Ministry for Primary Industries
Manatū Ahu Matua

Risk Management Proposal:
Actinidia Plants for Planting

FOR PUBLIC CONSULTATION

23 March 2018

New Zealand Government

Growing and Protecting New Zealand

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Table of Contents

Submissions **3**

Summary **4**

1. Introduction **7**

1.1 Objective 7

1.2 Purpose 7

1.3 Background 7

1.4 Commodity description 7

1.5 Format of the standard 8

1.6 Scope of this risk management proposal 9

2. Context **10**

2.1 Domestic 10

2.2 International 11

2.3 Strength of measures 11

3. Risk management approach **12**

3.1 Source information 12

3.2 Risk management measures 12

4. Proposed risk management measures for *Actinidia* plants for planting **16**

4.1 Proposed requirements for screening for regulated pests 16

4.2 Proposed requirements for post entry quarantine 20

4.3 Summary of regulated pests 22

5. Feasibility and practicality of proposed requirements **30**

5.1 Import permit 31

Appendix 1: **33**

Submissions

The Ministry for Primary Industries (MPI) invites comment from interested parties on the proposed new import health standard for *Actinidia* Plants for Planting (i.e. nursery stock). The proposed import health standard is supported by this risk management proposal.

The purpose of an import health standard is defined as follows in section 22(1) of the Biosecurity Act 1993 (the Act): "An import health standard specifies requirements that must be met to effectively manage risks associated with importing risk goods, including risks arising because importing the goods involves or might involve an incidentally imported new organism".

MPI must consult with interested parties in accordance with section 23 of the Act and MPI's consultation policy before issuing or amending an import health standard under section 24A of the Act. MPI therefore seeks formal comment on the proposed import health standard.

The following points may be of assistance in preparing comments:

- Wherever possible, comments should be specific to a particular section/requirement of the standard;
- Where possible, reasons, data and supporting published references to support comments are requested;
- The use of examples to illustrate particular points is encouraged.

MPI encourages respondents 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);
- Your address.

Send submissions to: plantimports@mpi.govt.nz.

If you wish to forward submissions in writing, please send them to the following address.

Plant Imports
Plants, Food & Environment
Ministry for Primary Industries
PO Box 2526
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New Zealand

All submissions must arrive by close of business on Friday 4 May. Submissions received by the closure date will be considered during the development of the final standard. Submissions received after the closure date may be held on file for consideration when the issued standard is next revised/reviewed.

Official Information Act 1982

Please note that your submission is public information and it is MPI policy to publish submissions and the review of submissions on the MPI website. Submissions may also 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.

Summary

(1) This summary gives an overview of the proposed import requirements for *Actinidia* plants for planting (nursery stock), as identified in the draft Import Health Standard: *Actinidia* Plants for Planting (hereafter referred to as 'the standard').

(2) The standard sets the requirements for importing new varieties of kiwifruit (including kiwiberry) into New Zealand for breeding or production.

(3) It is important to note that it is the requirements of the standard that are the subject of public consultation. This risk management proposal supports the standard and should be read in full, and in conjunction with the standard, to give an effective understanding of the rationale behind the proposed import requirements and of the import health standard development process undertaken by MPI.

Background

(4) *Actinidia* plants for planting have not been eligible for import since the previous import health standard was suspended in September 2013.

(5) MPI has developed new import requirements for *Actinidia*, based on information in the MPI Import Risk Analysis for "*Actinidia* Plants for Planting (tissue culture)", and is undertaking public consultation on the draft standard.

Scope of the standard

(6) The only goods which will be eligible for import are tissue cultures and dormant cuttings:

a) Tissue cultures will be deflasked into a greenhouse where they will be screened for regulated pests before they become eligible for a biosecurity clearance;

b) Dormant cuttings must only be used to generate tissue cultures which will then be deflasked into a greenhouse for disease screening. The cuttings themselves will never receive a biosecurity clearance and must be destroyed once tissue cultures have been generated.

(7) Restricting the commodity type to tissue cultures allows pathogens that would be not be present on tissue cultures to be excluded from the import pathway. This allowed import requirements to be developed within a relatively short time, and also means that there will be less biosecurity risk associated with imported *Actinidia* plants that will be held in a post entry quarantine greenhouse in New Zealand.

(8) The requirements listed above are discussed in Part 1.4 of this risk management proposal.

Format of the standard

(9) The standard has been prepared as a stand-alone document that includes only the requirements for *Actinidia*, and uses the standardised format that was developed as part of the MPI Requirements and Guidance Programme.

(10) This format was designed to ensure that MPI requirements are easy to understand, and developed in a clear and consistent way. The same format will be used when MPI develops or reviews import requirements for plants for planting of other horticultural species.

(11) Appendix 3 of the standard includes a list of regulated pests of *Actinidia* plants for planting. This list is intended to be incorporated into the MPI electronic database (ePest) in the future, and will be removed from the standard when this is done.

Screening for regulated pests

(12) The approach taken when developing phytosanitary requirements for *Actinidia* plants for planting is similar to that applied to other horticultural species under the existing Import Health Standard 155.02.06: Importation of Nursery Stock. However, this is the first new standard for plants for planting to be developed in recent years, and also the first since the post entry quarantine facility standard was re-issued in 2016.

(13) As such, MPI has incorporated more stringent pest screening requirements into the standard, including measures that have not yet been used for other commodity types. This includes applying specific environmental conditions to increase the likelihood of detecting certain regulated pests in post entry quarantine. In MPI's view, this represents a significant step forward in terms of increasing the likelihood of detecting regulated pests (particularly fungi) in imported plants.

(14) Part 2.3 of the standard describes the screening requirements that will apply for all *Actinidia* plants for planting, as follows:

a) Plants will be screened for signs and symptoms of pests and disease over two growing seasons (each of nine months) and a two month period of dormancy in between seasons;

b) Plants will be exposed to spring-, summer- and autumn-like conditions throughout each growing season;

c) During the summer-like conditions of the first growing season, plants will be exposed to additional environmental conditions that are known to be conducive to growth and/or symptom expression of certain regulated pests of *Actinidia*.

(15) Methods used to screen for regulated pests include the following:

a) Two plant health inspections per week, by the operator of the facility holding the plants, for the duration of the quarantine period;

b) Ten plant health inspections by an MPI Inspector;

c) Pre-determined testing (for example using polymerase chain reaction [PCR] or culture-based techniques) to detect specified regulated pests (as identified in Table 1 of the standard);

d) Diagnostic testing as required to identify any disease symptoms that are observed during plant health inspections.

(16) The measures described above are discussed in Part 4.1 of this risk management proposal.

Post entry quarantine

(17) Plants will be held in a post entry quarantine greenhouse whilst disease screening is being undertaken. This will prevent any regulated pests escaping into the wider environment.

a) The greenhouse must be approved under the MPI Facility Standard: Post Entry Quarantine for Plants;

b) Plants must be held in a Level 3B greenhouse for the first growing season, but may be transferred to a Level 3A greenhouse for the second season.

(18) The proposed requirements for post entry quarantine are discussed in Part 4.2 of this risk management proposal.

Offshore risk management

(19) Part 1.8 of the standard gives three options for importing *Actinidia* plants for planting into New Zealand, as follows:

a) Plants may be produced under an *Export Plan*;

b) Plants may be produced at an *Offshore Facility*;

c) Plants may be produced in any way other than the options listed above.

(20) When plants are produced using one of the first two options listed above, phytosanitary measures for some (or all) regulated pests listed in the standard will be applied prior to export, and MPI will recognise these measures as meeting the requirements of the standard. Depending on what measures were applied prior to export, there will be fewer disease screening requirements in New Zealand. This means that that the time taken for disease screening in New Zealand may be shorter, and/or may be done in a lower level of quarantine greenhouse.

(21) MPI may require plants produced using one of the first two options to undergo audit testing on arrival in New Zealand to verify the effective application of offshore phytosanitary measures. If this is the case, this testing will be done in a post entry quarantine facility after the plants arrive in New Zealand.

(22) When plants are produced in any other way, all of the measures described in Part 2.3 of the standard will need to be applied in post entry quarantine in New Zealand.

(23) More detail about options for offshore risk management are provided in Part 3.2.1 of this risk management proposal.

Feasibility and practicality of proposed requirements

(24) MPI recognise that restricting the scope of the standard to tissue cultures may result in some limitations in the varieties that can be imported in cases where tissue cultures are not available. This is why dormant cuttings are eligible for import, for the purpose of producing tissue culture which will then be deflasked for disease screening. It is acknowledged that the quarantine process will take longer if tissue cultures need to be generated in New Zealand.

(25) *Actinidia* germplasm has previously been imported into New Zealand as tissue cultures. This highlights that this is a feasible means of import for members of the *Actinidia* genus.

