

## 1. **Application**

### 1.1 **Applicant**

The Karori Wildlife Sanctuary Trust  
PO Box 28-107  
WELLINGTON

### 1.2 **Consents Applied for**

#### 1.2.1 *DL 990188(01): Discretionary Activity*

Discharge to land permit for the aerial application of cereal baits containing 20ppm of Brodifacoum in the upper Kaiwharawhara Stream catchment (Karori Wildlife Sanctuary)

#### 1.2.2 *DW 990188(02): Discretionary Activity*

Discharge to water permit for the aerial application of cereal baits containing 20ppm of Brodifacoum in the upper Kaiwharawhara Stream catchment (Karori Wildlife Sanctuary), excluding open water bodies

### 1.3 **Location**

Karori Wildlife Sanctuary, Waiapu Road, Karori, at or about map reference NZMS 260:R27;558.880

## 2. **Background, Statutory Requirements and Assessment of Effects**

The Karori Wildlife Sanctuary project was conceived in 1992 by the Wellington Branch of the Royal and Forest Bird Protection Society. The Karori Sanctuary project aims to protect and develop a significant conservation site in the Karori Valley by:

- The construction of a 9km predator proof fence around the site;
- The removal of all introduced mammalian pests and predators from within the fence;
- Restoration of the site, including the reintroduction of lost species of indigenous plants and animals and the rehabilitation of degraded habitat; and
- The development and promotion of the site as an educational, research, recreational and tourism facility.

To this end, the Trust received resource consent approval from the Wellington City Council and Wellington Regional Council in January 1998 for the

construction of the predator fence. This involved notification of the application, with the Wellington City Council acting as lead agency, and extensive consultation with affected parties.

The Karori Wildlife Sanctuary Trust is now applying to the Wellington Regional Council for resource consent to carry out the aerial application of Brodifacoum as part of stage two of the development of the Sanctuary, the removal of all pests and predators from within the fence.

### 3. **Proposal**

The Karori Wildlife Sanctuary Trust have applied for resource consent for the aerial discharge of Brodifacoum for the eradication of several species of rodent from the sanctuary, and associated eradication or reduction of populations of other pest species. The operation will involve two separate aerial applications of Brodifacoum, at a total application rate of no more than 15kg per hectare. The toxin itself will be contained in cereal pollard baits with a concentration of Brodifacoum of no more than 20 parts per million (0.002% per bait). Application will be by way of a helicopter fitted with a special sowing bucket, and using a Digital Global Positioning Navigation System (DGPS).

While the entire Sanctuary area will be subject to a number of eradication techniques (including trapping, hand baiting, bait stations, and firearms), the aerial application of Brodifacoum is the only component of the operation requiring resource consent. In recognition of the sensitivity of the surrounding environment, the operation will only occur in areas sufficiently removed from residential areas, with the aerial operation limited to that area above the lower reservoir only. Below the lower reservoir area, a ground baiting operation will be conducted.

In support of this operation, the applicant notes the following points:

- The site and its proposed use as a wildlife sanctuary is recognised and supported in the Wellington Conservancy Conservation Management Strategy (Department of Conservation 1996).
- The site is described as a priority site for protection in the Biological Resources of the Wellington Region (Wellington Regional Council 1984) because it is one of the best forested areas in the western side of Wellington.
- The Wellington Regional Council Regional Policy Statement identifies the valley as a site of regional significance for its landscapes, ecological, heritage and amenity values.
- A large number of introduced browsers and predators have an impact in the Karori Sanctuary which has resulted in the local extinction of most native forest birds and the stagnation of the natural forest

regeneration. Without intensive management the situation is unlikely to change.

- The aerial application of bait is the preferred option for rodent and pest eradication as it is considered to be the only feasible technique for the eradication of a number of rodent species, and significant reduction in other pest species.

Open water bodies will be excluded from the aerial operation, as a 50 metre buffer zone radiating out from the upper reservoir will be enforced, as will a similar 50 metre buffer zone between the aerial operation zone and the perimeter fence.

The timing of the aerial operation, between 1 August and 31 October 1999, is important as typically in winter months natural food sources are scarce and most animals have stopped breeding. While the main target species to be eradicated by the aerial operation are rodents (ship rats, norway rats and mice), the eradication program is also intended to eliminate possums, stoats, ferrets, weasels, rabbits, hares, goats, deer and pigs from the sanctuary.

