Date: July, 2012

To: Urban Stormwater Workgroup

From: Norm Goulet, Chairman

Re: Revised Principles and Protocols for Urban Stormwater BMP Verification.

This memo presents further revisions on the approach to verify the performance of urban BMPs in the Bay watershed, based on extensive discussion at the February and March USWG meetings, additional written comments by local and state partners, and internal discussions of three expert panels.

USWG members are requested to take two actions on this draft at the next meeting in April.

First, members are asked to indicate which verification principles they support in Part C of this memo, and which should be deferred pending further discussion by an ad-hoc Urban BMP Verification Committee (UBVC) later this Summer and Fall.

Second, members are requested to comment on the proposed process to develop more specific verification protocols outlined in Part D of this memo, and provide input on the charge and membership of the UBVC.

Part A. Why the Bay Partners Are Developing a Verification Framework

Given the ever increasing importance that accounting for implemented practices is taking on within the partnership—Bay TMDL reasonable assurance, two-year milestones, offsets, tradable credits—the Partnership must agree to a framework whereby we can have both expanded tracking and reporting of practices AND verifiable confidence in the outcome of those implemented practices.

The implementation, tracking, and reporting of pollution reductions practices and technologies has been at the center of the Partnership's Bay restoration efforts for close to three decades. Within the past two years, there have been numerous requests for and now commitments to improving the accountability of actions taken to install technologies and implement practices which prevent or reduce the loads of nutrients and sediment to Chesapeake Bay and its tidal tributaries and embayments.

- The Citizens Advisory Committee has repeatedly called on the Partnership to provide for transparent and open verification of cost shared as well as non-cost shared best management practices tracked and reported by the watershed's seven jurisdictions.

- The President's Chesapeake Bay Executive Order Strategy committed the U.S. Department of Agricultural (USDA) and the U.S. Environmental Protection Agency

(EPA) to develop and implement "mechanisms for tracking and reporting of voluntary conservation practices and other best management practices installed on agricultural lands" by July 2012.

- Within its Chesapeake Bay Independent Evaluation Report, the National Research Council's (NRC) panel put forth a series of five specific science-based conclusions all focused on their key finding that "accurate tracking of BMPs is of paramount importance because the CBP relies upon the resulting data to estimate current and future nutrient and sediment loads to the Bay."

- The 2010 Chesapeake Bay TMDL's Appendix S outlines the common elements from which EPA expects the watershed jurisdictions to develop and implement offset programs.

Part B. Background on Verification of Urban Stormwater BMPs

As part of the development review process, localities in the Chesapeake Bay typically conduct a post-construction inspection of stormwater BMPs to ensure that they are functional, maintain project engineering files and inspect them periodically to ensure they are still performing.

Phase 1 and Phase 2 communities have NPDES MS4 permit conditions which require them to have programs and staff in place to ensure that maintenance inspections are done according to a prescribed cycle. The frequency of maintenance inspections ranges from 3 to 5 years, depending on the permit status of the jurisdiction.

In addition, most MS4 communities have an annual reporting requirement, and often provide aggregate information on the number and type of BMPs that are installed during the reporting period.

Consequently, an inspection framework currently exists in much of the watershed which can be adapted to provide the foundation for a reliable BMP reporting, tracking and verification system. However, several problems need to be overcome to develop an effective system:

- Larger MS4 communities have an existing urban BMP inventory that numbers in the thousands, with hundreds more being added each year.

- Most Ms4s currently do not report all of the individual BMP information needed by the state to prepare the input deck for the Chesapeake Bay Watershed Model (CBWM), such as Chesapeake Bay Program (CBP) BMP classification, drainage area served, geographic location and year of installation.

- Very few localities have digitized their individual BMP files and integrated them within a spreadsheet and/or GIS system.

- In the absence of good geo-spatial data, the prospect for double counting of BMPs is significant, particularly when multiple BMPs of different ages are located within same drainage area. In other cases, BMPs that have failed or don't really meet the CBP BMP definition are counted when they should not be.

- Most non-MS4 localities have little experience in reporting BMP implementation data for new development to the state and no experience in reporting BMPs for existing development (e.g., retrofits). This is particularly true for communities that are not covered by a MS4 permit.

