



**Response guide
for exotic mosquito detections
at Australian first points of entry**

Australian Government Department of Health
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Introduction

Scope

This document provides guidance to stakeholders regarding the detection and control of exotic mosquitoes at first points of entry (FPoE) primarily through surveillance conducted by the Australian Government Department of Agriculture and Water Resources (Agriculture) under the *Biosecurity Act 2015*.

It is not intended to address the monitoring or control of domestic mosquito populations or consider vector monitoring conducted under jurisdictional legislation by State or Territory health authorities (S/T Health) or local governments (LG) outside of an FPoE.

About the guide

Under the *Biosecurity Act 2015* and in line with the World Health Organization's (WHO) *International Health Regulations 2005*, Agriculture monitors for the presence of exotic mosquitoes at over 90 air and sea ports determined as FPoE to Australia. Monitoring by Agriculture is conducted up to 400 metres (400m) from facilities used in operations involving international travellers, conveyances, containers, cargo and postal articles.

The *Response guide for exotic mosquito detections at Australian first points of entry* is intended to provide a nationally consistent approach to the management and control of exotic mosquitoes at FPoE¹. It contains information regarding the roles and responsibilities of stakeholders in order to strengthen responses to exotic mosquito detections at Australia's borders.

Some species of mosquito, not currently established in Australia, are capable of transmitting diseases that can have severe impacts on the health of people and animals. For this reason, it is vital that processes are in place to ensure that these mosquitoes are prevented from entering and becoming established in Australia.

The guidance provided here is based on current national and international exotic mosquito elimination best practice.

The aim of the response guide is to provide a practical resource for operational, policy and management staff from a range of government agencies and non-government organisations across Australia.

Key stakeholders include Agriculture, the Australian Government Department of Health (Health), S/T Health, the Department of Defence (Defence), LG, and relevant air and seaport authorities and operators.

It is intended that this guideline will provide a framework and information about best practice to support key stakeholders as they work together to develop a local action plan.

¹ This includes Defence installations such as patrol boat bases and military airfields where FPoE visits occur. Principal FPoE and their risk category have been derived from RC Russell, *Vector monitoring risk assessment of Australia's first ports of entry*, report to Health, Canberra, 2015.

The *Response guide for exotic mosquito detections at Australian first points of entry* is organised as follows:

Part 1: Definitions, shortened terms, background

Part 2: Exotic mosquitoes—detection response guidance

Part 3: Exotic mosquitoes—supporting guidance

Part 4: Bibliography

Development of the guide

The *Response guide for exotic mosquito detections at Australian first points of entry* was produced in 2017 by Health. It was developed in consultation with the National Arbovirus and Malaria Advisory Committee (NAMAC) and that committee's Working Group for the Development of National Guidelines for Exotic Mosquito Incursions, and Agriculture.

As a Member State of the WHO, Australia is obliged to comply with the *International Health Regulations 2005*. WHO confirmed in 2013 that "the prevention of mosquito invasions and disease emergence fulfils and complements the requirements of the International Health Regulations...for Member States to manage acute public health events and to develop and strengthen their capacities at designated ports, airports and ground crossings"².

In its *Regional framework for surveillance and control of invasive mosquito vectors and re-emerging vector-borne diseases*, WHO calls for the development of capacity and allocation of adequate resources at country and regional level, stating that "national governments should strengthen the early detection of introduced mosquitoes through systematic monitoring at points of entry and other high-risk sites within the country"³.

This guide was developed for all states and territories of Australia, including offshore territories and islands. It provides a framework to support a co-operative, flexible and consistent approach by all stakeholders in all jurisdictions.

Many people contributed their time and expertise to the development of this guide with special thanks to Mr Peter Whelan of Biting Insect and Technical Extension Services. In addition, the following individuals are acknowledged, with thanks:

Mr Stephen Doggett	New South Wales Health Pathology
Ms Rebecca Feldman	Victorian Department of Health and Human Services
Ms Gwenda Hayes	Biting Insect and Technical Extension Services
Dr Cassie Jansen	Queensland Department of Health
Ms Nina Kurucz	Northern Territory Department of Health
Dr Mike Lindsay	Western Australia Department of Health
Ms Maura McInerney	International Centre for Allied Health Evidence
Mr Callum Mack	Department of Health
Professor Scott Ritchie	James Cook University, Queensland
Professor Richard Russell	University of Sydney, New South Wales
Mr Angus Sly	Department of Agriculture and Water Resources
Associate Professor Craig Williams	University of South Australia

² WHO, *Regional framework for surveillance and control of invasive mosquito vectors and re-emerging vector-borne diseases 2014-2010*, World Health Organisation Regional Office for Europe, 2013.

³ WHO, *Regional framework 2014-2020*, 2013.

Part 1: Definitions, shortened terms, background**About this part**

Part 1 contains key definitions and a list of terms that have been abbreviated throughout the guide. It also contains background information regarding the management and control of exotic mosquitoes in Australia.

Glossary

detection refers to the detection, through surveillance and/or inspection, of exotic eggs, larvae, pupal or adult mosquitoes at an FPoE.

disinsection involves measures to control or kill the insect vectors of human diseases present in baggage, cargo, containers, conveyances, goods and postal parcels.

exotic mosquito refers to a species of mosquito not usually found in Australia (including external territories) that is of biosecurity and/or human health importance. It also refers to a mosquito species found in a specific area of Australia but is detected outside of its known distribution area.

FPoE refers to a seaport or airport facility (port) that has been declared eligible under legislation to land international arrivals—people and goods.

pathogen refers to a bacterium, virus, or other microorganism that can cause disease.

surveillance—enhanced is an expansion in the number, type and extent of mosquito monitoring traps, an increased frequency of inspection of the traps, and increased inspections of potential breeding sites. Any exotic mosquito detection generally requires enhanced surveillance.

surveillance—routine is conducted at FPoE through setting a base level of mosquito traps (egg, larval and/or adult traps) depending on the risk category and size of the port, as well as conducting surveys for larvae, in order to detect introductions of exotic mosquitoes.

the 400m zone is the area that is subject to routine surveillance by Agriculture for exotic mosquitoes. It extends a minimum distance of 400m from areas within FPoE that are used for operations involving travellers, conveyances, containers, cargo and postal articles.

vector means the carrier of a disease or infection, generally a biting insect or tick.

Shortened terms

FPoE	first point of entry
Health	Australian Government Department of Health
Agriculture	Australian Government Department of Agriculture and Water Resources
S/T Health	relevant state or territory department of health
Defence	Department of Defence
LG	relevant local government
NAMAC	National Arbovirus and Malaria Advisory Committee
PO	port operator—a seaport or airport authority or an operator of an FPoE
port/s	Australian seaports and airports

Background

The entry of exotic mosquitoes into Australia

In Australia, there are many ports that operate as FPoE for the international arrival of people and goods. These FPoE have surveillance processes in place to detect exotic mosquitoes.

The detection of exotic mosquitoes is considered in terms of 'risk' in recognition of the possibility that the mosquitoes will become established close to their entry point. The establishment of a new strain or species of pest or disease vector is considered to be a public health risk. In this guide, an exotic mosquito refers to a species that is of biosecurity and/or human health importance.

Aedes aegypti and *Aedes albopictus* are the two exotic mosquito species most frequently detected through inspection and surveillance procedures at FPoE as they are often associated with imported cargo and international conveyances. This is because these species have adapted to urbanised areas in close proximity to humans and lay desiccation-resistant eggs in container habitats including in goods to be imported to Australia. Both of these species are recognised vectors of disease, with *Ae. aegypti* the primary vector for dengue, Zika, chikungunya and yellow fever viruses.

Other species of mosquito also have the potential for entry into Australia and may be capable of transmitting pathogens of public health concern.

Traditionally, seaports have been considered more at risk of exotic mosquito entry than airports⁴. In the past, Australia received high numbers of illegal foreign fishing vessels and suspected irregular entry vessels that underwent quarantine processing at seaports. This process often resulted in the detection of exotic mosquitoes⁵. These vessels were seen as high risk for the importation of exotic mosquitoes due to the presence of drinking water receptacles such as 200L drums and 10L plastic containers that offer prime egg and larval habitat, and adult harbourage sites⁶. There has been a sharp decline in these vessels arriving, with cargo vessels (and the cargo they are carrying) now considered a more likely pathway for exotic mosquito entry at seaports.

On a daily basis, seaports receive a wide variety of vessels in addition to general cargo vessels. There is the potential for mosquito larvae or adults to be present in a receptacle on a vessel entering Australia. The risk is that these vectors will become established and spread from their entry point.

Prior to 2012, exotic mosquito detections generally occurred in seaports in northern Australia, with detections reported in the Northern Territory⁷, north Queensland⁸, and the north of Western Australia⁹.

⁴ RC Russell, *A report to AQIS on the requirements and procedures for vector mosquito monitoring at quarantine proclaimed first ports of entry (sea- and air-) to Australia*, 1998. Also see RC Russell, *Vector monitoring risk assessment of FPoE*, Health, Australia, 2015.

⁵ PI Whelan, G Tucker, 'Exotic *Aedes* surveillance and exclusion from the Northern Territory of Australia', *Supplement to the Bulletin of the Mosquito Control Association of Australia*, 1998,10:3. Also see Russell, *Report to AQIS*, 1998.

⁶ Russell, *Report to AQIS*, 1998. Also see Whelan and Tucker, *Exotic Aedes surveillance*, 1998.

⁷ Whelan and Tucker, *Exotic Aedes surveillance*, 1998. Also see PI Whelan, G Hayes, G Tucker, J Carter, A Wilson, B Haigh, 'The detection of exotic mosquitoes in the Northern Territory of Australia', *Arbovirus Research in Australia*, 2001, 8:395-404. Also see PI Whelan, G Lamche, C Prosser, H Espinoza, 'Exotic mosquitoes detected in cargo at East Arm port area 19 March 2003', *The Northern Territory Disease Control Bulletin*, 2003, 10:29-30. Also see G Lamche, PI Whelan, H Espinoza, 'Exotic mosquitoes detected in tyres at East Arm wharf, Darwin, Northern Territory, 1 December 2003', *Northern Territory Disease Control Bulletin*, 11:1:406.

⁸ SA Ritchie, 'Effect of some animal feeds and oviposition substrates on *Aedes* oviposition in ovitraps in Cairns, Australia', *Journal of the American Mosquito Control Association*, 2001, 17:206-208.

International airports, in contrast, have historically seen few exotic mosquito detections. This has largely been due to the requirement that airlines undertake disinsection to destroy pest and disease vectors (including exotic mosquitoes) that could be present in aircraft entering Australia.

Since 2012, exotic mosquito detections at international airports have outnumbered those at seaports. Darwin, Melbourne, Sydney, Adelaide, Brisbane and Perth airports have all experienced detections, pointing to a changed and increasing risk.

The management and control of exotic mosquitoes in Australia

In Australia, inspections at seaports are conducted on vessels and cargo on arrival, or soon after cargo is offloaded within the seaport.

Cargo vessels can carry either deck or containerised cargo that has rainwater-holding capacity. Many mosquito larval detections have been made in receptacles such as old tyres, machinery, plastic sheeting, and transport cradles¹⁰.

Due to the high volume of air traffic, inspection of arriving aircraft for exotic mosquitoes has not been routine practice. Instead, the airport itself is subject to routine monitoring to detect exotic mosquitoes that may enter through the international aircraft pathway, which can include the aircraft cabin and cargo holds, as well as within imported cargo and baggage.