Operations involving the aerial discharge of Brodifacoum have been successfully undertaken in the past. The most high profile example of such an operation was the eradication of two rodent species from the 1,965 hectare Kapiti Island in 1995. With the exception of the ship rat, all key species being targeted by the applicant in the proposed operation have been cleared from land areas much larger than the Karori Wildlife Sanctuary. The applicant suggests that experience with other rodent species indicates that the eradication of the ship rat from the 210 hectare sanctuary is readily achievable.

However, it should be noted that the proposed aerial application is unique as no other operation relying on the aerial application of Brodifacoum has ever been undertaken in an inland location, let alone in a location partially adjoining residential areas. Previous operations have all been conducted on offshore islands with open water bodies used as the barrier against accidental discharge. The applicant describes the sanctuary as an 'inland island' with the perimeter fence which encloses the Sanctuary acting as the barrier against accidental discharge.

The applicant proposes to undertake monitoring prior, during and after the aerial application which will assess the effect on target and non-target species, and effects on water and soil quality. Monitoring techniques proposed include bird and invertebrate surveys, as well as bait and toxin monitoring, radiotelemetry, trapping and soil and water quality analysis following the aerial operation.

The toxin Brodifacoum is registered only for use only by the Department of Conservation on unstocked offshore islands, and therefore requires an experimental users permit for its use.

#### **4. Other Consents and Approvals Required**

The applicant is required under the Pesticides Act 1979 to apply for an Experimental Users Permit, as Brodifacoum is not a registered pesticide. Pursuant to this Act, the applicant has sought and obtained a valid Experimental Users Permit for the aerial application of Brodifacoum.

Consent has been sought and obtained from the Medical Officer of Health for the use of controlled pesticides pursuant to the Pesticides (Vertebrate Pest Control) Regulations 1983.

The Health Act (1956) requires the use of pesticides to be in compliance with the noxious substances regulations (1954) and Water Supplies Protection Regulations (1951).

The Civil Aviation Act Regulations (1953) require aerial operators to have appropriate licences. Helicopter pilots involved in the aerial operation will be required to hold the appropriate agricultural ratings to undertake the aerial application of cereal baits containing Brodifacoum.

#### **5. Consultation**

The applicant consulted widely in preparing their application, contacting residents groups, recreational users, state and local government organisations, and tangata whenua. The following have been contacted:

- Department of Conservation
- Wellington Regional Council
- Wellington City Council
- Public Health Service (Office of the Medical Officer of Health)
- Representatives of Boundary Residents Groups
- Recreational user groups (Karori Harriers, Wellington Harriers, NZ Mountain Biking Association)
- Wellington Tenth's Trust
- Pesticides Board
- Victoria University Animal Ethic Committee
- Wellington Conservation Board
- NZ Police
- Transpower

#### **6. Notification and Submissions**

In accordance with Section 93 of the RMA, the application to the Wellington Regional Council was publicly notified in the Evening Post on Saturday, 10 April 1999. Signs were also posted at all the main entry and exit points to the Sanctuary at Wright's Hill, the Campbell Street Scout Hall, the main

entrance to the Sanctuary at Waiapu Road, Denton Park, and at Ashton Fitchett Drive (main entrance to the 'Windmill').

The Wellington Regional Council directly notified individuals and organisations also considered to be affected by the proposal. Such parties included the Department of Conservation, the Wellington City Council, the Wellington Tenth Trust, the Medical Officer of Health, the Fish and Game Council, various recreational user groups, and representatives from six Community Liaison Groups established for residential streets adjoining the Sanctuary. In addition, there were also approximately 125 neighbouring residents who were individually notified.

A total number of 12 submissions were received as a result of this notification process. Of these, seven submissions were in support of the application, three gave conditional support, and two were in opposition. One additional submission was also received after the closing date on 7 May 1999, which was also in support of the proposal.

Submitter concerns relating to the application centred on issues such as the potential for accidental discharge outside the boundary of the perimeter fence, the accuracy and reliability of helicopters in the application of the bait, the provision of suitable notification to adjacent property owners and the public relating to the closure of the perimeter fence and timing of the aerial applications, and the potential effect on children and domestic pets.

