Application Form for Predator Control in the Wet Jacket Operational Area

Tiakina Nga Manu / Battle for our Birds
May 2019

Name of applicant: s 9(2)(a)

Company/organisation: **Contract Wild Animal Control New Zealand**

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Date: 4 March 2019

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1. Introduction

1.1 Overview

It is proposed that the following pesticide uses will be applied:

- Pesticide Use **#1** - sodium fluoroacetate 1.5g/kg cereal pellet aerial
- Pesticide Use **#2** - sodium fluoroacetate 1.5g/kg cereal pellet hand-laid

Permission is sought for toxic application starting on or after 1 May 2019 and ending on or before 30 April 2020.

Non-toxic prefeed will be applied no earlier than 1 May 2019.

Primary method to be employed is aerial 1080 with hand laid 1080 to be used within buffer areas as required.

1.2 Treatment area

Wet Jacket Treatment Area – 40,000ha

Please see Appendix 1 – Map (1)

1.3 Treatment block(s)

Wet Jacket Treatment Area – 40,000ha

Please see Appendix 2 – Map (2)

1.4 Geographical location

The treatment area is contained within Fiordland National Park. It consists of a remote, back-country stretch of Fiordland coastline and includes two mainland peninsulas between Breaksea Sound and Dusky Sound plus a section of the mainland south of Dusky Sound. Included in the treatment area are several uninhabited, off-shore islands.

Dusky Sound contains a number of inshore islands and the mainland terrain is remote and mountainous. Access to the area is generally via sea-going vessel or aircraft, with the only formed track into the site being the Dusky Track which connects the head of Lake Hauroko to West Arm (of Lake Manapouri) with an additional track leading to Supper Cove, at the head of Dusky Sound.

The forest is predominantly silver beech (*Nothofagus menziesii*), with snow tussock, alpine communities, bare rock and snowfields above the bush line. Coastal area contains some mixed forest of beech, rata and kamahi with small patches of podocarp.

Please see Appendix 1 – Map (1)

1.5 Adjacent land tenure and uses

- Part-only of Fiordland National Park; a National Park under section 4 of the National Parks Act 1980
- Coastal Marine Reserve Area

1.6 Nearby residential areas or facilities

The treatment area is remote. The main divide separates all the closest townships from the treatment area.

Manapouri – 43km / West Arm – 18km / Deep Cove – 11km/ Clifden – 63km / Tuatapere – 67km / Te Anau – 55km

1.7 Community interests

Commercial & Recreational Interests
Fiordland is the location of several commercial fisheries, with associated water supply locations, helicopter landing sites and storage pot holding locations. These activities occur in the marine area adjacent to the treatment area.

Commercial deer recovery operations have historically, and continue to make a significant contribution to wild animal control in this area (FNPMP).

Recreational opportunities are limited by the remoteness of this site, however those who access the area have opportunity to undertake remote back-country pursuits.

- Sea kayaking
- Recreational hunting
- Tramping
- Fishing
- Diving

Tracks and Walkways
Public walking tracks in the Dusky Sound area are limited to the Dusky Track. It is an 84km tramping track that connects the head of Lake Hauroko to Supper Cove at the head of Dusky Sound. It is recommended that only 'experienced, well equipped groups with high levels of fitness' use this track due to the rough terrain and remoteness.

Many of the islands in the sound have marked trap-line routes that can be used by the public.

Iwi Interest
Dusky Sound was an important site for iwi for hunting, fishing and collecting. Visits to the area are likely to have occurred between the months of November to April. A comprehensive

compilation of information on iwi settlement and use in this area is available on the Journal of the Polynesian Society website (J.F. Coutts. 1969). Ngäi Tahu, which hold the mana whenua of the area, is also involved in the management of Fiordland National Park. They are kaitiaki (guardians) of the area, through long association and use. (FNPMP).

Historical Interest

Significant historical sites listed in the Fiordland National Park Management Plan include:

- Astronomer Point in Dusky Sound, where James Cook's astronomer determined the latitude and longitude of New Zealand
- Luncheon Cove in Dusky Sound, which was the site of the first European house in New Zealand,
- Richard Henry's house site, also in Dusky Sound, where some of the earliest conservation work in the country was undertaken and the Puysegur lighthouse at the entrance to Preservation Inlet.

The first recorded shipwreck on New Zealand shores occurred in Dusky Sound at Facile Harbour in 1795. This was the Endeavour, captained by William Bampton. The ballast stones from this ship can still be seen in the Harbour (CMS. 1998).

1.8 Management history

Management of the wider operational area is governed through the Fiordland National Park Management Plan, and all associated Acts and Laws that support the management plan. Islands in the sound are included in the Mainland Southland / West Otago Conservation Management Strategy. Coastal surveillance of the Dusky Sound area, including islands, is undertaken regularly by the Department of Conservation. Few plants are found, and those that are found are immediately removed to halt the spread.

Island Management

Resolution Island, Anchor Island, Indian Island, Breaksea Island, Cooper and Long Islands (plus many other 'stepping stone' islands) are managed by the Department of Conservation. Some of these islands hold no mammalian pest-species and the rest hold reduced or managed populations.

Pest control on the mainland is considered an important step in maintaining the pest-free and semi-pest free status of Dusky Sound islands, and would also help to maintain vegetation health and indigenous species populations on the mainland (Wildlands. 2013).

Marine Protection

Environment Southland governs the marine parts of Fiordland and is the statutory authority for resource consent applications in the marine area, including applications for coastal surface water activities.

MPI Fisheries is responsible for developing a compliance plan to inform and educate fishers on fisheries regulations and to provide surveillance and prosecution capabilities

The Department of Conservation is responsible for managing marine mammals, marine reserves, and some commercial concessions relating to tourism.
A group of representative stakeholders, the Fiordland Marine Guardians ("the Guardians"), were appointed by the Ministry for the Environment to advise on and manage issues relating to the FMA (Wildlands. 2013). Marine Reserves established in 2005 include:

- Moana Uta (Wet Jacket Arm) - 2007ha
- Taumoana (Five Fingers) Marine Reserve – 1466ha

Biosecurity
The Ministry for Primary Industries (MPI), Ministry for the Environment, Environment Southland, and Department of Conservation all contribute towards developing and implementing a Biosecurity Plan (Wildlands. 2013)

Important Bird Areas (IBA)
'Important Bird Areas' (IBAs) is a BirdLife International initiative, aimed at identifying, monitoring and conserving the most important sites for the world's birds. Important areas for New Zealand seabirds are presently being compiled (Gaskin 2013). The draft boundaries of the 'Dusky Sound Wet Jacket Arm IBA (multiple sites)' covers a number of islands in the Dusky Sound project area, including Anchor Island, Indian Island, and Parrot Island, and the Seal Islands and Petrel Islands (Wildlands. 2013).

