

Managing it All Maintenance Plans

Good Housekeeping Workshops

Merrimack Valley Stormwater
Collaborative

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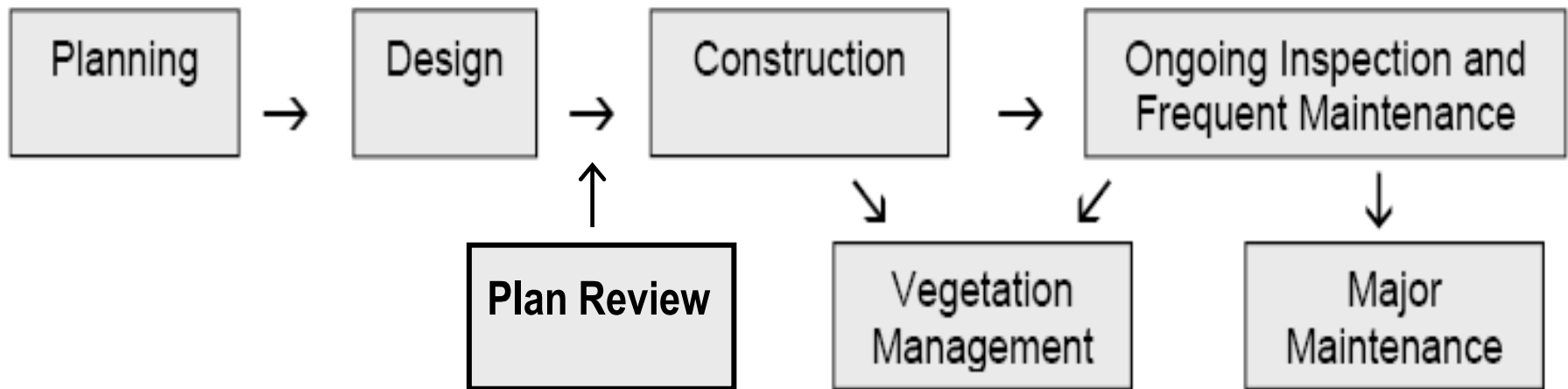


Horsley Witten Group, Inc.



The Life Cycle Approach to Stormwater Maintenance

- The most successful programs recognize that effective stormwater BMP maintenance involves more than just maintenance



Reduce Maintenance “Liability” During BMP Selection & Design

- Review site plans with maintenance in mind
- Require detailed maintenance plan
 - Inspection schedule
 - Maintenance frequency
 - Responsible party
- Require pretreatment
- Strive to make sediment removal operations quick and easy
- Design practices with gentle side slopes
- Include native vegetative “no mow” buffers around stormwater practices
- Require long-term vegetation management plan



Maintenance Program Scoping Questions

- What are the local watershed protection and restoration objectives?
- How many stormwater BMPs are currently in place?
- How many more stormwater BMPs are expected?
- Where will they be located?
- Who will maintain them?
- What will be the level of service provided by the community?
- How can the program be funded?



Maintenance Program Models

- Communities have several different options to consider when vesting maintenance responsibilities
 - Option 1: Private maintenance
 - Option 2: Public maintenance
 - Option 3: Hybrid



<p>REACTIVE</p>	<p>PERIODIC</p>
<p>Episodic maintenance Cheap in short term Expensive in long term Most property damage</p>	<p>Can be expensive and wasteful Need statistics Simple administration</p>
<p>PREDICTIVE</p>	<p>PROACTIVE</p>
<p>Scientific basis Cost-effective Not applicable everywhere Administration more difficult</p>	<p>Can be cost-effective Expensive if overused Can have institutional implications</p>

Reese, A.J., Presler, H.H., 2005



Maintenance Complexity is defined as:

Minimal	Simple
Stormwater Professional or Consultant is seldom needed	Stormwater Professional or Consultant is occasionally needed
Moderate	Complicated
Stormwater Professional or Consultant is needed half the time	Stormwater Professional or Consultant is always needed