- Several urban BMPs are implemented outside the local development review process, and therefore may not be properly counted or reported (e.g., street sweeping, reforestation, urban fertilizer management, tree planting and stream restoration). Localities will need to internally coordinate with multiple agencies and/or departments to accurately report this BMP data.

- Most localities do not currently report on voluntary BMPs that are installed by homeowners or watershed groups, even if they provide them financial or other incentives to do so.

- Most Bay states are just now developing tracking systems to aggregate the BMPs reported by individual localities, and several have not been able to keep up with BMP information submitted by 70 to 400 MS4s in their jurisdiction.

- Up to now, few states have allocated sufficient staff resources to fully enforce MS4 permit maintenance conditions, verify that local BMP information is accurate, and cull out BMPs from the CBWM input deck that are no longer achieving their intended nutrient or sediment removal rate.

- Some urban BMPs are installed in non-regulated areas in the watershed (i.e., not covered by MS4 permits). Consequently some of these communities may not have all of the legally required BMP inspection and maintenance provisions found in MS4 communities. As a consequence, BMP reporting and verification may be challenging in non-MS4 communities, particularly in smaller communities with limited staff resources.

- Perhaps the greatest weakness of the current system is that current post construction and maintenance inspection efforts are not oriented toward verifying the actual pollutant removal performance of the BMP in the field. Instead, local inspections primarily focus on whether a BMP was installed per design, and that its future condition will not cause harm to public safety and/or cause nuisance problems in the community. Consequently, it will be necessary to develop improved inspection guidelines that utilize visual indicators to verify that the hydrologic performance of the BMP is adequate to still achieve the intended nutrient and sediment removal rate.

- The current explicit assumption is that nearly all structural urban BMPs are permanent in nature. This means that a twenty year old wet pond keeps on performing in perpetuity. Consequently, BMP review panels have tended to discount the removal rates for these practices to account for their age, diminished capacity and lack of maintenance.

- Lastly, the paradigm on an individual urban BMP is changing as Bay states implement new stormwater performance standards. Going forward, new development sites will be

served by a system of many different credits, disconnections and micro-practices. An expert BMP panel has been convened on how to report these new composite BMPs, but localities are struggling with how to adapt their current BMP maintenance programs to effectively inspect the condition and performance of distributed LID practices.

Part C
Recommended Principles for Urban BMP Reporting, Tracking and Verification

The following 16 principles should guide the urban BMP verification process in each of the Bay States:

1. *Verification is Different Depending on Which Types of Urban BMPs are Considered.* The urban sector has nearly 20 different urban BMPs, with more BMPs being added every year. The need for verification differs among each type of BMP, but they can be generally classified into four broad categories:

    a. Traditional engineered stormwater BMPs that were historically installed through a local stormwater plan review process
    b. New runoff reduction BMPs that will be implemented to meet new state stormwater performance standards in the future and also go thru the local stormwater review process
    c. Non-structural or operational BMPs that are typically applied by a municipal agency
    d. Stormwater retrofits and restoration practices designed and installed by localities to treat existing impervious cover.

    Note: The Urban BMP Verification Committee of the USWG will work on specific protocols for each class of urban BMPs during 2012, in coordination with the CBP Verification Expert Panel.

2. *Key Role of Maintenance in Performance*. Regular inspections and maintenance of BMPs are critical to ensure their pollutant removal performance is maintained and extended over time, as well as maintain other local design objectives (e.g., flood control, public safety, stream protection and landscape amenity). Therefore, the core verification principle is to ensure that BMPs are installed and maintained properly over their design life to qualify for their pollutant removal rates. To ensure BMPs are installed and maintained properly there should be protocols for (1) the cycle for field verification of BMPs and (2) the process for BMP downgrades

3. *Utilize Existing MS4 Framework*. The existing MS4 inspection and maintenance framework for hundreds of communities in the Bay watershed should be the foundation of any BMP reporting and verification system for the Bay TMDL. Ongoing BMP reporting and maintenance inspections requirements in MS4 permits may need to be adjusted slightly to verify BMP performance, but the modifications should be limited to reduce the administrative burden for local and state agencies.

