Tomato Potato Psyllid (TPP)
National
Management
Plan

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Version 2

Tomato Potato Psyllid (TPP) National Management Plan

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1.0	1/5/19	Completed by NTTP
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Acknowledgements

The National Management Plan was established through the National TPP Coordination project which is supported by a steering committee including representatives from the processors, wares and seed mini tubers sectors of the potato industry. It also includes representation from Plant Health Committee through Biosecurity SA. A special thanks to the potato growers and processors who provided frank and fearless feedback, and the robustness of this document is built on their experience and advice.

This National Management Plan was informed with the outcomes of the Transition to Management final report released in December 2018 by the Department of Primary Industries and Regional Development Western Australia. This included the finding of a literature review, results of surveillance monitoring, research into field trials for spray efficacy and biological controls.

The Plan was correct at the time of writing. Information should be checked with the relevant jurisdiction that regulations are unchanged from those described in the plan.

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1 Introduction to the Management Plan

Tomato Potato Psyllid (*Bactericera cockerelli*) (TPP) was detected in Western Australia on 3rd February 2017. On the 20th April 2017 the Consultative Committee on Emergency Plant Pests (CCEPP) agreed that it was not technically feasible to eradicate TPP and on the 20th April the National Management Group (NMG) initiated the move to a Transition to Management (T2M) phase, under the Emergency Plant Pest Response Deed (EPPRD).

The objectives of the T2M plan were:

1. Further determine the status of *Candidatus* Liberibacter Solanacearum (CLso)
2. Establish arrangements to mitigate the impact of TPP in Australia in relation to market access and trade.
3. Preparing the nation for a detection of CLso.

The Transition to Management plan commenced in September 2017 and completed in mid-May 2018.

This TPP National Management Plan (Management Plan) provides an overarching framework upon which jurisdictional operational plans are developed to mitigate against the commercial spread of TPP and ensure trade of produce continues between the jurisdictions. The Management Plan is underpinned by scientific evidence and risk based assessment developed by the National TPP Coordination Steering Committee (Appendix 1).

The Management Plan describes symptoms, identification and testing for the pest (TPP) and *Candidatus* Liberibacter solanacearum (CLso), for which TPP is the only known vector, and precautionary measures and disinfection procedures to prevent pest and Liberibacter spread. The Management Plan also outlines best practice approaches to farm biosecurity and provides a decision making tree to guide growers on best approaches should their crops become infested by TPP. Surveillance procedures to check for presence of TPP are also outlined.

Importantly, the Management Plan articulates agreed roles and responsibilities of governments, industry and other stakeholders to manage TPP in Australia. Finally the Management Plan highlights future research opportunities.

1.1 Purpose

The purpose of the Management Plan is to minimise the impact of TPP by:

(1) Preventing the spread of TPP to new regions;
(2) Reducing the impact of TPP on currently affected regions; and
(3) Minimising the impact of TPP on domestic and international trade.

1.2 Benefits

The Management Plan has benefits to individual growers and to the Solanaceae industry, including:

a. Containment of TPP to current areas of infestation;
b. Reduced production losses from TPP if the best practice measures are applied;
c. Limiting the spread of other pests and diseases through application of the best practice hygiene measures;
d. Support for continued access to markets, including international markets.

1.3 Elements

The key focus areas of the National Management Plan are:

- Early detection through monitoring for TPP;
- Identifying the scope of infestation ie. know where it is and where it isn't;

- Measures to prevent spread of TPP;
- Reducing the risk of overwintering between crops.
- Provide effective TPP management across the supply chain to ensure business continuity.

Growers need to consider the actions they need to undertake to mitigate against the infestation of TPP in a cost effective manner. Ideally, the requirements will fit in with existing hygiene practices and will not add significant cost or inconvenience to growers.

Growers need to document a "on farm" management plan on how they will meet the requirements, so that all their staff can be aware of their role in TPP management. The operational procedures need to identify what actions are taken, who is responsible for the action, when it will be done and how it will be done. For development of a farm management plan, growers can adopt or modify the guiding documents provided in Appendices 6-9.

1.4 Constraints

The management of TPP is similar to other sap sucking insects that can be managed provided:

a) Growers are monitoring for TPP and records kept for customer confidence
b) Growers undertake an audit of host plant and remove them around their properties to reduce overwintering opportunities;
c) Overseas evidence has shown that where TPP is then CLso will follow. However current evidence (report from DPIRD) is that the TPP in Western Australia does not have CLso. This is unique in the world.
d) Australia could have another detection for TPP in another location away from Western Australia which is not directly related to the Western Australian detection. The detection will need to be treated with the same care as the Western Australian detection. Hence the importance of all jurisdictions maintaining ongoing monitoring
e) A mandatory program for the management of TPP involving all Australian solanaceous crop growers is not feasible.

1.5 Endorsement and Implementation

The Management Plan will be endorsed by: the Australian Government, state and territory governments, Nursery & Garden Industries Australia (NGIA), AUSVEG Ltd, and the Australian Processing Tomato Research Council Inc.

All partners (in managing TPP) have a role and responsibility in building capacity to manage TPP. These partners include federal and state governments, as well as the 'at risk' industries. The "at risk" industries include, commercial growers of solanaceous crops and nurseries.

2 Context

The known global distribution of TPP includes Canada, USA, Mexico, Central America, New Zealand and Norfolk Island. Prior to its detection in Western Australia in February 2017, TPP had not been previously detected anywhere on mainland Australia and Tasmania.

TPP was first detected in Perth, Western Australia (WA), on 3rd February 2017. The Department of Agriculture and Food, Western Australia (DAFWA, now Department of Primary Industries and Regional Development DPIRD), implemented property quarantine measures to contain and manage TPP.

The EPPRD was actioned and other jurisdictions implemented trade bans on produce moving from Western Australia on all host material including "hitch hiker" plants, because there had been no monitoring for TPP prior

to its detection. During the T2M phase other jurisdictions have also implemented monitoring programs for TPP, and to date, TPP has not been found in any other jurisdictions.

In the months that followed the decision to move from eradication to management, several jurisdictions implemented special movement arrangements on tomato seedlings and nursery stock to ensure the supply chain was maintained for nurseries and tomato producers.

Since the completion of the Transition to Management phase, and WA demonstrating freedom from CLso, market access for potato tubers from Western Australia to the eastern states has been granted. Based on best available scientific advice, the likelihood of TPP being transmitted from an infested commercial production facility in Western Australia to commercial properties in other states or territories is minimal. All potatoes are sold directly to domestic markets for fresh or processing consumption. Seed potatoes (mini tubers) produced in regions that are affected by TPP are taken from properties that undertake TPP monitoring and are treated with a pyrethrum dust to kill all insects that may be "hitch hiking" on seed potatoes.

On 20th April 2017, the National Management Group (NMG), under the EPPRD for TPP, agreed that it was not technically feasible to eradicate TPP from Western Australia. This was due to the identification of a large geographical area where TPP was found during the initial monitoring program using sticky traps. Interestingly the number of TPP found on commercial Solanaceous crops was very low. Most detections found were in metropolitan Perth, in individual back yards and public lands such as parks and road sides.

