Contra Costa Clean Water Program

Vector Control Plan

Provision C.3.e.iv.

Submitted to the

California Regional Water Quality Control Board

San Francisco Bay Region

1 June 2004

TABLE OF CONTENTS

0 · Summary

The Contra Costa Clean Water Program (CCCWP) has cooperated with the Contra Costa Mosquito and Vector Control District (CCMVCD) to prepare this Vector Control Plan (Plan) in compliance with Order R2-2003-0022, Provision C.3.e.iv, of the Regional Water Quality Control Board for the San Francisco Bay Region (Water Board).

The Plan describes control measures for mosquitoes and other vectors, including rats and other rodents. These control measures will be incorporated into forthcoming CCCWP guidance for planning, design, operation, and maintenance of stormwater treatment devices. Contra Costa municipalities will require that these devices be included in new and redevelopment projects as mandated under the Water Board's Order. The Plan's mosquito control measures are consistent with those developed by the California Department of Health Services.

1 · Introduction

This Vector Control Plan has been prepared with the assistance and cooperation of the Contra Costa Mosquito and Vector Control District (CCMVCD).

"Vector" means any animal capable of transmitting the causative agent of human disease or capable of producing human discomfort or injury, including, but not limited to, mosquitoes, flies, mites, ticks, other arthropods, and rodents and other vertebrates. (California Health and Safety Code §2002).

Contra Costa County, its 19 incorporated cities and towns, and the Contra Costa County Flood Control & Water Conservation District are member agencies in the Contra Costa Clean Water Program (CCCWP or Program). Independently and jointly through the Program, the member agencies implement provisions of a stormwater NPDES permit issued by the California Regional Water Quality Control Board for the San Francisco Bay Region (Water Board). (Although three Contra Costa cities and part of the unincorporated County are within the jurisdiction of the California Regional Water Quality Control Board for the Central Valley, the stormwater NPDES permit is being implemented throughout all incorporated and unincorporated areas of the County.)

In February 2003, the Water Board added new "C.3" Provisions to the stormwater NPDES permit. These provisions aim to address "pollutant discharges and changes in runoff flows from new development and significant redevelopment projects through implementation of post-construction treatment measures, source controls, and site design measures, to the maximum extent practicable" (Water Board, 2003).

The Program is preparing comprehensive guidance to assist municipal staff and applicants for planning and zoning approvals to implement the C.3 provisions. This comprehensive guidance is to be distributed before February 15, 2005, when many of the C.3 provisions go into effect.

The Contra Costa Clean Water Program (Program) prepared this Vector Control Plan in compliance with Provision C.3.e.iv. of the stormwater NPDES permit.

Provision C.3.e.iv requires that the Vector Control Plan include the following elements:

- Design guidance for treatment measures to prevent the production of vectors, particularly mosquitoes.
- Guidance on including vector abatement concerns in operation and maintenance and verification inspection activities.

The Vector Control Plan is not intended to be used as a stand-alone document. Rather, the specific vector-control measures described herein will be integrated into forthcoming guidance for treatment measure design and for operation and maintenance verification.

2 · Assessment of Potential for Vector-Related Problems in Stormwater Treatment Devices

Few empirical studies have addressed vector production in stormwater treatment BMPs.

The California Department of Health Services (CDHS) assisted the California Department of Transportation (Caltrans) to complete *A Three-Year Assessment of Vector Production in Structural Best Management Practices in Southern California* (CDHS, 2002). In collaboration with four mosquito and vector control agencies, CDHS monitored 37 structural BMPs at 31 sites in San Diego and Los Angeles Counties for mosquito abundance, vegetative cover, aquatic predators, physical and

chemical properties of water, and evidence of rodent and other vector populations.

Since mosquitoes are the most abundant vectors associated with aquatic habitats, CDHS (2002) emphasized mosquito production within BMP structures. The following conclusions from that report are most pertinent to vector control planning:

- Eight mosquito species were collected from Caltrans BMP structures, four of which are known vectors for human disease.
- BMP technologies that maintained permanent sources of standing water (multi-chambered treatment trains (MCTT), continuous deflective separators (CDS), and wet basins) supported large populations of immature mosquitoes.
- BMPs designed to drain rapidly (biofiltration swales and strips, sand media filters, infiltration basins and trenches, drain inlet inserts, extended detention basins and the oil/water separator) provided less suitable habitats for vectors.
- Immature mosquitoes were found in sumps, catch basins, spreader troughs, loose riprap, and effluent pipes with small diameter (easily clogged) orifices.
- Vector-proofing (sealing) efforts were sometimes effective (e.g. aluminum covers on MCTT settling basins) but sometimes not (e.g. modifications to CDS devices).

