



Operation & Maintenance Plans— Requirements and Recommendations

Vermont Stormwater Management Manual Update, Meeting #6

Shelburne, Vermont Town Offices

June 13, 2014



Adamant Accord

Meeting Facilitation and Mediation Services

Current Inspection & Maintenance Requirements

- General Permits 3-9015 and 3-9010: annual inspections before June 15 and submitted by July 15 (or July 30 for utilities/municipalities with ordinance)
- General annual inspection report form available at Program website— all permittees must use this form as of March 2013
- VSMM App. D8 has inspection / maintenance checklists but their use not required
- General Permit 3-9030 (stormwater-impaired waters not included in MS4 permits): annual inspections before June 15, annual report by Dec. 31

Maintenance & operation strategies in other states



- Some degree of maintenance usually required, but wide variation:
 - General requirement in permit conditions
 - Periodic inspection / maintenance explicitly required, general guidelines provided
 - Periodic inspection / maintenance explicitly required, specific guidance plus templates & checklists provided

Common Elements of Inspection / Maintenance Plan Requirements

- Site-specific manual or annotated site plan, including:
 - Contact information for the permit holder / responsible entity
 - As-built plans and/or plan showing locations and key components of stormwater practices
 - Letter of compliance from designer
 - Copy of deed covenant, easements/rights-of-way, executed maintenance agreement, etc.
 - Inspection and maintenance schedule and log
 - Practice-specific inspection and maintenance checklists or templates

Contact Information

- Identifies the party responsible for system upkeep (typically the permittee or the property owner)
- Current VT Annual Inspection Report provides a mechanism to report changes in ownership, project name, and/or amount of impervious surface
- Some states (including VT) require that stormwater management permits be recorded in land records

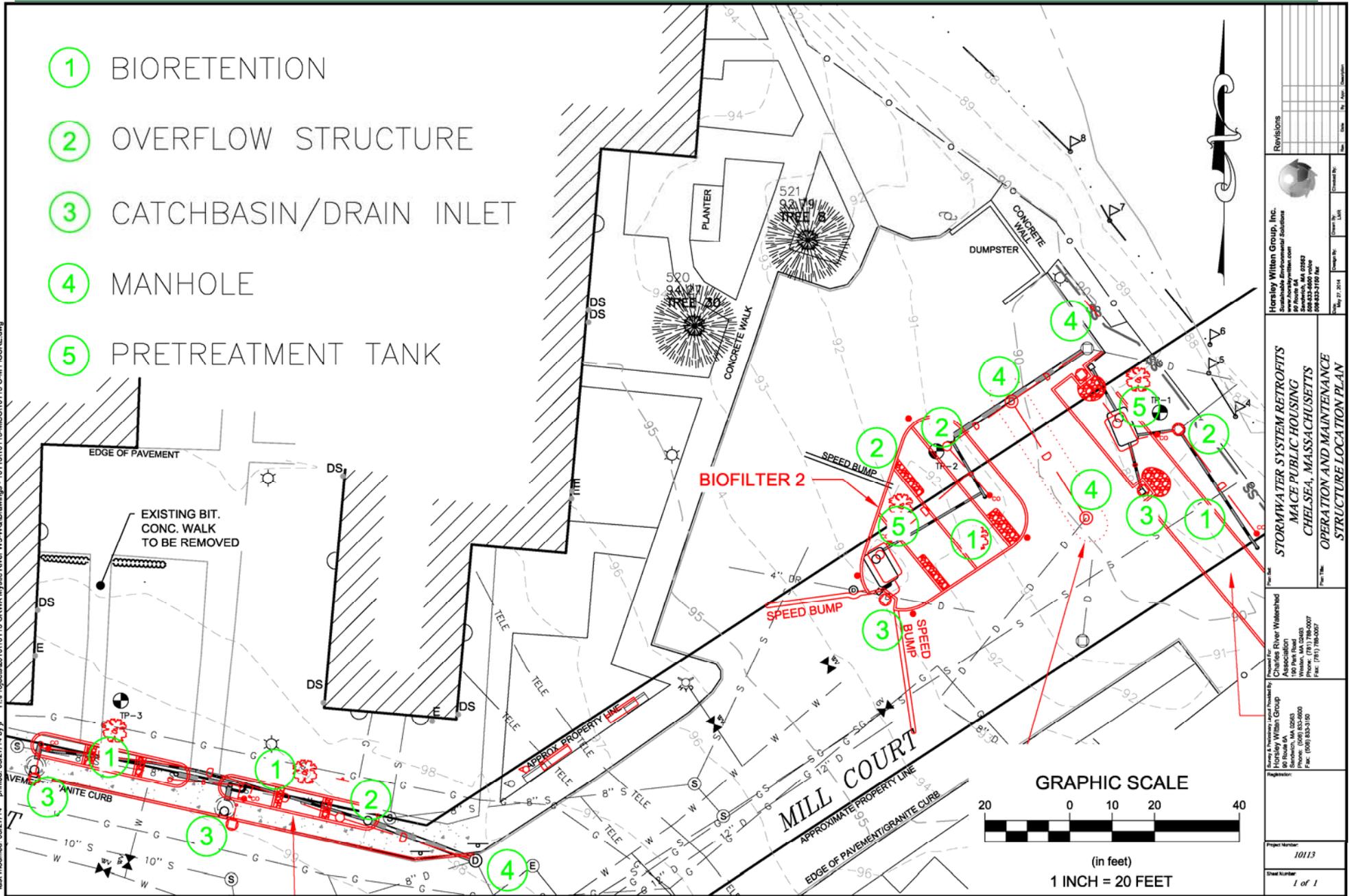
- **Recommendation:** no changes to current requirements

