

Design, Build, Operate, and Maintain (DBOM) Pilot Program for Stormwater Management



Informative Meeting
April 28, 2008



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SWM Program Objectives

1. To maintain and enhance safety, performance and aesthetic appearance of SHA stormwater management facilities

2. To comply with NPDES permit requirements:

Identify and Inspect SWM Facilities

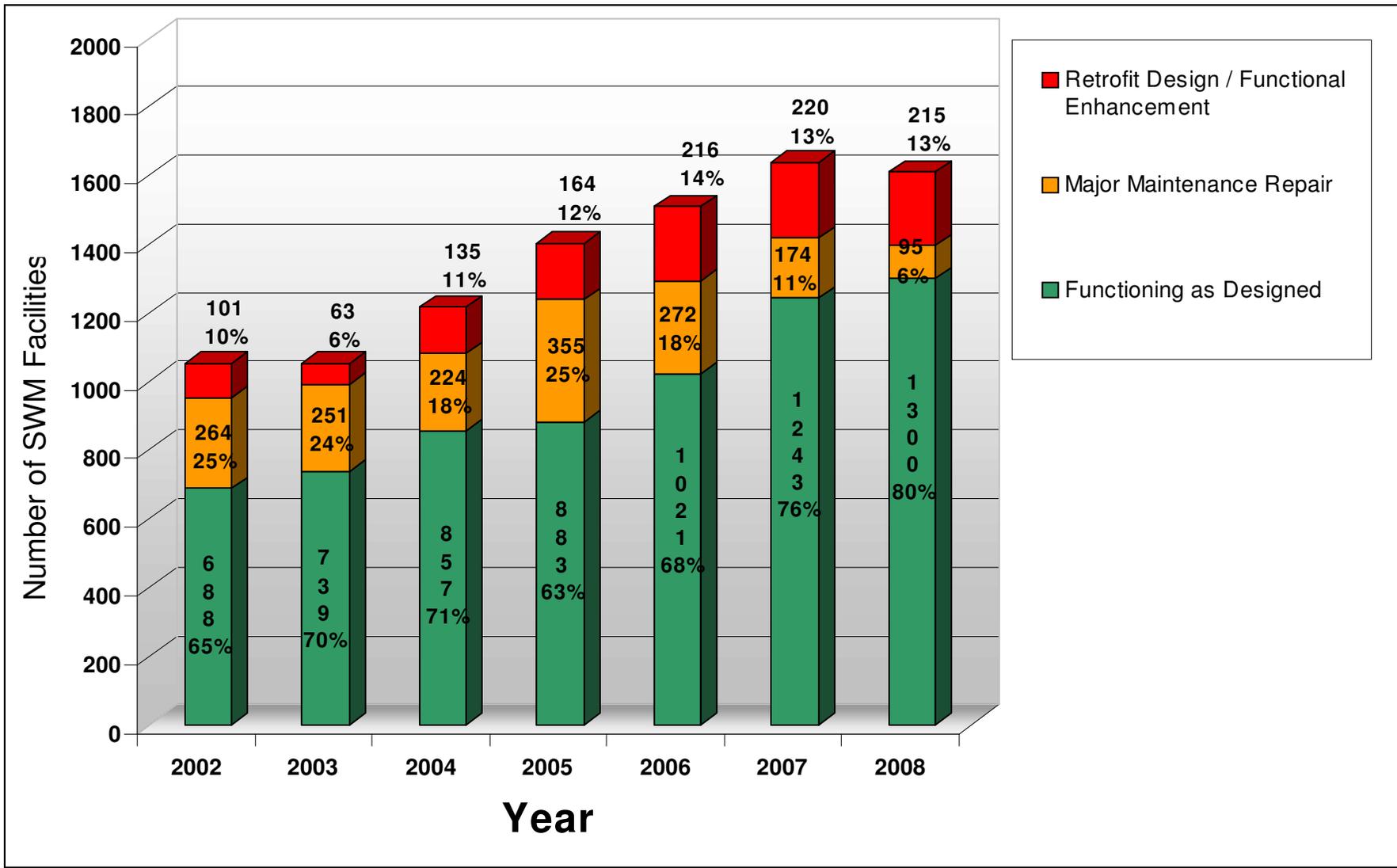
Perform routine maintenance within 1 year

Identify and perform required repair work

Re-inspect each facility at least once every 3 years

3. To meet SHA Business Goal

By the year 2010 90% of SHA SWM facilities will be functionally adequate



SHA Business Plan



Maintenance and Remediation

- >Two Tier Rating System:

- **Performance based rating**
 - structural integrity
 - functionality

- **Action / SHA Response rating**
 - priority for maintenance and remediation
 - compliance with NPDES permit requirements for remediation



MARYLAND STATE HIGHWAY ADMINISTRATION – Stormwater NPDES Program

Chapter 3

Best Management Practice Field Inspections & Data Collection Procedures

April 2007 (DRAFT)



Performance / Inventory Inspection Rating

Each of the inspection parameters is rated on a scale of 1 to 5

- 1 – Operating as Designed, No Issues Observed
- 2 – Functional, Minor Problems Exist
- 3 – Functional, Moderate Problems Exist
- 4 – Performance is Compromised, Major Problems
- 5 – Non-Functional, Hazardous Conditions

Overall inspection rating assigned for each facility

- A – Functioning as designed, no problem conditions
- B – Functioning as designed, minor problems exist
- C – Exhibits serious performance problems
- D – Major Problems, not functioning as designed
- E – Facility failed, hazardous conditions



SHA Action Rating



- I **No Response Required** – schedule for multi-year inspection
- II **Minor Maintenance** – perform as necessary to sustain BMP performance. Upon remedial action and re-inspection, can be candidate for multi-year inspection
- III **Major Maintenance or Repair** – is needed to return the site to original functionality within the existing footprint of the facility. Structural defects require repair and/or restoration
- IV **Retrofit Design** – is required on-site or at another location, since BMP cannot be returned to its original functionality within its existing footprint
- V **Immediate Response** – is mandatory to address any public safety hazards regardless of the functionality of the BMP
- VI **Abandonment** – of the BMP when the facility is not maintainable and will not provide sufficient benefits if retrofitted due to the lack of access for construction and maintenance, limited space or minimum impervious area treated

I – No action required

1/10/06



II – Routine maintenance



Trash & debris



Vegetation



III – Major maintenance



Erosion



Vegetation Issues



Ponding



III – Major maintenance (cont.)

Maintenance Access

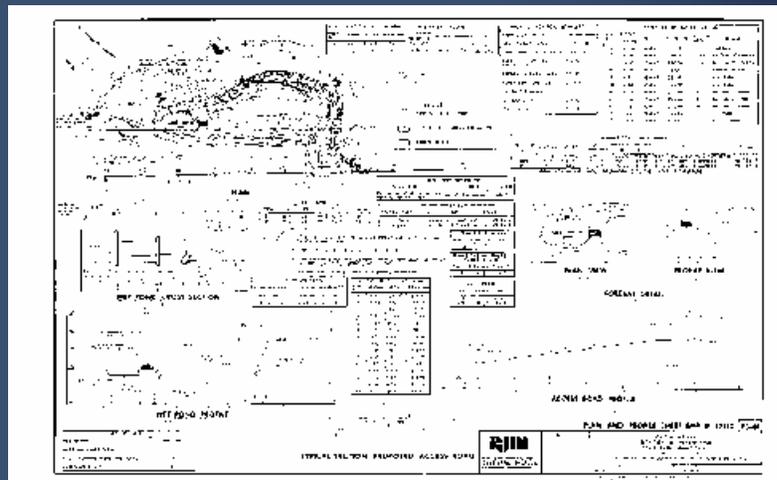


Remediation Plan: Work Order Template

- SWM facility inventory information
- Performance inspection comments
- Inspection Rating Summary
- SHA Action Rating

Recommended maintenance action list

Marked up SWM As-Built Plans
and Photographs



BMP ID# 16128		
Inspection Report		
BMP type:	infiltration basin	
Road:	MD202	
County:	Prince George's	
SHA Shop:		
Location:	CENTRAL AV	
Inspection Date:	8/15/2002	
Inspector:	MSM/MBE	
Inspection rating:	B	
SHA rating:	III	
Water Depth:		
Drainage Area:	6.03	
Surface Area:	0.165	
Principal spillway:		
Rating		
Debris:	2	
Ponding:	1	
Q in conditions:	1	
Q in stability:	1	
Aesthetics:	2	
Public Hazard:	1	
Fence:	3	
Access:	2	
Vegetation:	1	
Contamination:	1	
Forebay:	0	
Embankment:	0	
Structure:		
Comments:		
Map		
		
		
		
Maintenance Action List		
Action	Date	Comments
1. Repair erosion areas along top of roadway embankment by filling with rip rap		
2. Reset section of fence that is laying down		
Performed by		



SWM Facilities Maintenance

Minor Maintenance

- work orders developed for the contractors

Major Maintenance

- Remedial design required for major repairs in addition to work orders
 - "napkin design" = marked up photos and as-built plans
- Stabilization of eroded areas
 - Structural repairs
 - Vegetation management
 - Grading and dredging
 - Outfall repairs
 - Debris removal
 - Infiltration trench media replacement and well installation
-
- E&S may be required



IV – Retrofit Design

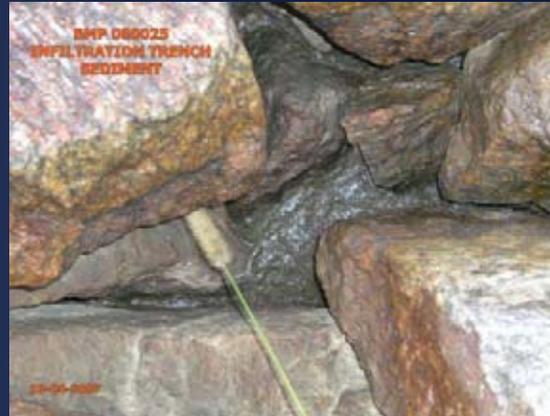


Embankment Failure



BMP 080027
INFILTRATION TRENCH
VEGETATION

10-04-2007



BMP 080025
INFILTRATION TRENCH
SEDIMENT

10-04-2007



BMP 080026
INFILTRATION TRENCH
OBSERVATION WELL

10-04-2007

Failed Infiltration



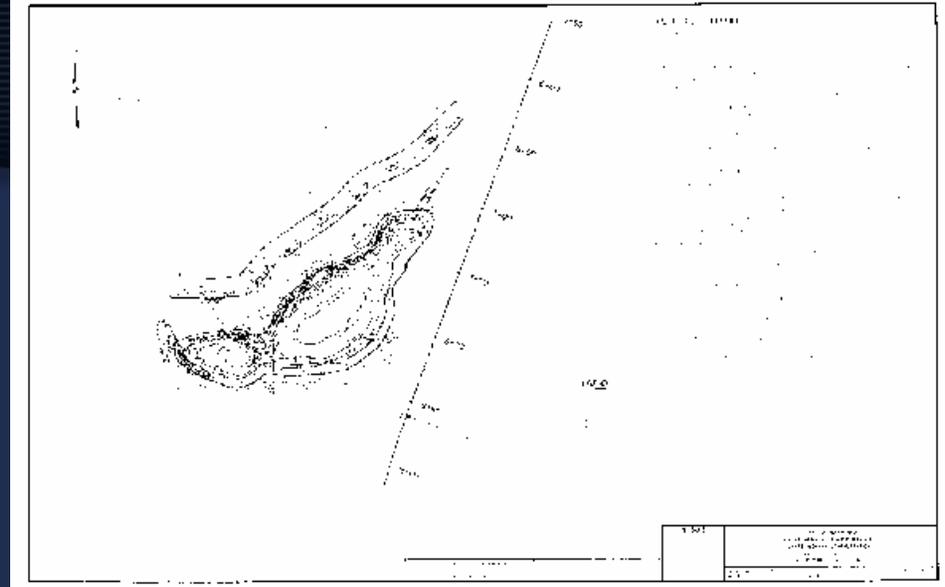
IV – Retrofit Design (cont.)

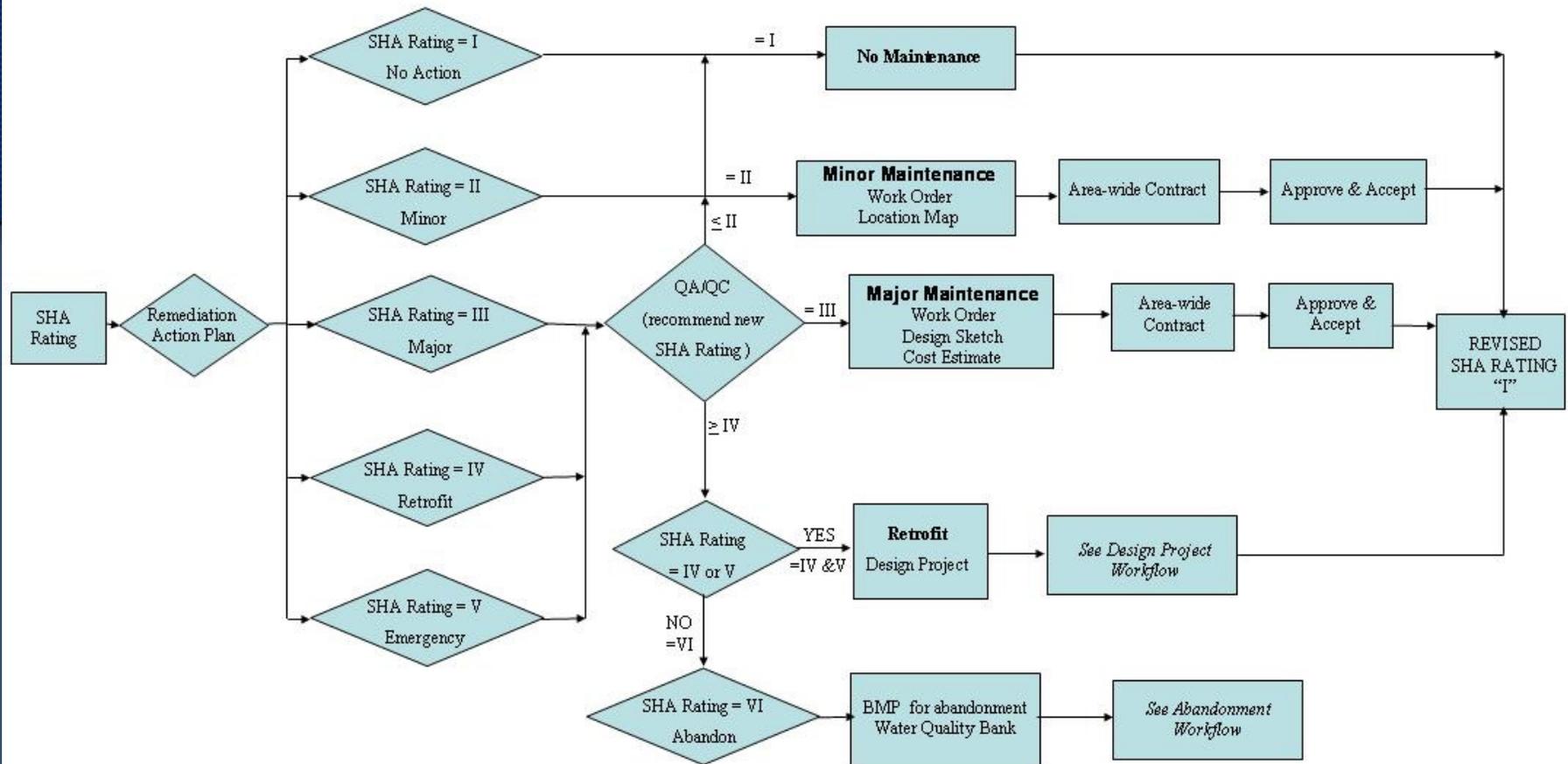
= Converting an existing failed SWM facility into a different type of BMP

- Clearing, grubbing
- Dredging
- Grading / re-grading
- Flow diversion
- Dewatering/ pumping
- Stabilization
- Landscaping
- Drainage systems installation
- Structural repairs
- Access road constriction
- Erosion & Sediment Control
- Permits required



Retrofit Design and Construction





Maryland State Highway Administration Stormwater management facilities Program
 Process for BMP Maintenance, and Remediation

Current BMP Remediation Process



BMP Maintenance Tracking

- Response Table – track remedial actions and documentation
- Maintenance Cost – from the contractor invoices
- Retrofit Cost – projects bid history



BMP No.	SHA Rating	Road	BMP Type	Action Type	NTP	Completion	Design	Contractor	Construction Cost
13047	IV	MD32	INFBASN	Functional Enhancement	05-Jan-04		STV	J.H. Burton & Sons, Inc.	\$176,542.33
13049	IV	MD32	INFBASN	Functional Enhancement	05-Jan-04		STV	J.H. Burton & Sons, Inc.	\$176,542.33
13050	II	MD32	INFBASN	Minor maintenance	30-Nov-01	30-Jun-03	SHA	Kevin Shaffer	\$1,500.00
13123	III	MD 32	RETPOND	Major maintenance		01-Aug-06	D&D	Merciers	\$1,205.77
13197	IV	US 1	INFTREN	Functional Enhancement	05-Jan-04	25-May-05	JMT	Nations Contracting Co., Inc.	\$19,045.45
13207	IV	MD100	INFTREN	Functional Enhancement	05-Jan-04	25-May-05	JMT	Nations Contracting Co., Inc.	\$19,045.45
13214	II	MD100	INFTREN	Minor maintenance		01-Aug-06	SHA	Merciers	\$217.71
13231	II	MD100	EXDET	Minor maintenance		14-Aug-06	SHA	Merciers	\$1,261.11
13232	IV	MD100	INFTREN	Functional Enhancement	05-Jan-04	25-May-05	JMT	Nations Contracting Co., Inc.	\$19,045.45
13327	II	MD 100	INFTREN	Minor maintenance		01-Aug-06	SHA	Merciers	\$413.73

Maryland SHA NDPES MS4 Program

Stormwater Management

Design / Build, Operate and Maintain (SWM DBOM)



Charles County Pilot Study
Informative Meeting
April 28, 2008

Purpose Today

- Introduce DBOM
- Outline Goals, Methods, and Procurement Process
- Identify Concerns and Predict Problems Prior to Advertisement



SWM DBOM

- Design: Engineers inspect stormwater facilities to determine the need for maintenance or retrofit. Preparation of plans for retrofits and major maintenance.
- Build: Contractors perform major maintenance or retrofits of facilities as determined by the engineers.
- Operate: Engineers review the facilities to ensure they are functioning as designed.
- Maintain: Contractors perform routine maintenance and respond to minor maintenance concerns.

DBOM Program Goals

- Pilot Study to Determine the Effectiveness of DBOM
- 3-Year Program
- Inventory of Charles County Completed April 2008 – 100 BMPs
- Achieve 100% of Facilities Functioning as Designed
- Establish Routine Maintenance Activities to Reduce Need for Retrofits

BMP Inspections

- Current Inspections Completed in April, 2008.
- BMP Inspection Manual Training
- Inspections Provide “Action Items” – Maintenance Activities to be Addressed
- Each BMP Given a Rating Based on Two Tier Rating System
- Follow-Up Inspections Performed by Selected Team in Year 3.
- Inspection Audits



BMP Inspections

BMP Inspection Manual Training

MARYLAND STATE HIGHWAY ADMINISTRATION - BMP ES Program

Chapter 3

Best Management Practice Field Inspections & Data Collection Procedures

July 2007



Version 2.0

Chapter 3 - BMP Inspections

>1



BMP Inspections

Facilities Included:

- 1 Dry Swale
- 1 Wet Swale
- 15 Grass Channels
- 1 Extended Detention Shallow Wetland
- 6 Detention Ponds
- 3 Dry Extended Detention Ponds
- 15 Retention Ponds
- 8 Wet Extended Detention Ponds
- 7 Infiltration Basins
- 43 Infiltration Trenches



Performance Rating vs. Action Response Rating



Performance Rating = E (Failure)



Performance Rating vs. Action Response Rating



Action Response Rating II
Routine Maintenance



BMP Inspections Inspection Data



BMP Inspection Tables

- BMP_INSPECTION
- BMP_INSPECTION_ACTION
- CONCERNS
- DRAINAGE_SWMFACILITY
- FILE_ATTACH_SWM

Field name	Data type	Allow nulls	Default value	Domain	Prec-ision	Scale	Length
OBJECTID	Object ID	Yes					
BMP_INSPECT_ID	Long integer	Yes			0		
FACILITY_ID	Long integer	Yes			0		
DATE_INSP	Date	Yes			0	0	8
INSPECTR	String	Yes					11
PLAN_MATCH	String	Yes		D_BooleanValues			1
CONTEXT	String	Yes		D_Context			5
SITE_HAZ	String	Yes		D_BooleanValues			1
DEBRIS	String	Yes		D_Insp_Sco			2
QIN_COND	String	Yes		D_Insp_Sco			2
QIN_STABILITY	String	Yes		D_Insp_Sco			2
BMP_VEG	String	Yes		D_Insp_Sco			2
BMP_CONT	String	Yes		D_Insp_Sco			2
PONDING	String	Yes		D_Insp_Sco			2
WAT_DEPTH	Double	Yes			0	0	
PERMPOOL	String	Yes		D_Insp_Sco			2
PRETREAT	String	Yes		D_Insp_Sco			2
MOW	String	Yes		D_Insp_Sco			2
ACCESS	String	Yes		D_Insp_Sco			2
COM_ACCESS	String	Yes					255
CONVEY_STABILITY	String	Yes		D_Insp_Sco			50
DS_CONDITION	String	Yes		D_Insp_Sco			50
SITE_VEG	String	Yes		D_Insp_Sco			2
EMBU_CVR	String	Yes		D_Insp_Sco			2
EMBU_ERO	String	Yes		D_Insp_Sco			2
EMBU_TOE	String	Yes		D_Insp_Sco			2
EMBD_CVR	String	Yes		D_Insp_Sco			2
EMBD_ERO	String	Yes		D_Insp_Sco			2
EMBD_TOE	String	Yes		D_Insp_Sco			2
EMBD_SEEP	String	Yes		D_Insp_Sco			2
ESPW_STAB	String	Yes		D_Insp_Sco			2
ESPW_OPEN	String	Yes		D_Insp_Sco			2
ORF_OPEN	String	Yes		D_Insp_Sco			2
ORF_TRSH	String	Yes		D_Insp_Sco			2
RSR_OPEN	String	Yes		D_Insp_Sco			2
RSR_TRSH	String	Yes		D_Insp_Sco			2
RSR_SEDI	String	Yes		D_Insp_Sco			2
RSR_STRC	String	Yes		D_Insp_Sco			2
RSR_VALV	String	Yes		D_Insp_Sco			2
PRIN_SPWY	String	Yes		D_Insp_Sco			2
SPWY_OUT	String	Yes		D_Insp_Sco			2
PUB_HAZ	String	Yes		D_Insp_Sco			2
PUB_HAZ_POT	String	Yes		D_Insp_Sco			2
FENCES	String	Yes		D_Insp_Sco			2
SAFE_WATERDEPTH	String	Yes		D_Insp_Sco			2
VISIBLE	String	Yes		D_Insp_Sco			2
RATING	String	Yes		D_Insp_Rating			2
COM_RESPON	String	Yes					120
COM_OVERAL	String	Yes					255



BMP Inspections Standard Action Items



Fields:

BMP_INSPECT_ID
COM_ACTION

BMP_INSPECT_ID –
unique identifier that links
the actions to the
inspection

COM_ACTION – action
codes that describe issues
associated with the BMP

- The BMP Inspection Action table allows the inspectors to identify a number of action items that they recommend be performed on the BMP's.
- The table stores codes identifying the required actions identified during the BMP inspections. (*d_action*)

Table BMP_INSPECTION_ACTION							
Field name	Data type	Allow nulls	Default value	Domain	Prec- ision Scale Length		
OBJECTID	Object ID						
BMP_INSPECT_ID	Double	Yes			0	0	
COM_ACTION	String	Yes		D_Action			120



BMP Inspections Concerns



- Used to track the presence of contaminants and invasive species
- A number of actions can be selected
- Detailed Information Contained within BMP Inspection Manual

Field name	Data type	Allow nulls	Default value	Domain	Prec- ision	Scale	Length
OBJECTID	Object ID						
BMP_INSPECT_ID	Long integer	Yes			0		
TYPE_CONC	String	Yes					2
BMP_CONC	String	Yes		D_BMP_Conc			10

BMP_INSPECT_ID – unique inspection ID for every inspection performed, used as a link

Type_Conc – indicates whether the record is an invasive species (I) or contamination (C) issue

BMP_Conc – specific concern observed; domain values



BMP Concerns

- No Existing Concerns Identified
- Illegal Contamination Entering Facility
 - Provide Clean-up of Identified Condition
 - Address Impacts to Stormwater Facility
- Invasive Species
 - Prepare Landscaping Plan for Approval by SHA
 - Remove Invasive Plants
 - Install and Maintain New Plantings



Minor/Routine Maintenance

- Inspection Identified Action Items to be Addressed
- Routine Maintenance Requirements Identified in Contract Documents for Each BMP Type
- Routine Maintenance To be Performed Annually
- Work Order Provided to SHA

Routine Maintenance

- Contract Documents Outline Routine Maintenance Requirements for Each BMP Type
(Pond)
 - Mow Side Slopes and Embankment
 - Remove Woody Vegetation from Embankment
 - Remove Trash and Debris
 - Inspect Trash Rack and Repair
 - Repair Perimeter Fence
 - Correct Erosion on Slopes
 - Seed Bare Areas

Minor/Routine Maintenance



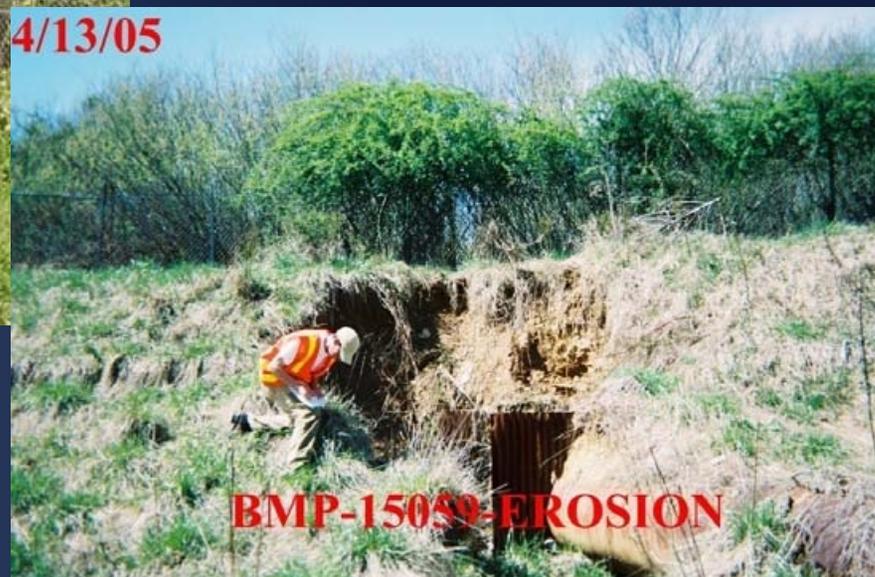
Major Maintenance

- Inspection Identified Major Problems that Must be Addressed
- 23 Infiltration Facilities Require Major Maintenance
- To be Scheduled Immediately
- Generally Requires Mobilization of Large Equipment
- Engineer to Develop Maintenance Plan for SHA Approval
- Work Order Provided to SHA

Major Maintenance



4/13/05



BMP-150S9-EROSION



Retrofit

- Inspection Identified BMP Failure or Imminent Failure
- Design/Approval
- Year 1 – Design and Permitting
- Year 2 – Design and Permitting / Construction
- Year 3 - Construction
- Submission of As-Built Drawings

Retrofit

Before



After



Retrofit Permitting Concerns



- SHA Concept Approval
- Maryland Department of the Environment Review/Approval
- Joint Federal/State Application for the Alteration of any Floodplain, Waterway, Tidal or Nontidal Wetlands
- Rare, Threatened, or Endangered Species



Retrofit Right-of-Way



- Contract Documents to Identify Right-of-Way Constraints
- DBOM Team Performs Design, Identifies Right-of-Way Needs
- DBOM Team Performs Survey, Prepares Right-of-Way Plats
- SHA Acquires Right-of-Way



Retrofit Site Investigation

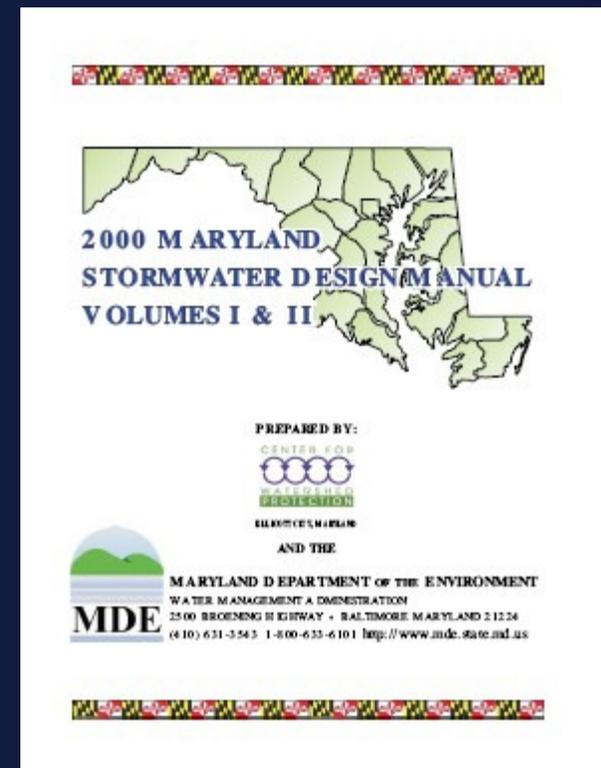
- Geotechnical Evaluation
 - Infiltration Rates
 - Embankment Material if Applicable
- Environmental Assessment
 - Wetland Delineation for Projects > 5,000 sf (Wetland Impacts Outside Ex. Facility Will Require Permit)
 - Stream Impacts
- Field Survey



Retrofit Design



- 2000 Maryland Stormwater Design Manual (Revised 2008)
 - Water Quality Volume
 - Recharge Volume
 - Channel Protection Volume
 - Overbank Flood Protection
 - Extreme Flood Volume
- MD-378 – Pond Standards/Specifications
- Erosion and Sediment Control Design



Retrofit Construction



- Construction Stakeout
- Coordinate with Inspectors, Subcontractors, Engineers
- Maintain Erosion and Sediment Control Practices
- Provide Shop Drawings to Engineer for Review/Approval
- As-Built Survey
- Preparation of As-Built Drawings



Performance Criteria

- Based on BMP Type
- Performance Based Rating of A or B
- Action/SHA Response Rating of I (No Action Required)
- Retrofits Meet Design Manual Requirements
 - Infiltration Rates
 - Forebay Requirements
 - Maintenance Access, etc.
- Concerns Addressed
 - Contaminants Removed
 - Invasive Species Removed
- Routine Maintenance Performed

Contract Documents

- Current Inspection Results
- Number of BMPs and Type of Each
- Performance Criteria for Each BMP
- Routine Maintenance Activities for Each BMP
- Current Minor and Major Maintenance Action Items
- Existing Concerns
- Incentives/Liquidated Damages

Contract Documents

- Retrofits Identified
- Concept Plan
 - Acceptable Method for Retrofit
 - Right-of-Way Constraints
 - Likelihood of Environmental Impacts (Wetlands, Waters of the US)
- Approval Requirements

Contract Documents

- Equipment Requirements
 - Field Inspection Equipment
 - Typical Construction Equipment
- Training Requirements
 - BMP Inspection Manual

Contract Documents Severe Weather/Unforeseen Circumstances



- Severe Weather
 - 25-Year Rainfall Event
- Unforeseen Circumstances
 - Vandalism
 - Offsite Construction Activity -> Sediment
 - Offsite Contamination
- SHA to Take Risk -> Contract Amendment



Contract Documents Payment Schedule



- Annual Lump Sum
- Year 1: Routine Maintenance
Major Maintenance
Retrofit Design/Permitting
- Year 2: Routine Maintenance
Major Maintenance
Retrofit Design/Permitting
Retrofit Construction
- Year 3: Routine Maintenance
Major Maintenance
Retrofit Construction
Inspections



Best Value

- Process
 - Pre-qualification of DBOM Team based upon key staff experience, previous project experience
 - Proposal submittal will include technical and price proposals, in separately sealed packages
 - Technical proposals rated independently of price proposals

Best Value

- Qualification Evaluation Factors
 - Legal Structure and Financial Information
 - Team Organization and Qualifications
 - Team Experience and Past Performance

Best Value

- Proposal Evaluation Factors
 - Legal Information
 - Financial Information
 - Project Management
 - Project Approach & Understanding
 - Innovation
 - Price

Procurement Schedule

- Summer 2008 Request for Qualifications
- Statement of Qualifications Due: RFQ+2 Months
- Technical & Price Proposals Due: Fall 2008
- Presentations: Late 2008
- Notice to Proceed: Early 2009
- Project Completion: Notice to Proceed + 3 Years

Key Differences from Standard Design/Build



- 3-Year Duration
- Ongoing Activities at All Facilities
- Maintenance Activities Do Not Require Full Design
- Inspections Required During Year 3, Maintenance May Be Performed Earlier to Prevent Major Maintenance
- Performance Requirements Based on Original Design for Maintenance, and Design Manual for Retrofits



ACEC/MHCA Feedback/Concerns

- What method for payment will be used?
 - Payment based on lump sum for each category
 - Routine Maintenance
 - Major Maintenance
 - Retrofit Design/Permitting
 - Retrofit Construction
 - Inspections
 - Paid Based on % Complete (Number of Facilities Completed in Each Category)
- How are MBE requirements going to be handled?
 - 15% MBE based on entire contract, not by task

ACEC/MHCA Feedback/Concerns

- How is the contractor to bid on construction if presence of wetlands is unknown?
 - Contract documents will provide the likelihood of wetlands
 - All projects > 5,000 sf will require environmental assessment
 - Typical of all Design-Build projects
- How is the contractor to price the retrofits, since there are so many unknowns for existing conditions?
 - Site visit will be necessary
 - Retrofit must meet current SWM standards, likely priced as new design



10.22.2001