The results of the DHS/Caltrans study are generally consistent with expectations regarding the potential for vector production: Facilities which allowed adult mosquitoes to access stagnant water were likely to harbor immature mosquitoes.

Design recommendations for stormwater treatment BMPs (CDHS, 2001a and Metzger, 2004) generally follow the results of this study and basic mosquito control principles.

Gingrich et al. (2004) found that stormwater ponds in Delaware, particularly ponds with shallow sides and shaded water surfaces, produced an abundance of mosquitoes. Three mosquito species were noted to be associated with transmission of West Nile Virus to animals or humans. The study was conducted during the unusually wet summer of 2003 and its applicability to typically dry California summers is unknown.

A national survey of vector control agencies (CDHS, 2001b) found that stormwater management BMPs can create attractive habitats for a variety of other vectors and/or nuisance pests in addition to mosquitoes. Other insect pests reported included midges, black flies, and roaches. Vertebrate species found in California stormwater BMPs included rats, mice, squirrels, and skunks.

Stormwater drainage systems in Contra Costa County, including catch basins and underground storm drains, have been found to harbor Norway rats (*rattus norvegicus*). Problem locations are typically associated with aging infrastructure, multiple entry points, and poorly draining vaults or pipes (Karl Malamud-Roam, personal communication). Above-ground areas with dense, damp vegetation (e.g. ivy) and access to water may harbor roof rats (*rattus rattus)* (Carlos Sanabria, personal communication). The design of stormwater treatment BMPs should avoid creating these conditions.

3 · General Design Criteria for Stormwater Treatment

The following design criteria are adapted from Metzger, M.E. (2004), *Managing Mosquitoes in Stormwater Treatment Devices*.

3.1 Dry Systems

This category includes stormwater treatment devices that are designed to drain completely following a storm event and remain dry, including extended detention basins, vegetated swales, infiltration devices, bioretention areas, and stormwater planter boxes.

The following design criteria are intended to ensure that these devices do not create mosquito problems:

- Design structures so that they do not hold standing water for more than 72 hours.[1] Special attention to groundwater depth is essential.

[1] CCMVCD personnel note that the following minimum mosquito production periods are typical to Contra Costa County: December-February, two weeks; April-May, 10 days; June-October, 3-5 days (3-4 days in areas that are exceptionally warm in summer). Devices that hold standing water fewer than five days will rarely cause problems.

- Incorporate features that prevent or reduce the possibility of clogged discharge orifices (e.g., debris screens).
- 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 that sumps hold water.
- Design distribution piping and containment basins witih adequate slopes to drain fully and prevent standing water. The design slopes should take in to consideration buildup of sediment between maintenance periods. Compaction during grading may also be needed to avoid slumping and settling, which can create depressions that will hold water.
- 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.

3.2 Systems with Sumps, Vaults, or Basins

The following design criteria are intended to ensure that these devices do not create mosquito problems:

- Completely seal structures that retain water permanently or longer than 72 hours to prevent entry of adult mosquitoes. Adult female mosquitoes can penetrate openings as small as $^{1}/_{16}$ inch to gain access to water for egg laying. Screening can exclude mosquitoes but is subject to damage and is not a method of choice.
- If using covers, they should be tight fitting with maximum allowable gaps or holds of $^{1}/_{16}$ inch. Gaskets form a more effective barrier when used properly.
- If the sump, vault or basin is sealed against mosquitoes, with the exception of the inlet or 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).
- Design devices with the appropriate pumping, piping, valves, or other necessary equipment to allow for easy dewatering if necessary.
- Design devices for easy access for inspection and without the need for confined-space-entry.

3.3 Stormwater Ponds and Wetlands

Nearly all stormwater ponds and wetlands will produce mosquitoes to some degree. Emergent and shoreline vegetation create habitats conducive to mosquito breeding that may be difficult for access for mosquito control.

Management of mosquitoes in stormwater ponds and wetlands should integrate biological control (e.g. stocking with mosquitofish), vegetation management, and chemical control (e.g. application of larvacides).

