



POST-CONSTRUCTION BEST MANAGEMENT PRACTICES

Advice for Establishing an Effective MS4 Program

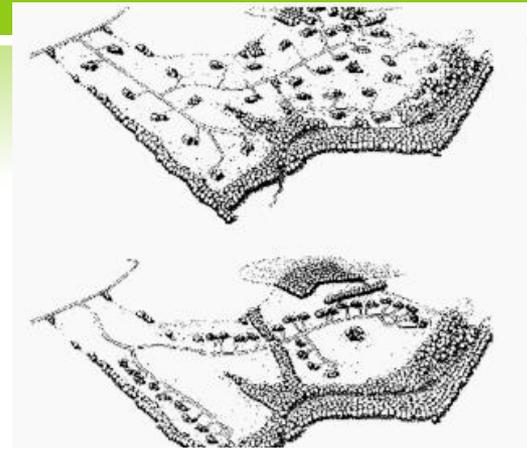
WHAT ARE POST-CONSTRUCTION BMPs?

- ⊙ Permanent storm water management practices and site design features which store, treat, infiltrate or reduce the volume of runoff from development sites
- ⊙ Required on all new development and redevelopment where 1 or more acre of land is disturbed
- ⊙ YES, this includes “small construction sites” that disturb 1 to 5 acres.

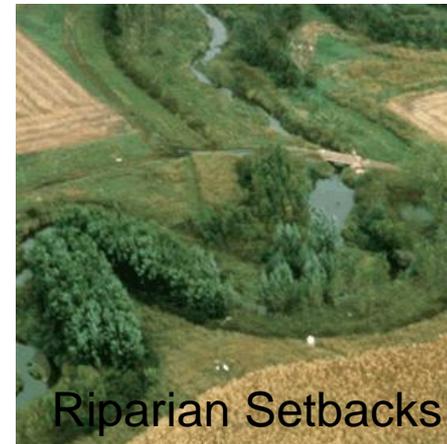
STRUCTURAL VS NON-STRUCTURAL BMPs



VS



Conservation Subdivision Zoning



STANDARD STRUCTURAL BMPs



Dry Enhanced Swale



Sand Filter



Infiltration Trench



Bioretention Cells



Constructed Wetlands

GREEN INFRASTRUCTURE

Permeable
Pavement



A rain barrel is used to collect rooftop runoff using a gutter/downspout system

Rain Barrel

Rain Garden
Retrofit



Vegetated conveyance



Green Roof

WHAT DRIVES THE INSTALLATION OF BMPs?

- ⊙ State and Federal Level
 - ⊙ Developers must install BMPs to meet NPDES permit requirements for construction activities disturbing ≥ 1 acre
 - Requires structural BMPs
 - Encourages non-structural BMPs
 - ⊙ Federal construction projects $\geq 5,000$ ft² must maintain or restore pre-development hydrology
 - Retain on-site the 95% storm event

WHAT DRIVES THE INSTALLATION OF BMPs?

- ⊙ Local Level
 - ⊙ Municipal storm water regulations require MS4s to pass local ordinances
 - Must meet or exceed Ohio EPA requirements by June 2011
 - MS4s have the authority to establish planning & zoning codes that require non-structural BMPs and drive development patterns
 - ⊙ Financial incentives such as reduced storm water utility fee
 - ⊙ Desire to improve image or the quality of life as a tool to recruit new businesses and residents
 - ⊙ Need to reduce the volume of storm water that enters the combined sewer system

ELEMENTS FOR AN EFFECTIVE POST-CONSTRUCTION PROGRAM

PASS ORDINANCES

- ⊙ Structural BMPs to treat the Water Quality Volume (WQv)
- ⊙ Establish standards for post-construction BMPs on small construction sites (< 5 acres)
- ⊙ Preserve open space where it really counts
 - ⊙ Riparian and wetland setbacks
- ⊙ Allow non-structural BMPs such as
 - ⊙ Conservation subdivision design
 - ⊙ Encourage compact development and smart growth

BUT, REVIEW WHAT'S ALREADY ON THE BOOKS!