(26) MPI acknowledge that the environmental conditions proposed in the standard may have an adverse effect on plant health. However it is considered important to impose these conditions in order to give the greatest certainty that plants released into New Zealand will be free from regulated pests.

(27) Plants that are multiplied during the quarantine period will not be subject to these environmental conditions. As such, if desired, large numbers of plants derived from parental plants (that were exposed to these conditions) will be eligible for biosecurity clearance at the end of the quarantine period.

1. Introduction

1.1 Objective

(28) MPI's objectives in developing an import health standard for *Actinidia* Plants for Planting are to:

a) Reopen the pathway for the import of *Actinidia* plants for planting into New Zealand, to give the New Zealand kiwifruit industry access to new, disease free germplasm;

b) Ensure that the known biosecurity risk from regulated pests associated with imported *Actinidia* plants for planting is managed appropriately;

c) Allow a period of time in post entry quarantine to allow the expression of any unknown risk organisms.

1.2 Purpose

(29) The purpose of this risk management proposal is to:

a) Summarise the known biosecurity risks that may be associated with imported *Actinidia* plants for planting;

b) Show how the measures proposed in the standard will effectively manage known biosecurity risks, and are consistent with New Zealand's domestic legislation and international obligations;

c) Provide information to support the consultation on the draft import health standard (hereafter referred to as '*the standard*').

(30) The risk management proposal is not itself the subject of consultation. However, MPI will accept comments and suggestions on the risk management proposal in order to improve future consultations on import health standards.

1.3 Background

(31) Imports of *Actinidia* plants for planting were suspended on 6 September 2013 because the MPI Chief Technical Officer (CTO) determined that the biosecurity risks associated with *Actinidia* could no longer be effectively managed under the existing import health standard 155.02.06: Importation of Nursery Stock.

(32) After the import health standard was suspended, MPI intended to review and reissue the standard following the completion of a risk analysis and public consultation.

(33) This work was put on hold in 2014 due to resource constraints, however MPI has subsequently received requests from industry, and from the National Plant Protection Organisation (NPPO) of Italy, to re-assess the import requirements for *Actinidia* germplasm. Work on import health standard development resumed in June 2017.

1.4 Commodity description

(34) The standard applies only to permitted species of *Actinidia* plants for planting (including kiwifruit and kiwiberry) that are listed in the MPI Plants Biosecurity Index (PBI). Interspecific hybrids of all permitted species will be eligible for import provided that every species in the parentage is identified with the full scientific name (genus and species).

(35) The following plant parts are proposed as eligible for import:

a) Tissue cultures derived from aerial plant parts:

i. The standard defines tissue cultures as 'plants *in vitro* that have been prepared as tissue culture from one parent by asexual reproduction (clonal techniques) under sterile conditions';

ii. "Plants *in vitro*" is defined as 'a commodity class for plants growing in an aseptic medium in a closed container' (in ISPM 5: *Glossary of phytosanitary terms*);

iii. The tissue cultures must be derived from aerial plant parts. The standard will not specify the type of aerial plant parts that may be used, but this can include tissue cultures derived from stems, shoots, leaves, terminal and axillary buds, flowers, petiole segments, anthers, pollen, seeds, embryos and endosperm;

iv. Tissue cultures derived from root or basal stem tissues close to the soil level will not be eligible for import.

b) Dormant cuttings imported solely for the purpose of generating tissue cultures:

i. Dormant cuttings have been included in the standard for the sole purpose of allowing tissue cultures to be generated in a post entry quarantine tissue culture facility in New Zealand;

ii. The option to import dormant cuttings for the purpose of initiating tissue cultures in New Zealand has been included to allow import of cultivars of *Actinidia* that are not available as tissue cultures from offshore sources. Once the tissue cultures have been generated, the cuttings from which they were derived will be disposed of using the approved quarantine waste system;

iii. Tissue cultures derived from the imported dormant cuttings will be deflasked and be screened for regulated pests in a post entry quarantine greenhouse in New Zealand;

iv. The same risks will be associated with domestically generated tissue cultures as with those of offshore origin. Hence the hazard identification, risk analysis and proposed risk management requirements apply equally to all *Actinidia* tissue cultures regardless of whether they were generated in New Zealand or offshore.

c) The type of material which will be screened for regulated pests is restricted to plants in tissue culture (which will be deflasked into a greenhouse). This restriction allows numerous pathogens that are not known to be present within tissue cultures to be excluded from the risk analysis, simplifying the risk analysis and making it easier to evaluate import requirements.

(36) Reference is made to '*Actinidia* plants for planting' throughout this document. When this phrase is used, it applies only to the commodity type that was considered when developing this standard (i.e. tissue cultures). The phrase does not apply to any other types of *Actinidia* plants for planting (such as whole plants, cuttings, pollen, or seeds).

1.5 Format of the standard

(37) MPI welcomes comment on the proposed format of the standard:

a) The standard has been prepared as a stand-alone document that includes only the requirements for *Actinidia* plants for planting;

b) The document uses the standardised format that was developed as part of the MPI Requirements and Guidance Programme. This format was designed to ensure that MPI requirements are easy to understand, and developed in a clear and consistent way;

c) The format differs considerably from that used in the existing import health standard for Importation of Nursery Stock (which contains the import requirements for all other species of nursery stock eligible for import into New Zealand);

d) MPI intend to transition other import health standards for high value crops (which are currently included in the existing import health standard for importation of nursery stock) to the proposed new format when the import requirements for these species are reviewed.

(38) Rather than using the term 'nursery stock', the commodity type is referred to as 'plants for planting'. This change has been made to be consistent with the terminology used in the International Standards for Phytosanitary Measures (ISPM's) as follows.

a) 'Plants for planting' is defined in ISPM 5: *Glossary of phytosanitary terms* as 'Plants intended to remain planted, to be planted or replanted'*;*

b) 'Planting' is defined as 'Any operation for the placing of plants in a growing medium, or by grafting or similar operations, to ensure their subsequent growth, reproduction or propagation'.

(39) Parts 1 – 3 and the appendices of the standard set out all biosecurity requirements for importing this commodity. The Introduction to the standard, and any information contained within guidance boxes, does not form part of the legal requirements, and is intended to provide general information in regards to the standard.

(40) Parts 1 and 3 of the standard describe 'general requirements' and 'phytosanitary inspection and certification requirements', respectively. Requirements in these Parts will remain unchanged in subsequent standards that are developed for high value crops, regardless of the commodity being imported.

(41) Part 2 of the standard describes specific requirements that will apply only to *Actinidia* plants for planting. This part of the standard will change in subsequent standard, to reflect the commodity-specific requirements.

(42) When the standard has been finalised, a guidance document will be produced. This document will give background information to assist in meeting the requirements, but will not form part of the legal requirements of the standard.

1.6 Scope of this risk management proposal

(43) This risk management proposal includes:

a) A summary of regulated pests associated with *Actinidia* plants for planting;

b) A description of the risk management measures proposed to manage these regulated pests;

c) A discussion on the feasibility and practicality of the proposed risk management measures included in the standard.

2. Context

2.1 Domestic

(44) Plant health is a key component of New Zealand's biosecurity system. The biosecurity system is regulated through the Biosecurity Act 1993. Section 22 of the Act describes an import health standard and outlines the types of matters that should be considered in an import health standard.

(45) MPI is the government authority responsible for maintaining biosecurity standards for the effective management of risks associated with the importation of risk goods into New Zealand (Part 3, Biosecurity Act 1993).

(46) The biosecurity system in New Zealand operates a series of components (pre-border, border and post border) that together provide a high level of assurance that pests are unlikely to establish in New Zealand. No one part of the system is able to achieve the necessary assurance on its own.

(47) No biosecurity system is capable of reducing risk to zero. The objective of New Zealand's biosecurity system is to reduce to an acceptable level the likelihood of unwanted impacts occurring. Within this system, the objective of an import health standard is to effectively manage the risks associated with imported goods in order to reduce to an acceptable level the likelihood of entry and establishment of regulated pests (including pests, diseases and weeds).

(48) An organism is 'regulated' by MPI if it could cause unacceptable consequences (i.e. likely to cause unacceptable economic, environmental, socio-cultural or human health impacts in New Zealand) if it were to enter and establish in New Zealand, provided the organism is:

a) Not present in New Zealand; or

b) If present in New Zealand is under official control; and

c) Is able to establish and spread in New Zealand.

(49) Organisms that are present in New Zealand may also be regulated, when found in association with imported goods, if they are known vectors of regulated pests.

(50) The focus of an import health standard for plant-based goods is to manage phytosanitary risks before the goods arrive at the New Zealand border. The expectation is that, to the greatest extent possible, consignments of plants and plant products meet New Zealand's phytosanitary import requirements on arrival (i.e. risk is managed off-shore).