Assumptions

Category of Maintenance	Type of Maintenance	complexity
Reactive maintenance	Structural Repairs	complicated
	Partial Rehabilitation	complicated
	Rehabilitation	complicated
Periodic maintenance	Inspection	simple
	Mowing	minimal
	Vegetation Management	minimal
Predictive maintenance	Solids and Debris Removal	moderate
Proactive maintenance	Pavement Vacuuming	moderate
	Erosion control & bank stabl	simple



Budgeting for a Local Maintenance Program

- Staff
- Equipment
- Administration
- Tracking/GIS
- Contractual Services
- Other



BMP Inventory & Asset Management



Survey Says... (n = 10)

What type of systems do you use to manage your maintenance schedule?

GIS-based asset management system

2

Written annual maintenance schedule

3

Response to verbal/written citizen requests for maintenance

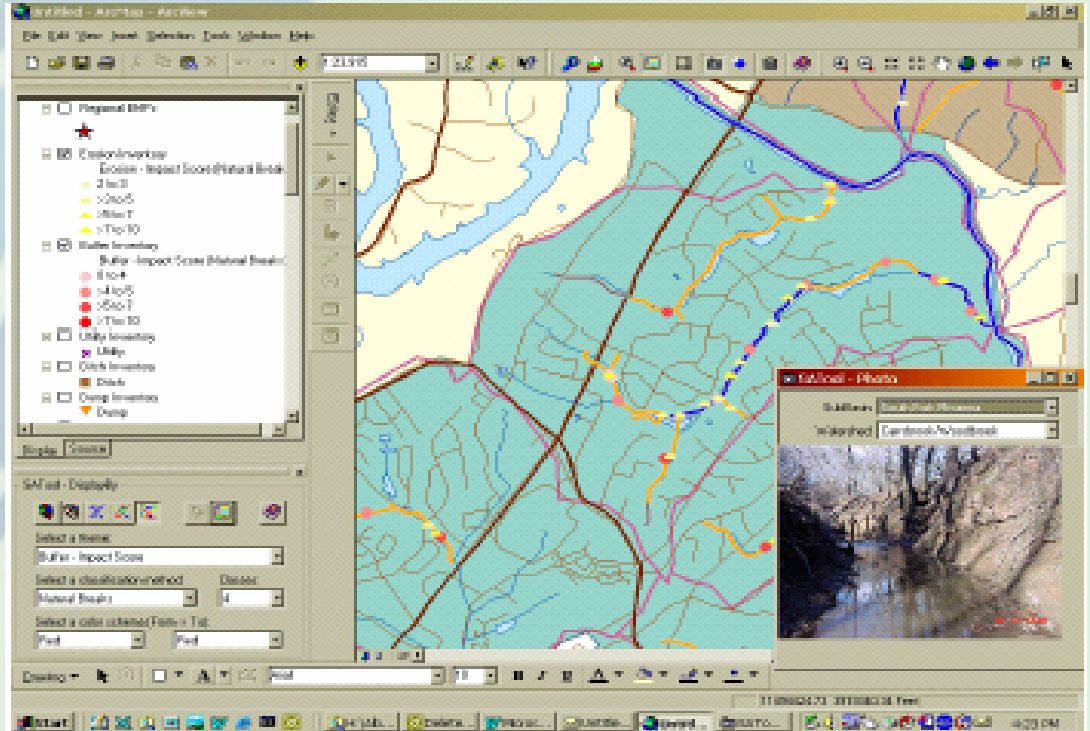
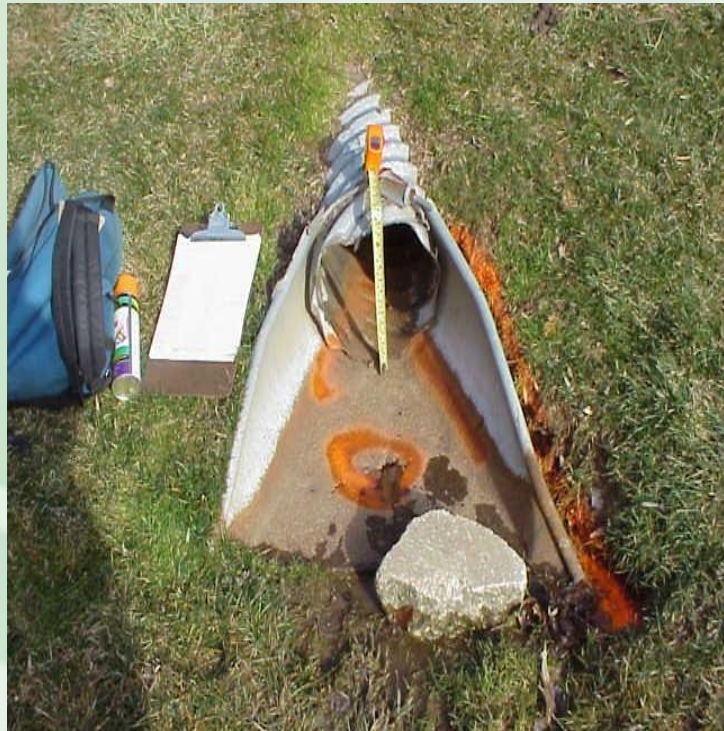
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Electronic maintenance request system (web-based, mobile App)