The following general design principles apply:

- Maintain water quality sufficient to support surface-feeding fish such as mosquitofish.
- If large predatory fish are present (e.g. perch and bass) mosquitofish populations may be reduced or eradicated.
- Design and maintain stormwater ponds and wetlands at depths in excess of four feet to limit the spread of cattails and other emergent vegetation.
- Build shoreline perimeters as steep and uniform as practical. Where appropriate, use concrete or liners in shallow areas to discourage plant growth.
- Minimize the extent of dense vegetation, particularly clumps of vegetation that extend more than 30 feet from the nearest access path.
- Provide access roads close to the shoreline and around the perimeter of the pond to the extent feasible. If possible, provide access on the windward side of the pond to facilitate application of pesticides if and when necessary.
- To provide for emergency control of mosquitoes or avian disease outbreaks, provide means for rapid dewatering of the pond (pipes, gate valves, or sumps that can be accessed by submersible pumps).

4 · Implementation of Design Guidance

4.1 General Principles and Provisions

Regardless of whether the design, construction, or maintenance of a stormwater treatment device follows guidelines or recommendations issued by any agency, the property owner retains responsibility to ensure that the device does not harbor vectors or otherwise create a

nuisance. Property owners must immediately abate any nuisance caused by the device.

4.2 Method of Implementation

4.2.1 Development Review of Private Projects

With the participation of staff from Contra Costa County and various cities and towns, the Program is currently preparing a *Stormwater C.3 Guidebook*. The *Stormwater C.3 Guidebook* will be geared to assist development project applicants to incorporate all C.3 requirements into their submittals and will include step-by-step guidance on:

- Site design
- Selection of source control and treatment BMPs
- Sizing and design of treatment BMPs
- Preparation of operation and maintenance plans.

The *Guidebook* will be used by all Contra Costa municipalities to facilitate integration of C.3 requirements into their development review process.

Design guidance for vector control will be integrated into, or referenced in, the *Stormwater C.3 Guidebook*.

4.2.2 Design of Public Projects

The Program has created a C.3 Capital Improvement Project (CIP) Work Group. The CIP Work Group has two main purposes:

- To develop procedural guidance that will assist municipalities to ensure that C.3 requirements are incorporated in capital improvement projects.
- To identify or create technical guidance needed to implement C.3 requirements for capital improvement projects.

The CIP Work Group's guidance will incorporate the general design principles described in Section 3, above, and will, as necessary, elaborate and specify design features that reduce potential reproduction of vectors.

As a first step, the CIP Work Group will review an early draft of the *Stormwater C.3 Guidebook* and determine whether the guidebook can be used or adapted to guide design of public projects.

4.3 Review of BMP Designs by CCMVCD

The Program will advise municipalities to refer projects with BMPs that are designed to hold water for longer than 72 hours (April through October) or longer than 14 days (November through March) to CCMVCD for review. This criterion and procedure will be evaluated annually (see Section 6).

4.4 Implementation Strategy and Priorities

In its stormwater treatment BMP design guidance, the CCCWP will incorporate or reference all the design criteria in Section 3, above. Within those criteria, the CCCWP will emphasize the following methods and techniques:

- Encourage site designs that reduce directly connected impervious area and thereby reduce the need for stormwater treatment BMPs.
- Encourage project designers to select BMPs that provide complete drainage within 72 hours of a storm. Selection of these devices can avoid most mosquito problems (Metzger, 2004). In particular, the CCCWP will encourage the use of small biofiltration and bioretention BMPs distributed throughout the site and incorporated into site landscaping.
- Avoid the need for pumps and sumps by designing stormwater BMPs to follow the site's hydraulic grade line.
- Emphasize the use of design and construction details that will avoid standing water (e.g. in energy dissipators and flow spreaders, or created unintentionally due to differential settlement).
- Ensure that the site design incorporates appropriate access to the BMP for maintenance.
- Ensure that the design of hatch covers and other BMP features allow for easy visual and physical access for inspection and maintenance.

4.5 Stormwater Treatment Device Selection and Design Guidance

In general, Contra Costa municipalities will consider approving any stormwater treatment devices that meet the Water Board's minimum requirements in Provision C.3.d. Design criteria for these devices will be consistent with those in the report, *A Preliminary Assessment of Design Criteria for Vector Prevention in Structural Best Management Practices in Southern California* (California Department of Health Services

(CDHS), June 2001), as may be updated or adapted for use in the Bay area.

