PESTICIDE APPLICATION PLAN

For the Biological and Residual Pesticide Discharges to Surface Waters of the US by the Orange County Vector Control District

FOR WATER QUALITY ORDER NO. 2011-0002-DWQ STATEWIDE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT FOR BIOLOGICAL AND RESIDUAL PESTICIDE DISCHARGES TO WATERS OF THE OF THE UNITED STATES FROM VECTOR CONTROL APPLICATIONS (GENERAL PERMIT) NO. CAG 990004

October 24, 2011

Prepared for:

State Water Resources Control Board

Santa Ana Regional Water Quality Control Board (Region 8)

San Diego Regional Water Quality Control Board (Region 9)

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List of Acronyms and Abbreviations

The District	Orange County Vector Control District
The County	Orange County
RWQCB	Regional Water Quality Control Board
SWRCB	State Water Resource Control Board
MVCAC	Mosquito and Vector Control Association of California
BMP	Best Management Practice
IVM	Integrated Vector Management
NPDES	National Pollutant Discharge Elimination System
CDPH	California Department of Public Health
DPR	Department of Pesticide Regulation
CDPH	California Department of Public Health
General Permit	General Permit No. CAG 990004, Permit for Vector Control

Introduction

The Orange County Vector Control District (the District) is a public health agency charged with protecting the citizens of Orange County from vectors and vector-borne disease under Division 3 (Pest Abatement) of the California Health and Safety Code (CAL. HSC. § 2000-2910). The District is an Independent Special District that carries out its mission with a balanced approach focused on protecting public health and the environment. The District's operations are based out of the city of Garden Grove, California, and service all 789 square miles of Orange County, home to more than three million residents. Service is provided to all 34 cities within Orange County as well as unincorporated areas, federal and state lands. The District operates year-round to control mosquitoes, other flies, red imported fire ants (RIFA), and rats.

The District is within the jurisdiction of the Santa Ana Regional Water Quality Control Board (Region 8) and the San Diego Regional Water Quality Control Board (Region 9), and is seeking coverage under the General Permit No. CAG 990004 as "a public entity" that applies biological and residual pesticides for vector control in or near waters of the United States (Exhibit 1). The District has previously obtained coverage under General Permit Order No. 2004-0008-DWQ for application of aquatic pesticides (larvicides) for vector control. This new Order No. 2011-0002-DWQ replaces Order No. 2004-0008-DWQ and covers adulticides (pesticides used to control adult mosquitoes) in addition to larvicides (pesticides used to control aquatic larval stages of immature mosquitoes).

The District utilizes an Integrated Vector Management (IVM) Program strategy to control the production of mosquitoes, filth flies and black flies, red imported fire ants (RIFA), and rats. The IVM Program consists of the following activities: 1) Surveillance for vectors, vector habitats, and associated pathogens/diseases-this includes field and laboratory analysis of vectors in order to evaluate populations and emerging disease threats; 2) Source reduction to limit breeding by vectors; this includes management of vegetation, land, and water with appropriate landowners to minimize vector production; 3) Education and outreach efforts targeted toward the public and private landowners in ways to facilitate source reduction and minimize disease-carrying vectors; 4) Distribution of mosquito fish (*Gambusia affinis*), a biological control measure used to reduce mosquito production isolated aquatic features, such as neglected residential swimming pools; and 5) Application of pesticides to minimize vector populations and reduce the threat of potential vector-borne disease transmission to humans.

The District is a member of the Mosquito and Vector Control Association of California (MVCAC), a statewide association of over 60 mosquito and vector control agencies. The District has joined the MVCAC NPDES Coalition Monitoring Program in an effort to meet water quality testing requirements set forth in this General Permit.

As required under Section VIII. Pesticide Use Requirements. C., of the General Permit, the District is submitting this document as its Pesticide Application Plan for review and approval by the State Water Resources Control Board (SWRCB).

Excerpts from Section VIII. Pesticide Use Requirements. C. Pesticide Application Plan., are included in ***bold italics.***

1 Description of Target Areas

Description of the ALL target areas and adjacent areas, if different from the water body of the target area, in to which larvicides and adulticides pesticides are being planned to be applied or may be applied to control vectors. The description shall include adjacent areas, if different from the water body of the target areas.

Orange County (the County) is a coastal county comprised of approximately 789 square miles. It is bordered on the southwest by the Pacific Ocean, on the north by Los Angeles County, on the northeast by San Bernardino County and Riverside County, and on the southeast by San Diego County. The northwestern part of the county lies on the coastal plain of the Los Angeles Basin, while the southeastern end rises into the foothills of the Santa Ana Mountains. With a Mediterranean climate, Orange County has a diversity of land uses ranging from urban/metropolitan centers, agricultural croplands, and residential communities as well as regional parks and national forests. The County also has nearly 40 miles of the Pacific Ocean coastline.

The District applies pesticides for the purpose of vector control to locations within the jurisdiction of two different Regional Water Quality Control Boards (RWQCBs): Santa Ana, Region 8 and San Diego, Region 9 (Exhibit 1). Watersheds of Orange County include the larger Santa Ana River, San Gabriel-Coyote Creek, Anaheim Bay-Huntington Harbor, Newport Bay, Aliso Creek, San Juan Creek, San Mateo Creek, and the smaller San Clemente Coastal Streams, Dana Point Coastal Streams, Laguna Coastal Streams, and Newport Coastal Streams watersheds (County of Orange, 2008) (See Table 1 and Figure 1 below). All watersheds in Orange County are potentially subject to treatment applications if threshold levels of target vectors are present and all other control alternatives have been considered and determined to be unsuitable.

The receiving water systems in Orange County which are potentially subject to pesticide applications by the District include any and all navigable waters and their tributaries, waters of the State, and waters of the US in Orange County and any adjacent to District boundaries that breed mosquitoes, black flies, or midges (See Table 1 below). This includes water features like the Santa Ana River and it tributaries, any and all flood control channels, basins, storm drains, gutters, roadside low spots, backyard pools, ponds, wetlands and any stagnant water feature found to be breeding mosquitoes exceeding threshold numbers.

Below is a list of the receiving waters in Orange County (See Table 1). These features, their tributaries, lakes, reservoirs, marshes, unnamed drainages, ditches and the water conveyances and infrastructure throughout the county can be subject to mosquito control applications by the Orange County Vector Control District (See Figure 1).