A full list of submitters are held on file.

## **7. Further Information and Meetings**

Of the 12 submission received prior to the closing date, only one submitter, who was in support of the application, wished to be heard at a formal hearing. Three others wished to be heard only if there was opposition to the application. Neither of the two submitters who opposed the application indicated that they wished to be heard.

On the basis that the only submitter wishing to be heard was in support of the application, I thought it possible negotiation with submitters and the applicant could lead to development of suitable conditions to mitigate or avoid any adverse effects, and therefore avoid the need for a formal hearing.

In consultation with both the applicant and submitters, a draft set of conditions was prepared which were intended to prove both workable for the applicant, and address the concerns of all submitters. These conditions were initially provided to all submitters for their consideration on 20 May 1999. Submitters were requested at this time to provide written confirmation that the draft conditions addressed their concerns, and in the case of those wishing to be heard at a formal hearing, that they were therefore willing to withdraw this right to be heard.

In response to this, all 13 submitters signed-off on the draft conditions, with all those who indicated that they wished to be heard also agreeing to withdraw this right.

## 8. Statutory Reasons for Requiring Resource Consents

### 8.1 Discharge Permits

Section 15 of the RMA, Discharge of Contaminants into the Environment, states:

(1) *No person may discharge any –*

- (a) *Contaminants or water into water; or*
- (b) *Contaminants onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water; or*
- (c) *Contaminants from any industrial or trade practice into air; or*
- (d) *Contaminants from any industrial or trade practice onto or into land –*

*Unless the discharge is expressly allowed for by a rule in a regional plan and in any relevant proposed regional plan, a resource consent, or regulations.*

(2) *No person may discharge any contaminants into the air, or into or onto land, from –*

- (a) *Any place; or*
- (b) *Any other source, whether moveable or not, -*

*in a manner that contravenes a rule in a regional plan or proposed regional plan unless the discharge is expressly allowed by a resource consent or allowed by section 20 (certain existing lawful activities allowed)*

Section 2 of the RMA defines contaminants to include:

*Any substance (including gases, liquids, solid and micro-organisms) or energy (excluding noise) or heat, that either by itself or in combination with the same, similar or other substances, energy or heat –*

- (a) *When discharged to water, changes or is likely to change the physical, chemical or biological condition of water; or*

- (b) *When discharged onto or into land or into air, changes or is likely to change the physical, chemical, or biological condition of the land or air onto which it is discharged.*

The proposal to undertake the aerial application of Brodifacoum in the Karori Wildlife Sanctuary is not an activity that is *expressly allowed for* by a rule in a regional plan. As this is the case, the proposed discharge to land requires resource consent under Section 15 (1) (b) and 15 (2) of the RMA.

As Brodifacoum is not a controlled pesticide under the First Schedule of the Pesticides Act 1979, Rule 15 of the Proposed Regional Plan for Discharge to Land for the Wellington Region, which states the following, is not relevant:

*The discharge of any solid or pesticide onto land in connection with:*

- (1) *the aerial application of any vertebrate pet controlled chemical listed as a “controlled pesticide” in the First Schedule of the Pesticides Act 1979;*

*is a controlled activity, and shall comply with the following standards and terms:*

- (a) *there shall be no application of pesticides in to open surface water bodies or onto any roof or other structures used as a catchment for water supply*
- (b) .....

Given the proposed aerial discharge of Brodifacoum to land does not meet the requirements of Rule 15 (1) above as it is not a controlled pesticide, Rule 1B of the Proposed Regional Plan - *Discharge of Contaminants not Otherwise Provided For* - becomes the relevant rule. Under this rule, the proposed activity is classified as a discretionary activity and therefore requires a consent under section 15(1) (b) and 15(2) of the RMA.

The proposed discharge of Brodifacoum to water under section 15 (1) (b) of the RMA is also classified as a discretionary activity, under Rule 5 of the Proposed Regional Freshwater Plan – *All Remaining Discharges to Water*. As this is not an activity *expressly allowed for* by a rule in a regional plan, the discharge of Brodifacoum to water therefore also requires resource consent, under section 15 (1) (b) of the RMA.