2. Outcomes and targets

2.1 Conservation outcome(s)

Conservation Outcome

Protection of the health and integrity of the fauna species susceptible to predation by rats, stoats and possums in this area, particularly:

- Yellow crowned parakeet *Cyanoramphus auriceps auriceps* (status: Not Threatened)
- Kea *Nestor notabilis* (status: Nationally Endangered)
- South Island kaka *Nestor meridionalis meridionalis* (status: Nationally Vulnerable)
- Kiwi *Southern Fiordland Tokoeka Apteryx australis* (status: Threatened - Nationally Vulnerable)
- Fiordland crested penguin *Eudyptes pachyrhynchus* (status: Nationally Endangered)
- Bats recorded on motion sensor cameras in Herrick Creek, Wet Jacket Arm. Could be either long-tailed bat *(Chalinolobus tuberculata*); or short-tailed bat *(Mystacina tuberculata tuberculata*)

Protection of the health and integrity of flora species susceptible to possum browse in this area, particularly:

- Kamahi (*Weinmannia racemosa*)
- Rimu (*Dacrydium cupressinum*)
- Miro *(Prumnopitys ferruginea)*
- Halls Totara *(Podocarpus cunninghamii)*
- Southern rata (*Metrosideros umbellate)*
- Tree fuchsia *(Fuchsia excorticata)*

In addition to the above, desired outcomes from this aerial baiting operation are also described in the 'Revised Stoat Operational Plan for Secretary and Resolution Islands 2014' (McMurtrie. P, 2014). This operation will trial the effectiveness of large-scale aerial baiting of the mainland to control rats, as a method of decreasing the immigration pressure of stoats, through secondary poisoning, to Resolution Island.

2.2 Target(s)

1. The following at-risk species will not go extinct at sites where predator control is undertaken:
   - Mohua
   - Whio
   - Long-tailed bat
   - Rock wren
   - Kea
   - Haast tokoeka

2. Where these at-risk species are being monitored at both control and non-treatment sites, the survivorship and productivity will be higher where the predator control occurs (cf. non-treatment site).

3. The operational targets are:

   To reduce possum numbers within the treatment area to a residual trap catch index of 3 possums per 100 trap night or less (<3% RTC), immediately following the operation;

   and

   To reduce rat and stoat tracking rate to below 5% within one month after bait application.

The Department of Conservation considers this necessary and feasible to improve forest health and protect threatened species.

In the South Island mistletoe has been recorded to comprise of up to 60% of possum diets (Sweetapple, Nugent, Whitford & Knightbridge, 2002). From this and other studies Sweetapple et al. (2002) concluded that a possum Residual Trap Catch (RTC) of less than 3-4% was needed to allow mistletoe recovery.

Rodent and stoat abundance varies wildly depending on the amount of food available. After a beech mast or heavy podocarp fruiting event rodent abundance can increase to plague proportions. Stoat numbers then increase in response to the abundance of food (rodents) available. As the food decreases rats and then stoats turn to alternative sources of food (birds and invertebrates). Possums and stoats are the main predators of kāka; stoats are the main predator of whio, pateke, kea and kiwi. Rats are significant predators of many smaller bird and invertebrate species; mohua are particularly susceptible during rat irruption events.

Further control is anticipated when monitoring indicates that possum numbers have rebuilt or predictive monitoring indicates that rodent and stoat irruptions are imminent.

3. Consultation and consents

3.1 Consultation

The Department of Conservation have identified and initially approached key-stakeholders to consult on the proposed operation.

Information on this operation has been provided to all runanga who have been identified as having an interest in this area through the recent, formal Kaitiaki Roopu forum.

All communications undertaken during these consultation processes will be entered into the Communication Register specific to this operation. The Communications Register identifies all individuals and groups who have, or who will be, consulted with and notified as part of the planning, consenting and/or operational communication processes for this operation. An uncontrolled copy of this register is attached. It will be regularly updated and updated copies will be supplied to PHU upon request, or at the conclusion of the operation.

3.2 Consents

The following documents are attached as Appendix 4:

- ☑ Public health permission (including application form) or proof of public health application [1] *[delete the options which do not apply]*
- ☐ Copies of landowner/occupier consents (if obtained in writing)
- ☑ Other (specify): Key Fact Sheet
- ☑ Other (specify): Communications Register

N.B. All documents related to this PHU consent application will be secured and maintained by the Department of Conservation in their docDM document management system. Copies of any and all documentation will be forwarded to the appropriate PHU upon request.

[1] The complete public health permission (including application form) must be sighted before DOC permission will be granted.

4. Methods

4.1 Treatment block 1

Pesticides – Aerial

Pesticide Use #1	Target Pest
Sodium fluoroacetate 0.15% cereal pellet, aerial	Rat Possum

Brand Name of pesticide	1080
Pre-Feed Lure/dye	6gm 16mm RS5 Single Cinnamon Undyed
Toxic Lure/mask (& %)	0.15% 6gm 16mm RS5 Double cinnamon Dyed green
Number of Pre-Feeds	One
Sowing Rates Pre-Feed	1.5kg/ha
Sowing Rates Toxic	1.5kg/ha
Other details about this method	None

Pesticides – Aerial Exclusions (which may require ground control)

Pesticide Use #2	**Target Pest**
Sodium fluoroacetate 0.15% cereal pellet, ground	Rat Possum
Brand Name of pesticide	1080
Pre-Feed Lure/dye	6gm 16mm RS5 Single Cinnamon Undyed
Toxic Lure/mask (& %)	0.15% 6gm 16mm RS5 Double cinnamon Dyed green
Number of Pre-Feeds	One
Sowing Rates Pre-Feed	1.5kg/ha
Sowing Rates Toxic	1.5kg/ha
Other details about this method	None

4.4 Justification for proposed method

SIPRAG (South Island Predator Response Action Group) have stated that aerial 1080 is the preferred method for rat and possum control at Battle for our Bird sites.