4. *Removal Rate Tied to Visual Inspections*. The basic concept is that urban BMPs will have a defined time-frame in which the pollutant removal rate applies, which can be

renewed or extended based on a visual inspection that confirms that the BMP still exists, is adequately maintained and is operating as designed.

*Note: Appendix A provides a template f*or an inspection form to quickly assess urban BMP performance in the field using simple visual indicators. This approach was refined and tested through an extensive analysis of BMPs located in the James River Basin of the Chesapeake Bay watershed. More detail on the methods and results can be found in Hirschman et al (2009). The basic form can be modified or adapted to meet the unique BMP terminology and design criteria employed in each Bay jurisdiction. The UBVC will look into other visual indicator methods as well.

5. *BMP Verification as Adaptive Management*. The purpose of verification is to maintain or expand the pollutant removal performance of existing and future local stormwater infrastructure assets. Field assessments are used to identify which BMPs are working well and which ones require preventative or corrective maintenance to maintain their function. In addition, field verification enables local governments to analyze their historical inventory of private and public stormwater BMPs to identify which individual projects present the best opportunities for additional nutrient reduction through retrofits or restoration of existing BMPs.

   The real world data collected on actual BMP performance also enables local and state agencies to improve the next generation of BMPs in an adaptive management process. This process can isolate the specific site conditions, design features and maintenance tasks that influence BMP longevity and performance, and incorporate these into improved design specifications, review and inspection procedures and maintenance requirements. Future BMP expert panels would review such data to determine if these improved BMPs would qualify for a higher removal rate.

6. *Sub-Sampling of BMP Inventory*. The intent of the visual indicator approach is to isolate the design and maintenance problems that are impairing BMP performance in the field and take corrective actions (not only for the individual BMP being inspected, but also to improve the design and maintenance regimes of future BMPs). With this in mind, MS4 and non-MS4 communities may elect to reduce the scope of their visual inspections by sub-sampling a representative fraction of BMPs in their local BMP inventory (subject to approval by their state).

7. *BMP Reporting Must Be Consistent with CBP Standards* Each state has a unique system to report BMPs as part of their MS4 permit. In some cases, states are still developing and refining their BMP reporting systems. Consequently, it may not be possible or even desirable to implement a Bay-wide BMP reporting format. However, to get credit in the context of CBWM progress runs, states will need to report BMP implementation data using CBP-approved rates or methods, reporting units and geographic location (consistent with NEIEN standards), and periodically update data based on the local field verification of BMPs.

8. *Initial Verification of BMP Installation*. MS4s will need to verify that urban BMPs are installed properly, meets or exceeds the design standards for its CBP BMP classification,

and is functioning hydrologically as designed prior to submitting the BMP for credit in the state tracking database. This initial verification is provided either by the BMP designer or the local inspector as a condition of project acceptance, as part of the normal local stormwater BMP plan review process. From a reporting standpoint, the MS4 community should outline the BMP review and inspection procedures it has in place and indicate if adequate staff is available to implement them.

9. *MS4 BMP Recordkeeping*. MS4s should maintain a more extensive engineering project file for each urban BMP project installed (i.e., construction drawings, digital photos, inspection records, and maintenance agreement, etc). As-built surveys may also be needed for some classes of urban BMPs in some communities. The project file should be maintained for the lifetime for which the BMP removal credit will be claimed. Localities are encouraged to develop a GIS-based BMP tracking system in order to schedule routine inspections and maintenance activities over time.

10. *Recommended Cycle for Field Verification of Urban BMPs.* Local inspectors should perform field verification at least once under their MS4 permit (typically 3 to 5 years). It is recommended that these rapid investigations of visual indicators would be integrated as part of routine stormwater BMP inspections required under their MS4 NPDES permits.

11. *Suggested Process for BMP Downgrades*. If the field inspection indicates that a BMP is not performing to its original design, the localities would have a defined time frame (e.g., one year) to take corrective maintenance or rehabilitation actions to bring it back into compliance. If the facility is not fixed during the defined timeframe, the pollutant reduction rate for the BMP would be eliminated, and the locality would report this to the state in its annual MS4 report. If corrective maintenance actions were verified for the BMP at a later date, the MS4 could take credit for it then.

