North Coast Corridor

PUBLIC WORKS PLAN/TRANSPORTATION AND RESOURCE ENHANCEMENT PROGRAM

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Appendix E

Water Quality

Technical Memorandum

Water Quality
Technical Memorandum

For

I-5 North Coast Corridor project

I-5 NCC
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2009 WQR Supplement
Revised August 2013
(Table II.2 only)

Executive Summary

This Technical Report is being prepared to update and supplement the Water Quality Report (WQR) prepared in 2009 for the I-5 North Coast Corridor (NCC) project. The purpose of this technical report is to provide additional information related to the recently adopted Caltrans NPDES permit and to describe the Department's practices and policies that are implemented by the various divisions to ensure all NPDES Permit mandates are complied with and documented.

The limits and description of the project have not changed since the WQR was completed. A Locally Preferred Alternative (LPA) has been selected and information presented in this technical report centers around the work being conducted in support of the LPA.

Caltrans permit was adopted by the State Water Resources Control Board (currently pending final approval of the Environmental Protection Agency and Office of Administrative Law), and is discussed in this technical report to ensure compliance with latest Permit requirements is identified and referenced during the project development process by the Department's Design Division and other functional units involved with the project development team. Furthermore, the SWRCB adopted a revised Construction General Permit (CGP) in 2009 which Caltrans projects are subject to. Specific CGP mandates not discussed in the 2009 WQR are addressed in this Technical Memorandum.

In 2010, EPA approved the latest CWA Section 303d impaired water listing and scheduling for assignment of TMDL requirements; a revised table is included showing impaired water bodies within the project limits. The Total maximum Daily Load (TMDL) work that is being addressed by the named dischargers (Caltrans, municipalities and other named stakeholders) is ongoing and Comprehensive Load Reduction Plans (CLRPs) are proposed to comply with Waste Load Allocations and other impairments. This technical report also discusses specific design procedures such as Caltrans infiltration tool calculation, low impact development, hydromodification and other requirements that are being assessed and documented for project implementation.

Design has prepared drainage basin delineation for both existing and preliminary design of the LPA. Current design has placed an emphasis on minimizing pavement areas; previous I-5 NCC documents such as the draft environmental document or the 2009 WQR included a larger impervious footprint than the current LPA. This technical memorandum discusses differences between existing and proposed impervious areas as well as existing treatment within the corridor which accounts for approximately 7% for the whole project footprint while after completion of the I-5 NCC, there will be approximately 27% of treatment of the total combined pavement based on preliminary design.

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I. NPDES PERMITS

I.1 Caltrans Statewide NPDES Permit

The State Water Resources Control Board adopted Order No. 99-06–DWQ, NPDES No. CAS000003 NPDES Permit Statewide Storm Water Permit and Waste Discharge Requirements (WDRs) For the State of California, Department Of Transportation (Caltrans) properties, facilities and activities herein referred to as Permit. The permit requires the Department to implement a Storm Water Management Plan, SWMP; which purpose is to protect and achieve water quality standards at all times. The minimum requirement is to ensure that pollutants in discharges from storm drain systems owned or operated by Caltrans are reduced to the maximum extent practicable (MEP) and that pollutants in discharges from construction activities covered by the General Construction Permit are reduced by employing Best Available Technology /Best Conventional Technology (BAT/BCT) performance standards. The MEP analysis is the process of evaluating the selected BMPs based on legal and institutional constraints, technical feasibility, relative effectiveness, and cost/benefit ratio.

The Department continues to comply with CWA§402 by complying with the requirements of the statewide NPDES permit The permit and the approved SWMP consolidated the Department's stormwater compliance activities under one permit and provided a framework for consistent and effective implementation of stormwater management practices on a statewide basis. This permit has been re-issued (Order 20012-011 DWQ) as of September 2012 and will have an effective date of July 1, 2013.

The Department continues to modify its guidance documents including, but not limited to, the Project Planning and Design Guide, Construction Storm Water Manuals and is currently in process of updating the Department's SWMP in coordination with SWRCB and RWQCBs to reflect latest Caltrans permit requirements.

I.2 Construction General NPDES Permit

The State Water Resources Control Board adopted Order No. 2009-0009–DWQ, NPDES No. CAS000002 NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities on September 2, 2009 with an effective date of July 1, 2010. The permit covers construction activities that result in land disturbance of equal or greater than one acre or construction activities that result in land surface disturbance of less than one acre if the construction activity is part of a common plan of development.

The permit requires the dischargers to implement a Storm Water Pollution Prevention Plan (SWPPP) that contains BMPs that will prevent construction pollutants from entering a receiving water body.

The SWPPP has the following objectives:

- All pollutants and their sources, including sources of sediment associated with construction, site erosion and other activities associated with construction are controlled;

- Where not otherwise required to be under a Regional Water Board permit, all non-storm water discharges are identified and either eliminated, controlled, or treated;
- Site BMPs are effective and result in the reduction or elimination of pollutants in storm water discharges and authorized non-storm water discharges from construction activity to the BAT/BCT standard;
- Calculations and design details as well as BMP controls for site run-on are complete and correct, and
- Stabilization BMPs installed to reduce or eliminate pollutants after construction.

I.2.1 Risk Level Determination

The new Construction General Permit is a risk-based permit that establishes three levels of environmental risk possible for a construction site. The Risk Level (RL) is calculated in two parts: 1) Project Sediment Risk, and 2) Receiving Water Risk. The RL determination quantifies sediment and receiving water characteristics and uses these results to determine the project's overall RL. Highly erodible soils, in higher rainfall areas, on steep slopes increase the 'sediment risk'. Monitoring and reporting requirements increase as the RL goes from 1 to 3.

The Department's stormwater program complies with the substantive provisions of the Construction General Permit on projects. The permit requirements are implemented during the design phase through the water pollution control plans and project's specifications. During the construction phase, the requirements will be met through the implementation of the Stormwater Pollution Prevention Plans (SWPPPs) prepared for each project under the construction phase of the project and compliance with the project's specifications.

I.2.2 RUSLE 2

Once the construction phase is complete and the project is stabilized, the Resident Engineer will work with the storm water group to complete a Notice Of Termination (NOT) and file with the SDRWQCB. This lets the regional board know that the project is no longer subject to CGP requirements but will still be in compliance with the Caltrans NPDES Permit.

One of the means of providing the validation of final soil stabilization is to provide computational proof using the Erosion Prediction Procedure (EPP) developed by Caltrans in 2008. The EPP uses the RUSLE2 computer program to estimate soil erosion loss and sediment transport in natural and disturbed construction sites. The EPP achieves "site stabilization" for a project through the use of simulated temporary and permanent BMPs, allowing the Project Engineer (PE) to assess the effect of the design parameters on soil erosion and sediment transport.

As part of designing the final stabilization of project surfaces, the PE uses RUSLE2 to generate the computation proof that sediment yield and stabilization are equivalent or better than pre-construction conditions. The information is produced from representative cross-sections of slope surfaces that validate the erosion control design as having equal or better protection than existing conditions (pre-construction). This information is included as part of the project's SWDR.

II. AFFECTED WATERSHED

Table II.1 below lists the hydrologic areas/subareas that are within the proposed *I-5 NCC Project*. The table compares the area of each of the hydrologic areas or sub-areas versus existing Caltrans right of way within the I-5 project limits. The table shows that the maximum Caltrans tributary area to any of the hydrologic subareas is less than two percent.

Table II.1 Existing I-5 Contribution to the watershed within project limits

Watershed	Hydrologic Area/Sub Area Name	HA/HSA Number	HA/HSA (Acres)	Existing I-5 Tributary Area* (Acres)	Existing I-5 Contribution to HA/HSA (%)
Penasquitos	Miramar HA	906.40	25924	288	1.10%
	Miramar Reservoir HA	906.10	32,594.8	332	1.02%
San Dieguito	Rancho Santa Fe HSA	905.11	22,610.5	221	0.98%
Carlsbad	San Elijo HSA	904.61	20,721.5	181	0.88%
	Batiquitos HSA	904.51	17,819.4	330	1.85%
	Encinas HA	904.40	2,991.4	47	1.56%
	Los Monos HSA	904.31	11,904.4	95	0.8%
	El Salto HSA	904.21	7,476.4	134	1.79%
	Loma Alta HA	904.10	5,199.6	40	0.78%
San Luis Rey	Mission HSA	903.11	29,930	114	0.38%
Santa Margarita	Lower Ysidora HSA	902.11	6710	38	0.57%

* Source: sangis/landuse/right_of_way.shp

II.1 Section 303 (d) of the Clean Water Act and & the Targeted Design Constituent

The CWA requires States to identify and make a list of surface water bodies that do not meet water quality standards, also referred to as "water quality limited segments", even after discharges of wastes from point sources have been treated by the minimum required levels of pollution control technology. States are required to compile these water bodies into a list, referred to as the "Clean Water Act Section 303(d) List of Water Quality Limited Segments" (List).

As part of Caltrans runoff characterization studies, The Department has identified pollutants that are discharging with a load or a concentration that commonly exceeds allowable standards and which are considered treatable by Caltrans approved treatment BMPs. These pollutants are referred to as Targeted Design Constituents (TDCs), which include sediment, metals (total and dissolved zinc, lead and copper), nitrogen, phosphorus and general metals.

Table II.2 below lists the 303(d) listed water bodies that will be potentially impacted by the proposed I-5 north coast corridor-widening project.

Table II.2 303(d) Impaired Water Bodies within project limits

Hydrologic Area	Water Body Name	HA/ HSA	Size	Pollutant	Caltrans TDC
Penasquitos	Soledad Canyon	906.10	2 Miles	Selenium, Sediment Toxicity	NA
	Los Penasquitos Creek	906.10	12 Miles	Total Dissolved Solids, Selenium, Toxicity, Total Nitrogen as N, Fecal Coliform, Enterococcus	Sediment, Nitrogen
	Los Penasquitos Lagoon	906.10	469 Acres	Sedimentation/Siltation	Sediment
	Rose Creek	906.4	13 Miles	Selenium, Toxicity	NA
San Dieguito	San Dieguito River	905.11	19 Miles	Total Dissolved Solids, Toxicity, Nitrogen, Fecal Coliform, Enterococcus, Phosphorus	Sediment, Nitrogen Phosphorus
Carlsbad	Loma Alta Creek	904.10	8 Miles	Selenium, Toxicity	NA
	Buena Vista Creek	904.210	11 Miles	Selenium, Sediment Toxicity	NA
	Buena Vista Lagoon	904.21	202 Acres	Indicator Bacteria, Nutrients, Sedimentation/Siltation	Sediment, Nutrients (N and P)
	Agua Hedionda Creek	904.31	7 Miles	Total Dissolved Solids, Selenium, Toxicity, Total Nitrogen as N, Fecal Coliform, Enterococcus, Phosphorus, Manganese	Sediment, Nitrogen Phosphorus
	Cottonwood Creek	904.51	2 Miles	Sediment Toxicity, Selenium, DDT	NA
	Encinitas Creek	904.51	3 Miles	Toxicity, Selenium	NA
	San Marcos Creek	904.51	19 Miles	Selenium, Sediment Toxicity, Phosphorus, DDE	Phosphorus
	San Elijo Lagoon	904.61	566 Acres	Sedimentation/Siltation, Indicator Bacteria, Eutrophic	Sediment
	Escondido Creek	904.62	26 Miles	Total Dissolved Solids, Selenium, Toxicity, Total Nitrogen as N, Fecal Coliform, Enterococcus, DDT Phosphate, Sulfates, Manganese	Sediment, Nitrogen Phosphorus
San Luis Rey	San Luis Rey River, Lower (west of I-15)	903.11	19 Miles	Chloride, Fecal Coliform, Phosphorus, Total Dissolved Solids, Total Nitrogen as N, Toxicity, Enterococcus	Phosphorus, Nitrogen
	Pacific Ocean Shoreline, at San Luis Rey River mouth		0 Miles	Enterococcus, Total Coliform	NA
Santa Margarita	Oceanside Harbor	902.11	52 acres	Copper	Copper

Source: http://www.waterboards.ca.gov/sandiego/water_issues/programs/303d_list/index.shtml
NA Not Applicable

III. BEST MANAGEMENT PRACTICES

Best Management Practices (BMPs) are considered to address potential water quality impacts during the planning and design, construction, and operational and maintenance phases. The SWMP divides the BMPs into separate categories from the planning and design phase to the operational and maintenance phase.

Short term potential impacts to water quality during the construction phase are avoided and or minimized through the use of Construction Site BMPs while the long term potential impacts, due to operation and maintenance of the freeway or other Department facilities, are avoided/minimized through the use of Design Pollution Prevention BMPs, Treatment BMPs and Maintenance BMPs

The general categories of BMPs have been identified for use in the Project Planning and Design Guide (PPDG) Manual and are shown in *Table III.1 BMP Descriptions*.

Table III.1 BMP Descriptions

BMP	Description
Design Pollution Prevention BMPs	Preservation of existing vegetation, concentrated flow conveyance, slope/surface protection, etc.
Treatment BMPs	Treatment Devices and facilities.
Construction Site BMPs	Temporary soil stabilization and sediment control, non-storm water management, and waste management. Refer to the Construction BMP Manual.
Maintenance BMPs	Litter pick up, waste management, street sweeping, etc.

Source: PPDG Manual, Table 2-3, July 2010

III.1 Department Standard Procedures and Practices

III.1.1 Project Planning and Design

During the process of planning and design of all new facilities and reconstruction or expansion of existing facilities, the Project Engineer considers and, as appropriate, incorporates BMPs. Design Pollution Prevention BMPs are permanent measures to reduce pollution discharges after construction is completed; while Treatment BMPs are permanent measures to improve/maintain storm water quality after construction is completed.

Project-specific BMP consideration is an iterative process that begins with initial project planning and scoping activities. As the project moves into detailed design, the Department's design division revisits the BMP consideration process and goes through a detailed BMP selection methodology that works efficiently with the design of the highway and drainage facilities. This process is documented in the Storm Water Data Report.

III.1.2 Storm Water Data Report

Every Caltrans project is required to complete a Storm Water Data Report (SWDR), which summarizes the storm water decisions made by the Project Development Team. These decision are made taking into consideration grading, environmental constrains, utility issues and any other conflicts that might arise when designing a project. The SWDR documentation includes various checklists to help project engineers determine feasibility of BMPs and any potential conflicts related to their implementation. The SWDR is initiated at the beginning of the project and is updated as the project progresses through design. The final SWDR not only documents the decisions made throughout the phases of the project but also include exhibits showing tributary drainage areas, percentages of treatment, water quality impairments and types of design pollution prevention, construction and maintenance BMPs that will be incorporated into the project.

A PA/ED level SWDR is being prepared for this project and is in process of being finalized for the initial phase of design. The work done to date includes delineation of impervious surface tributary drainage areas and preliminary siting and selection of potential treatment BMPs.

III.1.3 Design Pollution Prevention (DPP) BMPs

During the project development process, the Project Engineer will incorporate specific DPP BMPs into a project to minimize potential impacts to water quality. The design objectives of the DPP BMPs are as follows:

- *Prevent Downstream Erosion.*
- *Stabilize Disturbed Soil Areas.*
- *Maximize Vegetated Surfaces Consistent with Existing Caltrans Policies.*

The table below lists the DPP BMPs to achieve the above design objectives. The SWDR will include discussion of applicable DPPs and also document through completed checklist the process used to determine DPP applicability.

Table III.1.3.1 Design Pollution Prevention BMPs

Consideration of Downstream Effects Related to Potentially Increased Flow	
Peak Flow Attenuation Basins	Soil Modification
Reduction of Paved Surface (i.e., increase pervious area)	Energy Dissipation Devices
Preservation of Existing Vegetation	
Concentrated Flow Conveyance Systems	
Ditches, Berms, Dikes and Swales	Channel Linings
Overside Drains, Downdrains, Paved Spillways	Flared Culvert End Sections
Outlet Protection/Velocity Dissipation Devices	
Slope/Surface Protection Systems	
Vegetated Surfaces	Flared Culvert End Sections
Hard Surfaces	

Source: PPDG Manual, Table 2-4, 2010

III.1.4 Low Impact Development (LID)

Caltrans encourages the use LID features, which can mutually serve as both Design Pollution Prevention BMPs and Treatment BMPs; Due to limited right of way and the linear nature of the typical Caltrans project, the design must ensure that any design features do not create a safety hazard for the public or maintenance forces. LID uses site design and storm water management to maintain the site's pre-project runoff rates and volumes by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to the source.