In September 2017 the T2M program, managed by the Department of Primary Industries and Regional Development (DPIRD) commenced, with the following themes:

a. Surveillance and Operations
b. Managing TPP
c. Market Access and Trade
d. Research
e. Stakeholder Engagement.

a. Surveillance and Operations

All jurisdictions developed surveillance plans based on advice from the National Plant Health Surveillance committee. This is the ensure consistency, alignment with national and international standards to provide a level of confidence for claiming pest free status, especially if this becomes necessary for international trade.
All jurisdictions have undertaken monitoring programs in their respective areas especially during the spring, summer and autumn period. No TPP has been identified in any other jurisdictions. Western Australia has undertaken specifically targeted monitoring and collection of TPP to test for the existence of CLso in the trapped TPP. All monitoring has included a spring, summer and autumn trapping program. Even though large numbers of TPP have been tested in Western Australian and an independent interstate laboratory no CLso has been detected. The T2M program is due for completion in May 2018. The NMG will then consider what further actions need to be taken once a T2M report is delivered.

b. Managing TPP

A key outcome of the Transition to Management (T2M) phase will be a national management plan, which will provide an overarching framework on which jurisdictional plans can be managed.
Additionally Enterprise Management Plans for potatoes, tomatoes and the nursery industry will be developed and will be incorporated into the national management plan in Appendix 9.

c. Market Access and Trade

As Western Australia is the only jurisdiction currently affected, they have undertaken responsibility to minimise the impact of TPP on trade and harmonise national phytosanitary measures to provide an Appropriate Level of Protection (ALOP) for other jurisdictions in relation to moving host and non-host produce and nursery stock. Eastern jurisdictions, including Queensland, New South Wales, Victoria and South Australia.

d. Research

The research currently undertaken through the T2M includes:

1. To clearly identify native psyllid species from TPP
2. A literature review to contain the best available information from overseas, glass house/field Integrated Pest Management (IPM) practices, considerations of different crops and climates and spray management. Establish a list of effective chemicals
3. To evaluate the effectiveness of currently registered pesticides in the laboratory and the glasshouse against all life stages of TPP and submit data to APVMA for approval
4. Establish a TPP colony for ongoing research of management aids
5. Conduct trials for the use of Ethyl Formate as an effective post-harvest treatment for hosts of TPP
6. Establish a list of biological control agents for TPP with trials conducted in the laboratory and glasshouse.

e. Stakeholder engagement

Stakeholder engagement plans were developed for each jurisdiction and focus on raising awareness of TPP using agreed national themes and talking points. Key messages were updated during the T2M phase. All national stakeholders including, Plant Health Committee (PHC), state jurisdictions and industry bodies agreed that TPP was a pest of national significance in May 2017 and requiring the development of a national management plan for TPP. The National Management Plan is to be informed by the work carried out through the Transition to Management phase which was completed by May 2018.

In July 2018 the National Management Group accepted Western Australia's request for area freedom from CLso and Certificates of Freedom were issued by Western Australia. By December 2018 all other jurisdictions had granted market access for tubers from Western Australia.
In December 2018 the Plant Health Committee also issued a communique stating their commitment to ensuring business continuity for the movement of potato tubers across state borders for Queensland, South Australia, Victoria and New South Wales if TPP were found. This does not include TPP which is infected with CLso when the current EPPRD process would be actioned.

Further monitoring for TPP undertaken during 2018-19 has indicated TPP spreading to the east to take in Albany and Esperance.

3 Pest Characteristics

3.1 The insect

Internationally there are currently four haplotypes of TPP the western, central, north western and south western, which correlate with specific regions of North America. The TPP detected in Western Australia was identified as the western haplotype, which was previously found in western USA, Mexico, Honduras, Guatemala, New Zealand and Norfolk Island.

3.2 Lifecycle of TPP

Female tomato-potato psyllids mate 3-4 days after emerging as adults. They can mate more than once in their

lifetime of approximately 40 days. Each female can produce up to 500 eggs. Eggs hatch 3-9 days after being laid. Nymphs pass through five instars in 12-21 days depending on temperature, before becoming adults. The average lifecycle from eggs to adults takes 15-30 days.

Psyllids thrive at about 27 degrees C, while temperatures below 15 degrees C or above 32 degrees C adversely affect their development and survival. In conditions of average temperatures 4-5 generations per year could occur on outdoor host plants. In protected cropping facilities, tomato-potato psyllid development progresses rapidly between 15-32 degrees C. The lower temperature threshold for development is about 7 degrees C.

3.3 Hosts

TPP can reproduce on more than 60 Solanaceous plant species including cultivated and weedy plant species (Essig 1917; Knowlton and Thomas 1934; Pletsch 1947; Jensen 1954; Wallis 1955 & Butler & Trumble 2012). Australian native Solanaceous plant species may also be a host but remain to be tested.

Non crop plants that support TPP lifecycles include nightshades, ground cherry, African and Chinese Boxthorn. TPP can also maintain its lifecycle on some other wild and crop species from the Convolvulaceae including bindweed and sweet potato. A list of host plants for TPP can be found in Appendix 2 Table 1.

The current host list is under review following a request from industry stakeholders due to the economic impost for treatment required for non-host plants.

3.4 Hitch Hiker Plants

These are plants which TPP can move on but do not support any of the three stages of the TPP lifecycle.

3.5 *Candidatus* Liberibacter solanacearum (CLso)

TPP is the only own known vector for *Candidatus* Liberibacter solanacearum (CLso). This a phloem-limited, gram-negative, unculturable bacterium with five known haplotypes (A-E). CLso types A and B are associated with Solanaceae in Canada, USA, Mexico, Central America, New Zealand and Norfolk Island, while haplotypes C, D and E are associated with Apiaceae in Europe and wider Mediterranean region. The association of TPP with CLso was unknown until 2008 (Murphy et al 2014).

CLso is a horizontally transmitted by TPP, feeding first on an infected plant and then on healthy plants. Vertical transmission to progeny TPP does not occur. TPP nymphs and adults can only carry CLso if they feed on an infected plant.

The main economic impact of CLso is that it reduces the yield and quality of potato tubers, with fried chips processed from infected tubers exhibiting dark strips which is referred to as Zebra chip. . In addition to infecting potatoes, CLso also infects tomato, cape gooseberry, Jerusalem cherry, tamarillo, thornapple and sweet nightshade (Vereijssen et al 2015). Visual symptoms of CLso in potatoes are available in Appendix 2.

3.6 In-crop symptoms of TPP infestations

In-crop signs of tomato-potato psyllid include:

- Insects jumping from the foliage when disturbed (adult psyllids are sometimes called jumping plant lice as they readily jump and fly when disturbed) Psyllid yellows results in yellowing or purpling of foliage on potato plants caused by tomato potato psyllids feeding.
- Severe wilting of plants caused by high numbers of psyllids feeding.
- Yellowing of leaf margins and upward curling of the leaves caused by the injection of salivary toxins (called

psyllid yellows).

- Honeydew and psyllid sugar making the plants sticky and often appearing dirty.
- Shortening of stem internodes
- Stem death.

Examples of plant damage are documented in Appendix 2 and 9.