12. *Special Procedures for Urban BMPs Installed in Non-MS4s*. Several states such as PA and WV are expected to have considerable development occurring in non-MS4s communities, which tend to be very small in size and fairly new to stormwater BMP review. The Work Group acknowledges that these non-MS4s currently may not have all of the regulatory authority to fully meet the BMP verification principles outlined in this memo.

    Note: The UBVC will analyze alternative verification approaches that may be used by non-MS4s until they are able to develop greater verification capacity.

13. *Special Procedures for Urban BMPs Used for Offsets, Mitigation and Trading*. Some urban BMPs are built to offset, compensate or otherwise mitigate for impacts caused by development elsewhere in the watershed. Examples include stream restoration mitigation and stormwater retrofit offsets when full compliance with stormwater performance standards is not possible at a new development site.

    In other cases, urban BMPs may be built for purposes of trading nutrient credits within a community or a state. Special procedures need to be developed in both cases to prevent double counting of BMPs. In addition, states and localities may elect to require

more frequent BMP field inspection for these types of projects to assure they are meeting their intended nutrient reduction objectives.

Note: The UBVC will coordinate with the Trading and Offsets Work Group to develop special verification procedures for this category of BMPs.

14. *State Oversight of Local BMP Reporting*. To provide accountability, Bay states should audit a subset of local BMP project files, analyze local maintenance inspection records, or conduct joint field BMP inspections to verify performance thru MS4 Permit requirements. The state oversight process needs to be transparent and publicly accessible so that NGOs, watershed groups and other stakeholders can be confident that BMP implementation is real.

15. *EPA Review of State Verification Oversight*. EPA Region 3, under its existing NPDES MS4 permit oversight role, would periodically review the implementation of state BMP verification protocols to ensure they are being effectively implemented.

16. *Review and Verification of CBP BMP Accounting*: The accounting methods and verification procedures used by the Bay Program must be clear and transparent so that local governments and the states can readily understand how urban BMPs reported are being used to calculate pollutant reductions in the Bay Model. Better communication among the Bay Program and its state and local government partners will help to improve BMP reporting and ensure a fair representation of State and local program implementation.

Part D.
Process to Develop More Specific Verification Protocols for Individual BMPs

The recommended approach is for the Work Group to set up an ad-hoc Urban BMP Verification Committee (UBVC) to implement the preceding principles and develop specific protocols for each of the four classes of CBP-approved urban BMPs. The UBVC would coordinate with the CBP Verification Expert Panel and Urban BMP Expert Panels, and report back to the Work Group with its recommendations in 2012.

The UBVC will consist of local and state representatives who have responsibility for BMP reporting and inspection, as well as other stakeholders with experience in BMP implementation. The initial charge of the UBVC will be to:

- Develop verification protocols for urban BMPs that are not subject to a current or pending expert panel:
  - Class 1 BMPs
  - Class 3 BMP (street sweeping)
- Recommend alternative verification protocols for non-MS4 areas
- Examine verification issues for urban BMPs built for offsets, mitigation and trading
- Recommend efforts to stream line reporting and verification to reduce local fiscal impact, while retaining reasonable assurance that the BMPs are performing effectively

- Ensure the reporting and verification protocols are compatible with NEIEN, state tracking systems, and the CBWM.
- Consider other visual indicators [*this role was stated on page 5*]

The UBVC and the BMP Expert Panels would divide up the work of developing verification protocols for different urban BMPs for each of the four classes of BMPs.

1. The **UBVC** would have the lead role to define the verification protocols for all Class 1 EPA-approved BMPs. These include the engineered stormwater BMPs in the Table below.

Class 1 Traditional Stormwater BMPs	
This class includes traditional engineered stormwater BMPs that are typically installed through a local and/or state stormwater plan review process, and subsequently inspected by local stormwater authority, and reported in MS4 annual reports. These BMPs have a defined pollutant removal rate that has been established through an expert panel process and are CBP approved	
BMP Type	
Wet Ponds	Filtering Practices
Constructed Wetlands	Bioretention
Dry Detention Ponds	Permeable Pavement
Dry Extended Detention Ponds	Grass Channels
Infiltration	Bio-swales
Key issues in developing a verification protocol: Some BMP types in this class may have different design life, longevity or failure rate. This class also includes the oldest BMPs, so there is a higher probability that some suffer from design/maintenance problems that impair their performance. If practices are well designed/regularly maintained, they should perform well for decades.	

