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PENNSYLVANIA DEPARTMENT  
OF ENVIRONMENTAL  
PROTECTION

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**QAPP Addendum**

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BMP VERIFICATION  
PROGRAM PLAN

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Original:

March 4, 2016

Revised:

September 1, 2022

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## Background:

### History and Purpose of Best Management Practice (BMP) Verification

The Chesapeake Bay Program (CBP) Partnership has called for transparency and sound scientific support in the verification of the best management practices that are implemented as part of the states' Watershed Implementation Plans (WIPs) and the Chesapeake Bay Total Maximum Daily Load (TMDL). To respond to this request, *Strengthening Verification of Best Management Practices Implemented in the Chesapeake Bay Watershed: A Basinwide Framework, Report and Documentation from the Chesapeake Bay Program Water Quality Goal Implementation Team's BMP Verification Committee* (Verification Framework) (Chesapeake Bay Program 2014), was developed. The Verification Framework served as a guide for the states to document the methodology for verification of Best Management Practice (BMP) installation, function, and continued effectiveness of practices over time. This verification would be included as part of every state's Quality Assurance Program Plan (QAPP). The BMP Verification Program Plan is an addendum to our Quality Assurance Program Plan (QAPP). The QAPP is required by the Environmental Protection Agency (EPA) Chesapeake Bay Program Office for data submission and progress reporting towards Pennsylvania's pollution reduction goals. Pennsylvania's QAPP was most recently updated by DEP and approved by EPA in 2020.

Verification is formally defined by the CBP partners as "the process through which agency partners ensure practices, treatments, and technologies resulting in reductions of nitrogen, phosphorus, and/or sediment pollutant loads are implemented and operating correctly." The CBP Partnership's Principals' Staff Committee formally adopted five verification principles in December 2012. These are described in Table 1.

**Table 1. Verification Principles adopted by the Principals' Staff Committee.**

<b>Principle</b>	<b>Description</b>
<b>Practice Reporting</b>	Affirms that verification is required for practices, treatments and technologies reported for nitrogen, phosphorus and/or sediment pollutant load reduction credit through the Bay Program. This principle also outlines general expectations for BMP verification protocols.
<b>Scientific Rigor</b>	Asserts that BMP verification should assure effective implementation through scientifically rigorous and defensible, professionally established and accepted sampling, inspection and certification protocols. Recognizes that BMP verification shall allow for varying methods of data collection that balance scientific rigor with cost effectiveness and the significance of or priority placed upon the practice in achieving pollution reduction.
<b>Public Confidence</b>	Calls for BMP verification protocols to incorporate transparency in both the processes of verification and tracking and reporting of the underlying data. Recognizes that levels of transparency will vary depending upon source sector, acknowledging existing legal limitations and the need to respect individual confidentiality to ensure access to non-cost shared practice data.
<b>Adaptive Management</b>	Recognizes that advancements in practice reporting and scientific rigor, as described above, are integral to assuring desired long-term outcomes while reducing the uncertainty found in natural systems and human behaviors. Calls for BMP verification protocols to recognize existing funding limitations and allow for reasonable levels of flexibility in the allocation or targeting of funds.
<b>Sector Equity</b>	Calls for each jurisdiction's BMP verification program to strive to achieve equity in the measurement of functionality and effectiveness of implemented BMPs among and across the source sectors.

Verification can happen in multiple ways as part of other activities; either through inspections, complaint investigations, permit approvals, County Conservation District plan reviews, voluntary surveys, or by image capture.

There are two key components to verification:

- 1) Initial Verification (at PROJECT COMPLETION)
- 2) Follow-up Verification (Re-Verification of EXISTING PRACTICES):

The time between initial and follow-up verification will depend mostly on the particular BMP's "lifespan" or time period during which "credit" for pollution reductions are counted for progress toward Pennsylvania's pollution reduction goals in the Bay model. Some practices are "annual" or "single-year" practices while others are considered "multi-year" practices. This time period is also referred to as a BMP's Credit Duration. The type of assessment used to verify a BMP depends on the BMP type and its Credit Duration.

There are three typical assessment methods:

- 1) Visual Assessment – Single Year
  - Short term (annual) practices
  - Example BMPs: Cover Crops, Conservation Tillage, Forest Harvesting
- 2) Visual Assessment – Multi-Year
  - Long term (cumulative) practices, often "Structural"

Example BMPs: Animal Waste Storage Systems, Bioswales, Tree Planting, Forested and Grassed Buffers

3) Non-visual Assessment:

- A practice that cannot typically be visually assessed because it is a type of management system or an enhanced approach, rather than a physical BMP.
- Can last a single season or multiple years

Example BMPs: Nutrient Management, Street Sweeping, Manure Transport

Alternative methods for data collection and assessment may be utilized. PADEP has been successful in using alternative BMP verification methods which allowed BMP reporting at less than 100% Visual Assessment (field verification) based on statistical assessment. These have been special projects to address specific data needs and to explore potential alternative methods that could be used with limited staffing resources. To date these efforts have been conducted in the Agriculture sector and are planned for use in the Urban Stormwater sector. Table 2 lists the alternative methods and projects PA has commissioned or plans to commission to accomplish verification.

### [Incorporating the QAPP Addendum into the Phase 3 WIP](#)

Pennsylvania's approved BMP Verification Program Plan (QAPP Addendum) of March 4, 2016 was revised to its current form as an outcome of several meetings with stakeholders from Pennsylvania's Agriculture, Urban Stormwater, and Forestry sectors. While Pennsylvania is committed to working with EPA and CBP to continue to implement and strengthen best management practice (BMP) verification activities that balance verification work and limited resources, this revised BMP Verification Program Plan (QAPP addendum) focuses on verification of our Phase 3 Watershed Implementation Plan (WIP) priority BMPs for control of nitrogen, phosphorous, and sediment in the Agriculture, Urban Stormwater and Forestry sectors. As part of the Phase 3 WIP planning process, Pennsylvania chose these priority BMPs for implementation and verification. Table 3 shows the priority BMPs by sector and color-coded verification methodologies. Some BMPs have more than one verification methodology.

The BMP Verification Program Plan (QAPP addendum) sets forth our current plan for verifying the priority BMPs in non-point source pollution sectors as identified in the Phase 3 WIP. The QAPP addendum consists of four sections – Agriculture, Forestry, Urban Stormwater, and Plan Implementation – covering the following information.

- 1) A background of each sector introduces the relative WIP priority initiatives in each sector.
- 2) The sector-specific inspector/verifier qualifications are listed. These are the requirements for verifying that priority BMPs are installed and functioning as designed.








- 3) A discussion of the WIP priority initiatives and the associated priority BMPs for implementation and verification as part of those initiatives. The BMPs are described using templates created by experts at the Chesapeake Bay Program Office and agreed upon by the 60+ experts who attended the BMP Verification Summit on August 30, 2018.
- 4) The plan implementation section outlines existing programs and new verification programs or methods that Pennsylvania will use to verify the priority BMPs.

The goal of Pennsylvania's BMP Verification Program Plan as described in this addendum creates a comprehensive, implementable program which verifies priority practices identified in the Phase 3 WIP are installed and operational and continue to provide the pollution reductions for the Chesapeake Bay Program model to accurately reflect Pennsylvania's progress towards improved local water quality and the restoration of the Chesapeake Bay. This addendum not only functions as a part of our data quality assurance, but also as an integral part of Pennsylvania's Phase 3 WIP. We include this addendum as an appendix to the Phase 3 WIP so that, as the Countywide Action Plans are implemented, and as needs and resource allocations change, this plan may be updated and amended to include other projects and proposals, and otherwise modified.

**Table 2. Priority BMPs and Verification Methodologies Matrix**

Priority BMPs are shown by sector and color-coded verification methodologies. Some BMPs have more than one verification methodology.

<b>WIP Priority BMPs for Verification</b>	<b>Agriculture</b>	<b>Manure Transport</b>	<b>Tillage Practices</b>	<b>Dairy Precision Feeding</b>	<b>Cover Crop (Traditional)</b>	<b>Nutrient Management - Core Nitrogen and Core Phosphorus</b>	<b>Soil Conservation and Water Quality Plans</b>	<b>Nutrient Management- Supplemental Nitrogen and Phosphorus</b>	<b>Animal Waste Management Systems</b>	<b>Agriculture</b>
		<b>Manure Treatment Technologies</b>	<b>Prescribed Grazing</b>	<b>Barnyard Runoff Controls and Loafing Lot Management</b>	<b>Cover Crop (Commodity)</b>	<b>Grassed Buffers- with and without Stream Fencing</b>	<b>Forested Buffers- with and without Stream Fencing</b>	<b>Stream Restoration</b>	<b>Wetland Restoration</b>	
	<b>Urban Stormwater</b>	<b>Dry Detention Ponds and Hydrodynamic Structures</b>	<b>Dry Extended Detention</b>	<b>Vegetated Open Channels</b>	<b>Performance Standards: Bioretention Practices</b>	<b>Performance Standards: Infiltration Practices</b>	<b>Wet Ponds and Wetlands</b>	<b>Urban Forest Buffers</b>	<b>Stream Restoration</b>	<b>Urban Stormwater</b>
		<b>Riparian Forest Buffers</b>	<b>Urban Forest Expansion/ Conservation Landscaping</b>	<b>Urban Tree Canopy Expansion</b>	<b>Ag Stream Restoration</b>		<b>Urban Stream Restoration</b>	<b>Wetland Creation</b>	<b>Wetland Restoration</b>	

Approved Methodologies:	
 Survey	 Remote Sensing using Aerial Imagery
 Survey and/or Inspection	 Remote Sensing using Aerial Imagery and/or Inspection
 Inspection	 Remote Sensing using Lidar
	 Remote Sensing using Lidar and/or Inspection



## Agriculture:

Agricultural operations are required to be compliant with Chapter 102 (Erosion and Sediment Control), Chapter 91 (Manure Management) and, when animal numbers and density reach a certain threshold, Chapter 92a (National Pollutant Discharge Elimination System ((NPDES) Permitting) and/or Chapter 83/Act 38 (Nutrient Management).

Pennsylvania has three inspection programs relating to the compliance assurance of agricultural operations: NPDES Concentrated Animal Feeding Operations (CAFOs) are inspected at a minimum of 20% annually by Department of Environmental Protection (DEP) staff; Act 38 Concentrated Animal Operations (CAOs) are inspected annually by Conservation District and State Conservation Commission staff; and all other non-CAFO and non-CAO operations are inspected within the Chesapeake Bay Watershed at a rate of between 5-10% annually by Conservation District and DEP staff. The requirements for all operations include planning, record keeping, and implementing Best Management Practices, to include Nutrient and Manure Management, Animal Waste Management Systems, Barnyard Runoff Controls, Loafing Lot Management, Conservation/Agricultural Erosion and Sediment Control Plans and related practices.

Best Management Practices (BMPs) such as no-till or reduced till and cover crops are utilized by farms to reduce erosion and increase soil health and sustainability. These practices are currently verified by the transect survey methodology, which is performed by the Capital Resource Conservation and Development (Capital RC&D) and Conservation District staff annually. Rotational/Prescribed Grazing, Horse Pasture Management, or equivalent Resource Improvement Practice is verified via the Penn State Survey Methodology, Chesapeake Bay Ag Inspection Program, Nutrient Management Program or Natural Resource Conservation Service (NRCS) contracts. Animal Waste Management Systems (AWMS) are included in Nutrient Management Plans and Manure Management Plans and verified either via the Nutrient Management Program, NPDES CAFO Program, Chesapeake Bay Ag Inspection Program, Penn State Survey methodology, NRCS Remote Sensing, or NRCS contracts. Dairy Precision Feeding is utilized throughout the dairy industry, but with minimal accounting for the use of this practice. Manure Treatment Technologies, as they are reported, are certified and are verified to have generated credits via DEP's Nutrient Trading Program. Grassed and Forested Buffers are verified using the Penn State Survey and NRCS Remote Sensing methodology, Chesapeake Bay Ag Inspection Program, and funding sources (such as NRCS-Farm Service Agency (FSA), Growing Greener, DCNR, etc.). Stream and wetland restoration practices are typically reported and verified from the funding and/or implementing source (such as NRCS, US Fish and Wildlife Service (USFWS), Growing Greener, etc.). Refer to Table 3

### Inspector/Verifier Qualifications

Verifiers of these activities include federal (NRCS and FSA), state (DEP, DCNR, SCC, PDA), local (conservation districts), and third-party (Non-governmental organizations (NGOs) and private technical service providers (TSPs) such as Chesapeake Bay Foundation, William Penn Foundation, Penn State, and private entities). It is expected that for each BMP type, the verifier(s) will have the relevant training and experience with identifying the existence and visual indication of BMP function.

Typical training includes:

- Act 38 Nutrient Management Program – offers 11-13 days of training for certification. However, not all inspectors need to be certified in Act 38 and may attend some of the training days that are relevant to their field (i.e. DEP CAFO inspectors are not required to be Act 38 certified but are directed to attend the workshops and trainings). Additional nutrient management related workshops are supported by the program throughout the year. See PAPlants ([www.paplants.pa.gov/Index.aspx](http://www.paplants.pa.gov/Index.aspx)) for an up-to-date list of trainings and workshops.
- NRCS Conservation Planning – Federal staff and NRCS Technical Service Providers (TSPs) are provided web-based and in-person training for NRCS Conservation Planning certification. Conservation district staff are considered TSPs and may attend these trainings.
- Spring Agriculture Trainings – Three weeks of basic and advanced trainings are offered annually to federal and state staff as well as Technical Service Providers (TSPs) (conservation districts and some NGOs). These trainings are led by NRCS and SCC and include field exercises and assessments of resource concerns and identification of BMPs to address those concerns. “Basic” level training is provided to new staff. “Advanced” level training is split into two groups: agronomy and engineering. The advanced training runs concurrently, so more advanced staff may attend these trainings in concurrent years.
- Manure Management Planning Facilitator Trainings – Manure Management Planning trainings have been offered annually in-person by Penn State Extension and DEP for conservation district staff who provide planning assistance via workshops and one-on-one. This day-long training will be provided in web-based modules to conservation district staff and potentially others (consultants, NGOs, etc.).
- Inspection Program Standard Operating Procedures (SOPs) – The Chesapeake Bay Agriculture Inspection Program is led by DEP and executed by conservation districts and DEP regional offices. The SOPs ([CBO-INSP-001](#)) provides guidance for inspection and collection of data. Training has been and will continue to be provided in web-based and in-person format.
- PA Agriculture Conservation Stewardship (PACS) Program – third-party verifiers are required to maintain Act 38 Nutrient Management Certification and participate in web-based and/or in-person training specific to on-site assessments and BMP verification.
- Data Management - SOPs and accompanying web-based training is provided on the PA DEP Clean Water Academy for all technical staff who are entering data in the PracticeKeeper geodatabase. SOPs provided include CBO-DATA-002, PracticeKeeper – Agriculture Inspection Module and CBO-DATA-003, PracticeKeeper – Best Management Practice (BMP) Module. Accompanying web-based training is provided for each SOP. These two SOPs describe the procedures necessary to adequately track nutrient management and inspection outputs as well as BMPs. Additional web-based trainings provide the procedures described in the [Nutrient Management Program Administrative Manual](#) for the data reporting requirements of the Nutrient and Manure Management Program. Additional training has been and will continue to be provided in web-based and in-person format.

- Additional guidance and trainings will be provided to staff as developed.

Each priority Agriculture BMP is listed, below, under the associated Agriculture WIP Priority Initiative (PI). Each BMP is identified by the BMP name used in the Chesapeake Bay Model and described using the template created by experts at the Chesapeake Bay Program Office.

## **Priority Initiative 1: Agricultural Compliance**

### **Nutrient Management – Core Nitrogen and Core Phosphorus**

BMP Type: Annual. Nutrient Management Plans (NMPs) are 3-year plans; Manure Management Plans (MMPs) are 3-year+ plans to be updated as the conditions of the operation change; Nutrient Balance Sheets (NBSs) are components of MMPs and NMPs.

Program (Existing or New): Existing (Act 38 Nutrient Management Program; Chesapeake Bay Ag Inspection Program; Chapter 91 Manure Management Program); New (Pennsylvania Agriculture Conservation Stewardship Program (PACS)).

What factors can cause the BMP to fail? Annual Practice relies on record-keeping and compliance with regulations (Act 38 and Chapter 91).

Who does the verification? Compliance Inspections performed by Conservation Districts (Act 38) and Conservation Districts and DEP (Chapter 91), Penn State Extension (Surveys), Qualified third-party verifiers for the PACS Program (Certified Commercial Planners- Ch. 91) NRCS 590.

How is it verified? On-farm assessments (Act 38, Chapter 91, PACS Program); Surveys

Do resources exist to support verification techniques? Yes, via PA Nutrient Management Program Funds and EPA Chesapeake Bay Regulatory Accountability Program (CBRAP).

How often does it have to be verified/re-verified? Inspections occur on the same operation once every year for CAOs and CAFOs (Act 38); once every 10 years for non-CAOs, non-CAFOs (Chapter 91) as part of the Chesapeake Bay Agriculture Inspection Program. As this is an annual practice, a percentage of the total plan coverage would need to be inspected and reported. The rate of implementation would be assigned to the total known plan coverage.

What actions could help support better verification for the practice in PA the next few years? Building public and private technical assistance capacity for plan development and BMP implementation to ensure compliance with existing regulations.

## Manure Transport

BMP Type: Annual

Program (Existing or New): Existing (Act 38 – Nutrient Management Program; Act 49 – Commercial Manure Haulers and Brokers)

What factors can cause the BMP to fail? Annual Practice relies on ability to obtain/review Nutrient Balance Sheets (NBS) and records.

Who does the verification? Pennsylvania Department of Agriculture (PDA)/State Conservation Commission (SCC) via Manure Hauler/Broker Program Inspections, Conservation Districts via NBS technical reviews, PSU survey

How is it verified? Records reviews/on-site hauler or broker inspections (mushroom industry on receiving end, survey method)

Do resources exist to support verification techniques? Limited, via Nutrient Management Program Fund.

How often does it have to be verified/re-verified? Annual practice would need to be reported on an annual basis

What actions could help support better verification for the practice in PA the next few years? Regular record submission to the Department of Agriculture from Brokers and Manure Haulers.

## Soil Conservation and Water Quality Plans (i.e. PA Ag E&S/Conservation Plans)

BMP Type: Annual

Program (Existing or New): Existing (Act 38 Nutrient Management Program; Chesapeake Bay Ag Inspection Program; Chapter 102 Erosion and Sedimentation Control); New (PA Ag Conservation Stewardship Program)

What factors can cause the BMP to fail? Annual Practice relies on record-keeping and compliance with regulations (Act 38 and Chapter 102), verification for plan, not implementation of plan.

Who does the verification? Compliance Inspections performed by Conservation Districts (Act 38) and Conservation Districts and DEP (Chesapeake Bay Agriculture Inspection Program). Penn State Extension (Surveys). Qualified third-party verifiers for the PACS Program, NRCS- check implementation.

How is it verified? On-farm assessments; Surveys

Do resources exist to support verification techniques? Yes, via PA Nutrient Management Program Funds and EPA Chesapeake Bay Regulatory Accountability Program (CBRAP)

How often does it have to be verified/re-verified? Inspections occur on the same operation once every year for CAOs and CAFOs (Act 38); once every 10 years for non-CAOs, non-CAFOs (Chapter 91 and 102) through the Chesapeake Agriculture Inspection Program.

What actions could help support better verification for the practice in PA the next few years? Building public and private capacity to ensure compliance with existing regulations and verify thousands of BMPs per year. Increase funding for BMP implementation and to ensure continued Operation and Maintenance (O&M). Incentivize reporting of implementation.

## **Barnyard Runoff Controls and Loafing Lot Management**

BMP Type: Multi-Year

Program (Existing or New): Existing (Chapter 91 and Chapter 102 – Animal Concentration Area/Animal Heavy Use Area Management; Act 38 – Nutrient Management Program, Chapter 92 - NPDES); New (PA Ag Conservation Stewardship Program)

What factors can cause the BMP to fail? Improper O&M and management of animals

Who does the verification? NRCS (EQIP); Conservation Districts and DEP via Act 38, NPDES CAFO, and Chesapeake Bay Ag Inspection Programs; Qualified third-party verifiers for the PACS Program, PSU Survey

How is it verified? Visual Assessment

Do resources exist to support verification techniques? Potentially. Visual Assessment would increase time necessary to perform an On-farm assessment or inspection.

