



Rockhampton Regional Council

Vector Management Plan

2010 - 2014



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PART A: STRATEGIC OVERVIEW

1.1 Executive Summary

The Rockhampton Regional Council Vector Management Plan 2010-2014 provides a framework for Council and the community to manage vector agents in the region. A strategic overview is presented in the Plan. Operational programs are subsequently outlined, identifying the actions required to achieve the strategic objectives.

Council has a significant problem with freshwater and saltwater mosquitoes in the region. Increasing mosquito populations are the result of climatic conditions and the availability of suitable breeding sites. In the Rockhampton region, several communities are located in close proximity to salt marsh areas and other mosquito breeding sites. Geographical separation of communities within the region presents a major challenge to the delivery of operational programs.

The main focus of the Vector Management Plan 2010-2014 is to identify appropriate vector management activities to be implemented throughout the region. These activities will reduce the risk to the community of contracting vector-transmitted diseases as well as the nuisance value of pests. The Plan also focuses on proactive management activities, with the aim of reducing reactive management activities.

Rockhampton Regional Council is committed to the implementation of the Plan which has been developed with consideration for relevant best practice methods, legislation and the environmental amenity of the region.

1.2 Vision

To protect the health, lifestyle and welfare of the Rockhampton Regional Council communities from the effects of mosquitoes and vermin.

1.3 Mission Statement

To reduce the incidence of vector borne disease and the nuisance value of mosquitoes and vermin in the Rockhampton Regional Council area.

1.4 Objectives

- Provide an effective and equitable vector management service to the communities of Rockhampton Regional Council.
- Control mosquitoes and vermin by the use of cost effective and environmentally appropriate management methods.
- Undertake continual implementation, review and improvement of best practise methods for mosquito and vermin management.
- Increase community and stakeholders awareness of Council's Vector Management Plan 2010 – 2014.
- Undertake mosquito management in a manner consistent with the Mosquito Code of Practice for Queensland and the Australian Mosquito Control Manual.
- Reduce reactive vector management activities by increasing proactive vector management activities.
- Provide monitoring programs to accurately understand the mosquito population dynamics within the region.
- Have an integrated management approach which minimises chemical use, is sustainable and considers the environmental assets of the region.
- Undertake detailed species monitoring and data analysis for the purpose of developing and implementing proactive and effective operational programmes

PART B: BACKGROUND INFORMATION

2.1 Introduction

The effective control of mosquitoes in the Rockhampton Regional Council area is of considerable importance due to the impacts on public health from diseases such as Ross River Virus, Barmah Forest virus and dengue fever and to the impact on outdoor activities of residents due to nuisance biting of mosquitoes.

There are more than twenty common species of mosquitoes in the Rockhampton region; several of which are capable of transmitting disease.

Rockhampton Regional Council is committed to reducing the risk of disease and the nuisance value of mosquitoes and vermin in the region by implementing an integrated vector management program. This program uses a number of control techniques that will collectively contribute to the management of vector agents. These techniques reduce the reliance on chemicals and take into account environmental impact, sustainability and cost effectiveness.

This Plan identifies all the management activities that will be undertaken by Council's Vector Control Unit and provides time allocation for each activity. A standard operating procedure is provided for each activity.

A major theme of the Plan is proactive management as this will reduce the need for reactive management which is expensive and only provides short term outcomes.

2.2 Scope

The Rockhampton Regional Council Vector Management Plan 2010-2014 provides information regarding the management of mosquitoes and vermin in the region. The Plan identifies a strategic position and provides detailed information about the operational programmes that will be implemented.

The Plan will provide guidance to Council's Vector Control Unit regarding the delivery of on-ground activities. This guidance focuses on a systematic proactive approach which is initiated by detailed monitoring. It is expected this approach will deliver maximum outcomes for the resources available.

The Plan discusses customer request procedures, control methods, property inspection, monitoring and risk management. Information is also provided on the individual vector species present in the region.

2.3 Population and Topography

The Rockhampton Region includes the city of Rockhampton, Gracemere, Yeppoon and Emu Park on the Capricorn Coast and rural towns such as Mt

Morgan and Marlborough. Approximately 80 settlements are spread throughout the region. The region has a total population of 111,500 with 60,827 people residing in the City of Rockhampton.

The distribution of the population into this number of settlements provides challenges for the delivery of an effective vector management service for all settlements and associated residents.

There is considerable topographic diversity in the region with the large interface area between the terrestrial and saltwater aquatic environments, the most relevant for vector management. The region also contains the delta of the Fitzroy River and therefore encompasses large areas of salt marshes and low-lying landscapes. These salt marshes and low-lying landscapes regularly become inundated by tides, rain and flooding events, and have the potential to become breeding sites for mosquitoes.

This situation where many settlements, including Rockhampton City, are located near natural breeding sites provides a significant challenge to Council for the management of mosquitoes within the region.

2.4 Legislative Requirements

Health legislation pertaining to the control of designated pests being mosquitoes, rats and mice is contained in the *Public Health Act 2005* and the Public Health Regulation 2005.

It is the responsibility of local government to administer and enforce local government health risks outlined in the *Public Health Act 2005*. Also local government administers and enforces Division 2 Mosquitoes and Division 3 Rats and Mice of the Public Health Regulation 2005.

Public health risks that are administered by the Vector Control Unit are:

- an animal, structure, substance or other thing that:
 - is or is likely to become, a breeding ground or source of food for designated pests
 - harbours, or is likely to become something that harbours, designated pests.
- a designated pest that is, or is likely to be, hazardous to human health, or that contributes to, or is likely to contribute to, disease in humans or the transmission of an infectious condition to humans

A designated pest means any of the following:

- mosquitoes
- rats

- mice
- other animals prescribed under a regulation

There is no legislative requirement for local government to have a Vector Management Plan.

Other legislation with application to vector management activities include:

The Agricultural Chemical Distribution Control Act 1966

Chemical Usage (Agricultural and Veterinary) Control Act 1988

Fisheries Act 1994

Fisheries Regulation 1995

Nature Conservation Act 1992

Nature Conservation Regulation 1994

Environmental Protection Act 1994

2.5 Council Corporate and Operational Plans

The implementation of the Rockhampton Regional Council Vector Management Plan 2010-2014 is associated with various identified outcomes and activities in Council's Corporate and Operational Plans. These outcomes and activities include:

Corporate Plan Outcomes

- 1.2.1 Make the Rockhampton Region a safe, healthy and desirable place to live with a high level of amenity.
- 1.2.2 Promote and regulate public health and safety in accordance with the legislation through education and programme delivery.

Operational Plan Activities

- Environmental nuisance is managed
- Public health is protected through disease prevention and mitigation initiatives
- An appropriate vector management plan (mosquitoes and rodents) is in place and implemented

2.6 Environmental and Safety Considerations

The inherent nature of mosquito management activities has the potential to adversely affect the environment. The *Environmental Protection Act 1994* makes clear statements of intention in relation to a person's responsibility and the environment, known as the General Environment Duty. Section 319 of the *Act* defines this duty as:

'A person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to minimise the harm'

The *Act* stipulates that all activities, including mosquito management activities, should take environmental issues into consideration. The Mosquito Management Code of Practice for Queensland 2002 and the Australian Mosquito Control Manual provide further guidance.

