

BEFORE THE CANTERBURY REGIONAL COUNCIL

IN THE MATTER OF: the Resource Management Act
1991

AND

IN THE MATTER OF: a submission on the Proposed
Canterbury Land and Water
Regional Plan

**EVIDENCE OF ALASTAIR ANDREW CHALMERS FAIRWEATHER
FOR DIRECTOR-GENERAL OF CONSERVATION**

Dated 28 March 2013

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INTRODUCTION

- 1 My full name is **Alastair Andrew Chalmers Fairweather**
- 2 I am a Technical Advisor at the Department of Conservation's (DOC) National Office based in Hamilton. I have worked for DOC for 15 years, initially providing advice on animal pests to Waikato Conservancy and for the last 13 years as a national key contact for animal pests.
- 3 I hold the degrees of Bachelor of Science Technology (Ecology, Waikato University), Doctor of Philosophy (Ecology, University of Aberdeen) and a Graduate Diploma in Applied Statistics (Massey University).
- 4 I sit on the executive committee of the New Zealand Biosecurity Institute, and am a member of the New Zealand Ecological Society.
- 5 My area of expertise is in the management of invasive pest animals, in particular the use and toxicology of Vertebrate Toxic Agents (VTAs – vertebrate pesticides), risk assessments of VTAs and the registration of VTAs under the Hazardous Substances and New Organisms Act 1996 (HSNO) and Agricultural Compounds and Veterinary Medicines Act 1997 (ACVM).
- 6 I hold a NZ Environmental Protection Agency (NZ EPA) Controlled Substance Licence for cyanide, 1080 and pindone, and have been involved in planning, undertaking and auditing both ground and aerial control operations.
- 7 I am familiar with the proposed Canterbury Land and Water Regional Plan (pCLWRP) so far as it pertains to management of pest species.
- 8 I have read the Environment Court's Code of Conduct for Expert Witnesses, and I agree to comply with it.
- 9 In compiling this statement I have consulted published scientific research, including work I have contributed to. I confirm that the issues addressed in this evidence are within my area of expertise. I have not omitted to consider

material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

- 10 My evidence will deal with issues relating to Rule 5.23 discharge of vertebrate toxic agents in the pCLWRP as it pertains to DOC operations and which arise in relation to Hearing Group 2.
- 11 My evidence will address the following:
- General information about pest animal control undertaken by DOC in New Zealand and the Canterbury Region;
 - The ecotoxicity of 1080 and pindone, including its fate on land and in water and effects on terrestrial and aquatic species;
 - Comment on Rule 5.23 of the pCLWRP.
- 12 By way of background, to my evidence, at present the effect of proposed Rule 5.23 in the pCLWRP relating to aerial discharge of VTA's to land where it may enter water means DOC would require consent for such activity. DOC sought that such discharge be provided for as a permitted activity within Rule 5.23, subject to some additional conditions, but that submission has not been accepted.
- 13 I understand DOC supports the recommendations in the pCLWRP regarding Rule 5.21.

PEST CONTROL IN NZ AND THE CANTERBURY REGION

- 14 Apart from three species of bats, New Zealand's ecosystems evolved in the absence of terrestrial mammals. However, since humans settled in New Zealand about 900 years ago, at least 31 species of mammals have been introduced and established in the wild (Parkes & Murphy 2003). Many of these introduced mammal species have had major impacts on New Zealand's ecosystems through browsing of plants and predation of wildlife. Over 40%

of the pre-human land bird species are now extinct, and the proportion of birds classed as threatened is one of the highest in the world (Clout 1997).

- 15 DOC is the leading central government agency responsible for the conservation of New Zealand's natural and historic heritage. Its legislative mandate is the Conservation Act 1987 and other key statutes such as the National Parks Act 1980, the Reserves Act 1977 and the Wild Animal Control Act 1977. DOC undertakes pest animal control throughout New Zealand as a key component of the meeting its legislative mandate.
- 16 DOC manages approximately 808 000 ha of land in the Canterbury region. The pest animals managed by DOC for conservation purposes on this land include possums, rodents, Bennett's wallabies, mustelids (stoats, weasels and ferrets), feral cats, hedgehogs, feral deer, feral pigs and tahr at a cost of approximately \$760 000 in 2011-12. A further \$120 000 was spent by DOC controlling pests to meet the Canterbury Regional Pest Management Strategy (RPMS) rules.