Features that function as LID measures include, but are not limited to:
- Surface vegetation, such as biofiltration swales and strips;
- Soil amendments, such as compost and surface roughening;
- Subsurface storage, such as dry-wells, infiltration trenches, or swales underlain with permeable soil layers;
- Small detention areas, such as cisterns, traps, and check dams;
- Pervious materials, such as paving stone and porous concrete, when used in lieu of impervious materials at locations outside the highway prism;
- Disconnected drainage that relies upon overland flow rather than pipe networks to convey runoff to discharge locations; and,
- Contour Grading, grading that follows natural flow paths and terrain with an emphasis upon slope rounding and gradual elevation changes.

This project will review and propose LID features throughout the project footprint. Final selection will be made during final design once drainage, grading and other design features are determined and used as basis for feasibility and siting locations.

III.1.5 Hydromodification

The Department under its recently adopted statewide permit (Order 2012-0011-DWQ- effective date of July 1, 2013) is required to conduct a risk-based approach to ensure the project does not cause a decrease in lateral (bank) and vertical (channel bed) stability in receiving stream channels. The Department will assess pre-project channel stability and implementing mitigation measures that are appropriate to protect structures and minimize stream channel bank and bed erosion.

The permit requires that projects that add 1 acre or more of new impervious surface with any impervious portion of the project located within a Threshold Drainage Area (area draining to a location at least 20 channel widths downstream of a stream crossing (pipe, swale, culvert, or bridge) within Project Limits) must conduct a rapid assessment of stream stability at each stream crossing (e.g., pipe, culvert, swale or bridge) within that Threshold Drainage Area. If the stream crossing is a bridge, a follow up rapid assessment of stream stability is also required.

- If the results of the rapid assessment indicate that the representative reach is laterally and vertically stable (i.e., a rating of excellent or good) the Department does not have to conduct further analyses and must implement the Design Pollution Prevention and Treatment BMPs.
- If the results of the rapid assessment indicate that the representative reach will not be laterally and vertically stable (i.e., a rating of excellent or good), the Department must

determine whether the instability, in conjunction with the proposed project, poses a risk to existing or proposed highway structures by conducting appropriate Level 2 (and, if necessary, Level 3) analyses.

- If the results of the Level 2 and 3 analysis indicate that the instability, in conjunction with the proposed project, poses a risk to existing or proposed highway structures, other options must be implemented, including, but not limited to, in-stream and floodplain enhancement/restoration, fish barrier removal as identified in the report required under Article 3.5 of the Streets and Highways Code, regional flow control, off-site BMPs, and, if necessary, project re-design.

The project engineer will work with the hydraulics unit and other design support units such as geotechnical to conduct and document the assessment. This evaluation will be included as part of the SWDR at the PSE phase.

III.1.6 Treatment BMPs

Approved Treatment BMPs must be considered for this project as required under the SWMP to avoid or minimize the potential long term impacts from any Department facilities or activities. The approved treatment BMPs listed below are considered to be technically and fiscally feasible. Department experience has found these BMPs to be constructible, maintainable, and effective at removing pollutants to the maximum extent practicable.

The designer will follow Appendix E and the T-checklists found in the PPDG to select and determine specific treatment BMP feasibility. This assessment can be crudely described as

1) Determine if there are any TMDL adopted within project limits
2) Determine if there are any 303d listed water bodies within project limits
3) Determine whether constituents on 303dlist are Department's TDCs
4) Evaluate feasibility of incorporation by ensuring siting criteria is met
5) Run WQV/F calculations
6) Look at checklist T-1 Part 1
7) Run Infiltration Tool
8) Complete checklist T-1 part 1-10 thereby completing design criteria evaluation of all Approved Treatment BMPs
9) Document in SWDR

Table III.1.6.1 Approved Treatment BMPs

Biofiltration Systems	Infiltration Devices
Detention Devices	Traction Sand Traps
Dry Weather Flow Diversion	Gross Solid Removal Devices (GSRDs)
Media Filters	Multi Chamber Treatment Train
Wet Basins	

Source: PPDG Manual, Table 2-5, July 2010

A preliminary review of the project area has been completed and potential locations and types of treatment BMPs have been assessed for feasibility (based on criteria outlined in the PPDG and discussed above along with other factors such as climate, water volume, soil conditions, physical limitations, other environmental considerations, etc.). As the proposed project proceeds further into the design phase, the locations of these treatment BMPs would be further evaluated to determine feasibility in relation to right-of-way limitations, environmental constraints and hydraulic capacity. In addition, in areas where treatment BMPs cannot be incorporated due to above mentioned reasons, vegetation will be maximized and every effort will be made to ensure the successful establishment of landscaping and erosion control throughout the project limits. The project will also consider any future treatment BMPs that might be approved by Caltrans from the ongoing research and monitoring program.

Description, design criteria and siting consideration of approved treatment BMPs is presented below. The SWDR will document decisions made by the PE to determine feasibility and implementation of treatment BMPs to deal with TDCs and other parameters as required by the Permit and outlined in the PPDG.

III.1.6.1 BIOFILTRATION STRIPS AND SWALES

Biofiltration Strips are vegetated land areas, over which stormwater flows as sheet flow.
Biofiltration Swales are vegetated channels, typically configured as trapezoidal or v-shaped channels that receive and convey stormwater flows while meeting water quality criteria and other flow criteria.
Pollutants are removed by filtration through the vegetation, sedimentation, adsorption to soil particles, and infiltration through the soil. Strips and swales are effective at trapping litter, Total Suspended Solids (soil particles), and particulate metals. In most cases, flow attenuation is also provided, thus biofiltration swales and strips can also be considered a LID technique.
Caltrans Biofiltration Swale Design Guidance and Caltrans Biofiltration Strips Design Guidance for complete guidance on design criteria, site evaluation, and preliminary and final design.

<u>Description</u>

Biofiltration Strips are sloped vegetated land areas located adjacent to impervious areas, over which storm water runoff flows as sheet flow. Pollutants are removed by filtration through the vegetation, uptake by plant biomass, sedimentation, adsorption to soil particles, and infiltration through the soil. Biofiltration Swales are vegetated, typically trapezoidal channels, which receive and convey storm water flows while meeting water quality criteria and other flow criteria. Pollutants are removed by filtration through the vegetation, uptake by plant biomass, sedimentation, adsorption to soil particles, and infiltration through the soil.
When properly implemented, biofiltration strips and swales are aesthetically pleasing. Due to the presence of its vegetation, the public views these devices as a “landscaped roadside” this would make placement more acceptable than other Treatment BMPs using concrete vaults.

<u>Appropriate Applications and Siting Criteria</u>

Biofiltration Strips and Swales should be considered wherever site conditions and climate allow vegetation to be established and where flow velocities will not cause scour. A minimum vegetative cover of approximately 70% is required for treatment to occur.
Biofiltration Strips and swales are one of several BMPs for treatment of stormwater runoff

from project areas that are anticipated to produce pollutants of concern (e.g., roadways, parking lots, maintenance facilities, etc.).

III.1.6.2 INFILTRATION DEVICES

An Infiltration Device is designed to remove pollutants from surface discharges by capturing the Water Quality Volume (WQV) and infiltrating it directly to the soil rather than discharging it to surface waters. Infiltration devices may be configured as basins or trenches.

The following sections give a brief overview of infiltration devices and a summary of design criteria.

Description

Infiltration Basins are a volume-based Treatment BMP that temporarily store runoff in bermed or excavated areas for later infiltration over a limited period. During a storm, runoff enters the Infiltration Basin during which time the water level in the basin rises. During the rainfall, and for some time after it ends, the runoff infiltrates into the soil through the invert area, which is sized depending upon the design volume of runoff to be treated, the permeability of the soil below the invert, and the time period selected for infiltration (between 24 to 96 hours, but typical projects use 40 to 48 hours). Overflow events (when the runoff during rainfall events rises above the WQV elevation) are released, typically through a spillway through the confining berm, or through an overflow riser.

Infiltration Basins should be considered wherever site conditions allow and the design WQV exceeds 0.1 acre-feet.

An Infiltration Trench utilizes relatively shallow excavations backfilled with gravel or other high porosity materials to create subsurface storage for runoff that will over a design period infiltrate into the surrounding soils. Infiltration Trenches are often elongated, allowing them to be used in constricted areas, but there is no shape restriction.

The WQV should be directed to the Infiltration Trench by gravity flow in an open channel or as sheet flow and the captured volume should flow downward within the trench by the action of gravity and without vertical piping for distribution to lower depths of the trench.

Since infiltration trenches can be sited in circuitous alignments and sometimes implemented within a disconnected and distributed pattern, the BMP can also be considered a LID technique.

Infiltration Devices are considered the most effective Treatment BMP against most pollutants. Due to the effectiveness of treatment, Infiltration Devices are always a first choice to be considered when selecting a Treatment BMP for a Caltrans project.

Appropriate Applications and Siting Criteria

Infiltration Devices should be considered wherever site conditions allow. Appropriate sites for Infiltration Devices should have:

a) Sufficient soil permeability;
b) A sufficiently low water table;
c) The influent would not present a threat to local groundwater quality; and
d) Sufficient elevation to allow gravity drainage of the device when needed for maintenance purposes (Infiltration Basin only).

III.1.6.3 DETENTION DEVICES

A Detention Device is a permanent treatment BMP designed to reduce the sediment and particulate loading in runoff from the water quality design storm (Water Quality Volume [WQV]). While the WQV is temporarily detained in the device sediment and particulates settle out under the quiescent conditions prior to the runoff being discharged. A Detention Device is typically configured as a basin.

Detention Basins can remove litter, settable solids, total suspended solids, particulate metals, and absorbed pollutants such as heavy metals, oil, and grease by capturing, temporarily detaining, and gradually releasing storm water runoff.

The following sections give a brief overview of detention devices and a summary of design criteria. The PE shall refer to Caltrans Detention Basins Design Guidance for complete guidance on design criteria, site evaluation, and preliminary and final design.

Description

Detention Basins operate by intercepting runoff and detaining it long enough for the sediment and particulates to settle out under quiescent conditions prior to the runoff being discharged. Detention Basins are typically designed to completely drain after a storm event, and are normally dry between rain events. Detention Basins are designed for water quality purposes but they must also operate safely and effectively as part of the overall highway drainage system. Detention Basins must safely pass the peak drainage facility design event in accordance with the HDM.

In addition, Detention Basins should be able to operate by gravity flow while limiting clogging of the water quality outlet and providing a proper overflow spillway or overflow riser for larger runoff volumes. The basins should only require occasional maintenance and cleaning.

Entering flows should be distributed uniformly at low velocity to prevent re-suspension of settled materials and to encourage quiescent conditions. Low flow channels are often used to ensure conveyance to the outlet and to limit erosion during low flows. Basin shape and/or configuration should result in as natural an appearance as possible.

Appropriate Applications and Siting Criteria

Detention Devices and other approved Treatment BMPs should be considered for implementation wherever Infiltration Devices are not feasible. For Detention Devices, the WQV should be at least 0.1 acre-foot and site conditions must meet criteria.

Sufficient hydraulic head should be available so that water stored in the device does not cause an objectionable backwater condition in the upstream storm drain system. The seasonally high groundwater should be at least 10 ft below the invert of the Basin unless a liner is used.

III.1.6.4 DRY WEATHER FLOW DIVERSION

Dry Weather Flow Diversion (DWFD) devices provide permanent treatment by directing nonstormwater flow through a pipe or channel to a local municipal sanitary sewer system during the dry season or dry weather. This flow must be generated by Caltrans activities or facilities.

Description

Typically, dry weather flow diversions consist of a berm or wall constructed across the dry weather flow drainage channel so the dry weather flows are diverted to a pipe or channel leading to the sanitary sewer. A gate, weir, or valve should be installed to stop the diversion during the wet season or during storms during the wet season. Accordingly, the conveyance to the sanitary

sewer should be sized for the dry weather flows only. Wet weather flow is diverted back to the stormwater conveyance system.
If possible, a screen or trash rack should be installed at the diversion to reduce the likelihood of clogging the diversion pipe or channel. Maintenance vehicle access should be provided, especially if a screen is installed.
Appropriate Applications and Siting Criteria
DWFD should only be considered when all of the following conditions apply:
• Dry weather flow is persistent, and contains pollutants;
• An opportunity for connecting to a sanitary sewer is reasonably close and would not involve extraordinary plumbing, features or construction practices to implement;
• The POTW is willing to accept the flow during the dry season or dry weather.

III.1.6.5 MEDIA FILTERS

A Media Filter Treatment BMP device primarily removes TSS pollutants (sediments and metals) from runoff by sedimentation and filtering, and also is effective for dissolved metals, litter and potentially some nutrients (depending upon type of Media Filter selected).
Description
There are two types of approved Media Filter devices: The Austin Sand Filter and the Delaware Sand Filter; each is configured using two chambers. An Austin Sand Filter is usually open and at grade and has no permanent water pool; a Delaware Sand Filter is always configured with closed chambers and below grade and has a permanent pool of water. An Austin Sand Filter may be configured with earthen or concrete sides and invert; a Delaware Sand Filter is always made using concrete sides and invert.
In both types of Media Filters, stormwater is directed into the first chamber where the larger sediments and particulates settle out, and the partially treated effluent is metered into the second chamber to be filtered through a media. In the Austin Sand Filter, the first chamber may be sized for the entire WQV ('full sedimentation') or as a 'partial sedimentation' chamber, holding only about 20% of the WQV; the Delaware Sand Filter holds the entire WQV in the initial chamber, and is designed to pass the WQV from the second chamber.
The treated effluent (filtered water) is captured by perforated underdrains for release downstream. There is a drop in elevation of 3 ft to 6 ft between the invert of the inlet pipe and the invert of the device outflow pipe depending on device type, size or configuration.
The filter media typically consists of sand, which is effective for removal of coarse and fine sediments and particulate metals. Other materials, such as topsoil or organic materials may be added to the sand to increase the treatment capacity for some pollutants (for example, dissolved metals) but these additives often increase the nitrogen and phosphorus concentration levels in the effluent. When media filters are used to encourage infiltration or subsurface storage and mimic natural hydrology within small applications, then the media filters may be considered a LID technique.
Appropriate Applications and Siting Criteria
The minimum WQV for Media Filters is ≥ 4,356 ft3 (0.1 acre-ft [a-f])
Sites proposed for Media Filters must have sufficient hydraulic head to operate by gravity; generally between 3 to 6 ft of elevation drop is needed between the inflow to the initial chamber and effluent outflow from the second chamber.

Media Filters will perform better if the tributary area has a relatively high percentage of impervious area, and low sediment loading.
Standard details for a vector-proof Delaware Sand Filter have been developed when vector control is an issue.
For earthen-type Media Filters, at least 10 ft separation from seasonally high groundwater should be provided. For vault-type Media Filters, the level of the concrete base of the vault must be above seasonally high groundwater unless by special design.

III.1.6.6 WET BASIN

Wet Basins are detention systems comprised of a permanent pool of water, a temporary storage volume above the permanent pool, and a shoreline zone planted with aquatic vegetation. Wet Basins are designed to remove pollutants from surface discharges by temporarily capturing and detaining the Water Quality Volume (WQV) in order to allow settling and biological uptake to occur. Wet Basins are recommended for the following pollutants: Total Suspended Solids (TSS); nutrients; particulate metals; pathogens; litter; and Biological Oxygen Demand (BOD).

Description

A Wet Basin has temporary storage capacity above the permanent pool for the Water Quality Volume. The WQV enters the Wet Basin and commingles with the permanent pool, during which time the water level in the basin rises to inundate the surrounding vegetation during a WQ event. The commingled water is slowly discharged through a water quality riser until the water level returns to the level of the permanent pool.
The level of the permanent pool must be maintained year-round to support the plant community in the Wet Basin; this water level is maintained by connecting the Wet Basin to a stream channel, by seepage from springs, or by water from some other source.

Appropriate Applications and Siting Criteria

The site under consideration for a Wet Basin should, if possible, be located where the visual aesthetics of the permanent pool is considered a benefit (such as a roadside rest area or vista point). The proposed site must have a source of water to provide base flow sufficient to maintain a year-round plant community to account for losses due to infiltration and evapo-transpiration. The soil immediately below the invert must be relatively impermeable to limit loss of water by infiltration (NRCS Hydrologic Soils Group [HSG] soils C and D) unless a liner is used. Separation between seasonally high groundwater and basin invert should be > 10 ft; use liner if separation is between 1.0 ft and 10 ft unless approved by the local RWQCB due to presence of low permeability soils [Hydrologic Soil Groups C or D]).
Conditions that do not allow for siting are: sites having contaminated soils or groundwater plumes; objectionable backwater conditions in the storm drain system being induced; placement on or near unstable slopes, or slopes steeper than 15 percent.
Note also that if the impounded volume exceeds 15 a-f then the Wet Basin may classify as a jurisdictional dam and be subject to other requirements; consult with District Hydraulics if the volume below the spillway exceeds this threshold.

