

Section 4.1A

Effects on the Market Economy



This section contains the registers which identify effects on New Zealand's market economy. This includes the following effects that have an economic (monetary) impact:

Effects on farming (pastoral and horticulture)

Effects on forestry

Effects on the domestic economy

Effects on export markets

Effects on tourism

Effects on ecosystem services

Note: This section primarily assesses the costs and benefits of using 1080 on introduced, farmed flora and fauna (e.g. forestry, cattle, sheep, horticulture). However also included in this register are the effects of 1080 use on the hunting economy, and costs that may arise through loss of working animals (eg. farm dogs).

Effects on native flora and fauna are covered in Section 4.1D Effects on the Environment.

The assessment of effects on the market economy is based on the relative effect between future scenarios WITH 1080 and WITHOUT 1080, as described in the Pest Control Scenarios, and over a timeframe of approximately 10 years (2006 -2015).

Each adverse effect or benefit was assessed by asking the following questions:

- What is the relative likelihood that the risk/benefit will occur WITH 1080 compared to WITHOUT 1080?
- What is the magnitude of the risk/benefit when the effect WITH 1080 is compared to the effect WITHOUT 1080?

Significant effects that have been identified in these registers have been discussed further in Section 4.2.

BENEFITS REGISTER					
ID	Effect	How likely?	Magnitude of effect	Level of benefit	Commentary
Benefits to pastoral farming from reduction of bovine Tb in cattle and deer (total eradication or control to minimal levels) resulting from pest control					
M-B1	Reduction in loss of livestock to Tb and subsequent increase in income from meat production animals	Extremely likely	Minor	D	<p>Bovine Tb is a wasting disease in both cattle and deer, leading to weight loss and death. If an animal is suspected (through reacting or testing positive to Tb tests) of having Tb it is slaughtered. Due to current control programmes, a 78% reduction in Tb-infected cattle and deer herds, and a 62% reduction in Tb-reactor animals has occurred since the number of Tb infected animals peaked in 1994 (Spurr, Powlesland and Livingstone 2003).</p> <p>There are currently around 70,000 cattle herds and 5,000 deer herds in New Zealand. It is predicted that the use of 1080 for bovine Tb control will result in a reduction in the Annual Period Prevalence (APP) for cattle and deer herds from 0.51% to 0.17% by 2015, and will meet the National Pest Management Strategy target of 0.2% APP by 2012/2013. WITHOUT the use of 1080 it is predicted that the APP for cattle and deer herds will rise to 0.58%. It is therefore EXTREMELY LIKELY that a significantly greater reduction in Tb infection amongst livestock will result from a future WITH 1080 compared to WITHOUT 1080.</p> <p>The weighted annual average price to NZ farmers for all beef class animals (steers, heifers, cows, bulls, and vealers) was \$783.58 per head over 2005-06 (Meat & Wool New Zealand 2006). The average price for venison (hinds and stags) as at June 2006 was \$242 per head (Deer Farmer 2006).</p> <p>For the 2004/05 year 1,073 cattle and 1,318 deer were slaughtered as Tb reactors and a further 249 cattle and 214 deer were identified with Tb at routine slaughter. Cattle farmers are recompensed 65% of the market value by the AHB; but no compensation is given to deer farmers.</p> <p>Assuming that the number of cattle and deer slaughtered will reduce in proportion to the reduction in the number of infected herds (that is, by 75%) in a future WITH 1080 compared to one WITHOUT, the financial savings from the reduction in the loss of livestock to bovine Tb is a MINOR effect at a national level. This is based on the following calculation:</p> <p style="padding-left: 40px;">\$783.58 x 1,073 cattle slaughtered/yr (2004/05 figures used as a conservative estimate) x 35% loss of income/per cattle (as compensation is 65%) x 10 years (the timeframe over which this assessment is based) x 75% (75% less cattle and deer would be slaughtered by 2015 in a future WITH 1080) the increase in income to farmers over 10 years = \$2.2M.</p> <p>and;</p>

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ID	Effect	How likely?	Magnitude of effect	Level of benefit	Commentary
					<p>\$242 x1318 deer/year x 10 years x 75% = \$2.4M.</p> <p>This creates a combined increase in income to farmers of \$4.6M.</p> <p>Based on the above, the likelihood of this benefit occurring is EXTREMELY LIKELY (almost certain). The effect is MINOR (dollar benefit \$1M - \$50M and local and contained benefit), therefore the benefit is D (benefits are considerable but do not justify high costs or risks).</p>
M-B2	Increase in production from dairy animals	Likely	Minimal	B	<p>In cattle, milk production may decline due to Tb infection, which can impact on dairy farm income. There is currently no research available on the likelihood or magnitude of this impact but the condition and productivity of a cow generally only declines in the later stages of disease when it is most likely that the animal will be slaughtered (effects of which are captured in benefit M-B1).</p> <p>It is LIKELY that there will be a small reduction in the loss of production from Tb infection prior to cows with Tb being slaughtered in a significant number of animals in a future WITH 1080 compared to WITHOUT 1080.</p> <p>Although no research could be found on the loss of productivity amongst dairy cows in the later stages of Tb, a small percentage loss of productivity per cow prior to Tb detection could occur. The increase in income to farmers from increased production WITH 1080 has been conservatively estimated as <\$1M resulting in a MINIMAL effect based on the following:</p> <p style="padding-left: 40px;">Say 500 cows (about 50% of cattle slaughtered are dairy cows) x \$1,090 (average annual earnings from one cow for milksolids) / 12 (to obtain one months income loss, as later stages of Tb are likely to be picked up within one month by farmers) x 10 years x 75% (there will be 75% less infected herds by 2015 in a future WITH 1080) = \$350,000.</p> <p>Based on the above, the likelihood of this benefit occurring is LIKELY (a good chance that it may occur under normal operating conditions). The effect is MINIMAL (negligible benefit (<\$1M)), therefore the benefit is B (either insignificant or minor benefit).</p>
M-B3	Reduced costs to farmers from disease and vector control	Extremely likely	Minor	D	<p>The costs of vector and disease control are partially funded through a levy on cattle slaughter and deer industry contributions - this covers most of the cost of disease control (monitoring and management of Tb) and 40% of the costs of vector control. Government and local authorities provide the remaining funding for vector control (AHB 2005).</p> <p>Levies are a maximum of \$15 per adult cattle slaughtered. Dairy Insight Inc contributes funding on behalf of the dairy industry to cover Tb monitoring and management costs. Costs to cattle</p>

