waitakere

The Waitakere Ranges, in the western part of the city, are largely covered in native vegetation. Some is virgin bush, but most is in various stages of regeneration after substantial clearance pre-1900. Nevertheless, the Waitakere Ranges are botanically rich, containing more than a quarter of New Zealand's flowering plant species and two thirds of all native fern species.

Native fauna within Waitakere includes:

- Twenty-three rare threatened or uncommon bird species (e.g. tomtit).
- Common bird species in decline (e.g. kereru (Waitakere City Council, 2005)).
- All resident lizard species, including forest, pacific and Auckland green geckos.
- Large invertebrates including the Kahikatea, Kauri Snail and ground weta.
- Long tailed bat.
- Hochstetters frog.

There is a wide range of animal pests within Waitakere including rats, mustelids (i.e. stoats, weasels and ferrets), possums, goats, pigs, magpies, mynahs, exotic fish species, and rabbits. All these animal pests, along with feral and domestic cats and dogs, impact either directly or indirectly on native vegetation and wildlife; including birds, frogs, lizards and invertebrates.

Animal pests significantly and adversely affect the health of native plant and animal communities, and the survival of many native species. Some animal pests are more widespread and numerous than others therefore have greater impacts on native communities. Failure to manage key animal pest threats in Waitakere will potentially lead to local extinction of plant and animal species, and the progressive degradation of native ecosystems and their ability to provide essential ecosystem services to the environment.

Animal pests alter the structure, composition, abundance and health of native fauna and flora within the environment. This in turn will compromise the ability of native communities to:

- Sustain vegetation cover through pollination, seed dispersal, natural regeneration and successional processes.
- Regulate water quality by feeding and filtering processes of native animals and plants.
- Purify air through plant processes including oxygen production (photosynthesis).
- Break down waste material (i.e. decomposition)
- Generate, regenerate and purify soil.
- Mitigate flooding
- Maintain biodiversity
- Regulate the climate through carbon storage (*Daily et. al.*, 1997).

A large number of species within diverse communities are required for these ecosystem services to continue. Animal pests either directly and/or indirectly negatively impact a number of these native communities through predation or competition for resources such as habitat or food. Animal pests can also alter the environment so that it is no longer suitable for sensitive species to exist (Waitakere City Council, 2004).

Waitakere's history of extensive native bush areas, coupled with surrounding ecological corridors, and more recently, urban expansion, has rendered many of its natural areas vulnerable to high numbers of animal pests. A lack of education and understanding has also seen numbers of animal pests soar in the last century, particularly possum numbers. Streams, railway lines and roads act as connecting corridors, facilitating the spread of animal pests. Development of large land areas has also seen a movement of animal pests into urban areas.

Waitakere's reserves should be sanctuaries for native fauna, however recent reports suggest that populations are on the decline (Waitakere City Council, 2005). Of particular concern are locally, regionally and nationally endangered species. These species in particular require management intervention to help enhance their numbers, or in some cases facilitate the return of the species. A local example of this is Ark in the Park, a project within Cascades Kauri Park, Waitakere Ranges run in partnership with Forest and Bird and Auckland Regional Council. Control of possums, rats, wild cats and stoats has allowed for the reintroduction of North Island Robin and Whiteheads (Forest and Bird, 2006). Significant benefits of animal pest control have also been noted with an increase in other bird and invertebrate numbers (Forest and Bird, 2006).

Without animal pest control native fauna, flora will continue to decline.

1.1 Roles and Responsibilities

Waitakere City Council (WCC) has a number of roles in relation to animal pest management. These include:

- Responsibilities as a landowner, including legal obligations under the Biosecurity Act and any responsibilities that arise from the reviewed Regional Pest Management Strategy (RPMS) operative in July 2007.
- Commitment to progress a sustainable eco-city under the City's Long Term Council Community Plan.
- Obligations for sustainable resource management under the Resource Management Act.
- Commitment to protecting the City's native vegetation and fauna habitat under the District Plan and Wildlife Act and the goals of the New Zealand Biodiversity Strategy.
- A role in advocacy and educating the public and community groups regarding animal pest management and the threat of animal pests to the environment.