Due to the nature of vector control operations through the requisite use of 4WD vehicles, all terrain vehicles and the continual use of chemicals, safety of the operator is imperative. All activities associated with the implementation of the Plan will be consistent with Council's Zero Harm Policy.

2.7 Other Vector Management Plans

Local Governments receive direction from various State Government legislative documents regarding how vector management is to be undertaken in their respective areas. The relevant legislative documents are identified and briefly discussed in the previous section 2.4 Legislative Requirements.

Other documents consulted during the development of the Rockhampton Regional Council Vector Management Plan 2010-2014 include:

- The Local Government Association of Queensland Inc. (2002) *Mosquito Management Code of Practice for Queensland*
- Mosquito Control Association of Australia Inc. (2008) *Mosquito Management Code of Practice for Queensland*
- Queensland Government, Queensland Health (2005) *The North Queensland Dengue Fever Management Plan 2005-2010*

These documents have been used as technical references for the development of the Plan.

PART C: OPERATIONAL PROGRAMS

3.1 Customer Complaints and Enquiries

Public interaction is a necessary and important component of any vector management plan. It can be a source of useful information to identify problem areas and 'hot spots'. Careful, structured recording of information is required as this information can be used to develop historical understanding of the problem and associated areas.

Public interaction falls into a number of categories. The most obvious category is complaints and enquiries, but other categories include the dispersal of information, education programs and interaction with specific stakeholders.

Customer complaints and enquiries can greatly assist Council's Vector Control Unit by identifying the location of mosquitoes and vermin in the region. Once the areas have been identified, a proactive control program can be implemented in each respective area.

An operating procedure for customer requests is presented below, clearly identifying the response procedure by Council to complaints or enquiries from the public.

Complaints or Enquiries

Generally complaints and enquiries will be received by Council's call centre, and are in response to biting attacks by mosquitoes or the sightings of vermin or vermin harbourage. In most cases customers want to know what Council can do to remove or reduce the problem.

Immediately after a complaint is received at Council's call centre a 'Pathway request' (Customer Service and Enquiry module of RRC Pathway Production software) is generated and assigned to Council's Vector Control Unit. There the complaint is assessed and the appropriate action is implemented.

Customer service is a major component of the work of Council's Vector Control Unit with approximately 45% of all officers' time spent addressing requests.

The following customer service principles are applied when responding to all complaints or enquiries.

- Be polite
- Be timely
- Keep the person informed
- Provide additional information

Rockhampton Regional Council is committed to the delivery of a high level of customer service and this is reflected in the following standard operating procedure for customer requests.

3.1.1 Operating Procedure – Customer Complaints and Enquiries

Purpose

- To provide a high level of customer service to the communities of RRC in response to complaints and enquiries regarding vector management.
- To provide a systematic, uniform procedure for staff to follow when processing vector complaints or enquiries from the public.

Procedures

1. Complaint or enquiry received and allocated to responsible officer

Once a complaint or enquiry has been received by Council's call centre or Vector Management Unit a 'Pathway Request' is generated with Council's Senior Vector Management Officer as both responsible and action officer.

The Senior Vector Management Officer (SVMO) allocates a Vector Management Officer (VMO) as the action officer. That VMO is then responsible for the complaint or enquiry. This allocation by the SVMO to the final action officer occurs within two days of the complaint or enquiry being received by the SVMO.

2. Action Officer contacts the person making a complaint or enquiry.

- The action officer contacts the customer within two days of being allocated as the action officer for the complaint or enquiry – customer is contacted within four days of making complaint or enquiry.
- The action officer contacts and discusses the issue with the customer and clearly informs the customer of the proposed action and timeline to be undertaken to address the complaint or enquiry.
- The action officer records all relevant points (including proposed actions and timeline) of the conversation with the customer in the 'notes' section of the Pathway request. These notes must be clear, concise and accurate. This note input into the Pathway system must occur the same day the customer is contacted.
- On completion of the action, the customer is informed the action has been completed. This contact must be made prior to the Pathway request being completed. Comment must be made in Pathway notes stating the customer has been informed that the action has been completed.
- If the action is not completed by the proposed date, customer must be contacted and informed of the delay – notes will be added to the pathway request stating customer has been contacted and informed of the delay.

Evaluation Process – see 3.10 Reporting Requirements

3.2 Misting

Misting controls adult mosquitoes through dispersal of an adulticide throughout a specific area. Misting also controls other insects including biting midges and flies. The adulticide is dispersed from a misting machine which is commonly placed on the tray of a slow moving vehicle. This method of dispersal has the capacity to treat approximately fifty hectares per hour. The adulticide is a synthetic pyrethroid which is registered for the control of target insects in the community.

Misting is usually a reactionary response to community complaints regarding biting insects. During summer months misting is a major activity undertaken by Council's Vector Control Unit.

A proactive program of surveillance and treatment would constitute a more effective control method of known breeding sites. This Vector Management Plan 2010–2014 identifies various proactive activities which, if successfully implemented, may significantly reduce the need for misting in the region.

Proactive misting programs may be implemented as a result of monitoring activities which identify large numbers of mosquitoes in a specific area. All misting activities are undertaken only within or near settlements.

Misting is a major control activity used to address emergencies such as:

- a suspected disease outbreak;
- insect plagues following floods;
- when larval control has failed.

The advantages and disadvantages of misting are:

Advantages

- Large areas can be covered relatively quickly.
- Misting gives a quick kill, rapidly eliminating mosquitoes or, in the case of disease outbreaks, eliminating infected insects.
- When applied correctly misting penetrates under the vegetation canopy and around dwellings.
- Misting can be used to reduce adult mosquito numbers after failed applications of larvacide.

Disadvantages

- Treatments are not specific for mosquitoes; non–target insects may be impacted e.g. honey bees and butterflies.
- Treatments may need to be repeated at short intervals, in some cases daily during an emergency.
- Treatments need to be undertaken during a relatively small window of opportunity - for maximum effect when winds are light and when air temperature inversion occurs i.e. usually at dawn and dusk.

- Treatment may trigger complaints from residents who claim to be affected by the insecticide.
- Insecticidal misting equipment is expensive.
- Permits may be required to apply adulticides in environmentally-sensitive areas e.g. Marine Parks

3.2.1 Operating Procedure - Misting

Purpose

- To provide a quick control response to community complaints and enquiries regarding mosquitoes, midges and flies.
- To provide a proactive adult mosquito control option that can be used after the analysis of monitoring data.
- To provide a control response to disease out breaks and flooding events.

Procedure – Response to Complaint from Community

- On receipt of a complaint from the Pathway system, a Vector Management Officer contacts the complainant to ascertain:
 - landscape of the area
 - description of insect and severity of biting
 - time of biting.
- Decision is made regarding the need to undertake misting. If misting is to be undertaken the complainant is informed of when misting will occur.
- All relevant details are recorded for input into geographic information system (GIS) mapping.