There are no relevant provisions in the Transitional Regional Plan. Consent is therefore required under section 15 (1) (b) and 15 (2) of the RMA.

## 9. **Matters for Consideration**

Section 104 of the RMA outlines the matters that a consent authority must have regard to when assessing any application. The matters outlined in this section which are relevant for the consideration of this application include the following:

- Various sections of the RMA;
- The Regional Policy Statement for the Wellington Region;
- The Proposed Regional Plan for Discharges to Land for the Wellington Region; and
- The Proposed Regional Freshwater Plan.

A more detailed list of these matters is held on file.

## 10. **Assessment of Effects**

### 10.1 **Brodifacoum**

Brodifacoum (Talon ®) is a second-generation anticoagulant that prevents blood clotting, with the result being that animals usually die through a haemorrhage of the gutt. Developed approximately 20 years ago, Brodifacoum has proved highly effective in eradicating rats and mice, where a single ingestion of 1 milligram per kilogram of weight is usually sufficient to kill. In New Zealand, Brodifacoum has been used principally to control rats and possums, although it has also been used to control rabbits. Brodifacoum acts by interfering with the vitamin K dependent clotting factors in the liver of vertebrates to a degree where clotting time increases to a level where there is no clotting at all. Poisoned animals eventually die of heart failure. Vitamin K is an antidote to Brodifacoum.

Second-generation anticoagulants such as Brodifacoum vary from first-generation (such as Warafin and Pindone) in that only single doses are required to induce death, and Brodifacoum is extremely toxic to a number of animal species. This greater potency is attributed to their accumulation and persistence in the liver after absorption as a result of a greater binding affinity to the liver. Onset of symptoms in animals varies, but can take anywhere between one to four weeks depending on the size and type of animal, and the amount ingested. Sub lethal doses of Brodifacoum can remain in the liver of sheep for over 16 weeks and possums for 36 weeks.

As Brodifacoum has a delayed effect, with animals taking several days to die after consuming a lethal dose, there is a reduced risk of “bait shyness” which is considered advantageous in for successful eradication programs.

Toxicity varies between animals, but in most mammals LD<sub>50</sub> values are 1 mg/kg or less, although higher values are reported in sheep and dogs. LD<sub>50</sub> describes the toxicity of a compound, and provides an estimate of the amount of toxin in terms of milligrams of toxin ingested per kilogram of body weight which would be required to kill 50% of any individual species. Some examples are provided below:



Single Dose Acute Oral Toxicity (LD<sub>50</sub> mg/kg) of Brodifacoum

Brushtail possum	0.17 mg/kg
Rabbit	0.2 mg/kg
Cat	0.25 mg/kg
Dog	0.25 – 3.56 mg/kg
Rat	0.27 mg/kg
Mouse	0.4 mg/kg
Sheep	5-25 mg/kg

**10.2 Potential for Accidental Discharge outside of Sanctuary Perimeter Fence and Risk to Human Health**

Given the unique “inland island” nature of the proposed operation, and that this location in part borders residential areas, the possibility of accidental discharges outside of the perimeter fence must be considered. Any such discharge has the potential to significantly effect both humans, and domestic animals, depending on the location and scale of any accidental discharge.

Brodifacoum is toxic to humans, with a lethal dose estimated to be in the proximity of 15 milligrams of Brodifacoum. Evidence from supporting material received with earlier applications to discharge this bait indicates that a human would have to consume over 180 baits to obtain a lethal dose. However, the use of Brodifacoum can also cause anxiety to people who fear the potential for toxic effects as a result of its use.

Accidental discharge outside the perimeter fence could occur in a number of ways. These include: the failure of the helicopter to keep discharges within the operational area; an accident involving the helicopter discharging the bait; transport of at the conclusion of the operation out of the operational area (such as transport by birds); and breeches in the perimeter fence allowing the transfer of and access to baits.

In terms of mitigating potential risks to the public and domestic animals, the establishment of the perimeter fence is crucial. The applicant notes that the perimeter fence, which effectively creates an “inland island”, is significant in that it will prevent re-invasion by pests during and after the operation, and prevents entry by domestic pets.

