San Gabriel Valley Mosquito and Vector Control District

CEQA PRELIMINARY ASSESSMENT OF INTEGRATED VECTOR MANAGEMENT PRACTICES USED TO REDUCE THE RISK OF MOSQUITO-ASSOCIATED DISEASE AND ANNOYANCE

1. INTRODUCTION

This assessment evaluates whether the San Gabriel Valley Mosquito and Vector Control District's ("District") mosquito control activities are exempt under the California Environmental Quality Act ("CEQA"). This assessment is prepared under CEQA Guidelines sections 15060 and 15061 to evaluate the application of CEQA and the CEQA categorical exemptions to the District's integrated mosquito management program.

The District was formed in 1987 to protect the public in the San Gabriel Valley in Los Angeles County from mosquitoes and other vectors. The District's vector control program continuously surveilles mosquitoes and the diseases they may transmit to ascertain the risk of disease transmission and annoyance, and uses safe, integrated methods to manage vectors (discussed below) below levels where they may compromise public health.

CEQA was adopted by the California Legislature in 1970 and generally requires state and local agencies to prepare an environmental document (either an environmental impact report (EIR) or negative declaration) assessing the potential environmental impacts of discretionary projects that may affect the environment CEQA exempts from this requirement certain projects and activities which are declared exempt by the Legislature ("statutory exemptions"; listed in CEQA Guidelines sections 15260-15282) and other classes of projects that the State Secretary for Resources has determined do not have a significant effect on the environment ("categorical exemptions"; listed at CEQA Guidelines sections 15301-15329). This preliminary analysis focuses on certain categorical exemptions as applied to the District's integrated vector management program.

The District previously concluded that its vector control activities were exempt from CEQA (District Resolution 98-05). This CEQA preliminary assessment re-evaluates the exempt status of the District's vector control program in light of its current operations, activities, and conditions.

To accomplish long-range, intelligent, and environmentally sound mosquito control, mosquitoes must be managed with an integrated vector management (IVM) program. The District uses IVM by first surveying populations of mosquito larvae and adults to determine which species are present. Mosquitoes which pose a threat to public health are controlled with the most effective and environmentally sensitive means possible. Sometimes, sources of water can be modified or eliminated to reduce breeding areas. The District also may consider using biological control such as mosquitofish if there is no impact to the environment. When these approaches are not practical or effective, pesticides may be applied in specific areas.

The following sections analyze various practices of IVM which are used by the District and considers whether CEQA exemptions apply.

2. SURVEILLANCE FOR MOSQUITOES AND ARBOVIRUSES

Introduction

The District manages populations of mosquitoes because of the nuisance their bites create and the diseases they may transmit. We monitor and quantify over time and space (surveillance) the abundance of adult and immature (larvae/pupae) mosquitoes, and the presence of agents which are transmitted by mosquitoes and may cause disease. Surveillance identifies which species of mosquitoes are present; helps define their ecology and prevalence, and the risk of disease. Surveillance also helps evaluate the effectiveness of efforts to manage the population of mosquitoes and the diseases they may transmit.

Surveillance Methodologies

Like all organisms, mosquitoes employ strategies that maximize their reproductive success. Using two separate environments to develop and disperse (immature mosquitoes develop in water and winged adults do not) has allowed mosquitoes to survive for millions of years and presents vector control agencies with a challenge that requires two surveillance strategies.

Immature stages: Mosquitoes hatch from eggs, go through four larval stages (instars), and a transitional pupal stage. Documenting the presence and abundance of the immature stages is usually limited to larvae and pupae. The abundance of the immatures in a source of water is expressed typically as the mean number of immatures per dip from a standard 300 ml dipper (dip count). The approximate number of each larval instar and pupae are also recorded.

2.1.1 Adult stage: Mosquito adults, primarily females, are sampled to determine the direct threat posed by their presence and abundance plus the fact that females of certain species are the carriers of mosquito-borne diseases (e.g. Encephalitis or “sleeping sickness”). Various methodologies have been developed to both capture and quantify the relative abundance of mosquito species that affect human welfare. These methodologies consist of various types of traps that are mechanically configured to attract mosquitoes to the trap where they are captured by suction and sequestered in an escape-proof net or glass enclosure.

2.1.1.1 Host-seeking traps: Host-seeking traps modified from the standard CDC-type portable light trap use the chemical carbon dioxide (dry ice) to attract female mosquitoes behaviorally cued to seek a host to blood feed. Essential trap components include a battery power source, low ampere motor with suction-type fan housed in a durable plastic cylinder, and collection bag for holding captured adults. In addition to the CDC-type trap the District employs the use of Biogents (BG) Sentinel 2 traps outfitted with a chemically derived human scented lure to collect invasive (*Aedes)* mosquito species. These traps are pop-up containers outfitted with a plastic cuff to hold a collection net along with a fan and motor complex to suction mosquitoes attracted to the trap. Lastly a rechargeable 12-volt battery powers the trap overnight. The quantity of mosquitoes collected during each night of trap operation is expressed numerically as the number of mosquitoes per trap night.

2.1.1.2 Light traps: Light traps use a source of photo-attraction (incandescent light 25-watt lamp) to lure mosquitoes to the trap where they are pulled in by suction provided by an electric (110v AC) appliance motor/fan combination. Mosquitoes picked up by the suction are directed downward (via screened cone) inside the trap body to a glass collection jar where they are killed by an insecticide. The standard trap of this type used by most vector control agencies is the New Jersey Light Trap. This trap is considerably larger and less portable than the host-seeking trap and requires a source of 110v AC to operate. Like the host-seeking traps, the quantity of mosquitoes collected during each night of trap operation is expressed as the number of mosquitoes per trap night.

2.1.1.3 Artificial and natural shelter traps: Artificial shelters or artificial resting units (ARUs) consist of open-ended cubical boxes of various standard sizes that are painted red on all surfaces. ARUs, more commonly referred to as red boxes, are placed in the environment in a way to attract females that are seeking a dark protected refuge in which to rest (hide) during the day. The number of mosquitoes removed from the box during the day by mechanical aspirator is expressed as the number per resting unit or ARU. Natural shelters consist of the variety of places where mosquitoes will hide during the day within their immediate environment. Most natural shelters consist of rodent burrows, caves, debris piles, and dense underbrush. Abundance expressed from natural shelter collections is often given as the number collected per unit of time from a particular shelter substrate.

2.1.1.4 Gravid traps Reiter-Cummings modified gravid trap (Gravid traps) are employed to collect gravid mosquitoes, those seeking to deposit eggs in open water sources, as a part of the District's arbovirus surveillance program. The trap consists of a modified toolbox containing a collection unit, a fan/motor complex, and a 6-volt battery to create an appropriate level of suction to collect attracted mosquitoes. This toolbox is placed on top of a wash bin that is filled with approximately 0.5 gallons of "Gravid solution". Gravid solution is made at the district by filling a large capacity tank with dried alfalfa hay and allowed to age for 2 to 3 days. Like the host seeking traps, the quantity of mosquitoes collected during each night of trap operation is expressed as the number of mosquitoes per trap night.

2.2 Arbovirus Surveillance (Mosquito-borne Arboviruses): The District is very concerned with the likelihood of occurrence of mosquito-borne diseases. The viruses actively transmitted by mosquitoes are diseases contracted by wild birds and humans. These hosts are exposed as a consequence of the bite of an infective mosquito. Two viruses of greatest public health concern in California are West Nile virus (WNV) and St. Louis encephalitis virus (SLE). WNV and SLE predominately affects young children and the elderly

Detecting the presence of these mosquito-borne viruses in nature requires the application of a number of sophisticated methodologies. Two methods of encephalitis virus surveillance (EVS) commonly used by vector control agencies in California involve 1) capturing and testing female vector mosquitoes for the presence of mosquito-borne encephalitis viruses and 2) testing deceased avian carcasses for the accompanying viruses

2.2.1 Virus isolations from mosquito vectors: Female mosquitoes to be tested for the presence of encephalitis viruses are usually captured by either host-seeking, BG Sentinel or Gravid traps. Collections are sorted by species and pooled in lots of 50. Pools are later tested to determine if virus is present and to what extent virus is disseminated (minimum infection rate) throughout the vector mosquito population.

2.2.2 Virus isolations from deceased avian carcasses: Dead bird carcasses are collected from the field and orally swabbed to test for the presence of virus RNA. These samples are mailed out to accompanying agencies for viral testing.

2.3 Remote Sensing in Mosquito and Encephalitis Surveillance: Recent advances in spectral analysis via remote sensing (RS) by satellite/aircraft photography and video has provided a new technology for identifying potential risk areas of likely mosquito production and encephalitis virus transmission. Verification of risk sites identified by RS would be validated by ground surveys utilizing standard surveillance technologies. Once verified by ground-based surveillance, these new sites would then be considered for routine surveillance oversight.

2.4 Surveillance Activities and the Environment: The implementation of mosquito and encephalitis virus surveillance actions requires access for the placement of mosquito traps in the field to physically collect adult mosquitoes and detect the presence mosquito-borne pathogens. Routine inspection of mosquito breeding sources also requires access to allow vector control personnel to obtain samples of larvae. Vector control personnel involved with surveillance activities also require unencumbered access (employee safety required of Title 8) to potential mosquito breeding and disease transmission sites to determine quantitatively the threat posed by existing conditions.

2.4.1 Surveillance Policy: The prevailing District policy is to perform essential surveillance activities with the least negative impact on the environment. Technical staff routinely use pre-existing accesses such as roadways, open areas, walkways, and trails. At times, vegetation management (e.g., pruning trees, clearing brush and weed removal) may become necessary where overgrowth impedes freedom of vehicle travel and technician movement on foot. All of these actions only result in a temporary/localized physical change to the environment with regeneration/regrowth occurring within a span of one or two years.

Vector control staff involved with performing surveillance duties are aware of the consequences of their actions in the field. Staff are instructed to be respectful of the environment and associated wildlife and are to proceed with an attitude to limit their impact to only what is necessary to perform their assigned tasks. Wanton disregard for environmental respect and attendant abuses are not tolerated in the District's vector control surveillance operations.

In our vector control work, the District uses whenever possible existing roads, driveways and trails. The District strives to minimize any off-road travel. When off-road travel is necessary, District staff is instructed to avoid threatened and endangered plants and sensitive habitat areas and to minimize any environmental damage caused by off-road travel.

2.4.2 Non-invasive Sampling: Non-invasive sampling is considered a type of sampling that does not impact the environment directly. Low impact methods include the placement of host-seeking traps, light traps, artificial resting units (ARUs) and Gravid traps. In this situation, existing roads, trails, and clearings can be utilized if acceptable for accommodating sufficient surveillance access.

2.4.3 Invasive Sampling: Invasive sampling is considered a type of sampling that may impact the environment directly. Where roads, trails, and clearings have to be created to gain access to facilitate surveillance, the consequences may require removal of vegetation and grading to establish roads, trails, and minimal clearings. These actions are necessary to establish sites where routine surveillance actions are necessary based upon established environment risk factors associated with mosquito breeding and previous history of disease transmission. In any clearing or grading work, the District avoids endangered plants/habitat areas and minimizes the scope of the work to the smallest area feasible.

Obtaining samples of immature mosquitoes involves removal of some negligible quantities of water. This water may also include non-target organisms associated with the mosquito immatures. Technicians either will make a count of the immatures present or remove a small number for identification at the agency office laboratory, but then return to contents of the dipper back into the source. Taking dipper samples also requires the technician to wade into the source and repetitively sample/dip along transacts to assess the extent and magnitude of immature mosquito populations. Trampling of some vegetation can occur, but most sampling actions involve either walking the shoreline or wading through open water gaps that border emergent vegetation (grasses, tules, cattails, etc.) where mosquito immatures are most likely to be sampled.

2.4.4 Transportation and Access Requirements: Normal surveillance necessitates the use of access roads, trails, and clearings to facilitate sampling. Roads allow vehicles to transport needed staff and equipment to specific sites deemed critical. As indicated above, this action may necessitate the periodic removal of some marginal vegetation and weed control on the median between the wheel ruts of established dirt/gravel roads. Access trails (2-3 feet in width) to the margins of wetlands, ponds, streams, and rivers are maintained by periodic vegetation removal via simple pruning or mowing if necessary.

2.4.5 All-Terrain Vehicles (ATVs): The District sometimes relies upon the use of ATVs to facilitate access into areas that are not otherwise accessible by conventional transportation means or by foot. Some situations where flooding and wetlands preclude access by 4-wheel drive or reasonable walking distance in waders/boots do require the use of an approved ATV. Access is necessary for vector control staff to determine adequately 1) the presence and abundance of mosquitoes, either immature (larvae) or adult stages, and 2) the success of control operations in reducing the threat posed by documented and established mosquito breeding.

Overall, ATVs are used as an access means of last resort. Surveillance staff do not attempt to use these types of vehicles where environmental conditions (e.g., impenetrable vegetation/terrain, endangered/threatened plants, sensitive habitat) can result in causing an accident, personal injury or significant environmental damage. District policy also limits operation of ATVs to situations where 1) existing passages are available, 2) vegetation does not impede mobility, and 3) open water situations present the best course in which to proceed.

2.5 Analysis of CEQA Exemptions: CEQA categorical exemption classes 6 and 9 (CEQA Guidelines sections 15306 & 15309) exempt "basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource," and "activities limited entirely to inspections, to check for performance of an operation, or quality, health, or safety of a project."

The District's mosquito surveillance and monitoring activities described above constitute the types of inspection and data and information collection activities listed in these exemptions. The District monitors mosquito levels in order to determine and track the quantity, location and spread of mosquitoes, to provide the necessary data to make decisions on control measures, and to assess the effectiveness of its control methods.

Section 2.5 of this assessment demonstrates that the District's surveillance and monitoring activities minimally affect the land and water resources where data collection occurs, and that the District staff performing surveillance and monitoring conduct their activities in such a manner as to avoid any significant environmental impacts.