2. The **Performance Standard Expert Panel** will take the lead in for new runoff reduction practices installed to meet new state stormwater performance standards on new development or redevelopment project, as defined in the table below. In the event the Panel cannot reach consensus on selected verification issues, it may elect to send them to the UBVC for final resolution.

Class 2 New Runoff Reduction Practices
This class includes LID, ESD and runoff reduction BMPs that will be implemented to meet new state stormwater performance standards in the future. Multiple practices and credits are typically applied to new development and redevelopment sites. The practices are typically installed through a local and/or state stormwater plan review process, and subsequently inspected by local stormwater authority, and reported in MS4 annual reports. The maintenance needs for this class are still being developed, and localities are struggling with inspection effort. An Expert Panel is currently working on a detailed verification protocol, for this class of practices, and should be done in April
BMP Type
Treated Acres to the New State Specific Stormwater Performance Standard

Comment [MEG1]: WV has only one MS4 with a stormwater performance standard right now, but it appears that Class 1 BMPs are being used to meet the standard. Would we get credit for these treated acres under Class 1 or Class 2?

Treated Acres to the New State-Specific Redevelopment Performance Standard
Key issues in developing a verification protocol: Non-complying projects, Non-Ms4 areas, development of visual indicators.

The **UBVC** will take the lead on resolving outstanding reporting and verification issues associated with the street sweeping practice, whereas **future Expert Panels** will have the lead on the other non-structural or operational BMPs that are typically applied by a municipal agency, as shown below.

Class 3 Non-Structural or Operational BMPs	
This class includes less structural or operational urban BMPs that are typically "installed" by a municipal agency whose effort wax and wane from year to year due to local budget considerations. Many communities are struggling with how to report them, and not often included in MS4 reports	
BMP Type	*Panel ?*
Urban Fertilizer Management	Yes
Street Sweeping	Yes, but did not address verification
Tree Planting	Yes
Illicit Discharge Elimination	Yes
Key issues in developing a verification protocol: A lot	

Current Expert Panels will take the lead in devising verification protocols for stormwater retrofits, stream restoration and other urban watershed restoration practices, as shown below:

Class 4 BMPs to Treat Existing Development	
This class of practices are applied often applied to treat existing development and are typically designed and built through by a municipal agency	
BMP Type	*Panel ?*
Stormwater Retrofit	Yes
Stream Restoration	Yes
Reforestation	No*
* may be developed in 2012 or 2013 by Forestry Work Group	

Appendix A
Example of Visual Indicators Used to Verify BMP Performance
Adapted from Hirschman et al (2009)

The Center for Watershed Protection has updated a form to quickly assess urban BMP performance using simple visual indicators. This approach was refined and tested through an extensive analysis of hundreds of BMPs located in the James River Basin of the Chesapeake Bay watershed. More detail on the methods and results can be found in Hirschman et al (2009).

It is recommended that these rapid investigations be conducted during every other routine stormwater BMP inspection conducted by a locality in order to verify BMP performance. In many cases, the locality may choose to sub-sample their existing inventory of stormwater practices to gain better information.

The basic form can be modified or adapted to meet the unique BMP terminology and design criteria in each Bay state.

FACILITY ID:	**DATE:** ___/_____/___	**ASSESSED BY:**

NAME: _____
ADDRESS: _____
PHOTO IDS: _____

HANDHELD/ GPS ID:

SECTION 1- BACKGROUND INFORMATION (GIS)

BMP TYPE :

- ☐ Dry Detention Pond
- ☐ Extended Detention Pond
- ☐ Wet Pond
- ☐ Filter (specify: _____)
- ☐ Infiltration (specify:_____)
- ☐ Check if structure is underground
- ☐ Dry Swale
- ☐ Wet Swale
- ☐ Grass Channel
- ☐ Dry Well
- ☐ Permeable Pavement
- ☐ Bioretention
- ☐ Wetland
- ☐ Level Spreader
- ☐ WQ Inlet
- ☐ Proprietary Device
- ☐ Other _____