2



Synchronize Field Data and Office Data



Assets & Tracking Systems (example Montgomery County, MD)


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Work Materials Equipment Administration


Inbox
Operations Maintenance Management

Description	Count
All WOs Status of REVIEW	183
All Inspection Repair WOs Status = Released	316
Newly Added SWF Awaiting GIS	747
% On-Time Triennial Inspections Completed last 30 days	1.41
SWF status of Transfer	134
Data Change Work Orders	3
Closed Data Change Work Orders	15
GIS Change Work Orders	25
Released Complaint WO	6
All Inspection Repair WOs Status = Pre-released	250
All WOs Status of POSTPONED	78


KPIs




All UG Inspection not in compliance: 339




UG Triennial Inspection not in compliance: 108




FRANCIS' UG In compl




STEVE P'S AG Inspection repairs not in compliance: 71




ED'S AG Inspection repairs not in compliance: 106



All AG Inspection repairs not in compliance: 188



Completed Triennial Inspection WO in Status of Review: 179



Completed UG Triennial Inspection WO in Status Review: 33

Inspection compliance KPIs – status of program

Refresh Personalize Refresh Personalize

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Work Materials Equipment Administration

Asset 10000 City Village Park

Organization: 001 Department: 000-0000 Status: Inactive

Asset	Description	Status	Organization	Structure Number/Name	Structure Details	Compliance Date	Compliance
0000	City Village Park	Installed	SWP-COM	00000000	AGP0	06/11/2006	NSP-000000
0001	City Village Park	Installed	SWP-COM	00000000	AGP0	06/11/2006	NSP-000000
0002	City Village Park	Installed	SWP-COM	00000000	AGP0	06/11/2006	NSP-000000
0003	City Village Park	Installed	SWP-COM	00000000	AGP0	06/11/2006	NSP-000000
0004	City Village Park	Installed	SWP-COM	00000000	AGP0	06/11/2006	NSP-000000
0005	Montgomery County Office Paper Systems	Installed	SWP-PCO	00000000	NSP00	06/11/2006	NSP-000000
0006	Highland Elementary School	Installed	SWP-PCO	00000000	NSP00	06/11/2006	NSP-000000
0007	Stony Hill Elementary	Installed	SWP-PCO	00000000	NSP00	06/11/2006	NSP-000000
0008	Montgomery Industrial Park	Installed	SWP-PCO	00000000	NSP00	06/11/2006	NSP-000000
0009	TruGreen Chemicals	Installed	SWP-PCO	00000000	NSP00	06/11/2006	NSP-000000
0010	Montgomery County Airport Industrial Site	Installed	SWP-PCO	00000000	NSP00	06/11/2006	NSP-000000
0011	Red River Spring Elementary School	Installed	SWP-PCO	00000000	NSP00	06/11/2006	NSP-000000
0012	Culver Park Elementary High School	Installed	SWP-PCO	00000000	NSP00	06/11/2006	NSP-000000
0013	John Heppel Day School	Installed	SWP-PCO	00000000	NSP00	06/11/2006	NSP-000000
0014	Marshall Elementary School	Installed	SWP-PCO	00000000	NSP00	06/11/2006	NSP-000000
0015	Montgomery Industrial Park	Installed	SWP-PCO	00000000	NSP00	06/11/2006	NSP-000000
0016	Montgomery County Office Paper Systems	Installed	SWP-PCO	00000000	NSP00	06/11/2006	NSP-000000

Inspection Program





Inspections: Program Considerations

- Staffing: In-House Inspectors vs. Contractors
- Combine with ESC staff vs. separate
- How to handle on-lot, non-structural (alternative schedule)
- Compliance/enforcement
- Training for inspections staff:
 - Certification
 - Confined space
 - Documentation
 - BMPs
 - Vegetation management for BMPs
 - Etc.



Sample Maintenance Checklists

RI Stormwater Manual - Appendix E

Infiltration System Operation, Maintenance, and Management Inspection Checklist

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

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Annual)		
Trench/chamber or basin surface clear of debris		
Inflow pipes clear of debris		
Overflow spillway clear of debris		
Inlet area clear of debris		
2. Sediment Traps or Forebays (Annual)		
Obviously trapping sediment		
Greater than 50% of storage volume remaining		
3. Dewatering (Annual)		
Trench/chamber or basin dewatered between storms		
4. Sediment Cleanout of Trench/Chamber or Basin (Annual)		

Bioretention Operation, Maintenance, and Management Inspection Checklist

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

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Annual, After Major Storms)		
Bioretention and contributing areas clean of debris		
No dumping of yard wastes into practice		
Litter (branches, etc.) have been removed		
2. Vegetation (Annual, After Major Storms)		
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 10 inches		

Inspection Process

- Facilities inspected by a two-person team to ensure consistency
- Private owners notified by letter 1 month before inspection, are invited to participate - **Public facilities go on the list...**
- Inspection completed based on requirements of the suitable reference document
- Maintenance “punch-list” sent to owner and owner has 90 days to complete maintenance **or Town commits to schedule**



Findings

(based on a recent Virginia example)



- Many BMP owners willing to comply
- Many need guidance with identifying deficiencies and finding contractors
- Some owners, particularly non-profits and HOA's concerned about cost of inspections and maintenance
- Some owners completely ignore requests
- Some BMPs in very "critical" condition

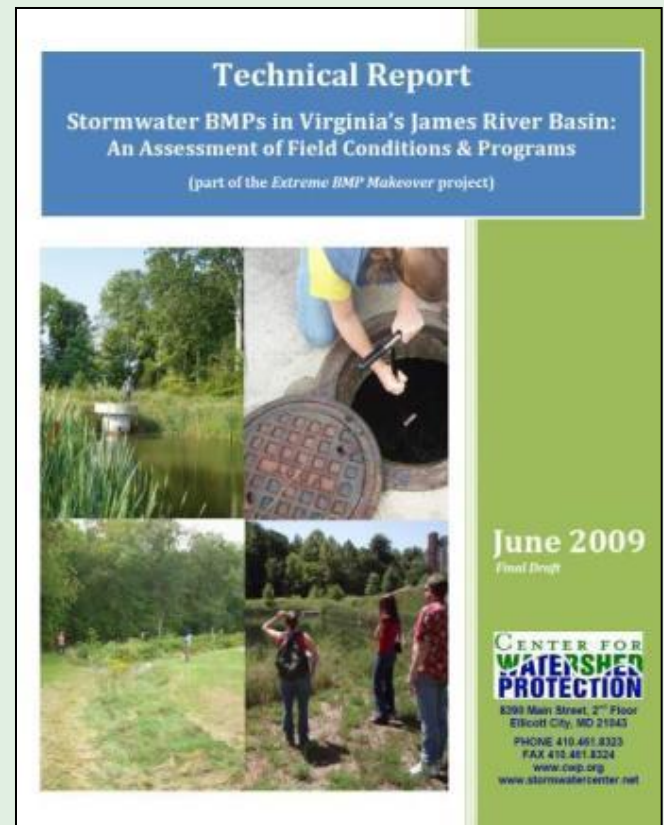


Doing The Maintenance

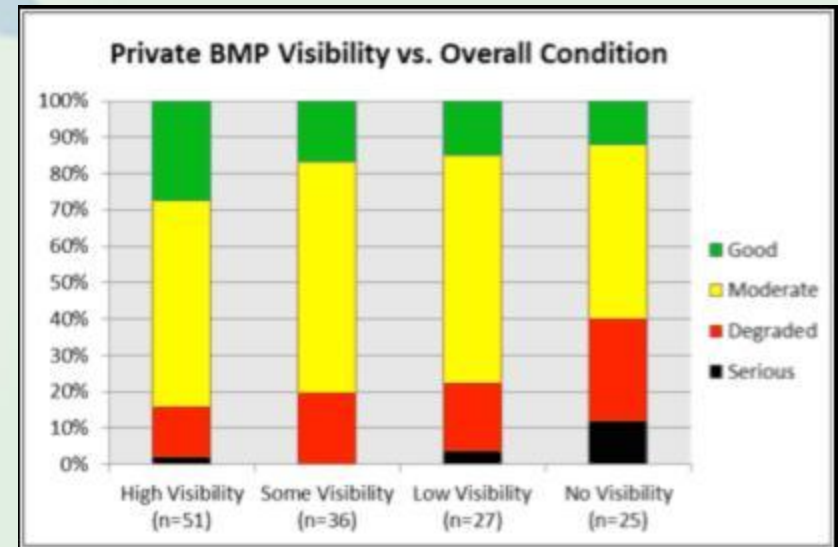
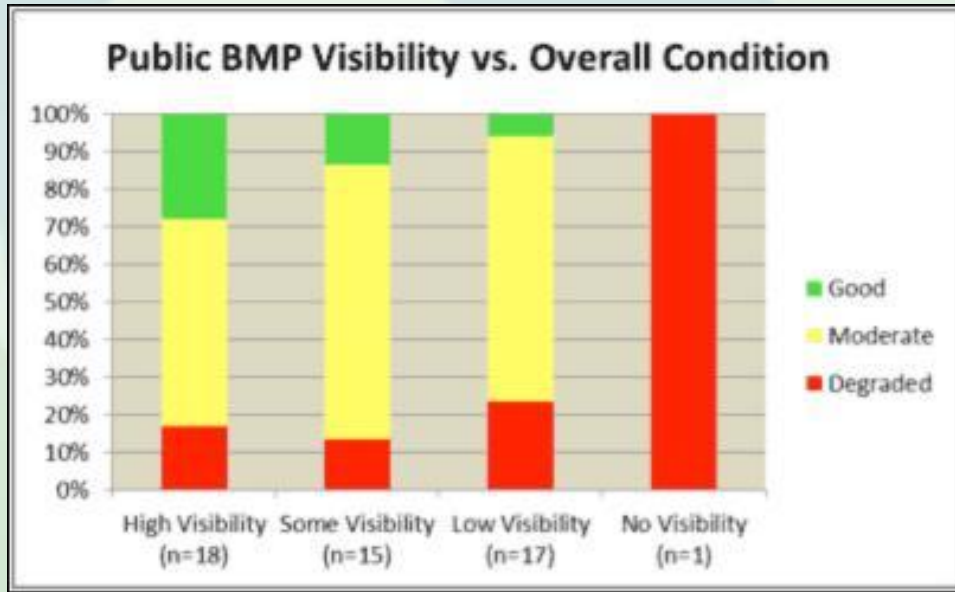