3. BIOLOGICAL CONTROL OF MOSQUITOES.

3.1 Introduction: Biological control of mosquitoes is the intentional use of mosquito pathogens, parasites or predators to reduce the size of target mosquito populations. It is one of the principal components of a rational and integrated mosquito control program. As resistance to pesticides and environmental concerns become more prevalent, biological control will be used more often as a method of protecting the public from mosquitoes and the diseases they transmit.

Biological control of mosquitoes is a relatively recent development and can be traced to observations and ecological studies in the 1940s and 1950s. Early investigations studied the potential effects of predators on mosquitoes. Results of such studies have been adopted in developing strategies to use mosquito predators in providing economical and sustained levels of control.

3.2 Biological Control Agents: Biological control agents of mosquitoes include a wide variety of pathogens, parasites and predators. As a rule, mosquito pathogens and parasites are usually highly specific to their mosquito host, whereas predators are more general in their feeding habits and opportunistically feed on mosquitoes.

3.2.1 Mosquito Pathogens: Mosquito pathogens include an assortment of viruses and bacteria. They are highly host-specific and usually infect mosquito larvae when they are ingested. Upon entering the host, these pathogens multiply rapidly, destroying internal organs and consuming nutrients. The pathogen can be spread to other mosquito larvae in some cases when larval tissue disintegrates and the pathogens are released into the water to be ingested by uninfected larvae.

Examples of viruses that can infect mosquitoes are mosquito iridoviruses, densonucleosis virus, nuclear polyhedrosis viruses, cytoplasmic polyhedrosis viruses and entomopoxviruses. Examples of bacteria pathogenic to mosquitoes are *Bacillus sphaericus* and several strains of *Bacillus thuringiensis israelensis*. The two bacteria produce proteins that are toxic to mosquito larvae. Both are produced commercially as mosquito larvicides.

3.2.2 Mosquito Parasites: The life cycles of mosquito parasites are biologically more complex than those of mosquito pathogens and involve intermediate hosts, organisms other than mosquitoes. Mosquito parasites are ingested by the feeding larva or actively penetrate the larval cuticle to gain access to the host interior. Once inside the host, parasites consume the internal organs and food reserves until the parasite's developmental process is complete. The host is killed when the parasite reaches maturity and leaves the host (*Romanomermis culicivorax)* or reproduces (*Lagenidium giganteum)*. Once free of the host, the parasite can remain dormant in the environment until it can begin its developmental cycle in another host.

Examples of mosquito parasites are the fungi *Coelomomyces* spp., *Lagenidium giganteum*, *Culicinomyces clavosporus* and *Metarhizium anisopliae*; the protozoa *Nosema algerae*, *Hazardia milleri*, *Vavraia culicis*, *Helicosporidium* spp. *Amblyospora californica*, *Lambornella clarki* and *Tetrahymena* spp., and the nematode *Romanomermis culicivorax.*

3.2.3 Mosquito Predators: Mosquito predators are represented by highly complex organisms, such as insects, fish, birds and bats, that consume larval or adult mosquitoes as prey. Predators are opportunistic in their feeding habits and typically forage on a variety of prey types. This allows the predators to build and maintain populations at levels sufficient to control mosquitoes, even when mosquitoes are scarce.

Examples of mosquito predators include representatives from a wide variety of taxa: coelenterates, *Hydra* spp.; platyhelminths, *Dugesia dorotocephala, Mesostoma lingua*, and *Planaria* spp.; insects, Anisoptera, Zygoptera, Belostomidae, Geridae, Notonectidae, Veliidae, Dytiscidae and Hydrophilidae; arachnids, *Pardosa* spp.; fish, *Gambusia affinis, Gasterosteus aculeatus, Poecillia reticula*; bats; and birds, anseriformes, apodiformes, charadriiformes and passeriformes.

3.2.4 Environmental Relationships in Biological Control: The effectiveness of a mosquito biological control agent lies in its ability to reduce mosquito numbers as quickly as possible. An ideal biological agent 1) feeds preferentially on mosquitoes, 2) exhibits an extremely efficient hunting or parasitizing strategy, and 3) reproduces quickly. These traits determine suitability for practical application.

New mosquito sources initially have few predators and other competing aquatic organisms. Vector control personnel use this knowledge to develop a control strategy that involves integrated vector management techniques.

Since mosquitoes are capable of colonizing sources within days of flooding, initial control efforts attempt to suppress the first generations of mosquitoes until natural predators or competitors can control them. Initial treatment includes the selective use of pesticides and appropriate environmental manipulation, such as vegetation and water quality management. Once biological control is established in a "managed" source, periodic inspections at timely intervals are adequate to monitor changes in larval abundance. Periodically, the source may require treatments with pesticides when 1) predators are not effective, 2) aquatic and shoreline vegetation provides too much shelter, 3) the water level changes, or 4) water quality does not support predators.

3.2.5 Conservation and Application of Predators: The ability of predators to control mosquitoes, is related to four factors: 1) whether mosquitoes are preferred prey, 2) whether the hunting strategy of the predator maximizes contact with mosquitoes, 3) whether the predator consumes large numbers of mosquitoes, and 4) whether the predator is present in sufficient numbers to control mosquitoes. Predator effectiveness is enhanced when proper conditions are present.

Within a typical aquatic environment that produces mosquitoes, predators are distributed among different substrates. For example, the surface of the pond supports water striders, planaria and spiders. Below the water surface, backswimmers, predaceous diving beetles and water scavenger beetles live and feed. If the pond contains vegetation, then the plant surfaces (periphyton) will support *Hydra*, damselfly and dragonfly nymphs, and giant water bug nymphs and adults. The benthos supports dragonfly and damselfly nymphs that feed on organisms associated with silts and organic detritus. Together, the different predators form a spatial network that accounts for predation throughout the pond. Ideally an adequate variety of vegetation should be present to maintain sufficient levels of predator diversity.
Greater potential for an acceptable level of mosquito control exists when more predators are present. Care should be taken so that mosquitoes do not have an advantage when too much or too little vegetation is removed.

Most of the currently registered mosquito larvicides minimally impact predators. Making applications at the lower end of the label rate can further minimize any undesirable impacts from these larvicides. The overall objective of using predators is to reduce the use and frequency of pesticide applications. This minimizes environmental impact and delays the development of mosquito resistance to pesticides.

Predation on mosquitoes is a natural process that will occur without human intervention. However, the level of mosquito control by natural predators can be increased by the conservation of predators in the environment and by augmentation of the predator population through stocking and habitat enhancement.

3.3 Practical Applications of Biological Control Agents: Relatively few biological control agents are currently being used in California, although a number have been studied and tested extensively in the laboratory and field. Many have shown potential but have not been used for a variety of reasons, including 1) difficulties in mass production, 2) failure to produce a consistent level of control, 3) expense, and 4) restricted application because of environmental concerns. Most agents, particularly predators and parasites, are only effective in association with mosquitofish and larvicides. Some of the practical biological control agents available to vector control agencies in California are *Bacillus thuringiensis israelensis*, *Bacillus sphaericus,* and the mosquitofish *Gambusia affinis.*

3.3.1 Microbial Agents and Mosquito Control: Commercial formulations of *Bacillus sphaericus* and *Bacillus thuringiensis israelensis* are extensively used as mosquito larvicides. Both are highly selective for mosquitoes and are innocuous to associated non-target organisms and predators. *Bacillus thuringiensis israelensis* is also toxic to black flies, a pest and disease vector.

Bacillus thuringiensis israelensis and *Bacillus sphaericus* are often considered chemical control measures because they are available in commercial formulations that consist of granular, powdered or liquid concentrates. The use of these two microbials is also discussed under the chemical control section.

3.4 Mosquitofish and Mosquito Control: *Gambusia affinis* is the most commonly used biological control agent for mosquitoes in the world. Correct use of this fish can provide safe, effective, and persistent suppression of a variety of mosquito species in many types of mosquito sources.
As with all safe and effective control agents, the use of mosquitofish requires a good knowledge of operational techniques and ecological implications, careful evaluation of stocking sites, use of appropriate stocking methods, and regular monitoring of stocked fish.

3.4.1 Aquatic Habitats: Mosquitofish are used to control mosquitoes in a wide variety of mosquito sources. These sources include both artificial and natural water bodies: industrial and municipal wastewater ponds, flood control basins and underground storm drains, neglected swimming pools, ornamental ponds, water troughs, irrigation, roadside ditches, seasonally flooded agricultural lands, rice fields, duck clubs, wildlife refuges, and such wetlands areas as marshes, sloughs, swamps and river seepage.

A high density of mosquitofish is required to control mosquitoes. In general, suitable habitats promote reproduction and recruitment rather than just sustaining the stocked mosquitofish population. Sources where conditions do not favor population growth may not be suitable for mosquito fish use or may require stocking at substantially higher rates.

The principal habitat characteristic that affects the successful use of mosquitofish is its relative stability. Mosquitofish usually are not effective in intermittently flooded areas unless a refuge impoundment is provided. Because of this, mosquitofish are more effective against mosquitoes breeding in permanent and semi-permanent water, such as *Culex* spp., *Anopheles* spp., and *Culiseta* spp., than against floodwater and invasive species, like *Aedes* spp. and *Psorophora* spp.

Mosquitofish are best suited for use in shallow, standing water and are particularly useful in large sources where the repeated use of chemical control is expensive, prohibited, or impractical.

Availability of food, other than mosquito larvae, and shelter are also important factors affecting the suitability of a site. Mosquitofish survival, growth, and reproduction are highly dependent on diet and feeding rates. Shelter to protect the young from cannibalistic adults is essential for population growth.

Vegetation, or other shelter, may also reduce predation on adult mosquitofish by birds, larger fishes, and other predators.

Habitats in which the water quality conditions, particularly temperature, dissolved oxygen, pH, and pollutants, exceed the tolerance limits of mosquitofish are not suitable sites for biocontrol. In sources with poor but sublethal water quality, feeding, reproductive activity and consequently mosquito control, may be adversely affected. Use of mosquitofish is sometimes possible in suboptimal environments that inhibit reproduction, but special stocking and monitoring methods may be required.

The presence of piscivorous fishes or other predators in the source habitat may rule out stocking with mosquitofish. High densities of invertebrate and vertebrate predators, such as notonectids and young game fish, which prey on both small mosquitofish and mosquito larvae, can prevent mosquitofish population growth.

3.4.2 Stocking Methods: Stocking methods can have significant effects on the degree of mosquito control achieved. In most cases, the objective is to release the minimum number of fish at the time when conditions within the source promote rapid population growth and at locations which facilitate dispersal throughout the source. The most appropriate methods depend on the type and location of the mosquito source, season, and the degree and duration of control desired.

3.4.3 Stocking Rate: Mosquitofish generally are released at densities lower than those necessary for mosquito control with the expectation that reproduction and recruitment will greatly increase the fish population within a few weeks. The best stocking rate depends primarily on the type of mosquito source, season, and mosquito control objective, for example immediate control vs. control later in the season. Understocking can result in inadequate mosquito control whereas overstocking may result in excellent control, but is wasteful of the usually limited fish supply.

Stocking rates are usually reported as fish per acre, or pounds of fish per acre. The number of mosquitofish per pound depends on the population structure of the sample (*e.g.*, a mixed population of adults and juveniles versus a sample containing only mature females), source (e.g., cultured vs wild-caught fish), and even season (early versus late in the breeding season). In general, for a mixed population, there are approximately 600-1,300 fish/lb.; the most common estimate is 1000 fish/lb.

In general, for early season stocking of mosquito sources that contain healthy populations of food organisms and adequate vegetation to provide shelter for the small mosquitofish, 0.2-0.5 lb./acre is appropriate. Higher stocking rates are necessary in a variety of circumstances, including:

- late season stocking and/or short flooded season, for example, wild rice fields or duck club ponds. In these situations, mosquitofish population growth is reduced as a result of a shorter breeding season and declining thermal and photoperiodic stimuli for breeding;
- poor quality environments which depress or inhibit reproduction and/or feeding, for example, habitats characterized by low temperature, low light, or high levels of chemical or organic pollution;
- sources in which immediate mosquito control is desired;
- sources which harbor high densities of mosquito larvae, for example, wild rice fields.

3.4.4 Stocking Date: Date of release of mosquitofish into a mosquito source affects biocontrol efficacy primarily through its influence on mosquitofish population growth. The age of the source affects its quality; both food and shelter may be sparse in new habitats. In mosquito sources stocked late in the season, population growth is reduced because of the shortened breeding season and declining reproductive stimuli. Stocking date necessarily varies with type of mosquito source but, in general, mosquitofish are released one to three weeks post-flooding. Mosquito sources that require late season stocking, such as duck club ponds are usually stocked with higher numbers of fish or treated with supplemental larvicides.

3.4.5 Stocking Location: An appropriate amount of mosquitofish must be stocked where mosquito larvae are present. Although mosquitofish can swim through dense vegetation, dispersal throughout a large habitat takes time and is slowed by the presence of additional barriers such as dikes or complicated shorelines.

The size and complexity of a source are important considerations when determining the number and locations of release sites. In large, complicated habitats, such as rice fields or wetlands, mosquitofish are typically released at several locations. For small area sources, all fish may be released at a single site.

Water flow may also be a consideration. In general, mosquitofish are stocked at the upstream end of the source since fish tend to move downstream from the release site.

3.4.6 Handling Release and Monitoring: Most mosquitofish are released by hand; however, mosquitofish can also be dropped from airplanes and helicopters when stocking large area sources such as rice fields. Regardless of the release method, care should be taken to minimize stress. Abrupt changes in water temperature should be avoided. Fish should be transported in water at a temperature similar to that at the end source. Mosquitofish should not be stocked during extremely hot weather or when water temperature approaches the upper tolerance limits of the fish (>35°C or 95°F).

