



GANNAWARRA
Shire Council

ATTACHMENT

UNDER SEPARATE COVER

Ordinary Council Meeting

15 November 2017

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GANNAWARRA SHIRE

ARBOVIRUS PLAN



Municipal Endorsement

The Gannawarra Shire as part of its emergency management planning has developed this Arbovirus Plan.

This plan is a sub-plan of the Gannawarra Shire’s Municipal Emergency Management Plan and was endorsed through formal motion by the Gannawarra Shire Municipal Emergency Management Planning Committee (MEMPC) on 2 November 2017 and adopted by Gannawarra Shire Council on 15 November 2017.

Plan endorsed by Municipal Emergency Management Planning Committee:

Signed: _____ Date: _____

Cr Brian Gibson
Chair of the Municipal Emergency Management Planning Committee

Plan adopted by Council:

Signed: _____ Date: _____

Eric Braslis
Chief Executive Officer

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1: Introduction

Viruses transmitted by mosquitoes are known as arboviruses. More than 275 species of mosquitoes are found in Australia but only a few species bite humans and fewer still are capable of transmitting a virus to humans and causing disease. There are four mosquito-borne viruses that pose a risk to human health in Victoria: Murray Valley Encephalitis, Ross River, Barmah Forest and West Nile Kunjin strain.

Both Ross River and Barmah Forest virus disease are considered endemic throughout Victoria with cases notified every year; both can be debilitating but not fatal. Murray Valley Encephalitis poses the greatest risk to life. Major outbreaks of Murray Valley Encephalitis have occurred in Victoria in 1918, 1951, 1956 and 1974. The 1974 outbreak was particularly devastating to the North West region of Victoria both in terms of fatalities, life-long disabilities, and cost to tourism.

Mosquitoes predominately breed in warm, stagnant water and are therefore most prolific over the spring and summer months. Local conditions of wetlands, irrigation and drainage management, rainfall and temperature are important determinants of mosquito numbers.

In addition to causing disease, mosquitoes are a considerable nuisance. Pain and annoyance caused by mosquito bites can have a negative impact on community wellbeing and enjoyment.

The area covered by the Gannawarra Shire has participated in the Victorian Arbovirus Disease Management and Control Program since its inception in 1975 following the Murray Valley Encephalitis outbreak.

The arbovirus program includes surveillance activities to monitor mosquito numbers and to test mosquitoes for viruses, control methods to reduce mosquito numbers and community education to reduce the risk of contracting disease through mosquito bites. Typically, the program runs from November to late March, dependant on weather conditions and mosquito population patterns.

While Gannawarra Shire Council has had a long history of involvement in the annual Arbovirus Disease Management and Control Program, this is the first time a specific plan has been developed.

The aim of this Arbovirus Plan is to provide guidance on mosquito surveillance, control and community awareness initiatives to minimise the incidence of arbovirus illness and disease to the community.

Implementation of this Arbovirus Plan will:

- Ensure that health information and support is available to the community.
- Increase the understanding and capacity of the community to minimise the risk of mosquito borne disease.
- Manage a mosquito borne disease outbreak effectively.
- Influence long term changes to improve community health and wellbeing by minimising mosquito breeding in the environment.

This will be achieved by:

- Undertaking strategies and actions to implement an annual integrated mosquito control and management program and community education initiatives.
- Forming partnerships with other levels of government and local agencies to improve mosquito management across the Gannawarra Shire.

2: Planning Framework

The following Acts outline the responsibility of Council when it comes to preventing and responding to arbovirus disease outbreaks and management of mosquito population numbers:

- *Emergency Management Act 1986* requires Council to have arrangements in place to prevent, respond to and recover from any emergencies that could occur in the municipality.
- *Local Government Act 1989* outlines the responsibility of Council to protect public health in emergencies.
- *Public Health and Wellbeing Act 2008* states that Council's function is to 'seek to protect, improve and promote public health and wellbeing within the municipal district.'

Furthermore, Part 4 of the *Public Health and Wellbeing Regulations 2009* empowers the Department of Health and Human Services and councils as their agents to direct owners and occupiers of land to carry out measures to reduce the incidence of mosquito breeding in order to prevent mosquito borne diseases.

The Department of Health and Human Services, Health Protection Branch has the overarching responsibility for the coordination of arbovirus disease management and prevention in Victoria.

Notification of human arbovirus infections to the Department of Health and Human Services by clinicians and laboratories is required under the *Health (Infectious Diseases) Regulations 2001*. Suspected or proven encephalitis caused by Murray Valley Encephalitis is a Group A notification and notification is required within 24 hours of diagnosis.

To reduce the risk of disease, the Department of Health and Human Services provides funding for the surveillance and management of vector mosquito breeding sites. It also supports educational activities and materials to inform communities and encourage personal and household mosquito control measures.

The Gannawarra Arbovirus Plan provides a framework for Council to meet its emergency management and other legislative obligations and ensure that a plan is in place to reduce the local incidence of mosquito borne disease and illness on the community.

3: Terminology

3.1 Arbovirus

Viruses transmitted by mosquitoes are known as arboviruses (arthropod borne viruses).

3.2 Ross River Virus and Barmah Forest Virus - alphaviruses

Ross River Virus and Barmah Forest Virus diseases are considered endemic human diseases throughout Victoria and the number of human cases per year varies widely depending on seasonal and other conditions.

3.3 Murray Valley Encephalitis Virus - flavivirus

Murray Valley Encephalitis Virus occurs in epidemics with major outbreaks occurring in Victoria in 1918, 1951, 1956 and 1974. During the 1974 outbreak, 58 cases were recorded, 13 died, 13 were left with permanent disabilities, and the remainder made a full recovery.

3.4 Kunjin Virus - flavivirus

A subtype of West Nile virus, closely related to Japanese Encephalitis. Kunjin virus has been detected in Victoria on several occasions since 1974. There have been three confirmed cases in Victoria since 2001. Fatalities are rare.

3.5 Prevention

Minimisation of the impacts of mosquito borne disease through the implementation of integrated mosquito control programs and community education aimed at reducing the likelihood of being bitten and therefore the risk of infection.

3.6 Preparedness

Planning and community awareness in the lead up to spring and summer periods when mosquito activity is likely to be the highest along with planning to scale up response to potential or realised disease outbreaks.

3.7 Response

Implementation of pre-determined actions to reduce mosquito borne disease through integrated mosquito control programs, community education, and responding to potential or realised disease outbreaks.

3.8 Recovery

Follow-up actions to support the community affected by mosquito borne disease to return to proper and effective levels of functioning.

4: Mosquitoes

4.1 Mosquito life cycle

Figure 1. Life cycle of a mosquito

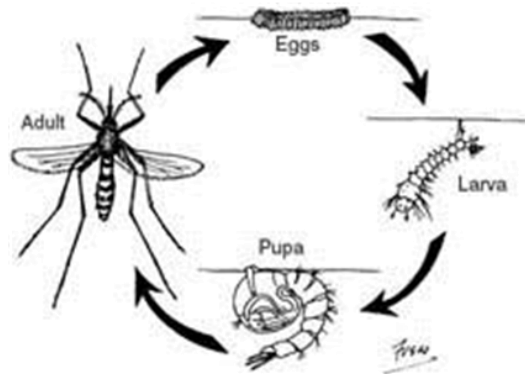


Diagram adapted from *Framework for Mosquito Management in Victoria (2004)*.

Eggs

The adult female mosquito lays eggs which then float on the surface of the water, or alternatively eggs are laid on soil or plants, depending on the species of mosquito. On average, eggs hatch into larvae within 48 hours.

Larvae

Larvae live in the water and come to the surface to breathe. They tend to concentrate in shallow waters where they gain shelter from larger predators. The larvae pass through four development stages known as instars. They shed their skin and grow in size. Following the fourth instar stage they change into pupae.

Pupae

This is a resting stage while the mosquito turns into an adult. The pupae do not feed and the adult emerges after approximately two days.

Adult

Following the pupae stage, the adult mosquito emerges and rests on the surface of the water to allow itself to dry before it is able to fly.

On average, the life cycle of a mosquito from egg to adult stage takes between 10-14 days, depending on mosquito species and weather conditions. The average life span of an adult mosquito is 21 days.

4.2 Mosquito species of interest in the Gannawarra Shire

The following mosquito species are commonly found throughout the Gannawarra Shire. Some are known to transmit vector borne disease (these are marked with an asterisk), and others are known as nuisance mosquitoes.

Culex australicus

Typically associated with freshwater grassy pools and permanent, well vegetated ponds. Generally more common in spring and autumn. Generally do not bite humans. Is thought to feed primarily on birds and rabbits.

Culex annulirostris*

Breeds in fresh water, however they are also capable of breeding in drains and constructed water bodies. Adult females mainly feed at dusk and to a lesser extent at dawn. Capable of transmitting diseases such as Ross River, Barmah Forest, Murray Valley Encephalitis and Kunjin.

Aedes sagax*

A day-time and nuisance-biting mosquito. Closely associated with temporary ground pools in both sunlit and shaded open forests. Most active during spring and occasionally autumn and winter. Can be very abundant following extensive rainfall or flooding.

Anopheles annulipes

Larvae are usually associated with permanent freshwater habitats. Larvae can also be found in mildly brackish water environments. Adult populations can be abundant in irrigated rural areas. Not thought to play an important role in disease transmission.

Culex quinquefasciatus

Larvae are typically associated with urban freshwater habitats with a high organic content such as drains, sillage pits, sewage treatment ponds and septic tanks. Associated with water holding containers in residential dwellings such as buckets, tyres, roof guttering and bird baths. Will bite humans both indoors and outdoors and is considered to be a major nuisance.

Culex molestus

Larvae are typically associated with subterranean habitats such as septic tanks. May also be found in ground pools with high organic content. Flight range is thought to be less than 500m. Known human biter and can be a domestic pest indoors.

Aedes bancroftianus

Found in a range of shaded or sunlit short-term freshwater ground pools, natural water courses, and roadside ditches. Larvae can be difficult to find as they attach themselves to vegetation or lie on their backs on the bottom of the pool. Has the potential to be a serious day-biting nuisance pest, particularly following extensive rains or flooding.

Aedes theobaldi

Larvae are typically associated with freshwater ground pools in sunlit grassy areas. Adults can disperse many kilometres from larval habitats. Adults are extremely abundant following major rainfall and flooding events. This suggests that large numbers of desiccation resistant eggs laid in suitable habitats can withstand many years of dry conditions.

Aedes vittiger

Typically associated with grassy pools of short-term water in open areas, or under a sparse woodland canopy. Has also been documented in agricultural areas where irrigation runoff creates pools in grassy areas. Eggs hatch after major rainfall events and larval development can be rapid (within a week). Readily bites humans during the day, evening and night.

Aedes notoscriptus*

Found in small natural reservoirs such as water holding plants, and in artificial water holding containers such as ornamental ponds. Adult mosquitoes generally disperse less than 200m. Typically bites during the afternoon and dusk. A severe nuisance pest, and can transmit Ross River virus and Barmah Forest virus and is one of the main vectors of heartworm in dogs.

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5: How mosquitoes affect health

The World Health Organization (WHO) lists mosquitoes as among the top threats to public health. This is especially the case in developing nations where each year, millions of people die as a result of contracting mosquito borne diseases, such as Malaria and Japanese Encephalitis.

There are four mosquito-borne viruses that pose a risk to human health in Victoria: Ross River Virus disease, Barmah Forest Virus disease, Murray Valley Encephalitis, and West Nile Kunjin strain:

Ross River Virus disease: can cause joint inflammation and pain, fatigue and muscle aches. Infected people can also develop a rash. Everyone recovers, although some people have intermittent symptoms for a year or more. Approximately 30 per cent of people infected with the virus will develop symptoms 3-11 days after being infected with others developing symptoms up to 21 days after the exposure. Fever is usually not a prominent feature.

Barmah Forest Virus disease: can cause joint inflammation and pain, fatigue and a rash of variable appearance. A full recovery can be expected. Most people recover completely within 6 months, although some people have intermittent symptoms for longer. Symptoms usually begin to appear between seven to ten (but up to 21) days after becoming infected, however many patients infected with Barmah Forest Virus will never develop any symptoms. The symptoms of Barmah Forest Virus disease are similar to Ross River Virus disease, however they tend to be milder.

Murray Valley Encephalitis: is a serious disease. As with other forms of encephalitis, it can cause inflammation (swelling) of the brain tissue which can lead to brain damage or death. People who get Murray Valley Encephalitis can show no symptoms. For those that do, it can take around 5-28 days between getting bitten and becoming sick. Symptoms include a high fever, nausea and vomiting, severe headache, seizure or fits (especially in young children), neck stiffness, drowsiness and confusion. In severe cases, delirium and coma can follow. In many cases, however, the person makes a full recovery.

Kunjin Virus: is a subspecies of West Nile Virus. Two main clinical forms of disease have been reported: mild disease and encephalitis. Fatalities are rare or absent. The incubation period is usually 7–28 days, similar to Murray Valley Encephalitis Virus.

Pain and annoyance caused by mosquito bites can have a negative impact on community wellbeing and enjoyment. In young children particularly, mosquito bites can cause mild to severe skin irritation and welts.

Mosquito borne diseases can cause varying financial impacts. For individuals, the cost of treatment may include:

- Missed time at work
- Funds to cover prescription or over-the-counter medicines
- Medical treatment or hospitalisation expenses
- Time spent visiting the doctor
- Transportation costs for doctors' visits and related travel

6: Community Profile relating to arbovirus

The Gannawarra Shire is located on the northern Victorian floodplain. There is a significant lakes system, forests and three major rivers; the Avoca, Loddon and Murray, along with other smaller tributaries such as the Gunbower Creek, Pyramid Creek and Barr Creek.

The population as at the last census in 2016 was 10,549.

There are two main townships: Kerang (population 3,893) and Cohuna (population 2,428). Rural townships are Koondrook (population 991), Leitchville (population 558), Quambatook (population 249) and Lalbert, Murrabit, Mystic Park and Lake Charm, each with a population of less than 250.

The western half of the Gannawarra Shire is used for dryland cropping, the eastern half for irrigated agriculture.

Waterways and forests are home to waterbirds and popular locations for outdoor recreation including fishing, camping, canoeing, water-sports, cycling and bushwalking.

There are a number of RAMSAR listed wetlands within Gannawarra that are significant environmental areas for bird breeding and part of the international migratory bird routes. Migratory birds can be carriers of mosquito borne flaviviruses (Murray Valley Encephalitis and Kunjin Virus).

Local forests are habitat for a range of native animals including macropods (kangaroos and wallabies) that are known hosts for mosquito borne alphaviruses (Ross River Virus and Barmah Forest Virus).

Inland floodwater from across northern Victoria enter the Murray River at Benjeroop in the north of the Gannawarra Shire.

As a floodplain, the land is low and flat. The risk of riverine flooding is high as is the spread of floodwater. As floodwaters recede, shallow water remains and becomes trapped in lower depressions throughout the Gannawarra Shire, its swamps and wetland systems.

Stormwater and irrigation runoff can also sit for significant periods of time.

Local rivers, lakes, waterways and forests are popular locations for camping and, in some areas, for new housing developments. Encroachment of tourism and development into mosquito breeding habitat creates a higher risk of mosquito borne infection and disease.

Environmental watering of Gunbower National Park and other state managed forests over the summer period has created an emerging risk, particularly for the townships of Koondrook and Cohuna.

Lack of suitable stormwater systems in Murrabit and the peripheral areas of Koondrook and Quambatook enable water to sit stagnant in open-cut roadside drains for a significant period of time enabling the proliferation of mosquito breeding to occur within these townships.

As the weather warms in the lead-up to the spring and summer periods and following periods of rainfall and/or riverine flooding, a proliferation of mosquito breeding occurs and the likelihood of contracting mosquito borne illness and disease increases across the Gannawarra Shire.

7: Climatic conditions and historical context

Mosquito numbers vary depending on rainfall, flooding and temperature patterns.

Changes in the seasonal and geographic patterns of rainfall and temperature influence the local abundance of mosquitoes (Webb, Doggett & Russell, 2016).

Overall warmer temperatures, when combined with variability in rainfall patterns, may increase mosquito populations and extend the period of their activity. The quantity and distribution of rainfall across spring, summer and autumn can all influence the abundance of mosquitoes.

An increased frequency of extreme weather events, as predicted in association with climate change, may also lead to more instances of spring and summer flooding and subsequent increases in mosquito populations.

Disease notifications of Ross River Virus disease and Barmah Forest Virus disease across the Gannawarra Shire occur annually. The last cases of Murray Valley Encephalitis was in 1974, however Murray Valley Encephalitis was detected in the Kerang Sentinel Chicken flock in 2011 and 2012.

During the last major flood season (2010/2011) across Victoria 754,640 mosquitoes were trapped, including 235,266 mosquitoes from the Gannawarra Shire (approx. 31%) (including 62,200 on a single night in one trap in February 2011).

The following season (2011/2012) 44,155 mosquitoes were trapped in the 24 traps along the Murray River, 4,186 of these mosquitoes were trapped in the Gannawarra Shire (approx. 10%).

The species caught in greatest number in the Gannawarra Shire during the season 2011/2012 was *Culex annulirostris*, accounting for 43% of the catch.

This mosquito feeds on a range of vertebrates (human, mammal, bird) and is an efficient vector of many arboviruses including Murray Valley Encephalitis, Kunjin and Ross River. Based on previous years (other than 2010/2011), it is expected that the annual catch of *C. annulirostris* would be around 18%.

8: Roles and Responsibilities

The responsibility for arbovirus disease prevention and control is shared across state and local governments, emergency management agencies, and the community.

The Department of Health and Human Services has responsibility for preventing and protecting public health by preparing for and responding to mosquito borne disease. It does this by:

- Coordinating the Victorian Arbovirus Taskforce (VATF): The VATF is made up of experts across various health agencies and is responsible for:
 - Providing advice on the control of mosquito borne diseases.
 - Providing advice and information regarding mosquito borne diseases and prevention methods which can reduce the likelihood of disease outbreaks.
 - Providing assistance to the Department of Health and Human Services in relation to response activities in the event of a vector borne disease outbreak. A response will be initiated where there is an actual or potential outbreak of Murray Valley Encephalitis and/or a very high incidence of Ross River Virus disease or Barmah Forest Virus disease in a particular area or region.
- Providing funding to high risk local government area to carry out mosquito surveillance and management and community education initiatives.
- Funding the collection and analysis of mosquitoes and blood samples for disease monitoring and prediction through the Department of Economic Development Jobs, Transport and Resources (Agriculture Victoria).
- Training council officers on integrated mosquito management and control.

Local government is responsible for mosquito management on council owned and managed land and can direct private landowners under the *Public Health and Wellbeing Act 2008* and regulations, to take action to treat mosquito breeding sites. On public land, councils are to seek to work with state agencies to take appropriate remedial action on land these agencies manage.

Individual community members are responsible for the maintenance of a healthy environment around their properties for their personal benefit and that of their family. They also have a responsibility to minimise risks to the health and wellbeing of their neighbours.

As part of the Victorian Arbovirus Management and Control Program, Gannawarra Shire is responsible for the following:

- Weekly bleeding of a sentinel chicken flock for serological testing for the early detection of the presence of Murray Valley Encephalitis Virus.
- Identification, recording and weekly monitoring of potential mosquito breeding sites to determine the need for control measures.
- Weekly trapping of adult mosquitoes at predetermined locations adjacent to known mosquito breeding sites.
- Treatment of mosquito breeding sites with a larvicide to control breeding of mosquitoes.
- Fogging to control adult mosquitoes.
- Community education using consistent state wide messaging.

9: Summary of elements of the Victorian Arbovirus Management and Control Program

The Victorian Arbovirus Management and Control Program consists of three major activities:

- Surveillance
- Suppression
- Education

9.1 Surveillance

Surveillance includes data collection, monitoring and surveillance of mosquito populations and weekly bleeding of poultry for serological testing.

- **Sentinel Chickens**

Sentinel chicken flocks are located at strategic locations determined in partnership with the Department of Health and Human Services and Department of Economic Development, Jobs, Transport and Resources (Agriculture Victoria). The chickens detect the presence of flaviviruses (Murray Valley Encephalitis Virus and Kunjin Virus) present in the adult mosquito population.

If a sentinel chicken is bitten by an infected mosquito, virus antibodies will be detected in blood tests conducted at a laboratory in Melbourne. If a test returns positive, a follow up sample will be required to confirm the results.

The sentinel chickens act as an early warning system for potential human cases of the viruses. If either of the two viruses is identified in the sentinel chicken flock, the Department of Health and Human Services uses that as an alert that the virus is present in the environment.

A sentinel chicken flock is located on the outskirts of Kerang throughout the mosquito season. Each week during the arbovirus season Council officers extract a drop of blood from each chicken in the flock and the samples are sent for testing.

- **Identification and Monitoring of Potential Mosquito Breeding Sites**

Identification, recording and weekly monitoring of potential mosquito breeding sites determines the need for control measures based on the numbers of mosquito larvae present, their species and the potential for the spread of mosquito borne disease.

Mosquitoes generally breed in warm stagnant water. Sites that enable water to sit for more than 5 days are potential breeding sites. The elimination of these sites is the desired outcome. This however is not always possible.

Areas that can support mosquito breeding located within townships have been identified and recorded (a register is maintained).

Identification is undertaken via 'dipping' for mosquito larvae and identifying which species are present. Control treatment is applied where an average of 5 or more larvae per dip is detected. Larval monitoring is undertaken using standard dipping techniques (5 dips per site) and recorded on the Mosquito Monitoring App, even if there is no larvae present.

- **Trapping of adult mosquitoes**

Trapping of adult mosquitoes with CO₂ baited traps is carried out weekly throughout the mosquito season at predetermined locations. These locations are adjacent to known mosquito breeding sites. Trapping provides information on mosquito numbers present and allow for species identification and virus isolation.

Trapping is carried out weekly to develop a long term picture/model and provide an early warning for disease outbreaks.

There are three strategic trapping locations in Kerang. These trapping locations are scientifically determined based on prevailing north westerly winds, migratory bird routes and proximity to population centres.

The three permanent locations are:

1. GAN-002 Golf Course (-35.740322, 143.941168)
2. GAN-003 Swamp (-35.707127, 143.906763)
3. GAN-004 Transfer Station (-35.720019, 143.925957)

In addition, strategic traps are sometimes set if the need arises. During the 2016/2017 season, two strategic traps were set at Koondrook and Cohuna to monitor the impact of summer environmental watering through Gunbower Island.

Mosquito traps are not set to attract, trap and kill all mosquitoes, but rather they are set in the same location on the same night each week for the same number of hours to provide a sample of the density of mosquitoes, the species of mosquitoes present in the environment, whether they are male or female (only female mosquitoes bite) and whether these mosquitoes are carrying viruses that may be transmitted to humans.

Apart from the strategic traps, trapping of mosquitoes for the purpose of determining ongoing control measures occurs at various locations throughout the Gannawarra Shire on an annual basis.

9.2 Suppression

Suppression aims to control mosquito populations by chemical application or by implementing engineering and drainage practices which minimise or eliminate potential breeding sites.

- **Chemical Treatment of Mosquito Breeding Sites**

Treatment of mosquito breeding sites with a larvicide is used to control breeding of mosquitoes when monitoring has identified mosquito numbers and species that are likely to pose a threat to human health.

Sites are treated using a risk based response and using principles of Integrated Pest Management (IPM¹). In general, priority is given to sites where disease vector mosquitoes are breeding, however sites with significant populations of nuisance mosquitoes may also be targeted.

Every endeavour is made to ensure non-target aquatic life is not affected and mosquito populations do not build up chemical resistance.

The Victorian Arbovirus Disease Management and Control program supports monitoring and control of mosquito breeding within a 7 kilometre radius of townships.

The following townships are included: Kerang, Cohuna, Koondrook, Murrabit, Quambatook and Leitchville.

Mosquito control within Lake Charm township will focus on the primary school and surrounding caravan park and visitor areas.

Treatment will generally be conducted in-house. This may be expanded to include an external pest controller if the situation escalates and more extensive treatment is needed. This is not always possible or achievable.

The main application methods used in the Gannawarra Shire are:

- Vehicles spraying, fogging or spreading directly from formed tracks.
- Vehicles on other tracks or across dry ground using all-terrain vehicles (ATVs) which are multi-wheeled or tracked vehicles with low ground impact.
- Foot-based dispersal using backpack spreaders or sprayers, or by hand.

A variety of chemicals are used:

S-methoprene:	An insect growth regulator absorbed by the larvae. Prevents the larvae from emerging from the pupal stage. This product is available in several different formulations, including slow-release briquettes, which can provide ongoing control for up to 150 days under certain environmental conditions.
Bacillus thuringensis israelensis (Bti)	Contains spores and endotoxins of naturally occurring bacterium. These spores and endotoxins are ingested by mosquito larvae, resulting in death within 24 hours. Bti is toxic only to the larvae. It does not harm other aquatic, marine or terrestrial fauna.
Temephos Organophosphate (Abate)	Affects the central nervous system through inhibition of cholinesterase. In larvae, this results in death before reaching the adult stage. Temephos is less selective than both Bti and S-methoprene and thus used on sites with low ecological value (e.g. where the water is polluted) or where there is such high mosquito populations that the other chemicals will be ineffective. It is of particular importance during disease outbreaks.

• **Adulticiding**

It is much more effective to reduce breeding sites and treat at the larval stage before mosquitoes hatch into adults and take flight. This is not always possible and adulticiding is therefore used as a risk minimisation strategy to reduce the number of adult mosquitoes in the environment.

Wide scale adulticiding can have high visibility (particularly fogging) and a robust communication strategy is required. Adulticiding treatments are generally reserved for high profile events and protecting vulnerable population areas.

Adulticiding is undertaken via the use of fogging or Ultra Low Volume (ULV) spraying. Knockdown is achieved via chemical pyrethroids.

9.3 Education

Community education on personal protection, elimination of mosquito breeding around the home, exclusion of mosquitoes and use of repellents will be carried out in the lead up to, and throughout the mosquito season.

Education campaigns need to be timely and be based on the statewide 'Beat the Bite' messages.

Primary school education kits, a roll-up banner and 'Big Moz' costume complement public education campaigns at Gannawarra.

9.4 Operations Manual

A Gannawarra Arbovirus Operations Manual is in place which consists of the following components:

- Risk Assessments
- Relevant Council Policies
- Standard Operating Procedures
- Equipment List
- Equipment Maintenance Schedule
- Staff Training Records
- Educational Materials – including Big Moz School Education Kit
- Communication Messages – template media releases and householder newsletter
- Victorian Government Plans including the *Framework for Mosquito Management in Victoria*, relevant policies, legislation and documentation relating to the Victorian Arbovirus Disease Management and Control Program.

The Gannawarra Arbovirus Operations Manual will be reviewed in line with this Arbovirus Plan and will be used by staff implementing the annual Arbovirus Program across Gannawarra Shire.

9.5 Staffing

The Gannawarra Shire Arbovirus Program is managed by Council's Manager Community Health with on-ground works coordinated jointly by Council's Manager Community Health and Local Laws Team Leader.

A Mosquito Monitor position is employed for 24 hours over a low rainfall year to implement required Surveillance and Suppression activities with community education a joint responsibility of the Mosquito Monitor and Community Health teams.

All Council Local Law Officers and Environmental Health Officers will maintain training levels to enable the activation of response in a high rainfall year or in response to an emergency situation as directed by the Department of Health and Human Services.

10: Arbovirus Actions – What are we going to do?

This Gannawarra Arbovirus Plan groups actions into the following themes:

- **Planning:** Longer term planning and environmental interventions aimed at reducing mosquito breeding.
- **Organisational capacity:** Training of Council staff to deliver an integrated mosquito control and management program and to upscale in the event of an arbovirus outbreak situation.
- **Stakeholder partnerships:** Actions to engage, support and work with partner agencies in preparing for, and responding to, outbreak events.
- **Community support:** A strategy and set of actions to identify, prepare and support the community in preparation for, or in response to, an arbovirus outbreak.
- **Communication:** Educational information that can be distributed to the community and service providers, describing the risks of arbovirus disease and personal steps to minimise the risk of disease.

The actions provide year round guidance to prevent, prepare, respond to and recover from arbovirus disease outbreaks.

Stage 1: Long term prevention actions

Stage 2: Preparation immediately before mosquito season

Stage 3: Response – low rainfall years

Stage 4: Response - high rainfall years and emergency response

Stage 5: Post event recovery

A Gannawarra Arbovirus Plan Annual Action Checklist has been included as Appendix 1 to assist with the annual implementation of this plan.

10.1 Stage 1: Longer term prevention actions

Planning

- Annually review and update this Gannawarra Arbovirus Management Plan.
- Review Community Emergency Risk Management Plan relating to Arbovirus risk across the Gannawarra Shire as part of Emergency Management processes.
- Consider linking Arbovirus Control to the Gannawarra Flood Response Plan so as to provide additional and clearer trigger points for early response.
- Reduce the likelihood of mosquito through planning and appropriate engineering design to minimise the pooling of stagnant water - stormwater drains with sediment traps, side cuts and open cut stormwater systems.
- Implement planning strategies to minimise mosquito risk - through use of buffer zones, location of developments, and design and maintenance of roadside drainage systems and constructed wetlands.
- Assess rainwater tanks on Council owned and managed land - include consideration of location, purpose, connections, overflow drainage, inlets, brackets, mesh screens, cleaning of gutters and spouts.
- Install a town stormwater system at Murrabit, as endorsed in the Council Plan 2017-2021 (which also incorporates the statutory Municipal Public Health and Wellbeing Plan 2017-2021).
- Investigate stormwater system extensions around peripheral areas of Koondrook and Quambatook townships.
- Continue to assess the risk to public health of environmental watering over summer periods through Gunbower Island and other local forests and wetland systems.
- Establish a maintenance schedule to ensure cyclic maintenance of Council assets including public halls, children's centres, pre-schools, senior citizen centres, libraries, swimming pools, offices and public toilets.
- Update and review the Gannawarra Arbovirus Operations Manual.
- Work in partnership with other stakeholders to control mosquito breeding on land that is not Council owned or managed.
- Develop partnerships with mosquito management and control staff from other councils involved in the annual Victorian Arbovirus Disease Management and Control program, particularly councils located along the Murray River.

Organisational capacity

- Maintain a trained workforce of skilled officers to implement the annual program as well as ramp up a response in an outbreak situation and/or under the direction of the Department of Health and Human Services.
- Undertake training and share resources, where appropriate, with other local governments involved in the annual Victorian Arbovirus Disease Management and Control program.

Community support

- Provide ongoing education to the community around mosquito control and key messages to reduce the risk of mosquito borne disease.

10.2 Stage 2: Preparation immediately before mosquito seasonPlanning

- Ensure maintenance schedule is underway or has been completed - slashing, mowing, removing blockages, cleaning of spouts and gutters, tanks screened etc. Put all requests through 'Confirm' system.
- Prepare for arrival of sentinel chicken flock.
- Monitor local weather conditions on the Bureau of Meteorology's website to inform preliminary surveillance / risk assessment of the upcoming season.
- Complete a stocktake of chemical supplies.
- Check equipment - maintenance and servicing of all equipment used in the implementation of the annual program.
- Ensure that all vehicles are registered and have fuel cards.
- Hold pre-season team meeting with Council staff involved.
- Prepare a Calendar of Events for the late Spring, Summer, early Autumn period.

Organisational capacity

- Ensure workforce is in place to respond as appropriate.
- Check training requirements of all staff.
- Carry out staff inductions.

Communications

- Review and prepare consistent community messages based on the Beat the Bite resources developed by the Department of Health and Human Services ready for distribution through local media or other communication channels.

10.3 Stage 3: Response – low rainfall years

Organisational capacity

- Commence surveillance activities.
- Add briquettes to rainwater tanks on Council owned and managed land not connected as drinking water, stormwater pits and drainage pits.
- Adult monitoring - set strategic mosquito traps weekly and send catch to laboratory in Melbourne.
- Adult monitoring – set non-strategic traps on an as needs basis.
- Sentinel chickens - collect blood samples weekly and forward to laboratory in Melbourne.
- Surveillance – monitor known mosquito breeding sites by larval dipping weekly.
- Treatment using larvicide of affected areas as assessed on a site by site basis.
- Ensure access to an appropriate vehicle for use of Mosquito Monitor over the season.
- Monitor disease notifications to inform local decision making processes.
- Report the following information to the Department of Health and Human Services via the Mosquito Monitoring App:
 - Adult and larval monitoring
 - Activities carried out and timing
 - Materials and methods used
 - Area treated
 - Costs involved
 - Impacts of the treatment
 - Complaints

Community support

- Respond to, investigate, and record complaints in Mosquito Monitoring App.
- Review Calendar of Events and monitor mosquito numbers in the lead up to outdoor events on public or Council owned or managed land with large gatherings of people and treat prior to events where necessary following completion of risk assessment.

Communications

- Distribute consistent community messages based on the Beat the Bite resources developed by the Department of Health and Human Services through local media or other communication channels on an as-needs basis.
- Communicate with other relevant stakeholders on an as needs basis such as schools, pre-schools, aged care facilities, caravan parks and hospitals.
- Consider the need for additional communications such as school visits, targeted letter drops and radio communications.

10.4 Stage 4: Response - high rainfall years and emergency response

Organisational capacity

- Activation of additional trained staff to assist where needed to provide the required response.
- Provide response as required as part of a Department of Health and Human Services directed response or the initiation of an emergency control program (when there is an actual or potential outbreak of Murray Valley Encephalitis and/or high incidence of Ross River Virus disease or Barmah Forest Virus disease in a particular area).
- Conduct a risk assessment of the situation and site evaluations.
- Ensure a sufficient supply of chemicals for treatment is available to meet the required 2 week supply.
- Carry out response activities as per 'Response – low rainfall years' with the addition of the following:
 - Upscale surveillance activities - monitor known mosquito breeding sites and other emerging sites by increasing the frequency of larval dipping.
 - Focus initially on township.
 - Add briquettes to additional sites for ongoing prevention of mosquito breeding. Monitor to ensure effectiveness.
 - Adult monitoring – set a larger number of non-strategic traps as required to monitor mosquito numbers, type and risk of disease transmission.
 - Outsource to local pest control company residual spraying of public buildings such as libraries, children centres, toilet blocks and halls where justification exists to do so.
 - Monitor disease notifications to inform local decision making processes.
 - Increase maintenance including slashing, pumping out water and clearing drainage.
 - Conduct adulticiding where justification based on risk assessment exists to do so or under the direction of the Department of Health and Human Services.
 - Give preference to high-risk sites (large population, vulnerability, number of mosquitoes and number of complaints).
 - Ensure access to appropriate vehicles to undertake necessary Mosquito Control and Management activities.
 - Increase frequency of team meetings to ensure coordinated response.
 - Provide additional reports to Department of Health and Human Services as required.
 - Work in partnership with other local governments involved in emergency response and share resources, where appropriate.

Communications

- Enact a wide scale community awareness and communication campaign which may include radio, television, print media, social media, letter drops, community and school newsletters, community talks.
- Large scale distribution of Beat the Bite resources to community information points, schools, pre-schools, children centres, caravan parks, emergency service volunteers etc.
- Communicate directly with organisations caring for vulnerable population groups to reduce mosquito breeding around these facilities.

10.5 Stage 5: Post event recovery

Organisational capacity

- Convene a post event debriefing session.
- Review the impact of the event.
- Consider what worked well and what could be improved in preparation for future seasons.
- Consider works to be completed to reduce known breeding sites.
- Evaluate the effectiveness of community education and awareness campaigns.

Community support

- Consider local recovery activities if required.
- Implement Recovery activities in partnership with the Department of Health and Human Services and other relevant stakeholders.

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11: Communications plan

Communication is an integral part of managing risk. The information delivered must be useful, timely, accurate, consistent and accessible.

The Department of Health and Human Services rolls out communication messages via its 'Beat the Bite' campaign across the wider region to ensure that the key messages and information are disseminated as widely as possible and to achieve a level on ongoing education through consistent messaging.

Council will communicate information about the risks of mosquitoes and preventative measures before the mosquito season begins. These messages will start to be disseminated through Council's existing networks and communication channels prior to the start of summer, or earlier where appropriate.

11.1 Beat the Bite

Council will undertake a consistent public messaging campaign based on the Victorian Beat the Bite messages to encourage community members and visitors to the area to protect themselves from being bitten – cover up, wear loose fitting clothing, apply repellents, reduce exposure at dawn and dusk, as well as information on measures for reducing mosquito breeding around the home.

The following table highlights the key messages:

Message	Main Points Summary
Personal Protection	<ul style="list-style-type: none"> • Cover-up and wear loose fitting clothing when outdoors • Use an insect repellent containing DEET (diethyltoluamide) or picaridin • Avoid being outdoors at dusk and dawn
Home Protection	<ul style="list-style-type: none"> • Maintain flywire screens • Use knockdown insect sprays • Sleep under mosquito nets • Use repellents such as Citronella or mosquito coils • Use of residual surface sprays in high use areas (e.g. outdoor toilet, shelters or around doorways)
Maintain Private Property	<ul style="list-style-type: none"> • Clean up potential breeding sites around the home - remove rubbish and other waste containers, empty pot plant trays, replenish birdbaths, animal water bowls at least once per week) • Don't over water • Improve drainage to stop water pooling or leaking • Maintain buildings (e.g. clean gutters, unblock drains) • Keep swimming pools well maintained • Keep fish ponds tidy with minimal vegetation • Keep lawns and gardens trimmed back
Employee Protection	<ul style="list-style-type: none"> • Ensure staff are educated on personal protection • Provide appropriate repellents • Wear suitable clothing • Roster tasks to try and avoid being outdoors dusk and dawn periods.

12: Review process

An annual review of this Arbovirus Plan will be undertaken prior to each summer season. The review will:

- Take into account changes at state and local level.
- Involve relevant stakeholders.
- Assess whether actions contained in the plan continue to have effective outcomes.
- Inform revision and improvement of the plan.

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Appendix 1: Gannawarra Arbovirus Plan Annual Implementation Checklist

Stage 1: Long term prevention actions (Timeline = ongoing)

Action	Person responsible	Complete	Underway	Not Commenced	Comments
PLANNING					
Annually review and update this Gannawarra Arbovirus Management Plan.					
Review Community Emergency Risk Management Plan relating to Arbovirus risk across the Gannawarra Shire as part of Emergency Management processes.					
Consider linking Arbovirus Control to the Gannawarra Flood Response Plan so as to provide additional and clearer trigger points for early response.					
Reduce the likelihood of mosquito through planning and appropriate engineering design to minimise the pooling of stagnant water - stormwater drains with sediment traps, side cuts and open cut stormwater systems.					
Implement planning strategies to minimise mosquito risk - through use of buffer zones, location of developments, and design and maintenance of roadside drainage systems and constructed wetlands.					
Assess rainwater tanks on Council owned and managed land - include consideration of location, purpose, connections, overflow drainage, inlets, brackets, mesh screens, cleaning of gutters and spouts.					
Install a town stormwater system at Murrabit, as endorsed in the Council Plan 2017-2021 (which also incorporates the statutory Municipal Public Health and Wellbeing Plan 2017-2021).					
Investigate stormwater system extensions around peripheral areas of Koondrook and Quambatook townships.					
Continue to assess the risk to public health of environmental watering over summer periods through Gunbower Island and other local forests and wetland systems.					
Establish a maintenance schedule to ensure cyclic maintenance of Council assets including public halls, children's centres, pre-schools, senior citizen centres, libraries, swimming pools, offices and public toilets.					
Update and review the Gannawarra Arbovirus Operations Manual.					
Work in partnership with other stakeholders to control mosquito breeding on land that is not Council owned or managed.					

Stage 1: Long term prevention actions (Timeline = ongoing) Continued

Action	Person responsible	Complete	Underway	Not Commenced	Comments
PLANNING					
Develop partnerships with mosquito management and control staff from other councils involved in the annual Victorian Arbovirus Disease Management and Control program, particularly councils located along the Murray River.					
ORGANISATIONAL CAPACITY					
Maintain a trained workforce of skilled officers to implement the annual program as well as ramp up a response in an outbreak situation and/or under the direction of the Department of Health and Human Services.					
Undertake training and share resources, where appropriate, with other local governments involved in the annual Victorian Arbovirus Disease Management and Control program.					
COMMUNITY SUPPORT					
Provide ongoing education to the community around mosquito control and key messages to reduce the risk of mosquito borne disease.					

Stage 2: Preparation immediately before mosquito season (Timeline=September/early October)

Action	Person responsible	Complete	Underway	Not Commenced	Comments
PLANNING					
Ensure maintenance schedule is underway or has been completed - slashing, mowing, removing blockages, cleaning of spouts and gutters, tanks screened etc. Put all requests through 'Confirm' system.					
Prepare for arrival of sentinel chicken flock.					
Monitor local weather conditions on the Bureau of Meteorology's website to inform preliminary surveillance / risk assessment of the upcoming season.					
Complete a stocktake of chemical supplies.					
Check equipment – maintenance and servicing of all equipment used in the implementation of the annual program.					
Ensure that all vehicles are registered and have fuel cards.					
Hold pre-season team meeting with Council staff involved.					
Prepare a Calendar of Events for the late Spring, Summer, early Autumn period.					
ORGANISATIONAL CAPACITY					
Ensure workforce is in place to respond as appropriate.					
Check training requirements of all staff.					
Carry out staff inductions.					
COMMUNICATIONS					
Review and prepare consistent community messages based on the Beat the Bite resources developed by the Department of Health and Human Services ready for distribution through local media or other communication channels.					

Stage 3: Response – low rainfall years (Timeline=October-March)

Action	Person responsible	Complete	Underway	Not Commenced	Comments
ORGANISATIONAL CAPACITY					
Commence surveillance activities.					
Add briquettes to rainwater tanks on Council owned and managed land not connected as drinking water, stormwater pits and drainage pits.					
Adult monitoring - set strategic mosquito traps weekly and send catch to laboratory in Melbourne.					
Adult monitoring – set non-strategic traps on an as needs basis.					
Sentinel chickens - collect blood samples weekly and forward to laboratory in Melbourne.					
Surveillance – monitor known mosquito breeding sites by larval dipping weekly.					
Treatment using larvicide of affected areas as assessed on a site by site basis.					
Ensure access to an appropriate vehicle for use of Mosquito Monitor over the season.					
Monitor disease notifications to inform local decision making processes.					
Report the following information to the Department of Health and Human Services via the Mosquito Monitoring App: <ul style="list-style-type: none"> • Adult and larval monitoring • Activities carried out and timing • Materials and methods used • Area treated • Costs involved • Impacts of the treatment • Complaints 					
COMMUNITY SUPPORT					
Respond to, investigate, and record complaints in Mosquito Monitoring App.					
Review Calendar of Events and monitor mosquito numbers in the lead up to outdoor events on public or Council owned or managed land with large gatherings of people and treat prior to events where necessary following completion of risk assessment.					

Stage 3: Response – low rainfall years (Continued)

Action	Person responsible	Complete	Underway	Not Commenced	Comments
COMMUNICATIONS					
Distribute consistent community messages based on the Beat the Bite resources developed by the Department of Health and Human Services through local media or other communication channels on an as-needs basis.					
Communicate with other relevant stakeholders on an as needs basis such as schools, pre-schools, aged care facilities, caravan parks and hospitals.					
Consider the need for additional communications such as school visits, targeted letter drops and radio communications.					

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Stage 4: Response – high rainfall years or emergency response (Timeline=September-April)

Action	Person responsible	Complete	Underway	Not Commenced	Comments
ORGANISATIONAL CAPACITY					
Activation of additional trained staff to assist where needed to provide the required response.					
Provide response as required as part of a Department of Health and Human Services directed response or the initiation of an emergency control program (when there is an actual or potential outbreak of Murray Valley Encephalitis and/or high incidence of Ross River Virus disease or Barmah Forest Virus disease in a particular area).					
Conduct a risk assessment of the situation and site evaluations.					
Ensure a sufficient supply of chemicals for treatment is available to meet the required 2 week supply.					
Carry out response activities as per 'Response – low rainfall years' with the addition of the following:					
<ul style="list-style-type: none"> Upscale surveillance activities - monitor known mosquito breeding sites and other emerging sites by increasing the frequency of larval dipping. 					
<ul style="list-style-type: none"> Focus initially on township. 					
<ul style="list-style-type: none"> Add briquettes to additional sites for ongoing prevention of mosquito breeding. Monitor to ensure effectiveness. 					
<ul style="list-style-type: none"> Adult monitoring – set a larger number of non-strategic traps as required to monitor mosquito numbers, type and risk of disease transmission. 					
<ul style="list-style-type: none"> Outsource to local pest control company residual spraying of public buildings such as libraries, children centres, toilet blocks and halls where justification exists to do so. 					
<ul style="list-style-type: none"> Monitor disease notifications to inform local decision making processes. 					
<ul style="list-style-type: none"> Increase maintenance including slashing, pumping out water and clearing drainage. 					
<ul style="list-style-type: none"> Conduct adulticiding where justification based on risk assessment exists to do so or under the direction of the Department of Health and Human Services. 					
<ul style="list-style-type: none"> Give preference to high-risk sites (large population, vulnerability, number of mosquitoes and number of complaints). 					
<ul style="list-style-type: none"> Ensure access to appropriate vehicles to undertake necessary Mosquito Control and Management activities. 					

Stage 4: Response – high rainfall years or emergency response (Continued)

Action	Person responsible	Complete	Underway	Not Commenced	Comments
ORGANISATIONAL CAPACITY					
<ul style="list-style-type: none"> Increase frequency of team meetings to ensure coordinated response. 					
<ul style="list-style-type: none"> Provide additional reports to Department of Health and Human Services as required. 					
<ul style="list-style-type: none"> Work in partnership with other local governments involved in emergency response and share resources, where appropriate. 					
COMMUNICATIONS					
Enact a wide scale community awareness and communication campaign which may include radio, television, print media, social media, letter drops, community and school newsletters, community talks.					
Large scale distribution of Beat the Bite resources to community information points, schools, pre-schools, children centres, caravan parks, emergency service volunteers etc.					
Communicate directly with organisations caring for vulnerable population groups to reduce mosquito breeding around these facilities.					

Stage 5: Post season actions (Timeline = April/May)

Action	Person responsible	Complete	Underway	Not Commenced	Comments
ORGANISATIONAL CAPACITY					
Convene a post event debriefing session.					
Review the impact of the event.					
Consider what worked well and what could be improved in preparation for future seasons.					
Consider works to be completed to reduce known breeding sites.					
Evaluate the effectiveness of community education and awareness campaigns.					
COMMUNITY SUPPORT					
Consider local recovery activities if required					
Implement Recovery activities in partnership with the Department of Health and Human Services and other relevant stakeholders.					

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Appendix 2: Contact details for Council staff, stakeholders and partner organisations

Name	Organisation	Business	Mobile	Email
Eric Braslis	GSC Chief Executive Officer	03 5450 9333	0408 051 752	eric.braslis@gannawarra.vic.gov.au
Geoff Rollinson	GSC Director Infrastructure Services	03 5452 9333	0428 510 188	geoff.rollinson@gannawarra.vic.gov.au
Narelle O'Donoghue	GSC Manager Community Health	03 5450 9333	0427 834 367	narelleo@gannawarra.vic.gov.au
Sarah Nelson	GSC Environmental Health Officer	03 5450 9333	0427 477 776	sarahn@gannawarra.vic.gov.au
Peter Bergman	GSC Manager Planning and Regulatory Services	03 5450 9333	0401 643 355	peter.bergman@gannawarra.vic.gov.au
Russell Barnes	GSC Local Laws Team Leader	03 5450 9323	0428 500 212	russell.barnes@gannawarra.vic.gov.au
Shane Leerson	GSC Mosquito Monitor, Local Laws Officer	03 5450 9302	0427 509 321	shane.leerson@gannawarra.vic.gov.au
Jeff Hogg	GSC Local Laws Officer	03 5450 9366	0407 819 272	jeff.hogg@gannawarra.vic.gov.au
Max Murphy	Department of Health and Human Services	03 5434 5538	0417 579 635	max.murphy@dhs.vic.gov.au
Rebecca Feldman	Department of Health and Human Services	03 9096 0247	0408 369 195	rebecca.feldman@dhhs.vic.gov.au
Robert Bakes	Department of Health and Human Services	03 5434 5514	0447 312 545	robert.bakes@dhhs.vic.gov.au
De Gilby	Department of Health and Human Services	03 5434 5608	0418 539 950	dee.gilby@dhs.vic.gov.au
Stacy Lynch	Department of Economic Development, Jobs, Transport and Resources	03 9032 7271	0423 812 245	stacey.lynch@depi.vic.gov.au
David Bowler	VicPolice - MERC	03 5452 1955	0457 561 488	david.bowler@police.vic.gov.au
Leeza Wishart	Parks Victoria	03 8427 3365	0427 886 956	leeza.wishart@parks.vic.gov.au

Appendix 3: References

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