

Mosquito Management

PLAN • 2025



**CITY OF
PERTH**
City of Light







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1. Introduction

The City of Perth is the capital city of Western Australia. It encompasses the Perth central business district, suburbs of West Perth, Perth, East Perth, Northbridge, and Crawley. It covers an area of just over eight square kilometres.

Heirisson Island is the main location of mosquito breeding grounds in the city. The southern portion of the island has tidal plains which are ideal for mosquito breeding. Pelican Point is also a site of mosquito management. It is a protected bird sanctuary under the control of the Marine Parks and Reserve Authority (Department of Biodiversity, Conservation and Attractions).

There are over 3,500 species of mosquitoes worldwide with nearly 100 species found in WA. Mosquitoes are a natural and important part of the local ecosystem. They are a food source for some birds, bats, amphibians, fish and insects,

as well as being pollinators of flowering plants. In WA, about 30 species are considered pests and / or carriers of viruses transmitting disease to humans with serious consequences.

In recognising the potential public health hazards of mosquitoes, this management plan is designed to control the number of mosquitoes and their effects on the City's community. The plan provides guidance on the control of seasonal mosquitoes.

Although certain mosquito control methods can pose environmental risks, significant benefits including reducing the impacts on public health, the economy, as well as addressing the nuisance posed by excessive mosquito numbers.

2. Scope of the Management Plan

This plan is specific to the management of mosquitoes within the City of Perth boundaries. It has been developed to meet the Department of Health, WA Mosquito Management Program and guidelines to Contiguous Local Authority Groups (CLAGs). The key requirement is to develop a comprehensive plan to gather valid data on local mosquito populations to inform development of maps showing “mosquito risk” that form the basis for future site-specific mosquito-borne disease management strategies.

The plan has been designed to provide a responsible approach to mosquito management without being detrimental to people or the environment.

The eradication of mosquitoes and use of insecticides to control adult mosquitoes is impracticable and not considered an appropriate management techniques.



4. Strategic Implications

This plan is aligned with The City of Perth Strategic Community Plan (2022-2032), Sustainable pillar. A sustainable community ensures a healthy environment where nature, social, and economic systems are in balance.

3. Health Legislation and Other Considerations

Under the Health (Miscellaneous Provisions) Act 1911 and subsidiary legislation, local government has the following responsibilities in relation to mosquito management:

- where required, preparing and implementing management programs for the control of nuisance and disease-carrying insects (e.g mosquitoes) or other arthropods;
- ensuring nuisance or disease-carrying insects breeding on 'non- private' land where such insects impact on residential areas are monitored and managed;

5. Management Plan Objectives

The objectives of this management plan are to:

1. Minimise the likelihood of human vector-borne disease and annoyance caused by mosquito outbreaks whilst balancing impacts on the natural environment.
2. Apply best practice mosquito management and regularly review the effectiveness of the MMP in consultation with the Department of Health and CLAG affiliated councils.
3. Manage the potential impact on both the natural environment and humans, to minimise any potential harm.



6. Background and Habitat

Heirisson Island and Pelican Point have the greatest potential to support significant mosquito breeding within the City boundary. These areas comprise a tidal plain and salt marsh area, both ideal habitats for mosquito breeding.

Within the City of Perth tidal movements and sea conditions are considered to have the single most impact on mosquito breeding. The second most significant factor is considered to be the success of mosquito management within surrounding local government areas. Successful management within surrounding areas minimises the likelihood of outbreaks and the establishment of significant breeding within the City's boundary.

High rainfall onto saltmarsh areas is conducive to mosquito breeding. Inspection of larval breeding sites at Pelican Point and Heirisson Island should be conducted 2-3 days post rainfall. Rainfall in warmer months in other areas, may have some impact on mosquito breeding through stormwater drains, ground pooling etc, but is not considered to present a significant risk to cause outbreaks needing regular monitoring or intervention.

Specific Mosquitoes

The most prevalent species of concern found at Heirisson Island and Pelican Point are *Aedes vigilax* and *Aedes camptorhynchus*. Both these species are known vectors of Ross River virus (RRV) and Barmah Forrester virus (BFV) and are particularly vicious biting mosquitoes. *Aedes vigilax* is more abundant during hotter months and high saline conditions. *Aedes camptorhynchus* is more abundant during winter, spring and early summer and can breed in brackish water, such as rainfilled saltmarsh areas.