After stocking, mosquitofish populations are monitored regularly to assess fish density, population growth, and biocontrol efficacy. A low number of fish may necessitate restocking or alternative mosquito control efforts.

3.5 Environmental considerations of Mosquitofish Use: Many species of larvivorous fish have been evaluated as agents to control mosquitoes, including various species of atherinids, centrarchids, cichlids, cyprinids, cyprinodontids, gasterosteids, and other poeciliids. However, mosquitofish are considered best suited from both biological and operational perspectives.

3.5.1 Advantages of Mosquitofish for Biological Control: Mosquitofish possess characteristics which make them efficient predators of mosquito larvae. They thrive in shallow, calm, vegetated waters, which is the same environment where many mosquitoes prefer to lay eggs. Mosquitofish tolerate wide ranges of water temperature and quality. Mosquitofish are surface-oriented predators where mosquito larvae are an accessible prey. The small size of the fish enable them to penetrate vegetated and shallow areas within the mosquito source. Mosquitofish are live-bearers that grow rapidly, mature at a young age, and reproduce quickly. This allows the fish to establish a high population in the source shortly after stocking. In many sources, seasonal peaks in mosquitofish activity and population growth coincide with mosquito reproduction times. Because of their omnivorous feeding habits, mosquitofish can thrive in habitats where mosquitoes occur intermittently.

Mosquitofish are hardy and easy to handle, transport, and stock. As a result of extensive research and practical experimentation in California, mosquitofish can be reliably cultured in large numbers. Problems still exist in some areas with winter survival rates and inadequate supplies of fish in the spring. Because the fish reproduce where they are stocked, long-term control can be achieved by stocking relatively few fish, often in a single application. Compared to pesticides, which require repeated applications, mosquitofish can provide inexpensive and safe long-term control, sometimes within days after application. Although not all introductions are successful, mosquitofish are an effective biological control agent alone and as a component of an integrated vector management program.

3.5.2 Limitations to the use of Mosquitofish for Biological Control: Not all types of mosquito sources are suitable for stocking with mosquitofish and mosquitofish are not effective in all situations. Since mosquitofish usually are not stocked in numbers sufficient to cause an immediate effect, they do not control mosquitoes as quickly as pesticides do. In some areas, federal, state, or local agency permission is required to stock mosquitofish.

3.5.3 Deciding Whether or Not to Use Mosquitofish: Mosquito control and public health professionals believe the effectiveness and safety of mosquitofish to be ecologically preferable to the application of pesticides or draining of the mosquito source. The use of mosquitofish as a component of an integrated vector management program, particularly in altered or artificial aquatic habitats, is increasingly more important with the limited availability of registered pesticides and as insect resistance to pesticides increases. As an agent for biological control of mosquitoes, mosquitofish deserve consideration as an optimal choice for proper environmental stewardship.

Though mosquitofish are not native to California, they are now ubiquitous throughout most of the state's waterways and tributaries. In much of the state's wetland areas, mosquitofish are now part of the natural ecosystem. Much of the aquatic habitat that is highly productive for mosquitoes is disrupted habitat, with flora and fauna that are predominately non-native species. In these areas, employing mosquitofish will have minimal impact on non-target species.

Many precautions are taken to minimize the environmental impact in habitats where mosquitofish are introduced. Mosquitofish are introduced into wetland communities that are biologically complex. The impact on habitats that contain native fishes are especially considered and weighed prior to introduction. Mosquitofish are stocked only in careful compliance with federal and state endangered species acts. This avoids the potential to impact threatened and endangered fish, amphibians, insects and other wildlife. The considered use of mosquitofish by the District ensures the protection of the environment by augmenting the natural process of predation on mosquito larvae through the use of a natural predator, the mosquitofish.

3.6 Analysis of CEQA Exemptions: CEQA categorical exemption classes 7 and 8 (CEQA Guidelines sections 15307 & 15308) exempt actions taken by regulatory agencies as authorized by state law to assure the maintenance, restoration, enhancement or protection of a natural resource or the environment where the regulatory process involves procedures for the protection of the environment. In order for this exemption to apply, the following elements must be satisfied:

- The District must be a "regulatory agency" authorized by state law to assure the maintenance, restoration, enhancement or protection of a natural resource or the environment.
- The District's biological control activities as described above must assure the maintenance, restoration, enhancement or protection of a natural resource or the environment.
- The District's regulatory processes must involve procedures for the protection of the environment.

3.6.1 The District is a "regulatory agency" authorized by state law to assure the maintenance restoration, enhancement or protection of a natural resource or the environment: The District is a local government agency created pursuant to state statute, Health and Safety Code division 3, chapter 5 (commencing with section 2200). State law charges the District with the authority and responsibility to take all necessary or proper steps for the control of mosquitoes and other vectors in the District.

The District and its employees are regulated by the State Department of Health Services (DHS). Vector control activities are coordinated with DHS pursuant to an annual Cooperative Agreement, under which the District commits to comply with certain standards concerning mosquito control and pesticide use. State law and the Cooperative Agreement require District vector control employees to be certified by DHS as a vector control technician. This certification helps to ensure that the employees are adequately trained regarding safe and proper vector control techniques, including the handling and use of pesticides and compliance with laws and regulations relating to vector control and environmental protection. The District also works in close coordination with the county agricultural commissioner, including periodic reporting of its activities.

As explained below, the District is one of many local, state and federal agencies involved in managing and regulating the environment. Its activities are undertaken in coordination with other agencies and pursuant to a framework of federal and state regulation.

CEQA does not define "regulatory agency." The CEQA Guidelines do define "public agency" to include the District. (CEQA Guidelines section 15379.) To "regulate" means to govern according to or subject to certain rules and restrictions. (New Webster Dictionary.)

The District, as authorized by state law, and through its Board of Trustees and staff, governs the control of mosquitoes and vectors in the environment within the District's boundaries. This action is subject to and done in accordance with District criteria regarding vector control that guide when, where, whether and how to control vectors (using biological control and other integrated vector management techniques), and various federal and state laws that regulate vector control and environmental protection. As such, the District qualifies as a regulatory agency.

3.6.2 The District's Biological Control Activities as Described Above Assure the Maintenance and Protection of a Natural Resources and the Environment: Biological control, and principally the use of mosquitofish, controls the level of mosquito larvae in water sources. The mosquitofish effectively control the larvae in water sources that otherwise could produce substantial numbers of adult mosquitoes. Mosquitofish act as a natural predator of mosquitoes to better control their levels in the current District environment. This control method maintains water sources and protects the adjacent environment in a condition more safe, healthful and comfortable for humans.

The District contains many sources that act as mosquito and vector breeding areas near populated areas. Without ongoing and effective vector control, the human environment would be significantly and adversely effected by substantial mosquito and other vector activity. The District's mosquito control program, including biological and chemical control, is essential to maintain the vectors in the environment at a tolerable level. The District's program will never alleviate all mosquitoes. Rather, it is a resource maintenance program aimed at striking a balance to allow comfortable and healthful human existence within the natural environment, while protecting and maintaining the environment. The control and abatement of vectors are necessary for our human environment to continue to be habitable.

3.6.3 The District's Regulatory Process Involves Procedures for the Protection of the Environment: There are numerous measures and procedures inherent in the District's integrated vector control management practices that protect and avoid impacts on the environment:

- As explained above, the integrated vector management principles followed by the District involve the careful design and selection of the appropriate mosquito control method in a particular circumstance in order to avoid environmental effects.
- The District coordinates with other resource agencies (e.g., California Department of Fish and Game, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers) regarding its vector control activities, especially in and around sensitive habitat areas.
- The District strictly complies with the state and federal Endangered Species Act to avoid any impact of an endangered or threatened species or its habitat.
- The District is an active member of the Mosquito and Vector Control Association of California, a statewide association representing the interests of vector control districts throughout the state. The Association, and its member districts, participate in the U.S. Environmental Protection Agency's Pesticide Environmental Stewardship Program, a program to encourage and further greater environmental stewardship by vector control districts.
- The District has adopted and enforces an employee injury and illness prevention plan, code of safe conduct, emergency response plan, and hazard communication program. Compliance with these plans better ensures safe and careful vector control activities, thereby helping to protect the environment from damage, e.g., by a pesticide spill.

4. PHYSICAL CONTROL AND SOURCE REDUCTION.

4.1 Description of activities: Physical control, also known as source reduction, environmental manipulation, or permanent control, is one part of the District's Integrated Vector Management (IVM) program. Physical control reduction is usually the most effective of the mosquito control techniques available and is accomplished by eliminating mosquito breeding sites. This can be as simple as properly discarding old containers that hold water capable of producing mosquitoes such as *Culex quinquefasciatus* or *Culiseta incidens* or as complex as implementing Rotational Impoundment Management (RIM). RIM is a source reduction strategy that controls salt marsh mosquitoes *(e.g., Ae. taeniorhynchus, Ae. squamiger)* at the same time as significant habitat restoration is occurring. Source reduction is important in that its use can virtually eliminate the need for pesticide use in and adjacent to the affected habitat. Source reduction is appropriately touted for its effectiveness and economic benefits.

4.2. Mosquito Producing Habitats to Consider for Source Reduction

4.2.1 Freshwater Lakes, Ponds And Retention Areas: Description of sites. Typical sites in California include the margins of reservoirs with shallow water and emergent vegetation, artificial ponds for holding drinking water for livestock and retention ponds created for holding rainwater. Some retention ponds have been constructed within freeway interchanges and others have been built in cities and towns to provide wildlife habitat and flood protection. Natural lakes are usually not a problem because most of the water is deep and there may be little emergent vegetation. Seasonal ponds such as central valley vernal pools and Sierra Nevada snow pools may produce large numbers of mosquitoes during part of the year. Vernal pools may be important habitats for rare and endangered species.

Typical mosquito species. There are several species of mosquitoes that exploit this type of habitat. In lower elevations in California, *Culex* species such as *Cx. tarsalis* and *Cx. stigmatosoma* may be found. *Culiseta inornata* and *Cs. incidens* also will breed in small ponds. In the Sierra Nevada, about 10 species of *Aedes* breed in melted snow. *Ae. tahoensis* and *Ae. hexodontus* are the most common species in these environments. At lower elevations, *Ae*. *washinoi* is a persistent problem along large river valleys. Larvae of this species are found in borrow pits, flooded quarries, and other ponds of freshwater.

4.2.2 Freshwater swamps and marshes: Description of sites. The vast freshwater swamps and marshes that formerly existed in the central valley of California have mostly been drained and converted to cultivated agricultural crops. Within federal and state property, many marshes have been created and operated to provide aquatic habitats for wildlife, especially waterfowl. Some of these marshes are drained and re-filled periodically to enhance the primary productivity of the habitat, and under certain circumstances, this can result in large populations of mosquitoes.

Typical mosquito species. - *Culex tarsalis, Cx. quinquefasciatus* and *Anopheles freeborni* are the most common species found in these habitats. Depending upon the management practices for the marsh or swamp, floodwater *Aedes* such as *Ae. vexans*, *Ae. melanimon*, Ae. nigromaculis and *Ae. dorsalis* can become serious problems, especially in those cases where marshes are periodically drained and re-flooded.

4.2.3 Temporary standing water: Description of sites. There are several species of mosquitoes that can breed in water that stands only 1 to 2 weeks. Such habitats include irrigation tail water as well as standing water in irrigated pastures. Many mosquito species are found in these sources. Pastures and other agricultural lands are enormous mosquito producers, frequently generating huge broods of *Aedes* and *Culex* mosquitoes.

Typical mosquito species. - *Culex tarsalis, Cx. quinquefasciatus, Cx. stigmatosoma, Aedes melanimon, Ae. nigromaculis* and *Culiseta inornate* are just some of the species that may breed in temporary pools.

4.2.4 Wastewater treatment facilities: Description of sites. Aquatic sites in this category include a wide variety of ponds, ditches and other structures designed to handle wastewater of some kind. Included are sewage treatment ponds, ponds managed for denitrification, dairy drains, dairy ponds, storm sewers and water that accumulates from log sprinkling systems (cold decks).

- Typical mosquito species.

  Culex. Mosquito species found in these types of sources are generally *Culex quinquefasciatus, Cx. stigmatosoma*, and to a lesser degree, *Cx. tarsalis*. Human activities are responsible for establishing the vast majority of the aquatic habitats used by *Cx. quinquefasciatus*, the southern house mosquito. A much wider range of larval habitats, including both artificial and natural aquatic systems, is used by *Cx. tarsalis*. In large wastewater ponds, immature *Cx. quinquefasciatus* are generally most abundant near the outflow area where the nutrient loads are normally the highest.

  Culex tarsalis, another common mosquito in wastewater, is like *Cx. stigmatosoma* in terms of its range of larval habitats, but its seasonal pattern of abundance is similar to that found in *Cx. quinquefasciatus. Cx. tarsalis* inhabit not only semipermanent ponds but also more ephemeral habitats, such as temporary pools in spray-irrigation fields. *Cx. tarsalis* is the species with the greatest impact because it is the dominant *Culex* spp. in California during the summer and fall, occurs in wastewater systems that vary over a wide range of nutrient loads, and is the primary vector of West Nile virus (WNV) and St. Louis encephalitis (SLE) virus.

  Aedes. Unlike *Culex,* whose eggs hatch within a few days after being laid in rafts on the water surface, *Aedes* lay their eggs individually on moist substrate with hatching occurring only after the eggs have been flooded. Consequently, *Aedes* are seldom found in wastewater systems where there is little or no variation in surface water levels. However, poorly designed, improperly operated, or inadequately maintained systems often lead to conditions that are ideal for an invasion by floodwater mosquitoes. Poorly drained spray-irrigation fields often become waterlogged, especially during the rainy season. Under these conditions, many broods of *Ae. vexans* can be produced in a single season. Land application of wastewater may increase the salt content of the soils. Under these conditions, inland sites may become suitable aquatic habitats for salt marsh mosquitoes.