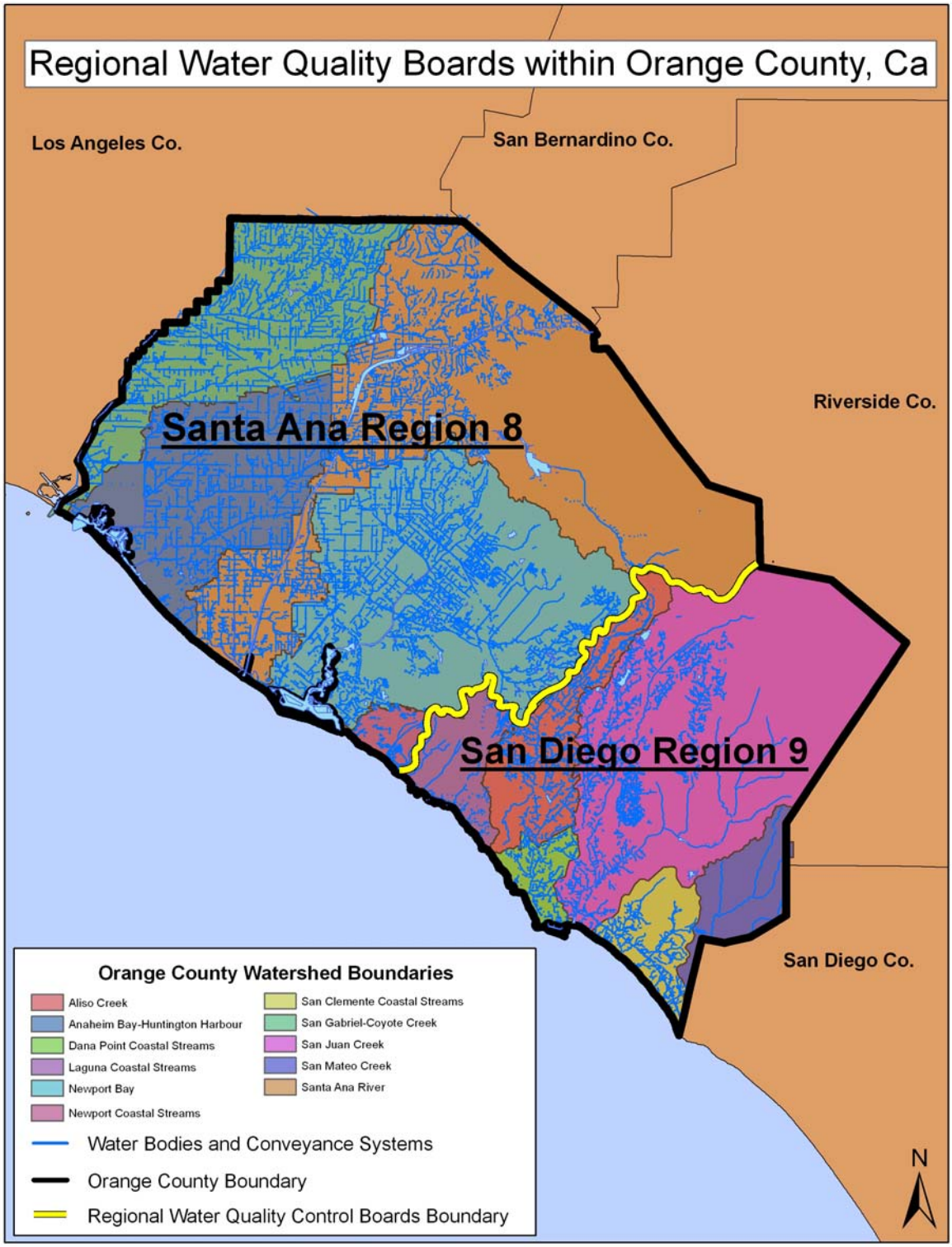

Figure 1. Regional Water Quality Control Board Boundaries, Watershed Boundaries, Water Bodies, and Conveyance Systems in Orange County.

Table 1. List of Orange County Receiving Waters by Water Quality Control Board Regions

Santa Ana Region 8	**San Diego Region 9**
Anaheim Bay-Huntington Harbor	***Aliso Creek***
Bolsa Chica Channel	Wood Canyon
Bolsa Chica Wetlands	Sulphur Creek
East-Garden Grove Wintersburg Channel	Aliso Hills Channel
Westminster Channel	English Channel
Newport Bay	***Dana Point Harbor***
Big Canyon Wash	***Salt Creek***
Costa Mesa Channel	***Laguna Canyon Creek***
Santa Isabella Channel	Boat Canyon Drainage
Santa Ana Delhi	Blue Bird Canyon Drainage
San Diego Creek	Rim Rock Canyon Drainage
Peters Canyon Wash	Hobo Canyon Drainage
Newport Coast	Emerald Canyon Drainage
Muddy Creek	***Prima Deshecha Canada***
San Gabriel River	***Prima Deshecha***
Coyote Creek	***Segunda Deshecha Canada***
Carbon Creek	***San Juan Creek***
Santa Ana River	Arroyo Trabuco
Santiago Creek	Oso Creek
	San Mateo Creek
Numerous unnamed drainages and tributaries	**Numerous unnamed drainages and tributaries**

For more specific application areas/sites see Section 4 of this document.

2 Pesticide Selection Factors

Discussion of the factors influencing the decision to select pesticide applications for mosquito vector control.

The District's Board of Trustees adopted an Integrated Vector Management & Response Plan (the IVM Plan) in May of 2010 (Appendix 1). The District's IVM Plan outlines surveillance and control measures for vectors in Orange County. The purpose of the IVM Plan is to provide guidelines to the District's staff and information to stakeholders regarding the various responses made to prevent and control disease vectors as well as introduced diseases and vectors in Orange County. This document details the roles and responsibilities of Management, Administration, Communications, Scientific/Technical, and Operations staff in responding to vector-borne disease threats. The responses are organized by vector species that cause illnesses in humans, domestic animals, and wildlife. The IVM Plan includes guidelines for surveillance for vectors and disease, site assessment, source reduction, biorational and chemical control methods, and public education. The IVM Plan establishes specific thresholds for the initiation of physical and chemical control based on numbers and species of vectors and the presence or absence of infective agents. Treatment thresholds are established for mosquito developmental sites in the IVM Plan where potential disease vector and/or nuisance risks are evident. Only those sources that represent imminent threats to public health or quality of life are treated.