PEST CONTROL TOOLS

- 17 The tools used in controlling the above pests include: shooting, trapping, fencing, biocontrol and VTAs.
- 18 Shooting is the only method used to control tahr, feral deer and feral pigs. It is also an important tool for controlling Bennett's wallabies and rabbits at medium - low densities.
- 19 Trapping is the primary tool used to control feral cats, mustelids and hedgehogs.
- 20 Fencing, in conjunction with shooting and VTAs, is used to control rabbits.
- 21 Rabbit Hemorrhagic Disease (RHD) is the only biocontrol agent available in NZ for a vertebrate pest (rabbits). Unfortunately its effectiveness as a control agent is diminishing.

- 22 VTAs are a key tool for control of rabbits, possums, rodents and Bennett's wallabies, especially at medium-high densities and over extensive areas.

VERTEBRATE TOXIC AGENTS AS A CONTROL TOOL

Land-based methods

- 23 In smaller operational areas, VTAs are usually applied by land-based methods (hand, mechanical spreader, bait stations or bait bags).

- 24 There are a range of VTAs that can be applied in this way, including 1080; cyanide; cholecalciferol; zinc phosphide, brodifacoum, and pindone and other first generation anticoagulants.

- 25 The potential benefits of land-based methods of applying VTAs include:

- They can be highly effective;
- VTAs can be applied in a targeted way meaning that waterways and sensitive areas can be avoided; and
- Some land-based methods (bait stations), contain the bait meaning spillage of bait onto land/water is minimised.

- 26 There are a number of disadvantages of ground control with VTAs:

- They are limited by terrain - in rugged country it becomes potentially slow and dangerous to workers;
- In remote locations, access and the logistics of having staff living in the field for extended periods can be an issue;
- The logistics of ground control becomes increasingly complex in large areas (>3000 ha); and
- At high pest densities a rapid knockdown may not be achieved.

Aerial application methods

- 27 In the Canterbury Region, the aerial application of VTAs is a particularly important tool for controlling rabbits, possums, Bennett's wallabies and

rodents over large areas, in remote, rugged, difficult terrain, at high pest densities and/or where a rapid knockdown of pest numbers is required.

28 Currently only two VTAs are approved for aerial application on the mainland of NZ- 1080 and pindone.

29 1080 is applied aurally to control rabbits, possums, rodents and Bennett's wallabies. Normally prefeeding is undertaken before a single aerial application of the toxic bait. Currently the following baits and sowing rates are used during aerial operations:

- For rabbits, toxic baits (carrot or cereal pellets containing 0.2-0.4 g/kg 1080) are sown at a rate of up to 15 kg/ha.
- For possums and rodents, toxic cereal baits (containing 0.8-1.5 g 1080/kg) are sown at rates of up to 5 kg/ha.
- For Bennett's wallabies, toxic baits (carrot or cereal pellets containing 1.5 - 2g 1080/kg) are sown at rates of up to 5 kg/ha.
- At these sowing rates, a maximum 10 g of 1080 per hectare is entering the environment. (Max allowed by EPA is 30 g).

30 Pindone is aurally applied to control rabbits. Prefeeding is not required and the toxic baits are aurally sown 2-3 times over a 4-6 week period.

- Pindone baits (carrot or cereal pellets containing between 0.17-0.25 g pindone/kg) are sown at rates of up to 5 kg/ha.
- Therefore the maximum amount of pindone entering the environment during an aerial operation is 3.75 g per hectare over 4-6 weeks.

31 Where current best practice is followed during aerial application of 1080 or pindone, pest kills exceed 90%.

32 A disadvantage of aerial application of VTAs is the opposition to this tool by sections of the community. Often this opposition arises due to concerns over baits getting into waterways, accidentally being applied over operational boundaries and non-target deaths. I discuss this further below.

1080

- 33 1080 has been used for pest control in New Zealand since the 1950s. A large body of scientific research has been undertaken into the fate of 1080 in the environment, its impact on the environment, non-targets and human health over a 60 year period.
- 34 Two recent reviews (Eason et al. 2011; Fairweather et al. 2012) of the scientific literature are attached to this evidence (Appendices 1 & 2). A summary of the research is as follows:
- a) The manufactured 1080 used in toxic baits is chemically identical to the toxic compound found in some poisonous plants, and highly toxic fluoroacetate-producing plants are globally distributed. In plants, fluoroacetate appears to be a secondary plant compound that is biosynthesised at high concentrations as a chemical defence mechanism against browsing invertebrates and vertebrates.
 - b) 1080 is absorbed through the gastrointestinal tract or via the lungs if inhaled. Fluoroacetate is not readily absorbed through intact skin. Within animals it is converted to fluorocitrate, which inhibits the Krebs cycle. The Krebs cycle is the metabolic pathway that produces the energy used in normal cell function. The combination of inhibited energy production and the accumulation of citrate in tissues and plasma will lead to death.