4 Managing TPP in Australia

4.1 Principles for Managing TPP

The following principles underpin the management of TPP in Australia:

a. TPP in Australia is managed in line with the principles of Australian and New Zealand Standard for Risk Management IS0 31000
b. TPP is a reportable pest in Australia
c. To whatever extent possible TPP will be managed by growers through best practice on farm biosecurity
d. Where required, government in collaboration with industry stakeholders will implement mitigation measures to reduce the risk of transmission of TPP to areas not infested with TPP

e. Industry, growers, governments and the public will work collaboratively to manage and monitor the impacts of TPP in Australia, through transparent communications and agreeing on strategies.

4.2 TPP is a Notifiable Pest

TPP is a notifiable pest in Australia. Growers are required to report any suspected detections of TPP to the Chief Plant Health Manager (CPHM) in their jurisdiction. If in an area or jurisdiction that is currently not infested with TPP, the CPHM will request the grower to provide evidence (sticky traps) and symptomatic plant material for testing. The CPHM will notify the Australian Chief Plant Protection Officer (ACPPO) and affected industries, if there is a confirmed positive diagnosis in accordance with the current jurisdictional diagnostic requirements. The period for the initial assessment is about 7 days. Reporting of new cases of TPP will be made when the detection changes area freedom or if TPP is detected on a previous unknown host.

Even though TPP has been identified in Western Australia, any incursion outside of Western Australia, in the first instance, needs to be assessed as a "new" incursion until testing has been completed to determine if it is directly linked. It will also be necessary to undertake a trace back exercise to establish the origin and pathway for future learnings.

For the Eastern Block jurisdictions (Queensland, New South Wales South Australia and Victoria) there is a commitment from the relevant CPHM from the respective jurisdictions to ensure movement of potato tubers so that business continuity is assured.

4.3 Management of Risk Pathways

The Management Plan applies a Hazard Analysis Critical Control Point (HACCP) based approach for managing TPP. High risk pathways, and the points at which regulatory or other control measures are required, have been identified. Table 1, describes the agreed points at which management controls are required to manage the risk pathways of TPP. These include soil, potato seed, nursery stock, tubers, hitch hiker plants, debris and waste from previous crops, conveyances such as bins, farm tools and machinery, transport vehicles and personnel.

A Decision Tree (Appendix 4) underpinned by the HACPP approach has been developed to assist growers to identify the risks and the steps to mitigate against them. The Decision Tree is intended as a resource for reducing the risk of TPP transmission and should be used as a component of state or territory TPP Operational Plans. The Decision Tree has been developed to be used in concert with the TPP Biosecurity Action Planner (Appendix 6) and Checklist (Appendix 7).

Table1: Points at which controls are to be applied to manage Tomato Potato Psyllid in Australia

Risk Pathway	**Import into Australia**	**State or Territory borders**	**TTP Infested Region**	**TTP Infested Property within a Region**	**Non-infested Property within a non-infested region**
Soil Control required: Action:	No No action is required as TPP or CLso are not known to survive in or be transmitted in soil	No No action is required as TPP or CLso are not known to survive in or be transmitted in soil	No No action is required as TPP or CLso are not known to survive in or be transmitted in soil	No No action is required as TPP or CLso are not known to survive in or be transmitted in soil	No No action is required as TPP or CLso are not known to survive in or be transmitted in soil.
Potato Seed Control required: Action:	All leafy green Solanaceous crops prohibited All imports managed by Department of Agriculture (DA)	Yes Certification preferred however decision to move seed is a commercial decision	Yes Certification preferred Grower responsibility to manage seed movements	Yes Certification preferred Grower responsibility to manage seed movements	Yes Certification preferred Grower responsibility to manage seed movements
Nursery Stock Control required: Action:	Yes Comply with current import requirements as stipulated by DA	Yes Controls on Nursery Stock of host plants from infected states. CPHM certification required via ICA	Yes Controls on Nursery Stock of host plants from infected areas. If an accredited nursery under Biosure, clear documentation of treatments required for movement. Jurisdiction to manage on a situational basis via ICA	Yes Controls on Nursery Stock of host plants from infected properties. Jurisdiction to manage on a situational basis. Support by proof of area freedom with evidence gained by sticky traps and records	No If outside of infected region. Supported by proof of area freedom with evidence of monitoring by sticky traps and records
Tubers					

Control required: Action:	Yes Importation of tuber prohibited. Managed by DA	Yes In accordance with jurisdictional requirements	Yes Movement of tubers out of TTP region is prohibited	Yes Movement of tubers is permitted within a TPP infested region	No n/a
Plant debris and waste from previous crops Control required: Action:	Yes Prohibited, managed by DA	Yes Controls on movement and destruction of solanaceous plants including debris and waste from previous crops is removed from all fresh tubers before moving across state borders. CPHM certification required to move out of infested state.	Yes Controls on movement and destruction of solanaceous plants not required all green leafy material is left in property. Jurisdiction to manage on a situational basis.	No Controls on movement and destruction of solanaceous plants not required all green leafy material is left on property Jurisdiction to manage on a situational basis.	No Supported by proof of area freedom
Hitch hiker plants Control required: Action:	n/a	Yes To be managed by the jurisdictions on a case-by-case basis.	No To be managed at the property level	No To be managed at the property level	
Conveyances (eg crates, boxes, bins, pallets) Control required: Action:	Yes Managed by DA on a situational basis	Yes Controls on Conveyances that may have come into contact with infected plants. Managed by each jurisdiction on a case by case basis	Yes Controls on Conveyances that may have come into contact with infected plants. Jurisdiction to manage on a situational basis. May be managed by via on farm biosecurity	Yes Controls on Conveyances that may have come into contact with infected plants. Jurisdiction to manage on a situational basis. May be managed by via on farm biosecurity	No Supported by proof of area freedom. May be managed by via on farm biosecurity /auditable HACCP.

			/auditable HACCP.	/auditable HACCP.	
Tools, equipment, farm machinery Control required: Action:	Yes Used machinery/equip-ment must be clean and free of green leafy material managed by DA.	Yes Controls on tools, equipment, machinery used on farm that may have come into contact with soil or may carry green leafy material CPHM certification required	Yes Controls on tools, equipment, machinery used on farm that may carry green leafy material. Jurisdiction to manage on a situational basis. May be managed by via on farm biosecurity /auditable HACCP.	Yes Controls on Tools, equipment, machinery used on farm that may carry green leafy material. Jurisdiction to manage on a situational basis. May be managed by via on farm biosecurity /auditable HACCP.	No Supported by proof of area freedom. May be managed by via on farm biosecurity /auditable HACCP.
Transport vehicles Control required: Action:	No	No To be managed at property level.	No To be managed at property level.	No To be managed at property level.	No To be managed at property level.
Personnel Control required: Action:	No	No	No	No	No

*Controls on tubers may change subject to international trading requirements.

4.4 Importation of potato varieties into Australia

TPP cannot be transmitted by mini seed tubers, however CLso can be. All potato variety imports are by tissue culture which are then subjected to quarantine requirements. Imported tissue culture are:

a) Tested for a range of viruses and include CLso. In June 2008 potato varieties imported from New Zealand were tested for CLso using Polymerase Chain Reaction (PCR). This testing was subsequently expanded to include potato imports from all countries in November 2009.

   Where tested offshore, potato varieties must be accompanied by an official government phytosanitary certificate and/or laboratory test certificate.

A national diagnostic protocol for seed potatoes continues to be under review to find a cost effective method. Until a final National Diagnostic Protocol for CLso is endorsed, an interim testing protocol is being applied by diagnostic laboratories for testing of collected leaf material, which is an expensive process.

Importation of Potato material prior to June 2008 from New Zealand and November 2009 from all other countries could have carried CLso and remained untested. The potential risk is that some of this material has been stored in germplasm for many years. Whilst the risk is low it is important that if a variety is brought out of storage which arrived before those dates is tested fort CLso before release. The location of these imports is varied and will require Federal Government notification of the importers to highlight the potential risk and measures to mitigate against it.

4.5 Moving Plant Material, and Machinery within Australia

Movement of plant material, tubers and machinery may differ between states and territories. For further information about specific requirements regarding the movement of plant material, machinery within Australia, growers are encouraged to check with local biosecurity officers or refer to the following websites:

Tasmania (Tasmanian Biosecurity Import Requirements Database) http://imports.dpipwe.tas.gov.au/ImportRx.nsf

Northern Territory (Contact NT Quarantine) https://nt.gov.au/industry/agriculture/food-crops-plants-and-quarantine/plants-and-quarantine/plant-quarantine-contacts-and-plant-inspectors

New South Wales (Plant Quarantine Manual) http://www.dpi.nsw.gov.au/content/biosecurity/plant

Queensland (Queensland Biosecurity Manual) https://www.daf.qld.gov.au/data/assets/pdf file/0004/379138/QLD_Biosecurity_Manual_2016.pdf

Victoria (Plant Quarantine Manual) http://agriculture.vic.gov.au/agriculture/horticulture/moving-plants-and-plant-products/importing-plants

Western Australia (Import Requirements Database) https://www.agric.wa.gov.au/iaquarantine/

South Australia (Plant Quarantine Standard) http://www.pir.sa.gov.au/biosecurity/plant_health

5 Surveillance

5.1 National Surveillance

Historically there was no comprehensive monitoring program for TPP in Australia. A monitoring program managed through the University of Tasmania has been maintained for 6 years and has not detected TPP during that time in Tasmania. On several occasions monitoring has occurred in other States but not on a regular basis. With the implementation if the T2M phase, all jurisdictions have undertaken monitoring for TPP during the autumn 2017, spring 2017, summer and autumn 2017-18, and summer and autumn 2018 - 2019 with no TPP detected. Indications are that most jurisdictions intend to continue with monitoring for TPP. Future surveillance programs will require ongoing national coordination.

The Department of Primary Industries and Regional Development (WA) is leading a national TPP surveillance program in collaboration with all other jurisdictions. The program is operated in peri-urban regions, the sight

where TPP was first detected. The program initially is for 3 years, with 2 years completed(2021). Apart from WA no other jurisdiction has identified TPP. Testing of TPP in WAA for CLso has also not found CLso to be present. The evidence gathered will provide a level of confidence to growers and their stakeholders to assist in knowing where TPP is present or absent. The evidence gathered can underpin pest free status if this becomes necessary for the purposes of international trade. Importantly it will also provide industry stakeholders with early warning evidence to manage TPP when it arrives.

5.2 On-Farm Surveillance

During routine surveillance, growers need to record all observations, including a lack of detection, as this information may become a crucial component of supporting international market access.

For detection, an easy to use sticky trap is commercially available. This type of monitoring is the current best practice for the detection of TPP. Should growers suspect a TPP infestation, they should immediately apply strict biosecurity protocols to limit the potential spread on any infestation. If concerned, growers can submit a sticky trap for examination and/or insects collected from scouting the crop for eggs, nymphs and adults, to the biosecurity authority in the relevant state or territory. However, growers are encouraged to contact the local biosecurity office or their agronomist in the first instance. Details for state diagnostics agencies can be found in the Risk Mitigation Summary Guide found in Appendix 8.

6 On-Farm Management

If TPP is detected in a crop the risk of spread throughout the crop is likely to be high however it can be managed with the use of biological controls and a spray regime. Crop infection should be carefully managed to prevent spread of the TPP and CLso. Growers can implement simple procedures to prevent the movement of TPP onto or off their properties:

a) Use seed potatoes from a reputable producer that can provide evidence that TPP is not present on their property. If TPP is present demonstrate through documented evidence of the TPP management program they have in place monitoring and testing of TPP found on traps;
b) If new varieties of potatoes are imported then documentation should indicate if they come from a TPP infested region and the steps taken to mitigate against the presence of TPP eg spray and IPM programs as well as PCR testing for CLso to ensure confidence to the customer;
c) Follow best practice sanitation and cultural practices including controlling non-crop hosts, especially solanaceous species that border fields, and manage TPP along with other plant pests as a precaution;
d) Scout fields for symptoms at regular intervals;
e) Take plant tissue samples and have a diagnostic analysis for CLso completed on suspect plants;
f) Restrict farm visitor access;
g) Clean and disinfect tools, clothing and machinery to ensure they are free of all insects including TPP before these leave the property.

When managing a new TPP detection:

a) Wear gloves and protective clothing and place in bags for disposal;
b) Dispose of protective clothing by burning or deep burial;
c) Sanitise equipment used in conjunction with detection;
d) Restrict contractors and visitors entering the farm.

A decision tree is provided in Appendix 4 to assist growers to determine the risk of TPP on their property and how to manage the risk. A simple On-Farm Risk Mitigation Summary Guide can be found in Appendix 7.

7 Roles and Responsibilities

To manage TPP effectively, each section of the management hierarchy has roles and responsibilities. The management hierarchy includes partners at the national, state/territory, industry and individual grower level. These roles and responsibilities cover areas such as monitoring, surveillance and diagnostics, reporting, TPP farm management and TPP / CLso import risk management. These are outlined in Table 2.

Table 2: Roles and responsibilities for Management of TPP

Activity	**Grower Responsibility**	**Peak Industry Body Responsibility**	**State and Territory Government Responsibility**	**Australian Government Responsibility**
Monitoring, surveillance and diagnostics	Understanding of signs and symptoms of TPP Monitoring crops for TPP Collecting and submitting samples for testing where there is concern that a crop may be infested with TPP. Be aware of TPP habitat and lifecycle and know what to look for. Provide feedback on effectiveness and currency of awareness material. Be aware of procedures for appropriate monitoring, best practice placement, collection and inspection of traps	Development of National TPP Surveillance Protocol Development of TPP awareness material for growers. Encouraging grower support for the Plan. Coordinating and facilitating grower involvement in applicable surveillance programs. Identify and contribute to RD&E that would improve diagnostic methods. Contribute to development of national protocols for diagnostics for CLso.	Development of National TPP Surveillance Protocol Providing guidance on development of awareness material for growers. Provide diagnostic services to growers. Contribute to a National CLso Diagnostic Protocol. Identify and contribute to RD&E that would facilitate continued development of diagnostic and management methods for TPP and CLso.	Development of National TPP Surveillance Protocol Providing guidance on development of awareness material for growers. Lead the process for the finalisation of an effective National CLso Diagnostic Protocol. Identify and contribute to RD&E that would facilitate continued development of diagnostic and management methods for TPP and CLso
Reporting	Report suspect detection to biosecurity agency in the state/ territory where it occurs via the Exotic Plant Pest Hotline 1800 084 881.	Report suspect detection to Chief Plant Health Manager in the affected jurisdiction.	Reporting of new infestations of TPP beyond existing areas of infestation.	Report national and regional TPP and CLso status to international community.

TPP Farm management	Implementing appropriate on- farm biosecurity procedures for control of the pest in accordance with enterprise management plans in the Plan.	Continued management of TPP in accordance the nationally agreed measures led by the Plant Health Committee in collaboration with industry bodies. Develop and coordinate awareness and general on farm biosecurity best practice training. Contributing development and ongoing review/maintenance of the Plan. Ensuring the Plan is published, publicised and accessible to growers. Promotion of farm biosecurity practices, in accordance with the Plan.	n/a?
TPP and CLso import risk management	n/a	n/a	Advise on risk requirements to support market access. Maintain measures to minimise TPP and CLso risk on imports as appropriate. Maintain and communicate Australia's plant pest status with respect to TPP and CLso Advise on minimum requirements to support export market access.

8 Research Opportunities

The management plan is a living document and during its preparation several areas of research have been identified, especially through the T2M phase which will assist stakeholders to better prepare for managing TPP.

These are as follows:

- To give high priority to field trials of:
    - spray rates and frequencies of suitable chemicals for TPP management which will lead to Australian Pesticides and Veterinary Medicines Authority (APVMA) registration.
    - biological controls to assist in the management of TPP with IPM programs.
- To identify all native psyllids found in commercial production regions and the potential of native psyllids as vectors for CLso.
- To maintain a TPP colony established in Western Australia to monitor and test the hypothesis that TPP become infected with CLso ("hot") over generations of feeding on specific solanaceous crops. DPIRD (WA) has maintained a TPP colony for 4 years where multiple generations have occurred. No CLso has emerged to date.
- To determine the ways TPP "hitch hike" on other plants, produce, machinery and personnel. There is a need to revisit non-host plants and their role as "hitch hiker" plants. Historical publications indicate TPP can "hitch hike" on non-host plants, however there are no recent publications where the introduction of current "on farm" best practice management are implemented.
- To verify the status of known (or suspected) non-hosts that occur in Australia, including weeds that can sustain TPP populations.

At present, there is no known potato variety that is resistant to attack by TPP or infection by CLso. There is a research project underway in New Zealand to assess resistance to TPP of a range of varieties.

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10 Appendices

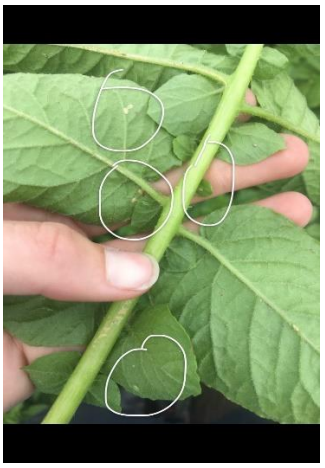
Appendix 1 – National TPP Steering Committee

The National TPP Steering Committee provides direction and **advice** on TPP and CLso. Additionally the steering committee seeks to establish national agreement on hosts, risk material and risk pathways that support the development of the national TPP management plan. Members are selected for their expertise and are not representing their respective organisations.

Mr Tony Cukrov, SupaFresh
Dr Nigel Crump, VICSPA
Mr. Callum Fletcher, AUSVEG
Mr Michael Hicks, Snackfoods
Ms Zarmeen Hassan, AUSVEG
Dr Penny Measham, Hort. Innovations
Mr Simon Moltoni, Potatoes WA
Mr Andrew Bishop, CPHM Tasmania

Appendix 2 - Symptoms of TPP lifecycle and CLso Infection in Potatoes

TPP eggs on Boxthorn with a pen to indicate size.



TPP Nymphs on Potato

Adult TPP on *Lycium* ferocissimum (Boxthorn)

Potato plant infected with CLso

Appendix 3 Hosts of TTP

It is essential that hosts, non-hosts and hitcher pathways for TPP be identified and regularly reviewed in accordance with the best up to date evidence as they provide the foundation for any trade restrictions, movement controls and biosecurity risk management practices.

1. Hosts for TPP

TPP has a specific known host range mainly within the Solanaceous family. The family Solanaceae contains tomatoes, potatoes, capsicums, chillies, and tamarillo including non-commercial plants and weeds such as nightshades. CLso is plant borne in known hosts. TPP is the only known vector for the transition of CLso from infected plants to non-infected plants. When considering TPP, the current international evidence is that CLso will also be present. The manifestation of CLso as Zebra Chip Complex is of particular concern to the potato industry.

The following list of hosts is used as the basis for this paper and is supported by scientific literature as at April 2018. The table below lists the natural hosts of TPP.

Table 1: Known hosts of the tomato potato psyllid

Host Scientific Name	Common name (s)
Nicandra physalodes (L.) Gaertn.	Apple of Peru
Solanum carolinense L.	Ball nightshade, Bull nettle, Horse nettle, Devil's tomato
Solanum aviculare G. Forst.	Bullibulli
Physalis peruviana L	Cape gooseberry
Physalis franchetti Mast.	
Physalis heterophylla Nees	Chinese lantern
Nierembergia hippomanica Miers	Clammy ground-cherry
Lycopersicon pimpinellifolium (L.)	
Physalis angulata L.	Cup flower
Solanum melongena L.	Mill Currant tomato
Nicotiana affinis Moore	Cut leaf ground-cherry
Solanum villosum Mill.	Eggplants, Aubergine
Hyoscyamus niger L.	Flowering Tobacco
Physalis pruinosa L.	Hair nightshade
Solanum capsicastrum Link ex Schauer	Henbane
Datura stramonium L.	Husk tomato
Physalis longifolia Nutt.	Jerusalem cherry
	Jimsonweed, Thornapple
Physalis mollis Nutt.	Longleaf ground-cherry
Physalis rotundata Rydb.	Longleaf ground-cherry
Lycium halimifolium Mill.	Longleaf ground-cherry
Solanum pyracanthum Jacq.	Matrimony vine
Solanum tuberosum L	Porcupine tomato
Physalis lobata Torr	Potato
Solanum betaceum Cav. [synonym: Cyphomandra betacea (Cav.) Sendtn.]	Purple ground- berry
Nicotiana tabacum L.	Tamarillo
Physalis ixocarpa Brot. ex Hornem. [synonym: Physalis philadelphica Lam.]	
Lycopersicon esculentum Mill [synonyms: Solanum lycopersicum L., Lycopersicon lycopersicum (L.) H. Karst.]	Tobacco

Solanum gracile Sendtn.	Tomatillo
	Tomato
Solanum sisymbriifolium Lam.	
Solanum elaeagnifolium Cav.	Velvety nightshade
	Viscid nightshade, Sticky nightshade
Physalis comata Rydb.	White horse- nettle, Silver- leaf nightshade
Solanum jamesii Torr.	Wild ground- cherry
Solanum triflorum Nutt.	Wild potato
Solanum nigrum	Wild tomato
Datura meteloides Dunal	Wonderberry, Black nightshade, Blackberry nightshade, Garden huckleberry
Hyoscyamus albus L.	
Lycium andersonii A. Gray Lycium exsertum A. Gray	
Lycium fremontii A. Gray	
Lycium macrodon A. Gray Lycium pallidum Miers	
Lycium parishii A. Gray	
Lycium quadrifidum	
Moc. & Sessé ex Dunal	
Lycium torreyi A. Gray	
Nicotiana glutinosa L.	
Nicotiana texana Maxim. Physalis lanceolata Michx. Solanum baylisii Geras.	
Solanum citrullifolium A. Braun Solanum mexicanum Moc. & Sessé ex Dunal	
Solanum racemigerum Zodda	
Solanum sanitwongsei Craib	

2. Issues with Host List

The specific plant host range of TPP is not clear due to the definition of “hosts”, “non-hosts” and “hitch hiker” plants:

- TPP can colonize on plants that are not from the Solanaceous family such as sweet potato, African Boxthorns.
- Insufficient research work has been undertaken to determine exactly how CLso moves around a plant.
- It remains unclear whether Australian native psyllids can act as a vector for CLso.
- Internationally where the western haplotype is detected CLso has also been discovered in the TPP population and confirmed through plant testing. The testing of TPP in Western Australia has not found CLso to be present.
- There has been no testing of the Western Australian TPP research colony which was established for the T2M phase for CLso as it was out of scope.

3. The risk of unknown host plants

The risk of unknown host plants in the establishment and spread of CLso is low. International evidence has shown that CLso can be found in seed such as tomatoes and carrots. To date the tomato seed CLso does not appear to become active in a growing plant. The CLso associated with carrots is of the Haplotype C and D and not vectored by TPP. There may well be native psyllids that can act as vectors but they are unknown hence further work on understanding the native population.

4. The risk of potato tubers carrying CLso

Published international evidence demonstrates that potato tubers can carry CLso. To date no tubers in Australia have tested positive to CLso either in TPP infested regions or non-infested regions. The current known facts are:

- Infected tubers are likely to be symptomatic, and therefore unsaleable. Unsaleable tubers would be removed from the pathway at the farm, wholesale or processing stages of the supply chain.
- Unsaleable tubers that leave the farm will be managed as waste at the factory.
- Mini tubers as seed from a CLso infected solanaceous host may be a carrier. Current evidence shows that CLso does not spread evenly throughout the plant or tuber. TPP that feeds on infected plants may or may not become "hot". Evidence shows that the incidence rate for "hot" TPP is about 3-5%
- Potato varieties that were imported prior to 2008 and held in germplasm remain a possible source of CLso; which will diminish as stocks are used. Note. Mandatory PCR testing of all imported potato tissue culture came into effect on 4 November 2008
- Mini tubers domestically produced are a potential source of CLso if infected TPP are present. Future testing could be implemented however this needs to be cost effective. Fortunately at this stage the only known seed potato production site where TPP is present is in Western Australia. Seed growers have maintained a monitoring program for TPP and only a few TPP have been detected.
- There are currently no known varieties of potatoes resistant or tolerant to TPP or CLso.

Australia's import conditions require potato tissue culture be tested for CLso. All host species (Solanaceous family members and Apiaceous family, in particular carrot seed) have an ability to carry CLso. It is only the solanaceous family that is known for maintaining the TPP lifecycle and there is scientific evidence that CLso is associated with tomato seed however CLso does not manifest itself in the plant.

Australia is a member of the World Trade Organisation (WTO) and must follow internationally agreed plant health standards and guidelines when developing import conditions. These standards require that import conditions are justified by scientific evidence, and are applied at the species level, unless there is sound scientific justification to regulate at a higher or lower taxonomic level. If Australia does not follow its international obligations, other countries have the right to bring the case to the WTO for dispute settlement.

5. The level of risk associated with backyard and non-commercial plantings

The Western Australian experience has found TPP mainly in backyards and community gardens and parks, with smaller numbers in some commercial crops. The round of testing of TPP under the T2M program focused on high numbers trapped on non-commercial sites and in particular individual backyards. Subsequent TPP trapping programs in Western Australia has focused on locations where high numbers of TPP were identified during the previous trapping program.

Issues:

- Backyards and community gardens may become infected from TPP that remain unmanaged and "overwinter".
- They can spread from backyard to backyard especially on non-commercial tomatoes, chillies, eggplants etc.
- TPP movement as a result of human activity, where TPP "hitch hike" on machinery or by "sharing" of

infested plants/fruit. Generally adult TPP are not attracted to humans and would prefer to stay located in or near their respective colonies.

- TPP can be dispersed by wind similar to other sap sucking insects such as aphids and white fly.
- TPP eggs and nymphs are readily transported on leafy green parts of host varieties, more so than adults which will tend to fly away.
- The persistence of TPP in backyards will vary between regions and the management by owners. Community gardens have the potential for TPP infestations along with backyards, and hence have an increased risk of further spread.

6. Other potential pathways for the movement of TPP (e.g. , bins, transport etc)

For the following pathways, what is the likelihood that TPP will enter a production environment if no mitigation methods are applied?

Pathway	**Likelihood**
Mini tuber seed direct pathway to production system	Low
Seed potatoes, G1-G5 plus farm save and unspecified generation.	Low
Green plant debris and waste from previous infected crop	High
The movement of potato tubers for processing and ware	Low
TPP lifecycle does not occur on tubers, tools, equipment, machinery used on farm	Low to medium
Adult TPP can “hitchhike” on non-host pathways but it is not preferred by TPP and clothes of farm personnel and visiting agronomists	low-medium
Transport vehicles	Low - not a direct pathway
Hands and clothes of personnel in the supply chain	Low - not a direct pathway
Domestic livestock, pest animals	Low - TPP could “hitch hike” on animals but is highly unlikely

Factors that need to be considered for trade (both interstate and international)

a) Industry and Regulatory stakeholders consider:

- The factors that need to be considered for trade include:
    - The establishment and maintenance of a national monitoring program for the presence of TPP. Know where it is and where it isn’t.
    - Develop a cost effective diagnostic tool for testing plants and tubers for CLso.
    - Maintain TPP free places of production.