Treatment thresholds are based on the following criteria: mosquito species present, mosquito stage of development, nuisance or disease potential, mosquito abundance, flight range, proximity to populated areas, size of source, presence/absence of natural enemies or predators, and presence of sensitive/endangered species IVM Plan (Appendix 1, pages 23-31 for larval mosquito control and pages 32-41 for adult mosquito control).

When thresholds are exceeded, an appropriate control strategy is implemented. Control strategies are selected to minimize potential environmental impacts while maximizing efficacy. The method of control is based on the above threshold criteria but also habitat type, water conditions and quality, weather conditions, cost, site accessibility, size of site and a number of other factors as specified in the IVM Plan (Appendix 1, pages 23-31 for larval mosquito control and pages 32-41 for adult mosquito control).

In following the principles of Integrated Vector Management it is always the District's focus to first prevent mosquito and vector breeding/harborage through public education this is also known as Cultural Control, which aims to influence or change the behavior of people so that their actions prevent the development of vector populations or the transmission of vector-borne disease. The next best option can be Physical Control (or Source Reduction) this practice involves environmental manipulation that results in a reduction of vector development sites. This is not always possible or feasible due to environmental regulations on some habitats and/or access restrictions. Another strategy is Biological Control, involving the use of a biological agent like mosquitofish which the District plants in neglected swimming pools that consume mosquito larvae as an alternative to pesticide use. Some conditions are not favorable or appropriate for mosquitofish use. Finally, after many factors have been considered the District may need to use Chemical Control as a last resort treatment option.

Additional considerations are also drawn from and in accordance with the California Mosquito-borne Virus and Surveillance & Response Plan (Appendix 2, pages 8-17). Additionally, each of the control methods and specific vector reduction guidelines (or best management practices) can be found in the District's Vector Reduction Manual: Procedures and Guidelines (Appendix 4, pages 11-35).

3 Types of Pesticide Products

The following list of products may be used by the District for larval or adult control. This list is adapted from Attachment E and F within the NPDES Permit for Biological and Residual Pesticide Discharges to Waters of the U.S. for Vector Control Applications (Table 2). All of these products are used according to label directions and may be applied by ground (hand, truck, ATV, backpack, etc.) or by air (helicopter or fixed wing aircraft). The types of pesticides used in mosquito control and the methods of applications are also discussed in detail and listed in the Best Management Practices for Mosquito Control in California (Appendix 3, Appendix A- Mosquito Control and Arbovirus Surveillance, pages 26-34 and Appendix B, Compounds Approved for Mosquito Control in California, pages 35-39).

Table 2. Pesticides Approved for Use Under Terms of General Permit NO. CAG 990004 and Method of Application.

Pesticide Product	EPA Reg. No.	Method of Application
Pyrocide Mosquito Adulticiding Concentrate for ULV Fogging 7395	1021-1570	Ultra low volume (ULV), vehicle (ground) and aircraft (air)
Evergreen Crop Protection EC 60-6	1021-1770	ULV ground and air
Pyrenone Crop Spray	432-1033	ULV ground and air
Prentox Pyronyl Crop Spray	655-489	ULV ground and air
Pyrocide Mosquito Adulticiding Concentrate for ULV Fogging 7396	1021-1569	ULV ground and air
Aquahalt Water-Based Adulticide	1021-1803	ULV ground and air
Pyrocide Mosquito Adulticide 7453	1021-1803	ULV ground and air
Pyrenone 25-5 Public Health Insecticide	432-1050	ULV ground and air
Prentox Pyronyl Oil Concentrate #525	655-471	ULV ground
Prentox Pyronyl Oil Concentrate or 3610A	655-501	ULV ground and air
Permanone 31-66	432-1250	ULV ground and air
Kontrol 30-30 Concentrate	73748-5	ULV ground and air
Aqualuer 20-20	769-985	ULV ground and air
Aqua-Reslin	432-796	ULV ground and air
Aqua-Kontrol Concentrate	73748-1	ULV ground and air
Kontrol 4-4	73748-4	ULV ground and air
Biomist 4+12 ULV	8329-34	ULV ground and air
Permanone RTU 4%	432-1277	ULV ground and air
Prentox Perm-X UL 4-4	655-898	ULV ground and air
Allpro Evoluer 4-4 ULV	769-982	ULV ground and air
Biomist 4+4	8329-35	ULV ground and air
Kontrol 2-2	73748-3	ULV ground and air
Scourge Insecticide with Resmethrin/Piperonyl Butoxide 18%+54% MF Formula II	432-667	ULV ground and air
Scourge Insecticide with Resmethrin/Piperonyl Butoxide 4%+12% MF Formula II	432-716	ULV ground and air
Anvil 10+10 ULV	1021-1688	ULV ground and air
AquaANVIL Water-based Adulticide	1021-1807	ULV ground and air
Duet Dual-Action Adulticide	1021-1795	ULV ground and air
Anvil 2+2 ULV	1021-1687	ULV ground and air
Zenivex E20	2724-791	ULV ground and air
Trumpet EC Insecticide	5481-481	ULV ground and air
Fyfanon ULV Mosquito	67760-34	ULV ground and air
Spheratax SPH (50G)	84268-2	Conventional ground/hand/air
Teknar HP-D	73049-404	Conventional ground/hand/air
Vectobac-G Biological Mosquito Larvicide Granules	73049-10	Conventional ground/hand/air
Vectomax CG Biological Larvicide	73049-429	Conventional ground/hand/air
Vectomax WSP Biological Larvicide	73049-429	Conventional ground/hand
Vectomax G Biological Larvicide/Granules	73949-429	Conventional ground/hand/air
Zoecon Altosid Pellets	2724-448	Conventional ground/hand/air
Zoecon Altosid Pellets	2724-375	Conventional ground/hand/air
Zoecon Altosid Liquid Larvicide Mosquito Growth Regulator	2724-392	Conventional ground/hand/air
Zoecon Altosid XR Entended Residual Briquets	2724-421	Conventional ground/hand

Pesticide Product	EPA Reg. No.	Method of Application
Zoecon Altosid Liquid Larvicide Concentrate	2724-446	Conventional ground/hand/air
Zoecon Altosid XR-G	2724-451	Conventional ground/hand/air
Zoecon Altosid SBG Single Brood Granule	2724-489	Conventional ground/hand/air
Mosquito Larvicide GB-1111	8329-72	Conventional ground/hand/air
BVA 2 Mosquito Larvicide Oil	70589-1	Conventional ground/hand/air
BVA Spray 13	55206-2	Conventional ground/hand/air
Agnique MMF Mosquito Larvicide & Pupicide	53263-28	Conventional ground/hand/air
Agnique MMF G	53263-30	Conventional ground/hand/air
Abate 2-BG	8329-71	Conventional ground/hand/air
5% Skeeter Abate	8329-70	Conventional ground/hand/air
Natular 2EC	8329-82	Conventional ground/hand/air
Natular G	8329-80	Conventional ground/hand/air
Natular XRG	8329-83	Conventional ground/hand/air
Natular XRT	8329-84	Conventional ground/hand

The District plans to use the pesticides listed in Table 3 below and reserves the right to use any product approved under the terms of this General Permit (Table 2).

