Santa Clara Valley
Urban Runoff
Pollution Prevention Program

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MEMORANDUM

TO: **Management Committee**
BMP O & M Verification Work Group

FROM: **Paul Randall and John Fusco, Program Staff**

DATE: **June 16, 2003**

SUBJECT: **Guidance on Prioritization and Frequency of Stormwater Treatment Best Management Practice Inspections**

Introduction

Permit Provision C.3.e.i of the Santa Clara Valley Urban Runoff Pollution Prevention Program's Municipal Storm Water NPDES permit requires Co-permittees to compile "a list of properties (public and private) and responsible operators for all treatment Best Management Practices (BMPs)[1]. . In addition, the Dischargers shall inspect a subset of prioritized treatment measures for appropriate operation and maintenance, on an annual basis, with appropriate follow-up and correction."

The purpose of this memorandum is to provide guidance to municipal agencies for prioritizing treatment measures for inspection and determining inspection frequencies, as part of a BMP O&M verification inspection program. This guidance will assist Co-permittee staff in developing a process for identifying specific stormwater treatment BMPs to be included in annual inspection programs, for compliance with Provision C.3.e.i.

To assist Co-permittees in implementing prioritized treatment BMP inspection programs, Program staff conducted a review of existing documents relating to the inspection and maintenance of stormwater treatment systems. The primary goal of reviewing existing documents was to learn what criteria were used to prioritize the inspection of treatment control BMPs. In addition, Program staff received recommendations regarding prioritization from BMP O & M Verification Work Group during the April 3 and 23, 2003 meetings. Information relating to prioritization was also obtained from persons with first-hand experience in developing and implementing the BMP inspection program for the City of Bellevue, WA.

Criteria for Prioritizing Treatment BMPs and Determining Inspection Frequencies

Program staff suggests that Co-permittees consider the following criteria when prioritizing the municipal inspection of public and privately owned treatment control BMPs:

- Likelihood of failure resulting in high repair and/or replacement costs;
- Level of maintenance needed for continued performance and operation;
- Decline in operational effectiveness due to age;
- Located in areas with ongoing construction activities (i.e., increased sediment loading);

[1] For clarification, in this memorandum the following terms have the same meaning: stormwater treatment controls, stormwater BMPs, BMPs, treatment control BMPs, stormwater treatment BMPs and stormwater treatment systems.

- Owned and/or maintained by residential owners;
- Complaints and/or facility owner/operator with history of non-compliance;
- Likelihood of creating habitats favorable for mosquito production;
- Potential to support endangered species populations.

The last two criteria, likelihood of mosquito production and potential to support endangered species, are under the purview of other agencies (i.e., Santa Clara County Department of Environmental Health-Vector Control District and U.S. Fish and Wildlife Service, respectively). As applicable, Co-permittees will need to coordinate these aspects of their inspection programs with these agencies.

The list of criteria is not presented in order of importance. Each Co-permittee should use the most appropriate criteria for prioritizing and inspecting BMPs based on local conditions and characteristics. The rationale for using each of the proposed inspection frequency criteria, along with references to existing documentation, is provided below.

Likelihood of Failure Resulting in High Repair and/or Replacement Costs

Stormwater treatment systems that rely on infiltration (e.g., infiltration basins and trenches) have been documented to fail from excessive sediment accumulation resulting in clogged systems. Over sixty percent of the infiltration trenches built in Prince George's County, Maryland had stopped functioning within five years of construction (CASQA, 2003). Lack of advanced pretreatment controls (e.g., vegetative filter strips) is suggested to be a significant contributor to system failures (WMI, 1997). In addition, all contributing drainage areas must be stabilized to ensure long-term functioning of infiltration practices. If infiltration systems become clogged, the entire stone reservoir base layer usually requires replacement resulting in large costs.