Annotated (As-Built) Site Plans

- Several states require annotated design plans detailing the location of stormwater treatment practices and the associated inspection and maintenance needs
- Notes on required inspection & maintenance activities often included
- Some states require updates with as-built conditions if constructed practices varied from original design
 - May not work with VT post-construction permitting process
- **Recommendation:** Require submittal, with permit application, of an annotated design plan including:
 - Location of stormwater treatment practices
 - Associated inspection and maintenance needs
 - Link(s) to appropriate practice inspection / maintenance templates(?)

Annotated (As-Built) Site Plan Example

- ① BIORETENTION
- ② OVERFLOW STRUCTURE
- ③ CATCHBASIN/DRAIN INLET
- ④ MANHOLE
- ⑤ PRETREATMENT TANK



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<p>Horley Witten Group, Inc. Stormwater Management Solutions 80 Route 6A, Suite 200 Chelsea, MA 01937 Phone: (617) 883-3100 Fax: (617) 883-3150</p>	
<p>Project Name: STORMWATER SYSTEM RETROFIT'S MACE PUBLIC HOUSING CHELSEA, MASSACHUSETTS Structure Location Plan</p>	
<p>Project No: 10113</p>	<p>Sheet No: 1 of 1</p>

Letter of Compliance from Designer

- Requiring post-construction certification - one approach for ensuring proposed facilities are properly installed
- Some states require as-built plans, letters of compliance from designers, and/or post-construction documentation to demonstrate compliance with maintenance activities
- VT's rules require that “the first annual inspection report for a new development, redevelopment or expansion shall include a written certification by a designer, other than the landowner, stating that the stormwater system was installed in accordance with the conditions of the general permit and is functioning properly.”
- **Recommendation:** Add requirement to submit as-builts and an updated annotated site plan with first annual inspection report(??)

Copies of Easements, Rights-of-Way, Maintenance Agreements

- Copy of deed covenant, easements/rights-of-way, executed maintenance agreement, etc. often required as part of an inspection / maintenance plan document in other jurisdictions where conserved land, undeveloped/forested/riparian buffers, etc. are credited as stormwater management practices
- VTDEC Stormwater Program has indicated a clear preference for continuing to rely on permits recorded in land records as sufficiently protective of these practices
- **Recommendation:** no change to current requirement

Inspection and Maintenance Schedule/Log

- Clear maintenance schedules and tracking logs aid the permit-holder in maintaining the stormwater system – and allow the regulatory agency to check for permit compliance.
- Several states require submittal of a formalized inspection and maintenance schedule and maintenance of an on-site logbook to document when inspections were performed and what maintenance work was completed
- **Recommendation:** no change to formal schedule established in rule / permit requirements...for now.