The most vulnerable areas at airports are the unloading or processing areas for luggage, passengers and cargo. This includes air bridges, passenger arrival areas and baggage handling areas in the terminal close to landed planes, along with areas where cargo or air transport containers are unloaded or opened.

At all FPoE, vessel and cargo inspections are supported with on-shore surveillance methods to detect exotic mosquitoes. The on-shore exotic mosquito surveillance program generally involves the setting of egg-traps, larval traps and adult traps, as well as conducting surveys for larvae in order to detect exotic mosquitoes.

The response to an exotic mosquito detection may involve enhanced surveillance and various methods of elimination. The aim is to ensure that all imported and local receptacles are free of any exotic mosquito eggs and that all exotic mosquito adults are destroyed.

Monitoring and surveillance at FPoE – the 400m zone

Surveillance of exotic mosquitoes at all FPoE is conducted by Agriculture. Surveillance is carried out to a minimum distance of 400m from facilities that are used for operations involving travellers, conveyances, containers, cargo and postal articles in line with WHO's *International Health Regulations 2005*. This is referred to as the 400m zone.

⁹ SA Harrington, MD Lindsay, AK Broom, SA Long, 'Report on an investigation for the presence of *Aedes (Stegomyia) aegypti* mosquitoes in the Broome region', West Kimberley, Western Australian Department of Health report, 2001.

¹⁰ PI Whelan, G Hayes, G Tucker, J Carter, A Wilson, B Haigh, 'The detection of exotic mosquitoes in the Northern Territory of Australia', *Arbovirus Research in Australia*, 2001, 8:395-404. Also see PI Whelan, G Lamche, C Prosser, H Espinoza, 'Exotic mosquitoes detected in cargo at East Arm Port area 19 March 2003', *The Northern Territory Disease Control Bulletin*, 2003, 10:29-30. Also see M Shortus, PI Whelan, 'Recommended interim water receptacle treatment for exotic mosquitoes on international foreign fishing vessels arriving in Australia', *Northern Territory Disease Control Bulletin*, 2006, 13:2:32-34. Also see HT Nguyen, PI Whelan, 'Detection and elimination of *Aedes albopictus* on cable drums at Perkins Shipping, Darwin, Northern Territory', *Northern Territory Disease Control Bulletin*, 2007, 14:3:39-41. Also see HT Nguyen, PI Whelan, M Finlay-Doney, SY Soong, 'Interceptions of *Aedes aegypti* and *Aedes albopictus* in the port of Darwin, Northern Territory, 25 January and 5 February 2010', *Northern Territory Disease Control Bulletin*, 2010.

Monitoring beyond the 400m zone and away from facilities associated with international operations may be conducted by S/T Health (see page 27 for further information). While S/T Health may choose to conduct additional surveillance outside of the 400m zone at an FPoE within its jurisdiction (in cooperation with Agriculture) guidance in this document relates to surveillance conducted by Agriculture within the 400m zone.

Surveillance methods currently in use in Australia include sentinel tyres for mosquito larval surveillance, ovitraps for egg surveillance, and a number of specialised traps for adult mosquito surveillance (see Section 12). Routine or seasonal inspections are also carried out to locate and sample potential breeding sites at FPoE.

Response to exotic mosquito detections

If an exotic mosquito is detected through Agriculture surveillance activities, S/T Health will determine what action needs to be taken at the FPoE to mitigate the public health risk. Following a request from S/T Health, port operators (PO) will generally carry out vector control activities through a third party. While unlikely, should a PO refuse to conduct the required response activities, it can be legally compelled to do so under the *Biosecurity Act 2015*.

Under section 252A of the *Biosecurity Act 2015*, the Director of Human Biosecurity or the Chief Human Biosecurity Officer for a state or territory may (in writing) direct the operator of an FPoE to carry out vector control activities within the port (see page 57). Failure to comply with a direction issued under section 252A may attract civil or criminal penalties.

Part 2: Exotic mosquitoes—detection response guidance

About this part

Part 2 contains response guidance for use following an exotic mosquito detection at an FPoE.

During the development of the guidance, reference was made to NAMACs 2008 draft document *Recommended protocol for action when a risk importation or introduced exotic mosquito is detected*. Also of influence was the more recent (2015) *Emergency response protocol (exotic mosquito detection)*, prepared for ports in the Cairns, Townsville and Mackay regions by Queensland Health, Townsville City Council and Agriculture.

Recent 'real life' scenarios of exotic mosquito detections in Australian ports were considered, including responses to detections at airports in Perth, Adelaide, Darwin, Brisbane, Sydney and Melbourne.

Part 2: Exotic mosquitoes—detection response guidance consists of the following sections:

- Section 1: Response guide
- Section 2: Scenario flow charts
- Section 3: Action guide
- Section 4: Response verification
- Section 5: Response checklist

Using the guidance

When an exotic mosquito is detected, in order to:

- define the detection situation being dealt with - refer to **Section 1: Response guide**
- identify responsibilities for controlling the situation - refer to **Section 1: Response guide**
- determine the recommended response - refer to **Section 1: Response guide**
- see the steps to take in specific situations when exotic mosquitoes are detected - refer to **Section 2: Scenario flow charts**
- determine actions that should be taken in specific time periods following an exotic mosquito detection - refer to **Section 3: Action guide**
- confirm the process of verification - refer to **Section 4: Response verification**
- keep track of response activities - use **Section 5: Response checklist**, or
- review supporting documentation as needed - see **Part 3: Exotic mosquitoes - supporting guidance**.

Section 1: Response guide

#	Situation	Corresponding flowchart	Lead stakeholder	Is enhanced surveillance required? By whom?	Enhanced surveillance methods recommended	Recommended response	Responsibility for response	Identification (ID) requirements*
	Observation of mosquitoes on vessel, aircraft or air bridge but unable to collect specimen or confirm if exotic or local.		Agriculture	No, but consider as a precaution.	None required.	Collect mosquitoes and identify wherever possible. Routine surveillance.	Agriculture	
Routine inspection of vessels, planes and cargo by Agriculture								
1	Detection of any larvae (no pupal skins) in recently imported cargo where there is no evidence of adult emergence.	Scenario 1	Agriculture	No, but consider as a precaution.	None required.	Treatment of infested cargo and further inspections of cargo.	Agriculture	<ul style="list-style-type: none"> • Morphological • Confirmation • Molecular
2	Detection of suspected exotic species (all life stages) on vessels, planes or air bridges or associated with cargo, where adult emergence/dispersal is likely.	Scenario 2	Agriculture	Yes - Agriculture	Additional BioGents-Sentinel (BG) traps. Replace standard ovitraps with sticky ovitraps. Additional sticky ovitraps. Use CO ₂ light traps (if non- <i>Aedes</i>).	Fogging within identified risk environments. Residual treatment in harbouring areas. Receptacle surveys Treatment of potential breeding sites.	PO PO Agriculture and S/T Health PO	<ul style="list-style-type: none"> • Morphological • Confirmation • Molecular

* Legend: ID requirements:

- Morphological = taxonomical ID by Agriculture
- Confirmation = morphological confirmation by medical entomologist
- Molecular = supplementary use of molecular techniques to ID species if identity is uncertain
- Origin testing = advanced molecular analysis to determine the origin of the exotic mosquito
- eDNA = molecular analysis of water samples from potential breeding sites for evidence of exotic mosquito breeding

#	Situation	Corresponding flowchart	Lead stakeholder	Is enhanced surveillance required? By whom?	Enhanced surveillance methods recommended	Recommended response	Responsibility for response	Identification (ID) requirements*
Routine mosquito monitoring/trapping by Agriculture								
3	Detection of suspected exotic <i>Aedes</i> spp. (all life stages).	Scenario 3	Agriculture	Yes - Agriculture	Additional BG traps. Replace standard ovitraps with sticky ovitraps. Additional sticky ovitraps.	Fogging. Residual treatment in receptacles/ harbouring areas. Receptacle surveys. Treatment of potential breeding sites. Suspend operation of tyre traps and replace standard ovitraps with sticky traps in proximity of detection site.	PO Agriculture and S/T Health PO Agriculture	<ul style="list-style-type: none"> • Morphological • Confirmation • Molecular • eDNA (if available) • Origin testing
4	Detection of suspected exotic non- <i>Aedes</i> spp. (all life stages).	Scenario 4	Agriculture	Yes - Agriculture	Additional BG traps. Use CO ₂ light traps.	Targeted fogging. Residual treatment in harbouring areas. Larval habitat surveys within 1km of detection site. Treatment of potential breeding sites.	PO PO Agriculture and S/T Health PO	<ul style="list-style-type: none"> • Morphological • Confirmation • Molecular • eDNA (if available)

*** Legend: ID requirements:**

- Morphological = taxonomical ID by Agriculture
- Confirmation = morphological confirmation by medical entomologist
- Molecular = supplementary use of molecular techniques to ID species if identity is uncertain
- Origin testing = advanced molecular analysis to determine the origin of the exotic mosquito
- eDNA = molecular analysis of water samples from potential breeding sites to confirm exotic mosquito breeding

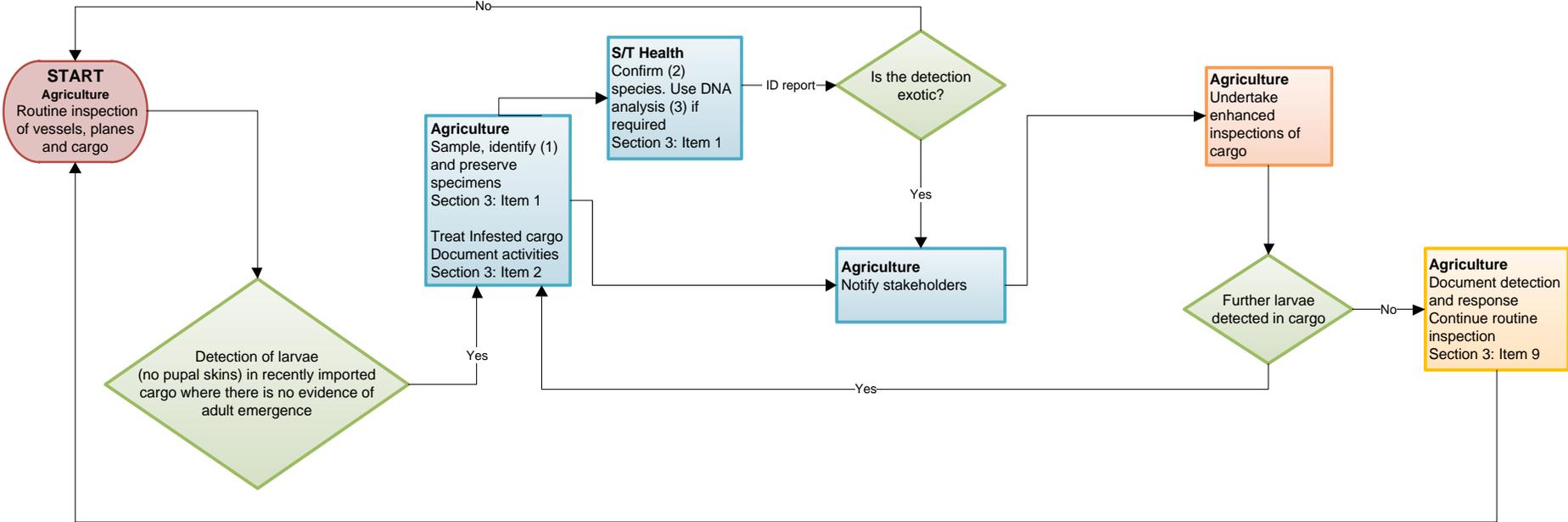
Section 2: Scenario flow charts

About the scenario flow charts

This scenario guidance refers readers to specific advice contained in Section 1 (Response guide) and Section 3 (Action guide).