4.2.5 Containers: Description of sites. Containers such as flowerpots, cans, tree holes, fountains and tires are excellent habitats for several *Aedes* and *Culiseta* species. Abandoned or poorly maintained swimming pools also fall into this category. Typically, problems with container breeders occurs during the wetter parts of the year.

Typical mosquito species. Container-inhabiting mosquitoes of particular concern in the San Gabriel Valley consist of invasive *Aedes* spp., *Ae. aegypti, Ae. albopictus and Ae. notoscriptus.* These *Aedes* app. Are notoriously difficult to control due to their preference for containers as breeding sources. Continued efforts are made to mitigate these container breeders but effective control is only achieved through high amounts of time and labor.

4.3 Physical control methods

4.3.1 Source Reduction in Freshwater Habitats: Source reduction for mosquito control in freshwater habitats typically involves constructing and maintaining channels (ditches) to reduce mosquito production in areas such as flood plains, swamps, and marshes. The principle that directs source reduction work entails manipulating water levels in low-lying areas to eliminate or reduce the need for spraying applications.

Two different mosquito control strategies or approaches are considered when performing freshwater source reduction. One strategy involves reducing the amount of standing water or reducing the length of time that water can stand in low areas following significant rainfall events. This type of strategy involves constructing channels or ditches with control elevations low enough to allow for a certain amount of water to leave an area before immature mosquitoes can complete their life cycle.

Another strategy involves constructing a main central ditch with smaller lateral ditches at the lowest elevations of intermittent wet areas to serve as a larvivorous fish reservoir. As rainfall increases, larvivorous fish move outward to adjacent areas to prey on immature mosquitoes, and as water levels decrease, larvivorous fish retreat to water in the ditches. Weirs are constructed in main ditches to decrease water flow, decrease emergent aquatic weeds, prevent depletion of the water table, and allow larvivorous fish year-round refuge.

At this time, the District is rarely involved in construction of new drainage projects. The District rarely performs maintenance on existing drainage systems. This maintenance includes cutting, mowing, clearing debris, and excavating built up spoil material.

Over the past several decades, urban development has occurred in areas where mosquito control drainage ditches have existed as the primary drainage systems. In many cases, maintenance responsibility for mosquito control projects has been taken over by city and county public works departments and integrated those projects into their comprehensive stormwater management programs. Also irrigation districts and reclamation districts have integrated into their comprehensive drainage management programs maintenance programs to control mosquito breeding associated with crop land irrigation.

4.3.2 Aquatic Plant Management And The Effects On Mosquito Populations: This section describes the practices used to control mosquitoes and aquatic plants associated with freshwater environments only.

Certain mosquito species use various aquatic plants as a primary habitat for egg deposition and larval development. Because aquatic plants can, at times, produce heavily vegetated stands, the use of conventional mosquito management techniques, such as biological and chemical control, may be ineffective. Therefore, removal of the habitat may be the only means of reducing these mosquito populations to a desired level.

Aquatic plant management can have a positive effect on the control of mosquito populations. A primary goal in reducing mosquitoes that use aquatic plants is to eradicate or manage the aquatic plant communities at the most feasible level.

Several important aquatic plant species provide harborage for mosquitoes. The most noticeable are smartweed, bulrush and cattails.

While it can be possible to fill small artificial ponds that produce mosquitoes, it is usually impossible to do so in natural areas (however small), large permanent water bodies, or in areas set aside for stormwater or wastewater retention. In such situations, other options that are effective in controlling mosquitoes include periodic drainage, providing deep-water sanctuary for larvivorous fish, minimizing emergent and standing vegetation, and maintaining steep banks. *Aedes*, *Culex*, *Coquillettidia, Mansonia*, and *Anopheles* mosquitoes are frequently produced in these habitats.

Eradication or maintenance level control of aquatic plants is the best method of mosquito control.

Physical control methods include the use of equipment or tools to physically remove aquatic vegetation. Examples would include aquatic harvesters, backhoes, bucket cranes, underwater weed trimmers, and machetes. Mechanical control is limited to areas that are easily accessible to the equipment. Also, mechanical control can be labor intensive and extremely expensive.

4.3.3 Freshwater Swamps and Marshes: Environmental laws greatly restrict habitat manipulations in these areas (which can produce *Aedes*, *Culex*, *Anopheles*, and *Culiseta* species), making permanent control there difficult. Consequently, the District does not usually undertake physical control projects in these areas. If it does so, the District would undertake separate CEQA assessment on a case by case basis.

4.3.4 Wastewater treatment facilities: In many parts of California, clean freshwater for domestic, agricultural, or industrial uses is becoming a critical resource. Wastewater recycling and reuse help to conserve and replenish freshwater supplies. California citizens daily produce approximately 100 gallons of wastewater per capita from domestic sources alone. Concern for water quality conditions in lakes, rivers, and marine areas has resulted in the enactment of new state laws that will greatly limit future disposal of wastewater into these aquatic systems. To adjust to these changing conditions, many communities must implement wastewater reuse and recycling programs. Mosquito problems are frequently associated with some of the conventional wastewater treatment operations, and the expanded use of wastewater recycling and reuse may inadvertently create even more mosquito habitats.

Pond management options which are effective in controlling mosquitoes include periodic draining, providing deep water sanctuary for larvivorous fish, minimizing emergent and standing vegetation, and maintaining steep banks. The District routinely advises property owners on the best management practices for ponds to reduce mosquito development. In addition, the District provides localized vegetation management on ponds that enter into a contract with the District to discourage mosquito oviposition sites.

4.3.5 Septic Systems: Many households in California, especially in rural areas, use on-site treatment systems, such as septic tanks and associated drain fields. With proper soil porosity, sufficient lateral fields, and low human congestion, these systems are safe and efficient. The wastewater in a properly located and maintained septic tank system will percolate into the subsoil without causing surface water accumulation that may induce mosquito production. Yet, when these systems are placed in locations with inappropriate soil conditions, wastewater will flow laterally, often into nearby swales and ditches. Physical control measures include repair and rebuilding of systems, and ditch maintenance in areas where lateral flow occurs.

4.3.6 Municipal Treatment Facilities: In California, municipal treatment facilities may be associated with mosquito problems. These can stem from operation of both small (package plants) and large facilities. Package plants may result in mosquito production in holding ponds because they are poorly maintained or operated beyond their capacity. Larger plants may use various methods to improve water quality conditions beyond the levels obtained in secondary treatment process. These methods include spray irrigation, rapid-dry ponds, aquatic plant/wastewater systems, and the use of natural or modified wetlands. Physical control methods include vegetation management, pond maintenance, structure repair, and improvement of pond substrates.

4.3.7 Hyper-Irrigation Systems: Secondarily treated wastewater is used to irrigate golf courses, road medians, pastures, sod fields, and other types of crops. The City of Modesto system is an example of the hyper-irrigation system used to eliminate treated wastewater. During the summer, these irrigated fields may become waterlogged, particularly those in low-lying areas with high water tables or in poorly drained soils. Under these conditions, the continued application of wastewater will result in the accumulation of surface water, thus providing aquatic habitats for a variety of mosquito species. Physical control methods are employed by landowners, and include proper grading of irrigated lands, and better water management

4.3.8 Wastewater/Aquatic Plant Systems: At some sewage treatment facilities in California, certain species of aquatic plants (e.g., water hyacinths) have been added to human-made ponds containing secondarily treated wastewater for nutrient removal and biomass production. Mosquito problems can be produced in this type of system if the inflow has received an inadequate secondary treatment. Effective nutrient removal requires periodic harvesting of a portion of the standing crop.

4.3.9 Stormwater and wastewater management: The management of stormwater and wastewater is very important, and when done without sound engineering, poor construction or improper maintenance, can result in considerable mosquito problems. Because of recent restrictions on the flow of stormwaters into natural waterways, the question of design of stormwater retention facilities has become a critical issue. Physical control measures may be required, but proper design of facilities will be the most important factor.

Currently there is a wide range of mosquitoes produced in these facilities including floodwater *Aedes* species in intermittently wet facilities and *Culex* and *Anopheles* species associated with permanent or semi-permanent wet facilities. The *Aedes* species are the most pestiferous. *Cx. quinquefasciatus* is often found in the intermittently wet facilities and serves as the primary vector for WNV and SLE.

Mosquito production can be engineered out of stormwater and wastewater facilities but not always easily. Permanent water ponds can be kept clean of weeds with a water quality sufficient to support mosquito-eating fish. Dry facilities can be designed to dry down in three days to prevent floodwater mosquito production, but some standing water beyond the three-day period may occur due to intermittent rainfall common during the rainy season.

4.3.10 Agricultural and Industrial Wastewater: Many commercial operations have on-site treatment facilities for decreasing nutrient loads from their wastewater, and generally, they use techniques similar to those applied to domestic wastewater. The quantity of wastewater produced at some commercial locations, such as those processing certain crops, may be highly variable during the year. Therefore, the amount of surface water in the holding ponds or spray fields used in the wastewater treatment may fluctuate considerably, thereby contributing to the production of certain species of flood-water mosquitoes. Wastewater from feed lots and dairy barns is often placed in holding or settling ponds without any prior treatment. Several mosquito species of the genus *Culex* can become extremely abundant in these ponds, especially in the absence of aquatic plant control.

4.3.11 Agricultural croplands: The production of agricultural crops when performed improperly results in mosquito breeding located in the field or adjacent to the field. This is often the result of improper land preparation or improper water management. Two different mosquito control strategies or approaches are considered to eliminate mosquito breeding. The first is to prevent water from standing longer than 3 days. This can be accomplished by reducing the amount of water applied to the crop or re-leveling the land before planting the next crop, to ensure the land is put to the property grade. The second approach is used when it is determined that regardless of the land preparation or reduction of irrigation time that water will stand. The second approach involves the establishment of ponds where mosquito fish are stocked to control mosquito breeding. These ponds or tailwater ditches are put to grade so that the water stands in only one area of the field. The District contacts the property owner and provides consultation and references to other agencies and consultants who can help the property owner develop a plan to eliminate mosquito breeding on his property. The District does not physically perform any work on agricultural croplands to eliminate mosquito breeding. The following is a listing of some of the crops where mosquito breeding is mainly found: corn fields, irrigated pasture, alfalfa, nut crops, grape vineyards. The primary species of mosquitoes found in and adjacent to these fields are: *Ae. nigromaculis, Ae. melanimon, Ae. vexans, Cx. tarsalis* and *Cx. quinquefasciatus*.

4.4 Container habitats

4.4.1 Miscellaneous containers: An artificial container, such as flowerpots, cans, barrels, and tires. A container breeding mosquito problem can be solved by properly disposing of such materials, covering them or tipping them over to ensure that they do not collect water. A container-breeding mosquito problem can be solved by properly disposing of such materials, covering them, or tipping them over to ensure that they do not collect water. The District has an extensive program that addresses urban container breeding mosquito problems through house-to-house surveillance and formalized education programs.

4.4.2 Tires: Waste tires have been legally and illegally accumulating in California for the past several decades. The legal accumulations usually take the shape of a somewhat organized pile containing up to several million tires. Illegally dumped tires may be scattered about from singly up to piles containing 40 to 50 thousand carcasses. Unfortunately, most of the problem tires are not in large piles, but scattered about, making removal difficult and, at best, labor intensive.

The design of tires makes them ideal breeding sites for several species of mosquitoes, of which, some are very important vectors of disease. Until the mid-1980s, waste tires were considered more of a nuisance and environmental threat than the possible foci of mosquito-borne disease epidemics. This changed in 1985 when a substantial breeding population of *Ae. albopictus* was discovered in Houston, Texas. It is probable that this population arrived from Japan as eggs deposited inside used tires.

Thus far, *Ae. albopictus, Ae. aegypti and Ae. notoscriptus* have not become established in California, and the dry summers here are not favorable to their establishment. However, their introduction poses a serious threat, and California mosquitoes such as *Culiseta incidens* and *Culex quinquefasciatus* may breed here in tire carcasses.

For management of used tires, the California Integrated Waste Management Board oversees storage sites with more than 500 tires. That agency also has developed regulations regarding the storage of waste tires with regards to vector control. These regulations include the provision of the local vector control agency being involved with the permit process required to store used tires.

4.5 Analysis of CEQA Exemptions: CEQA categorical exemption classes 1 and 4 (CEQA Guidelines sections 15301 & 15304) provide exemptions for some, but not all, physical control and source reduction activities. Class 1 exempts the operation, maintenance and minor alteration of existing drainage or other facilities involving negligible or no expansion of use.
Examples include the maintenance of stream channels and debris clearing to protect fish. Class 4 exempts the minor alteration of land, water and vegetation that do not involve the removal of mature, scenic trees. Examples include minor trenching where the surface is restored and maintenance dredging where the spoil is deposited in an authorized spoil area.

As applied to the District's physical control and source reduction activities described above, the following activities fit within these CEQA exemptions: maintenance of and clearing of debris from drainage channels and waterways; excavation of built up soil material; removal of water from tires and other urban containers; cutting, trimming, mowing and harvesting of aquatic and riparian plants (but not including any mature trees, threatened or endangered plant species, or sensitive habitat areas); and minor trenching and ditching.

Consistent with the scope of the exemptions, and as applied to vector control activities, exempt minor trenching and ditching means the following: digging, excavating and expanding ditches, drains and trenches in situations where all of the following conditions are satisfied: the capacity of the new or expanded facility is only negligible or insignificant; the surface area is restored; the soil, if any, is deposited in an authorized area; and the work does not impact any mature trees, threatened or endangered plant species, or sensitive habitat areas.