Due to improper installation and maintenance, porous asphalt and pervious concrete also have a high rate of failure due to sediment clogging (EPA, 1999). Clogging may occur due to improper design, batching, pouring and finishing of the pavement system (WMI, 1997). The failure of porous pavements, as with other infiltration systems, usually relates to the limited implementation of pretreatment controls. Proper maintenance of permeable pavement systems is critical for long-term operation. Maintenance may include frequent sweeping and periodic steam cleaning to prevent sediment and debris from clogging pores. Once clogged, it is very difficult and expensive to rehabilitate porous pavements. As a result, complete replacement may be required. Other types of porous pavements (i.e., turf blocks and interlocking pavers) have been reported to be effective over time and are much less expensive to replace.

Level of Maintenance Needed for Continued Performance and Operation

Stormwater treatment systems based on filtration (e.g., media filters, drain inserts, hydrodynamic separators) may clog frequently and will stop performing if not proper maintained. Once oil and grease or sediments clog the filter media, the system is no longer effective in removing pollutants from stormwater runoff. Filter systems require inspection by the property owner on a monthly basis and after major storm events to ensure proper functioning. In addition, filter surfaces should be cleaned out twice per year (WMI, 1997).

Decline in Operational Effectiveness Due to Age

The life expectancy of treatment control BMPs should be factored in when setting their inspection priority, as certain BMPs may be less effective in treating stormwater runoff or controlling stormwater volume over time. The longevity of BMPs varies; some may be relatively short (e.g., four years for sand filters) while other remain effective much longer (e.g., twenty years for infiltration basins). Maintenance history and site conditions will also impact the long-term effectiveness of certain BMPs. As a result, the lifespan of certain BMPs will vary based on local conditions and characteristics. Documenting the performance of treatment control BMPs may be useful in determining their typical lifespan.

Located in Areas with Ongoing Construction Activities (Increased Sediment Loading)

Excess sediment accumulation substantially reduces the effectiveness of stormwater treatment controls that filter stormwater runoff (e.g., infiltration, filtration and biofiltration BMPs). When used in areas with ongoing construction, these types of treatment controls can become clogged with soils dislodged from immature landscaping, tracking, and other soil moving activities. Some treatment systems (e.g., infiltration basins, underground detention tanks) are not recommended for operation until the drainage area has been completely stabilized (CASQA 2003). If stormwater treatment controls are put into operation during the construction phase, inspections and maintenance activities should be increased to ensure proper functioning. Treatment control systems requiring sediment and/or vegetation removal should be placed offline (for a short period of time) to allow for vegetation to recover or earthwork to stabilize.

Owned and/or Maintained by Residential Owners

The State of Maryland's stormwater program has conducted a series of surveys on the maintenance of stormwater facilities. Results are available in a report entitled *Maintenance of Stormwater Management Structures, a Departmental Summary*. The report includes the following conclusions relating to BMP ownership and the extent of maintenance:

a) Publicly-owned treatment controls are better maintained than private facilities;

b) Commercial/industrial facilities are more likely than residential facilities to be aesthetically satisfactory;

c) Based on criteria set by the State of Maryland regarding satisfactory operation and maintenance, forty-five percent of commercial/industrial stormwater facilities were completely satisfactory (for O&M) compared to twenty-four percent of residential facilities. Operation and maintenance is more likely to occur when very clear ownership exists (e.g., commercial/industrial facilities). O&M was less satisfactory for residential developments, where a Homeowners Association or the developer is responsible. Homeowners Associations either do not have the necessary funds required to contract BMP maintenance, or make BMP O & M a lower priority to other types of maintenance (e.g., landscaping);

d) Commercial/industrial facility owners are more concerned about their image, including the appearance of their grounds, than residential facility owners. This is especially true if the residential facility owner is the developer;

e) Residential owners do not appear to have the technical expertise to inspect or maintain treatment controls systems.

Based on the results of these surveys, treatment control BMPs owned and maintained by residential owners (especially Homeowners Associations) should receive higher priority for periodic municipal inspection than those owned and maintained by other private or public property owners. To increase the likelihood of inspection and maintenance of treatment control BMPs by private landowners, Co-permittees should strongly consider implementing public education programs. Education programs have been proven to be successful in encouraging continued maintenance (e.g., Hillsborough County, FL's "Adopt-a-Pond" program).