Fate in the environment

- c) On land, 1080 in baits is removed through a combination of microbial breakdown and leaching. This process occurs within 1 – 2 weeks in warm moist conditions or when baits are exposed to rain. Under cool dry conditions it may take several weeks and, in extreme cold or drought 1080 can persist in baits for several months.

- d) If baits enter waterways directly, the 1080 is rapidly lost from the baits over 36 hours and the baits themselves will disintegrate over 3 - 4 days.
- e) Following rain, 1080 leaches from baits into the soil where it is broken down to non-toxic by-products by microorganisms. The rate at which 1080 is degraded in soil is affected by soil temperature and moisture content, with slower breakdown at lower temperatures/moisture content. Under favourable conditions this degradation takes 1-2 weeks. There is no indication 1080 affects mineralisation of nitrogen by soil microorganisms.
- f) 1080 is highly water soluble, and has the potential to enter waterways via baits, or in groundwater containing 1080 that has leached out of baits during a heavy rainfall event. However, recent research indicates that little of the 1080 released into soil from baits leaches into ground water.
- g) In natural water 1080 breaks down to non-toxic by-products within 1 - 2 weeks. Factors which affect rate at which 1080 degrades in aquatic environments include temperature, the presence of aquatic plants and microorganisms, and flow and volume of the waterway.
- h) Dilution of 1080 also plays a significant part in determining the concentration of 1080 that will be present in waterways. While substantial 1080 breakdown will occur over the first 24 hours in water, the effect of dilution will be immediate. This dilution effect will rapidly lead to 1080 in water reaching undetectable concentrations.
- i) There has been extensive monitoring of waterways for 1080 residues following aerial 1080 operations. Between 1990 and 2011, Landcare Research analysed 2537 water samples with 96.6% of the samples taken containing no residues.

- j) Where residues have been detected in water samples, most have been less than 1 µg/l 1080 and associated with very small streams and/or the presence of bait. 1 µg/l 1080 is equivalent to about 3.75 kg of 1080 possum bait (containing a total of 2.5 g 1080) dissolving in an Olympic-sized pool.
- k) The Ministry of Health has set a maximum of 3.5 µg/l for 1080 in drinking water (Ministry of Health 2008). 1080 residues have never been detected in drinking water supplies.
- l) In experiments, 1080 was taken up by some plants (e.g. rye grass, käramuramu and puka), but not others (e.g. pikopiko) when toxic baits were placed at the base of the plant. However, the amount of 1080 taken up was very small. Based on the peak concentration observed in rye grass (0.08 g/kg), a 50 kg sheep would need to eat about 250 kg of grass to have a 50% chance of dying from 1080 poisoning. Similarly, a 70 kg person would need to eat 28 tonnes of käramuramu or 9.3 tonnes of puha in one sitting to have a 50% chance of dying from 1080 based on the highest residues recorded in the plants (5 µg/kg for käramuramu and 15 µg/kg for puha).

Non-target Impacts

- m) While 1080 is a broad-spectrum toxin, there is a wide variation between species in their susceptibility to 1080 poisoning. Birds are generally less susceptible to 1080 than mammals. Lizards and fish appear relatively tolerant of 1080.
- n) There has been monitoring of native animal populations during aerial 1080 operations since the 1980s.
- o) Bird deaths have been reported during aerial 1080 operations. In response to these deaths, surveys and monitoring of native birds during 1080 operations has been undertaken since the mid 1980s.

Based on the results of this work, there is no indication that any species of native bird has been affected by 1080 at a population level when cereal pellet or carrot baits are used.

- p) Invertebrate populations have been monitored during aerial poisoning operations. There have been no 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.
- q) Research into the responses of aquatic invertebrates community to 1080 contamination and monitoring of longfin eels, upland bullies, and freshwater crayfish indicates there is no cause for concern.
- r) Dogs are especially vulnerable and highly likely to die if they eat 1080 baits or scavenge animals killed by 1080. Most estimates of deer kill during aerial 1080 operations are between 30 and 60%. However, where deer numbers are high or there is limited food for the deer, kills have been as high as 90%. Productivity figures for red deer populations are around 30% so a low to moderate by-kill of deer populations is probably negated within a couple of years.

NATIONAL REVIEWS OF USE OF 1080

- 35 In 2007 the Environmental Risk Management Authority NZ (ERMA NZ) (now NZ EPA) released its decision on the reassessment of 1080. The reassessment process included reviewing all available scientific literature. ERMA NZ concluded that the benefits of using 1080 outweighed the adverse effects and decided to approve the continued use of 1080 in New Zealand with additional controls around aerial application (ERMA NZ 2008).
- 36 The Parliamentary Commissioner for the Environment (PCE) published the findings of her review of the use of 1080 in NZ in 2011. The PCE concluded there was a solid body of evidence supporting the continued use of 1080,

therefore not only should its use continue, but more should be used. In making this conclusion, the Commissioner recommended that there was a strong case for making the use of 1080 a permitted activity under the Resource Management Act 1991 (RMA), with local control reserved to those activities that are not covered by existing controls under other legislation (Wright 2011).

PINDONE

37 A review of the existing scientific literature (Fairweather & Fisher 2012) is included in this submission (Appendix 3). A summary of the review is as follows:

- a) Pindone belongs to the indandione class of anticoagulants. It has the same mode of action as other anticoagulants such as brodifacoum, by inhibiting the formation of vitamin K-dependent clotting factors in the blood. This leads to extensive haemorrhaging causing death.
- b) Being a first generation anticoagulant (like warfarin and diphacinone), pindone is readily metabolised and it is far less persistent in the environment than second-generation anticoagulants such as brodifacoum. For example the elimination half-life (the time taken for 50% of the pesticide in the body to be eliminated/broken down) of pindone in rat livers is 2.1 days compared to 113.5 days for brodifacoum.
- c) There are two forms of pindone - an acid and a salt. The acid form is insoluble and used in the manufacture of cereal pellets. The salt form is soluble and is used to make Pindone Liquid Concentrate which is applied to carrot and oat baits.

Fate in the Environment

- d) As cereal baits containing the acid form of pindone decay, the pindone in the baits will bind with the underlying soil. The rate at which this occurs will depend on factors such as temperature, rainfall and microbial activity. Under dry conditions this process could take months. Pindone absorbs visible light and there are indications that it is broken down by sunlight. This is probably an important degradation route, and is supported by observations that the loss of pindone occurs from the surface of baits.
- e) When exposed to rain or moisture, the soluble pindone salt will leach out of carrot baits. Following high rainfall this process could take days but in extreme cold or drought the soluble pindone salt could persist in baits for several months.
- f) There are indications pindone has some insecticidal and fungicidal properties, hence the breakdown of pindone in soil is probably mostly through chemical reactions. As stated above sunlight plays an important part in the breakdown of pindone. If the acid form of pindone in cereal pellets entered the soil, its half-life is likely to be in the order of a month and any residues could be expected to degrade at a moderate rate. In contrast, because the sodium salt form of pindone in carrot baits is water soluble, residues are unlikely to persist.
- g) The degradation time of pindone in water is likely to be slow. The pindone salt form is soluble in water so it could potentially leach into waterways. If the pindone did enter a waterway, temperature, the pH of water and exposure to sunlight light will affect the rate at which the pindone degrades. Dilution will also be important in determining the concentration of any residue present in the water. The acid form

of pindone has a very low solubility in water. Leaching from soil into water is therefore unlikely to occur.

- h) Limited sampling of water following aerial pindone operations has been undertaken, with no residues being found in the water.

Non-target Impacts

- i) The toxicity of pindone to different species is highly variable and animals are generally far more susceptible to repeat doses of pindone than single doses. While there is no LD₅₀ (Lethal Dose 50%, which is the estimated dose that kills 50% of the test animals) data for insects, pindone is reported to have insecticidal properties.
- j) A wide range of bird species (native and non-native) have been found dead following pindone operations, however it is unknown if this has an impact at a population level. A single study of lizards suggests they are unlikely to be at risk from the use of pindone. However, some lizards have been found dead following pindone operations.
- k) There is an effective antidote for domestic animals poisoned with pindone.

EXISTING REGULATORY CONTROLS AROUND THE AERIAL APPLICATION OF VTAs

38 1080 and pindone have approval under the HSNO Act and are registered under the ACVM Act. As stated above 1080 has also been reassessed under the HSNO Act.

39 As part of the EPA and ACVM regulatory processes, controls have been placed on how 1080 (ERMA NZ 2008) and pindone (ERMA NZ 2011) can be applied. These controls are designed to minimise the environmental impacts of their aerial application. The EPA decision documents that contain the controls for 1080 and pindone are attached to this evidence (Appendices 4 & 5).

- 40 Pilots applying 1080 or pindone aerially are required to hold an ACVM controlled substance licence. The intention of the licence requirement is to ensure that a person is a 'fit and proper' person and has knowledge of the relevant legislation relating to the safe use of the VTA being applied. The pilot also must hold an Agricultural Chemical Rating from the Civil Aviation Authority (CAA). To get this rating a pilot must have shown knowledge of how to apply toxins from the air.
- 41 Prior to undertaking an aerial 1080 operation, permission is required from a Public Health Unit (Medical Officer of Health, Health Protection Officer or an employee of the Ministry of Health). This is to ensure that public health risks are assessed and managed effectively. The permission will include conditions around how 1080 may be applied near drinking water supplies (Ministry of Health 2010). The permissions guidelines document is appended to this submission (Appendix 6).

DOC CONTROLS AROUND USE OF VTAS

Assessment of the risks of VTA use on land managed by DOC

- 42 DOC has its own internal process for assessing the risks surrounding the use of VTAs on land managed by DOC. This process was developed in conjunction with Landcare Research. Before any VTA can be used on land managed by DOC it must pass this risk assessment.
- 43 The DOC risk assessment examines the impacts a VTA use will have on the environment, non-target animals and human health. It also assesses the operational efficacy of the VTA. The assessment is based on all the scientific literature available and is undertaken by a panel of experienced DOC scientists and VTA users.
- 44 All the 1080 and pindone uses discussed in my evidence have been put through the DOC risk assessment process and are permitted to be used on land managed by DOC.

Standard Operating Procedures (SOPs)

- 45 When DOC is applying VTAs, or VTAs are being applied by an external agency to land managed by the Department, there are a number of DOC national SOPs that must be followed. These SOPs include requirements around:
- consultation and notification of affected parties;
 - writing Assessments of Environmental Effect (AEE) documents;
 - accurately identifying boundaries around operational areas;
 - safe handling of pesticides; and
 - obtaining consents from landowners and DOC to lay VTA.

DOC Consent

- 46 DOC must provide its consent before a VTA can be applied to land it manages by its own staff or external people/organisations. Before granting its consent, the application is assessed to ensure all SOP requirements are met. The lowest delegation for signing off a consent for an aerial application is a Conservator.
- 47 In issuing its consent for an aerial operation DOC imposes performance standards (conditions around how the pesticide may be used, see Appendix 7 for examples) which are designed to minimise impacts the aerial application of a VTA may have on the environment.
- 48 10% of all consents are audited to ensure compliance with the performance standards.

NEED FOR ADDITIONAL CONTROLS UNDER THE RESOURCE MANAGEMENT ACT

- 49 As mentioned above, the Parliamentary Commissioner for the Environment stated in her report that there was a strong case for making the use of 1080 a permitted activity under the RMA, with local control reserved to those activities that are not covered by existing controls under other legislation (Wright 2011).

50 I have read the current Canterbury Region NRRP Chapter 4: Water Quality document and note rule WQL18 made the aerial discharge of VTAs a permitted activity as long as certain conditions were met. I also note that the majority of the conditions were similar to those applied to the aerial application of 1080 under the HSNO Act and in the permission from the Public Health Unit.

COMMENTS ON SECTION 42A REPORT VOLUME 2 – pCLWRP

Proposed amendment to Rule 5.23

Condition 2 (a): proposal to remove the words “that is more than 3 m wide”

51 The above change proposed in the s42A report means that aerial discharges of VTAs that may be to any wetted bed of a river, lake or artificial watercourse of any width (not only those over 3m wide) would require resource consent.

52 None of the scientific evidence presented above indicates a need to make this change as neither 1080 nor pindone have significant impacts on the aquatic environment at the sowing rates used to control pests.

53 The proposed change is of serious concern because streams smaller than 3 m are often not marked on maps and are difficult to see from the air through dense vegetation. As a result, it will be very difficult to meet the revised condition 2(a), and will force anyone undertaking the aerial application of a VTA into Rule 5.24 by default.

54 If users attempted to adhere to this condition 2(a), there could potentially be large gaps in bait coverage, particularly at sites where there are a number of small streams within 40 m of each other. This would result in operational failures due to pests surviving in the gaps, and conservation and Canterbury RPMS objectives not being met.

Aerial application should only be undertaken by an AIRCARE accredited operator

- 55 The NZAAA and Horticulture NZ submitted that a new clause should be added to Rule 5.23 that aerial application should only be undertaken by an AIRCARE accredited operator. In the s42A report it is proposed that this submission is accepted (Paragraph 6, page 9).
- 56 AIRCARE is not an industry wide standard. It has been developed by a subsection of the industry and to be AIRCARE accredited you must be a member of the NZAAA.
- 57 As stated above, legally all pilots who discharge a VTA from the air must hold an ACVM Controlled Substance Licence and CAA Agricultural Chemical Rating. Pilots therefore have knowledge of the rules and regulations surrounding the aerial application of 1080 and pindone.

CONCLUSION

- 58 I consider that the scientific evidence indicates that there will be minimal impacts from the aerial application of 1080 and pindone to control pests on the land where it may enter water in the Canterbury Region. There are also stringent requirements in place under other legislation that must be complied with before VTAs can be used aerially. On that basis I agree with the PCE's recommendation that the aerial application of VTAs is able to take place without consent being required, as a permitted activity, subject to conditions.



Alastair Andrew Chalmers Fairweather

28 March 2012

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- Eason C, Miller A, Ogilvie SC, Fairweather A 2011. An updated review of the toxicology and ecotoxicology of sodium fluoroacetate (1080) in relation to its use as a pest control tool in New Zealand. *New Zealand Journal of Ecology* 35: 1-20.
- ERMA NZ 2008. Environmental Risk Management Authority Decision. Application for the Reassessment of a Hazardous Substance under Section 63 of the Hazardous Substances and New Organisms Act 1996: Sodium Fluoroacetate (1080) and Formulated Substances Containing 1080. ERMA, Wellington. 215 p.
- ERMA NZ 2011. Environmental Risk Management Authority Decision: To manufacture Pindone Liquid Concentrate as a vertebrate toxic agent for rabbits. ERMA NZ, Wellington. 25 p.
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Parliamentary Commissioner for the Environment, Wellington. 85 p.

APPENDICES

- Appendix 1: Eason C, Miller A, Ogilvie SC, Fairweather A 2011. An updated review of the toxicology and acotoxicology of sodium fluoroacetate (1080) in relation to its use as a pest control tool in New Zealand. *New Zealand Journal of Ecology* 35: 1-20
- Appendix 2: Fairweather AAC, Broome KG, Fisher P 2012. Sodium Fluoroacetate Pesticide Information Review. Version 2012/3. Unpublished report docdm-25427. Department of Conservation, Hamilton, NZ. 110 p.
- Appendix 3: Fairweather AAC, Fisher P 2012. Pindone Pesticide Information Review. Version 2012/1. Unpublished report docdm-124982. Department of Conservation, Hamilton, NZ. 48 p.
- Appendix 4: ERMA NZ 2008. Environmental Risk Management Authority Decision. Application for the Reassessment of a Hazardous Substance under Section 63 of the Hazardous Substances and New Organisms Act 1996: Sodium Fluoroacetate (1080) and Formulated Substances Containing 1080. ERMA, Wellington. 215 p.
- Appendix 5: ERMA NZ 2011. Environmental Risk Management Authority Decision: To manufacture Pindone Liquid Concentrate as a vertebrate toxic agent for rabbits. ERMA NZ, Wellington. 25 p.
- Appendix 6: Ministry of Health 2010. Issuing Permissions for the Use of Vertebrate Toxic Agents (VTAs): Guidelines for Public Health Units: Revised edition 2010. Ministry of Health, Wellington. 70 p
- Appendix 7: DOC Performance Standard Sheets for 1080 1.5g/kg cereal pellets aerially applied & Pindone 0.25g/kg cereal pellet aerially applied.

Appendix 1

Appendix 2

Appendix 3

Appendix 4

Appendix 5

Appendix 6

Appendix 7

Appendix 8