

DRAFT

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

QAPP Addendum

VERIFICATION PROGRAM

July 8, 2015

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II. Introduction

The Chesapeake Bay Program has called for increased transparency and scientific rigor in the verification of the best management practices that are implemented as part of the states' Watershed Implementation Plans 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 is intended to serve as a guide for the states to document the methodology for verification of BMP installation, function, and continued effectiveness of practices over time. This Verification Framework provides the requirements for reporting and documentation of practice verification for the states to follow. Specific guidance is provided for each of the source sectors (agriculture, forestry, urban stormwater, wastewater, wetlands, and streams).

Verification is formally defined by the Chesapeake Bay Program 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 Chesapeake Bay Program 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.

Principle	Description
Practice Reporting	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.
Scientific Rigor	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.
Public Confidence	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.
Adaptive Management	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 and allow for reasonable levels of flexibility in the allocation or targeting of funds.
Sector Equity	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.

Pennsylvania is committed to working with EPA and the Chesapeake Bay Program to continue to implement and strengthen BMP verification activities that balance verification work and limited resources. This QAPP addendum provides details on Pennsylvania's BMP Verification Program for the Chesapeake Bay.

III. Selection of Priority BMPs for Verification

While it is the goal to verify implementation of all best management practices (BMPs) implemented within the Chesapeake Bay Watershed, resource constraints dictate that priorities be set to focus on those BMPs of greatest contribution to achieving Pennsylvania’s pollutant load reduction goals. BMPs considered to be of the highest priority for developing verification procedures were those that are generally projected to contribute at least 5 percent of the load reduction to the state by 2025. Other BMPs, such as certain stormwater practices, were also selected to be addressed in this version of the QAPP addendum. Determinations of percent contribution were based on the “watermelon charts” provided by the Chesapeake Bay Program in Appendix P of the Verification Framework (Chesapeake Bay Program 2014). These charts provided the percent contribution from each BMP based on the state WIP. The resulting priority BMPs are listed in Table 2. In total, these BMPs account for 76, 64, and 84 percent, respectively, of the N, P, and sediment load reductions projected for 2025 under the Phase II WIP. Verification protocols for other BMPs with lower anticipated contributions to the overall load reductions will be developed but at a slower pace, given the reduced reliance on these practices to Pennsylvania’s reduction strategy.

Table 2. Highest Priority BMPs for verification protocol development.

Sector	BMP
Agriculture	Animal Waste Management Systems
Agriculture	Conservation Plans/SCWQA
Agriculture	Conservation Tillage
Agriculture	Cover Crops
Urban	Erosion and Sediment Control
Agriculture	Forest Buffers
Agriculture	Land Retirement/Environmental Planting
Agriculture	Nutrient Management
Agriculture	Poultry and Swine Phytase
Urban	Urban Stormwater BMPs
Urban	Wastewater Treatment/CSOs

IV. Agricultural Practice Protocols

Animal Waste Management Systems

Animal waste management systems are practices designed for proper handling, storage, and use of wastes generated from AFOs. They include a means of collecting, scraping, or washing wastes and contaminated runoff from confinement areas into appropriate waste storage structures (Chesapeake Bay Program [Watershed Model Phase 5.3](#)).

Significance of BMP

Animal waste management systems account for 5.8 and 15.7 percent, respectively, of the N and P load reductions projected for 2025 under the Phase II WIP. The implementation goal for 2025 is 8,629 units. Animal waste management systems are considered a high priority for verification.

Verification Gaps

Pennsylvania currently has no verification procedures for animal waste management systems, but proposes to address this need by using either remote sensing or a statistical approach (Please see Section VII, “Next Steps” for additional details.).

Conservation Plans/SCWQA

Soil conservation and water quality plans (SCWQA or conservation plans) are a combination of agronomic, management and engineered practices that protect and improve soil productivity and water quality, and are designed to prevent deterioration of natural resources on all or part of a farm (Chesapeake Bay Program [Watershed Model Phase 5.3](#)). The practices help to control erosion and nutrient runoff by modifying cultural or structural practices. Cultural practices can change from year to year and include changes to crop rotations. The practices do not include reduction credits to certain cultural practice changes on crop or hay land, such as conservation tillage or cover crop practices which are credited as individual BMPs. However, cultural practice changes are reflected in pastureland reduction efficiencies. Structural components consisting of longer term conservation measures included in the *Field and Pasture Erosion Control Practices* include the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) conservation practices listed below. Note that credit cannot be taken for each practice implemented under a farm erosion and sediment plan or an NRCS Conservation Plan; the suite of practices listed in the plan are prescribed to meet a USDA-NRCS RUSLE2 prediction of soil losses at or below the soil loss tolerance value (T) for the accredited land acreage.

Applicable NRCS codes

- Access Road (560)
- Alley Cropping (311)
- Animal Trails and Walkways (575)
- Conservation Cover (327)
- Conservation Crop Rotation (328)
- Contour Buffer Strips (332)
- Contour Farming (330)
- Critical Area Planting (342)
- Diversion (362)
- Field Border (386)
- Filter Strip (393)
- Grade Stabilization Structure (410)
- Grassed Waterway (312)
- Lined Waterway or Outlet (468)
- Residue Management, Seasonal (344)
- Rock Barrier (555)
- Row Arrangement (557)
- Sediment Basin (350)
- Strip cropping (585)
- Structure for Water Control (587)
- Terrace (600)
- Underground Outlet (620)
- Water and Sediment Control Basin (638)
- Windbreak/Shelterbelt Establishment (380)

Many conservation practices are available to address soil movement, transport, and loss from agricultural fields. The practices used are site-specific based on site conditions, landowner operation, and land use.

Significance of BMP

Conservation plans account for 2.4, 4.1, and 6.7 percent, respectively, of the N, P, and sediment load reductions projected for 2025 under the Phase II WIP. The implementation goal for 2025 is 2,908,925 acres. Conservation plans are considered a high priority for verification.

Verification Procedures

Programs Involved in Verification

Conservation plans are reported from a suite of practices employed by NRCS in implementing BMPs at agricultural operations. Examples of these practices include contour farming, diversions, hedgerow planting, irrigation systems, and terraces among many others. Data for reporting this practice is primarily received from NRCS or the Farm Services Agency (FSA) of USDA. A small number of plans (4 records covering 6,500 acres in 2014, for example) were reported from Pennsylvania's Growing Greener Program. Lesser quantities of the conservation plan "sub-practices" are reported from the 319 and Nutrient Management Act Programs, which do not officially report "plans" but BMPs that map into the conservation plan BMP within Scenario Builder.

Method

Initial certification of practices by NRCS follows methods specified in the [General Manual](#), Title 450, Part 407 (GM-450, Part 407). Subpart B addresses documentation and certification of practices. Spot checking is statewide and covers all practices installed or reported in the state (Subpart B of General Manual). Five percent of total practices installed or reported in the state are spot checked, with a limit of 20 installations required per practice. No more than 3-5 low-risk practice installations need to be checked by an office, field office, or county.

When selecting the installation to be spot checked, NRCS must first determine the kind and number of practices installed in the fiscal year from field office records. In choosing which practices to spot check, State Conservationists (STCs) and Directors are directed to prioritize the spot checking of conservation practices that pose a greater risk to: life, property, and the environment; practices where a high percentage of annual cost-share funds were used; and practices with a high installation cost compared to other practices. STCs and Directors are required to develop a procedure to set priorities for conservation practices to be spot checked. High-risk practices may be spot checked at a higher rate than low-risk practices. The person performing the spot checking is directed to select random samples of the technical work of as many members of the staff as practicable. The work of each staff member of the staff should be spot checked a minimum of once every 3 years.

Spot checks are to be distributed among various practices applied during the year, and each type practice should be spot checked at least every three years. If errors or deficiencies are found, staff are directed to check additional installations until a true picture of the quantity and quality of the work is obtained. All cost-shared practices for which NRCS is technically responsible on all farms that NRCS employees own, or have an interest in, are to be spot checked. These

checks, as well as those checks made during State Quality Reviews, are counted as part of the spot-check requirement.

NRCS is also directed to spot check five percent of NRCS program technical service provider (TSP) certifications. Complete construction checks and checks of the documentation furnished by the TSP, including approved drawings and specifications, should be made on one or more jobs installed by each TSP during the year. The check notes are to be recorded and filed.

In addition, NRCS is directed to spot check at least 10 percent of the conservation practice and practice components for the first 3 years after certification (excluding renewals) or recertification of a TSP. For a Technical Service Provider (TSP) where the number of installations of a conservation practice or practice component exceeds 50 in a given year, only 5 are required to have a spot check. After the first 3 years of certification or recertification of the TSP, a spot check is to be performed on at least 5 percent of the conservation practice or practice components. For a TSP where the number of installations of a particular type of conservation practice or practice components exceeds 100 in a given year, only 5 are required to have a spot check.

Checking will determine the accuracy and adequacy of the design, quality of installation, accuracy of measurements and computations, adequacy of supporting records, and the need and practicability of the practice, including its role in a resource management system. The checker should make enough notations to substantiate checking of the installation and the supporting data. The checker is to record the observations and measurements made in determining accuracy of the original document. Notes and records of spot checks are to be filed at the field office that helped install the practice.

Spot-checking reports are to be created as soon as the spot checking is completed. Reports are to be addressed to the appropriate line officer with a copy to the NRCS District Conservationist. Reports are to include the result (pass/fail), plus the following information:

- Name and extent of each practice checked.
- Participant's name and location of property on which a practice was checked.
- Statement that the practice checked met specifications and the amount certified is correct.
- Program under which the practice was applied.
- Adequacy of supporting data.
- Other comments as needed.
- If the spot check reveals deficiencies such as a practice that fails to meet specifications, lack of supporting data, or errors in quantities, the report is to include:
 - Details of how the practice failed to meet specifications or lacked adequate supporting data, or both.
 - Recommendations for correcting deficiencies.
 - Suggested training or other action to help prevent recurrence of deficiencies.
 - If the spot check reveals quality work, this should also be documented.

Prompt and thorough follow-up of spot-checking reports is essential. If the checker questions need and practicability, he or she is to discuss the findings and opinions with the appropriate line officer. STC and Directors will ensure that line officers report annually the status of spot

checking to the STC within 90 days after the end of the spot-check year. Deficiencies are to be described in detail, and a follow-up report is required each 60 days until all follow-up action has been completed.

If performance of the practice has been certified, and significant errors in quantities certified are found, the office responsible for making cost-sharing payments and the participant are to be informed immediately. If a practice does not meet specifications, the District Conservationist is to take action immediately to assist the participant in making necessary modifications to meet specifications.

The program participant and the TSP will be notified in writing of the deficiencies and corrective actions needed. A reasonable time period will be specified for the corrective action needed. For TSP assisted practices, failure to correct the deficiency within the specified time period may trigger the TSP decertification process by the STC.

When corrective measures have been taken, a final check is to be made and the case closed. If corrective work is not done, the agency providing cost sharing is to be given the information and take further action in accordance with program regulations.

Verification Teams

Staffing

Initial certifications are conducted by NRCS Technical Specialists and TSPs. Follow-up spot checks of practices implemented under USDA programs are carried out by an NRCS Technical Specialist with proper job approval authority-meaning people qualified to install the practice are the only ones eligible to conduct the follow-up. Staff for practices implemented under Pennsylvania's Growing Greener Program, the Section 319 program, and Nutrient Management Act program are certified immediately following implementation by NRCS Technical Specialists, Qualified State and Federal Fish and Wildlife Staff, Qualified Private Sector Engineers and Agricultural BMP Experts, DEP Watershed Managers, TSPs, Qualified Conservation District Staff and Other Qualified Individuals.