Inspection and Maintenance Activity Checklists / Templates

- Inspection form templates ensure effective and consistent inspection and evaluation of stormwater control and treatment practices.
- Vermont, New York, Rhode Island manuals all include (nearly identical) standardized inspection templates by BMP class that can easily be used on specific sites
 - Stormwater Pond/Wetland
 - Infiltration Trench
 - Permeable Pavement (RI only)
 - Sand/Organic Filter
 - Bioretention
 - Open Channel

Inspection and Maintenance Activity Checklists / Templates – VT Example

Bioretention Operation, Maintenance and Management Inspection Checklist

Project:
 Location:
 Site Status:
 Date:
 Time:
 Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Monthly)		
Bioretention and contributing areas clean of debris		
No dumping of yard wastes into practice		
Litter (branches, etc.) have been removed		
2. Vegetation (Monthly)		
Plant height not less than design water depth		
Fertilized per specifications		
Plant composition according to approved plans		
No placement of inappropriate plants		
Grass height not greater than 6 inches		
No evidence of erosion		
3. Check Dams/Energy Dissipaters/Sumps (Annual, After Major Storms)		
No evidence of sediment buildup		
Sumps should not be more than 50% full of sediment		

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
No evidence of erosion at downstream toe of drop structure		
4. Dewatering (Monthly)		
Dewaterers between storms		
No evidence of standing water		
5. Sediment Deposition (Annual)		
Swale clean of sediments		
Sediments should not be > 20% of swale design depth		
6. Outlet/Overflow Spillway (Annual, After Major Storms)		
Good condition, no need for repair		
No evidence of erosion		
No evidence of any blockages		
7. Integrity of Filter Bed (Annual)		
Filter bed has not been blocked or filled inappropriately		

Comments:

Actions to be Taken:

Inspection and Maintenance Activity Checklists / Templates – RI Example

Operation and Maintenance Checklist

Date:
Time:
Inspector:

	Description	Maintenance Required? (Y/N)
Bioretention Facility - Inspect annually and after major storms		
Sediment Removal	Remove sediment from the filter bed when sediment buildup is >1".	
Side Slopes and Surface	Repair any soil gullyng and revegetate/ replenish topsoil on barren areas as necessary.	
Inlet/Outlet Structures	Repair or replace as necessary. Remove sediment as needed. Remove trash and debris.	
Mulch	Remove and replenish mulch layer every other year to original design depth. If mulch becomes clogged with sediment, excavate clogged area down to soil media and replenish. Mulch replacement must be double shredded pine wood (not bark)	
Vegetation Replacement	Confirmation of plant materials by landscape professional. Replace dead or dying vegetation as necessary.	
Pruning	Prune for sight visibility as necessary. Separation of herbaceous vegetation root stock will occur when over-crowding access (1x/3yrs).	
Infiltration Capacity Maintenance	If standing water is observed 48 hrs after a storm event, the top 3" will be roto-tilled to break up hard-packed soil and then revegetated.	
Drainage Inlets, Catch Basins, Drain Manholes, and Pre-treatment Tanks - Inspect twice annually		
Sediment Removal	Remove sediment from the catch basins and tanks when sediment buildup is > ½ tank/sump depth (2 feet typical).	
Debris Cleanout	Remove all trash, debris, and sediment from all inlet structures twice annually or as needed.	
Structures	Repair as necessary.	

	Description	Maintenance Required? (Y/N)
Routine Maintenance – Perform annually		
Debris Removal	Remove trash from paved and perimeter areas.	
Pavement Sweeping	Sweep pavement after spring thaw.	
Drainage Network	Ensure proper operation.	

