Ministry for Primary Industries
Manatū Ahu Matua

The Risk Management Proposal Associated with the Review and Amendment of the Import Health Standard for Vehicles, Machinery and Tyres (now Vehicles, Machinery and Equipment)

FOR PUBIC CONSULTATION

December 2017

Ministry for Primary Industries
Manatū Ahu Matua

Disclaimer

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Submissions

The Ministry for Primary Industries (MPI) invites comment from interested parties on the proposed amendments to the Import Health Standard for Vehicles, Machinery and Tyres (now re-named as the Import Health Standard for Vehicles, Machinery and Equipment - VME). The proposed changes are supported by this discussion document. An import health standard (IHS) "specifies requirements to be met for the effective management of risks associated with importing risk goods, including risks arising because importing the goods involves or might involve an incidentally imported new organism" (section 22(1) Biosecurity Act 1993).

MPI seeks comment on the proposed amendments to the IHS: Vehicles, Machinery and Equipment. MPI has developed this proposal based on best assessment of the best available scientific evidence regarding risk associated with this pathway. If you disagree with the measures proposed to manage the risks, please provide either data or published references to support your comments. This will enable MPI to consider additional evidence which may change how risks are proposed to be managed. The following points may be of assistance in preparing comments:

- wherever possible, comments should be specific to a particular amendments in IHS requirements or a question asked in this document (referencing section numbers or subjects as applicable);
- where possible, reasons, data and supporting published references to support comments are requested; and
- the use of examples to illustrate particular points is encouraged.

The amendments proposed in this document are intended to update the IHS to ensure that the biosecurity risks associated with the importation of VME are managed in response to commercial practices and changing scientific knowledge.

MPI encourages respondents to these documents to forward comments electronically. Please include the following in your submission:

- the title of the consultation document in the subject line of your email;
- your name and title (if applicable);
- your organisation's name (if applicable); and
- your address.

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Please send submissions to: standards@mpi.govt.nz, or should you wish to forward submissions in hard copy format (writing), please send them to the following address to arrive by close of business on the XXX December 2017.

Biosecurity and Environment Group
Plant, Food and Environment Directorate
Ministry for Primary Industries
PO Box 2526, Wellington
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Submissions received by the closure date will be considered during the development of the final versions of the IHS. Submissions received after the closure date may be held on file for consideration when the IHS is subsequently reviewed.

Official Information Act 1982

Please note that submitted documents are public information. These documents may be the subject of requests for information under the Official Information Act 1982 (OIA). The OIA specifies that information is to be made available to requesters unless there are sufficient grounds for withholding it, as set out in the OIA. Submitters may wish to indicate grounds for withholding specific information contained in their submission, such as the information is commercially sensitive or they wish personal information to be withheld. Any decision to withhold information requested under the OIA is reviewable by the Ombudsman.

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Information on the IHS Consultation Process from 2015 to 2017

1. Purpose

The purpose of this document is to:

- clarify the proposed amendments to the requirements for the IHS: Vehicles, Machinery and Equipment – VEHICLE-ALL;
- provide justification for the proposed amendments and how they manage risk; and
- seek feedback on the proposed amendments to importing requirements.

2. Background

2.1 Timing of the Initial Consultation

Between the 25th September 2015 and the 30th November 2015, the Ministry for Primary Industries (MPI) conducted a consultation programme and invited comment from interested parties on proposed amendments to the IHS. At that time, MPI provided the IHS to interested parties for reference. This was sent out as per the most up-to-date format to provide consistency, ease of use and to clarify information and legal requirements. Changes were proposed included:

- The IHS changed to include a table holding information on the maximum number or volume of biosecurity contaminants and regulated pests that may be found associated with imported vehicles, machinery and tyres. This table is currently held in the associated Guidance Document (as of this date) but being located there is not considered to be enforceable (being guidance only). This led the table to initially be placed within the body of the IHS (Section 2) in the September 2015 draft IHS for appropriate enforceability. For the 2017 draft IHS, MPI considers the table to be better placed in Schedule 2 (attached to the back of the IHS) where it can be modified without unduly having to change the rest of the IHS. Details of the changes made to the revised table are found in Section 5.7 as below).
- Amended requirements for used agricultural, forestry and horticultural items being added that specified mandatory cleaning or treatment.
- Amended requirements being added for the management of used vehicles in Japan (mainly for management of Asian Gypsy Moth (AGM) before being shipped to NZ as break-bulk (non-containerised), commercial consignments and being mandatory through an MPI-approved system.
- Amended requirements being added for the management of the Brown Marmorated Stink Bug (BMSB) in the United States of America (USA) that included mandatory fumigation or heat treatment.

