

**NPDES MS4 Phase II Permit Guidance:
Developing and Verifying the Impervious Area
Baseline and Restoration Target**

August 2019



Contents

Contents	2
Introduction.....	3
Estimating and Verifying the Impervious Area Baseline and Restoration Target.....	7
Part 1: Year 1: Estimating the Impervious Area Baseline and Restoration Target.....	8
Part 2: Years 2 through 5: Verifying and Refining Impervious Area Baseline and Restoration Target	10
A. Using BMP Data to Verify Water Quality Treatment	12
B. Gathering BMP Data Through Field Investigation.....	12
C. Additional Options to Reduce Impervious Area Baseline	13
D. Options to Account for Past Restoration Credits.....	13
Frequently Asked Questions	14
Reporting.....	14
BMP Data Development and As-Built Plans	14
Restoration Credit	15
Minimum Control Measures	16
Appendix A: Allowable Water Quality Stormwater BMPs.....	18

List of Tables

Table 1. Example Work Plan	3
Table 2. Example Restoration Activity Schedule	4
Table 3. Description of Deliverables for MS4 Progress Report.....	5
Table 4. MES Impervious Area Treatment	8
Table 5. Accounting for Redevelopment	13

List of Figures

Figure 1. Process for Refining the Impervious Area Baseline and Restoration Target	11
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Introduction

The purpose of this document is to provide guidance to Maryland’s National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Phase II permittees on developing the requisite data and verifying impervious area restoration targets during the five year permit term. Most permittees have developed initial estimates for their restoration target. This guidance will assist permittees in further developing their work plan, restoration schedule, and stormwater best management practice (BMP) database to verify the restoration targets identified in the first year of the permit term. Permittees will show progress toward data development and verification during the 5-year permit term.

There are four items which must be included in the MS4 Progress Report as part of the annual submission to address the impervious area restoration requirements:

1. Impervious Area Restoration Reporting Form (located in Appendix D, Section 1 of the permit, and also available as a fillable form on MDE’s website)
2. Work Plan (the example provided in the permit is copied below in Table 1)
3. Restoration Activity Schedule (the example provided in the permit is copied below in Table 2)
4. Urban Stormwater Best Management Practice (BMP) Database (digital copy to be submitted in Microsoft Excel format)

Table 1. Example Work Plan

Year 1	<ul style="list-style-type: none"> • Develop impervious area baseline assessment. • Develop restoration work plan for MDE review and approval. • Assess opportunities and timelines for implementing water quality BMPs. • Assess opportunities to develop partnerships with other NPDES permittees. • Determine funding needs and develop a long term budget.
Year 2	<ul style="list-style-type: none"> • Update and submit Urban BMP database. • Maintain inspection records for all BMPs. • Perform watershed assessments and identify water quality problems and opportunities for restoration. • Develop list of specific projects to be implemented for restoration and identify on the Restoration Activity Schedule (Table 2). • Incorporate future growth agency-wide/jurisdiction-wide master plans into restoration planning efforts. • Evaluate and refine budget needs for project implementation.
Year 3	<ul style="list-style-type: none"> • Update and submit Urban BMP database and documented maintenance and inspection status for all BMPs. • Develop adaptive management strategies for BMP implementation that identify opportunities for improved processes and procedures. • Continue to identify opportunities for water quality improvement projects and collaborative partnerships to meet restoration requirements.
Year 4	<ul style="list-style-type: none"> • Update and submit project implementation status in Table 2. • Update and submit Urban BMP database and documented maintenance and inspection status for all BMPs. • Submit narrative describing progress and updated adaptive management strategies toward implementing restoration projects.
Year 5	<ul style="list-style-type: none"> • Update and submit project implementation status in Table 2. • Provide complete list of specific projects needed to meet the twenty percent restoration requirement in Table 2 and include the projected implementation year (no later than 2025).

Table 2. Example Restoration Activity Schedule

Type of Restoration Project	BMP ¹ Code	Cost (\$K) ²	Imperv Acres Treated	Imperv Acre Target and Balance	Project Status ³	Year Complete or Projected Implementation Year (by 2025)	MD Grid Coordinates	
							Northing	Easting
				100				
Dry pond retrofit to wet	PWET	1,500	36	64	UC			
Bioretention	FBIO	260	6	58	P			
Bioswale	MSWB	100	2	56	P			
Dry pond retrofit to wet	PWET	800	10	46	P			
BMP retrofit	PWET	500	8	38	P			
Redevelopment	REDE	300	5	33	P			
Rain Gardens (4)	MRNG	20	2	31	P			
Disconn rooftop r/o	NDRR	200	10	21	P			
Stream restoration (1,000 linear feet)	STRE	500	10	11	P			
Outfall Stabilization	OUT	200	2	9	P			
Shallow marsh	WSHW	150	4	5	P			
Reforestation on Imperv	IMPF	100	3	2	P			
Green Roof, extensive	AGRE	100	0.5	1.5	P			
Perm pavement on existing pavement	APRP	150	2	-0.5	P			

¹ See Appendix B, Tables B.1.a, b, and c, Urban BMP database. BMP codes are identified under “MDE BMP Classification”

² Provide cost at project completion

³ Project Status: Enter P for planning and design, UC for under construction, and C for complete

Table 3. Description of Deliverables for MS4 Progress Report

Table 3 below provides an overview of the information needed to develop the requisite information when reporting progress toward the impervious area (IA) restoration goal during the permit term.

Deliverable	Key Information	Year 1 Annual Report	Years 2 through 4 Annual Reports (adaptive management process)	Deliverable in Year 5
IA Baseline Assessment	<ul style="list-style-type: none"> • Use available information such as aerial photos, BMP data, stormwater reports, and plans to determine an estimate of untreated impervious area; • Determine missing data needed and verify initial estimates during the 5 year permit term. 	<ul style="list-style-type: none"> • Provide an estimate of untreated impervious area with written narrative on methods used; • Use available BMP and land use information with the goal of reducing the baseline in the future with updated information; • Does not require completed BMP data or as-built plans; • Be able to justify estimates with known information; • Be cautious about over-estimating the level of treatment provided, so targets do not substantially increase in year 5. 	<ul style="list-style-type: none"> • Provide annual updates to the baseline assessment as new information is available. 	<ul style="list-style-type: none"> • Final impervious area baseline; • All data should be compiled to verify baseline information.
Work Plan	<ul style="list-style-type: none"> • Identify information needs and BMP data to verify baseline assessment and reduce restoration target; • Outline a process that includes a long-term strategy of program development, funding, project identification, and 	<ul style="list-style-type: none"> • Describe missing data needed to verify baseline – this may include: <ul style="list-style-type: none"> ○ maintenance records ○ as-built plans ○ ownership or maintenance agreements ○ rural and urban area disconnections • Outline strategies for program implementation to identify potential restoration projects. This may consider potential funding sources, budget planning, watershed 	<ul style="list-style-type: none"> • Provide annual updates on Work Plan strategies and activities completed; • Plans may be adjusted and refined over the permit term; • Describe adaptive management necessary to facilitate future activities identified in Work Plans. 	<ul style="list-style-type: none"> • The Work Plan should describe the adaptive management process utilized during the permit term to show how restoration goals can be met.

Deliverable	Key Information	Year 1 Annual Report	Years 2 through 4 Annual Reports (adaptive management process)	Deliverable in Year 5
Work Plan (cont.)	<p>construction scheduling;</p> <ul style="list-style-type: none"> • Consider future development and redevelopment and opportunities for stormwater projects. 	<p>assessments, partnerships, trading opportunities, and incorporating future growth into long term restoration objectives.</p>		
Restoration Activity Schedule	<ul style="list-style-type: none"> • Identify restoration achieved from projects completed dating back to 2006; • List any projects that are planned for future implementation if available. 	<ul style="list-style-type: none"> • Estimate restoration projects and impervious acres restored dating back to 2006; • Subtract each proposed BMP's credit from the restoration goal identified during the baseline assessment. 	<ul style="list-style-type: none"> • Use construction plans to verify past credits; • Evaluate redevelopment projects post-2006 and in the future for potential restoration credit; • Provide a list of projects for future implementation; • Provide a schedule with projected implementation dates; • Use 2025 as long-term target; • Consider evaluating trading opportunities to meet targets. 	<ul style="list-style-type: none"> • Provide a list of projects with estimated implementation dates by 2025; • Estimate acres that may need to be acquired through trading in order to meet 2025 goal based on budget projections.
BMP Database	<ul style="list-style-type: none"> • Impervious area baselines can be estimated with the following information: <ul style="list-style-type: none"> ○ BMP type; ○ Year built; ○ Impervious area treated; ○ Inspection data ○ Inspection status (pass/fail) 	<ul style="list-style-type: none"> • Review available BMP plans and stormwater management reports to develop BMP database. • The first submission can estimate the level of treatment based on era of BMP design; • Work Plans should establish a strategy for updating the database during the permit term. 	<ul style="list-style-type: none"> • Update the database as information is verified through as-built plans and BMP inspections; • Use updated data to verify baseline assessment; As the database is updated, restoration targets can be updated; • Use database records to identify potential retrofit projects to meet restoration targets. These projects are to be submitted with the Restoration Activity Schedule. 	<ul style="list-style-type: none"> • The BMP database should be maintained and updated annually and as new information is received.

Estimating and Verifying the Impervious Area Baseline and Restoration Target

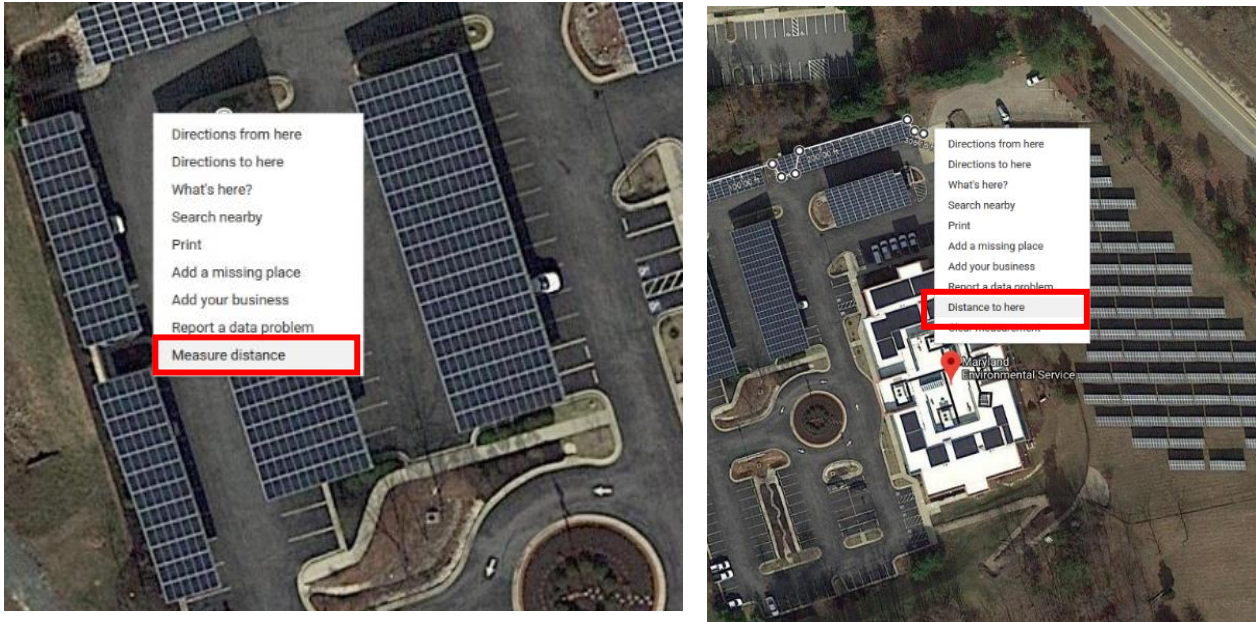
The NPDES MS4 Phase II general permit issued by MDE requires an impervious area baseline assessment to be developed during the first year of the permit term. Part 1 of this section will provide a simple example creating the baseline. The initial steps of the assessment involve estimating impervious areas onsite and determining areas that are already treated by stormwater BMPs. The example below will use available data for the Maryland Environmental Service's (MES) building in Millersville, Maryland to calculate the impervious area baseline for a specific property. Municipal governments and other agencies covered under the MS4 general permit may use this information as a general guide for application to their jurisdiction or site.

Part 2 of this section will describe the steps to refine the baseline in years 2 through 5 and how to verify assumptions using updated information in future years. As an example, some information such as the level of water quality treated, verification of drainage areas, or inspection and maintenance data may not be available or complete in the first year. This information can be updated during the permit term in order to recalculate the baseline impervious area estimate.

Part 1: Year 1: Estimating the Impervious Area Baseline and Restoration Target

1. Determine the Total Impervious Area Onsite (example below uses Google Maps Imagery)

Process: Right click on the map and choose the “Measure distance” tool. The area can be measured by right clicking and choosing “Distance to here” until all impervious area is captured (sidewalks, driveways, buildings, etc.). **MES’s campus has 2.51 acres of impervious surface.**



2. Develop a Record of All BMPs Onsite

Process: Include the BMP type, built date, drainage area, impervious area, estimated P_E addressed (i.e. rainfall treated), and impervious area treated. Some information can be developed in the future and used to adjust the baseline throughout the permit term. **MES’s site has 7 BMPs as outlined in the table below.**

Table 4. MES Impervious Area Treatment

MES BMPS							WQ Treat
	BMP_NAME	BMP DRAIN AREA	ADDRESS	Built Date	IMP ACRES	PE ADR	IA Treat
1	Bioretention A	0.18	259 Najoles Rd, Millersville MD 21108	5/8/2003	0.07	1.00	0.07
2	Dry Pond B	5.60	260 Najoles Rd, Millersville MD 21108	7/4/2001	0.31	0.00	0.00
3	Bioretention C	0.24	261 Najoles Rd, Millersville MD 21108	11/20/1990	0.20	0.50	0.10
4	Bioretention D	0.22	262 Najoles Rd, Millersville MD 21108	7/5/2010	0.07	1.00	0.07
5	Bioretention E	0.59	263 Najoles Rd, Millersville MD 21108	1/14/2002	0.57	1.00	0.57
6	Bioretention F	0.67	264 Najoles Rd, Millersville MD 21108	5/8/2008	0.26	1.00	0.26
7	Bioretention G	0.29	265 Najoles Rd, Millersville MD 21108	4/9/2001	0.27	0.50	0.14
TOTAL IMPERVIOUS ACRES							1.21

3. Calculate the Total Impervious Area Treated by all Water Quality BMPs Onsite

Process: Use the design plans and/or aerial imagery to determine drainage area and impervious area for each BMP. Refer to Appendix A for a list of BMPs that provide acceptable water quality treatment. The P_E can be estimated based on BMP era. However, this information will later need to be verified if information is missing on the plans, or if the BMP was built between 1985 and 2002. In addition, facilities such as dry ponds do not receive any credit, regardless of year built.

Multiply the impervious acres within each drainage area by the P_E value to get the impervious area treated by each BMP. Add these together to get the total impervious area treated. **In this case, the total acres treated at MES is 1.21 acres as noted in Table 4.**

4. Determine the Restoration Requirement

Process: Determine the amount of untreated impervious area onsite by subtracting the total treated area from the total impervious area onsite, then multiply the total untreated impervious acres by 20%.

$$(2.51 \text{ acres} - 1.21 \text{ acres} = 1.3 \text{ acres}).$$

MES's restoration requirement is: $(1.3) * 0.2 = 0.26 \text{ acres}.$

Publicly Available Resources with Aerial Imagery and Land Use Data:

1. imap.maryland.gov/Pages/data.aspx
2. chesapeakeconservancy.org/conservation-innovation-center/high-resolution-data/land-cover-data-project/
3. *Google Maps or Google Earth*

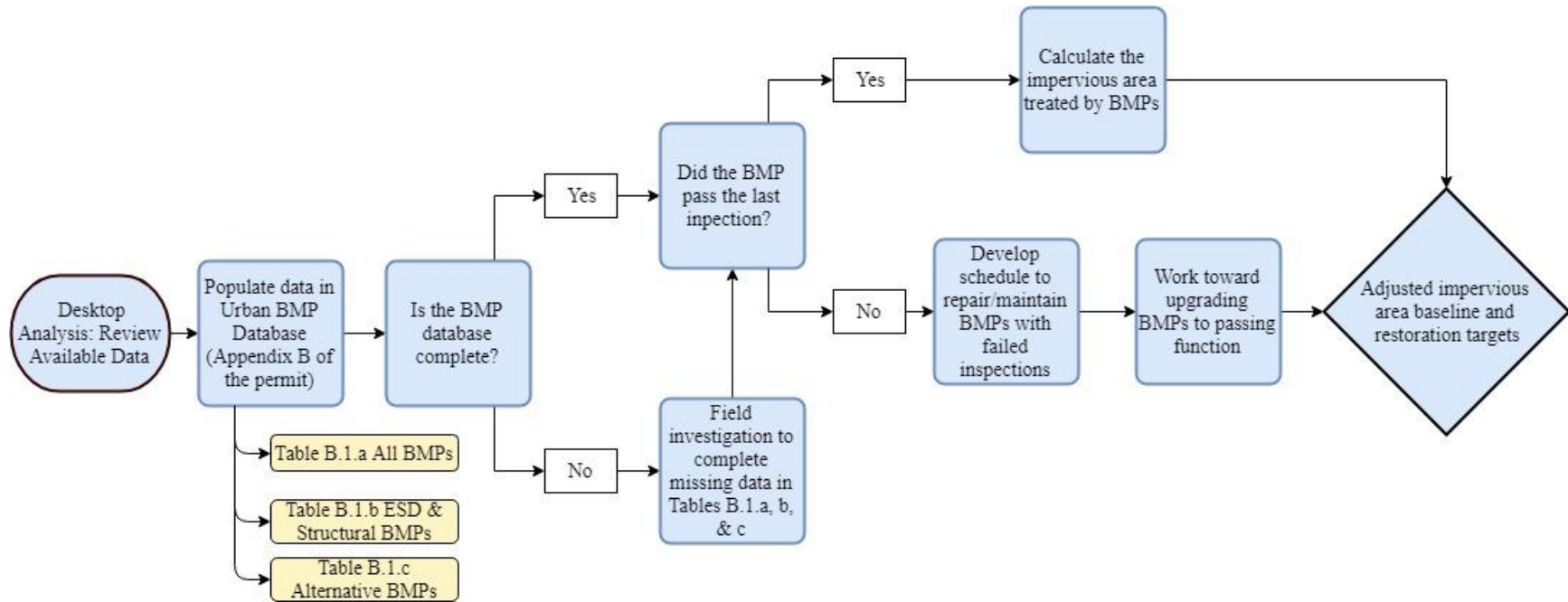
Part 2: Years 2 through 5: Verifying and Refining Impervious Area Baseline and Restoration Target

It is expected that the baseline will be refined throughout the permit term as new information is gathered and treatment amounts are verified. The permittee's Work Plan should outline a schedule detailing how information needs will be addressed during the permit term. A realistic schedule in the Work Plan may look something like this:

- Year 1 – determine data needs and develop a schedule for obtaining missing BMP information (e.g., 12 BMPs need as-built verification data)
- Year 2 – initiate activities identified in the schedule for getting the as-built information and reviewing available plans (e.g., 30% of BMPs will be surveyed in each year for years 2, 3, and 4, so that as-built surveys are completed by year 5)

Figure 1 provides a general graphic of the process to refine and verify assumptions in the impervious area baseline and restoration targets. The discussion below will provide greater detail on how to develop the missing the information and what resources to use.

Figure 1. Process for Refining the Impervious Area Baseline and Restoration Target



A. Using BMP Data to Verify Water Quality Treatment

Process: Perform a desktop analysis by gathering BMP data from plans and available resources to verify water quality treatment:

- a. Review available BMP inventory and data. Determine fields with missing data, such as location, drainage area, impervious area, BMP type, P_E, approval date, built date, inspection dates, or maintenance dates.
- b. Review all available plan sets and files to compile BMP data required in permit.
- c. Rely on as-built plans to determine constructed storage volumes and verify water quality treatment amount. When as-built plans are not available, perform in depth field inspections as described in letter 'B' below.
- d. Review BMP data and determine:
 - i. Number of BMPs with missing inspection information
 - ii. Number of BMPs with failed inspections
 - iii. Develop a plan to catch up on inspections and bring failed BMPs into compliance
- e. Develop a strategy to recover missing BMP data needed to verify water quality assumptions in the baseline.
- f. As inspection and maintenance work is completed, impervious acres treated may be removed from the baseline and restoration targets adjusted accordingly.

Resources:

- Hard copy files of approved plans and stormwater reports
- Scanned plans
- AutoCAD files provided by the designer or approving authority can help verify measurements of BMPs and structures
- Aerial imagery can verify impervious area and locate stormwater infrastructure. Google Earth provides time lapse imagery to verify BMP built dates
- Some counties maintain geographic information system (GIS) spatial data such as topography, impervious area, and storm drain networks. Free GIS software is available through QGIS
- County or State agencies may have additional documentation

B. Gathering BMP Data Through Field Investigation

Process: After reviewing all available documentation, begin field investigation to recover information not available through desktop analysis:

- a. Perform field investigations and surveys to develop as-built plans or verify BMP design. MDE's guidance memo "Stormwater Best Management Practices (BMPs) and Completion Dates for MS4 Permitting Purposes" (May 2, 2018) provides information on how to verify storage volumes in the field and is available at:

mde.maryland.gov/programs/water/StormwaterManagementProgram/Documents/NPDES%20PI%20Resource%20Files/MDE%20Memo%20on%20BMPs%20and%20Completion%20Dates%20for%20MS4%20Permit%20Requirements%204_9_2018.pdf

- b. Catch up on BMP inspections and develop a long-term plan for bringing failed BMPs into compliance through maintenance.

C. Additional Options to Reduce Impervious Area Baseline

- a. *Impervious Surfaces in Rural Areas*
The impervious area baseline may be reduced by evaluating potential impervious area disconnections, as described in Appendix B of the permit. As an example, rural roads or rural properties may have measures in place which already function as a BMP. When documentation is provided to verify the water quality treatment these areas can be shown as treated and subtracted from the baseline assessment. Refer to page B-11 of the permit for the full description of this process.
- b. Land areas owned or operated by other jurisdictions or portions of industrial properties that have their own NPDES permit can be deducted.

D. Options to Account for Past Restoration Credits

- a. *Account for Restoration Dating Back to 2006*
Any restoration projects that provides acceptable water quality treatment and implemented after 2006 may be used as credit toward the restoration requirement. These practices most commonly include tree planting, stream restoration, or outfall stabilization.
- b. *Account for Redevelopment Dating Back to 2006*
Impervious acres that have been treated in accordance with redevelopment regulations after 2006 can be used as credit toward the restoration requirement. If the BMP was built before 2006, the treated area should be counted toward the baseline. The impervious acre credit granted depends on the regulatory requirements at the time the project was approved. State regulations required treatment for twenty percent of existing impervious area prior to 2010. However, this requirement changed to fifty percent of existing impervious area to be treated in 2010. Table 5 below shows how the redeveloped impervious acres may be credited toward restoration. For projects that are a combination of redevelopment and new development, the treated area for the redeveloped portion of the project may only be used toward the restoration credit. Treatment for the new development portion of the project should be included in the baseline.

Table 5. Accounting for Redevelopment

Existing Impervious Area within LOD	State Regulations: 2000 (20% I) or 2010 (50% I)	Treatment Requirements (acres)	Impervious Acre Credit (full WQv provided)
5	2000	1	1
10	2000	2	2
5	2010	2.5	2.5
10	2010	5	5

- c. Use updated data to refine restoration targets and report to MDE through progress reports annually.

Frequently Asked Questions

Reporting

1. Is there an electronic version of the reporting form?

Yes, MDE has distributed this information to all permittees. These are also available here under the Additional Resources tab:

mde.maryland.gov/programs/Water/StormwaterManagementProgram/Pages/NPDES_MS_4_New.aspx

2. What cost information should be reported in progress reports?

Reporting should include an estimate of the cost of developing and implementing the required program activities on an annual basis using available information. The information may be updated annually.

BMP Data Development and As-Built Plans

1. If a water quality BMP does not have recent inspection records, can these BMPs receive credit in the first year baseline assessment?

This is allowed for the first year estimate. The permittee's Work Plan should discuss how this information will be updated before the end of the permit term to verify the credit for treated areas. If these BMPs are not brought into compliance by the end of the permit term, the restoration target will increase. Therefore, MDE recommends that these implications be considered when submitting the first year baseline estimate.

2. If a failed BMP is brought back into compliance through repair or maintenance, can restoration credit be earned for those efforts?

No, failed BMPs that are returned to proper functioning as originally designed will count toward treated impervious area in the baseline.

3. If a stormwater BMP does not have as-built records, can it be counted towards the baseline?

This is allowed for the first year estimate. However, additional information will be needed in the future years to verify the actual performance and as built condition of the BMP.

4. What if design or as-built plans do not include the drainage area for a BMP?

If the drainage area is not provided for the BMP, then it may be estimated through either a desktop analysis or field verification. Permittees could review current site topography (contours) available on the county's online GIS catalog. A field evaluation of the area's topography and stormwater conveyances draining to the BMP could also be used to estimate the drainage area.

5. What if I don't know when my BMP was built?

Aerial imagery or Google Earth's time lapse feature can be used to approximate when a BMP was built.

6. How do I verify what my P_E value is?

The P_E value may be listed on the stormwater plan set or in the stormwater computations report. If these documents are not available, then the P_E value can be determined using MDE's guidance document titled "Stormwater Best Management Practices (BMPs) and Completion Dates for MS4 Permitting Purposes" (May 2, 2018). This guidance provides additional details on documentation needed to verify water quality treatment, including a drainage area map, impervious area draining to the BMP, and BMP measurements obtained through a field inspection.

7. How do you address projects with a combination of redevelopment and new development?

Redevelopment projects require treatment for a certain percentage of the existing impervious surface (either 20% if constructed 2000-2010 or 50% if constructed after 2010). If the redevelopment project was built prior to 2006, then the treatment provided should be counted in the baseline. If the redevelopment project was built post-2006, then the treatment provided may be counted towards the restoration goal. A project with a combination of new development plus redevelopment must be evaluated by reviewing plans and computations to determine the level of water quality treatment required for the redeveloped portion of the project. The new development portion of that project may only be counted toward the baseline.

8. How do I account for annexed or sold land during the permit term?

Any sold land may be removed from the baseline. Any land purchased after the permit was issued should be noted. This area can be incorporated into restoration requirements in the next permit cycle.

9. If a permittee owns or operates a facility covered under the industrial stormwater permit (12-SW) that has a separate restoration requirement, do they need to restore that in addition to the MS4 restoration requirement?

The permittee should include the impervious area for their industrial facilities in their baseline for the MS4 permit. This impervious area will not need to be restored as a separate requirement under the 12-SW permit.

Restoration Credit

1. Will MDE be updating guidance to reflect Chesapeake Bay Program (CBP) expert panel reports for various BMP efficiencies, and what happens if new expert panels change credit previously allowed under the permit?

Alternative BMPs planned during this permit term and listed in the Restoration Activity Schedule will receive the credit according to Appendix B, Table B.4 in the permit. MDE will consider new BMPs approved by CBP during the permit term and provide guidance to permittees on potential impervious acre credits. Any planned projects under the terms of future permits will need to meet any change in criteria noted in that permit.

2. Can nutrient credit trading be used to meet the restoration goal?

Yes. Trading does not need to be finalized during this permit term because this is a planning permit that does not contain a minimum restoration requirement. The Restoration Activity Schedule can identify the amount of trading a permittee needs to plan for by 2025 to meet restoration targets.

3. Can a permittee earn credit for BMPs installed as part of a forest conservation or wetland mitigation project?

No, any stormwater BMP installed to meet regulatory requirements for new development are not acceptable for restoration credit.

4. Will MDE accept partial credit for street sweeping if operations do not occur two times per month?

MDE will accept partial credit for load reductions as noted in the table “Pollutant Reductions Associated with Different Street Cleaning Practices” in the Chesapeake Bay Program document “Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices” (May 19, 2016). These reductions may be converted to an impervious area equivalent.

Minimum Control Measures

1. When must permittees submit the first progress report on the six minimum control measures (MCMs)?

The first progress report addressing MCMs is due on October 31, 2020. However, the permit requires that new permittees develop programs within the first year of the permit term, and initiate implementation of the programs thereafter. MDE strongly recommends that new permittees should already be in the process of developing standard operating procedures for the illicit discharge detection and elimination program (MCM 3) and good housekeeping plans for pollution prevention (MCM 6). Renewal permittees must maintain the established programs, initiate implementation of any needed changes to meet new requirements, and report progress toward meeting new permit requirements. The report due on October 31, 2020 should reflect MCM activities during the period of October 31, 2018 through June 30, 2020.

Appendix A

Appendix A: Allowable Water Quality Stormwater BMPs

ESD BMPs		
	BMP Type	BMP Code
1	Bio-Swale	MSWB
2	Disconnection of Non-Rooftop Runoff	NDN
3	Disconnection of Rooftop Runoff	NDRR
4	Dry Wells	MIDW
5	Enhanced Filters	MENF
6	Grass Swale	MSWG
7	Green Roof-Extensive	AGRE
8	Green Roof-Intensive	AGRI
9	Infiltration Berms	MIBR
10	Landscape Infiltration	MILS
11	Micro-Bioretenion	MMBR
12	Permeable Pavements	APRP
13	Rain Gardens	MRNG
14	Rainwater Harvesting	MRWH
15	Reinforced Turf	ARTF
16	Sheetflow to Conservation Wetlands	NSCA
17	Submerged Gravel Wetlands	MSGW
18	Wet Swale	MSWW
Structural BMPs		
	BMP Type	BMP Code
1	Bioretention	FBIO
2	Dry Swale	ODSW
3	Extended Detention-Wetland	WEDW
4	Extended Detention Structure, Wet	PWED
5	Infiltration Basin	IBAS
6	Infiltration Trench	ITRN
7	Micropool Extended Detention Pond	PMED
8	Multiple Pond System	PMPS
9	Organic Filter (Peat Filter)	FORG
10	Perimeter (Sand) Filter	FPER
11	Pocket Pond	PPKT
12	Pocket Wetland	WPKT
13	Retention Pond (Wet Pond)	PWET
14	Sand Filter	FSND
15	Shallow Marsh	WSHW
16	Underground Filter	FUND
17	Wet Pond-Wetland	WPWS
18	Wet Swale	OWSW

Alternative BMPs		
	BMP Type	BMP Code
1	Catch Basin Cleaning	CBC
2	Impervious Surface Elimination (to forest)	IMPF
3	Impervious Surface Elimination (to pervious)	IMPP
4	Mechanical Street Sweeping	MSS
5	Outfall Stabilization	OUT
6	Planting Trees or Forestation on Pervious Urban	FPU
7	Regenerative Step Pool Storm Conveyance	SPSC
8	Septic Connections to WWTP	SEPC
9	Septic Denitrification	SEPD
10	Septic Pumping	SEPP
11	Shoreline Management	SHST
12	Storm Drain Vacuuming	SDV
13	Stream Restoration	STRE
14	Regenerative/Vacuum Street Sweeping	VSS