Importantly, the perimeter fence will also prevent poisoned animals escaping from the operational area. The applicant notes: *“It is the view of the applicant that the risk of poisoned animals escaping the operational area across the fence is negligible...”*. While indicating that initially some larger animals such as possums and cats may be able to cross the fence from the inside, the applicant expects this number to decline as those animals who are able to do so leave the fence and are excluded from returning. By the time the aerial operation commences (at least one month after the fence closure) it is anticipated that few animals, if any will remain in the area which are likely to test the fence. During the time of the aerial operation there will be large

quantities of highly palatable bait inside the perimeter fence which will mean animals will not need to try and escape the enclosure in search of food.

The fence itself is a 2.0 to 2.5 metre high mesh barrier with a curved hood at the top. The hood has shown over two years of trials to be effective in stopping agile predators (possums, stoats, cats) from crossing the fence. It will be checked on a regular basis by the applicant for any signs of damage which may allow entry or exit into the operational area.

In addition to the perimeter fence, the applicant has also proposed a number of other measures designed to mitigate risk. There will be a 50 metre 'buffer zone' or aerial exclusion zone inside the perimeter fence, and observers will be stationed at 500 metre intervals inside the perimeter fence to monitor and pick up any accidental discharges within this exclusion zone. Where the perimeter fence borders residential areas, observers will also be stationed at 500 metre intervals outside of the perimeter fence. The helicopter to be used in the aerial operation will be fitted with a Digital Global Positioning System (DGPS) to aid the accuracy of bait application. This system also allows a printed map to be downloaded which allows for checking of any areas where bait application may be questionable. The helicopter will be loaded with bait inside the enclosed perimeter fence, and all bait will be stored within the fence.

A long range forecast predicting at least three days calm weather will be required prior to the commencement of the operation. At least 24 hours prior to the commencement, the applicant will notify all adjoining landholders of the intention to carry out the aerial application and will identify anticipated dates and duration of the applications. During the entire eradication program the public will be excluded from entering the sanctuary and the applicant will place notices at all points where the public normally gains access stating the nature of the operation and the area to which it relates. The applicant also proposes to notify the Medical Officer of Health. Prior to the reopening of the sanctuary to the public, the applicant will ensure that all remaining baits have been removed from formed walking tracks.

### **10.3 Potential Effects of Brodifacoum on Domestic Animals**

Both cats and dogs are also susceptible to poisoning from Brodifacoum. The applicant has indicated that between 2-30 pellets would need to be ingested per kilogram of weight to achieve LD<sub>50</sub> for dogs, and approximately two pellets to achieve LD<sub>50</sub> for cats. Assuming that the average cat may weigh about 5 kilograms, and the average dog 20 kilograms, this would equate to a cat needing to consume 10 pellets and a dog at the very least 40 pellets to prove fatal.

The risk of secondary poisoning also requires consideration when assessing the potential effect on domestic animals, through the consumption of carcasses, such as possum or bird carcasses. To prove fatal, however, any carcass consumed by a domestic animal would need to contain the equivalent dose of Brodifacoum which would otherwise prove fatal to the domestic pet. I do not consider that this represents a likely scenario.

In order to mitigate the potential effect on domestic animals, the applicant has proposed to give adjoining neighbours at least 48 hours notice of the intention to fully close the perimeter fence so precautions can be taken to ensure pets are not accidentally trapped inside. Any domestic animals that may have been accidentally trapped will be caught and returned to their owners prior to the aerial operation beginning. Signs will also be placed every entry point which will clearly state “*No Dogs Allowed*”.

The pollard baits themselves are of a cereal base and will contain no fish or meat flavours. This is likely to make the bait at the very least unpleasant to domestic animals. Local veterinary clinics will also be contacted by the applicant prior to the operation, and informed of the visible effects of poisoning from Brodifacoum and that vitamin K is a successful antidote to the toxin. Kennel Clubs will also be informed. Residents will also be made aware of the nature of the antidote as a component of the letter box drop informing them of the operation.

#### 10.4 **Potential Effects of Brodifacoum on Soil**

Brodifacoum binds to soil and is slowly degraded. The applicant makes reference to a study conducted by ICI where less than 2% of Brodifacoum added to four different soil types leached no more than two centimetres, and that the half-life of Brodifacoum in soil varies from 12-25 weeks. Analysis by the National Chemical Residue Analytical Laboratory of bait and soil samples from Kapiti Island after rodent eradication showed a consistent pattern of decline in four different habitats to 40-50% of original Brodifacoum analysis after one month. After three months, this had reduced further to 10-30%.