This is based on several factors, including:

- cost effectiveness,
- non-target impacts, and
- persistence of some other toxins in the environment.

Large-scale rat and possum control during beech mast years is critical to maintain the conservation gains achieved by the intensive management of animal pests within the Fiordland management area.

This site is encompassed by mountain ranges on all sides, the topographic boundaries provide additional protection to the treatment area post-operation.

The Wet Jacket treatment area contains numerous nationally threatened plant and invertebrate taxa that are either endemic to the area or highly range restricted.

The vulnerability of these taxa to rat predation and/or possum predation/herbivory has been well documented and both the sustained control of possum populations at low densities and the alleviation of rat predation at rat irruptive phases is required to maintain or improve viable populations of these species.

Additionally, there will be significant benefits to forest health due to the zero density of ungulates in this area.

5. Further information

Details of contractor or principle

Further information

Contract Manager

Company/organisation:	Department of Conservation
Contact person:	Site Lead: s 9(2)(a), 9(2)(g)(ii)
Contact number:	Fiordland District s 9(2)(a), 9(2)(g)(ii) s 9(2)(a), 9(2)(g)(ii)

Project Manager

Company/organisation:	Contract Wild Animal Control New Zealand
Contact person:	s 9(2)(a)
Contact number:	s 9(2)(a) s 9(2)(a)

Bait Sowing

Company/organisation:	s 6(d)
Contact person:	s 6(d), 9(2)(a)
Contact number:	s 6(d), 9(2)(a)

The 'Battle for our Birds' programme is a national predator-control campaign led by the Department of Conservation in response to widespread and heavy beech masting, which is expected to produce an irruption of predators such as rodents and mustelids which threaten our endangered species.

Native birds and particularly hole-nesting birds are susceptible to predation by arboreal ship rats (*Rattus rattus*) and our native species have evolved few predator-avoidance behaviours. For instance, mohua (*Mohoua ochrocephala*) is a small, hole-nesting passerine that was once present in most forest habitats over much of South Island and Stewart Island, but began to decline noticeably around the 1890s and is now present in only 25% of its former range (O'Donnell 1996).

Declines and local extinctions in mohua populations during winters coincident with high rat densities have been reported in New Zealand from Eglinton Valley, Fiordland (Dilks *et al.* 2003); Mt Stokes, Marlborough; Catlins State Forest Park, Otago; and the Dart Valley (McQueen & Lawrence 2008). Mohua start nesting in spring (October) (Elliott 1996) and are unlikely to be nesting from June to September. However, mohua, and other birds and bats taking refuge at night in confined spaces such as holes in tree trunks, are vulnerable to predation by rats, especially during rat plagues.

In upland beech forest ship rats are a periodic threat to forest birds following beech mast events while in lowland coastal forest they are a constant threat. Most threat occurs over the breeding season when eggs, chicks and incubating birds are at risk on the nest (Innes *et al.* 2010). However, roosting birds and bats are also at risk outside the breeding season (Elliott *et al.* 1996; O'Donnell *et al.* 2002; Pryde *et al* 2005; O'Donnell *et al* 2011).

Fast knockdown, predator control methods are seen as key to the protection of these species in the face of a plague. Using aerially applied toxin that is fast acting and only requires one application is the preferred method. Sodium fluoroacetate (1080) is the only toxin that meets these criteria and is registered for aerial use on mainland New Zealand.

Appendix 1: DOC Performance Standards

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

Pesticide Use #1	Sodium fluoroacetate 1.5g/kg Cereal pellet Aerial (0.15% 1080 Pellet)	Target Pests: Possums, Rats

Location of operation
Wet Jacket

CSL REQUIRED

Caution Period
The estimated caution period for this operation is *[assessor to complete]* months after last date of bait application and is subject to compulsory bait and carcass monitoring. This estimated caution period cannot be reduced to less than 4 months, and must be extended if the endpoints for monitoring have not been met at the end of the period.

Performance Standards

*Compulsory for **all** operations*

1. For operations targeting rats, prefeed with this pesticide use.
2. The DOC Code of practice for aerial 1080 in kea habitat DOC-2612859 must be followed.
3. Flight paths to and from the bait loading zones by aircraft equipped with loaded or uncleaned bait sowing equipment must avoid: stocked paddocks, residential dwellings, and any other 'no fly zones' specified by consent providers.
4. An aircraft must not, when flying to or from the treatment area, fly over a public drinking water supply or waterway that is less than 100 metres upstream of a point of extraction from a water source for a drinking water supply (not being a water supply exclusively for stock).
5. For operations targeting possums, baits will have a mean size in excess of 6g and 95% of baits should weigh more than 4g.
6. The baits must be dyed green or blue.
7. The boundaries of the bait preparation and loading site are marked and loading site signs docdm-181171 erected. At the end of every day of the operation (including the final day), the loading site and any storage area must be fenced so that people do not inadvertently enter the site and stock cannot gain access to the area. The fence and signs remain in place until you judge that there is no longer a risk to stock.
8. If there is any likelihood that farm stock has been exposed to 1080, the owner must be advised as soon as possible and stock removed from the area.
9. The product must only be used as specified on the manufacturer's product label.

Compulsory for this operation (delete those that you won't be applying to your operation)

10. Bait sowing rate must be no greater than 5kg/ha for 6gm baits (or equivalent bait density per hectare for other bait sizes).
11. Designate a "Safety Officer" on loading site who audits and ensures adherence to safety standards.
12. Use bait sowing buckets with retractable legs.
13. *[Add further standards as required. These could include local performance standards as well as any recommendations from Current Agreed Best Practice that you want to apply to your operation. Attach conditions from other consents as separate pages.]*

Information Needs

*Compulsory for **all** operations*

Nil

Compulsory for this operation

1. *[Add as required.]*

Operational Planning & Design Considerations

- Apply bait in coldest months of year.