YEAR CONSTRUCTED: _____

OWNERSHIP
☐ Public ☐ Private ☐ Unknown

SITE CHARACTERIZATION

DRAINAGE AREA: _____(acres) **IMPERVIOUS COVER:** _____(acres) Discerned from: ☐ Plan ☐ County Data ☐ GIS ☐ Field

CONTRIBUTING DRAINAGE AREA (% land use**):** *Note – All percentages should sum up to 100%.*

_____Industrial _____Commercial _____Urban/Residential _____Suburban/Res
_____Forested _____Institutional _____Golf course _____Park
_____Crop _____Pasture _____Other: _____

WATER QUALITY VOL (FROM DESIGN PLAN): _____(ft^3)

SECTION 2- FIELD VISIT

Rain in last 48 hrs? ☐ Yes ☐ No

Evidence of high water table (e.g., excessive soil saturation)*?* ☐ Yes ☐ No

DESIGN ELEMENTS

FACILITY SIZE:
Length: _____(ft)
Width: _____(ft)
Surface Area: _____(ft^2)
Depth of WQ storage _____(ft)

OBSERVED WQ STORAGE VOL:
_____(ft^3)

HYDRAULIC CONFIGURATION
☐ On-line Facility
☐ Off-line Facility

DESIGN STORM(S):
☐ Water Quality
☐ Flood Control
☐ Channel Protection
☐ Unknown

BMP SIGNAGE: (check all that apply)
☐ None ☐ Flood Warning ☐ Stormwater Education ☐ No Trespassing ☐ Wildlife Habitat
☐ Public Property ☐ Do Not Mow ☐ Other: _____

OUTLET CHARACTERISTICS

PRIMARY OUTLET STRUCTURE: ☐ N/A – infiltration w/ no outlet ☐ Pipe ☐ Riser ☐ Weir ☐ Large Storm Overflow ☐ Open channel ☐ Large Storm By-pass ☐ Other: _____

OUTLET FEATURES: ☐ N/A ☐ Trash Rack ☐ Pond Drain ☐ Inverted outlet pipe ☐ Hooded outlet ☐ Anti-vortex device ☐ Perforated pipe ☐ Gravel Diaphragm ☐ Micropool outlet ☐ Multiple outlet levels
Outlet includes restrictor? ☐ Yes ☐ No

OUTLET STRUCTURE CONDITIONS:
Erosion at Outlet: ☐None ☐Slight ☐Moderate ☐Severe
Outlet Clogging: ☐None ☐Slight ☐Moderate ☐Severe
Structural Problems: ☐None ☐Slight ☐Moderate ☐Severe

CONDITIONS AT OUTFALL: ☐ Stream ☐ Closed storm sewer ☐ Surface channel ☐ Road ditch ☐ Other: _____ ☐Unknown

Active Erosion: ☐None ☐Slight ☐Moderate ☐Severe
Trash: ☐None ☐Slight ☐Moderate ☐Severe
Sedimentation: ☐None ☐Slight ☐Moderate ☐Severe
Odor: ☐None ☐Slight ☐Moderate ☐Severe
Algae: ☐None ☐Slight ☐Moderate ☐Severe
Other WQ Problems: ☐None ☐Slight ☐Moderate ☐Severe

Emergency Spillway Type: ☐ Channel ☐ Riser Overflow ☐ Weir ☐ Other: _____

SOIL OR FILTER MEDIA

TYPE OF FILTER/INFILTRATION MEDIA: (check all that apply)
☐ Soil mix _____(in) ☐ Sand _____(in) ☐ Gravel _____(in) ☐ Large Stone _____(in)
☐ Organic material _____(in) ☐ Other_____ ☐ N/A ☐ Unknown
Avg. depth of sediment build-up on surface?_____(in)

SOIL MEDIA SAMPLE: *Note – Complete during site investigation, if applicable*
Dominant Soil Type ☐ Clay ☐ Loam ☐ Sand ☐ Sand/Loam
Is the soil homogenous? ☐ Yes ☐ No

Comments:

VEGETATION

GENERAL OBSERVATIONS:
☐ Landscaped
☐ Aquatic Bench
☐ Invasive Species
☐ Plant Diversity