Specific information about Multi-Chamber Treatment Train, Gross Solids Removal devices and Traction Sand Traps are not included since the project location, TDC or operations do not meet the design criteria.

III.1.7 Water Quality Volume/ Flow

Water Quality Volume (WQV)

Treatment BMPs are designed to treat the lower volume or flow of more frequent (i.e. return period < 1 year) storm events. The volume associated with the frequent events are commonly referred to as the WQV for BMPs designed based on volume, and Water Quality Flow (WQF) for BMPs designed based on flow.

Treatment BMPs are sized to accommodate the WQF or WQV from the contributing drainage area. Flows in excess of these values are diverted around or through the Treatment BMP. Methods for determining the WQV are generally tied to an analysis of rainfall depths generated over 24-hour periods although the WQV may be determined by the drawdown time of certain Treatment BMPs.

The WQV of Treatment BMPs is based on using either of the following methods:

1. Where they are established, sizing criteria from the RWQCB or local agency (whichever is more stringent) will be used; or
2. Where the RWQCB or local agency does not have an established sizing criterion, Caltrans will use the following method:

Water Quality Flow (WQF)

The listed values of rainfall intensity are used in the Rational Formula (Q=CiA) to estimate runoff from areas that would discharge flow to flow-based Treatment BMPs. The resulting runoff rate would be the design WQF to be used at any specific site. The WQF is the primary design criteria used for various types of flow-based Treatment BMPs (e.g. Biofiltration Swales). Caltrans, the SWRCB and the nine RWQCBs worked cooperatively to establish these values. For San Diego, the negotiated rainfall intensity is 0.20"/hr region wide. In addition to designing for the WQF, the PE must also insure that the flow-based Treatment BMPs include a bypass or an overflow device to convey peak discharges from larger design storms consistent with Section 861.3 of the Highway Design Manual.

III.1.8 Infiltration Tool

In order to determine infiltration by vegetated and earthen BMPs, the Department created a workbook containing two separate tools: the Strip and Swale Infiltration Tool (SSIT) and the Basin Infiltration Tool (BIT). The SSIT was created to estimate infiltration for biofiltration strips and swales, infiltration trenches, and other subsurface infiltration practices.

The BIT was created to estimate infiltration for infiltration basins and detention basins. The values generated by these tools are intended to be used in the SWDR, which requires the input of an infiltration estimate for four scenarios:

1) flow across native soil or existing fill,
2) flow across amended soil,
3) infiltration basins, and
4) detention basins.

The output generated will be used by Design to determine whether infiltration is occurring and whether it can be increased by use of compost or other soil amendments.

III.1.9 Existing Treatment BMPs within the I-5 Corridor

Litigation between the Department and the Natural Resource Defense Council (NRDC), Coast Keepers and the United States Environmental Protection Agency (USEPA) resulted in a requirement to develop a Best Management Practice (BMP) Retrofit Pilot Program in District 7 and 11 (BMP Retrofit Pilot Program). Moreover, subsequent to the Statewide Permit adoption (Order 99-06-DWQ), and as described in SWMP section 4.4.1 and PPDG, Caltrans conducts an assessment whenever new construction or reconstruction is taking place, documented in the SWDR. Below is a list of the treatment BMPs that have been constructed within the I-5 corridor as either part of the BMP Retrofit Pilot Program or ongoing construction projects along with some photographs.

Table III.1.9.1 Existing Treatment BMPs within the I-5 North Coast Project*

Watershed	Location Description	BMP type	Total Tributary Area (Treated Acres)
Penasquitos	N Roselle St, 5/805 I-5/SR-56	Biofiltration Swales Detention Basin	7.7
San Dieguito	N of Del Mar Heights Lomas Santa Fe	Biofiltration Swales and Detention Basin Biofiltration Swales	24
Carlsbad	Lomas Santa Fe I-5 at Manchester Avenue I-5/La Costa I-5 & Palomar Airport Rd.	Biofiltration Swales Detention Basin Wet Basin Biofiltration Swale	15

Source: BMP Retrofit program Final Report (CTSW-RT-01-050) and project files (EAs 0301U4, 06510,2358U4)
*Park and Ride treatment numbers not included in table.

I-5/SR-56 Detention Basin after storm event

I-5 at Manchester Ave. Detention Basin after storm event

I-5 @ Lomas Santa Fe Biofiltration Swales after construction

III.1.10 Current Pavement Areas

Table III.1.10.1 below shows existing and proposed pavement acreage by watershed for the I-5 NCC project. These calculations differ from previously provided numbers as a result of more precise cross-section and design information; previous data was based on GIS data.

Table III.1.10.1 Pavement Acreage

Watershed/ Hydrologic Area	Sub watershed/ Major Water Bodies	Location	Existing Impervious Area (Acres)		Proposed Impervious Area (Acres)	
Penasquitos 906	Rose Canyon	La Jolla V. Dr. To Voight St	11.7	193.5	8.7	30.0
	Penasquitos	Voight St To Roselle St	33.1		15.0	
		5/805 To SR 56	115.1		0.0	
		SR 56 – Del mar Height Ave	33.6		6.3	
San Dieguito 905	San Dieguito	Del mar - S. Dieguito River	38.5	90.2	12.7	29.0
		S. Dieguito - V.V. Blvd	14.2		9.4	
		V. V. - Lomas Sanfe Ave	37.5		6.9	
Carlsbad 904	San Elijo Lagoon	Loma. - Manchester Ave	14.5	327.8	20.2	142.3
		Man. - Birmingham Ave	38.3		19.0	
	Cottonwood	Bir. - Encinitas Blvd	28.3		12.7	
		Enc - Leucadia Ave	15.1		6.8	
	Batiquitos	Leu - La Costa Ave	36.6		12.6	
		L.C. - Poinsettia Lane	19.1		8.3	
	Encinas	Poin - Palomar Air. Rd	27.3		10.7	
		Pal - Cannon Rd	32.9		11.3	
	Agua Hedionda Lagoon	Cannon - Tamarack Ave	16.7		7.2	
		Tamarack -Carlsbad V. Dr	28.2		9.0	
	Buena Vista Lagoon	Carlsbad - SR 78	21.9		7.2	
		SR 78 - Cassidy St	21.0		4.4	
	Loma Alta Creek	Cass. - Oceanside Blvd	10.1		5.4	
		O.Blvd. - Mission Ave	17.8		7.5	
San Luis Rey 903	San Luis Rey	Mission - SR 76	16.8	46.0	4.5	12.4
		SR 76 - Harbor Dr	29.2		7.9	
Santa Margarita 902	Santa Margarita (Oceanside Harbor)	Harbor - Vandergrift Blvd	11.7	11.7	0.8	0.8
			Totals	669.2		214.5

III.1.11 Proposed Treatment BMPs

As discussed above, there has been preliminary siting for treatment BMPs based on the current footprint. Based on the proposed areas that will receive treatment, an equivalent of 112 % of the new pavement will receive treatment.

Table III.1.11.1 Treatment Acreage for I-5 NCC Project

Watershed/ Hydrologic Area	Subwatershed/ Major Water Bodies	Location	Existing Treatment Acreage		Proposed Treated Acreage	
Penasquitos 906	Rose Canyon	La Jolla V. Dr. To Voight St	0.0	7.8	9.8	41.7
	Penasquitos	Voight St To Roselle St	0.9		25.1	
		5/805 To SR 56	6.9		6.9	
		SR 56 – Del mar Height Ave	0.0		0.0	
San Dieguito 905	San Dieguito	Del mar - S. Dieguito River	17.7	24.1	23.2	36.4
		S. Dieguito - V.V. Blvd	0.0		4.3	
		V. V. - Lomas Sanfe Ave	6.4		9.0	
Carlsbad 904	San Elijo Lagoon	Loma. - Manchester Ave	2.0	15.0	3.1	137.8
		Man. - Birmingham Ave	4.8		18.1	
	Cottonwood	Bir. - Encinitas Blvd	0.0		25.7	
		Enc - Leucadia Ave	0.0		11.5	
	Batiquitos	Leu - La Costa Ave	4.1		24.9	
		L.C. - Poinsettia Lane	0.0		10.3	
	Encinas	Poin - Palomar Air. Rd	4.1		8.2	
		Pal - Cannon Rd	0.0		9.3	
	Agua Hedionda Lagoon	Cannon - Tamarack Ave	0.0		0.0	
		Tamarack -Carlsbad V. Dr	0.0		0.0	
	Buena Vista Lagoon	Carlsbad - SR 78	0.0		0.0	
		SR 78 - Cassidy St	0.0		11.3	
	Loma Alta Creek	Cass. - Oceanside Blvd	0.0		0.0	
		O.Blvd. - Mission Ave	0.0		15.5	
San Luis Rey 903	San Luis Rey	Mission - SR 76	0.0	0	6.1	19.5
		SR 76 - Harbor Dr	0.0		13.4	
Santa Margarita 902	Oceanside Harbor	Harbor Dr - Vandergrift Blvd	0.0	0	20264.0	5.0
				46.9		240.5

Summary Table of I-5 NCC Impervious Areas being treated

	Existing	Proposed (includes existing)
Impervious	669.2 acres	883.57 acres
Treated Impervious	46.9 acres	240.5 acres
% Treatment	7 %	27 %
Proposed Equivalent Area Treated (proposed treated/added impervious)		**112%**

IV. PROJECT OPERATION AND MAINTENANCE

The Division of Maintenance performs various activities on different facilities throughout the state to ensure safe and usable conditions for the public. Most of the activities are performed by small crews with minimal soil disturbance.

IV.1 Maintenance of Treatment BMPs

The operation and maintenance requirements for each type of treatment BMPs are outlined in Family F-7 and Appendix C of the maintenance staff guide, they are included in the following pages.

C.23 STRUCTURAL TREATMENT SYSTEM MAINTENANCE

Revised October 2007

The following systems represent the approved structural treatment best management practices (STBMPs) that have been approved as technically and fiscally feasible in reducing constituents of concern to improve water quality. The systems include:

- Biofiltration Strips and Swales (Section C.23.1),
- Infiltration Basins (Section C.23.2),
- Infiltration Trenches (Section C.23.3),
- Detention Devices (Section C.23.4),
- Traction Sand Traps (Section C.23.5),
- Gross Solids Removal Devices (Section C.23.6),
- Austin Sand Filters (Section C.23.7),
- Delaware Sand Filters (Section C.23.8),
- Multi-Chambered Treatment Trains (Section C.23.9), and
- Wet Basins (Section C.23.10).

This section of the Staff Guide describes typical STBMPs and their recommended maintenance. Actual field STBMPs may vary from the standard schematics shown in this section. Division of Maintenance supervisory staff may modify the recommended frequency of a maintenance activity on a site-specific basis to ensure functionality.

Previous study of STBMPs demonstrated that inspection frequency and vegetation management were primary cost factors (BMP Retrofit Pilot Study Final Report, CTSW-RT-01-050). Consequently these items are minimized in these guidelines, though other district policies, such as fire safety and aesthetics, may dictate more frequent maintenance. Further, with increasing numbers of STBMPs, it is critical that the maximum amount of necessary work is accomplished with each site visit. To this end, it is recommended that STBMP inspectors carry the necessary equipment (Table C-61) to unclog a BMP that needs immediate maintenance. If the BMP is inspected 3 days after a storm event, concurrent unclogging may allow draining before the 96-hour limit for vector breeding and vector control district consultation. It also allows subsequent maintenance, if needed, to be scheduled during a dry period rather than the period immediately following a storm, which is often a period of peak demand on maintenance resources.

There may be occasions where emergencies arise, such as accidents, toxic spills, or other incidents, where immediate response is needed. On those occurrences, Caltrans crews will respond to the emergency, on a priority basis and, if necessary, the BMP will be taken out of service until the BMP functionality can be restored. The goal for such critical situations is to have the BMP back into service within 30 days.

Prior to intrusive maintenance at any BMP, maintenance personnel should check with the District biologist to ensure there are no endangered species, threatened species or species of special concern within the BMP maintenance area.

This section does not include maintenance that may be necessary for vector control of devices that hold a permanent pool of water where vector prevention has failed. In such cases the local vector control authority should be consulted.

For many treatment BMPs, the wet season inspections are scheduled 3 days after substantial rainfall events (0.75 inches is suggested for most areas of California), which requires tracking storm size and when the storm event ended. A rain gauge at the maintenance station can be used to verify storm size. There are also Internet resources, such as weather.com where the 'yesterday' tab gives precipitation measurements.

Table C-61. Inspection and Unclogging Equipment list

ITEM	PURPOSE
Hard hat, boots, gloves	Safety and comfort
Camera, inspection forms, tape measure	Documentation
Plumbing snake and thin rod	Unclogging orifices
Metal rake	Breaking up accumulated sediment that act as dams, scarifying infiltration basins and filters,

C.23.1 Biofiltration Strips and Swales

Revised October 2008

Description:

These measures are intended to maintain established biofiltration swales and strips as effective devices for treating runoff discharges. These requirements for inspection and maintenance will allow the devices to continue to function as designed for water quality purposes.

Appropriate Application:

The BMP maintenance described in Table C-62 and Table C-63 apply to personnel that inspect and maintain biofilter swales, where water depths tend to be deeper than strips so plant height guidelines may be helpful to performance. For strips, the Roadside Vegetated Treatment Sites (RVTS) Study (CTSW-RT-07-127.01.2) characterized the treatment benefit of roadside strips that did not have a water quality based maintenance program. The comparison of the RVTS results with previous studies suggest that maintenance of biofiltration strips, beyond the Department's current statewide protocols for vegetation, do not enhance pollutant removal. Therefore, biofiltration strips and other RVTS-type areas that receive sheet flow should be maintained according to existing district maintenance protocols. Further, some areas may have strips that do not have vegetation to design standards (e.g. 80 percent coverage) because soil and climate may limit the success of establishment. In these cases, stormwater treatment benefit may still occur, mostly from infiltration, so a continual effort to force establishment of vegetation may not be justified. Refer to the District landscape architect office for advice on identifying these circumstances.

Swales tend to have higher water depths than strips, so preventative and corrective maintenance for maintaining plant vegetation height should be implemented.

The preventative maintenance routine is described in Table C-62, and the corrective maintenance activities are described in Table C-63.

Chemical vegetative control measures will not be used on vegetated treatment BMPs except where Caltrans is directed by the California Department of Food and Agriculture to treat the BMPs for invasive weeds. Fire control strips up to 2.4 meters (8 feet) wide may be maintained through pesticide applications adjacent to biofiltration swales. The areas used for fire control will not be considered as part of the treatment system. Report the use of chemicals in the Caltrans Stormwater Management Annual Report.

Implementation:

Field measurements of maintenance indicators are made by visual observation. Frequencies provided are for the minimum required level of service. Greater maintenance frequencies may be required depending on the particular site and level of traffic. A schematic of a biofiltration swale and strip is shown in Figure C-10.

TABLE C-62: BIOFILTRATION SWALES SYSTEMS PREVENTATIVE MAINTENANCE

FREQUENCY	ROUTINE ACTION	ACTIVITY CUT-SHEET
Annually	Mow grass, grass-lined swales and strips to an average height of 6 inches	B-40

TABLE C-63: BIOFILTRATION SWALES MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Evidence of significant channeling, erosion, seeps, or ponding	Annually in late wet season	Correct channelized, eroded, seeped, or ponded areas using additional fill and vegetation depending on coverage and/or by removing accumulated sediment. Complete prior to next wet season.
Average vegetation height exceeds 12 inches, emergence of trees, or woody vegetation	Semi-Annually, once during wet season, once during dry season (depending on growth)	Cut vegetation to an average height of 6 inches; cuttings may be removed at discretion of District Maintenance.
Less than 80 percent coverage in swale invert and swale side slope	Semi-Annually, once late wet season and once late dry season	Assess quantity needed and reseed/revegetate barren spots by November. Contact environmental or landscape architect for appropriate seed mix. Scarify area to be restored, to a depth of 2-inches. Restore side slope coverage with hydroseed mixture. If growth is unsuccessful after 2 applications (2 seasons) of reseeding/revegetating, an erosion blanket or equivalent protection should be installed over eroding areas
Debris/trash present	Inspect during routine trash collection	Remove litter, and debris per routine District schedule.