Procedure – Response to Analysis of Monitoring Results

- Data from monitoring activities e.g. light traps, field sampling is analysed and, if necessary, a proactive misting program is developed and implemented.
- All relevant details are recorded for input into GIS mapping

Resources Required

- Three vehicles with mounted misting units and chemicals.

Records

Detailed records will be incorporated into a geographic information system mapping layer. Information recorded will include:

- Location of complaint and misting
- Reason for misting e.g.:
 - in response to complaint;
 - proactive program;
 - emergency response.
- Area of misting.
- Dates and times when misting occurred.

3.3 Salt Marsh Control

There is considerable topographic diversity in the Rockhampton region. The large interface area between terrestrial and saltwater aquatic environments presents a notable consideration in terms of mosquito management. The region also contains the delta of the Fitzroy River, thereby encompassing large areas of salt marshes and low-lying landscapes. These salt marshes and low-lying landscapes regularly become inundated by tides, rain and flooding events, and have the potential to become breeding sites for mosquitoes.

The salt marsh areas in the region are the major breeding sites for mosquitoes and are therefore the main focus area for control activities by Council's Vector Control Unit. (see Appendix 1. - Maps 1 & 2)

Control

Control focuses on the monitoring and treatment of mosquito larvae within salt marsh areas adjacent to settlements in the region.

Currently aerial salt marsh control activities are confined to thirteen salt marsh sites adjacent to Rockhampton City. This activity will be extended to salt marsh sites at the Capricorn Coast, which will incorporate sites adjacent to the settlements of Keppel Sands, Emu Park and Yeppoon.

Once appropriate sites have been identified, a monthly surveillance program will be developed which requires officers to undertake sampling of the water body for mosquito larvae at appropriate times. These times include periods of selected inundating tides and after rain events which exceed 50 millimetres within a 48-hour period.

From analysis of sampling results a decision will be made regarding the treatment of the salt marsh. Treatment consists of the aerial application of a larvicide which is a bacterium called *Bacillus thuringiensis israelensis* (B.T.I.); to the salt marsh site. After application of B.T.I., post-treatment monitoring will be undertaken to determine the success of the treatment.

Mosquito larvae develop through four moults or instars. Within the Rockhampton region mosquito larvae develop at a rate of one instar per day. The biological agent B.T.I. is effective only on mosquito larvae ranging from the first to third instar. It is imperative to accurately predict the day of the surveillance and treatment to ensure the mosquito larvae are at a treatable stage of their life cycle. The ideal treatment stage is the second instar. At this stage, larvae have had a maximum time to ingest the biological agent B.T.I, and are also large enough for officers to see and count accurately. A 24-hour window of opportunity is thereby provided to ensure accurate surveillance and effective treatment.

Analysis of sampling results also provides an opportunity to implement a proactive misting program, if deemed necessary, and to inform the nearby community of the pending emergence of large numbers of mosquitoes.

Surveillance and treatment often occur on privately-owned salt marsh areas. In these instances, permission from landowners to enter the property for surveillance and treatment would be required.

The main target species of larvacidal salt marsh control is *Ochlerotatus vigilax* which is a vector of Ross River and Barmah Forest viruses. Several other species may also be controlled by aerial application of the biological agent B.T.I.

Ochlerotatus vigilax (prior to 2000, was known as *Aedes vigilax*)



Characteristic Features

Female: A mid-sized mosquito of dark appearance with banded legs; proboscis with pale scaling on basal two-thirds underside; scutum with dark bronze and some golden scales; wings dark scaled with sparse mottling of narrow white scales mainly along front veins; hind legs with femur and tibia mottled, tarsi with basal bands; tergites dark with pale basal bands; sternites pale scaled with dark lateral apical or sub-apical patches (occasionally bands).

Habits & Habitats

Ochlerotatus vigilax breed in saline habitats on salt marshes usually behind mangroves. Hatching of eggs is in response to inundation of mudflats through extremely high tides, although rainfall can initiate hatching. Adults are most abundant in summer months and are active from mid-spring through autumn; they attack humans and other animals readily and bite during the day in sheltered areas (or full sunlight in larval habitats), but also at evening and night.

Vector & Pest Status

This is the major coastal pest species and can disperse and be windblown for many kilometres. It can create nuisance problems over large and diverse areas. It is accepted as the major vector of Ross River and Barmah Forest virus in coastal areas; it is also known to carry dog heartworm.

3.3.1 Operating Procedure – Rural Salt Marsh Control

Purpose

- To monitor and control the mosquito larvae of *Ochlerotatus vigilax* in the salt marsh areas adjacent to major settlements in the Rockhampton region.
- To reduce the incidence of Ross River and Barmah Forest virus in the region.
- To retain the lifestyle amenity of the region by the reduction of nuisance mosquito species.

Procedure

- Officers will develop a list of all rural salt marsh sites where surveillance and associated treatment may occur.
- Officers will undertake surveillance during appropriate times including periods of highest monthly tides and after rain events which exceed 50 millimetre within a 48-hour period.
- Officers will sample at nominated peg sites throughout the respective salt marsh.
- Sampling results will be analysed to determine the need for:
 - aerial treatment of the respective salt marsh areas;
 - proactive misting program in adjacent settlements;
 - informing nearby community of pending emergence of large numbers of mosquitoes.
- If aerial treatment is undertaken, post-treatment monitoring will be undertaken to determine the effectiveness of the treatment.

Resources Required

- All Vector Control Unit staff will participate in surveillance activities. This concerted effort is required due to the time restrictions imposed by inundation times and larval development. There are also numerous salt marsh sites which will require surveillance.
- Three vehicles and two all terrain vehicles
- Sampling equipment
- Aircraft and larvicide

Records

Detailed records incorporating tables and graphs are required for all program activities.

3.3.2 Operating Procedure – Urban Salt Marsh Control

Purpose

- To monitor and control the larvae of *Ochlerotatus vigilax* as well as the larvae of other mosquito species in the salt marsh areas within the major settlements in the region.
- To reduce the incidence of Ross River and Barmah Forest virus in the region.
- To retain the lifestyle amenity of the region by the reduction of nuisance mosquito species.

Procedure

- Officers will develop a list of all urban salt marsh sites where surveillance and associated treatment may occur.
- Officers will undertake surveillance during appropriate times including selected inundating tides and after rain events which exceed 50 millimetres within a 48-hour period.
- Sampling results will be analysed to determine the need for:
 - manual treatment of the respective salt marsh areas;
 - proactive misting program in adjacent urban areas;
 - informing community of pending emergence of large numbers of mosquitoes.
- If manual treatment is undertaken, post-treatment monitoring will be undertaken to determine the effectiveness of the treatment.

Resources Required

- All Vector Control Unit staff will participate in surveillance activities. This concerted effort is required due to the time restrictions imposed by inundation times and larval development
- Three vehicles and two all terrain vehicles
- Sampling equipment
- Larvicide

Records

Detailed records incorporating tables and graphs will be required for all program activities.