Please refer as needed to additional guidance and information contained in Part 3.

Scenario 1: Detection of any larvae (no pupal skins), where there is no evidence of adult emergence, during routine inspections.

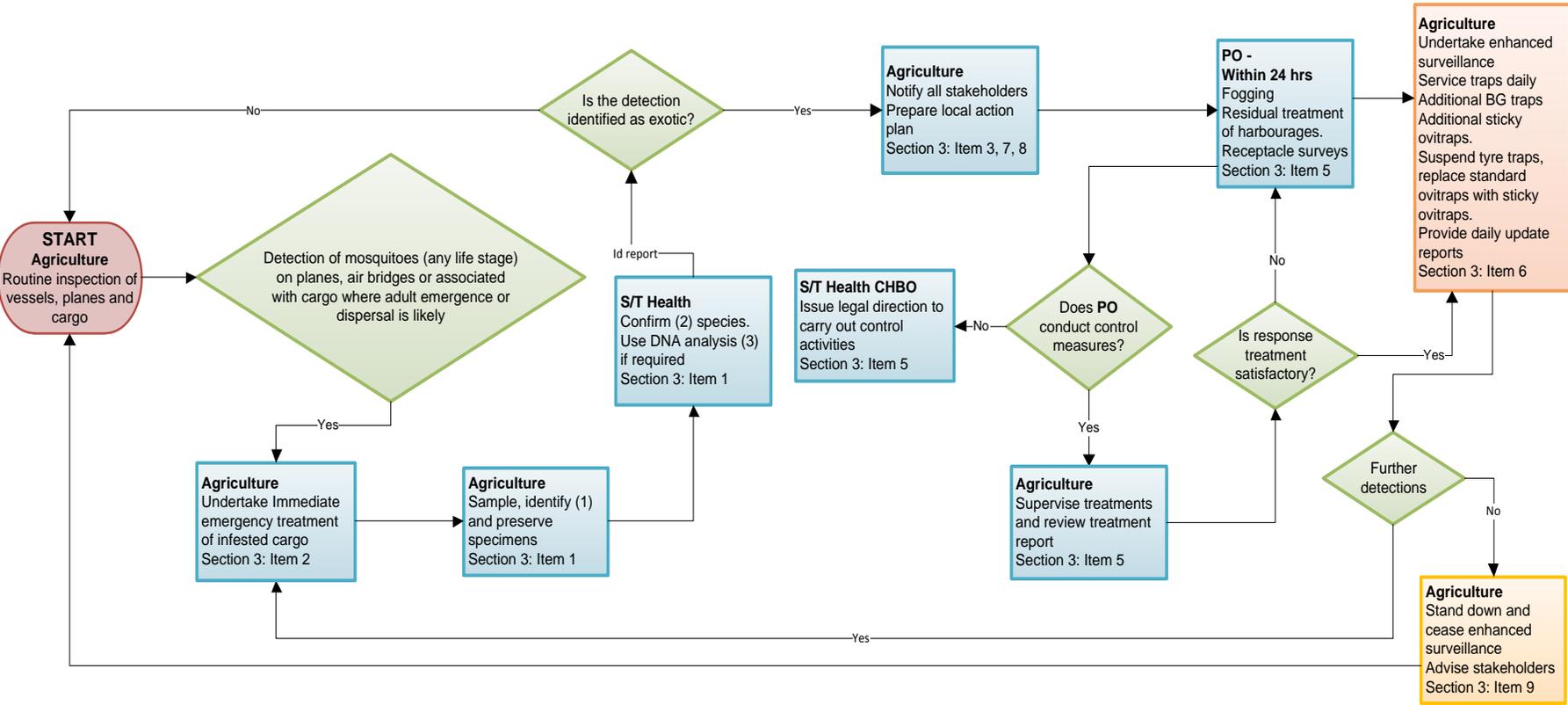


Notes:

- (1) Identification through morphological taxonomy
- (2) Confirmation of identification by medical entomologist
- (3) For specimens unable to be clearly identified, molecular analysis can be used to confirm species

The usual lead agency is identified in BOLD. Check for involvement of other agencies in Section 3: Action guide of the *Response guide for exotic mosquito detections at Australian first points of entry*. Section and item numbers refer to further information provided in Sections 1 and 3 of the *Response guide for exotic mosquito detections at Australian first points of entry*

Scenario 2: Detection of suspected exotic species (any life stage) during routine inspections of vessels, planes and cargo where adult emergence/dispersal is likely.

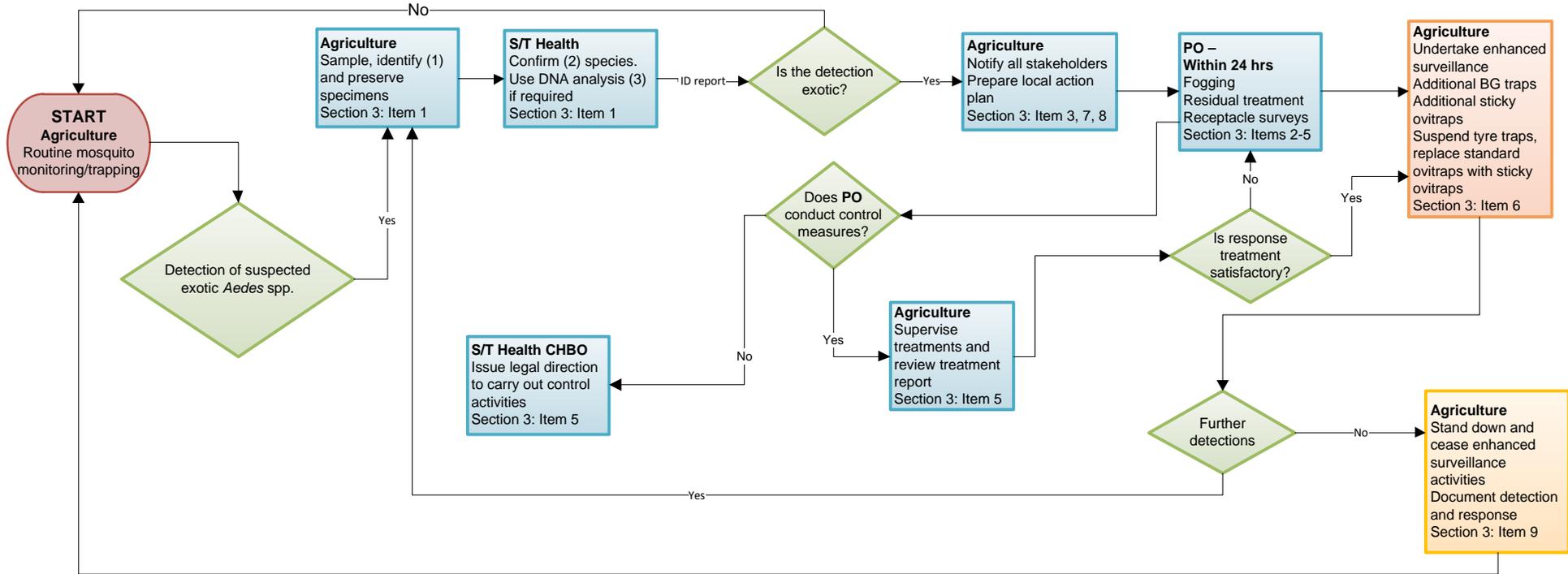


Notes:

- (1) Identification through morphological taxonomy
- (2) Confirmation of identification by medical entomologist
- (3) For specimens unable to be clearly identified, molecular analysis can be used to confirm species

The usual lead agency is identified in BOLD. Check for involvement of other agencies in Section 3: Action guide of the *Response guide for exotic mosquito detections at Australian first points of entry*. Section and item numbers refer to further information provided in Sections 1 and 3 of the *Response guide for exotic mosquito detections at Australian first points of entry*.

Scenario 3: Detection of suspected exotic *Aedes* spp. (any life stage), during routine mosquito monitoring/trapping

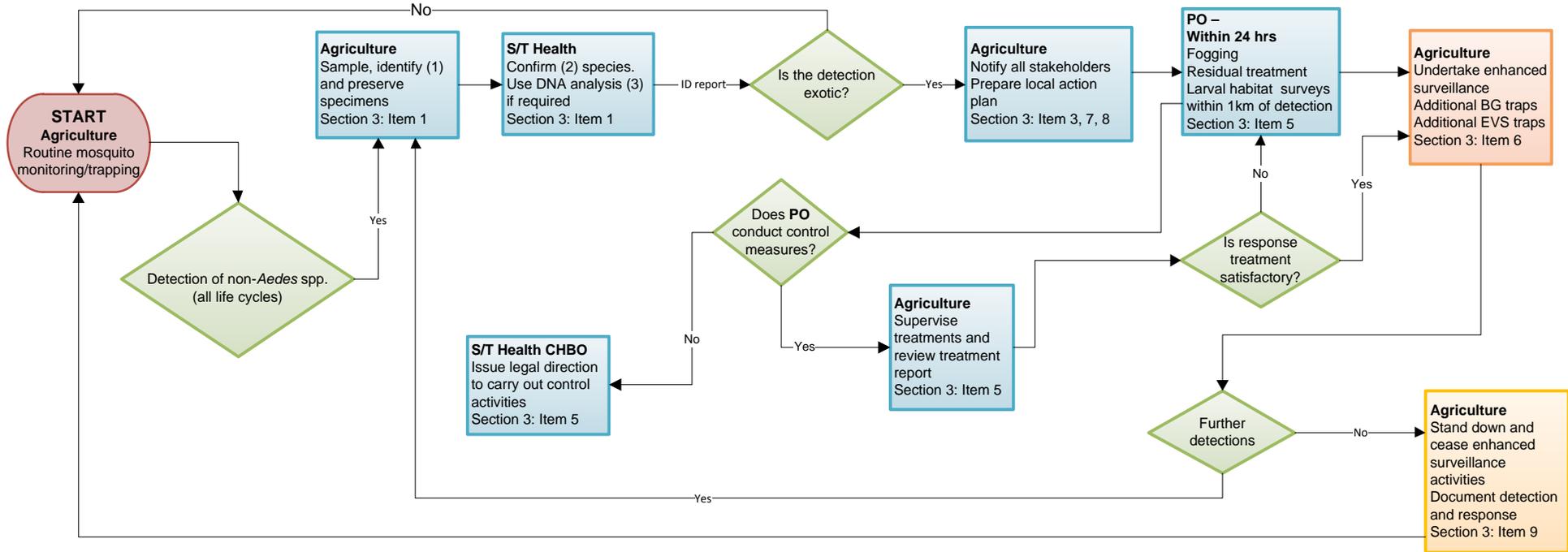


Notes:

- (1) Identification through morphological taxonomy
- (2) Confirmation of identification by medical entomologist
- (3) For specimens unable to be clearly identified, molecular analysis can be used to confirm species

The usual lead agency is identified in BOLD. Check for involvement of other agencies in Section 3: Action guide of the *Response guide for exotic mosquito detections at Australian first points of entry*. Section and item numbers refer to further information provided in Sections 1 and 3 of the *Response guide for exotic mosquito detections at Australian first points of entry*.