The changes made to the proposed draft IHS and GD in 2015 were supported by the first version of this RMP document. Further changes made to the 2017 draft versions of the IHS and GD will be explained in the Sections as below.

3. Background and Context to Consultation

3.1 International Regulation of Risk Goods

The WTO and SPS Agreements set in place rules that protect each country's sovereign right to take the measures necessary to protect the life or health of its people, animals, and plants while at the same time facilitating trade. It embodies and promotes the use of science-based risk assessments to manage the risks associated with the international movement of goods. "The SPS Agreement will continue to guide how NZ sets standards and makes decisions related to biosecurity. In particular, it will be important to maintain the standards of transparency and scientific rigour required by the SPS Agreement, and to make decisions as quickly as possible. This will encourage other countries to comply with the rules of the SPS Agreement, and also demonstrate that NZ's strict controls are justified to countries that challenge them." Balance in Trade [online reference ISBN 978-0-478-33881-2].

3.2 Domestic Regulation of Risk Goods

The NZ biosecurity system is regulated through the Biosecurity Act 1993 (the Act). Section 22 of the Act describes an import health standard (IHS) and requires all risk goods (including inanimate items such as Vehicles, Machinery and Tyres) entering NZ to be covered by one. MPI is the NZ government Ministry responsible for maintaining biosecurity standards for the effective management of risks associated with the importation of risk goods into NZ (Part 3, Biosecurity Act 1993).

MPI is committed to the principles of transparency and evidence-based technical justification for all phytosanitary measures, new and amended, imposed on importing pathways. MPI periodically reviews IHSs, related documents and other standards so that the legal requirements are clear and that information is consistently presented and easy as possible to understand.

The amendments proposed in the in 2015 were intended to update and improve the IHS to ensure that the biosecurity risks associated with the importation of vehicles, machinery and tyres were managed in response to increased scientific knowledge and changing commercial practices. In this regard to the September 2015 consultation, MPI sought comment on the proposed amendments to the IHS (as above). Addition data or evidence was requested from interested parties to enable MPI to consider information which could assist in re-developing or improving the IHS regarding risk management measures and procedures.

At the time of consultation, MPI also advised interested parties that all submitted information would become public information, and that this information could be the subject of requests under the Official Information Act 1982 (OIA). Furthermore MPI advised interested parties that the OIA states that information must be made available on request to MPI unless there were sufficient grounds for withholding it.

4. Biosecurity Risk Associated with Vehicles, Machinery and Tyres

4.1 Import Risk Analysis of Biosecurity Risk (Conclusions and Explanation)

The biosecurity risk associated with this pathway was documented in the vehicles and machinery import risk analysis in 2007 (MAF 2007). This risk analysis demonstrated that many different pests and types of contaminants could be associated with imported vehicles and machinery. The main conclusions were:

- Biosecurity risk depends on the conditions and locations where vehicles and machinery are used and stored prior to export.
- Used vehicles are a higher biosecurity risk than new vehicles.
- Vehicles and machinery are a higher risk than other "inanimate" cargo such as shipping containers due to:

    1. The complex construction of vehicles and machinery creates more habitats for pests and can make inspection and cleaning more difficult.
    2. Used usually vehicles have a longer period of time and greater opportunities for contamination and infestation through ordinary daily use than new cars.
    3. Vehicles and machinery usually remain in NZ permanently and are used well outside the main MPI surveillance networks. This increases the likelihood of pests establishing in NZ if they arrive on vehicles and machinery.

4.2 Specific Pests of Significance (as highlighted in the Import Risk Analysis)

4.2.1 Asian Gypsy Moth – AGM (*Lymantria dispar*)

AGM has been considered as a high-risk pest to NZ for decades given the larvae are voracious feeders on a huge range of host plants including forestry and horticultural species and could significantly impact NZ's primary industries. In addition, AGM is also likely to be problematic on NZ native vegetation and negatively affect NZ's ecological status. MPI interception data shows that used vehicles are the highest risk pathway for AGM egg masses to arrive in NZ. The way that used vehicles are stored before export combined with the volume of trade from Japan has led MPI to thoroughly manage this vehicle pathway from Japan. These continuing concerns

have led MPI to propose modification of the 2017 draft version of the IHS where all used vehicles from Japan are to be managed through MPI-approved systems.

4.2.2 Brown Marmorated Stink Bug – BMSB (*Halyomorpha halys*)

Another significant pest associated with the import of vehicles, machinery and equipment is BMSB. This pest has the potential to become a significant problem in NZ due to biology, phenology and current global distribution if not prevented from entering and establishing (Fraser et al 2017, MPI 2012). The biosecurity risk of BMSB was also documented in a MPI pest risk analysis in 2012 (MPI 2012). Vehicles and machinery were identified as a likely pathway of entry. It concluded that the use of visual inspection alone had limited effectiveness for detecting mobile or hidden organisms associated with vehicles and machinery; and at that time vehicles and machinery were not identified as being a higher risk pathway over other inanimate or inorganic commodities.

The natural range of BMSB is China, Korea and Japan where competition and natural predators appear to keep the population low and from becoming a serious problem with vehicles. BMSB has become widespread and a major horticultural and human nuisance pest in other parts of world including the USA and Italy. In late 2014, large numbers of BMSB were detected arriving in NZ on vehicles imported from the USA. This situation resulted from BMSB reaching high population density in manufacturing areas in the Eastern USA and then seeking shelter from winter weather conditions inside the vehicles were being stored prior to export (StopBMSB 2015). This led MPI to urgently amend the IHS for Vehicles, Machinery and Tyres on the 23rd of December 2014 and add new measures for specific management of BMSB from the USA. The measures added were imposed for imported vehicles and machinery from the USA over all 12 months of the year. MPI has also been closely monitoring this pathway for compliance since that time.

BMSB is continuing to spread and become more problematic in other places such as Europe. BMBS is estimated to have established in Italy in 2009 and has now become an important agricultural and nuisance pest across Italy and other European countries since 2015 with significant population increases and distribution. This led MPI once again to urgently amend the IHS for Vehicles, Machinery and Tyres on the 25th of August 2017 and add similar measures for specific management of BMSB from Italy although a specific risk period between the 1st of September and the 30th of April of any year is specified (see Section 5.6 as below).

5. Proposed Amendments to the 2017 Draft Version of the IHS

5.1 General Formatting Changes

The 2017 draft version of the IHS has been renamed as the Import Health Standard (IHS): Vehicles, Machinery and Equipment (VME). It has been revised and migrated into the most up-to-date MPI Requirements & Guidance format to clarify requirements, improve consistency and layout.

5.2 MPI-Approved Biosecurity Treatments

MPI has standardised the location for biosecurity treatments into a single location for easy access for importers, MPI Inspectors, stakeholders, and treatment operators. Offshore (pre-export) and onshore treatments are specified in MPI Standard: *MPI Approved Biosecurity Treatments - MPI-STD-ABTRT* (located at: http://www.biosecurity.govt.nz/border/transitional-facilities/bnz-std-abtrt). *MPI Approved Biosecurity Treatments* will also be incorporated by reference into the IHS to ensure the treatments are mandatory for importation (where required).

5.3 Amended Management Measures for Vehicles, Machinery and Equipment

Under Part 3: *Additional requirements for specified types of Vehicles, Machinery and Equipment and specified regulated pests* (this includes components, parts and tyres), changes have been proposed as follows:

- Part 3.1: Agricultural, forestry and horticultural equipment and steel cables (including components, parts and tyres) must be cleaned or treated before being shipped to NZ. Cleaning or treatment must be confirmed by being accompanied by certification.

- Part 3.4 has been modified to hold "Requirements for Specific Regulated Pests" that are associated with imported vehicles, machinery and equipment.
- Part 3.4.1 covers importation of all used vehicles from especially for the management of AGM in Japan. MPI now specifies that all used vehicles (cars and trucks) must be managed through an MPI-approved system in Japan before being shipped to NZ. Used Japanese cars and trucks include all that are shipped as either break-bulk or containerised cargo, and include all commercial or private consignments.
- Part 3.4.2 covers management of BMSB on imported items (VME). This requirement will be expanded from only being specified for imported items from the USA and Italy to imported items from other BMSB risk countries. The revised list of countries will be specified in Schedule 3 (as attached to the IHS) and is subject to modification as required. It is anticipated that approximately 12 European countries will be added under the revised IHS requirements (expected by April 2018). MPI will require management of BMSB from identified Northern hemisphere countries from the 1st of September through the 30th of April of any year as this period has been scientifically identified as the critical period of export risk to NZ (MPI 2015a). Management of imported items from the USA will also be aligned with Northern Hemisphere countries for the risk period (from the 1st of September to 30th of April) of any year.