TABLE C-63: BIOFILTRATION SWALES MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Sediment at or near vegetation height, channeling of flow within swale and energy dissipaters, inhibited flow due to change in slope	Annually in the dry season	• Remove sediment. If flow is channeled, determine cause and take corrective action. If sediment becomes deep enough to change the flow gradient, remove sediment during dry season, and properly dispose of sediment, and revegetate. • Notify engineer or District Maintenance Storm Water Coordinator to determine if regrading is necessary. If necessary, regrade to design specification and revegetate swale/strip. If regrading is necessary, the process should start in May. Revegetate strip/swale in Nov. Target completion prior to wet season. • Remove and properly dispose of sediment. Refer to Activity Cut-Sheet B-48. .
Burrows, holes, mounds	Annually and after vegetation trimming	Where burrows cause erosion or jeopardize structural integrity, backfill firmly.
Water accumulation in spreader ditch and/or collector ditch for more than 72 hours	Within 72 hours after a storm event 0.75 inches or greater. If no such event occurs before April 1, conduct wet season inspections in April.	At the time of inspection, de-water the spreader ditch to a depth of less than 0.25 inches. If sediment impedes the de-watering activity, then move or remove that portion of the sediment. Dispose sediment properly.
Inlet structures, outlet structures, side slopes or other features hindered by debris or damaged, significant erosion, fence damage, graffiti, vandalism, etc.	Semi-Annually, late wet and late dry season	Repair/take corrective action prior to wet season. Contact the District Maintenance Storm Water Coordinator if repairs /solutions are not readily available in the field. The District Maintenance Storm Water Coordinator will coordinate with appropriate staff for repairs/solutions.

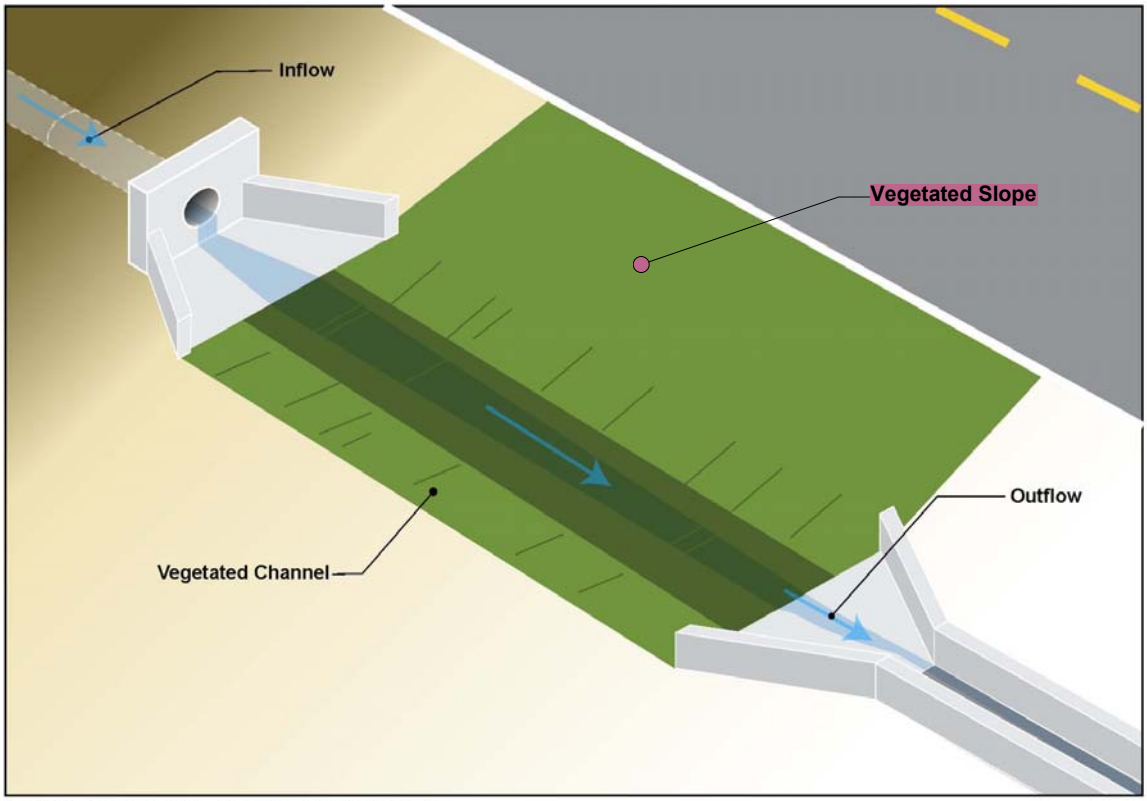


Figure C-10
Schematic of a Biofiltration Swale & Strip

C.23.2 Infiltration Basins

Revised October 2009

Description:

These measures are intended to maintain infiltration basins as effective devices for treating runoff discharges. These requirements for inspection and maintenance will allow the devices to continue to function as designed for water quality purposes.

Appropriate Applications:

The BMP maintenance described in Table C-64 and Table C-65 apply to personnel who inspect and maintain infiltration basins. The preventative maintenance routine is described in Table C-64, and the actual maintenance activities are described in Table C-65. A schematic of an infiltration basin is shown in Figure C-11.

Implementation:

Field measurements of maintenance indicators are made by visual observation. The illustration below provides a graphical representation of the drain time threshold for standing water:

TABLE C-64 INFILTRATION BASIN PREVENTATIVE MAINTENANCE

FREQUENCY	ROUTINE ACTION	ACTIVITY CUT-SHEET
Annually at the end of the wet season	Trim vegetation to an average height of 6 inches.	B-39, B-40

TABLE C-65: INFILTRATION BASIN MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Emergence of trees or woody vegetation	Once during wet season, once during dry season	Remove any trees, or woody vegetation at District Maintenance discretion, reasons may include maintenance access, clogged inlets, or tree preservation requirements in coastal zone.
Debris/trash present	Inspect during routine trash collection- Minimum twice per year	Remove and dispose of trash and debris per routine District schedule.

TABLE C-65: INFILTRATION BASIN MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Standing water for more than 72 hours	Annually 3 days after a 0. 75-inch storm event. If no such event occurs before April 1, conduct wet season inspections in April.	• Drain facility, if possible, by scarifying the invert or by opening the maintenance drain at the time of inspection. • Notify engineer or District Maintenance Storm Water Coordinator to consider the following: - Remove sediment, scarify invert, and regrade if necessary. - If unable to achieve acceptable infiltration rate or implement alternative solution then move to decommission. - If standing water cannot be removed within 96 hours notify the District Maintenance Storm Water Coordinator/Vector Control District. - Remove and properly dispose of sediment. Refer to Activity Cut-Sheet B-48.
Standing water for more than 96 hours	1 day after above inspection where standing water was observed and action taken.	Notify the District Maintenance Storm Water Coordinator/Vector Control District.
Sediment depth exceeds marker on staff gage	Annually in the dry season	Remove and properly dispose of sediment. Regrade and revegetate bare areas. Guidelines on revegetation will be consistent with existing vegetation within basin. Also refer to maintenance activity for 'Evidence of Erosion' indicator for guidelines on revegetation.
Evidence of erosion	During dry season	Reseed/revegetate barren spots prior to wet season. Contact environmental or landscape architect for appropriate seed mix. Scarify surface if needed. If after two applications (2 seasons) of reseeding / revegetating and growth is unsuccessful both times, an erosion blanket or equivalent protection will be installed over eroding areas. No erosion blanket will be installed in the basin invert.
Burrows, holes, mounds	Annually and after vegetation trimming	Where burrows cause erosion or jeopardize structural integrity, backfill firmly.

TABLE C-65: INFILTRATION BASIN MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Inlet structures, outlet structures, side slopes or other features hindered by debris or damaged, significant erosion, graffiti or vandalism, fence damage, etc.	Semi-Annually, late wet season and late dry season	Take corrective action prior to wet season. If repair solutions are not readily available in the field notify the District Maintenance Storm Water Coordinator who will coordinate with appropriate staff.
Average plant height is greater than 12 inches	Inspect once during wet season and once during dry season	Cut or remove vegetation and clippings as appropriate.

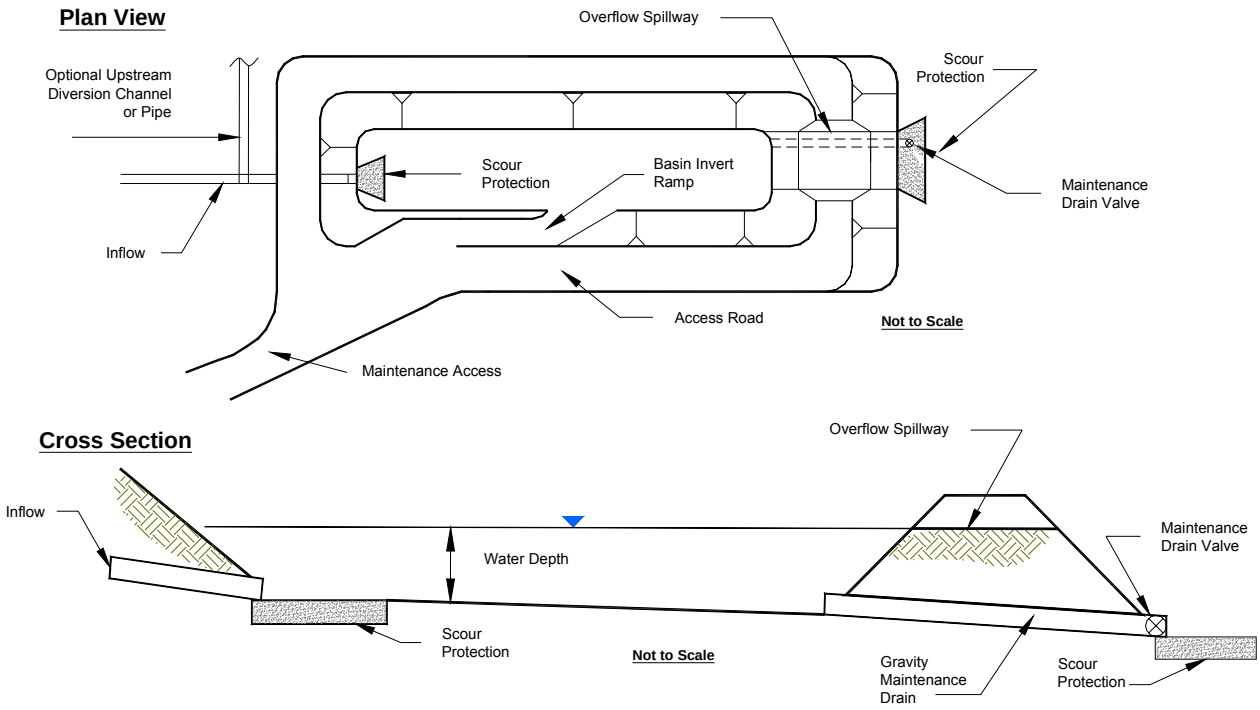


Figure C-11
Schematic of an Infiltration Basin

C.23.3 Infiltration Trenches

Revised October 2009

Description:

These measures are intended to maintain effective infiltration trenches for treating runoff discharges. These requirements for inspection and maintenance will allow the devices to continue to function as designed for water quality purposes.

Appropriate Application:

The BMP maintenance described in Table C-66 applies to personnel who inspect and maintain infiltration trenches. The maintenance activities are described in Table C-66. A schematic of an infiltration trench is shown in Figure C-12.

Implementation:

Field measurements of maintenance indicators are made by visual observation. The illustration below provides a graphical representation of the drain time threshold for standing water:

TABLE C-66: INFILTRATION TRENCH MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Standing surface water for more than 72 hours	Once annually, within 72 hours after a 0.75 inch storm event. If no such event occurs before April 1, conduct wet season inspections in April.	• Drain facility by unclogging the orifice or opening the emergency drain at time of inspection • Notify engineer or District Maintenance Storm Water Coordinator to consider the following: – Undertake investigation for course of action to achieve acceptable infiltration rate. If unable to achieve acceptable infiltration then BMP operations cease. • Remove top 18-inch layer of trench, including surface gravel layer, filter fabric, and trench filler material; wash trench filler material and reinstall surface gravel layer, filter fiber, and trench filler material into trench prior to wet season. Refer to Activity Cut-Sheet B-48.

TABLE C-66: INFILTRATION TRENCH MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Standing water for more than 96 hours	1 day after above inspection where standing water was observed and action taken.	Notify the District Maintenance Storm Water Coordinator/Vector Control District.
Trash/debris present.	Inspect during routine trash collection-Minimum twice per year	Remove and dispose of trash and debris per routine District schedule.
Visible sediment	Annually in the dry season	Remove top 18-inch layer of trench, including surface gravel layer, filter fabric, and trench filler material; wash trench filler material and reinstall surface gravel layer, filter fiber, and trench filler material into trench prior to wet season.
Inlet structures, outlet structures, filter fabric or other features hindered by debris or damaged, emergence of trees or woody vegetation, graffiti or vandalism, fence damage, etc.	Semi-Annually, late wet season and late dry season	Take corrective action, prior to wet season. If repair solutions are not readily available in the field notify the District Maintenance Storm Water Coordinator who will coordinate with appropriate staff.

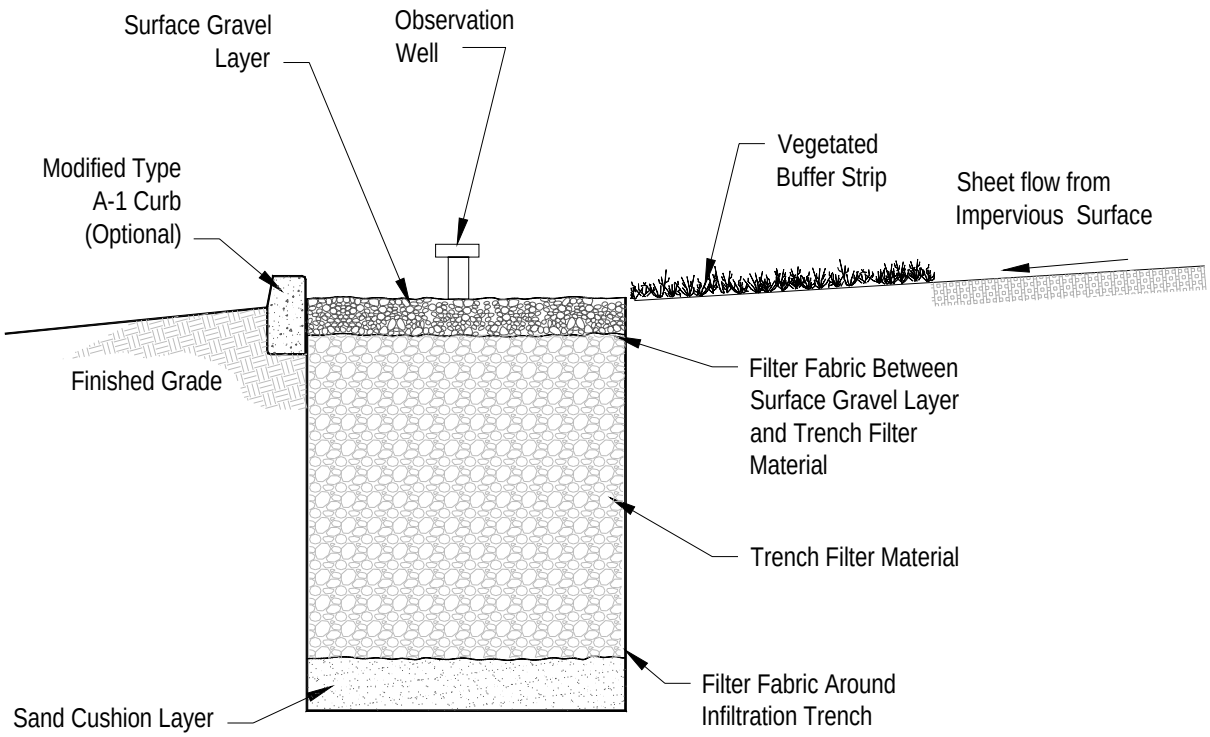


Figure C-12
Schematic of an Infiltration Trench

C.23.4 Detention Devices

Revised October 2009

Description:

These measures are intended to maintain effective detention devices for treating runoff discharges. These requirements for inspection and maintenance will allow the devices to continue to function as designed for water quality purposes.

Appropriate Application:

The BMP maintenance described in Table C-67 and Table C-68 apply to personnel who inspect and maintain detention devices. The preventative maintenance routine is described in Table C-67, and the actual maintenance activities are described in Table C-68. A schematic of a detention device is shown in Figure C-13. A schematic of a water quality outlet structure is shown in Figure C-14.