Appendix 4 - Decision Tree for Management of CLso in a TPP infested region

	Assessing Risk	Answer	Action	Comments
1	Am I in a State with TPP?	Yes	Go to 3	
		No	Go to 2	
2	Have I received any leafy green material, used packaging on my farm or received vehicles or people from an infected property or state?	Yes	Go to 3	
		No	Go to 5	see Note 1 - Transmission
3	Have I been monitoring for TPP?	Yes	Go to 4	
		No	Go to 5	see Note 2 - Testing agencies
4	Was TPP detected?	Yes	Go to 6	
		No	Liaise with State Biosecurity or PIB for Quarantine status	see Note 3 - Replanting
		No result yet	Assume infected until result known	
5	Did the potato seed I am using come from an accredited seed grower?	Yes	Do not plant seed unless tested	see Note 1 - Transmission
		No	Go to 6	
		Unsure	Contact supplier	
6	Have I planted untested seed of the varieties or observed any symptoms in crops in the last three years consistent with CLso infection?	Yes	There is potential for infection to exist. Check susceptible weed see page 22 for example species around planted area. . Go to 8	
		No	Go to 7	See Note 4 Indicator Species
		Unsure	Go to 8	
7	Unlikely to have TPP on farm – maintain a good On Farm Biosecurity Program	Go to 9		see note 5 TPP lifespan
8	Was TPP present on traps and /or in the field?	Yes	Liaise with State Biosecurity or PIB for Quarantine status	see Note 3 – Re-sowing
		No	Go to 7	
9	Do I have an on-farm Biosecurity Program?	Yes	Go to 10	
		No	Go to 11	See Note 6 On Farm Biosecurity
10	Is it up to date for TPP?	Yes	Ensure it is being implemented	
		No	Go to 11	
11	Develop an on-farm Biosecurity Program based upon TPP management template			See Note 6 - On Farm Biosecurity

Decision Tree Notes	
1	**Transmission Methods** TPP can be introduced into a crop from host weed and plants that surround the crop. CLso can be introduced to a crop through seed potatoes and carried by TPP that can be moved in or fly in from CLso infected areas. • Infection of new plants with CLso occurs through the transition by "hot TPP" that feed on an infected plant and then move onto a non-infected plant. Direct infection can only occur by "hot TPP" feeding on a non-infected plant. There is no transmission of CLso from plant directly to another plant through touching each other or by the roots. • CLso cannot be transmitted by water or in nutrient solutions. • TPP can "hitch hike" on machinery, equipment, clothing, or even humans but is unlikely. Best practice on farm biosecurity will mitigate against this. • TPP can spread in the field where there is no IPM and spray management practices deployed. • Using seed potato harvested from CLso infected host plants.
2	**Testing Agencies** Information on testing laboratories for TPP Taxa and CLso infection is available from the Exotic Plant Hotline 1800 084 881. Australia's import conditions require seed testing for all host species for which there is scientific evidence that CLso is associated with the seed eg carrots and tomatoes. Potato tissue culture is also tested for CLso.
3	**Re-sowing** There is nothing to stop growers from re-sowing in previously infected areas. However proving TPP absence requires ongoing monitoring which growers need to consider. (1) Current scientific information from overseas suggests that TPP is the only known vector for CLso in solanaceous crops. Further research is required in Australia to test native psyllids adaptability to become a vector for CLso. (2) If TPP is found then on farm management practices including IPM and spray regimes will mitigate against the impact on TPP. Planting is a business decision and is done at one's own risk.
4	**Host Species*** **See Appendix 1 Table 1 on Host list**
5	**TPP Lifespan*** **Refer to Appendix 9 Enterprise Management Plans**
6	**On Farm Biosecurity** Refer to the Farm Biosecurity Action Planner and Checklist for Management of TPP. Appendix 6
Considerations	
What Do I Need to Know? o Where TPP is and where it isn't? o All mini tubers held in germplasm that arrived before 2008 will require CLso testing before release. o Currently there are no known resistant Cultivars. o There is no cure for CLso. o Familiarise yourself with the Taxa of TPP and the symptoms CLso. o Some varieties appear to be more impacted than others by CLso. o CLso infected plants located in the field need to removed and destroyed (Rogueing). o Vehicle and people movements need to be controlled in TPP infected areas and between properties to mitigate against spread of TPP. o Do a thorough check to see if there are any potential linkages between your property and those that are or may be infected, include all potential forms of movement and materials.	

*Accompanying notes will be updated in line with advances in R&D.

Appendix 5 - Major Risk Pathways for Movement

Risk	Action
Vehicles and equipment TPP cannot remain viable on • Organic material (decaying) • Vehicle surfaces CLso only remains viable in the green parts of solanaceous plants and in infected tubers	Best practice on farm biosecurity promotes the cleaning of vehicles and machinery which are stored at dedicated facilities on site away from growing areas. Equipment and dedicated farm vehicles do not move off the property and are cleaned (particularly of green leafy material) between use in different growing areas. Visitor vehicles park at designated areas and on site vehicles travel on designated pathways between growing areas to minimise interaction with farm equipment. Gate signs direct traffic and inform visitors about property access points, and who to contact for queries.
Boxes and packaging TPP is not viable on • Organic material • Conveyance surfaces	Boxes and bins need to be free of all green leafy material. Unused boxes and bins are stored on clean hard floors in a covered area away from growing areas.
Staff and Farm Visitors TPP is not viable on • Hands • Clothes, especially footwear • Vehicles including tyres	Best Practice on farm biosecurity promotes that visitor clothing, footwear and tools are checked for adult TPP and any leafy green material and removed before entering the farm. Cleaning facilities including footbaths and brushes are maintained and accessible for visitors and staff. Staff are trained about on-farm biosecurity practices and visitors inducted in biosecurity expectations prior to moving past the farm office. All visitors report to management, sign a visitor register and report previous movements in other growing regions upon entering the property. Gate signs direct traffic and inform visitors about property access points, designated visitor parking and restricted areas (growing areas).
Waste and weeds TPP can remain viable for periods on • Host based green leafy waste • And live host weeds	Waste is disposed of as soon as possible and stored away from growing areas. Growing areas are surrounded by host-free buffer zones.
Planting materials TPP lifecycle is not sustained on • tubers However CLso is viable in tubers	Planting material is sourced from reputable suppliers. Ensure that seed potato growers are monitoring for TPP by providing records and results from ongoing trapping. . Seek to be provided with any tests for CLso

Appendix 6 - Farm Biosecurity Action Planner

Farm Biosecurity Action Planner

This Action Planner is a template with which you can address the risk factors in Appendix 10.4. It is designed such that you can put in your individual management action in the blank column.

Risk	Estimated risk rating* (0 = no risk, 10 = high risk)	Mitigation practices	Action
Vehicle movement With multiple entry sites, vehicle access cannot be controlled, making it difficult to stop visitors moving into growing regions. These risks are increased when the vehicles have been exposed to different growing areas.		Visitor vehicles are restricted to parking only at designated areas and on site vehicles travel on designated pathways between growing areas. Gate signs direct traffic and inform visitors about property access points, and who to contact for queries.	
Vehicle hygiene Areas where organic matter can become lodged, such as tyre treads and grilles, can sustain TPP eggs and nymphs Runoff from clean down areas can carry TPP eggs and nymphs		Clean vehicles and equipment dedicated on site Facilities that are well maintained and away from growing areas. Keep dedicated equipment and vehicles for on farm use.	
Staff and Farm Visitors on farm TPP have the potential to "hitch hike" on visitors and staff from other areas on the farm or other growing regions. Staff that are untrained in good biosecurity practices can spread diseases, pests and degrade biosecurity systems in place.		Visitor clothing, footwear and tools are checked for leafy green material and insects, and are removed before entering the farm. Cleaning facilities including footbaths and brushes are maintained and accessible for visitors and staff. Staff are inducted in on farm biosecurity practices and visitors are made aware of biosecurity expectations prior to moving around the farm. All visitors report to the farm office and sign a visitor register upon entering the property.	