3.4 *Aedes aegypti* Property Inspections

Council's Vector Control Unit undertakes, and will continue to undertake, regular property inspections for the purpose of identifying and controlling the mosquito species responsible for the transmission of Dengue fever.

Dengue fever is a serious medical condition which annually infects large numbers of people in North Queensland. During 2009–2010 over 1,000 cases were diagnosed in North Queensland.

To date, dengue fever has not been diagnosed in large numbers in the Central Queensland region although the mosquito species *Aedes aegypti*, which is a vector for dengue fever, has been found in the region.

A detailed discussion regarding dengue fever and *Aedes aegypti* is presented below.

Aedes aegypti is a container breeder and are found to coexist with humans. Breeding commonly occurs in containers e.g. pot plant saucers, tyres, garden plants and containers around the home.

If *Aedes aegypti* is identified on private property Council has the ability to instruct the property owner/tenant to undertake control. On property under the control of Council, the Vector Control Unit will undertake control activities.

A major activity associated with the control of *Aedes* species is public education and awareness. This education is usually delivered to the community by press releases involving newspapers, radio and television.

Queensland Health is the lead agency for the management of dengue fever in Queensland. The department monitors the numbers of people diagnosed with the disease and implements inspection, control and awareness procedures if an outbreak occurs. The Department also provides quarterly statistics regarding disease notification to all Queensland Local Governments. Local Governments provide assistance to the activities of Queensland Health as well as implement their own inspection, control and awareness programmes.

Dengue Fever

Overview

Currently, dengue is the most important viral disease transmitted by mosquitoes afflicting humans in a world context. Clinical symptoms range from mild fevers, to a severe and potentially life threatening haemorrhagic disease. Source reduction of the breeding habitats of the major mosquito vector, *Aedes aegypti*, is the best form of control.

Natural History

The normal cycle of dengue infection is considered to be human - mosquito - human. From feeding on an infected and viraemic human, the female mosquito is able to transmit the dengue virus after an incubation period of 8-10 days, wherein virus infection, replication and dissemination result in infection of the salivary glands making the mosquito infective for life.

In Australia epidemics of dengue occurred in the late 19th century and early 20th century. Australia was considered to be free of local dengue following 1955 (when there had been a large outbreak in Townsville), but in 1981 a major outbreak with an estimated 3,000 infections occurred in northern Queensland, presumably initiated by an infected traveller.

In Australia, there are three possible vectors: *Aedes aegypti*, whose distribution is restricted to Queensland; *Aedes scutellaris*, which is present in north Queensland and is a known vector of dengue in Papua New Guinea; *Aedes katherinensis*, which is found in northern Queensland, the Northern Territory and northern Western Australia but appears to be not an effective vector.

Additionally, *Aedes albopictus*, poses a threat to Australia. It is an important vector that has been introduced from Asia to many countries, as eggs or larvae transported in artificial container habitats such as used motor vehicle tyres, and water barrels on ships. If it was introduced to Australia it is likely it could readily establish and present a threat for dengue transmission.

It is assumed that *Aedes aegypti* is the vector of greatest concern because of its distribution and close association with humans. *Aedes aegypti* is predominantly a day-biting mosquito whose larvae may be found almost exclusively in clean water in man-made containers such as water-barrels, rainwater tanks, wells, vases, tyres, bottles, tins, and vegetative material found in the domestic environment. Although the species is currently restricted to Queensland, there are past records of *Aedes. aegypti* being found in NSW, the NT and WA.

Symptoms

Dengue is a debilitating infection of comparatively short duration with a high attack rate but a low fatality rate. The so-called 'classical' Dengue Fever (DF) form usually affects older children and adults with fever, violent headache, and severe pains in the muscles and joints following an incubation period of 5-8 days, and lasts about 4-7 days; recovery is generally complete although convalescence may be long. A more severe form, Dengue Haemorrhagic Fever (DHF), involves internal bleeding and is sometimes associated with severe shock (the Dengue Shock Syndrome (DSS)), and occurs most frequently in infants and young children.

Dengue virus occurs as four serotypes, designated DEN 1, 2, 3 and 4; each has been involved in both uncomplicated dengue and in cases with haemorrhagic syndrome.

Laboratory Diagnosis

A variety of blood tests are used to demonstrate the presence of specific antibodies to Dengue virus. Blood samples should be taken during the acute and convalescent phases of the illness, and a fourfold rise in antibody levels will confirm the clinical diagnosis.

Treatment

No specific antiviral treatments exist nor is there any vaccine available. For patients with DHF or DSS, treatment is supportive.

Prevention

Restricting the availability of potential breeding habitats for *Aedes aegypti* will help to reduce mosquito densities and therefore reduce the possibility of disease transmission. All containers capable of holding water in the domestic environment can provide habitat for the larval stage of the mosquito and this includes water-barrels, rainwater tanks, wells, vases, tyres, bottles, pot plants saucers and in vegetative material.

Personal protective measures include: avoiding known mosquito infested areas, especially at dawn and dusk when mosquitoes are most active; ensuring that houses are adequately fly screened (with small mesh); using insect repellents that contain the chemical DEET, and reapplying it regularly; and wearing loose fitting long sleeved shirts and pants.

Aedes aegypti



Characteristic Features

Female: A smallish, dark mosquito with conspicuous white markings and banded legs; the proboscis is all black although the palps are white tipped; the scutum has a dorsal pattern of white scales in the form of a 'lyre' with curved lateral and two central stripes contrasting with the general covering of narrow dark scales; wings are dark scaled; hind legs with femur pale scaled for basal three-quarters with dark scales dorsally on apical two-thirds and ventrally on apical third, tibia dark but tarsi with pale basal bands on 1-4 and 5 all pale; abdominal tergites with median and lateral white scale patches or bands, sternites predominantly pale scaled with subapical bands on distal segments.

Geographic Distribution

An introduced species, currently known to exist only in Queensland and predominantly northern coastal Qld, but previously known from WA, NT, and southern NSW.

Habits & Habitats

Adults are also found within or close-by human environments, often biting indoors or in sheltered areas near the house; biting is predominantly by day in shaded areas but may also occur early in the night.

Vector & Pest Status

Can be an important domestic pest but is of principal concern as major vector of Dengue fever and Yellow fever; potential vector of dog heartworm, and Murray Valley encephalitis and Ross River viruses.

3.4.1 Operating Procedure – *Aedes* Property Inspections

Purpose

- To monitor and control *Aedes aegypti* within the major settlements in the Rockhampton region.
- To reduce the incidence of dengue fever in the region.
- To increase community awareness of dengue fever and control activities which can be undertaken by the community.

Procedure

- Council's Vector Management officers will, in conjunction with Queensland Health officers, regularly undertake private property inspections throughout the region to determine the extent of *Aedes aegypti* breeding which is occurring in the region.
- Council's Vector Management officers will undertake ongoing property inspection programs which focus on high-risk premises such as youth hostels, transport centres, schools, industrial sites and plant nurseries.
- If *Aedes aegypti* is found during an inspection a further broader inspection program will be implemented in the area.
- Council's Vector Management officers will receive quarterly disease notification statistics from Queensland Health and if necessary implement inspection, control and public awareness programs.