Rotational impoundment management, major trenching and ditching, and other land alteration/source reduction projects that do not fit the above list of exempt activities generally are not exempt from CEQA. These activities will need to be analyzed on a case-by-case basis with project-specific initial studies or other appropriate environment documents. Likewise, other physical control activities not described above are not exempt from CEQA under the class 1 or 4 exemptions and they too will need to be analyzed on a case-by-case basis.

5. **CHEMICAL CONTROL:** Mosquito control operations use a combination of two basic chemical control methods to control mosquitoes: adulticiding and larviciding. Only those pesticides registered by the United States Environmental Protection Agency and California Environmental Protection Agency are used by the District for mosquito control. With the existing federal and state limitations and regulations, the pesticides available for mosquito control, when applied in accordance with legal requirements, are very environmentally sensitive and cause no or very minor ecological impact.

The Environmental Hazards section on labels of pesticides used for mosquito control instructs applicators about how to avoid and minimize environmental impacts. For example, adulticide labels instruct the applicator to avoid direct application over water or drift into sensitive areas (i.e., wetlands) due to a potentially high toxicity of these compounds to fish and invertebrates. Although there is some variation in the habitats to be avoided, they usually include lakes, streams and marshes. The District strictly follows label instructions and carefully monitors environmental and meteorological conditions to maximize effectiveness while avoiding and minimizing non-target exposure and environmental effects.

5.11 Description of Adulticides & Adulticiding Activities: Application of insecticides for control of adult mosquitoes (adulticiding) is probably the most visible practice exercised by mosquito control agencies. The most common form of adulticiding is the application of insecticide aerosols at very low dosages and using little or no diluent. This method is commonly called the ultra-low-volume (ULV) method. Ground adulticiding is almost exclusively conducted with specially designed ULV equipment.

The efficiency of adulticiding is dependent upon a number of integrated factors. First, the mosquito species to be treated must be susceptible to the insecticide applied. Some California mosquitoes are resistant or more tolerant to some adulticides thus affecting the selection of chemical. Second, insecticide applications must be made during periods of adult mosquito activity. This factor is variable with species. Some species of mosquitoes are diurnal (daytime biting), while others are crepuscular. Adulticiding should be timed when the mosquitoes are flying and/or exposed to the aerosol mist.

The chemical application has its own set of conditions that determine success or failure. The application must be at a dosage rate that is lethal to the target insect and applied with the correct droplet size. It has been shown that droplets within the 10-25 micron range are most effective in controlling adult mosquitoes.

Ground applications with densely vegetated habitats may require a higher dosage rate than that of open areas. This is purely a function of wind movement and its ability to sufficiently carry droplets to penetrate foliage.

Environmental conditions may also affect the results of adulticiding. Wind determines how the ULV droplets will be moved from the output into the treatment area. Conditions of no wind will result in the material not moving from the application point. High wind, a condition that inhibits mosquito activity will quickly disperse the insecticide too widely to be effective. Light wind conditions (< 6 mph) are the most desirable, moving the material through the treatment area and are less inhibiting to mosquito activity.

ULV applications are generally avoided during hot daylight hours. Thermal conditions will cause small droplets to rise, moving them away from mosquito habitats and flight zones. Generally, applications are made between sunset and sunrise, depending upon mosquito flight activity. This practice minimizes exposure of non-target species such as bees or butterflies. Some mosquitoes (*Aedes* species) are most active during the daytime. Applications for these species should be made during the period of highest activity provided that meteorological conditions are suitable for application and care is made to avoid non-target impacts.

5.2 Adulticides: Throughout the discussion of adulticide materials, signal words which may occur on the material's label are mentioned. Following is an explanation of these signal words:

CAUTION. This word signals that the product is slightly toxic. An ounce to more than a pint taken by mouth could kill the average adult. Any product which is slightly toxic orally, dermally, or through inhalation or causes slight eye and skin irritation will be labeled "CAUTION".

WARNING. This word signals that the product is moderately toxic. As little as a teaspoonful to a tablespoonful by mouth could kill the average sized adult. Any product which is moderately toxic orally, dermally, or through inhalation or causes moderate eye and skin irritation will be labeled "WARNING".

DANGER. This word signals that the pesticide is highly toxic. A taste to a teaspoonful taken by mouth could kill an average sized adult. Any product which is highly toxic orally, dermally, or through inhalation or causes severe eye and skin burning will be labeled "DANGER".

In its mosquito control work, the District regularly uses the following adulticides:

5.2.1 Pyrethrins and Pyrethroids - General Description: Natural pyrethrins (pyrethrum) are extracted from chrysanthemum flower heads grown commercially in parts of Africa and Asia. Synthetic analogues of the natural pyrethrins reached commercial success in the 1950s. Like the natural pyrethrins, 'first generation' synthetic pyrethroids such as phenothrin and tetramethrin, are relatively unstable to light. During the 1960s-1970s, great progress was made in synthetic light-stable pyrethroids. These photostable pyrethroids represent the 'second generation' of these compounds.

Pyrethroids exhibit rapid knockdown and kill of adult mosquitoes, characteristics that are considered a major benefit of their use. The mode of action of these compounds relates to their ability to affect sodium channel function in the neuronal membranes.

Synthetic pyrethroids are not cholinesterase inhibitors, are non-corrosive and will not damage painted surfaces. They are less irritating than other mosquito adulticides and have a less offensive odor. In comparison to other adulticides, pyrethroids may be effectively applied at much lower rates of active ingredient per acre. The synthetic pyrethroids are mimics of natural pyrethrum, a botanical insecticide. Natural pyrethrum is used in agricultural areas and has a significantly higher cost.

5.2.1.1 Prallethrin.

INTRODUCTION. Prallethrin is a pyrethroid compound expressed as parts per million (ppm) in applications. The District utilizes AquaDuet and Duet as a part of our adulticiding operations. This label contains a CAUTION statement and is contains 0.084 pounds of Prallethrin/Gallons of product utilized.

FORMULATIONS AND DOSES. Prallethrin is applied by Ground ULV with a dosage of 0.00024 lbs of pyrethroid/acre (PBO at 0.0012 lbs/acre and Sumithrin at 0.0012 lbs/acre)

TARGET SPECIES. Prallethrin is used against all California mosquitoes.

5.2.1.2 Sumithrin

INTRODUCTION. Sumithrin is a pyrethroid compound expressed as parts per million (ppm) in applications. The District utilizes AquaDuet and Duet as a part of our adulticiding operations. This label contains a CAUTION statement and is contains 0.422 pounds of Sumithrin/Gallons of product utilized.

FORMULATIONS AND DOSES. Sumithrin is applied by Ground ULV with a dosage of 0.0012 lbs of pyrethroid/acre (PBO at 0.0012 lbs/acre and Prallethrin at 0.00024 lbs/acre)

TARGET SPECIES. Sumithrin is used against all California mosquitoes.

5.2.1.3 Resmethrin.

INTRODUCTION. Resmethrin is another of the 1st generation synthetic pyrethroids used in California. Resmethrin, like permethrin, is a photolabile pyrethroid compound produced by AgrEvo and formulated as the active ingredient in products such as Scourge. Resmethrin is similar to the other pyrethroids in providing rapid knockdown and quick kill of adult mosquitoes. Resmethrin exhibits very low mammalian toxicity, degrades very rapidly in sunlight and provides little or no residual activity.

FORMULATIONS AND DOSAGES. Resmethrin products are available in several concentrations that range from 1.5% to 40% and may or may not contain piperonyl butoxide. Scourge products, containing resmethrin and piperonyl butoxide (a synergist), have a maximum rate of application of 0.007 lbs per acre of the active ingredient.

TARGET SPECIES. Resmethrin is used against all California mosquitoes.

5.2.1.4 Deltamethrin

INTRODUCTION. Deltamethrin is a pyrethroid ester insecticide commonly used in California mosquito control. The District employs deltamethrin in the product Suspend SC. Similar to other pyrethroids, it acts as a quick knockdown agent able to be utilized in a variety of settings around residences and diverse ecosystems alike.

FORMULATIONS AND DOSAGES. Deltamethrin products are available in a wide array of concentrations but the District utilizes a concentration of 4.75% as the active ingredient in Suspend SC. The product is applied at 3.75 (fl.oz) of Suspend SC per 100 sq. ft.

TARGET SPECIES. Deltamethrin is used against all California mosquitoes.

5.2.2 Organophosphates – General Description Organophosphates are a group of human-made chemicals that affect insects and mammals. Organophosphates are widely used insecticides today. They are used in agriculture, the home, gardens, veterinary practices, and in mosquito control.

Organophosphate insecticides (such as diazinon) are one type of pesticide that works by damaging an enzyme in the body called acetylcholinesterase. This enzyme is critical for controlling nerve signals in the body. For the District, we employ Nuvan Prostrips containing Dichlorvos to control adult mosquitoes emerging from local sources.

5.2.2.1 Dichlorvos.

INTRODUCTION. Dichlorvos, also known as DDVP, is an organophosphate pesticide used to control a variety of insect pests, including mosquitoes. While dichlorvos is intended to be released in air pathways for adult control, when ingested it has a high rate of metabolism and excretion from nontarget hosts. It is the active ingredient utilized in Nuvan Prostrips, utilized by the district, to paralyze insect nervous systems.

FORMULATIONS AND DOSAGES. Dichlorvos makes up 18.6% of the active weight of Nuvan Prostrips and is applied in 65-80 gram increments depending on the application area.

TARGET SPECIES. Dichlorvos is used against all California mosquitoes.

5.3 Ground Adulticiding Techniques and Equipment. The District regularly applies the following ground application techniques and equipment:

5.3.1Adulticide Application made from Truck-mounted Equipment (Ground adulticiding): Ground adulticiding is a common method of controlling adult mosquitoes in California and in some counties is often perceived by the general public as the only method used.

Ground adulticiding generally consists of barrier spraying, and Ultra Low Volume (ULV) aerosol applications. Barrier treatments for adult mosquitoes consist of an application using a material to the preferred foliage, buildings, or resting areas of the species in order to intercept adult mosquitoes hunting for blood meals.

This technique is often used as a barrier treatment and is based on the natural history and behavioral characteristics of the mosquito species treated.

5.4 Equipment: Ground adulticiding equipment is normally mounted on some type of vehicle, but smaller units are available that can be carried by hand or on a person's back. Pickup trucks are the most common motorized vehicle for conveyance.

Every manufacturer now produces a mid-range machine in the 8-12 horsepower (or equivalent) class and a few even smaller <6 HP machines. These units are more compact, lighter and typically are more fuel efficient than their larger relatives. The atomization capabilities of the larger machines in this class are normally sufficient for many of the pesticides now being used, particularly at the 5 MPH rates. All of the flow systems available for the larger units may be fitted to this class machine as well. There are several hand held, 2-cycle engine, ULV sprayers available that are useful for small area treatments. There are several units configured as backpacks, with the engine/blower mounted on a pack frame connected to a remote nozzle with a hose. These units utilize an orifice to control flow and either aspirating or gravity feed to supply the insecticide.

Larvicides and Larviciding.

INTRODUCTION

Larviciding is a general term for the process of killing mosquitoes by applying natural agents or commercial products designed to control larvae and pupae (collectively called larvicides) to aquatic habitats. Larvicide treatments can be made from either the ground or air. Larviciding was implemented as a malaria control procedure in the early 1900's and over the years, has become prominent. Many Mosquito Control Districts in California have incorporated larviciding into their pest management practices.

There may be times when it makes no sense to attempt any larviciding at all. The size and location of the source area may make timely larviciding impossible. Effective larviciding results are not always easy to achieve. Accuracy of the larvicide application is extremely important. Congregated larvae may be easy targets, but missing a relatively small area containing them is also easy and leads to the emergence of many adults. Application timing is important because different materials have different requirements. As with adulticides, dosage rates must be both sufficiently high to kill targeted species and sufficiently low to minimize non-target effects.

A wide variety of aquatic habitats and communities, ranging from small domestic containers to larger agricultural and marshland areas, are treated with larvicides. Natural fauna inhabiting these sites may include amphibians, fish, vertebrates and invertebrates, particularly insects and crustaceans. Frequently, the aquatic habitats targeted for larviciding are temporary or semi-permanent. Permanent aquatic sources usually contain natural mosquito predators such as fish and do not require further treatment, unless vegetation is so dense that it prevents natural predation. Temporary sites such as marshes and flooded agricultural areas or woodland depressions produce prolific numbers of flood-water mosquitoes. These sites are generally very low in species diversity due to the time needed for most species to locate and colonize them. While flood water mosquitoes develop during the first week post-inundation, it may take two to three weeks for the first macro invertebrate predators to become established. Finally, many non-target species exploiting temporary aquatic habitats can recover from localized population declines via re-colonization from proximal areas.

5.5 Larvicides: Throughout the discussion of larvicide materials, signal words on the label are mentioned. Following is an explanation of these signal words:

- **CAUTION.** This word signals that the product is slightly toxic. An ounce to more than a pint taken by mouth could kill the average adult. Any product which is slightly toxic orally, dermally, or through inhalation or causes slight eye and skin irritation will be labeled “CAUTION”.

- **WARNING.** This word signals that the product is moderately toxic. As little as a teaspoonful to a tablespoonful by mouth could kill the average sized adult. Any product which is moderately toxic orally, dermally, or through inhalation or moderate eye and skin irritation will be labeled “WARNING”.

- **DANGER**. This word signals that the pesticide is highly toxic. A taste to a teaspoonful taken by mouth could kill an average sized adult. Any product which is highly toxic orally, dermally, or through inhalation or causes severe eye and skin burning will be labeled “DANGER”.Commercially available and experimental larvicides plus natural control agents available in California are discussed below. Arbitrarily, they are loosely categorized by their modes of entry/action on target/non- target organisms: Contact Pesticides, Surface Active Agents, Stomach Toxins, and Chitin Inhibitors.

Registered trade names and active ingredients of products are used in the discussions.

In its mosquito control work, the District regularly uses the following larvicides:

Contact Pesticides: As the name implies, this loosely defined group of compounds is effective when mosquito larvae or pupae come in contact with it. Chemicals are absorbed through the insects outer “skin” or cuticle, and may be incidentally ingested or enter the body through other routes. Contact agents can be further subdivided into two sub-groups: 1) toxins primarily affecting an insect’s nervous system; and 2) toxins primarily affecting an insect’s endocrine system. The District does not use any formulations of the organophosphate malathion and formulations of the botanical pyrethrum to control mosquito larval stages. However the District does use endocrine system agents used in this period include many s-methoprene formulations.

5.5.1 s-Methoprene.

INTRODUCTION. s-Methoprene does not produce non-discriminatory, rapid toxic effects that are associated with nervous system toxins. s-Methoprene is a true analogue and synthetic mimic of a naturally occurring insect hormone called Juvenile Hormone (JH). JH is found during aquatic life stages of the mosquito and in other insects, but is most prevalent during the early instars. As mosquito larva mature, the level of JH steadily declines until the 4th instar molt, when levels are very low. This is considered to be a sensitive period when all the physical features of the adult begin to develop. s-Methoprene in the aquatic habitat can be absorbed on contact and the insect’s hormone system becomes unbalanced. When this happens during the sensitive period, the unbalance interferes with 4th instar larval development.

One effect is to prevent adults from emerging. Since pupae do not eat, they eventually deplete body stores of essential nutrients and then starve to death. For these and perhaps other reasons, s-Methoprene is considered an insect growth regulator (IGR).

There have been widely distributed reports regarding the effect methoprene may have on certain amphibians. Reports of frog abnormalities have been widely circulated, but these reports have not stood up to scientific scrutiny.

FORMULATIONS. Currently, three s-methoprene formulations are utilized by the District under the trade name of Altosid. These include Altosid Liquid Larvicide (A.L.L.), Altosid XR Briquets, Altosid Pellets WSP and. Altosid labels contain the signal word "CAUTION". Additionally, two MetaLarv products are utilized : MetaLarv S-PT and MetaLarv XRP.

ALTOSID LIQUID LARVICIDE (A.L.L.). This flowable formulation contains 5% (wt./wt.) s-Methoprene. The balance consists of inert ingredients that encapsulate the s-Methoprene, causing its slow release and retarding its ultraviolet light degradation.

DOSAGES. Use rates are 3 to 4 ounces of A.L.L. 5 (equivalent to 0.01008 to 0.01344 lb. AI) per acre, mixed in water as a carrier and dispensed by spraying with conventional ground and aerial equipment. Because the specific gravity of Altosid Liquid is about that of water, it tends to stay near the target surface. No rate adjustment is necessary for varying water depths when treating species that breathe air at the surface.

TARGET SPECIES. Liquid formulations are designed to control fresh and saline flood water mosquitoes with synchronous development patterns. Cold, cloudy weather and cool water slow the release and degradation of the active ingredient as well as the development of the mosquito larvae. Accordingly, formulation activity automatically tracks developing broods.

ALTOSID XR BRIQUETS. It is made of hard dental plaster (calcium sulfate), 1.8% (wt./wt.) s-methoprene (.00145 lb. AI/briquet) and charcoal (to retard ultra violet light degradation). Despite containing only 3 times the AI as the "30-day briquet", the comparatively harder plaster and larger size of the XR Briquet change the erosion rate allowing sustained s-methoprene release up to 150 days in normal weather.

DOSAGES. XR Briquets should be applied 1 to 2 per 200 sq. ft. in no-flow or low-flow water conditions, depending on the species.

TARGET SPECIES. Targets are the same as for the smaller briquets. Appropriate treatment sites for XR Briquets include storm drains, catch basins, roadside ditches, ornamental ponds and fountains, cesspools and septic tanks, waste treatment settlement ponds, flooded crypts, transformer vaults, abandoned swimming pools, construction and other man-made depressions, cattail swamps and marshes, water hyacinth beds, pastures, meadows, rice fields, freshwater swamps and marshes, woodland pools, flood plains and dredge spoil sites.

ALTOSID PELLETS WSP. Altosid Pellets WSP were approved for use in April 1990. They contain 4% (wt./wt.) s-methoprene (0.04 lb. AI/lb.), dental plaster (calcium sulfate), and charcoal. Like the Briquets discussed above, Pellets are designed to slowly release s-methoprene as they erode. Under normal weather conditions, control can be achieved for up to 30 days.

DOSAGES. Label application rates can range from 2.5 lbs. to 10.0 lbs. per acre (0.1 to 0.4 lb. AI/acre), depending on the target species and/or habitat.

TARGET SPECIES. The species are the same as listed for the briquet formulations. Listed target sites include pastures, meadows, rice fields, freshwater swamps and marshes, salt and tidal marshes, woodland pools, flood plains, tires and other artificial water holding containers, dredge spoil sites, waste treatment ponds, ditches, and other man-made depressions, ornamental pond and fountains, flooded crypts, transformer vaults, abandoned swimming pools, construction and other man-made depressions, tree holes, storm drains, catch basins, and waste water treatment settling ponds.

METALARV S-PT. MetaLarv S-PT was approved for use by the EPA in 2015 under EPA Reg. No. 73049-475. It contains S-Methoprene at 4.25% net weight per 40 lb container of product. It acts as an insect growth regulator for up to 42 days.

DOSAGES. Depending on the ecological location the dosages (lbs/acre) vary. In smaller container locations (ornamental fountains, transformer vaults, swimming pools etc.) or low water flood water sites (pastures, meadows, bogs, etc.) 2.5-5 lbs/acre is recommended. In larger more contaminated holding sites or flood water location holding more water 5-10 lbs/acre is recommended.

TARGET SPECIES. MetaLarv S-PT is designed to mitigate the emergence of *Aedes*, *Ochlerotatus*, *Psorophora*, *Anopheles*, *Culex*, *Culiseta*, *Coquillettida*, and *Mansonia* spp.

METALARV XRP. MetaLarv XRP was approved for use by the EPA in 2020 under EPA Reg. No. 73049-475. It contains S-Methoprene at 4.25% net weight per 40 lb container of product. It acts as an insect growth regulator for up to 105 days in drainage systems and 42 days in surface waters.

DOSAGES. Typical treatment dosages include 1 pouch per closed water system, or in larger drainage systems to be 1 pouch/100 sq. ft.

TARGET SPECIES. MetaLarv XRP is recommended for all species of mosquitos that inhabit larger containers as breeding sources or drainage systems where application is advised.

5.5.2 Surface Active Agents.

INTRODUCTION. Larvicides in this category include Oils and ethoxylated Isostearyl Alcohols. Unfortunately, none of the currently supported larvicides previously discussed act as pupacides. Therefore, pupal control must be achieved through the use of these products.

Oils were first used as effective Anopheline larvicides for malaria control in California at the turn of the century. Commonly used larviciding oils kill larvae and pupae when inhaled into the tracheae along with air at the surface of the water. With low dosages below 3 gallons per acre adequate mosquito control is not achieved. Dosage rates ranging from 3 gallons to 5 gallons per acre provide adequate mosquito control.

The District generally uses surface oils in heavily polluted waters, where beneficial organisms are low or nonexistent, in areas with late (non-feeding) instar larvae or pupae, or in areas where other larvicides have failed.

COCOBEAR MOSQ LARVICIDE OIL. CocoBear Mosquito Larvicide Oil was approved by the EPA in 2012 under EPS Reg. No. 8329-93. It contains mineral oil at 10% net weight. It acts as a larvicide and pupacide product by suffocating surface insects then dissipating in the environment. Contains the signal word “CAUTION”.

DOSAGES. Depends on area and vegetation levels. 3 gallons per surface acre is generally recommended, can be amended for smaller areas of 10 ounces per 1,000 sq. ft. Can also be increased in dense vegetation areas to 5 gallons per acre.

TARGET SPECIES. Suffocation is applicable to all open water sources mosquitoes. Generalist product for control but caution is advised to ensure nontargets are minimally affected.

5.5.3 Stomach Toxins.

INTRODUCTION. Mosquito control makes use of two stomach toxins whose active ingredients are manufactured by bacteria. These control agents are often designated as Bacterial Larvicides. Their mode of action requires that they be ingested to be effective, which can make them more difficult to use than the contact toxins and surface active agents. Bacteria are single-celled parasitic or saprophytic micro-organisms that exhibit both plant and animal properties, and range from harmless and beneficial to intensely virulent and lethal. A beneficial form, *Bacillus thuringiensis* (Bt), is the most widely used (especially in agriculture) microbial pesticide in the world. It was originally isolated from natural Lepidopteran (butterflies and moths) die-offs in Germany and Japan. Various Bt products have been available since the 1950's, and in 1976, Dr. Joel Margalit and Mr. Leonard Goldberg isolated from a stagnant riverbed pool in Israel, a subspecies of *B. thuringiensis* that had excellent mosquito larvicide activities. It was named B.t. variety israelensis (Bti.) and later designated Bacillus thuringiensis Serotype H-14. Either of these two designations may be found on the labels of many bacterial mosquito larvicide formulations used today. Another species of bacteria, *B. sphaericus* (Bs), also exhibits mosquito larvicide properties.

BTI (Bacillus thuringiensis israelensis).

INTRODUCTION. Like a tiny chemical factory capable of only one production run, each Bti organism may produce, if the environmental conditions around it are favorable, five different microscopic protein pro-toxins packaged inside one larger protein container or crystal. The crystal is commonly referred to as delta (d-) endotoxin. If the d-endotoxin is ingested, these five proteins are released in the alkaline environment of an insect larvae's gut. The five proteins are converted into five different toxins if specific enzymes also are present in the gut. Once converted, these toxins work alone or in combination to destroy the gut wall. This leads to paralysis and death of the larvae.

Bti is grown commercially in large fermentation vats using sophisticated techniques to control environmental variables such as temperature, moisture, oxygen, pH and nutrients. The process is similar to the production of beer, except that Bti bacteria are grown on high protein substrates such as fish meal or soy flour and the spore and delta endotoxin are the end products. At the end of the fermentation process, Bti bacteria exhaust the nutrients in the fermentation machine, producing spores before they lyse and break apart. Coincidental with sporulation, the delta endotoxin is produced. The spores and delta endotoxins are then concentrated via centrifugation and microfiltration of the slurry. It can then be dried for processing and packaging as a solid formulation(s) or further processed as a liquid formulation(s). Since some fermentation medium (e.g. fish meal) is always present in liquid formulations, they generally smell somewhat like the medium.

Products containing Bti are ideally suited for use in integrated pest management programs because the active ingredient does not interrupt activities of most beneficial insects and predators. Since Bti has a highly specific mode of action, it is an insecticide of minimal environmental concern. Bti controls all larval instars provided they have not quit feeding, and can be used in almost any aquatic habitat with no restrictions. It may be applied to irrigation water and any other water sites except treated finished drinking water. Bti is fast acting and its efficacy can be evaluated almost immediately. It usually kills larvae within 1 hour after ingestion, and since each instar must eat in order for the larvae to grow, that means Bti usually kills mosquito larvae within 24 hours of application. It leaves no residues, and it is quickly biodegraded. Resistance is unlikely to develop simultaneously to the five different toxins derived from the Bti delta-endotoxin since they have five different modes of action. This suggests that this mosquito larvicide will continue to be effective for many years.

Bti labels carry the CAUTION signal word, suggesting the material may be harmful if inhaled or absorbed through the skin. However, the 4-hr Inhalation LC 50 in rats is calculated to be greater than 2.1 mg/liter (actual) of air, the maximum attainable concentration. The acute Dermal LD 50 in rabbits is greater than

2,000 mg/kg body weight and is considered to be non-irritating to the eye or skin. That is equivalent to a 220 lb. individual spilling more than a half gallon of Bti liquid onto himself or into his eyes. Toxicology profiles also suggest that the inert ingredients (not the Bti) in liquid formulations, may cause minor eye irritations in humans. The acute Oral LD 50 in rats is greater than 5,000 mg/kg body weight (similar to an individual drinking over 5 quarts) suggesting the material is practically non-toxic in single doses. Common table salt has an LD 50 of 4,000 mg/kg of body weight.

Bti applied at label rates has virtually no adverse effects on applicators, livestock, or wildlife including beneficial insects, annelid worms, flatworms, crustaceans, mollusks, fish, amphibians, reptiles, birds or mammals. However, non-target activity on larvae of insect species normally associated with mosquito larvae in aquatic habitats has been observed. There have reported impacts in larvae in the Order Diptera, Suborder Nematocera, Families Chironomidae (midges), Ceratopogonidae (biting midges) and Dixidae (dixid midges). These non-target insect species, taxonomically closely related to mosquitoes and black flies, apparently contain the necessary gut pH and enzymes to activate delta-endotoxins. However, the concentration of Bti required to cause these effects is 10 to 1,000 times higher than normal use rates. Further, studies report these impacts are short-lived, with the population of these species rebounding quickly.

Concerning the operational use of Bti, timing of application is extremely important. Optimal benefits are obtained when treating 2nd or 3rd instar larvae. Treatments at other development stages may provide less than desired results. Therefore a disadvantage of using Bti is the limited treatment window available.

Bacillus sphaericus.

INTRODUCTION. *Bacillus sphaericus* (Bs) is a commonly occurring spore-forming bacterium found throughout the world in soil and aquatic environments. Some strains produce a protein endotoxin at the time of sporulation. It is grown in fermentation vats and formulated for end use with processes similar to that of Bti. A standard bioassay similar to that used for Bti. has been developed to determine preparation potencies. The bioassay utilizes *Culex quinquefasciatus* 3rd-4th instar larvae. The endotoxin destroys the insect's gut in a way similar to Bti. and has been shown to have activity against larvae of many mosquito genera such as *Culex, Culiseta*, and *Anopheles*. The toxin is only active against the feeding larval stages and must be partially digested before it becomes activated. At present, the molecular action of *Bs* is unknown. Isolation and identification of the primary toxin responsible for larval activity has demonstrated that it is a protein with a molecular weight of 43 to 55 kD.

FORMULATIONS AND DOSAGES. The District utilizes are five basic Bti/Bs formulations: liquids, water dispersible granules, fine granules, water soluble pouches, and briquets. These labels contain the signal word "CAUTION". Since fourth instar mosquito larvae quit feeding prior to becoming pupae, it is necessary to apply product. prior to this point in their development. Although the details are poorly understood, evidence suggests that larvae also undergo a period of reduced feeding or inactivity prior to molting from 1ST to 2ND, 2ND to 3RD, and 3RD to 4TH instars. If we apply Bti/Bs at these points in their development, the toxic crystals may settle out before the larvae resume feeding, and with synchronous broods of mosquitoes, complete control failures may result. With asynchronous broods, efficacy may be reduced. Kills are usually observed within 24 hours of toxin ingestion. As a practical matter, apparent failures are usually followed with oil treatments.

The amount of toxins contained within Bti/Bs products are reported indirectly as the result of at least two different bioassays and are difficult to equate to one another. Prepared volumes of toxins are applied to living mosquito larvae and the resulting mortality produces through formulae numerical measures known as International Toxic Units (ITU's) and *Aedes* aegypti International Toxic Units (AA-ITU's). These measures are only roughly related to observed efficacy in the field, and are therefore inappropriate to consolidate and report on like other toxicants.

BTI LIQUID. Currently, the District utilizes Vectobac 12AS as a commercial brand of Bti liquid. The label recommends using 4 to 16 liquid oz/acre in unpolluted, low organic water with low populations of early instar larvae (collectively referred to below as clean water situations). The Vectobac 12 AS label also recommends increasing the range from 16 to 32 liquid oz/acre when late 3rd or early 4th instar larvae predominate, larval populations are high, water is heavily polluted, and/or algae are abundant. The recommendation to increase dosages in these instances (collectively referred to below as dirty water situations) also is seen in various combinations on the labels for all other Bti formulations discussed below.

Bti liquid may also be “Duplexed” with the Altosid Liquid Larvicide discussed above. Because Bti is a stomach toxin and lethal dosages are somewhat proportional to a mosquito larvae’s body size, earlier instars need to eat fewer toxic crystals to be adversely affected. Combining Bti with methoprene (which is most effective when larvae are the oldest and largest) allows a District to use less of each product than they normally would if they would use one or the other. Financially, most savings are realized for treatments of mosquitoes with long larval development periods, asynchronous broods or areas with multiple species of mosquitoes.

BTI/BS WATER DISPERSABLE GRANULE. VectoBac WDG (Bti) and Vectlex WDG (Bs) brands of water dispersible granules utilized as larvicides by the District. VectoBac WDG directions say to use between 1.75-7.00 oz/acre in smaller locations and 7.00-14.00 oz/acre for larger or dirtier water sources. Vectolex WDG directions say to use 8-24 oz/acre of product in all applicable dirty water sources for mosquito control.

BTI/BS FINE GRANULES. VectoMax FG is a fine granule product that includes a mixture of the bacteria Bti and BS. In most large area settings where a fine granule would be employed, the application rate states to use 5-20 lbs/acre and in small sources, such as stockpiles of tires or landfills, to apply 0.5-2 lbs/1000 sq. ft.

BTI/BS WATER SOLUBLE POUCH. VectoMax WSP is a water-soluble pouch that includes a mixture of Bti and Bs. Due to the target specificity of Bti/Bs these pouches can be utilized in close contact with humans and animals with no deleterious effects. The directions state for one water soluble pouch to be applied for up to 50 sq. ft. in a wide variety of locations.

BTI BRIQUET. FourStar Briquet 90/180 are long release products containing Bti and Bs. These products contain in the label “Warning” thus require different safety precautions as many of our other Bti/Bs products. They contain 1% Bti, 6 % Bs, 60-80% plaster of paris and made up of “other ingredients” to balance the products. Application rates state to place one briquet for sites up to 100 sq. ft. and apply one additional briquet for each 100 sq ft. In dirty and polluted settings to possibly double the application rate.

5.5.4 Spinosad

INTRODUCTION. While many of the previous listed products act in one particular manner, ingested or contact Spinosad is effective in both options. Spinosad is a natural substance made by a bacterium that can toxic to insects. It is a mixture of two chemicals called spinosyn A and spinosyn D. It is used to control a wide variety of pests including thrips, leafminers, spider mites, ants, fruit flies, and for our purposes mosquitoes. Spinosad can be currently found in over 80 registered pesticide products, primarily utilized on agricultural crops and ornamental plants. At the district we utilize Spinosad in a variety of formulations which include: tablets, bi-layer/dust free tablets, and water soluble pouches. Spinosad works by affecting an arthropods nervous system upon contact/ingestion. In an effective treatment, it causes muscles to flex uncontrollably and often physical paralysis leading to death within 1-2 days.

FORMULATIONS. Currently, there are five products utilized by the district containing Spinosad: Natular DT, Natular G30 Granule, Natular G30 WSP, Natular T30, Natular XRT. Each of these products contain the precautionary statements for “CAUTION” and all safety measures abiding by that status should be followed.

NATULAR DT. This product contains 7.48% Spinosad mixture as well as 0.1 grams of Spinosad per extended-release bi-layer tablet. This product can absorb moisture so the weight of the tablet and percent by weight of the active ingredient can vary with hydration. When treating artificial containers, one tablet should be used to treat up to 192 liters (50 gallons).

NATURAL G30 GRANULE. This product contains 2.5% mixture Spinosad per bulk weight of granules. Applications by the district focus on two groups of sources. Areas classified as temporary standing water, freshwater sites, dormant rice fields, freshwater swamps or marshes and marine/costal areas are treated at 5 to 12 lbs. per acre or 5 to 12 g per 100 sq. ft. of water. In areas classified as stormwater/drainage systems and wastewater sites we apply 5 to 20 lbs. per acre or 5 to 20 g per 100 sq. ft. of water.

NATULAR G30 WSP. This product contains 2.5% mixture Spinosad per water soluble pouch. These pouches are designed to be applied at 1-2 pouches per 100 sq. ft. or 1 pouch per 750-1500 gallons. For storm water drainage areas, sewers and catch basins 1 to 2 pouches can be applied per catch basin or contained site.

NATULAR T30. This product contains 8.33% mixture Spinosad per dust-free tablet but it can also absorb moisture so calculation by weight is not a verifiable metric. These tablets are designed to be applied every 30 days in a variety of settings but applied per 100 sq. ft. and increasing the application per 2 ft. in depth.

NATULAR XRT. This product contains 6.25% mixture Spinosad per dust-free tablet but it can also absorb moisture so calculation by weight is not a verifiable metric. Application parameters mimic Natular T30 with the exception of this products extended release over 180 days as opposed to 30 days.

5.5.5 Pyriproxyfen

INTRODUCTION. Similar to Spinosad, Pyriproxyfen (PPF) acts not only on contact but orally ingested as well. Where it differentiates though is it acts as an insect growth regulator rather than a neurologic stimulant. PPF mimics a natural hormone in insects and disrupts their natural growth. While PPF mainly affects young insects and eggs it controls a variety of arthropods such as fleas, cockroaches, ticks, ants, carpet beetles, and most pertinent to the District mosquitoes. PPF is found in more than 300 pesticide products registered by the EPA and is utilized in many forms like liquids, granules dusts, and pellets. The District utilizes PPF in as a dust packet with included pellets, a concentrated liquid and a sand granule.

IN2MIX. This product combines PPF with a fungal bacteria to eliminate all stages of the mosquito within a localized area. The PPF eliminates larva as an IGR and the fungal bacteria, *Beauveria bassiana*, reduces adult viability. These packets contain 74.03% pyriproxyfen and 10% bacteria per 50g packets. These packets are designed to be used in individually placed In 2 Care traps and replaced/refilled every 4 weeks. This product is designed to control all locally identified mosquito species.

NYGUARD IGR CONC. This product contains 10% PPF per container of concentrated liquid. The product is recommended to be used in a wide array of settings but must follow specific mixing instructions based on the area treated. The amount of Nyguard required to treat a 1,500 sq. ft. area changes depending on your needed concentration; 0.01% treatment needs 4 ml of material per gallon of water, 0.02% treatments needs 8 ml per gallon of water, and 0.03% treatment needs 12 ml of material per gallon of water.

SUMILARV. This product contains 0.5% PPF as the active ingredient. These sand granules are applied to a variety of open/closed water sources and treatment amounts are based on the total volume of the water source. Sources that are up to 500 gallons of water are treated with 10g of material, 500-1000 gallon sources with 30g of material, 1500-3000 gallons with 60g, 3000-4500 gallons with 90g, and 4500-6000 gallons with 120g of material. These treatments last up to 6 weeks of control at which time reassessment of area control is necessary.

5.5.6 Larviciding Techniques and Equipment.

A variety of larviciding equipment is used for both aerial and ground applications, necessitated by the wide range of breeding habitats, target species, and budgetary constraints. There are advantages and disadvantages to each application system and to the ground treatments themselves.

The District regularly uses the following ground application equipment and techniques:

5.5.6.1 Ground Application Equipment.

The District uses 4-wheel drive pick-ups equipped with sprayer units primarily for larviciding. In most cases, the spray equipment is bolted to the bed of the tuck. Chemical container tank, high pressure pump (for spray volume), low volume electric, (for low volume spray of pesticides), 18 Hp gasoline driven Kolher engine (Blower) and spray wand mounted to the driver side of the vehicle, control panel to operate the equipment is located in the cab of the truck. The driver can operate the power spray equipment from inside the cab of the truck.

Specialized equipment, such as All Terrain Vehicle's (ATV's) and curb rigs, have a chemical container mounted on the vehicle, a 12 volt electric pump supplying high pressure low volume flow, and a hose and spray tip allowing for application while steering the vehicle. ATV's are ideal for treating areas such as agricultural fields, pastures, and other off-road sites. Additional training in ATV safety and handling is provided to employees before operating these machines. The curb rigs are right hand drive vehicles designed to apply larvicides to catch basins.

Additional equipment used in ground applications includes hand held sprayers, broadcast spreaders and backpack blowers. Hand held sprayers (hand cans) are standard one or four gallon style pump-up sprayers used to treat small isolated areas. The broadcast spreaders are used to apply granules and pellets. Backpack sprayers are gas powered blowers with a chemical tank and calibrated proportioning slot. Generally a pellet or small granular material is applied with a backpack sprayer or "belly grinder" machine designed to distribute pellets or granules.

5.6.6 Discussion.

ADVANTAGES OF GROUND APPLICATION. There are several advantages to using ground application equipment, both when on foot and when conveyed by vehicles. Ground larviciding allows applications while in close proximity to the actual treatment area, and consequently treatments to only those micro habitats where larvae are actually present. This also reduces both the unnecessary pesticide load on the environment and the financial cost of it. Both the initial and the maintenance costs of ground equipment is generally less than those for aerial equipment. Ground larviciding applications are less affected by weather conditions than are aerial applications.

DISADVANTAGES OF GROUND APPLICATION. Ground larviciding is impractical for large or densely wooded areas. There is also a greater risk of chemical exposure to applicators than there is during aerial larviciding operations. Damage may occur from the use of a ground vehicle in some areas. Ruts and vegetation damage may occur, although both these conditions are reversible and generally short-lived. Technicians are trained to recognize sensitive areas and to use good judgement to avoid significant impacts.

MANAGING LARVICIDE RESISTANCE. Selecting the proper class of larvicide and the formulation are both important in pesticide resistance management.

One way to encourage resistance is to use sub-lethal dosages. Many feel that the USEPA erred when it began allowing the market (cost) to dictate what the low dosage would be, despite the recommendations on the product label. Insects with inherent tolerances for weakly applied pesticides may survive to produce tolerant offspring. Soon, an entire population of tolerant mosquitoes may arise, and then continued use of the very low dose that caused the problem will affect only non-targets. Another way to accomplish the same thing is to depend on slow-release formulations beyond their recommended use period. Release rate studies have shown that the active ingredient are not available "linearly", and that beyond the recommended time limits, they may be sublethal. Districts acknowledge these issues, and take measures to rotate pesticides used on larval sites to avoid this situation.

Currently used mosquito larvicides, when applied properly, are efficacious and environmentally safe. These agents have been successfully integrated into District programs. Compared to the adulticides, there is less concern for the drift of mosquito larvicides, primarily due to application techniques. Mosquito larvicides are usually applied directly into natural and man-made aquatic habitats as liquid or solid formulations, and aerial drift is negligible. Drift in water can result from flushing or rainwater runoff. Under these conditions, dilution greatly reduces the pesticide concentration and consequently reduces exposure to non-targets.

Application of larvicides to organic croplands is an issue that the District has worked with and continues to the present. Larvicide applications are often a result of natural conditions such as flood water or rainwater breeding mosquitoes on organic croplands. The District takes measures to avoid impacts to organic growers. Organic farmland is located and plotted by the district. The District contacts organic growers before applying any larvicides to their crop. Under the California Health and Safety Code section 110825 the District is allowed to apply adulticides to organically grown crops as long as the residue level does not exceed 5% of the Environmental Protection Agencies established residue allowed for that crop. However, the United States Department of Agriculture is currently developing a national organic rule that will address adutlicide applications to organic crops, once the new rule is adopted, it will determine if any, the adulticides that can be applied to organically grown crops to control mosquitoes.