1.2 Waitakere City Council's Strategic Framework

Waitakere City Council's Annual Plan and Long Term Council Community Plan 2006-2016 contain a vision for integrating the Council's social, economic and environmental goals. Of particular relevance to animal pest control is recognition of the need to protect and restore the health of the natural and physical environment. Animal pest management is a key component of this policy goal, as animal pests pose one of the greatest threats to the integrity of the City's native ecosystems.

The aims of the Annual Plan and Long Term Council Community Plan have been translated into specific, short to medium term outcomes (termed "Strategic Platforms"), with objectives and targets that determine the Council's implementation programmes. The Annual Plan and Long Term Council Community Plan also sets out the level of service Waitakere City Council will provide to meet the objectives and how this will be funded within the next 10 years. These programmes are tested and adjusted on a yearly basis through the Annual Plan process.

The Animal Pest Strategy fits within Waitakere City Council's strategic framework as a mechanism to support the goals and 2020 vision of the Green Network Strategic Platform.

1.3 Purpose of the five year work programme

This five year work programme is designed to implement the objectives and targets in the Waitakere Animal Pest Strategy.

This five year programme outlines the Best Practice Methodologies for animal pest control in Waitakere's prioritised reserves. Control methods vary for each species depending on:

- Their classification within the RPMS.
- Best Practice control methods.
- Health and safety issues.
- The priority of controlling each animal pest.
- Practicalities of control within annual budgets.

2.0 Goal and Objectives

The following five year work programme will assist the Council in achieving the overriding goal and objectives of the Animal Pest Strategy.

The goal of the Animal Pest Strategy is for the:

"Protection of the quality, resilience, biodiversity and ecological integrity of Waitakere's natural habitat and ecosystem services from the impacts of animal pests".

2.1 Objectives

The following objectives define the Animal Pest Strategy's approach to achieving this goal:

1. Protect priority (high value) areas from the impacts of animal pests.
2. Minimise future costs by adopting Best Practice Guidelines (Section 7).
3. Address legal responsibilities under the Regional Plant Pest Management Strategy (RPMS).

3.0 Best Practice Methodologies

3.1 Phases of Animal Pest Control

All animal pest control should begin with an initial control phase and then move in to the on-going maintenance control phase, to ensure numbers are reduced to low densities and then kept at low densities.

3.1.1 Initial control of animal pests

Animal pests are generally present in an area for some time before they develop into a serious threat. As their breeding capacity increases in a certain area, numbers also increase and their impact on the surrounding native bush, birds, reptiles and invertebrates increases. To achieve effective and efficient control, works must be undertaken following the Best Practice Guidelines within the Waitakere Animal Pest Strategy.

Animal pest control should ideally be undertaken during the prime target times, e.g. possum control should be undertaken during early winter (April-May) when juveniles are present and again in spring to early summer (Oct-Nov). Timing of animal pest control should also consider timing of seasonal events such as fruiting, and new bird arrivals.

Initial control must be undertaken on a regular basis in the first year to ensure numbers are reduced to a low density (e.g. possum and rat numbers in a site to be reduced to a 5% trap catch rate). The frequency of initial control required will depend on the target animal pest species, pest densities and control methods (see Section 2.0 for details). Once initial control has achieved the desired 5% trap catch rates or, 15% bait take, the emphasis should shift to ongoing maintenance control to ensure pest populations are maintained below these target rates. The frequency of maintenance control will again be determined by variables such as the density of the initial pest population (see Section 3.0).

3.1.2 Maintenance control of animal pests

The Animal Pest Strategy aims to minimise future costs by adopting Best Practice Guidelines for the management of animal pest populations. To ensure this is the case, initial control must be followed by maintenance control.