TYPE OF GROUND COVER (% of Surface Area in Plan View up to low Outlet**):**
Note – All percentages should sum up to 100 %.
_____Trees _____Grasses/Perennials _____ Ponded water _____ Other: _____
_____ Managed Turf _____ Bare Soil _____Shrubs _____ N/A
_____ Gravel/stone _____ Mulch _____ Emergent wetland

Depth of mulch, if present: ☐ Hardwood _____(in) ☐ Pine Straw _____ (in) ☐ Other_____ (in)
Rate degree of shading of BMP Surface Area by trees: ☐ Well Shaded ☐ Some Shading ☐ No Shading ☐ N/A

INLET CHARACTERISTICS

INLET #1:
Diameter/Width:
_____(in)

TYPE OF INLET: ☐ Open Channel ☐ Closed Pipe
☐ Sheet Flow ☐ Curb Cut ☐ Other: _____

Elevation difference between bottom of inlet and BMP surface:
_____ (in)

INLET SUBMERSION:
☐ Complete
☐ Partial
☐ None

INLET CONDITIONS:
Inlet Erosion ☐None ☐Slight ☐Moderate ☐Severe
Inlet Clogging ☐None ☐Slight ☐Moderate ☐Severe
Structural Problems ☐None ☐Slight ☐Moderate ☐Severe

Comments:

INLET #2:
Diameter/Width:
_____(in)

TYPE OF INLET: ☐ Open Channel ☐ Closed Pipe
☐ Sheet Flow ☐ Curb Cut ☐ Other: _____

Elevation difference between bottom of inlet and BMP surface:
_____ (in)

INLET SUBMERSION:
☐ Complete
☐ Partial
☐ None

INLET CONDITIONS:
Inlet Erosion ☐None ☐Slight ☐Moderate ☐Severe
Inlet Clogging ☐None ☐Slight ☐Moderate ☐Severe
Structural Problems ☐None ☐Slight ☐Moderate ☐Severe

Comments:

PRETREATMENT

TYPE OF PRETREATMENT *(check all that apply)*
☐ None
☐ Sediment Forebay (_____ ft^3)
☐ Grass Channel
☐ Riprap Channel or Apron
☐ Grass Filter Strip
☐ Plunge Pool?
☐ Stone Diaphragm
☐ Other: _____

PRETREATMENT FUNCTION ☐ By design ☐ Incidental
Is pretreatment functioning? ☐ Yes ☐ No
Is sediment removal necessary? ☐ Yes ☐ No
Signs of pretreatment bypass? ☐ Yes ☐ No
Signs of flow of sediment from pretreatment to BMP? ☐ Yes ☐ No
Severity: ☐ Slight ☐Moderate ☐Severe

GENERAL DESIGN

BMP FEATURES (check all that apply)
☐ Maintenance Access
☐ Fence
☐ Multi-cell
☐ Micropool
☐ Impermeable Liner
☐ Underdrain
☐ Clean Out
☐ Observation Well
Is water present in observation well?
☐ Yes ☐ No Depth: _____ ft
☐ Pond Drain
☐ Other:_____

CONVEYANCE THROUGH BMP
☐ No Defined Channel
☐ Low Flow Channel
☐ Concrete ☐ Eroded ☐ Earthen ☐ Other _____
Length of Shortest Flow Path: _____(ft)

Is BMP designed with a Permanent Pool? ☐ Yes ☐ No

PERFORMANCE

GENERAL PROBLEMS: (check all that apply)

☐ Maintenance Needed	☐ Erosion at Embankments	☐ Permanent Pools not stable
☐ Water Bypass of Inlet	☐ Erosion within Facility	☐ Inadequate vegetation
☐ Water Bypass of Outlet	☐ Deposition within Facility	☐ Dead or Diseased Vegetation
☐ Incorrect Flow Paths	☐ Inappropriate Ponding of Water	☐ Too many invasive plants
☐ Short-circuiting of treatment mechanism	☐ Clogged Pond Drain/Underdrain	☐ Trees on Embankment
☐ No or ineffective treatment	☐ Clogged Media	☐ Failing structural components
☐ Ineffective pretreatment	☐ Inappropriate media material	☐ Safety issue (Note:_____)
☐ Others _____ __	☐ Inappropriate underlying soil (infiltration)	