Scenario 4: Detection of suspected exotic non-Aedes spp. (any life stage), during routine mosquito monitoring/trapping



Notes:

- (1) Identification through morphological taxonomy
- (2) Confirmation of identification by medical entomologist
- (3) For specimens unable to be clearly identified, molecular analysis can be used to confirm species

The usual lead agency is identified in BOLD. Check for involvement of other agencies in Section 3: Action guide of the *Response guide for exotic mosquito detections at Australian first points of entry*. Section and item numbers refer to further information provided in Sections 1 and 3 of the *Response guide for exotic mosquito detections at Australian first points of entry*.

Section 3: Action guide

About the action guide

This response action guide is based on a scenario involving the detection of an exotic container/receptacle-breeding mosquito such as *Ae. albopictus* or *Ae. aegypti* in areas of Australia where these vectors are currently not present.

The action guide is intended to serve as a 'best approach'. Jurisdictions with limited resources will need to adjust methods accordingly and request assistance if required.

Depending on the circumstances of a detection, an emergency response may not be required. A reduced response regarding insecticides and enhanced surveillance may be appropriate where:

- enhanced surveillance is already being conducted due to a previous detection, and/or
- limited benefit would be gained from additional insecticide treatments e.g. where residual treatments have been applied recently in response to a previous detection (provided there is confidence that the previous treatment was effective and appropriate).

For ground-pool habitat mosquitoes such as *Anopheles* spp., initial surveillance should be expanded to include potential and relevant larval habitats within 1km of the detection site. NAMAC should be consulted regarding further action in these circumstances.

Day of detection	Item	Action
1	1	<p>Sampling and identification (Agriculture, S/T Health)</p> <ul style="list-style-type: none"> • Collect all specimens present including adults, larvae, pupae and skins from all infested receptacles, or from larval, egg, or adult monitoring traps. • Identify mosquito samples as rapidly as possible. If a specimen is identified as exotic, a S/T Health medical entomologist must confirm the identification. • Kill larvae using hot water and transfer into vials of 100% ethanol and label with all relevant collection data. • Kill adults and keep them dry and frozen until identification is confirmed. • Take high-resolution photos of specimens for confirmation by a medical entomologist. If delays with confirmation are expected, keep specimens in the freezer. Once confirmation is obtained, place adult specimens into 100% ethanol for DNA analysis. If the specimen is to undergo virus testing it should be preserved in RNAlater[®] rather than ethanol, and stored in the freezer. • Species confirmation, especially for damaged specimens or larvae, may require rapid molecular techniques. Check the requirements for preserving and sending specimens for molecular analysis with the medical entomologist and the receiving laboratory.
1	2	<p>Immediate control of activities at site of detection (Agriculture, S/T Health)</p> <ul style="list-style-type: none"> • If the detection is directly associated with imported cargo or an international conveyance, regulations apply. These include regulations regarding biosecurity treatments (e.g. fumigation) of imported vessels and cargo suspected of harbouring biosecurity pests. • Spray knock-down aerosol into infested receptacle to kill larvae, pupae or adults present after sampling as above. • Drain all water-holding receptacles if possible, and collect all larvae and pupae present. • Spray immediate area—and any cargo that may be acting as an adult mosquito harbourage—with an aerosol or ULV knockdown insecticide. • Surface spray any receptacles associated with the detection with a residual insecticide. • Any receptacles, cargo or vessels associated with the detection should be isolated, contained and the risk managed by an appropriate biosecurity treatment (e.g. fumigation) ordered by Agriculture. While Agriculture can apply a biosecurity control order to any containers or cargo in the port area, this should only be necessary where there is firm evidence they are cross-contaminated or pose a real risk of transporting an exotic mosquito. • If the detection has been made in a larval trap or ovitrap, re-check the trap for larvae and then immediately remove the trap from the port and disinfect it prior to re-use or disposal. • Agriculture should notify relevant stakeholders of the specific details of the detection.

1-2	3	<p>Planning and management (Agriculture, PO, S/T Health, Defence and, where relevant, the approved treatment provider)</p> <ul style="list-style-type: none"> • Conduct risk assessment—using this guidance. • Arrange meeting of Agriculture, S/T Health, PO, approved treatment provider, and Defence if required, to prepare an action plan. Can be by phone to expedite response. • S/T Health will formally request that the PO carry out required control measures. • Produce a map of the detection site to assist with operations, including developing priority zones for access and treatment. • Agree geographic areas of responsibility and review resources (human and material). • Consider and discuss implications for working outside normal hours, especially access requirements.
1-2	4	<p>Additional measures (Agriculture, S/T Health, Defence)</p> <ul style="list-style-type: none"> • If a property-by-property survey of breeding sites is required, S/T Health should begin the process of implementing an authorised prevention and control program.
1-5	5	<p>Control measures (PO, Agriculture, S/T Health, Defence)</p> <ul style="list-style-type: none"> • Priority should be given to the area within a 400m radius of the detection. Initial exotic mosquito control at the detection site should be carried out by Agriculture (e.g. removal of water, chlorination, fumigation, treating with s-methoprene). All other exotic mosquito control using insecticides should be carried out by the PO (through their nominated treatment provider) in conjunction with S/T Health (LG and Defence if required). Enhanced surveillance (e.g. additional mosquito trapping) should be undertaken when required. • Fogging should be conducted as soon as possible. This is particularly important if adult mosquitoes have been detected. Fogging is conducted by the PO-nominated treatment provider or Defence (for defence bases). <i>Note:</i> Agriculture staff are not trained or licensed to conduct these chemical treatments. Agriculture staff may accompany/escort the trained and licensed treatment provider around the port. • All harbourage areas associated with the detection site should be treated using an appropriate residual insecticide by the PO-nominated treatment provider or Defence (for defence bases). <i>Note:</i> Agriculture staff are not trained or licensed to conduct these treatments. • The treatment provider should provide a treatment report for all work undertaken including a list of chemicals used and rates applied as well as a map and/or details on the areas treated. • All vector monitoring traps within the areas to be treated must be turned off, covered and/or removed prior to any treatments being conducted to avoid the traps becoming contaminated with insecticide. All vector monitoring traps must be redeployed within 12 hours of treatments being conducted. • Agriculture and/or S/T Health should undertake supervision of treatments and review of all treatment reports provided by the treatment provider to ensure that treatments were conducted as requested. • If the PO does not carry out treatments as requested, the relevant Chief Human Biosecurity Officer or Health may legally compel the PO to do so by issuing a direction under the <i>Biosecurity Act 2015</i>.

1-28	6	<p>Surveillance (Agriculture, S/T Health, and Defence if required)</p> <ul style="list-style-type: none"> Enhanced trapping and surveillance will be implemented for at least one month post detection. Suitable numbers of traps are deployed to provide coverage of areas likely to attract mosquitoes (e.g. cooler, shaded, vegetated areas). Suspend operation of standard ovitraps and tyre traps within the immediate area of the detection during enhanced surveillance by removing them from the environment. Replace standard ovitraps with sticky ovitraps and deploy additional sticky ovitraps. Suitable surveillance traps are dependent on the exotic mosquito species initially detected and must be checked daily for the first 10 days (including weekends) post-detection. After 10 days of daily checking, if no additional detections have occurred and on agreement by key stakeholders, traps are checked every second day for one week and then weekly until key stakeholders agree to stand down enhanced surveillance.
1-28	7	<p>Planning and management (Agriculture, PO, S/T Health, LG where applicable and Defence if required)</p> <ul style="list-style-type: none"> Updates to all stakeholders will be provided by Agriculture. Reports by S/T Health, the PO or by other service providers are to be forwarded to Agriculture at agreed intervals. All operations and surveillance results should be mapped and documented.
1-60	8	<p>Media and communications (Agriculture, S/T Health, PO, and Defence if required)</p> <ul style="list-style-type: none"> A media statement is only required if the media are seeking information or if S/T Health wishes to advise the public of operations. Agriculture, S/T Health, PO, and Defence if relevant, may prepare media statements. The information within these statements is to be agreed to by all key stakeholders. Ensure the media sections of all key stakeholders are liaising with one another.
1-60	9	<p>Stand-down phase (Agriculture, PO, S/T Health, and Defence if required)</p> <ul style="list-style-type: none"> If no additional target mosquitoes have been found after one month, key stakeholders may decide to reduce the scope of surveillance. A final report regarding the detection and response should be compiled and distributed by Agriculture to relevant stakeholders.

Section 4: Response verification

Supervision and verification of treatments

Unless there is a suitable level of confidence in the provider, an officer from Agriculture (and S/T Health if required) is required to verify that treatment procedures are carried out by a third-party treatment provider.

A formal report prepared by the treatment provider should include information regarding:

- the treatment provider
- any fogging operations undertaken
- all treatment locations
- all insecticides used (including concentration of active ingredients, brand name, batch number and amount applied)
- all equipment used
- safety measures taken to prevent application to non-target areas
- the type and destination of cargo (if relevant), and
- the number and type of receptacles treated (if relevant).

When verifying that treatments are conducted, the relevant party should check and document:

- the type and concentration of insecticide used
- the route and intended targets of fogging operations
- the apparent effectiveness of fogging operations for complete coverage of the intended target areas
- that all relevant receptacle and residual treatments have been carried out, and
- any environmental conditions that may have affected the efficacy of treatments.

Section 5: Response checklist

✓	Action	Usual lead agency	Comment
	Management of immediate risk associated with the detection when found in/on imported cargo or a conveyance (i.e. collection of all larval and pupal specimens, aerosol knockdown insecticide applied, fumigation of infested goods)	Agriculture	
	Suspect exotic mosquito identified	Agriculture	
	Confirmation of identification by medical entomologist	S/T Health	
	PO notified of the detection	Agriculture	
	Risk assessment conducted	S/T Health, Agriculture	
	Local action plan prepared	S/T Health, Agriculture	
	PO formally informed of treatment requirements	S/T Health	
	Health advised about the detection and the treatments being requested	Agriculture	
	Treatment provider engaged to carry out required treatments	PO	
	Required treatments undertaken and supervised by Agriculture, S/T Health	Treatment provider	
	Additional surveillance traps deployed	Agriculture	
	Ground surveillance/breeding site surveys undertaken	Agriculture, S/T Health	
	Pathway analysis conducted	Agriculture	
	Reassessment of situation and expansion of efforts if required	Agriculture, S/T Health	
	Surveillance traps considered for placement beyond the 400m zone.	S/T Health	
	Decision made to stand down and cease enhanced surveillance	Agriculture, S/T Health	
	Communication strategy		
	Updates of enhanced surveillance results provided to all key stakeholders	Agriculture	
	Timing and completion of treatments confirmed	PO, Treatment provider	
	Media/public communication strategy prepared and delivered if required	S/T Health, Agriculture, Health, PO	
	Key stakeholder meetings held	S/T Health, Agriculture, PO	

Section 6: Additional considerations

Detections beyond the 400m zone or beyond the port boundary

At some FPoE, under jurisdictional legislation or with the cooperation of the PO, S/T Health (or LG) may choose to conduct its own surveillance beyond the 400m zone but still within the FPoE boundary. Additional surveillance may also occur beyond the FPoE boundary. In circumstances where this additional jurisdictional surveillance occurs beyond the 400m zone, S/T Health is considered the lead agency for responses to detections. Agriculture can help facilitate access to secure areas of the port when and where required.

Communication between stakeholders is vital and Agriculture and Health should be informed immediately of any exotic mosquito detection that occurs within an FPoE as a result of S/T surveillance.

Both Agriculture and S/T Health may need to conduct enhanced surveillance following an exotic mosquito detection beyond the 400m zone.

While any response to a detection outside of the 400m zone will be assessed on a case by case basis depending on the circumstances, considerations outlined in the previous scenarios regarding enhanced surveillance, habitat surveys and treatment options may provide some guidance. The key stakeholders and the response will vary depending on whether the detection is considered to be within the FPoE or whether the detection occurs beyond the port boundary.