- For operations targeting possums, do not repeat aerial operations within 4 years using the same bait.
- Current Agreed Best Practice – Possum Control – Aerial Application of 1080 Cereal Pellets docdm-341728
- Current Agreed Best Practice – Rat Control – Aerial Application of 1080 Cereal Bait docdm-29375

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

_____.

[Name] Director, Operations

Pesticide Use #2	Sodium fluoroacetate 1.5g/kg Cereal pellet Handlaying (0.15% 1080 pellet)	Target Pests: Possums, Rats

Location of operation
Wet Jacket

CSL REQUIRED

Caution Period
The estimated caution period for this operation is *[assessor to complete]* months after last date of bait application and is subject to compulsory bait and carcass monitoring. This estimated caution period cannot be reduced to less than 4 months, and must be extended if the endpoints for monitoring have not been met at the end of the period.

Performance Standards

*Compulsory for **all** operations*

1. For operations targeting rats, prefeed with this pesticide use.
2. For operations targeting possums, baits will have a mean size in excess of 6g and 95% of baits should weigh more than 4g.
3. The baits must be dyed green or blue.
4. The product must only be used as specified on the manufacturer's product label.

Compulsory for this operation (delete those that you won't be applying to your operation)

5. The DOC Code of practice for aerial 1080 in kea habitat DOC-2612859 must be followed.
6. *[Add further standards as required. These could include local performance standards as well as any recommendations from Current Agreed Best Practice that you want to apply to your operation. Attach conditions from other consents as separate pages.]*

Information Needs

*Compulsory for **all** operations*

Nil

Compulsory for this operation (delete those that you won't be applying to your operation)

1. Monitoring: For operations targeting possums, follow best practice for pre and post control result monitoring to estimate percentage kill and report results in operational report.
2. Monitoring: Monitor for native non-target animals in operational area, send samples for residue testing and report search effort and results in operational report. The Vertebrate Pesticides Residue Database SOP docdm-33461 applies.
3. *[Add as required.]*

Operational Planning & Design Considerations

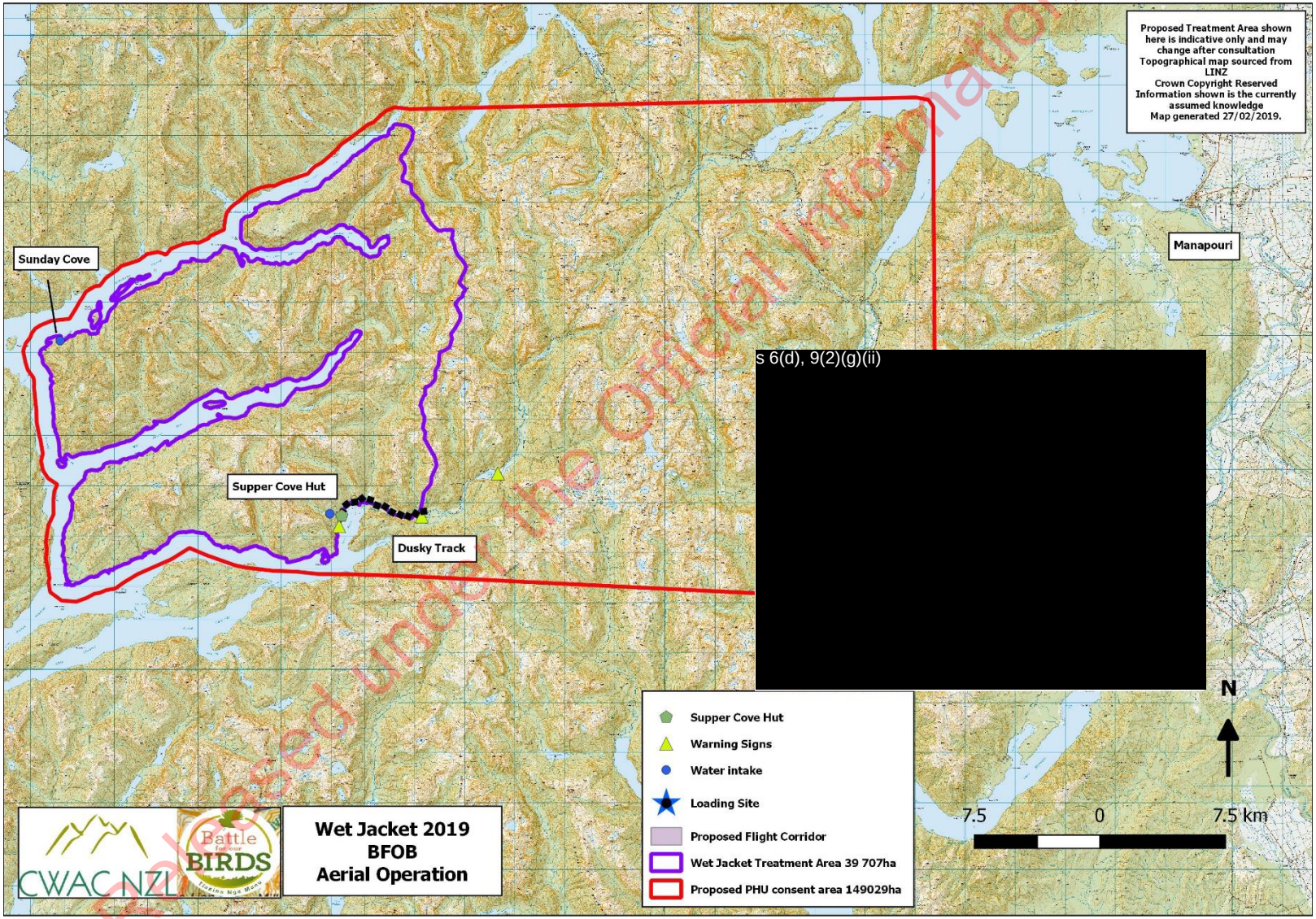
- Current Agreed Best Practice – Possum Control – Handlaying 1080 Cereal Pellets docdm-29797.

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

_____.

[Name] Operations Manager

Appendix 2: Maps



Appendix 3: Communication Record

The Department of Conservation has an ongoing consultation and notification process in place.

The 'Wet Jacket Communications Plan' is held by the Department of Conservation, in its electronic DOCDM system.

This is a live document that will be updated by Contract Wild Animal Control New Zealand at regular intervals throughout the operational period.

It will be available through the DOCDM system: FNP-19-BFOB All Sites.

Appendix 4: Consents

The operational area includes:

- Part-only of Fiordland National Park; a National Park under section 4 of the National Parks Act 1980
- Coastal Marine Reserve Area

1) RMA notification will occur as per NES (RMA Section 360).

2) PHU consent has been applied for. A copy of the application form is attached to this application as a separate document.

3) Landowner/occupier permissions will be recorded in the Consultation record.

4) Declined land owner/occupier permissions will also be recorded in the Consultation record.

Appendix 5: Assessment of environmental effects

Complete this section if an Assessment of Environmental Effects (AEE) is required by the DOC manager approving the permission. An AEE that has been prepared on the DOC RMA AEE template (docdm-96227) for a resource consent application can be attached instead if it covers all the pesticides uses in this application.

Effects on non-target native species

Target benefit species

Native Bats

Bats have been recorded on motion sensor cameras in Herrick Creek, Wet Jacket Arm/Moana Utu which could be either long tailed or short tailed bats.

Native Birds

Due to the coastal to montane environmental gradient of the Fiordland area there is a wide range of habitats for a number of bird species.

Threatened and at-risk bird species recorded in and around Dusky Sound Peninsula include:

Conservation Status of New Zealand birds, 2012 (Robertson et al. (2012), Dusky Sound/Tamatea Conservation and Restoration Plan (2015).

Common Name	Scientific Name	Threat Category
Grey Duck	*Anas superciliosa superciliosa*	Nationally Critical
Black- billed gull	*Laurus bulleri*	Nationally Critical
Southern falcon	*Falco novaseelandiae* "southern"	Data Deficient
South Island kaka	*Nestor meridionalis meridionalis*	Nationally Vulnerable
Southern Fiordland kiwi / tokoeka	*Apteryx australis*	Nationally Vulnerable
Reef Heron	*Egretta scara sacra*	Naturally Endangered
Red-billed gull	*Larus novaehollandiae scopulinus*	Nationally Vulnerable
Fiordland crested penquin/*tawaki*	*Eudyptes pachyrhynchus*	Nationally Endangered
Pied shag	*Phalacrocorax varius varius*	Nationally Vulnerable
Rock wren	*Xenius gilviventris*	Nationally Endangered
Kea	*Nestor notabilis*	Nationally Endangered

New Zealand pipit / *pihoihoi*	*Anthus novaseelandiae novaeseelandiae*	At Risk
Southern blue penguin	*Eudyptula minor minor*	At Risk
South Island pied oystercatcher	*Haematopus finschi*	Recovering
Variable oystercatcher	*Haematopus unicolor*	Naturally Uncommon
Long-tailed cuckoo	*Eudynamys taitensis*	Naturally Uncommon
Little black shag	*Phalacrocorax sulcirostris*	

Other native bird species recorded in and around the treatment area which are not threatened include:

Common Name	**Scientific Name**
South Island rifleman	*Acanthisita chloris chloris*
Western weka	*Gallirallus australis australis*
Sooty shearwater	*Puffinus griseus*
Black shag	*Phalacrocorax carbo novaehollandiae*
Little shag	*Phalacrocorax melanoleucos brevirostris*
Bellbird / *kōparapara*	*Anthornis melanura melanura*
White-faced heron	*Ardea novaehollandiae*
New Zealand scaup	*Aythya novaeseelandiae*
Shining cuckoo/*pipiwharauroa*	*Chalcites lucidus*
Yellow-crowned parakeet	*Cyanoramphus auriceps auriceps*
Black swan	*Cygnus atratus*
Grey warbler/ *riroriro*	*Gergone igata*
New Zealand kingfisher	*Sancta vagans*
Pigeon/kereru	*Hemiphaga novaeseelandiae*
Southern black-backed gull	*Larus domincanus dominicanus*
Brown creeper	*Mohoua novaseelandiae*
Morepork/ *ruru koukou*	*Ninox novaeseelandiae*
Paradise shelduck/ *putangitangi*	*Tadorna variegata*
Spotted shag	*Strictocarbo punctatus punctatus*
Spur-winged plover	*Vanellus miles novaehollandiae*
Silvereye/ *tauhou*	*Zosterops lateralis*
South Island fantail/ *piwakawaka*	*Rhipidura fuliginosa fuliginosa*
South Island robin/*toutouwai*	*Petrica australis australis*
South Island yellow breasted tomtit/*miromiro*	*Petroica macrocephala macrocephala*
Tui	*Prosthemadera novaeseelandiae*

Native Flora

Threatened plant species within the Dusky Sound Peninsulawhich will benefit from control efforts include:

Common Name	Scientific Name	Threat Category
Scarlet mistletoe	*Peraxilla colensoi*	Declining
Red mistletoe	*Peraxilla tetrapetala*	Declining
Yellow mistletoe	*Alepis flavida*	Declining

Native Invertebrates

Dusky Sound and its adjacent fiords, islands and mainland have not been fully explored for terrestrial invertebrates, but what is known is that the Dusky Sound area harbours a distinctive and important invertebrate fauna. Important features of this invertebrate fauna include:

Dusky Sound Conservation and Restoration Plan (2015), Leschen *et al* (2012), Mahfeld *et al* (2012), Stringer *et al* (2012) and Buckley *et al* (2012).

Common Name	Scientific Name	Threat Category
Beetle (Carabidae)	*Mecodema rex*	At Risk-Naturally Uncommon
Earthworm (Megascolicidae)	*Perieodrilus ricardi*	At Risk-Naturally Uncommon
Landsnail (Punctidae)	Punctidae sp. 121 (NMNZ M.57797)	At Risk-Naturally Uncommon
Beetle (Staphylinidae)	*Psuedopsis* sp.1 (NZAC 04001461)	At Risk-Naturally Uncommon
Landsnail (Charopidae)	*Ptychodon blacki*	At Risk-Naturally Uncommon
Beetle (Curculionidae)	*Anagotus* sp. [turbotti group]	At Risk-Naturally Uncommon
Moth (Noctuidae)	*Meterana pictula*	At Risk-Declining
Flax weevil (Curculionidae)	*Anagotus* fairburni	At Risk-Declining
Knobbled weevil (Curculionidae)	*Hadramphus stilbocarpae*	At Risk-Declining
Landsnail (Charopidae)	Charopidae sp.60 (NMNZ M.100283)	Data Deficient
Beetle (Lucanidae)	*Geodorcus helmsi*	Not Threatened
Landsnail (Rhytididae)	*"Powelliphanta" fiordlandica*	Not Threatened

Native Herpetofauna

The herpetofauna of Dusky Sound area is not well known due to a combination of the remoteness of the area, the challenging access and the difficulties of surveying lizards in the heavily forested

areas that are typical of the Doubtful Sound Ecological District. Species likely to be present include:

Dusky Sound Conservation and Restoration Plan (2015), Threat classification after Hitchmough et al.