Complaints and/or Facility Owner/Operator with History of Non-Compliance

Treatment control BMPs causing complaints about trash accumulation, unmaintained landscape or other areas of concern; or have a history of deferred maintenance should be given a higher priority for inspection until inspection and maintenance by the owner(s) improves or is resolved.

Likelihood of Creating Habitats Favorable for Mosquito Production

The Santa Clara County Department of Health Vector Control District (Vector Control District) has identified several stormwater BMP maintenance objectives to reduce or eliminate mosquito production (Noor Tietze, DEH, personal communication, 2003). These include the following:

- Keeping wetland edges simple (i.e., steep banks with deep water);
- Minimizing stagnant water (i.e., maintain constant exchange of water in systems);

- Minimizing surface area (i.e., deeper water habitat is preferable); and
- Preventing access to underground systems that may have standing water.

Water that is stagnant for more than one week creates suitable conditions for mosquito production. Therefore, maintenance activities should focus on maintaining water flow by vegetation management; reducing standing water by ensuring proper infiltration and drainage operation; and restricting access to systems with standing water by sealing off openings.

Treatment control BMPs that could promote mosquito production include infiltration systems that are clogged and no longer drain according to their design (i.e., within 72 hours); vegetated systems with standing water (e.g., wet ponds, vegetated swales and filter strips); and underground vaults and sumps without screens (Noor Tietze, DEH, personal communication, 2003).

To assist Co-permittees in adequately addressing vector control concerns, Program staff will develop a strategy for collaborating with the Vector Control District. Currently, the Vector Control District has requested that Co-permittees provide them with treatment control BMP locations on a regular basis (more than once a year) and ensure access (for inspection) to treatment control BMPs. Program staff will also work with the BASMAA New Development Committee to develop a regional approach that addresses vector control and endangered species issues relevant to treatment control BMP inspection and maintenance.

Potential to Support Endangered Species Populations

Certain treatment control BMPs (e.g., wet ponds) may provide suitable habitat for threatened or endangered species. The likelihood for species colonization increases if the treatment control BMP is not adequately maintained (e.g., insufficient vegetation removal). Once endangered species colonize, they are protected under State and Federal laws. As a result, higher operation and maintenance costs will occur.

Other Prioritization Criteria-Considered but Discarded from Consideration

Other criteria were considered for prioritizing the inspection frequency of treatment control BMPs. However, they were discarded after consultation with persons knowledgeable with developing inspection and maintenance programs. These criteria were briefly discussed during the April 23, 2003 BMP O & M Verification Program Work Group meeting. Criteria which were initially considered but discarded from consideration include:

- Increasing the inspection frequency of treatment control measures with multiple components. This criterion was discarded because individual components of complex systems (e.g., wet ponds, bioretention, vegetative swales) may continue to work (for long periods of time) in the absence of maintenance; and
- Routinely inspecting treatment control measures that treat large volumes of stormwater runoff. This criterion was also not considered for similar reasons (i.e., depending on the type of treatment control, they may continue to work properly despite minimal maintenance). Treatment controls with high potential for pollutant accumulation were incorporated with the high maintenance needs criterion.

Municipal Inspection Frequencies

To ensure the proper function of treatment control BMPs, the following factors should be considered when determining appropriate inspection frequencies:

- Type of BMP
- Local climate and precipitation
- Land use type
- Level of effort required for inspection

- Establishment of maintenance contracts
- Fluctuation in economic resources

The CASQA BMP Municipal Handbook includes suggested inspection frequencies for treatment control BMPs constructed in California. These frequencies may need to be adjusted to accommodate site-specific conditions. For example, higher inspection frequencies should be considered for treatment control BMPs implemented in areas that receive more rainfall (WMI, 1997). BMPs that treat large runoff volumes will accumulate higher amounts of pollutants over time. Inspection frequencies should also account for impacts from large storm events. Similarly, treatment control BMPs that are in land uses suspected to generate high concentrations of pollutants (e.g., sediments, oil and grease) should be inspected more frequently to ensure proper operation. Results from routine inspections should ultimately determine the proper maintenance frequency for specific BMPs.