5.3.1 Rationale for the Proposed Changes to the IHS

- Part 3.1: Despite the current IHS requiring agricultural, forestry and horticultural equipment and steel cables to be clean (internally and externally) or treated, MPI commonly intercepts non-compliant items at the NZ that have not been cleaned or treated. With the requirement for specific certification, MPI considers that importers will compelled to be compliant. MPI will also have a better ability to monitor compliance of the importer and any associated exporters or certifying agencies.
- Part 3.4: This IHS section is mainly focused on management of items that have a high likelihood of infestation by high risk pest like AGM and BMSB that have been regularly intercepted in vehicles and machinery from Japan and the USA. MPI data confirms that management (cleaning or treatment) of vehicles in the country of origin is the most effective method of managing the pathway and minimising importation of these pests.
- Part 3.4.1: This primarily relates to the management of AGM (although other pests and contaminants will be managed) found on imported used Japanese cars and trucks. MPI will require that all such vehicles (excluding non-standard items) must be managed in Japan before export to NZ by being processed through an MPI-approved system. Importers can also apply for coverage of non-standard vehicles (such as other specialist vehicles) to be managed through an MPI-approved system.
- Part 3.4.2: This relates specifically to the management of BMSB (although other contaminants and pests will be managed too) associated with VME from the USA (the states of Alaska and Hawaii are excluded as BMSB does not occur in those places); and for a range of European countries where BMSB is already, or is becoming, a significant pest. Management of BMSB will be through a range of options that will be conducted in the countries of origin and provided for importers.

  BMSB Management Options include:

  1. Obtaining VME from NPPO recognised pest free areas.
  2. Obtaining VME from pest free places of production where BMSB do not occur
  3. Establishing an MPI-approved system in the country of export for the importation of VME into NZ.
  4. Imported items being fumigated or heat treated (before export for break-bulk items; or before shipping or on-arrival in NZ for containerised items).

5.4 BMSB and Environmental Conditions/Temperature

BMSB activities and responses to environmental temperature were reviewed by MPI (MPI 2015a). The conclusions reached supported an increase in the post-treatment storage period. The conclusions reached were that:

- Only sustained daytime temperatures of 15°C or above allowed for normal BMSB activity.

- BMSBs do not fly at night at temperatures below an average of 21°C so a post-treatment period of 120 hours is considered to pose little risk of re-contamination during winter conditions at European or USA ports due to much lower temperatures.
- These ports are not attractive to BMSB being predominantly bitumen or concrete surfaced areas that are extremely busy with a high level of commercial activity.
- There is also an absence of suitable vegetation to attract, host and sustain BMSB.
- MPI has also not experienced any BMSB re-infestation issues whatsoever in the case of the importation of break-bulk items from USA West coast ports that had been treated and held post-treatment (on the exit port) for 120 hours before export to NZ (specified in MPI CTO-Directions in 2016 and 2017).

Note: Treatment must be conducted from the 1st of September to the 30th of April and within 120 hours of planned departure from the port of export.

In addition, treatment for containerised items may be conducted within 12 hours of arrival at the place of first arrival in NZ. Treatment of containerised cargo in the country of origin is not subject to a post-treatment protection period prior to shipping as re-infestation with BMSB cannot occur. However, open-sided, open-topped (even with a soft cover) and flat rack containers is considered by MPI as 'break-bulk' for BMSB risk and requires mandatory offshore treatment due to the risk of BMSB not being excluded.

5.5 The Required Treatment Efficacy for BSMB Management

Approximately 4 million risk good units (of all kinds and via all risk pathways) enter NZ from BMSB host countries per annum. Of these risk items, around 30,000 vehicles arrive per annum from the BMSB areas that are considered by MPI to present a high enough risk to require mandatory treatment with fumigation or heat.

For vehicles being exported to NZ from these countries during the Northern Hemisphere winter risk period (1 September to 30 April), only unmated overwintering adult BMSB are found as other stages are not present given the pest's lifecycle. Since 2005, the maximum number of BMSB found in a vehicle was 49. The highest number of BMSB found alive was 36, and only 14 vehicle consignments have been intercepted with 10 BMSB or more. Even with untreated consignments, normally only 1 or 2 BMSB are usually found alive as there is a high natural mortality due to shipping conditions that appear to be unfavourable to BMSB survival.