Table 3. Planned Pesticides for Use by Orange County Vector Control District.

PESTICIDES USED FOR MOSQUITO CONTROL AT ORANGE COUNTY VECTOR CONTROL DISTRICT

Active Ingredient	Trade Name	EPA Reg. No.	Manufacturer	Formulation	Active Ingredient	Application	Pesticide Classification
Bacillus thuringiensis israelensis (Bti)	VectoBac 12AS	73049-38	Valent BioSciences Corporation	Liquid	11.61%	Larvae	Biorational
Bacillus thuringiensis israelensis (Bti)	VectoBac G	73049-10	Valent BioSciences Corporation	Granules	2.80%	Larvae	Biorational
Bacillus sphaericus (Bs)	VectoLex CG	73049-20	Valent BioSciences Corporation	Granules	7.5%	Larvae	Biorational
Bacillus sphaericus (Bs)	VectoLex WSP	73049-20	Valent BioSciences Corporation	Water Soluble Pouches	7.5%	Larvae	Biorational
Bacillus sphaericus (Bs)	VectoLex WDG	73049-57	Valent BioSciences Corporation	Water Disperible Granules	51.2%	Larvae	Biorational
Bacillus sphaericus (Bs) 6% Bacillus thuringiensis israelensis (Bti) 1%	FOURSTAR	83362-3	Fourstar Microbials	Briquet	7.0%	Larvae	Biorational
Spinosad	Natular 2EC	8329-82	Clarke Mosquito Control Products, Inc.	Liquid	21%	Larvae	Biorational
Monomolecular Film	Agnique MMF	53263-28	Cognis Corporation	Liquid	100%	Larvae & Pupae	Surface Film
Monomolecular Film	Agnique MMF-G	53263-30	Cognis Corporation	Granules	32%	Larvae & Pupae	Surface Film
Aliphatic Petroleum Hydrocarbons	Mosquito Larvicide GB-1111	8329-72	Clarke Mosquito Control Products, Inc.	Liquid	98.7%	Larvae & Pupae	Surface Film
Highly refined petroleum distillate	BVA 2	70589-1	BVA OILS	Liquid	97.0%	Larvae & Pupae	Surface Film
S-Methoprene	Altosid Briquets	2724-375	Wellmark International Zoecon	Briquet	8.62%	Larvae	IGR
S-Methoprene	Altosid XR Extended Residual Briquets	2724-421	Wellmark International Zoecon	Briquet	2.1%	Larvae	IGR
S-Methoprene	Altosid Liquid Larvicide Concentrate	2724-446	Wellmark International Zoecon	Liquid	20%	Larvae	IGR
S-Methoprene	Altosid Pellets Mosquito Growth Regulator	2724-448	Wellmark International Zoecon	Pellet-type Ganules	4.25%	Larvae	IGR
Sumithrin 10% Piperonyl Butoxide 10%	Aqua Anvil	1021-1807-8329	Clarke Mosquito Control Products, Inc.	Liquid	20.00%	Adult	Pyrethroid
Etofenprox 20%	Zenivex E20	2724-791	Wellmark International Zoecon	Liquid	20.00%	Adult	Pyrethroid

4 Description of Application Areas

Description of ALL the application areas* and the target areas in the system that are being planned to be applied or may be applied. Provide a map showing these areas.

Any site that holds water for more than 96 hours (4 days) can produce mosquitoes. Source reduction is the District's preferred solution, and whenever possible the District works with property owners to affect long-term solutions to reduce or eliminate the need for continued applications as described in Item 2 above and in detail in the District's Vector Reduction Manual (Appendix 4, for policies see pages 1-7, for specific guidelines to reduce mosquitoes see pages 8-25). Mosquito breeding sources and areas that require adult mosquito control are difficult to predict from year to year based on the weather and variations in local environmental conditions. However, the typical sources treated by OCVCD are listed in Table 4 below.

The targets for application projects are primarily the immature aquatic stages of insect vectors, including mosquitoes, midges, and black flies, which predominantly breed in standing or slow-moving water. These insect disease vectors may pose a threat to human public heath, especially due to the risk they may spread West Nile virus, and require treatment to eliminate or minimize the health risks. Using the District's IVM Plan (Appendix 1, pages 25-31 for larval mosquito control and pages 34-44 for adult mosquito control) decision matrix, District personnel use pesticides as a last resort to treat water features that have undesirable insect pest vectors exceeding threshold levels. Larvicides are applied at larval mosquito development sites which can include drainage channels, riparian areas, wetlands, roadside ditches, neglected swimming pools, ornamental ponds, catch basins, detention/retention basins, and potentially, any aquatic site or low lying area that has standing water for longer than 96 hours. Many of these applications take place in urban watershed storm water conveyance systems. Exhibit 2 depicts the anticipated larviciding application areas within water conveyance systems throughout the County based on 2010 treatment application data. Additional application areas include breeding locations within the coastal wetlands, and intermittent or ephemeral streams.

Areas requiring larvicide applications are treated, as necessary, primarily from spring to late fall during the warmest months (approximately March – November). However, if vectors are a persistent problem at some locations, applications may be made year-round. Pesticides are applied only to water that will persist for at least 96 hours when a vector is present at threshold levels and when alternative measures are infeasible and/or unsuitable for the given conditions.

