

# **Used vehicle import health standard options**

**Cost-benefit analysis of proposed  
changes to import arrangements**

**Report to Biosecurity New Zealand**

**6 June 2007**





## **Preface**

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## Executive Summary

This draft report presents quantified estimates of the costs and benefits of proposed changes to Import Health Standards for used vehicles. The quantified results from the analysis, and their interpretation, are intended to assist wider consideration of the different options for this pathway.

The used car pathway has been identified by MAF's Import Risk Analysis as posing high risk for biosecurity, because the characteristics of vehicles and how they are used in their countries of origin and in New Zealand provide plenty of opportunities for organisms to hitch-hike into the country and become established in suitable habitat. The pathway is complex and constraints of time and information mean this cost benefit analysis is of necessity at a fairly high level.

The analysis concentrates on the direct costs for all those involved in the trade, including border regulators, importers, ports and shipping companies. The additional costs are likely to be ultimately passed on in higher prices to consumers, and there may also be some marginal changes in the type of vehicles made available in the New Zealand market, due to changes in the profitability of supplying different types of vehicle. The analysis includes the costs of different processes in the options under consideration, and also some delay costs, but there is insufficient information to include all logistical impacts of the different processes in ports around New Zealand.

Benefits in the analysis come primarily from the avoided cost of pest incursions precluded by greater efficacy of the new proposed measures, and from savings in existing border checking processes replaced. The expected value of incursions in future years is difficult to assess from current data, both because of variability among impact estimates of different pests and because there are insufficient data to assign a probability to arrival and establishment of different pests. Most economic impact estimates of recent pest incursions have a very wide range between high and low estimates, and most exclude to varying degree valuation of more difficult to quantify consequences, such as impacts on health and the quality of the natural environment.

The analysis uses "reverse inference" of the value of benefits required to justify the costs of the different options compared. This gives an annual value of benefit required for an option to break-even over the 20 year span of this analysis. It is hard to translate this into an expected value of incursions avoided, because the probabilities of hazards arriving in New Zealand are unknown, and the hazards that arrive on vehicles are also found in other pathways. However, this inferred benefit gives an indication of the relative value of the different options compared to continuation of current arrangements.

The results of the analysis are presented in the table below. This suggests that continuing the current arrangements implies an annual value of benefits of \$28.2 million. Compared to this other options considered are:

- Option 1 (improvement to facilities and inspections through use of a videoscope) would require an increase in annual value of benefit of \$10.8 million (38%);
- Option 1 (improvement to facilities, without videoscope) would require an increase in annual value of benefit of \$2 million (8%);
- Option 2 (replacing current inspections and targeted treatment with 100% treatment of all vehicles) would require an increase in annual value of benefit of \$12.6 million (45%);
- Option 3 (supplementing other options by changing air filters in all vehicles) would require an increase in annual value of benefit of \$1.8 million (6%).

### ***Comparison of options with continuation of the current arrangements***

	<u>High level</u>	<u>Baseline forecasts</u>	
Analysis period (years)	20	20	20
Discount rate	5%	5%	10%
Average annual percent change	1.5%	-2.4%	-2.4%
Number of imported used vehicles	3,353,500	3,119,774	3,119,774
Inspected/treated onshore	1,475,540	1,372,700	1,372,700
Pre-cleared/treated offshore	1,877,960	1,747,073	1,747,073
<b><u>Base case (current regime)</u></b>			
Required annual benefit (constant \$)	34,744,590	28,213,927	28,213,927
Total costs (PV\$)	454,644,114	421,471,750	302,833,959
Average cost per vehicle (PV\$)	\$212.13	\$212.56	\$212.56
<b><u>Option 1 (Improved facilities)</u></b>			
Required annual benefit (constant \$)	10,697,512	10,813,760	10,856,809
Total costs (PV\$)	172,733,330	161,540,589	116,531,468
Average cost per vehicle (PV\$)	\$80.59	\$81.47	\$81.79
<b><u>Option 1 (Improved facilities, no videoscope)</u></b>			
Required annual benefit (constant \$)	2,006,201	2,122,449	2,165,498
Total costs (PV\$)	32,394,238	31,706,060	23,243,355
Average cost per vehicle (PV\$)	\$15.11	\$15.99	\$16.31
<b><u>Option 2 net of baseline savings</u></b>			
Required annual benefit (constant \$)	17,089,782	12,642,590	12,648,472
Total costs (PV\$)	223,625,284	188,860,437	135,762,272
Average cost per vehicle (PV\$)	\$104.34	\$95.25	\$95.29
<b><u>Option 3 (air filters)</u></b>			
Required annual benefit (constant \$)	2,002,323	1,852,447	1,859,782
Total costs (PV\$)	26,201,040	24,239,858	17,416,712
Average cost per vehicle (PV\$)	\$12.23	\$12.23	\$12.23

Source: NZIER

The analysis indicates the relative costs of the different options, and the relative annual benefits required to justify them. Whether the different options would achieve the required improvement in benefits over current arrangements is a matter for judgement over the effectiveness of measures

on this pathway, and the extent to which other pathways continue to provide opportunities for hazards to enter New Zealand.

The results of this analysis are strongly driven by the number of vehicles being imported and the costs per vehicle. Two of the options also involve some fixed installation costs on facility improvements, but these are a relatively small part of the total cost given the volume of used vehicles expected to be imported over the next 20 years.

The principal cost components in the analysis relate to inspection costs, decontamination and treatment process costs, and assumptions about re-inspection and subsequent re-treatments. An estimate of delay cost is included for fumigation processes that take over a day, but the analysis does not attempt to estimate the logistical costs of the options.

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# 1. Introduction

This report presents a quantified assessment of the costs and benefits of alternative procedures for managing the biosecurity risk pathway of imported used vehicles. The analysis is intended to inform a wider process of assessment of the effectiveness of current risk management measures, and proposed risk management options for this pathway.

Imports of used vehicles present a potential pathway for various types of undesirable organisms to gain entry to New Zealand. Most of these are opportunistic “hitch-hiker” organisms rather than those specific to the goods themselves, so it is difficult to tell in advance which organisms are likely to arrive, or what their expected impact in New Zealand is likely to be. A risk analysis by Biosecurity New Zealand has suggested various ways of improving the current arrangements for inspecting and treating imported used vehicles. The analysis in this report is intended to examine the costs and benefits of these proposals against a continuation of the current arrangements.

Our approach draws on the CBA methodology outlined in Ministry of Agriculture and Forestry (2002) *Cost-Benefit Analysis of Unwanted Organism or Pest Response Options*. It is modified to the extent necessary to assess pre-emptive measures against encroachment at the border, rather than responses once encroachment has occurred. There are different issues and processes around new vehicles and used machinery, which are excluded from this analysis of imports of used cars only.

## 1.1 The options to be analysed

Used car imports have accounted for around two-thirds of new vehicle registrations in New Zealand in recent years, and they make a significant contribution to the variety and choice of vehicles available. In the year to March 2006, there were 146,491 used cars imported, with an aggregate value of \$1,044 million (in cost, insurance, freight terms), equivalent to \$7,126 per vehicle.<sup>1</sup> The declared value of the vehicles alone for duty purposes was \$878 million or \$5,994 per vehicle. The volumes have been around this level or higher since 2002, peaking at around 168,000 in 2004. The average value of vehicles has shown less variation and appears relatively unaffected by exchange rate changes, and in real terms has declined slightly in recent years. The manner in which used vehicles are used, both in their countries of origin and in their dispersal through New Zealand, make them a significant potential pathway for entry into the country of organisms at risk to biosecurity.

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<sup>1</sup> Statistics New Zealand Harmonised Trade – Imports Series TIMM.STTV

The options for biosecurity clearance of used vehicles are summarised in the table below.<sup>2</sup> Broadly the choice being examined is between:

- Continuation of the current regime (Base case);
- Improvements to the current regime (Option 1);
- An alternative regime replacing the current regime (Option 2);
- Improvements to the alternative regime (Option 3).

**Table 1 Border options for used vehicle imports**

<b>Current Regime</b>	<b>Option 2 Alternative</b>	
	<b>(Risk Analysis Preferred Options)</b>	
	<b>Onshore</b>	<b>Offshore</b>
100% inspection onshore or offshore		
Decontamination and/or treatment of detected contaminants EITHER Fumigation OR Heat treatment	100% Decontamination plus  EITHER Fumigation OR Heat treatment	100% Decontamination plus  EITHER Fumigation OR Heat treatment
	Audit	Audit
Reinspection	100% inspection if audit fails	100% inspection if audit fails
	Improved facility specification (Reduce escapes pre-treatment)	Improved facility specification (Reduce post-treatment re-contamination)
<b>Option 1 Add ons</b>	<b>Option 3 (Add on to Option 2)</b>	
Compliance centres registered as Transitional Facilities		
Improve current inspection with videoscope		
Air filters replaced/cleaned	Air filters replaced/cleaned	Air filters replaced/cleaned
Improved facility specification		

Source: NZIER

<sup>2</sup> These options are representative of those in the Import Risk Analysis but may not be identical in detail.

- The current regime is described in the top left quadrant, with all vehicles being inspected on arrival or offshore and those in which signs of contamination are found are subjected to appropriate decontamination and/or treatment, re-inspection and possible repeat of the process;
- The first option for improvement, shown in the bottom left hand quadrant, is to strengthen the current procedures by:
  - Registering locations where imported vehicles are checked for compliance with safety standards as Transitional Facilities capable of undertaking biosecurity inspections as well;
  - Improving current inspection processes with use of a videoscope allowing more detailed scrutiny;
  - Replacing and/or cleaning all air filters before vehicles are released from facilities;
  - Improving the specifications for transitional facilities to reduce the likelihood of organism escape prior to inspection in the case of on-shore facilities, or reduce likelihood of re-contamination in the case of facilities off-shore in the countries from which the vehicles are dispatched.

Decontamination is understood to be interior vacuuming and external pressure washing or steam cleaning of vehicles to remove seeds and soil. Fumigation and heat treatment are additional treatment measures designed to exterminate live invertebrates and vertebrates.

- A second option for improvement, as shown in the top right quadrant, would be to:
  - Replace the current inspection by putting all vehicles through a process of decontamination and treatment;
  - Audit a sample of vehicles coming from each source to ensure the thoroughness of decontamination;
  - Reinstate 100% inspection of vehicles from those sources which the audit indicates are not achieving the required level of decontamination;
  - Differentiate procedures, as appropriate, between decontamination and treatment that occurs in on-shore facilities and that which occurs off-shore in the country of despatch;
  - Improve the facility specification to reduce the likelihood of organism escape prior to inspection in the case of on-shore facilities, or reduce likelihood of re-contamination in the case of facilities off-shore in the

countries from which the vehicles are dispatched (as per section 35.3.3 of the Import Risk Assessment).<sup>3</sup>

- A third option, shown in the bottom right hand quadrant, would, in addition to the procedures in Option 2 above:
  - Replace or clean engine & air conditioning air filters in all vehicles leaving the facilities.

Option 1 is additional to the current arrangements, so the analysis requires identifying the additional costs, and any additional benefit in reduced risk of damaging incursions. Option 2 and Option 3 substantively replace the current arrangements, so any savings in ceasing or replacing current arrangements will need to be netted off the new costs of these options.

## 1.2 Approach and limitations

The used car pathway for biosecurity threats is complex and constraints of time and information mean this cost benefit analysis is of necessity at a fairly high level. Even without precise information and limited detail it can still be informative to identify the broad magnitudes of effects of different options in choosing between them.

The approach of this study has been to draw up a broad depiction and model of the import clearance processes under each of the different options (including the current regime) to get an indication of likely costs of each option. The cost of components in the different options are drawn from a mix of sources of varying reliability. Particular uncertainty surrounds the cost of delays imposed by the different options, as there is insufficient information about the flows of vehicles through the importation processes to model the options with any accuracy. Some allowance for the more obvious sources of delay is included in the cost estimates, but these are incomplete and likely to understate the logistical costs of the options, given the uneven flow of vehicle arrivals and the queues that form when peak flows overwhelm installed processing capacity.

Benefits are more difficult to estimate than costs because of uncertainties and intangible elements in them, so the model has been used to infer the value of benefit required to make the additional costs incurred worthwhile. Whether such benefit can be achieved by an option is a matter for technical judgement about the efficacy of the measures proposed.