Two species of mosquitoes known to breed in man-made environments such as drains, ornamental water bodies, backyards etc are *Culex quinquefasciatus* and *Aedes notoscriptus*.

Both species bite humans, particularly at night, and will enter buildings in search of blood meals. *Culex quinquefasciatus* is not known to transmit the common mosquito borne diseases RRV or BFV. *Aedes notoscriptus* has been associated with urban outbreaks of RRV.

Table 1. Common mosquito species associated with wetlands, stormwater drains and backyard habitats in City of Perth.

Mosquito Species	Habitat associations	Public Health Risk
SALTWATER		
<i>Aedes vigilax</i>	Tidally influenced saltmarsh.	Vicious biting, important vector of RRV and BFV.
<i>Aedes camptorhynchus</i>	Saltmarsh and brackish wetlands in close proximity to dense urban areas.	Typically greater in cooler months. Also vicious biting, important vector of RRV and BFV.
FRESHWATER		
<i>Aedes notoscriptus</i>	Small water holding containers around dwellings such as tins.	Regarded as vector of RRV in urban areas.
<i>Culex annulirostris</i>	Fresh water as well as water holding infrastructure such as man made lakes and containers. Prefers heavily vegetated sites and mildly brackish water	Known vector of RRV, BFV, Murray Valley encephalitis (MVE), Japanese encephalitis virus (JEV) and Kunjin viruses and also implicated in transmission of RRV and BFV.
<i>Culex quinquefasciatus</i>	Ground pools, fish ponds or artificial structures containing highly organic water and polluted water.	Breeds in clean and polluted domestic environments. A poor vector of disease in WA but is considered a pest.

7. Integrated Mosquito Management

The traditional concept of ‘eradicating’ mosquitoes by treating habitats with insecticides has been superseded by the more realistic objective of ‘control’, where mosquito population numbers are reduced to tolerable or non-threatening levels through an integrated pest management (IPM) approach.

This method reduces an over reliance on chemicals to treat mosquito numbers. In turn it reduces the environmental impact and is considered more sustainable and cost effective.

Modern MMPs outline the need for an IPM which at the least uses trapping, (adulticiding in the north of WA), larvaciding, biological and chemical controls, and breeding source reduction; as well as incorporating public education/awareness in the MMP.

Mosquito populations will fluctuate from year to year (as well as seasonally) in response to changing environmental conditions.

Approaches to mosquito management can be direct or indirect and focus source reduction, chemical control and biological control. Chemical and biological control strategies are the most appropriate management strategies implemented at Heirisson Island and Pelican Point.

Mosquito Management in Wetlands

Effective monitoring forms the basis of the mosquito management plan in the City. The monitoring approaches used by the City include tidal and weather patterns, larvae habitats and dipping, adult trapping, recording community complaints, and undertaking yearly data comparison.





8. Mosquito Management

Management Approaches

MONITORING

This is the most critical aspect of the management plan. Effective monitoring enables sustainable effective treatment and ensures that over treatment doesn't occur.

Breeding habitats are monitored per the following schedule:

1. All year round – monthly in winter and fortnightly in peak season. Within 2-3 days (weekend dependant) of a rainfall event in the hotter weather and tide and sea height trigger levels being reached (see Appendix 1 for trigger heights) – this ensures that BTI treatment can be applied at the right stage of the mosquito lifecycle (700g per hectare for 1st to early 4th instar larval stage).
2. Until water subsides, attend within 24-48 hours to verify treatment effectiveness (kill rates) and reapply treatment if required.
3. Irrespective of point 1, attend every 2 weeks (14 days) during September to April to:
 - a. check for larval activity;
 - b. set up mosquito traps late afternoon – see figure 3 , if deemed appropriate following larval dipping.
4. Recover mosquito traps 12-18 hours after deployment. Captured mosquitoes are frozen, identified, counted and the data is recorded.



BIOLOGICAL

The constructed wetland in Queens Gardens and the Freeway interchange are stocked with native Australian fish to increase the natural predation of mosquito larvae.

The natural wetland at Pelican Point and naturally mimicking wetland at Heirisson Island are treated with larvacides. Larvacides are used on rotation to mitigate chemical resistance occurring in mosquito populations.