Directing our main efforts at controlling mosquito larvae allows the District to localize treatments and use the least toxic alternatives. Adult mosquitoes may occasionally be targeted for control. However, since pesticides must be applied over a greater area and are less selective, the District avoids using them wherever possible. Currently, there are four sites in the County that are receive adulticide treatment when they exceed threshold levels due to persistent mosquito breeding conditions and their proximity to human populations (Exhibit 3). Those sites include the University of California, Irvine Marsh and the Bolsa Chica Wetlands (the District does contracted treatments at these sites), Big Canyon Lake, and Ladera Ranch Marsh.

Table 4. List of typical sites that maybe targeted for mosquito control applications in Orange County.

Source Type
Above Ground Spas
Agricultural Crop Ditches
Catch Basins
Cemetery Flower Containers
Cemetery Grounds
Containers
Creeks
Dams
Ditches
Drainages
Fish Ponds
Flood Control Channels
Fountains
Freeway Drainages
Freshwater Marshes
Gutters
Holes
Knot Holes
Lakes or Ponds
Misc. Standing Water
Mitigation Sites
Off Street Drains
Ornamental Ponds
Ornamental Streams
Pool and Spa Heaters
Rainwater Depressions
Reservoirs
Retarding Basins
Saltwater Marshes
Sewage/Settling Ponds
Sumps
Swimming Pools
Underground Storm Drains
Water Spreading

5 Other Control Methods Used

Other control methods used (alternatives) and their limitations.

With any mosquito or other vector source, the District's first goal is to look for ways to eliminate the source, or, if that is not possible, for ways to reduce the vector potential. The most commonly used methods and their limitations are included in the Best Management Practices for Mosquito Control in California (Appendix 3, pages 4-19). The following is an excerpt from Appendix A of the Best Management Practices for Mosquito Control in California (Appendix 3, [Appendix A- Mosquito Control and Arbovirus Surveillance, pages 26-27]) called Mosquito Control and Arbovirus Surveillance:

Environmental Management

Manipulating or eliminating potential mosquito breeding sources can provide dramatic reductions in mosquito populations. There are three levels of environmental management.

1. *Source elimination: This approach completely eliminates potential habitats for mosquitoes. This strategy is generally limited to artificial habitats created by urbanization. Examples of source elimination include emptying or turning over containers holding water, filling in holes containing water with sand or gravel, cleaning drainage ditches of debris, and covering or inverting structures and vessels that could hold water.*
2. *Source reduction: This strategy aims to alter and sometimes eliminate available habitat for larvae which substantially reduces mosquito breeding and the need for repeatedly applying pesticides. Unlike source elimination, standing water may exist but the total amount of water, or the time the water is left standing, is greatly reduced. Source reduction may require some maintenance (see below) to prevent further mosquito breeding. Examples of source reduction include limiting the growth of emergent vegetation in wetlands and ponds, constructing drainage ditches to remove water from areas prone to flooding, and clearing stormwater channels of silt and debris. Routine larval monitoring can indicate whether these efforts are effective or need further action.*
3. *Source maintenance: When eliminating or significantly altering mosquito breeding sources is prohibited and/or inappropriate, reducing the number of sheltered, predator-free habitats while having minimal impact on the surrounding environment can make an area unsuitable for mosquitoes. Source maintenance can include water management, vegetation management, wetland infrastructure maintenance, and wetland restoration. Strategic, focused plans must be developed for each site.*

Biological Control

Biological control uses predators, parasites, or pathogens to reduce populations of mosquito larvae and is often combined with environmental management to enhance results. The mosquitofish (Gambusia affinis) has been used to control mosquitoes in California since 1921 and is the most widely used biological control agent in the world. These small fish are effective against mosquito larvae because they grow and reproduce rapidly, feed at the water surface where mosquito larvae are found, and tolerate a wide range of temperature and water quality. Other fish are occasionally used with mixed success. Fish are most effective in permanent ponds and wetlands, but are also used in rice fields and stormwater canals with permanent water. Many local mosquito control agencies propagate mosquito eating fish. Although many other

animals have been tested for mosquito control, and in natural wetlands predation is an important factor in reducing mosquito production, biological control by the intentional addition of mosquito predators other than mosquitofish is largely experimental rather than operational.

There are inherent limitations to these alternative control measures. The limiting factors with Environmental Management (also referred to as physical control and/or source reduction) can be complex. In cases where appropriate and feasible, the District conducts or advises on environmental management control strategies like source elimination, source reduction and source maintenance with the cooperation of property owners and land managers, and under appropriate regulatory guidelines. The District has recently formalized its agency-specific Vector Reduction Program by developing and adopting the Vector Reduction Manual: Procedures & Guidelines (VRM) (Appendix 4). This document describes how the District aims to work with property owners to reduce or eliminate vector-favorable conditions by encouraging the implementation of Vector Reduction Guidelines (for specific guidelines to reduce mosquitoes see pages 8-25), which are based on IVM techniques and strategies. Some specific methods used by the District include educating residents that mosquitoes develop in standing water and encouraging them to remove sources of standing water on their property, working with property owners to find long-term water/environmental management strategies that meet their needs while minimizing the need for public health pesticide applications.

The District's Biological Control practices include the use of mosquitofish, *Gambusia affinis*, primarily in neglected swimming pools and other impoundments. The limiting factors to the use of mosquitofish includes considerations about appropriate habitat, water quality, persistence of water source, and availability.

6 Anticipated Product Amounts

Approximately how much product is needed/anticipated to be used and how this amount was determined.

The need to apply product is determined by surveillance. Actual use varies annually depending on mosquito abundance. The total amounts of mosquito control pesticides applied by the District from January 2010 – December 2010 are shown in Table 5 below (from Pesticide Use Reports). These amounts serve as an approximation of the amount of product anticipated for use in 2011. Several factors influence the amounts of pesticides applied, which can include rainfall, weather patterns, disease outbreak, and availability of products. Other public health pesticides in addition to those listed below may be used as part of the District's best management practices.

Table 5. Pesticide Usage for Mosquito Control by OCVCD (January 2010 – December 2010).