Information has been drawn from a range of sources, including:

- Published statistics around the import of vehicles into New Zealand;

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<sup>3</sup> The facility improvements are the same in Option 1 and Option 2 and are aimed at both preventing recontamination/escape and inspection enhancements as set out in this section.

- A report commissioned by MAF from PriceWaterhouseCoopers on the Costs of Compliance for achieving biosecurity clearance (2005);
- Interviews with individuals in MAF, other agencies and the vehicle importing industry about their current processes and costs and how they might change under the proposed options;
- Questionnaires sent to vehicle importers, shipping companies and port companies seeking information on their current processes and costs and how they might change under the proposed options.

The information gained from these sources is of variable quality. Reliance has been placed on information where there is consistency or convergence between different sources, but there remain areas where there is uncertainty about the inputs which are dealt with by assessing the sensitivity of results to varying values for those uncertain inputs.

### **1.3 Outline of report**

This report proceeds in section 2 by outlining the structure of the cost benefit analysis, and explaining its components and the assumptions and inputs used in it. Section 3 provides results for the different options and reports on analysis of their sensitivity to changes in key variables. Section 4 interprets the results in light of caveats, uncertainties and limitations.

## 2. Outline of costs and benefits

A cost benefit analysis is a systematic process for assessing the merit, from the viewpoint of the community as a whole, of the consequences of change of state, as brought about by an investment project or a change in government policy. In the current case of Import Health Standards for used vehicles into New Zealand, the change of state is created by the new procedures for clearing imported used vehicles for biosecurity purposes. The consequences of the new procedures are compared against the situation that would have prevailed with the existing arrangements, with a view to establishing whether the additional costs incurred by the new processes are matched by additional benefits over the status quo.

The core steps in any CBA are the following:

- Identifying all relevant effects of an intervention, distinguishing between costs and benefits, private and societal effects.
- Quantifying these effects as far as possible.
- Valuing as many effects as possible on a consistent basis, while recognising that full quantification is often not possible.
- Distributing these effects over time and reducing them to a common basis for comparison through discounting.
- Where appropriate, applying sensitivity analysis to test the robustness of results to changes in key inputs, and to allow for risk and uncertainty around expected outcomes.

The aim of an economic cost benefit analysis is to examine the likely effect of a measure on the economic welfare or well-being of those affected. This commonly revolves around:

- Effects on producers (in this case all those involved in the supply and regulatory clearance of imported used vehicles), who face changes in the resources required to complete import processes;
- Effects on consumers of a service (in this case users of imported used vehicles), who may face changes in the prices they face, and in the choices of vehicle available on the market;
- Effects on third parties and the wider environment (in this case the nationwide benefit of biosecurity risk averted).

Producer effects are generally the most direct and readily identified. But more indirect consequences for consumers and the wider environment also need to be acknowledged, even if more difficult to quantify with any certainty. To avoid double counting, any cost on producers that is passed onto consumers is recorded only once, and transfer payments (like taxes)

with no effect on overall resource productivity are excluded from the analysis.

## 2.1 Structure of the analysis

The analysis examines costs and benefits of proposed changes over a 20 year time horizon, from 2007 to 2026 inclusive. Costs and benefits of the different measures are projected over this time horizon in constant dollar terms (i.e. excluding inflationary effect) and then discounted back to present value terms to put effects that occur at different time periods on a consistent value basis.

The costs primarily arise from additional resources used in implementing the proposed new procedures, and include administrative costs for regulatory agencies and compliance costs for companies in meeting the new procedures. There is also the possibility of allocative costs if new procedures result in changes in behaviour solely to avoid the new procedures (for instance substitution between vehicle sources determined by differences in the ease of achieving compliance between them). The benefits comprise savings in current procedures that are no longer required, which can be netted off any increase in costs, and reductions in the expected value of biosecurity incursions due to reductions in the risks of such incursions.

More specifically, in the proposals for import health standard requirements for used vehicles, the benefits are:

- Reduced risk of damaging biosecurity incursions, the economic value of which is indicated by the avoided costs of such incursions;
- Public preferences to reduce risks over and above tangible costs avoided (for instance, New Zealanders' aversion to snakes is probably disproportionate to the risks they pose to the community), the economic value of which is indicated by public willingness to pay for avoiding risk;
- Savings from existing processes rendered redundant by new measures.

The costs of these options are:

- The direct costs of meeting regulatory requirements, including costs of inspection, decontamination and treatment measures;
- The costs of additional delays for those going through the system of biosecurity clearance;
- Indirect effects flowing from the change in costs of importing vehicles, including changes in demand and supply behaviour in response to changes in the import regulatory system.

The costs are rather more tangible and predictable than the benefits, particularly those relating to changes in risk of incursions. Because of the uncertainty around the value of these changes in risk, the analysis addresses

benefits through a backward analysis or “reverse inference”, i.e. having estimated the cost of the different options, it infers an annual value of benefit that would need to be obtained for the incremental cost of moving from one option to another to be justified by the additional benefit obtained (i.e. to break even). These values can then be compared with the economic impact of known incursions to assess whether the scale improvement they require is likely to be achievable from the proposed option.

### ***Discount rate***

The discount rate is the mechanism used in cost benefit analysis to convert values of effects in different time periods to a common, present value basis. The rate is intended to reflect the opportunity cost of capital and the observed preference in the community at large for consumption now over consumption in future. The opportunity cost reflects the fact that \$1,000 in 10 years time has a present value of less than \$1,000, because a smaller sum could be invested now at a rate of interest to provide \$1,000 in 10 years. Time preference reflects commonly observed human behaviour, motivated in part by the risk that consumption deferred may never be realised because of unforeseen events.

In New Zealand, public sector cost benefit analyses have since the late 1970s used a discount rate of 10% in real terms. The availability and risks of capital have changed markedly since that time, and in other countries such as the UK the discount rate has accordingly been reduced in recent years. In New Zealand, there is no reason for the discount rate to have stayed the same other than the convenience of having a single rate that makes comparisons across different spending options easier. Guidelines from the Treasury now suggest other rates can be used if a case is made for doing so. As most of the costs in this analysis are borne by entities in the New Zealand public rather than out of government budgets, the discount rate should reflect opportunity costs in the economy at large rather than those created by government’s budgetary constraints. In other biosecurity analyses a rate of 5% has often been used, with 10% rate used as a sensitivity check. These are the rates used in this analysis.

## **2.2 Defining the baseline**

The first step in CBA is to define the baseline scenario – the base case or “default” relative to which proposed changes are compared. The baseline in this case is taken to be continuation of the status quo. The baseline may evolve over time as a projection of the current status quo (including volume of vehicles, mix of on-shore and off-shore clearances) or with adjustments according to likely changes in the volume and origin of used vehicles.

### 2.2.1 Current patterns in used vehicle imports

Recent imports of used vehicles are presented in Table 2. Over 95% of used vehicle imports originate in Japan, and of other source countries, only Singapore and USA contribute 1% or more to imports. This pattern suggests that other than in Japan, New Zealand is likely to be a market attracting too few vehicles for importers from those countries to find it worthwhile to have special facilities for New Zealand biosecurity pre-clearance at export ports. So there is likely to continue to be a need for two-channel biosecurity clearance, with pre-clearance off-shore and clearance on arrival in New Zealand for vehicles from origins without pre-clearance.

**Table 2 Origins of used vehicle imports in 2005**

	Used cars	Used Commercial vehicles	Total used vehicles	
Japan	155,025	12,040	<b>167,065</b>	95.1%
Australia	1,149	85	<b>1,234</b>	0.7%
Thailand	0	0	<b>0</b>	0.0%
Korea	0	0	<b>0</b>	0.0%
Germany	46	0	<b>46</b>	0.0%
South Africa	16	0	<b>16</b>	0.0%
Great Britain	584	76	<b>660</b>	0.4%
Belgium	0	0	<b>0</b>	0.0%
France	0	0	<b>0</b>	0.0%
Spain	0	0	<b>0</b>	0.0%
USA	1,543	127	<b>1,670</b>	1.0%
Singapore	4,550	71	<b>4,621</b>	2.6%
Other	340	17	<b>357</b>	0.2%
	<b>163,253</b>	<b>12,416</b>	<b>175,669</b>	<b>100.0%</b>

Source: MAF Import Risk Assessment Table 1, p20

Table 3 shows the distribution of imports across New Zealand ports.

Around half the vehicles are imported through Auckland, and over 75% through Auckland, Christchurch and Wellington combined. The table also shows the number found to have signs of contamination and requiring some form of de-contamination process. For vehicles imported in car ships across ports the proportion requiring decontamination ranges from a low of 68% of cars in Nelson to a high of 90% of cars in Auckland, with an average of 84%. A lower proportion of vehicles entering in containers, other vehicles, and vehicles inspected and pre-cleared in Japan have recorded contamination.<sup>4</sup>

<sup>4</sup> Note, the "other vehicle" category includes such vehicles as tractors, bulldozers, cranes and boats which are regarded as machinery with characteristics distinct from cars and other light vehicles and are outside the scope of this cost benefit analysis.

**Table 3 Distribution of imports into New Zealand**

12 months from July 2004 to June 2005

Entry point	Inspected on arrival	Requiring decontamination	Proportion decontaminated
Auckland	37,906	34,070	90%
Christchurch	12,648	9,432	75%
Dunedin	569	401	70%
Invercargill	23	17	74%
Lyttelton	212	168	79%
Nelson	1,780	1,209	68%
Napier	1,874	1,412	75%
Tauranga	999	856	86%
Wellington	8,971	6,777	76%
<b>Carships total</b>	<b>64,982</b>	<b>54,342</b>	<b>84%</b>
Cars in containers	8,903	3,778	42%
<b>Total inspected NZ</b>	<b>73,885</b>	<b>58,120</b>	<b>79%</b>
Inspected in Japan	99,343	39,875	40%
<b>Combined total</b>	<b>173,228</b>	<b>97,995</b>	<b>57%</b>
Pre-inspected offshore	57%		
Inspected on arrival	43%		

Source: MAF Carships and Quancargo Database

The videoscope survey, slippage survey and the risk analysis reported in the Import Risk Analysis indicate the current regime of visual inspection of all vehicles and decontamination and treatment of those on which contamination matter is discovered may be missing significant biosecurity hazards. Reducing the risk of incursion caused by this “slippage” is a potential benefit and primary reason for investigating the proposed changes in procedures.

### 2.2.2 Future levels of used vehicle imports

The level of future used vehicle imports, and the mix of imports being pre-cleared off-shore or treated on arrival in New Zealand, are likely to be key determinants of the costs of changes to the current biosecurity clearance regime. These are included in the cost benefit analysis as a baseline of activity.

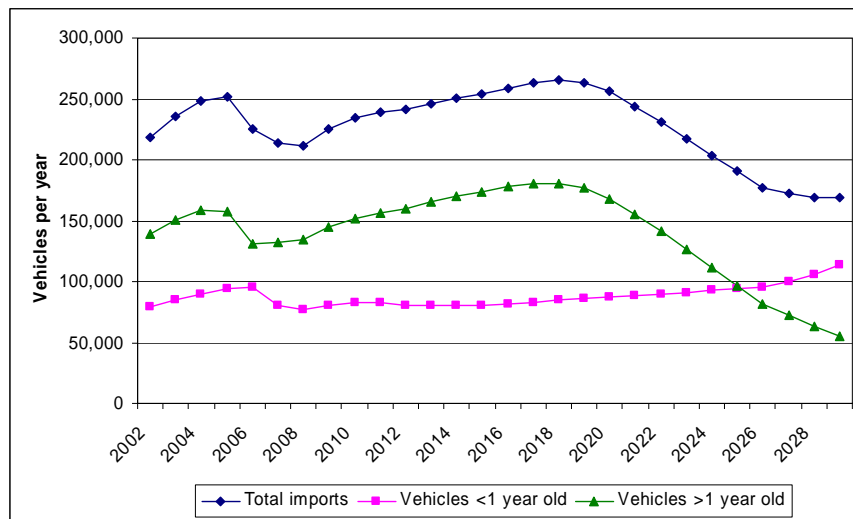
Used vehicle imports have grown since import controls were lifted in the early 1990s, with some year to year fluctuations according to changes in exchange rates and other factors (such as income growth and price of fuels). The rate of vehicle scrappage has not grown as fast over this period, so the stock of vehicles in New Zealand has been growing. Simply projecting vehicle imports according to a continuation of past trends, or in line with expected income growth, results in the unlikely scenario of 3 or 4 vehicles for every household by 2030, compared to approximately 1.8 vehicles per

household in 2006. Over the same period household size is expected to decline, from 2.6 per household in 2006 to 2.4 in 2030, due largely to population ageing. So 3-4 vehicles per household would approximate to 1.25 to 1.7 vehicles per person. This appears unrealistic, given that there are currently 0.7 vehicles per person in New Zealand, and it has the fourth highest rate of vehicles per head of population of all OECD countries.