BIO CHEMICAL AGENTS USED INCLUDE:

1. BTI;
2. Growth Inhibitors
3. BTI & Growth Inhibitors Dual Action

BTI consists of the naturally occurring soil bacterium *Bacillus thuringiensis israelensis* (BTI) and produces a protein crystal which contains microscopic pro-toxins, which when ingested are capable of destroying the gut wall and killing mosquito larvae. This is the most common larvicide used in Australia and despite broad scale use in many estuarine and freshwater habitats with no direct or indirect non-target impacts having been reported. BTI is applied in highly organic rich environments such as the City's wetland area, if larval activity is observed in a specific area to prevent mosquitoes reaching adulthood.

The City currently uses the following larvicides:

- Prolink is a synthetic insect growth regulator that mimics the juvenile hormone produced by insect endocrine systems. When absorbed by the larvae, development is interrupted and immature

larva fail to successfully develop to adults, usually dying in the pupal stage. These are slow release that may provide residual control of mosquitoes for up to three months. This should not be applied in 'highly organic rich environments' as it binds to organic content and makes it less effective and may promote resistance.

- BTI and growth inhibitors is a dual action and consists of a combination of bacterial and hormonal control.
- Larvacides are to be applied in accordance with the manufacturer's specifications and safety data sheets (SDS).

PHYSICAL CONTROL

The City will monitor its stormwater drains for water retention and blockages so that breeding in stormwater drains are minimised.

The City uses registered chemicals designed to reduce the breeding cycle of mosquito larvae (larvicides) on the advice from the Department of Health.

In a situation where there is an outbreak of mosquito-borne disease or when instructed by the Department of Health, the City may use pesticide fogging (Adulticides). Fogging close to the River will require permission and authorisation from the Swan River Trust. It is the least preferred treatment method and unlikely to be used except in extreme circumstances due to its undesirable environmental impacts, especially on non-target species, including those that may prey on mosquitoes, financial cost and limited effectiveness on mosquito management overall.

City of Perth Specific Treatments

CONSTRUCTED AND NATURAL WETLANDS (HEIRISSON ISLAND AND PELICAN POINT)

The main method of treatment is application of Vectobac at the rate of 300–500g per hectare. This is applied manually using a calibrated spreading machine and drone where access is challenging.

The use of XR Briquettes (S-methoprene) at Heirisson Island and Pelican Point may reduce the number of times required to walk through wetlands to carry out treatments. This avoids impacting on vegetation and bird nesting areas.

Briquettes are applied in the salt marsh area 3.2 metres apart (on a fixed location float

system). When flooding occurs the briquettes slowly release S-methoprene into the water system. The treatment typically lasts for 2–3 months.

STORMWATER DRAINS

Treatment of artificial water catchments are only carried out when larval presence is identified. BTI is the preferred treatment method for stagnant catchments. Storm water drains are regularly maintained by removing blockages that may encourage breeding or by treating with S-methoprene pellets or secured briquettes.

POINT FRASER

Point Fraser is a public recreation reserve of 6.13 hectares located on Swan River foreshore in East Perth (see Figure 2).

Figure 2 – Point Fraser



The redevelopment of Point Fraser began in 2002 with the objective of significantly enhancing the recreational use of the area, whilst respecting the value and sensitivities of the site and the Swan River landscape.

Some of the features include a constructed wetland to treat stormwater from an urban catchment prior to its discharge to the Swan River. Designed to mitigate flooding with vegetated swales to infiltrate and treat stormwater on site. The site has been identified as a negligible risk area for mosquito breeding.

Resourcing

HUMAN RESOURCE

- Environmental Health Officer; and/or Environmental Health Assistant; and/or contractor.

BUDGET

The budget for mosquito management includes the following items and is adjusted annually dependant on the previous financial year demands. There can be considerable variation on resourcing required from year to year:

- Officers Salary/Contractor fees.
- Purchase of larvicides and equipment (PPE).
- Purchase of dry ice.
- Mosquito Management Course to be attended by responsible officers.

Figure 3 – Mosquito Trapping



EQUIPMENT/RESOURCES

Equipment required to deliver the City's management actions are as follows:

- Vehicle
- Vectobac spreader
- Microscope
- Mosquito Traps
- Ladles
- Stakes and floats (for Prolink Briquette usage only)
- Drone
- St John First Aid Kit
- Safety Clothing (high visibility vest, rubber boots, gloves, sun glasses, disposable masks, disposable overalls, trousers, long sleeve shirts, Hats sun screen cream and mosquito repellent, two-way radio, spotter/2nd person)

SAFETY

- Safe work method statements (SWMS)
- St John First Aid Kit
- Working in pairs in remote/isolation locations
- Safety Data Sheets (SDS) for all chemicals used

TRAINING REQUIREMENTS

- Mosquito Management Course (Department of Health)
- Pesticide Management and Safety/ Hazmat
- Senior First Aid Course
- Internal Health and Safety awareness course

PUBLIC AWARENESS

The City in conjunction with Department of Health and CLAG partners, aim to provide information and education to residents to increase engagement to reduce adult mosquitoes around the home and backyard breeding sites.