The following specific guidance will be incorporated into the Contra Costa Clean Water Program's *Stormwater C.3 Guidebook.*

4.5.1 Site design to reduce the need for BMPs

The *Stormwater C.3 Guidebook* will emphasize the multiple benefits of site designs that promote infiltration and landscape "microdetention," including the benefit of reducing the number and size of treatment BMPs that may be required.

4.5.2 Biofiltration/bioretention BMPs

The Program will promote, as a first choice for stormwater treatment BMPs, the use of biofiltration devices (e.g. filter strips, planter boxes, and swales) and bioretention areas distributed throughout the site and integrated into site landscaping. Suggested preliminary designs for stormwater planter boxes, swales, vegetated filters, and landscape infiltration/bioretention and will be similar to those used by the City of Portland. The preliminary design of these devices calls for the use of imported soils or sand with an infiltration rate of 5 inches per hour.

In the typical case where infiltration to groundwater is not feasible (because of clay soils, high groundwater, or geotechnical hazards) these devices can be fitted with underdrains and, if necessary, impermeable liners.

Because biofiltration and bioretention devices are designed to promote relatively rapid filtration, standing water is unlikely to occur. However as noted by CDHS (2001a), water may collect in riprap or rock used for energy dissipation. Program guidance will advise designers to use cemented rock or other means of avoiding the collection of water in energy dissipators.

The potential for clogging of soils presents another potential concern. The Program will address this in two ways. First, the Program will encourage site drainage designs that feature "self-retention" for landscaped areas so that only impervious areas drain to these BMPs. This substantially reduces the likelihood of clogging by sediment. Second, the Program will include, in standard operation and maintenance plans for these BMPs, periodic checks to insure that the surface of the BMP has not accumulated sediment and that the BMP continues to absorb or drain water rapidly.

4.5.3 Sand Filters

Program guidance will encourage the use of sand filters where a sedimentation vault is not necessary for pre-treatment and runoff from the area tributary to the filter is unlikely to contain much sediment. A filter receiving only roof drainage is one example of such an application.

Except for the sedimentation vaults that accompany some filter designs, the primary vector-related concern for sand filters is that filter clogging may cause standing water on the surface of the filter. The wet or barely submerged media can favor reproduction of midges, flies, or mosquitoes. The Program will address this concern by requiring, in standard operation and maintenance plans, periodic visual checks to insure that clogging has not occurred.

4.5.4 Infiltration Basin/Infiltration Trenches

The primary concern for devices that depend on infiltration to groundwater is that they must be properly sited and maintained so that they continue to drain rapidly and standing water does not occur.

The Program is implementing a Water Board-funded *Stormwater Infiltration BMP Feasibility Study*, which will address siting, design, and maintenance of infiltration BMPs in the County. Vector-related concerns will be incorporated into the recommendations of this study.

4.5.5 Extended Detention Basins (Dry Basins)

Although they are designed to retain water for at least 40 hours, and may retain water for more than 72 hours, studies in Southern California (CDHS 2001a, 2001b, 2002) found that mosquito problems in dry basins occurred only near inlets and outlets and resulted from specific flaws in design and construction (noted above).

Program guidance will emphasize that the design of extended detention basins should provide for complete drawdown within 72 hours under all rainfall conditions.

Because it is difficult to design and construct outlet orifices for small basins, and because small basins are more difficult to maintain, Program guidance will emphasize that dry basins are most appropriate for larger drainage areas (more than one acre impervious area).

All detention basins require periodic inspection and maintenance, including checks after each storm event for outlet blockages. Suitable access must be provided for

vehicles and equipment needed to remove accumulated vegetation and debris; this access will also provide for inspection by vector control personnel.

4.5.6 Wet Basins and Constructed Wetlands

Wet ponds and modified or constructed wetlands create a challenge for mosquito control because nearly all will produce mosquitoes to some degree (Metzger 2004).

Program guidance will emphasize that wet ponds or constructed wetlands for stormwater treatment should only be considered when the project proponent can demonstrate an ongoing, enforceable commitment to maintenance. Maintenance will typically include removal of debris and removal of vegetation to maintain access to the water surface for inspection and mosquito control.