For this analysis we have drawn on forecasts of vehicle imports from other work carried out at NZIER, which uses a model calibrated to recent observed data to examine possible changes to the vehicle fleet under other policy changes (see Appendix B). Critical inputs into the model include the number of households in the country, the maximum number of vehicles per household, the average vehicle kilometres travelled, income per capita, vehicle prices, fuel prices and technological change as it affects vehicle fuel efficiency.

The results of a business as usual projection are presented in Figure 1. The model uses vehicle registrations differentiated by age of vehicle, so for current purposes it is assumed that vehicles less than 1 year old at registration are New Vehicles and those greater than 1 year old are Used Vehicles.<sup>5</sup>

**Figure 1 Forecast imports of new and used vehicles**



Source: NZIER, using LTNZ Vehicle Registrations data

The figure shows the recent drop in vehicle imports, and a recovery in import activity to around 2020. The drop off at that point reflects a constraint in the model that limits vehicles per household to 2.4. This is an arbitrary constraint, but we believe some constraint is preferable to the

<sup>5</sup> This is an approximation. Some vehicles imported as “New” are in fact greater than 1 year old; whereas some vehicles imported as “Used” may be less than 1 year old.

alternative of unconstrained growth resulting in more than 1 vehicle for every man, woman and child in the country. Other changes in the national policy environment over this period, including the possibility of tightening emissions standards for vehicles and road pricing to ease congestion, are likely to check the growth in vehicles and with it the demand for imports.

As is apparent in the graph, the model suggests used imports bear the brunt of the downturn in overall imports. Demand for new vehicle imports holds up, as these are more likely to contain the technological features necessary to comply with new standards. For the purposes of the cost benefit analysis, the bulk of the downturn in used imports is more than 15 years hence, and its effect on the analysis will be moderated by discounting.

The sensitivity of the analysis results to this downturn can be tested by changing the assumption on level of imports in the latter years of the analysis. In the base analysis, the annual average percent change in imported used vehicles is -2.24%: the total imported is 132,732 in 2007, rising to a peak of 180,490 in 2018 and falling to 81,802 in 2026. In the alternative scenario for sensitivity testing, the annual average percent change is 1.5% per year, and the profile is the same up to 2018, then tails off slightly to 178,450 by 2026 (i.e. ending at more than double the baseline forecast).

## **2.3 Costs and benefits relative to baseline**

Once the baseline is defined, the next step is to identify, quantify and value, to the extent feasible and useful, the costs and benefits of the risk management options relative to the baseline scenario. This is complicated because the likely responses of importers and users of used vehicles need to be taken into account to model realistically the likely outcomes under each of the risk management options. Such responses include potential changes to the numbers, types or source countries of used vehicles or importation practices to mitigate the costs faced.

### **2.3.1 Impacts of biosecurity threats**

Biosecurity is about warding off threats to activities and assets of value to the community. When considering changes to biosecurity arrangements, the economic issue is whether the additional costs of such changes are matched by benefits of an equal or greater value. This raises the question of what is the economic value of threat averted to the community?

A study for the New Zealand Conservation Authority (Hackwell & Bertram 1999) estimated the total costs on the New Zealand economy posed by exotic pest and weed species. These estimates had two components:

- Production losses caused by a small subset of pests already in New Zealand, which detract from the productive value of activities;

- Defensive expenditures incurred by government, regional councils and private entities to contain these costs or prevent their escalation through new pest arrivals.

These components are not the full value of biosecurity to the community. Additional elements are:

- Less tangible effects of existing pests that detract from community well-being (e.g. on health and environmental quality), which were not amenable to quantification but would add to the estimates of costs if they were;
- The expected value of damage averted by potential pests kept at bay by the defensive expenditures.

This last item is not known with any certainty, but it is the ultimate purpose of defensive activity. It can be expected to be some value greater than the current defensive expenditures, as it would not be rational to spend more on defensive activities than the expected benefit obtained from them.

A breakdown of the 1999 study estimates is summarised in Table 4.

**Table 4 Economic impacts of pests and weeds**

<u>Defensive expenditures</u>	\$m	% GDP	2007 \$m
Border control/quarantine	30		
Pest surveillance/response	25		
TB vector control	20		
Pest control on conservation land	36		
Protected species & habitats	32		
Other Biosecurity activities	7		
Policy advice	5		
Research	40		
	<b>195</b>	<b>0.20</b>	
Regional councils	25	0.03	
Intermediate agricultural purchases	180	0.19	
Allowance for other sectors	40	0.04	
<b>Total defensive expenditures</b>	<b>440</b>	<b>0.46</b>	542.29
<b>Production losses</b>			
Argentine stem weevil	165	0.17	
Rabbits	50	0.05	
Possums	40	0.04	
Thistle	20	0.02	
Clover root weevil	20	0.02	
Gorse & blackberry	10	0.01	
Rose grain aphid	9	0.01	
Powdery mildew	7	0.01	
Wasps	1	0.00	
Other insect & animal pests	36	0.04	
Microbiological pests	42	0.04	
<b>Total production losses</b>	<b>400</b>	<b>0.42</b>	492.99
<b>GDP 1996/97</b>	<b>96,000</b>		118,318

Source: Hackwell and Bertram 1999

In the 1999 study, the annual loss of output in New Zealand due to existing pest infestation was estimated to be \$400 million in 1996/97, and annual

defensive expenditure aimed at preventing increase of such infestation was estimated to be \$440 million. The sum of these two estimates was 0.9% of GDP. These estimates make no allowance for additional less tangible impacts on health and environment, or the averting of additional cost from prevention of new pest infestations.<sup>6</sup>

Table 4 updates the dollar estimates to 2007 values using the CPI. However, since this study was made, GDP has grown considerably larger than indicated by a simple inflation adjustment: the nominal value of GDP in the year to March 2007 is expected to be around \$161,940 million rather than the \$118,300 in the updated table. Defensive expenditures will also have increased, as the government's annual Vote allocation to Biosecurity has increased markedly since 2001/02 and is now around double what it was when the study was undertaken.

A full update of this study is beyond the scope of this cost benefit analysis. The table is reproduced here as an indication of the magnitude of total impacts of biosecurity, with the proviso that they would certainly be bigger if adverse effects on community well-being caused by pest impacts on health, environmental quality, biodiversity and cultural and heritage values were also taken into account. They also indicate the relative magnitudes of different identified pest species, indicating that animal and insect pests have greater impact than weed species.

A more recent paper estimated average Biosecurity New Zealand response cost per unwanted new organism to be \$540,000, and the average cost of each unwanted organism that becomes permanently established to be \$300,000 per year (Kriticos et al 2005). There is a wide variation around these averages, with 97% of new organisms having a response cost of \$50,000 on average, but 3% of organisms having an average cost of \$16.5 million. The paper linearly extrapolates a rate of new incursion per year to suggest 514 new pests would become established between 2005 and 2017 with a cumulative cost of \$921 million assuming no improvements in the biosecurity system. These estimates do not appear to have been discounted, and they have been used to postulate potential savings from percentage reductions in incursions in general, rather than to examine the potential incremental reductions possible from specific measures or pathways.

### **2.3.2 Attributing risks to the used vehicle pathway**

Measures enacted at the border on biosecurity clearance for used vehicles represent a form of defensive expenditure. As a border measure, these

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<sup>6</sup> Note however that defensive expenditures and averted damage are not additive: much of the value of averted damage is subsumed within the defensive expenditures made to avert it, although there may be a benefit surplus from cost effective measures that is additional. Defensive expenditures indicate a community's willingness to pay for protection, but not the full value they obtain from that protection.

expenditures affect only the likelihood of new pest incursions, not the damage caused by pests already in New Zealand.

The benefits of a biosecurity border measure are largely defined in terms of the avoided costs of new incursions. The expected value of an incursion is defined as the scale of likely impact times the probability of its occurrence in any one year. The expected value of incursions through the used vehicle channel is inherently difficult to determine, because of the large number of hitch-hiker organisms that could enter via this pathway, their variable impacts, the difficulty of linking any known incursion to a particular pathway and the paucity of data with which to quantify the likelihood of entry of any individual organism via the vehicle pathway.

MAF's *Import Risk Analysis: Vehicles and Machinery* identifies used vehicles as an important potential pathway for new incursions, because of the volume of vehicle imports, the nature of the pathway, and the wide range of pests that may come in. While some other pathways may account for a greater number of border crossings – for instance, containers and at-risk packaging – the way that used vehicles are procured in their origin countries and used once in New Zealand increases the potential for them to pick up organisms and deposit them in New Zealand habitats where they may establish and spread. The risk on the pathway is also positively related to the number of imported vehicles. However, there is insufficient data to assign a probability to that risk, or express how the frequency of incursions would change with different border arrangements.

Apportioning risk of border incursions to the used vehicle pathway requires a comprehensive assessment of the relative risk of incursion on the used vehicle pathway compared to other pathways. This is beyond the scope of this cost benefit analysis.

### **2.3.3 Identifying benefits of different options**

Benefits in an economic cost benefit analysis are an expression of the extent to which the community at large is better off under one option compared to an alternative. Benefits arise from changes in community well-being, whether they are derived from effects on economic activity, health, quality of the natural environment or less tangible effects such as the community's sense of security and cultural integrity.

When considering measures aimed at protecting the natural environment, economic value can be derived from various sources, including:

- The avoidance of losses to productive activities or assets, such as damage to farming systems, infrastructure and so on;
- The avoidance of costs to community health, such as expenditures on medical treatments or days lost for production as a result of sickness associated with environmental change;

- The avoidance of less tangible effects contrary to community preference, such as the “nuisance” created by some environmental changes which may be valued by the community’s willingness to pay to avoid such nuisance (for instance taking measures to suppress noise, pest species and other nuisance effects);
- Public preferences to maintain the status quo, as expressed in willingness to pay to retain biodiversity and sites of heritage and cultural significance.

The Import Risk Analysis identifies a shortlist of 11 groups of hitchhiker organisms on the used vehicle pathway from which example organisms were selected for more detailed assessment. Individual organisms known to be of high impact were selected for assessment, but there may be additional organisms of high impact associated with the pathway which were not assessed. If the benefits of the risk management options outweigh the costs for these organisms alone, any other organisms they eliminate can be regarded as an additional benefit. Noting the scale of potential impact of these organisms provides a reference point against which to compare the size of benefit required in a backwards analysis of the costs incurred. The question then becomes, if the net cost of the new measure is \$X million, is it feasible that it will have eliminated risk of incursion of organisms with an impact of \$Y million?

By way of illustration, Table 5 presents some estimates of the economic impacts of different organisms that have been subject of recent incursions in New Zealand.<sup>7</sup> The information is drawn from a range of different studies, over different periods, and using methodologies which, although broadly similar, are not necessarily entirely consistent across studies. For instance, the studies of the White Spotted Tussock Moth and the Asian Gypsy Moth have not included adverse effects on human health from introduction of these species, because of insufficient data to estimate the population at risk and the likely impact. But the study of Red Imported Fire Ant has included the cost for health impacts to humans and their pets, and other “nuisance” impacts, using values drawn and adapted from overseas studies. All the studies estimate the economic impact of the pest’s unimpeded spread, and they do not include incursion response costs.

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<sup>7</sup> Figures are drawn from Harris Consulting (2003a) & (2003b), MAF Policy (2001), NZIER (1999) and MAF revisions of the Harris Consulting results. See Appendix A References.

**Table 5 Estimates of impacts of selected recent incursions**

	Year	Period Years	Total PV cost <i>PV\$m</i>	Annual PV cost <i>PV\$m</i>	Discount rate	Total PV at Mar 07 <i>PV\$m</i>	Annual PV at Mar 07 <i>PV\$m</i>	
Red imported fire ant	2001	23	665.0	74.86	10%	702.68	86.39	
Painted apple moth	2002	20	157.2	18.46	10%	164.46	20.73	
Asian Gypsy Moth	2004	41	114.4	11.67	10%	117.41	12.62	
Fall web worm	2003	20	33.5	3.93	10%	34.71	4.35	
Pine Pitch Canker	2004	35	31.7	3.29	10%	34.69	4.01	
White spotted tussock moth	1997	30	18.6	1.97	10%	20.41	2.42	
						<b>Total</b>	<b>1074.36</b>	<b>130.53</b>
						<b>Average</b>	<b>179.06</b>	<b>21.75</b>

Source: NZIER, compiled from other reports (see Appendix A References)

The table shows the total present value cost of impact over the respective study periods of the different pests, and that same value annualised as a constant value of impact over the study period at the studies' discount rate of 10%. The right hand columns present total and annualised present values updated to March 2007 values by adjustment with the consumer price index.