Treatment efficacy can be described in a number of ways, but the most common method is to state that an appropriately effective treatment achieves a % mortality of the most tolerant life stage likely to be present at the 95% level of confidence. Given the relatively low numbers of vehicles from the BMSB risk areas and the low level of infestation, it is considered that treatment efficacy at 99.9% mortality of the adults at the 95% level of confidence (= no survivors in 1,000) is sufficient. This efficacy can also be referred to as Probit-8. Probit-8 is sufficient to prevent adult BMSB accumulating in the highest relevant cargo arrival area (being the Auckland region) in numbers sufficient to establish a breeding population.

The level of treatment efficacy required was determined by modelling the number of adult BMSB arriving via the vehicle pathway in NZ (at any location) over the most likely survival period. Factors included in the modelling were:

- The level at which the risk goods were infested (and the level of aggregation);
- The destination of the risk goods within NZ; and
- BMSB's biological characteristics such as adult longevity and the distance of spread.

MPI considers the use of Probit-9 as being unnecessary treatment efficacy for BMSB management in the vehicle pathway and Probit-8 is sufficient. The concept of Probit-9 as an efficacy standard originated with Baker (1939), who used it to recommend cold and heat treatments for fruit flies. Baker gave no rationale for selecting Probit-9 mortality as an efficacy criterion other than to, "assure no survival of [fruit fly] eggs or larvae in the products treated". Importantly, Baker (1939) did not test sufficient individuals to meet Probit-9 requirements and confirm no survivors among 93,616 insects at the dose expected to achieve that mortality (Schortemeyer 2011).

Probit-9 efficacy was established by the USA as the efficacy requirement for the treatment of fruit flies (Diptera: Tephritidae) or pests of similar significance. Probit-9 efficacy is equivalent to 99.9968% or no survivors in around 30,000 of the target pest at the 95% level of confidence. This number or approximate numbers have often been reported in the literature for a number of pest species, however in recent years alternative levels of efficacy have been estimated for other pest species.

For instance Australia, Japan, and New Zealand now accept a quarantine treatment efficacy of 99.99% for fruit fly pests. At a 95% confidence level, a 99.99% level of efficacy equates to no survivors in 10,000 treated pests. Determining an appropriate level of treatment efficacy must address the expected prevalence of a pest on the material in question, the biological characteristics of the pest, and the minimum number of pests required to create a new breeding population (i.e. the maximum pest limit).

Once a target level of efficacy has been established, research is required to verify that a treatment can achieve the target. Where treatment verification to appropriate numbers may not be possible, the analysis of carefully designed dose response experiments may be used to define appropriate treatment dosages.

Trials carried out to date have shown that adult BMSB are very susceptible to treatments used on the vehicle pathway such as fumigation by both Methyl bromide (MB) and Sulfuryl fluoride (SF), and heat.

5.6 Research on Treatments for BMSB Management

Prior to December 2014, the treatments available in the version of the IHS for management of BMSB were based on an existing treatment schedule covering a wide range of pests associated with vehicles. At the end of 2014, due to BMSB challenges, MPI added additional treatments as emergency measures to the existing MB and heat treatments, and also utilised SF treatments to deal with infestation.

After the 2015 draft IHS consultation period, MPI received comments from stakeholders about MPI's proposed treatments for management of BMSB. Concerns were raised about the efficacy of MPI's use of existing or new treatments and when they would be applied. However, MPI has confidence that the efficacy and timing of MB and SF fumigation and heat treatments is sound and the measures are supported by science. In addition, no scientific evidence was provided that proved a different position to that held by MPI. Given concerns from stakeholders, MPI undertook to gather ongoing interception information on live or dead BMSB after treatment and conduct further work on effective pre-export measures for VME.

From 2015, MPI re-evaluated available data on BMSB treatments to monitor efficacy, and this included research data provided in 2015 by the United States Department of Agriculture, Agricultural Research Service (USDA-ARS), the Virginia Institute of Technology and MPI also commissioned fumigation research. This data showed that BMSB was also susceptible to lower doses of MB and SF and lower heat treatment temperatures. Since that time, additional fumigation regimes have been added as extra effective treatment options. These were specified and used under the direction of MPI Chief Technical Officer Decision Documents for the management of BMSB.