The applicant intends to undertake localised soil monitoring following the aerial operation to test for traces of Brodifacoum.

#### 10.5 **Potential Effects of Brodifacoum on Water**

Brodifacoum is extremely insoluble in water. The applicant suggests Brodifacoum released from baits in water would bind to organic matter in sediment rather than run down streams into water supply. Given this, it is considered only the erosion of soil itself would see Brodifacoum reaching water, but even then Brodifacoum would remain absorbed in organic material and settle out in sediment making the chances of long term contamination of water minimal. Analysis from Kapiti Island is also cited in the case of water quality, where a sample from a spring on the island showed no traces of Brodifacoum. The limit of detection in water for Brodifacoum is 0.0001 micrograms per millilitre.

The aerial operation will exclude all open water bodies, and a 50 buffer zone will be observed to ensure this. The applicant states that any toxic bait falling into streams within the aerial zone should be retained within the Sanctuary as Brodifacoum is insoluble, and streams are channelled through both reservoirs before discharge. The applicant has agreed to monitor water quality as a result

of the aerial operation by taking a water sample for analysis from the outlet of the lower dam. However, any Brodifacoum, which may be accidentally discharged into either the reservoirs or streams, would be very highly diluted due to mixing with reservoir water and I consider it unlikely that this testing will show any traces of Brodifacoum present in any water body.

#### 10.6 **Potential Effects of Brodifacoum on Non-Target Species**

Brodifacoum has the potential to significantly effect non-target species, both through primary and secondary poisoning. A wide range of small and large birds, including saddlebacks, blackbirds, weka and pukeko have been found dead as a result of Brodifacoum operations in the past. The risk of secondary poisoning to non-target species is also higher from second-generation anticoagulants such as Brodifacoum as they are not substantially metabolised and excreted before death.

The applicant states however that there are no threatened native birds which are known to be susceptible to Brodifacoum resident in the area. The only exception to this is the weka. However, these birds are held in captivity and their enclosures are out of the aerial application zone. Brodifacoum is extremely toxic to fish, but there are no threatened native fish known to be present in the Sanctuary which could be adversely effected. Although the applicant notes that the aerial application may have an effect on introduced trout and perch, they consider this effect as a positive outcome as these fish are regarded as a pest. The sanctuary also does not have any population of invertebrates or reptiles which may be at risk.

In summary, the applicant states:

*Furthermore, the Sanctuary has few threatened indigenous species present at this time, and only the weka is considered as a species with the potential to be significantly affected by this operation. Since the weka are held in captivity, they can be excluded from the poison operation and any risk thereby minimised.*

### 11. **Consent Conditions**

The applicant has indicated that there should be no more than two aerial applications of Brodifacoum to ensure the success of the operation. While it is planned to carry out both of these aerial application in the period between 1 August 1999 and 31 October 1999, it is possible that due to factors beyond their control the applicant may wish to conduct either one of both of these drops in the following year.

I therefore recommended that the term of the consent be for two years. A term of two years will provide certainty to the applicant should adverse conditions prevent the operation being conducted in the year of grant. I do not consider that this term unreasonable there will be no more than two aerial application of Brodifacoum during the term of the consent.

## 11.1 Reasons for Conditions

*Conditions 10 and 11 impose restrictions on the quantity of Brodifacoum and application rates allowed in the aerial operation.*

*Conditions 12-18 relate to the operational area and need for adequate buffer zones from water bodies and the perimeter fence and best practice to ensure that the possibility of accidental discharge outside of this area is minimised and monitored.*

*Conditions 19–22 address concerns raised by submitters regarding the completion of the perimeter fence and adequate notification of the commencement of the operation.*

*Condition 23 is in response to a request from the applicant that authorised guided walks be able to continue at the conclusion of the aerial operation. As a component of the applicants operating revenue comes from these walks, I considered this to be a reasonable request.*

*Condition 24 addresses specific monitoring requirements to assess the effectiveness of the aerial operation.*