<u>5.7 Analysis of CEQA Exemptions.</u>

CEQA categorical exemption classes 7 and 8 (CEQA Guidelines sections 15307 & 15309) exempt actions taken by regulatory agencies as authorized by state law to assure the maintenance, restoration, enhancement or protection of a natural resource or the environment where the regulatory process involves procedures for the protection of the environment. As discussed in section 3 regarding biological control, the District qualifies as a “regulatory agency” under these exemptions. The remaining issues as applied to chemical control therefore are these:

- Whether the District’s chemical control activities as described above assure the maintenance, restoration, enhancement or protection of a natural resource or the environment.

- Whether the District’s regulatory processes involve procedures for the protection of the environment.

<u>5.7.1</u> The District’s chemical control activities as described above assure the maintenance, restoration, enhancement or protection of natural resources or the environment.

The use of pesticides is an effective means to control mosquito populations in the District. The use of larvicides maintains and limits the proliferation of mosquito larvae in water sources. This control method maintains and protects the environment in a condition more safe, healthful and comfortable for humans.

The District contains many sources that act as mosquito breeding areas near populated areas. Without ongoing and effective vector control, substantial mosquito activity would significantly and adversely effect the human environment. The District’s mosquito control program, including chemical control, is essential to maintain the vectors in the environment at a tolerable level. The District’s program will never alleviate all mosquitoes. Rather, it is a resource maintenance program aimed at striking a balance to allow comfortable and healthful human existence within the natural environment, while protecting and maintaining the environment. History has shown us that the control and abatement of vectors are necessary for our human environment to continue to be habitable.

<u>5.7.2</u> The District’s regulatory process involves procedures for the protection of the environment.

In addition to the environmental protection measures and procedures inherent in the District’s IVM program as discussed in section 3, there are other practices unique to the District’s chemical control program that protect the environment:

There are numerous federal and state laws and regulations that strictly control and regulate the storage, transport, handling, use and disposal of the pesticides in order to protect against surface and groundwater contamination and other impacts to the environment and public health. (E.g., Federal Insecticide, Fungicide and Rodenticide Act; Cal. Food & Agric. Code divisions 6 & 7; Cal. Code of Regs., title 3, division 6.) The District and its staff consistently comply with these laws and regulations.

The District uses only pesticides registered by the U.S. Environmental Protection Agency and California Department of Pesticide Regulation. The District then strictly complies with the pesticide label restrictions and requirements concerning the storage, transport, handling, use and disposal of the pesticides.

Consistent with the District's integrated vector management principles, when using pesticides, the District selects the least hazardous material that will meet its goals and the District rarely uses restricted materials-type pesticides.

Pesticides are applied only by duly certified and trained vector control technicians or applied by seasonal personnel under the direct supervision of a certified employee. The training includes education on appropriate practices to avoid environmental impacts and assure compliance with regulatory requirements.

The District regularly calibrates its pesticide application equipment to ensure that it emits the proper quantities of material.

6. EXCEPTIONS TO CATEGORICAL EXEMPTIONS.

A project or activity that is otherwise categorically exempt from CEQA may not be exempt if one of three exceptions applies (CEQA Guidelines § 15300.2):

1. There is a reasonable possibility that the activity may have a significant effect on the environment due to unusual circumstances;

2. The cumulative impact of successive projects of the same type in the same place, over time is significant; or

3. For categorical exemption classes 3, 4, 5, 6 and 11 (i.e., applies only to physical control), the project may impact an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted by a federal, state or local agency.

The District has considered these exceptions as applied to its usual and ordinary mosquito surveillance and control practices, and, based on the District's information and evaluation, none of the exceptions applies to the usual mosquito control program. However, in the future the District could be involved in a particular mosquito control activity that triggers or implicates one of these exceptions. The Board of Trustees of San Gabriel Valley Mosquito and Vector Control District delegate to the District Manager the responsibility to evaluate the particular activity on a case-by-case basis to determine whether the exception applies. Because it is impossible to determine what those future activities might me that would trigger an exception to the exemption, the District can only commit to evaluating the future activity. The methodology used to conduct the evaluation will be based upon the nature of the activity.

7. CONCLUSION.

Except for major land alteration/source reduction projects and activities that may fall within one of the exceptions to the CEQA categorical exemptions, the District's usual and ongoing integrated mosquito management program and activities as described in this assessment are categorically exempt from CEQA.

8. REFERENCES:

Durso, S.L. 1996. The Biology and Control of Mosquitoes in California. Mosquito and Vector Control Association of California. 150pp.

Reeves, W.C. 1990. Epidemiology and control of mosquito-borne arboviruses in California, 1943-1987. Mosquito and Vector Control Association of California. 508 pp.

Interagency guidelines for the surveillance and control of selected vector-borne pathogens in California. Mosquito and Vector Control Association of California. xx pp.

Service, M.W. Mosquito ecology field sampling methods. 1993. Second Edition. Elsevier Applied Science. 988 pp.

Mount, G.A., C.S. Lofgren, K.F. Baldwin and N.W.Pierce. 1970 Droplet size and mosquito kill with ultra low volume aerial sprays dispersed with a rotary-disc nozzle Part II. Mosq. News 30

Thompson, Malcolm A. 1989 Susceptibility Levels of Adult Mosquitoes to the Organophosphorus Insecticides in California Proceedings and Papers of the Fifty-seventh Annual Conference of the California Mosquito and Vector Control Association, Inc. January 29 thru February 1, 1989.

University of California Statewide Integrated Pest Management Project Publication 3324 -1988 The Safe and Effective Use of Pesticides.

Armstrong, J.A. 1979. Effect of meteorological conditions on the deposit pattern of insecticides. Mosq. News 39

Florida Coordinating Council on Mosquito Control 1998 Florida Mosquito Control: The state of the mission as defined by mosquito controllers, regulators, and environmental managers.

University of Florida Mosquito and Vector Control Association of California 1996 The Biology and Control of Mosquito in California *Mosquito and Vector Control Association of California (Year Unknown) Pesticide Applications and Safety Training For Applicators Of Public Health Pesticides Proceedings and Papers of the Annual Conferences of the Mosquito and Vector Control Association of California 1973-1997.*

COPY

CEQA Notice of Exemption

To: Conny B. McCormack, County Clerk
County of Los Angeles
12400 E. Imperial Hwy.
Norwalk, CA 90650

From: San Gabriel Valley Mosquito and Vector Control District
1145 N. Azusa Canyon Road
West Covina, CA 91790

Project Title: District vector surveillance and control program.

Project Location - Specific: All areas throughout the listed cities and county within the boundaries of the District, and in particular all existing and potential mosquito, black fly, bee, wasp, midge, tick, flea, rat, mice, ground squirrel, and other vector breeding/nesting sites.

Project Location **Cities:** Alhambra, Arcadia, Azusa, Bradbury, Claremont, Covina, Duarte, El Monte, Glendora, Industry, Irwindale, La Puente, La Verne, Monterey Park, Monrovia, Pomona, Rosemead, San Dimas, San Gabriel, Sierra Madre, Temple City, Walnut, and West Covina.

County: Those unincorporated areas of Los Angeles County which lie within the boundaries of the District.

Description of Project: The project consists of the District's ongoing program of integrated pest management and control, which consists of education, surveillance and monitoring of vectors and treatment and control using a variety of physical control and source reduction (including the operation, maintenance and minor alteration of land, water, and existing drainage facilities), biological control (including the use of mosquitofish), and chemical control (including the use of pesticides), all as more specifically described in the District's CEQA Preliminary Assessment dated December 11, 1998.

Name of Public Agency Approving Project: San Gabriel Valley Mosquito and Vector Control District.

Name of Person or Agency Carrying Out Project: San Gabriel Valley Mosquito and Vector Control District and its staff managed by the District Manager.

Exempt Status: *(check one)*

_X_ Ministerial (Sec. 21080(b)(1); 15268);
____ Declared Emergency (Sec. 21080(b)(3); 15269(a));
_X_ Emergency Project (Sec. 21080(b)(4); 15269 (b)(c));
_X_ Categorical Exemption. State type and section number: Exempt pursuant to CEQA Guidelines sections 15301, 15302, 15304, 15306, 15307, 15308, 15309, 15321, and 15322 as described on District Resolution No. 98-05, attached hereto and incorporated herein.
____ Statutory Exemptions. State code number:____________________

Reasons Why Project is Exempt: See District Resolution No. 98-05, attached hereto and incorporated herein.

Lead Agency Contact Person: District Manager, P. Sue Zuhlke; Phone Number: (626) 814-9466

If filed by applicant: N/A

1. Attach certified document of exemption finding.
2. Has a notice of exemption been filed by the public agency approving the project?__Yes __No

Signature: Sue Zuhlke Date: 12-11-98 Title: District Manager

_X_ Signed by Lead Agency Date received for filing at OPR: N/A

____ Signed by Applicant

A RESOLUTION OF THE BOARD OF TRUSTEES OF THE SAN GABRIEL VALLEY MOSQUITO AND VECTOR CONTROL DISTRICT ADOPTING CEQA IMPLEMENTING REGULATIONS, PRELIMINARY ASSESSMENT AND EXEMPTIONS, AND APPROVING CEQA NOTICE OF EXEMPTION FOR VECTOR CONTROL PROGRAM

RESOLUTION NO. 98-05

WHEREAS, the California Environmental Quality Act (CEQA) and CEQA Guidelines require the District to adopt objectives, criteria, and procedures for the evaluation of projects and the preparation of environmental documents (Pub. Res. Code, § 21082; CEQA Guidelines, § 15022(a));

WHEREAS, CEQA Guidelines section 15022(d) authorizes the District to adopt the State CEQA Guidelines through incorporation by reference as the District's implementing procedures;

WHEREAS, the District has prepared a CEQA Preliminary Assessment evaluating the CEQA-exempt status of its vector surveillance and control program; and,

WHEREAS, by this resolution, the District adopts the Preliminary Assessment, determines that its vector surveillance and control program is exempt from CEQA, and authorizes the execution and filing of a CEQA Notice of Exemption;

NOW, THEREFORE, BE IT RESOLVED by the Board of Trustees of the San Gabriel Valley Mosquito and Vector Control District as follows:

1. Adoption of CEQA Guidelines. The State CEQA Guidelines (California Code of Regulations, Title 14, Chapter 3, § 15000 et seq.), as the same may be amended from time to time by the State Secretary for Resources, are hereby adopted and incorporated by reference as the District's procedures, objectives, and criteria to implement CEQA.

2. Approval ofPreliminary Assessment. The District hereby adopts the CEQA Preliminary Assessment for Vector Control dated December 11, 1998 as presented at this meeting and on file in the District office.

3. Approval ofProject. The District Board hereby approves the ongoing vector surveillance and control program as described in the Preliminary Assessment (the "Project").

4. Findings ofCEQA Exemption. Based on the Preliminary Assessment, and as explained in more detail in the Preliminary Assessment, the Board hereby finds that the Project is exempt from CEQA as follows:

A. Surveillance and Monitoring. Because the District's vector surveillance and monitoring activities constitute basic data collection, research, experimental management, resource evaluation, inspection, and monitoring of vector levels and adequacy of treatment performance, the activities are exempt from CEQA pursuant to CEQA Guidelines sections 15306 and 15309. This finding of exemption does not apply to surveillance and monitoring activities that result in a serious or major disturbance to an environmental resource.

B. Biological Control. Because the District's biological control activities constitute actions by the District as a regulatory agency to assure the maintenance, restoration, enhancement, and protection of the environment and natural resources, the activities are exempt from CEQA pursuant to CEQA Guidelines sections 15307 and 15308.

C. Physical Control. Because the District's physical control and source reduction activities constitute the operation, maintenance and minor alteration of land, water, and existing drainage facilities, and removal of minor vegetation, the activities are exempt from CEQA pursuant to CEQA Guidelines sections 15301, 15302, and 15304. This finding of exemption does not apply to rotational impoundment management, major trenching and ditching, other major land alteration/source reduction projects, and any project that involves the removal of mature, scenic trees or endangered or threatened plants.

D. Chemical Control. Because the District's chemical control activities constitute actions by the District as a regulatory agency to assure the maintenance, restoration, enhancement, and protection of the environment and natural resources, the activities are exempt from CEQA pursuant to CEQA Guidelines sections 15307 and 15308.

E. Public Education. Because the District's education activities constitute the adoption, alteration, or termination of educational or training programs which involve no physical alteration in the area affected or which involve physical changes only in the interior of existing school or training structures, the activities are exempt from CEQA pursuant to CEQA Guidelines section 15322.

5. Approval of Notice of Exemption. The District Manager is authorized and directed to sign and file a CEQA Notice of Exemption consistent with the above finding.

6. Delegation of Authority to District Manager. The Board hereby authorizes the District Manager or his or her designee to perform the following functions and responsibilities concerning CEQA compliance:

A. To execute and file CEQA Notices of Exemption.

B. To periodically review, and update as necessary, the District's CEQA Preliminary Assessment.

C. For activities and projects that are not exempt from CEQA under the above findings and the adopted Preliminary Assessment: to prepare and conduct CEQA initial studies and other preliminary assessments; to decide whether the activity is exempt; and, to prepare or cause to be prepared negative declarations and/or environmental impact reports. Provided, however, that the following actions shall require approval by the Board of Trustees: approval of contracts with environmental consultants, adoption of new or revised CEQA preliminary assessments, and adoption of final negative declarations and environmental impact reports.

PASSED AND ADOPTED by the Board of Trustees of the San Gabriel Valley Mosquito and Vector Control District on the 11th day of December, 1998, by the following vote:

AYES: Barakat, Barron, Bruesch, Evans, Finlay, Hackney, Hall, Herfert, Kern, Leiga, Moranda, Morgan, Neher, Nodal, Pedroza, Phillips, Polimeni, Swain, Sykes, White

NOES: None

ABSTAIN: None

ABSENT: Condie, Hammond, Templeman, Thurston

Henry Morgan, President of the Board of Trustees

ATTEST:

41!

David M. Barron, Secretary of the Board of Trustees