Common name	Scientific name	Threat category
Fiordland skink	*Oligosoma acrinasum*	At Risk - Relict
Green gecko	*Naultinus* sp.	
Common skink	*Oligosoma chloronoton/lineoocellatum*	
Cryptic skink	*Oligosoma inconspicuum*	At Risk - Declining
Common gecko	*Woodworthia maculatus*	
Southern forest gecko	*Mokopiriraku* 'southern forest'	Nationally endangered
Aurora frog	*Leiopelma auroraensis*	

Aquatic Fauna

Threat classifications for fish are from Allibone *et al* (2010) and for crustaceans from Hitchmough *et al.* (2007), Dusky Sound Conservation and Restoration Plan (2015). Species likely to be present are:

Common name	Scientific name	Threat category
Common bully	*Gobiomorphus cotidianus*	Not Threatened
Giant kokopu	*Glaxis argenteus*	At Risk - Declining
Inanga	*Galaxias maculatus*	At Risk - Declining
Koaro	*Galaxias brevipinnis*	At Risk - Declining
Banded kokopu	*Galaxias fasciatus*	Not Threatened
Longfin eel	*Anguilla dieffenbachia*	At Risk - Declining
Redfin bully	*Gobiomorphus huttoni*	At Risk - Declining
Koura	*Paranephrops zealandicus*	Chronically Threatened – Gradual Decline
Shortfin eel	*Anguilla australis*	Not Threatened

Non-target species

As above

Effect of operation on native species

Native Birds

Studies carried out on native and non-native species suggests 1080 is likely to be toxic to most native animals. There is wide variation in sensitivity between taxonomic groups. Mammals are more sensitive than birds and invertebrates on a weight for weight basis. The small size of many native species relative to the target pests means that toxic baits used for pest control are capable of causing harm to almost any animal that eats the bait. Therefore, the level of exposure to the bait becomes important in determining the

effects on non-target native species in the field.

There are records of a range of native bird species found dead after aerial poisoning operations and many of these individuals have contained residues of 1080. However, when records are discounted: from operations which did not meet current bait quality standards (e.g. using unscreened, un-dyed carrot bait with berry fruit lures) or from those animals which did not have detectable 1080 residues, the Department of Conservation, Vertebrate Pesticide Residue Database 1994-2013 contains only 35 individuals representing 10 native species across all bait types used in aerial poisoning. No conclusions about population effects can be drawn from this information but it is useful to focus further studies.

There have been numerous studies examining the effects of aerial poisoning on native non-target populations over the last 20 years. 21 species of native birds, particularly threatened species, have been monitored. None of the studies have identified population level mortality which threatened the viability of the species, although the only reliably calculated mortality rates are for kokako, kiwi, kaka, whio and fernbirds. The upper 95% mortality rates for kokako, kiwi, kaka, whio are all less than 3.5%. The mean mortality rate for fernbirds is 9.4%.

Limited monitoring of short tailed bats and native frogs has not indicated detectable mortality due to aerial 1080 poisoning.

Invertebrate populations have been monitored in nine aerial poisoning operations and none have shown significant population effects on any species studied, nor is there evidence to suggest poisoned invertebrates are a significant factor in secondary poisoning of other animals. Long term monitoring of native land snails indicates substantial benefits to threatened populations in sites treated with aerial poisoning.

The risks 1080 operations pose to aquatic species is considered very low. Fish are very tolerant to 1080. Additionally, 1080 contamination of water is rarely found during 1080 operations and is at an extremely low level when it has occurred. No mortality of longfin eels, köaro or upland bullies was observed during experiments where high densities of cereal 1080 pellets were placed in water just upstream of them. Eels and koura have survived experimental feeding of cereal 1080 pellets, and eels have survived feeding on possum tissue containing 1080. There have also been no detectable effects on aquatic invertebrate communities in field studies when 1080 baits were placed at high densities in streams.

Risks to threatened bird species present in the treatment areas (see section 3.3) are discussed below:

A total of 42 weka (Gallirallus australis) have been exposed to this

method and bait type over 4 operations and 1 has died from poisoning.

A total of 23 radio tagged morepork (Ninox novaeseelandiae) has been exposed to this method and bait type over 5 operations and none have died from poisoning (Greene et al. 2013). Call count monitoring at Waipoua did not indicate significant 1080 related mortality (Pierce & Montgomery, 1992 cited in Broome, Fairweather & Fisher, 2009).

A total of 59 fernbirds (Bowdleria punctata) has been exposed to this method and bait type over 3 operations and 7 have disappeared after poisoning.

A total of 21 colour banded and 5 un-banded South Island robins (Petroica australis) were monitored during 2 aerial 1080 pellet operations, all survived.

Transect counts of SI tomtits, grey warbler, SI robins and riflemen were conducted before and after the 2010 Waitutu aerial 1080 operation (1 kg ha^{-1} pre-feed followed by 2 kg ha^{-1} 0.15% 1080 pellets). The transects were located at five sites, three within the operational area and two in a non-treatment area. While the numbers of tomtits and grey warblers detected on the transects changed following the application of the 1080, the scale and direction of the changes (decreases for tomtits and increases for grey warbler) was similar at all five sites. The pre- and post-control counts of riflemen and SI robins were similar between the operational area and non-treatment sites. The authors therefore concluded there was no evidence for population level impacts from 1080 on any of these species (Greene et al. 2013)

Blue duck (whio) (Hymenolaimus malacorhynchos) are unlikely to eat cereal pellet baits and their aquatic invertebrate prey are unlikely to be contaminated by 1080. However, studies have been done to determine their survival following aerial 1080 operations. There was no reduction in visual counts of blue duck in the Otira valley after application of 0.15% 1080 Pellets at 6 kg/ha in 1989 (Spurr & Powlesland, 1997 cited in Broome, Fairweather & Fisher 2009). Additionally, all 19 radio-tagged blue ducks in Waihaha survived for at least four weeks following aerial application of carrot bait (0.08%) at 15 kg/ha (Greene, 1998 cited in Broome, Fairweather & Fisher 2009).