- ⊙ Many existing ordinances conflict with good post-construction storm water management
 - ⊙ Do downspouts have to be connected to the MS4?
 - ⊙ Do parking lots have to be as large as they are?
 - ⊙ Do roads have to be as wide as they are?
 - ⊙ Do zoning densities and setbacks encourage sprawl?
 - ⊙ Does zoning require separated land uses?
 - ⊙ Do height limitations force “building out” rather than “building up”?

GUIDANCE TO REVIEW ORDINANCES

- ◎ New Jersey Department of Environmental Protection
 - ◎ Non-structural storm water strategies
 - <http://www.state.nj.us/dep/stormwater/guidance.htm>
- ◎ Center for Watershed Protection
 - ◎ Post-Construction Program Guidance
 - Tool 4: Code and Ordinance Worksheet
 - http://www.cwp.org/documents/cat_view/76-stormwater-management-publications.html

PLAN REVIEW

- ⦿ Plan review gives the MS4 operator the opportunity to ask for better practices
 - ⦿ You must suggest the better, more innovative practices rather than settling for the pipe-to-pond paradigm
 - ⦿ New Jersey Department of Environmental Protection Low-Impact Development Checklist
http://www.state.nj.us/dep/stormwater/bmp_manual2.htm

LONG-TERM MAINTENANCE PLANS

- ⊙ A post-construction plan is not complete without a long-term maintenance plan
 - ⊙ Who will be responsible?
 - ⊙ What are the routine and non-routine maintenance tasks for each BMP?
 - Does MS4 have standards for what these tasks should be?
 - ⊙ How often must these tasks be completed?
 - ⊙ Have easements been established to access the BMP for maintenance?
 - ⊙ Does the MS4 operator have any recourse if the responsible party fails to follow maintenance plan?

POST-CONSTRUCTION O&M STANDARDS

From Portland, OR *Stormwater Management Manual Chapter 3*

Sand Filters

Operations & Maintenance Plan

Sand filters consist of a layer of sand in a structural box used to trap pollutants. The water filters through the sand and then flows into the surrounding soils or an underdrain system that conveys the filtered stormwater to a discharge point. All facility components, vegetation, and source controls shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation, and 2 times per year thereafter, and within 48 hours after each major storm event. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

Filter Inlet shall allow water to uniformly enter the sand filter as calm flow, in a manner that prevents erosion.

- Inlet shall be cleared of sediment and debris when 40% of the conveyance capacity is plugged.
- Source of erosion shall be identified and controlled when native soil is exposed or erosion channels are forming.
- Sediment accumulation shall be hand-removed with minimum damage to vegetation using proper erosion control measures. Sediment shall be removed if it is more than 4 inches thick or so thick as to damage or kill vegetation.
- Rock splash pads shall be replenished to prevent erosion.

Reservoir receives and detains stormwater prior to infiltration. If water does not drain within 2-3 hours of storm event, sources of clogging shall be identified and correction action taken.

- Debris in quantities more than 1 cu ft or sufficient to inhibit operation shall be removed routinely (e.g., no less than quarterly), or upon discovery.
- Structural deficiencies in the sand filter box including rot, cracks, and failure shall be repaired upon discovery.

Filter Media shall allow stormwater to percolate uniformly through the sand filter. If water remains 36-48 hours after storm, sources of possible clogging shall be identified and corrected.

- Sand filter shall be raked and if necessary, the sand/gravel shall be excavated, and cleaned or replaced.
- Sources of restricted sediment or debris (such as discarded lawn clippings) shall be identified and prevented.
- Debris in quantities sufficient to inhibit operation shall be removed no less than quarterly, or upon discovery.
- Holes that are not consistent with the design structure and allow water to flow directly through the sand filter to the

<p>storm, sources of possible clogging shall be identified and corrected.</p> <ul style="list-style-type: none"> • Sand filter shall be raked and if necessary, the sand/gravel shall be excavated, and cleaned or replaced. • Sources of restricted sediment or debris (such as discarded lawn clippings) shall be identified and prevented. • Debris in quantities sufficient to inhibit operation shall be removed no less than quarterly, or upon discovery. • Holes that are not consistent with the design structure and allow water to flow directly through the sand filter to the ground shall be filled.
<p>Underdrain Piping (where applicable) shall provide drainage from the sand filter, and Cleanouts (where applicable) located on laterals and manifolds shall be free of obstruction, and accessible from the surface.</p> <ul style="list-style-type: none"> • Underdrain piping shall be cleared of sediment and debris when conveyance capacity is plugged. Cleanouts may have been constructed for this purpose. • Obstructions shall be removed from cleanouts without disturbing the filter media.
<p>Overflow or Emergency Spillway conveys flow exceeding reservoir capacity to an approved stormwater receiving system.</p> <ul style="list-style-type: none"> • Overflow spillway shall be cleared of sediment and debris when 50% of the conveyance capacity is plugged. • Source of erosion damage shall be identified and controlled when erosion channels are forming. • Rocks or other armament shall be replaced when sand is exposed and eroding from wind or rain.
<p>Vegetation</p> <ul style="list-style-type: none"> • Vegetation, large shrubs or trees that limit access or interfere with sand filter operation shall be pruned. • Fallen leaves and debris from deciduous plant foliage shall be raked and removed. • Nuisance or prohibited vegetation from the Portland Plant List (such as blackberries or English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed.
<p>Spill Prevention measures shall be exercised when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.</p>
<p>Training and/or written guidance information for operating and maintaining sand filters shall be provided to all property owners and tenants. A copy of the O&M Plan shall be provided to all property owners and tenants.</p>
<p>Access to the sand filter shall be safe and efficient. Egress and Ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.</p> <ul style="list-style-type: none"> • Obstacles preventing maintenance personnel and/or equipment access to the facility shall be removed. • Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.
<p>Insects & Rodents shall not be harbored in the sand filter. Pest control measures shall be taken when insects/rodents are found to be present.</p> <ul style="list-style-type: none"> • If sprays are considered, then a mosquito larvicide, such as Bacillus thurensensis or Altoside formulations can be applied only if absolutely necessary, and only by a licensed individual or contractor. • Holes in the ground located in and around the sand filter shall be filled.

ENFORCEMENT

- ⦿ Establish an inventory of post-construction BMPs in your community
- ⦿ Ensure post-construction BMPs are built per plan before accepting the structure or turning it over to the responsible party
 - ⦿ Consider a storm water performance bond
 - ⦿ http://www.cwp.org/documents/cat_view/76-stormwater-management-publications.html
- ⦿ Require responsible party to submit maintenance certification annually or inspect the BMP yourself
 - ⦿ Develop or adopt BMP inspection checklists
- ⦿ Ordinances must include enforcement provisions should responsible party fail to meet obligations

POND INSPECTION CHECKLIST

From Center for Watershed Protection: *Managing Stormwater in Your Community: A Guide for Building an Effective Post-Construction Program*

Facility ID: _____

Location: _____

GPS Coordinates: _____

Inspector(s): _____

Date: _____

Time: _____

Stormwater Pond/Wetland Maintenance Inspection Checklist

Party Responsible for Maintenance:

Contact:

Phone Number:

E-mail:

Mailing Address:

<i>Key Questions</i>			
	Item	X	Comments
1.	Type of stormwater pond or wetland (check all that apply)		
	a. Permanent pool sized for full WQv	<input type="checkbox"/>	
	OR		
	Shallow wetland sized for full WQv	<input type="checkbox"/>	
	OR		
	Micropool	<input type="checkbox"/>	
	b. Extended detention	<input type="checkbox"/>	
	c. Ties into groundwater	<input type="checkbox"/>	
	d. Pond with some wetland plantings	<input type="checkbox"/>	
	e. Multiple pond system	<input type="checkbox"/>	
2.	Type of wetland		
	a. Emergent	<input type="checkbox"/>	
	b. Forested	<input type="checkbox"/>	

Key Questions

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1. Type of stormwater pond or wetland (check all that apply)		
a. Permanent pool sized for full WQv	<input type="checkbox"/>	
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b. Extended detention	<input type="checkbox"/>	
c. Ties into groundwater	<input type="checkbox"/>	
d. Pond with some wetland plantings	<input type="checkbox"/>	
e. Multiple pond system	<input type="checkbox"/>	
2. Type of wetland		
a. Emergent	<input type="checkbox"/>	
b. Forested	<input type="checkbox"/>	
3. Type of pretreatment facility		
a. Sediment forebay	<input type="checkbox"/>	
b. Grass filter strip	<input type="checkbox"/>	
c. Other	<input type="checkbox"/>	Type of pretreatment facility:

A. Contributing Drainage Area

0 = Good condition. Well maintained, no action required.

1 = Moderate condition. Adequately maintained, routine maintenance needed.

2 = Degraded condition. Poorly maintained, routine maintenance and repair needed.

3 = Serious condition. Immediate need for repair or replacement.

<input type="checkbox"/>	Inspected					
<input type="checkbox"/>	Not Inspected					
Item						Comments
1. Excessive trash/debris	0	1	2	3	N/A	
2. Bare/exposed soil	0	1	2	3	N/A	
3. Evidence of erosion	0	1	2	3	N/A	

http://www.cwp.org/documents/cat_view/76-stormwater-management-publications.html

PERFORMANCE BONDS

From Center for Watershed Protection *Managing Stormwater in Your Community: A Guide for Building an Effective Post-Construction Program*, Tool 7

BOND NUMBER _____

FOR CITY/TOWN/VILLAGE USE ONLY

Project Name: _____

File Number: _____

**CITY/TOWN/VILLAGE OF [NAME OF CITY/TOWN/VILLAGE]
STORMWATER MANAGEMENT PERFORMANCE BOND
(SURETY)**

KNOW ALL MEN BY THESE PRESENTS, that _____

_____, as Principal, and _____

_____, a corporation in the State of _____

_____, duly authorized as a surety company to transact business in the State of _____

_____, as Surety, are held and firmly bound unto the [City/Town/Village]

of [Name of City/Town/Village], a municipal corporation under the laws of the State of

[State], as Obligee, in the amount of _____

_____ Dollars (\$ _____), for the payment whereof

Principal, Obligee, and Surety, jointly and severally, shall be bound to their heirs, assigns, and legal representatives.

UPCOMING WORKSHOPS

- ◎ Post-Construction BMP Tour – FREE!
 - ◎ Sept 16, 2010
 - ◎ Sites in Lorain and Cuyahoga Counties
- ◎ Post-Construction BMP Design Seminar
 - ◎ Nov 3, 2010
 - ◎ Lorain County Community College
- ◎ Information at www.epa.ohio.gov/ocapp/storm_water.aspx

FOR MORE INFORMATION

- ⊙ Websites
 - ⊙ Ohio EPA – www.epa.ohio.gov/dsw/storm/index.aspx
 - ⊙ US EPA – www.epa.gov/npdes/stormwater
- ⊙ Contacts
 - ⊙ Dan Bogoevski (330) 963-1145
 - Cuyahoga, Geauga, Lake, Lorain & Wayne
 - ⊙ Phil Rhodes (330) 963-1136
 - Portage, Summit & Stark
 - ⊙ Chris Moody (330) 963-1118
 - Ashtabula, Mahoning, Medina & Trumbull