(51) In the case of plants for planting, regulated pests can survive in living plant material that does not show any signs of infection. Therefore, if specified in an import health standard, plants for planting must enter post entry quarantine and be screened to verify that they are free from regulated pests before receiving a biosecurity clearance. The standard may allow such screening to be done either offshore, or after the plants arrive in New Zealand.

(52) MPI monitors the pathway performance related to each import health standard to ensure biosecurity risks are effectively managed. This is achieved through verification and inspection activities at the border and, where necessary, audits of offshore production systems.

(53) MPI is committed to the principles of transparency and evidence-based technical justification for all phytosanitary measures, new and amended, imposed on importing pathways.

2.2 International

(54) Where possible, phytosanitary import requirements are aligned with international standards, guidelines, and recommendations[1] as per New Zealand's obligations under Article 3.1 of the World Trade Organisation (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures; WTO, 1995 (SPS Agreement).

(55) The SPS Agreement sets 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.

(56) In keeping with New Zealand's obligations under the SPS Agreement and the IPPC (International Plant Protection Convention), phytosanitary measures must:

a) Be scientifically justified and only for regulated pests. The strength of any phytosanitary measure will depend on the assessment of risk, with an emphasis on the consequences of the pest establishing in New Zealand;

b) Not discriminate unfairly between countries or between imported and domestically produced goods;

c) Not be more trade restrictive than required;

d) Be based on international standards wherever possible, but WTO members can adopt a measure that is more stringent than an international standard, provided the measure is scientifically justified.

2.3 Strength of measures

(57) Measures are required for regulated pests where the 'probability of introduction and spread' on a pathway is unacceptable (i.e. if a regulated pest is able to enter through the pathway, find a suitable host, and establish and spread in New Zealand).

(58) The greater the risk a pest will cause unwanted harm, the greater the level of assurance MPI requires that the pest is managed in a consignment. The required strength of a measure depends on the risk posed by a particular regulated pest on a particular pathway and is determined by a combination of the consequences the pest may cause if it was introduced into New Zealand and the likelihood that the pest will enter and establish from a pathway.

(59) Plants for planting are one of the most high risk pathways for the inadvertent introduction of pests and diseases to new areas. Part of the reason for this is that plant pests can survive in living plant material that does not show any signs of infection/infestation, and the living plant material may allow the pests to establish. Because plants imported for planting may be multiplied and/or widely distributed throughout the country, including in key areas of commercial production, the likelihood of pests surviving and being transferred to suitable domestic hosts is higher than for many other import pathways. This is why, if required in an import health standard, plants for planting must be screened for regulated pests before they are cleared for entry into New Zealand.

[1] Note that international standards, guidelines or recommendations referred to in the WTO agreement are those of Codex, OIE (World Organisation for Animal Health) and the IPPC.

3. Risk management approach

(60) This Part of the risk management proposal includes a description of the information used to develop the standard, and describes the types of risk management measures that may be applied to plants for planting that are imported into New Zealand.

3.1 Source information

(61) The following information was used to identify risk organisms associated with *Actinidia* plants for planting, and to evaluate the appropriate measures to manage their entry and establishment in New Zealand:

a) MPI risk analyses;

b) Import health standard 155.02.06: Importation of Nursery Stock;

c) Information from domestic stakeholders;

d) The MPI emerging risk database;

e) Relevant literature (scientific journals, webpages, books, databases etc.);

f) Information received from the requesting NPPO;

g) Interception records (MPI).

3.2 Risk management measures

(62) Risk management measures that may be considered when developing an import health standard for plants for planting are discussed below. These measures can be applied either before export (i.e. pre-border) or at the New Zealand border.

(63) As noted earlier in this document, plants for planting present a particularly high biosecurity risk, including for the following reasons (taken from ISPM 36: *Integrated measures for plants for planting*):

a) Some pests do not cause distinct visual symptoms, particularly at low pest incidence;

b) Symptoms of infestation may be latent or masked at the time of inspection (e.g. as a result of pesticide use, nutrient imbalances, dormancy of plants at time of dispatch, presence of other non-regulated pests or by removal of symptomatic leaves);

c) Small insects or eggs may be hidden under bark or scales of buds etc.;

d) The type of packaging, size and physical state of the consignment can influence the effectiveness of inspection;

e) Detection methods for many pests, particularly pathogens, may not be available.

(64) Based on the above, when importing many types of plants for planting, greater emphasis is put into measures that are applied at the border (including post entry quarantine) than for other commodity types.

(65) Where possible, an import health standard will include options to manage risk offshore.

3.2.1 Pre-border measures

(66) Generic pre-border risk management measures that may be applied include:

a) Commercial production to reduce pest prevalence, including production of tissue cultures;

b) Treatment for regulated insects, mites, nematodes and/or fungi;

c) Official pre-export inspection and phytosanitary certification by the NPPO of the exporting country to verify that pre-export measures have been undertaken and were effective, and that the consignment is free from visibly detectable regulated pests.

(67) As well as the generic risk management measures, specific measures may be applied offshore to manage risk associated with some, or all regulated pests that are listed in an import health standard for plants for planting.

(68) The option for measures to be applied offshore is included in Part 1.8 of the standard, which allows *Actinidia* plants for planting to be produced according to an *Export Plan*, or at an *Offshore Facility* (see Parts 3.2.1.1 and 3.2.1.2 of this risk management proposal).

(69) When specific measures are applied offshore, the plants for planting are likely to have fewer disease screening requirements on arrival in New Zealand:

a) The requirements for screening for regulated pests on arrival in New Zealand, along with the level of post entry quarantine and the length of the quarantine period will depend on the number and type of phytosanitary measures that have been applied offshore;

b) These measures will be evaluated when an *Export Plan* is agreed, or when an *Offshore Facility* is approved;

c) Phytosanitary requirements that must be applied in New Zealand will be identified in the import permit for each consignment (as discussed in Part 5.1 of this risk management proposal).

(70) Audit testing may be required after plants arrive in New Zealand to verify the effective application of phytosanitary measures that were applied prior to export. If audit testing is required, plants may need to be held in a post entry quarantine facility until testing is completed. Any audit testing requirements will be identified when MPI agrees on an *Export Plan* or approves an *Offshore Facility*.

3.2.1.1 Production according to an Export Plan

(71) An *Export Plan* is an agreement between MPI and the NPPO of the exporting country that describes all activities that support the effective application of phytosanitary measures that are applied prior to export.

a) An *Export Plan* will not be agreed upon until a CTO is satisfied that the *Export Plan* meets New Zealand's expectations for biosecurity;

b) An *Export Plan* must be agreed before imports can commence;

c) Any countries with an *Export Plan* for *Actinidia* plants for planting will be identified in the MPI e-Pest database;

d) There are no *Export Plans* in place for *Actinidia* plants for planting at the time of writing this risk management proposal.

(72) A combination of the following measures may be included in an *Export Plan* to manage biosecurity risk associated with some, or all, of the regulated pests associated with *Actinidia* plants for planting:

a) Country freedom, where a CTO is satisfied that a country has country freedom status in relation to a particular pest. To ensure country freedom, measures described in ISPM 8: *Determination of pest status in an area* and ISPM 4: *Requirements for the establishment of pest free areas* must be applied by the exporting country;

b) Production in a pest free area, using systems to establish and maintain freedom as described in ISPM 4: *Requirements for the establishment of pest free areas*;

c) Pest free place of production under the supervision of the NPPO of the exporting country, as described in ISPM 10: *Requirements for the establishment of pest free places of production and pest free production sites*;

d) The use of Integrated measures for plants for planting under the supervision of the NPPO of the exporting country, as described in ISPM 36: *Integrated measures for plants for planting*.

3.2.1.2 Production in an MPI approved offshore facility:

(73) MPI can approve an *Offshore Facility* to undertake some (or all) of the screening for regulated pests that would otherwise be done in post entry quarantine in New Zealand;

(74) Offshore facilities must be approved to the MPI Standard PIT-OS-TRA-ACPQF: Accreditation of Offshore Plant Quarantine Facilities and Operators;

(75) More information about offshore facilities, and the process for approval of an *Offshore Facility*, can be found on the MPI website at http://mpi.govt.nz/news-and-resources/resources/registers-and-lists/offshore/;

(76) There are no approved offshore facilities for *Actinidia* plants for planting at the time of writing this risk management proposal.

3.2.2 Measures at the border

(77) Measures and verification activities that are applied at the border include:

a) Inspection of documents to verify that the phytosanitary certificate, and other associated documents, comply with the requirements of the standard;

b) Inspection of plants at the place of first arrival to verify freedom from visible pests. For horticultural crops, it is expected that all plants will be inspected at the border;

c) Remedial action (for example treatment) if a regulated pest is detected during the on-arrival inspection, or if any required treatments were not applied prior to export;

d) Screening plants for regulated pests in a post entry quarantine facility, using some or all of the following measures:

i. Growth under environmental conditions conducive to disease development;

ii. Inspections for signs and symptoms of regulated pests;

iii. Diagnostic testing to verify whether a regulated pest is present in plants showing signs or symptoms of diseases;

iv. Pre-determined testing (for example using biological indexing, microbial culturing, or polymerase chain reaction [PCR]).

