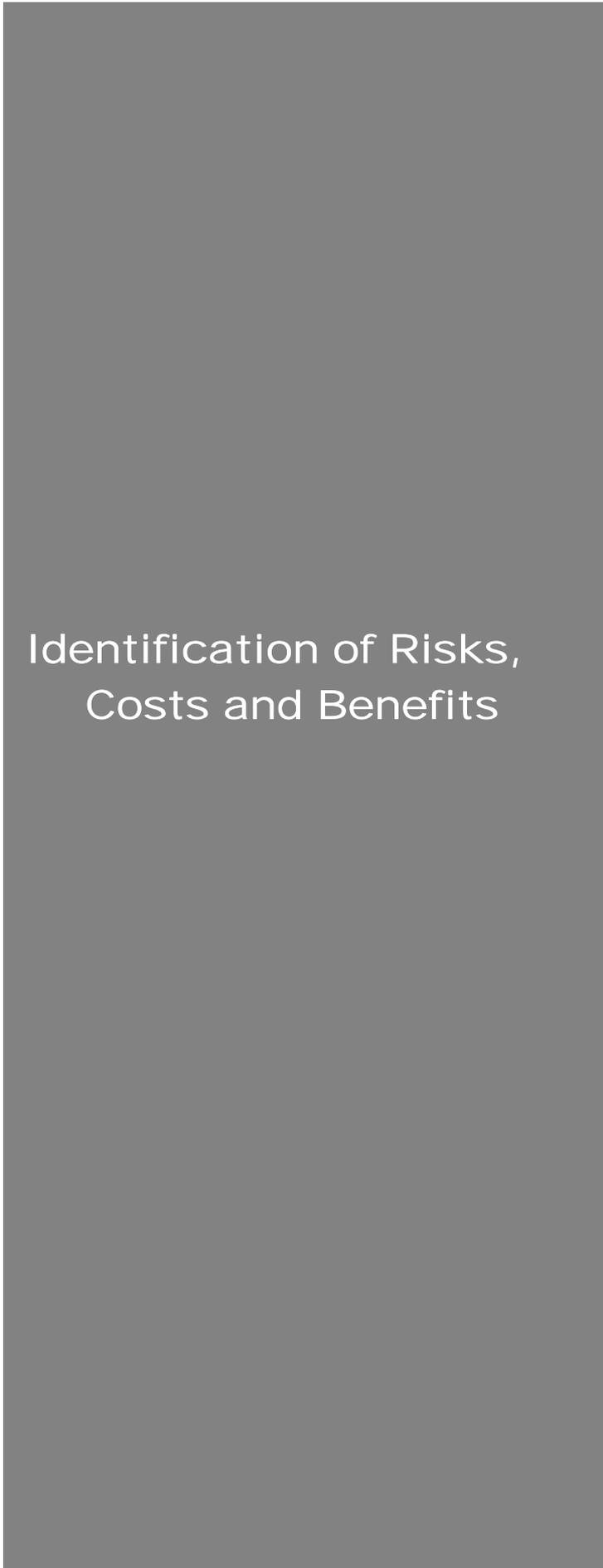


Section 4.1 Identification of Risks,
Costs and Benefits



This section describes the methodology of the risk assessment, and provides guidance on the qualitative rankings that have been applied to the various effects of the use of 1080 that are listed in the following effects registers.

1. General Approach

The assessment of risks, costs and benefits has been carried out in accordance with the general methodology outlined in the Risk Management Standard (AS/New Zealand S 4360:2004). The basic principles presented in the Standard have been used to develop a more detailed methodology to meet the requirements of the reassessment application, taking into account guidance provided by ERMA.

Risks and benefits are assessed by estimating the magnitude of the possible effects and the likelihood of their occurrence. For each effect, the combination of these two components determines the level of risk or benefit, which is a two dimensional concept. Risk assessment may be qualitative or quantitative. For this reassessment, a largely qualitative approach was taken, informed by quantitative data where this was available.

In accordance with ERMA's requirements, the effects of use of a substance have been assessed under the following categories:

- 4.1A Effects on Market Economy
- 4.1B Effects on Social and Community
- 4.1C Effects on Human Health & Safety
- 4.1D Effects on Environment

For each category, the beneficial effects and adverse effects of 1080 use were assessed.

In most cases, the assessment was undertaken based on the comparison (relative risk assessment) between a future WITH 1080 and a future WITHOUT 1080, as described in the Pest Control Scenarios in the Context section of the application. This relative risk assessment approach has been used to assess the effects of 1080 use on market economy and social and community, as well as the beneficial effects on human health and safety and environment.

The adverse effects on human health and safety and environment have been presented slightly differently. The adverse effects in these categories have been assessed separately for a future WITH 1080 and a future WITHOUT 1080. The risks of the two scenarios have then been compared to assess the relative effect.

2. Risk Assessment Methodology

Qualitative matrices have been used to prioritise risks (and benefits), and to identify any risks/benefits that are significant. The measure of the level of risk or benefit is a combination of the **magnitude** of the effect occurring and the **likelihood** of the effect occurring. This is specific to this application therefore measures of the level of risk should not be compared between applications.

It is important to note that the risk identification process and assessment conducted in this application is based on the **controlled risks**. That is, the assessment assumes that 1080, cyanide and traps continue to be used in accordance with current practice, controls and regulations.

2.1 Magnitude of Effect

Magnitude is a measure of the endpoint and is described in terms of the type of risk that might occur. The magnitude of the effect is not the same as the effect itself. The qualitative descriptors used for magnitude of effect are surrogate measures to enable the end effect to be gauged.

The **magnitude matrices** contain descriptors for the magnitude of beneficial effects (benefits, page 6) and adverse effects (risks and costs, page 8). These descriptors were based on generic assumptions and were discussed and refined by participants during the lifecycle workshop and subsequently during the assessment.

2.2 Likelihood of Effect Occuring

Likelihood in this context applies to the composite likelihood of the end effect, and not either to the initiating event, or any one of the intermediary events. It includes:

- the concept of an initiating event (triggering the hazard or benefit), and
- the exposure pathway that links the source (hazard or benefit) and the area of impact (human health, environment, economy, or social community).

The likelihood term applies specifically to the resulting effect or the final event in the chain, and will be a combination of the likelihood of the initiating event and several intermediary likelihoods. Hence the likelihood has been assessed by analysing the pathway of the "chain of events" from source to the final impact or effect. Each event in the chain is dependent upon the previous event occurring in the first place.

The likelihood descriptors used for beneficial and adverse effects are shown in the tables, and are the same for benefits and adverse effects. These are based on examples provided by ERMA and have been adopted here unchanged as the descriptions are relatively intuitive and therefore easy to apply.

2.3 Assigning the Level of Risk or Benefit

Using the qualitative descriptors for magnitude of effect and likelihood of the event occurring, two additional two-way tables representing a level of risk and a level of benefit (combined likelihood and magnitude of effect) have been constructed as shown in the following tables. Six levels of effect have been allocated: A, B, C, D, E and F. These terms have been used to emphasise that the matrix is a device for determining which risks and benefits require further assessment to determine their significance in the decision making process. Avoiding labels such as 'low', 'medium', and 'high' removes the aspect of perception.

Benefits

The development of the **benefit matrix** (page 7) has been undertaken to ensure that the level of bias towards conservative assignment of risk levels is reflected in the level of

benefits assigned. This ensures that the appropriate level of significance is assigned to a benefit, that is, that the benefit is not exaggerated. This is necessary to ensure a consistent approach for assessing risks and benefits.

The six categories of **benefit** have been combined into four broad bands as indicated by the shading:

A or B	Either insignificant or minor benefit
C or D	Benefits are considerable but do not justify high costs or risks
E	Great benefit at a regional and local level, or moderate benefits at a national level; may justify cost or risk to realise
F	Extreme benefits at a national and local level; warrants cost or risk to realise

The lowest level (A) has been deemed to be equivalent to 'insignificant'. In this table 'A' is given to a number of combinations. In contrast the highest level (F) has been deemed equivalent to having an extreme benefit at a national and local level.

Risk

The **risk matrix** (page 9) is not symmetrical. This is to allow for classification of very low probability of adverse effects, making it a conservative assessment.

The six categories of **risk** have been combined into four broad bands as indicated by the shading:

A or B	Either insignificant or minor and not warranting further assessment
C or D	Risks within the ALARP band (As Low as Reasonably Practicable) and broadly classed as tolerable subject to ongoing monitoring and control.
E	Risks generally warrant further controls to bring them into the tolerable range.
F	Risks regarded as unacceptable.

3. Identification of Benefits and Adverse Effects

The identification and initial assessment of effects was informed by:

- **A lifecycle workshop** convened by the applicants in July 2004 to bring together the collective knowledge and experience of the applicants and associated organisations (pesticide manufacturers, regional councils, research organisations and applicators) involved in the use of 1080 over the last 30 years. This was followed by another workshop, in June 2006, on the lifecycle and effects of 1080, cyanide and traps on human health and the environment.
- **Assessment of submissions received from extensive iwi consultation** carried out by the applicants during 2004 (See Section 4.3).

- **Assessment of submissions received from the public consultation process** carried out by the applicants during 2004 (see Appendix D for the analysis of submissions).
- An extensive collection of studies, research, policy documents, technical information and other literature developed over recent years on the subject of 1080, referenced individually throughout the application.

This identification process allowed all effects to be described and presented in a consistent and structured way to facilitate an objective, comprehensive and holistic assessment.

ASSESSMENT OF BENEFITS**Magnitudes of Benefits Matrix**

	Market Economy	Social & Community	Human & Health and Safety	Natural Environment: soil, water, air	Natural Environment: animals & plants
Extreme	Dollar benefit \$500M+ National benefit	Major national social benefit	Significant long term health benefits to the national community	National environmental benefits	Long term, widespread benefits to species and/or ecosystems Improves native biodiversity Significant (greatest) benefits to native species of national significance
Major	Dollar benefit \$100M - \$500M Regional benefit	Substantial social benefit to local and regional communities	Significant benefits to local community health	Regional environmental benefits	Long term benefit to localised species and/or ecosystem(s) Major benefits to native species of national significance
Moderate	Dollar benefit \$50M - \$100M Localised benefit	Local community and some regional social benefit	Minor benefits to individuals or medium term benefits to surrounding community	Localised environmental benefits	Measurable benefit to localised species communities Some discernible ecosystem benefit Some benefits to native species of national significance
Minor	Dollar benefit \$1M - \$50M Local and contained benefit	Minor localised community benefit	Mild short term health benefits to identified and isolated groups	Localised and contained environmental benefits	Localised impact benefiting a few (<10) individuals and local biodiversity No discernible ecosystem benefit Some benefits to native species
Minimal	Negligible benefit (<\$1M)	Negligible benefit	Mild short term health benefits in individuals in highly localised area	Highly localised and contained environmental benefits	No discernible ecosystem impact Negligible benefit to native biodiversity Few benefits to native species

Section 4.1 Identification of Risks, Costs, Benefits - Introduction

Level of Benefit Matrix

	Magnitude of effect				
Likelihood	Minimal	Minor	Moderate	Major	Extreme
Highly improbable	A	A	A	A	B
Improbable	A	A	A	B	B
Very unlikely	A	A	B	B	C
Unlikely	A	B	B	C	D
Likely	B	B	C	D	E
Very likely	B	C	D	E	F
Extremely likely	C	D	E	F	F

Likelihood Matrix

Descriptor	Description
Highly improbable	Almost certainly not occurring but cannot be totally ruled out
Improbable (remote)	Only occurring in very exceptional circumstances.
Very unlikely	Considered only to occur in very unusual circumstances
Unlikely (occasional)	Could occur, but is not expected to occur under normal operating conditions.
Likely	A good chance that it may occur under normal operating conditions.
Very likely	Expected to occur if all conditions met
Extremely likely	Almost certain

The six categories of **benefit** have been combined into four broad bands as indicated by the shading:

A or B	Either insignificant or minor benefit
C or D	Benefits are considerable but do not justify high costs or risks
E	Great benefit at a regional and local level, or moderate benefits at a national level; may justify cost or risk to realise
F	Extreme benefits at a national and local level; warrants cost or risk to realise

ASSESSING ADVERSE EFFECTS / RISKS

Magnitude of Adverse Effect Matrix

	Market Economy	Social & Community	Human Health and Safety	Natural Environment: soil, water, air	Natural Environment: animals & plants
Extreme	High national economic impact \$500M+ Long term prevention of resource use Containment, clean-up and repair \$5M+	High national community and cultural impact and disruption	Fatality and/or significant irreversible effects reaching beyond the immediate community	Extreme sensitivity to 1080 Significant environmental impacts at a regional range Extreme persistence Present at very high concentrations	Lethal to a number of non-target species populations Possible species and biodiversity loss Permanent widespread ecological damage
Major	High regional economic and some national impact \$100-500M Medium term prevention of resource use Containment, clean-up and repair \$500K - \$5M	High community and cultural impact for the region, some nationally Social disruption to community	Significant irreversible effects or reversible effects reaching beyond the immediate community	High sensitivity to 1080 Serious environmental impact at a local range Long term persistence High bioavailability Present at high concentrations	Lethal to a population of non-target species, but no species loss, some biodiversity loss or population loss Heavy ecological damage, costly restoration
Moderate	Some economic impact for the region, none for the nation \$50-100M Little prevention of resource use Containment, clean-up and repair \$50 - \$500K	Some community and cultural impact for the region, some social disruption (e.g. people delayed) Many unconnected individuals are affected	Minor irreversible effects to individuals, or reversible medium term effects in surrounding community	Moderate sensitivity to 1080 Significant environmental impact at the catchment range Moderate persistence Present at moderate concentrations	Lethal to a number of non-target individuals within a population, little biodiversity loss Major, but recoverable ecological damage
Minor	Low economic impact for the region or nation \$1-50M No prevention of resource use Containment, clean-up and repair \$5 - \$50K	Low community and cultural impact for the region and nation Potential social disruption (e.g. community on alert) Some unconnected individuals are affected	Mild reversible short-term effects in localised area	Low sensitivity to 1080 Low environmental impacts Low persistence Rapid breakdown Present at low concentrations, around level of detection	Sub-lethal to some non-target individuals within a population Lethal to a very few non-target individuals Limited but medium term effects No biodiversity loss Highly localised impact
Minimal	Negligible economic impact (<\$1M) Low cost of containment, clean-up and repair (<\$5K)	Minimal social disruption, community and cultural impact A very few unconnected individuals are affected	No effects	Non toxic breakdown products Negligible environmental impact No persistence Below detection limits	No or perceived effects on very few non-target species Lethal to one or two non-target individuals Minor short-term effects

Section 4.1 Identification of Risks, Costs, Benefits - Introduction

Level of Risk Matrix

Likelihood Matrix

Descriptor	Description
Highly improbable	Almost certainly not occurring but cannot be totally ruled out
Improbable (remote)	Only occurring in very exceptional circumstances.
Very unlikely	Considered only to occur in very unusual circumstances
Unlikely (occasional)	Could occur, but is not expected to occur under normal operating conditions.
Likely	A good chance that it may occur under normal operating conditions.
Very likely	Expected to occur if all conditions met
Extremely likely	Almost certain

Likelihood	Magnitude of adverse effect				
	Minimal	Minor	Moderate	Major	Extreme
Highly improbable	A	A	B	C	D
Improbable	A	B	C	D	E
Very unlikely	B	C	D	E	E
Unlikely	C	D	E	E	F
Likely	D	D	E	F	F
Very likely	D	E	F	F	F
Extremely likely	D	E	F	F	F

The six categories of **risk** have been combined into four broad bands as indicated by the shading:

A or B	Either insignificant or minor and not warranting further assessment
C or D	Risks within the ALARP band (As Low as Reasonably Practicable) and broadly classed as tolerable subject to ongoing monitoring and control.
E	Risks generally warrant further controls to bring them into the tolerable range.
F	Risks regarded as unacceptable.