The specific design of the wet ponds and constructed wetlands requires detailed consideration of the detention times in different pond areas, vegetation types, maintenance schedules, and other factors. Program guidance will emphasize the need to obtain CCMVCD review at various stages of design, to provide adequate access for CCMVCD vehicles and equipment, and to provide for ongoing cooperation between O&M personnel with the CCMVCD.

4.5.7 Vaults (e.g. Stormceptors™, Continuous-Deflection Separators (CDS®), Oil/Water Separators, Drain Inlet Inserts, and Multi-Chambered Treatment Trains (MCTTs)

Program guidance will discourage use of these devices. With the exception of MCTTs, (which include a sand filter following a settling chamber) they are generally not as effective in removing most stormwater pollutants of concern. Vaults, CDSs, and MCTTs and all create a relatively high potential for mosquito reproduction (Caltrans, 2004).

Program guidance will emphasize that if these devices are allowed, special design features to seal the devices against mosquito access will be required. In addition, the devices must provide suitable access doors and hatches to allow for frequent inspections and maintenance.

5 · Operation and Maintenance Verification

Contra Costa municipalities will implement comprehensive operation and maintenance verification programs in

accordance with Provision C.3.e. These O&M verification programs will include all stormwater treatment devices.

The Contra Costa Mosquito and Vector Control District will perform inspections and vector control activities and enforcement at facilities that potentially harbor vectors.

5.1 Access for Stormwater BMP Inspections

CCMVCD generally uses its authority under the state health code to abate nuisances and public health threats. This is almost always sufficient to obtain access, but if CCMVCD is turned away by a property owner, they can obtain an inspection warrant.

Municipalities will require all property owners with stormwater treatment BMPs to provide access to municipal inspectors and to CCMVCD inspectors. Depending on the characteristics of the development and municipal policy, access may be guaranteed by municipal ordinance, by agreement between the municipality and property owner, or as a condition of a permit to operate the BMP.

5.2 Prioritization of BMP Inspections for Mosquito Control

CCMVCD's current inspection prioritization procedure is as follows:

- Sites that are known to be problems are inspected every 14 days during the mosquito breeding season.
- Sites that have been found previously to be breeding sites are visited once a month.
- Other sites are visited only in response to complaints or requests for assistance.

The Program and the municipalities will assist the CCMVCD's inspection activities as follows:

- The Program will provide CCMVCD the locations and types of stormwater treatment BMPs. This information will be updated at least annually and as often as quarterly if annual updates prove insufficient.
- In their individual O&M verification programs, municipalities will give higher priority to inspecting wet basins, vaults, BMPs with sumps, and BMPs that are otherwise designed to retain standing water for longer than 72 hours.

- Municipal inspectors will report to CCMVCD any noted evidence of immature mosquitoes or other vector problems.

CCMVCD intends to assist the municipalities by informing the Program when it identifies potential or apparent vector production in a stormwater treatment BMP.

5.3 Enforcement

Contra Costa municipalities typically use notifications and warnings as a first step to obtain compliance with stormwater pollution-prevention requirements. CCMVCD uses a similar approach when requiring property owners to abate conditions that may produce vectors.

As authorized by the California Health and Safety Code, CCMVCD may issue an order to abate nuisance conditions. Following a public hearing, the County may abate the nuisance and bill the property owner, or may execute fines.

Similarly, in their stormwater ordinances Contra Costa municipalities have identified stormwater pollution as a nuisance and have similar powers to issue an order to abate or to abate the problem and bill the owner. Municipalities can enforce these provisions as an infraction or as a misdemeanor.

To facilitate effective enforcement, CCMVCD has asked all Contra Costa municipalities to adopt administrative citation authority and to extend this authority to CCMVCD. This authority allows CCMVCD officers to issue citations for failure to abate nuisance conditions. Fines are $100 for the first offense, $250 for the second, and rise to $1000 per day for continued noncompliance. Two municipalities have implemented this authority; others are considering it or are in the process of implementation.