Qualifications, Training, and Certification

NRCS technical specialist requirements are specified by the U.S. Office of Personnel Management.

TSP requirements are found here:

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/technical/tsp/>

TSPs must be certified by NRCS via certification agreements that specify licensing requirements.

The qualifications, training, and certification of staff responsible for practices implemented under Pennsylvania's Growing Greener Program, the Section 319 program, and Nutrient Management Act program are consistent with those used to qualify individuals as NRCS Technical Service Providers or other qualified technical experts.

Data Collection and Entry

Information on BMPs implemented under FSA and NRCS programs is obtained for DEP by CBPO staff working under a 1619 Agreement set up between USDA and the U.S. Geological Survey (USGS). On a yearly basis, USGS staff (or their contractor) provide a specially-prepared Excel file that contains information on NRCS implemented BMPs for a given time period pertaining to that year's NEIEN submission. This information is subsequently reviewed by DEP and re-formatted for inclusion in its NPS BMP database.

Information on BMPs implemented under Pennsylvania's Growing Greener Program, the Section 319 program, and Nutrient Management Act program is obtained through the staff at the DEP Bureau of Conservation and Restoration and the DEP Grants Center and entered into the NEIEN database by agency staff and agency authorized sub-contractors.

Practices that comprise conservation plans are reported into NEIEN as received from the state programs and NRCS/FSA and processed by Scenario Builder to establish the total acres of Conservation Plan Management within a given county. The conservation plan crediting function occurs within Scenario Builder and the data used to report these BMPs is almost entirely supplied by NRCS/FSA. NRCS and DEP are working together on an aerial imagery pilot to help determine methodologies for verifying BMPs that are reported by NRCS. Information on the pilot is contained later in this document under "Additional Data Collection Efforts".

Independent Verification of Data

NRCS verifies the work of a TSP, but independent verification of NRCS work is not performed by those outside of agency employees, although quality checks are performed by only those having appropriate Job Approval Authority.

Data on BMPs implemented under Pennsylvania's Growing Greener Program, the Section 319 program, and Nutrient Management Act program is verified by local project sponsors and DEP agency staff.

Validation of External Data

NRCS verifies the work of a TSP, but independent verification of NRCS is not performed.

As described above, BMP data from USDA/NRCS are obtained and compiled by USGS under an existing 1619 agreement. It is assumed that data tracking and verification protocols followed by USDA meet the requirements established by the CBPO. The data received from USGS are believed to be accurate, and are not modified once received, with one exception. That is, the unit values pertaining to "fencing" are reduced by 70% since not all fencing installed as NRCS practice code 382 is used for streambank fencing (which is what DEP utilizes this information to estimate). Based on discussions with NRCS staff in Pennsylvania, it is estimated that up to 30% of the total fencing installed in the state could be used for this particular BMP. Consequently, beginning with the 2014 Progress Run submission, DEP will use 30% of the total fencing as an estimate for streambank fencing until a better approach for quantifying this particular practice from NRCS data is developed.

Data on BMPs implemented under Pennsylvania's Growing Greener Program, the Section 319 program, and Nutrient Management Act program are collected internally by DEP agency staff and aggregated by agency authorized sub-contractors.

Addressing Historical Data and Double Counting

Historical data are handled by DEP staff or contractors that report data to the Watershed Model. DEP staff review historical BMP data to determine if past reported practices are still relevant for inclusion in the model and to determine if there is any double counting or misrepresentation of the data in the prior reports.

To address historical data on conservation plans, unless verification data is made available confirming that a plan still exists, reported plans will now be removed from NEIEN after a period of ten years.

Prevention of double-counting of conservation plans is an important part of data entry into NEIEN. With the exception of NRCS-funded BMPs, data sources provide enough information to allow DEP staff or contractors to confirm whether a BMP is being reported by more than one data source. However, for NRCS-funded BMPs, data has been generated for DEP by CBPO staff working under a 1619 Agreement set up between USDA and the U.S. Geological Survey. This is more fully described in Pennsylvania’s QAPP in Section 3.2.9 titled “USDA – Natural Resource Conservation Service.” That section helps to explain how some of the BMP activities included in the original file provided by USGS may have received funding from sources other than NRCS (e.g., various state programs). In these cases, the federally-funded BMPs are selected for reporting, and potentially duplicative “state-funded” datasets are not reported. In other words, if there is not enough information available to determine whether a BMP is potentially being duplicatively reported from both NRCS and non-NRCS datasets, then only the NRCS (federal) data is reported. This conservative approach is intended to prevent duplicative reporting and double-counting.

Summary

A snapshot summary of verification procedures for conservation plans and SCWQA is provided in **Table 3**.

Table 3. Jurisdictional Verification Protocol Design Table: Conservation Plans and SCWQA.

Verification Element	Description
BMP or Group	Conservation Plans and SCWQA
Geographic Scope	All counties within the Chesapeake Bay Watershed
A. WIP Priority	High
B. Data Grouping	Agriculture
C. BMP Type	Annual, Multi-Year, Structural, Management
D. Initial Inspection	
Method	NRCS: On-site certification. DEP: On-site verification conducted by local grant administrators.
Frequency	NRCS: At installation and annually thereafter (depends on practice to some degree). DEP: At installation and periodically (approximately once every other year) after by grant administrator.
Who Inspects	NRCS: Technical Specialist, or a TSP. DEP: Regional Water Quality Program Staff. Private Sector Engineers and Qualified Agricultural Experts. Local Project Grant Administrators.
Documentation	NRCS: Immediate reports to District Conservationist and inclusion of a summary of completed spot checks in the year-end Quality Assurance Report. DEP: Sign-off on final project reports. Private Sector Engineers and Qualified Agricultural Experts: As-built drawings and sign offs. Local Project Grant Administrators: Final project reports.
E. Follow-Up Check	

Follow-Up Inspection	NRCS: On-site
Statistical Sub-Sample	NRCS: 5% follow-up on-site inspections
Response if Problem	NRCS: If a practice does not meet specifications, the program participant and the TSP will be notified in writing of the deficiencies and corrective actions needed. A reasonable time period will be specified for the corrective action needed. For TSP assisted practices, failure to correct the deficiency within the specified time period may trigger the TSP decertification process by the STC. When corrective measures have been taken, a final check is to be made and the case closed. If corrective work is not done, the agency providing cost sharing is to be given the information and take further action in accordance with program regulations.
F. Lifespan/Sunset	NRCS: Checks practices throughout contract lifespan. DEP: Local Grant Administrators check practices throughout the project lifespan for funded practices.
G. Data QA, Recording & Reporting	NRCS: Immediate reports to District Conservationist and inclusion of a summary of completed spot checks in the year-end Quality Assurance Report. Data from NRCS/FSA are assumed accurate by DEP. Double-counting is addressed based on funding source information. DEP: Local Project Administrators report BMPs installed in their grant project final reports. This final report information is submitted to the DEP regional office and the Grants Center for the recording of grant program accomplishments.

Verification Gaps

There are no verification gaps for USDA programs. Projects implemented using DEP provided funds are well verified at implementation time but are not consistently tracked by DEP staff after that time. There is no established and consistently followed statistical sampling of past installed state funded projects by DEP staff. A majority of these state funded projects are inspected in later years by local grant administrators but this information is not collected or verified at the state level.

Conservation Tillage

Conservation tillage involves planting and growing crops with minimal disturbance of the surface soil (Chesapeake Bay Program [Watershed Model Phase 5.3](#)). Conservation tillage requires two components, (a) a minimum 30% residue coverage at the time of planting and (b) a non-inversion tillage method. No-till farming is a form of conservation tillage in which the crop is seeded directly into vegetative cover or crop residue with little disturbance of the surface soil. Minimum tillage farming involves some disturbance of the soil, but uses tillage equipment that leaves much of the vegetation cover or crop residue on the surface. The Continuous High-Residue Minimum Soil-Disturbance (HR) BMP is a new crop planting and residue management practice in which soil disturbance by plows and implements intended to invert residue is eliminated. Any disturbance must leave a minimum of 60% crop residue cover on the soil surface as measured after planting. HR involves all crops in a multi-crop, multi-year rotation and the crop residue cover requirement (including living or dead material) is to be met immediately after planting of each crop.

Significance of BMP

Conservation tillage accounts for 6.9, 2.4, and 33.6 percent, respectively, of the N, P, and sediment load reductions projected for 2025 under the Phase II WIP. The implementation goal for 2025 is 829,065 acres. Conservation tillage is considered a high priority for verification.

Verification Procedures

Programs Involved in Verification

Conservation tillage is implemented voluntarily by farmers and under a variety of programs including those of USDA, CBIG, 319, REAP, and Growing Greener.

Method

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, <http://www.ctic.purdue.edu/CRM/>. Pennsylvania survey procedures are based on the original methods described in "[Cropland Roadside Survey Method: Procedures for Cropland Roadside Transect Surveys for Obtaining Reliable County- and Watershed-Level Tillage, Crop Residue, and Soil Loss Data](#)". The methodology is described in Appendix C of the QAPP (DEP 2015).

As part of the survey, data are collected for seven different categories of tillage. Data on only four of these categories where residue exceeds 30% are used for NEIEN reporting purposes. In this case, all BMP acres are submitted as "Conservation Tillage" acres. The type of data collected in recent surveys includes county, crop (e.g., corn, forage, soybeans), and acreage with various levels of residue (e.g., <15%, 15-30%). The 2014 survey, and all future surveys, will include a 60% residue classification to capture high-residue conservation tillage in accordance with CBPO-approved guidance.

Information on conservation tillage obtained from the above survey approach is QA/QC checked as part of the survey methodology. The reported results are assumed to be accurate, and the data are not further checked or verified prior to inclusion in the annual submission to CBPO via NEIEN. The Cropland Roadside Survey method includes the following statement regarding data

quality: “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”.

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.

Verification Teams

Staffing

County survey teams are staffed by three individuals; two of whom work in multiple counties in order 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, the consulting and data entry technicians staff multiple counties.

Qualifications, Training, and Certification

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.

The training was developed by the survey organizer, Capital Resource Conservation and Development Area Council (Capital RC&D), in collaboration with a technical consultant, Joel Myers. 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 also 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.

Validation of External 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.

Addressing Historical Data and Double Counting

Section 3.3.4 (“Conservation Tillage”) of Pennsylvania’s QAPP provides details on historical data input related to conservation tillage. Previously, Pennsylvania had been using CTIC data to report conservation tillage. However, Pennsylvania has been working successfully with Capital RC & D to transition to the transect survey approach previously described in this section, a process that started in 2007 with a limited scope. After 2010, Capital RC&D was engaged by DEP to conduct a more extensive survey in which additional counties were added. This first survey (conducted in spring of 2012) was used as the basis for the 2012 NEIEN submission. In 2012, fifteen (15) counties were included in the survey. In 2013, the survey was conducted in twelve (12) new counties and repeated in three (3) counties that were done in 2012. One additional county was surveyed in 2014, and plans call for repeating this survey for all counties previously evaluated on a rotating basis, depending on availability of resources, but not to exceed five years. Currently, counties with greater than 50,000 acres of agriculture are surveyed.