A total of 60 radio tagged kāka (Nestor meridionalis) have been exposed to this method and bait type over 4 operations and none have died from poisoning. Additionally, 38 radio tagged birds have been exposed to 0.08% carrot baits over 2 operations and none have died from poisoning (Greene et al. 1998; Powlesland et al. 2003).

Kereru (NZ pigeon/kūkupa) (Hemiphaga novaeseelandiae) have not been monitored individually when exposed to this method and

bait type. However none of six birds ate non-toxic cereal pellets offered in a trial on Kapiti island (Spurr & Powlesland, 1997). Monitoring of kereru during 5 aerial 1080 operations using cereal pellets did not detect population changes using the five minute count method (Spurr & Powlesland 1997). Additionally, all 15 radio tagged birds exposed to an aerial 1080 operation using carrot bait survived (Powlesland et al. 2003).

Kārearea (NZ falcon) (Falco novaeseelandiae) have not been monitored individually when exposed to this method and bait type. However falcon territories have remained occupied, presumably by the resident birds, during four aerial 1080 operations using cereal pellets (Pureora 1984, Mapara 1990-92) and one using carrot bait (Waihaha 1994) (Spurr & Powlesland, 1997). The total number of falcon involved in this monitoring is about 13, although the Mapara birds (3 pair) were exposed in three consecutive years (Calder & Deuss, 1985: Bradfield, 1993 cited in Broome, Fairweather & Fisher, 2009); Greene et al. 1998).

Kākāriki (parakeet) (Cyanoramphus spp.) nests have been monitored during two aerial cereal 1080 operations. Fifteen nests were monitored during the October 2007 Hurunui Valley operation and a further seven nests were monitored during a 1080 operation in the Dart Valley. Dead chicks in a failed nest in the Hurunui Valley operation contained 1080 residues and the female was not seen after the nest failed. All the monitored nests in the Dart Valley operation were successful, however two unmonitored kākāriki were found dead with 1080 residues in their tissues. The combined estimate of mortality of nesting parakeets from these operations was 2.27% (0.1-12 % 95% CI) (Rhodes, Elliot & Kemp, 2008 cited in Broome, Fairweather & Fisher, 2009). The authors concluded that while some kākāriki were killed during the 1080 operations, given the rate of nest predation observed in areas where no predator control was carried out, the net benefit from the 1080 operations was positive. No detectable impact could be determined through five minute bird count monitoring after four aerial 1080 operations using carrot or cereal pellet baits (Spurr & Powlesland et al. 1997). Additionally following an intensively monitored aerial 1080 operation in Waihaha in 1994 using carrot bait, (Greene et al. 1998) observed "...kākāriki remained common within the study area...".

Kāhu (Australasian harrier) (Circus approximans) have not been monitored individually when exposed to this method and bait type. However no detectable impact could be determined through five minute bird count monitoring before and after an aerial 1080 operation using cereal pellets on Rangitoto Island and "the small resident population was still seen...throughout the year following the poisoning" (Miller & Anderson, 1992). Additionally, (Pierce & Maloney, 1989 cited in Broome, Fairweather & Fisher, 2009) found no evidence of dead harriers after aerial 1080 poisoning of rabbits in the McKenzie basin.

A total of 145 radio tagged kea (Nestor notabilis) have been exposed to this method and bait type over 10 operations and 20 have died from poisoning. Additionally, 2 radio tagged birds have been exposed to 0.08% carrot baits over 1 operation and none have died from poisoning (Kemp & van Klink, 2008 cited in Broome Fairweather & Fisher 2009).

Options to manage risk and/or levels of exposure:

Adopting accepted operational practices reduces the risk for birds. Techniques developed in recent years are important components of the operation.

- For 1080 dull green dyed bait has been shown to be the least attractive colour to birds.
- Cinnamon–lured baits instead of fruit lures help to repel most birds.
- Ensuring bait meets all quality specifications is considered the best way to avoid adversely affecting birds.

In March 2010, the DOC Pesticide Advisory Group reviewed the research results to date to recommend new compulsory performance standards. DOC staff and AHB representatives have been consulted on the operational implications of the new standards. These standards are being reviewed again taking into account the learning's from the 2014 Battle for our Birds 1080 operations. The up-dated DOC Code of Practice for aerial 1080 in kea habitat and the latest version of the DOC Performance Standards for this pesticide use will be followed. This operation will adhere to these standards to ensure that the risk to kea is minimized to the extent that current research indicates.

Bats

Lesser short-tailed bats (*Mystacina tuberculata*) feed on arthropod taxa known to consume 1080 baits. Thus, they may be vulnerable to secondary poisoning after control operations using aerially broadcast 1080 baits and residues in those prey can in theory be enough to kill a bat. Lloyd (1994) offered non-toxic cereal pellets containing a fluorescent marker to captive bats and hand broadcast baits throughout an area known to be inhabited by bats and concluded *"…short-tailed bats are unlikely to eat carrot or grain-based baits…"*.

In a study in Rangataua Forest where 0.15% 1080 pellets were aerially broadcast (3 – 5 kg /ha) over *"…almost the entire winter range…"* of the study animals, a total of 269 short-tailed bats were caught at their roost following poisoning and held for 48 hours to determine mortality or signs of poisoning. All animals survived and showed no signs of 1080 poisoning (Lloyd & McQueen 2002). This result compares favourably for the assessment of risk for insectivores surmised by an earlier study (Lloyd & McQueen 2000).

An aerial 1080 operation was conducted over 10,300ha in the Eglinton Valley on the 12th December 2014 as a response to a rat plague event. This provided an opportunity to measure the effects of an aerial 1080 operation on a well-marked lesser short-tailed bat population. The highest ever count of short-tailed bats in the Eglinton Valley was recorded on video after the 1080 drop. In addition, at least 98.6% of the individually recorded short-tailed bats recorded immediately prior to deployment of the 1080 in December were still alive. Modelling of the population showed that any decline of survival was due to immigration or emigration of predominantly males rather than deaths (Edmonds & Pryde 2015).

Invertebrates

The effect of the aerial 1080 operation on common invertebrates within the area will be minor.