WATER QUALITY IN FACILITY: ☐N/A

Algae	☐None	☐Slight	☐Moderate	☐Severe
Odor	☐None	☐Slight	☐Moderate	☐Severe
Turbidity	☐None	☐Slight	☐Moderate	☐Severe
Color	☐Normal	☐Abnormal: _____		

EVIDENCE OF:

- ☐ Geese
- ☐ Animal Burrows
- ☐ Mosquitoes
- ☐ BMP Alteration

PROBLEM		1=NONE	2 - FEW	3 – SEVERAL	4-SEVERE
TRASH		No evidence of trash	A few pieces of trash throughout BMP	Trash accumulation near inlet/outlet	Lots of trash in BMP or BMP used for storage
BMP BANK EROSION		No noticeable erosion	Slight erosion < 5% of bank affected	Moderate erosion ~15% of bank affected	Banks severely eroded, >25% of bank affected
SEDIMENT DEPOSITION		No sediment deposition	Areas of minor sediment deposition	Areas of some deposition, may be severe near inlet/outlets	Lots of deposition resulting in pond bottom clogging
SURFACE SLOPE		0-1% BMP surface slope	1-3% BMP surface slope or steeper slopes with check dams,	3-5% BMP surface slope with no check dams,	>5% surface slope;
SIDE SLOPES		BMP side slopes 3:1 or flatter	BMP side slopes 2:1	Steep BMP side slopes	Risk of side slope failure
STRUCTURAL		No evidence of structural damage	Minor problems (e.g., bank slump, eroded channels)	Moderate structural problems –failure pending	Structural failures (e.g., bank failure, blowout)
VISIBILITY		High visibility, near high-traffic areas	Some visibility, near traffic areas	Limited visibility, near low traffic areas	No visibility, behind buildings or fences
ACCESSIBILITY		Maintained access area for vehicles	Access area designated, but not maintained	Access for vehicles not designated	Access for vehicles not possible
VEG COVER		No mowing in/around BMP	Mowing along BMP edges but areas of no mow in BMP bottom	Mowed turf vegetation	BMP bottom has large areas of bare soil
		Dense plant cover (>75%)	Plant cover, 50-75%	Some plant cover, 25-50%	Sparse vegetative cover (<25%),
VEG HEALTH	TREES	Healthy and established	Slightly stressed	Stressed	Dead
	GROUND COVER	Healthy and established	Slightly stressed	Stressed	Dead
	SHRUBS	Healthy and established	Slightly stressed	Stressed	Dead
	EMERGENT WETLAND	Healthy and established	Slightly stressed	Stressed	Dead

OVERALL PERFORMANCE SCORE (circle one number)

Excellent design and function, no general problems with performance			BMP is well designed, but is undersized or has a few performance problems		BMP is adequately designed, several problems with performance are noted			Poor BMP design, severe performance problems or failure	
10	9	8	7	6	5	4	3	2	1

FIELD NOTES

GOOD OR INTERESTING DESIGN FEATURES:
PHOTO #'S:

POOR OR PROBLEMATIC DESIGN FEATURES:
PHOTO #'S:

SECTION 3 – DESIGN PLAN VERIFICATION

PLAN AVAILABLE: ☐ As-built ☐ Other: _____

Do field observations match design plans/as-builts? Describe any differences.

Soil type in facility	☐ N/A	☐ Yes	☐ No	If no, describe:
Pretreatment type and size	☐ N/A	☐ Yes	☐ No	If no, describe:
Signage	☐ N/A	☐ Yes	☐ No	If no, describe:
Low-flow channel	☐ N/A	☐ Yes	☐ No	If no, describe:
Dimensions/volume	☐ N/A	☐ Yes	☐ No	If no, describe:
Inlet type, #, and sizing	☐ N/A	☐ Yes	☐ No	If no, describe:
Outlet type, #, and sizing	☐ N/A	☐ Yes	☐ No	If no, describe:
Vegetation composition	☐ N/A	☐ Yes	☐ No	If no, describe:
Other features	☐ N/A	☐ Yes	☐ No	If no, describe: