

Arbovirus & Mosquito Management Plan 2017-2020

SHIRE OF CAMPASPE

Lifestyle & Opportunity

TABLE OF CONTENTS

APPENDICIES

To be completed

1. INTRODUCTION

Mosquito populations are always present in the environment so it is important to have strategies in place to manage mosquito numbers and potential risks associated with an increase in vector mosquitoes and vector borne diseases.

Some mosquitoes that can be found within the Shire of Campaspe are known vectors that can transmit diseases. The most common mosquito borne diseases in Victoria are Ross River Virus (RRV) and Barmah Forest Virus (BFV). Of more concern is Murray Valley Encephalitis (MVE) which has not been seen in Victoria for a number of years, however is still of significant concern to health authorities due to the serious nature of the illness.

The Victorian Government through the Department of Health and Human Services (DHHS) are responsible for the State Arbovirus program. The purpose of this program is to monitor and reduce the public health risks associated with arboviruses. This is done by assisting select Local Governments to conduct surveillance, mosquito trapping and community education. The Campaspe Shire Council has participated in the Victorian Arbovirus Disease Control Program (VADCP) since its inception in 1975 following an outbreak of Murray Valley Encephalitis (MVE) across the region.

The 1974 MVE outbreak saw a total of 58 cases and 13 deaths from the disease nationally. This outbreak had significant impact in Victoria, not just in terms of clinical cases and medical burden but through the negative economic impacts to the region, particularly to the Murray Valley region.

In 2016-17 Victorian experienced the largest outbreak of RRV on record with over 2000 confirmed cases across the state. Majority of these cases were from the Loddon Mallee and Hume Regions in Northern Victoria. In addition, cases were isolated in metropolitan Melbourne with no clear link to travel to areas where RRV is usually found. This outbreak led to increased funding from the State Government to identified high risk Councils for increased surveillance and treatment throughout Victoria to combat the large numbers of mosquitos and RRV cases. Campaspe Shire Council were one of the councils considered high risk and received additional funding for the season.

The Campaspe Shire Councils Arbovirus Program typically runs from November to late March each year, dependent on weather conditions and mosquito population patterns. Council employs a Mosquito Monitor on a casual basis to carry out the day to day activities of the program. The overall management of the program is the responsibility of the Environmental Health Department within council.

The Arbovirus and Mosquito Management Plan outlines how council manages their mosquito program and explains the importance of ongoing support for mosquito management within Campaspe Shire into the future.

1.1. Purpose

The Campaspe Shire Councils Arbovirus and Mosquito Management Plan has been developed to provide clear guidance and direction for the implementation of Councils Arbovirus Program. The plan also identifies how Council manages mosquito control and education initiatives.

The plan aims to assist council to:

- Protect the public health of the community and minimise the impact of mosquito borne disease.
- Provide for an emergency response in the event of an outbreak of mosquito borne disease in the region.
- Educate residents and visitors to our municipality of the risks posed by local mosquito populations and the steps they can take to protect themselves.
- Educate residents on ways they can prevent breeding from around their homes.

1.2. Municipal Profile

The Shire of Campaspe is located in north central Victoria, about 180kms north of Melbourne. The Shire of Campaspe is bounded by the Murray River and the New South Wales border in the north, Moira Shire in the north-east, the City of Greater Shepparton in the east, Strathbogie Shire and the City of Greater Bendigo in the south, Loddon Shire in the west, and Gannawarra Shire in the north-west.

The Shire has an estimated population of more than 38,000 people and an increasing population. Echuca is the largest urban area in the Shire and is located adjacent to the Murray River. The bridge which crosses the Murray River into New South Wales at Echuca provides a major connection between the two states. The majority of the community lives in the townships of Echuca, Kyabram, Gunbower, Lockington, Rochester, Rushworth, Stanhope and Tongala, with smaller townships in Colbinabbin, Toolleen, Girgarre, Corop and Nanneella.

The Shire of Campaspe is predominantly a rural area. Land use across the Shire is dominated by agriculture, predominantly irrigated agriculture, and the landscape is visually defined by the network of irrigation and drainage channels. The local economy is based on agricultural production (dairy, beef cattle, sheep, cereals and grains, vegetables and viticulture), processing of agricultural products (milk, grapes), as well as the provision of services and tourism. During the peak tourist season (December – March), the population can increase to 3 times the regular population.

The Shire is characterised by a flat landscape that slopes to the north. There is a variation in landscape and vegetation types, from river valleys, plains grasslands to river red gum floodplains.

Major features of the Shire include the Campaspe, Murray and Goulburn Rivers, the Port of Echuca, Kyabram Fauna Park, Whroo Historic Reserve (including the Balaclava open cut mine), Oppy Museum, Lockington & District Living Heritage Complex, Torrumbarry Weir, Waranga Basin, Lake Cooper, Gunbower Island, Wallenjoe Wetlands, several state forests and various wineries.

Floods have been the cause of the majority of emergencies in the Shire of Campaspe as three rivers, the Goulburn, Murray and Campaspe traverse the Shire. Flooding of the Murray River mainly affects the Port area of Echuca and the east of Echuca whereas flooding of the Campaspe River causes major problems at Rochester and the surrounding area. Rochester was severely affected by flooding in 2011. The flooding in January 2011 resulted in 80% of Rochester Township being inundated. Over 250 properties had above floor inundation. The level was higher than the 1 in 100 year flood, probably around the 1 in 150 year flood.

2. BACKGROUND

2.1. Budget

Councils Arbovirus Program is funded by Campaspe Shire Council and the Victorian Arbovirus Disease Control Program within the Department of Health and Human Services. The current funding model is as follows:

Item	Reimbursement
Salary	50%
Travel and Vehicles	50%
Control Agents	100%
Consumables	100%
Other items	50-100%

Reimbursement from Department of Health and Human Services is completed at the end of each season following submission of an annual report by Council.

The Department of Health and Human Services are currently reviewing the funding arrangements with Councils. It is expected that a more formal arrangement will be established for funding in the coming years.

2.2. Legislation

Public Health and Wellbeing Act 2008

In Victoria the Public Health and Wellbeing Act 2008 (PHWB Act) is the primary piece of legislation used in the management of the health of the community.

Objectives

(a) protecting public health and preventing disease, illness, injury, disability or premature death;

(b) promoting conditions in which persons can be healthy;

(c) reducing inequalities in the state of public health and wellbeing.

Section 7 – Principle of primacy of prevention

(1) The prevention of disease, illness, injury, disability or premature death is preferable to remedial measures.

(2) For that purpose, capacity building and other health-promotion activities are central to reducing differences in health status and promoting the health and wellbeing of the people of Victoria.

Section 24 – Function of Councils

The function of a Council under this Act is to seek to protect, improve and promote public health and wellbeing within the municipal district by—

(a) creating an environment which supports the health of members of the local community and strengthens the capacity of the community and individuals to achieve better health;

(b) initiating, supporting and managing public health planning processes at the local government level;

(c) developing and implementing public health policies and programs within the municipal district;

(d) developing and enforcing up-to-date public health standards and intervening if the health of people within the municipal district is affected;

(e) facilitating and supporting local agencies whose work has an impact on public health and wellbeing to improve public health and wellbeing in the local community;

(f) co-ordinating and providing immunisation services to children living or being educated within the municipal district;

(g) ensuring that the municipal district is maintained in a clean and sanitary condition.

Public Health and Wellbeing Regulations 2009

Under the Public Health and Wellbeing Regulations 2009 authorised officers of councils have the powers to direct owners of property to take measures to prevent the breeding of mosquitoes.

Part 4—Arbovirus Infection Control

Section 12 – Prevention of mosquito breeding

(1) For the purposes of section 235(a) of the Act, in order to prevent the breeding of mosquitoes which may be vectors of arboviruses, an authorised officer may give written directions to the owner or occupier of any premises to remove, or take steps to avoid, any condition on those premises conducive to the breeding of mosquitoes.

(2) A person to whom a direction is given under subregulation (1) must comply with the direction.

2.3. Council Plan

Shire of Campaspe Council Plan 2017-2021

The Council Plan is council's key planning document for the four year term of council. It describes the objectives of council and the activities to meet these objectives. The Council Plan for Campaspe Shire also incorporates the Municipal Health and Wellbeing Plan, a requirement of the Public Health and Wellbeing Act 2008.

The Arbovirus and Mosquito Management Plan has been developed in line with councils Vision, Mission and the strategic objectives of the Council Plan.

Vison – We are strong, supportive, vibrant and sustainable.

Mission – Campaspe Shire Council will provide services, facilities, support and advocacy to enable our community to be healthy, connected, prosperous and resilient.

Council Plan strategic objective	
Strong and Engaged Communities	Educate and engage with the community about councils Mosquito Management Program. Provide them with advice and information on personal protection and removal of breeding sites around the home.
Resilient Economy	Effective management of mosquito numbers ensures the community continues to provide services to the community, particularly in the tourism sector.
Healthy Environment	Appropriate management of treatment sites and use of chemical products that are considered the safest option for the environment and ecosystems.
Balanced Services and Infrastructure	Involvement in future developments to prevent the establishment of new mosquito breeding sites within the community.
Responsible Management	Ensuring mosquito management is carried out in the most cost effective way, while protecting the health of the community.

2.4. Stakeholders/partners Roles and Responsibilities

Councils Arbovirus Program requires collaboration with a number of agencies to be successful. Council is committed to developing and improving relationships with new and existing stakeholders and agencies involved in Arbovirus management.

Campaspe Shire Council

Council's Environmental Health Department is responsible for overseeing and managing councils Arbovirus Program. This includes:

- Providing local services to the community to support residents in the protection of public health, this includes educational material and assistance in management of mosquito control within their own properties.
- Manage council land to prevent the breeding of mosquitoes and the removal or treatment of breeding sites.
- Provide regular reports of treatment activities to the Department of Health and Human Services.
- Carry out trapping of adult mosquitoes and send them to the DHHS approved laboratory for identification and virology testing.
- Approve and monitor planning developments and the impact these can have on mosquito breeding.
- Liaise with internal departments including planning, design engineering, parks and gardens in the management of potential breeding sites.
- Any other activities as requested by Department of Health and Human Services.

Department of Health and Human Services

The Department of Health and Human Services are responsible for the management of the statewide mosquito surveillance program including:

- Monitoring and prediction of disease prevalence

- Provide strategic direction for the prevention of disease.
- Training of local government and other staff in mosquito management.
- Providing funding to local government for mosquito monitoring activities.
- Manage and fund laboratory support services in identification, virology and entomology programs.
- Coordinate emergency response activities.

Parks Victoria

Parks Victoria are responsible for the management of parks and reserves including the Murray River reserve. They approve mosquito management programs to be carried out on their land. They are responsible for promoting community education on conservation and the environment and inform park users of any mosquito management programs being carried out.

Neighboring municipalities

Collaboration with neighboring municipalities is essential in the effectiveness of mosquito management and arbovirus control. Council must work closely together to ensure a consistent approach is taken in the treatment of mosquitos across the region. Councils that border the Shire of Campaspe will have in place Arbovirus Management Plans that will outline the activities they undertake in the management of mosquitos. All councils that participate in the Victorian Arbovirus Disease Control Program are required to prepare a Management Plan. These plans are overseen by the Department of Health and Human Service to ensure a consistent approach across councils.

Landowners and the community

Owners of private property are responsible for ensuring they do not allow mosquitoes to breed on their property. This includes the removal of breeding sites as well as taking preventative steps to reduce the likelihood of mosquitoes breeding.

Members of the community are responsible for ensuring they take measures to prevent or reduce the likelihood of getting bitten. This includes educating themselves on personal protection, wearing appropriate clothing and repellant when outdoors.

2.5. Mosquito lifecycle

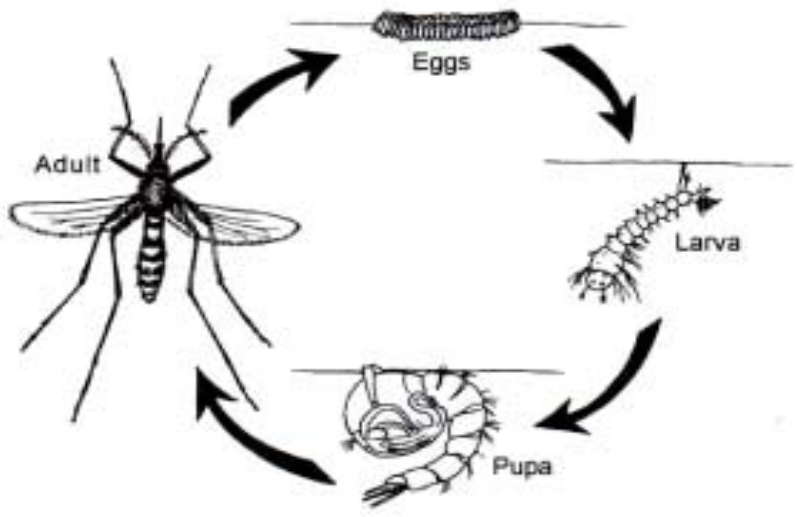

Diagram obtained from Framework for Mosquito Management in Victoria (2004)

Eggs - The adult female mosquito lays eggs which then float on the surface of the water or alternately they are laid on soil or plants depending on the species of mosquito. *Culex* and *Anopheles* spp. lay their eggs on the surface of the water whereas *Aedes* spp. lay their eggs on damp soil that is then flooded by water following rain and/or flood events. On average, eggs hatch into larvae within 48 hours.

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

Pupae - Mosquito pupae are otherwise known as tumblers because of their swimming action and their shape. This is a resting stage and it is the time when 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.

2.6. Mosquito Species of Interest

These mosquito species are commonly found throughout the Shire of Campaspe, some are known to transmit vector borne disease, and others are known nuisance mosquitoes.

Mosquito name	Description
Culex australicus	Culex australicus are a medium sized mosquito, normally brownish in colouration. They are known vectors of Ross River virus (RRV), Barmah Forest virus (BFV), Murray Valley Encephalitis virus (MVEV) and Kunjin virus however they are not known to readily bite humans, more known to feed off rabbits and birds. They are more prevalent in freshwater grassy ground pools and permanent well-vegetated ponds. Most common in the environment during Spring and Autumn. Usually seen after first flood events. They are known to harbour in paddocks and forest type environments. Known to be a precursor species for *Culex Annulorostris*.
Culex annulorostris	Breed in fresh water however they are also capable of breeding in drains and constructed water bodies. Adult females mainly feed at dusk and night and to a lesser extent at dawn and are capable of transmitting vector borne diseases such as Ross River virus (RRV), Barmah Forest virus (BFV), Murray Valley Encephalitis virus (MVEV) and Kunjin virus. This species of mosquito normally appear after Culex Australicus. They are a medium sized mosquito with a white band located on their proboscis. Dependent on weather conditions, they can travel medium to long distances, ranging between 2km to 10km in distance.
Aedes sagax	This species of mosquito breeds in fresh waters, along with roadside ditches. They are known as a pest mosquito and readily bite humans. They are a larger sized mosquito who predominately enter the environment following large rain or flood events.

Mosquito name	Description
Aedes camptorhynchus	Adults can be active throughout the year and are known saltwater species although they are thought to breed in some freshwater environments. They feed throughout the day and night and are vicious biters.
Aedes notoscriptus	Readily attack humans night and day and are known to be a vector of dog heartworm. Their human vector status is generally unknown. They are known as 'container breeders' and are found to harbour in shaded areas. They are known to attack during the day and tend to be aggressive in nature. They travel short distances, ranging between 200 metres to 500 metres. Their distinguishing features include black and white stripes, including a white band on their proboscis.
Aedes vittegar	Readily attack humans and other animals often during the day but also at evening and night. Are known to be a significant pest in irrigation areas and after flood events. Commonly known as a nuisance pest, and can be ferocious when attacking. Known as day biters.
Culex quinquefasciatus	Like to breed in manmade polluted/organic water features including stormwater drains, tyres, drums, disused swimming pools, rain water tanks and septic tank systems. They are attracted to indoor environments and like to attack at night. They are capable of travelling medium distances ranging between 1-2kms. They are a medium sized mosquito and are a brown/golden coloured. They are known to make a loud audible buzzing noise.

2.7. Arboviruses of Importance in Australia

There are a number of arboviruses of public health important within Australia. In the northern states of Australia the viruses most prevalent can be different to those we experience in Northern Victoria.

Within the Murray Valley region Ross River Virus (RRV) and Barmah Forest Virus (BFV) are endemic and human cases are identified every year. Of particular concern is Murray Valley Encephalitis (MVE) due to the serious nature of the disease. Cases of MVE are rare and very serious.

Below is a table of the current arboviruses of concern throughout Australia.

Virus Genus	Name of Virus	Abbreviation	Comments
Flavivrus	Murray Valley Encephalitis Virus	MVEV	MVE virus is endemic in northern Australia where sporadic cases or small outbreaks of MVE occur every few years, usually at the end of the wet season. Seven outbreaks of MVE have occurred at irregular intervals in south-eastern Australia since 1917. The most recent was in 1974. During those times, there was heavy rainfall leading to widespread flooding, which promoted large increases in water bird and vector mosquito populations. The MVE virus numbers were amplified in the bird–mosquito–bird cycle, and humans became infected when bitten by mosquitoes carrying the virus. MVE seems to occur in people who receive large numbers of mosquito bites during a single exposure.

Virus Genus	Name of Virus	Abbreviation	Comments
	Kunjin Virus West Nile Virus	KUNV WNV	West Nile virus/Kunjin virus has many similarities to MVE virus, and these two viruses can only be distinguished by virological tests. This distinction is important during periods when weather patterns and other surveillance indicators suggest that an outbreak of MVE virus may be imminent in south-east Australia. MVE has a higher mortality rate and can be more prevalent.
	Japenese Encephalitis Virus	JEV	The occurrence of JEV disease in Papua New Guinea and probable spread from there to cause disease in the Torres Strait islands poses a significant threat to Australia. There is a theoretical concern that migratory birds could carry the virus southwards in Australia, even as far as Victoria.
	Dengue 1, 2, 3 and 4 virus	DENV-1, 2, 3, 4	Local transmission has not been reported in Victoria for decades; however, dengue does occur in travelers returning from endemic areas from time to time.
Alphavirus	Ross River Virus	RRV	Major outbreaks have occurred in all parts of Australia, primarily from January to May each year. RRV disease has been detected and possibly transmitted to humans in most major metropolitan areas of Australia, including Perth, Brisbane, Sydney and Melbourne. RRV disease is considered endemic throughout most parts of Victoria, particularly around inland waterways and coastal regions, but not in metropolitan Melbourne. Epidemics usually follow heavy rains, or high tides that inundate salt marshes or coastal wetlands.
	Barmah Forest Virus	BFV	BFV disease is considered endemic throughout Victoria. Since 1988, it has been reported in Western Australia, Queensland, New South Wales and the Northern Territory. Outbreaks have been reported in Victoria throughout the Murray Valley and the Gippsland area. In Victoria, the number of notified cases per year varies widely depending on seasonal and other conditions.
	Chikungunya	CHIKV	No locally acquired cases have been reported in Australia, and there is no evidence confirming incursions of chikungunya into Australia. However, a few visitors and returning residents entering Australia have been diagnosed with the disease. There is the potential for significant socioeconomic impact should it become established in Australia.

3. RISK ASSESSMENT AND MANAGEMENT

3.1. Community Implications

There are a number of potential implications for council and the community if risks are not managed appropriately. The table below list some of the potential issues council must consider.

Public Health	Increase in disease cases and possible Murray Valley Encephalitis outbreaks. Increased morbidity and mortality rates within the community.
Social and Economic	Loss of amenity and outdoor enjoyment due to increase in nuisance mosquitos. Loss of income for individuals who are unable to work due to illness. Reduction in numbers of visitors to the region. Financial implications for businesses due reduction in tourism to the area and staff illness.
Environmental	Impact on natural ecosystems and animals through the use of inappropriate chemical treatment.
Legal	Legal implications for council if not meeting obligations under the Public Health and Wellbeing Act 2008 in the protection of the health of the community.

In order to assess the potential impacts on the community and determine a relevant course of action a risk assessment approach is taken to determine the appropriate level of response by council.

3.2. Risk Assessment

3.2.1. Individual Site Assessment

Mosquito management programs are based on public health risk so it is important that each site is assessed throughout the season to determine the action required. Each site will be different so it is essential that the mosquito monitor physically assesses all possible breeding sites before making a decision on what level of response is required. This ensures that the public health risk is managed as well as being cost effective for council.

The following factors must be considered in determining what action is required:

- assessment of the physical site
- weather conditions
- incidence of disease (RRV, BFV)
- population numbers
- species trapped in adult traps
- historical data associated with breeding sites

Following the assessment the mosquito monitor will determine if control methods are required. A more detailed process for carrying out a risk assessment can be found in the appendices.

3.2.2. Operational Risk Assessment

At the beginning of each season an operational risk assessment is conducted to determine the level of activity and resources that will be required for the coming season. This assessment will be based on the current conditions and advice provided by the Department of Health and Human Services (DHHS).

The tables below demonstrate each risk level as determine by officers and the criteria for each of these risks.

Level of Risk	Criteria
Extreme	Incidence of MVE in humans as confirmed by DHHS
Very High	High likelihood of MVE cases in humans. Confirmed detection of MVE in sentinel chickens or trapped mosquitos
High	Potential for cases of MVE. High incidence of RRV or BFV cases in current season or during the past 5 years.
Moderate	High numbers of nuisance mosquitos. Increased numbers of RRV or BFV cases.
Low	Low numbers of nuisance mosquitos. No increase in endemic cases of RRV or BFV.

Once the level of risk is determined an appropriate level of response must be determined. The table below explains the response that council would need to provide based on the level of risk determined.

Level of Risk	Response
Extreme	Increased surveillance and treatment activities including adult spraying. Increased communications to the community and at a state level. Direction to be taken from the DHHS regarding activities required.
Very High	Increased surveillance and treatment activities may include adult spraying. Increased communications to the community. Direction to be taken from DHHS regarding activities required.
High	Increase surveillance and treatment activities in areas considered high risk. Adult spraying of mosquitoes only to be carried out at the direction of DHHS. Some additional communications may be required.
Moderate	Regular surveillance and treatment activities will be undertaken. Additional surveillance and treatment will be determined following direction from DHHS. Communications to continue as standard.
Low	Regular surveillance to occur with treatment activities if required. Standard communication to be provided to the community.

It is important to note that the level of risk can change at any time throughout the season based on the conditions. Officers will assess the operational requirements based on the activities of the mosquito monitor. This will include

- Number and size of breeding sites found,
- Amount and type of treatment applied to breeding sites
- Numbers of mosquitos trapped
- Number of complaints received.

If the conditions of the season change the level of risk could change and further activity and resources may be required.

4. KEY PRIORITY AREAS

4.1. Surveillance

Mosquito monitoring provides important information on the activity of vector and pest mosquito species. It also provides triggers for public health warnings and an assessment of necessary mosquito control activities.

Council employs a Mosquito Monitor on a casual basis for approximately 22 weeks between November and the end of March depending on weather conditions and mosquito numbers. The monitor conducts regular trapping of adult mosquitoes and treats identified active breeding sites by undertaking larval sampling. They also investigate complaints made by the community regarding potential breeding sites.

It is a requirement that the mosquito monitor provides weekly reports to Council's Environmental Health Department. These reports outline the activities conducted throughout the week, numbers and types of mosquitoes caught and any treatment undertaken of larval breeding sites. The data from these reports are entered into a database, which provides basic data about the identification of adult mosquitoes in the area and locations and treatment controls of active larval breeding sites.

A new application (app) has been developed for reporting of council activities to the Department of Health and Human Services. This app allows an officer to enter information about surveillance and trapping directly into the app whilst in the field. Campaspe Shire council officers began the use of this app by entering trapping locations and results in the 2015/16 season. Use of the app will be increased including the entering of larval surveillance starting in the 2017/18 season.

Mosquito Surveillance within the Shire of Campaspe is carried out through a range of activities as detailed below.

4.1.1. Breeding sites

The location of potential mosquito breeding sites is based on levels of mosquito activity identified in previous years, along with any complaints received by Council. Depression levels, the amount of rainfall and table drains are also considered when determining potential breeding sites.

Mosquitoes have the ability to breed in a number of locations dependent on the species, including:

- Saltmarsh – coastal. Saline or brackish. Fresh or muddy (not prevalent in our municipality).
- Freshwater – rivers, lakes, inland or coastal. Flooded areas. Clean or polluted.
- Shallow flooded plains and grassland
- Vegetated margins of permanent or temporary lakes, ponds, drains, creeks etc.
- Roadside drains
- Constructed wetlands
- Irrigation ditches
- Agricultural land
- Containers around the home including bird baths, animal water bowls/troughs, wheelbarrows, watering cans, pot plant plates and trays, septic tanks, drains and gutters, water tanks, BBQ pits, air conditioner trays, neglected swimming pools and ponds

Council Mosquito Monitor checks known breeding sites throughout the municipality by conducting visual checks and dipping for larvae. The mosquito monitor has a list of all breeding sites, including current and past sites, which are monitored as needed. New breeding sites are added to this list as they are found so they can be monitored into the future. If a breeding site is found to be active with mosquito larvae treatment will be applied as needed.

4.1.2. Control methods

Once breeding sites are identified a treatment method will be determined based on the number of larvae present. This will be determined by a risk assessment of the area including its proximity to human and animal populations and a determination made as whether treatment is required and what the best type of treatment is. It may be determined that no treatment is required due to natural predators being present in the environment or minimal breeding activity.

There are three types of control methods that may be used by Council.

Physical	Alteration of the breeding site to minimise or prevent mosquito breeding. This may include the removal of vegetation or other works to make the water flow more freely.
Chemical	Use of chemicals to reduce mosquito populations, both larvae and adult treatment. Chemicals that can be used are listed below.
Biological	Use of biological means to reduce mosquito populations. This may involve introduction of predators like fish or other water insects.

Council may elect to use physical and chemical treatment methods to treat active mosquito larval breeding sites. Biological treatment is rarely used as an option unless predators are naturally occurring in the breeding environment.

A list of the types of chemicals used in council's mosquito management plan can be found in the table below.

S-methoprene: Prolink	S-methoprene is an insect growth regulator which interferes with the normal development of mosquito larvae, resulting in the prevention of the development of adult mosquitoes. The use of these products has a residual effect, resulting in residual control of mosquitoes. These are safe to use in rainwater tanks – residual effect ranging from 30 to 150 days depending on the product used.
Bacillus thuringensis israelensis (BTI)	BTI is a selective microbial mosquito larvicide which is mostly effective on 1st, 2nd, 3rd and early 4th instar mosquito larvae.
Organophosphates	Abate 10SG is an organophosphate insecticide used in public health programs for the control of mosquito larvae by treating breeding areas. Due to the high toxicity to other insects this is used only in an emergency situation where the public health risk is considered significant.
No moz	Active ingredient is S-methoprene. This product is suitable for homeowners who wish to treat on a small scale around their property.
Sumilarv	Administered in a sachet formulation. It uses controlled release granules that slowly dissolve in water source.
Adulticiding chemicals	Twilight ULV is a highly effective adulticide concerntrate used for the treatment of adult mosquitos. The environmental impacts are low.

Removal of the identified breeding site is the preferred option for council in the reduction of mosquito numbers. If treatment of a breeding site is required councils preferred method is the use of the PROLINK products as it is highly effective and has minimal impact on the surrounding environment.

Spraying of adult mosquitoes is not current practice as part of council's mosquito program. Adulticiding is effective in reducing adult numbers of mosquitoes in a specific location for a limited period of time. Adulticiding may be considered during a regular season prior to events where large numbers of people are attending and at risk. It may also be considered around schools and childcare centres to reduce the risk of children getting bitten and to improve amenity within play areas. A risk assessment would be carried out prior to the commencement of any adult spraying for each location identified. This assessment would assist in determining the level of treatment required as well as the appropriate treatment method to be used.

4.1.3. Adult trapping

To monitor the activity of mosquitoes, adult mosquito populations are trapped on a weekly basis between November and late March throughout the municipality. Adult populations are sampled using a dry-ice baited Encephalitis Vector Surveillance (EVS) trap operated at fixed sites.

EVS traps use carbon dioxide (normally supplied via dry ice) to attract mosquitoes. Traps are set in the late afternoon and collected the following morning, these are the times when mosquitoes are known to be most active.

Mosquitoes collected in these traps are sent to AgriBio at the Department of Economic Development, Jobs, Transport and Resources (DEDJTR), in Bundoora for identification and screening of viruses. The benefits of this is clear, accurate data and species identification is obtained for council, the Department of Economic Development, Jobs, Transport and Resources and the Department of Health and Human Services.

Traps are currently set at eight locations across the municipality. Further details of the locations of these traps can be found in the appendices.

4.1.4. Sentinel Chickens

The sentinel chicken program is an early warning system for the identification of arboviruses and is conducted at various locations throughout Victoria. This assists in the early identification of viruses in particular Murray Valley Encephalitis (MVE) and forms part of both the state and national virus monitoring programs.

Throughout the mosquito season flocks of chickens, specific to the program, are bled and then tested for the presence of flaviviruses including Murray Valley Encephalitis and Kunjin Virus. Currently the Campaspe Shire does not have a sentinel chicken flock within the municipality. Flocks are located within neighboring councils including Barmah and Cobram in Moira Shire Council, at Kerang within Gannawarra Shire Council and at Toolamba within the Greater Shepparton City Council.

If in the future if the Department of Health and Human Services requested a sentinel chicken flock to be located within Shire of Campaspe consideration would need to be given to this and a suitable location established.

4.2. Communication and Education

Community education is a major component of Campaspe Shires Arbovirus Program. The public health message regarding mosquitoes is a primary focus for the community and visitors to the region. Information is available on Councils website, at Councils Customer Service Centres and is disseminated at local tourist locations (ie. caravan parks etc.) as required.

The Beat the Bite campaign produced by the Department of Health and Human Services is the basis for councils public health messaging. This program has prepared educative material available for councils to use within the community. These messages focus on the importance of protecting yourself from getting bitten by mosquitoes and reducing breeding sites around the home. As this campaign is produced by the state it ensures consistency of messaging across municipalities.

Media and Communications

The Campaspe Shire develop and issue media releases at the beginning of the program and again prior to the summer holiday period. Working with the media is an important component of community education because it provides an opportunity for the dissemination of accurate information on mosquitoes and personal protection strategies, as well as opportunities to publicise the local mosquito management program and raise awareness.

Campaspe Shire Council supports local events and encourages all community groups and organisers of events to supply information to people attending their events about the importance of protecting themselves. Council are able to assist with the provision of information to event organisers to be distributed at events during periods where mosquito numbers are of concern.

Further information can be found at https://www.betterhealth.vic.gov.au/campaigns/beat-the-bite

4.3. Complaint Investigation

When mosquito numbers are high council often receive complaints from the community about potential breeding sites.

When a complaint is received by Councils Environmental Health Department, details of the complaint are forwarded to Councils Mosquito Monitor who will then investigate the complaint. This may include attending the complainant's property to discuss the details of the complaint with them. If the complaint is about another property or breeding on public land the mosquito monitor will attend the location and investigate the concerns raised.

The investigation may include larval dipping and treatment of the breeding site. Alternatively an adult trap could be placed in the area overnight to determine the extent of the issue and the mosquitoes that are causing the nuisance. Managing complaints in this way is an excellent opportunity to connect the local community with the mosquito management program and provide education on personal protection and reducing breeding around the home.

4.4. Emergency Management

The Department of Health and Human Services are responsible for initiating an emergency control program to minimise the incidence and spread of arboviruses. An emergency control program will be carried out if DHHS considers that there is an actual or potential outbreak of MVE and/or a very high incidence of RRV or BFV in a particular area or region.

This is likely to involve council's current level of activity as well as additional monitoring of breeding sites, adult trapping and adult spraying of mosquitoes. It is important to ensure that adequate chemicals and equipment for adulticiding are available in the event that these are required. An assessment of the risk to public health will need to be carried out for each location that adulticiding will be carried out to determine the priority in which they are completed.

In the event of increased risk of arboviruses adult spraying of locations prior to large scale community events will be considered. A risk assessment will be completed prior to any spraying occurring in the lead up to an event where a large group of people are expected to congregate. Any adult spraying of mosquitos will be fully funded and arranged by council through the arbovirus program. Event organisers will be encouraged to supply information to the attendees about protection against mosquitos. Consideration should also be given to supplying insect repellant at the event, either for free or at a charge to the attendees. Council will not provide insect repellent to event organisers for distribution at events.

5. ACTION PLAN

Environmental Health Coordinator – EHC
Environmental Health Officer – EHO
Mosquito Monitor - MM
Communications Officer - CO

5.1. Administration and Program Management

Action	Time	Responsible Officer/s	Comments
Review of current breeding sites	Prior to start of season and throughout the season as needed.	EHC, EHO, MM	A review of breeding sites is to be undertaken to ensure that a current database is available for staff outlining the location, trends and breeding activity of identified sites.
Chemical stocktake and ordering	One month prior to program start.	EHO	Ensure adequate chemical stock is available for the season to commence. Continue use of appropriate chemicals for larvaeciding and look at alternative treatment methods.
Reporting	As required	EHC	Reporting of activities to be provided to the Department of Human Services as required under agreement. Reporting is to be done through the App. Reports to be provided to Council and EMG as requested. May include program activities as well as current public health issues or concerns.
Financial Management	Ongoing	EHC	Manage the day to day expenditure for the program and provide details of expenditure to the Department of Health and Human Services as required, including annual report/acquittal.
Training	As required	EHC	Maintain training needs for staff including staff to attend the Victorian Mosquito Management Training Course run by the Department of Health and Human Services.
Staff	As required	EHC	Ensure adequate staff are available to carry out the annual Arbovirus program and that succession planning has been considered and planned for.
Stakeholder relationships	Prior to start of season and throughout the season as needed.	EHC, EHO, MM	Meet with relevant agencies and stakeholders to discuss arrangements for the upcoming season. Document any agreements/arrangements discussed in relation to tasks to be completed.

Action	Time	Responsible Officer/s	Comments
Review and Evaluation of Mosquito Management Plan	At the end of the mosquito monitoring season	EHC	An annual review of the plan will be carried out as well as a major review of the plan prior to the 2020 season.

5.2. Surveillance

Action	Time	Responsible Officer/s	Comments
Adult Trapping	Weekly	MM	Alternate between 4 locations a week.
Send adult traps to Agribio Bundoora	Weekly	EHO,MM	Traps set at designated locations will be forwarded to DEPI Bundoora weekly to identify mosquitoes and obtain data.
Larvae sampling	As required	MM	Focus on areas known to be mosquito breeding areas and in areas where adult trapping numbers are high.
Treatment of larval breeding sites	As required	MM	Each breeding site will be assessed and treatment determined as needed.
Adulticiding	As required	MM, Contractor	Adult spraying will be considered in circumstances where the benefits to the community and risk requires alternative treatment to be applied.

5.3. Communication and Education

Action	Time	Responsible Officer/s	Comments
Delivery of education materials	Beginning of program and before Christmas holiday period	EHO	Aim to promote Personal Protection within the community through the use of repellents, removal of stagnant water etc, through the delivery of Beat the Bite brochures and materials.

Action	Time	Responsible Officer/s	Comments
School Education	Prior to start of season and throughout the season as needed.	EHO, MM	Send correspondence to schools offering free education session to be run by an EHO and Councils Mosquito Monitor to educate students about mosquito breeding and protecting themselves.
Media releases	Beginning of program and as needed.	EHC, CO	Work with the communications team to develop media releases with current messages

5.4. Complaint investigation

Action	Time	Responsible Officer/s	Comments
Complaints	As received.	EHC, EHO, MM	Complaints received via Councils Request Management System/ECM to be referred to MM for action as required.
Complaints	Monthly	EHC	A monthly review of all complaints to be carried out to ensure action has been taken appropriately and there are no other public health concerns that need to be addressed.

5.5. Emergency Management

Action	Time	Responsible Officer/s	Comments
Surveillance activities	As required	EHC, EHO, MM	Additional surveillance including larval and adult trapping will be carried out as requested by the Department of Health and Human Services.
Treatment activities	As required	EHC, EHO, MM	Additional treatment including adult spraying and larval treatment will be carried out as requested by the Department of Health and Human Services.

6. REFERENCES

Victorian Government Department of Sustainability and Environment (2004). Framework for Mosquito Management in Victoria.

Department of Health Australia. Framework for the surveillance, prevention and control of Murray Valley Encephalitis virus in Australia, Revision number 1: 18 November 2013.

Australian Government Department of Communicable Diseases Information, Arbovirus and malaria surveillance. http://health.gov.au/internet/main/publishing.nsf/Content/arbovirus+malaria+surveillance-2

Blue Book – Guidelines for the control of Infectious Disease. Department of Health and Human Services.

Victorian Government Public Health and Wellbeing Act 2008 and Public Health and Wellbeing Regulations 2009.