5.4 Typical Stormwater Treatment BMP O&M Requirements for Vector Control

The following requirements, or similar, will be incorporated into CCCWP guidance for stormwater BMP operation and maintenance:

5.4.1 Vegetated Filters, Swales, and Bioretention Areas

These BMPs remove pollutants primarily by filtering runoff slowly through an active layer of soil. Routine maintenance is needed to insure that flow is unobstructed, that erosion is prevented, and that soils are held together by plant roots and

are biologically active. Typical maintenance consists of the following:

- Inspect inlets for channeling, exposure of soils, or other evidence of erosion. Clear any obstructions and remove any accumulation of sediment. Examine rock or other material used as a splash pad and replenish if necessary.
- Inspect outlets for erosion or plugging.
- Inspect side slopes for evidence of instability or erosion and correct as necessary.
- Observe soil at the bottom of the swale or filter for uniform percolation throughout. If portions of the swale or filter do not drain within 48 hours after the end of a storm, the soil should be tilled and replanted. Remove any debris or accumulations of sediment.
- Confirm that check dams and flow spreaders are in place and level and that channelization within the swale or filter is effectively prevented.
- Examine the vegetation to insure that it is healthy and dense enough to provide filtering and to protect soils from erosion. Replenish mulch as necessary, remove fallen leaves and debris, prune large shrubs or trees, and mow turf areas. Confirm that irrigation is adequate and not excessive. Replace dead plants and remove invasive vegetation.
- Abate any potential vectors by filling holes in the ground in and around the swale and by insuring that there are no areas where water stands longer than 48 hours following a storm. If mosquito larvae are present, contact the CCMVCD for information and advice. Mosquito larvicides should be applied only when absolutely necessary and then only by a licensed individual or contractor.

5.4.2 Planter Boxes

Planter boxes capture runoff from downspouts or sheet flow from plazas and paved areas. The runoff briefly floods the surface of the box and then percolates through an active soil layer to drain rock below. Typical maintenance consists of the following:

- Examine downspouts from rooftops or sheet flow from paving to insure that flow to the planter is unimpeded. Remove any debris and repair any damaged pipes. Check splash blocks or rocks and repair, replace, or replenish as necessary.

- Examine the overflow pipe to make sure that it can safely convey excess flows to a storm drain. Repair or replace any damaged or disconnected piping.
- Check the underdrain piping to make sure it is intact and unobstructed.
- Observe the structure of the box and fix any holes, cracks, rotting, or failure.
- Check that the soil is at the appropriate depth to allow a reservoir above the soil surface and is sufficient to effectively filter stormwater. Remove any accumulations of sediment, litter, and debris. Confirm that soil is not clogging and that the planter will drain within 3-4 hours after a storm event.
- Determine whether the vegetation is dense and healthy. Replace dead plants. Prune or remove any overgrown plants or shrubs that may interfere with planter operation. Clean up fallen leaves or debris and replenish mulch. Remove any nuisance or invasive vegetation.

5.4.3 Sand Filters

Sand filters remove pollutants by physical settling and adsorption as runoff flows through the granular media. Unlike the soil in planter boxes and vegetative filters, the sand does not support soil organisms that keep the medium mixed and adsorptive. Sand filters may be more prone to blinding (development of an impermeable surface layer) and clogging (accumulations of clayey sediments deeper in the filter).

Typical maintenance consists of the following:

- Check inlets. Remove any accumulated sediment or debris. Examine splash blocks or rock and replace or replenish as needed.
- Insure that the overflow pipe or spill point is clear and can convey excess flows to storm drains. Look for any evidence of channeling or erosion. Replace or replenish rocks or armoring.
- Observe the structure of the filter and fix any holes, cracks, or failure.
- Look at the sand depth to insure that the level allows a sufficient reservoir above the surface. Remove any debris or accumulated sediment. Confirm that the surface of the sand is not blinded by fine sediment. If it is, remove and replace the top layer of sand. Check that the filter as a

whole is not clogged. If it is, all media may need to be removed and replaced. If no blinding or clogging is apparent, rake the surface of the sand.

- Check the underdrain piping to make sure it is intact and unobstructed.

5.4.4 Wet and Dry Detention Basins

These larger-scale BMPs remove pollutants by detaining runoff in a quiescent pool long enough for some of the particulates to settle to the bottom. They require both routine (preventative) maintenance and non-routine maintenance.