Resources Required

- Vector Control Unit and Queensland Health staff
- Vehicles

Records

Detailed records incorporating tables and graphs will be required for all program activities. Inspection locations and associated results data will be downloaded into GIS mapping layer.

3.5 Urban Freshwater Control

The landscapes of the Rockhampton region, combined with its seasonal rainfall regime, create a suitable environment for the breeding of several freshwater mosquito species. Some of these species are vectors of disease while others provide considerable nuisance value to the communities in the region.

Control

Control activities are undertaken only within or near settlements and focus on either permanent water bodies such as lagoons, or on semi-permanent water bodies which fill during rainfall events.

The control methodology is similar to salt marsh control in that the results of detailed surveillance are analysed prior to the implementation of treatment.

If larvae counts from the sampling of a water body exceed a predetermined threshold number, consideration is given to:

- treating the water body with a larvicide;
- implementing a proactive misting program in the area;
- informing the community of the pending mosquito problem.

Proactive treatment without prior sampling may be undertaken if water bodies have historically been shown to be breeding sites. Water bodies on lands under Council control may also receive precautionary proactive treatment should significant rainfall or flooding events be predicted.

Treatment activities focus on larvae management through the manual application of a larvicide called S-methoprene. Manual application of S-methoprene is a common practice although aerial application may be considered for large water bodies. This larvicide is an insect growth hormone and is safe for workers and the environment.

The main target species of urban freshwater control is *Culex annulirostris* which is a vector of Ross River and Barmah Forest viruses. Several other species are also controlled by this activity

Culex annulirostris



Characteristic Features

Female: A medium sized mosquito of brownish to dark appearance with banded legs; proboscis dark scaled with a pale band in middle third; scutum with dark bronze and golden narrow scales (a few pale narrow scales at the 'shoulders' and towards the rear); wings dark scaled; hind femur mottled with pale scales and scattered pale scales on tibia, tarsi 1-4 with pale basal bands, 5 all dark; tergites dark scaled with basal pale bands typically extended medially, sternites with pale scaling from base typically interrupting an apical dark band.

Habits & Habitats

Adults are generally active from mid-spring to late-autumn; feed readily on humans but also on other mammals and birds, and most feeding activity occurs from sunset for about 2 hours and again to a lesser degree at dawn; disperses 5-10 km.

Vector & Pest Status

This is the major summer pest of inland riverine areas of eastern Australia. It is an efficient vector of a range of arboviruses in the laboratory and has been incriminated in field studies as a vector of many arboviruses including Murray Valley encephalitis, Kunjin, Barmah Forest and Ross River virus. It is also able to carry dog heartworm and is probably a major vector of myxomatosis.

3.5.1 Operating Procedure – Urban Freshwater Control

Purpose

- To monitor and control *Culex annulirostris* larva and other mosquito species larvae in the fresh water bodies within the major settlements in the region.
- To reduce the incidences of Ross River and Barmah Forest virus in the region.
- To retain the lifestyle amenity of the region by the reduction of nuisance mosquito species.

Procedure

- Officers will develop a list of all urban fresh water bodies where surveillance and associated treatment may occur.
- Officers will undertake surveillance during appropriate times, particularly after rain events that exceed 50 millimetres within a 48-hour period.
- Sampling results will be analysed to determine the need for:
 - manual treatment of the respective freshwater area;
 - proactive misting programs in adjacent urban areas;
 - informing community of pending mosquito problem.
- If manual treatment is undertaken post-treatment monitoring will be required to determine the effectiveness of the treatment.

Resources Required

- Vector Control Unit staff
- Three vehicles and two all terrain vehicles
- Sampling equipment
- Larvicide

Records

Detailed records incorporating tables and graphs will be required for all program activities.

3.6 Vermin Control

For the purposes of the Rockhampton Regional Council 2010–2014 Vector Management Plan, the term ‘vermin’ refers to rats and mice only.

Local Governments have a legislative requirement under the *Public Health Act 2005* to administer and enforce sections of the *Act* addressing vermin control. Local Governments are obliged to control vermin in order to reduce vermin harbourage and potential harbourage sites on lands under the Council control. The *Public Health Act 2005* authorises Council to serve a public health order on a land owner or tenant of private land to reduce vermin harbourage and/or potential harbourage sites.

Control activities undertaken on Council lands include monitoring and baiting. Council will, if necessary, undertake inspections on private land and provide technical information regarding control to property owners or tenants. Should an inspection indicate the presence of vermin harbourage, Council may serve a public health order on a property owner or tenant to reduce that harbourage.

Most vermin control activities undertaken by the Vector Control Unit are in response to customer complaints or enquiries. Council provides free rat and mice baits to the community. Baits are available at the customer service centres in Rockhampton, Yeppoon, Gracemere and Mt Morgan.

3.7 Other Pests

Residents of the region may regard other animals such as birds, termites, spiders, cockroaches, snakes and ants as pests. Generally Council does not undertake control activities to reduce these pests. Vector Management Officers direct private property owners to commercial pest control firms for control of these pests.

The *Nature Conservation Act 1992* provides protection for all native flora and fauna in Queensland. These provisions must be taken into account when monitoring and controlling the above-mentioned pests on lands under Council control. Consultation between Council and the Department of Environment and Resource Management (the administering State Department of the *Act*), will serve to mitigate any potential problems.

3.8 Light Trap Monitoring

Accurate mosquito species data is crucial to the success of any vector control activity. Data is collected through light trap sampling of mosquito populations.

Light traps, which are considered to be reliable tools for mosquito sampling, are small, transportable pieces of equipment which attract and capture adult mosquitoes. They may be placed in rural and urban areas to collect mosquito population information for the respective area. Data obtained from light traps include species type, number of individuals and activity times. This data assists in the development of effective control activities for the area.

The light trap is normally placed in an area of interest for a period of 24 hours. Samples are collected and analysed after 24 hours. (see Appendix 1. – Map 4)
When selecting trap sites the following is considered:

- Security: traps may be stolen or damaged.
- Livestock: if traps are set in areas where cattle graze, precautions need to be taken to prevent trap damage. The presence of grazing animals near traps will bias the collections in an unpredictable manner.
- Light: traps should be set away from other lights to avoid mosquito distraction. Traps sites should be visited after dark to check for unexpected lights in the area.
- Climate – wind will blow mosquitoes away from an exposed area; therefore a sheltered site is preferable.
- Trial sites – a brief trapping program at a number of sites within the area to be sampled will reveal the most productive permanent site.

3.8.1 Operating Procedure – Light Trap Monitoring

Purpose

- To monitor the adult mosquito population of the region.
- To develop and implement an effective proactive control program based on analysis of data collected from light trap monitoring.

Procedure

- Officers will undertake ongoing monitoring as per the following table:

Area Monitored	Number of Traps in Area
Rockhampton City	6
Yeppoon	1
Emu Park	1
Keppel Sands	1
Gracemere	1
Mount Morgan	1
Glenlee / Glendale	1

- Officers will analyse sample results to determine areas of high mosquito population and/or presence of disease-carrying mosquito species.
- Officers will implement treatment to control the mosquito population an area.

Resources Required

- Vector Control Unit staff
- Three vehicles and two all-terrain vehicles
- Twelve light traps.

Records

Detailed records incorporating tables and graphs will be required for all program activities. Data from monitoring will be incorporated into geographic information system layer.

3.9 Reporting Requirements

Three reporting formats will be used by Council's Vector Control Unit. These are:

1. Tables and graphs based on information extracted from Council's Pathway system. As the Pathway system is Council's mechanism for recording and tracking customer complaints, the information presented in these tables and graphs will be based only on customer complaints and enquiries.
2. Table presenting the monthly activities of Council's Vector Control Unit as well as disease notification information from Queensland Health.
3. Geographic Information Systems Mapping

1. Tables and Graphs from Pathway System

The series of tables and graphs presented below will be updated every three months from Pathway system data. Please note that numbers in these tables and graphs are examples only.

Table 1. Complaints and Enquiries, April – June 2010

Mosquito	200
Midge	45
Mosquito Harbourage	67
Vermin	23
Vermin Harbourage	12
Ants	5
Flies	0
Other Pests	7
Total	359

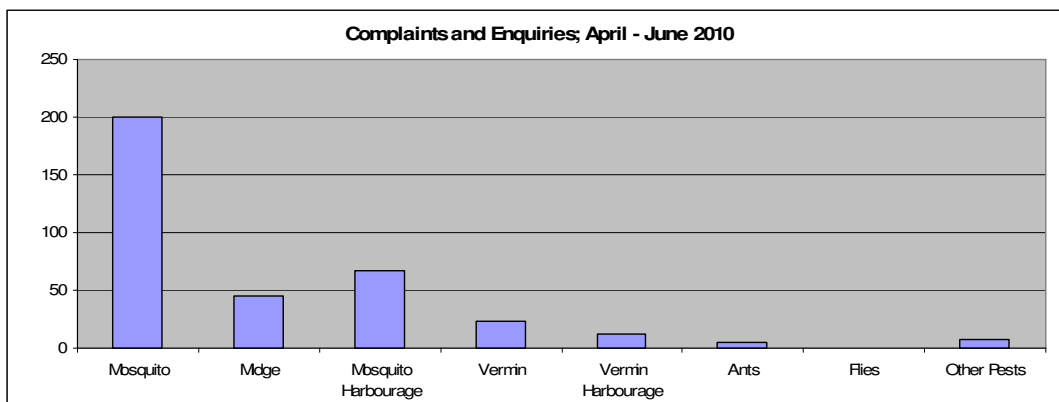


TABLE 2. Number & Location of Complaints & Enquiries, April – June 2010

	Rockhampton	Mt Morgan	Yeppoon	Gracemere
Mosquito	100	30	60	10
Midge	15	15	7	8
Mosquito Harbourage	30	17	10	10
Vermin	8	5	5	5
Vermin Harbourage	3	3	6	0
Ants	4	1	0	0
Flies	0	0	0	0
Other Pests	2	2	2	1
Total	162	73	90	34

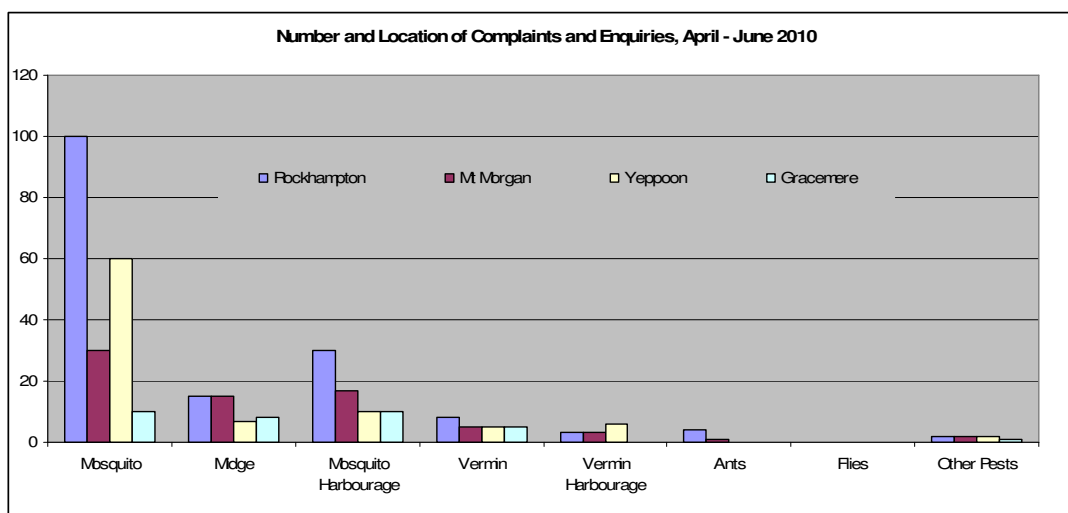
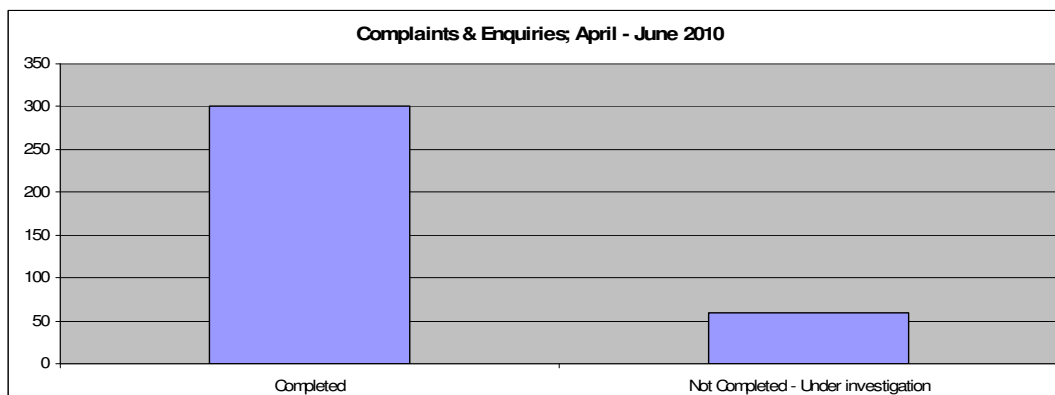


TABLE 3. Complaints & Enquiries, April – June 2010

Completed	300
Not Completed - Under investigation	59
Total	359



2. On-Ground Activities and Disease Notification Statistics

The Vector Control Unit uses the following table to provide monthly information on various activities undertaken by the Unit. The table also presents statistics supplied by Queensland Health on vector-borne disease occurrence.

Table 4. Vector Control Unit Monthly Report 2010-2011

VECTOR CONTROL ACTIVITIES	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	YTD	
COMPLAINTS														
Mosquito														
Midge														
Mosquito Harbourage/breeding														
Vermin														
Vermin Harbourage														
Ants/Flies														
Other Pests														
Total														
VERMIN														
VERMIN HARBOURAGE														
Premises Investigated														
Notices Issued														
Action taken														
MOSQUITO & MIDGE														
MOSQUITO HARBOURAGE/BREEDING COMPLAINTS														
Premises Investigated														
Notices Issues														
SALTMARSH AERIAL TREATMENT														
Number of Sites Sampled														
Number of Sites Breeding														
Action Taken														
URBAN SALTMARSH														
Number of Sites Sampled														
Number of Sites Breeding														
Action Taken														
AREAS AFTER RAIN														
Number of Sites Sampled														
Number of Sites Breeding														
Action Taken														
DENGUE MANAGEMENT - Aedes aegypti														
Houses Inspected														
Breeding present														
Notice Issued														
Action Taken														
High Risk Premises Inspected														
Breeding present														
Notice Issued														
Action Taken														
VECTORBORNE ILLNESS NOTIFICATIONS FROM QLD HEALTH DEPARTMENT														
DISEASE TYPES IN RRC														
Ross River Virus														
Barmah Forest Virus														
Notifications 1/07/09 - 30/09/09	Number (Rate/100,000 population)													
	Rockhampton Regional					Gladstone & Calliope				Queensland				
Ross River Virus														
Barmah Forest Virus														
WH&S INCIDENTS														
Personal														
Vehicle														
Equipment														
Total														
VEHICLE MILEAGE														
Plant 211/819														

2 Geographic Information Systems Mapping

Mapping layer presentation of data collected from operational program activities will assist the Vector Control Unit with many aspects of vector management, in particular with the implementation of proactive programs. Significant geographic and historic data is required to effectively develop these proactive programs.

The following information will be presented on mapping layers:

- Locations, topics and dates of complaints and enquiries.
- Misting locations and dates.
- Locations and dates of property inspection programs.
- Urban and rural salt marsh control sites and associated inspection results and treatments.
- Freshwater control sites and associated inspection results and treatments.
- Disease notification locations.
- Light trap monitoring sites and monitoring results.

3.10 Implementation of Control Programs

The following table identifies the major activities associated with the mentioned control programs undertaken by the Council's Vector Control Unit. For each activity a time is allocated in days for each month. There are 1000 work days (5 Officers) available in the Vector Control Unit for these program activities.

It is anticipated this table will be regularly reviewed and modified. A major goal of the Vector Management Plan is to reduce the need for reactive activities such as misting by the implementation of proactive monitoring and subsequent saltwater and freshwater control.

Activity	J	F	M	A	M	J	J	A	S	O	N	D	Total
Customer Requests	17	17	17	15	15	15	15	15	17	17	17	17	194
Salt Marsh Control - Rural	17	17	17	17	14	12	12	12	14	17	17	17	183
Light Trap Monitoring	15	15	15	15	12	10	10	10	12	15	15	15	159
Urban Freshwater Control	7	7	7	7	7	7	7	7	7	7	7	7	84
Misting	10	10	9	6	4	1	1	1	4	6	9	10	71
Reporting	5	5	5	5	7	7	7	7	7	5	5	5	70
Other - e.g. training, meetings etc.	1	1	2	6	6	10	10	10	5	5	2	1	59
Salt Marsh Control - Urban	4	4	4	4	4	7	7	7	4	4	4	4	57
Vermin Control	3	3	3	3	6	6	6	6	6	3	3	3	51
Property Inspections	2	2	2	3	6	6	6	6	5	2	2	2	44
Other pests Control	2	2	2	2	2	2	2	2	2	2	2	2	24
Monthly Total	83	83	83	83	83	83	83	83	83	83	83	83	996

PART D: VECTOR AND NUISANCE SPECIES

The following tables identify the mosquito species and other pests found in the region.

4.1 Salt Water Mosquito Species

Species	Habitat	Vector of
<i>Culex sitiens</i>	Salt Marshes	Ross River Virus
<i>Ochlerotatus vigilax</i>	Salt Marshes	Ross River Virus
<i>Ochlerotatus alternans</i>	Salt Marshes & Freshwater Pools	None Known
<i>Ochlerotatus procox</i>	Salt Marshes	Ross River Virus
<i>Anopheles hilli</i>	Salt Marshes & Brackish Pools	Malaria & Filariasis
<i>Anopheles farauti</i>	Brackish Pools	Malaria

4.2 Fresh Water Mosquito Species

Species	Habitat	Vector of
<i>Coquillittidia xanthogaster</i>	Swamps	None Known
<i>Ochlerotatus vittiger</i>	Temporary Grassy Pools	None Known
<i>Culex annulirostris</i>	Fresh Water Swamps	Ross River Virus
<i>Culex australicus</i>	Clean or Polluted Water	None Known
<i>Culex quinquefasciatus</i>	Polluted Water	Periodic Filariasis
<i>Culex halifaxii</i>	Polluted Domestic Sites	Malaria
<i>Aedes lineatopennis</i>	Temporary Grassy Pools	None Known
<i>Mansonia uniformis</i>	Edges of Freshwater Pools	None Known
<i>Anopheles bancroftii</i>	Common in Hyacinth Swamps	Malaria
<i>Uranotaenia nivipes</i>	Temporary Grassy Pools	None Known
<i>Culex orbostiensis</i>	Swamp Margins	None Known
<i>Anopheles amictus</i>	Edges of Freshwater Pools	Malaria
<i>Anopheles annulipes</i>	Temporary & Permanent Pools	Malaria
<i>Culex gelidus</i>	Temporary & Permanent Pools	Japanese Encephalitis

4.3 Container Breeding Mosquito Species

Species	Habitat	Vector of
<i>Aedes aegypti</i>	Domestic Artificial Containers	Dengue Fever
<i>Ochlerotatus notoscriptus</i>	Domestic Artificial Containers	Ross River Virus
<i>Ochlerotatus kochi</i>	Leaf Axils of Plants	None Known
<i>Tripteroides atripes</i>	Temporary & Permanent Pools	None Known

4.4 Vermin Species

Species	Habitat	Vector of
<i>Rattus norvegicus</i> (Norway rat)	Burrows & wall/roof voids	Murine typhus fever, Rat-bite fever & salmonella
<i>Rattus rattus</i> (Roof rat)	Wall/roof voids & vines and trees	Murine typhus fever, Rat-bite fever & Salmonella
<i>Mus musculus</i> House mouse	Burrows, wall/roof voids, cupboards & furniture	Lymphocytic choriomeningitis, Poliomyelitis, Favus & Salmonella

4.5 Other Pests

Species	Habitat	Vector of
Flies	Vegetation growing or decayed, soil and decaying organic matter	Salmonella, dysentery, typhoid, fever, cholera, hepatitis, tuberculosis, poliomyelitis and various parasitic worms
Meat Ants	Vegetation growing or decayed, soil and decaying organic matter	Can mechanically carry disease organisms
Wasps/Bees	Vegetation & buildings	None known. Some people may be allergic to sting

PART E: EMERGENCY RESPONSE

Mosquitoes can be a major problem during or following major events such as flooding caused by rainfall, major runoff or storm surge (see Appendix 1 – Map 3).