Implementation:

Field measurements of maintenance indicators are made by visual observation. The figure below provides a graphical representation of the drain time threshold for standing water:

TABLE C-67: DETENTION DEVICE PREVENTATIVE MAINTENANCE

FREQUENCY	ROUTINE ACTION	ACTIVITY CUT-SHEET
Annually at the end of wet season	Remove accumulated debris around outlet structure	B-39, B-40

TABLE C-68: DETENTION DEVICE MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Emergence of trees or woody vegetation	Once during wet season, once during dry season	Remove any trees, or woody vegetation if interferes with function of detention basins (impaired access to inlet/outlets, clogged outlets, or reduced storage volume).
Trash/debris present	Inspect during routine trash collection	Remove and dispose of trash and debris per routine District schedule.

TABLE C-68: DETENTION DEVICE MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Evidence of erosion	During dry season	Reseed/revegetate barren spots prior to wet season. Contact environmental or landscape architect for appropriate seed mix. Scarify surface if needed. If after two applications (2 seasons) of reseeding / revegetating and growth is unsuccessful both times, an erosion blanket or equivalent protection will be installed over eroding areas. No erosion blanket will be installed in the basin invert.
Standing water for more than 72 hours	Within 72 hours after a storm event 0.75 inches or greater. If no such event occurs before April 1, conduct wet season inspections in April.	• Drain facility • Check and unclog clogged orifice at time of inspection. • Notify the District Maintenance Storm Water Coordinator if an immediate solution is not evident. • Remove and properly dispose of sediment. Refer to Activity Cut-Sheet B-48.
Standing water for more than 96 hours	1 day after above inspection where standing water was observed and action taken.	Notify the District Maintenance Storm Water Coordinator/Vector Control District.
Sediment depth exceeds marker on staff gage (average 18 inches)	Annually in the dry season	Remove and properly dispose of sediment. Regrade if necessary.
Burrows, holes, mounds	Annually and after vegetation trimming	Where burrows cause erosion or jeopardize structural integrity, backfill firmly.
Inlet structures, outlet structures, side slopes or other features hindered by debris or damaged, significant erosion, graffiti or vandalism, fence damage, etc.	Semi-Annually, late wet season and late dry season	Take corrective action prior to wet season. Consult engineer or District Maintenance Storm Water Coordinator if immediate solution is not evident.
Average plant height is greater than 12 inches	Inspect once during wet season and once during dry season	Cut or remove vegetation and clippings as appropriate.

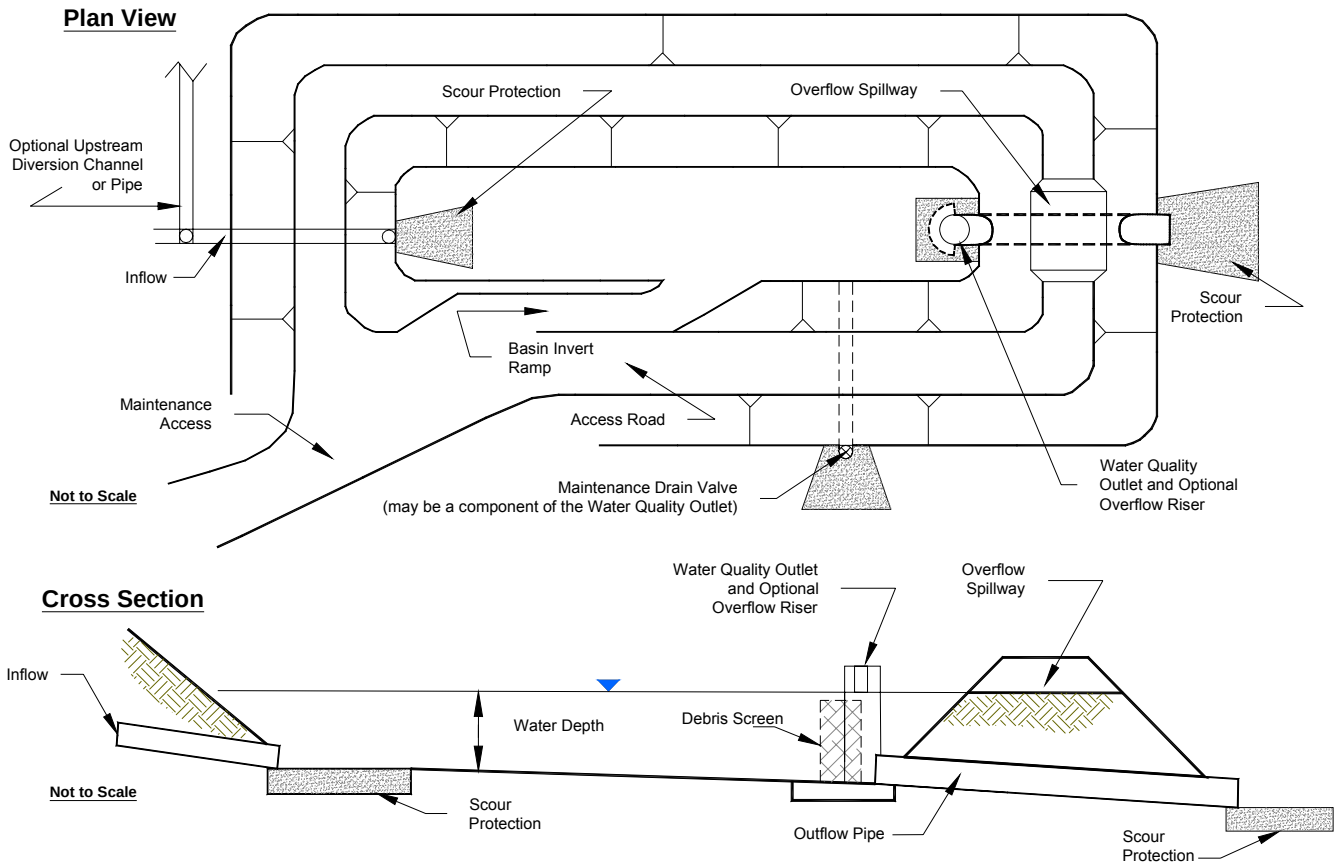


Figure C-13
Schematic of a Detention Device

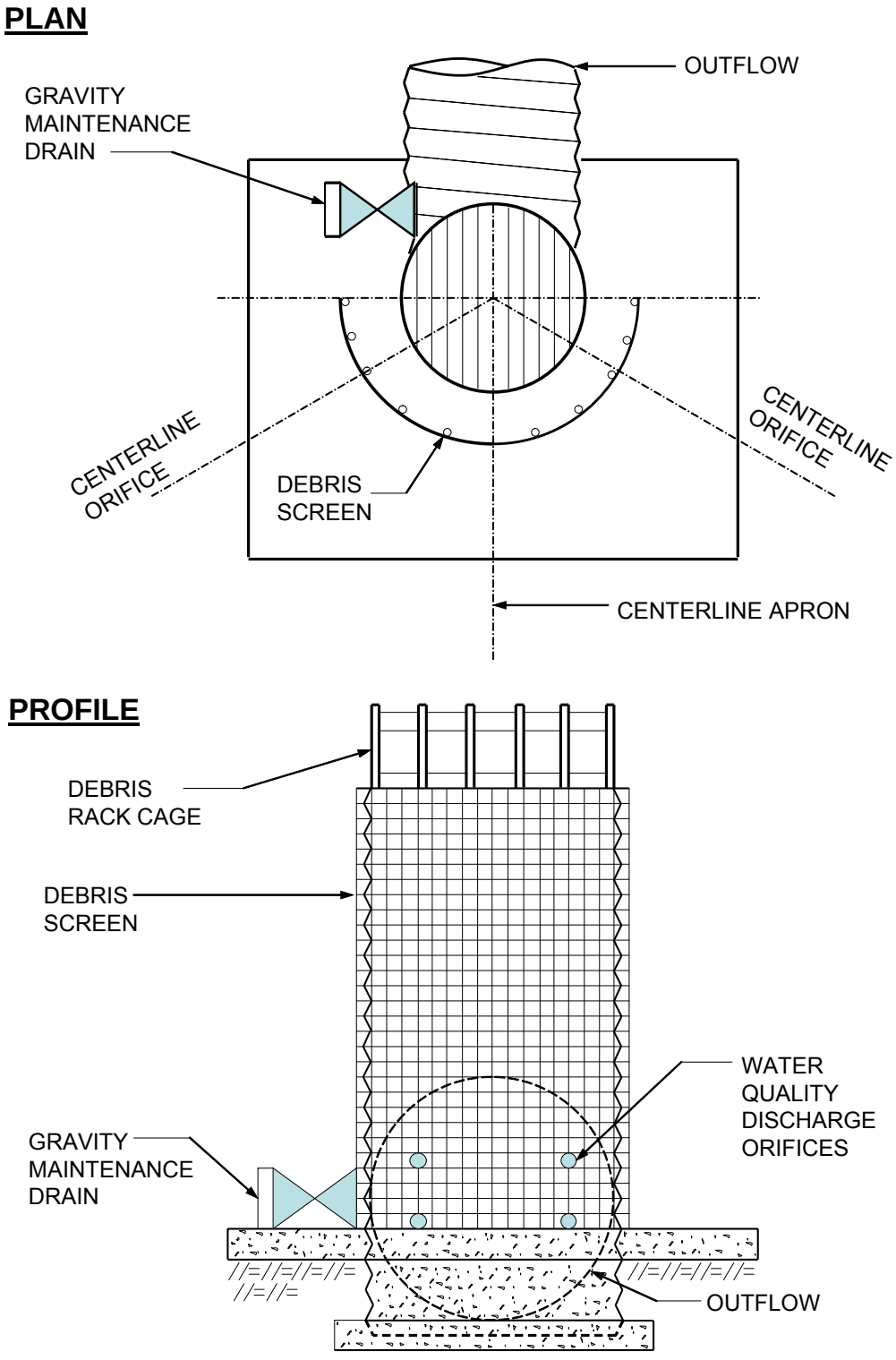


Figure C-14
Schematic of a Water Quality Outlet Structure

C.23.5 Traction Sand Trap Devices

Revised October 2009

Description:

This BMP is intended to maintain sand trap devices as effective devices for treating runoff discharges. These requirements for regular inspection and maintenance will allow the devices to continue to function as designed.

Appropriate Applications:

The BMP maintenance described in Table C-69 applies to personnel who inspect and maintain traction sand trap devices. The maintenance activities are described in Table C-69.

Implementation:

Field measurements of maintenance indicators are made by visual observation. The illustration below provides a graphical representation of the drain time threshold for standing water. Schematics of a Traction Sand Trap are shown in Figures C-15 and C-16.

TABLE C-69: TRACTION SAND TRAP DEVICE MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Sediment volume exceeds design capacity	Inspect annually and after significant storms	• Remove accumulated sediment. • Remove and properly dispose of sediment. Refer to Activity Cut-Sheets B-48 and B-49.
General maintenance items: Inlet/outlet structural integrity, damaged structures, graffiti or vandalism, etc.	Semi-Annually, late wet season and late dry season	Take corrective action prior to wet season. Report general maintenance problems to the District Maintenance Storm Water Coordinator if immediate solution is not evident.
Standing water in structure, between April 16th and September 30th, 96 hours after a storm event.	Inspect 96 hours after one run- off generating storm per year.	Drain facility if possible. If standing water cannot be removed notify the District Maintenance Storm Water Coordinator/Vector Control District.

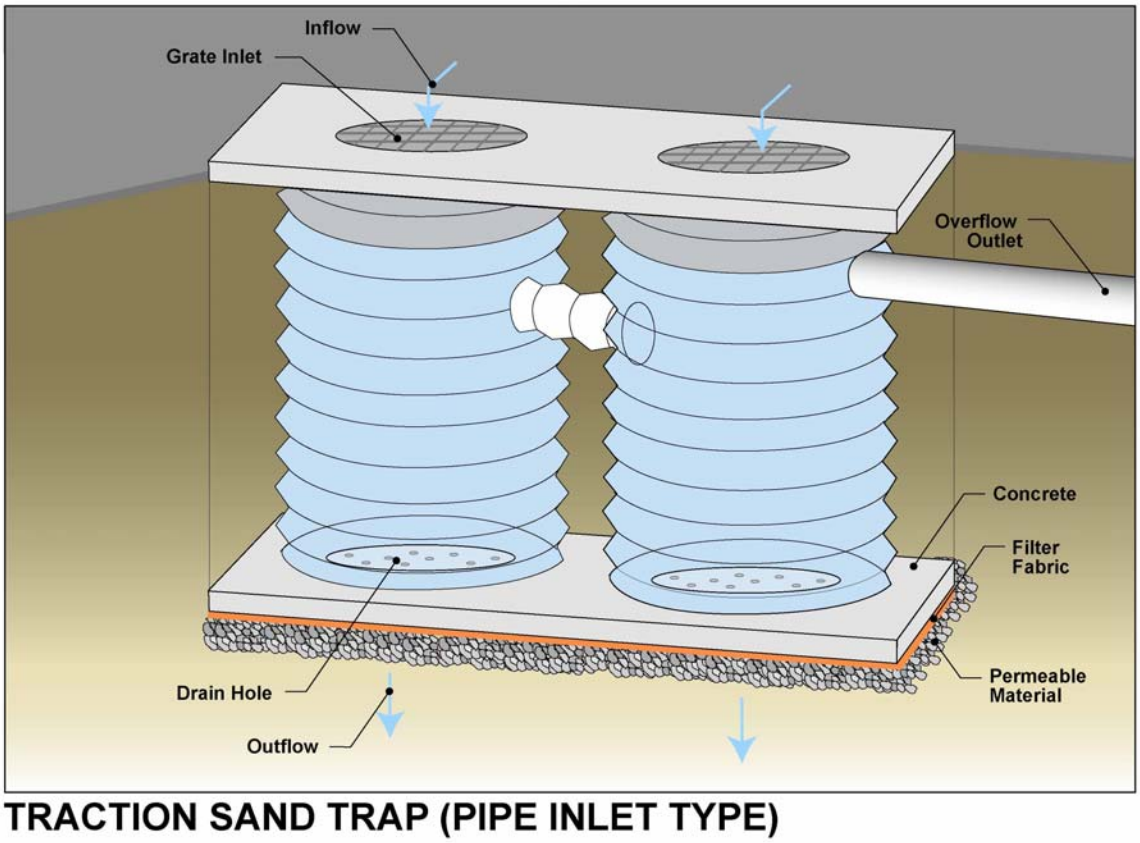


Figure C-15
Schematic of a Traction Sand Trap (Pipe Inlet Type)

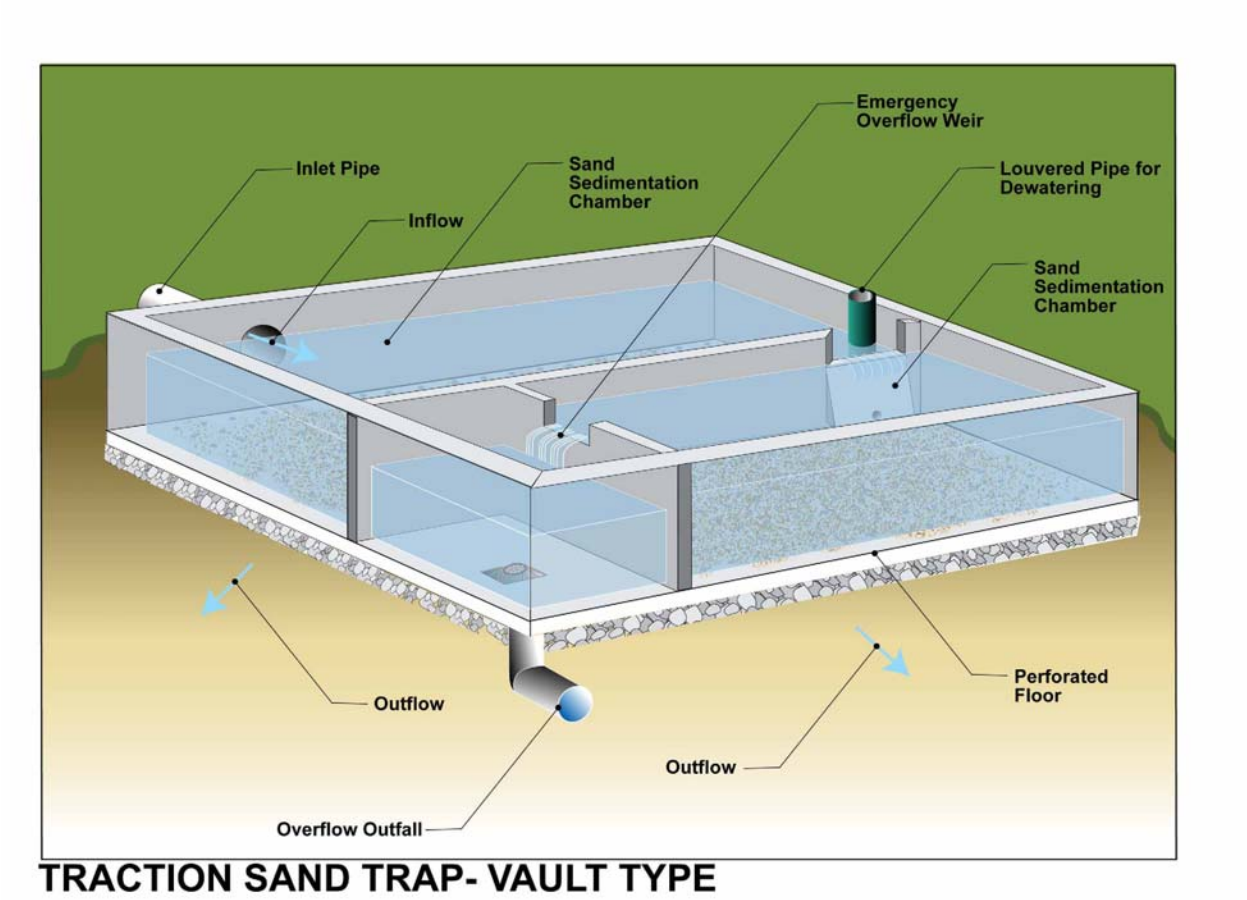


Figure C-16
Schematic of a Traction Sand Trap (Vault Type)

C.23.6 Gross Solids Removal Devices

Revised October 2009

Description:

This BMP is intended to maintain gross solids removal devices as effective devices for treating runoff discharges. These requirements for regular inspection and maintenance will allow the devices to continue to function as designed.