The current program 'Fight the Bite' is used as a resource to communicate with the public: (ww2.health.wa.gov.au/Articles/F_I/Fight-the-Bite-campaign).

INFORMATION GATHERING

The City gathers information on mosquito numbers, trapping locations, treatment performed, complaints received, public comments and notifiable diseases to present to CLAG on a bi-monthly basis. The information gathering and record keeping forms justification for the annual funding application as part of the CLAG.

STAKEHOLDERS

The following stakeholders contribute to the success of this plan:

- Department of Health WA
- Department of Waters and Environmental Regulation
- Department of Biodiversity, Conservation and Attractions
- The Swan-Canning Rivers Group (CLAG)
- Impacted Community members

LEGISLATION

*City of Perth Health Local Law 2000,
Part 6 Pest Control Sections Division 2*

Public Health Act 2016

Health (Miscellaneous Provisions) Act 1911

Environmental Protection Act 1986

9. Contiguous Local Authority Group

The Swan-Canning Rivers Group (CLAG) has been established under the Mosquito Control Advisory Committee (MCAC) which is coordinated by Department of Health WA.

The CLAG consists of four local authorities City of South Perth, City of Canning, City of Melville and the City of Perth. This enables a regional approach to vector borne disease management.

The WA Department of Health provides mosquito control training and funding of up to 50% of the CLAG's larvicide purchases. The Department also funds 50% of other Mosquito Management costs including cultural controls, as well as compiling data on notifiable diseases and environmental information to assist the CLAG with their treatment programs.

All CLAG members are required to sign a Memorandum of Understanding (MOU) and have a current Mosquito Management Plan (MMP) in place which is endorsed by the Department of Health.

The CLAG collated information from its members to aid in public consultation and measure the effectiveness of mosquito control measures.

Appendix 1 – Mosquito Monitoring Schedule

Monitoring Task	Frequency	Trigger	Action / Recording	Duration of treatment	Expected outcome / Reporting
Review Department of Transport-Marine- Tide Predictions website	Weekly	Tides of >1.1m with seas <2m; or Tides of >1.1m with seas >2m.	• Visual inspection of site within 2-4 days of tidal/ seas event to assess water pooling	Weekly until pooling subsides.	Early detection.
Larval dipping with treatment as required	Fortnightly (Sep-Apr)	An increase of 20 larvae per average larvae dip.	Hierisson Island = Treatment with Vectobac as per label rates.	Weekly until pooling subsides.	Reduction in emergence of adult mosquitoes.
	Monthly (May-Aug)	If significant larval densities per dip found in saltmarsh - the water body may require treatment, dependent on instar stage of larvae.	Pelican Point = Treatment with Vectobac as per label rates where practicable. Alternatively use S-Methoprene briquettes distributed at 3.2m apart for water depth up to 30cm.		
	Within 2-4 days of significant rainfall or high tide event or (Sep - Apr)	No change or decline in mosquito larvae	Nil further action.	-	-
Adult Trapping	Fortnightly (Sep-Apr)	Significant increase in average number of adults per trap (150 biting mosquitos and larval presence is threshold level to commence first treatment of season)	Treatment with Vectobac as per label rates.	Reduce current mosquito larvae (from 2nd to 4th instars).	Significant reduction in adult numbers (to less than 150 biting mosquitos at minimum).
		No change or decline in the number of adult mosquitoes	Nil further action.	-	-
Vegetation monitoring	Fortnightly (Sep-Apr)	Veg density significant increase, leading to protection of mosquito larvae, predators and reduction in water movement	Hierisson Island Request to City of Perth - Parks team for weed removal/thinning.	Until it grows back.	Reduction in larval numbers.
	Quarterly (May-Aug)		Pelican Point Make recommendation to DWER to thin vegetation. City of Perth not to undertake any ground or vegetation works to area.		

Appendix 2 – Mosquito Sampling Locations



● Mosquito trapping (sampling) locations

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