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					<p>farmers for disease control therefore vary according to herd numbers and number of cattle slaughtered.</p> <p>Deer Industry New Zealand contributes directly for the deer industry however, this contribution does not cover the cost of routine Tb testing which is currently met directly by the owners of deer. For deer farmers direct costs are higher than for cattle as Tb testing can be from \$3 - \$10 per animal, with additional vet fees as well. For deer herds that become Tb infected there are further costs for re-testing. There is also a cost to both cattle and deer farmers for testing from time spent testing and providing testing facilities.</p> <p>Most vector control costs are funded by industry levies, government and local authorities. However deer and cattle farmers also undertake vector control on a voluntary basis through Locally Initiated Programmes (LIPs). The LIP programme equips and assists farmers to undertake vector control on their own land. The main cost for participating farmers is their time.</p> <p>Given the reduced number of Tb infected livestock in the future scenario WITH 1080, compared to one WITHOUT 1080, it is EXTREMELY LIKELY that by 2015 the costs associated with vector and disease control will be reduced.</p> <p>By 2015 in a future WITH 1080, the total budget for vector control will remain in the same range as currently (\$35 – 40M per year). The AHB has forecast a further reduction to \$10-15M per year by 2025, WITH 1080. By comparison, WITHOUT 1080, vector control will require a budget of \$55-60M per year until a more cost effective method is identified for containing or eradicating infection from wild animal populations.</p> <p>The accumulated cost savings for individual farmers attributable to the use of 1080 from a reduction in the levy placed on cattle slaughter and industry contributions for both vector and disease control is likely to be at least \$8M per year by 2015. As the cost savings will increase gradually at an unknown rate over this time period it is estimated that this will result in a MINOR effect. This is based on the following assessment:</p> <p style="padding-left: 40px;">\$20M more money will be spent annually on vector control in a future WITHOUT 1080. Industry share of this (direct costs to farmers) is in the order of \$8M.</p> <p>Disease control costs are likely to remain the same WITH and WITHOUT 1080 as the same level of testing and control of herds will need to be maintained as long as any risk of Tb infection amongst cattle and deer herds exists. Therefore there will be no difference in a future WITH and WITHOUT 1080 in the costs to farmers from disease control.</p>

BENEFITS REGISTER					
ID	Effect	How likely?	Magnitude of effect	Level of benefit	Commentary
					Based on the above, the likelihood of this benefit occurring is EXTREMELY LIKELY (almost certain). The effect is MINOR (dollar benefit \$1M - \$50M and local and contained benefit), therefore the benefit is D (benefits are considerable but do not justify high costs or risks). Note: Benefits to the domestic economy from reduced costs to the agricultural sector and government are assessed in M-B7.
M-B4	Removal or relaxation of restrictions on livestock movements	Extremely likely	Major	F	Restrictions on the movement of cattle and deer can generate significant costs and loss of income for farmers. In a future WITH 1080, the reduction in infected herds and in vector risk areas will mean less restrictions on livestock movements. This has been identified as a significant benefit and a discussion on the likelihood and effects of this benefit is contained in Section 4.2.
Benefits to farms from reduction in vertebrate pest numbers (mainly possums and rabbits)					
M-B5	Reduced competition for grazing from pests (wallabies, possums, rabbits & hares)	Very likely	Major	E	Rabbits are a significant threat to pastoral production in New Zealand as they compete with farm livestock for available feed. To a lesser extent possums impact on pastoral values as well - pasture consumption by possums living in the bush/pasture margin has been estimated at 0.1 kg of pasture per possum per day – economic damage has been estimated at \$12M worth of pasture annually (Statistics NZ 1994). Wallabies also impact on pastoral production and 1080 is the only pesticide currently registered for their control. As the major impact on pasture is by rabbits, these pests are the focus of this assessment. In a future WITH 1080, the ability to control rabbits using 1080 will benefit pastoral farmers. This has been identified as a significant benefit and a discussion on the likelihood and effects of this benefit is contained in Section 4.2.
M-B6	Improved livestock herd health from improved water quality	Very likely	Minimal	B	There are links between possum presence and giardia (<i>Giardia spp</i>) and Cryptosporidium (<i>Cryptosporidium parvum</i>) pathogens in stream environments (www.gw.govt.nz/story8615.cfm) that may be sourced for livestock water. Other wild animals such as deer, and pigs may also be responsible for spreading giardia. Experimental work has found associations between pathogen (giardia or cryptosporidium) infection and decreased animal performance in sucking animals (Harp et al. 1990 and Olsen et al. 1995 in Abacus Biotech 2004). It is believed that water quality affects animal productivity (e.g. weight gain), and there is overseas evidence that the intake of water by cows has a major impact on their productivity

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					<p>(Abacus Biotech 2004). There may be some effect on cattle and deer from drinking water of lower water quality due to faecal contamination from possums or other feral animals.</p> <p>It is therefore considered VERY LIKELY that there will be some small level of benefit to herd health from improved water quality WITH 1080 compared to WITHOUT 1080 given the larger area of land under pest control and consequent reduced possum numbers.</p> <p>In the absence of quantitative data, the possible effects of improved water quality on productivity can only be estimated as <\$1M, that is the effect will be MINIMAL.</p> <p>Based on the above, the likelihood of this benefit occurring is VERY LIKELY (expected to occur if all conditions met). The effect is MINIMAL (negligible benefit (<\$1M)), therefore the benefit is B (either insignificant or minor benefit).</p>
Benefits to the domestic economy from reduction, or elimination in certain areas, of bovine Tb in cattle and deer					
M-B7	Reduced costs to the agricultural sector and government associated with vector control	Extremely likely	Moderate	E	<p>Approximately 40% of the costs of vector control are met from farmers and industry groups, through a levy on cattle slaughter and deer industry contributions. Government and local authorities provide the remaining funding for vector control (AHB 2005). A reduction in vector control costs resulting from the reduction in infected herds and in vector risk areas that will occur WITH 1080, means that this has been identified as a significant benefit.</p> <p>A discussion on the likelihood and effects of this benefit is contained in Section 4.2.</p>
M-B8	Reduced likelihood of formal restrictions on access to export markets for beef, venison and dairy products	Unlikely	Major	C	<p>International market restrictions can severely restrict or close down access to overseas markets for New Zealand products. Barriers to trade for New Zealand meat and dairy products could be imposed if our level of bovine Tb infection is perceived to be a risk.</p> <p>The dairy industry had an export value of \$5.7 billion in the year to March 2005, about 20% of all foreign trade (Ministry of Agriculture & Forestry 2005). Meat products (lamb, beef and venison) had an export value of \$4.2 billion in the year to March 2005 (Ministry of Agriculture & Forestry 2005) of which \$1.9 billion was beef and \$199M was venison. While the US market dominates export quantities and values, exports go to more than 90 other countries. Given the high value of the market any loss would have a major effect.</p> <p>The projected APP WITH 1080 is 0.17%, compared to 0.58% WITHOUT 1080. To be officially recognised as bovine Tb free, the APP must be less than 0.2%. Currently overseas markets for New Zealand beef, dairy and venison do not require New Zealand to be bovine Tb free – so long as we meet guidelines regarding produce safety and testing required by the Terrestrial Animal</p>

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					<p>Health Code of the World Organisation for Animal Health (see Section 4.4 International Obligations). Recently the international trading environment has become more benign where bovine Tb is concerned. There are currently some Overseas Market Access Restrictions that prohibit the sale of some products in certain countries (e.g. Russia) due to our bovine Tb levels, however, these are becoming fewer. It is therefore expected that this benefit could occur WITH 1080, but is UNLIKELY overall. The benefit may arise from a decreased occurrence of Tb overall and resultant decrease in the risks of failing to meet safety and testing guidelines or an incident of Tb and harmful pathogens found in products.</p> <p>However the magnitude of the effect has been assessed as MAJOR based on the value of the export market. Should formal restrictions be placed on the market it is possible some or all export dollars from this source could be lost.</p> <p>Based on the above, the likelihood of this benefit occurring is UNLIKELY (could occur, but is not expected to occur under normal operating conditions). The effect is MAJOR (dollar benefit \$100M - \$500M, and regional benefit); therefore the benefit is C (benefits are considerable but do not justify high costs or risks).</p>
M-B9	Reduced likelihood of restrictions on access to export markets for live cattle and deer	Extremely likely	Minimal	C	<p>The levels of Tb in New Zealand cattle and deer currently prevent any exports of live animals to Australia and North America, and limit live export trade to other countries. The achievement of international freedom from Tb (achieved when 99.8% of domestic cattle and deer herds have been free of bovine Tb for three years) would be possible WITH 1080 but not WITHOUT 1080. It is therefore EXTREMELY LIKELY that this benefit will occur WITH 1080.</p> <p>New Zealand mainly exports live animals to Mexico, Europe and other countries who have bovine Tb at similar levels to ours. It is possible but not likely that New Zealand would trade live cattle or deer with North America or other Tb free countries if New Zealand gains Tb freedom and market restrictions were removed as a result. For this reason the magnitude of the benefit within a 10 year timeframe is MINIMAL as no improved economic performance will result. The main benefit for farmers who trade live animals in achieving Tb freedom is in the reduction of management and monitoring of bovine Tb. The magnitude is based on:</p> <p style="padding-left: 40px;">\$0 - \$1M benefit estimate for gaining access to markets for live animals.</p> <p>Based on the above, the likelihood of this benefit occurring is EXTREMELY LIKELY (almost certain). The effect is MINIMAL (negligible benefit (<\$1M)); therefore the benefit is C (benefits are considerable but do not justify high costs or risks).</p>

Section 4.1A Effects on Market Economy

BENEFITS REGISTER					
ID	Effect	How likely?	Magnitude of effect	Level of benefit	Commentary
M-B10	Reduced likelihood of loss of markets due to market perceptions of New Zealand's Tb status	Very likely	Major	E	<p>The effect M-B8 assesses the likelihood of formal trade restrictions being placed on New Zealand export markets as a result of bovine Tb infection levels. Given the regulatory environment, the use of 1080 to control Tb is not likely to result in significant benefits to market access. However, a greater risk is posed to export markets if consumer concerns about potential exposure to Tb infection result in a loss of market share (i.e. loss of New Zealand's market share of the total sales of all dairy and meat products in which we compete).</p> <p>This has been identified as a significant potential effect and is discussed in detail in Section 4.2.</p>
Benefits to horticulture from reduction in vertebrate pest numbers (particularly possums)					
M-B11	Reduction in crop damage/losses due to possum browsing (for orchards etc.)	Unlikely	Minimal	A	<p>Possum and rabbits impact upon horticulture by browsing fruits and vegetation associated with horticulture.</p> <p>The use of 1080 is not common for the prevention of possum or rabbit damage to horticultural crops. This is largely because many horticultural areas are close to settled areas where 1080 is not frequently used. Some regional councils use 1080 expressly for the purpose of protecting horticultural values but this is not a widespread occurrence. In these situations it is likely the use of cyanide and trapping will have a similar effect on possum control and for this reason it is UNLIKELY that the benefit will be realised.</p> <p>Hackwell and Bertram (1999) quoted a figure of \$1M per year lost by horticulture to possums. No figures are available for the damage rabbits do to horticulture, however as it is mostly damage to seedlings that are of concern, it is likely to be similar or less than that of possums. Given this, and given that 1080 is not extensively used to protect horticultural crops, any reduction in crop losses are estimated to be MINIMAL in magnitude WITH 1080 compared to WITHOUT 1080 i.e. benefits of < \$1M attributable to the use of 1080 compared to cyanide and trapping.</p> <p>Based on the above, the likelihood of this benefit occurring is UNLIKELY (could occur, but is not expected to occur under normal operating conditions). The effect is MINIMAL (negligible benefit (<\$1M)), therefore the benefit is A (either insignificant or minor benefit).</p>
Benefits to forestry from reduction in vertebrate pest numbers (particularly possums, deer, pigs)					
M-B12	Reduction in damage to exotic forestry plantations, particularly seedlings	Extremely likely	Minor	D	<p>Forestry plays an important part in the New Zealand economy. For the year ended March 2005, New Zealand exported \$3.3 billion of wood and wood products (Ministry of Agriculture and Forestry 2005).</p>

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ID	Effect	How likely?	Magnitude of effect	Level of benefit	Commentary
					<p>New Zealand's planted production forests covered an estimated 1.81 million hectares as at 1 April 2005 (Ministry of Agriculture and Forestry 2006b). Seventy percent of this area is in the North Island and 30% in the South Island. Thirty-one percent of the entire planted forest estate is in the Central North Island wood supply region. Other significant forest resources are in the Northland, Nelson/Marlborough and Otago/Southland regions.</p> <p>Possums, rabbits and hares caused significant damage to new plantations of <i>Pinus radiata</i> in the Central North Island, established in the 1960s and early 1970s. At some sites, up to 90% of young pine trees were browsed, and up to 50% may have died following possum damage to the terminal shoots (leaders) of young seedlings. Possums also bend and break terminal shoots and lateral branches in the upper part of young pines. For these reasons possums are controlled around forest areas using 1080 and other methods. Other pests that have an impact on plantation forestry are feral pigs and deer, however the level of impact and economic costs of these pests are unknown.</p> <p>Currently 1080 is used in both aerial and ground control operations to protect young production forest plantings from predation by possums, rabbits and hares. In 2004 50,200 ha of planting was undertaken in New Zealand. In 2005 it was estimated that 6,000 ha of planting was undertaken (Ministry of Agriculture and Forestry 2006b). It is this new growth that will be most vulnerable to pest damage over the timeframe of this assessment (10 years) and therefore the calculation of benefits is based on new growth areas.</p> <p>Once <i>Pinus radiata</i> reaches 14 years old, possums have little effect on the trees. Areas with new plantings are likely to experience possum damage where possum densities are high. The areas of plantation forestry that are most at risk from possums are those associated with waterways and indigenous forests (Hosking 2001). Possum damage in radiata pine plantations is currently at its lowest for years due to pest control (Hosking 2001) however an increase in pest numbers could change this. Forestry companies currently use 1080 as the main tool for targeting pests over large areas of forestry particularly in the Central North Island. The likelihood of a benefit occurring for forestry WITH 1080 compared to WITHOUT 1080 is therefore considered EXTREMELY LIKELY.</p> <p>The value of a 5% loss at planting in a <i>Pinus radiata</i> plantation could represent losses at harvesting of between NZ\$282 and NZ\$840 per hectare, at current prices (Green, 2004). The economic impact of pest control choices over the timeframe of the assessment would not be felt until the trees planted during that timeframe are harvested.</p>

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ID	Effect	How likely?	Magnitude of effect	Level of benefit	Commentary
					<p>Any losses due to pest damage must be tempered with the knowledge that forests lose a significant proportion of the original plantings prior to harvest. However given the value of the forestry industry the magnitude of a loss in effectiveness of pest control on this scale is likely to be MINOR over a 10 year timespan (given pest damages occurs within 14 years of planting). Over a longer timeframe the cost to the forestry industry would be much more significant. As no quantitative information is available on the proportion of damage possums compare with other expected damage, or the amount of seedlings likely to be planted over the next 10 years the magnitude is an estimate only.</p> <p>Based on the above, the likelihood of this benefit occurring is EXTREMELY LIKELY (almost certain). The effect is MINOR (dollar benefit \$1M - \$50M and local and contained benefit), therefore the benefit is D (benefits are considerable but do not justify high costs or risks).</p>
Benefits for tourism and outdoor recreation spending from protection of conservation values through a reduction in vertebrate pests					
M-B13	Benefits for tourism as a result of maintenance of healthy forest habitat and native biodiversity	Likely	Minor	B	<p>Tourism is a high value earner making a large contribution to the New Zealand economy from foreign exchange earnings and GST. The most recent information available reports that international visitor expenditure in New Zealand in 2002 was \$6.1billion. Domestic tourism also contributed \$6.9 billion (Ministry of Tourism 2006). As a fast growing sector it is currently similar in size to the dairy industry.</p> <p>A study undertaken by the Ministry for the Environment (2001) identified that "New Zealand is perceived by Asian, European and North American tourists, as an "Eden-like" escape. Tourism New Zealand has taken advantage of these perceptions in presenting New Zealand to these countries, with its marketing strategy hinging on New Zealand's clean environment. The New Zealand Tourism Strategy 2010 notes that: <i>"the natural environment is fundamental to the New Zealand brand..."</i></p> <p>New Zealand has 14 national parks and more than eight million hectares protected in public conservation lands. The Ministry of Tourism (2005) notes that more than half New Zealand's international tourists visit conservation lands during their time here, whether to have a picnic, drive to Milford Sound, take a short walk, or go tramping. Domestic tourists also often travel to visit the conservation lands. Many tourism businesses rely on access to conservation areas to take visitors on guided walks and other recreation experiences.</p> <p>The natural values that attract a significant proportion of visitors to New Zealand may be linked to the conservation outcomes of 1080 use being achieved e.g. protection of threatened native birds</p>

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ID	Effect	How likely?	Magnitude of effect	Level of benefit	Commentary
					<p>(refer Section 4.Effects on the environment). It is unknown whether the average visitor would be aware of the difference in value between a landscape with high native biodiversity and ecosystem integrity (protected by 1080) and one with less biodiversity and ecosystem integrity (protected with another tool or not at all in the absence of 1080). It is also difficult to distinguish between attraction to other wilderness values in a given ecosystem (e.g. geological formations). As these outcomes are less likely to be achieved WITHOUT the use of 1080 it is LIKELY that this benefit will accrue WITH 1080, compared to WITHOUT 1080.</p> <p>Assuming that awareness will vary significantly between different tourists the economic benefits of protecting an area for tourist benefit also has a significant amount of variation. However, the protection of New Zealand's clean green image, upon which we sell our tourism products, would be compromised by declining natural values resulting from vertebrate pest damage, providing some level of surety about the likelihood of this benefit occurring.</p> <p>The target for tourism in 2010 is a \$26.8 billion domestic and international tourism contribution to New Zealand's economy (Ministry of Tourism 2003).</p> <p>A few examples of where this money may be earned for tourism by New Zealand natural values include:</p> <ul style="list-style-type: none"> • Milford walking track - \$70-400/walker/visit (Woodford and Cowie 1977) • Greenstone and Caples Valley recreation - \$28/tramper/visit; \$59/hunter/visit; \$39/angler/visit; \$32/trekker/visit (Kerr 1996a) • Greater Wellington Regional Council Parks - \$10.50 per person per visit (Kerr 1996b) • Northland forests and the Coromandel (expenditure unknown) <p>All of the areas named above rely to some extent on vertebrate pest control to protect the values people visit them for.</p> <p>A study undertaken by the Ministry for the Environment (2001) into valuing New Zealand's clean green image showed that a change in tourist purchasing behaviour would accompany worsened environmental perceptions yielding an estimated loss of \$530 million for our top five tourism markets alone (direct value added and GST only). Worsened environmental perceptions could occur due to a failure to protect our native biodiversity and ecosystems. However, it is not possible to link worsened environmental perceptions directly to the use of 1080 and protection of our clean green image, as many other factors contribute to tourist decisions to visit targeted</p>

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					<p>areas within NZ, and visitors have diverse reasons for travelling. For example, some tourists may seek out NZ as a specific outdoors tramping destination, whereas others may observe our national parks as part of a coach tour. Additionally, awareness between tourists or level of understanding about conservation and biodiversity goals within NZ may vary significantly.</p> <p>Based on the Ministry for the Environment's work and assuming that only a small proportion of potential tourists have a high level of awareness of New Zealand's biodiversity values and habitat, this effect is likely to be MINOR over the timeframe of this assessment. It is important to note that should this effect be reassessed based on a longer timeframe this benefit would increase in significance. This would reflect the longer timeframe over which many adverse ecosystem or habitat level effects may occur in a future WITHOUT 1080 (assuming no new pest management techniques become available) which would then become obvious to visitors.</p> <p>Based on the above, the likelihood of this benefit occurring is LIKELY (a good chance that it may occur under normal operating conditions.). The effect is MINOR (dollar benefit \$1M - \$50M and local and contained benefit), therefore the benefit is B (either insignificant or minor benefit).</p>
Benefits to the economy from protection of ecosystem services from pest impacts					
M-B14	Benefits to aspects of the New Zealand economy which benefit from ecosystem services in general	Likely	Minor	B	<p>Ecosystem services can be defined as the quantifiable services that an ecosystem provides to humans, including consumables and non-consumables. Ecosystem services provide for production, recreation, employment and community well-being. They provide us with both indirect and direct benefits. For example, forests provide humans with timber that has a direct economic value, but they also have an important role in terms of climate and erosion control.</p> <p>Healthy ecosystems may also help reduce the effects of climate change. This may have economic implications for government responsibilities in the future as carbon sequestration capacity is likely to benefit from the use of 1080, given the larger areas receiving pest control. However, due to uncertainty over the extent to which carbon sequestration in indigenous forests will be able to earn carbon credits, this potential benefit has not been quantified as an economic benefit in this assessment.</p> <p>Possums and other vertebrate pests affect the health of ecosystems and thereby their capacity to provide ecosystem services of value to the economy. In particular they may impact on the health of forests, and the production levels possible from agricultural/horticultural systems.</p> <p>The value of various ecosystem services can be calculated in order to give a value to healthy ecosystems. The Ministry for the Environment and the Centre for Ecological Economics has</p>

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					<p>undertaken a substantial body of work to calculate the monetary value of ecosystem services. They found that ecosystem services such as pollination, soil formation, nutrient recycling, wetland contribution to flood control, rainfall, and sunlight contribute to more than half the current level of New Zealand's Gross Domestic Product (Massey News 2005). Some of these ecosystem services are linked to ecosystems that are the target of pest control for conservation outcomes. As conservation outcomes are less likely to be achieved without the use of 1080 it is LIKELY that this benefit will be achieved compared to a future scenario WITHOUT 1080. One of the main points of difference is that 1080 enables far larger and more inaccessible areas of land supporting valuable ecosystem services to be protected.</p> <p>A study undertaken by Environment Waikato identified the total value derived from ecosystem services at \$19,700 per ha/ year for lakes and rivers, \$2,400 ha/year for forests and \$39,800 for freshwater wetlands (Patterson and Cole 1998). These are all ecosystem types that will benefit from the use of 1080 (refer 4.1D Benefits to the environment). However, it is acknowledged that the science of estimating ecosystem service economic value is still developing. Hence this assessment takes a very conservative approach to assessing the magnitude of the effect.</p> <p>Given that the science of estimating ecosystem service contributions to the economy is still uncertain the magnitude of this effect has been estimated as MINOR over the timeframe of this assessment. As with benefits to tourism however, it is important to note that this effect would likely be more significant over a longer timeframe.</p> <p>Based on the above, the likelihood of this benefit occurring is LIKELY (a good chance that it may occur under normal operating conditions). The effect is MINOR (dollar benefit \$1M - \$50M and local and contained benefit), therefore the benefit is B (either insignificant or minor benefit).</p>
M-B15	Reduced costs from erosion and flood damage from maintaining healthy vegetation cover and catchment/soil erosion plantings.	Extremely likely	Minor	D	<p>It has been estimated that the damage caused by possums to poplars and willows planted to reduce catchment or soil erosion is between \$30,000 - 80,000 annually. The possible benefit in the form of flood damage prevented by catchments protected from possum damage has not been quantified by any research to date. The government has acknowledged this potential benefit from pest management by funding the Thames Coast Project. The Project has recognised that the effectiveness of pest control for flood mitigation purposes is dependent on pest numbers being maintained at a low level (Environment Waikato 2003).</p> <p>Given that possum control can be carried out over a greater area WITH 1080 than WITHOUT 1080, it is EXTREMELY LIKELY that there will be reduced erosion and flood damage associated</p>

BENEFITS REGISTER					
ID	Effect	How likely?	Magnitude of effect	Level of benefit	Commentary
					<p>with a future WITH 1080 compared to a future WITHOUT 1080.</p> <p>Flood damage from one flood in New Zealand can cost the nation and local regions millions of dollars in repairs. As climate change creates more frequent flood risks and resulting increases in flood damage to property, it is likely that protecting catchments as well as plantings from possum damage will result in a benefit in the order of magnitude of millions of dollars. The order of magnitude of this benefit in a future WITH 1080 is conservatively estimated as MINOR compared to WITHOUT 1080.</p> <p>Based on the above, the likelihood of this benefit occurring is EXTREMELY LIKELY (almost certain). The effect is MINOR (dollar benefit \$1M - \$50M and local and contained benefit), therefore the benefit is D (benefits are considerable but do not justify high costs or risks).</p>

REGISTER OF ADVERSE EFFECTS					
ID	Effect	How likely?	Magnitude of effect?	Level of risk?	Commentary
Effects on <i>farmers</i> from poison use in New Zealand wilderness and rural areas					
M-A1	Loss of livestock from poisoning	Unlikely	Minimal	C	<p>There are isolated reports of the loss of livestock to accidental poisoning. Most of these reports are associated with bovine Tb control operations which take place on or close to productive rural land. Large mammals such as sheep, cattle and deer have low susceptibility to 1080 (the LD₅₀ for sheep is 0.25 mg/kg and cattle is 0.4 mg/kg and for deer 0.5 mg/kg (Broome et al. 2004). This means that a 50 kg sheep could die if they eat 8.33 g (1-2 pellets assuming a 6 g pellet of 1.5 g/kg 1080) and a 170 kg cow could die if they consumed 44.54 g (7 pellets, based on the same assumptions). Based on the same size and concentration, an 80kg deer would need to consume 26.67 of 1.5 g/kg 1080 bait (over three 6 g baits or over two 12 g baits).</p> <p>By comparison, the LD₅₀ for cyanide (CN) is 2.30 mg/kg for sheep and 3.5 mg/kg for cattle and deer (Fisher and Fairweather, 2004). This means that they are less susceptible to CN than to 1080. However the higher dose of cyanide contained in each Feratox pellet means that the total number of Feratox pellets required to be eaten to kill the mammal is about the same or less in some cases for cyanide. A cow could die if it consumed six Feratox (cyanide) pellets (weighing 0.2 g each and based on a concentration of 500 g/kg CN), a dose equivalent to the LD₅₀. As a deer is lighter than a cow, it would need to consume only one or two Feratox (cyanide) pellets to receive the LD₅₀ dose.</p> <p>The causes of accidental livestock death are largely due to exposure to a poison through human error such as restocking too early, gates left open or damaged fencing allowing stock access to poison operational areas. There is a slightly higher chance of accidental stock death associated with 1080 due to aerial dispersal and the unlikely possibility of inaccurate targeting of 1080 distributed from the air, however, this is balanced by the somewhat lower number of cyanide baits required to kill an animal. Overall, the likelihood of the effect occurring is UNLIKELY when comparing the WITH 1080 and the WITHOUT 1080 scenarios.</p> <p>Given the current price of livestock (refer M-B1) and the small number of livestock that are lost, the magnitude of the effect is considered to be MINIMAL.</p> <p>Based on the above, the likelihood of this effect occurring is UNLIKELY (could occur, but is not expected to occur under normal operating conditions). The effect is MINIMAL (negligible economic impact (<\$1M)), therefore the risk is C (risks within the ALARP band</p>

REGISTER OF ADVERSE EFFECTS					
ID	Effect	How likely?	Magnitude of effect?	Level of risk?	Commentary
					and broadly classed as tolerable subject to ongoing monitoring and control).
M-A2	Loss of working dogs from poisoning	Unlikely	Minimal	C	<p>There are isolated incidents of working dogs fatally poisoned by accidental exposure to 1080. As with livestock the accidental deaths are largely due to exposure to a poison through human error such as allowing dogs access to areas recently poisoned, gates left open or damaged fencing.</p> <p>Dogs are highly sensitive to 1080. With an LD₅₀ of 0.06 mg/kg they would need to ingest less than one gram of a 6g, 1.5 g/kg cereal pellet to receive a fatal dose (Broome et al 2004), although they are at much greater risk from scavenging carcasses than direct consumption of baits. Dogs can be treated for exposure to 1080, with the chances of success higher if treatment is received earlier. The LD₅₀ for dogs from cyanide is 4.1 mg/kg meaning a dog would need to eat just over 3 baits (Feratox Pellets of 500 g/kg) to receive a lethal dose.</p> <p>Secondary poisoning of dogs (when dogs scavenge on poisoned carcasses) is a greater risk with 1080 than with cyanide (Eason and Wickstrom 2001) due to the longer time period over which 1080 poisoned carcasses contain lethal doses of 1080 for dogs. The chance of exposure to poisoning is therefore slightly greater WITH 1080 compared to WITHOUT 1080. However, overall there is a low risk of dogs being poisoned by cyanide or 1080 therefore the likelihood of the effect occurring in a future WITH 1080 compared to WITHOUT is UNLIKELY (occasional). In general poisoning is not expected to occur unless human error is involved.</p> <p>The number of dogs likely to die if 1080 is used compared to cyanide is small. Taking the value of a working dog into account (less than \$10k) the magnitude of the effect is MINIMAL on a national scale.</p> <p>Based on the above, the likelihood of this effect occurring is UNLIKELY (could occur, but is not expected to occur under normal operating conditions). The effect is MINIMAL (negligible economic impact (<\$1M)), therefore the risk is C (risks within the ALARP band and broadly classed as tolerable subject to ongoing monitoring and control).</p>

REGISTER OF ADVERSE EFFECTS					
ID	Effect	How likely?	Magnitude of effect?	Level of risk?	Commentary
M-A3	Costs associated with the temporary removal of stock from land during pest control operations and requirement for stand-down period following operations	Unlikely	Minimal	C	<p>Usage protocols require livestock to be excluded from areas undergoing treatment and people are warned away until danger periods have passed. The temporary removal of stock from land may create a financial cost to farmers.</p> <p>Livestock are vulnerable to both 1080 and cyanide and must be kept away from areas where poisons are being used and also prevented from returning to an area subjected to pest control for a stand-down period. The temporary removal of stock from land is more likely to occur during a 1080 aerial operation than during ground control operations. Aerial dispersal has become increasingly accurate with the use of GPS equipment; however the larger areas of land that can be covered do mean that more livestock need to be moved to match the pace of operations. Given that most operations on or near farmland are likely to be ground operations there is not going to be a large difference in the types of operations undertaken near fanned areas in a future WITH 1080 compared to WITHOUT 1080. The likelihood of this risk occurring is UNLIKELY.</p> <p>The impacts of temporary removal are infrequent and short-term, with the main cost being farmer's time. The overall effect is considered to be MINIMAL, when comparing the WITH 1080 against the WITHOUT 1080 scenario.</p> <p>Based on the above the likelihood of this effect occurring is UNLIKELY (could occur, but is not expected to occur under normal operating conditions). The effect is MINIMAL (negligible economic impact (<\$1M)), therefore the risk is C (risks within the ALARP band and broadly classed as tolerable subject to ongoing monitoring and control).</p>
Effects on the domestic and international markets from use of toxins in pest management					
M-A4	Negative impact on domestic and international market values and access for meat and dairy produce from contamination of meat and dairy produce with toxins	Improbable	Moderate	C	<p>Livestock poisoning from either 1080 or cyanide is improbable as livestock are excluded from treatment areas and sub-lethal doses are metabolised and excreted quickly from animals (see further information on the risk of contaminated meat in section 4.1.C Effects on Human Health). Should a risk to the food supply be identified in an area where 1080 or cyanide is used, the New Zealand Food Safety Authority will assess the situation to ensure no risk is posed to human health.</p> <p>There are more restrictions on the selling of feral meat (from wild animals) when using 1080 compared to cyanide. Buying feral deer for human consumption is subject to strict protocols that require the animal to be sourced from 1080-free areas. Processors of feral deer meat must take special care with buying and testing to ensure their product is safe.</p>

REGISTER OF ADVERSE EFFECTS					
ID	Effect	How likely?	Magnitude of effect?	Level of risk?	Commentary
					<p>By comparison, hunters can hunt in areas where cyanide has been used and don't have to observe any special boundaries or stand down periods. For this reason there is a slightly higher risk of having an impact on markets from a future WITH compared to WITHOUT 1080.</p> <p>The likelihood of an impact on domestic and international market values from contamination of produce (either domestic or feral) in a future WITH 1080 compared to WITHOUT 1080 is however IMPROBABLE.</p> <p>The magnitude of this effect has been assessed as MODERATE. While the size of the farmed meat market is substantial, the wild meat market, both domestically and internationally, is relatively small. Due to the number of variables involved and the intangible nature of the effect it is difficult to identify a figure associated with this effect.</p> <p>Based on the above the likelihood of this effect occurring is IMPROBABLE (only occurring in very exceptional circumstances). The effect is 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) therefore the risk is C (risks within the ALARP band and broadly classed as tolerable subject to ongoing monitoring and control).</p>
M-A5	Negative impact on domestic and international markets due to market perceptions of the use of toxins	Improbable	Moderate	C	<p>The perception of large-scale use of any poison in New Zealand rural areas could impact on the value of and access for New Zealand primary produce both domestically and internationally. Specifically, trading partners may perceive that there is an increased risk of a poison entering the food chain through meat or dairy products.</p> <p>Both 1080 and cyanide break down quickly in the environment. Sub-lethal doses of cyanide are metabolised within the body quicker than 1080. This is reflected by the fact that there is no stand-down period for hunting wild animals following cyanide pest control operations. However, the likelihood of contamination of meat products occurring is considered Improbable for 1080 and Highly Improbable for cyanide, and the level of adverse effect of this in both instances would be Minor (see Section 4.1C, Effects on Human Health and Safety).</p> <p>Neither 1080 nor cyanide are expected to cause human health effects via consumption of contaminated dairy products. The main reasons for any greater risk from the use of 1080 are:</p> <ul style="list-style-type: none"> The aerial dispersion of 1080 and the possible perception of indiscriminate

REGISTER OF ADVERSE EFFECTS					
ID	Effect	How likely?	Magnitude of effect?	Level of risk?	Commentary
					<p>dispersal of a poison aerially;</p> <ul style="list-style-type: none"> The faster breakdown rates of cyanide in carcasses compared to 1080. <p>Overall the likelihood of negative perceptions impacting on domestic and international market values from the use of 1080 compared with use of cyanide is IMPROBABLE.</p> <p>Currently the New Zealand Food Safety Authority reports that none of our trading partners are concerned about the use of 1080 in New Zealand (Jolly 2005). Due to the number of variables involved and the intangible nature of the effect it is difficult to identify the magnitude of this effect. However, given the substantial value of the beef and dairy market (discussed in M-B11), it is considered to be MODERATE for the use of 1080 compared to the use of cyanide and trapping methods.</p> <p>Based on the above the likelihood of this effect occurring is IMPROBABLE (only occurring in very exceptional circumstances). The effect is MODERATE (some economic impact for the region, none for the nation \$50-100M) therefore the risk is C (risks within the ALARP band and broadly classed as tolerable subject to ongoing monitoring and control).</p>
Effects on horticulture					
M-A6	Potential barriers to organic certification from contamination of produce with toxins	Very unlikely	Minimal	B	<p>Certified organic properties can lose their certification if chemical pesticides such as 1080 or cyanide are found on the property during audits (Brown 2005). As no organic property would directly apply a pesticide on their property, the main possibility for the discovery of 1080 or cyanide would be from human error i.e. accidental or inaccurately applied treatments. Cyanide and 1080 both break down in the environment relatively quickly further minimising the risk to organic farms. The possibility of an inaccurate treatment is only slightly higher with the use of 1080 compared to cyanide given the greater amounts of land covered by aerial dispersal and the possibility of inaccurately targeted applications. Overall the likelihood of 1080 posing a barrier to organic certification in comparison with cyanide is VERY UNLIKELY.</p> <p>There are no known instances of 1080 applications affecting organic farmers. In practice AHB has agreed to the exclusion of certified farms from poisoning operations, with suitable buffer zones applied around organic properties. If this effect did occur it would happen at an individual farm level and not at a community level. The costs would be expressed in terms of lower prices for non-organic produce (varying dependent on product and market prices) and costs associated with re-certifying. Initial certification costs will also be lost.</p>

REGISTER OF ADVERSE EFFECTS					
ID	Effect	How likely?	Magnitude of effect?	Level of risk?	Commentary
					<p>For example Bio-Gro charges \$1,650 in fees for the assessment of applications, on-site audit, review of audit reports, and the registration/certification decision and issue (Bio-Gro 2005). Considering the number of properties that may be affected the magnitude is considered to be MINIMAL.</p> <p>Based on the above the likelihood of this effect occurring is VERY UNLIKELY (considered only to occur in very unusual circumstances). The effect is MINIMAL (negligible economic impact (<\$1M), low cost of containment, clean-up and repair (<\$5K)), therefore the risk is B (either insignificant or minor and not warranting further assessment).</p>
M-A7	Potential impact on international and domestic market values and access for pipfruit, kiwifruit etc	Highly improbable	Minimal	A	<p>1080 is not commonly used for the prevention of possum or rabbit damage to horticultural crops. This is largely because many horticultural areas are close to settled areas where 1080 is not frequently used. Some regional councils use 1080 expressly for the purpose of protecting horticultural values but this is not a widespread occurrence. Where toxins are used it is likely they would be a contained bait station with no direct contact with the soil or plants. The likelihood of the adverse effect occurring is HIGHLY IMPROBABLE for the above reasons and also due to the lack of evidence of crop contamination for both 1080 and cyanide use.</p> <p>Should the adverse effect occur it is difficult to quantify the costs to the domestic and international market from the use of 1080 compared to cyanide, however the magnitude of the effect has been estimated as MINIMAL.</p> <p>Based on the above the likelihood of this effect occurring is HIGHLY IMPROBABLE (almost certainly not occurring but cannot be totally ruled out). The effect is MINIMAL (negligible economic impact (<\$1M), low cost of containment, clean-up and repair (<\$5K)), therefore the risk is A (either insignificant or minor and not warranting further assessment).</p>
Effects on tourism and outdoor recreation spending from the use of 1080 in areas valued by tourists and outdoor recreation enthusiasts					
M-A8	Restricted access and voluntary avoidance of recreational areas during pest control operations	Likely	Minimal	D	<p>Pest control operations in areas valued by tourists and outdoor enthusiasts may restrict the use of an area for a short period. People may also avoid an area where 1080 or cyanide pest control operations are being undertaken. Restricted access or voluntary avoidance of a recreational area is LIKELY to happen WITH 1080 compared to WITHOUT 1080, particularly for aerial 1080 operations. Aerial operation effects are mitigated to a great extent by the winter timing of operations.</p> <p>The economic effect of this is not expected to be very significant as few instances of</p>

REGISTER OF ADVERSE EFFECTS					
ID	Effect	How likely?	Magnitude of effect?	Level of risk?	Commentary
					<p>restricted access occur, and there are alternative areas open to the public and visitors at all times. Some areas may be disadvantaged over other areas, but effects should not be experienced nationwide. Taking into account the highly localised effects of a pest control operation, the magnitude of the effect of restricting access is assessed to be MINIMAL, when comparing WITH 1080 against WITHOUT 1080 scenarios.</p> <p>Based on the above the likelihood of this effect occurring is LIKELY (a good chance that it may occur under normal operating conditions). The effect is MINIMAL (negligible economic impact (<\$1M), low cost of containment, clean-up and repair (<\$5K)), therefore the risk is D (risks within the ALARP band and broadly classed as tolerable subject to ongoing monitoring and control).</p>
M-A9	Negative perceptions of large scale aerial application of pesticide and impact on tourist spending	Likely	Minimal	D	<p>Of specific concern to the tourism industry is the perception that any use of a toxin in New Zealand is contradictory to our image as a clean and green nation. However, there is a large amount of uncertainty of how tourists perceive the use of 1080 or any other toxins in New Zealand. There has been no research done on the perception of the use of 1080 by visitors to New Zealand. It is known that over 90% of visitors to New Zealand come for its landscape. International visitors are probably not aware of the use of 1080 or cyanide in New Zealand when they make a choice on destination for their holiday. It is therefore unlikely that the use of 1080 or cyanide will prevent an international visitor from coming to New Zealand or visiting a region.</p> <p>Local visitors are likely to be better informed and more likely to have an opinion on the use of 1080 in wilderness areas. The widespread use of any toxin in the New Zealand landscape is perceived as very undesirable. New Zealander's have polarised perceptions of risks to New Zealand's environment (including native forests and biodiversity), from the use of 1080. It is most likely to have a highly localised effect.</p> <p>The likelihood of negative perceptions preventing tourism or outdoor recreation spending is largely determined by local visitors as it is very unlikely that international tourists base their decisions on the use of 1080 or cyanide in New Zealand. It is considered LIKELY that a local visitor may have negative perceptions of the use of 1080 in recreational areas compared to the use of cyanide, largely due to widespread aerial distribution of 1080 and the perceived risk to waterway and catchment values. As views are polarised it is just as likely that local visitors have a positive perception of the use of 1080 compared to tourism as well. This analysis has conservatively considered the negative perceptions.</p>

REGISTER OF ADVERSE EFFECTS					
ID	Effect	How likely?	Magnitude of effect?	Level of risk?	Commentary
					<p>The magnitude of the adverse effect is largely due to local visitor perception and unlikely to have a national impact as visitors can choose to visit other areas. The use of 1080 or cyanide is very unlikely to influence an international visitor's choice of New Zealand as a destination. On the contrary, it protects the values visitors most want to experience. When comparing WITH 1080 against WITHOUT 1080 scenarios, the magnitude of the effect is therefore MINIMAL.</p> <p>Based on the above, the likelihood of this effect occurring is LIKELY (a good chance that it may occur under normal operating conditions). The effect is MINIMAL (negligible economic impact (<\$1M), low cost of containment, clean-up and repair (<\$5K)), therefore the risk is D (risks within the ALARP band and broadly classed as tolerable subject to ongoing monitoring and control).</p>
M-A10	Negative impact from restrictions on hunting and associated decrease in hunter spending	Likely	Minimal	D	<p>There are more restrictions for the consumption of feral meat when using 1080 compared to cyanide. Due to the risk of secondary poisoning from feral animals, recreational hunters are restricted to 1080-free areas. However, hunters can hunt in areas where cyanide has been used without restriction. It is therefore LIKELY that hunters will experience restrictions to where they can hunt WITH 1080 compared to WITHOUT 1080.</p> <p>However, there are alternative areas for hunters to choose from should one area be restricted to hunting. Rather than choosing not to go hunting and spend money in a particular community, hunters may transfer their spending to a different community and hunt in an area free from 1080. The adverse effect of using 1080 in comparison to cyanide is therefore highly localised and the magnitude is MINIMAL.</p> <p>Based on the above the likelihood of this effect occurring is LIKELY (a good chance that it may occur under normal operating conditions). The effect is MINIMAL (negligible economic impact (<\$1M), low cost of containment, clean-up and repair (<\$5K)), therefore the risk is D (risks within the ALARP band and broadly classed as tolerable subject to ongoing monitoring and control).</p>
M-A11	Negative impact on recreational hunting activity from by-kill and associated loss of business activity and commercial opportunities	Very unlikely	Minimal	B	<p>Deer, pigs and other wild animals are sometimes killed in 1080 operations (particularly aerial) as by-kill. This may also occur during cyanide operations however little research has been undertaken into the non-target effects of cyanide operations on non-target wild animals. Research that does exist concludes that deer populations are likely to recover within a few years (Nugent & Fraser 2005). The likelihood of this adverse effect is considered VERY UNLIKELY under the current application of 1080. Note: The likelihood</p>

REGISTER OF ADVERSE EFFECTS					
ID	Effect	How likely?	Magnitude of effect?	Level of risk?	Commentary
					<p>is expected to reduce even further in the future with the development and application of effective deer repellent 1080 baits, however as these are still being trialled at present, this has not been considered in this assessment.</p> <p>If deer numbers decrease hunters may not go hunting as frequently, reducing demand for local accommodation, food, fuel and other services. The recreational hunting industry has been valued at \$14 per day or \$180-240 per animal shot (Nugent and Henderson 1990). Given that wild animal populations are likely to recover in the short-term, there will still be areas where pest control operations will have no impact on deer numbers and the value of hunting activity to local communities, the magnitude of this effect would be both short-term localised and MINIMAL in a future WITH 1080 compared to WITHOUT 1080.</p> <p>Based on the above the likelihood of this effect occurring is VERY UNLIKELY (considered only to occur in very unusual circumstances). The effect is MINIMAL (negligible economic impact (<\$1M), low cost of containment, clean-up and repair (<\$5K)), therefore the risk is B (either insignificant or minor and not warranting further assessment).</p>
Effects on rural employment and economy					
M-A12	Negative impact on fur industry due to reduction in possum populations and availability of resource	Improbable	Minimal	A	<p>The possum fur industry is not thought to be a significant export earner for New Zealand. The fur trade industry in New Zealand peaked in 1980/81 when export of skins reached an all-time high. However prices and exports have been low since 1990, and many professional and part-time hunters have left the industry.</p> <p>The use of 1080 is a more effective tool than cyanide to reduce and maintain possum populations. However the possibility of reducing possum numbers to the point where few remain for hunting and the fur industry is unlikely either WITH 1080 or WITHOUT 1080. Most trappers for the fur trade use cyanide on possums. Past research has indicated that some possum populations have been exploited hard enough to change their composition, and in some areas possum numbers declined significantly when skin prices (Clout and Barlow 1982). Should possum populations be reduced in the long term it would still be possible to achieve sustained fur yields from less sensitive habitats. Given these factors the likelihood of a negative impact on the fur industry from reduced possum populations is IMPROBABLE in a future WITH 1080 compared to WITHOUT 1080.</p> <p>Taking into account the extent of reduction of possums required to make the fur industry no longer viable, the magnitude of the adverse effects from the use of 1080 compared to</p>

REGISTER OF ADVERSE EFFECTS					
ID	Effect	How likely?	Magnitude of effect?	Level of risk?	Commentary
					<p>cyanide is MINIMAL. This magnitude is further justified as any adverse effect could be countered by harvesting fur from less sensitive environments where other forms of control are not needed.</p> <p>Based on the above the likelihood of this effect occurring is IMPROBABLE (only occurring in very exceptional circumstances). The effect is MINIMAL (negligible economic impact (<\$1M), low cost of containment, clean-up and repair (<\$5K)), therefore the risk is A (either insignificant or minor and not warranting further assessment).</p>
M-A13	Reduced opportunities for employment from trapping and hunting for control of possums and other pests	Improbable	Minimal	A	<p>Ground control programmes can provide greater local employment over an extended period of time than aerial control programmes, thus benefiting the local economy. With the downturn in skin prices, and the increase in funds available for possum control work since 1989, there has been a significant transition by many professional hunters from being commercial hunters (fur trade) to pest control contractors. Contract hunters are increasingly used by DOC, AHB, private landowners and most regional councils, especially as more operations shift from initial reduction to maintenance control. Companies that employ contract hunters are currently reporting that there is a shortage of skilled and willing people in the industry (Green 2004).</p> <p>As such it is IMPROBABLE that this adverse effect will occur WITH 1080 compared to WITHOUT 1080 as there is currently no shortage of work for skilled hunters and contract hunting is a complementary control method to initial 1080 operations rather than a direct competition.</p> <p>Taking this into account, the magnitude of the effect would be MINIMAL when comparing WITH 1080 against WITHOUT 1080 scenarios.</p> <p>Based on the above the likelihood of this effect occurring is IMPROBABLE (only occurring in very exceptional circumstances). The effect is MINIMAL (negligible economic impact (<\$1M), low cost of containment, clean-up and repair (<\$5K)), therefore the risk is A (either insignificant or minor and not warranting further assessment).</p>

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