

COUNTY OF SAN DIEGO

GUIDELINES FOR DETERMINING SIGNIFICANCE
AND
REPORT FORMAT AND CONTENT REQUIREMENTS

VECTORS



LAND USE AND ENVIRONMENT GROUP

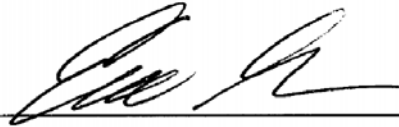
Department of Planning and Land Use
Department of Public Works

July 30, 2007

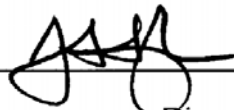
Modified January 15, 2009

APPROVAL

I hereby certify that these **Guidelines for Determining Significance and Report Format and Content Requirements for Vectors** are a part of the County of San Diego, Land Use and Environment Group's Guidelines for Determining Significance and Technical Report Format and Content Requirements and were considered by the Director of Planning and Land Use, in coordination with the Director of Public Works on the 30th day of July, 2007.



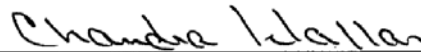
ERIC GIBSON
Interim Director of Planning and Land Use



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Director of Public Works

I hereby certify that these **Guidelines for Determining Significance and Report Format and Content Requirements for Vectors** are a part of the County of San Diego, Land Use and Environment Group's Guidelines for Determining Significance and have hereby been approved by the Deputy Chief Administrative Officer (DCAO) of the Land Use and Environment Group on the 30th day of July, 2007. The Director of Planning and Land Use is authorized to approve revisions to these Guidelines for Determining Significance and Report Format and Content Requirements for Vectors except any revisions to the Guidelines for Determining Significance presented in Section 4.0 must be approved by the DCAO.

Approved, July 30, 2007



CHANDRA WALLAR
Deputy CAO

COUNTY OF SAN DIEGO
GUIDELINES FOR DETERMINING SIGNIFICANCE
VECTORS



LAND USE AND ENVIRONMENT GROUP

Department of Planning and Land Use
Department of Public Works

July 30, 2007

EXPLANATION

These Guidelines for Determining Significance for Vectors and information presented herein shall be used by County staff in the review of discretionary projects and environmental documents pursuant to the California Environmental Quality Act (CEQA). These Guidelines present a range of quantitative, qualitative, and performance levels for particular environmental effects. Normally, (in the absence of substantial evidence to the contrary), an affirmative response to any one Guideline will mean the project will result in a significant effect, whereas effects that do not meet any of the Guidelines will normally be determined to be “less than significant.” Section 15064(b) of the State CEQA Guidelines states:

“The determination whether a project may have a significant effect on the environment calls for careful judgment on the part of the public agency involved, based to the extent possible on factual and scientific data. An ironclad definition of significant effect is not always possible because the significance of an activity may vary with the setting.”

The intent of these Guidelines is to provide a consistent, objective and predictable evaluation of significant effects. These Guidelines are not binding on any decision-maker and do not substitute for the use of independent judgment to determine significance or the evaluation of evidence in the record. The County reserves the right to modify these Guidelines in the event of scientific discovery or alterations in factual data that may alter the common application of a Guideline.

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List of Acronyms

BMP	Best Management Practice
CDC	Center for Disease Control
DEH	Department of Environmental Health
HOA	Homeowners Association
HSC	Health and Safety Code
SDCC	San Diego County Code
SWMP	Stormwater Management Plan
VCP	Vector Control Program
WNV	West Nile Virus

INTRODUCTION

This document provides guidance for evaluating the adverse environmental effects that a proposed project may have related to vectors. Specifically, this document addresses the following supplemental vector questions that the County of San Diego has added to the questions listed in the California Environmental Quality Act (CEQA) Guidelines, Appendix G, under VII. Hazards and Hazardous Materials:

Would the project substantially increase human exposure to vectors capable of spreading disease by:

- a. Proposing a vector breeding source, including but not limited to, sources of standing water for more than 72 hours (e.g. ponds, stormwater management facilities, constructed wetlands); or
- b. Proposing a vector breeding source, including but not limited to, composting or manure management facilities, confined animal facilities, animal boarding/breeding/training operations; or
- c. Proposing a substantial increase in the number of residents located within one-quarter mile of a significant existing offsite vector breeding source.

1.0 GENERAL PRINCIPLES

A vector is any insect, arthropod, rodent or other animal of public health significance that can cause human discomfort, injury or is capable of harboring or transmitting the causative agents of human disease. Zoonoses are diseases of domestic and wild animals that can be transmitted to humans under natural conditions. Zoonotic disease-causing microorganisms can be carried by a "vector," such as a flea, tick, or mosquito, that transfers the disease agent from its source in nature to a human host. In the County of San Diego, the most significant vector populations include mosquitoes, rodents, flies, and fleas. Important vectors in San Diego County and the major sources of these vectors are discussed below.