The table shows the estimated impacts of some of these species entering and becoming established in New Zealand could be very high. There is a wide uncertainty around these estimates, which are drawn from the middle of the range of estimates for the respective species. For example, Table 6 shows the very wide range of impact estimates for Asian Gypsy Moth and Fall Web Worm, reflecting the uncertainty about their effect in New Zealand's environmental conditions.

**Table 6 Range of impact estimates for two moth species**

	Asian Gypsy Moth	Fall Web Worm
<i>PV\$m over 50 years</i>		
High	398.2	222.9
Medium	46.2	33.5
Low	4.9	7.9

Source: MAF revisions of estimates in Harris Consulting 2003a, 2003b

The results may also be subject to substantial revision with the provision of new information: for instance, the impact of the tussock moth in the table is about half that of its initial estimate after laboratory trials revealed that the moth posed a much smaller threat to commercial pine forests than was originally thought. Conversely, some species may have a greater impact on

New Zealand ecology than initially expected. The difficulty of quantifying and valuing likely impacts on human health and amenity, and varying use of overseas estimates of impact value, add to the variability amongst the estimates.

The estimates in table 5 cover just 6 species from 3 of the 11 hazard groups identified from the Import Risk Analysis for used vehicles, with a combined potential impact of \$1 billion. Even excluding red imported fire ant as a rather large estimate (possibly inflated by overseas-derived values adapted to New Zealand conditions) and a pest not found in Japan, the potential impacts of these species would exceed \$300 million if they were all to become established.

The expected value of incursions of these species is unknown, because there is insufficient information to quantify the likelihood of the organism arriving and establishing in New Zealand. However, if there was a 1% chance of these organisms establishing each year, there would be an expected value of damage of \$10.7 million on the basis of the estimates in this table.

A wider range of potential species for incursion would increase the expected value of incursions. So too would taking account of less tangible effects on health, biodiversity, cultural and heritage sites etc. Health impacts can be substantial, taking account of not only medication costs but also the time lost to productive activity by sickness.<sup>8</sup>

As indicated above, there are many qualifications around these estimates, and they can only be used as a broad indication of potential benefits of improved risk management. Moreover, because it is not known by which pathway these known incursions came into New Zealand, it is not appropriate to attribute the full cost of each organism prevented to measures taken to manage risks on the used vehicle pathway.

No amount of scrutiny of existing impact studies will overcome the inability to assign probabilities to the incursions of these species, or to attribute risk of such incursion to the used vehicle pathway. The examples in Table 5 are a partial subset of species that may come in via the used vehicle pathway which understate total impact of these species to the extent they exclude intangible impacts of value to the community and potential incursions of other species. But there is no basis for applying a “multiplier” to scale up the total impact when the full set is unknown, nor is it feasible to isolate the incremental change in probability attributable to changes in the used car regime.

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<sup>8</sup> The cost of Ross River Virus if introduced to New Zealand through the vector species like southern saltmarsh mosquito (not a risk on the vehicle pathway) has been estimated at \$137 million in other work at NZIER.

Hence it is not possible in this case to provide an expected value of avoided risk to use in the numerical analysis. Instead, we use “reverse inference” of the value of benefit required to justify the cost, with some discussion around whether that value appears feasible in light of the value of incursions known to have occurred. The implications of this for comparing the options for used vehicle import health standards are discussed further in the interpretation of section 3.6.

#### **2.3.4 Identifying the costs**

For cost benefit analysis it is useful to distinguish between:

- Administrative costs for agencies implementing the procedures;
- Compliance costs for importers and others in going through the procedures;
- Allocative costs arising from changes in behaviour by importers and those both upstream (their suppliers) and downstream (their customers) brought about by a change in the procedures – for instance, if changes in delays cause end users to switch to other sources of vehicles which would not be their first choice in the absence of the delays.

Administrative and compliance costs are usually directly associated with the proposed changes, and in that sense easy to identify. Allocative costs are more indirect, as they result from “secondary market effects” for the affected products. For instance, measures that appreciably increase the cost of newly imported vehicles relative to existing vehicles can raise the value of existing vehicles. Both the price of existing vehicles and new vehicles change, which in turn can change behaviour over replacement purchases, whether to scrap or retain existing vehicles, as well as affecting the affordability of vehicles for those wanting to acquire their first vehicle or to change their vehicle in accord with lifestyle demands (e.g. family growth).

Detailed description of the values and assumptions on costs used in the model are provided in Appendix C and in discussion of the results from the modelling.

#### ***Cost of delay***

One of the recurring points raised in canvassing those involved in used car importing was how the change in procedures implied in different options would affect the delay in the importation process. Delay is a cost on any inspection process that slows down the clearance of vehicles and release to the showroom, as it ties up working capital in stock that is temporarily unavailable for sale, and may involve extra labour and other costs in attending to vehicles. However, reducing delay is not a “free good” if it results in increased risk of unwanted organisms entering the country. A comparison of costs and benefits of different options would ideally reflect how delay costs vary across the different options.

In the case of used vehicle imports, there is insufficient reliable information on how vehicles move through the importation process to model changes in delays with accuracy. Some of the more obvious sources of delay can be modelled by assumption, but these will be incomplete and likely to understate the logistical costs imposed by different options. The broad approach to delay costs is outlined below.

In the base case (current processes) general inspection delay (compared to an alternative of no inspection whatsoever) is taken as given, fixed and unavoidable and not explicitly valued. However, there is a delay cost that varies with the number of vehicles requiring further intervention, and as this can be expected to change under different options, this can be estimated through two elements:

- The opportunity cost of capital tied up in vehicles, represented by a daily finance charge for a vehicle of average value;
- Demurrage charges, which represent the opportunity cost for port operations of space occupied on the wharf.

In the model, delay costs only apply to vehicles incurring fumigation, as this process requires 24 hour cycle of gassing and ventilation. Demurrage charges only apply to vehicles not cleared from the wharf within 5 days, so only a proportion of vehicles incurring delay cost also incur demurrage. This is only a partial estimate of delay cost, due to limitations of time, resources and data available to this project.

Partial delay costs are estimated for Option 1 (improvements to current regime) and Option 2 (alternative to current regime), as explained in Appendix C. For Option 3, delays are not considered as significant and they are excluded from the model.

### 3. Comparison of options

The following section describes the preliminary results of the comparative analysis of the different options. Input values have been derived from various sources: MAF sources such as the Import Risk Analysis (2007) and the Biosecurity Cost Regulations (2006), and canvassing of those involved in the used vehicle importing processes, including importers, shipping companies, port companies and officials from the Quarantine Service and Land Transport New Zealand compliance services. All values used are exclusive of indirect taxes like GST.

A spreadsheet model has been constructed to carry out the analysis. Because of the large number of parameters in the model representing different cost components of the different options, central estimates of inputs are used to represent the most likely estimates, and sensitivity analysis is applied to some of the larger individual components to examine how changes in assumptions affect the results. As most costs are input on a dollar per vehicle basis, vehicle numbers are the main driver of total costs, overwhelming fixed cost components like facility standards upgrades.

The cost parameters in each of the options modelled are described more fully in Appendix C. The benefits of each option are modelled as the annual value in constant dollar terms which is required to achieve a net benefit of zero over 20 years (i.e. to break even in present value terms). This annual value is not constant, but adjusts in proportion to the number of vehicles being imported. In other words, as vehicle imports increase, risk rises and so too does the value of benefit required to justify the cost of each option. This is modelled as a simple proportional increase (decrease) in required benefit as vehicle imports rise or fall from year to year.

In this analysis two streams are modelled, vehicles pre-cleared in Japan and those not pre-cleared but inspected on arrival in New Zealand. The model does not examine separately vehicles pre-cleaned in countries other than Japan, as the numbers are very small, but there is provision to separate these out in future if required.

#### 3.1 Baseline and counter-factual

The counter-factual in a cost benefit analysis is a scenario describing what is expected to happen in the absence of any changes, against which the effects of other proposed options can be compared. In this case it is essentially a projection of the status quo arrangements applied to the forecast of used vehicle imports as described in section 2.

In the baseline, the projected vehicle import numbers are divided between those inspected on arrival in New Zealand, and those that are pre-cleared in Japan and elsewhere, according to the current proportional split.

Representative costs for the processes they undergo are then applied to the vehicles in these separate streams.

All vehicles incur a first inspection cost, which is the GST-exclusive inspection fee charged by MAF. This is equivalent to ¼ hour of MAF officials' time at standard charge out rates. The Import Risk Analysis notes that vehicles can be inspected by 3 people in 3 minutes (i.e. 9 person minutes), so the fee more than covers this inspection time. In practice, inspection times vary widely according to the peculiarities of each vehicle so the inspection fee appears unlikely to understate the average cost. Biosecurity clearance also involves organising inspection and administration such as data entry, invoicing and clearance documents.

The proportions of vehicles requiring intervention in the form of vacuuming, steam cleaning or pressure washing is drawn from MAF Quancargo and CarShips records. A smaller proportion require further intervention in the form of fumigation or heat treatment: heat treatment is not yet available in Japan and in New Zealand it is currently an experimental process accounting for few vehicles, although this situation could change in both countries over the 20 year time frame of analysis. The costs per vehicle for vacuuming, steam cleaning, fumigation and heat treatment are from industry sources canvassed for this analysis.

The cost quoted for bromide fumigation in Japan is currently \$600, around 3 times that in New Zealand. The model now assumes that all fumigation is under taken on arrival in New Zealand at the New Zealand cost, even those vehicles identified as needing fumigation during pre-inspection in Japan.

All vehicles undergoing intervention face a re-inspection cost, and a percentage of these face a secondary intervention (repeating the process). The cost of this repeat process in the model is the expected value of all the treatments – i.e. the cost of vacuuming, steam cleaning and fumigation/heat treatment times their respective probabilities of being required.

Vehicles undergoing secondary intervention of fumigation are assumed to incur an extra day's cost at the port, and a proportion of them face additional port costs. The delay cost per vehicle per day is based on the daily interest charge on a vehicle of \$7,000 c.i.f. value, at annual interest rate of 7.5%.<sup>9</sup> Port costs per vehicle per day are based on the demurrage charges from ports around the country canvassed for this study, to represent the opportunity cost of wharf space tied up by vehicles that require secondary intervention.

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<sup>9</sup> Interest payments are generally excluded from national cost benefit analysis on grounds that they are simply financial transfer payments between different entities within the economy with no effect on real resource productivity. They are used here as an indication of the opportunity cost of working capital tied up in vehicles delayed on the wharf.

The assumptions in the baseline are outlined in the table below.

**Table 7 Baseline parameter inputs**

	In NZ	Japan
Share of vehicles	44%	56%
Precleaning		133
Inspection cost/vehicle	22	35
Intervention (all sorts) rate	79%	40%
Intervention rate (vacuuming)	74%	37%
Cost/vehicle - vacuum	58	58
Intervention rate (steam cleaning)	62%	31%
Cost/vehicle - steam clean	116	116
Further intervention (% for treatment)	5%	3%
%fumigated	95%	100%
Treatment: Bromide fumigation	191	191
Treatment: Heat	196	
Cost/vehicle - reinspection	22	35
Secondary intervention rate	3%	3%
Delay cost per vehicle per day	21	21
Demurrage/port costs per vehicle day	50	50
Percentage attracting port costs	20%	0%
Discount rate	5.0%	5.0%

Source: NZIER

On the basis of these assumptions, the current system incurs a cost of \$421 million in present value terms over the 20 year forecast period, equivalent to a cost of \$212 per vehicle imported over that period. This unit cost figure per vehicle is similar to the \$200 cited in PWC (2005) and in industry responses during canvassing. On the assumption that the current system is “worthwhile”, it must be delivering benefits at least as large as the costs incurred, i.e. \$421 million in present value terms. This would be equivalent to an annual benefit of \$28.2 million in constant dollar terms.