The Proof is in the Puddle

- ~ 50% of BMPs surveyed show some sign:
 - *Excess sediment*
 - *Clogging*
 - Erosion
 - Vegetation problems
 - Trash
 - Structural degradation
 - Flow alteration



If seems to matter if you can see it



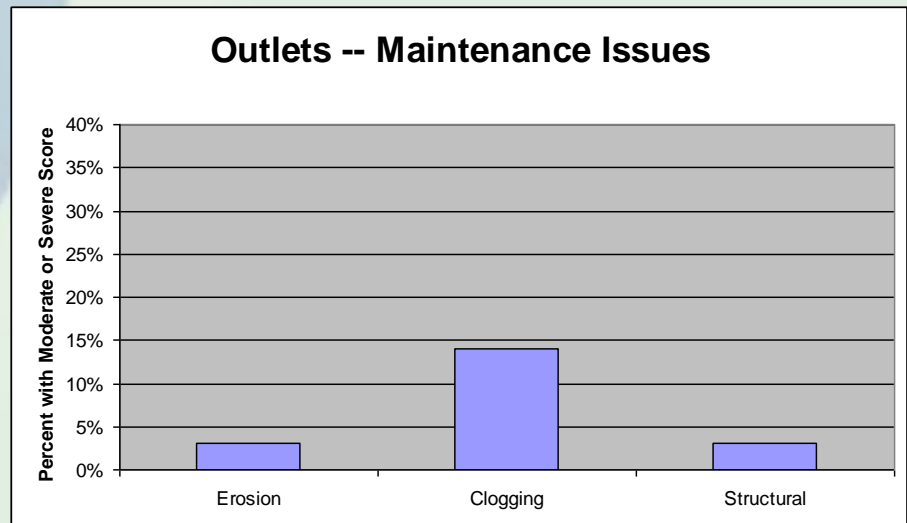
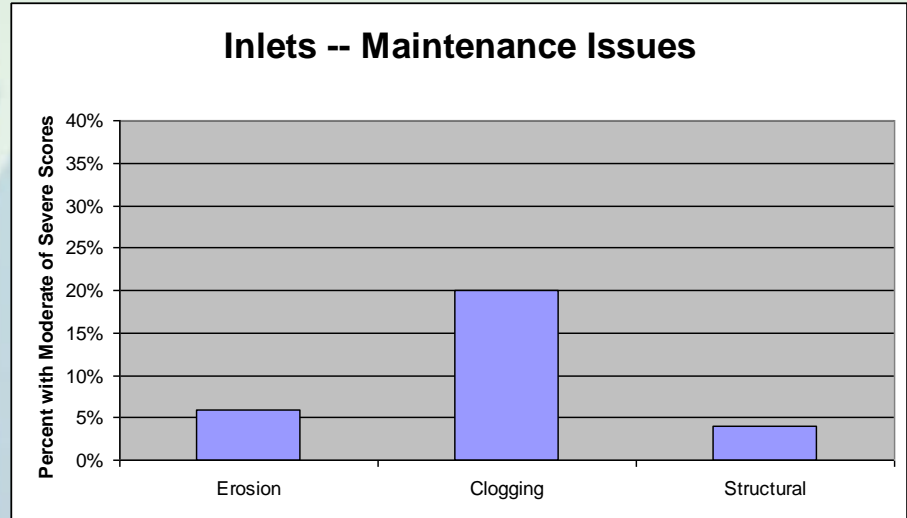
Source: Dave Hirschman: BMP assessment in Lynchburg, VA



Excess Sedimentation



Clogging at Inlets & Outlets



Erosion: Inlets, slopes, BMP surface



Questions?