Inspection frequencies are also related to the level of effort required to determine treatment control BMP effectiveness. Many BMPs may only require visual inspections for structural integrity, presence of mosquitoes or accumulation of trash and debris (Lisa Austin, Geosyntec Consultants, personal communication, 2003). Other BMPs will require more detailed assessments (e.g., measurement of sediment accumulation). As a result, a higher level of effort is required especially when access is difficult (e.g., underground detention systems). In general, BMPs with limited access (for maintenance) may require more frequent inspections.

The mechanism by which treatment control BMPs are maintained can also impact the frequency of municipal inspection. If BMPs will be routinely inspected and/or maintained by contractors, Co-permittees can consider reducing their inspection frequencies. Maintenance contracts would be useful for BMPs that require frequent maintenance, (e.g., sand filters or drain inserts). If private property owners can demonstrate that maintenance is occurring according to design specifications, Co-permittees may consider giving these treatment controls a lower inspection priority.

The type and total number of BMPs inspected each year also depends on the cost of follow-up activities (e.g., the response required to address improperly maintained BMPs) and the availability of resources to conduct inspections. Due to uncertain State budget conditions and likely repercussions on local agency budgets, individual Co-permittees will be operating with limited resources for some stormwater program elements. As a result, Co-permittees may have to adjust the type and total number of inspections conducted in a particular year based on available funding.

The establishment of regular inspection frequencies is recommended to ensure proper operation or compliance with maintenance standards (City of Bellevue, WA, 2002). For example, the City of Bellevue has determined that agency staff will conduct biennial inspections (i.e., every 2 years) for all privately owned treatment control BMPs. The implementation of an alternate inspection frequency will be based on an evaluation of maintenance records over a four-year period. Program staff recommends that Co-permittees initially establish a regular inspection frequency for all treatment controls and adjust these frequencies over time to reflect actual BMP maintenance needs on a site-by-site basis.

Factors Influencing Effectiveness of Inspections

The development of maintenance standards for treatment controls will help increase inspection program efficiency and effectiveness and help ensure long-term operation of treatment control BMPs Maintenance standards developed by Co-permittees should identify the key parameters that trigger the need for maintenance activities for each BMP. These parameters should be easily identified and quantifiable to reduce the subjectivity of inspections and allow them to be completed in less time. For example, inspections of detention basins should include measuring sediment accumulation with sediment measuring sticks. When sediment accumulates beyond established threshold values, sediment removal would be required.

The City of Bellevue, WA has developed maintenance standards to assist private and public property owners in identifying proper inspection and maintenance procedures and to assist public agency staff in the oversight of these facilities. These maintenance standards are found within the document entitled *Utilities Surface Water Maintenance Standards for Public and Private Systems (Draft), December 2002*. The City of Bellevue has also created standardized public and private inspection and maintenance checklists for use during inspections. Inspection results are documented and tracked over time (by municipal staff) to determine the effectiveness of maintenance activities. Public and private inspection and maintenance checklists developed by the City of Bellevue, WA are attached to this memorandum.

Each document provides information describing the conditions when maintenance is needed and recommendations to correct the observed problem. The descriptions are not subjective and should be useful in determining needed maintenance. Information provided in each document should be adapted to reflect local conditions and characteristics. Program staff recommends that Co-permittees consider the information found in the Bellevue documents when developing their inspection programs.

References

City of Bellevue, WA. Utilities Department. *Utilities Surface Water Maintenance Standards for Public and Private Systems (Draft),* December 2002.

City of Bellevue, WA Utilities Department. Inspection and Maintenance Checklists for Owners of Private Systems, December 2002.

City of Bellevue, WA Utilities Department. Public Inspection and Maintenance Checklists, December 2002.

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