	Jan 2010 – Dec 2010		
Product	**Amount**	**Unit**	**No. of Applications**
Altosid Pellets	816.79	pounds	518
Altosid Briquets	50.82	pounds	559
Altosid XR Briquets	1,158.54	pounds	2,945
GB-1111	948.72	gallons	2,529
BVA-2	1,351.72	gallons	220
Aquaprene XL Briquets	30.00	pounds	3.0
Aquaprene XL Granules	19.00	pounds	2.0
Agnique MMF	4,426.30	ounces	823
Agnique MMF-G	157.00	pounds	19
Vectobac G	42,619.50	pounds	2,085
Vectobac 12AS	138.26	gallons	542
Vectolex CG	1,444.00	pounds	4.0
Vectolex WDG	294.56	pounds	121
Aqua Anvil	98.39	gallons	181

Please note that the District has discontinued the use of Golden Bear (GB-1111), as this product is no longer being manufactured. Additionally, the District, as of June 2011 has discontinued the use of Aquaprene XL Briquets and Aquaprene XL Granules.

7 Monitoring Locations

Representative monitoring locations* and the justification for selecting these monitoring locations.

The District is a member of the MVCAC NPDES Coalition Monitoring Program (the Coalition). Please refer to the MVCAC NPDES Monitoring and Reporting Plan post on the State Water Resources Control Board website.

8 Evaluation of Available BMPs

Evaluation of available BMPs to determine if there are feasible alternatives to the selected pesticide application project that could reduce potential water quality impacts.

The District uses BMPs described in its own IVM Plan (Appendix, pages 3, 6, and 23-40) and Vector Reduction Manual (Appendix 4, pages 1-7 and 8-25), as well as practices in accordance with state guidelines from the Best Management Practices for Mosquito Control in California (Appendix 3, pages 4-19) and the California Mosquito-borne Virus and Surveillance & Response Plan (Appendix 2, pages 4-8).

Protocol for these evaluations is discussed in the aforementioned documents and in Items 2 and 5 above. Best management practices are continually evaluated through ongoing inspection and surveillance methods, review or reassessment of alternative control options prior to each pesticide application, treatment effectiveness evaluations, pursuit of long-term or preventative source reduction, educational or biological solutions.

9 Description of BMPs

Description of the BMPs to be implemented. The BMPs shall include, at the minimum.

The District uses BMPs described in its own IVM Plan (Appendix, pages 3, 6, and 23-40) and Vector Reduction Manual (Appendix 4, pages 1-7 and 8-25), as well as practices in accordance with state guidelines from the Best Management Practices for Mosquito Control in California (Appendix 3, pages 4-19) and the California Mosquito-borne Virus and Surveillance & Response Plan (Appendix 2, pages 4-8).

Specific elements have been highlighted below under items 9.1-9.6:

9.1 Measures to Prevent Pesticide Spill

District staff monitors application equipment on a daily basis to ensure it remains in proper working order. Spill mitigation devices are placed in all spray vehicles and pesticide storage areas to respond to spills. Employees are trained on spill prevention and response annually. All safety, handling, and use requirements and instructions are followed per pesticide product labels and Material and Safety Data Sheets.

9.2 Measures to Ensure Minimum and Consistent Amount Used

Spray equipment is calibrated each year and is a part of stipulation of the Cooperative Agreement, a Memorandum of Understanding with the California Department of Public Health. All safety, handling, and use requirements and instructions are followed per pesticide product labels and Material and Safety Data Sheets.

9.3 Applicator Education on Adverse Effects of Pesticide Application

The California Vector Control Technician Certification and Continuing Education Guidelines (CPDH, 2007) describes all topics that vector control technicians are trained and certified in. Applicators are required to complete pesticide and safety training annually which will include NPDES Permit training.

9.4 Descriptions of Specific BMPs for Each Application Mode

The District calibrates truck-mounted and handheld larviciding equipment each year to meet application specifications. Supervisors review application records daily to ensure appropriate amounts of material are used. Ground-based Ultra Low Volume (ULV) application equipment is calibrated for output and droplet size to meet label requirements. Aerial larviciding equipment is calibrated by the Contractor. Although the District does not typically make airplane applications, if needed, aerial adulticide equipment will be calibrated regularly and droplet size will be monitored by the agency to ensure droplets meet label requirements. If airplanes used in urban ULV applications and the primary airplane used for rural ULV application will be equipped with advanced guidance and drift management equipment to ensure the best available technology is being used to place product in the intended area. If a secondary airplane is used in rural ULV applications it will be equipped with an advanced guidance system.

All safety, handling, and use requirements and instructions are followed per pesticide product labels and Material and Safety Data Sheets.

9.5 BMPs for Pesticide Products Used

Please see the Best Management Practices for Mosquito Control in California (Appendix 3, [Appendix A- Mosquito Control and Arbovirus Surveillance, pages 26-34 and Appendix B, Compounds Approved for Mosquito Control in California, pages 35-39]) for general pesticide application BMPs, and the current approved pesticide labels for application BMPs for specific products.

9.6 BMPs for Environmental Setting

The District uses environmental setting, specific BMPs described in its own IVM Plan (Appendix 1, pages 25-44) and Vector Reduction Manual (Appendix 4, pages 8-25), as well as practices in accordance with state guidelines from Best Management Practices for Mosquito Control in California (Appendix 3, pages 4-19) and the California Mosquito-borne Virus and Surveillance & Response Plan (Appendix 2, pages 4-17).

The District has recently formalized its agency-specific Vector Reduction Program by developing and adopting the Vector Reduction Manual: Procedures & Guidelines (the VRM) (Appendix 4, pages 8-25). This document describes how the District aims to work with property owners to reduce or eliminate vector-favorable conditions by encouraging the implementation of Vector Reduction Guidelines, which are based on IVM techniques and strategies. This document includes specific vector reduction guidelines (or BMPs) for the following environmental settings:

Residential and Commercial Mosquito Sources
Low Impact Developments (LIDs)
Ornamental Ponds and Water Features
Tire Storage
Sprinkler and Irrigation Systems
Nurseries
Cemeteries
Golf Courses
Equestrian Facilities
Agriculture
Wetlands
Stormwater Systems and Urban Runoff
- Above Ground Structures
- Underground Structures
- Flood Channels
- Natural Watercources
- Freeway Drains
- Wastewater Management

The District works extensively with property owners, land managers, cities, engineers, stormwater programs, regulatory agencies, and other interests to minimize vector production and harborage throughout Orange County and the region.