Part 3: Exotic mosquitoes—supporting guidance

About this part

Part 3 of this guide compliments Part 2 by providing additional guidance and support to people who respond to exotic mosquito detections at Australian FPoE.

Information about inspection, surveillance and treatment methods is based on best practice in Australia and internationally. The key reference is the 2010 NAMAC draft document *Inspection, surveillance and treatment for exotic mosquito importations at ports in northern Australia*. Other reference documents include the WHO's 2013 *Regional framework for surveillance and control of invasive mosquito vectors and re-emerging vector-borne disease 2014-2020*, and a paper prepared in 2014 by the California Department of Public Health, titled *Guidance for surveillance of, and response to, invasive Aedes mosquitoes and locally acquired exotic mosquito-borne infections transmitted by these mosquitoes in California*.

Part 3: Exotic mosquitoes—supporting guidance consists of the following sections:

- Section 6: Regulatory framework
- Section 7: Stakeholders and their responsibilities
- Section 8: Staff training and competencies
- Section 9: Mosquito species of particular concern
- Section 10: Port clean-up and pre-emptive treatments
- Section 11: Inspection methods
- Section 12: Surveillance methods
- Section 13: Routine surveillance
- Section 14: Enhanced surveillance
- Section 15: Treatment methods—receptacles
- Section 16: Treatment methods—adult mosquitoes
- Section 17: Treatment methods—insecticides
- Section 18: Record-keeping, reporting, and useful documents

Section 7: Regulatory framework

The response to exotic mosquito detections at Australian FPoE occurs within a regulatory framework that includes the following Acts and regulations:

- *Biosecurity Act 2015*
- *Biosecurity Regulation 2016*
- *International Health Regulations 2005*
- Individual state and territory public health acts and regulations.

Biosecurity Act 2015

The *Biosecurity Act 2015* provides the legislative framework for managing diseases and pests that may cause harm to human, animal or plant health, or the environment.

Under the *Biosecurity Act 2015*, all FPoE are designated permanent biosecurity monitoring zones. Within permanent biosecurity monitoring zones, a range of powers may be exercised in order to assess biosecurity risk and to impose measures to manage any risk present. The *Biosecurity Act 2015* requires that biosecurity officials consider a number of principles when exercising these powers. For example, when deciding what control activities a PO must conduct in response to an exotic mosquito detection, a biosecurity official must be satisfied that:

- response activities are likely to be effective in, or contribute to, preventing the potential establishment of exotic species of mosquito in Australia
- response activities are appropriate and adapted to achieve that purpose for the FPoE
- the way the response activities will be conducted is no more restrictive or intrusive than required for the FPoE's circumstances, and
- the period of time in which the response activities will be conducted is only as long as is necessary¹¹.

Sections of the *Biosecurity Act 2015* with particular relevance to exotic mosquito management and control include:

- Section 378: FPoE designated as permanent biosecurity monitoring zones
- Section 318: Biosecurity officers may inspect premises
- Section 536: Persons assisting biosecurity officers
- Section 314: Circumstances when biosecurity risk assessment powers may be used
- Section 379: Powers that may be exercised in permanent biosecurity monitoring zones
- Section 347: Supervising a biosecurity measure
- Section 252A: Direction to operator of FPoE to carry out activities to control vectors

The *Biosecurity Act 2015* is available online at the [Australian Government Federal Register of Legislation](#).

¹¹ The principles are listed in section 32 'Principles of General Protection of the Act' of the *Biosecurity Act 2015*.

Biosecurity Regulation 2016

Included in the *Biosecurity Regulation 2016* are requirements that must be met before a landing place can be determined to be an FPoE.

One of these requirements is that there must be appropriate procedures in place to manage the level of biosecurity risk associated with operations carried out at the landing place or port.

The *Biosecurity Regulation 2016* is available online at the [Australian Government Federal Register of Legislation](#).

International Health Regulations 2005

The *International Health Regulations 2005* are part of an agreement between 196 countries, including all Member States of WHO, to work together to secure global health. Compliance with the regulations is largely voluntary. The *Biosecurity Act 2015* and the *Biosecurity Regulation 2016* incorporate into domestic law Australia's obligation under the *International Health Regulations 2005*.

The *International Health Regulations 2005* include specific measures for vector-borne diseases, with exotic mosquito management and control covered by a requirement that “programs be established to control vectors that may transport an infectious agent that constitutes a public health risk to a minimum distance of 400m from those areas of point-of-entry facilities that are used for operations involving travellers, conveyances, containers, cargo and postal parcels, with extension of the minimum distance if vectors with a greater range are present”¹².

The [International Health Regulations 2005](#) are available online on the WHO website.

Public health acts

States and territories in Australia have public health acts and other legislation that may be used to facilitate mosquito control outside the 400m zone and beyond port boundaries. This legislation varies in detail in each jurisdiction.

State and territory legislation is available online through government websites in each jurisdiction.

¹² WHO, *International Health Regulations (2005) – 3rd edition*, World Health Organisation, Geneva, 2016.

Section 8: Stakeholders and their responsibilities

Stakeholder	Responsibilities
Health	<ul style="list-style-type: none"> • Australia’s commitment to WHO’s <i>International Health Regulations 2005</i>. • Policies regarding: <ul style="list-style-type: none"> ○ exotic mosquito management and control ○ ship sanitation, and ○ aircraft disinsection. • Facilitation of NAMAC. • Human health powers under the <i>Biosecurity Act 2015</i>.
Agriculture	<ul style="list-style-type: none"> • Detection and identification of mosquitoes at FPoE. • Surveillance, monitoring and response activities at approved arrangement sites. • Declaring when an exotic mosquito has been detected and seeking independent verification and further analysis. • Enhanced surveillance activities following an exotic mosquito detection. • Ground surveys and liaison with stakeholders and tenants in FPoE to encourage and promote source reduction. • Reporting requirements regarding exotic mosquito detections and related responses to Health and other stakeholders. • Coordination of emergency control of vessels, aircraft or cargo at sites where the presence of exotic mosquitoes is suspected.
S/T Health	<ul style="list-style-type: none"> • Risk assessments in conjunction with Agriculture to determine vector control responses following a detection. • Communication of required response measures to PO. • Surveillance and control activities beyond port boundaries. • Provision of advice on exotic mosquito management and control to other stakeholders.

<p>PO</p>	<ul style="list-style-type: none"> • Exotic mosquito control activities in liaison with S/T Health. • Provision of access to port sites for purposes of risk assessment and mosquito management and control. • Provision of appropriate conditions and assistance during mosquito control activities. • Liaising between port tenants and leaseholders, Agriculture, and S/T officers. • Maintaining a clean, sanitary site that is free of potential mosquito breeding habitats wherever possible and reasonable. • Communication of relevant health, safety and environmental issues and encouraging source reduction by all stakeholders and tenants within the FPoE.
<p>Defence</p>	<ul style="list-style-type: none"> • Liaising with Agriculture and S/T Health regarding exotic mosquito management and control operations. • Routine monitoring and surveillance at Defence bases determined as FPoE (unless alternative arrangements are in place). • Maintaining a clean, sanitary site that is free of potential mosquito breeding habitats wherever possible and reasonable. • Reporting the detection of exotic mosquitoes to Agriculture. • Conducting or supporting response activities.

The funding for inspection, surveillance and response activities related to exotic mosquito management and control at FPoE generally aligns with the responsibilities of key stakeholders.

Activity—Ground Surveys	Funding responsibility	Comments
Inspections within the 400m zone	Agriculture	<ul style="list-style-type: none"> Defence is responsible for costs in Defence areas
Surveys beyond the 400m zone and outside ports	S/T Health	<ul style="list-style-type: none"> Agriculture may help facilitate surveys beyond the 400m zone but within secure port boundaries where required
Activity—Surveillance	Funding responsibility	Comments
Routine and enhanced surveillance	Agriculture	<ul style="list-style-type: none"> Defence is responsible for costs in Defence areas Funding not subject to cost-recovery
Surveillance outside the 400m zone and beyond port boundaries	S/T Health	<ul style="list-style-type: none"> Monitoring beyond the 400m zone is at the discretion of S/T Health and/or LG Agriculture may help facilitate surveillance within the port boundary where required
Activity—Response	Funding responsibility	Comments
Response activities within defined port boundaries	PO	<ul style="list-style-type: none"> At approved arrangements, the operators of the premises are responsible for response costs
Response activities outside port boundaries	S/T Health and/or LG	<ul style="list-style-type: none"> At approved arrangements, the operators of the premises are responsible for response costs
Treatment of imported goods that are infested or likely to be infested with mosquito eggs or larvae	Importer/owner of the infested goods	<ul style="list-style-type: none"> Agriculture will direct the goods for biosecurity treatment (e.g. fumigation)

Section 9: Staff training and competencies

Need for staff training and development
<p>Response activities following exotic mosquito detections must be undertaken by skilled and competent staff to ensure consistency of practice and that quality standards are met.</p>
<p>Staff require mentoring and access to training and development opportunities related to a number of topics relevant to their area of work. These topics may include:</p> <ul style="list-style-type: none"> • basic mosquito biology • calibration of equipment • safe practice in pesticide handling/application/storage/transportation • mosquito surveillance • mosquito identification • collecting and recording of mosquito samples • integrated mosquito management • biological control • habitat modification • legislative requirements • data reporting requirements • mosquito program planning, development, implementation and evaluation, and • outbreak management.
Mosquito management training
<p>All front-line staff involved in FPoE surveillance and response activities are expected to have undertaken specific mosquito management education and training.</p>
<p>Relevant training may be provided through:</p> <ul style="list-style-type: none"> • Mosquito Control Association of Australia (MCAA) • WA Health • NSW Health Pathology at Westmead Hospital, NSW
Pesticide training
<p>All States and territories require competency training for people involved in the application of pesticides for commercial purposes, such as nominated treatment providers. Training is also generally required under pest management or health and safety legislation.</p>

Section 10: Mosquito species of particular concern

- *Ae. aegypti* and *Ae. albopictus* are the primary target for exotic species detection and elimination due to the human health risks they pose. They are also considered important due to the frequency of detection and their recorded invasiveness in other parts of the world.
- While *Ae. aegypti* is already present in parts of Queensland, detections of *Ae. aegypti* in other states and territories or in locations where it is not known to occur is considered in the same way as other exotic species. Imported *Ae. aegypti* may possess insecticide resistance or have a different vectorial capacity than the strains already present in Australia.
- It is important to note that *Ae. albopictus* is more cold tolerant and poses a greater risk of establishment than *Ae. aegypti* in the southern states of Australia.
- Other exotic *Aedes* species that could possibly be encountered include *Aedes atropalpus*, *Aedes koreicus*, *Aedes japonicus*, or *Aedes triseriatus*, which have been recorded as being transported in receptacles in other countries¹³. The exotic species *Aedes japonicus* has been intercepted at a seaport in New Zealand at least three times and the potential for this species to be imported to Australia is high¹⁴. Surveillance methodologies for *Ae. aegypti* are acceptable for other receptacle-laying *Aedes* species.
- Non-*Aedes* spp. such as *Anopheles* spp. (e.g. *Anopheles sundaicus* and *Anopheles subpictus*) and *Culex* spp. (e.g. *Culex tritaeniorhynchus*) also need to be considered. These species can be potential vectors of human pathogens and may be present in neighbouring countries such as Indonesia and Timor Leste. Different surveillance methods may be required to detect these species, e.g. carbon dioxide baited traps and larval habitat surveys.