Risk	Estimated risk rating* (0 = no risk, 10 = high risk)	Mitigation practices	Action
Waste Leafy green farm waste can be repository for TPP eggs and nymphs.		Waste is disposed of as soon as possible, stored away from growing areas and water sources.	
Planting and packaging materials Seed potatoes are not a source for TPP however tubers can carry CLso.		Planting material is sourced from reputable suppliers and treated for pests as required, especially those which undertake TPP monitoring and keep records of trap catches. Seek to be provided with any tests for CLso Unused boxes and bins are stored on clean hard floors in a covered area.	
Monitoring Lack of monitoring can lead to TPP incursions going unnoticed, this can increase the risk of CLso been spread throughout the crop if initially present. .Allowing TPP to go unmanaged, during which time they may establish in growing regions and spread to other properties. Recording a *lack of observation* during regular monitoring is essential for proving property freedom.		Regular monitoring is carried out in crops and surrounding vegetation. Staff are trained to be aware of TPP lifecycle and impact of TPP on plants. Posters, information pages and fact sheets are available on property to help staff identify symptoms. Monitoring results are documented.	

Growing Area regulation Unnecessary movement in growing areas can increase the risk of spreading TPP establishment. Neighbouring properties could harbour TPP. Weeds as hosts can be a source for sustaining the TPP lifecycle. Animals have the potential to spread TPP as a hitch hiker.		Gate signs direct traffic and inform visitors about property access points. There is a designated visitor parking area. Regular communication is maintained with neighbours regarding biosecurity procedures. Feral animal and weed populations are controlled.	
Biosecurity planning Not implementing biosecurity strategies can increase the risk of TPP establishment, will lead to higher long-term costs for managing TPP and place market access at risk.		A biosecurity plan with prioritised actions is maintained for each growing area on your property. This plan is updated as goals are achieved and is integrated into the overall Farm Management Plan.	
Extra risk:			
Extra risk:			

***Estimated risk rating**

The risk rating is a qualitative estimate that aims to indicate high priority areas of farm biosecurity for TPP. It is important to note that individual properties may face different levels of risk for each aspect of biosecurity. For this reason farm biosecurity plans should be tailored accordingly to be most effective. Attributing a value to the risk rating should be based on current knowledge of farm traffic, farm management practices, and professional advice.

Appendix 7 - Farm Biosecurity Checklist

Farm Biosecurity Checklist				
Biosecurity Practice	**In place**	**In progress**	**No**	**N/A**
Vehicle Cleaning				
Wash down facilities are provided on site for machinery, equipment and vehicles				
Run-off water from wash down facilities is collected for disposal				
Clean down facilities are located near farm entrances and away from growing areas				
A hard pad is provided in vehicle wash down area				
High pressure water and air hoses are available for removal of plant material and soil from machinery, equipment and vehicles				
Wash-down facility and surrounds are inspected frequently for potential sources of contamination (eg. organic matter and host weeds)				
Records of wash down facility inspections are logged				
Machinery is inspected and disinfected before entering growing areas				
Vehicle Movement				
Visitor vehicle access is restricted to designated parking areas				
Only on-site vehicles are used to transport equipment and visitors around the farm				
Vehicle movement is kept to a minimum in growing areas				
Designated tracks are used to limit vehicle movement on growing areas				
Machinery and vehicles are cleaned before moving off property				
Staff and Farm Visitors				
Footbaths and brushes are easily accessible and used				
Visitor clothing, footwear and tools are checked for soil and organic matter before entering the farm				
Staff are trained in biosecurity and farm hygiene practices				
Visitors are inducted in biosecurity expectations prior to moving around the farm				
Visitors sign a register to monitor movements between farms				
Appropriate hygiene supplies are available to staff and visitors (hand sanitiser, gloves, foot baths)				

Contractor entry is conditional to a biosecurity induction and hygiene protocols				
Growing Areas and Controlled Access				
Signs requesting phone check in and providing farm contacts are visible at main entrances				
Farm is divided into 'zones' with restricted/ minimised people, machinery and equipment movement between zones				
A sanitation procedure is in place where there is regular movement of people, machinery or equipment between zones				
There is regular communication with neighbours regarding minimising TPP transmission				
Boundary fences are regularly inspected and maintained				
Vermin, feral animal, weed and wildlife populations are managed in line with regulations				
Plants and Materials				
Records of planting material are maintained				
Planting material are sourced from reputable suppliers				
Imported tomato seed has been tested for CLso presence.				
Potato cultivars imported before 2008 and held in storage are PCR tested for CLso prior to planting				
Records of seed or seedling tests are logged				
Monitoring				
Symptom monitoring is regularly conducted in crops				
Symptom monitoring is regularly conducted in neighbouring vegetation				
Staff are trained to recognise TPP and visual symptoms of CLso.				
Staff know how and where to report suspect plant disease symptoms				
Activities and results of TPP monitoring are recorded, including lack of observations				
Monitoring records are well organised and maintained				
A farm management plan is maintained for TPP				
Packaging and pallets				
Unused boxes and bins are stored on clean hard floors in a covered area.				
Boxes and pallets are clean of leafy green material.				
Dirty pallets are cleaned in the wash down area.				

Appendix 8 – On Farm Risk Mitigation Summary Guide

General Information

Use mini tubers from reputable suppliers who have maintained ongoing TPP monitoring and record keeping.
Be aware of what TPP looks like in crops that you grow.
Conduct visual surveillance for these symptoms.
If you see suspect symptoms have samples of affected plants tested.
Manage your crop to minimise the impact of TPP.

General Surveillance

- Be aware of what the taxa and crop symptoms of TPP (eg psyllid yellows) are in crops that you are growing. Also familiarise yourself with the symptoms of CLso infection in a plant.
- Visually inspect your crops and maintain a sticky trap monitoring program, commencing prior to and throughout the growing period to monitor for TPP.
    a. If you observe TPP or unknown insects on the sticky traps have the insects diagnosed by a professional eg entomologist, agronomist or if you are confident with your capabilities to diagnose TPP then review yourself. Send a sample to a lab for confirmation – check with your agronomist or relevant government officers on the process for submitting samples. See the section below on sample preparation.
    b. Report TPP to your relevant jurisdictional biosecurity department or initially contact the Exotic Pest Hotline.
- If you suspect you have TPP, isolate the infected area of the crop until independent diagnostic results are known to reduce the potential movement of hitch hiker TPP.

Actions Following Detection

It is required that detections are reported to aid in delimiting the pest and for effective management of TPP. Following a positive detection the presence of the insect must be reported to the appropriate state or territory Department of Primary Industry. Call the Exotic Plant Pest Hotline (1800 084 881) to be directed to your relevant agency.

Re-sowing

There is no regulation to prevent re-sowing however growers should continue with their normal planting practices. Remember TPP adults, nymphs and eggs, cannot survive without a host. Restrict movement of people and farm vehicles on the site.
Destroy and remove any infected plants and surrounding weed hosts plants.
Continue to monitor other host plants on your property, and on linked properties.
Maintain farm zoning and biosecurity best practices. Complete the biosecurity checklist and action planner provided in this Plan to aid in developing appropriate protocols for managing TPP.

Appendix 9 – Enterprise Management Plans for Potatoes, Tomatoes and Nurseries

The final copies for these respective EMP's are available on the TPP Portal. They are subject to continuous improvement as further evidence becomes available as a result of research and international experience.