Pennsylvania does not plan to address any historical conservation tillage data, as the information reported prior to 2010 was based on CTIC data that has been reviewed by DEP and appears to be consistent and does not warrant changing previously recorded data.

Because of the nature of the survey, programmatic double-counting of BMPs is avoided.

Summary

A snapshot summary of verification procedures for conservation tillage is provided in **Table 4**.

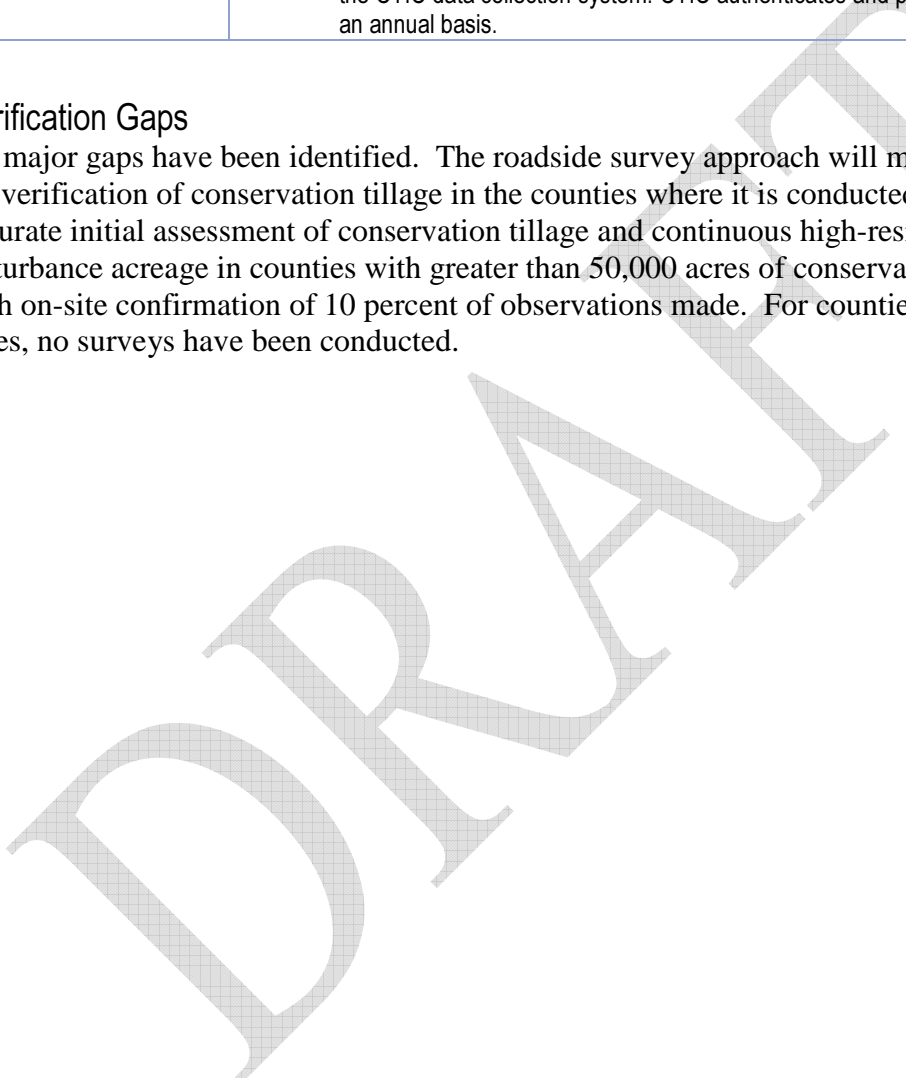
Table 4. Jurisdictional Verification Protocol Design Table: Conservation Tillage.

Verification Element	Description
BMP or Group	Conservation Tillage
Geographic Scope	All counties within the Chesapeake Bay Watershed with greater than 50,000 acres of agricultural land use
A. WIP Priority	High
B. Data Grouping	Agriculture
C. BMP Type	Management
D. Initial Inspection	
Method	CTIC Cropland Roadside Transect Survey
Frequency	Rotating basis, depending on availability of resources, but not to exceed five years. Goal is to conduct the surveys every other year.
Who Inspects	Team of 3 trained people: County agricultural agency staffer (knowledge of agriculture in surveyed county; 1 per county), consulting technician (agricultural professional with cropland experience), data entry technician (mapping and GIS expertise)
Documentation	Crop (or land use if not crop), % residue cover (e.g., 0-15%, 15-30%, ≥60%), and GPS point
E. Follow-Up Check	
Follow-Up Inspection	Annual practice.
Statistical Sub-Sample	10% of crop observations of each survey technician is field verified by consulting technician
Response if Problem	Only acreage meeting residue cover requirements are reported for credit.

F. Lifespan/Sunset	Annual practice.
G. Data QA, Recording & Reporting	<ul style="list-style-type: none"> • 90% confidence in accuracy (Hill 1996) • 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 also 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. • 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.

Verification Gaps

No major gaps have been identified. The roadside survey approach will meet all requirements for verification of conservation tillage in the counties where it is conducted. This includes an accurate initial assessment of conservation tillage and continuous high-residue minimum soil-disturbance acreage in counties with greater than 50,000 acres of conservation tillage, coupled with on-site confirmation of 10 percent of observations made. For counties with less than 50,000 acres, no surveys have been conducted.



Cover Crops

Cereal cover crops reduce erosion and the leaching of nutrients to groundwater by maintaining a vegetative cover on cropland and holding nutrients within the root zone (Chesapeake Bay Program [Watershed Model Phase 5.3](#)). This practice involves the planting and growing of cereal crops (non-harvested) with minimal disturbance of the surface soil. The crop is seeded directly into vegetative cover or crop residue with little disturbance of the surface soil. These crops capture or “trap” nitrogen in their tissues as they grow. By timing the cover crop burn or plow-down in spring, the trapped nitrogen can be released and used by the following crop. Different species are accepted as well as, different times of planting (early, late and standard), and fertilizer application restrictions. Manure application on cover crops is not modeled and acres of cover crops that receive manure are not eligible. There is a sliding scale of efficiencies based on crop type and time of planting.

Commodity cover crops differ from cereal cover crops in that they can be harvested for grain, hay, or silage and they might receive nutrient applications, but only after March 1 of the spring following their establishment. The intent of the practice is to modify normal small grain production practices by eliminating fall and winter fertilization so that crops function similarly to cover crops by scavenging available soil nitrogen for part of their production cycle.

Significance of BMP

Cover crops account for 5.1 percent of the N load reduction projected for 2025 under the Phase II WIP. The implementation goal for 2025 is 598,620 acres. Cover crops are considered a high priority for verification.

Verification Procedures

Programs Involved in Verification

Cover crops are implemented voluntarily by farmers and under a variety of programs including those of USDA, CBIG, 319, REAP and Growing Greener.

Method

While Section 3.3.5 (“Cover Crops”) of the Pennsylvania QAPP describes current reporting procedures for cover crops, pilot programs utilizing transect surveys and aerial imagery analysis for verifying cover crops are being conducted in Pennsylvania.

A transect survey of cover cropping following an agronomic season will provide a statistically valid county-wide assessment. The survey is completed in two parts; in the fall, cover crop species, estimated establishment date, establishment density, planting method and manure application are recorded. In late spring confirmation of cover crop species (if possible) and termination method - either harvest or burn down, are recorded for the same points.

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 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, <http://www.crmsurvey.org/>. 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. 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 agriculture 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.

Following the five county survey effort in 2015, 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 make a determination 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 in the model. When exact species of winter grain or rye is easily identified it is recorded.

Additionally, as part of a pilot program in the Potomac Basin, Pennsylvania is working with NRCS to determine if aerial imagery can be used for cover crops. Please see Section VII, “Next Steps” for additional details.

Verification Teams

Staffing

For transect surveys, county survey teams are staffed by three individuals, two of whom survey multiple counties in order to achieve greater consistency between counties. Each team includes:

- 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.
- 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.
- 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.

Qualifications, Training, and Certification

For transect surveys, training was developed by the survey organizer, Capital RC&D, in collaboration with a technical consultant, Joel Myers. 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 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

For transect surveys, survey data are entered electronically during the survey using an Excel-based data entry sheet with drop-down data options. Data entry technicians 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.

Independent Verification of Data

For transect surveys, 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.

Validation of External Data

For transect surveys, survey data are verified with a spot check of 10 percent of crop observations, but no other validation is performed.

Addressing Historical Data and Double Counting

As described in Section 3.3.5 (“Cover Crops”) of the Pennsylvania QAPP, prior to the transect survey and aerial imagery pilots, annual estimates of the cultivated land in the Pennsylvania portion of the Chesapeake Bay watershed where cover crops are grown were obtained via a combination of two sources of data: NASS winter wheat information and NRCS data. This was the only approach available to DEP because no programs existed to track cover crop acres. Information on crop types or cover crop acres obtained from this historical approach was assumed to be accurate, and the data were not further checked or verified prior to inclusion in the annual submission to CBPO via NEIEN. NASS-based estimates of winter wheat, however, were reduced by 50% to provide a reasonable estimate. Changes in current reporting procedures reduced the number of acres in NEIEN from 197,279 in 2009 to 76,698 in 2014, with most acres now reported as commodity cover crops.

DEP is working on a process to utilize CEAP data to help address historical data on cover crops.

Work will continue on the transition from past reporting practices to utilizing transect surveys and aerial imagery. Because of the nature of these procedures, double-counting of BMPs will be avoided.

Summary

A snapshot summary of verification procedures for cover crops is provided in **Table 5**.

Table 5. Jurisdictional Verification Protocol Design Table: Cover Crops.

Verification Element	Description
BMP or Group	Cover Crops
Geographic Scope	After completion of two pilots, intent is to verify within all counties within the Chesapeake Bay Watershed with significant agricultural acreage
A. WIP Priority	High
B. Data Grouping	Agriculture
C. BMP Type	Management
D. Initial Inspection	
Method	Transect survey or Aerial Imagery
Frequency	The transect survey is completed in two parts; in the fall and following spring. Frequency of verification will be determined after the transect survey and aerial imagery pilots are completed.
Who Inspects	Transect surveys: Team of 3 trained people: County agricultural agency staffer (knowledge of agriculture in surveyed county; 1 per county), consulting technician (agricultural professional with agronomic crop experience), data entry technician (mapping and GIS expertise). Aerial Imagery: NRCS personnel.
Documentation	Transect surveys: All data are GPS points, cover crop species, estimated establishment date, establishment density, planting method and manure application. Late spring confirmation of cover crop species (if possible) and termination method - either harvest or burn down, are recorded for the same GPS points. Aerial Imagery: Aggregate Data.
E. Follow-Up Check	
Follow-Up Inspection	Annual practice.
Statistical Sub-Sample	Transect Survey: 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. Aerial Imagery: A percentage of BMPs will be ground-truthed.
Response if Problem	Only acreage meeting cover crop requirements are reported for credit.
F. Lifespan/Sunset	Annual practice.
G. Data QA, Recording & Reporting	Transect surveys: Survey data are entered electronically during the survey using an 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. Aerial Imagery: Aggregate Data.

Verification Gaps

Other than determining how often to conduct verification, no gaps have been identified in the new reporting/verification procedures being developed, but work will continue on the pilot programs to help confirm that there are no gaps. It is anticipated that the approaches will meet all requirements for verification of cover crops.

Riparian Buffers

Riparian Buffers are linear areas along rivers and streams that help filter nutrients, sediments and other pollutants. Agricultural riparian forest buffers are linear wooded areas along rivers, streams, and shorelines (Chesapeake Bay Program [Watershed Model Phase 5.3](#)). The recommended buffer width for riparian forest buffers (agriculture) is 100 feet, with 35 feet minimum width required. Agricultural riparian grass buffers are linear strips of grass or other non-woody vegetation maintained between the edge of fields and streams, rivers, or tidal waters that help filter nutrients, sediment, and other pollutants from runoff. The recommended buffer width for riparian grass buffers (agriculture) is 100 feet, with 35 feet minimum width required.

Significance of BMP

The 2025 statewide implementation goals and estimated share of pollutant load reductions for riparian buffers are summarized in the table below. Because load reductions exceed 5 percent for riparian buffers, this BMP is considered a high priority for verification.

BMP	2025 Goal (Acres)	Percent of Estimated Load Reduction Due to BMP		
		Nitrogen	Phosphorus	Total Solids
Forest Buffers	174,707	12.9	5.7	8.8
Agriculture	158,813			
Urban	15,894			
Grass Buffers	55,280	3.6	1.7	2.5
Agriculture	46,885			
Urban	8,395			

Verification Procedures

Programs Involved in Verification

Pennsylvania reports forest and grass buffer implementation data to the Watershed Model from several sources. The following table summarizes information on buffers that is collected and reported through NEIEN:

Source BMP Name	Chesapeake Bay Model BMP Name	Source
Grass Buffers	Grass Buffers	NRCS, CBIG, NMA, 319, REAP, Growing Greener
Riparian Buffer	CREP Riparian Forest Buffer	FSA
Riparian Forest Buffer	Riparian Forest Buffer	NRCS, CBIG, NMA, 319, REAP, Growing Greener

Method

The majority of riparian buffer acreage is implemented under USDA programs. FSA relies on NRCS for technical assistance, taking advantage of their expertise for initial certification and follow-up checks. See *Conservation Plans/SCWQA* above for information on NRCS initial and follow-up verification procedures. However, FSA also has additional procedures of its own for verification of riparian buffer implementation and maintenance, including a spot-check on up to 10 percent of all CRP-1's (i.e., contracts) before the end of each fiscal year until all practices in

the plan are applied and the approved cover is established. The 10 percent required is based on the total number of CRP-1's approved in the previous fiscal year. FSA and NRCS or a TSP are to work together to prioritize and select the contracts and practices on which to complete an annual status review. These procedures are documented in [FSA Handbook 2-CRP](#).

For forest buffers, NRCS or a TSP is required to spot check the site at the end of the second year to determine whether the riparian buffer is established and meets the standards and specifications for NRCS conservation practice code 391A, Riparian Forest Buffer. Information assessed during this process includes:

- Implementation of the approved conservation plan, including tree thinning, if applicable
- Condition of installed practices
- Need for revisions or additional assistance.

DEP staff annually visit riparian buffer sites, and determine if buffers are still in place. Sites visited include projects funded by CBIG, 319, REAP, and Growing Greener. Via a checklist, staff capture the following data: Location; Type of Buffer; and status of the buffer (to include photos).

Verification Teams Staffing

See *Staffing* under *Conservation Plans* for information on USDA programs. In addition, DEP staff from the Bureau of Conservation and Restoration conduct site visits. DEP's annual goal is to visit 25 percent of all buffer sites to conduct verification, and DEP has been able to meet that goal the past few years.

Qualifications, Training, and Certification

See *Qualifications, Training, and Certification* under *Conservation Plans* above for information on USDA programs. DEP staff enroll in NRCS training classes.

Training and Certification

See *Training and Certification* under *Conservation Plans* above for information on USDA programs. DEP staff enroll in NRCS training classes.

Data Collection and Entry

Information on BMPs implemented through NRCS programs and by FSA through the Conservation Reserve Program (CRP) and Conservation Reserve Enhanced Program (CREP) are obtained for DEP by CBPO staff working under a 1619 Agreement set up between USDA and the USGS. On a yearly basis, USGS staff (or their contractor) provide a specially-prepared Excel file that contains information on FSA-implemented BMPs for a given time period pertaining to that year's NEIEN submission. This information is subsequently reviewed by DEP and re-formatted for inclusion in its NPS BMP database.

Data collected by DEP staff visiting buffer sites is entered into an internal database.

Independent Verification of Data

See *Independent Verification of Data* under *Conservation Plans* above for information on USDA programs. No independent verification of DEP data is needed, since staff are well trained.

Validation of External Data

Information on BMP implementation obtained from USDA is assumed to be accurate, and the data are not further checked or verified prior to inclusion in the annual submission to CBPO via NEIEN. As described above, BMP data from USDA are obtained and compiled by USGS under an existing 1619 agreement. It is assumed that data tracking and verification protocols followed by USDA meet the requirements established by the CBPO.

Since DEP conducts site visits and collects data, there are no external sources of data to validate.

Addressing Historical Data and Double Counting

Section 3.2.8 of the PA QAPP (“USDA – Farm Services Agency) contains additional information on how historical data is addressed, and how double-counting is prevented. In 2013, DEP addressed historical data issues by correcting the units of BMPs funded by FSA programs. This addressed a reporting error that occurred when DEP transmitted data in 2009. Since this has been corrected, historical data has been addressed.

The *Conservation Plans* section of this document explains how DEP prevents double-counting of BMPs that are cost-shared. DEP compares federal and non-federal data and only reports federal data when more than one program funds a BMP.

While developing this document for the PA BMP Verification Program, a determination was made that DEP staff visiting buffer sites will now inform NEIEN data entry staff when a riparian buffer site is determined to no longer be in place. NEIEN data entry staff will remove BMP information in NEIEN to reflect the change in status. This programmatic change will enhance the accuracy of the data being reported.

Summary

A snapshot summary of verification procedures for riparian buffers is provided in **Table 6**.

Table 6. Jurisdictional Verification Protocol Design Table: Riparian Buffers.

Verification Element	Description
BMP or Group	Riparian Buffers
Geographic Scope	All counties within the Chesapeake Bay Watershed
A. WIP Priority	High
B. Data Grouping	Agriculture
C. BMP Type	Annual, Multi-Year, Structural, Management
D. Initial Inspection	
Method	NRCS/FSA: On-site certification. DEP: On-site verification conducted by local grant administrators and follow-up by DEP staff on a recurring basis.
Frequency	NRCS/FSA: At installation and annually thereafter (depends on practice to some degree). DEP: At installation and periodically by DEP staff in the Bureau of Conservation and Restoration. Approximately 25 percent of buffer sites are visited annually for verification purposes.
Who Inspects	NRCS/FSA: Technical Specialist, or a TSP. DEP: Staff in the Bureau of Conservation and Restoration.

Documentation	NRCS: Immediate reports to District Conservationist and inclusion of a summary of completed spot checks in the year-end Quality Assurance Report. FSA: Form FSA-848B. DEP: Final project reports. DEP staff collect data during site visits that is used to populate an internal database.
E. Follow-Up Check	
Follow-Up Inspection	NRCS/FSA: On-site. DEP: Approximately 25 percent of buffer sites are visited annually for verification purposes.
Statistical Sub-Sample	NRCS: 5% follow-up on-site inspections. FSA: up to 10% follow-up on site-inspections each year.
Response if Problem	<p>NRCS: If a practice does not meet specifications, the program participant and the TSP will be notified in writing of the deficiencies and corrective actions needed. A reasonable time period will be specified for the corrective action needed. For TSP assisted practices, failure to correct the deficiency within the specified time period may trigger the TSP decertification process by the STC. When corrective measures have been taken, a final check is to be made and the case closed. If corrective work is not done, the agency providing cost sharing is to be given the information and take further action in accordance with program regulations.</p> <p>FSA: NRCS or TSP will provide COC signed copies of the annual status reviews and the following information, if applicable:</p> <ul style="list-style-type: none"> • the reason why the practices have not been established • why the practice does not meet the design standards and specifications • what action must be taken for the practice to meet the standards and specifications • the estimated time it will take to meet the standards and specifications. <p>DEP: Staff coordinate with program leads. If a buffer no longer exists, data is to be removed from NEIEN.</p>
F. Lifespan/Sunset	NRCS/FSA: Checks practices throughout contract lifespan. DEP: Buffer data removed from NEIEN if buffer no longer exists.
G. Data QA, Recording & Reporting	NRCS/FSA: Immediate reports to District Conservationist and inclusion of a summary of completed spot checks in the year-end Quality Assurance Report. Data from NRCS/FSA are assumed accurate by DEP. Double-counting is addressed based on funding source information. DEP: Data from site visits recorded in an internal database.

Verification Gaps

No gaps have been identified for verification of riparian buffers, as federal and state efforts result in nearly 1/3 of sites being verified annually. No gaps have been identified for verification of grass buffers reported from federal sources. Grass buffers reported from state funded sources could be considered, but an analysis to determine the contribution of loading and number of BMPs reported would need to be conducted first to determine if the effort would have merit.

Land Retirement/Environmental Planting

Agricultural land retirement takes marginal and highly erosive cropland out of production by planting permanent vegetative cover such as shrubs, grasses, or trees. Land retired and planted to trees (Land Retirement of TRP to HYO (HEL)) can be reported under *Tree Planting* (Chesapeake Bay Program [Watershed Model Phase 5.3](#)). Land retirement to hay without nutrients (HEL) converts land area to hay without nutrients. Land retirement to pasture (HEL) converts land area to pasture.

Significance of BMP

Land retirement and environmental planting accounts for 18.2, 5.8, and 13.8 percent, respectively, of the N, P, and sediment load reductions projected for 2025 under the Phase II WIP. The implementation goal for 2025 is 407,379 acres. Land retirement and environmental planting is considered a high priority for verification.

Verification Procedures

Programs Involved in Verification

Land Retirement/Environmental Planting BMPs are funded under the following programs: NRCS, FSA, CBIG, and Growing Greener. The majority of data reported by Pennsylvania for this category are funded by NRCS or FSA. The following table summarizes information that is reported to NEIEN (Tree Planting has not yet been considered):

Source BMP Name	Chesapeake Bay Model BMP Name	Source
Conservation Cover	Land Retirement	NRCS 327, CBIG, Growing Greener
CREP Wildlife Habitat	Land Retirement	FSA CP-4, CBIG, Growing Greener
Critical Area Planting	Land Retirement	NRCS 342, CBIG, Growing Greener
Introduced Grasses	Land Retirement	FSA CP-1, CBIG, Growing Greener
Native Grasses	Land Retirement	FSA CP-2, CBIG, Growing Greener

Method

See *Conservation Plans/SCWQA* above for information on NRCS initial and follow-up verification procedures. See *Riparian Buffers* for information on FSA verification procedures. As described more fully in *Conservation Plans/SCWQA*, projects implemented using DEP provided funds are well verified at implementation time but are not consistently tracked by DEP staff after that time. There is no established and consistently followed statistical sampling of past installed state funded projects by DEP staff. A majority of these state funded projects are inspected in later years by local grant administrators but this information is not collected or verified at the state level. Additionally, DEP staff, funded through CBIG, currently conduct verification of approximately 10 percent of all projects funded with CBIG funds, but data is not available currently on the percentage of Land Retirement or Environmental Planting projects funded by CBIG are verified.

Verification Teams

Staffing

See *Riparian Buffers* for information on FSA staffing. See *Conservation Plans/SCWQA* above for information on NRCS and DEP staffing.

Qualifications, Training, and Certification

See *Riparian Buffers* for information on FSA qualifications, training, and certification. See *Conservation Plans/SCWQA* for information on NRCS and DEP qualifications, training, and certification.

Data Collection and Entry

See *Riparian Buffers* for information on FSA data collection and entry. See *Conservation Plans/SCWQA* for information on NRCS and DEP data collection and entry.

Independent Verification of Data

See *Riparian Buffers* for information on FSA independent verification of data. See *Conservation Plans/SCWQA* for more information on independent verification of NRCS and DEP data.

Validation of External Data

See *Riparian Buffers* for information on validation of external data for FSA programs. See *Conservation Plans/SCWQA* for information on data validation of projects for NRCS and DEP programs.

Addressing Historical Data and Double Counting

In 2013, DEP addressed historical data issues by correcting the units of BMPs funded by NRCS/FSA programs. This addressed a reporting error that occurred when DEP transmitted data in 2009. Since this has been corrected, historical data has been addressed.

See *Conservation Plans/SCWQA* above for more information on historical data and prevention of double counting.

Summary

A snapshot summary of verification procedures for Land Retirement and Environmental Planting is provided in **Table 7**.

Table 7. Jurisdictional Verification Protocol Design Table: Land Retirement and Environmental Planning.

Verification Element	Description
BMP or Group	Land retirement and environmental planting
Geographic Scope	All counties within the Chesapeake Bay Watershed
A. WIP Priority	High
B. Data Grouping	Agriculture
C. BMP Type	Annual, Multi-Year, Structural, Management
D. Initial Inspection	
Method	NRCS/FSA: On-site certification. DEP: On-site verification conducted by local grant administrators:
Frequency	NRCS/FSA: At installation and annually thereafter (depends on practice to some degree). DEP: At installation and periodically (approximately once every other year) after by grant administrator.
Who Inspects	NRCS/FSA: Technical Specialist, or a TSP. DEP: Regional Water Quality Program Staff. Private Sector Engineers and Qualified Agricultural Experts. Local Project Grant Administrators.
Documentation	NRCS: Immediate reports to District Conservationist and inclusion of a summary of completed spot checks in the year-end Quality Assurance Report. FSA: Form FSA-848B. DEP: Sign-off on final project reports. Private Sector Engineers and Qualified Agricultural Experts: As-built drawings and sign offs. Local Project Grant Administrators: Final project reports.
E. Follow-Up Check	
Follow-Up Inspection	NRCS/FSA: On-site

Statistical Sub-Sample	NRCS: 5% follow-up on-site inspections. FSA: up to 10% follow-up on site-inspections each year.
Response if Problem	<p>NRCS: If a practice does not meet specifications, the program participant and the TSP will be notified in writing of the deficiencies and corrective actions needed. A reasonable time period will be specified for the corrective action needed. For TSP assisted practices, failure to correct the deficiency within the specified time period may trigger the TSP decertification process by the STC. When corrective measures have been taken, a final check is to be made and the case closed. If corrective work is not done, the agency providing cost sharing is to be given the information and take further action in accordance with program regulations.</p> <p>FSA: NRCS or TSP will provide COC signed copies of the annual status reviews and the following information, if applicable:</p> <ul style="list-style-type: none"> • the reason why the practices have not been established • why the practice does not meet the design standards and specifications • what action must be taken for the practice to meet the standards and specifications • the estimated time it will take to meet the standards and specifications.
F. Lifespan/Sunset	NRCS/FSA: Checks practices throughout contract lifespan. DEP: Local Grant Administrators check practices throughout the project lifespan for funded practices.
G. Data QA, Recording & Reporting	NRCS/FSA: Immediate reports to District Conservationist and inclusion of a summary of completed spot checks in the year-end Quality Assurance Report. Data from NRCS/FSA are assumed accurate by DEP. Double-counting is addressed based on funding source information. DEP: Local Project Administrators report BMPs installed in their grant project final reports. This final report information is submitted to the DEP regional office and the Grants Center for the recording of grant program accomplishments.

Verification Gaps

There are no verification gaps for USDA programs. Projects implemented using DEP provided funds are well verified at implementation time but are not consistently tracked by DEP staff after that time. There is no established and consistently followed statistical sampling of past installed state funded projects by DEP staff. A majority of these state funded projects are inspected in later years by local grant administrators but this information is not collected or verified at the state level. Before developing procedures for DEP state funded projects, an analysis to determine the contribution of loading and number of BMPs reported would need to be conducted first to determine if the effort would have merit.

Nutrient Management

Nutrient management plan (NMP) implementation (crop, hay, pasture) is a comprehensive plan that describes the optimum use of nutrients to minimize nutrient loss while maintaining yield (Chesapeake Bay Program Watershed Model Phase 5.3). An NMP details the type, rate, timing, and placement of nutrients for each crop. Soil, plant tissue, manure, or sludge tests are used to assure optimal application rates. Decision agriculture is a management system that is information and technology based, is site specific and uses one or more of the following sources of data: soils, crops, nutrients, pests, moisture, or yield for optimum profitability, sustainability, and protection of the environment. In a yield reserve program using enhanced nutrient management, the farmer would reduce the nitrogen application rate by 15%. These three definitions for nutrient management (NM) are being reconsidered by the Nutrient Management Expert Panel for the Phase 5.3.2 model. Proposals have centered on a 3-tier system. The first tier, Crop Group Nutrient Application Management (CGNAM), has been approved and replaces nutrient management as defined above. If Tiers 2 and 3 are approved, the expectation of the Expert Panel is that they will replace both decision agriculture and enhanced nutrient management BMPs.

Pennsylvania's nutrient management reporting to the Watershed Model includes the following practices that are further defined in this section:

- Manure Management Plans (MMPs). PA anticipates that these plans will be considered as Tier 1 by the CBP; and
- Act 38 Nutrient Management Plans and NRCS 590 Plans (NMPs). PA anticipates that these will be considered as Tier 2 by the CBP; and
- Precision Nutrient Management and Planning (Precision NM). PA anticipates that Precision NM will be considered as Tier 3.

Significance of BMP

Nutrient management accounts for 5.6 and 2.6 percent, respectively, of the N and P load reductions projected for 2025 under the Phase II WIP. The implementation goal for 2025 is 2,046,033 acres. Nutrient management is considered a high priority for verification.

Verification Procedures

Programs Involved in Verification

Chapter 91 and Manure Management Plans (MMPs): Pertain to every farm in Pennsylvania that generates or uses manure, regardless of the size of the farm, including farms that:

1. Pasture livestock or poultry; or
2. Maintain an Animal Concentration Area (barnyard, exercise lot, or feedlot); or
3. Apply manure to their crop fields.

MMPs are crop specific comprehensive plans that describe the optimum use of nutrients (NP) to minimize nutrient loss while maintaining yield. Activities deal with the type, rate, timing and placement of nutrients for crops. These plans are a management type of BMP that is generally not cost-shared in Pennsylvania. State standards for MMPs are guided by Chapter 91 <http://www.pacode.com/secure/data/025/chapter91/chap91toc.html> .

PA Act 38 Nutrient Management Plans and NRCS 590 Plans (NMPs): PA Act 38 NMPs are comprehensive plans that describe the optimum use of nutrients (NPK) to minimize nutrient loss while maintaining yield. Activities deal with the type, rate, timing and placement of nutrients for crops. These plans are a management type of BMP that is generally not cost-shared in Pennsylvania. State standards for NMPs are guided by Act 38 of 2005 (Pennsylvania Nutrient and Odor Management Act), which amended Pennsylvania's first Nutrient Management Act (Act 6 of 1993).

It should be noted, that Comprehensive Nutrient Management Plan (CNMP) developed for NRCS programs, utilizing the NRCS code 590 standard for Pa, follow the Act 38 NMP planning format, calculations, and style.

Additionally, CAFO NMPs follow the same Act 38 NMP format, with some additional CAFO permit requirements added to the planning tools.

Precision Nutrient Management (Precision NM): A management type BMP that utilizes extensive soil and yield testing to optimize nutrient applications for optimum yields, while also protecting water quality. Precision NM is site-specific management that utilizes a series of layers of information about each field. Those layers could include:

- A. Grid sampling, guided by GPS, provides more accurate soil test data.
- B. Variable rate fertilizer application.
- C. Variable rate seeding, variety changes can adjust for soil properties and productivity.
- D. Crop scouting with new digital technologies improves field records.
- E. On-the-go yield monitors can quickly track variability in the field.

Each time a measurement is made (soil tests, scouting reports, yield data, etc.), another layer of information is added. Over time, multiple layers of information are added and become part of the database that can guide future crop management decisions. By geo-referencing each data point to its precise geographic location, these data layers can be "stacked" for analysis to determine the relationship between layers for any point in the field.

Method

I. MMPs

The Land Application of Manure Supplement to the Manure Management Manual serves as the guidelines and handbook to develop MMPs. Farmer records are kept on site.

Please refer to Section VII ("Next Steps") of this document for information on methodologies that DEP is considering for reporting and verifying MMPs.

II. NMPs

The Act 38 Technical Manual serves to guide the development of NMPs. For Concentrated Animal Operations (CAOs), Concentrated Animal Feeding Operations (CAFOs), and Volunteer Animal Operations (VAOs) required by Act 38 to obtain an NMP, approval of the plan is by the State Conservation Commission, or delegated conservation district, and must be obtained through an extensive and thorough review process. Annual status reviews are conducted by the State Conservation Commission or delegated Conservation Districts, and updates or amendments are made to a plan, if needed, to ensure compliance.

Farmer records are kept on site and reviewed by the SCC or delegated Conservation Districts during the annual review. Important data such as animal types, animal numbers, nutrients applied, crop yields, manure exported or imported, etc. are recorded.

In addition to the annual review previously described, NMPs are updated or amended every three years. For CAFOs, DEP regional offices inspect facilities at least once every five years for NPDES permit conditions. Note, the Act 38 NMP is one portion of the NPDES permit for CAFOs and that is inspected yearly.

Conservation District staff annually review implementation of each NMP as described in prior paragraphs. Double counting is avoided because there is only one plan per site.

III. Precision NM

Pennsylvania currently does not have standards or a verification program established yet for precision NM, as the industry and technology are making great strides, monthly, with this emerging technology. One must note that if a farm employs precision NM, they must not over apply nutrients or they would be in violation of Chapter 91. DEP has not reported Precision NM to NEIEN, but anticipates that reporting will occur in the near future.

Verification Teams

Staffing

In addition to the verification steps conducted by the SCC and delegated Conservation Districts as listed in the prior paragraphs for MMPs and NMPs (Tiers 1 and 2), certified planners help prepare plans. For Tier 3 Nutrient Management Planning, Certified Crop Advisors (CCA) or Certified Professional Agronomists (CPAg) generally prepare these plans.

The CCA and CPAg programs of the American Society of Agronomy are the benchmarks of professionalism. The CCA certification was established in 1992 to provide a benchmark for practicing agronomy professionals in the United States and Canada.

Qualifications, Training, and Certification

To become certified for Tier 2 (Act 38 or equivalent NMPs), a planner must pass an exam following participation in a program that includes a minimum of 10 classes. Final certification requires a need to write and review a certain number of plans, determined by the certification

category. Continued education credits are required to renew certification. More information on certification can be found at <http://extension.psu.edu/plants/nutrient-management/certification> .

Data Collection and Entry

MMPs. Please refer to Section VII (“Next Steps”) of this document for information on methodologies that DEP is considering for reporting and verifying MMPs.

Act 38 NMPs are recorded in a DEP database when initially certified or amended. DEP data on annual and quarterly activities is collected that supplements the initial NMP information. Trained staff enter the information. For NRCS 590 Plans, information on how NRCS verifies practices is contained earlier in this document under “Conservation Plans/SCWQA”.

Precision NM: DEP has not reported Precision NM to NEIEN, but anticipates that reporting will occur in the near future.

Independent Verification of Data

For all three levels of NM, Conservation Districts and certified NMP writers, reviewers, and CCAs serve as independent reviewers, following the previously described methodologies of review and verification. This is supplemented by DEP inspections of CAFOs.

Validation of External Data

Approval of an NMP is an extensive process overseen by trained State Conservation Commission professionals and certified plan review specialist. Trained conservation district professionals and certified plan review specialists conduct annual reviews as previously described. Trained DEP staff conduct CAFO inspections.

Addressing Historical Data and Double Counting

Section 3.2.2 (“DEP CBIG and Nutrient Management Act Programs”) contains additional details on how NM plans are entered into NEIEN, and how prevention of double-counting is addressed.

DEP has addressed historical data for NM plans. Past data was revised after reviewing and revising internal reporting. CAO/VAO plan acreages were revised (removed) based on the plan end dates (from '97 to present). “Imported acre” plans were given a three year lifespan, and NRCS (only about 5%) were reported as new acres. This has resulted in a significant drop in the number of acres reported in NEIEN. For example, data indicates that in 2009 PA reported 1,202,385 acres under Nutrient Management, and most recently reported only 344,684 acres in the 2014 Progress Run. It is anticipated that these numbers will increase if MMPs are recognized for reporting in NEIEN. As previously mentioned, in anticipation, DEP is developing procedures to collect MMP data.

When Tier 2 NM plans are updated or amended every three years, new plan information is provided for DEP reporting to the Chesapeake Bay Program. SCC or delegated Conservation District staff help provide a quality assurance review by verifying lists. Data is also reviewed by DEP staff or contractors entering NEIEN data to help ensure historic data is not re-reported for the current reporting year, which avoids possible double counting. Unless data is provided to

indicate that a plan has been updated or is still valid, Pennsylvania will remove plans from NEIEN that are older than three years. As Pennsylvania develops protocols for Tier 1 and Tier 3 NM, the topics of historical data and prevention of double-counting will be addressed.

Summary

A snapshot summary of verification procedures for nutrient management related to Act 38 NMPs is provided in Table 8. For NRCS 590 Plans, information on how NRCS verifies practices is contained earlier in this document under “Conservation Plans/SCWQA”.

Table 8. Jurisdictional Verification Protocol Design Table: Nutrient Management.

Verification Element	Description
BMP or Group	Nutrient Management
Geographic Scope	All counties within the Chesapeake Bay Watershed – plans required by Act 38
A. WIP Priority	High
B. Data Grouping	Agriculture
C. BMP Type	Management
D. Initial Inspection	
Method	Act 38 Manual guides development of NMPs.
Frequency	At plan approval.
Who Inspects	Plans for CAOs, CAFOs, and VAOs are approved by the SCC or delegated Conservation Districts.
Documentation	Farmer records are kept on site and reviewed by the SCC or delegated Conservation Districts during the annual review. Important data such as animal types, animal numbers, nutrients applied, crop yields, manure exported or imported, etc. are recorded.
E. Follow-Up Check	
Follow-Up Inspection	Annual practice.
Statistical Sub-Sample	No. DEP data on annual and quarterly activities is collected to supplement the initial NMP information. NMPs for CAOs and CAFOs are inspected yearly, on site. VAO are inspected at least once every 3 years
Response if Problem	Plan updated or amendments are required. The regulations and law spell out 10 specific items that would trigger a plan amendment. Plan amendments are handled similar to a new plan submission
F. Lifespan/Sunset	Annual practice. NMPs are for 3 years, unless an end date is provided prior to that time frame.
G. Data QA, Recording & Reporting	NMP data are recorded in a DEP database when initially certified or amended. Trained staff enter the data to the DEP database.

Verification Gaps

If nutrient management BMPs are changed for either Phase 5.3.2 or 6.0, adjustments may need to be made to certify and verify with follow-up monitoring that these new BMPs are in place and warranting credit in the Watershed model. Pennsylvania seeks to verify manure management plans (MMPs) such that they receive model credit in the future and is currently working on a protocol to capture data for MMPs and implement verification procedures (more information is provided in Section VII of this document).

Phytase

Phytase is a feed supplement that can be included in poultry and swine diets. Manure phosphorus reductions occur because animal absorption of the element is improved, resulting in a reduced need for phosphorus in feed and reduced amounts of phosphorus in manure.

Significance of BMP

The 2025 statewide implementation goals and estimated share of pollutant load reductions for poultry and swine phytase are summarized in the table below. Because phosphorous load reductions related to poultry phytase exceed 5 percent, this BMP is considered a high priority for verification. This may change when Phase 6 of the Watershed Model is implemented.

BMP	2025 Goal*	Percent of Estimated Load Reduction Due to BMP		
		Nitrogen	Phosphorus	Total Solids
Phytase				
Poultry	100% @ 32%	N/A	9.1	N/A
Swine	99% @ 17%	N/A	1.8	N/A

* Goals are expressed as percent Animal Units (AU) @ % Phosphorous Reduction

Verification Procedures

Currently, for poultry phytase, Pennsylvania receives credit for 100% AU @ 19% phosphorous reduction. This crediting is established by the Chesapeake Bay Program and is applied across all jurisdictions. In addition to poultry phytase use, the Commonwealth is working to receive recognition of swine phytase in annual progress runs. Discussions with members of the agricultural sector in Pennsylvania indicate that the implementation of phytase feed management occurs at a high rate. Additionally, there are discussions at Chesapeake Bay Program workgroups regarding possible changes to the Phase 6 Watershed model that would impact how loading rates associated with manure are calculated. There may not be a need to report phytase implementation levels beginning in 2017.

Given the high implementation rate and anticipated changes in Phase 6 of the Watershed Model, Pennsylvania is proposing to not develop a verification program for phytase at this time. However, DEP is pursuing funds for a project to conduct a comprehensive study on poultry manure nutrients and volume production. If initiated, this two-year study would provide data needed to guide the development of a verification program for poultry manure. Results of this study could then be used to inform future work related to swine manure.

Verification Gaps

No gaps have been identified, but this will be re-evaluated once the Watershed Model is updated for Phase 6.

V. Stormwater Management Protocols

This section describes the BMP verification procedures and practices related to stormwater management BMPs for stormwater discharges related to National Pollutant Discharge Elimination System (NPDES)-permitted construction activities and post-construction stormwater management. BMPs addressed in this section include, but are not limited to, wet ponds, constructed wetlands, retention/detention basins, infiltration trenches/basins, pervious pavement, dry wells, rain gardens, bioretention, swales, buffer restoration, rooftop disconnection, and vegetated roofs.

25 Pa. Code Chapter 102 states that a “permit is required for the discharge or potential discharge of stormwater into waters of this Commonwealth from construction activities, including clearing and grubbing, grading and excavation activities involving 1 acre (0.4 hectare) or more of earth disturbance activity or an earth disturbance activity on any portion, part, or during any stage of, a larger common plan of development or sale that involves 1 acre (0.4 hectare) or more of earth disturbance activity over the life of the project.” Permits are also required for roadway maintenance activities with earth disturbance activities on 25 or more acres; timber harvesting activities on 25 or more acres; and oil and gas activities on 5 acres or more.

Stormwater management BMPs implemented or retrofitted as part of an MS4 program, or the Section 319 and Growing Greener grant programs are not addressed in this verification discussion. These programs implement smaller numbers of new practices and will be addressed in subsequent versions of this document.

Erosion and Sediment Control

Erosion and sediment control practices (E&S BMPs) protect water resources from sediment pollution and increases in runoff associated with land development activities. By retaining soil on-site, sediment and attached nutrients are prevented from leaving disturbed areas and polluting streams. This activity may include the use of features such as a silt fence, slope drains, and permanent vegetation.

Significance of BMP

The 2025 statewide implementation goal and estimated share of the pollutant load reduction for erosion and sediment control practices is less than 3 percent of the total TN, TP and TSS load reductions. Erosion and sediment control practices are the first step in the regulatory framework that allows for the implementation and tracking of post-construction stormwater (PCSM) BMPs; therefore, the verification processes for E&S BMPs are described simultaneously with the PCSM BMPs.

Post-Construction Stormwater BMPs (filtering and infiltration practices)

Filtering practices capture and temporarily store the water quality volume and pass it through a filter of sand, organic matter and vegetation, promoting pollutant treatment and recharge. Examples practices include surface sand filters, swales, porous pavement, and bioretention areas (raingardens). Infiltration practices are used to capture and temporarily store the water quality volume before allowing it to infiltrate into the soil, promoting pollutant treatment and groundwater recharge. Examples include infiltration trenches, infiltration basins, and porous pavement. Other practices can be implemented through the Chapter 102 program, but are less prevalent.

Significance of BMP

The 2025 statewide implementation goal and estimated share of the pollutant load reduction for filtration and infiltration BMPs is 15.2 percent of TN, 13.7 percent of TP and 15.5 percent of TSS.

Verification Procedures

Programs Involved in Verification

The primary entity responsible for collecting and assisting with reporting of stormwater BMPs to NEIEN is the DEP Bureau of Waterways Engineering and Wetlands, NPDES Construction and Erosion Control Program. Through the Chapter 102 NPDES permitting process, erosion and sediment control BMPs and PCSM BMPs are required to be implemented and reported.

The NPDES Construction and Erosion Control Program develops and coordinates regulation for the implementation of the Chapter 102 Program and for construction activities regulated under the NPDES rules pertaining to stormwater discharges from construction activities to waters in Pennsylvania. The Program provides guidelines for individual permits and the General Permit PAG-02 for Stormwater Discharges Associated with Construction Activities. Additional information can be found at http://www.portal.state.pa.us/portal/server.pt/community/npdes_construction_erosion_control/21657.

The BMPs implemented can be for public or private entities and are required statewide through regulations, for all construction that meets the size criteria. Chapter 102 states that PCSM BMPs must adhere to the requirements specified in this regulation for a stormwater management plan and E&S and PCSM BMPs must follow the design standards listed in the PA DEP Erosion and Sediment Pollution Control Manual (<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-88925/363-2134-008.pdf>) ; and the Pennsylvania Stormwater BMP Manual, <http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305>.

County Conservation Districts have received delegated authority from DEP to conduct on-site inspections of E&S and PCSM BMP implementation and for the notice of termination inspection for the NPDES permit.

Method

As part of the individual NPDES permit or general (PAG-02) permit for Stormwater Discharges Associated with Construction Activities, a Notice of Intent (NOI)/application must be submitted to PA DEP for approval prior to receiving the permit. The Program reviews the NOIs for completeness, including, among other things, Plan requirements, details or typicals for each BMP, implementation and maintenance of the proposed BMPs, and an inspection schedule. Requirements of the final NPDES permit include maintenance of E&S practices through the life of the disturbance activities and until permanent stabilization measures are implemented. The development of separate E&S and PSCM Plans is also required. The PSCM Plan requires BMPs to be identified on plan drawings, specifications for BMPs, the sequence of BMP installation, construction details for BMPs, the inspection schedule for each BMP, and directions for maintenance and/or replacement of each BMP. The seal of a licensed professional (Professional Engineer, Land Surveyor, Geologist or Landscape Architect) licensed to practice in the Commonwealth of Pennsylvania is required on E&S Plans and PSCM Plans for engineered structural BMP calculations and specifications.

For individual permits, initial inspections of E&S BMPs are conducted within 30 days of commencement of earth disturbance activities and every 90 days during construction activities. General permit activities are inspected once within 30 days of commencement of earth disturbance activities, and once during construction activities. More frequent inspections may be triggered by, among other things, proximity to receiving waters, sites on steep slopes, concerns identified during the Plan review, complaints received, and a history of non-compliance. Pre-construction meetings are mandatory for a general permittees to help improve the initial implementation of E&S practices.

E&S BMPs are also required to be inspected on a weekly basis and within 24 hours after each major storm event for the life of the practice. A Visual Site Inspection Report is required to be filled out by the permittee or authorized representative for these inspections. This form is utilized mainly to confirm compliance of the project and to provide comments and notes if repairs or replacement are needed (<http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-87500/3150-FM-BWEW0083.pdf>). The inspection reports must be maintained for review during compliance inspections.

All inspections in the Chesapeake Bay watershed are conducted by the delegated county Conservation Districts as the delegated authority, but DEP retains inspection authority in all of the Chesapeake Bay counties; since this authority is delegated, routine inspections are not conducted by DEP staff. The Conservation District inspectors use Earth Disturbance Inspection Reports (EDIR) to complete compliance inspections and document violations. If a violation is noted, it is documented on the EDIR, photos are taken, violations are identified, and the violations are reviewed with the responsible party, with voluntary compliance as the goal. A follow-up inspection is made to confirm corrective action was taken.

If there are problems identified in a follow-up inspection, there are compliance and enforcement actions. Noncompliance reporting can lead to supplemental monitoring/ inspections. Any permit noncompliance constitutes a violation of the Pennsylvania Clean Streams law and the

federal Clean Water Act and may be subject to enforcement action; for permit termination, revocation, reissuance, or modification; or for denial of a permit or permit renewal.

If non-compliance is identified a notice of violation (NOV) is issued to the permittee/operator. If the violation can be corrected voluntarily, the case is settled through a Consent Assessment of Civil Penalty. If there is a pattern of non-compliance identified during follow-up inspections or Visual Site Inspections are not being conducted or documented, that information can be used to refer a permittee to DEP for appropriate enforcement follow-up.

If not voluntarily resolved, DEP may file a complaint with the Environmental Hearing Board (EHB) to ask for judgment. If violations continue, a Compliance Order will be issued, requiring corrective actions within specified time period. An alternative to the civil process through the EHB is to issue a Summary Citation, which is a criminal violation. This option is often used because it is handled by a District Magistrate, rather than at the state level.

Once permanent stabilization of the earth disturbance activities and installation of PCSM BMPs occurs, the permittee or co-permittee submits a notice of termination (NOT) to PA DEP (<http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-9453>). The NOT must include the permit number; site location, including address, latitude/longitude, USGS Quad Map; permittee contact information; certification of licensed professional that as-built conditions are true and in conformance with Chapter 102 and the PCSM Plan (professional seal is required); a copy of drawings/as-builts; a summary of the installed BMPs including whether they are volume, rate or water quality practices, the number of BMPs, total treated acres and total treated volume; and identification of the person responsible for long term O&M for each practice. The submission of an NOT triggers a field inspection that is required in order to approve or deny the NOT. The field inspection, conducted by the county Conservation District, includes a check for permanent stabilization, removal of E&S BMPs, and proper installation of PCSM BMPs. The field inspection is the final verification at end of the E&S practice lifespan and the initial verification of the PCSM BMP practices. The PCSM BMP inspection is primarily visual and is intended to confirm that the practices are installed according to the PCSM plan. Confined spaces are not inspected.

PA Code, Chapter 102 § 102.8 states that long-term operations and maintenance of post construction stormwater BMPs is required. 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 and buffer provisions.

There is no established life-span for PCSM BMPs. 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.

Both the E&S and the PCSM BMPs are held to the standards set in the submitted plans. The plans are submitted to the delegated Conservation District and adhere to the requirements of the Chapter 102 regulations as outlined in 102.4 and 102.8 for E&S and PCSM plans respectively.

Unlike the E&S inspections and initial PCSM inspection, follow-up inspections will only be conducted by DEP staff, and authority is not anticipated to be delegated to the Conservation Districts as a standard practice at this time. While follow-up inspections of PCSM BMPs are conducted based on complaints or other case-by-case situations, there is currently no routine follow-up inspection program for PCSM BMPs in this program. DEP is developing a strategy for follow-up inspections within Pennsylvania's portion of the Chesapeake Bay watershed. DEP is in the process of hiring three staff to conduct the follow-up inspections under prioritized inspection strategy such as areas with a greater risk of problems, sites with a history of non-compliance, projects in water quality priority watersheds, areas of greater risk of problems and other factors.

Verification Teams

Staffing

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 storms events until the permit for the earth disturbance activity is terminated (acknowledgment of the notice of termination or NOT). E&S BMPs are inspected during construction by the local Conservation District. When the NOT is provide by the permittee, information about the specifics of each BMP (location, date of installation, treatment area and volume, etc.) is established in the NOT record.

Qualifications, Training, and Certification

The NOT inspection of E&S and PCSM BMPs is completed by a (1) licensed professional (P.E., P.G.) with a valid Pennsylvania P.E. or P.G. certification, (2) or someone under the responsible charge of P.E. or P.G., as specified in 102.8 (e) and (k). and (3) an E&S technician with 1 to 2 years of experience in the field of E&S Control and trained and experienced in PCSM design methods and techniques applicable to the size and scope of the project.

There is annual statewide training along with annual meetings, professional and other similar events for the inspectors. There are no certification requirements; however, it is preferred that the inspectors have the National Institute for Certification in Engineering Technologies (NICET) certification in erosion and sediment control, be a certified professional erosion and sediment control specialist (CPESC), or be a licensed P.E. or P.G.

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.

E&S inspections and the NOT initial inspection for PCSM BMPs are conducted by the Conservation Districts. The Conservation Districts are required to submit NPDES Quarterly Reports to DEP through the 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, but there are annual statewide training, annual meetings, professional events, and similar events for training. 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 Construction and Erosion Control Program maintains an Access database where Chapter 102 permit information obtained from the Pennsylvania Bulletin is logged. When the Regional Offices submit additional data based on the NOT, this is added to the database, creating a record of known PCSM projects, including location, applicant, receiving waters, previous land use, proposed land use, prior contaminated land use, remediation, E&S control, PCSM practices, treated drainage area, and whether the practices address rate, volume, and/or water quality. This Access database is used to generate the data that is reported to the Chesapeake Bay Program through NEIEN.

Data analysis is performed by DEP Central Office staff members with at least three years of professional environmental protection experience and a bachelor's degree in the biological, physical, or environmental sciences, engineering, or in a field closely related to environmental protection or regulation; OR an equivalent combination of experience and training that includes three years of professional environmental protection experience. There are annual statewide training, annual meetings, professional events, and similar events for continuing education.

Independent Verification of Data

Since DEP initially collects permit information from the Pennsylvania Bulletin, there is a pre-populated list against which data submitted by the Regional Offices or conservation districts can be checked. If a permit is identified in the Pennsylvania Bulletin, but the Regional Office or conservation district does not report any data to the Central Office, the DEP staff know to contact the Regional Office or conservation district for more information and to either add data or remove the permit from the database, depending on the situation. Conversely, if a Regional Office or conservation district reports data for a permit that was not published in Pennsylvania Bulletin, it provides the Central Office an opportunity to conduct QA/QC follow-up with the Regional Office or conservation district on the permit publishing requirements.

Validation of External Data

Inspection data validation is performed by inspectors with at least three years of professional environmental protection experience and a bachelor's degree in the biological, physical, or environmental sciences, engineering, or in a field closely related to environmental protection or regulation; OR an equivalent combination of experience and training that includes three years of professional environmental protection experience. There are annual statewide training, annual meetings, professional events, and similar events for continuing education. Data validation is

triggered by the receipt of the Notice of Intent/NPDES application and is as needed for follow up inspections. Data validation can be completed through a site inspection, coordination with plan reviewers, or spot-checking approved plans.

Addressing Historical Data and Double Counting

DEP does not currently have a verification methodology for historical data/BMPs implemented prior to 2006. Chapter 102 permit-related E&S and PCSM BMPs have been tracked and recorded by DEP since 2006, according to the methodology described above. In developing a follow-up inspection program, DEP does not intend to attempt to verify practices installed prior to 2006, except on a case-by-case basis. DEP intends to allow these earlier practices to be phased out of the model according to procedures outlined by the CBPO Verification Committee. It is not feasible to conduct follow-up inspections for all practices installed in 2006 or later, so the inspections will be prioritized based on a number of factors, including locations of known stormwater management issues, practices in MS4 jurisdictions, and practices in priority watersheds. The follow-up inspection program is still under development and protocols have not been finalized at this time.

Stormwater BMPs are reported primarily from four possible sources, through the Chapter 102 permitting program, retrofits and installations conducted to meet MS4 permit requirements, the Section 319 grants program, and the Growing Greener grants program. Because Section 319 and Growing Green grants cannot be used to meet permit requirements, these practices are not at risk of double counting under the Chapter 102 permits or MS4 permits. In addition, Section 319 and Growing Greener are both administered by the DEP Bureau of Conservation and Restoration, any potential overlap between these two programs would be known to DEP.

NPDES stormwater permitted facilities located in an MS4 community are required to provide the MS4 municipality with the NOT, so the municipality can track post construction BMPs, their location, and the associated operation and maintenance requirements. Chapter 102 Section 102.8 also requires that record drawings and as-builts be submitted to the municipality. Any practices reported by the MS4s would most likely be part of retrofit activities, not earth disturbance activities, and would not be part of the Chapter 102 program. MS4 permits will report those practices that treat areas under one acre. Those areas over one acre, regardless of location, will be reported by the construction stormwater permitting program. This can include projects in MS4 areas for development or redevelopment that are one acre or greater in earth disturbance.

Summary

A snapshot summary of verification procedures for urban BMPs is provided in **Table 9**.

Table 9. Jurisdictional Verification Protocol Design Table: Urban Stormwater BMPs

Verification Element	Description
BMP or Group	Stormwater Management
Geographic Scope	All counties within the Chesapeake Bay Watershed
A. WIP Priority	High
B. Data Grouping	Urban Stormwater
C. BMP Type	Structural
D. Initial Inspection	
Method	On-site inspections of permitted sites
Frequency	E&S: Within 30 days of commencement of earth disturbance Post-Construction: upon final inspection associated with Notice of Termination - final inspection of E&S practices
Who Inspects	A valid Pennsylvania P.E. or P.G. certification or someone under the responsible charge of P.E. or P.G. or 1-2 years in the of E&S Control and trained and experienced in PCSM design methods and techniques applicable to the size and scope of the project
Documentation	E&S: Greenport Post-Construction: NOT inspections
E. Follow-Up Check	
Follow-Up Inspection	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) Post-Construction: None, program in development
Statistical Sub-Sample	E&S: all practices Post-Construction: program in development, procedures not established
Response if Problem	Compliance and enforcement action
F. Lifespan/Sunset	E&S: Notice of Termination at end of construction, when permanent stabilization is complete. Post-Construction: Perpetual
G. Data QA, Recording & Reporting	PCSM BMPs recorded in Access database populated based on permit data. Database is used to develop NEIEN submission

Gaps

As detailed in this section, significant procedures are in place for verification of BMPs, but there are areas that could be considered for additional activity. Older BMP practices that were put into place before the current permitting requirements, are not tracked or verified through any existing mechanism. Additionally, while the practices installed under the NPDES Stormwater Construction permitting are used for compliance with MS4 Minimum Control Measures 4 and 5 (Construction Site Runoff Control and Post-Construction Runoff Control), this does not capture urban stormwater BMPs implemented as retrofits as part of MS4 compliance for sites with earth disturbance under one acre. These practices are not accounted for under the verification protocols for urban stormwater BMPs outlined above. While there is currently no on-going verification program for PCSM practices, changes are being considered for the next MS4 permit related to this topic.

There are other activities being considered to address PCSM practice follow-up verification. DEP intends to hire three staff to conduct follow-up verification. DEP intends to develop a verification prioritization scheme using a variety of data collection methods that can balance

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scientific rigor with cost-effectiveness. Once developed, this program can serve a secondary verification/validation purpose. Additional information will be added to this Verification Program document when available.

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VI. Wastewater Treatment Protocols

Significance of BMP

Based on the 2025 statewide implementation goals and estimated share of pollutant load from the wastewater sector, wastewater is anticipated to contribute approximately 11 percent of the total nitrogen, 25 percent of the total phosphorus and 10 percent of the total suspended sediment loads in 2025.

As noted in the Chesapeake Bay Program Wastewater Treatment Workgroup's BMP Verification Guidance, "all significant facilities have or will have nutrient permit limits and specific nutrient monitoring requirements in place under the Chesapeake Bay TMDL. These numeric nutrient limits will ensure that significant wastewater treatment facilities continue to provide the most reliably verified load reductions in the restoration effort...The existing national regulations and delegated state NPDES permitting programs have very specific verification and inspection requirements for wastewater treatment facilities, which meet or exceed the Bay Program partners' BMP verification principles." The NPDES permit program is the basis for wastewater verification.

Verification Procedures

Verification procedures are contained in the December 2014 document drafted by DEP's Bureau of Point and Nonpoint Source Management titled "Quality Assurance Project Plan for Reporting of Pennsylvania NPDES Point Source Data to EPA's Chesapeake Bay Program."

Verification Gaps

Pennsylvania has not identified any verification gaps for wastewater treatment.

VII. Next Steps

Historical Data Cleanup

Pennsylvania has been working on historical data cleanup for the past few years. More specific details for individual BMPs are contained in Sections IV (Agricultural Practice Protocols) and Section V (Stormwater Management Protocols). The December 2014 “Quality Assurance Project Plan for Reporting of Pennsylvania NPDES Point Source Data to EPA’s Chesapeake Bay Program” discusses how gaps are identified and addressed for point sources.

Additional Data Collection and Verification Efforts

When Pennsylvania completed its Phase I Watershed Implementation Plan (WIP) in 2011, the Commonwealth included a chapter titled “Pennsylvania’s Unfinished Business.” Part of the intent of that chapter was to communicate concepts that DEP was considering for moving the WIP forward. Similarly, this section will describe various options that Pennsylvania is considering regarding BMP verification.

Documenting Conservation Practices Through the Use of Remote Sensing – A Pilot Study in the Potomac Watershed

DEP has contracted with the Natural Resources Conservation Service (NRCS) to conduct a pilot project to inventory BMPs within Pennsylvania’s portion of the Potomac Watershed using remote imagery. The end result of this remote sensing pilot will be a determination as to whether this is an effective means by which to document BMPs in other areas of the Chesapeake Bay Watershed within Pennsylvania.

To ensure that the intent of Section 1619 of the 2008 Farm Bill is met, only aggregate data is provided to the Department. Trained NRCS professionals with extensive BMP knowledge interpret the remote imagery and aggregate the BMP data for potential use in the Watershed Model, similar to how DEP currently receives data protected by Section 1619. As part of their training, NRCS professionals use the online “Introduction to Image Interpretation Course” provided by the National Employee Development Center. In addition to NRCS staff, the project team includes an advisor from the Chesapeake Bay Program that works with the Watershed Model.

It is anticipated that the pilot program will be concluded by December 2015. At that point in time, DEP will be able to better determine if this methodology can be employed to verify BMPs. If it is a viable option, DEP’s QAPP will be updated and verification protocols will be submitted to the CBP team in Annapolis for review and comment.

The following types of practices, including the corresponding NRCS practice code, are being evaluated as part of the pilot:

Animal Waste Management Systems:

- a) Animal Waste Storage, 313
- b) Waste Treatment, 629

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- c) Waste Treatment Lagoon, 359
- d) Animal Mortality Facility, 316
- e) Animal Composting Facility, 317

Barnyard Runoff Controls:

- a) Heavy Use Area Protection, 561
- b) Roof Runoff Structure, 558
- c) Vegetated Treatment Area, 635
- d) Animal Trails and Walkways, 575

Cropland Practices: (Note: These practices are being evaluated to determine if their existence is credible evidence of the Conservation Planning BMP)

- a) Contour Buffer Strips, 332&CP15
- b) Contour Farming, 330
- c) Contour Orchard and Other Fruit Area, 331
- d) Diversion, 362
- e) Field Windbreak/ Shelterbelt, 380 & CP5
- f) Field Border, 386
- g) Filter Strip, 393
- h) Grassed Waterway, 412
- i) Stone-Lined Waterways, 468
- j) Riparian Herbaceous Cover, 390
- k) Terrace, 600
- l) Water and Sediment Control Basin, 638
- m) Cross Wind Trap Strips, 588
- n) Vegetative Barrier, 601

Pasture Practices:

- a) Access Control (Stream Crossing), 578
- b) Pasture Fencing, 382
- c) Spring Development, 574
- d) Precision Rotational Grazing, 528
- e) Riparian Fencing, 382

Forest Practices:

- a) Tree Shrub Establishment, 612
- b) Riparian Forest Buffers, 391
 - <35 feet
 - 35-50 feet
 - 50-100 Feet
 - >100 Feet

Cover Crops: Use of Landsat data

Additional Information:

- NRCS will ground-truth, for quality assurance purposes, a percentage of the BMP data obtained from aerial images.
- Data will be aggregated at the HUC 12 Watershed Level. If fewer than five farmers participate at that level, data will then be aggregated at a higher level, to either the county or Potomac Watershed level.

Selecting Additional Best Management Practices for Verification

As described previously, Pennsylvania has directed its initial verification programmatic work toward those practices that the Commonwealth is depending upon the most to achieve nutrient and sediment reductions through the WIP, and other sections of this document address Pennsylvania's approach to those BMPs. It is Pennsylvania's intent to develop procedures for additional BMPs. BMPs will be prioritized based upon the percentage of reductions anticipated. For those BMPs that are contributing less than one percent of reductions, it is not likely that verification procedures will be developed.

Verification Program Core Elements

Statistical Approach for On-Site Verification

Due to the potentially large number of BMPs that may need to be verified, Pennsylvania will use statistical approaches as one important element of the overall BMP verification program. For example, Pennsylvania estimates that there are approximately 33,600 farming operations in the Commonwealth's Chesapeake Bay drainage area, with an undetermined number of BMPs installed. To determine the status of BMP implementation for this sector by visiting every facility would exceed available resources, and doesn't include BMPs from other sectors.

Pennsylvania has already successfully used the statistical approach of transect surveys for reporting conservation tillage, which is more fully described in another section of this document. A pilot program utilizing transect surveys for cover crops is being conducted (see Section IV, Cover Crops, for more details). Although no other BMPs have yet been identified for this approach, DEP will continue to research which BMPs this successful technique may be used with.

To move the statistical approach forward, Pennsylvania has begun reviewing the September 1997 EPA document titled "Techniques for Tracking, Evaluating and Reporting the Implementation of Nonpoint Source Control Measures", document ID EPA 841-B-97-010. Pennsylvania will further this effort by following the guidance on Page 49 of the CBP Basinwide Verification Framework, "Take Full Advantage of EPA Funding Available to Support Verification".

Self Evaluations

Self-reporting of BMPs provides an opportunity to verify BMPs at significantly reduced costs, when compared to conducting visits to 100 % of facilities for any sector. For example, DEP is working to build a partnership with external entities that would allow for self-reporting of Manure Management Plans (MMPs). This will be developed in a manner that would support the important concepts of 1619 confidentiality contained in national law, but still allowing the reporting of this important practice to the Watershed Model at an aggregated level that doesn't

contain individual producer information. Data would be collected with a short survey asking for the following types of information: Number of acres under a Manure Management Plan; Manure Type; and date plan was implemented.

The MMPs reported through self-reporting would have a programmatic element allowing for on-site verification of a percentage of the BMPs reported. Conservation District staff will provide the on-site verification.

Protocols

For on-site BMP verification, checklists will be developed to guide individuals verifying the existence of BMPs. An example of a form currently used by DEP employees is mentioned in the section of this document that addresses buffers.

Verification will not be an engineering inspection that confirms practice specifications. Rather, it will be a short visual review to confirm that the BMP is in place and appears to be functional, as best can be determined by the verifier. Two sources of information will be used to guide protocol development:

- NRCS National Conservation Practice Standards (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/references/?cid=nrcs_dev11_001020);
- Resource Improvement Practice checklists contained in Appendix H of the CBP's Basinwide Framework document.

Data Management

DEP has begun development of a system that will focus on BMPs, not just for the agricultural sector, but also for other critical sectors including stormwater and earth disturbance activities.

Professionals Conducting Verification

DEP is planning to use CBRAP funds to help support the verification of BMPs. DEP is working with Conservation Districts to develop deliverables related to BMP verification in annual grant awards. In addition, DEP staff funded through CBIG currently conduct verification of approximately 10 percent of all projects funded with CBIG funds. Additional BMP verification by DEP is being considered. Details are being worked out.

Overall GAPS

There are a few practices that are considered high priority for verification program development; however, they have yet to be addressed. These practices either currently, or are anticipated to, contribute significantly to Pennsylvania's overall load reduction strategy. These practices include manure transport, animal waste management systems, and manure management plans.

BMPs addressing the forestry, wetlands, stream restoration, and extractive sectors have not been addressed in this version of the Verification Program document. These sectors will be addressed in subsequent versions of this document.

It is important to note that DEP relies on the information on BMPs implemented under FSA and NRCS programs that is obtained for DEP by CBPO staff working under a 1619 Agreement set up between USDA and the U.S. Geological Survey (USGS). It is important that this process continues, and that the federal verification procedures continue.

VIII. References

25 Pennsylvania Code, Chapter 102.

<http://www.pacode.com/secure/data/025/chapter102/chap102toc.html>; Accessed June 2015

Chesapeake Bay Program. 2014. 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. Annapolis, MD.

DEP 2014. Pennsylvania Department of Environmental Protection. *Quality Assurance Project Plan for Reporting of Pennsylvania NPDES Point Source Data to EPA's Chesapeake Bay Program*. Bureau of Point and Non-Point Source Management. Harrisburg, PA.