For any basin, vault, or other device that is designed to hold, or does hold, water for longer than 72 hours, the following will typically be required:

- A copy of the O&M plan must be provided to CCMVCD.
- Access to all potential vector-producing areas will be given to CCMVCD personnel.
- Copies of O&M reports will be supplied to CCMVCD.
- The CCMVCD will be given advance notice of O&M activities such as silt management, vegetation management, and water management.
- A schedule of routine O&M activities will be given to the CCMVCD.
- O&M personnel will cooperate with CCMVCD and adjust activities as necessary to facilitate control of mosquitoes and vectors.

Typical routine (preventative) maintenance for wet and dry basins consists of the following:

- Examine inlets to insure that piping is intact and not plugged. Remove accumulated sediment or debris near the inlet.
- Examine outlets and overflow structures and remove any debris or sediment that could plug the outlets. Identify and correct any sources of sediment and debris. Check rocks or other armoring and replace as necessary.
- Inspect embankments, dikes, berms, and side slopes for signs of erosion or structural deficiencies.
- Confirm that any fences around the facility are secure.
- Control vectors by filling any holes in or around the pond and examine the pond for evidence of mosquito larvae.

Typical non-routine maintenance includes the following:

- Dredge accumulated sediment. This may be required every five to 15 years, and more frequently if there are excess sources of sediment (as may occur on newly constructed sites where soils are not yet stabilized). Dredging is usually a major project requiring mechanized equipment. The work will include an initial survey of depths and elevations, sediment sampling and testing, removal, transport, and disposal of accumulated sediment, and reestablishment of original design grades and sections.
- Remove invasive plants. Depending on the success of the design and the rate of sedimentation, ponds may be subject to excessive growth of rooted macrophytes, which reduce the effective area of the pond and create quiescent surface water that supports mosquito larvae. Removal may require a level of effort similar to dredging.

6 · Coordination and Continuous Improvement

CCMVCD will review and comment on drafts of the *Stormwater C.3 Guidebook* and on any other forthcoming CCCWP guidance for planning, design, operation, and maintenance of stormwater treatment devices.

CCMVCD and CCCWP will hold and document a planning meeting at least annually to jointly evaluate their performance in limiting vector problems at stormwater treatment facilities in the County.

The meeting will include evaluation and follow-up actions (if any) for the following issues (partial list):

- BMP tracking and notification to CCMVCD of new stormwater treatment BMPs.
- Selection and design of stormwater treatment BMPs.
- Process for review of BMP designs, including criteria for referring designs to CCMVCD for review.
- Coordination of field inspections.
- Abatement and enforcement.
- Opportunities for cross-training of municipal and CCMVCD staff.

7 · References

Caltrans. California Department of Transportation, Division of Environmental Analysis. *BMP Retrofit Pilot Program Final Report,* CTSW-RT-01-50. January 2004. 315 pp.

CDHS. California Department of Health Services, Vector-Borne Disease Section. *A Preliminary Assessment of Design Critieria for Vector Prevention in Structural Best Management Practices in Southern California.* June 2001(a). 50 pp.

CDHS. California Department of Health Services, Vector-Borne Disease Section. *A Preliminary Assessment of Vectors Associated with Stormwater Management Structures in the United States: A Nationwide Vector Control Perspective.* June 2001(b). 25pp. + appendices.

CDHS. California Department of Health Services, Vector-Borne Disease Section. *A Three-Year Assessment of Vector Production in Structural Best Management Practices in Southern California.* June 2002. 49 pp.

Gingrich, John B., Gregory M. Williams, and Kevin Harkins, Department of Entomology and Wildlife Ecology, University of Delaware, Newark, DE. "Stormwater Ponds and Constructed Wetlands as Breeding Sites for Suspected West Nile Virus Vectors in Delaware." *Proceedings of the New Jersey Vector Control Association.* 2004.

Malamud-Roam, Karl, Director of Environmental Programs, Contra Costa Mosquito and Vector Control District. Personal communication, 26 May 2004.

Metzger, Marco E. *Managing Mosquitoes in Stormwater Treatment Devices.* University of California, Division of Agriculture and Natural Resources. ANR Publication 8125. January 2004. 11 pp. http://anrcatalog.ucdavis.edu

Sanabria, Carlos, Lead Vector Control Inspector, Contra Costa Mosquito and Vector Control District. Personal communication, 26 May 2004.

Water Board. California Regional Water Quality Control Board for the San Francisco Bay Region. Order No. R2-2003-0022, Finding 13. February 2003. www.swrcb.ca.gov/rwqcb2