1.1 Vectors and Disease

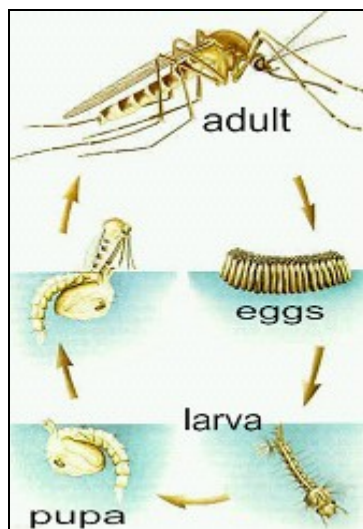
1.1.1 Mosquitoes

The mosquito has four stages of life (Figure 1, The Mosquito Life Cycle). The life cycle begins when a female lays an egg raft on top of water that can contain up to 100 eggs. Total development from egg to adult can be less than one week during periods of warm weather and the average mosquito lives for about two weeks. Almost all mosquitoes need standing water to complete their life cycle. For this reason, mosquitoes are found in areas of standing water including wetlands, irrigation ponds, detention basins, percolation and infiltration basins, and other stormwater conveyance systems.

Some mosquito species are vectors of diseases. There are approximately 24 different species of mosquitoes that are found in San Diego County and of these, there are at least four that are known to carry diseases that can be passed to humans. Discomfort

is probably one of the primary motives for local public support of mosquito control programs, especially in urban areas. However there is no practical distinction between human - vector contact that merely causes discomfort and human - vector contact that increases human exposure to vectors capable of transmitting significant human health diseases. The recent spread of West Nile virus (WNV) has increased the health risk of mosquito contact and increased the importance of designing and maintaining potential vector breeding sources to prevent mosquito breeding. Prevention and remedial measures can also protect or prevent (1) the individuals who are allergic to bites of various mosquitoes and other vector species; (2) numerous bites or stings from vectors which destroy the pleasure of patio or garden use in suburban areas; (3) large numbers of biting or stinging vectors in recreational areas; and (4) secondary infections which can result from the bites and stings of vectors.

Figure 1. The Mosquito Life Cycle



Arboviruses

Arboviruses (arthropod-borne viruses) are a large group of viruses that are spread mainly by blood-sucking insects. In the United States, arboviruses are most commonly spread by mosquitoes. Arboviruses that have been found or may occur in San Diego County include Western equine encephalitis, Saint Louis encephalitis, and most recently WNV. The aforementioned arboviruses are transmitted to humans through mosquito bites. Birds are often the source of infection for mosquitoes, which can then spread the infection to horses, other animals, and people. Most people infected with arboviruses have few or no symptoms, but arboviruses can cause serious and potentially fatal inflammation of the brain (encephalitis) as well as other complications.

As an example, WNV infected mosquitoes can transmit WNV to both humans and other animals, such as horses. WNV is not spread from person to person, only certain species of mosquitoes carry the virus, and very few mosquitoes are actually infected. An infected mosquito can bite any animal, but not all animals will become ill.

The majority of people and animals that are infected with WNV have a mild illness or no symptoms. In rare cases, WNV can cause encephalitis in humans. The elderly are at a higher risk for the disease. Symptoms can include fever, headache, nausea, body aches, mild skin rash, or swollen lymph nodes. The incubation period of the virus ranges from three to fifteen days in humans.

San Diego County's Vector Control Program (VCP), discussed further in Section 2.3, has developed a comprehensive early detection, surveillance, and response plan to control the spread of WNV. Included in the plan are surveillance measures such as dead bird testing, sentinel chicken testing, and year round mosquito trapping. Some bird species are particularly sensitive to the virus and can provide an early warning that the

virus is circulating in a certain area. Other enhancements include significant education and outreach through the VCP website at www.sdfightthebite.com.

1.1.2 Rodents

A rodent is a mammal of the order *Rodentia*, such as a mouse, rat or squirrel. Rats are very destructive pests that can spread disease, contaminate foods and food preparation areas, and cause costly structural damage. Diseases spread by rats that can harm humans include plague and hantavirus.

Plague

Plague is a bacterial disease carried by rodents that is spread through the bite of an infected flea. Rodents, usually ground squirrels, can carry plague. Humans and their pets can also be infected with plague if bitten by infected fleas at campgrounds or rural areas, typically at the higher elevations. The County conducts plague surveillance, mostly at higher elevation localities. Surveillance and testing often yields one or more positive blood tests in ground squirrels each year. In response, plague-warning signs are posted at campgrounds to inform visitors of the appropriate precautions.

Hantavirus

Hantavirus is a potentially fatal rodent-borne disease. Both hemorrhagic and respiratory strains of hantavirus occur in wild rodents (deer and harvest mice) in San Diego County. Humans typically become infected with hantavirus by breathing air-borne particles of wild rodent droppings and urine contaminated with the virus. Symptoms of the virus include fever, headache, nausea, vomiting, and respiratory failure. Most human cases occur when people open up and occupy mountain cabins or other small-enclosed structures that are infested with wild mice. The first locally acquired human case of hantavirus reported in San Diego County was in Campo in 2004.

1.1.3 Flies

Flies are two-winged insects of the order *Diptera*. Flies have the potential to carry and transmit pathogens. Flies have been known to transmit salmonella, shigella, and typhoid as well as parasitic worms and protozoa. When flies forage on feces and spoiled food they come into contact with these pathogens and can spread them to other animals and humans. The fly that is most often a pest to humans is the house fly. In two weeks, one female fly may lay more than 1,000 eggs in sources including but not limited to, animal wastes, household garbage and piled lawn clippings.

The most common fly diseases are dysentery, salmonella, and e-coli that can cause stomach infection with cramping, fever or blood-stained stools; and cholera which is an infection of the intestines that can cause diarrhea.

1.1.4 Fleas

Fleas are small, wingless, dark brown insects. Their thin bodies allow them to hop, jump and move quickly through hair and feathers. Fleas are usually brought into the home by dogs, cats or other furry pets. In order to live and reproduce, they feed off the blood of humans and animals, such as dogs and cats. Diseases spread by fleas include plague, tapeworm and typhus. Tapeworms are an intestinal parasite obtained by swallowing an infected flea and Murine Typhus is a disease spread by the bite of a rat flea. Prevention is the best way to control flea bites. Preventative measures should be taken before flea season begins in spring and summer.

1.2 Vector Sources

Vector sources occur where site conditions provide habitat suitable for breeding. Backyard residential sources of standing water are common vector breeding sources. These sources include unmaintained swimming pools and buckets, toys, and other common items that can hold even small amounts of water. Ponds and reservoirs are another major source of vectors. The vector sources listed below focus specifically on the types of vector breeding sources that would most commonly be associated with proposed land development projects and that could represent a potential hazard related to vector generation.

1.2.1 Standing Water

Any source of standing water, including but not limited to natural and constructed wetlands, irrigation ponds, detention basins, percolation and infiltration basins, and other stormwater conveyance systems that hold standing water can be breeding grounds for mosquitoes and other vectors resulting in adverse public health effects related to vectors and disease transmission.

Stormwater Management

A standard requirement for new development is the incorporation of measures, or Best Management Practices (BMPs), to reduce stormwater flow rates, allow stormwater to infiltrate back into the ground, and to reduce constituent concentrations in runoff. Unfortunately, BMPs for managing runoff often provide aquatic habitats suitable for mosquitoes and other vector species as an unintended consequence of their implementation.

Examples of post-construction conditions that may increase the probability of mosquito production in Stormwater Management BMPs include clogging (e.g., effluent pipes, media filters, infiltration basins), establishment of invasive or exotic vegetation, groundwater fluctuations, non-stormwater runoff (i.e., increases in runoff frequency, residence time, and/or volume), scouring and erosion, structural damage (e.g., shifting or settling, roots), trash and sediment accumulation (e.g., formation of pools, clogging, redirected water flows), vandalism, and vegetation overgrowth. Other conditions favorable to mosquito production may become apparent as structures age.

An often overlooked aspect of treatment BMP implementation is the long-term commitment of funds necessary for proper maintenance of structures. Routine and timely maintenance is critical for suppressing mosquito breeding as well as for meeting local water quality goals. If maintenance is neglected or inappropriate for a given site, even structures designed to be the least “mosquito friendly” may become significant breeding sites. Furthermore, unmaintained BMPs can revegetate with native plant species and provide habitat for endangered, threatened, or sensitive species which can complicate ongoing maintenance if activities conflict with regulatory protections for habitats and water bodies.

Every possible effort should be made to “design the bugs out” during early project design phases. Vectors should be addressed during the preparation of stormwater management and maintenance plans and during preconstruction planning to avoid creating possible public health hazards. The County of San Diego includes guidance in the Standard Urban Stormwater Mitigation Plan (SUSMP) to consult vector control authorities to verify the acceptability of detention basins to minimize the mosquito production potential of treatment BMPs. The County of San Diego requires that stormwater management facilities be designed so that water will drain within 72 hours to prevent mosquito breeding.

Wetlands

Wetlands are a potential source of vector breeding habitat. The condition of the wetland dictates its potential to generate vectors. For example, flowing and aerated water does not support mosquito breeding, while stagnant water does support mosquitoes. It is important that when a natural wetland is located on a proposed project site, that any habitat management plan take into account the need for the management of vectors. Similarly, easements to protect wetlands should recognize that entry by vector control professionals may be required to monitor and abate vectors for the protection of public health and safety.

1.2.2 Composting and Manure Management

The presence of large quantities of manure can significantly increase problems related to vectors, particularly from the breeding of flies. Equine operations, kennels, and animal agricultural uses such as poultry ranches or other animal breeding operations can increase vector populations, if not properly managed.

Proper planning and effective management of sources of manure can ensure that intense breeding grounds for vectors are not supported. Nuisance insects that do not transmit disease can occur in sufficient numbers to become a public health problem by causing intense annoyance and distress to humans and animals. To minimize the generation of both disease and nuisance causing insects, proper management practices must be identified for all facilities or operations that deal with manure and/or composting.

2.0 EXISTING REGULATIONS AND STANDARDS

There are several existing Federal, State, and local programs, which have been enacted to prevent or mitigate the damage to public health and safety and the environment from vectors. In California, these programs have been created via the Health and Safety Code.

2.1 Federal Regulations and Standards

Center for Disease Control; National Center for Infectious Diseases; Division of Vector-Borne Infectious Diseases [<http://www.cdc.gov/ncidod/dvbid/index.htm>]

The Division of Vector-Borne Infectious Diseases serves as a national and international reference center for vector-borne diseases. As one of the few remaining centers responsible for these agents, it is incumbent on the division to maintain leadership and scientific competence in all major disciplines relating to the field of vector-borne infectious diseases. The mission of the division is to (1) develop and maintain effective surveillance for vector-borne viral and bacterial agents and their arthropod vectors; (2) conduct field and laboratory research and epidemic aid investigations; (3) define disease etiology, ecology, and pathogenesis in order to develop improved methods and strategies for disease diagnosis, surveillance, prevention and control; (4) provide diagnostic reference and epidemiologic consultation, on request, to state and local health departments, other components of CDC, other federal agencies, and national and international health organizations; and (5) provide intramural and extramural technical expertise and assistance in professional training activities. Emphasis is given to laboratory and epidemiological research to improve diagnosis, surveillance, prevention, and control of diseases of major public health importance such as Lyme disease, dengue/dengue hemorrhagic fever, WNV, yellow fever, arboviral encephalitis, plague, and tularemia. In addition, expertise is maintained for other vector-borne infectious diseases that occur only sporadically or in periodic epidemics.

2.2 State Regulations and Standards

California Department of Health Services, Infectious Disease Branch, Vector-Borne Disease Section [<http://www.dhs.ca.gov/ps/dcdc/disb/disbindex.htm>]

The Infectious Diseases Branch is a statewide program whose primary mission is to protect and promote the health of California residents through the surveillance, investigation, prevention and control of communicable diseases of public health importance. They monitor and address disease occurrences which impact all local health jurisdictions in California, and which may affect public health policy on a national and international level.

The Vector-Borne Disease Section is a service agency, which through its seven regional offices, provides technical consultation and assistance to local vector control agencies to prevent and control such vector-borne diseases as hantavirus, plague, malaria, tickborne diseases, and arboviral encephalitis. The Veterinary Public Health

Section assists local counties in the investigations and control/prevention of animal diseases that can be transmitted to humans, such as rabies, brucellosis, and Q-fever. A variety of resources can be found on their website.

Mosquito Abatement and Vector Control District Law¹

The intent of the Mosquito Abatement and Vector Control District Law is to create and continue a statutory authority for special districts (or Counties exercising the powers of a district through an existing department or agency) to conduct effective programs for the surveillance, prevention, abatement, and control of mosquitoes and other vectors. It encourages vector control districts to cooperate with other public agencies and to adapt the powers and procedures provided by the law to meet the their own local circumstances.

Sections §2060-2067 of the Mosquito Abatement and Vector Control District Law addresses the abatement of public nuisances. It grants power to a district to take the necessary steps to abate a public nuisance including the issuance of a notice to inform the owner that the nuisance exists and the steps they should take to abate the nuisance and prevent recurrence. In addition, the district may impose a civil penalty of up to \$1,000 per day for each day that the nuisance continues after specified times. Section §2062 of the Code deals directly with flies in agricultural operations.

California Uniform Retail Food Facilities Law²

Requirements for retail food facilities are listed in the California Uniform Retail Food Facilities Law. The County Department of Environmental Health (DEH), Food and Housing Division inspects more than 27,000 food establishments annually. Any person operating a retail food facility (including a vending vehicle or catering business) must, by law, apply for and obtain a valid public health permit. Permit and inspection requirements of foot retail businesses addresses the potential vector sources that arise from food establishments. The goal of the DEH Food and Housing Division is to protect the environment and enhance public health by preventing disease, promoting environmental responsibility, and when necessary, enforcing environmental and public health laws.

2.3 Local Regulations and Standards

San Diego County, Department of Environmental Health, Vector Control Program

[<http://www.co.san-diego.ca.us/deh/chd/vector/index.html>]

The Vector Control Program (VCP) mission statement is “to protect the public health and safety, and promote the welfare of San Diego residents by preventing vector-borne diseases and minimizing discomfort and injury caused by vectors.” The primary

¹ Health and Safety Code, Pest Abatement, Chapter 1, Article 5, Sections §2000-2067
<http://www.leginfo.ca.gov>

² California Health and Safety Code, Division 104 Environmental Health, Part 7 Retail Food.
<http://www.sdcounty.ca.gov/deh/fhd/pdf/curffl2006.pdf>.

objective of controlling vectors is to preserve or create an environment favorable to humans and animals by lessening the effect that vectors and/or nuisances have upon the quality of life. Under the powers of a vector control district, as adopted by the County Board of Supervisors, the VCP provides countywide vector prevention and control services funded through a voter approved benefit assessment district. Mosquito, domestic rat, fly and other vector prevention and control programs are provided to reduce the risk of diseases these vectors can transmit and to minimize nuisances they cause.

San Diego County Code of Regulatory Ordinances – Vector Control³

These chapters of the County Code address general nuisances, vector control, and the prevention and control of fly breeding on commercial poultry ranches. Chapter 1 addresses how to handle public nuisances including violations and abatement. Chapter 2 grants authority to the Department of Environmental Health to exercise the powers of a vector control district as set forth in the California Health and Safety Code, and states that the Director "may correct or abate any public nuisance relating to vectors...". Chapter 3 provides for the investigation, continuing regulation, prevention and abatement of fly breeding sources with the goal of securing public health, safety, and welfare. This chapter also established a Fly Abatement and Appeals Board composed of five persons appointed by the Board of Supervisors. The board conducts public hearings related to the formation of proposals for the prevention and control of fly breeding and violations of the provisions of this chapter.

San Diego County Code of Regulatory Ordinances - Stormwater and Discharge Control⁴

This chapter of the County Code establishes the County of San Diego Watershed Protection, Stormwater Management, and Discharge Control Ordinance which sets forth stormwater management requirements for categories of existing sources and activities, and new land disturbance and land development activities. The ordinance prohibits polluted non-stormwater discharges to the stormwater conveyance system and establishes minimum requirements for stormwater management for development projects to reduce stormwater pollution and erosion. The ordinance requires the use of structural BMPs to detain or infiltrate stormwater for some land development projects and specifies that these BMPs must be designed to drain within 72 hours to preclude mosquito breeding.

³ Title 6, Division 4, Disease Control, Chapters 1-3, sections §64.203-64.330
http://www.amlegal.com/sandiego_county_ca/

⁴ Title 6, Division 4, Disease Control, Chapters 1-3, sections §67.801-67.825 plus appendices
http://www.amlegal.com/sandiego_county_ca/. Also known as the County of San Diego Watershed Protection, Stormwater Management, and Discharge Control Ordinance.

3.0 TYPICAL ADVERSE EFFECTS

Typical adverse effects related to vectors are two-fold. First, vectors can cause significant public health risks due to the transmission of disease to human and animal populations. Second, vectors can create a nuisance for the residents of the County. The risk of disease transmission is clearly an adverse effect that must be considered a primary concern in the environmental review process. A project that proposes a source of vector breeding habitat could result in an unnecessary increase in vector populations. When the vector breeding source is located near a substantial human population, a potentially adverse environmental effect could occur. Similarly, a project that proposes to place a substantial number of people near an existing offsite vector breeding source could significantly increase the potential exposure of people to vectors, resulting in a significant impact.

When potential project impacts related to vectors are not adequately mitigated, costs to the County DEH and costs to the taxpayer may increase due to vector control responsibilities that could have been avoided through proper planning during the design phase. Increased costs incur to respond to complaints, to advise on self-help measures, to abate nuisances, or to take enforcement action to require that a nuisance be abated.

4.0 GUIDELINES FOR DETERMINING SIGNIFICANCE

The Health and Safety Code defines a “public nuisance” as (1) any breeding place for mosquitoes, flies, or other vectors of public health importance; (2) water which is a breeding place for mosquitoes, flies or other animals of public importance; and (3) the presence of rodents or evidence of rodent activity such as rodent droppings, trails, or evidence of feeding activity. The guidelines are intended to address the potential for human exposure to vectors that result from land development and associated operational uses.

The following significance guidelines should guide the evaluation of whether a significant impact related to vectors will occur as a result of project implementation. A project will generally be considered to have a significant effect if it proposes any of the following, absent specific evidence to the contrary. Conversely, if a project does not propose any of the following, it will generally not be considered to have a significant effect related to vectors, absent specific evidence of such an effect:

4.1 Standing Water

The project proposes a BMP for stormwater management or construction of a wetland, pond or other wet basin that could create sources of standing water for more than 72 hours, and as a result, could substantially increase human exposure to vectors, such as mosquitoes, that are capable of transmitting significant public health diseases or creating nuisances.

Significance guideline 4.1 is included to recognize that sources of standing water, particularly where the water would be standing for more than 72 hours, provides excellent habitat for vector breeding. 72 hours is the time generally required for mosquito breeding to occur.

4.2 Composting and Manure Management

The project proposes a use that involves the production, use and/or storage of manure or proposes a composting operation or facility and as a result, could substantially increase human exposure to vectors that are capable of transmitting significant public health diseases or creating nuisances.⁵

Significance guideline 4.2 is included because areas of concentrated manure and composting operations and facilities typically require careful management to minimize vector production. Where residents would be located near sources of manure, this would usually constitute a substantial increase in the potential exposure of people to vectors.

4.3 Projects Proposed Near Existing Offsite Vector Sources

The project would result in a substantial increase in the number of residents located within one-quarter mile of a significant offsite vector breeding source; including but not limited to, standing water (e.g. agricultural ponds, reservoirs) and sources of manure generation or management activities (e.g. confined animal facilities, horse keeping operations, composting operations).

Significance Guideline 4.3 addresses the potential for a project to result in a substantial increase in the number of residents located near an existing offsite vector breeding source. Residents are specified in this Guideline due to the expectations for a safe, nuisance free, outdoor environment that is generally associated with one's place of residence. By identifying those projects that would result in a substantial increase in the number of residents located within one-quarter mile of an existing vector breeding source, projects that could trigger new vector control activities by the DEH Vector Control Program will be identified. It is necessary to identify projects that could introduce people near existing vector breeding sources so that the DEH Vector Control Program can prioritize monitoring, education and abatement activities towards those areas that would result in the greatest potential human exposure to vectors.

⁵ Examples of projects that would typically involve the production, use and/or storage of manure include but are not limited to, equine operations, kennels, composting operations, and agricultural operations such as poultry ranches or other animal raising operations.

5.0 STANDARD MITIGATION AND PROJECT DESIGN CONSIDERATIONS

Discussed below are a variety of standard mitigation and project design considerations that may be available to either fully or partially mitigate a project's potential impacts related to vectors. The adequacy of incorporating one or more of the measures listed below to reduce the significance of a project's potential vector impact will be evaluated on a case-by-case basis.

5.1 Standing Water

Minimizing mosquito production potential requires that standing water not be available for sufficient time to permit emergence of adult mosquitoes. For stormwater BMPs, this can be achieved in one of three ways: 1) discharge of all captured water within 72 hours, 2) deny mosquitoes access to standing water, or 3) make the habitat less suitable for mosquito breeding. Design considerations and ongoing maintenance requirements to minimize vectors depends on the type of stormwater BMP or other wet basin that is being proposed. Detailed below are summaries of applicable design recommendations for various types of stormwater BMPs and other sources of standing water such as ponds and constructed wetlands that is adapted from the document, "Managing Mosquitoes in Stormwater Treatment Devices" prepared by the University of California, Agriculture and Natural Resources, UC Mosquito Research Program. Management of standing water to eliminate the potential for vector breeding sources associated with stormwater treatment facilities must be addressed in the project's SWMP.

Design Measures to promote rapid discharge of captured water in BMPs

The most effective strategy to exclude vectors from stormwater management facilities is to design the system to ensure that water is discharged within 72 hours, thereby eliminating the potential vector breeding source. Design considerations for promoting rapid discharge of captured water in stormwater BMPs include:

- Select or design an alternative (or modified) stormwater device that provides adequate constituent removal and complete drainage within 72 hours. Examples include extended detention (dry detention) basins, vegetated swales, infiltration devices, and media filters. Special attention to groundwater depth is essential to determining water residence times.
- Incorporate features that prevent or reduce the possibility of clogged discharge orifices (e.g., debris screens). The use of weep holes is not recommended due to rapid clogging.
- Use the hydraulic grade line of the site to select a treatment BMP that allows water to flow by gravity through the structure. Pumps are not recommended because they are subject to failure and often require sumps that hold water.
- Design distribution piping and containment basins with adequate slopes to drain fully and prevent standing water. The design slope should take into consideration buildup of sediment between maintenance periods. Compaction during grading may also be needed to avoid slumping and settling.

- Avoid the use of loose riprap or concrete depressions that may hold standing water.
- Avoid barriers, diversions, or flow spreaders that may retain standing water.

Design measures to exclude vectors from enclosed sources of standing water in structural BMPs

Denying access to mosquitoes is necessary for stormwater treatment systems with sumps, vaults, or basins that incorporate features that hold permanent or semi-permanent standing water. Sumps, vaults, and basins may be located both above and below ground, but they are particularly common features of below ground proprietary and non-proprietary treatment devices that tie into existing storm sewers. Examples include above and below ground media filters, oil water separators, vortex separators, and vault-type devices. The following are design recommendations that apply to stormwater treatment systems that would hold permanent or semi-permanent standing water:

- Completely seal structures that retain water permanently or longer than 72 hours to prevent entry of adult mosquitoes. Adult female mosquitoes may penetrate openings as small as 1/16 inch (2 mm) to gain access to water for egg laying. Screening can exclude mosquitoes, but it is subject to damage and is not a method of choice.
- If using covers, they should be tight fitting with maximum allowable gaps or holes of less than 1/16 inch (2 mm) to exclude entry of adult mosquitoes. The use of gaskets can provide a much more effective barrier when used properly.
- If the sump, vault, or basin is sealed against mosquitoes, with the exception of the inlet and outlet, submerge the inlet and outlet completely to reduce the available surface area of water for mosquito egg-laying (female mosquitoes can fly through pipes). Alternatively, creative use of flapper or pinch valves, collapsible tubes (Mulligan and Schaefer 1982), and “brush curtains” might be effective for mosquito exclusion in certain designs.
- Design structures with the appropriate pumping, piping, valves, or other necessary equipment to allow for easy dewatering of the unit if necessary
- Provide safe access. Devices with deep sumps or vaults and covered devices with heavy lids or grates are design examples that can prevent safe routine maintenance for vector control. All stormwater treatment devices should be easily and safely accessible without the need for special requirements (e.g., OSHA requirements for “confined space”). This allows vector control personnel to effectively monitor and, if necessary, abate vectors. If utilizing covers, the design should include spring-loaded or lightweight access hatches that can be opened easily for inspection.

Design measures to manage vectors in ponds, constructed wetlands, and unenclosed BMPs that would retain water

For wet ponds, constructed wetlands, wet basins, and other stormwater BMPs where rapid discharge or vector exclusion is not an option, the primary tool for vector management is to make the habitat less suitable for mosquito breeding through vegetation management, physical practices, and chemical control as appropriate. While

some vegetation may be necessary to achieve water quality goals, excess vegetation can provide unnecessary breeding sources for mosquitoes. Ongoing monitoring and maintenance is an essential component in the implementation of a vegetation management strategy.

- Support mosquito predators and biological control, where feasible. Note that mosquitofish are not allowed in any jurisdictional wetlands or in BMPs that flow to jurisdictional wetlands.
 - stormwater ponds and constructed wetlands should maintain water quality sufficient to support surface-feeding fish which feed on immature mosquitoes and can aid significantly in mosquito control.
 - large predatory fish (e.g., perch and bass) can negatively impact or eradicate mosquitofish populations. In this case, careful vegetation management remains the only non-chemical mosquito control measure.
- Vegetation Management - removal of emergent vegetation is necessary as it provides mosquito larvae refuge from predators, protection from surface disturbances, and increased nutrient availability. Also, vegetation overgrowth can interfere with monitoring and control efforts. The following are suggested design measures and management techniques to manage vegetation ponds, constructed wetlands, and unenclosed BMPs for mosquito control:
 - Perform routine maintenance to reduce emergent plant densities to facilitate the ability of mosquito predators (i.e., fish) to move throughout vegetated areas.
 - Remove wet basin emergent vegetation semi-annually (early Spring and Fall) or as recommended by San Diego County Vector Control Program.
 - No more than 50% of the surface area of any standing water should have emergent vegetation, e.g. cattails, sedges, etc.
 - Eliminate floating vegetation conducive to mosquito production (i.e., water hyacinth [*Eichhornia* spp.], duckweed [*Lemna* and *Spirodela* spp.], and filamentous algal mats).
 - Control emergent vegetation by pulling, either mechanically or by hand; or frequent clear cutting. Pulling the vegetation, is recommended rather than cutting, as it tends to grow back more quickly and at greater density after cutting.
 - An alternative to semi-annual clean-outs is to remove swaths or patches of vegetation every three months such that no patch grows so dense as to exclude mosquito-eating fish. No stand of cattails should be any larger than twenty feet wide by 10 feet deep (200 square feet). All cattail stands need to be separated by 10 feet of non-vegetative water.
 - Note: any proposed vegetation removal in ponds, constructed wetlands, and stormwater management facilities must not conflict with existing regulation for wetland protections, site specific requirements for habitat protection, or other requirement related to biological resource protection. Potential impacts associated with ongoing maintenance for vector control must be evaluated as part of the whole of the project under CEQA.

- Wet basins should be constructed with 2:1 slope and maintain a minimum four foot depth to contain vegetation within the prescribed zone. Incorporate periodic silt removal into the maintenance plan to maintain adequate water depth.
- Wet basin construction should be designed to exclude the entry of unauthorized persons. Where appropriate, barriers such as, fences or walls may be included. Open bodies of water often attract the attention of people who in turn, release game fish, which predate upon mosquito fish.
- Provide safe and adequate perimeter access for ongoing maintenance activities. Access around the perimeter of wet basins is needed to provide access for vector management activities. Mosquito larvicides are applied with handheld equipment at small sites and with backpack or truck-mounted high-pressure sprayers at large sites. The effective swath width of most backpack or truck-mounted larvicide sprayers is approximately 20 feet (6 m) on a windless day. Because of these equipment limitations, all-weather road access (with provisions for turning a full size work vehicle) should be provided along at least one side of large aboveground structures that are less than 25 feet (7.5 m) wide. Structures that have shoreline- to-shoreline distances in excess of 25 feet should have a perimeter road for access to all sides.
- Where a basin is constructed with steep sides, provide a safety shelf or sloping ramp as a safety measure to ensure vector maintenance personnel or other persons can get out if they accidentally fall in.

5.2 Composting and Manure Management

The standard mitigation for projects that propose a use that would include composting or manure management is the requirement that management activities outlined in a Vector Management Plan be carried out in association with proposed project activities or uses. The Vector Management Plan would identify details of the proposed operations and the ongoing management activities that would ensure vector breeding is minimized. Vector Management Plans are intended to provide management tools to prevent vector-breeding sources. Where the project is a conditional use subject to permit conditions (i.e. MUP, ZAP), ongoing compliance with the Vector Management Plan shall become a condition of the project. Where the project is a planned development or will establish an Homeowners Association (HOA), the respective mechanisms for applying project conditions shall be used to ensure that the Vector Management Plan is carried out. In all cases where a Vector Management Plan is required, the DEH Vector Control Program would be provided with a copy of the plan for review and concurrence to ensure that appropriate management practices are identified.

5.3 Projects Proposed Near Existing Offsite Vector Sources

In most cases, the normal maintenance activities of property by property owners, including management of potential vector breeding sources, would adequately mitigate the potential for offsite vector sources to create adverse effects for proposed projects located nearby. For privately owned vector sources, the owners of the potential vector source would typically meet their legal obligation to prevent the source from becoming

vector breeding habitat. Similarly, for publicly owned vector sources, the public entity that owns the source or the DEH VCP would meet the legal obligation to prevent the source from becoming vector breeding habitat. Therefore, the legal responsibilities of property owners to ensure nuisances from vectors are not produced in combination with the enforcement and vector control activities of the DEH VCP would typically adequately mitigate the potential adverse impact of placing new residents near a potential vector breeding source.

However, there may be cases where additional project mitigation would be required for impacts related to vectors. For example, if the DEH VCP has identified the site as a known vector breeding source that cannot be effectively abated and feasible mitigation has been identified that the project could provide to allow the site to be effectively abated, then the project may be required to provide additional project level mitigation. Such mitigation may include providing vegetation clearing and vehicular access to the vector breeding source to allow abatement to occur, wetland modification, or other measures.

For all projects that would result in a substantial increase in the number of residents located within one-quarter mile from a significant offsite vector breeding source, a condition would be placed on the project to require notification to the DEH VCP, prior to Final Map Recordation. Notification to the DEH VCP allows the DEH VCP to prioritize monitoring of potential vector sources to the areas where the greatest potential for human exposure to vectors exists.

6.0 REFERENCES

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California Environmental Quality Act (PRC §21000-21178).
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