How often does it have to be verified/re-verified? Once every 10 years. (Resource Improvements = once every 5 years)

What actions could help support better verification for the practice in PA the next few years? Building public and private capacity to ensure compliance with existing regulations and verify thousands of BMPs per year.

## Priority Initiative 2a: Soil Health: Residue Management

### Tillage Practices, to include Conservation Tillage and High Residue Management (No-till)

BMP Type: Annual

Program (Existing or New): Existing (Resource Enhancement and Protection-REAP; Transect Survey);

What factors can cause the BMP to fail? Annual Practice relies on implementation that year, as well as weather/climate.

Who does the verification? Capital RC&D, along with the CDs, run the transect study program since 2014

How is it verified? Follow CBP/CTIC survey protocol, Farmer survey/question during inspection to add confidence to transect survey,

Do resources exist to support verification techniques? Yes, via the EPA Chesapeake Bay Regulatory Accountability Program funding.

How often does it have to be verified/re-verified? Annual practice would need to be reported on an annual basis

What actions could help support better verification for the practice in PA the next few years? Increase data set for lands known to practice conservation tillage/no-till.

## Priority Initiative 2b: Soil Health: Cover Crops

### Cover Crop – Traditional

BMP Type: Annual

Program (Existing or New): Existing (Transect Survey)

What factors can cause the BMP to fail? Annual Practice relies on implementation that year, as well as weather/climate.

Who does the verification? Capital RC&D, along with the CDs, run the transect study program since 2014

How is it verified? Follow CBP/CTIC survey protocol

Do resources exist to support verification techniques? Yes, via the EPA Chesapeake Bay Regulatory Accountability Program funding.

How often does it have to be verified/re-verified? Annual practice would need to be reported on an annual basis

What actions could help support better verification for the practice in PA the next few years? Provide funding and support for continuation and development of

additional methodologies for traditional cover crop data collection and reporting to ensure crediting of practices.

## Cover Crop – Commodity

BMP Type: Annual

Program (Existing or New): Existing (Resource Enhancement and Protection – REAP)

What factors can cause the BMP to fail? Annual Practice relies on implementation that year, as well as weather/climate.

Who does the verification? Capital RC&D, along with the CDs, run the transect study program since 2014

How is it verified? Follow CBP/CTIC survey protocol

Do resources exist to support verification techniques? Yes, via the EPA Chesapeake Bay Regulatory Accountability Program funding.

How often does it have to be verified/re-verified? Annual practice would need to be reported on an annual basis

What actions could help support better verification for the practice in PA the next few years? Provide funding and support for development of methodology for commodity cover crop data collection and reporting and ensure CBP approval of methodology.

## Priority Initiative 2c: Soil Health: Prescribed Grazing

### Rotational/Prescribed Grazing (to include Resource Improvement)

BMP Type: Annual

Program (Existing or New): Existing; New (PA Ag Conservation Stewardship Program)

What factors can cause the BMP to fail? Annual Practice relies on implementation that year.

Who does the verification? NRCS (Grazing Plans); Conservation Districts and DEP via Act 38 and Chesapeake Bay Ag Inspection Programs; Qualified third-party verifiers for PACS Program

How is it verified? Review of Visual Inspection; Records Review, as applicable

Do resources exist to support verification techniques? Potentially. More data needs to be collected to understand the full universe of implementation.

How often does it have to be verified/re-verified? Annual practice would need to be reported on an annual basis

What actions could help support better verification for the practice in PA the next few years? Increase data set for lands known to practice rotational/prescribed grazing. Building public and private capacity to ensure compliance with existing regulations and verify thousands of BMPs per year.

## Priority Initiative 3: Enhanced Nutrient Management

### Nutrient Management – Supplemental Nitrogen and Phosphorus

BMP Type: Annual

Program (Existing or New): Existing (Act 38 Nutrient Management Program; Chesapeake Bay Ag Inspection Program); Chapter 91 Manure Management Program); New (PA Ag Conservation Stewardship Program, 4-R Nutrient Stewardship)

What factors can cause the BMP to fail? Annual Practice relies on record-keeping. Some Supplemental NM BMPs such as Nitrogen and Phosphorous Placement are required under PA Programs; however, other BMPs rely on voluntary implementation.

Who does the verification? Compliance Inspections performed by Conservation Districts (Act 38) and Conservation Districts and DEP (Chapter 91), Penn State Extension (surveys); Qualified third-party verifiers for the PACS Program and other grant-funded programs (4R Nutrient Stewardship)

How is it verified?

On-farm assessments (Act 38, Chapter 91, PACS Program); Surveys

Do resources exist to support verification techniques? Potentially. Funding will need to be provided to ensure continued farm surveys and assessments.

How often does it have to be verified/re-verified? As this is an annual practice, a percentage of the total plan coverage would need to be inspected and reported. The rate of implementation would be assigned to the total known plan coverage.

What actions could help support better verification for the practice in PA the next few years? Increasing education and awareness of “enhanced” nutrient management practices; increasing incentives for adoption and reporting of enhanced practices

## Priority Initiative 4: Animal Waste Management Systems (AWMS)

### Animal Waste Management Systems

BMP Type: Multi-Year

Program (Existing or New): Existing (NRCS, PA Act 38, PA Chapter 91, Chapter 92a); New (PA Ag Conservation Stewardship Program)



What factors can cause the BMP to fail? Improper O&M

Who does the verification? NRCS (EQIP); Conservation Districts, State Conservation Commission and DEP via Act 38, NPDES CAFO, and Chesapeake Bay Ag Inspection Programs; Penn State Extension (survey); Qualified third-party verifiers for the PACS Program

How is it verified? Visual Assessment / Survey w/ statistically valid QA/QC spot-check

Do resources exist to support verification techniques? Potentially. Visual Assessment would increase time necessary to perform the inspection.

How often does it have to be verified/re-verified? Once every 15 years. RI (Solid AWMS) = once every five years.

What actions could help support better verification for the practice in PA the next few years? Building public and private capacity to ensure compliance with existing regulations and verify thousands of BMPs per year.

## **Priority Initiative 5: Dairy Precision Feeding**

### **Dairy Precision Feeding**

BMP Type: Annual

Program (Existing or New): New

What factors can cause the BMP to fail? Management-based practice

Who does the verification? NRCS for cost-shared practices; Non-cost shared has historically not been reported/verified, Penn State, nutritionists, PDMP, Center for Dairy Excellence, self-reporting, New Bolton Large Animal Veterinary Center, veterinarians, Co-ops, Feed mills

How is it verified? Unknown, Survey- feed records

Do resources exist to support verification techniques? Limited

How often does it have to be verified/re-verified? Annual practice would need to be reported on an annual basis

What actions could help support better verification for the practice in PA the next few years? Better ability to collect information via co-ops, associations, etc.

## Priority Initiative 6: Development of Integrated System for Excess Manure

### Manure Treatment Technologies

BMP Type: Annual

Program (Existing or New): Nutrient Trading

What factors can cause the BMP to fail? Annual Practice relies on ability to obtain/review records.

Who does the verification? DEP (Nutrient Trading Program)

How is it verified? Records review

Do resources exist to support verification techniques? Minimal resources to support verification techniques.

How often does it have to be verified/re-verified? Annual practice would need to be reported at minimum on an annual basis, but may be verified multiple times in a year

What actions could help support better verification for the practice in PA the next few years? Record submission from Brokers and Manure Haulers, record submissions from locations previously receiving manure (nutrient management/ag practices when received manure and now that they aren't receiving manure).

## Priority Initiative 7: Enhanced Development of Forested and Grassed Buffers

### Grassed Buffers - with and without Stream Fencing (35+ feet width)

BMP Type: Multi-Year

Program (Existing or New): Existing (Act 38, Chapter 91, Chapter 92); New (PA Ag Conservation Stewardship Program)

What factors can cause the BMP to fail? Improper O&M

Who does the verification? NRCS (cost-share); Conservation Districts and DEP via Act 38, NPDES CAFO, and Chesapeake Bay Ag Inspection Programs; Penn State Extension (survey); Qualified third-party verifiers for the PACS Program, NRCS

How is it verified? Visual Inspection / Survey w/ statistically valid QA/QC spot-check, remote sensing (timing critical)

Do resources exist to support verification techniques? Potentially. Visual Inspection would increase time necessary to perform the inspection.

How often does it have to be verified/re-verified? Once every 10 years. (Resource Improvement = once every 5 years)

What actions could help support better verification for the practice in PA the next few years? Building public and private capacity to ensure compliance with existing regulations and verify thousands of BMPs per year.

### **Forested Buffers - with and without Stream Fencing (35+ feet width)**

BMP Type: Multi-Year

Program (Existing or New): Existing (NRCS, PA DEP Growing Greener); New (PA DCNR Buffer Grants, PA Ag Conservation Stewardship Program (PACS))

What factors can cause the BMP to fail? Improper O&M

Who does the verification? NRCS (EQIP); Penn State Extension (survey); Qualified third-party verifiers for the ACS Program, DCNR Foresters, NRCS

How is it verified? Visual Inspection / Survey w/ statistically valid QA/QC spot-check remote sensing, DCNR-PracticeKeeper (soon), 10 Million Tree Project

Do resources exist to support verification techniques? Potentially. Visual Inspection would increase time necessary to perform the inspection.

How often does it have to be verified/re-verified? Once every 10 years. (Resource Improvement = once every 5 years)

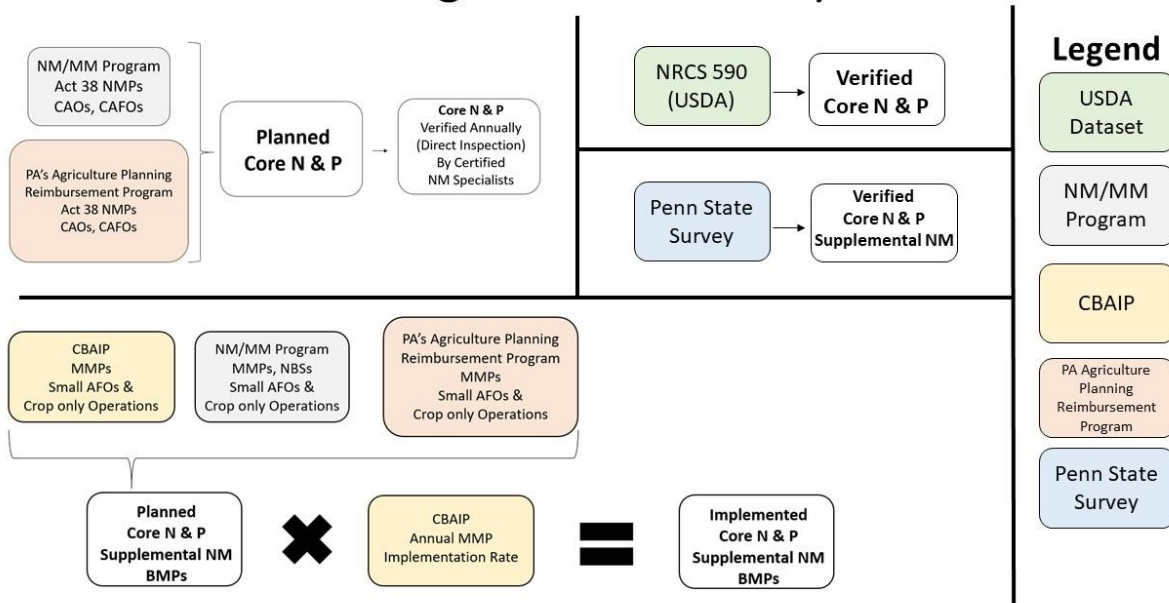
What actions could help support better verification for the practice in PA the next few years? Building public and private capacity to ensure compliance with existing grant requirements and verify hundreds of acres of forest buffers per year.

# Programs and Projects – Agriculture

## Nutrient and Manure Management Program

As required by the PA Nutrient Management Act, agricultural BMPs are recorded in Act 38 Nutrient Management Plans (see Title 25, Chapter 83, Subchapter D and the Pennsylvania Act 38 Nutrient Management Program Technical Manual). Additionally, BMPs are recorded as part of Manure Management Plans, and as part of the Nutrient Management and Manure Management Delegation Agreement found in the Pennsylvania Nutrient Management and Manure Management Manual Program Administrative Manual.

## Nutrient Management in Pennsylvania



**BMP Sector:** Agriculture, Animal and Natural

**BMP List:**

- Access Road
- Animal Mortality Facility
- RI-2 Animal Compost Structure
- Animal Trails and Walkways
- Brush Management
- Composting Facility
- Conservation Cover
- Constructed Wetland
- Contour Buffer Strips
- Contour Farming
- Critical Area Planting
- Diversion
- Fence
- Heavy Use Area Protection
- Hedgerow Planting
- Integrated Pest Management
- Lined Waterway or Outlet
- Pipeline
- Prescribed Grazing
- RI - 15 Rotational Grazing
- Pumping Plant
- Riparian Forest Buffer
- RI-10 Forest Buffer on Watercourse
- RI-9 Forest Nutrient Exclusion Area on Watercourse - Narrow
- Riparian Herbaceous Cover
- RI-8 Grass Buffer on Watercourse

Exclusion Fence with Forest Buffer	Roof Runoff Structure
Exclusion Fence with Grass Buffer	RI - 16 Barnyard Clean Water Diversion
Field Border	Roofs and Covers
Filter Strip	Seasonal High Tunnel System for Crops
Forage and Biomass Planting	Sediment Basin
Forest Stand Improvement	Spring Development
Grassed Waterway	Stream Crossing
Streambank and Shoreline Protection	Waste Storage Facility
Stripcropping	RI-1 Dry Waste Storage Structure
Structure for Water Control	Waste Transfer
Subsurface Drain	Waste Treatment
Terrace	Water Well
Trails and Walkways	Watering Facility
Underground Outlet	RI - 18 Watering Trough
Upland Wildlife Habitat Management	Wetland Creation
Vegetated Treatment Area	Wetland Restoration
Soil Conservation and Water Quality Plans	Wetland Wildlife Habitat Management

**Nutrient Management BMPs: Core N, Core P, N Placement, N Rate, N Timing, P Placement, P Rate, P Timing Soil Conservation and Water Quality Plans: Ag. E&S Plans** are verified as part of all CBAIP inspections completed. The results of this verification are described on the [CBAIP Inspection Report](#) according to the [Chesapeake Bay Agricultural Inspection Program SOP No. CBO-INSP-001](#). Soil Conservation and Water Quality Plans are directly reported from the results of the assessment of Ag. E&S Plans during the CBAIP inspection. The results of the inspections are recorded in the PracticeKeeper Geodatabase according to PracticeKeeper – Agriculture Inspections Module SOP No. CBO-DATA-002 and the accompanying DEP Clean Water Academy (CWA) learning module. An export excel file is downloaded from the PracticeKeeper Geodatabase including the data entered at the time of the inspection according to the program procedures listed above. The file is then submitted to Barry Evans for additional QA/QC and Ted Tesler for incorporation into the BMP Data Warehouse and eventually to EPA Chesapeake Bay Program Office through NEIEN.

**Manure Management Plans (MMP) and Nutrient Balance Sheets (NBS):** As outlined in the procedures listed above, MMPs and NBSs are verified as part of all CBAIP inspections completed. At a minimum, a statistically significant subsample of agricultural operations with known MMPs and Nutrient Balance Sheets (NBSs) in the Pennsylvania portion of the Chesapeake Bay Watershed is inspected as part of the CBAIP annually. The subsample size will assure a maximum 5% margin of error and 95% confidence level. Based on inspections conducted as part of the CBAIP, a unique rate of nutrient management BMP implementation is determined for each county in the Pennsylvania portion of the Chesapeake Bay Watershed. The county-specific implementation rate is derived from a county-level analysis of data obtained during the on-site inspection of nutrient application and setback records as well as farmer interviews during the CBAIP inspection. The data for each inspection is documented on the [CBAIP Inspection Report](#) according to the [Chesapeake Bay Agricultural Inspection Program SOP No. CBO-INSP-001](#). It is also recorded in the PracticeKeeper Geodatabase according to the PracticeKeeper-Agriculture Inspection Module SOP No. CBO-DATA-002, [Nutrient](#)

[Management Program Administrative Manual](#), and accompanying web-based trainings found on the DEP Clean Water Academy. Acres of each planned Supplemental Nutrient Management BMP is recorded and related to the MMP in the PracticeKeeper Geodatabase. To determine implemented acres of Core N and Core P, the county-specific implementation rate is then applied to the acres that have planned nutrient application recommendations identified in the known universe of MMPs tracked and recorded in the PracticeKeeper Geodatabase within the respective county. Only acres with verified MMPs within the Chesapeake Bay Watershed are considered. Similarly, the county specific implementation rate is applied to the acres planned of each specific Supplemental Nutrient Management BMP (Rate N & P, Placement N & P, Timing N & P) to determine the acres of implemented Supplemental Nutrient Management in the respective county.

**All other BMPs tracked and recorded** are recorded in the PracticeKeeper Geodatabase according to the PracticeKeeper – Best Management Practice (BMP) Module SOP No. CBO-DATA-003.

A BMP is not reported if it was funded by a funding source that is reported by another program. For example, all practices funded by USDA programs or DCNR grants that are also within the credit duration of the BMP will be removed from the dataset before reporting to NEIEN. The file is then submitted to Barry Evans for additional QA/QC and Ted Tesler for incorporation into the BMP Data Warehouse and eventually to EPA Chesapeake Bay Program Office through NEIEN.

**Verification of Implementation – Responsible Party:** County Conservation District Chesapeake Bay Technicians

**Reverification of BMP – Responsible Party:** County Conservation District staff participating in the Chesapeake Bay Agriculture Inspection Program (CBAIP)

**Reverification of BMP – Timeline:** Within the credit duration of the BMP

**Initial Implementation Date:** Recorded in the PracticeKeeper Geodatabase as the date the practice is initially verified as meeting the BMP definition after the implementation of the BMP (within the same construction season as installation)

**Reinspection/Reverification Date:** Recorded in the PracticeKeeper Geodatabase as the date the inspection of the BMP occurred.

**Location Information:** BMP is manually drawn in the PracticeKeeper Geodatabase by the individual that has verified the BMP as implemented and is updated as needed upon reverification.

**BMP Credit Duration Tacking:** All BMPs in the PracticeKeeper Geodatabase with a known Chesapeake Bay Partnership BMP Crosswalk have the credit duration associated with the PracticeKeeper BMP. As County Conservation Districts (CCD), State Conservation Commission (SCC), and DEP staff interact with the agricultural operation, they are encouraged to reverify the BMP when they are on-site. Some programs, such as the Act 38 Nutrient Management Program may require this verification if the BMP is part of the Nutrient Management Plan. A report can be downloaded from the PracticeKeeper

Geodatabase identifying the BMPs that are approaching or are past the credit duration of the BMP. As the Chesapeake Bay Agriculture Inspection Program (CBAIP) transitions to Phase 2, the participating CCDs and DEP regional offices will be encouraged to prioritize the operations with multiple BMPs appearing on the report for CBAIP Phase 2 Inspections. If the BMP is not functioning at the time of the Phase 2 Inspection and it is required to comply with state Agriculture Erosion and Sediment Control, Manure Management, or Nutrient Management Regulations, the agricultural operation will be offered a timeline to repair the BMPs. If the required BMPs have not been repaired by the deadlines provided in the inspection report, CCDs may refer to DEP or the SCC for enforcement. Regardless of if the BMP is required for regulatory compliance, the BMP will be identified as a non-functioning BMP in the PracticeKeeper Geodatabase until the time that it is appropriately maintained. If a BMP is indicated as non-functioning it will be removed from the dataset before submission to NEIEN.

***Resource improvement practices that have been implemented without public cost-share funds:*** If a practice is implemented to meet NRCS Field Office Technical Guide standards and specifications it can be recorded as the NRCS practice regardless of if the practice was funded with public funds. Based on the professional judgement of the trained individual performing the BMP verification, if there is a question about if the practice meets NRCS standards and specifications, the practice is identified as a resource improvement practice if it meets the visual indicators identified in the *Chesapeake Bay Program Resource Improvement Practice Definitions and Verification Visual Indicators Report*, July 2014.

***Collected Data:*** All data is tacked and recorded in the PracticeKeeper Geodatabase according to the PracticeKeeper – Best Management Practice (BMP) Module SOP No. CBO-DATA-003.

***Identification of compliant, noncompliant, and failed BMPs or systems, and the information used to amend the program's tracking database:*** All BMPs in the PracticeKeeper Geodatabase with a known Chesapeake Bay Partnership BMP Crosswalk have the credit duration associated with the PracticeKeeper BMP. As County Conservation Districts (CCD), State Conservation Commission (SCC), and DEP staff interact with the agricultural operation, they are encouraged to reverify the BMP when they are on-site. Some programs, such as the Act 38 Nutrient Management Program may require this verification if the BMP is part of the Nutrient Management Plan. If the BMP is not functioning at the time of the Phase 2 Inspection and it is required to comply with state Agriculture Erosion and Sediment Control, Manure Management, or Nutrient Management Regulations, the agricultural operation will be offered a timeline to repair the BMPs. If the required BMPs have not been repaired by the deadlines provided in the [CBAIP Inspection Report](#) or [NM Status Review Report](#), CCDs may refer to DEP or the SCC for enforcement. Regardless of if the BMP is required for regulatory compliance, the BMP will be identified as a non-functioning BMP in the PracticeKeeper Geodatabase until the time that it is appropriately maintained. If a BMP is indicated as non-functioning it will be removed from the dataset before submission to NEIEN.

## **Qualifications**

CCD and SCC staff receive classroom, web-based, and on-the-job training to determine that the installed BMP meets the BMP definition. If the BMP is reported as implemented in the PracticeKeeper Geodatabase, it is assumed that the BMP meets the BMP definition. CCD staff often have NRCS Job approval authority for planning, inventory & evaluation, design, and construction of the BMPs verified as NRCS BMPs.

CCD Nutrient Management specialists are certified through a rigorous 12-day training series and pass an exam to obtain certification. The training series includes the following:

- (1) Nutrient Management Orientation
- (2) Managing Manure Nutrients Workshop
- (3) Stormwater and Soil Loss Workshop
- (4) P-Index Workshop
- (5) Plan Writing Workshop
- (6) ACA and Manure Storage Workshop
- (7) Plan Review Workshop

CCD and SCC staff receive web-based training and written guidance on the procedures to document the BMP in the PracticeKeeper Geodatabase (SOP No. CBO-DATA-003, [Nutrient Management Program Administrative Manual](#), and the accompanying DEP Clean Water Academy Learning Modules.)

## Chesapeake Bay Agricultural Inspection Program

Pennsylvania's Chesapeake Bay Agriculture Inspection Program (CBAIP) is a phased regulatory farm inspection program implemented by DEP and participating County Conservation Districts (CCDs) to track Manure Management Plans (MMPs), Agriculture Erosion and Sediment Control (Ag. E&S) plans, Nutrient Balance Sheets (NBSs) and other agricultural BMPs. This program uses the PracticeKeeper Geodatabase to document plans, their related BMPs, and agricultural inspections. Through this program, Pennsylvania verifies plan completeness and implementation as well as BMP implementation. There are three inspection types as part of this program: Initial Inspections, Follow-up Inspections, and Phase 2 Inspections. The procedures for CBAIP inspections are outlined in the [Chesapeake Bay Agricultural Inspection Program SOP No. CBO-INSP-001](#).

**Sector:** Agriculture, Animal and Natural

**BMP List:**

Access Road	Heavy Use Area Protection
Animal Mortality Facility	Hedgerow Planting
RI-2 Animal Compost Structure	Integrated Pest Management
Animal Trails and Walkways	Lined Waterway or Outlet
Brush Management	Pipeline
Composting Facility	Prescribed Grazing
Conservation Cover	RI - 15 Rotational Grazing
Constructed Wetland	Pumping Plant
Contour Buffer Strips	Riparian Forest Buffer
Contour Farming	RI-10 Forest Buffer on Watercourse
	RI-9 Forest Nutrient Exclusion Area on Watercourse
Critical Area Planting	- Narrow
Diversion	Riparian Herbaceous Cover



Fence	RI-8 Grass Buffer on Watercourse
Exclusion Fence with Forest Buffer	Roof Runoff Structure
Exclusion Fence with Grass Buffer	RI - 16 Barnyard Clean Water Diversion
Field Border	Roofs and Covers
Filter Strip	Seasonal High Tunnel System for Crops
Forage and Biomass Planting	Sediment Basin
Forest Stand Improvement	Spring Development
Grassed Waterway	Stream Crossing
Streambank and Shoreline Protection	Waste Storage Facility
Stripcropping	RI-1 Dry Waste Storage Structure
Structure for Water Control	Waste Transfer
Subsurface Drain	Waste Treatment
Terrace	Water Well
Trails and Walkways	Watering Facility
Underground Outlet	RI - 18 Watering Trough
Upland Wildlife Habitat Management	Wetland Creation
Vegetated Treatment Area	Wetland Restoration
Soil Conservation and Water Quality Plans	Wetland Wildlife Habitat Management

*Nutrient Management BMPs:* Core N, Core P, N Placement, N Rate, N Timing, P Placement, P Rate, P Timing

*Soil Conservation and Water Quality Plans:* Ag. E&S Plans are verified as part of all CBAIP inspections completed. The results of this verification are described on the [CBAIP Inspection Report](#) according to the [Chesapeake Bay Agricultural Inspection Program SOP No. CBO-INSP-001](#). Soil Conservation and Water Quality Plans are directly reported from the results of the assessment of Ag. E&S Plans during the CBAIP inspection. The results of the inspections are recorded in the PracticeKeeper Geodatabase according to PracticeKeeper – Agriculture Inspections Module SOP No. CBO-DATA-002 and the accompanying DEP Clean Water Academy (CWA) learning module. An export excel file is downloaded from the PracticeKeeper Geodatabase including the data entered at the time of the inspection according to the program procedures listed above. The file is then submitted to Barry Evans for additional QA/QC and Ted Tesler for incorporation into the BMP Data Warehouse and eventually to EPA Chesapeake Bay Program Office through NEIEN.

*Manure Management Plans (MMP) and Nutrient Balance Sheets (NBS):* As outlined in the procedures listed above, MMPs and NBSs are verified as part of all CBAIP inspections completed. At a minimum, a statistically significant subsample of agricultural operations with known MMPs and Nutrient Balance Sheets (NBSs) in the Pennsylvania portion of the Chesapeake Bay Watershed is inspected as part of the CBAIP annually. The subsample size will assure a maximum 5% margin of error and 95% confidence level. Based on inspections conducted as part of the CBAIP, a unique rate of nutrient management BMP implementation is determined for each county in the Pennsylvania portion of the Chesapeake Bay Watershed. The county-specific implementation rate is derived from a county-level analysis of data obtained during the on-site inspection of nutrient application and setback records as well as farmer interviews during the CBAIP inspection.

The data for each inspection is documented on the [CBAIP Inspection Report](#) according to the [Chesapeake Bay Agricultural Inspection Program SOP No. CBO-INSP-001](#). It is also recorded in the PracticeKeeper Geodatabase according to the PracticeKeeper-Agriculture Inspection Module SOP No. CBO-DATA-002, [Nutrient Management Program Administrative Manual](#), and accompanying web-based trainings found on the DEP Clean Water Academy. Acres of each planned Supplemental Nutrient Management BMP is recorded and related to the MMP in the PracticeKeeper Geodatabase. To determine implemented acres of Core N and Core P, the county-specific implementation rate is then applied to the acres that have planned nutrient application recommendations identified in the known universe of MMPs tracked and recorded in the PracticeKeeper Geodatabase within the respective county. Only acres with verified MMPs within the Chesapeake Bay Watershed are considered. Similarly, the county specific implementation rate is applied to the acres planned of each specific Supplemental Nutrient Management BMP (Rate N & P, Placement N & P, Timing N &P) to determine the acres of implemented Supplemental Nutrient Management in the respective county.

*All other BMPs tracked and recorded as part of the CBAIP* are recorded as follows:

All data is tracked and recorded in the PracticeKeeper Geodatabase according to the PracticeKeeper – Best Management Practice (BMP) Module SOP No. CBO-DATA-003.

b) Attributes Tracked:

- i) BMP type
- ii) BMP subtype
- iii) Status
- iv) Geographic Scale
  - (1) Manually drawn BMP.
    - (a) Latitude and Longitude is based on the calculated centroid of the BMP.
    - (b) County is derived from the intersection of the drawn BMP and county boundaries.
    - (c) Watershed is derived from the intersection of the drawn BMP and watershed boundaries.

v) Dates

- (1) Planned
- (2) Inventory & Evaluation
- (3) Surveyed
- (4) Design Approved
- (5) Implemented

vi) BMP Participants

- (1) Designer
- (2) Design Reviewer
- (3) Design Approver
- (4) Implementer
- (5) Planner

vii) Implemented Amount

viii) Unit of Measure

ix) Funding Source, Amount, and Date

x) Inspections (Reverification Data)

- (1) Inspector Name
- (2) Date Inspection Performed
- (3) BMP Compliance
- (4) Verified Amount

- c) Potential sources of duplicate BMPs
  - i) BMPs that were implemented using funding sources that are reported separately including USDA programs, Conservation Excellence Grant, REAP, Growing Greener, 319, NFWF, PennVest or DCNR grants.
    - (1) If a BMP is solely or co-funded with any of the funding sources listed above, it is removed from the exported dataset before reporting to NEIEN.
- d) Data Entry Errors
  - i) Obvious data entry errors such as implementation dates, etc. are communicated with the entity responsible for data entry and they are asked to correct the data before submission to NEIEN.

An export excel file is downloaded from the PracticeKeeper Geodatabase with other BMP data. BMPs related to the following funding programs are submitted on the same excel file:

- (1) Act 13 Unconventional Gas Funds
- (2) Ag. Plan Reimbursement Program
- (3) County Action Plan Implementation Grants
- (4) Chesapeake Bay Special Projects (CBIG)
- (5) DEP Streambank Fencing
- (6) Exelon
- (7) Mariner East 2 Grant
- (8) NRCS Conservation Technical Assistance, and
- (9) Privately funded BMPs

Privately funded BMPs are reported in the PracticeKeeper Geodatabase as part of the required output measures associated with the following Agricultural Programs:

- (1) Nutrient and Manure Management Program
- (2) Chesapeake Bay Technicians
- (3) Chesapeake Bay Engineers (CBIG)
- (4) Pennsylvania's Chesapeake Bay Agriculture Inspection Program

A BMP is not reported if it was funded by a funding source that is reported by another program. For example, all practices funded by USDA programs or DCNR grants that are also within the credit duration of the BMP will be removed from the dataset before reporting to NEIEN. The file is then submitted to Barry Evans for additional QA/QC and Ted Tesler for incorporation into the BMP Data Warehouse and eventually to EPA Chesapeake Bay Program Office through NEIEN.

**Verification of Implementation – Responsible Party:** County Conservation District Chesapeake Bay Technicians

**Reverification of BMP – Responsible Party:** County Conservation District staff participating in the Chesapeake Bay Agriculture Inspection Program (CBAIP)

**Reverification of BMP – Timeline:** Within the credit duration of the BMP

**Initial Implementation Date:** Recorded in the PracticeKeeper Geodatabase as the date the practice is initially verified as meeting the BMP definition after the implementation of the BMP (within the same construction season as installation)

**Reinspection/Reverification Date:** Recorded in the PracticeKeeper Geodatabase as the date the inspection of the BMP occurred.

**Location Information:** BMP is manually drawn in the PracticeKeeper Geodatabase by the individual that has verified the BMP as implemented and is updated as needed upon reverification.

**BMP Credit Duration Tacking:** All BMPs in the PracticeKeeper Geodatabase with a known Chesapeake Bay Partnership BMP Crosswalk have the credit duration associated with the PracticeKeeper BMP. As County Conservation Districts (CCD), State Conservation Commission (SCC), and DEP staff interact with the agricultural operation, they are encouraged to reverify the BMP when they are on-site. Some programs, such as the Act 38 Nutrient Management Program may require this verification if the BMP is part of the Nutrient Management Plan. A report can be downloaded from the PracticeKeeper Geodatabase identifying the BMPs that are approaching or are past the credit duration of the BMP. As the Chesapeake Bay Agriculture Inspection Program (CBAIP) transitions to Phase 2, the participating CCDs and DEP regional offices will be encouraged to prioritize the operations with multiple BMPs appearing on the report for CBAIP Phase 2 Inspections. If the BMP is not functioning at the time of the Phase 2 Inspection and it is required to comply with state Agriculture Erosion and Sediment Control, Manure Management, or Nutrient Management Regulations, the agricultural operation will be offered a timeline to repair the BMPs. If the required BMPs have not been repaired by the deadlines provided in the inspection report, CCDs may refer to DEP or the SCC for enforcement. Regardless of if the BMP is required for regulatory compliance, the BMP will be identified as a non-functioning BMP in the PracticeKeeper Geodatabase until the time that it is appropriately maintained. If a BMP is indicated as non-functioning it will be removed from the dataset before submission to NEIEN.

**“Resource improvement” practices that have been implemented without public cost-share funds:** If a practice is implemented to meet NRCS Field Office Technical Guide standards and specifications it can be recorded as the NRCS practice regardless of if the practice was funded with public funds. Based on the professional judgement of the trained individual performing the BMP verification, if there is a question about if the practice meets NRCS standards and specifications, the practice is identified as a resource improvement practice if it meets the visual indicators identified in the *Chesapeake Bay Program Resource Improvement Practice Definitions and Verification Visual Indicators Report*, July 2014.

**Collected Data:** All data is tacked and recorded in the PracticeKeeper Geodatabase according to the PracticeKeeper – Best Management Practice (BMP) Module SOP No. CBO-DATA-003.

**Attributes Tracked:**

1. BMP type
2. BMP subtype
3. Status
4. Geographic Scale
  - a. Manually drawn BMP.

- i. Latitude and Longitude is based on the calculated centroid of the BMP.
    - ii. County is derived from the intersection of the drawn BMP and county boundaries.
    - iii. Watershed is derived from the intersection of the drawn BMP and watershed boundaries.
  5. Dates
    - a. Planned
    - b. Inventory & Evaluation
    - c. Surveyed
    - d. Design Approved
    - e. Implemented
  6. BMP Participants
    - a. Designer
    - b. Design Reviewer
    - c. Design Approver
    - d. Implementer
    - e. Planner
  7. Implemented Amount
  8. Unit of Measure
  9. Funding Source, Amount, and Date
  10. Inspections (Reverification Data)
    - a. Inspector Name
    - b. Date Inspection Performed
    - c. BMP Compliance
    - d. Verified Amount
- e) Identification of compliant, noncompliant, and failed BMPs or systems, and the information used to amend the program's tracking database - All BMPs in the PracticeKeeper Geodatabase with a known Chesapeake Bay Partnership BMP Crosswalk have the credit duration associated with the PracticeKeeper BMP. As County Conservation Districts (CCD), State Conservation Commission (SCC), and DEP staff interact with the agricultural operation, they are encouraged to reverify the BMP when they are on-site. Some programs, such as the Act 38 Nutrient Management Program may require this verification if the BMP is part of the Nutrient Management Plan. If the BMP is not functioning at the time of the Phase 2 Inspection and it is required to comply with state Agriculture Erosion and Sediment Control, Manure Management, or Nutrient Management Regulations, the agricultural operation will be offered a timeline to repair the BMPs. If the required BMPs have not been repaired by the deadlines provided in the [CBAIP Inspection Report](#) or [NM Status Review Report](#), CCDs may refer to DEP or the SCC for enforcement. Regardless of if the BMP is required for regulatory compliance, the BMP will be identified as a non-functioning BMP in the PracticeKeeper Geodatabase until the time that it is appropriately maintained. If a BMP is indicated as non-functioning it will be removed from the dataset before submission to NEIEN.
- f) Qualifications
  - i) CCD and SCC staff receive classroom, web-based, and on-the-job training to determine that the installed BMP meets the BMP definition. If the BMP is reported as implemented in the PracticeKeeper Geodatabase, it is assumed that the BMP meets the BMP definition. CCD staff often have NRCS Job

approval authority for planning, inventory & evaluation, design, and construction of the BMPs verified as NRCS BMPs.

- ii) CCD Nutrient Management specialists are certified through a rigorous 12-day training series and pass an exam to obtain certification. The training series includes the following:
  - (1) Nutrient Management Orientation
  - (2) Managing Manure Nutrients Workshop
  - (3) Stormwater and Soil Loss Workshop
  - (4) P-Index Workshop
  - (5) Plan Writing Workshop
  - (6) ACA and Manure Storage Workshop
  - (7) Plan Review Workshop
- iii) CCD and SCC staff receive web-based training and written guidance on the procedures to document the BMP in the PracticeKeeper Geodatabase (SOP No. CBO-DATA-003, [Nutrient Management Program Administrative Manual](#), and the accompanying DEP Clean Water Academy Learning Modules.)

## **Agricultural Planning Reimbursement Program**

PA's Agricultural Planning Reimbursement Program was a 4- year state funded program through which agricultural operators/landowners in Pennsylvania's portion of Chesapeake Bay Watershed could be reimbursed for fees they paid to consultants to create Manure Management Plans (MMPs), Nutrient Management Plans (NMPs), and Agriculture Erosion & Sediment Control Plans (Ag E&S Plans). This program was open to all agricultural operators/landowners in Pennsylvania's Chesapeake Bay watershed from August 2017 through June 2021.

Plans and associated agricultural and natural BMPs are further verified or updated with surveys, inspections or visits by DEP or the County Conservation District and updated or verified in PracticeKeeper as needed. As DEP and CCD staff interact with the plans and BMPs as part of normal workflow, the BMPs will be reverified and reported according to the PracticeKeeper – Best Management Practice (BMP) Module SOP No. CBO-DATA-003 003 and accompanying DEP Clean Water Academy web-based training. If a plan has been approved and entered on the Conservation District tenant, DEP did not enter or accept the BMPs from the PracticeKeeper Partner BMP Module. BMP information entered on the PracticeKeeper Partner BMP Module was reviewed for accuracy by Lisa Beatty before acceptance into the PracticeKeeper Geodatabase.

*Act 38 Nutrient Management Plans* are written and reviewed by Certified Nutrient Management Specialists and formally approved by County Conservation District (CCD) Boards or the State Conservation Commission (SCC). All CAOs and CAFOs are inspected annually to assure that the plan is being implemented and is on schedule. The frequency and number of on-site status reviews is outlined in the [Nutrient Management Program Administrative Manual](#). A certified Nutrient Management Specialist will annually assess the compliance of the operation and implementation of the Nutrient Management Plan using the [NM Status Review Report](#).

*Manure Management Plans* MMPs and NBSs are verified as part of all CBAIP inspections completed. At a minimum, a statistically significant subsample of agricultural operations with known MMPs and Nutrient Balance Sheets (NBSs) in the Pennsylvania

portion of the Chesapeake Bay Watershed is inspected as part of the CBAIP annually. The subsample size will assure a maximum 5% margin of error and 95% confidence level. Based on inspections conducted as part of the CBAIP, a unique rate of nutrient management BMP implementation is determined for each county in the Pennsylvania portion of the Chesapeake Bay Watershed. The county-specific implementation rate is derived from a county-level analysis of data obtained during the on-site inspection of nutrient application and setback records as well as farmer interviews during the CBAIP inspection.

The data for each inspection is documented on the [CBAIP Inspection Report](#) according to the [Chesapeake Bay Agricultural Inspection Program SOP No. CBO-INSP-001](#). It is also recorded in the PracticeKeeper Geodatabase according to the PracticeKeeper-Agriculture Inspection Module SOP No. CBO-DATA-002, [Nutrient Management Program Administrative Manual](#), and accompanying web-based trainings found on the DEP Clean Water Academy. Acres of each planned Supplemental Nutrient Management BMP is recorded and related to the MMP in the PracticeKeeper Geodatabase. To determine implemented acres of Core N and Core P, the county-specific implementation rate is then applied to the acres that have planned nutrient application recommendations identified in the known universe of MMPs tracked and recorded in the PracticeKeeper Geodatabase within the respective county. Only acres with verified MMPs within the Chesapeake Bay Watershed are considered. Similarly, the county specific implementation rate is applied to the acres planned of each specific Supplemental Nutrient Management BMP (Rate N & P, Placement N & P, Timing N &P) to determine the acres of implemented Supplemental Nutrient Management in the respective county.

- g) Describe how verification protocols and procedures are being routinely carried out for each BMP and for each tracking mechanism with an emphasis on the following:

**Sector:** Agriculture, Animal Natural

***BMP List:***

Access Road	Roof Runoff Structure
Animal Trails and Walkways	Roofs and Covers
Composting Facility	Sediment Basin
Conservation Cover	Spring Development
Contour Farming	Stream Crossing
Critical Area Planting	Streambank and Shoreline Protection
Diversion	Stripcropping
Fence	Structure for Water Control
Field Border	Subsurface Drain
Filter Strip	Terrace
Forage and Biomass Planting	Trails and Walkways
Forest Stand Improvement	Underground Outlet
Grassed Waterway	Vegetated Treatment Area
Heavy Use Area Protection	Waste Storage Facility
Integrated Pest Management	Waste Transfer
Lined Waterway or Outlet	Water and Sediment Control Basin
Pipeline	Water Well
Prescribed Grazing	Watering Facility
Riparian Forest Buffer	Wetland Wildlife Habitat Management
Exclusion Fence with Grass Buffer	

Nutrient Management: Core N, Core P, and Supplemental Nutrient Management

**Verification of Implementation – Responsible Party:** Contracted Ag. E&S, NMP, and MMP Plan Writers

**Reverification of BMP – Responsible Party:** DEP Regional Office staff, County Conservation District staff participating in the Chesapeake Bay Agriculture Inspection Program (CBAIP), or other qualified technical staff.

**Reverification of BMP – Timeline:** Within the credit duration of the BMP

**Initial Implementation Date:** Recorded in the PracticeKeeper Geodatabase as the date the practice is initially verified as meeting the BMP definition after the implementation of the BMP (within the same construction season as installation)

**Reinspection/Reverification Date:** Recorded in the PracticeKeeper Geodatabase as the date the inspection of the BMP occurred.

**Location Information:** BMP is manually drawn in the PracticeKeeper Geodatabase by the individual that has verified the BMP as implemented and is updated as needed upon reverification.

**BMP Credit Duration Tacking:** All BMPs in the PracticeKeeper Geodatabase with a known Chesapeake Bay Partnership BMP Crosswalk have the credit duration associated with the PracticeKeeper BMP. As County Conservation Districts (CCD), State Conservation Commission (SCC), and DEP staff interact with the agricultural operation, they are encouraged to reverify the BMP when they are on-site. Some programs, such as the Act 38 Nutrient Management Program may require this verification if the BMP is part of the Nutrient Management Plan. A report can be downloaded from the PracticeKeeper Geodatabase identifying the BMPs that are approaching or are past the credit duration of the BMP. As the Chesapeake Bay Agriculture Inspection Program (CBAIP) transitions to Phase 2, the participating CCDs and DEP regional offices will be encouraged to prioritize the operations with multiple BMPs appearing on the report for CBAIP Phase 2 Inspections. If the BMP is not functioning at the time of the Phase 2 Inspection and it is required to comply with state Agriculture Erosion and Sediment Control, Manure Management, or Nutrient Management Regulations, the agricultural operation will be offered a timeline to repair the BMPs. If the required BMPs have not been repaired by the deadlines provided in the inspection report, CCDs may refer to DEP or the SCC for enforcement. Regardless of if the BMP is required for regulatory compliance, the BMP will be identified as a non-functioning BMP in the PracticeKeeper Geodatabase until the time that it is appropriately maintained. If a BMP is indicated as non-functioning it will be removed from the dataset before submission to NEIEN.

**Describe how you ensure the proper identification of relevant BMPs as “resource improvement” practices that have been implemented without public cost-share funds:** If a practice is implemented to meet NRCS Field Office Technical Guide standards and specifications it can be recorded as the NRCS practice regardless of if the practice was funded with public funds. Based on the professional judgement of the trained



individual performing the BMP verification, if there is a question about if the practice meets NRCS standards and specifications, the practice is identified as a resource improvement practice if it meets the visual indicators identified in the *Chesapeake Bay Program Resource Improvement Practice Definitions and Verification Visual Indicators Report*, July 2014.

**Describe information collected to ensure that reported BMPs follow CBP approved definitions of the practices. Describe the critical information that is documented, if applicable, and include links or reference to inspection forms:**

1. *Act 38 Nutrient Management Plans* are written and reviewed by Certified Nutrient Management Specialists and formally approved by County Conservation District (CCD) Boards or the State Conservation Commission (SCC). This procedure is outlined in [25 Pa. Code § 83.261 and 25 Pa. Code § 83.361](#). The procedures are further described in program guidance documents, the [Nutrient Management Program Administrative Manual](#) and [Pennsylvania Act 38 Nutrient Management Program Technical Manual](#). Certified Nutrient Management Specialists must attend a 12-day training series and pass an exam to obtain certification. Identification of resource problem areas, prescribing appropriate BMPs to address the problem areas, and verification that the BMPs are appropriately installed is an integral part of the training series. BMPs described in the NRCS Field Office Technical Guide may be used address manure and stormwater resource concerns identified in the plan, and all other BMPs must be approved by the State Conservation Commission. This is outlined in [25 Pa. Code § 83.311, 25 Pa. Code § 83.321, and 25 Pa. Code § 83.351](#). Therefore, nearly all BMPs required in Act 38 Nutrient Management Plans will meet NRCS Standards and Specifications once implemented. BMP type, implementation date, implemented amount, unit of measure, location data, and other identifying information are all recorded in the PracticeKeeper Geodatabase on the related BMP by CCD or SCC staff according to the PracticeKeeper – Best Management Practice (BMP) Module SOP No. CBO-DATA-003 and accompanying DEP Clean Water Academy web-based training. Nutrient Management BMPs are recorded in the Nutrient Management Plan Module of the PracticeKeeper Database according to the guidance in the [Nutrient Management Program Administrative Manual](#) and accompanying web-based trainings found on the DEP Clean Water Academy.
2. *Agriculture Erosion and Sediment Control Plans (Ag. E&S Plan)* must include BMPs designed to minimize the potential for accelerated erosion and sedimentation from agricultural plowing or tilling activities and animal heavy use areas. Commonly, BMPs identified in Ag. E&S Plans are described in the PA NRCS Field Office Technical Guide and, once implemented, meet NRCS Standards and Specifications. Based on the professional judgement of the individual preparing the plan, their knowledge of NRCS standards and specifications and the *Chesapeake Bay Program Resource Improvement Practice Definitions and Verification Visual Indicators Report*, July 2014, if appropriate, the BMP is verified as implemented and the implementation date is identified in

the implementation schedule of the Ag. E&S Plan. This process and associated template documents is thoroughly described in the [Soil Erosion and Sediment Control Manual for Agricultural Operations](#) and the [Ag. Erosion and Sediment Control Manual DEP Clean Water Academy Training](#). BMP type, implementation date, implemented amount, unit of measure, location data, and other identifying information are all recorded in the PracticeKeeper Geodatabase through the Partner BMP Module and DEP BMP quality assurance/quality control and approval process. Any associated BMPs are then related to the Ag. E&S Plan.

3. *Manure Management Plans (MMP)* that are written according to the guidance in the [Manure Management Manual](#) will include BMPs related to pasture management, animal concentration areas, manure storage facilities, and nutrient management. As stated in [25 Pa. Code § 91.36](#), the Manure Management Manual and Pennsylvania Technical Guide (NRCS Field Office Technical Guide) contain current engineering and agronomic practices that meet the regulatory requirements for manure storage facilities in Pennsylvania. Therefore, nearly all manure storage facilities recorded as part of Manure Management Plans written according to the guidance in the Manure Management Manual will be implemented according to NRCS practice standards and specifications. Additionally, one option to meet the pasture management requirements outlined in the Manure Management Manual is to develop and implement an NRCS 528 Prescribed Grazing Plan. For the BMPs identified in the MMP, such as Waste Storage Facilities and Prescribed Grazing, the BMP type, implementation date, implemented amount, unit of measure, location data, and other identifying information are all recorded in the PracticeKeeper Geodatabase through the Partner BMP Module and DEP BMP quality assurance/quality control and approval process. Nutrient Management BMPs are recorded in the Nutrient Management Plan Module of the PracticeKeeper Database by DEP staff according to the guidance in the [Nutrient Management Program Administrative Manual](#) and accompanying web-based trainings found on the DEP Clean Water Academy. Any associated BMPs are then related to the MMP.

***Identification of compliant, noncompliant, and failed BMPs or systems, and the information used to amend the program's tracking database*** - All BMPs in the PracticeKeeper Geodatabase with a known Chesapeake Bay Partnership BMP Crosswalk have the credit duration associated with the PracticeKeeper BMP. As County Conservation Districts (CCD), State Conservation Commission (SCC), and DEP staff interact with the agricultural operation, they are encouraged to reverify the BMP when they are on-site. Some programs, such as the Act 38 Nutrient Management Program may require this verification if the BMP is part of the Nutrient Management Plan. If the BMP is not functioning at the time of the Phase 2 Inspection and it is required to comply with state Agriculture Erosion and Sediment Control, Manure Management, or Nutrient Management Regulations, the agricultural operation will be offered a timeline to repair the BMPs. If the required BMPs have not been repaired by the deadlines provided in the [CBAIP Inspection Report](#) or [NM Status Review Report](#), CCDs may refer to DEP or the SCC for enforcement. Regardless of if the BMP is required for regulatory compliance, the BMP will be identified

as a non-functioning BMP in the PracticeKeeper Geodatabase until the time that it is appropriately maintained. If a BMP is indicated as non-functioning it will be removed from the dataset before submission to NEIEN.

### ***Qualifications of Program Personnel***

Contractors attended an afternoon training session for completing Agricultural Planning administrative reviews via webinar on September 21, 2017. Guidance used by the contractors to determine whether the Ag E&S plan is administratively complete, can be found here: [Ag E & S Plan Checklist](#). The guidance used by the contractors to determine whether a MMP is administratively complete, can be found here: [MMP Admin Complete Guide](#).

Certified Nutrient Management Specialists must attend a 12-day training series and pass an exam to obtain certification. The training series includes the following courses:

1. Nutrient Management Orientation
2. Managing Manure Nutrients Workshop
3. Stormwater and Soil Loss Workshop
4. P-Index Workshop
5. Plan Writing Workshop
6. ACA and Manure Storage Workshop
7. Plan Review Workshop

CCD staff receive classroom, web-based, and on-the-job training to determine that the installed BMP meets the BMP definition. If the BMP is reported as implemented in the PracticeKeeper Geodatabase, it is assumed that the BMP meets the BMP definition. CCD staff often have NRCS Job approval authority for planning, inventory & evaluation, design, and construction of the BMPs verified as NRCS BMPs.

CCD staff receive web-based training and written guidance on the procedures to document the BMP in the PracticeKeeper Geodatabase (SOP No. CBO-DATA-003, [Nutrient Management Program Administrative Manual](#), and the accompanying DEP Clean Water Academy Learning Modules.)

## **Pennsylvania Agriculture Conservation Stewardship Program (PACS)**

PACS is a conceptual voluntary program designed to recognize and provide certain benefits to Pennsylvania farmers who step forward to document their environmental stewardship. The program focuses on ensuring farmers meet Pennsylvania environmental regulatory compliance (soil conservation and manure management) along with the utilization of practices that demonstrate the farmer's conservation stewardship addressing all resource concerns on the farm.

The program relies on third party entities to perform environmental assessments of farms applying for recognition, with the oversight of the local county conservation district or other designated entity to administer and provide assessment of program applications.

For conservation districts that choose to support the implementation of this program, the conservation district will provide on-farm inspections on at least 10% of the farms submitting PACS program applications to the conservation district for consideration. These inspections will be considered as counting towards the county's Chesapeake Bay agriculture initial inspection goal if the farm has not been previously accounted for in the

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inspection program, the farm is not a prior identified Confined Animal Operation (CAO) or Confined Animal Feeding Operation (CAFO) with an approved nutrient management plan, and the inspection is performed consistent with the with Standard Operating Procedure No. BCW-INSP-018, *Chesapeake Bay Agricultural Inspection Program.*, including the completion of the required inspection report and the record keeping and compliance follow up. For every 10 applications received by participating conservation districts, there will be a minimum of one on-farm inspection completed. This language is included in the Technician Agreement.

The scope of work for this program would be covered within the Ag Inspection SOP here: [http://files.dep.state.pa.us/Water/BNPNSM/AgriculturalOperations/AgriculturalCompliance/Final\\_SOP\\_Chesapeake\\_Bay\\_Agricultural\\_Inspection\\_Program.pdf](http://files.dep.state.pa.us/Water/BNPNSM/AgriculturalOperations/AgriculturalCompliance/Final_SOP_Chesapeake_Bay_Agricultural_Inspection_Program.pdf).

This is currently a pilot program in a few counties.

*BMPS captured:*

**Nutrient Management, Soil Conservation and Water Quality Plans, Animal Waste Management Systems, Manure Treatment Technologies, Prescribed Grazing, Barnyard Runoff Controls and Loafing Lot Management, Grassed Buffers- with and without Stream Fencing, Forested Buffers- with and without Stream Fencing and other Ag BMPs.**

## **Capital Area Resource Conservation & Development (RC&D) Conservation Tillage Survey**

Cropland residue transect survey procedures used by the Pennsylvania Chesapeake Bay Counties Survey were adapted from those developed by the Conservation Technology Information Center (CTIC) and detailed by the National Crop Residue Management Survey on their website, [www.ctic.org/CRM](http://www.ctic.org/CRM). Survey procedures are described in "Revised & Simplified Cropland Roadside Transect Survey: Procedures for Using the Cropland Roadside Transect Survey for Obtaining Tillage/Crop Residue Data," available online at [https://efotg.sc.egov.usda.gov/references/Delete/2003-10-06/nb\\_450\\_2\\_2\\_a1%5B1%5D.pdf](https://efotg.sc.egov.usda.gov/references/Delete/2003-10-06/nb_450_2_2_a1%5B1%5D.pdf). According to this document, "When conducted properly, this cropland transect survey procedure provides a high degree of confidence in the data summaries. Users can have 90% or more confidence in the accuracy of the results". The Chesapeake Bay Counties Survey uses CTIC procedures and data collection standards with the goal of collecting data that can be authenticated and published by CTIC.

In addition to working within CTIC guidelines, quality assurance and quality control components are detailed below.

**Survey Routes** - Routes were developed for each county using the CTIC procedures and were adapted to a hilly geography. Each county survey route was developed by a local county agriculture technician with route development guidance adapted from CTIC guidelines. The routes will be reused for each future resurvey.

**Survey Teams and Qualifications** – County survey teams are staffed by three individuals; two of whom work in multiple counties to achieve greater consistency of process between counties. Each team includes one county agriculture agency staffer (from the county to be surveyed), one consulting technician and one data entry technician, with the consulting and data entry technicians staffing multiple counties. A description of each observation (identification of the growing crop and estimation of the percentage of residue cover) is made by the consulting technicians. Qualifications for this position include extensive experience as an agricultural professional working with crop land. The Data Entry Technician qualifications include experience with mapping and GIS data. The county agricultural agency member is typically from the conservation district and is selected for their knowledge of agriculture in the surveyed county.

**Training** – The training was developed by the survey organizer, Capital RC&D, in collaboration with a technical consultant, Joel Myers. A one-day training is required for the entire survey team. Training includes an overview of the entire survey process and review of multiple in-field examples of crop residue. The training is supported by multiple photo guides and written survey procedures. Training may be modified and expanded depending upon the experience of the consulting technicians. In-field post-training testing of the consulting technicians is done during the first week of the survey by the technical consultant and documented for quality assurance. Evaluation of the data entry technicians is also conducted by the technical consultant and documented. This training was shown to be effective for the 2012/2013 tillage survey.

**Data Collection and Entry** – Survey data is entered electronically during the survey using an Excel-based data entry sheet with drop-down data selection on a tablet computer. The data entry technicians are responsible for locating and confirming each data point, using GPS and entry of the observation information for each data point into the data entry sheet. The GPS waypoints are pre-loaded and appear on screen in a map of the survey route. The pre-entered points were visited in previous surveys. The location of the survey vehicle is tracked on the tablet GPS and shown on the map. With this system the data points can be found easily and entered with minimal data entry error.

**Independent Verification of Data** – Independent verification of the data collected by each survey technician is conducted by the technical consultant during the first two weeks of the survey. Ten-percent of the crop observations of each technician is visited and documented. Review of the verification documents is performed by Capital RC&D and results of that review are reported to the technical consultant and the survey technician team. Any concerns are appropriately addressed to ensure data reliability.

**External Validation of Data** – Data summaries are developed from the collected data for each county and entered in the CTIC data collection system. CTIC authenticates and publishes the residue data on an annual basis.

**Chesapeake Bay Program Partnership Agricultural Workgroup Approval:** This methodology was approved by the Chesapeake Bay Program Partnership. The final approval can be found here:

[https://www.chesapeakebay.net/channel\\_files/24633/agwg\\_draft\\_call\\_summary\\_121516\\_2.pdf](https://www.chesapeakebay.net/channel_files/24633/agwg_draft_call_summary_121516_2.pdf).

*BMPs Captured:*  
**Tillage Practices**

## Capital Area RC&D Cover Crop Survey

Cover crop transect survey procedures were developed with the technical expertise of a project team consisting of four former NRCS technical staff and reviewed by Mark Dubin, the Chesapeake Bay Program *Cover Crop Expert Panel* Coordinator. The project team considered important variables identified in the Chesapeake Bay Program's "Cover Crop Expert Panel Draft Report" to determine observable cover crop attributes that impact nitrogen reduction. The first survey was implemented in five counties to test if these attributes could be reliably collected using a transect survey method. These attributes included cover crop species, estimated date of planting, density of the planted crop, planting method and occurrence of fall application of manure.

The transect survey route for each county was created using procedures adapted from a method developed and tested by the Conservation Technology Information Center (CTIC) and detailed as the National Crop Residue Management Survey on their website, [www.ctic.org/CRM](http://www.ctic.org/CRM). The cover crop transect survey route and observation points were determined and used by a transect survey of crop residue carried out during 2012 and 2013. Routes were developed for each county using the CTIC procedures adapted to the regional road layout in Pennsylvania

Information collected by the 2015 cover crop survey teams included attributes required to characterize cover cropping for the Chesapeake Bay Model and provide data useful for ag agency understanding of current practices. They include, harvested crop, cover crop species, planting method, cover crop density, estimated days from planting (based on cover crop height), and manure application.

**Survey Team Duties and Qualifications** – County survey teams are staffed by three individuals, two of whom survey multiple counties to achieve greater consistency between counties. Each team includes:

- 1) County Agriculture Agency Staffer to drive the team along the survey route. This person is selected for their knowledge of agriculture in the surveyed county.
- 2) The Consulting Technician surveys multiple counties each year and provides the description of each observation (harvested crop, cover crop, planting method, cover crop density, estimated days from planting and manure application). The primary qualification for this position is extensive experience as an agricultural professional working with agronomic crops.
- 3) The Data Entry Technician also works in multiple counties each year. The technician guides the team along the survey route, identifies each pre-determined observation point and enters the cover crop data determined by the consulting technician. Qualification required for this position includes experience with mapping and GIS data.

**Training** – Training was developed by the survey organizer, Capital RC&D, in collaboration with a technical consultant, Joel Myers. A half-day training was required for the consulting technicians and data entry technicians and an hour-long training was provided to the county agency staff. Training included an overview of the entire survey

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process and review of multiple in-field cover crop examples. The training is supported by photos and written survey procedures. Training may be modified and expanded depending upon the experience of the consulting technicians.

**Data Collection and Entry** – Survey data is entered electronically during the survey using an Excel-based data entry sheet with drop-down data options. Data entry techs use a laptop computer with county-specific data sheets and ArcGIS maps with the survey route and points identified. The data entry technicians are responsible for locating and confirming each pre-established data point, using ArcGIS and a GPS device. At each observation point, observation information is entered into the Excel-based data entry sheet. The GPS waypoints are pre-loaded and appear on screen in a map of the survey route. The location of the survey vehicle is tracked on the GPS and shown on the map. With this system, the data points can be found easily and entered with minimal data entry error.

Following the five county survey effort, a post-survey discussion including all participants did not identify areas of significant concern regarding field identification of cover crop establishment date and estimation of cover crop density however, distinguishing between annual rye and small winter grains – particularly when the plants are very small is difficult. The group discussed the cost/benefit of taking the time to decide between those crops using a magnifying glass or other method that would result in significantly increasing the time needed to complete the survey. The consensus of the group was that sacrificing the determination of exact species (of winter grain/rye) to a default species grouping was a necessary sacrifice. The default crop species or group will be the species that has a lower nutrient impact on the model. When exact species of winter grain or rye is easily identified it will be recorded.

**Internal Independent Verification of Data** – Independent verification of the data collected by each survey technician is performed in the spring when the cover crop points are revisited to determine if the cover was harvested or burned down. Ten-percent of the crop observations of each technician are visited by an independent quality control technician and documented. Review of the verification documents are performed by Capital RC&D and results of that review reported to the technical consultant and the survey technician team. Any concerns are appropriately addressed to ensure data reliability.

**Chesapeake Bay Program Partnership Agricultural Workgroup Approval:** This methodology was approved by the Chesapeake Bay Program Partnership. The final approval can be found here: [https://www.chesapeakebay.net/channel\\_files/24633/agwg\\_draft\\_call\\_summary\\_112116.pdf](https://www.chesapeakebay.net/channel_files/24633/agwg_draft_call_summary_112116.pdf).

*BMPs captured:*

**Cover Crop (Traditional)**

**Penn State University Voluntary BMP Reporting Outreach**

*2016 Reporting:*

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The Penn State University Agricultural Voluntary BMP Reporting outreach was an effort to allow producers to voluntarily report BMPs implemented on their operations through paper or web-based forms. The survey was mailed to approximately 20,000 farmers in late January 2016, with returns accepted until the end of April 2016. A total of 6,782 were completed and returned. The reporting was comprised of agricultural BMPs installed without cost-share including structural and management action BMPs. (Structural BMPs reported as Resource Improvement (RI) Practices without known design specifications (shorter Credit Duration than BMPs meeting Federal/State Cost Share standards).

The final report (December 15, 2016) is available at the link below:

<http://files.dep.state.pa.us/Water/ChesapeakeBayOffice/Farm%20Survey%20Report%20Final%20121516.pdf>

Future producer surveys will use the revised TetraTech recommendations contained within the report at the link below:

[https://www.chesapeakebay.net/channel\\_files/25874/producer\\_survey\\_recommendation\\_report\\_2018-02-14.pdf](https://www.chesapeakebay.net/channel_files/25874/producer_survey_recommendation_report_2018-02-14.pdf)

### 2020 Reporting:

The 2020 survey of Pennsylvania farmers in Lancaster, York, Adams and Franklin Counties was conducted to provide producers an opportunity to self-report conservation practices implemented on their farms. This survey followed successful methodologies of a survey of all Pennsylvania farmers across the Chesapeake Bay watershed undertaken in 2016. The survey especially sought data on “voluntary,” non-cost shared practices. The instrument and procedures were developed in collaboration by survey research experts in Penn State’s Survey Research Center, and subject matter experts from state agencies and agriculture. The survey development and implementation process were led and managed by the Agriculture and Environment Center (AEC), Penn State University, College of Agricultural Sciences.

The survey was mailed to approximately 15,000 farmers in February 2020, with returns accepted until the end of May 2020. A total of 1,794 were completed and returned. See *Appendix F for a detailed description of the PennState Survey.*

### Data Verification Procedures

To assess the reliability of the self-reporting, approximately 10 percent of returns were selected randomly for on-farm verifications conducted by trained and experienced Penn State Extension staff. Extension educators were able to complete farm visits on approximately 10 percent of farms in Lancaster and York Counties. Farm visits in Adams and Franklin Counties are ongoing. Accordingly, statistical reliability analysis was conducted for only Lancaster and York Counties at this time. Analyses of the data reject systematic under or over reporting in the sample data for the majority of relevant conservation practices and means and 95% confidence intervals indicate reliability in the reported data. We further applied various methodologies to ensure that conservation practices reported by respondents were not already reported to the Chesapeake Bay Program through other methodologies employed by the Commonwealth.



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Information on BMPs obtained from the above survey approach was QA/QC checked and corrected as part of the survey methodology. Information on farm conservation practices QA/QC checked as part of the survey methodology is presumed to be accurate, and the data was not further checked or verified prior to inclusion in the annual submission to CBPO via NEIEN.

*Matthew Royer, Penn State University Director of Agriculture and Environment Center provided a summary procedure description for the 2016 and 2020 Penn State Survey Report detailed in Appendix F. PennState did not complete a survey in PA for 2021.*

DEP BWR&NSM is working with Mark Dubin, CBPO to explore on how to continue and improve this survey by updating these approved protocols on a regular basis.

#### *BMPs Captured:*

**Core N and P Nutrient Management, Animal Waste Management Systems, Barnyard Runoff Controls, Prescribed Grazing, Soil Conservation and Water Quality Plans, Grassed Buffers on converted cropland, with or without Stream Fencing, Forested Buffers on converted cropland, with or with and without Stream Fencing**

#### **Stream Bank Fencing**

*Data from DEP's streambank fencing program is entered in the PracticeKeeper Geodatabase by DEP Northeast Regional Office staff.*

Sector: Agriculture

BMP List: Exclusion Fence with Forest Buffer, Exclusion Fence with Grass Buffer

Verification of Implementation – Responsible Party: PA DEP Northeast Regional Office staff

Reverification of BMP – Responsible Party: PA DEP Northeast Regional Office staff, County Conservation District staff participating in the Chesapeake Bay Agriculture Inspection Program (CBAIP), or other qualified technical staff.

Reverification of BMP – Timeline: Within the credit duration of the BMP (10 years)

- h) Describe how verification protocols and procedures are being routinely carried out for each BMP and for each tracking mechanism with an emphasis on the following:

Initial Implementation Date: Recorded in the PracticeKeeper Geodatabase as the date the practice is initially verified as meeting the BMP definition after the implementation of the BMP (within the same construction season as installation)

**Reinspection/Reverification Date:** Recorded in the PracticeKeeper Geodatabase as the date the inspection of the BMP occurred.

**Location Information:** BMP is manually drawn in the PracticeKeeper Geodatabase by the individual that has verified the BMP as implemented and is updated as needed upon reverification.

BMP Credit Duration Tacking: All BMPs in the PracticeKeeper Geodatabase with a known Chesapeake Bay Partnership BMP Crosswalk have the credit duration associated with the PracticeKeeper BMP. As County Conservation Districts (CCD), State Conservation

Commission (SCC), and DEP staff interact with the agricultural operation, they are encouraged to reverify the BMP when they are on-site. Some programs, such as the Act 38 Nutrient Management Program may require this verification if the BMP is part of the Nutrient Management Plan. A report can be downloaded from the PracticeKeeper Geodatabase identifying the BMPs that are approaching or are past the credit duration of the BMP. As the Chesapeake Bay Agriculture Inspection Program (CBAIP) transitions to Phase 2, the participating CCDs and DEP regional offices will be encouraged to prioritize the operations with multiple BMPs appearing on the report for CBAIP Phase 2 Inspections. If the BMP is not functioning at the time of the Phase 2 Inspection and it is required to comply with state Agriculture Erosion and Sediment Control, Manure Management, or Nutrient Management Regulations, the agricultural operation will be offered a timeline to repair the BMPs. If the required BMPs have not been repaired by the deadlines provided in the inspection report, CCDs may refer to DEP or the SCC for enforcement. Regardless of if the BMP is required for regulatory compliance, the BMP will be identified as a non-functioning BMP in the PracticeKeeper Database until the time that it is appropriately maintained. If a BMP is indicated as non-functioning it will be removed from the dataset before submission to NEIEN.

**Collected Data:** All data is tacked and recorded in the PracticeKeeper Geodatabase according to the PracticeKeeper – Best Management Practice (BMP) Module SOP No. CBO-DATA-003.

Attributes Tracked:

- 2) BMP type
  - a) Fence
- 3) BMP subtype
  - a) Exclusion Fence with Forest Buffer
  - b) Exclusion Fence with Grass Buffer
- 4) Status
- 5) Geographic Scale
  - a) Manually drawn BMP.
    - i) Latitude and Longitude is based on the calculated centroid of the BMP.
    - ii) County is derived from the intersection of the drawn BMP and county boundaries.
    - iii) Watershed is derived from the intersection of the drawn BMP and watershed boundaries.
- 6) Dates
  - a) Planned
  - b) Inventory & Evaluation
  - c) Surveyed
  - d) Design Approved
  - e) Implemented
- 7) BMP Participants
  - a) Designer
  - b) Design Reviewer
  - c) Design Approver
  - d) Implementer
  - e) Planner
- 8) Implemented Amount
- 9) Unit of Measure

**10) Funding Source, Amount, and Date****11) Inspections (Reverification Data)**

- a) Inspector Name
- b) Date Inspection Performed
- c) BMP Compliance
- d) Verified Amount

**Identification of compliant, noncompliant, and failed BMPs or systems, and the information used to amend the program's tracking database -**

All BMPs in the PracticeKeeper Geodatabase with a known Chesapeake Bay Partnership BMP Crosswalk have the credit duration associated with the PracticeKeeper BMP. As County Conservation Districts (CCD), State Conservation Commission (SCC), and DEP staff interact with the agricultural operation, they are encouraged to reverify the BMP when they are on-site. Some programs, such as the Act 38 Nutrient Management Program may require this verification if the BMP is part of the Nutrient Management Plan. If the BMP is not functioning at the time of the Phase 2 Inspection and it is required to comply with state Agriculture Erosion and Sediment Control, Manure Management, or Nutrient Management Regulations, the agricultural operation will be offered a timeline to repair the BMPs. If the required BMPs have not been repaired by the deadlines provided in the [CBAIP Inspection Report](#) or [NM Status Review Report](#), CCDs may refer to DEP or the SCC for enforcement. Regardless of if the BMP is required for regulatory compliance, the BMP will be identified as a non-functioning BMP in the PracticeKeeper Geodatabase until the time that it is appropriately maintained. If a BMP is indicated as non-functioning it will be removed from the dataset before submission to NEIEN.

**Qualifications**

- e) DEP Northeast Regional Office staff receive classroom, web-based, and on-the-job training to determine that the installed BMP meets the BMP definition. This training includes NRCS Bootcamp, Nutrient Management Certification Series, and web-based trainings found on the DEP Clean Water Academy. If the BMP is reported as implemented in PracticeKeeper, it is assumed that the BMP meets the BMP definition.
- f) DEP Northeast Regional Office staff receive web-based training and written guidance on the procedures to document the BMP in the PracticeKeeper Geodatabase (SOP No. CBO-DATA-003 and the accompanying DEP Clean Water Academy Learning Module.)
- g) CCD, DEP, and SCC staff receive classroom, web-based, and on-the-job training to determine if the reverified BMP meets the BMP definition. This training includes NRCS Bootcamp, Nutrient Management Certification Series, and web-based trainings found on the DEP Clean Water Academy. If the BMP is reported as meeting visual indicators of the BMP definition at the time of the inspection, then it is assumed that the BMP meets the BMP definition.

## **Manure Transport**

**BMP Sector:** Agriculture, Animal  
*BMPs Captured:* Manure Transport

As required by [25 Pa. Code § 83.301](#) and Act 49 of 2004 (the Commercial Manure Hauler and broker Certification Act) and described in the [Nutrient Management and Manure Management Program Administrative Manual](#), Nutrient Balance Sheets (NBSs) are required for all manure exported from agricultural operations participating in the Act 38 Nutrient Management Program, regardless of if the manure is brokered or transferred to a known landowner for land application. The NBSs are submitted to the County Conservation District (CCD) either as part of the Act 38 Nutrient Management Plan (when the manure is transferred to a known landowner for land application), or from the manure broker (when the manure is transferred through a broker for land application). CCD Nutrient Management Specialists then review the NBSs as part of the required output measures of the Nutrient and Manure Management Delegation Agreement to verify completeness. The procedures for the review of the NBSs are outlined in the [Nutrient Management and Manure Management Program Administrative Manual](#). The NBSs and manure transferred that is associated with the NBS is tracked and recorded in the PracticeKeeper Geodatabase according to the quarterly reporting requirements described in the [Nutrient Management and Manure Management Program Administrative Manual](#) and the accompanying web-based trainings found on the DEP Clean Water Academy.

Act 38 Nutrient Management Plans and the associated exported manure is entered in to the PracticeKeeper Geodatabase by County Conservation District (CCD) and State Conservation Commission (SCC) Staff according to the guidance in the [Nutrient Management Program Administrative Manual](#) and accompanying web-based trainings found on the DEP Clean Water Academy.

**Reverification of BMP – Responsible Party:** County Conservation District Certified Nutrient Management Specialists

**Reverification of BMP – Timeline:** Within the credit duration of the BMP (1 year)

**Initial Implementation Date:** Recorded as the year of documented transport

**Reinspection/Reverification Date:** Only annual data is reported

**Location Information:** NBS (brokered manure) and Act 38 NMP (landowner for known land application) are manually drawn in the PracticeKeeper Geodatabase by the individual that has verified the NBS is complete and documents a transfer. County and address are recorded for the exporter when the manure is received from a broker. County and address of the importer is recorded when the manure is exported directly from the participating Act 38 agricultural operation to a landowner for known land application.

### **Qualifications**

- a) CCD Nutrient Management specialists are certified through a rigorous 12-day training series and pass an exam to obtain certification. The training series includes the following:
  - i) Nutrient Management Orientation
  - ii) Managing Manure Nutrients Workshop
  - iii) Stormwater and Soil Loss Workshop

- iv) P-Index Workshop
- v) Plan Writing Workshop
- vi) ACA and Manure Storage Workshop
- vii) Plan Review Workshop

## **NRCS Remote Sensing (Potomac Pilot)**

NRCS and DEP's Remote Sensing proof of concept effort to determine if aerial imagery could be used to identify and inventory BMPs was carried out in the five counties of the Potomac River Basin by analyzing grids within the study area. A total of 28 NRCS conservation practices were targeted for identification in the pilot project. The list of practices was based on BMPs that could be detected remotely. Field verification was used to assess accuracy. Five percent of farms in Somerset, Bedford, Fulton and Adams County were visited while ten percent of the farms were visited in Franklin County. Field verification methods were established based on the agreed scope of work by NRCS, DEP, and EPA. The CBP's Agriculture Workgroup approved only a limited number of practices (limited population size) based on specific remote sensing statistical standards for accuracy developed by a contractor for the Chesapeake Bay Program Partnership Agriculture Workgroup.

The final report (December 13, 2016) is available at the link below:

[https://www.chesapeakebay.net/channel\\_files/24633/assessment\\_of\\_pilot\\_remote\\_sensing\\_12-13-2016.pdf](https://www.chesapeakebay.net/channel_files/24633/assessment_of_pilot_remote_sensing_12-13-2016.pdf).

*BMPs Captured:*

**Forest Buffers, Prescribed Grazing, Access Control, Fencing, and Mortality Composters.**

## Urban Stormwater

This section describes the verification procedures for BMPs implemented to meet the National Pollutant Discharge Elimination System (NPDES) permit requirements for the Chapter 102 Construction Stormwater and Municipal Separate Stormsewer System (MS4) programs.

### ***Significance of Urban BMPs***

The Bureau of Clean Water administers the statewide Erosion and Sediment Control (E&S) and Post-construction Stormwater (PCSM) program under 25 Pa. Code Chapter 102. Chapter 102 requires an NPDES permit from DEP for construction activities with earth disturbances greater than or equal to one acre, not including agricultural plowing or tilling, animal heavy use areas, timber harvesting activities, oil and gas activities, or road maintenance activities. If eligible, persons disturbing one or more acres may apply for coverage under the PAG-01 NPDES General Permit for Discharges of Stormwater Associated with Small Construction Activities or PAG-02 NPDES General Permit for Discharges of Stormwater Associated with Construction Activities. If ineligible for PAG-01 or PAG-02 coverage, persons may apply for an individual NPDES permit using the Individual NPDES Permit Application for Discharges of Stormwater Associated with Construction Activities. Note that the PAG-01 will not become effective until March 1, 2022 and thus there will not be a significant number of BMPs to report for some time.

The Bureau of Clean Water also administers the statewide permitting of MS4s. Municipalities and other entities such as universities and prisons that meet certain standards must obtain NPDES permit coverage for discharges of stormwater from their MS4s. MS4s must apply for NPDES permit coverage or a waiver if they are located in an urbanized area as determined by the latest decennial census by the U.S. Census Bureau, or if they are designated as needing a permit by DEP. Small MS4s required to obtain permit coverage may, if eligible, apply for coverage under the 2018 NPDES General Permit for Stormwater Discharges from Small MS4s (PAG-13) which is currently in effect. Small MS4s that are ineligible for PAG-13 General Permit coverage may apply for an individual permit. In Pennsylvania, there are two Large MS4s, no Medium MS4s, and 1,059 Small MS4s.

MS4 NPDES Permit coverage is generally for a 5-year term. The applicant submits either an Individual Permit application or a "Notice of Intent" (NOI) to discharge under the statewide General Permit at least 180 days prior to the expiration date of coverage. When the statewide PAG-13 General Permit is reissued by DEP, as was done in March 2018, MS4s covered by the previous PAG-13 General Permit were automatically covered by the reissued PAG-13 General Permit if a timely NOI is submitted by the MS4. New requirements may then apply to the MS4. The MS4 can, if it chooses, apply for an individual NPDES permit in lieu of continued coverage under the reissued General Permit.

#### ➤ **Chapter 102 Construction Stormwater NPDES-Permit Required BMPs**

Land development activities that change the surface features of land alter stormwater runoff characteristics. Unmanaged changes in stormwater runoff

volume, rate, and water quality can alter the chemical, physical or biological properties of receiving waters.

E&S BMPs minimize the potential for accelerated erosion and sedimentation to protect, maintain, reclaim and restore water quality and existing and designated uses of surface waters. E&S BMPs include, but are not limited to, compost filter socks/berms, inlet protection, sediment traps, silt fence, and vegetative stabilization. E&S BMPs are inspected by delegated county conservation district staff. These staff are trained to conduct permit reviews and inspections in accordance with delegated program requirements, administrative manuals, and associated Standard Operating Procedures.

PCSM BMPs are implemented to manage the changes in the volume, rate, and quality of stormwater runoff that occur after a site is developed. PCSM BMPs include, but are not limited to, extended detention basins, infiltration basins, bioretention facilities, swales, riparian buffer restoration and wet ponds. PCSM BMPs are inspected by delegated county conservation district staff. These staff are trained to conduct permit reviews and inspections in accordance with delegated program requirements, administrative manuals, and associated Standard Operating Procedures.

➤ **MS4 NPDES-Permit Required BMPs**

The 2018 PAG-13 General Permit for MS4 permittees required permittees develop a Pollutant Reduction Plan (PRP) to improve the quality of their stormwater runoff. The PRP required permittees to estimate the existing sediment and nutrient loads generated by the area that drains to their MS4, and identify BMPs to reduce pollutant loads by the following percentages within 5 years following DEP's approval of coverage: sediment - 10%; Total Phosphorus (TP) - 5%; and Total Nitrogen (TN) - 3%.

Permittees were required to use the design specifications of the PA BMP Manual as well as the guidance materials published by the Chesapeake Stormwater Network (i.e. "expert panel reports") to develop their PRP pollutant load reduction strategies. BMPs chosen by permittees to meet the load reduction goals of their PRP included, but are not limited to, stream restoration, street sweeping, bioretention, basin retrofits, vegetation swales, and infiltration basins.

## **Ch 102 Erosion and Sediment Control (E&S) and Post Construction Stormwater Management (PCSM) BMPs**

### ***Method***

As part of the individual NPDES permit or general (PAG-01 or PAG-02) permit for Stormwater Discharges Associated with Construction Activities, an administratively complete NOI must be submitted 30 to 120 calendar days prior to the planned date for commencing any new discharge. The Program reviews the NOIs for completeness. A

complete PAG-02 NOI consists of the completed NOI form and all required attachments and Modules referenced in the NOI checklist.

The E&S Control Module 1 must be completed by all applicants for PAG-02 coverage, which serves as the narrative component of the applicant's E&S Plan under 25 Pa. Code § 102.4(b). Site-specific E&S Plan Drawings and Standard Worksheets from the E&S Manual (and additional supporting calculations where necessary) must be submitted as attachments to the NOI.

The PCSM Module 2 must be completed by all applicants for PAG-02 coverage, which serves, along with PCSM Plan Drawings and supporting calculations, as the applicant's PCSM Plan under 25 Pa. Code § 102.8. For the stormwater analysis required by 25 Pa. Code § 102.8(g), applicants whose projects do not meet criteria for site restoration projects must demonstrate the following:

- **Volume Management** – The applicant must demonstrate that the net change in runoff volume (comparing post-construction to pre-construction conditions) up to and including the 2-year/24-hour storm event will be managed, unless a more stringent design standard from a current Act 167 Plan approved by DEP within the past five years is used.
- **Peak Rate** – The applicant must demonstrate that the net change in peak rate for the 2-, 10-, 50-, and 100-year/24-hour storm events will be managed, unless a more stringent design standard or a standard based on flood protection from a current, approved Act 167 Plan is used. Small projects with less than 5 acres of earth disturbance and less than or equal to one acre of impervious surface following construction may be exempt from completing the peak rate stormwater analysis section of Module 2 (consistent with the "Small Site Exception," Worksheet 6, of the current Pennsylvania Stormwater BMP Manual).
- **Water Quality** – The applicant must demonstrate that the net change in pollutant loading up to and including the 2-year/24-hour storm event will be managed.

Other required NOI attachments include municipal and county notification forms, which serve to notify the municipality and county where the project is located and collect information on the presence of Act 167 stormwater management plans and municipal stormwater management ordinances, and a PNDI receipt documenting that the project will have No Impact, Conservation Measures, Avoidance Measures that are accepted by the applicant, or Potential Impact that is cleared through follow-up correspondence with jurisdictional agencies.

### ***BMP Verification***

25 Pa. Code §102.8 requires the long-term operation and maintenance (O&M) of PCSM BMPs. The permittee and landowner are responsible for long-term O&M unless a different person is identified in the Notice of Termination. If another party will be performing O&M, DEP must be notified. An Instrument is recorded with recorder of deeds to identify the BMPs at the facility, provide access to the site and provide notice that responsibility for O&M stays with the property even after ownership changes. Permits issued after November 19, 2010 and renewals issued after January 1, 2013, are required to meet long



term O&M requirements. Therefore, all BMPs installed after these dates have specific maintenance responsibilities assigned.

There is no established lifespan for PCSM BMPs by Pennsylvania regulation or policy. DEP considers the O&M to be a perpetual responsibility. DEP expects that perpetual O&M responsibilities include replacement of the practice with the same or better practice, if replacement is needed. In addition, any site redevelopment would require, as part of the NPDES permit, documentation of maintenance of existing practices, or replacement with appropriate practices.

Implementation and maintenance of E&S BMPs are self-verified by the responsible party or a licensed professional representative, during routine weekly inspections and after storm events until the permit for the earth disturbance activity is terminated (acknowledgment of the NOT). E&S BMPs are inspected during construction by the local Conservation District. When the NOT is provided by the permittee, information about each PCSM BMP (location, date of installation, treatment area and volume, etc.) is established in the NOT record.

NOT inspections of PCSM BMPs are completed by Conservation District staff that are trained by DEP. There are no certification requirements for inspectors; however, many inspectors have the National Institute for Certification in Engineering Technologies (NICET) certification in erosion and sediment control, or are a certified professional erosion and sediment control specialist (CPESC).

The Chapter 102 Program requires deed restrictions for all PCSM BMPs, through the Notice of Termination process, and also requires that record drawings be submitted. Initial installation and functioning of PCSM BMPs is verified by county conservation districts as part of a final inspection. Long-term inspections and O&M are the responsibility of the party listed in the recorded instrument – a homeowner’s association, the landowner, another third party, etc.

The following provides the key elements of monitoring, reporting and record keeping under the General Permit:

- ***Inspection and Oversight Requirements*** – visual site inspections must occur throughout the duration of construction and until the NOT has been submitted the permittee. Three types of inspections are required: 1) routine inspections (at least weekly); and 2) post-storm event inspections (within 24 hours of each 0.25 inch or greater storm event or the occurrence of snowmelt sufficient to cause a discharge; and 3) corrective action inspections. Each inspection must be documented on DEP’s Chapter 102 Visual Site Inspection Report or an alternative with identical information.
- ***Licensed Professional Oversight of Critical Stages*** – a licensed professional or a designee shall be present on-site and be responsible for oversight of critical stages of implementation of the PCSM Plan, unless a PCSM Plan is not developed, in accordance with 25 Pa. Code § 102.8(k). Critical stages may include the installation of underground treatment or storage BMPs, structurally engineered

BMPs, or other BMPs as deemed appropriate by DEP. The licensed professional or designee must document findings related to implementation of critical stages.

- ***Non-Compliance or Potential Pollution Reporting*** – In accordance with 25 Pa. Code §§ 91.33 and 92a.41(b), permittees must provide immediate notification to DEP for any incident causing or threatening pollution (no later than 4 hours of becoming aware of the incident). In addition, 40 CFR § 122.41(l)(6) requires reporting within 24 hours of any non-compliance with the permit that may endanger health or the environment, including a written report within 5 days.
- Other requirements including permittee monitoring upon receipt of notification from DEP or CCD.

### ***Programs Involved in Verification***

The entity responsible for collecting and assisting with reporting of stormwater BMPs to NEIEN is DEP's NPDES permitting program within the Bureau of Clean Water.

The BMPs can be implemented by public or private entities and are required statewide through regulations, for all construction that meets the size criteria. Chapter 102 states that E&S and PCSM BMPs must follow the design standards listed in the PA DEP Erosion and Sediment Pollution Control Manual

(<http://www.depgreenport.state.pa.us/elibrary/GetFolder?FolderID=4680>) and the

Pennsylvania Stormwater BMP Manual

(<http://www.depgreenport.state.pa.us/elibrary/GetFolder?FolderID=4673>), respectively, unless an alternative that provides equal or better treatment is proposed.

### ***Data Collection and Entry***

All Chapter 102 permit actions are published in the Pennsylvania Bulletin. Individual permits are published as applications, and again when they are issued (permits are issued, withdrawn, or declined). General permits are published once. The Conservation Districts are required to submit NPDES Quarterly Reports to DEP through GreenPort (a limited access, online database). The Quarterly Reports are for Conservation Districts to identify their activities for the quarter. Data entry is done by the technicians or administrative staff. There are no specialized qualifications for staff members doing data entry. Information included in the reports includes training/outreach, media events, E&S and PCMS plan reviews, inspections, permit processing, complaints, enforcement activities and penalties, and the actual or estimated cost of implementing program.

The NPDES Program previously maintained an Access database where Chapter 102 permit information is logged. The information recorded included project location, applicant, receiving waters, previous land use, proposed land use, prior contaminated land use, remediation, E&S BMPs, PCSM BMPs, treated drainage area, and whether the practices address rate, volume, and/or water quality. This Access database was used to generate the data that is reported to the Chesapeake Bay Program through NEIEN. As a result of staffing shortages this database is no longer maintained. However, in 2021 DEP launched the Chapter 102 ePermit System that will be utilized by all applicants in the future. The ePermit System collects BMP data submitted by applicants.

DEP does not currently have a verification methodology for historical data/BMPs implemented. Chapter 102 permit-related PCSM BMPs have been tracked and recorded by DEP since 2006. In developing a follow-up verification program, DEP does not intend to attempt to verify practices installed prior to 2006, as these practices generally exceed the credit duration of those that the jurisdictions are credited for in the model.

NOT inspections of PCSM BMPs are completed by Conservation District staff that are trained by DEP. DEP provides training to County Conservation Districts through web-based training modules posted to [Clean Water Academy](#) and during annual webinars/in-person training events. There are no certification requirements for inspectors; however, many inspectors have the National Institute for Certification in Engineering Technologies (NICET) certification in erosion and sediment control or are a certified professional erosion and sediment control specialist (CPESC).

Each priority Urban Stormwater BMP is listed, below, under the associated Urban Stormwater WIP Priority Initiative (PI). Each BMP is identified by the BMP name used in the Chesapeake Bay Model and described using the template created by experts at the Chesapeake Bay Program Office.

## **Priority Initiative for Chapter 102: Stormwater Management Controls**

### **Dry Detention Ponds and Hydrodynamic Structures**

BMP Type: Structural. Note that this category includes a wide range of BMPs (basins that temporarily store runoff, swirl concentrators, grit chambers, and others). Verification practices will therefore vary.

What factors can cause the BMP to fail? BMP removed, soil compaction, overgrown with weeds, filled with sediment & trash, washed out.

Who does the verification? CCD (prior to NOT); responsible party named on O&M Agreement (on-going).

How is it verified? Field inspection, assessment of visual indicators (structural stability of embankments and inflow/outflow structures, vegetative conditions, sediment accumulation, ponding water).

Do resources exist to support verification techniques? Yes, original recorded design drawings for BMP are the primary resource for determining if an existing BMP is functioning as designed. Where original designed are unavailable, the BMP Manual provides guidance that can be used to determine if the functionality of the BMP meets a minimum standard.

How often does it have to verified/re-verified? Varies, in accordance with O&M plan.

What actions could help support better verification for the practice in the next few years? Additional staffing/resources.

## **Dry Extended Detention**

BMP Type: Structural

What factors can cause the BMP to fail? BMP removed, soil compaction, overgrown with weeds, filled with sediment & trash, washed out.

Who does the verification? CCD (prior to NOT); responsible party named on O&M Agreement (on-going).

How is it verified? Field inspection, assessment of visual indicators (structural stability of embankments and inflow/outflow structures, vegetative conditions, sediment accumulation, ponding water).

Do resources exist to support verification techniques? Yes, original recorded design drawings for BMP are the primary resource for determining if an existing BMP is functioning as designed. Where original designed are unavailable, the BMP Manual provides guidance that can be used to determine if the functionality of the BMP meets a minimum standard.

How often does it have to verified/re-verified? Varies, in accordance with O&M plan.  
What actions could help support better verification for the practice in the next few years? Additional staffing/resources.

## **Infiltration Practices**

BMP Type: Structural. Note that this category includes other practices such as dry wells/seepage pits, infiltration berms/retentive grading, infiltration trenches, pervious pavement, and subsurface infiltration beds.

What factors can cause the BMP to fail? Common reasons for infiltration failure include poor design or soil testing, construction compaction, failed pre-treatment, clogging by sediment, sinkholes or surface ponding.

Who does the verification? CCD (prior to NOT); responsible party named on O&M Agreement (on-going)

How is it verified? Usually requires a field inspection at the project site that relies on visual indicators to determine the condition and pollutant removal function. Visual indicators to be assessed include of the structural stability of embankments and inflow/outflow structures, vegetative conditions, accumulated sediment, and ponding water.

Do resources exist to support verification techniques? Yes, original recorded design drawings for BMP are the primary resource for determining if an existing BMP is functioning as designed. Where original designed are unavailable, the BMP Manual provides guidance that can be used to determine if the functionality of the BMP meets a minimum standard.

How often does it have to verified/re-verified? Varies, in accordance with O&M plan  
What actions could help support better verification for the practice in PA the next few years? Additional staffing/resources.

## **Bioretention Practices**

BMP Type: Structural

What factors can cause the BMP to fail? Common reasons for BMP failure include poor design, poor construction, sediment clogging, vegetative failure and surface ponding.

Who does the verification? CCD (prior to NOT); responsible party named on O&M Agreement (on-going).

How is it verified? Usually requires a field inspection at the project site that relies on visual indicators to determine the condition and pollutant removal function. Visual indicators to be assessed include structural stability of embankments and inflow/outflow structures, vegetative conditions (including presence of invasive species), and accumulated sediment.

Do resources exist to support verification techniques? Yes, original recorded design drawings for BMP are the primary resource for determining if an existing BMP is functioning as designed. Where original designed are unavailable, the BMP Manual provides guidance that can be used to determine if the functionality of the BMP meets a minimum standard.

How often does it have to verified/re-verified? Varies, in accordance with O&M plan.  
What actions could help support better verification for the practice in PA the next few years? Additional staffing/resources.

## **Riparian Buffers**

BMP Type: Structural

What factors can cause the BMP to fail? Trees die (from lack of and/or improper O&M, disease, drought, flooding, cutting, deer damage or other), or growth stunted by non-preferred vegetation in first 5 years. Stormwater cuts channels which limit infiltration and filtering expected through sheet flow.

Who does the verification? CCD (prior to NOT); responsible party named on O&M Agreement (on-going).

How is it verified? field inspection, visual indicators.

Do resources exist to support verification techniques? Yes, original recorded design drawings for BMP are the primary resource for determining if an existing BMP is functioning as designed. Where original designed are unavailable, the BMP Manual provides guidance that can be used to determine if the functionality of the BMP meets a minimum standard.

How often does it have to verified/re-verified? Varies, in accordance with O&M plan.

What actions could help support better verification for the practice in the next few years? Additional staffing/resources.

## **Wet Ponds and Wetlands**

BMP Type: Structural

What factors can cause the BMP to fail? BMP removed, overgrown with weeds, filled with sediment & trash, washed out, sinkholes.

Who does the verification? CCD (prior to NOT); responsible party named on O&M Agreement (on-going)

How is it verified? Field inspection, assessment of visual indicators (structural stability of embankments and inflow/outflow structures, vegetative conditions/invasive species, mosquito control).

Do resources exist to support verification techniques? Yes, original recorded design drawings for BMP are the primary resource for determining if an existing BMP is functioning as designed. Where original designed are unavailable, the BMP Manual provides guidance that can be used to determine if the functionality of the BMP meets a minimum standard.

How often does it have to verified/re-verified? Varies, in accordance with O&M plan.

What actions could help support better verification for the practice in the next few years? Additional staffing/resources.

## **Vegetated Swales**

BMP Type: Structural

What factors can cause the BMP to fail? BMP removed, overgrown vegetation, filled with sediment & trash, washed out.

Who does the verification? CCD (prior to NOT); responsible party named on O&M Agreement (on-going).

How is it verified? Field inspection, assessment of visual indicators (structural stability of embankments, vegetative conditions, impediments to drainage flow).

Do resources exist to support verification techniques? Yes, original recorded design drawings for BMP are the primary resource for determining if an existing BMP is functioning as designed. Where original designed are unavailable, the BMP Manual provides guidance that can be used to determine if the functionality of the BMP meets a minimum standard.

How often does it have to verified/re-verified? Varies, in accordance with O&M plan.

What actions could help support better verification for the practice in the next few years? Additional staffing/resources.

## **Constructed Filters**

BMP Type: Structural

What factors can cause the BMP to fail? BMP removed, filled with sediment & trash, accumulated sediment in its pore space, washout of filtering media.

Who does the verification? CCD (prior to NOT); responsible party named on O&M Agreement (on-going).

How is it verified? Field inspection, assessment of visual indicators (structural stability, standing water, condition of filtering media).

Do resources exist to support verification techniques? Yes, original recorded design drawings for BMP are the primary resource for determining if an existing BMP is functioning as designed. Where original designed are unavailable, the PA BMP Manual provides guidance that can be used to determine if the functionality of the BMP meets a minimum standard.

How often does it have to verified/re-verified? Varies, in accordance with O&M plan.

What actions could help support better verification for the practice in the next few years? Additional staffing/resources.

### ***Independent Verification of Data***

Independent verification of data is conducted by the Pennsylvania State University as part of the uploading process into NEIEN.

### ***Summary***

A snapshot summary of verification procedures for urban BMPs is provided in Table 4.

**Table 3: Jurisdictional Verification Protocol Design Table: Urban Stormwater BMPs**

Verification Element	Description
<b>BMP or Group</b>	Stormwater Management
<b>Geographic Scope</b>	All counties within the Chesapeake Bay Watershed
<b>A. WIP Priority</b>	High
<b>B. Data Grouping</b>	Urban Stormwater
<b>C. BMP Type</b>	E&S Control & PCSM
<b>D. Initial Inspection</b>	
<b>Method</b>	On-site inspections of permitted sites
<b>Frequency</b>	Within 30 days of commencement of earth disturbance; prior to issuing the NOT
<b>Who Inspects</b>	Conservation district staff
<b>Documentation</b>	Greenport
<b>E. Follow-Up Check</b>	
<b>Follow-Up Inspection</b>	E&S: weekly and within 24 hours of a major storm event for duration of construction and until the receipt of the Notice of Termination (NOT)
<b>Statistical Sub Sample</b>	All practices
<b>Response if Problem</b>	Compliance and enforcement action
<b>F. Lifespan/Sunset</b>	Notice of Termination at end of construction when permanent stabilization is complete.
Verification Element	Description
<b>G. Data QA, Recording &amp; Reporting</b>	E&S BMPs recorded in Access database populated based on permit data. Database is used to develop NEIEN submission

## Municipal Separate Storm Sewer System (MS4) BMPs

The following BMP implementation requirements apply to MS4 permittees:

- **E&S BMPs**

- Minimum Control Measure (MCM) 4, BMP #3 requires permittees to enact, implement and enforce an ordinance or SOP to require the implementation and maintenance of E&S control BMPs, including sanctions for non-compliance, as applicable.
  - (1) Municipal permittees shall enact, implement, and enforce an ordinance to require the implementation of E&S control BMPs, including sanctions for non-compliance. All municipal permittees shall submit a copy of an ordinance that is consistent with DEP's 2022 Model Stormwater Management Ordinance as an attachment to an Annual MS4 Status Report by September 30, 2022 (existing permittees) or the fourth Annual MS4 Status Report following approval of coverage under this General Permit (new permittees).
  - (2) Permittees that lack the authority to enact ordinances shall develop, implement and enforce an SOP to require the implementation and maintenance of E&S control BMPs by September 30, 2022 (existing permittees) or the first Annual MS4 Status Report following approval of coverage under this General Permit (new permittees).

- **PCSM BMPs**

- MCM 4, BMP #1 requires permittees to enact, implement and enforce an ordinance or SOP to require the implementation and maintenance of E&S control BMPs, including sanctions for non-compliance, as applicable.
  - (1) Municipal permittees shall enact, implement, and enforce an ordinance to require the implementation of E&S control BMPs, including sanctions for non-compliance. All municipal permittees shall submit a copy of an ordinance that is consistent with DEP's 2022 Model Stormwater Management Ordinance (3800-PM-BCW0100j) as an attachment to an Annual MS4 Status Report by September 30, 2022 (existing permittees) or the fourth Annual MS4 Status Report following approval of coverage under this General Permit (new permittees).
  - (2) Permittees that lack the authority to enact ordinances shall develop, implement and enforce an SOP to require the implementation and maintenance of E&S control BMPs by September 30, 2022 (existing permittees) or the first Annual MS4 Status Report following approval of coverage under this General Permit (new permittees).
- MCM 5: BMP #3 requires permittees to ensure adequate O&M of all post-construction stormwater management BMPs that have been installed at



development or redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale.

New permittees must develop an inventory of PCSM BMPs by the end of the first year of General Permit coverage and continually update the inventory during the term of coverage under the General Permit as development projects are reviewed, approved, and constructed. Existing permittees must update and maintain their current inventory during the term of coverage under the General Permit. The permittee must track the following information in its PCSM BMP inventory:

- All PCSM BMPs that were installed to meet requirements in NPDES Permits for Stormwater Discharges Associated with Construction Activities approved since March 10, 2003.
- The exact location of the PCSM BMP (e.g., latitude and longitude, with street address).
- Information (e.g., name, address, phone number(s)) for BMP owners and entities responsible for BMP O&M, if different from BMP owners.
- The type of BMP and the year it was installed.
- Maintenance required for the BMP type according to the Pennsylvania Stormwater BMP Manual or other manuals and resources.
- The actual inspection/maintenance activities conducted for each BMP.
- An assessment by the permittee if proper O&M has occurred during the year and if not, what actions the permittee has taken, or shall take, to address compliance with O&M requirements.

- **PRP BMPs**

MS4 permittees with at least one stormwater discharge to surface waters within the Chesapeake Bay watershed must develop and submit a Chesapeake Bay Pollutant Reduction Plan (CBPRP) with the NOI to reduce the load of nutrients (nitrogen and phosphorus) and sediment to surface waters. The CBPRP is approved upon DEP's approval of coverage under this General Permit.

MS4 permittees are required to implement their approved CBPRP and comply with the following: The permittee shall achieve the pollutant load reduction(s) (lbs/year) proposed in its CBPRP within 5 years following DEP's approval of coverage under the General Permit (identified on page 1 of the General Permit). The minimum percent reduction for pollutant loadings of sediment, Total Phosphorus (TP), and Total Nitrogen (TN) shall be 10%, 5%, and 3%, respectively, over the 5-year period following DEP's approval of coverage. Pollutant reduction efficiencies for selected BMPs shall be in accordance with the BMP Effectiveness Values document published by DEP or Chesapeake Bay Program Office expert panel reports. The permittee shall submit a report demonstrating implementation of the CBPRP as an attachment to the first Annual MS4 Status Report that is due following completion of the 5th year of General Permit coverage.

## **Method**

Municipalities and other entities such as universities and prisons that meet certain standards must obtain NPDES permit coverage for discharges of stormwater from their MS4s. MS4s must apply for NPDES permit coverage or a waiver if they are located in an urbanized area as determined by the latest Decennial Census by the U.S. Census Bureau, or if they are designated as needing a permit by DEP. DEP has developed a [reporting tool that can be used to generate lists of NPDES-permitted and waived MS4s](#) in Pennsylvania.

The area regulated by the MS4 permit is the urbanized area (UA) within the municipality which drains to impaired waters, plus any additional area outside the UA which drains into the MS4 conveyance system, less any areas which can be “parsed out.” Parsing is optional, but if pursued, requires careful mapping (see the PRP Instructions, Attachment A).

## **BMP Verification**

MS4 Annual Reports are the basis for BMP reporting and tracking of BMPs in municipalities regulated by MS4 permits. The Annual Report should describe implementation of the permittee’s stormwater management program (i.e., minimum control measures) and progress with implementing the BMPs identified in the Chesapeake Bay PRP. Permittees have 5 years from the date of DEP’s approval of coverage to implement their PRP BMPs. A report demonstrating that the pollutant load reduction obligations of the PRP have been met is required as an attachment to the first Annual MS4 Status Report that is due following completion of the 5th year of General Permit coverage.

- **E&S and PCSM BMP required by Ordinance or SOP**

Under PAG-13, MS4 permittees must rely on DEP’s statewide program for issuing NPDES permits for stormwater discharges associated with construction activities, (described above in the Chapter 102 section) to meet the requirements of MCM 4, BMP #1 and MCM 5, BMP #3 of the permittee’s stormwater management program.

The primary purpose of the MS4 Program’s compliance monitoring program (described in more detail in the following bullet point) is to verify implementation of PRP-required BMPs. However, a permittee’s field inspection may involve PCSM inspection of 102 BMPs for assurance of continued maintenance required under MCM 5.

- **MS4 PRP BMPs**

The MS4 Annual Report requires a BMP inventory of all new structural BMPs and ongoing non-structural BMPs implemented during the reporting period that are being used toward achieving load reductions in the PRP. Information on each BMP that is to be reported includes a name or BMP description, drainage area, latitude/longitude, name of receiving waterbody, date of installation or implementation, and whether the BMP was completed pursuant to a NPDES permit for stormwater under Chapter 102 or other NPDES permit. BMPs that were

installed in a previous reporting period should not be reported again, except for ongoing non-structural practices that are continuing through the current reporting period (e.g. street sweeping).

All permitted MS4s within the Chesapeake Bay Watershed will receive a compliance inspection (office and field inspection) within 5 years of permit issuance/reissuance or coverage approval. The procedures by which DEP conducts office and field inspections of regulated MS4 activities, review PRPs, and provides compliance assistance are included in the following SOP: Standard Operating Procedure (SOP) Compliance and Program Activities for Municipal Separate Storm Sewer Systems (MS4s) SOP No. BCW-INSP-002.

Prior to the start of each calendar year, the Bureau of Clean Water transmits a target list of MS4 compliance inspections to Clean Water Program Managers and Operations Chiefs. The purpose of the list is to provide guidance for inspection activities to meet DEP's overall objectives contained in the annual Compliance Monitoring Strategy (CMS).

The term "office inspection" means a visit to the MS4 headquarters (e.g., borough office) to meet with a point of contact for MS4 implementation. The inspection evaluates permit compliance with the Minimum Control Measures (MCMs) as well as records which document progress in PRP/TMDL Plan implementation.

On-site "field" inspections are required for MS4s in the Chesapeake Bay Watershed. The primary purpose of the field inspection is to verify implementation of PRP-required BMPs. Based on a visual inspection, BMPs will be assumed to be operating as designed unless they are not being maintained or otherwise give the inspector reason to doubt their effectiveness. Where necessary, the WQS may request corroborating information. Problems with BMPs that are observed by staff should be discussed with the MS4 representative and documented in the Inspection Report. In some cases, BMPs are activities that may not occur at the time of the field inspection (e.g., street sweeping). In such cases, staff request documentation to confirm the location and frequency of the BMP activity.

Wherever possible digital photographs are taken of each BMP. The photograph(s) are incorporated into the inspection report and include a caption including the date the photograph was taken and the location of the BMP.

While there are no qualification standards or certifications, most Clean Water Program staff that conduct office and field inspections are classified as Water Quality Specialists. In some Regional Offices, a staff engineer is dedicated to reviewing MS4 permit applications and conducting permit inspections. MS4 inspectors participate in periodic internal trainings on conducting office and field inspections of MS4 entities. There is also a checklist that each inspector is expected to follow when inspecting an MS4 community's documentation and BMP sites. The checklist is to be completed and saved to a central database to document the review.

### ***Programs Involved in Verification***

The entity responsible for collecting and assisting with reporting of stormwater BMPs to NEIEN is DEP's NPDES permitting program within the Bureau of Clean Water.

The BMPs can be implemented by public or private entities and are required statewide through regulations, for all construction that meets the size criteria. PRP BMPs must follow the design standards listed in the Pennsylvania Stormwater BMP Manual, (<http://www.depgreenport.state.pa.us/elibrary/GetFolder?FolderID=4673>). Pollutant reduction efficiencies for selected BMPs shall be in accordance with the BMP Effectiveness Values document published by DEP or Chesapeake Bay Program Office expert panel reports.

### ***Data Collection and Entry***

- **PCSM BMPs** - The MS4 permit requires permittees to track PCSM BMPs installed within the area regulated by the MS4 permit on a PCSM BMP Inventory. Permittees report the status of PCSM (inspection/maintenance, an assessment if proper O&M has occurred during the year, etc.) in annual status reports. These BMPs are not reported by the MS4 program to NEIEN. As these BMPs were installed to meet the requirements in NPDES permits for stormwater discharges associated with construction activities, these BMPs would overlap with the BMPs reported by the Ch 102 program.
- **PRP BMPs** - The Annual Report requires a BMP inventory of all new structural BMPs and ongoing non-structural BMPs implemented during the reporting period that are being used toward achieving load reductions in the PRP. Information on each BMP that is to be reported includes a name or BMP description, drainage area, latitude/longitude, name of receiving waterbody, date of installation or implementation, and whether the BMP was completed pursuant to a NPDES permit for stormwater under Chapter 102 or other NPDES permit.

PRP BMP data is tabulated by DEP Regional offices and provided to DEP Central Office for review. The PRP BMP data is checked against general BMP design guidelines from the PADEP BMP Manual. Any BMP that appears to be inconsistent with the general guidelines is flagged for verification and removed from the MS4 Program BMP dataset for the reporting year.

All MS4 permittees will be required to submit a Final PRP Report with the first MS4 Annual Status Report due after the final year of the current permit term. Within the Final PRP Report, MS4 permittees will be required to provide additional documentation on each BMP completed to meet the pollutant load reduction obligations of their PRP. With this additional documentation, the crediting of BMPs previously flagged for verification will be reviewed. Once these BMPs are verified, they will be added to the MS4 Program BMP dataset and reported to the Bay Office.

Annual practice BMPs (i.e. street sweeping, or storm sewer solids removal reported as lbs) are also flagged for verification and removed from the MS4 Program BMP dataset for the reporting year. As these BMPs are reported as lbs TSS and not and

annual load reduction (lbs/yr), there can be variation in the load reduction achieved per year. At the end of the MS4 permit term, permittees will sum the load reductions achieved by these BMPs during each year of the permit term and divide by the number of years in the permit term (5) to determine an annualized (lb/yr) load reduction. The MS4 Program will verify that the load reduction for these BMPs were calculated correctly using the data provided in the final PRP report (i.e. that the permittee is reporting only the dry sediment portion of the material collected) before adding BMP to the MS4 Program BMP dataset.

### ***Independent Verification of Data***

The PRP BMP spreadsheet is shared with the Bureau of Watershed Restoration & Nonpoint Source Management at DEP, so the verified BMPs can be included in the annual progress run submission (NEIEN) for the Chesapeake Bay model.

### ***Addressing BMP Double Counting***

Several practices are in place to ensure data accuracy and to avoid the double counting of BMPs.

- When joint BMP projects are completed, each MS4 permittee reports only the load reduction that resulted from the portion of the BMP installed within their jurisdiction. MS4s under a joint PRP do not report joint BMPs in their Annual Reports unless the BMP is located within their jurisdiction. This is necessary to avoid double counting of BMP load reductions.
- BMPs from any agency that reports directly to DEP's Bureau of Watershed Restoration and Nonpoint Source Management are removed from the MS4 BMP dataset. For example, the Department of Defense (DOD) reports directly to the Bureau of Watershed Restoration and Nonpoint Source Management, therefore any BMPs reported by the DOD facility in York County as part of compliance with their MS4 permit are not included in the MS4 Program BMP dataset.

### **Electronic Reporting**

The MS4 Program is working on developing an electronic eReporting system for the submission of MS4 annual reports from all MS4 permittees. When this system becomes available, DEP users will be able to run a report to export all BMP data input into the system by permittees. This report will then be provided to the Bay Office for reporting to EPA.

### ***Summary***

A snapshot summary of verification procedures for urban stormwater BMPs is provided in Table 5.

**Table 4: Jurisdictional Verification Protocol Design Table: MS4 Urban Stormwater BMPs**

Verification Element	Description
<b>BMP or Group</b>	Stormwater Management – MS4 PRP BMPs
<b>Geographic Scope</b>	All counties within the Chesapeake Bay Watershed
<b>A. WIP Priority</b>	High
<b>B. Data Grouping</b>	Urban Stormwater
<b>C. BMP Type</b>	Structural
<b>D. Initial Inspection</b>	
<b>Method</b>	Field inspections of reported BMPs
<b>Frequency</b>	Once within 5-year MS4 permit term
<b>Who Inspects</b>	DEP Water Quality Specialist; MS4 permittee
<b>Documentation</b>	Annual Report and MS4 Compliance Inspection Report
<b>E. Follow-Up Check</b>	
<b>Follow-Up Inspection</b>	Varies based on O&M plan of BMP; at least one per permit term.
<b>Statistical Sub-Sample</b>	
<b>Response if Problem</b>	Referral, corrective action pursued, possible compliance and enforcement action. If practices are no longer existing or functional and the issues cannot be resolved, they should be removed from the NEIEN report.
<b>F. Lifespan/Sunset</b>	As set at the maximum by the Urban Stormwater Workgroup
<b>G. Data QA, Recording &amp; Reporting</b>	MS4 BMPs recorded in an Excel spreadsheet populated based on date reported in MS4 Annual Status reports.

## Priority Initiative MS4 Program BMPs: Stormwater Management Controls

### Dry Detention Ponds and Hydrodynamic Structures

BMP Type: Structural. Note that this category includes a wide range of BMPs (basins that temporarily store runoff, swirl concentrators, grit chambers, and others); what they have in common is limited pollutant capture (10% sediment). Verification practices will therefore vary.

What factors can cause the BMP to fail? BMP removed, soil compaction, overgrown with weeds, filled with sediment and/or trash, washed out.

Who does the verification? MS4 permittees are responsible for verifying the BMP continues to function as designed and reporting the BMP status to DEP in annual MS4 Status Reports. Permittees often hire independent consultants to do the actual inspections.

How is it verified? Field inspection, assessment of visual indicators (structural stability of embankments and inflow/outflow structures, vegetative conditions, sediment accumulation, ponding water)

Do resources exist to support verification techniques? Yes, original recorded design drawings for BMP are the primary resource for determining if an existing BMP is functioning as designed. Where original designed are unavailable, the BMP Manual provides guidance that can be used to determine if the functionality of the BMP meets a minimum standard.

How often does it have to verified/re-verified? Sufficient to “assure maintenance” in accordance with MS4 permit. BMPs installed under a stormwater ordinance consistent with DEP’s model ordinance are inspected once every three years (at a minimum) to ensure their continued functioning. CBP requirement is to verify at 10 years.

What actions could help support better verification for the practice in the next few years? More frequent DEP inspections of MS4s, BMP O&M training (physical training and improved website-based materials).

## **Dry Extended Detention**

BMP Type: Structural

What factors can cause the BMP to fail? BMP removed, soil compaction, overgrown with weeds, filled with sediment & trash, washed out.

Who does the verification? MS4 permittees are responsible for verifying the BMP continues to function as designed and reporting the BMP status to DEP in annual MS4 Status Reports. Permittees often hire independent consultants to do the actual inspections.

How is it verified? Field inspection, assessment of visual indicators (structural stability of embankments and inflow/outflow structures, vegetative conditions, sediment accumulation, ponding water)

Do resources exist to support verification techniques? Yes, original recorded design drawings for BMP are the primary resource for determining if an existing BMP is functioning as designed. Where original designed are unavailable, the BMP Manual provides guidance that can be used to determine if the functionality of the BMP meets a minimum standard.

How often does it have to verified/re-verified? Sufficient to “assure maintenance” in accordance with MS4 permit. BMPs installed under a stormwater ordinance consistent with DEP’s model ordinance are inspected once every three years (at a minimum) to ensure their continued functioning. CBP requirement is to verify at 10 years.

What actions could help support better verification for the practice in the next few years? More frequent DEP inspections of MS4s, BMP O&M training (physical training and improved website-based materials).

## **Vegetated Open Channels**

BMP Type: Structural

What factors can cause the BMP to fail? BMP removed, overgrown vegetation, filled with sediment & trash, washed out.

Who does the verification? MS4 permittees are responsible for verifying the BMP continues to function as designed and reporting the BMP status to DEP in Annual MS4

Status Reports. Permittees often hire independent consultants to do the actual inspections.

How is it verified? Field inspection, assessment of visual indicators (structural stability of embankments, vegetative conditions, impediments to drainage flow).

Do resources exist to support verification techniques? Yes, original recorded design drawings for BMP are the primary resource for determining if an existing BMP is functioning as designed. Where original designed are unavailable, the BMP Manual provides guidance that can be used to determine if the functionality of the BMP meets a minimum standard.

How often does it have to verified/re-verified? Sufficient to “assure maintenance” in accordance with MS4 permit. BMPs installed under a stormwater ordinance consistent with DEP’s model ordinance are inspected once every three years (at a minimum) to ensure their continued functioning. CBP requirement is to verify at 10 years.

What actions could help support better verification for the practice in the next few years? More frequent DEP inspections of MS4s, BMP O&M training (physical training and improved website-based materials).

## **Wet Ponds and Wetlands**

BMP Type: Structural

What factors can cause the BMP to fail? BMP removed, overgrown with weeds, filled with sediment & trash, washed out, sink hole.

Who does the verification? MS4 permittees are responsible for verifying the BMP continues to function as designed and reporting the BMP status to DEP in annual MS4 Status Reports. Permittees often hire independent consultants to do the actual inspections.

How is it verified? Field inspection, assessment of visual indicators (structural stability of embankments and inflow/outflow structures, vegetative conditions/invasive species, mosquito control)

Do resources exist to support verification techniques? Yes, original recorded design drawings for BMP are the primary resource for determining if an existing BMP is functioning as designed. Where original design drawings are unavailable, the BMP Manual provides guidance that can be used to determine if the functionality of the BMP meets a minimum standard.

How often does it have to verified/re-verified? Sufficient to “assure maintenance” in accordance with MS4 permit. BMPs installed under a stormwater ordinance consistent with DEP’s model ordinance are inspected once every three years (at a minimum) to ensure their continued functioning. CBP requirement is to verify at 10 years.



What actions could help support better verification for the practice in the next few years? More frequent DEP inspections of MS4s, BMP O&M training (physical training and improved website-based materials).

## **Stream Restoration**

BMP Type: Structural

What factors can cause the BMP to fail? Common reasons for BMP failure include poor design and/or construction, extreme storms, unexpected channel erosion, floodplain deposition.

Who does the verification? MS4 permittee, reported to DEP in annual MS4 Status Reports. A land conservation agency or the contractor that installed the stream restoration project may also have responsibility for verification.

How is it verified? Initial verification requires review of original design drawings/specifications and field inspection along the project reach. Follow-up inspections limited to field inspection and assessment using visual indicators (streambank conditions/erosion, riparian buffer condition, floodplain connection).

Do resources exist to support verification techniques? Yes. The Chesapeake Stormwater Network (CSN) developed the following technical memo with recommended methods for verifying the pollutant reduction performance of individual stream restoration projects built to meet the Chesapeake Bay TMDL: [Recommended Methods to Verify Stream Restoration Practices Built for Pollutant Crediting in the Chesapeake Bay Watershed](#).

How often does it have to be verified/re-verified? Stream restoration projects need to be verified every 5 years after their original Chapter 105 construction permit expires and sufficient to “assure maintenance” in accordance with MS4 permit. BMPs installed under a stormwater ordinance consistent with DEP’s model ordinance are inspected once every three years (at a minimum) to ensure their continued functioning. CBP requirement is to verify at 5 years.

What actions could help support better verification for the practice in PA the next few years? Outreach and training on the Bay-wide guidance, including visual examples of different scenarios that may be encountered would be helpful for the MS4 and practitioner community.

## **Forest Buffers**

BMP Type: Structural

What factors can cause the BMP to fail? Trees die (from lack of and/or improper O&M, disease, drought, flooding, cutting, deer damage or other), or growth stunted by non-preferred vegetation in first 5 years. Stormwater cuts channels which limit infiltration and

filtering expected through sheet flow. Lots of onsite maintenance in the first five years can avoid this.

Who does the verification? MS4 permittee, reported to DEP in annual MS4 Status Reports. A land conservation agency may also have responsibility for verification through other project agreements.

How is it verified? field inspection, visual indicators, remote sensing.

Do resources exist to support verification techniques? Yes, original recorded design drawings for BMP are the primary resource for determining if an existing BMP is functioning as designed. Where original designed are unavailable, the BMP Manual provides guidance that can be used to determine if the functionality of the BMP meets a minimum standard.

How often does it have to be verified/re-verified? Sufficient to “assure maintenance” in accordance with MS4 permit. BMPs installed under a stormwater ordinance consistent with DEP’s model ordinance are inspected once every three years (at a minimum) to ensure their continued functioning. CBP requirement is to verify at 15 years.

What actions could help support better verification for the practice in the next few years? BMP O&M training (physical training and improved website-based materials).

## **Bioretention Practices**

BMP Type: Structural

What factors can cause the BMP to fail? Common reasons for BMP failure include poor design, poor construction, sediment clogging, vegetative failure, and surface ponding. Most bioretention practices have good longevity if they are regularly maintained.

Who does the verification? MS4 permittees are responsible for verifying the BMP continues to function as designed and reporting the BMP status to DEP in annual MS4 Status Reports. Permittees often hire independent consultants to do the actual inspections.

How is it verified? Usually requires a field inspection at the project site that relies on simple visual indicators to determine the condition and pollutant removal function. Visual indicators to be assessed include structural stability of embankments and inflow/outflow structures, vegetative conditions (including presence of invasive species), and accumulated sediment. The practice needs to be inspected every 10 years to ensure it is still working and renew the pollutant reduction credit for another 10 years. It is helpful to have a copy of the original design, planting plan or an as-built construction drawing handy to compare the practice against.

Do resources exist to support verification techniques? Yes. Bioretention has become widely used in new and redevelopment projects in recent years. Since bioretention is a runoff reduction practice, it has high nutrient and sediment reduction capability when designed to the criteria in the BMP Manual. The original recorded design drawings for

BMP are the primary resource for determining if an existing BMP is functioning as designed. Good outreach and training materials on how to construct, inspect and maintain bioretention practices can be found on the CSN website ([www.chesapeakestormwater.net](http://www.chesapeakestormwater.net)), including webcasts, technical resources, inspection checklists and other guidance. Municipalities should also refer to the relevant sections of the BMP Manual.

How often does it have to verified/re-verified? Sufficient to “assure maintenance” in accordance with MS4 permit. BMP installed under a stormwater ordinance consistent with DEP’s model ordinance are inspected once every three years (at a minimum) to ensure their continued functioning. CBP requirement is to verify at 10 years.

What actions could help support better verification for the practice in PA the next few years? BMP O&M training (physical training and improved website-based materials).

## **Infiltration Practices**

BMP Type: Structural<sup>1</sup>

<sup>1</sup>Note: this guidance also applies to other LID practices such as permeable pavement, filtering practices, and runoff reduction (RR) practices.

What factors can cause the BMP to fail? Common reasons for infiltration failure include poor design or soil testing, construction compaction, failed pre-treatment, clogging by sediment, sinkholes or surface ponding. Most infiltration practices have good longevity if they are located on suitable soils and are regularly maintained.

Who does the verification? MS4 permittees are responsible for verifying the BMP continues to function as designed and reporting the BMP status to DEP in Annual MS4 Status Reports. Permittees often hire independent consultants to do the actual inspections.

How is it verified? Usually requires a field inspection at the project site that relies on simple visual indicators to determine the condition and pollutant removal function. Visual indicators to be assessed include of the structural stability of embankments and inflow/outflow structures, vegetative conditions, accumulated sediment, and ponding water. It is helpful to have a copy of the original design or an as-built construction drawing handy to compare the practice against

How often does it have to verified/re-verified? Sufficient to “assure maintenance” in accordance with MS4 permit. BMP installed under a stormwater ordinance consistent with DEP’s model ordinance are inspected once every three years (at a minimum) to ensure their continued functioning. CBP requirement is to verify at 10 years.

Do resources exist to support verification techniques? Yes. Infiltration is a preferred approach to stormwater design in PA and has become widely used in new and redevelopment projects in recent years. Infiltration practices can be an effective stormwater retrofit where soils permit for PA MS4’s implementing PRPs. Since infiltration is a runoff reduction practice, it has high nutrient and sediment reduction capability when

designed to the criteria in the BMP Manual. The original recorded design drawings for BMP are the primary resource for determining if an existing BMP is functioning as designed. Additionally, Appendix B-4 of CSN (2013) has good resources to how to construct, inspect, maintain, and verify infiltration practices. Many large and small communities rely on these visual indicators to inspect infiltration practices.

What actions could help support better verification for the practice in PA the next few years? BMP O&M training (physical training and improved website-based materials).

## **Street Sweeping**

BMP Type: Annual Practice

What factors can cause the BMP to fail? Street cleaning is a common municipal practice, but it can be ineffective if not properly tracked, not conducted frequently enough, or if an ineffective sweeper technology is used.

Who does the verification? MS4 permittees are responsible for verifying the effectiveness of this BMP. Appropriate crediting is determined based on the type of sweeper used and the frequency at which sweeping occurs. This BMP is tracked through coordination with public works departments who conduct sweeping operations.

How is it verified? MS4 permittees must keep accurate and comprehensive records of street sweeping operations to claim any pollutant load reduction credit for this BMP. This includes documentation of the sweeper type used, routes swept, and frequency of sweeping.

How often does it have to be verified/re-verified? As this is an annual BMP, the load reduction is calculated every year for area swept that year.

Do resources exist to support verification techniques? Yes. The Chesapeake Stormwater Network (CSN) developed the following technical memo with recommended methods for verifying the pollutant removal rates from street cleaning practices: [Recommended of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices \(2016\)](#).

What actions could help support better verification for the practice in PA the next few years? Training on the technical memo referenced above.

## **Storm Sewer Solids Removal**

BMP Type: Annual Practice

What factors can cause the BMP to fail? Storm sewer solids removal is often conducted through the installation of inlet filters and end of pipe solids removals systems. Inadequate or maintenance can cause these systems to clog or break.

Who does the verification? MS4 permittees are responsible for verifying the BMP continues to function as designed and reporting the BMP status to DEP in annual MS4

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Status Reports. Public works departments may maintain these BMPs as part of routine maintenance and may also have a part in performing inspections.

How is it verified? Requires a field inspection using visual indicators to determine the condition of the filter and pollutant removal function. For proprietary devices it is helpful to have a copy of the manufacturer's specifications handy to ensure that the device is installed properly and is functioning as intended.

How often does it have to verified/re-verified? Sufficient to "assure maintenance" in accordance with MS4 permit. The functionality on an inlet filter depends on the frequency of maintenance. As this is an annual BMP, the load reduction is calculated every year for area swept that year.

Do resources exist to support verification techniques? Yes. The Chesapeake Stormwater Network (CSN) developed the following technical memo with recommended methods for verifying the pollutant removal rates from storm drain cleaning practices: [\*Recommended of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices\*](#) (2016).

What actions could help support better verification for the practice in PA the next few years? Training on the technical memo referenced above.

## Forestry:

Forestry practices consist of BMPs that reduce both Urban and Agricultural runoff. BMPs that include tree planting, native meadow establishment, wetland establishment, etc. are cost-effective for improving water quality while also providing significant wildlife habitat benefits. Riparian forest buffers and upland tree plantings on both agricultural and developed lands also provide significant human health and social benefits in addition to water quality benefits, while reducing flooding impacts.

Currently, most Forestry-associated BMPs have been verified through field inspections, visual indicators, or surveys. Moving towards a more comprehensive verification process via remote sensing will save time, money, and resources and yield more complete data. Newly implemented buffers will be tracked by DEP and DCNR primarily through PracticeKeeper, which will assist the future remote sensing verification process. Below, each BMP is identified, along with the Priority Initiative (PI) within the preliminary Forestry Workgroup recommendations for the Phase 3 WIP and a brief overview of the verification requirements.

Requirements for the DCNR Programs and BMPs can be found at the following link:

[2016 State Forest Resource Management Plan \(PDF\)](#)

### Inspector/Verifier Qualifications

Inspectors should be familiar with the BMPs outlined in the Forestry PIs, and how to identify these practices on the landscape via remote sensing technologies.

For any field-inspection verification necessary, inspectors/verifiers should have a basic knowledge of Forestry BMPs, especially including riparian forest buffers, basic native tree identification skills, and basic invasive plant and insect identification skills.

Each priority Forestry BMP is listed, below, under the associated Forestry WIP Priority Initiative (PI). Each BMP is identified by the BMP name used in the Chesapeake Bay Model and described using the template created by experts at the Chesapeake Bay Program Office.

### **Priority Initiative 1: Forested Riparian Buffers**

#### **Department of Conservation and Natural Resources (DCNR)**

Forestry BMPs can be verified via on-site visual inspections, remote sensing, and surveys with statistically valid QA/QC spot checks. Currently, because remote-sensing protocols are not yet developed, most Watershed Forestry BMPs are verified via visual inspection. The BMPs are in both the developed and agricultural sectors.

DCNR and its grantees and partners are responsible for the initial implementation of Watershed Forestry BMPs, as well as their verification. Specifically, whether or not the planting (meadow, tree, or forest) is still in place, and if the survival rate is 70% or greater, is what is inspected during visual inspections. DCNR, TreePennsylvania, Penn State Extension, and TreeVitalize grantee organizations are responsible for verification of the Tree Plantings. Tree Planting verification is performed after trees are planted by grantees via submitted photo or visual inspection. Whether or not the tree is planted properly and living is what is inspected. If the tree is not planted properly, measures are taken to correct that. If the tree is not living, the BMP is not recorded. DCNR program personnel are all qualified at the time of hire, and all grantees are all trained and qualified via the [TreeTenders program](https://extension.psu.edu/tree-tenders) linked at <https://extension.psu.edu/tree-tenders>.

Maintenance Procedures: describe post-planting establishment and maintenance activities, responsible parties, and approximate timelines for performing these activities for the duration of the landowner agreement, including but not limited to:

Seasonal inspections

Mowing (meadows may not be mowed for the duration of the Landowner Agreement unless recommended and approved by DCNR) and/or herbicide applications

Replacement planting/seeding to maintain 70% stocking of original planting

At the end of their BMP lifespan, DCNR intends to conduct a spot check of all DCNR-implemented Watershed Forestry Practices via a statistically valid QA/QC method. Because the implementation of DCNR BMPs did not begin until late 2017, we have not reached the end of any of the DCNR Watershed Forestry BMP's lifespan as of 2022. If BMPs are still in place and functioning with 70% survival at their lifespan, they will be verified and renewed according to DEP-defined methodology. If they are no longer functioning or in place, the BMP will not be renewed. Staff responsible for on-site inspections and data reviews have technical expertise, qualifications, and titles established by their respective programs related to this reporting and verification. These qualifications can be found within the appropriate job descriptions.

- 1) Regional Watershed Forestry Specialists
- 2) Lawn Conversion Program Coordinator
- 3) Watershed Forestry Program Coordinator
- 4) Watershed Forestry Program Manager
- 5) Service Foresters

For Forest Harvesting BMP all DCNR field staff inspecting this BMPs are trained as foresters and are qualified by DCNR Bureau of Forestry. DCNR are responsible for the implementation and verification of these BMPs. Verification is performed by staff directly after implementation has taken place. A visual inspection of each site is compared to the BMP plans for that site, to verify BMPs specified in the plan are on the ground. As

single-year practices, one visual inspection is all that is carried out.

**BMPs Captured:** Forest Buffers, Riparian Forest Buffer, Stream Channel Stabilization, Stream Habitat Improvement and Management, Stream Restoration, Streambank and Shoreline Protection, Streambank Stabilization, Conservation Landscaping, Urban Forest Planting, Tree Planting, Tree/Shrub Establishment, Urban Forest Buffer, Urban stream restoration, Wetland Creation, Wetland Restoration and Forest Harvesting Practices

## Riparian Forest Buffers

BMP Name: Riparian Buffers (Urban Riparian Forest Buffers, Ag Riparian Forest Buffers, Ag Riparian Grass Buffers)

BMP Type: Multi-Year

Program (Existing or New): Existing (NRCS, PA DEP Growing Greener); New (PA DCNR Buffer Grants, Ag Conservation Stewardship Program, TreeVitalize Urban Riparian Buffers, etc.).

What factors can cause the BMP to fail? Improper O&M, Natural Disaster (i.e. flooding shortly after installation, drought, etc.), Invasive Species.

Who does the verification? USDA, DEP, DCNR, PSU, MS4 communities, etc.

How is it verified? remote sensing, field inspection, visual indicators, PSU survey w/ statistically valid QA/QC spot-check, etc.

Do resources exist to support verification techniques? Potentially/in some areas. MS4 communities have resources to verify urban forest buffers if utilized within PRPs, DCNR grants will utilize Service Foresters and Buffer Technicians. USDA verifies all buffers, forest and grass, installed with USDA funding.

How often does it have to be verified/re-verified? Ag: Once every 10 years. (Resource Improvement = once every 5 years). Urban: sufficient to “assure maintenance” in accord with MS4 permit- CBP requirement is to verify at 15 years.

What actions could help support better verification for the practice in the next few years? Development of remote sensing verification process/partnership with USDA to verify all buffers through remote sensing.

## Priority Initiative 2: Tree Canopy

### Urban Tree Canopy Expansion



BMP Name: Tree Planting (Urban Tree Canopy Expansion)

BMP Type: Multi-Year

Program (Existing or New): Existing (Treevitalize)

What factors can cause the BMP to fail? Improper O&M, Natural Disaster (i.e. drought).

Who does the verification? USDA, DEP, DCNR, PSU, MS4 communities, etc.

How is it verified? remote sensing, field inspection, visual indicators.

Do resources exist to support verification techniques? Potentially/in some areas. MS4 communities have resources to verify urban tree canopy expansion if utilized within PRPs, TreeVitalize grants will utilize Service Foresters and Penn State Extension foresters.

How often does it have to be verified/re-verified? Once every 10 years.

What actions could help support better verification for the practice in the next few years? Development of remote sensing verification process in PA.

### **Priority Initiative 3: Turf Conversion (Woods and Pollinator Habitat)**

#### **Urban Forest Expansion/Conservation Landscaping**

BMP Name: Turf Conversion (Urban Forest Expansion; Conservation Landscaping)

BMP Type: Multi-Year

Program (Existing or New): USDA, DEP, DCNR, PSU, MS4 communities, etc. Existing (TreeVitalize, DCNR);

What factors can cause the BMP to fail? Improper O&M, Natural Disaster (i.e. flooding shortly after installation, drought, etc.), Invasive Species.

Who does the verification? DEP, DCNR, PSU, MS4 communities, etc.

How is it verified? remote sensing, field inspection, visual indicators

Do resources exist to support verification techniques? Potentially/in some areas. MS4 communities have resources to verify urban practices if utilized within PRPs, DCNR grants will utilize existing staff to assist with verification.

How often does it have to be verified/re-verified? Once every 15 years. (Resource Improvement = once every 5 years)

What actions could help support better verification for the practice in the next few years? Development of remote sensing verification process in PA.

## Priority Initiative 5: Stream and Wetland Restoration

### Ag Stream Restoration

BMP Type: Multi-Year

Program (Existing or New): Existing (DEP, USDA, federal grants, etc.)

What factors can cause the BMP to fail? Improper O&M, Natural Disaster (i.e. major flood events).

Who does the verification? DEP, USDA

How is it verified? remote sensing, field inspection, visual indicators

Do resources exist to support verification techniques? Potentially/in some areas. MS4 communities have resources to verify urban practices if utilized within PRPs, USDA verifies practices installed with USDA funding.

How often does it have to verified/re-verified? Once every 10 years.

What actions could help support better verification for the practice in the next few years? Development of remote sensing verification process in PA.

### Urban Stream Restoration

BMP Type: Multi-Year

Program (Existing or New): Existing (DEP, USDA, federal grants, etc.)

What factors can cause the BMP to fail? Improper O&M, Natural Disaster (i.e. major flood events).

Who does the verification? DEP, USDA

How is it verified? remote sensing, field inspection, visual indicators

Do resources exist to support verification techniques? Potentially/in some areas. MS4 communities have resources to verify urban practices if utilized within PRPs, USDA verifies practices installed with USDA funding.

How often does it have to verified/re-verified? Once every 5 years.

What actions could help support better verification for the practice in the next few years? Development of remote sensing verification process in PA.

### Wetland Creation

BMP Type: Multi-Year

Program (Existing or New): Existing (DEP, USDA, federal grants, etc.)

What factors can cause the BMP to fail? Improper O&M, Natural Disaster (i.e. major flood events).

Who does the verification? DEP, USDA

How is it verified? remote sensing, field inspection, visual indicators

Do resources exist to support verification techniques? Potentially/in some areas. MS4 communities have resources to verify urban practices if utilized within PRPs, USDA verifies practices installed with USDA funding.

How often does it have to be verified/re-verified? Once every 15 years.

What actions could help support better verification for the practice in the next few years? Development of remote sensing verification process in PA.

## **Wetland Restoration**

BMP Type: Multi-Year

Program (Existing or New): Existing (DEP, USDA, federal grants, etc.)

What factors can cause the BMP to fail? Improper O&M, Natural Disaster (i.e. major flood events).

Who does the verification? DEP, USDA

How is it verified? remote sensing, field inspection, visual indicators

Do resources exist to support verification techniques? Potentially/in some areas. MS4 communities have resources to verify urban practices if utilized within PRPs, USDA verifies practices installed with USDA funding.

How often does it have to be verified/re-verified? Once every 15 years.

What actions could help support better verification for the practice in the next few years? Development of remote sensing verification process in PA.

## **Programs and Projects – Forestry**

### **Chesapeake Conservancy Forestry Remote Sensing Project**

As part of the Chesapeake Bay Phase 6 Watershed Model development, Chesapeake Conservancy and others completed land cover mapping for the entire watershed. This mapping included an assessment of land cover and assignment of land use to define the acreages of land use within each land-river segment in the model. Additionally, aerial imagery was used to map and identify buffered and unbuffered stream reaches in the watershed. This work was completed through the Chesapeake Bay Land Use

Workgroup. The workgroup has committed to repeating this mapping effort in 5 to 7 years to establish updated land use in the model and assess the progress of buffer implementation over this period. While other local mapping efforts may additionally be completed during this period, the Chesapeake Conservancy’s work for the Land Use Workgroup is expected to serve as a primary data source for Pennsylvania land use change and buffer assessment going forward. For more information, please see the Chesapeake Conservancy Workplan for project for CAST21 and CAST23.

*BMPs Captured:*

**Urban Forest Buffers, Riparian Forest Buffers, Grassed Buffers-with and without Stream Fencing, Forested Buffers-with and without Stream Fencing, Wet Ponds and Wetlands, Urban Forest Expansion/Conservation Landscaping, Urban Tree Canopy Expansion, Land Conservation**

**Chesapeake Bay Foundation Keystone 10 Million Trees**

The Chesapeake Bay Foundation (CBF) works with partners across the state to support a variety of tree planting BMP projects in the Agriculture and Developed sector. The verification plan we are using for riparian buffers and tree canopy initiatives are very similar and rely heavily on our partners to ensure projects are implemented and reported properly. The sectors that partners submit for include Agriculture and Developed; specific BMPs are listed in the insert below:

Sector	BMP
Agriculture	Riparian Forest Buffer (RI-10 Forest Buffer on Watercourse)
	Riparian Forest Buffer – Narrow (RI-9 Forest Nutrient Exclusion Area on Watercourse – Narrow)
	Tree/Shrub Establishment
Developed	Riparian Forest Buffer (RI-10 Forest Buffer on Watercourse)
	Riparian Forest Buffer – Narrow (RI-9 Forest Nutrient Exclusion Area on Watercourse – Narrow)
	Tree/Shrub Establishment – Urban Tree Canopy
	Tree/Shrub Establishment – Urban Forest Planting

## **Implementation & verification**

CBF staff and trained CBF partners are responsible for the initial implementation of all BMPs. Partners typically have knowledgeable staff who are familiar with how to implement a successful tree planting event. After the BMP is implemented, partners submit planting event information after the implementation date that includes an image of the planting for verification purposes. All partners either been trained or have received training resources on how to use our Tree Tracker tool to submit their implementation information. At the end of each planting season CBF staff (including the Program Contact and QA/QC Data Contact) verify the planting information that was submitted for that planting season in preparation for annual state reporting. Prior to reporting submissions CBF staff verify the planting using remote sensing, spatial indicators, and partner communications.

### **How verification protocols and procedures are being carried out for each BMP**

Sites that are reported by project partners are currently verified only once as installation by either the project partner or CBF staff. As part of the form partners submit to request trees for planting events. After the BMP is implemented by partners and the data is verified by CBF staff there is typically no additional inspection or maintenance of the BMP by CBF staff. Some partners may have their own inspection or maintenance protocols that they implement outside of the program. All implemented and verified BMP's remain in the CBF database unless we become aware that the BMP is no longer functioning through partner communications.

As the K10 program progresses we will be incorporating long-term verification techniques that include using remote sensing to verify the BMP is functioning properly or if we need to remove the BMP from the CBF database. This can only be implemented approximately 5 years post-planting once the plantings "canopy out" and would be most successful for planting sites with a high density of trees.

### **Compliance and amending program database**

After BMPs are implemented by partners and the data is verified by CBF staff there is typically no additional inspection or maintenance of the BMP by CBF staff; all implemented and verified BMP's remain in the CBF database unless we become aware that the BMP is no longer functioning through partner communications. When information regarding a failed BMP is shared with CBF staff the QA/QC Data Contact will be notified to update this BMP in our system and it will be tagged as non-compliant.

### **Qualifications of program personnel**

All project partners are provided with training resources when they join the program to ensure they know how to use the Tree Tracker tool to submit their BMP information.

Tree Tracker Training Videos: Provide thorough directions on how to find planting events in the tool and update information, including adding a planting polygon, once the planting has been implemented.

- BMP Decision Tree: Provides clear definitions for multiple tree planting BMPs so that partners correctly submit this information in the Tree Tracker.
- Tree Tracker User Guide: A text document that provides thorough instructions on how to use the Tree Tracker to submit and update planting data.

By reviewing these training videos, the BMP decision tree, and the user guide partners gain an understanding of the type of BMPs, design standards and features (e.g., planting density and minimum widths), maintenance guides, and other factors. Project partners are provided these materials upon joining the K10. At the K10 annual partner meetings, there are additional trainings provided to keep partners up-to-date on any changes made to the tool.

## **Planned Reporting Programs:**

### **Manure Treatment Technologies**

#### *BMPs Captured:*

#### **Manure Treatment Technology**

These technologies are treatment and site specific. Certification of a manure treatment technology involves administrative completeness and technical reviews of a certification request that must include a detailed description of the technology process, all inputs and outputs of nutrients, the calculation methodology, and a verification plan detailing exactly what information will be provided to verify that the facility has generated credits. Verification involves administrative completeness and technical reviews of the verification request to ensure that the facility has followed its verification plan and correctly calculated the credits generated.

If the technology involves wastewater treatment and a discharge or manure storage (depends on the type of manure and whether the thresholds under 91.36(a) are exceeded), then an NPDES or WQM permit may be required. Depending on the technology and any volatilized emissions, an air quality permit may be required (e.g., thermochemical – we have one of these facilities that has generated credits and needs an air quality permit). There may also be waste permits required depending on the process and what byproducts or waste are produced.

## CAFO Electronic Reporting

Pennsylvania will be developing an electronic reporting form for CAFO Annual Reporting in order to meet EPA's Electronic Reporting Rule requirements. Part of the existing annual report includes self-reporting of BMPs that had been implemented during the reporting year. DEP intends to utilize this information either to report directly (i.e. manure storage facility) or to verify industry trends (i.e. species of cover crop).

### *BMPs Captured:*

**All Ag BMPs, but focus is on the following: Animal Waste Management Systems, Manure Treatment Technology, Nutrient Management – Supplemental N and P, Cover Crop (Commodity), Dairy Precision Feeding**