¹³ WHO, *Regional framework*, 2013.

¹⁴ R Russell, H Dowler, J Gardner, S Gilbert, M Stone, 'Reflections on a successful eradication programme. In Brian H Kay and Richard C Russell (eds), *Mosquito eradication: The story of killing *Campto** (pp. 245-256), CSIRO Publishing, Collingwood, 2013.

Section 11: Port clean-up and pre-emptive treatments

Australia's biosecurity legislation provides for the issuing of a legal direction to treat premises if an exotic mosquito detection occurs and specific requirements are met.

While a port clean-up may form part of the biosecurity measures required by the legal direction to treat premises, there are some actions that port operators should take as part of their normal operations to maintain a sanitary port environment.

The *Biosecurity Regulation 2016* lists requirements that must be met before determining a landing place or a port as an FPoE. This includes the requirement for appropriate procedures to be in place to manage the level of biosecurity risk associated with operations carried out at the port.

Port clean-up

On-site rubbish and other items that can hold water may act as places for adult exotic mosquitoes to harbour or lay eggs, increasing the risk of the mosquitoes becoming established. On-site rubbish also reduce the chance that exotic mosquitoes will be collected in surveillance and monitoring traps. They also make the tasks of receptacle spraying and adult space treatment much more difficult.

- Identify and record details of all relevant receptacles and tag where possible to indicate priority for removal or treatment.
- Seal receptacles and remove or concentrate them in one area away from overseas arrival points.
- Manage moveable and small receptacles likely to collect rainwater by storing them undercover (not tarped), sealing them, or turning them over to prevent filling with rain.
- Manage larger receptacles (including temporary traffic barriers and fuel spill holding tanks) and open-lined drains by treating them with appropriate chemicals or insecticides.

Receptacle pre-emptive treatments

While priority should be given to port clean-up and receptacle removal, there may be receptacles in port areas that cannot be removed, or otherwise prevented from offering a larval habitat for exotic mosquitoes. In these situations, the receptacles can be used as trap-and-kill zones.

Receptacle pre-emptive activities include the following:

- applying a recommended insecticide for the killing of both adults and larvae to receptacles left on site
- performing receptacle pre-emptive treatment rounds in conjunction with annual receptacle surveys for exotic breeding mosquitoes, as well as at the beginning of each wet season (in tropics) or in Spring (in temperate areas), and
- conducting additional pre-emptive treatment rounds after exotic mosquito detections or during seasonal and periodic surveys—all potential mosquito breeding receptacles should be identified on treatment with a coded sticker (detailing month and year of insecticide treatment) so new or missed receptacles can be identified and treated between treatment rounds.

Additional pre-emptive activities include:

- treating all drains and water bodies that have a potential for mosquito breeding with a residual application of insecticides such as methoprene briquettes (120-day briquettes or other) or approved surfactants
- treating habitats such as marshes, ponds, channels, drains and sumps with anti-mosquito agents. Treatment options (depending on circumstances) include bio-rational insecticides (biocides such as *B.t.i.* and insect growth regulators such as s-methoprene) and chemical pesticides (organophosphate and pyrethroid), monomolecular films (e.g. Aquatain[®]) and biological agents (fish), and
- using lethal tyre piles as a pre-emptive treatment, with care taken to inspect and treat them on a regular basis to prevent the establishment of breeding sites for vectors.

Section 12: Inspection methods

Receptacles
<p>Following an exotic mosquito detection at a seaport, any cargo or receptacle capable of holding water on the vessel should be inspected to determine if water or waterlines are present.</p>
<p>If there is any water, or evidence of water-holding:</p> <ul style="list-style-type: none"> • note the receptacle as high-risk—it being possible that there are exotic mosquito eggs, larvae or adults present, and • tag the receptacle for more intensive inspection, removal and/or insecticide treatment.
<p>If larvae are present in any receptacle:</p> <ul style="list-style-type: none"> • take a sample of the larvae, and • treat with an appropriate insecticide all receptacles with water, or receptacles likely to have held water in the previous week.
Aircraft and air bridges: international aircraft arrivals
<p>Agriculture officers should be vigilant for any flying adult mosquitoes in the aircraft and air bridges.</p>
<p>If any flying adult mosquitoes are observed:</p> <ul style="list-style-type: none"> • report the observation to S/T Health • space-spray the areas using a can of aerosol knockdown spray after all passengers have disembarked • if possible and practical, lay white sheets on the floor and below walls where mosquitoes are seen resting so that killed mosquitoes can be collected • collect specimens and, using tweezers, place in a tissue-lined collecting container, and • label container with all relevant information, including location of collected insect, aircraft company, flight number, date and arrival time, lounge number and airport name, location, origin of last port of call, and name of collector.
<p>Enhanced surveillance is triggered if adult mosquitoes are identified as exotic. Enhanced surveillance should be considered if adult mosquitoes are observed dispersing into the local port environment directly from the conveyance (e.g. mosquitoes observed flying out of an aircraft hold upon opening on arrival).</p>

Baggage and cargo offloading and handling areas: recently unloaded luggage or cargo

All airport employees should be vigilant for any flying adult mosquitoes and immediately report any sighting to the relevant Agriculture officer.

Following a report of mosquito activity, the Agriculture officer should:

- report the observation to S/T Health
- space-spray the vicinity of the sighting using a can or aerosol knockdown spray
- search for insects
- if possible and practical, lay white sheets on the floor and below walls where mosquitoes are seen resting so that killed mosquitoes can be collected
- collect specimens and, using tweezers, place in a tissue-lined collecting container, and
- label container with all relevant information, including location of collected insect, aircraft company, flight number, date and arrival time, lounge number and airport name, location, origin of last port of call, and name of collector.

Enhanced surveillance should be considered even if no specimens are collected.

Section 13: Surveillance methods

Ovitrap
Ovitrap are recommended for use in all high-risk FPoE.
<p>Ovitrap should be set:</p> <ul style="list-style-type: none"> • in secluded and rain-sheltered positions • low to the ground • relatively close to areas with frequent human activity • in areas protected from animal disturbance, and • in shady positions near vegetation.
Methoprene is added to the water of ovitrap to prevent any adult emergence should eggs become flooded before servicing or should <i>Culex</i> spp. lay eggs on the surface of the water.
Ovitrap that are found to be positive for exotic mosquitoes must be removed from the port environment and disinfected (super chlorine solution) prior to re-use or disposal.
Ovitrap require regular monitoring and should be inspected weekly enabling a relatively accurate estimation of the date of entry. If ovitrap are used routinely as larval traps (i.e. when they cannot be serviced weekly or fortnightly and there is no assessment of eggs on paddles), then sentinel tyres should be used in parallel with larval trap ovitrap.
BG adult mosquito traps
BG traps are recommended for use at all FPoE.
BG traps are visual adult traps that trap adult mosquitoes with the aid of a suction fan. They require mains or battery power, and generally need to be in secure locations and inspected weekly. Additional CO ₂ can be used to bait the traps and is supplied by dry ice daily (manually), or weekly by a gas cylinder.
BG traps 'favour' receptacle-breeding species such as <i>Ae. aegypti</i> or <i>Ae. albopictus</i> and when supplemented with CO ₂ , can collect many species. The BG trap, with olfactory attractant (BG-lure), has been shown to be more effective at collecting <i>Ae. aegypti</i> than EVS traps ¹⁵ . Other research has shown them to be more effective at collecting <i>Ae. albopictus</i> than CDC light traps with CO ₂ ¹⁶ .

¹⁵ CR Williams, SA Long, RC Russell, SA Ritchie, 'Field efficiency of the BG-sentinel compared with CDC backpack aspirators and CO₂-baited EVS traps for collection of adult *Aedes aegypti* in Cairns, Queensland, Australia, *Journal of the American Mosquito Control Association*, 2006, 22:296-300

¹⁶ WH Meeraus, JS Armistead, JR Arias, 'Field comparison of novel and gold standard traps for collecting *Aedes albopictus* in Northern Virginia, *Journal of the American Mosquito Control Association*, 2008, 24:2:244-248.

BG traps allow adult identification without the time delay associated with rearing eggs or larvae as occurs with specimens collected from ovitraps. However, these traps are relatively expensive and require security and experienced personnel to check and maintain them. BG trap collections of more than 3-4 days' duration generally contain damaged and difficult-to-identify specimens unless specific precautions are taken during collection and handling.

CO₂ -baited adult traps

Encephalitis virus surveillance (EVS) baited traps are attractant traps with a suction fan for collection of a wide range of species of adult female mosquitoes. The trap consists of an insulated bucket of dry ice and a motor suction device suspended underneath for collection into a receiving catch container¹⁷. Alternatively, the CDC miniature light trap may be used where a baited trap is required. The use of octenol lures can also enhance the numbers or species caught^{18,19,20}.

These traps are usually set in the early evening, run overnight, and are collected in the early- to mid-morning of the next day. Some traps collect into simple net bags or screened rigid plastic containers collected daily, while others have special catching bags with preservative or bottles with alcohol that can be collected weekly.

There is considerable variation in CO₂ -baited trap types used between jurisdictions. The EVS trap is the preferred trap type. Ideally, EVS traps should be baited with dry ice and set in the late afternoon and collected mid-morning. Traps should be set once per week, near vegetation and close to passenger and cargo areas.

The advantage of this trap type is its attractiveness to a wide range of mosquito species, not just container-breeding mosquitoes. They are, however, relatively expensive, need some security, and also require CO₂.

Tyre larval traps

Tyre larval traps or 'sentinel tyres' are constructed from disused standard car or light truck tyres. They are filled with water to a designated maximum water level or naturally flood with rain. The inside of the tyre, just above the water line, provides a suitable surface for female mosquitoes to oviposit. When the tyre is flooded, the eggs hatch, and are sampled as larvae during the next inspection. Tyres should be inspected weekly so that late instar larvae are present. As all eggs and larvae cannot usually be removed from tyres, they require regular treatment with an insect growth regulator, such as methoprene pellets, to prevent adult emergence.

¹⁷ DL Rohe, RP Fall, 'A miniature battery powered CO₂-baited trap for mosquito-borne encephalitis surveillance', *Bulletin of the Society for Vector Ecology*, 1979, 4:24-27.

¹⁸ WK Reisen, RC Cummings, O Delgado, A Gutierrez, RP Meyer, TW Scott, 'Comparative effectiveness of three adult mosquito sampling methods in habitats representative of four different biomes of California', *Journal of the American Mosquito Control Association*, 1999, 15:24-31.

¹⁹ WK Reisen, RP Meyer, RF Cummings, O Delgado, 'Effects of trap design and CO₂ presentation on the measurement of adult mosquito abundance using Centers for Disease Control-style miniature light traps', *Journal of the American Mosquito Control Association*, 2000, 16:13-18.

²⁰ RC Russell, 'The relative attractiveness of carbon dioxide and octenol in CDC- and EVS-type light traps for sampling the mosquitoes *Aedes aegypti* (L.), *Aedes polynesiensis* Marks, and *Culex quinquefasciatus* Say in Moorea, French Polynesia', *Journal of Vector Ecology*, 2004, 29:309-314.

Sentinel tyre traps do not need sheltered protected areas as the tyre itself offers harbourage. They can be used where there is limited ability to service the traps on a regular basis.

The tyre should always have the same upright orientation so that eggs laid are laid on the same surface area.

Sentinel tyres that are found to be positive for exotic mosquitoes must be removed from the port environment and disinfected (super chlorine solution) prior to reuse or disposal.