**Table 8 Base case (counter-factual) – Initial results**

Required annual benefit (constant \$)	28,213,927
Required total benefit (PV\$)	421,471,750
Costs (PV\$)	421,471,750
Break even net benefit (PV\$)	0
Average cost per vehicle (PV\$)	\$212.56

Source: NZIER

Table 9 breaks down the cost components in the base case. Most of the costs are attributable to off-shore operations, both because there are more vehicles pre-inspected and treated offshore and because some of the cost components appear higher than their counterparts on arrival in New Zealand. From the canvassing of those in the industry, however, higher costs incurred offshore

are often regarded to be more than offset by more rapid clearance from the wharf on arrival in New Zealand.

**Table 9 Break down of cost components in the base case**

<u>Onshore</u>	
5%	Inspection - onshore
9%	Decontamination - vacuum
15%	Decontamination - steam clean
2%	Treatment - fumigation
0%	Treatment - heat treatment
4%	Reinspection
1%	Post reinspection intervention
0%	Delay cost
<u>35%</u>	<u>Total costs</u>
<u>Offshore</u>	
9%	Inspection - offshore
35%	Pre-cleaning
6%	Decontamination - vacuum
10%	Decontamination - steam clean
1%	Treatment - fumigation or heat
4%	Reinspection
0%	Post reinspection intervention
0%	Delay cost
<u>65%</u>	<u>Total costs</u>

Source: NZIER

### 3.2 Option 1 – Improved current procedures

Option 1 supplements the current procedures through a variety of measures, improving the standards at transitional facilities, upgrading safety compliance centres to the standards of transitional facilities, requiring the air filters in all vehicles to be cleaned or replaced, and supplementing inspections with a videoscope inspection. The parameters are outlined in the table below.

The transitional facility set up costs per site are drawn from canvassing responses and are one-off installation costs in the spreadsheet, representing the additional cost of upgrading to meet the new standards. After the first year there is a maintenance cost for the upgraded facilities set at 20% of the installation cost. The figures quoted are quite low on the expectation that only minor improvements are required on most sites, such as finer wastewater screening and provision for disposal of biosecurity-risk material. Some sites could face considerably higher costs if required, for instance, to remove all puddling on vehicle-standing surfaces. An alternative assumption of \$50,000 average cost per site is described under sensitivity testing.

**Table 10 Option 1 inputs**

	In NZ	Japan
Number of transitional facilities	149	11
Transitional facility set up cost/site	8,889	8,889
Transitional facility maintenance cost/site	1,778	1,778
Compliance centre audit costs	200	
Compliance centres to TF costs	8,889	
Compliance centre number	79	
Additional treatments & delays	4%	1%
Videoscope inspection	46	71
% of air filters to be replaced	50%	50%
Air filter replacement \$/vehicle	18	18
Air filter cleaning \$/vehicle	7	7

Source: NZIER

The videoscope inspection costs are estimates derived from information about the videoscopes used in surveying the effectiveness of the current visual inspection procedures. The current videoscope is primarily a research tool and has limitations for practical applications, being expensive to acquire, susceptible to damage and costly to maintain. This analysis assumes at least 2 videoscope devices at each port in New Zealand and Japan, with more at larger ports of Auckland, Christchurch and Wellington, giving a total of 25 devices across New Zealand and 18 in Japan. Each unit has a capital cost of \$36,000, which has been annualised at a rate of 5% over 10 years to estimate the cost of videoscope inspection. Inspection time per vehicle with a videoscope at 45 minutes is three times the standard inspection (\$25 for ¼ hour), so the *additional* time cost for videoscope inspection is assumed to be equivalent to two standard inspections. Combining this with the annualised cost per vehicle gives the current estimates for on-shore and off-shore inspections. This is likely to be an underestimate as no allowance has been made for videoscope repairs and staff training in use of the videoscope and interpretation of its findings.

Industry contacts canvassed for this study were divided as to whether air filter cleaning or replacement was most likely. One school of thought is that filters are so cheap that it is easier to install new filters and dispose of the used ones. Another view, however, is that the variety of filters used in different vehicles is so wide that it would be impractical to hold stock to replace them all, and that it would be less costly to clean them and refit them in their specific vehicles. The costs quoted by respondents were under \$20 for new filters, and between \$5 and \$10 for cleaning and refitting. The modelling is based on these values (adjusted to remove GST) and an assumption about what proportion of vehicles have new filters fitted. These

costs also exclude labour time, as industry contacts suggested these would be marginal once incorporated into other tasks in readying cars for export.

Delay costs are estimated for this option for those vehicles detained for fumigation.<sup>10</sup> There is insufficient information to estimate delays caused by longer inspection processes and the constraint imposed by the limited number of videoscope units themselves, although these may be considerable. Delays on the wharf are likely to be driven by the peaking of vehicle flows, which under present arrangements can be alleviated by deploying more staff to expedite inspections on the wharf. Capital facilities like videoscope units and heat treating facilities are lumpy investment items which are uneconomic to provide sufficient to meet peak conditions, so some queuing and hold ups with these facilities are likely to occur.

On the basis of these assumptions, these improvements would incur a cost of \$161 million over 20 years in present value terms, equivalent to around \$81 per vehicle. To achieve a net benefit, the improvement in detection and prevention of biosecurity risks slipping into the country would need to match the costs over 20 years in present value terms, equivalent to an implicit annual benefit of \$10.8 million in constant dollar terms.

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**Table 11 Option 1 Initial results**

Required annual benefit (constant \$)	10,813,760
Required total benefit (PV\$)	161,540,589
Costs (PV\$)	161,540,589
Break even net benefit (PV\$)	0
Average cost per vehicle (PV\$)	\$81.47

Source: NZIER

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Table 12 presents a cost breakdown of Option 1. As in the base case, most of the costs occur to the off-shore pre-inspection stream, as this accounts for most of the vehicles. The table also shows that the cost of acquisition and operation of videoscopes is a substantial part of the total, exceeding 70% of the estimated cost across both on-shore and off-shore streams. It also increases the estimated cost of delays and subsequent treatments as a result of higher detection rate of contamination and at risk organisms. The Import Risk Analysis presents some information of slippage rates and the higher detection with the videoscope of materials that evaded visual inspection, as a result of the videoscope survey. Whether videoscope inspections in

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<sup>10</sup> Delay has been calculated for fumigation only because fumigation requires at least 24 hours for gassing and ventilation in New Zealand, or even longer in Japan where vehicles must be ventilated until residual traces reach pre-set levels. This means fumigation delays vehicles by at least a day and can be represented in the calculation of delay cost used here. Heat treatment may take longer than current inspections, but the delay per vehicle is measured in hours rather than days and depends on congestion on the wharf which varies with shipment size, timing and so on. There is no data on which to model a representative delay per vehicle from heat treatment.

practice would achieve as high efficacy as to justify the additional cost is a technical matter.

**Table 12 Cost breakdown of Option 1**

<b>Onshore</b>	
3%	Transitional facilities improvement costs
1%	Compliance centres to TF
0%	Compliance centre auditing
25%	Improvement - videoscope
5%	Air filters replaced
2%	Air filters cleaned
5%	Additional treatment and delay cost
<b>41%</b>	<b>Total costs</b>
<b>Offshore</b>	
0%	Transitional facilities improvement costs
49%	Improvement - videoscope
6%	Air filters replaced
2%	Air filters cleaned
1%	Additional treatment and delay cost
<b>59%</b>	<b>Total costs</b>

Source: NZIER

Table 13 presents results with videoscope removed, indicating that the required annual benefit to break even would be little over \$2 million. The average cost per car of this reduced Option 1 would be \$16. As the videoscope inspection also adds to the time required for processing vehicles on the wharf, the full cost difference between the with and without videoscope options would be even greater than indicated in the table.

**Table 13 Option 1 – excluding videoscope**

Required annual benefit (constant \$)	2,122,449
Required total benefit (PV\$)	31,706,060
Costs (PV\$)	31,706,060
Break even net benefit (PV\$)	0
Average cost per vehicle (PV\$)	\$15.99

Source: NZIER

### 3.3 Option 2 – Replacement of current procedures

Option 2 proposes decontamination and treatment of all vehicles in place of the current regime of inspection plus decontamination and/or treatment of vehicles with hazards detected. In the model, all vehicles are vacuumed, steam cleaned and either fumigated with methyl bromide or heat treated, and subject to an audit and repeat treatment and re-inspection if the audit fails. In the case of repeat treatment, vehicles also incur delay cost.

There are substantial uncertainties around this option. Heat treatment is not currently available in Japan (although it could be soon) and only in experimental form in New Zealand. There are at least two potential suppliers of heat treatment processes in New Zealand, and both suggest costs per vehicle would be around half those currently incurred in the experimental applications if heat treatment was more widely used. This would give heat treatment a cost advantage over fumigation, compared to similar costs for the two methods at present. Heat treatment also appears likely to reduce the delays for individual vehicles moving off the wharf, compared to fumigation.

There is also uncertainty about how such 100% treatment processes would be logistically incorporated in the distribution chain, and how they would affect the delays in moving vehicles off the wharf. Proposals for heat treatment units have capacity to handle 3 to 9 vehicles on a half hour heating cycle, suggesting a maximum of 18 vehicles an hour moving through a single 9-car unit. According to one potential supplier, allowing for vehicle cooling and handling time, the cycle may extend to 40 minutes in practice, resulting in 27 vehicles being treated every two hours. This appears to place a constraint on the processing of vehicles, which can be physically unloaded off ships at around 70 an hour, and go through current inspection procedures at up to 20 an hour per team of three inspectors.<sup>11</sup>

Given these uncertainties, the model focuses on the most clearly identifiable changes under this option, recognising that this probably underestimates the costs incurred by all affected parties – importers, inspectors, shippers and port companies. These changes are chiefly the replacement of inspection and selective treatment with 100% treatment. There are additional changes under this option to the transitional facilities standards. The delay costs include a higher proportion of vehicles attracting port costs, but they are almost certainly under-stated in the model, as it has been difficult from the canvassing to converge on a central estimate of how the supply chain would be slowed down. There was a prevailing view, however, from representatives of importers, shipping companies and port companies that this option would increase delays relative to the status quo, with the suggestion that at least some parts of the trade would be abandoned.

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<sup>11</sup> Japanese operators have provided similar estimates for heat treatment for units with through put estimated at 8 units/hr 192 units/day, 50,000 units per year. The cost would be 11,000 yen (\$125) for the 1<sup>st</sup> 3 years then 9,000 yen (\$100) for 120,000/year plus cars., compared to between \$80 and \$100 per car depending on volume throughput estimated by firms in New Zealand.

**Table 14 Option 2 inputs**

	In NZ	Japan
Cost/vehicle - vacuum	58	58
Cost/vehicle - steam clean	116	116
%fumigated	5%	5%
Treatment: Bromide fumigation	191	191
Treatment: Heat	89	100
Audit cost/vehicle	20	20
Audit sample rate	25%	25%
Delay cost per vehicle per day	21	21
Demurrage/port costs per vehicle day	50	50
Percentage attracting port costs	20%	0%
Prob of audit fails	5%	5%
Reinspection \$/veh	22	35
Improvement costs	8,889	8,889
Transitional facility maintenance \$/site/yr	1,778	1,778

Source: NZIER

On the basis of these assumptions, this regime would incur a cost of around \$610 million over 20 years in present value terms, equivalent to \$307 per vehicle. This would require an annual biosecurity benefit of \$41 million to break even.

**Table 15 Gross costs and benefits of Option 2**

Required annual benefit (constant \$)	40,856,517
Required total benefit (PV\$)	610,332,187
Costs (PV\$)	610,332,187
Break even net benefit (PV\$)	0
Average cost per vehicle (PV\$)	\$307.81

Source: NZIER

But because Option 2 replaces the current inspection regime, the costs of the base case can be deducted to arrive at net costs, which are around \$188 million over 20 years. To achieve a net benefit, the improvement in detection and prevention of biosecurity risks slipping into the country would need to match the costs over 20 years in present value terms, equivalent to a required annual benefit of \$12.6 million in constant dollar terms. The net increase in average cost per vehicle is \$95.

**Table 16 Option 2 Initial results – net of savings in base case procedures**

Required annual benefit (constant \$)	12,642,590
Required total benefit (PV\$)	188,860,437
Costs (PV\$)	188,860,437
Break even net benefit (PV\$)	0
Average cost per vehicle (PV\$)	\$95.25

Source: NZIER

Note that the results in Table 16 are all net figures and hence are additional to the costs currently being incurred. As incremental costs they are useful for comparing with the results for Option 1, which are also incremental on what is currently being incurred on biosecurity on this pathway. But the aggregate cost to the nation of the processes covered by Option 2 is the gross cost before deduction of Base Case savings.

The breakdown of costs for Option 2 is presented in Table 17. The decontamination and treatment processes are the most costly components, driven by the number of vehicles entering the country. Fumigation is a small component, as it is assumed it only remains in use in ports with low volumes that lack heat treating facilities, and accounts for 5% of vehicles treated in New Zealand. The reversal of proportional split between fumigation and heat treatment compared to the base case reduces the additional cost impact of this option. If 95% of vehicles were fumigated as in the base case, the gross cost of this option would be almost doubled, with a required annual benefit of \$82 million and equivalent to average cost of \$622 per vehicle. This implies that the achievement of lower cost heat treatment with higher volume throughput is critical to the costs of this option.

On-shore processing in New Zealand accounts for a higher share of cost than in the baseline, because there are more transitional facilities receiving improvement in New Zealand than in Japan. Netting off the savings from procedures in the baseline no longer required produces bigger savings for the offshore cost streams than those onshore, because of higher inspection costs in Japan in the baseline.

**Table 17 Breakdown of gross costs for Option 2**

<b>Onshore</b>	
8%	Decontamination-vacuuming
17%	Decontamination-pressure wash
1%	Treatment-fumigation
12%	Treatment-heat
3%	Audit
0%	Inspection if audit fails
3%	Secondary intervention
0%	Wharf clearance delay
1%	Facility improvement/year
0%	Savings from Baseline
<u>45%</u>	<u>Total costs</u>
<b>Offshore</b>	
11%	Decontamination-vacuuming
21%	Decontamination-pressure wash
2%	Treatment-fumigation
17%	Treatment-heat
1%	Audit
0%	Inspection if audit fails
3%	Secondary intervention
0%	Wharf clearance delay
0%	Facility improvement/year
0%	Savings from Baseline
<u>55%</u>	<u>Total costs</u>

Source: NZIER

### 3.4 Option 3 – Air filters and replacement procedures

Option 3 is an additional option to Option 2, requiring replacement or cleaning of air filters in cars. Aside from fluctuations in currency exchange rates, the costs of these options are the same in New Zealand and Japan. As industry respondents appeared divided as to whether they would replace or clean filters, it is assumed that 50% of vehicles receive each treatment.

**Table 18 Option 3 inputs**

	In NZ	Japan
Air filter replacement	18	18
Air filter cleaning	7	7
% of air filters to be replaced	50%	50%

Source: NZIER

On the basis of these assumptions, this option incurs a present value cost of \$24 million over the 20 year analysis period. The value of annual benefit required from this measure to break even would be \$1.8 million.

**Table 19 Option 3 initial results**

Required annual benefit (constant \$)	1,852,447
Required total benefit (PV\$)	24,239,858
Costs (PV\$)	24,239,858
Break even net benefit (PV\$)	0
Average cost per vehicle (PV\$)	\$12.23

Source: NZIER

The estimate in Option 3 is the same as the filter component in Option 1. So comparing the separate results, air filters would add approximately \$12 to the average cost per vehicle, improvements at facilities and compliance centres as estimated here would add \$3.73 to the cost per vehicle, and the videoscope inspections would add \$67.84 per vehicle.

### 3.5 Sensitivity analysis

Given the large number of parameters in the model, sensitivity analysis is selective and focused on items where uncertainty is greatest or where impact on results is likely to be greatest. To illustrate the sensitivity of the results of the analysis to input assumptions, Table 20 compares results from three analyses with different settings. The central column in the table reproduces results described in the previous section (3.4). The right hand column presents the results with the same assumptions but a 10% discount rate. The left hand column presents the results with the alternative vehicle forecast with relaxation of the 2 cars per household constraint, discounted at 5%.

**Table 20 Effect of changing settings on analysis**

	<u>High level</u>	<u>Baseline forecasts</u>	
Analysis period (years)	20	20	20
Discount rate	5%	5%	10%
Average annual percent change	1.5%	-2.4%	-2.4%
Number of imported used vehicles	3,353,500	3,119,774	3,119,774
Inspected/treated onshore	1,475,540	1,372,700	1,372,700
Pre-cleared/treated offshore	1,877,960	1,747,073	1,747,073
<b><u>Base case (current regime)</u></b>			
Required annual benefit (constant \$)	34,744,590	28,213,927	28,213,927
Total costs (PV\$)	454,644,114	421,471,750	302,833,959
Average cost per vehicle (PV\$)	\$212.13	\$212.56	\$212.56
<b><u>Option 1 (Improved facilities)</u></b>			
Required annual benefit (constant \$)	10,697,512	10,813,760	10,856,809
Total costs (PV\$)	172,733,330	161,540,589	116,531,468
Average cost per vehicle (PV\$)	\$80.59	\$81.47	\$81.79
<b><u>Option 1 (Improved facilities, no videoscope)</u></b>			
Required annual benefit (constant \$)	2,006,201	2,122,449	2,165,498
Total costs (PV\$)	32,394,238	31,706,060	23,243,355
Average cost per vehicle (PV\$)	\$15.11	\$15.99	\$16.31
<b><u>Option 2 net of baseline savings</u></b>			
Required annual benefit (constant \$)	17,089,782	12,642,590	12,648,472
Total costs (PV\$)	223,625,284	188,860,437	135,762,272
Average cost per vehicle (PV\$)	\$104.34	\$95.25	\$95.29
<b><u>Option 3 (air filters)</u></b>			
Required annual benefit (constant \$)	2,002,323	1,852,447	1,859,782
Total costs (PV\$)	26,201,040	24,239,858	17,416,712
Average cost per vehicle (PV\$)	\$12.23	\$12.23	\$12.23

Source: NZIER

Under the baseline forecasts, the average annual percent change in car imports is -2.4% over the analysis period, with imports growing to 2018 but declining thereafter as the 2 cars per household constraint bites. Changing the discount rate from 5% to 10% reduces the present value costs of each option by around 28%. This is the same for the Base Case, Option 2 and Option 3 (28.1%) because the predominant driver of costs is vehicle numbers. It is slightly lower for Option 1 (28.0%) because this option has a higher proportion of one-off costs of facility improvements, but the difference is insignificant.

Changing the discount rate to 10% also changes the annual benefit required to break even. For the Option 2 and Option 3, the required benefit is appreciably larger when discounting at 10% than when discounting at 5%. For Option 1 with videoscope inspections, the required benefit at 10% discount rate is higher than at 5%, for reasons similar to those affecting cost, but lower when videoscopes are excluded. The required annual benefit in the baseline is the same at 5 or 10% discount rates. This is because the way the annual benefit is calculated to adjust year by year in proportion to the number of vehicles coming into the country each year, to reflect how biosecurity incursion risk moves in proportion to vehicle imports. If the

benefit were calculated to be independent of the vehicle numbers (which are also driving the cost estimates in the baseline), changing discount rate would also change the required annual benefit. Again, the differences in result would not change the relative ordering of the options by costs or required benefits.

With the high level vehicle forecasts, the number of vehicles imported over the 20 year analysis period increases by 7% compared to the baseline forecast, and the total costs and required annual benefits all increase by 8% in all options. The costs and benefits increase by more than the vehicle numbers because the difference in vehicle numbers comes at the end of the analysis period, when additional costs incurred by increased vehicles are more heavily discounted. There is nevertheless a close correlation between vehicle numbers and the cost estimates.

One of the uncertainties in the current analysis is the representative cost of facility improvements for transitional facilities and compliance centres. Table 21 shows the impact of raising the average cost of site improvements from \$8,889 to \$50,000 in Option 1, a 560% increase in input value that results in 13.9% increase in cost estimates. Site improvement costs also feature in Option 2, although they are a smaller part of total cost calculation. Changing this input value would raise the required annual benefit under Option 2 by 12%, from \$12.6 million to \$14.1 million.

**Table 21 Option 1 – Higher cost site improvements**

Percentage increase over initial assumption of improvement costs

Required annual benefit (constant \$)	12,318,378	13.9%
Required total benefit (PV\$)	184,017,217	13.9%
Costs (PV\$)	184,017,217	13.9%
Break even net benefit (PV\$)	0	
Average cost per vehicle (PV\$)	\$92.81	13.9%

Source: NZIER

Setting the delay cost component of the model to zero reduces the cost and required annual benefit by 0.5% in the base case, by 0.8% in Option 1 and by 0.3% in Option 2. Delays at the border do not play a significant part in the estimated costs of the options in this analysis, because only part of the delay cost has been estimated from the available data.

### 3.6 Interpretation

The cost estimates in a quantified cost benefit analysis are often much more “concrete” and certain than the benefit estimates. One of the outcomes of this analysis is to indicate the relative scale of resource inputs used in the different options.

Table 22 shows the changes in required annual benefit and 20 year present value of each option compared with the counter-factual, or continuation of the current regime. The percentage changes are effectively the same regardless of the discount rate or vehicle forecasts used.

**Table 22 Change over counter-factual (Base case)**

Baseline car forecasts, discount rate 5%

**Base Case (Current arrangements)**

Required annual benefit (constant \$)	28,213,927	
Total costs over 20 years(PV\$)	421,471,750	

Additional costs and required benefits

**Option 1 (Improved facilities)**

Required annual benefit (constant \$)	10,813,760	38%
Total costs over 20 years(PV\$)	161,540,589	38%

**Option 1 (Improved facilities without videoscope)**

Required annual benefit (constant \$)	2,122,449	8%
Total costs over 20 years(PV\$)	31,706,060	8%

**Option 2 (Alternative procedures)**

Required annual benefit (constant \$)	12,642,590	45%
Total costs over 20 years(PV\$)	188,860,437	45%

**Option 3 (Air filters)**

Required annual benefit (constant \$)	1,852,447	7%
Total costs over 20 years(PV\$)	24,239,858	6%

Source: NZIER

Option 1, which is additional to the current regime, would add over a third to the cost of the current import regime, or just 8% without inclusion of the videoscope inspections.

Option 2 net of the baseline savings (i.e. total costs less the savings in current procedures no longer required) increases the costs of the import regime and the annual benefit required to break even by 45%, compared to the current regime that it replaces. This is a smaller increase than in the preliminary draft, principally because of the changed assumption increasing the use of lower cost heat treatment in place of fumigation.

Option 3 amounts to 6% increased cost relative to the current regime. Option 3 is additional to Option 2, so the combined cost of options 2 and 3 would be 52% increase over the cost of the current regime. However, as modelled Option 3 could also be a stand-alone add-on to the current regime in place of Option 1. In other words, in Option 1 (without videoscope), the cost of filters on all vehicles adds 6% to the present value cost of the current regime over 20 years, and the improvements of facilities adds a further 2%.

The critical question these estimates raise is whether the additional costs are worth the benefit obtained? This would be the case if they reduced the

expected value of incursion impacts by a greater amount than the costs incurred. This would arise if they reduced the probability of biosecurity hazards slipping across the border, or, alternatively, if they reduced the frequency with which such incursions happen.

As indicated in section 2.3.2 above, quantifying the expected values is difficult because:

- There are few quantified estimates of hazard incursions, and these do not cover the full range of hazards identified in the import risk assessment;
- The main hazards are not unique to the used vehicle pathway, so it is difficult to assign probabilities to their arrival or to attribute changes in risk to changes in this pathway.

The estimated annual benefit required to break even gives an indication of the change in risk required, but without probabilities to convert incursion impacts to expected values there is no basis for comparing these estimates or assessing their relative effectiveness. Moreover, when there is such uncertainty over what threats may arrive through the pathway, and such wide variation in estimated impacts if they do, there can not be a definitive expected value to assess the benefits.

In such circumstances, comparing the relative value of benefit required with the expected improvement in efficacy over the status quo provides some measure of the relative cost effectiveness of the different options, and an indication of whether they are likely to be worthwhile. Efficacy refers to the effectiveness in detecting and excluding organisms on this pathway and is a technical matter for judgement by those familiar with both the used vehicle pathway and other pathways.

What these results indicate is that some measures (Option 1 without videoscope, Option 3) could be worthwhile with relatively small increase in effectiveness in excluding hazards, whereas other measures (particularly Option 2) would require much larger improvement in effectiveness, the feasibility of which needs to be viewed in light of the effectiveness of other measures at the border. A major part of Option 1 and Option 3 is the installation of air filters, which is largely intended to stop the spread of seeds of weed species, some of which may be high consequence organisms. If the cost of cleaning or replacing filters is as low as suggested by respondents to the canvassing for this report, this measure requires a relatively low incremental benefit to make the incremental cost worthwhile. However, this conclusion is qualified by unresolved uncertainty about the viability of seeds in filters, and hence of what the measure would achieve.

Consideration of Option 1 with videoscope or Option 2 is more problematic as the costs are considerably higher, and are likely to be higher still if logistical impacts and delays are accounted for more fully than has been possible in this analysis. According to the material in this report (results and

Table 4), current used vehicle import procedures have an implied benefit equivalent to around 6% of the total annual cost on the economy of the few pest species whose potential economic impact of incursions in recent years have been estimated., Option 2 would be required to provide a benefit 45% greater than this to break even. Whether the imported vehicle pathway is so great a risk relative to other incursion pathways that would make such increased benefit possible is again a technical issue, not an economic one.

**a) Limitations in the analysis**

The analysis in this report reflects the limitations of time and data available in its preparation. Particular areas that may bear further examination in the consultation process include:

- Logistical practicalities and possible delays for importers, ports and shipping operators under the different options being considered;
- Public willingness to pay to avoid non-market consequences of biosecurity incursions (e.g. health risks, environmental damage, nuisance values from biting insects etc);
- The likely viability of technical treatment processes that are not yet commercially available, and what would replace them if they prove to be impractical.

The analysis does not estimate effects on other regulatory agencies at the border resulting from changed biosecurity procedures. In particular, MAF inspectors provide an initial assessment of damage to vehicles that assists in identification of vehicles and problems at safety compliance centres. If MAF border checks ceased to provide this information, Land Transport New Zealand would incur costs in setting up alternative systems. What this would entail, and how much it would cost, are currently indeterminate and omitted from this analysis.

**b) Indirect and secondary market effects**

The quantified cost benefit analysis focuses on direct cost impacts of different options and benefits required to justify these costs. There can also be various indirect impacts of options which change processes at the border, the significance of which is discussed below.

A central question is whether changes in border arrangements change the incentives and behaviour of producers and consumers of the affected trade. The average value of used vehicles coming into the country is around \$7,000 in c.i.f. terms, on top of which distributors add their mark-up. The options examined in this analysis would add between about \$12 to \$105 to the direct costs of bringing vehicles into the country. Moreover, vehicle purchases are made so irregularly by most buyers they appear to be not particularly price sensitive (NZIER, 2007). In that context, none of the

options appears to place a major burden on potential buyers of used cars, and claims about the industry's demise appear much exaggerated.

However, impacts on the importing business are likely to be greater than the estimates in this analysis. Logistical and delay costs are under-stated in this analysis for want of data. In addition, variation around the \$7,000 average value means there will be some vehicles of lower value, for which \$100 additional cost may make an appreciable difference to customer choices between newly imported used vehicles and other used vehicles already in New Zealand. Coming on top of other possible changes to regulation of vehicle imports (such as those regarding emissions standards and micro-dotting car components to deter theft), such additional cost (and logistical changes) may make an appreciable difference to importers' profit margins and their ability to retain sales and pass on costs.

So there is some likelihood of contraction at the margin of the supply of certain types of vehicle at the lower end of the price scale. These vehicles tend to be low powered, fuel efficient and cheap substitutes for motor-cycles with a worse risk of road crash casualties. So the more costly options may have some effect in reducing the availability of vehicles of a type which would support other government objectives towards the environment and road safety.

Quantifying such indirect effects on the vehicle market is beyond the scope of the current analysis, but could be explored through further consultation with the industry and examination of the vehicle market in New Zealand.

## 4. Conclusions

This report describes a spreadsheet analysis of the costs and benefits of different options for improving biosecurity controls over the used vehicles imported into New Zealand. Inputs have been derived from canvassing of industry participants and other regulatory agencies with an interest in border controls, and from other published sources such as the Import Risk Assessment.

The costs are more readily quantifiable than the benefits. In this case they are driven largely by the number of vehicles coming into the country. A number of factors, including population ageing, reduction in household size and other prospective regulatory controls over vehicle emissions, appear likely to curtail used vehicle inputs in the foreseeable future. Nevertheless substantial imports are likely to continue over the next 20 years, so that even small increases in average cost per vehicle for biosecurity clearance accumulate to large amounts over the analysis period.

Canvassing of industry participants also raised suggestion of other, unquantifiable costs over some of the proposed changes, which have not been included in this analysis. These surround questions over the logistics of more stringent controls at the wharf and the delay costs for those involved in the import trade. In particular, control options that depend on facilities of fixed capacity are likely to create constraints and delays at periods of peak vehicle movements, although this is not modelled in this analysis because of limitations of data. There were suggestions that some options would cause some contraction of the trade, but suppliers in Japan and elsewhere are unlikely to abandon the opportunities for marketing used vehicles in New Zealand, although the mix of vehicles may change.

The analysis uses “reverse inference” of the value of benefits required to justify the costs of the different options compared. It is hard to translate this into an expected value of incursions avoided, because the probabilities of hazards arriving in New Zealand are unknown, and the hazards that arrive on vehicles are also found in other pathways. The analysis indicates the relative costs of the different options, and the relative annual benefits required to justify them. Whether the different options would achieve the required improvement in benefits over current arrangements is a matter for judgement over the effectiveness of measures on this pathway, and the extent to which other pathways continue to provide opportunities for hazards to enter New Zealand.

## Appendix A References

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## Appendix B Vehicle forecasts

The baseline forecast of the number of light vehicles uses a model developed in NZIER (2007), based on assumptions about:

- growth in the **number of households** in New Zealand
- maximum numbers of **vehicles per household** in New Zealand
- maximum average **vehicle kilometres travelled** by vehicles
- growth in **income per capita**
- growth in **vehicle prices**
- growth in **fuel prices**
- **technological change** that increases fuel efficiency

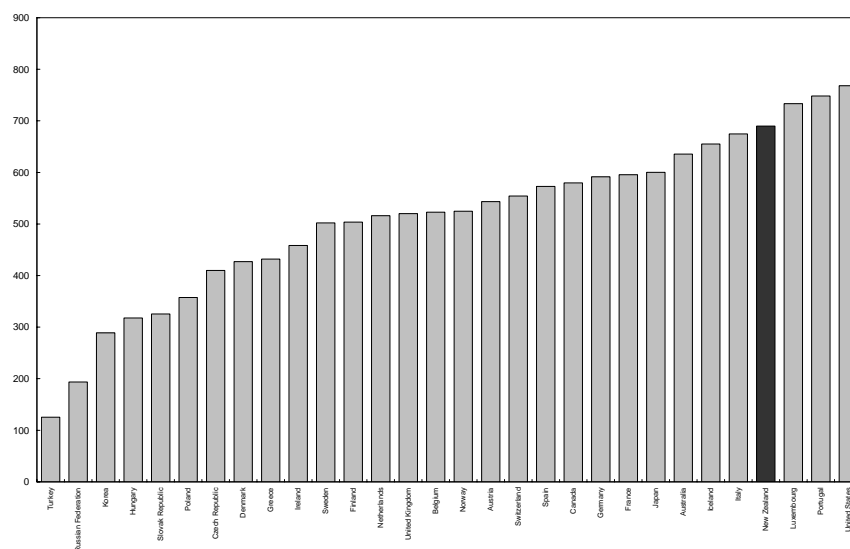
The forecast number of households is a key driver of total vehicle demand. More (less) households means more (less) vehicle demand. The number of households is assumed to grow according to Statistics New Zealand's population projections (series 5), with trend growth in numbers of people per household taken from Statistics New Zealand's household projections.

There is a strong relationship between income growth and numbers of vehicles in the fleet. It would be simplistic to project the vehicle fleet to grow inexorably as incomes grow, as this would result in 3 or 4 vehicles for every household in 2030, compared with approximately 1.8 vehicles per household in 2006. Currently, there are 0.7 road motor vehicles per person in New Zealand. If household size declines as expected due to population ageing from approximately 2.6 now to around 2.4 in 2030, 3 or 4 vehicles per household would approximate to between 1.25 and 1.7 vehicles per person in the economy.

The model is set to constrain growth in demand so that vehicles do not rise above 2.4 vehicles per household, equal to 1 vehicle per person in 2030.

**Figure 2 Road motor vehicles in the OECD, 2004**

Road Motor Vehicles per thousand population



Source: OECD country statistical profiles 2006

## Appendix C IHS cost benefit analysis model

The cost benefit analysis is based on a spreadsheet which models each of the options for applying biosecurity clearance to future vehicle flows. For each option the forecast annual used vehicle imports are split between those inspected/treated on arrival in New Zealand, and those pre-inspected and treated offshore. The costs of the different options are then estimated for each option according to individual elements and processes within them.

As currently structured, the model assumes all off-shore pre-inspection takes place in Japan, which is where the majority of imports originate from and where off-shore inspection is already established. It could be adapted to considering off-shore inspection costs in other countries if suitable information came to light.

The number of imports inspected on arrival or pre-inspected offshore is based on the current share of vehicles coming through these two channels (as in Table 3 above).

### C.1 Base case (current procedures)

The base case model of current procedures estimates costs for the vehicles inspected on arrival in New Zealand using the following parameters:

- Inspection costs: number of vehicles times the inspection fee (excluding GST) for going through biosecurity procedures.

- Vacuuming cost: number of vehicles times the intervention rate on vehicles requiring interior vacuuming (from Quancargo database) times the cost of vacuuming per vehicle (from survey).
- Pressure wash/steam cleaning cost: number of vehicles times the intervention rate on vehicles requiring exterior pressure wash (from Quancargo database) times the cost of pressure washing per vehicle (from survey).
- Treatment cost for fumigation or heat treatment: number of vehicles times the intervention rate on vehicles requiring fumigation or heat treatment times the cost of these respective treatments per vehicle (from survey). The intervention rate inferred from the Database are low but variable with time periods, so an initial assumption is made that 5% receive treatment of some kind:
  - As heat treatment is currently available only on pilot basis, only 5% of vehicles requiring treatment are heat treated in the base case model.
  - The balance of vehicles requiring treatment receive fumigation.
- Re-inspection costs: the share of vehicles that receive decontamination or treatment of any kind (from Quancargo database) incur the cost of a second MAF biosecurity inspection.
- Post-reinspection (secondary) treatment: the share of vehicles that are found to require further intervention after re-inspection cannot be extracted from the Database but is expected to be very low, so an initial assumption is made of 3% require further treatment: the cost per vehicle is assumed to be the weighted average of treatment costs in the initial round of interventions.
- Delay: number of vehicles undergoing secondary intervention times delay cost per vehicle plus demurrage rate times a share of vehicles incurring demurrage costs. The components of this calculation are:
  - Delay cost is the opportunity cost of working capital tied up in vehicles held for an extra day on the wharf, and is estimated as the daily finance cost of a loan for a vehicle of average c.i.f. value of \$7,000. This is around \$21 per vehicle per day at a finance rates around 7-8%.
  - Demurrage is a penalty charged by ports for goods not cleared from the wharf within 5 days, but which is claimed by ports to be related to the opportunity cost on their operations of space taken up on the wharf. Rates vary from port to port but the model assumes a demurrage rate of \$50 incurred after 5 days on the wharf. Delayed vehicles will not incur demurrage if cleared within the 5 day limit, so in the absence of firm data on the incidence of demurrage it is assumed that it applies to 20% of delayed vehicles.

Limitations and uncertainties around the on-shore inspection model include:

- No provision for transport costs from the wharf to transitional facilities for treatment: this is likely to understate somewhat the costs of treatment and delays incurred.
- Delay costs are incomplete in the absence of detailed data on flows of vehicles across the wharf at the different ports around New Zealand.

The base case model of current procedures estimates costs for the vehicles pre-inspected in Japan using the following parameters:

- Inspection costs: number of vehicles times the inspection fee (\$24) plus the average cost per vehicle of maintaining MAF inspectors in Japan (\$11.20 per vehicle on recent costs).
- Pre-cleaning cost: number of vehicles times cost of pre-cleaning (from survey responses).
- Vacuuming cost: number of vehicles times the intervention rate on vehicles requiring interior vacuuming times the cost of vacuuming per vehicle (from survey).
- Pressure wash/steam cleaning cost: number of vehicles times the intervention rate on vehicles requiring exterior pressure wash times the cost of pressure washing per vehicle (from survey).
- Treatment cost for fumigation or heat treatment: number of vehicles times the intervention rate on vehicles requiring fumigation times the cost of fumigation per vehicle (from survey). Heat treatment is not currently available in Japan, although it may become so if sufficient number of vehicles require it. The analysis assumes fumigation takes place in New Zealand at New Zealand prices for those vehicles that require it.
- Re-inspection costs: the share of vehicles that receive decontamination or treatment of any kind incur the cost of a second MAF biosecurity inspection (but this is only the inspection fee, not the cost of maintaining inspectors in Japan, as this latter cost is already recovered in first inspection).
- Post-reinspection (secondary) treatment: the share of vehicles that are found to require further intervention after re-inspection is unknown but assumed to be 3%; the cost per vehicle is assumed to be the weighted average of treatment costs in the initial round of interventions.
- Delay: number of vehicles undergoing secondary intervention times delay cost per vehicle. The calculation is the same as for vehicles inspected on arrival, but the demurrage rate is set to zero, as with treatment before shipping there may be no additional time cost for the extra procedures.

The off-shore pre-inspection model has limitations in some of the processes used. For example, some vehicles that fail inspection in Japan are shipped to New Zealand for treatment on arrival, but there are no data on what proportion of vehicles are treated in this way. The shares of vehicles

requiring different types of intervention in Japan are unknown, so it is assumed the same proportions of total intervention share for each treatment as in vehicles inspected on arrival in New Zealand.

## **C.2 Option 1 (improvements to current procedures)**

Option 1 involves improvements to the specifications of transitional facilities, upgrade of vehicle safety compliance centres to the standards of transitional facilities, the use of videoscope inspections and changing or replacing air filters. It differs from other options in having a number of costs which are incurred per site and are not variable with the number of vehicles.

The Option 1 model for improvements to current procedures estimates costs for the vehicles inspected on arrival in New Zealand using the following parameters:

- Transitional facilities improvement costs: number of transitional facility sites times an average cost of improvements. The capital cost of improvements is incurred in the first year of the analysis; in subsequent years the cost incurred is maintenance of improvements, estimated to be 20% of their capital cost.
  - There was wide variability in survey respondents' views on what typical costs might be: some viewed them as minor works on plumbing (fitting improved wastewater filter screens) and arrangements for secure disposal of at risk material, while others foresaw major works in resurfacing vehicle storage areas.
- Compliance centre improvement costs: number of compliance centres times an average cost of improvements required to meet transitional facility standards. The capital cost of improvements is incurred in the first year of the analysis; in subsequent years the cost incurred is maintenance of improvements, estimated to be 20% of their capital cost.
  - As with transitional facility improvements, there could be wide variability and hence uncertainty around these costs.
- Videoscope inspection costs: number of vehicles times the cost of videoscope inspection, derived by:
  - A capital cost of \$36,000 per videoscope unit, annualised at 5% over a 10 year expected life to annual cost of \$116,550.
  - An assumption of 25 units across the 9 ports in New Zealand, with at least 2 units at each port to ensure continuous availability, 3 units at Wellington, 4 at Christchurch and 6 at Auckland.
  - Annualised cost of all units divided by number of vehicles per year to derived a cost per vehicle (around \$2).

- Inspection time per vehicle of 45 minutes valued at twice the current inspection time (two standard inspections in addition to the current inspection).
- Air filters cleaned or replaced: number of vehicles times standard cost of cleaned or replaced air filter.
  - Industry sources consulted were divided as to whether it would be less costly to replace filters or clean them (if the stock-holding costs of a large variety of filters is too high).
  - It is assumed that half the filters are cleaned and half replaced, in the absence of firmer information to the contrary.
  - The model only estimates costs for one filter changed/replaced per vehicle (the engine filter), and hence understates the likely cost should air conditioning filters be subject to the same requirement.
  - The model costs are for parts only, not labour, which is regarded to be marginal to other activities undertaken in preparing vehicles for export.
- Additional treatments and delay costs: applies to an assumed additional share of vehicles requiring intervention, and estimated as the cost of fumigation plus delay and demurrage.

Identifiable delays arise from:

- Increased inspection time per vehicle when using the videoscope, the average time required being 45 minutes to one hour, compared to 15 minutes per vehicle under current visual inspections, or less if more than one person inspects each vehicle.
- Increased interventions for treatment due to higher rate of contamination detection. The Import Risk Analysis suggests higher detection rates from the videoscope survey, but this was not conducted under the conditions of time pressure experienced in normal clearance operations. The base assumption is that videoscope inspection would double the number of vehicles requiring fumigation compared to visual inspection.

The Option 1 model for improvements to current procedures estimates costs for the vehicles pre-inspected in Japan uses the same estimation processes as for the New Zealand model, other than the following:

- Transitional facilities improvement costs: average cost of improvements times number of transitional facility sites, which is assumed to be one for each of 9 export ports in Japan.
  - No compliance centre improvement costs in Japan.
- Videoscope inspection costs: number of vehicles times the cost of videoscope inspection, based on assumption of 2 units at each of 9 export ports.

- Air filters cleaned or replaced: number of vehicles times standard cost of cleaned or replaced air filter.
- Additional treatments and delay costs: applies to an assumed additional share of vehicles requiring intervention, multiplied by the cost of fumigation plus delay and demurrage.

### **C.3 Option 2 (Alternative to current procedures)**

Option 2 is the principal alternative under consideration to replace the current inspection procedures. It would entail the thorough decontamination and treatment of all used vehicles coming into New Zealand, plus improvements to transitional facilities. Its costs are estimated using the following parameters:

- Vacuuming cost: number of vehicles times the cost of vacuuming per vehicle (from survey).
- Pressure wash/steam cleaning cost: number of vehicles times the cost of pressure washing per vehicle (from survey).
- Treatment cost for fumigation or heat treatment: a weighted average of the cost of these respective treatments per vehicle (from survey) times number of vehicles receiving each treatment.
  - Although heat treatment is currently available only on a pilot basis and only a minority of vehicles are heat treated in the base case model, two potential suppliers of heat treatment facilities approached in the survey suggested the cost of heat treatment per vehicle would be half or less than the cost of fumigation, suggesting most vehicles would be heat treated where available.
  - The viability of heat treatment in ports with low volumes of vehicles imported is open to question, so fumigation is likely to remain in use at least in those ports.
  - The costs of this option are based on an assumption that 95% of vehicles are heat treated and 5% fumigated.
- Audit costs: the number of vehicles imported times a sample rate times the cost of audit per vehicle. The sample rate is set at 25% of vehicles to ensure less than 1% probability of contamination being undetected. The audit cost per vehicle is assumed to be just less than current inspection costs, at \$20.
- Reinspection cost: Number of vehicles times probability of audit failure times inspection cost. There is no information on likely audit failure rate so this is assumed to be 5%.

- Post-reinspection (secondary) treatment: the number of vehicles times audit failure rate times the sum of vacuuming cost plus pressure washing cost plus fumigation cost.
  - Delay: number of vehicles undergoing secondary intervention times delay cost per vehicle plus demurrage rate times a share of vehicles incurring demurrage costs.
- Transitional facilities improvement costs: number of transitional facility sites times an average cost of improvements. Costs are as in Option 1, the capital cost of improvements being incurred in the first year of the analysis; in subsequent years the cost incurred is maintenance of improvements, assumed to be 20% of their capital cost.

For vehicles being pre-inspected in Japan, the model parameters are as follows:

- Vacuuming cost: number of vehicles times the cost of vacuuming per vehicle (from survey).
- Pressure wash/steam cleaning cost: number of vehicles times the cost of pressure washing per vehicle (from survey).
- Treatment cost for fumigation or heat treatment: a weighted average of the cost of these respective treatments per vehicle (from survey) times number of vehicles receiving each treatment.
  - The viability of heat treatment in Japan's nine ports is uncertain: higher volumes improve viability, but if heat treatment is only required for exports to New Zealand, in some ports facilities may not be available.
  - The costs of this option are based on an assumption that 95% of vehicles would be heat treated and 5% fumigated once the heat treatment facilities are available in Japan.
- Audit costs: the number of vehicles imported times a sample rate times the cost of audit per vehicle. The sample rate is set at 25% of vehicles to ensure less than 1% probability of contamination being undetected. The audit cost per vehicle is assumed to be just less than current inspection costs, at \$20.
- Reinspection cost: Number of vehicles times probability of audit failure times inspection cost. There is no information on likely audit failure rate so this is assumed to be 5%.
- Post-reinspection (secondary) treatment: the number of vehicles times audit failure rate times the sum of vacuuming cost plus pressure washing cost plus fumigation cost.
- Delay: number of vehicles undergoing secondary intervention times delay cost per vehicle plus demurrage cost times a share of vehicles incurring demurrage costs. As in the base case, the applicability of demurrage to off-shore processes is doubtful and share is set at 0%.

- Transitional facilities improvement costs: number of transitional facility sites in Japan times an average cost of improvements. Costs are as in Option 1, the capital cost of improvements being incurred in the first year of the analysis; in subsequent years the cost incurred is maintenance of improvements, assumed to be 20% of their capital cost.

#### **C.4 Option 3 (improvements to alternative procedures)**

Option 3 is simply the addition of a requirement to change or clean air filters in addition to Option 2 procedures, as a means of reducing the risk of inert but viable seeds from surviving the other processes.

- Air filters cleaned or replaced: number of vehicles times standard cost of cleaned or replaced air filter. Calculations and caveats the same as for the air filter cost estimates in Option 1.
  - Labour time and wharf delays not estimated for this option, as they are regarded as likely to be marginal relative to other activities undertaken in preparing vehicles for export.

### **Appendix D Data and assumptions on delays**

Many of those canvassed to provide information for this analysis expected many of the changes to increase the time required to get through border biosecurity, with associated delay costs. The potential delay caused by the different options is a function of the flow of vehicles across the wharf and the capacity of shore facilities to process them. There were insufficient data and resources to model this in this analysis so only partial accounting for delay is achieved.

Vehicles arrive in shipments varying from very few up to several hundred. When more than one ship arrives in close succession, vehicles to be processed may sometimes number in the thousands at the larger ports.

The Impact Risk Analysis suggests a team of 2 inspectors can inspect a vehicle in 3 minutes. The inspection fee is \$25 inclusive of GST, which is ¼ hour of an inspector's time at standard charge out rates. This suggests a single inspector should be able to complete inspection in 9 minutes, with the balance of the time to complete other administrative processes. With 2 extra people on the inspection, a car should be capable of being inspected in 5 minutes, implying 12 vehicles inspected per hour by such teams.

Vehicles are currently required to be inspected/processed within 12 hours of landing, which limits the capacity of a 3 person team to 144 vehicles in 12

hours' continuous working. But capacity at any one port can be expanded on a continuous basis by deploying more staff to process large shipments.

Heat treatment units are capable of treating up to 9 cars at a time on a 40 minute heating and cooling cycle. This means 27 vehicles could be treated in 2 hours from a single unit, resulting in similar hourly throughput as the current visual inspections (12.5 per hour). But the units can only be expanded in lumpy increments. As with any such fixed infrastructure, it is rarely economic to provide capacity to deal with the peak as this lowers the capacity utilisation achieved at non-peak periods. Hence we expect capacity of units installed to be oriented to dealing with average flows, and that at peak periods queues and delays will be created.

An increase in delays can be expected from all the options that involve installation of fixed capacity equipment (Option 1 with videoscope and Option 2). But as the flows and peaks of vehicle arrivals are beyond the scope of this analysis, such delays in throughput have not been included in the estimates.

In the baseline scenario (current arrangements), delay is estimated for the proportion of vehicles undergoing fumigation, as this requires vehicles to be gassed and ventilated for 24 hours, thus delaying clearance by at least a day.

In Option 1 with videoscope inspections, the additional resource cost of inspector time is valued in the estimates, but the delay cost of slower inspections is not, because this will depend on the vehicle flows and the amount of congestion caused by the longer inspections.

In Option 2, delay cost is estimated for the small proportion of vehicles that still require fumigation, but not for the majority that are assumed to use heat treatment.

In practice there may be additional sources of delay in smaller ports if vehicles have to be transported to other centres that have treatment facilities. Again, this has not been factored into this analysis because of insufficient data.