There is a trend for disaster situations to be handled at the local level, circumventing the need for declaring a State of Disaster. This trend places increasing importance on planning procedures to mitigate the effects of particular events and to allow effective remedial and recovery responses.

Potential for an emergency situation also arises if exotic mosquitoes are introduced either naturally or accidentally, or if there is an outbreak of mosquito-borne disease in Queensland.

For acceptable mosquito control practices during emergency situations refer to Table 5 on the following page.

Liaison between Council's Vector Control Unit and the relevant lead agencies responsible for the management of disaster situations or disease outbreaks is crucial to the implementation of a vector management response.

The Local Disaster Management Group is the responsible management unit for disaster situations including flooding, cyclones and storm surges. Queensland Health is the lead agency responsible for the management of disease outbreak within the region.

OBJECTIVE: To meet the objectives and aims of emergency programs and emergency-instigated activities while at the same time minimising the environmental impact of mosquito control.

Table 5. Mosquito management activity performed during emergency situations.

Specific interest areas	Mosquito control operations in emergency situations	Requirements for compliance with the Mosquito Management Code of Practice
<p>Mosquito control during a disaster situation i.e. flooding.</p>	<p>Mosquitoes should only be controlled during a disaster situation in a way that minimises or prevents environmental harm, taking into account priorities, resources and the range of issues that need to be dealt with in the area of the disaster situation.</p>	<ul style="list-style-type: none"> • A section on mosquito management and control should be considered for inclusion in Council's counter disaster plan, if the issue of mosquito control is probable under any of the disaster scenarios addressed by the counter disaster plan. . • The component of counter disaster plans that deals with mosquito control should be reviewed every twelve months for purposes of including up-to-date control techniques (particularly chemicals), having the least detrimental impact on the environment. • Mosquito control operations undertaken during a State of Disaster should be in accordance with the Mosquito Management Code of Practice.
<p>Mosquito control following a disaster situation, and when an emergency situation has been established.</p>	<p>Mosquito control should only be carried out in a way that minimises or prevents environmental harm, while taking into account the reason for which the emergency has been established and any mosquito management or control work done during the disaster situation.</p>	<ul style="list-style-type: none"> • Mosquito control programs need to take into account previous activity undertaken during a disaster situation and the content of relevant sections of counter disaster plans and integrated mosquito management programmes. • Mosquito management and control activities undertaken during an emergency situation should be guided by the government agency responsible for administering the legislation under which the emergency has been established. • Mosquito control operations undertaken during an emergency situation should be in accordance with the Mosquito Management Code of Practice.
<p>Establishment of an emergency situation not associated with a declared disaster i.e. disease outbreak.</p>	<p>The response to disease outbreaks, and the introduction and establishment of exotic mosquitoes with the potential to expand the vector base for existing or exotic diseases should be developed taking guidance from the Mosquito Management Code of Practice.</p>	<ul style="list-style-type: none"> • The Mosquito Management Code of Practice should be considered when mosquito control is being planned and implemented under an emergency situation. • Mosquito control activities to be guided by the government agency i.e. Queensland Health, responsible for administering the legislation allowing the emergency to be established.

PART F: STAKEHOLDERS

Several major stakeholders in the Rockhampton region have an interest in vector management. It would be beneficial for both Council's Vector Control Unit and stakeholders to work together to achieve the objectives of the Vector Management Plan 2010-2014. Further, co-operation between stakeholders and Council's Vector Control Unit would provide information-sharing opportunities.

Following are major stakeholders in the region:

6.1 Mackay and Gladstone Regional Councils

Mackay and Gladstone Regional Councils have vector management responsibilities and capabilities. Both Councils have similar issues and challenges to Rockhampton Regional Council, the most notable similarities being coastal environments and numerous settlements.

There is a need for Council to formalise relationships with these two Local Governments for the purposes of:

- Sharing information regarding control methods and staff development
- Sharing resources in the event of a natural disaster or a disease outbreak

In order to facilitate development of this relationship, it is proposed that staff from the three local governments meet quarterly to discuss common issues and challenges.

6.2 Australian Quarantine and Inspection Service (AQIS) and Rockhampton Airport

The greatest risk area for introduction of vector-borne disease into the Rockhampton region is the international point of contact: the airport. International passenger arrivals are augmented by military personnel involved in exercises at Shoalwater Bay.

In order to reduce the risk of vector-borne disease entering the region via the airport, mosquito species must be controlled within an area of the Rockhampton Airport prior to the arrival of large numbers of international visitors (such as military personnel).

Monitoring and control programs, developed through liaison between Council's Vector Control Unit, AQIS and the Rockhampton Airport, should coincide with the arrival of increased numbers of international passengers

6.3 Queensland Health

Queensland Health is the lead agency for the management of vector-transmitted diseases in Queensland. Queensland Health has several responsibilities in regard to mosquito management, the most notable being:

- Managing disease outbreaks.
- Monitoring the presence of container-breeding mosquito larvae in the urban environment
- Keeping the community informed.
- Providing vector-borne disease statistics to local governments, for example statistics on Ross River fever and dengue fever cases
- Providing vector management training to local governments.
- Initiate approved inspection programs.

Council's Vector Control Unit has worked closely with the staff of Queensland Health. It is anticipated this arrangement will continue and that further combined activities such as salt marsh monitoring and *Aedes aegypti* property inspections will strengthen the relationship between Council's Vector Control Unit and Queensland Health.

PART G: PUBLIC AWARENESS AND EDUCATION

Vector management information will be provided to the community through:

- The Rockhampton Regional Council website
- Promotional material
- Media releases.

Rockhampton Regional Council Website

The home page of Council's website will contain a link which takes the user to a dedicated vector management section. Council's Vector Management Plan may be downloaded from this section. The vector management section will provide information on:

- Action the community may take to control and reduce the impact of mosquitoes.
- Seasonal and other updates on the mosquito situation, for example breeding seasons and occurrence of vector-transmitted disease within the region.
- Links to relevant websites, for example Queensland Health.

Promotional Material

Greater community understanding of mosquito-related issues will be promoted through a series of pamphlets and fact sheets. These issues will include, but not be limited to, personal protection and methods of reducing the impact of mosquitoes. The pamphlets and fact sheets will be available at all customer service centres and at various Council events conducted throughout the year.

Media releases

The media outlets of television, radio and newspapers will be used when required to inform the community about vector issues. Media releases will be made via these outlets in the following situations:

- Prior to mosquito breeding season. The community will be informed of the potential increase in mosquito numbers. Recommendations on how to reduce the impact of mosquitoes will also be made.
- When proactive monitoring results indicate a potential increase in the number of mosquitoes.
- When there is an occurrence of mosquito-transmitted disease in the region.

APPENDIX 1. MAPS

Map 1. Lower Fitzroy River Salt Water Mosquito Breeding Areas - Aerial Control

Map 2. Capricorn Coast Salt Water Mosquito Breeding Areas - Proposed Aerial Control

Map 3. Rockhampton Regional Council 1991 Flood Area

Map 4. Light Trap Monitoring Locations