Lethal ovitraps and lethal tyre piles

Several variants of lethal ovitraps have been developed. The concept behind these traps is to lure oviposition site-seeking females to a container from which they cannot escape or where they have contact with a lethal dose of insecticide.

One form of lethal ovitrap is a lethal tyre pile. These are marked piles of 3 or more tyres set near to arrival facilities of ports. They are regularly filled with freshwater and a relevant residual adult insecticide is applied to the inner surfaces. Methoprene 120-day briquettes are applied to the inside of the tyre to prevent adult emergence.

Sticky ovitraps

Sticky ovitraps are ovitraps with a sticky internal sheet to capture adult mosquitoes as they lay eggs. They should be inspected on a weekly basis or more frequently, as they require new sticky sections inserted each week.

Sticky ovitraps facilitate the removal of exotic females from the port area. However, mosquitoes caught in the glue can be damaged, making morphological identification challenging. As such, they are not generally used for routine monitoring, but are a key enhanced surveillance method once a detection of an exotic mosquito has been confirmed.

Sticky ovitraps are useful for detecting receptacle-breeding *Aedes* species. It has been found that they are as sensitive in detecting *Ae. aegypti* as standard ovitraps and outperformed standard ovitraps in a trial at Cairns International Airport and residential areas of Cairns²¹.

²¹ SA Ritchie, S Long, A Hart, C Webb, RC Russell, 'An adulticidal sticky ovitrap for sampling container-breeding mosquitoes', *Journal of the American Mosquito Control Association*, 2003, 19:235-242.

Receptacle surveys on vessels or cargo
<p>When water is present, the entire water volume should be inspected. For small receptacles, the water should be decanted by a sampler and inspected for larvae, pupae, and pupal skins. All the water including debris in the bottom should be examined for any possible live or dead larvae, pupae or pupal skins.</p>
<p>If larvae or pupae are detected, they, and accompanying debris in the receptacle should be transferred to a uniquely labelled vial (e.g. urine sample jar) before treating the receptacle. The approximate total number of larvae in the receptacle, with all information of receptacle type, volume of water, and numbers of larvae or pupae should be recorded on a prepared data record sheet. The data sheet should also have all details of the vessel or cargo source, dates of arrival, receptacle type, volume of water, and presence of larvae. If possible, the inspection data record sheet should also state if the larvae are <i>Aedes</i> or <i>Culex</i> species.</p>
<p>If only pupal skins are present, they should be collected and preserved, as they may be identifiable. A water sample should be collected for possible eDNA analysis (where available). If pupae alone are found, these should be collected alive into secure uniquely labelled receptacles and taken immediately to a secure laboratory for rearing to the adult stage for positive identification. If pupae occur with 4th instar larvae, a representative sample of larvae is generally satisfactory for identification of the pupae—on the assumption that the larvae will include some of the same species as the pupae. But some of the pupae should be reared to adults in case the larvae cannot be conclusively identified. Any rearing of larvae and pupae to adults by Agriculture staff that are suspected to be exotic is only permitted in full consultation with an Agriculture entomologist or a S/T Health medical entomologist and only within a secure insectary.</p>
Receptacle surveys in ports
<p>Routine receptacle surveys for mosquito breeding should be conducted by Agriculture at least once and up to 3 times per year at all FPoE. The frequency of receptacle surveys will vary depending on the receptivity of the FPoE to the establishment of exotic mosquitoes, and should take into account local temperature and rainfall.</p>
<p>Receptacle surveys need to identify, record, and tag where possible or practical all potential mosquito breeding receptacle that remain consistently on site in a port area. These tagged receptacles should be treated with residual insecticides every 3 months and sampled for larvae regularly as part of routine vector monitoring (dipping).</p>
<p>Surveys should incorporate clean-up measures to remove receptacles to make port areas less receptive to the establishment of exotic mosquitoes.</p>
Non-receptacle breeding habitat larval surveys
<p>There are very few jurisdictions that carry out regular or systematic non-receptacle breeding habitat larval surveys. High-risk ports should carry these out at least 1 or 2 times per year and in peak seasonal times for mosquito breeding.</p>

Section 14: Routine surveillance

The need for routine surveillance
<p>Routine surveillance is undertaken at FPoE to detect exotic mosquitoes. This type of surveillance involves the use of adult mosquito traps and larval and egg traps. The number, type, (including whether or not they are enhanced with CO₂ or other attractants) should be determined in line with requirements at each FPoE. The number and type of traps used in each port will depend on a number of factors, including:</p> <ul style="list-style-type: none"> • the extent of the port • the frequency of international arrivals • the number of discrete buildings related to passenger and cargo arrivals and processing • the nature of operations in each area, and • the number of habitats for mosquito breeding and harbourage.
Routine surveillance—what is involved
<p>Currently recommended traps for routine surveillance include BG traps (standard or CO₂-enhanced), standard ovitraps, sentinel tyre traps and EVS traps. Decisions around the appropriate trap to use involve consideration of the availability of power, security, and suitable sites for their operation.</p>
<p>Standard BG traps are suitable in enclosed areas at terminal facilities, while enhanced BG traps usually collect more specimens.</p>
Routine surveillance—when it is done
<p>Routine exotic mosquito surveillance traps are in continuous operation at all FPoE. Traps should be serviced weekly for collection and identification of species. Lethal traps along with pre-emptive harbourage spraying in high-risk areas are recommended in high-risk ports²².</p>
Routine surveillance—collection and identification of specimens
<p>The preservation, storage and conveyance of specimens should conform to best-practice advice provided by medical entomologists or specialised laboratories. Specimens may be sent to medical entomologists for confirmation of species identification. Alternatively, high-resolution images of the specimen showing key diagnostic features can be emailed to medical entomologists.</p>
<p>Exotic <i>Aedes</i> mosquitoes may require DNA analysis for identity confirmation (as required), point of origin, and putative insecticide resistance status. Further testing for the presence of virus in specimens is open to the requirements of S/T Health in each jurisdiction.</p>

²² RC Russell, *Vector monitoring risk assessment*, 2015.

Section 15: Enhanced surveillance

The need for enhanced surveillance

Following the detection of exotic mosquitoes at an FPoE, a range of response activities occur to ensure their elimination. In most cases, a period of enhanced surveillance is appropriate.

Situations that trigger enhanced surveillance include:

- when flying adult mosquitoes likely to have been imported are observed in aircraft or in air bridges
- when exotic larvae, pupae and pupal skins are collected in routine ovitraps or tyre traps or other on-shore receptacles, and
- when adult exotic mosquitoes are collected in routine adult surveillance traps.

Enhanced surveillance—the use of additional traps

During a period of enhanced surveillance:

- deploy additional traps (generally a doubling of the number of traps in place)
- enhance standard BG traps with CO₂ wherever possible
- consider using CO₂-baited EVS traps, and sticky ovitraps where possible, as well as routine surveillance traps such as BG traps
- suspend the use of standard ovitraps and tyre traps in the immediate proximity of the detection site until detection response activities are concluded (this is because these traps may not allow for timely analysis of any eggs laid in them)
- temporarily replace standard ovitraps with sticky traps
- collect standard ovitraps or tyre traps and seal them in plastic bags to avoid attracting adult mosquitoes and to avoid insecticide contamination
- set additional traps in as many locations as needed to cater for the number and range of suitable harbouring sites around disembarkation and cargo unloading and processing areas
- give preference to adult traps (e.g. BG traps) and lethal traps (e.g. sticky ovitraps) to ensure that adults are collected and removed from the environ
- target the type of additional traps deployed to the species of exotic mosquito present, and
- consider applying residual insecticide for adult mosquitoes to surfaces inside small and large receptacles and in harbourage areas, in as many locations as deemed necessary. In doing this, take into account the location of the exotic mosquito detection, the physical layout of the port with regard to potential harbourage and breeding sites, and the extent of any probable dispersal of exotic adults. This includes setting or re-applying insecticide to lethal tyre piles, and the setting of sticky traps or other lethal traps.

Enhanced surveillance—receptacle surveys

Enhanced surveillance involves surveys to locate and sample water-holding receptacles for larvae.

Key actions to consider include the following:

- undertake surveys near the detection to locate and sample water-holding receptacles
- if the detection is extensive, or multiple detections occur in a short period of time, take water samples from potential mosquito breeding sites in the port area for eDNA analysis
- apply residual insecticide to the inside surfaces of any water-holding receptacle that cannot be removed or destroyed. For environmental reasons, different insecticides will be needed to treat water in drains
- with regard to water-holding receptacles, record the date, location, and elimination treatment where relevant
- manage larval samples by labelling with details of the receptacle type, size, amount of water, number of larvae/pupae and location, name of the collector, date and location. Process collected larvae in relation to alcohol preservation and identification on the day of collection, and
- based on the site of detection, prevailing wind patterns, and flight range of the species of concern, consider expanding beyond the 400m zone or defined boundaries of the port to determine possible establishment.

Enhanced surveillance—time frames

- Samples must be identified within 24 hours from the day of collection.
- Enhanced surveillance will continue for at least 1 month post detection.
- The inspection of surveillance traps will be daily for the first 10 days.
- After 10 days, if no additional detections have occurred and on agreement by key stakeholders, traps may be inspected every second day for one week and then weekly checks until key stakeholders agree to stand down enhanced surveillance.

Section 16: Treatment methods—receptacles

Agriculture treatment of receptacles
<ul style="list-style-type: none"> • Treatment of receptacles by Agriculture officers are outlined in Agriculture work instructions²³. • Initial treatment of receptacles involves the use of methoprene and, to a lesser extent, monomolecular films or chlorine solution.
PO or S/T Health treatment of receptacles
<ul style="list-style-type: none"> • If a receptacle contains water or any mosquito larvae following an exotic mosquito detection, it is assumed that the receptacle contains exotic mosquito eggs on the inside surfaces. • Water-holding receptacles are emptied where larvae will not survive, and then treated with a chlorine spray to kill possible eggs on inner surfaces²⁴.
Receptacles and insecticides
<ul style="list-style-type: none"> • Receptacles suitable for insecticide treatments include those with potential for collecting rainwater or those that contain water but which are not required or in use for human/animal drinking water or food storage, and do not contain ornamental fish. • The insecticide used should be based on the approved list in section 17. This list is subject to review by Agriculture and Health with reference to NAMAC. • All insecticides to be applied by licenced pest managers in line with label instructions. • Insecticides such as methoprene or monomolecular films can be applied to rainwater tanks, roof gutters and other water storage or lined water conveyance areas (drains) where there is standing water and mosquito breeding is possible.

²³ Any state or territory wishing to access these work instructions can contact Agriculture.

²⁴ M Shortus, P Whelan, 'Recommended interim water receptacle treatment for exotic mosquitoes on international foreign fishing vessels arriving in Australia', NT Disease Control Bulletin, 2006, 13, 2:32-34.