(78) The following factors are considered when determining the disease screening measures that will be applied, the length of the quarantine period, and/or the type of post entry quarantine facility in which the plants must be held:

a) Likelihood of entry of a regulated pest on a particular import pathway:

i) Whether a particular regulated pest is likely to be associated with the plant parts being imported (for example seeds vs. tissue cultures vs. bulbs vs. whole plants);

ii) Presence or absence of the quarantine pest in the exporting country;

iii) Whether material is produced under an *Export Plan* or at an *Offshore Facility*;

iv) Available treatment methods (for example fungicide, insecticide or other treatment before plants enter PEQ).

b) Pathogen biology:

i. Mode of transmission;

ii. Whether vectors are present (or likely to be present) in New Zealand;

iii. Whether vectors are likely to be present in close proximity to the PEQ facility;

iv. Whether the same (or related) species as the imported plants, or other known host species, are likely to be present in close proximity to the PEQ facility;

v. Epidemiological characteristics.

c) Available disease screening methods (for example growing season inspection, biological indexing, PCR);

d) Likelihood of establishment of a quarantine pest via an import pathway;

e) Potential environmental, economic, human health and/or socio-cultural consequences of establishment.

4. Proposed risk management measures for *Actinidia* plants for planting

(79) This section of the risk management proposal includes the following:

a) A description of the proposed requirements for screening for regulated pests;

b) A description of the proposed requirements for post entry quarantine including the length of the quarantine period and the level of post entry quarantine greenhouse in which *Actinidia* plants for planting must be held;

c) A summary of all regulated pests (or groups of regulated pests) and a description of the disease screening measure(s) that are proposed for each pest.

(80) All of the measures described in this section will be required for plants that are not produced under an *Export Plan*, or at an *Offshore Facility*. Plants that are produced using one of these options will have fewer requirements on arrival in New Zealand because some, or all of the required measures will have been applied prior to export.

(81) For each consignment of *Actinidia* plants for planting, the phytosanitary measures that need to be applied in New Zealand will be identified on the import permit, as discussed in Part 5.1 of this risk management proposal.

4.1 Proposed requirements for screening for regulated pests

(82) All *Actinidia* plants for planting will be screened for regulated pests as described in Part 2.3 of the standard.

(83) Screening will consist of a combination of some or all of the following measures, depending on the characteristics of the regulated pest:

a) Exposing plants to specific environmental conditions conducive to disease development;

b) Regular plant health inspections to detect any signs or symptoms of regulated pests;

c) Specific testing (for example using polymerase chain reaction (PCR) or culture based identification to detect regulated pests.

4.1.1 Environmental conditions

(84) Part 2.3.1 of the standard identifies the environmental conditions under which *Actinidia* plants for planting must be grown. This is intended to increase the likelihood of detecting disease organisms either directly (by inducing expression of visible disease symptoms), or indirectly (by increasing the titre of an organism before samples are taken for pre-determined testing).

(85) Growing plants under conditions conducive to disease development is listed as a general requirement that may be considered for post entry quarantine facilities in ISPM 34: *Design and operation of post-entry quarantine stations for plants*, and is recognised as a risk management measure in ISPM 36: *Integrated measures for plants for planting*. This measure was recommended for further investigation by Johnson (2014)[2] to increase the possibility of detecting organisms that may be present on plant material imported into New Zealand, and to further reduce overall biosecurity risk.

[2] Johnson, N. (2014). Barriers to importation of plant germplasm. https://www.mpi.govt.nz/dmsdocument/6949-barriers-to-importation-of-plant-germplasm.

(86) Where possible, the environmental parameters described in the standard are based on conditions known to be conducive to growth and/or symptom expression of regulated pests of *Actinidia* plants for planting. While these conditions may not be optimal for every regulated pest, applying these conditions should increase the efficacy of disease screening.

(87) Exposing plants to a wide range of environmental conditions in post entry quarantine will also maximise the likelihood of symptom expression of new disease organisms, and allow more effective management of biosecurity risk associated with these organisms.

(88) It is proposed that all *Actinidia* plants for planting should be subjected to the conditions described in the following sections (included in Part 2.3.1 of the standard).

4.1.1.1 Spring-like conditions for three months

(89) At the start of each growing season, plants must be held for three months at a daytime temperature range between 18°C and 21°C and night time temperatures between 15°C and 18°C.

(90) This temperature range is generally considered conducive to the detection of viral diseases (either directly when symptoms are expressed, or indirectly by testing). In particular, *Pelargonium zonate spot virus* is known to show symptoms early in spring, which may disappear in summer. Similarly, the bacterium *Pseudomonas syringae* pv. *actinidiae* is more likely to be detected when plants are grown under cool conditions.

(91) The three month period of growth under spring-like conditions during the first growing season will be long enough to ensure that there is sufficient plant growth to enable the first batch of samples to be taken for pre-determined testing (see Part 4.1.3).

4.1.1.2 Summer-like conditions for four months

(92) Following the spring-like conditions, plants must be held for four months at a daytime temperature range between 21°C and 25°C and night time temperatures between 18°C and 21°C (except when plants are being held as described in clause (94)).

(93) This is conducive to the expression of symptoms of certain fungal diseases (including *Verticillium nonalfalfae* and some of regulated fungi listed in Appendix 1), and will also provide conditions suitable for detecting phytoplasmas.

(94) During the summer-like period in the first growing season, it is proposed that plants should be exposed to the following additional environmental conditions:

a) A continuous 28 day period at a minimum relative humidity of 85% (whilst temperatures are maintained at 21°C to 25°C). During this time, plants must be subjected to continuous misting for two 48 hour periods. There must be at least two weeks between each misting period;

b) High humidity in conjunction with warm temperatures and sustained leaf wetness will encourage the expression of foliar symptoms of fungal infection. In the absence of specific data for some of the fungi that are regulated on *Actinidia*, applying these conditions is considered an effective way to increase the likelihood of disease symptom expression.

(95) A continuous four week period with a daytime temperature range between of 25°C and 30°C, and night time temperatures above 20°C. Plants must continue to be held at a minimum relative humidity of 85% during this time:

a) These conditions are conducive to symptom expression and growth of the oomycete species that are regulated on *Actinidia* plants for planting and should increase the likelihood

of detecting *Ceratocystis fimbriata*, *Pectobacterium carotovorum subsp. actinidiae* and some of the fungal genera listed in Appendix 1;

b) This regime must be applied after plants have been exposed to conditions described in paragraph (94)a).

(96) It is suggested that the additional environmental conditions should be applied part way through the summer growth period (for example during the second and third months). This will allow plants to re-acclimatise to growth at lower temperatures before autumn-like conditions are applied.

(97) The conditions described in paragraph (94) are only required in the first growing season, although plants will continue to be closely inspected for signs and symptoms of disease throughout the second growing season.

4.1.1.3 Autumn-like conditions for two months

(98) Plants must be held for two months at a temperature range between 15°C and 18°C for the autumn-like period of each growing season although lower temperatures may be applied at night time.

(99) It is considered important for plant health to expose plants to autumn-like temperatures prior to transitioning into dormancy to mimic the natural seasonal cycle.

4.1.1.4 Dormancy for two months

(100) Plants must be held dormant (at around 4°C) for two months at the end of the first growing season to ensure that there is a clear separation between seasons, and to mimic the natural seasonal cycle.

4.1.2 Plant health inspections

(101) All plants must be regularly inspected throughout the quarantine period, as described in Part 2.3.3 of the standard, to detect the expression of any disease symptoms, and to identify any regulated pests, as soon as possible.

4.1.2.1 Inspections by the post entry quarantine facility operator (or nominated delegate)

(102) The facility operator (or a nominated delegate) must inspect all plants for signs and symptoms of pests and diseases two times per week for the duration of the quarantine period:

a) As stated in the post entry quarantine facility standard, if plants are bagged and held in cool storage for dormancy, inspections are not required during this time;

b) It is a requirement of the post entry quarantine facility standard that accurate records must be kept of all inspections;

c) The facility standard also describes actions that must be taken following the detection of a pest or disease in post entry quarantine.

(103) Information about inspections by the operator is given in part 3.6.1 of both the MPI Facility Standard: Post Entry Quarantine for Plants and the Guidance Document: Post Entry Quarantine for Plants. Part 3.7 of these documents includes information about reporting timeframes and actions to be taken by the facility operator if a disease organism is detected in post entry quarantine.

4.1.2.2 Inspections by the MPI inspector

(104) The MPI inspector must inspect all plants in the post entry quarantine greenhouse for signs and symptoms of regulated pests and disease at regular intervals throughout the quarantine period.

(105) A total of ten inspections will be done by the inspector (five in each growing season):

a) During the first growing season, inspections should be completed as follows:

i. Inspection 1: within 14-28 days of plants entering a state of active growth in the Level 3B greenhouse;

ii. Inspection 2: during the final 14 days of the three month period of spring like growth in the first growing season;

iii. Inspection 3: when plants are being grown between 21°C and 25°C with relative humidity above 85% and after at least one 48 hour period of leaf wetness;

iv. Inspection 4: either during the final seven days of the 28 day period at 25°C to 30°C, or in the seven days immediately following the completion of this period;

v. Inspection 5: during the final 28 days of growth under autumn-like conditions.

b) Inspections will be done at similar times in the second growing season. However, timings may be slightly different because the specific environmental conditions required in the summer of the first growing season are not needed in the second season.

(106) Information about inspections by the MPI inspector is given in part 3.6.2 of the MPI Facility Standard: Post Entry Quarantine for Plants and the Guidance Document: Post Entry Quarantine for Plants.

4.1.3 Testing for regulated pests

(107) All plants will require testing to verify freedom from regulated pests as follows:

a) Diagnostic testing:

i. Diagnostic testing may be undertaken when disease symptoms become evident on a plant in post entry quarantine to verify the regulatory status of the organism causing the symptoms;

ii. Depending on the type of symptoms, samples may be tested for the presence of various classes of disease organism, including bacteria, fungi, oomycetes, phytoplasmas, viroids and viruses;

iii. The exact diagnostic test(s) that will be done will be decided on by the MPI inspector, and by staff at the diagnostic facility. This will depend on the type of disease symptom(s) that are present.

b) Pre-determined testing:

i. This is required for all regulated pests listed in Table 1 of the standard, regardless of whether or not the plant is showing signs or symptoms of pests or disease;

ii. Pre-determined testing is required to provide additional assurance that a consignment is free from particularly high risk regulated pests, and/or if it is recognised that growing season inspection may not effectively manage the risk (e.g. when it is known that a particular regulated pest has a prolonged latent period).

(108) All testing must be done in a diagnostic facility accredited to the MPI Standard 155.04.03: A standard for diagnostic facilities which undertake the identification of new organisms, excluding animal pathogens.

4.2 Proposed requirements for post entry quarantine

(109) On arrival in New Zealand, all *Actinidia* plants for planting will require post entry quarantine in a greenhouse accredited to the MPI Facility Standard: Post Entry Quarantine for Plants, as described in Part 2.4 of the standard. The purpose of this is to ensure that any regulated pests that are imported in association with *Actinidia* plants for planting do not escape into the wider environment whilst plants are being screened for these pests.

a) The facility standard sets the operational and structural requirements for post entry quarantine facilities;

b) All facilities are regularly audited by MPI to ensure ongoing compliance with all relevant standards.

(110) The quarantine period and level of post entry quarantine are discussed in the following sections.

4.2.1 Quarantine period

(111) *Actinidia* plants for planting will require 20 months post entry quarantine before they will become eligible for a biosecurity clearance (unless they are produced under an *Export Plan* or from an *Offshore Facility*, as described in Part 3.2.1 of this risk management proposal).

a) This is the minimum amount of time that will be required to screen plants for regulated pests;

b) During this time the plants will have two complete growing seasons, with one period of dormancy in between the first and second growing seasons;

c) Factors which were considered when determining the length of the quarantine period are discussed below.

(112) It is now known that in addition to systemic pathogens (including viruses, phytoplasmas and bacteria), fungal and oomycete disease organisms may also be transmitted through plants in tissue culture.

a) There is limited evidence about how long it will take for disease symptoms to be expressed in greenhouse plants that are derived from infected tissue cultures. If fungi or oomycete disease organisms are present in tissue culture, it is probable that they would initially be at very low levels, and it could take some time for a disease organism to multiply and colonise host tissue, and induce symptoms in deflasked plants. As such, a single growing season may not be long enough for disease symptoms to become evident;

b) The quarantine period must be long enough to ensure that, when combined with other risk management measures (such as pre-determined testing and/or the application of specific environmental conditions), risk will be effectively managed before a biosecurity clearance is issued.

(113) The two growing season period combined with the application of specific environmental conditions and pre-determined testing for high risk organisms is intended to maximise the likelihood of detecting regulated pests and hence minimise biosecurity risk. This amount of time is not considered prohibitively long given the potential impacts that new regulated pests could have on the kiwifruit industry, other industries or on the wider environment, if they established in New Zealand.

(114) As well as managing known risk, post entry quarantine is an important measure by which new risk organisms or new host associations are identified on the plants for planting pathway. There are multiple examples of new host associations being identified in plants in post entry quarantine in New Zealand, including examples of virus detection in *Actinidia*. This highlights the need for the quarantine period to be long enough to allow organisms which may be at very low concentrations, and for which no tests are available, to build up sufficiently to induce symptoms.

(115) MPI accept that there is a high level of uncertainty to consider when setting a post entry quarantine period. The proposed quarantine period of 20 months provide a high likelihood of detecting any disease organisms that are present in imported plants for planting, while at the same time being a balanced approach in terms of not imposing overly restrictive quarantine requirements.

(116) MPI has an active project examining the likelihood of fungal and oomycete disease organisms being present on the tissue culture pathway. Import requirements for *Actinidia* plants for planting will be re-evaluated if new evidence is found about the likelihood of these organisms being present in tissue culture.

4.2.2 Level of post entry quarantine

(117) It is proposed that all tissue cultures should be deflasked into a Level 3B quarantine greenhouse for disease screening in the first growing season. In the second growing season, the importer may elect to transfer plants to a Level 3A greenhouse for the remainder of the quarantine period.

4.2.2.1 Level 3B post entry quarantine greenhouse

(118) A Level 3B post entry quarantine greenhouse is the most secure level of quarantine facility under the MPI Facility Standard: Post Entry Quarantine for Plants. This level of facility can contain highly mobile spore-dispersed organisms, which is considered particularly important in the first growing season. This is because plants will be of an unknown phytosanitary status (aside from being visually inspected by the NPPO of the exporting country prior to export) and will be exposed to environmental conditions that may be conducive to the production of dispersal structures such as windborne spores.

(119) The first growing season will be used to verify freedom from high risk disease organisms including *Ceratocystis fimbriata*, *Phytophthora* spp., *Pseudomonas syringae* pv. *actinidiae* and *Pectobacterium carotovorum* subsp. *actinidiae*. These organisms require containment in a Level 3B greenhouse because of their means of dispersal, and/or because of the potential high impact of these regulated pests.

(120) Pre-determined testing for all organisms listed in Table 1 of the standard will also be done while plants are in the Level 3B greenhouse.

4.2.2.2 Level 3A post entry quarantine greenhouse

(121) Quarantine in a Level 3A greenhouse for the second growing season is considered to correspond with the level of residual risk associated with *Actinidia* plants for planting for the following reasons:

a) Screening for highly mobile and particularly high risk disease organisms, along with all pre-determined testing, will have been done in the first growing season, so the plants will no longer be of unknown phytosanitary status;

b) Plants will have been regularly inspected for disease symptoms over the previous nine months, with remedial action (e.g. treatment) taken if any regulated pests are identified.

(122) Although risk will be lower in the second growing season, it is recognised that sporulating organisms (which may not be contained within a Level 3A greenhouse based solely on the physical requirements for this level of facility) could still be present in the imported plants. However, the following operational measures are considered sufficient to manage this risk during the second season:

a) Regular plant health inspections (twice per week) must be completed by the post entry quarantine facility operator in order to detect any disease symptoms as soon as practical;

b) Contingency plans must be developed to describe actions that will be taken to contain any spore-borne disease organisms within the facility in the event that disease symptoms are observed;

c) Operational restrictions must be applied to minimise the likelihood of spores being dispersed outside the PEQ facility. In particular, overhead irrigation will be prohibited; this will minimise the chances of fungi which are aerially dispersed (e.g. by rain splash) from escaping from the facility.

(123) Level 3A post entry quarantine greenhouses must be fitted with a mechanically ventilated heating and cooling system. This will enable relevant environmental conditions to be maintained throughout the second growing season.

(124) If a request is made to transfer plants to a Level 3A greenhouse, this will only be allowed if:

a) All environmental conditions were applied as required in the first growing season;

b) All pre-determined testing was completed during the first growing season;

c) Remedial actions were taken to manage the risk associated with any regulated pests that were detected in the first growing season, including verification that any remedial actions were effective.

4.3 Summary of regulated pests

(125) This part of the risk management proposal summarises all regulated pests identified on the *Actinidia* plants for planting pathway and identifies the measures that are proposed to manage each regulated pest.