5.6.1 Fumigation with MB

The existing MB treatment rate of 48 g/m^3 for 24 hours will still apply for treatments at the 10-15°C temperature range as no new data were supplied for doses of MB at temperatures less than 15°C. Relevant literature on the effectiveness of MB fumigation on insects found on or near the surface of commodities reports that it is very effective with direct application to exposed insects at a concentration:time (C:T) value of <140 g.h/m^3 and temperatures >10°C; or at 120 g.h/m^3 at > 15°C. However, higher doses are required when the insects are partially or completely enclosed in a commodity such as being in wood.

For fumigation of vehicles and machinery, penetration is very good as long as all sealed compartments such as boots, compartments, hatches and trunks are opened up before the treatment begins (currently a standard pre-fumigation action). Based on the information supplied by the USDA-ARS on the fumigation of 2nd-3rd instars of BMSB (the most tolerant stage) and the efficacy data for direct MB exposure to a range of insects to achieve an Probit-8 efficacy), a reduced MB fumigation C:T rate of >140 g.h/m^3 for treatments at >10°C is very effective for killing BMSB.

5.6.2 Fumigation with SF

In both the USA and in Europe, SF is the only fumigant available for the treatment of vehicles. The USDA-ARS demonstrated that SF fumigation at was very effective for killing adult BMSB. MPI conducted a peer reviewed assessment of level of SF efficacy that is required to manage the risk of BMSB on the vehicle pathway (Ormsby 2016). The assessment was conducted on cargo volume and detected contamination levels using both data for the dead and live BMSB found to model the maximum number of insects.

Modelling used the exposed trial numbers only (without extrapolation) and the cargo that had been treated up until that time. It showed a specified SF fumigation treatment C:T value of >135 g.h/m^3 for treatments conducted at >10°C and applied over a >12 hour period (8 g/m^3 of fumigant remaining at treatment completion) provided a SF treatment at Probit-8 efficiency level that was sufficient for appropriate BMSB management through the VME pathway.

The C:T advice for SF was based on modelling of the numbers of BMSB used by Walse et al 2015 which reported exploratory research trial with relatively low numbers of BMSB in each repeated part of the trial. Mortality of BMSB seen in the fumigation trials showed that as soon as the C:T of 96g.h/m^3 was achieved there were no survivors, and insect mortality began at 48g.h/m^3. The likelihood of there being significant variation in insect death for surface dwelling/hiding BMSB adults in greater numbers is considered to be far less likely than for other insect eggs, larvae or pupae that may be better protected within a commodity such as fruit or wood to varying degrees. It is considered that a SF rate of 140g.h/m^3 is sufficient to kill BMSB risk on this pathway as large numbers of BMSB have not been intercepted. As the biggest number of BMSB detected in a consignment so far at the NZ border was 56 (where there was a mixture living and dead individuals) the efficacy stated above is appropriate and effective for mortality.

MPI works cooperatively with the Australian government (Department of Agriculture and Water Resources - DAWR) in managing BMSB associated with imported risk goods such as vehicles, machinery and equipment. DAWR's SF treatment schedule for BMSB aligns with MPI's requirements and are equivalent to the current MPI rates for 12 hours. These SF treatments being at least 48g/m^3 for a period of 6 hours or longer; at least 16g/m^3 for a period of 12 hours or longer; and both with an SF concentration end point of 50% or greater (minimum of 24 and 8 g/m^3 respectively) when conducted at temperatures of 10°C or greater.

MPI also conducted verification audits of treatment operations for BMSB in late 2015 in the USA. The fumigations audited were found to be achieving 40% higher C:T values than the target concentrations. The increased concentration values were explained by the fumigant being retained well in the fumigation space and a longer fumigation period being used matching the normal working period. The verification audits results provided high level assurance that BMSB was being killed on vehicles and machinery from the USA after being treated effectively. Since the current SF rate were implemented, over 46,000 vehicles have been treated and only dead BMSB have been found in fumigated cargo imported into New Zealand (and Australia) to date.

To summarise fumigation for BMSB management with MB and SF, MPI has conducted a thorough assessment on the rates of both fumigants. MPI is satisfied that the fumigants and rates used are effective for appropriate control of BMSB that may be associated with imported vehicles, machinery and equipment.

5.6.3 Heat Treatment

MPI studied heat treatment data for appropriate management of BMSB. MPI considered the effectiveness of the heat treatment requirements of 56°C for 30 minutes under the International Standard for Phytosanitary Measures Number 15 (International Plant Protection Convention - ISPM 15 - Regulation of Wood Packaging Material in International Trade) given it is well established and recognised. The work conducted with BMSB showed that it was effectively managed by this temperature and time regime. BMSB work corresponded to that conducted previously with a wide range of insect wood pests. MPI also considered research conducted by Aigner and Kuhar from the Virginia Institute of Technology in the USA on the mortality of BMSB after heat treatment. Mortality of 100% for adult BMSB was shown at 45°C for 1 hour or at 50°C for 15 minutes.