Section 17: Treatment methods—adult mosquitoes

Space spraying (adulticiding)
<ul style="list-style-type: none"> • For large-scale operations—vehicle-mounted machines using ULV or thermal fogging. • For building interiors—small-scale ULV or thermal fog machines. • For outdoor scenarios—ULV applications. • For indoor scenarios—thermal fogging.
<p>When planning spraying/fogging operations, consider the following:</p> <ul style="list-style-type: none"> • inform key stakeholders and landholders and provide warning to reduce or eliminate their employees' exposure to insecticide • operations will extend up to 400m from the detection point • potential mosquito harbourage targets include air bridges, luggage and cargo unloading areas, processing areas, transport facilities, and air can storage areas • fogging will incorporate open buildings near the detection, and extend to areas of rubbish or accumulated objects likely to harbour mosquitoes • give attention to the underside of structures that are elevated from the ground, e.g. demountable buildings and vehicles • hedges, dense garden beds and dense clumps of vegetation offer sheltered harbouring areas and are to be included in operations • fogging should be directed to areas below 3m from the ground • landholders and businesses are not to remove any receptacle from their premises until fogging and receptacle treatments have been carried out, and • Adult and larval or egg monitoring traps need to be sealed in plastic bags or removed prior to fogging to avoid contamination. Traps may be uncovered or redeployed 2 hours after fogging.
Treatment of surfaces
<ul style="list-style-type: none"> • Apply residual barrier sprays to indoor and outdoor surfaces as well as to vegetated harbourage areas, using approved insecticides and methods.
Efficacy of Treatment
<ul style="list-style-type: none"> • Consideration should be given to the verification of response treatments by chemical or biological means such as surface swabs or live fly bioassays when required.

Treatment variations for different species
<p>For exotic <i>Aedes</i> species:^{25,26,27,28,29,30,31}</p> <ul style="list-style-type: none"> undertake adult spraying/fogging operations in the late afternoon to early evening or early morning when adult mosquito flight activity is likely to be at a peak.
<p>For <i>Ae. aegypti</i>:</p> <ul style="list-style-type: none"> extend fogging operations to the interior of sheds and buildings where ease of mosquito access is evident, as well as outdoor areas where there are dark objects or surfaces in shaded areas apply residual sprays to dark harbourage areas, including the underside of objects apply residual sprays to all potential water-holding receptacles there is no need to apply larvicide to artificial ponds or lakes, or earth sided or unlined storm water drains, and residual sprays of surfaces such as walls should be limited to no higher than 2m from the ground or floor surface.
<p>For <i>Ae. albopictus</i>:</p> <ul style="list-style-type: none"> concentrate fogging on vegetated areas and shaded situations, and where there is rubbish or other objects offering mosquito harbourage.
<p>For container-breeding <i>Culex</i> species and other container-breeding <i>Aedes</i> species:</p> <ul style="list-style-type: none"> Fogging and treatment of receptacles is the same as for <i>Aedes albopictus</i>.
<p>For ground-pool habitat <i>Anopheles</i> or <i>Culex</i> species:</p> <ul style="list-style-type: none"> concentrate larvicide applications and fogging for adults on artificial ponds, storm drains, lakes or other water bodies where there is emergent or marginal vegetation, and extend fogging operations up to 1km from the exotic mosquito detection location to cater for the probable longer flight range of these species.

²⁵ Pettit W, Kurucz N. 'A series of exotic mosquito detections at Darwin International Airport, Northern Territory between February 2015 and January 2016', *Northern Territory Disease Control Bulletin*, 2016, 23:4: 15

²⁶ PI Whelan, RC Russell, G Hayes, G Tucker, G Goodwin, 'Exotic *Aedes* mosquitoes: Onshore detection and elimination in Darwin, Northern Territory, Australia', *Communicable Disease Intelligence*, 2001, 25:4: 283-285.

²⁷ PI Whelan, G Lamche, C Prosser, H Espinoza, 'Exotic mosquitoes detected in cargo at East Arm port area, 19 March 2003', *Northern Territory Disease Control Bulletin*, 2003, 10: 29-30.

²⁸ HT Nguyen, PI Whelan, M Finlay-Doney, SY Soong, 'Interceptions of *Aedes aegypti* and *Aedes albopictus* in the port of Darwin, Northern Territory, 25 January and 5 February 2010', *Northern Disease Control Bulletin*, 2010.

²⁹ N Kurucz, W Pettit, 'Incursions of *Aedes aegypti* in the Darwin port area, Northern Territory, Australia 23 April and 3 May 2013', *Northern Territory Disease Control Bulletin*, 2013, 20:4: 1-4.

³⁰ R Feldman, N Cliff, D Ivanic, C Michael, 'Exotic mosquito detections in Victoria: 2012-2016'. *Abstracts of 12th Symposium of the Mosquito Control Association of Australia and Arbovirus Research in Australia*, Surfers Paradise, Queensland, 4-9 September 2016.

³¹ SL Doggett and C Webb, '*Aedes aegypti* at Sydney airport; the detections and response, *Abstracts of 12th Symposium of the Mosquito Control Association of Australia and Arbovirus Research in Australia*, Surfers Paradise, Queensland, 4-9 September 2016.

Section 18: Treatment methods—insecticides

All insecticides must be registered with the Australian Pesticides and Veterinary Medicines Authority (APVMA) for the purpose stated. Check the product label for use patterns, dilution rates and target species as not all products containing the listed active ingredients are labelled for use against mosquitoes. Please note that knockdown and residual treatments must be conducted by a licenced pest management expert.

Control type	Active ingredient	Application method	Comments
Adult knockdown The use of a 4 th generation pyrethroid is preferred.	deltamethrin	Thermal or ultra-low volume (ULV) fogging.	Deltamethrin is currently the preferred active ingredient for adult knockdown.
	cypermethrin	Thermal or ULV fogging.	An alternative fourth generation pyrethroid preferred over formulations containing earlier generations such as bioresmethrin or d-phenothrin.
Residual harbourage sprays for vegetation, internal and external walls and the inner surfaces of receptacles. A combination neonicotinoid and pyrethroid is preferred.	beta-cyfluthrin plus imidacloprid	Pressure sprayers.	Neonicotinoids have a different mode of action to pyrethroids. beta-cyfluthrin and imidacloprid is the preferred combination of active ingredients for residual treatments.
	bifenthrin plus imidacloprid	motorised pressure sprayer equipment or hand-held pressure sprayers for small areas.	An alternative to beta-cyfluthrin combined with imacloprid, but still preferred over non-combination formulations lacking neonicotinoids.
Treatment for receptacles and/or drains Slow release s-methoprene formulation (such as briquettes) is preferred.	s-methoprene	Hand application to receptacles, drains or ground larval habitats.	Preferred treatment for drains and receptacles.
	Light mono molecular oil	Hand droplet application to large receptacles or lined drains with pupae or larvae.	For quick action against larvae and pupae but should be used in conjunction with other long-lasting products such as s-methoprene.
	Bacillus thuringiensis var. israelensis (b.t.i)	Pressure sprayers and granules.	Fast acting against feeding larvae but as it needs to be ingested to be effective, Bti does not affect pupae, adults, or late larval stages when active feeding has ceased.

Section 19: Record-keeping, reporting, and useful documents

Record-keeping, reporting, and useful documents

Clear communication pathways and reporting processes are vital to ensure that all stakeholders are aware of exotic mosquito detections.

When an exotic mosquito detection is confirmed, details must be reported to relevant parties within Agriculture, Health and S/T Health.

Communication with the public and with media organisations is a matter for consideration and agreement by key stakeholders at each FPoE. This process should occur in consultation with Agriculture, Health and the PO.

Record-keeping

Details of all inspections, detections, surveillance, and treatments are to be documented, with the following information recorded (where applicable):

- vessel/aircraft type
- country and port of origin
- transit ports and dates of transit
- date of docking/landing
- location of docking/landing
- date of inspection
- receptacles with water
- receptacles with larvae
- species identified and verification of identification, and
- date and type of treatments.

Detailed maps and satellite imagery are a useful for marking trap locations and identifying potential harbourage areas.

Specific details treatment details to be recorded include:

- areas treated
- type and location of receptacles treated
- chemicals and methods used
- details of warnings and other communications provided
- dates, times and locations of treatments, and
- general observations and any follow-up treatment or inspection requirements.

Useful documents

On the following pages are documents that can be printed or copied as required to assist with record-keeping and reporting. The documents include:

- key contact list
- exotic mosquito detection response report
- receptacle surveillance results
- enhanced surveillance report
- request to undertake a treatment activity (details to include in correspondence), and
- legal direction to treat premises.

Key contacts

Name	Position	Landline	Mobile	Email
COMMONWEALTH CONTACTS				
Department of Agriculture and Water Resources (Biosecurity)				
Australian Government Department of Health				
LOCAL CONTACTS				
Department of Agriculture and Water Resources (Biosecurity)				
State/territory health department				
Local government				
Seaport authority				
Airport authority				
Department of Defence				

Exotic mosquito detection response report

Date of detection	Detection site	Lead stakeholder	Species	Stages	Fogging, barrier, harbourage control/date	Receptacle control/date	Treatment provider	Insecticide type and application	Comments

Receptacle surveillance results

Port, location, date of survey:						
Receptacle type	Numbers	With water	With larvae	Species	Instars	Treatment type

Request to undertake a treatment activity (suggested wording and details to include in correspondence)

Dear **{name of recipient}**

On **{date}**, **{name of State/Territory department of health}** was informed by the Department of Agriculture and Water Resources that during their routine surveillance for exotic mosquitoes, **{details of mosquito detected}** was detected at **{name of first point of entry}**.

A risk assessment by the **{institution providing medical entomology services}** and the Department of Agriculture and Water Resources concluded that a potential emergence event cannot be ruled out due to **{further details as required}** and recommended the following chemical control measures to be implemented as soon as possible to eradicate any potential establishment of the exotic species.

In the first instance, I request that **{name of port operator}** conduct adult mosquito control via **{details of treatment required, when and where treatment should be undertaken}** as recommended by **{name of relevant medical entomologist}**. These recommendations are supported by **{name of State/Territory department of health}** and the Department of Agriculture and Water Resources. **{Further details of treatment required, e.g. insecticides to be used}**.

Further measures may be required in the coming days and weeks to monitor and control this detection. I will issue further requests to **{name of port operator}**, based on expert advice and any other detections of **{name of mosquito species identified in this detection}**.

Should you have any questions regarding this request please contact **{name, position and contact details of appropriate contact person in State/Territory department of health}**.

Kind regards

{name and position of sender}

Legal direction to treat premises

COMMONWEALTH OF AUSTRALIA

DIRECTION TO CARRY OUT VECTOR CONTROL ACTIVITIES

SECTION 252A *BIOSECURITY ACT 2015*

I, [insert full name], on the basis of evidence that [exotic mosquitoes /mosquito larvae] have been detected at [insert port name] ('the Airport') in the State/Territory of [state/territory], being a first point of entry, under section 252A(1) of the *Biosecurity Act 2015* ('the Act');

DIRECT, [name of operator], to carry out the activities in the areas of the Airport, at the times and in the manner, specified below in order to control vectors in those areas:

1. Within [X] days of the date of this Direction, disinsection by 'fogging' must be carried out in and around [insert relevant area and relevant chemical].
 - a. [List specific areas if required]
 - b. [List specific areas if required]
 - c. [List specific areas if required]
2. Within [X] days of the completion of the activities mentioned in paragraph 1 , all external drains must be cleaned and treated with S-Methoprene Briquettes.
3. Within [X] days of the completion of the activities mentioned in paragraph 1, a residual barrier spray [insert relevant chemical] must be applied in and around the areas mentioned in paragraph 1.

Dated this _____ day of _____ 2017

[insert name]

Chief Human Biosecurity Officer for [name of State/Territory]

[NOTE: A person to whom a direction under subsection 252A of the Act is given, and who fails to comply with the direction, may be prosecuted for an offence punishable by up to 5 years imprisonment or a pecuniary penalty of up to 500 penalty units (subsection 252A(3)). Alternatively, civil penalty proceedings may be taken against the person that may require the person to pay an amount up to 120 penalty units (subsection 252A(4)). As at 1 June 2017, a penalty unit is equal to \$180 and is increased on 1 July each following year – section 4AA *Crimes Act 1914*]

Part 4: Bibliography

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