10 Identification of the Problem

Prior to first pesticide application covered under this General Permit that will result in a discharge of biological and residual pesticides to waters of the US, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, the Discharger must do the following for each vector management area:

10.1 Establishment of Vector Populations

If applicable, Establish densities for larval and adult vector populations to serve as action threshold(s) for implementing pest management strategies;

Only those mosquito sources that District staff determines to represent imminent threats to public health or quality of life are treated. The presence of any mosquito may necessitate treatment, however higher thresholds may be applied depending on the District's resources, disease activity, or local needs. Treatment thresholds are based on a combination of one or more of the following criteria: mosquito species present, mosquito stage of development, pest, nuisance, or disease potential, disease activity, mosquito abundance, flight range, proximity to populated areas, size of source, presence/absence of natural enemies or predators, and presence of sensitive/endangered species or habitats. This is discussed in detail in the District's IVM Plan (Appendix 1, pages 25-44).

10.2 Identification of Target Vector Species

Identify target vector species to develop species-specific pest management strategies based on developmental and behavioral considerations for each species;

The District address this practice as discussed in its IVM Plan (Appendix 1, page 4-6) and Vector Reduction Manual (Appendix 4, pages 8-10), as well as practices in accordance with state guidelines from the Best Management Practices for Mosquito Control in California (Appendix 3, pages 2-3 and [Appendix D-Mosquitoes of California, pages 42-45, and Appendix E-Typical Larval habitats of California Mosquitoes, page 46]) and the California Mosquito-borne Virus and Surveillance & Response Plan (Appendix 2, pages 4-11) that are used by this agency.

Twenty-two species of mosquitoes occur within Orange County, and their control is the primary focus of the District's activities. There are currently 22 mosquito species known to occur within Orange County. In addition, the District conducts surveillance for imported mosquito species that may have the potential to establish themselves in southern California.

Certain species of mosquitoes found within Orange County can transmit West Nile virus (WNV), St. Louis encephalitis (SLE), western equine encephalitis (WEE), malaria, and potentially other viruses to humans. West Nile virus is also a threat to wildlife, primarily birds, and has contributed to thousands of bird deaths, including special status species, in Orange County since 2004. A few species of mosquitoes are also capable of transmitting dog heartworm and other viral diseases, including myxomatosis, to both domestic and wild animals. Although some species of mosquitoes have not been shown to transmit disease, most species can cause human discomfort from bites that are inflicted to obtain a blood meal. Reactions range from irritation in the area of the bite to severe allergic reactions to secondary infections resulting from

scratching the irritated area. Additionally, an abundance of mosquitoes can cause economic losses, and loss of use or enjoyment of recreational, agricultural, or industrial areas.

In general, the District may coordinate (or advise) the flowing with the property owners or land managers based on species-specific vector management strategies:

Standing –Water Mosquitoes prefer water commonly found in ornamental ponds, unmaintained swimming pools, freeway drains, stormwater systems, natural waterways, and flood control channels.

Common Mosquito Reduction Guidelines:

a. Drain standing water.
b. Reduce or eliminate emergent vegetation in and along the edges of the water.
c. Hold water level constant to encourage natural predators or biological control agents (e.g. mosquito fish).

Container Mosquitoes prefer contained areas of water, such as tree holes, buckets, tires, etc. Some standing water mosquitoes will also develop in containers.

Common Mosquito Reduction Guidelines:

a. Drain containers of standing water.
b. Cover, overturn, or create drainage holes that prevent standing water in the container.
c. Identify and prevent water from refilling containers.

Salt Water Mosquitoes lay their eggs on moist soil. When they become submerged, due to tidal fluctuations, the eggs hatch.

Common Mosquito Reduction Guidelines:

a. Flood when air temperatures do not encourage rapid mosquito development (late fall rather than summer).
b. Reduce or eliminate emergent vegetation.
c. Flood quickly to encourage all eggs to hatch at once and minimize the need for multiple larvicide applications.

10.3 Identification of Known Breeding Areas

Identify known breeding areas for source reduction, larval control programs and habitat management;

Any site that holds water for more than 96 hours (4 days) can produce mosquitoes. Source reduction is the District's preferred solution, and whenever possible, the District works with property owners to implement long-term solutions to reduce or eliminate the need for continued applications as described in Item 2 above. Further, the District address this practice as discussed in its IVM Plan (Appendix 1, pages 23-41) and Vector Reduction Manual (Appendix 4, pages 1-7), as well as practices in accordance with state guidelines from the Best Management Practices for Mosquito Control in California (Appendix 3 [Appendix A- Mosquito Control and Arbovirus

Surveillance, pages 26-32]) and the California Mosquito-borne Virus and Surveillance & Response Plan (Appendix 2, pages 4-11).

10.4 Analysis of Surveillance Data

Analyze existing surveillance data to identify new or unidentified sources of vector problems as well as areas that have recurring vector problems.

The District continually collects adult and larval mosquito surveillance data, dead bird reports, avian seroprevalence test results, and uses them to guide mosquito control activities. The District uses Geographic Information Systems (GIS) technology to analyze these data along with service requests and work records to monitor and changes in abundance and distribution of mosquitoes and other target vector species. Also, periodic aerial surveillance reveals possible neglected pools and other potential mosquito breeding sources.

This is further described in the District's IVM Plan (Appendix 1, pages 23-41) and in accordance with the California Mosquito-borne Virus and Surveillance & Response Plan (Appendix 2, pages 4-11).

11 Examination of Alternatives to Treatments

Dischargers shall continue to examine alternatives to pesticide use to reduce the need for applying larvicides that contain temephos and for spraying adulticides. Such methods include:

a. Evaluating the following management options, in which the impact to water quality, impact to non-target organisms, vector resistance, feasibility, and cost effectiveness should be considered:
• No action
• Prevention
• Mechanical or physical methods
• Cultural methods
• Biological control agents
• Pesticides

The District uses the principles and practices of Integrated Vector Management (IVM) as described in its agency specific Integrated Vector Management and Response Plan (Appendix 1, pages 2-3,6, and 23-41), its Vector Reduction Manual: Procedures and Guidelines (Appendix 4, pages 1-7 and pages 8-25) and discussed in Item 2 above. As stated in Item 10 above, locations where vectors may exist are assessed, and the potential for using alternatives to pesticides is determined on a case-by-case basis. Commonly considered alternatives include: 1) Eliminate artificial sources of standing water; 2) Ensure temporary sources of surface water drain within four days (96 hours) to prevent adult mosquitoes from developing; 3) Control plant growth in ponds, ditches, and shallow wetlands; 4) Design facilities and water conveyance and/or holding structures to minimize the potential for producing mosquitoes; and 5) Use appropriate biological control methods that are available. Additional alternatives to using pesticides for managing mosquitoes are listed on pages 8-35 of the District's Vector Reduction Manual: Procedures and Guidelines (Appendix 4).