Comments:

Actions to be taken:

June 13, 2014



Inspection and Maintenance Activity Checklists / Templates – CA Example

Bioretention Area Inspection and Maintenance Checklist

Property Address: _____

Property Owner: _____

Treatment Measure No.: _____

Date of Inspection: _____

Type of Inspection: Monthly

Pre-Wet Season

After heavy runoff End of Wet Season

Other: _____

Inspector(s): _____

Defect	Conditions When Maintenance Is Needed	Maintenance Needed? (Y/N)	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)	Results Expected When Maintenance Is Performed
1. Standing Water	When water stands in the bioretention area between storms and does not drain within five days after rainfall.			There should be no areas of standing water once inflow has ceased. Any of the following may apply: sediment or trash blockages removed, improved grade from head to foot of bioretention area, or added underdrains.
2. Trash and Debris Accumulation	Trash and debris accumulated in the bioretention area.			Trash and debris removed from bioretention area and disposed of properly.
3. Sediment	Evidence of sedimentation in bioretention area.			Material removed so that there is no clogging or blockage. Material is disposed of properly.
4. Erosion	Channels have formed around inlets, there are areas of bare soil, and/or other evidence of erosion.			Obstructions and sediment removed so that water flows freely and disperses over a wide area. Obstructions and sediment are disposed of properly.
5. Vegetation	Vegetation is dead, diseased and/or overgrown.			Vegetation is healthy and attractive in appearance.
6. Mulch	Mulch is missing or patchy in appearance. Areas of bare earth are exposed, or mulch layer is less than 3 inches in depth.			All bare earth is covered, except mulch is kept 6 inches away from trunks of trees and shrubs. Mulch is even in appearance, at a depth of 3 inches.
7. Miscellaneous	Any condition not covered above that needs attention in order for the bioretention area to function as designed.			Meet the design specifications.

Inspection and Maintenance Activity Checklists / Templates – CWP Example

#6

SIDE SLOPE EROSION

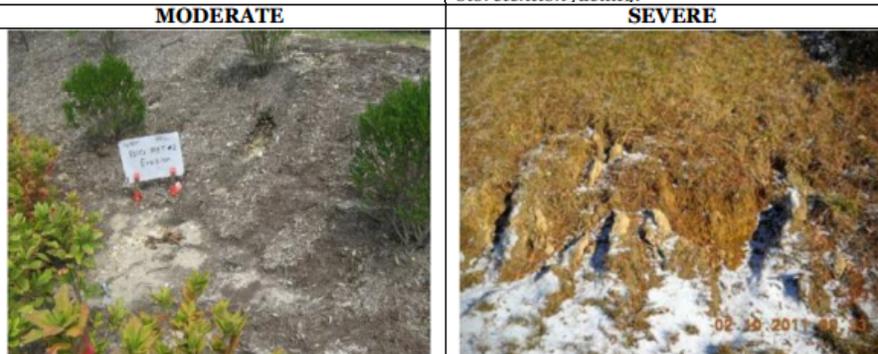
PERIMETER ZONE

Description: This indicator evaluates the stability of the side slopes of the bioretention area which should be 3:1 or flatter. Erosion of the side slopes can indicate a problem with grading or incoming runoff velocities and may require better inflow protection measures.



There is no evidence of side slope erosion occurring in this bioretention.

There is minor side slope erosion occurring as a result of overland flow of water into the bioretention facility.



The side slopes in this bioretention are too steep which is causing moderate erosion.

Severe side slope erosion is occurring.

	MAINTENANCE TRIGGER	TASK/INVESTIGATION
PASS	No evidence of side slope erosion.	None
MINOR	Isolated rill erosion, less than 1"	Spot soil replacement and reseeding.
MODERATE	Gully erosion of 3" or less at several points on the slope	Schedule visit to fill gullies (and replant, stabilize), add inflow protection measures.
SEVERE	Gully erosion greater than 3" at any point	Investigate whether the gullies are formed by too much runoff.

- <http://chesapeakestormwater.net/2013/04/technical-bulletin-no-10-bioretention-illustrated-a-visual-guide-for-constructing-inspecting-maintaining-and-verifying-the-bioretention-practice/>

Maintenance and Inspection Recommendations - Summary



- Maintain consistency in inspection / maintenance requirements across permits
- Keep annual inspection and form submittal requirement (fillable PDF or web-based)
- Require annotated design plan and short narrative for I&M at permit application
 - Update with first annual inspection?
- Provide inspection & maintenance templates for specific BMP classes (fillable PDF and/or Word)

Questions / Discussion