Appropriate Applications:

The BMP maintenance described in Table C-70 applies to personnel who inspect and maintain gross solids removal devices. The maintenance activities are described in Table C-70. Schematics of a Linear Radial Device are shown in Figures C-17 and C-18. A schematic of a Type 1 Inclined Screen Device is shown in Figure C-19, and a schematic of a Type 2 Inclined Screen Device is shown in Figure C-20.

Implementation:

Field measurements of maintenance indicators are made by visual observation. The illustration below provides a graphical representation of the drain time threshold for standing water:

TABLE C-70: GROSS SOLIDS REMOVAL DEVICE MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY
Inlet structures, outlet structures, or other features hindered by debris or damaged. Check for graffiti or vandalism.	Semi-Annual Inspection, late dry season and end of wet season	Take corrective action prior to wet season. Report to District Maintenance Storm Water Coordinator if immediate solution is not evident.
Presence of gross solids (trash and debris)	Recommend monthly during the wet season.	• Remove trash and debris as needed to maintain proper functioning. Minimum is to inspect for trash and debris with Semi-Annual Inspection. • Remove accumulated gross solids. Refer to Activity Cut-Sheet B-48
Standing water in structure 72 hours after any storm	With Semi-Annual Inspection and 72 hours after any	Remove standing water and material that may be impeding complete gravity drainage

TABLE C-70: GROSS SOLIDS REMOVAL DEVICE MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY
	storm.	
Standing water for more than 96 hours	1 day after above inspection where standing water was observed and action taken.	Notify the District Maintenance Storm Water Coordinator/Vector Control District.
Screens • clogged, • damaged • loose • do not open/close properly.	Minimum Semi-Annually, late dry season and end of wet season	Clean screens. Contact the District Maintenance Storm Water Coordinator if repairs /solutions are not readily available in the field. The District Maintenance Storm Water Coordinator will coordinate with appropriate staff for repairs/solutions.

1 Monitoring and abatement of vectors may be done through agreement with the local vector control authority.

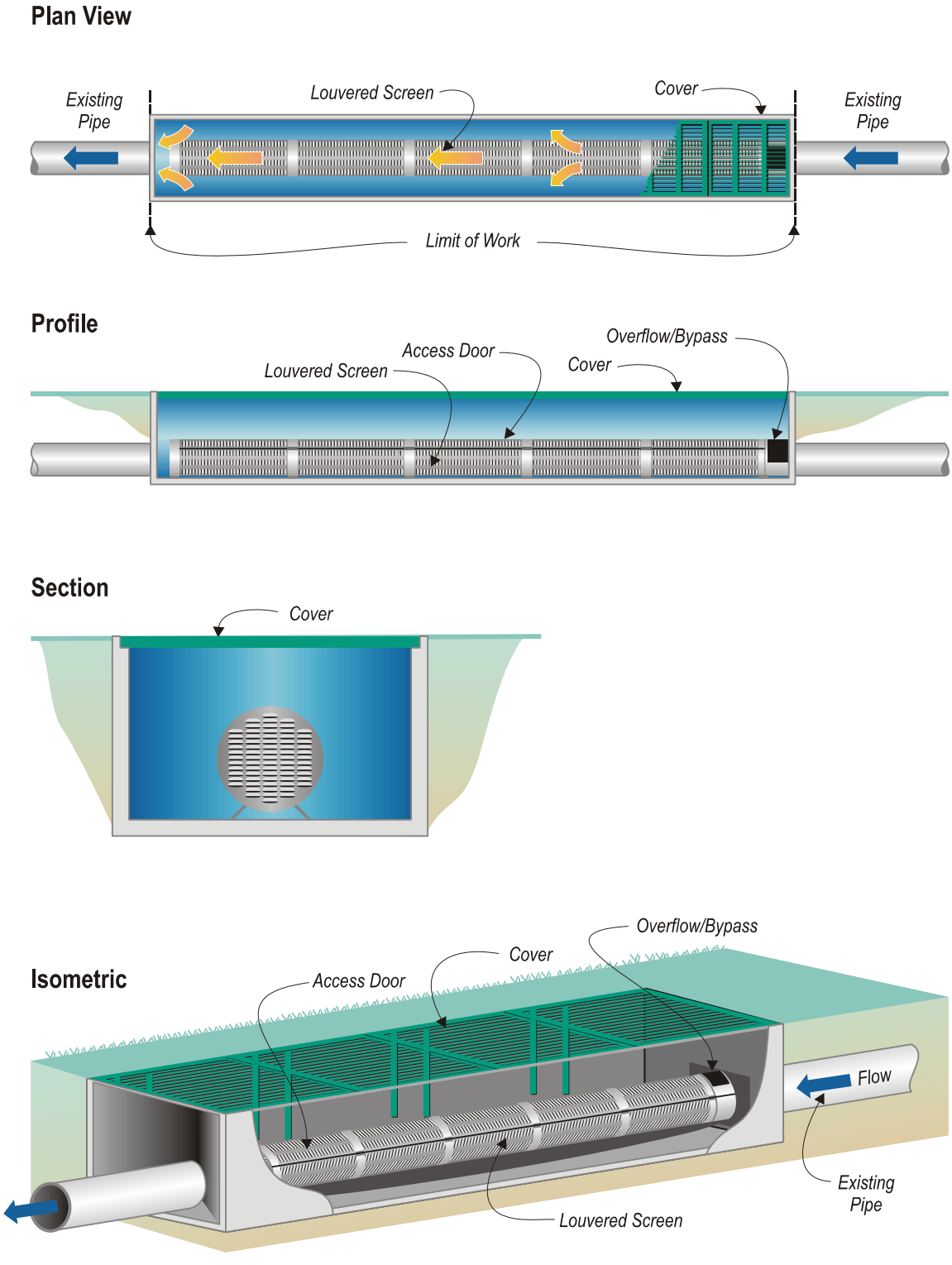


Figure C-17
Schematic of a Linear Radial Device

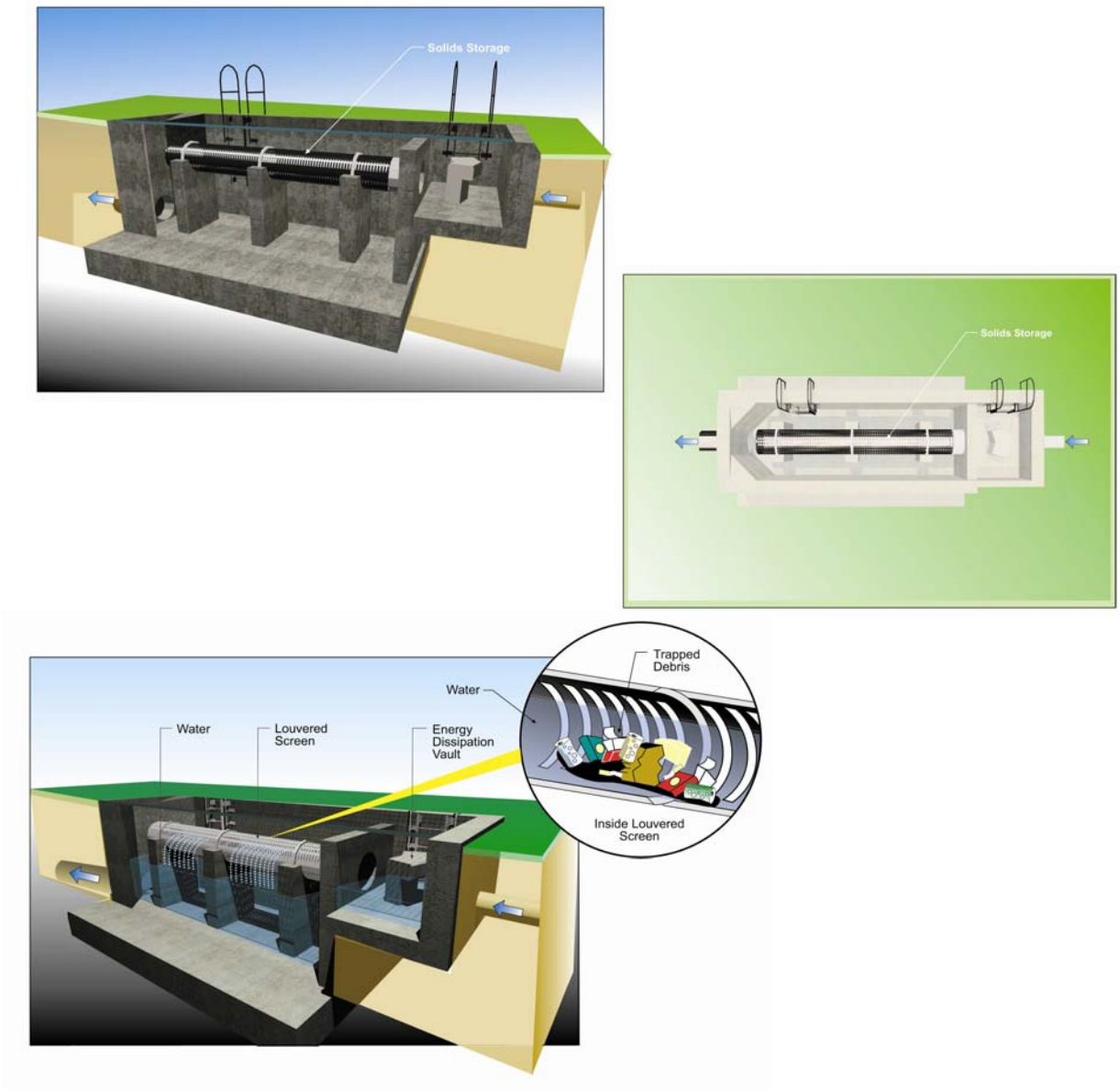


Figure C-18
Schematic of a Linear Radial Device (HV)

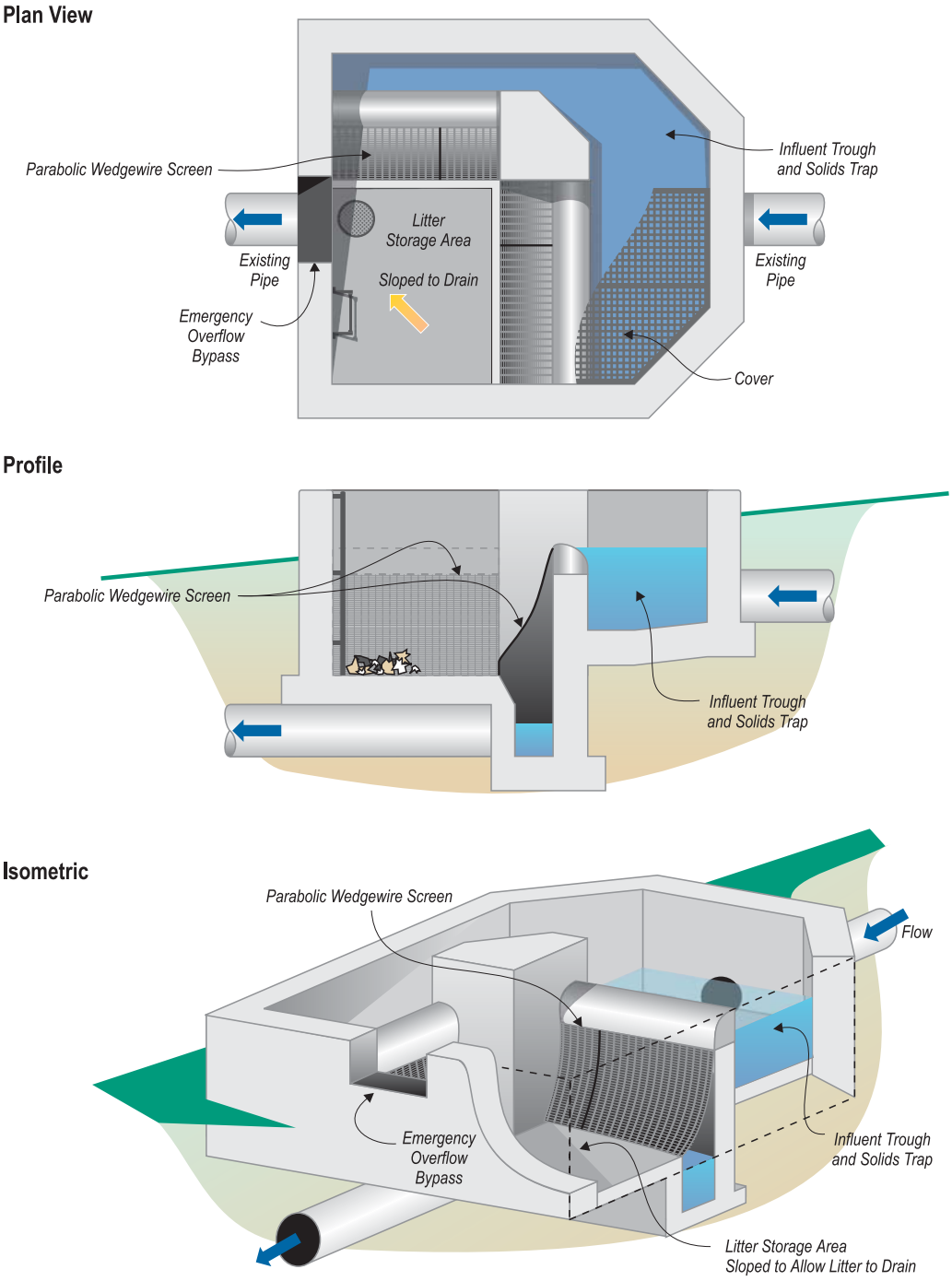


Figure C-19
Schematic of a Type 1 Inclined Screen Device

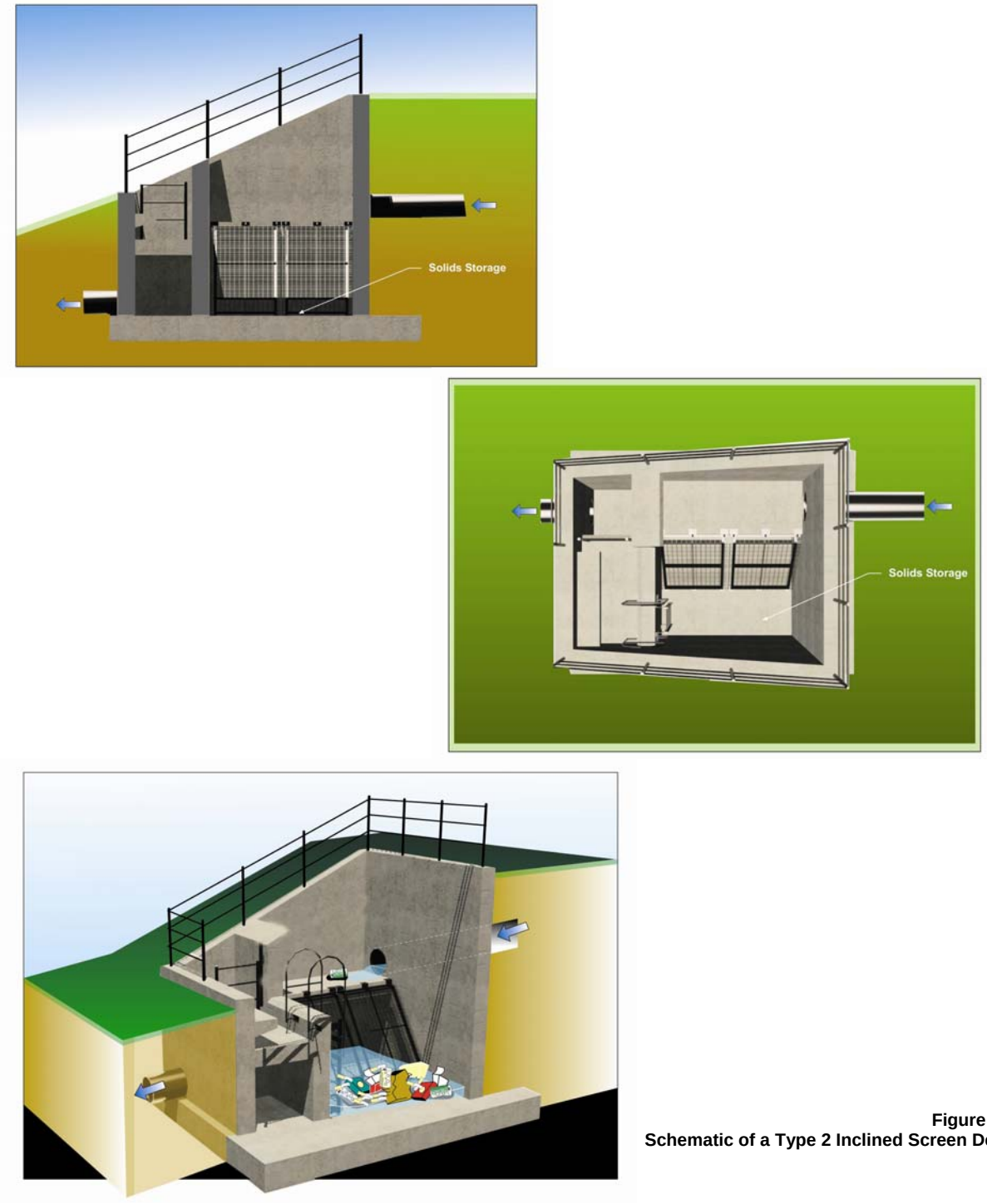


Figure C-20
Schematic of a Type 2 Inclined Screen Device

C.23.7 Austin Sand Filters

Revised October 2009

Description:

This BMP is intended to maintain Austin sand filters as effective devices for treating runoff discharges. These requirements for regular inspection and maintenance will allow the devices to continue to function as designed.

Appropriate Applications:

The BMP maintenance described in Table C-71 applies to personnel who inspect and maintain Austin sand filters. The maintenance activities are described in Table C-71. A schematic of an Austin Sand Filter is shown in Figure C-21.

Implementation:

Field measurements of maintenance indicators are made by visual observation. The figure below provides a graphical representation of the drain time threshold for standing water:

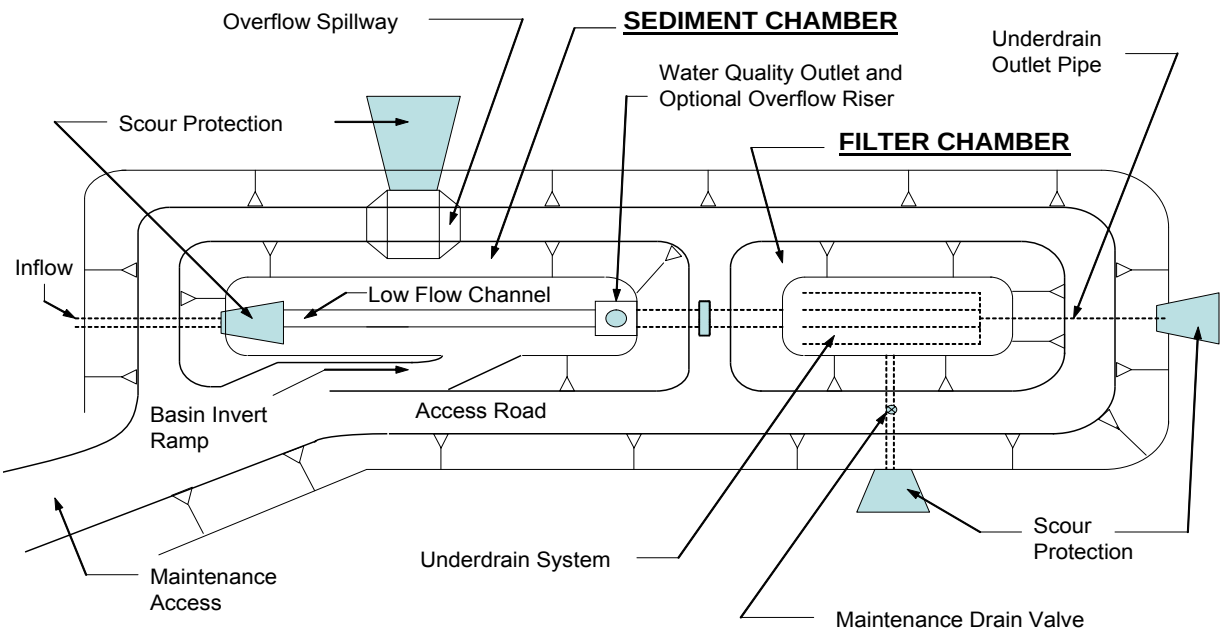
TABLE C-71: AUSTIN SAND FILTER MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Drain time exceeds 72 hours	Annually, 3 days after a 0.75-inch storm event. If no such event occurs before April 1, conduct wet season inspections in April	• Remove sediment, trash and debris. • For sand filters with a standpipe, if standing water is upstream of the dividing wall, check orifice and unclog orifice at time of inspection. • If standing water is over the sand bed, scarify with a rake at time of inspection. The top 2 inches of media may need to be removed and disposed of if drain time continuously exceeds design time. Contact the District Maintenance Storm Water Coordinator who will coordinate with appropriate staff regarding remediation. • Restore media depth to 18 inches when overall media depth drops to 12 inches.[1] • Sand media should be ASTM C331 • Remove sand; sand media should be ASTM C331. Reference Activity Cut-Sheet B-48.
Standing water for more than 96 hours	1 day after above inspection where standing water was	Notify the District Maintenance Storm Water Coordinator/Vector Control District.

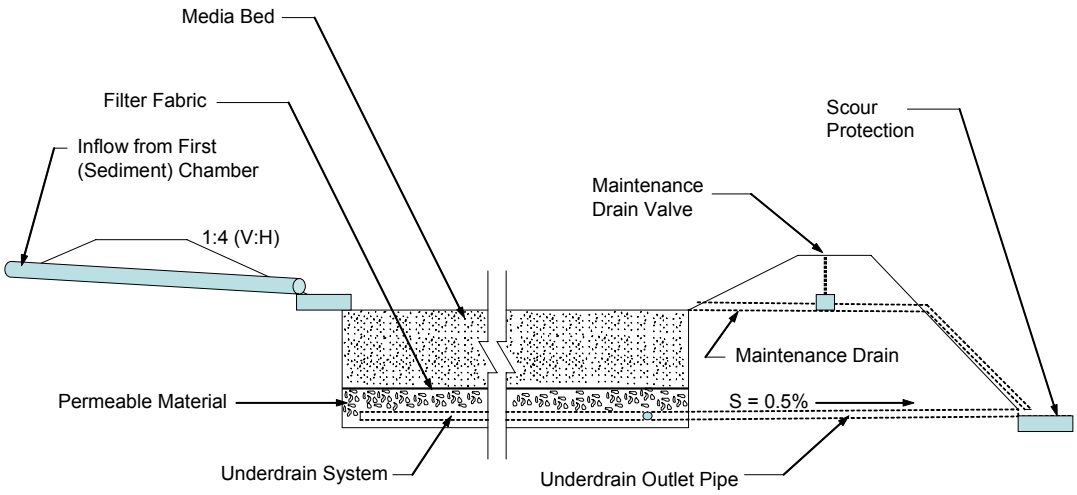
TABLE C-71: AUSTIN SAND FILTER MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
	observed and action taken.	
Sediment depth exceeds marker on staff gage in sedimentation basin; or sediment interferes with gravity drainage in standpipe and/or orifice plate	Annually during dry season.	Remove sediment prior to wet season and dispose of properly.
Trash/debris present	Supervisors may set a schedule for debris and trash removal. Minimum is twice per year.	Remove and dispose of trash and debris per routine District schedule.
Burrows, holes, mounds	Annual inspections after vegetation trimming	Where burrows cause erosion or jeopardize structural integrity, backfill firmly.
Water accumulation in any structure or other location within the filter	Annually 3 days after a 0.75-inch storm event. If no such event occurs before April 1, conduct wet season inspections in April.	• Remove sediment, trash, and debris. • Check orifice in standpipes, and check pump where applicable. • Gravity drains where possible. • If standing water cannot be removed within 96 hours or remains through wet season, notify the District Maintenance Storm Water Coordinator/Vector Control District.
Inlet structures, outlet structures, filter fabric or other features hindered by debris are damaged or reveal emergence of vegetation, graffiti or vandalism, fence damage, etc.	Semi-Annually, late wet season and late dry season	Take corrective action for repairs and cleaning. Contact the District Maintenance Storm Water Coordinator if repairs /solutions are not readily available in the field. The District Maintenance Storm Water Coordinator will coordinate with appropriate staff for repairs/solutions.

1 Specification data to replace the sand at the Austin and Delaware media filters and at the Multi-Chambered Treatment Trains (MCTTs) can be found within the Caltrans Standard Specifications, May 2006 manual in sections 90-2.02 and 90-3.03. The filter fabric specification for the MCTTs can be found in Caltrans Standard Specifications, May 2006 manual in section 88-1.03 for underdrains. In addition, an apparent opening size of 100 (U.S. Sieve) is recommended. See Appendix D.



Plan View



Second (Filter) Chamber Cross Section

NOT TO SCALE

Figure C-21
Schematic of an Austin Sand Filter

C.23.8 Delaware Sand Filters

Revised October 2009

Description:

This BMP is intended to maintain Delaware sand filters as effective devices for treating runoff discharges. These requirements for regular inspection and maintenance will allow the devices to continue to function as designed.

Appropriate Applications:

The BMP maintenance described in Table C-72 applies to personnel who inspect and maintain Delaware sand filters. The maintenance activities are described in Table C-72. A schematic of a Delaware Sand Filter is shown in Figure C-22.

Implementation:

Field measurements of maintenance indicators are made by visual observation. The illustration below provides a graphical representation of the drain time threshold for standing water:

TABLE C-72: DELAWARE SAND FILTER MAINTENANCE ACTIVITIES

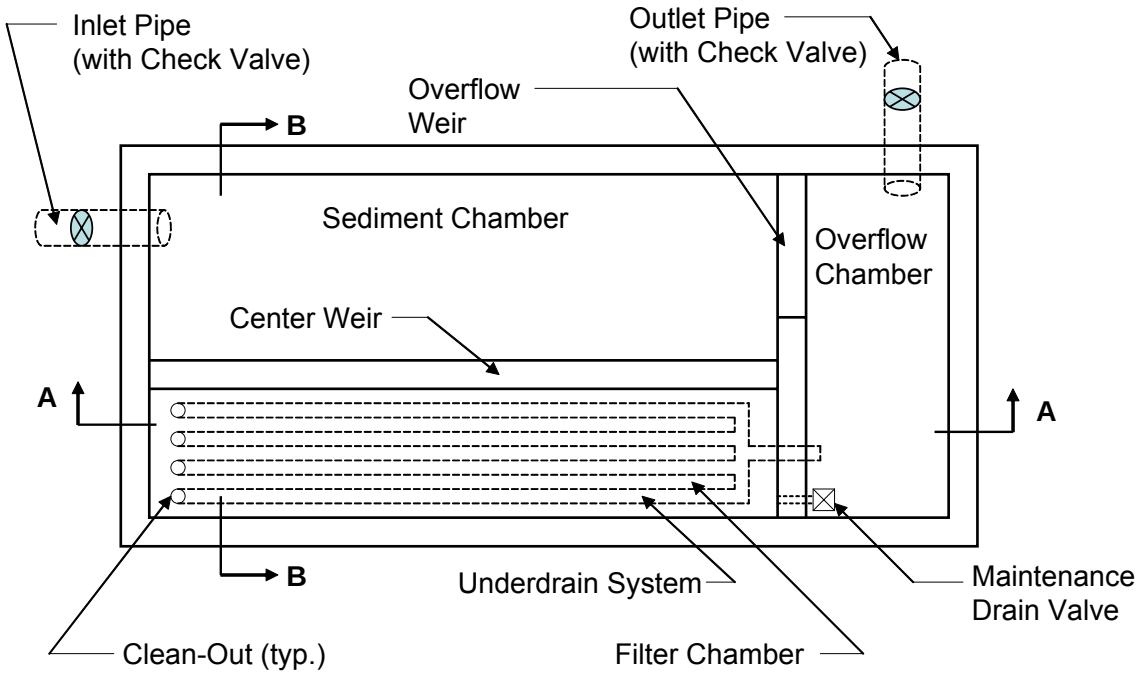
MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Drain time exceeds 72 hours in the filter chamber	Annually, 3 days after a 0.75-inch storm event. If no such event occurs before April 1, conduct wet season inspections in April	• Remove sediment, trash and debris. • Check orifice and pumps where applicable. • The top 2 inches of media may need to be removed and disposed of if drain time continuously exceeds design time. Contact the District Maintenance Storm Water Coordinator who will coordinate with appropriate staff regarding remediation. • Restore media depth to 18 inches when overall media depth drops to 12 inches[1]. • [2]Sand media should be ASTM C331 • Remove sand; sand media should be ASTM C331. Refer to Activity Cut-Sheet B-48.
Sediment depth exceeds marker on staff gage in sedimentation basin	Annually during dry season	Remove sediment prior to wet season and properly dispose.

TABLE C-72: DELAWARE SAND FILTER MAINTENANCE ACTIVITIES

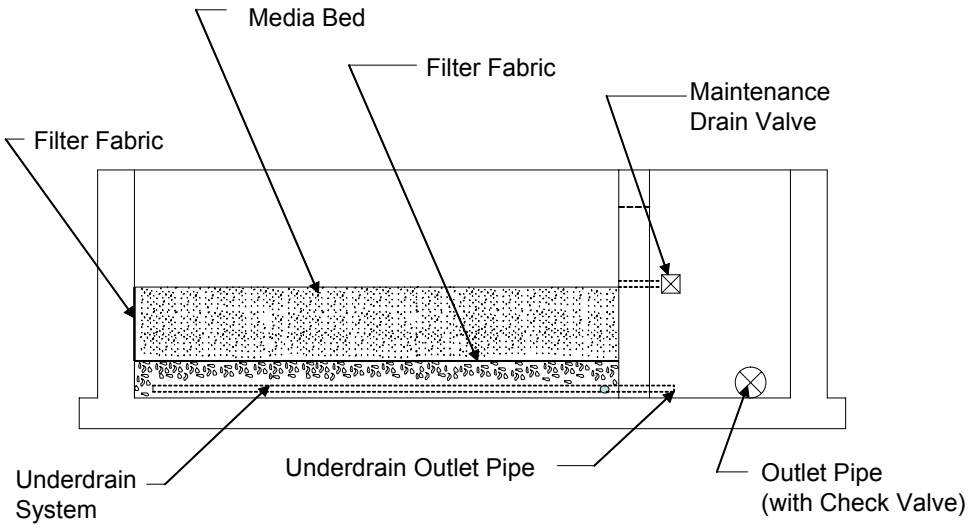
MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Trash/debris present	Supervisors may set a schedule for debris and trash removal. Minimum is twice per year.	Remove and dispose of trash and debris per routine District schedule.
Inlet structures, outlet structures, filter fabric or other features hindered by debris are damaged, or reveal emergence of vegetation, graffiti or vandalism, fence damage, etc.	Semi-Annually, late wet season and late dry season	Take corrective action for repairs and cleaning. Contact the District Maintenance Storm Water Coordinator if repairs /solutions are not readily available in the field. The District Maintenance Storm Water Coordinator will coordinate with appropriate staff for repairs/solutions.
Valve Leakage	Semi-Annually, late wet season and late dry season	Tighten with wrench

1 Escondido sand filter restores media to a depth of 12 inches.

2 Specification data to replace the sand at the Austin and Delaware media filters and at the Multi-Chambered Treatment Trains (MCTTs) can be found within the Caltrans Standard Specifications, May 2006 manual in sections 90-2.02 and 90-3.03. The filter fabric specification for the MCTTs can be found in Caltrans Standard Specifications, May 2006 manual in section 88-1.03 for underdrains. In addition, an apparent opening size of 100 (U.S. Sieve) is recommended. See Appendix D.



Plan View



Section A-A

Figure C-22
Schematic of a Delaware Sand Filter

C.23.9 Multi-Chambered Treatment Train (MCTT)

Revised October 2009

Description:

This BMP is intended to maintain MCTTs as effective devices for treating runoff discharges. These requirements for regular inspection and maintenance will allow the devices to continue to function as designed.

Appropriate Applications:

The BMP maintenance described in Table C-73 and Table C-74 apply to personnel who inspect and maintain MCTT devices. The preventative maintenance routine is described in Table C-73, and the actual maintenance activities are described in Table C-74. A schematic of a Multi-Chambered Treatment Train is shown in Figure C-23.

Implementation:

Field measurements of maintenance indicators are made by visual observation. The illustration below provides a graphical representation of the drain time threshold for standing water:

TABLE C-73 MULTI-CHAMBERED TREATMENT TRAIN (MCTT) PREVENTATIVE MAINTENANCE

FREQUENCY	ROUTINE ACTION	ACTIVITY CUT-SHEET
Annually, in Summer	Replace sorbent pillows in main settling chamber	B-48

1 Specification data to replace the sand at the Austin and Delaware media filters and at the Multi-Chambered Treatment Trains (MCTTs) can be found within the Caltrans Standard Specifications, May 2006 manual in sections 90-2.02 and 90-3.03. The filter fabric specification for the MCTTs can be found in Caltrans Standard Specifications, May 2006 manual in section 88-1.03 for underdrains. In addition, an apparent opening size of 100 (U.S. Sieve) is recommended. See Appendix D.

TABLE C-74: MULTI-CHAMBERED TREATMENT TRAIN (MCTT) MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Drain time through the filter chamber is greater than 72 hours or sediment accumulation is greater than 0.1 inch over more than 50 percent of the fabric surface area	Annually, 3 days after a 0.75-inch storm event. If no such event occurs before April 1, conduct wet season inspections in April.	• Remove and replace filter fabric blanket.[1] • If problem persists, notify the District Maintenance Storm Water Coordinator; the media may need to be replaced. Complete prior to wet season. • [1]Sand media should be ASTM C33 • Remove and replace media filter. Refer to Activity Cut-Sheet B-48. • Remove and properly dispose of sediment. Refer to Activity Cut-Sheet B-48.
Standing water for more than 96 hours	1 day after above inspection where standing water was observed and action taken.	Notify the District Maintenance Storm Water Coordinator/Vector Control District.
Trash and debris present	Semi-Annually, late wet season and late dry season	Remove and dispose of trash and debris.
Sediment accumulates to 50% of the volume underneath the tube settlers (~6 inches). Maximum of 2-feet in grit chamber	Remove tube settler in sedimentation basin and plastic grate in grit chamber; measure sediment depth annually during the dry season	Remove sediment prior to wet season and properly dispose.
Water accumulation greater than 72 hours in any structure or other location within the device that is not protected from mosquito access [2]	Annually, 3 days after a 0.75-inch storm event. If no such event occurs before April 1, conduct wet season inspections in April.	Take action to drain standing water, such as removing accumulated sediment
Water accumulation greater than 96 hours in any structure or other location within the device that is not protected from mosquito access	1 day after above inspection where standing water was observed and action taken.	Notify the District Maintenance Storm Water Coordinator/Vector Control District.
Operation greater than 9 years	Every 9 years	Remove and replace filter media and dispose properly .[1]

TABLE C-74: MULTI-CHAMBERED TREATMENT TRAIN (MCTT) MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Sorbent pillows in main settling chamber darkened by oily material	Annually, in Summer	Annually, renew sorbent pillows, or immediately if pillows are darkened by oily material; and properly dispose.
Pump –storm status Indicator lights show Amber. Amber =pump failure Green=OK	Within 72 hours after every storm	Make assessment to determine if problem is electrical or mechanical. Take appropriate action. Replace pump if needed.
Pump-Warranty status	Annually in the dry season	Inspect pumps for serviceability and required periodic maintenance per manufacturer's guidelines
Inlet structures, outlet structures, pump status indicator lights, filter fabric, settling tubes, mosquito screen over sump pumps (if any), or other features hindered by debris or damaged, emergence of vegetation, graffiti or vandalism, fence damage, etc.	Semi-Annually, during wet season and late dry season	Take corrective action prior to the wet season. Contact the District Maintenance Storm Water Coordinator if repairs /solutions are not readily available in the field. The District Maintenance Storm Water Coordinator will coordinate with appropriate staff for repairs/solutions.

1 Specification data to replace the sand at the Austin and Delaware media filters and at the Multi-Chambered Treatment Trains (MCTTs) can be found within the Caltrans Standard Specifications, May 2006 manual in sections 90-2.02 and 90-3.03. The filter fabric specification for the MCTTs can be found in Caltrans Standard Specifications, May 2006 manual in section 88-1.03 for underdrains. In addition, an apparent opening size of 100 (U.S. Sieve) is recommended. See Appendix D.

2 At time of publication, all Caltrans MCTTs have covers that prevent mosquito access to permanent standing water features

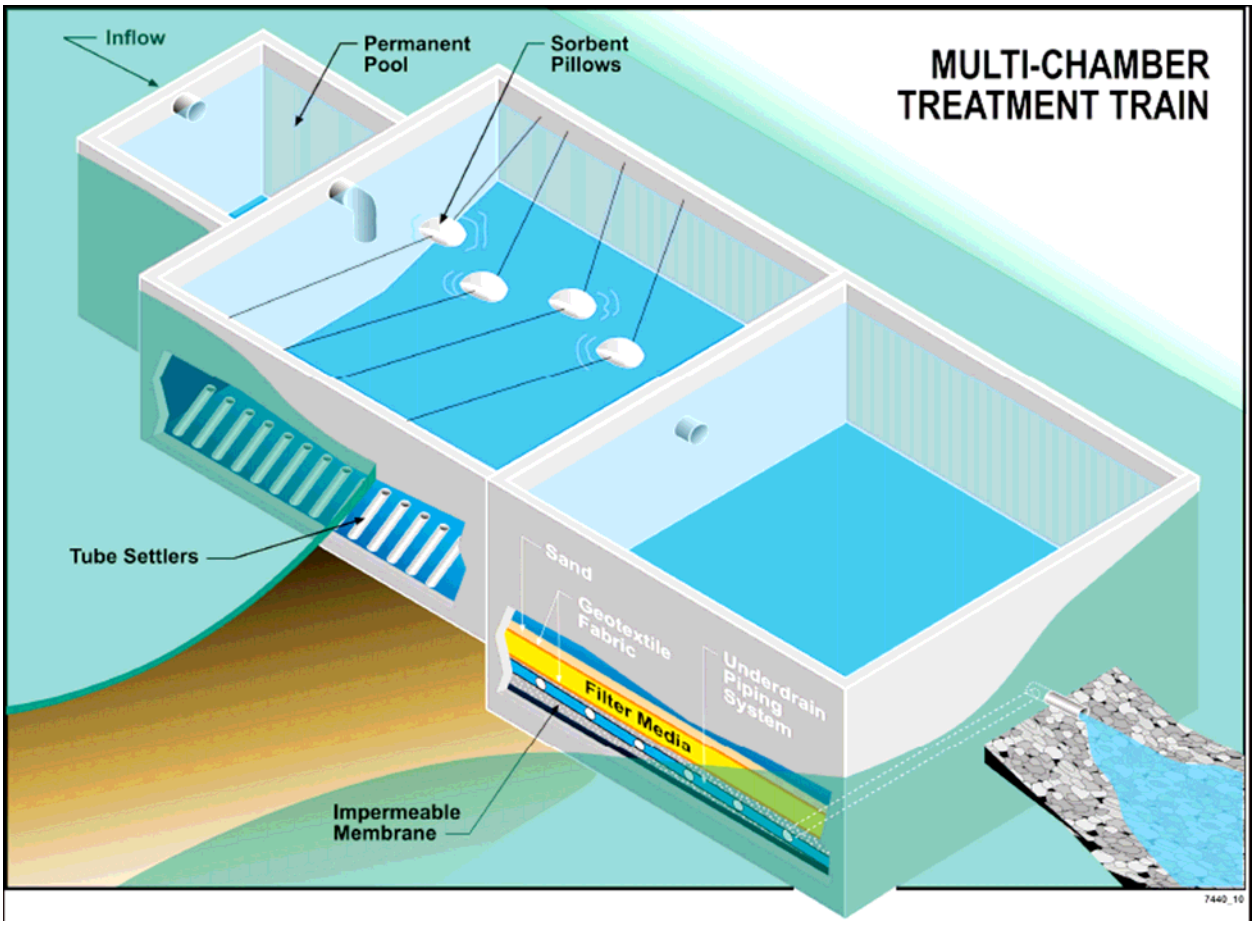


Figure C-23
Schematic of a Multi-Chambered Treatment Train (MCTT)

C.23.10 Wet Basin

Revised October 2009

Description:

This BMP is intended to maintain wet basins as effective devices for treating runoff discharges. These requirements for regular inspection and maintenance will allow the devices to continue to function as designed.

Appropriate Applications:

The BMP maintenance described in Table C-75 and Table C-76 apply to personnel who inspect and maintain wet basin devices. The preventative maintenance routine is described in Table C-75, and the actual maintenance activities are described in Table C-76. A schematic of a wet basin is shown in Figure C-24.

Implementation:

Field measurements of maintenance indicators are made by visual observation. The illustration below provides a graphical representation of the drain time threshold for standing water:

TABLE C-75: WET BASIN PREVENTATIVE MAINTENANCE

FREQUENCY	ROUTINE ACTION	Activity Cut-Sheet
Annually prior to dry season	Maintain vegetated access road to reduce fire hazard from contact with vehicle catalytic converters	B-39, B-40

TABLE C-76: WET BASIN MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Drawdown greater than 25 hours or water is flowing over weir	Once during wet season and after completion or modification of the facility. Inspect 25+ hours after 0.75-inch storm event.	If drawdown is greater than 25 hours: • Open gate to discharge water to permanent pool elevation. • Clear outlet of debris. • Notify the District Maintenance Storm Water Coordinator. If water is spilling over weir, open canal gate until water level is at permanent pool elevation. Check/clear outlet of debris.
Burrows, holes, mounds	Annually and after vegetation trimming	Where burrows cause erosion or jeopardize structural integrity, backfill firmly.
Inlet structures, outlet structures, side slopes or other features hindered by debris or damaged, significant erosion, graffiti or vandalism, fence damage, etc.	Semi-Annually, late wet season and late dry season	Take corrective action, or restore to as constructed condition prior to wet season. Contact the District Maintenance Storm Water Coordinator if repairs /solutions are not readily available in the field. The District Maintenance Storm Water Coordinator will coordinate with appropriate staff for repairs/solutions.
Observable vegetation coverage/density	Annually	• Have a biologist survey the Wet Basin to determine if any birds are nesting or other sensitive animals are present. If birds are nesting, with advice from the biologist, proceed with the maintenance. • Lower and maintain the water level to expose the area to be maintained; do not completely drain basin. • Cut vegetation. • Dispose of the vegetation material in a landfill or other appropriate disposal area. • Restock mosquito fish as recommended by vector control agency.

TABLE C-76: WET BASIN MAINTENANCE ACTIVITIES

MAINTENANCE INDICATOR	INSPECTION FREQUENCY	MAINTENANCE ACTIVITY
Vegetation density is such that mosquito fish cannot swim freely in the planted area	Annually, or at a special request of the local vector control agency	• Have a biologist survey the Wet Basin to determine if any birds are nesting or other sensitive animals are present. If birds are nesting, with advice from the biologist, proceed with the maintenance. • Lower and maintain the water level to expose the area to be maintained; do not completely drain basin. • Cut the vegetation to below the permanent pool water surface. • Dispose of the vegetation material in a landfill or other appropriate disposal area.
Sediment is more than 2 inches in the forebay and 4 inches in the main pond, or sediment depth exceeds marker on staff gage	When pond is drained for Zone 1 vegetation removal, or every 3 years	• Remove and properly dispose of sediment. By November, restore vegetation to the plan shown on the as-built drawings. • Remove sediment accumulation in forebay and main pond. Refer to Activity Cut-Sheet B-48.

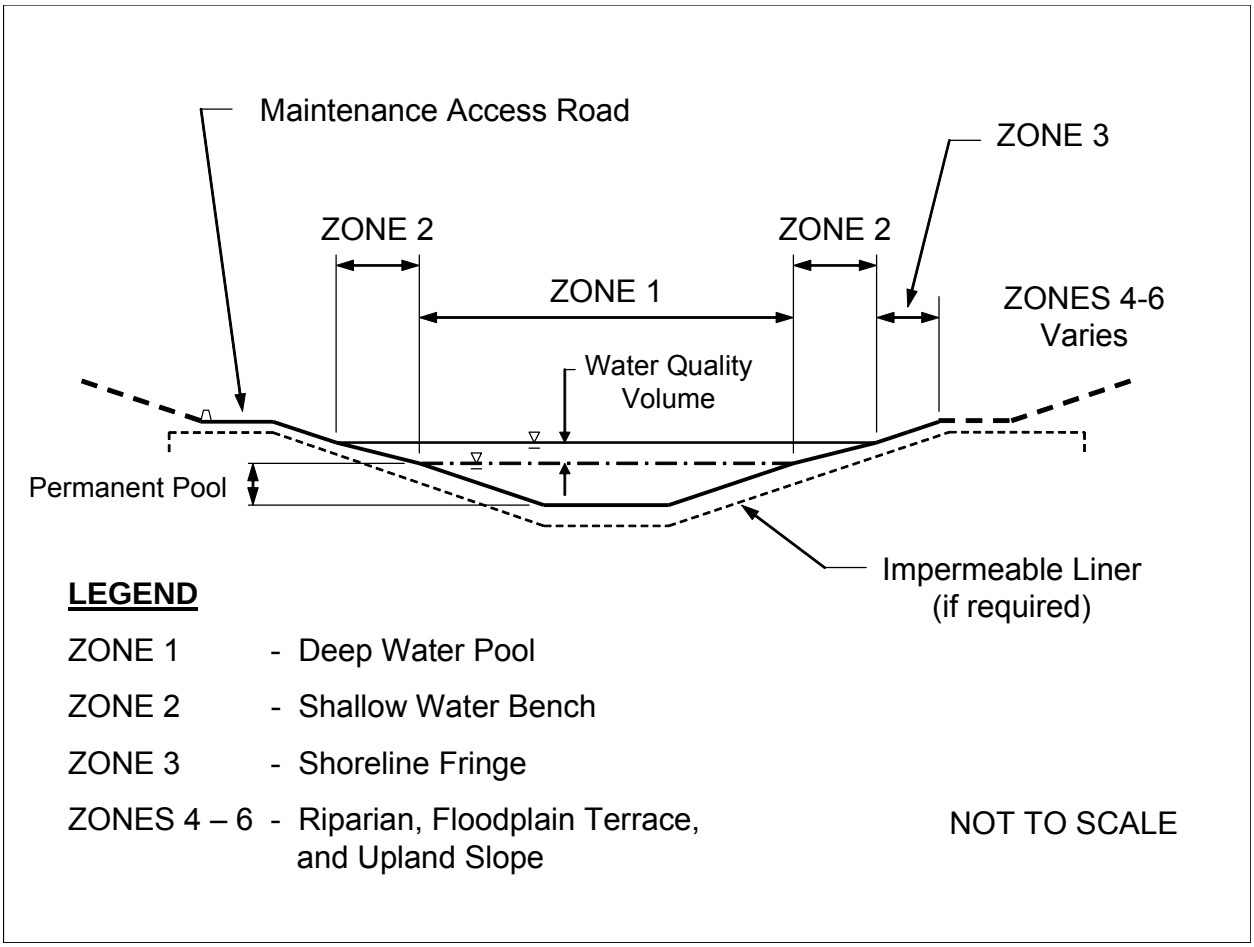


Figure C-24
Schematic of a Wet Basin