If there are no alternatives to pesticides, dischargers shall use the least amount of pesticide necessary to effectively control the target pest.

b. Applying pesticides only when vector are present at a level that will constitute a nuisance

c. Using the least intrusive method of pesticide application.

d. Public education efforts to reduce potential vector breeding habitat.

e. Applying a decision matrix concept to the choice of the most appropriate formulation.

The District uses the principles and practices of Integrated Vector Management (IVM) as described in its agency specific Integrated Vector Management and Response Plan (Appendix 1 pages 2-3, 6, and 23-41). Implementing preferred alternatives depends on a variety of factors including availability of agency resources, cooperation with stakeholders, coordination with other regulatory agencies, and the anticipated efficacy of the alternative. If a pesticide-free

alternative does not sufficiently reduce the risk to public health, pesticides are considered, beginning with the least amount necessary to effectively control the target vector.

A “nuisance” is specifically defined in California Health and Safety Code (HSC) §2002(j). This definition allows vector control agencies to address situations where even a low number of vectors may pose a substantial threat to public health and quality of life. In practice, the definition of a “nuisance” is generally only part of a decision to apply pesticides to areas covered under this permit. As summarized in the California Mosquito-borne Virus Surveillance and Response Plan, the overall risk to the public when vectors and/or vector-borne disease are present is used to select an available and appropriate material, rate, and application method to address that risk in the context of our IVM program.

12 Correct Use of Pesticides

Users Coalition's or Discharger's use of pesticides must ensure that all reasonable precautions are taken to minimize the impacts caused by pesticide applications. Reasonable precautions include using the right spraying techniques and equipment, taking account of weather conditions and the need to protect the environment.

This is an existing practice of the District, and is required to comply with the Department of Pesticide Regulation's (DPR) requirements and the terms of our California Department of Public Health (CDPH) Cooperative Agreement. All pesticide applicators receive annual safety and spill training in addition to their regular continuing education. All errors in application and spills are reported to the proper authority.

13 Public Notices

Specify a website where public notices, required in Section VIII.B, may be found.

Attached as Appendix 5 is the Public Notice the District has distributed to potentially affected government agencies and has posted on its website (www.ocvcd.org).

Distribution list of potentially affected government agencies.

Cities
City of Aliso Viejo
City of Anaheim
City of Brea
City of Buena Park
City of Costa Mesa
City of Cypress
City of Dana Point
City of Fountain Valley
City of Fullerton
City of Garden Grove
City of Huntington Beach
City of Irvine
City of La Habra
City of La Palma
City of Laguna Beach
City of Laguna Hills
City of Laguna Niguel
City of Laguna Woods
City of Lake Forest
City of Los Alamitos
City of Mission Viejo
City of Newport Beach
City of Orange
City of Placentia
City of Rancho Santa Margarita
City of San Clemente
City of San Juan Capistrano
City of Santa Ana
City of Seal Beach
City of Stanton
City of Tustin
City of Villa Park
City of Westminster
City of Yorba Linda

City and Regional Water Districts

East Orange County Water District
El Toro Water District
Metropolitan Water District of Southern California
Municipal Water District of Orange County
Orange County Water District
Santa Ana Watershed Association
Santa Ana Watershed Project Authority
Santa Margarita Water District

Schools (County Superintendent)

Orange County Department of Education

Additional Local Agencies

County of Orange: Agricultural Commissioner
County of Orange: Division of Environmental Health
County of Orange: OC Parks
County of Orange: OC Stormwater Program

State and Federal Regulatory Agencies

California Coastal Commission
California Department of Fish and Game (Region 5: South Coast Region)
California Department of Fish and Game - Bolsa Chica
Santa Ana Regional Water Quality Control Board (Region 8)
San Diego Regional Water Quality Control Board (Region 9)
California Department of Transporatation (CalTrans): District 12
Bureau of Land Management (South Coast Field Office: Palm Springs)
U.S. Army Corps of Engineers (Los Angeles District: South Coast Branch)
U.S. Fish and Wildlife Service
Environmental Protection Agency (Region 9: The Pacific Southwest)

14 References

Best Management Practices for Mosquito Control in California. 2010. Available by download from the California Department of Public Health—Vector-Borne Disease Section at http://www.westnile.ca.gov/resources.php under the heading *Mosquito Control and Repellent Information*. Copies may be also requested by calling the California Department of Public Health—Vector-Borne Disease Section at (916) 552-9730 or the Orange County Vector Control District at (714) 971-2421.

California Department of Public Health. 1989. The California Vector Control Technician Certification and Continuing Education Guidelines (2007 Revision). Accessed 3/03/2011 http://www.cdph.ca.gov/certlic/occupations/Documents/VCTCEGuide.pdf

California Mosquito-borne Virus Surveillance and Response Plan. 2010. [Note: this document is updated annually by CDPH]. . Available by download from the California Department of Public Health—Vector-Borne Disease Section at http://www.westnile.ca.gov/resources.php under the heading *Response Plans and Guidelines*. Copies may be also requested by calling the California Department of Public Health—Vector-Borne Disease Section at (916) 552-9730 or the Orange County Vector Control District at (714) 971-2421.

County of Orange. 2008. Orange County General Plan 2005 (2008 Revision). Accessed 3/03/2011 http://www.ocplanning.net/GeneralPlan2005.aspx

MVCAC NPDES Coalition Monitoring Plan. 2011. Posted on SWRCB website: http://www.waterboards.ca.gov/water_issues/programs/npdes/docs/aquatic/vectorcontrol/mvcac.pdf

Orange County Vector Control District Integrated Vector Management and Response Plan. 2010. http://www.ocvcd.org/documents/CA_Integrated_VMRG_6-9-10.pdf

Orange County Vector Control District Vector Reduction Manual: Procedures and Guidelines. 2010. http://www.ocvcd.org/documents/VectorReductionFinal.pdf

State Water Resources Control Board (SWRCB), 2011, Water Quality Order No. 2011-0002-DWQ, Statewide General National Pollutant Discharge Elimination System Permit For Biological and Residual Pesticide Discharges to Waters of Waters Of The United States From Vector Control Vector Control Applications (General Permit No. CAG 990004).