Invertebrate populations have been monitored in several aerial 1080 poisoning operations and none have shown significant population effects on any species studied, nor is there evidence to suggest poisoned invertebrates are a significant factor in secondary poisoning of other animals. Long term monitoring of native land snails indicates substantial benefits to threatened populations in sites treated with aerial poisoning due to reduced predator populations.

An extensive study of forest invertebrates on 1080 baits (Sherley, et al, 1999) found that at any time only a small proportion of baits had invertebrates on them, and the few individuals per bait represented a small section of the fauna present in the litter. The number of invertebrates recorded on baits in treatment grids declined when 0.15% 1080 pellets were laid at 18 kg/ha, but started to return to original levels (relative to control grids) within 6 days of removal of the toxic baits. This sowing rate is approximately nine times that proposed to be used in the Fiordland / Waikaia treatment area. The reduction in invertebrate numbers did not extend further than 20cm around any bait.

Another study (Spurr & Berben, 2004 cited in Broome, Fairweather & Fisher, 2009) hand laid 0.15% 1080 cereal pellets at 5 kg/ha to simulate aerial poisoning in Tararua Forest Park in 1999 and monitored the occupancy of artificial refuges by tree weta (*Hemideina crassidens*) and cave weta (*Isoplectron sp.*). No significant impact of bait application was found for these species nor was there any effect observed on numbers of slugs, spiders and cockroaches which also commonly used the same refuges.

No impact was detected on populations of weta in Waipoua Forest and all cockroaches, centipedes, millipedes, kauri snails and all but one beetle survived in enclosures with 0.08% 1080 pellets (Pierce & Montgomery et al. 1992).

Spurr (1994b cited in Broome, Fairweather & Fisher, 2009) found no impacts on populations of amphipods, ants, beetles, collembolans, millipedes, mites, slugs, snails, spiders and cave weta at Puketi Forest or Titirangi Scenic Reserve where 0.08% 1080 pellets were aerially applied at 5 kg/ha.

In Mapara where 0.08% 1080 pellets were aerially applied in three consecutive years (1990-92), a comparison of invertebrate fauna showed a greater number of predatory insects in the treatment site, characteristic of a healthy forest, and more fungal eating insects in the non-treatment site, characteristic of unhealthy forest (Bradfield, 1993 cited in Broome, Fairweather & Fisher, 2009).

Reptiles
Lizards and frogs were not monitored in any 1080 poisoning operations prior to 1994; however, none have been reported killed by 1080. Captive McCann's skinks (*Oligosoma maccanni*) ate non-toxic cereal pellets (RS5 and Agtech), especially when the baits were wet, but the level of consumption (0.01-0.02g) was probably insufficient for the animals to have received a lethal dose had the baits been toxic (Freeman, 1997).

Aquatic Fauna
Significant adverse effects on fish and other aquatic fauna do not occur based on the following data:

- Water contamination is rarely found and extremely low level when it has occurred,
- In a study conducted by NIWA (Suren & Lambert, 2006) no mortality of fish due to 1080 leaching from baits was observed, and
- Eels have survived experimental feeding of cereal pellets and possum tissue containing 1080 (Suren & Lambert, 2004).

No adverse effects on marine mammals have occurred to the Applicant's knowledge.

Performance standards and information needs

Ensuring 1080 bait meets all quality specifications is considered the best way to avoid adversely affecting birds and other native species

1. 1080 baits will be lured with cinnamon.
2. If 20mm baits are being used - 1080 baits will have a mean size of 12g or more and 95% of baits will weigh more than 9g.

   If 16mm baits are being used - 1080 baits will have a mean size of 6g or more and 95% of baits will weigh more than 2.5g.
3. 1080 bait quality will be checked to ensure bait size complies with standards.
4. 1080 baits will be dyed green to deter birds.
5. 1080 baits will be sown at a maximum average sowing rate of 2 kg/ha but not greater than 5 kg/ha.
6. RS5 baits will be used.
7. DOC kea code of practice will be followed.

Effects on non-target domestic and feral animals

Non-target species

In 1909, ten moose were brought from Canada for liberation at Supper Cove. The harsh environment and competition from red deer have made it unlikely that any moose still survive today although unconfirmed reports of moose sightings have been made over the years. (DOC. 2009).

Other introduced animal pests recorded within the treatment area include:

Dusky Sound Conservation and Restoration Plan (2015).

Common Name	Scientific Name	Extent
Kiore	*Rattus exulans*	Low on mainland, absent on islands
Red deer	*Cervus elaphus scoticus*	Widespread on mainland, low on islands
Stoat	*Mustela ermine*	Widespread on mainland, low on islands
Weasel	*Mustela nivalis vulgaris*	Uncertain on mainland, none on islands
Brushtail possum	*Trichosurus vulpecula*	Low on mainland, absent on islands
Mouse	*Mus musculus*	Present on mainland and some islands
Norway rat	*Rattus norvegicus*	Present on mainland and some islands
Ship rat	*Rattus rattus*	Present on some islands, widespread on mainland

Effects of operation on domestic and feral animals

There is no domestic livestock within or adjacent to the treatment area.

Dogs are highly susceptible to 1080 and must not be exposed to the opportunity to directly eat toxic baits or scavenge from poisoned possum carcasses. Carcasses can remain toxic after 1080 poisoning until completely decomposed which can take between 1-12 months, depending on weather conditions and micro-site factors.

Under the National Parks Act 1980 (Part VA) dogs are not permitted in a national park without a permit. In line with the Fiordland National Park by–laws and management plan, no

permit will be issued for any part of the treatment area. All dogs illegally brought into the Fiordland control areas by the visiting public are at risk from the operation.

Performance standards and information needs

8. Signs will be erected at normal public entry points to the treatment area and maintained until the caution period has expired. Signs at public entry points will clearly state "poison baits or carcasses are deadly to dogs".

9. No permits to take dogs into the treatment areas will be issued until the operational all-clear is given i.e. caution period has ended and warning signs have been removed by DOC staff.

Further information

Further information

There is an RMA AEE saved to the DOCDM for this site:

Dusky – DOCDM 2694342

There will also be a DOC BfoB Operational Plan available, incomplete at the time of submission.

References

The following published references were used in developing this AEE:

Broome, K. G., Fairweather, A. A. C., & Fisher, P. (2009, May). Sodium fluoroacetate: A review of current knowledge. Hamilton, New Zealand: Department of Conservation.