4.3.1 Insects and mites:

(126) MPI did not identify the types of insects and mites that may be present on *Actinidia* plants for planting. This is because the generic risk management measure of transferring plants into tissue culture and multiplying these plants *in vitro* is expected to reduce to an acceptable level the likelihood of insects or mites being present for the following reasons:

a) Selection and processing of healthy mother plant material will minimise the likelihood of insects or mites being transferred into tissue culture;

b) If any insects or mites were present they would be visibly detectable, and/or would be likely to contaminate growing medium with bacteria or fungi that are associated with their activity;

c) Contaminated cultures would be discarded as a normal part of *in vitro* plant management;

d) Discarding contaminated cultures would remove any insects or mites.

(127) Dormant cuttings can be imported to generate tissue cultures that will go through post entry quarantine because:

a) The current measures for treatment of insects or mites on dormant cuttings, included in the Import Health Standard 155.02.06: Importation of Nursery Stock, will manage risks

associated with any insects or mites that may be present on dormant cuttings of *Actinidia*. These measures are included in Appendices 1 and 2 of the standard;

b) These treatments will be applied prior to export. The NPPO of the exporting country will verify that the correct treatments were applied on the *Disinfestation and/or Disinfection Treatment* section of the phytosanitary certificate;

c) Once the tissue cultures have been generated, the measures described in paragraph (126) will manage any residual risk from insects or mites that may be imported in association with dormant cuttings, as will disposal of cuttings in the quarantine waste.

4.3.2 Fungi

(128) Twelve species of fungi were identified as regulated pests on *Actinidia* plants for planting, as discussed in the following sections.

4.3.2.1 *Ceratocystis fimbriata*

(129) Screening for two complete growing seasons is considered appropriate to manage the risk associated with *C. fimbriata*, provided that the following measures are applied:

a) Plants must be exposed to environmental conditions conducive to expression of symptoms of infection with *C. fimbriata* (described in paragraph (95));

b) Plants must be regularly inspected for signs and symptoms of *C. fimbriata* throughout the quarantine period. This must include at least two inspections per week by the facility operator and regular inspections during the growing season by the MPI inspector;

c) Plant samples must be tested for *C. fimbriata* by PCR, using stem samples collected at the end of the first summer growth period.

(130) The measures described above are considered justified because:

a) *C. fimbriata* causes severe symptoms on *Actinidia* plants, with annual mortality rates of up to 30%, and the death of most affected plants. Infected plants have reduced fruit size and lower production;

b) *C. fimbriata* could also cause significant disease on other plant genera of environmental and/or economic significance in New Zealand.

(131) The proposed screening is likely to result in effective detection of the pathogen because:

a) When *Actinidia* plants were held in a greenhouse at temperatures between 18°C to 35°C following inoculation with *C. fimbriata*, multiple inoculated plants died during the 60 day experiment, and there was significant xylem discolouration in all inoculated plants. In the same study, plants held at lower temperatures (26°C±3°C) in a growth chamber had less mortality and less xylem discolouration;

b) Pre-determined testing using is required as well as growing season inspection, to increase the likelihood of detecting *C. fimbriata*, given that it is not known how long it would take for plants derived from tissue culture to show symptoms.

4.3.2.2 *Verticillium nonalfalfae*

(132) Screening for two complete growing seasons is considered appropriate to manage the risk associated with *V. nonalfalfae* provided that the following measures are applied:

a) Plants must be regularly inspected for signs and symptoms of *V. nonalfalfae* throughout the quarantine period.

b) Plant samples must be tested for *V. nonalfalfae* by PCR or by culture-based identification, using stem samples collected during the first summer growth period before plants are exposed to temperatures above 25°C.

(133) The measures described above are considered justified because *V. nonalfalfae* causes severe symptoms on *Actinidia* plants, with up to 80% mortality in some orchards.

(134) The proposed screening is likely to result in effective detection of the pathogen because:

a) In general, diseases caused by *V. nonalfalfae* are favoured by moderate temperatures and supressed by higher temperatures;

b) Experimental inoculation of one-year old *Actinidia* plants held at 24°C with 16 hours of light per day induced characteristic wilting on 90% of plants within eight weeks of inoculation;

c) Pre-determined testing using PCR or by culture-based identification is required as well as growing season inspection, to increase the likelihood of detecting *V. nonalfalfae.* This is because it is not known how long it would take for plants derived from tissue culture to show symptoms, and because plants infected with *V. nonalfalfae* may be asymptomatic.

4.3.2.3 All other regulated fungi (listed in Appendix 1:)

(135) Screening for two complete growing seasons is considered appropriate to manage the risk associated with the ten species of regulated fungi listed in Appendix 1:, provided that the following measures are applied:

a) Plants must be exposed to environmental conditions that are conducive to expression of symptoms of fungal disease as described in paragraph (94)a) and (95) of this risk management proposal;

b) Plants must be regularly inspected for signs and symptoms of fungal disease throughout the quarantine period.

(136) The measures described above are considered justified because:

a) *Actinidia* is a very important crop in New Zealand, meaning that even a low level of impact can translate to a very high financial cost and/or high socio-cultural impacts;

b) There is always uncertainty around the potential impacts of a disease organism in a new environment. The fungal species listed in Appendix 1: may not be major pathogens in the environment in which they were first detected, however it is considered important to effectively manage the risk associated with these organisms. This is because the imported plants (or their progeny) will be grown in commercial production areas (making it highly likely that any regulated pests associated with the plants will establish), and because of the high level of uncertainty around the impacts these regulated pests could have in New Zealand.

(137) The proposed screening is likely to result in effective detection of these pathogens because:

a) The environmental conditions that must be applied during post entry quarantine are known to be conducive to symptom expression for some of these pathogens;

b) For other species, there is little (or no) information about what conditions are conducive to disease development. However, because the conditions that will be applied are generally known to be conducive to fungal disease development, this will maximise the likelihood of detecting these fungi.

4.3.3 Oomycetes

(138) Four species of oomycetes were identified as regulated pests on *Actinidia* plants for planting, as follows:

4.3.3.1 *Phytophthora drechsleri* and *Phytophthora palmivora*

(139) Screening for two complete growing seasons is considered appropriate to manage the risk associated with *P. drechsleri* and *P. palmivora*, provided that the following measures are applied:

a) Plants must be exposed to environmental conditions conducive to expression of symptoms of infection with these species of *Phytophthora* (see paragraph (95) of this risk management proposal);

b) Plants must be regularly inspected for signs and symptoms of *P. drechsleri* and/or *P. palmivora* throughout the quarantine period;

c) Plant samples must be tested using PCR or by culture-based identification, using stem samples collected at the end of the summer growth period.

(140) The measures described above are considered justified to manage the pathogens because:

a) *P. drechsleri* can cause severe symptoms on *Actinidia* plants, including leaf chlorosis, scorch and defoliation, root and stem rot coupled with eventual death of infected vines;

b) *P. palmivora* has similar effects, including crown and root rots and necrotic lesions under the bark resulting in eventual death of infected vines.

(141) The proposed screening is likely to result in effective detection of these pathogens because:

a) In greenhouse experiments, two year old *Actinidia* seedlings that were inoculated with *P. drechsleri* and incubated at 24°C to 30°C showed symptoms of root rot and defoliation 10 days after inoculation;

b) In greenhouse experiments, artificial inoculation of root tissue of 8 month old *Actinidia* seedlings with *P. palmivora* induced leaf necrosis and defoliation and a 40% reduction in roots two months after inoculation; plants were maintained at 25°C to 30°C in the daytime, and above 20°C at night;

c) PCR testing or culture-based identification is required as well as growing season inspection to increase the likelihood of detecting *Phytophthora* spp., because it is not known how long it would take for plants derived from tissue culture to show symptoms.

4.3.3.2 *Phytopythium helicoides* and *Phytopythium vexans*

(142) Screening for two complete growing seasons is considered appropriate to manage the risk associated with *P. helicoides* and *P. vexans*, provided that the following measures are applied:

a) Plants must be exposed to environmental conditions conducive to expression of symptoms of infection with *Phytopythium* spp. (see paragraph (95) of this risk management proposal);

b) Plants must be regularly inspected for signs and symptoms of *P. helicoides* and/or *P. vexans* throughout the quarantine period;

c) Plant samples must be tested using PCR or culture-based identification using stem samples collected at the end of the summer growth period.

(143) The measures described above are considered justified to manage the pathogens because:

a) *P. helicoides* causes leaf curl and necrosis followed by plant decline and death, as well as root and collar rot. Disease incidence of up to 38% has been reported on *Actinidia* in China;

b) *P. vexans* has been recorded in Turkey as causing root and collar rot, leaf curling and necrosis and general plant decline. Pathogenicity testing on one-year old potted kiwifruit induced symptoms on over 65% of inoculated plants within 40 days;

c) *Phytopythium litorale*, which has similar optimal and maximum growth temperatures has established in New Zealand.

(144) The proposed screening is likely to result in effective detection of these pathogens because:

a) The *Phytopythium* genus is characterised by high optimal growth temperatures. An optimal temperature of 34°C was reported in culture for strains of *P. helicoides* from kiwifruit, and hyphal growth occurred within a 7°C to 42°C temperature range. *P. vexans* has a similarly wide growth range (between 4°C and 37°C);

b) Pre-determined testing using PCR or culture based identification is required as well as growing season inspection to increase the likelihood of detecting *Phytopythium* spp., given that it is not known how long it would take for plants derived from tissue culture to show symptoms.

4.3.4 Bacteria

(145) Four species of bacteria were identified as regulated pests on *Actinidia* plants for planting, as discussed in the following sections:

4.3.4.1 *Acidovorax valerianellae*

(146) Screening for two complete growing seasons is considered appropriate to manage the risk associated with *A. valerianellae*, provided that the following measures are applied:

a) Regular growing season inspections to detect signs or symptoms of infection with *A. valerianellae*.

(147) The measures described above are considered justified and sufficient to manage the pathogen because this is a newly recorded disease which so far has only been reported from *Actinidia* in Korea and there is no information about the potential impact.

(148) The proposed screening is likely to result in effective detection of these pathogens because:

a) Disease symptoms associated with *A. valerianellae* increase as the temperature and relative humidity increase;

b) Although there is no specific information about what environmental conditions lead to optimal pathogen development, reports from other hosts suggest that symptom development is rapid;

c) Plants will be held under high temperature and relative humidity in post entry quarantine, and will be regularly inspected for disease symptoms during this time.

4.3.4.2 *Pectobacterium carotovorum* subsp. *actinidiae*

(149) Screening for two complete growing seasons is considered appropriate to manage the risk associated with *P. carotovorum* subsp. *actinidiae*, provided that the following measures are applied:

a) Plants must be exposed to specific environmental conditions conducive to expression of symptoms of infection with *P. carotovorum* subsp. *actinidiae* (see paragraph (95) of this risk management proposal);

b) Plants must be regularly inspected for signs and symptoms of *P. carotovorum* subsp. *actinidiae* throughout the quarantine period;

c) Plant samples must be tested using PCR or culture-based identification, using samples that are collected at the end of the summer growth period.

(150) The measures described above are considered justified to manage the pathogen because *P. carotovorum* subsp. *actinidiae* causes sudden leaf blight and die back or blight on young canes and severe infection can kill plants.

(151) The proposed screening is likely to result in effective detection of *P. carotovorum* subsp. *actinidiae* because:

a) This organism has a high optimal growth temperature (above 25°C), and disease symptoms become evident in summer;

b) Testing is required as well as growing season inspection to increase the likelihood of detecting *P. carotovorum* subsp. *actinidiae* given that it is not known how long it would take for plants derived from tissue culture to show symptoms.

4.3.4.3 *Pseudomonas syringae* pv. *actinidiae*

(152) Screening for two complete growing seasons is considered appropriate to manage the risk associated with *P. syringae* pv. *actinidiae*, provided that the following measures are applied:

a) Plants must be grown under specific environmental conditions conducive to growth of *P. syringae* pv. *actinidiae* as described in paragraphs (89) and (90) of this risk management proposal;

b) Plants must be regularly inspected for signs and symptoms of *P. syringae* pv. *actinidiae* throughout the quarantine period;

c) Plant samples must be tested for *P. syringae* pv. *actinidiae* by PCR, using leaf samples that are collected after plants have been grown at 18°C to 21°C for at least two months, and before plants are exposed to higher temperatures.

(153) The measures described above are considered justified to manage the pathogen because:

a) *P. syringae* pv. *actinidiae* causes leaf spotting, flower wilt, bacterial ooze (red exudate), cankers and cane die-back. Infection can lead to vine death and results in significant production losses;

b) Although one biovar of *P. syringae* pv. *actinidiae* (Psa3) is present in New Zealand, this biovar is under official control. Other virulent strains are not present in New Zealand, and can have significant impacts.

(154) The measures described above are likely to result in effective detection of the pathogen because:

a) *P. syringae* pv. *actinidiae* has a low optimal growth temperature meaning that disease symptoms are likely to be expressed under the spring-like conditions proposed for disease screening;

b) Testing by PCR is required as well as growing season inspection because P. *syringae* pv. *actinidiae* can be found as a contaminant of tissue culture, and may be asymptomatic. Furthermore, there is evidence that disease symptoms may not become evident in the field during the first two to three years of infection.

4.3.5 Phytoplasmas

(155) Phytoplasmas belonging to the 16SrI (aster yellows), 16SrXII (stolbur) and 16SrX (apple proliferation) groups were identified as risks on *Actinidia* plants for planting.

(156) Screening for two complete growing seasons is considered appropriate to manage the risk associated with these organisms, provided that the following measures are applied:

a) Plants must be regularly inspected for signs and symptoms of phytoplasma infection throughout the quarantine period;

b) Plants must undergo specific PCR testing for phytoplasmas using samples that are collected towards the end of the summer growth period.

(157) The measures described above are considered justified because phytoplasmas have been associated with symptoms including premature reddening of the leaves with downward curling and crinkling.

(158) The measures are likely to result in effective detection of phytoplasmas because.

a) Any disease symptoms arising from phytoplasma infections will be identified during growing season inspections;

b) PCR testing is required to detect any asymptomatic infections.

4.3.6 Viruses

(159) Three species of virus were identified as regulated pests on *Actinidia* plants for planting, as discussed in the following sections:

4.3.6.1 *Actinidia chlorotic ringspot-associated virus* (AcCRaV)

(160) Post entry quarantine for 20 months with two complete growing seasons is considered appropriate to manage the risk associated with AcCRaV, provided that the following measures are applied:

a) Regular inspection for signs and symptoms of AcCRaV throughout the quarantine period;

b) Plant samples must be tested for AcCRaV by PCR, using leaf samples that are collected after plants have been grown in spring-like conditions for at least two months (see clause (89)).

(161) The measures described above are considered justified because AcCRaV is a newly described virus and it is not known whether it is likely to cause production losses or other damage, or if it will have synergistic interactions with other virus species.

(162) The proposed screening is likely to result in effective detection of the virus because:

a) Any disease symptoms caused by the virus will be detected in post entry quarantine;

b) PCR primers will be used to detect any asymptomatic infections.

4.3.6.2 *Pelargonium zonate spot virus* (PZSV)

(163) Post entry quarantine for 20 months with two complete growing seasons is considered appropriate to manage the risk associated with PZSV, provided that the following measures are applied:

a) Plants must be regularly inspected for signs and symptoms of PZSV throughout the quarantine period;

b) Plant samples must be tested for PZSV by PCR and by herbaceous indexing using the indicators *Chenopodium quinoa*, *Nicotiana benthamiana*, *N. glutinosa* and *N. tabacum*. These tests must be done using leaf samples that are collected after plants have been grown in spring-like conditions for at least two months (see clause (89)), and before plants are exposed to summer-like conditions.

(164) The measures described above are considered justified to manage the virus because PZSV can induce severe symptoms on kiwifruit.

(165) The proposed screening is likely to result in effective detection of the virus because:

a) Symptoms of PZSV appear early in spring under conditions similar to those proposed for disease screening;

b) PCR testing is required in addition to growing season inspection because the virus has been isolated from symptomless *Actinidia* leaves.

c) Herbaceous indexing is required to provide a higher degree of confidence that all strains of the virus will be detected.

4.3.6.3 Tomato necrotic spot associated virus (TNSaV)

(166) Screening for two complete growing seasons is considered appropriate to manage the risk associated with TNSaV, provided that the following measures are applied:

a) Regular inspection for signs and symptoms of TNSaV throughout the quarantine period;

b) Plant samples must be tested for TNSaV by PCR, using leaf samples that are collected after plants have been grown in spring-like conditions for at least two months.

(167) The measures described above are considered justified to manage the virus because TNSaV is a newly described virus and it is not known whether it is likely to cause production losses or other damage:

(168) The proposed screening is likely to result in effective detection of the virus because:

a) Any disease symptoms caused by the virus will be detected in post entry quarantine;

b) PCR primers will be used to detect any asymptomatic infections.

5. Feasibility and practicality of proposed requirements

(169) Tissue cultures (or plants derived from tissue cultures) are the only plant parts that will be able to receive a biosecurity clearance under the standard.

a) The scope of the import risk analysis, and the standard, was restricted to tissue cultures. This allowed numerous pathogens that would be not be present on tissue cultures to be excluded from the import pathway, so allowed import requirements to be finalised within a relatively short time;

b) It was considered important to re-open the import pathway to help the New Zealand kiwifruit industry have access to new varieties of *Actinidia*;

c) *Actinidia* plants for planting have previously been imported into New Zealand as plants in tissue culture, meaning that this is expected to be a feasible pathway for import;

d) Because some cultivars may not be available in tissue culture, the standard allows the import of dormant cuttings to initiate tissue cultures in New Zealand. This means that there should be not be any undue restrictions on the cultivars that can be imported. It is recognised that it will take longer for new cultivars to receive a biosecurity clearance if tissue cultures need to be generated in New Zealand.

(170) A key risk management measure in the standard is the application of environmental conditions that will be conducive to the expression of disease symptoms. In particular, this includes exposing plants to high humidity, high leaf moisture levels, and high temperatures in the summer-like period of the first growing season:

a) MPI recognise that this may encourage the growth of non-regulated disease organisms of local origin, which could result in increased costs (if these organisms need to be identified). However, contamination with local origin organisms in the first growing season will be minimised because all air entering the Level 3B post entry quarantine greenhouse must be filtered through fine dust filters (which will exclude most disease propagules);

b) These environmental conditions may not be optimal for plant growth. This means that an extra period of growth may be required during the first growing season to develop plants to a stage where this treatment will not have an unacceptable adverse effect on plant health, or to allow resumption of growth after the conditions have been applied;

c) This risk management measure is required because the most rapid disease development usually occurs when environmental conditions, in particular moisture and temperature, are optimal for development of the particular disease organism. These conditions are not necessarily optimal for the growth of the plant itself (Agrios, 2005)[3]. Any tissue culture plants that are multiplied during the disease screening period will not be exposed to these environmental conditions, meaning that only plants that are deflasked into the greenhouse for inspection and testing would be affected;

d) MPI acknowledge that additional equipment (for example a misting system) may be needed to effectively maintain some of the required conditions in the first growing season;

e) All operating manuals for greenhouses that hold *Actinidia* plants for planting will include a description of the conditions that will be applied during each growing season, and how these will be monitored, maintained and recorded. The operating manual must be approved by

[3] Agrios, G.N., 2005. Plant Pathology. 5th eds. Department of Plant Pathology. University of Florida. United States of America.

MPI before plants can be transferred to the greenhouse. This will help to ensure that conditions are maintained correctly throughout the quarantine period.

(171) Plants will remain in post entry quarantine for a minimum of 20 months before they will become eligible for a biosecurity clearance.

a) Plants can be multiplied during the post entry quarantine period. This may be done either in the Level 3B greenhouse (if sufficient space is available), in a Level 3A greenhouse in the second growing season, or by multiplying tissue cultures in a Level 3 tissue culture facility. This means that large numbers of plants, especially tissue cultures, could be available for release by the time a biosecurity clearance is issued;

b) When plants are obtained from an *Offshore Facility*, or in accordance with an Export Plan, there may be fewer post entry quarantine requirements on arrival in New Zealand. This means that the quarantine period may be shorter, as described in Part 3.2.1.

5.1 Import permit

(172) As described in Part 1.6 of the standard, the import permit will identify:

a) The regulated pests for which screening is required in New Zealand;

b) The minimum quarantine period (based the regulated pests for which screening is required in New Zealand);

c) The level of post entry quarantine greenhouse and/or tissue culture laboratory in which consignments must be held (based the regulated pests for which screening is required in New Zealand).

(173) Listing these requirements on the import permit is considered the best way to clearly identify the phytosanitary measures that will be required for each consignment of *Actinidia* plants for planting after they arrive in New Zealand. This is because when plants are produced under an *Export Plan* or are obtained from an *Offshore Facility*, some phytosanitary measures will have been applied prior to export. However, the exact measures which are applied will differ between facilities.

(174) If plants are obtained from any other source, the import permit will indicate that all phytosanitary measures described in the standard must be applied after plants arrive in New Zealand, namely that:

a) Plants must undergo all screening described in Part 2.3 of the standard on arrival in New Zealand before they can become eligible for a biosecurity clearance;

b) The minimum quarantine period will be 20 months, although this may be extended if regulated pests are detected;

c) Plants must be deflasked and held in a Level 3B greenhouse for the first growing season;

d) Plants may be transferred to a Level 3A greenhouse for the second growing season provided that all pre-determined testing has been completed with negative test results returned and plants were effectively treated for any regulated pests that were detected during the first growing season (as described in Part 4.2.2.2);

e) The post entry quarantine facility(s) in which the plants must be held will be identified on the import permit.

(175) If plants are obtained under an *Export Plan*, or from an approved facility, some of the required phytosanitary measures will have been applied prior to import. In this case, the import permit will identify the residual requirements that must be applied in New Zealand, including:

a) The requirements of Part 2.3 that must applied in New Zealand;

b) The minimum quarantine period;

c) The level of post entry quarantine greenhouse;

d) In this case, the length of the quarantine period and type of post entry quarantine greenhouse will depend on the specific regulated pests for which phytosanitary measures have been applied prior to export. This will be different for each *Export Plan* or *Offshore Facility*.

(176) The outcome of including the above details on the import permit will be that for all *Actinidia* plants for planting, regardless of source, all phytosanitary measures described in the standard will be applied before plants become eligible for clearance.

Appendix 1:

Summary of regulated fungi identified in the risk analysis for which risk management measures are described in Part 4.3.2.3

Disease organism	Notes
Colletotrichum simmondsii	- Recorded as an endophyte on *Actinidia*. - Causes fruit rots on various other plant genera including *Capsicum*, *Fragaria*, *Persea* and *Vaccinium*. *Vitis* is also recorded as a host.
Colletotrichum taiwanense	- Recorded on *Actinidia* in China as causing considerable blossom and fruit drop in 2011 and 2012. - This was the first report of *Actinidia* as a host of this species, no subsequent reports to date. - Inoculation on stems of detached fruit resulted in symptoms within four days when stems were held at 95% relative humidity and 25°C.
Corynespora cassiicola	- Recently recorded in China as causing extensive leaf necrosis and defoliation along with reductions in fruit quality and yield. - *C. cassiicola* is present in New Zealand, but has not been recorded on *Actinidia*. Six phylogenetic lineages have been described within *C. cassicola*, and there is evidence of host specificity within each lineage. - It is not certain which lineage has been identified on *Actinidia* in China, likewise it is not known whether the *Actinidia*-infecting lineage is present in New Zealand. - In the field, infected *Actinidia* plants showed severe symptom development at average temperatures of around 24°C and high humidity (90%).
Diaporthe tulliensis	- Recently isolated from severe stem cankers on *Actinidia chinensis* in China in 2015 and experimentally demonstrated to be virulent towards shoots and fruit. - Limited information available as the first record of *D. tulliensis* on *Actinidia* was in 2015, and it was co-isolated with two other species of *Diaporthe*, both of which are present in New Zealand and non-regulated. - Artificial inoculation of *D. tulliensis* on detached shoots of *A. chinensis* induced visible disease symptoms within seven days. - No information found about what conditions are conducive to disease development on *Actinidia*.
Erysiphe actinidiae var. *actinidiae* *Erysiphe actinidiae* var. *argutae*	- Both cause powdery mildew on leaves and stems of *Actinidia* spp. - Recorded from temperate to tropical regions, and likely to be able to establish in New Zealand. - Limited information on potential impact in New Zealand. - Disease symptoms likely to be expressed when plants are grown under humid conditions (e.g. >85% relative humidity) at temperatures between 23°C and 30°C.
Phyllosticta actinidiae	- Causes brown spot disease on leaves of *Actinidia* spp. and is recorded from Russia and China. - Appears to have a limited impact with no records found in relation to losses caused by this disease. - Very little information about biology of this organism. It is noted that the length of time taken for symptoms to be expressed can vary depending on the life cycle of the particular species of *Phyllosticta*.

Pseudocercospora actinidiae *Pseudocercospora hangzhouensis*	- Cause sooty mould on leaves and fruit dimples, along with post-harvest fruit softening and rotting. - Limited information about impacts, but members of this genus may be serious pathogens on other host species (e.g. citrus and avocado), classified by KVH as presenting a moderate threat. - Symptoms induced on plants within two months of inoculation with *P. actinidiae*.
Pucciniastrum actinidiae	- A host specific basidiomycete that causes rust symptoms on *Actinidia* spp. and is reported from China, Japan and Taiwan. - Little is known about impacts on *Actinidia*, however *Pucciniastrum actinidiae* it is considered to be capable of establishing in New Zealand. - Limited information about environmental conditions required for disease development of *P. actinidiae*. Information about other members of the genus indicates that in some cases disease symptoms appear within 11 days of infection (when plants were artificially inoculated and held in humid conditions at 20-25°C for 48 hours after inoculation), although symptom expression can take much longer (for example up to one year after field infection) for other members of the genus.