Animal pest control is an ongoing process due to the likelihood of continual animal pest immigration into sites from adjoining areas. A 'vacuum effect' typically occurs where after initial control animal pest numbers decrease significantly, then adjoining populations colonise the area, and numbers quickly return to pre-control levels.

If bush or a corridor of vegetation/ trees surrounds a site, animal pest species will utilise these areas for dispersal and movement. If a long-term management programme is proposed for such a site, then a buffer control zone will need to be established around the area to ensure pest species are managed systematically in to the future. Reserve boundaries could also be the focus of control efforts to target immigrating pests.

The most cost effective approach to reducing the extent of either single or multiple animal pest populations is to undertake control work within targeted areas (i.e. site-led). Maintenance control is a vital component of this process.

Once pest populations within any given site are reduced to a maintenance control level, the frequency of control visits will decrease, as will the resources required for control within the site. Resources then can be used in reserves next on the priority list.

3.2 Best Practise Methodologies

The Best Practice Control Methodologies provided within Section 7 of the Strategy are to be adhered to when designing and implementing animal pest control programmes within Waitakere.

The RPMS considers a number of animal pest species, some of which may be the target of control programmes within Waitakere.

It is recommended that trapping and bait stations be used for undertaking animal pest in the five year work programme.

These procedures are necessary to:

- Continue previous animal pest control undertaken in WCC.
- Ensure efficient and cost-effective methods are used.
- Work in conjunction with the RPMS objectives and actions.
- Ensure all contractors undertake correct methodology.

The different animal pest control methods are discussed below.

3.2.1 Trapping methodology

Trapping is the main method proposed in this five year programme. Timms traps (possums), Snap-e traps (rats) and DOC 150 traps (mustelids) are likely to be the main traps required. Different sites will require different trapping methodologies depending on:

- **Accessibility:** Traps should not be placed within inaccessible sites such as cliff areas. This may require adjustment of the trapping 'grid'.
- **Terrain:** Depending on the target animal, a particular habitat may prove more favourable to some species (e.g. possums prefer ridges over gully areas); therefore the layout of traps should follow favoured habitats where appropriate.
- **Public access and usage:** Traps should be placed away from public tracks.
- **The size of buffers to residential areas:** The size of a buffer can influence the density of target pest populations; therefore will help determine the required spacing for traps.
- **Vegetation type:** Select likely catch areas, i.e. focus efforts within areas of high food resources and suitable habitat for each target species.

Trapping should occur during optimal periods. These are times when animal pest species are at their lowest population density and when sensitive native species are

vulnerable to predation/grazing. Generally, trapping should be timed to reduce pest populations during the breeding season (i.e. trap during early winter (April-May) and again in early summer (October-November) if required).

Trap catch rates must be at a minimal level of 5% by the end of the first year.

Trap catch rates

Trap catch rates are calculated using trap nights. Trap nights must be recorded for the duration of the trapping period, and are based on species caught and the setting of the traps per night.

One trap night occurs when:

- A target pest is caught; or
- The trap is still set.

Half a trap night occurs when:

- Something other than the target pest is caught; or
- The trap is set off and nothing is caught.

The total 'trap nights' for each trap in the reserve then becomes the total trap catch for the day. For previous day(s) that traps were not checked, assume trap nights are the same.

The following formula is then be used to calculate the trap catch rate:

$$\frac{\text{Total number of target pests caught} \times 100}{\text{Total trap nights}} = \text{Trap catch rate}$$

Example:

As part of the possum control contract for North Shore City Te Ngahere caught 22 possums over 779.5 trap nights (using the definition of trap nights above).

Using these numbers in the formula below, calculates a trap catch rate of:

Target

A 5% trap catch rate for targeted pest control is the set target to achieve within the first year of initial control.

Monitoring (i.e. recording catches per trap) must be undertaken to determine if this target is being achieved. Adaptive management will then be required to either increase or decrease the trapping frequency within each reserve, depending on yearly trap catch results.

3.2.2 Bait stations and poison

Bait stations are generally more effective than trapping methods in a large area. The use of poison targets a number of species and many individuals simultaneously, whereas trapping only controls one animal at a time. Bait stations are also less labour intensive than trapping, as bait only needs to be replaced when bait stations are empty, the bait has deteriorated, or after a specified period of time for the second 'pulse'. Poisoning also avoids animal pests becoming trap shy.

Despite greater efficiency of controlling animal pests, the perceptions and effects of poison use on the environment need to be considered. Issues to consider when using poison include:

- Bioaccumulation of poisons in the environment, soils and other animals.
- The risk of effecting non-target species (e.g. dogs, cats, birds and invertebrates).
- Public perceptions of the risk of poisons.
- Risk of animals becoming bait shy.

Due to the risk to domestic animals and the resources required for community liaison when using poison (e.g. public notification), it is recommended that poison is only used in reserves that have no (or very limited) public access, no neighbouring residential areas, and a vegetation buffer around all reserve boundaries. Further precautionary measures to be taken include:

- Use 'Philproof' bait stations.
- Display appropriate signage at reserve entrances (include dates and duration of the control programme).
- Place bait stations away from public walking tracks and open areas (i.e. minimise contact with people and their domestic animals).
- Use Philproof bait stations to minimise the likelihood of secondary poisoning.
- Use 'Pest off' or 'Talon' bait with green dye to repel birds and other non-target animals.
- Take advantage of animal behaviour to reduce the probability of people or non-target animals coming into contact with dead animals (e.g. possums frequently die in their dens when using Brodifacoum).

In reserves where poisoning is the preferred method of control (see tables below), 'pulses' will be required once every three months for the first year. A pulse involves the initial filling of bait stations with poison, followed by a refill approximately two weeks later. The percentage take of each bait station will be recorded during every visit. Assuming the previous amount of bait used is known, bait take can quickly be measured, by assessing the amount of bait remaining in each station. Where incomplete pellets remain, an estimate of the remaining portion of bait to the nearest $\frac{1}{4}$ can be used.

Target

All control operations using bait stations/poison must aim for a percentage take of 15% or less in all the bait stations. Once this has been achieved, the frequency of control can reduce to annual visits (see Section 3.0 for more details on how to adaptively manage animal pest control).

Poison options for bait stations

When considering the use of poison it is important to assess all available options. Appendix one outlines the advantages and disadvantages of poisons commonly used in possum control.

Brodifacoum is the preferred poison for animal pest control. Brodifacoum is effective in controlling most animal pests to low densities for sustained periods, and has a comparatively low risk to the public and pets when compared with Feratox, cyanide and 1080. These factors, combined with the general acceptance of Brodifacoum throughout the animal pest management industry as an effective and comparatively



safe poison, means Brodifacoum is the preferred poison for use during animal pest control within suitable priority parks (as per North Shore City Council possum control 2001 - ongoing).

3.2.3 Trapping vs. bait stations

Timms traps are the most appropriate control methodology for possum control within most reserves for the five year work programme. Trapping is chosen for the following reasons:

- Lower perceived risk in reserves with public access.
- Trapping lowers the risk of killing domestic animals.
- Fewer resources are required for community liaison and public notification.
- Reduced risk to the environment through bioaccumulation of poisons in the environment, soils and other animals.
- Reduced risk to non-target species.

It is hoped that through time with education, the more effective methodology of poisoning can be slowly integrated into urban reserves.

A few of Waitakere City Council reserves are selected as appropriate for pest control using bait stations and poison, for the following reasons:

Remoteness:

- Domestic animals and the public are less likely to utilise these reserves as houses are located at least 100 metres away from any reserve boundary.
- The reserve has a bush buffer around all reserve boundaries of at least 100 metres.
- Reserves with no public access.
- The size of the reserve (>15 hectares) means bait stations will be more efficient and cost effective.

Degree of public access:

Reserves such as Kay Road Balefill (50.762ha) are permanently closed to the general public and are therefore appropriate areas for installing bait stations. Large reserve areas such as Waitakere Quarry (57.350 ha) have no walking tracks, allowing for the careful siting of bait stations away from areas of high public use.

3.2.4 Recording

To be able to learn from and amend the pest control programme, daily records must be kept including:

- Animal pest species sighted
- Animal pest species killed
- Animal pest species caught per trap
- Bait take per bait station
- Trap catch rates if applicable
- Hours spent in each area

This is a simple way to ascertain if objectives are being achieved. For example, when recording trap catch rates, it would soon become apparent if the frequency of control visits needed to be increased due to persisting high numbers of target animals.



3.3 Monitoring

Monitoring involves the measurement of change in animal pest abundance and environmental indicators following animal pest control. It is useful in any evaluation of the effectiveness of individual animal pest control programmes and of this work programme and the Animal Pest Management Strategy. Fundamentally a field exercise, monitoring costs time and money, but without it, it is hard to evaluate ongoing investment into animal pest control.

Examples of control objectives to use during monitoring includes:

- Increased abundance and diversity of five minute bird count results
- Increased breeding success of kereru
- Increased abundance and diversity in invertebrate pitfall trap samples
- Presence of juvenile lizards

3.3.1 Purpose of Monitoring

Monitoring should be undertaken before, during and after scheduled programme control and where practical response control to assess the effectiveness of best practise methodologies and to ascertain that target objectives are being met, including objectives of this Strategy.

Monitoring methods include a variety of measures using data that will already have been collected during animal pest control operations. These include:

- Trap catch rates
- Costs per hectare
- Time spent per hectare
- Species controlled

Monitoring results such as trap catch rates can be compared to the control efforts of Auckland Regional Council to help ascertain similarities or disparities between results. These measures will help determine if current methodologies are helping restore the control sites to functioning native ecosystems.

3.4 Non-Target Species

Non-target species are animal species excluding the current animal pest targeted. Any non-target species must be recorded. If any non-target animal pest species are injured, the contractor must kill them on-site, in a humane manner.

Injured or uninjured non-target species that are not animal pests must be released from traps and taken for treatment immediately and returned to their owner. Any protected or native non-target animals that are caught and injured in traps shall be delivered to the nearest agency that can care for them. This may be the Department of Conservation or Bird Rescue centre.

Should any non-target native species be caught, steps must be taken to try and reduce the number of non-target species caught.

3.5 Public Notification

Notification of animal pest control in reserves is the responsibility of both the contractor and the Council. Scheduled notification (work specified in detail in a

scheduled programme i.e. possum control) and service request notification (ad hoc responses to service requests) should follow similar procedures as required by the Council. They are as follows:

3.5.1 Scheduled notification

Details of scheduled animal pest control being undertaken should be given to the Council by the contractor three weeks prior to undertaking the work for public notification in a local newspaper and the Councils internet site. Notification must include:

- Dates of control scheduled for each reserve
- Method of control for each animal specie(s)
- Type of bait (if used)
- Re-entry time if appropriate
- Any possible hazards
- Contact details of the contractor

It will be the responsibility of the Council to notify the public (at least a week in advance) of planned control work. The proposed reserves for control and the methods of control will be made available.

3.5.2 Service request notification

The contractor will be responsible for public notification for any request for services control at least two weeks prior to undertaking the work. Procedures must follow the same as scheduled notifications as above apart from the following:

- Use of agrichemicals (e.g. wasp control) requires door-to-door notification of residents within a 100-metre radius of the control operation prior to any control work being undertaken.
- Notification can be given to residents after control operations only in extreme emergency situations where time does not permit.

Signs must also be erected at all public access points of the operational area where animal pest control is being undertaken. This is the responsibility of the contractor. The notice must state what control method is being undertaken and a warning against pets in the area. Contact details of the contractor and the Council must also be included.