However, to improve confidence that heat treatment will kill BMSB (and other pests), MPI has also provided the temperature requirement to 60°C as an option. This decision is based on experience in NZ where heat treatment providers found items of larger mass were more difficult to heat to attain the core temperature required (at coldest part of the item). MPI will require heat treatment at 60°C for 10 minutes for vehicles weighing less than 3,000 kg; or 60°C for 20 minutes for vehicles weighing more than 3,000 kg is utilised to manage inconsistencies with heating rates throughout heavy vehicles or machinery.

5.6.4 Revised Treatment Measures for the Management of BMSB

The revised fumigation and treatment requirements are:

- Methyl bromide fumigation at 10°C+ to achieve a minimum C/T of 140 g.h/m^3 over 12 hrs with a starting dose of 16 g/m^3 and a final reading concentration of at least 8 g/m^3 or
- Sulfuryl fluoride fumigation at 10°C+ to achieve a minimum C/T of 140 g.h/m^3 over 12 hrs with a starting dose of 16 g/m^3 and a final reading concentration of 8 g/m^3 or
- Heat treatment at 56°C for 30 minutes for VME or
- Heat treatment at 60°C for 10 minutes for VME weighing less than 3,000kg; or
- Heat treatment at 60°C for 20 minutes for VME weighing more than 3,000kg (in the coldest location).
- MPI-approved insecticide treatment before shipping and also on arrival, followed by MPI inspection for aircraft.

Note 1: All of these treatments are permitted to have a post–treatment storage period of 120 hours for break-bulk VME.
Note 2: Where management options have been conducted before shipping to NZ, post-treatment protection before export of such items to NZ is required.

5.7 Seasonal Application of Management Measures for BMSM

MPI imposed emergency treatment measures for BMSB associated with vehicles and machinery from the USA in late December 2014. These measures were in response to large numbers of BMSB detected on vehicles imported from the USA. In December 2014, it was also recognised that there was a higher BMSB risk period during the NZ spring and summer period, and conversely a much lower risk BMSB period during the NZ winter. The exact timing during the year when risk levels changed were not known in 2014 and the emergency measures were applied over all 12 months of the year as a precautionary principle.

Regarding the risk posed by BMSB, MPI obtained expert advice from Dr Anne Nielsen (Assistant Professor and Extension Specialist, Rutgers University Entomology Department, USA). MPI requested assistance on determining the likelihood of establishment of BMSB during the NZ autumn/winter period. Dr Nielsen's advice confirmed the likelihood that BMSB establishing during the autumn/winter period in NZ (from the beginning of May to the end of August of any year) was seen as being extremely low.

Dr Nielsen's advice stated that if one assumed that a female BMSB was reproductively able, it was unlikely that it would re-enter diapause on encountering NZ's lower temperatures and shorter day lengths in the autumn/winter period. Dr Nielsen also stated that if an egg-bearing female BMSB arrived during this period, it would most likely lay viable eggs. However, whether the BMSB eggs hatch or not is dependent on the temperature in which the female BMSB was subject to. Given that the minimum temperature for development of all life stages is reported to be between 11 and 14.7°C there is the possibility that there may be some egg hatch and development in warmer areas of NZ.

Dr Nielsen said that if the eggs did hatch and the day-length was not suitable (where the hatched BMSB nymphs did not encounter the long days of summer that would signal a move to a reproductive state), such BMSB nymphs may continue to develop (albeit slowly) into a diapausing adult. Dr Nielsen concluded that it was more likely that any developing nymph in that situation would die due to lack of suitable host plants and unsuitable weather conditions. There is a very low likelihood that egg laying and subsequent survival and development of BMSB nymphs would result from egg-bearing females entering NZ during the autumn/winter period in NZ.

The evidence for the changing risk across seasons has been further reviewed and is documented by MPI (2015a) and this is summarised as follows:

- The establishment of a population of BMSB in NZ relies on multiple individuals arriving simultaneously, surviving, and remaining in close proximity.
- Seasonal behaviour of BMSB has shown that it is likely to arrive in NZ during the period from September to April, (corresponding to the Northern Hemisphere risk period) and unlikely to arrive from May to August.
- BMSB breeds, feeds and shelters on plants during the summer season where it is found. At this time of the year it is not likely to be attracted to, or be found on vehicles and machinery, except for short periods while moving between feeding sources.
- BMSB aggregates and finds overwintering locations in the Northern Hemisphere during autumn (fall) in response to day-length cues. During autumn and winter, large groups of BMSB aggregate together in sheltered locations.
- This aggregation results in large numbers of bugs sheltering in such places as garages, hollow trees, houses or warehouses; and in the structure of vehicles and machinery.
- Environmental conditions in NZ mean that BMSB is likely to establish in NZ if it arrives from around September to April, and is unlikely to establish from May to August.
- BMSB that arrive from May through to the end of August in NZ are unlikely to survive as they will encounter winter conditions (short days and low temperatures). Additionally, the range of suitable food such as fruit on host plants will be much less abundant.
- MPI's interception records show an increase in the number of BMSB found since 2015. This is the result of increasing numbers of BSMB in an expanding range of countries, MPI's increasing ability to detect BMSB, and the focus on detecting them at the NZ border
- NZ and Australian interception records have shown that the majority of BMSB arrive on inanimate items during the northern hemisphere autumn and winter period as above, and this confirms the biological information above. By contrast, very few BMSB have ever been intercepted in NZ or Australia during the northern hemisphere spring and summer period (May to August). Australian and NZ interception records align well and BMSB research shared with MPI supports that MPI data and records are reliable.

In summary, while it is possible that there are BMSB that have not been detected at the NZ border, the pattern of interceptions do not provide evidence to justify MPI imposing mandatory treatment or management of these pathways for the NZ autumn/winter period (from the beginning of May to the end of August).

The likelihood of BMSB being found on any part of the imported vehicles, machinery and equipment pathway during the NZ autumn/winter period is insignificant, and MPI considers establishment at that time is so low as to be considered negligible.

Therefore, requiring treatment measures for BMSB during this autumn/winter period is not scientifically justified nor of operational value. MPI considers that the data gathered and the advice from experts such as Dr Nielsen supports that treatment and management measures should only be applied over the winter-window risk period (from the 1st of September to 30th of April of any year) for imported vehicles, machinery or equipment from any Northern Hemisphere country where BMSB is considered to be a risk. In this regard, the Import Health Standard includes the treatment and management measures for BMSB from the 1st of September to the 30th of April for relevant Northern Hemisphere countries only.

5.8 Changes to the IHS Regarding General Categories of Biosecurity Contaminants and Regulated Pests

Schedule 2, Table 1 in the 2017 draft version of the IHS has also been modified and re-formatted to be consistent with other MPI IHSs and provides more clarity to importers. It is now included as Schedule 2 of the 2017 draft version of the IHS having been moved from the GD.

The first major change relates to dead bees initially being considered as regulated contaminants. However, MPI scientific analysis has determined that are no plausible scenarios whereby dead bees found in imported vehicles or machinery would be problematic. The finding was that dead bees would not harbour viable pathogens at an infectious dose rate and they would not come into direct contact with bee hives in NZ. Sporadic findings of dead bees in imported vehicles or machinery is not a feasible introduction or exposure pathway for exotic honey bee pathogens or pests to enter NZ.

The second and third major changes are that MPI specifies in the current Guidance Document that 5 pieces of dead, desiccated plant material are not considered to be regulated contaminants. This basic information was repeated in the 2015 draft IHS with some minor wording changes and examples. The 2017 version of the IHS now provides more clarification mentioning "small" pieces of loose dead or dry plant material (and provides examples). The acceptable number of contaminants remains at 5. Finally, additional wording mentions that burnt, dried or scorched material associated with exhaust systems and radiators are not seen as contaminants as they have been repeated exposed for a variety of time periods to heating that meets or exceeds MPI's heat treatment requirements for such material.

Industrial information referenced below lists that the normal temperature range for a vehicle's radiator is approximately 90 – 95^{o}C, whereas the exhaust system temperature at the manifold end ranges from 370 to 540^{o}C and the temperature at the muffler end is approximately 260^{o}C. Such temperatures would be replicated in engines and exhaust systems of machinery.

References to these temperature ranges include:

- https://www.enginebasics.com/,
- https://itstillruns.com/,
- http://depts.washington.edu/vehfire/ignition/autoignition/surftemper.html, http://www.enginesens.com/html/exhaust_gas_temp.html

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