# Agricultural BMP Verification Guidance: Version 3.6.0

# Chesapeake Bay Program's Agriculture Workgroup (AgWG)

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**Summary**

In response to an independent program evaluation by the National Academy of Sciences, and the federal documentation requirements of the EPA Chesapeake Bay TMDL, the Chesapeake Bay Program (CBP) partnership has set in motion a partnership led process for developing a programmatic BMP data verification standard. The partnership's Agriculture Workgroup (AgWG) has subsequently taken responsibility for developing verification guidance for providing agricultural BMP data to the EPA Chesapeake Bay Program Office (CBPO) for representing actions to address both nutrient and sediment sources of contributions to the Bay. The following paper is intended to provide background information on the workgroup's development of agricultural BMP verification guidance, document the multiple approaches deliberated by the partnership and their positive and negative attributes, and provide additional detailed verification guidance based on the supplementary document entitled "***Agricultural BMP Verification Guidance Matrix: Version 3.6.0***" dated February 18, 2014. The Version 3.6.0 represents multiple months of discussions and suggestions by the diverse membership of the AgWG and the review comments of the partnership's independent BMP Verification Review Panel in order to create a programmatic verification standard for implementation by the partnership.

**Part 1: The Need for Agricultural BMP Verification and the CBP Process**

The case for a adopting a universal approach to BMP verification across the sectors has been building for the nearly thirty-year history of the Chesapeake Bay Program partnership. The development and implementation of the Chesapeake Bay TMDL has brought the requirement for reasonable assurance, the adoption of two-year milestones to track progress, and the interrelationship of trading and offset state programs. The need for expanding the tracking and reporting of implemented BMPs primarily from traditional agency incentive programs to private non-cost shared and functional equivalent BMPs, all while improving public confidence in the water quality benefits being obtained from traditional and new sources of BMPs, has necessitated an new approach to verification.

The desire to quantify the progress toward achieving the goals of the Bay TMDL has as a focus the implementation, tracking and reporting of conservation practices across the watershed. Within the past several years, the partnership has come under increasing scrutiny and requests to improve the accountability of its actions to address the commitments made to the restoration goals. A few examples of this increasing interest in BMP verification include:

- The Chesapeake Bay Independent Evaluation Report developed by the National Research Council's (NRC) panel identified five specific science-based conclusions. These conclusions focused on the finding that "accurate tracking of BMPs is of paramount importance because the CBP relies upon the resulting data to estimate current and future nutrient and

sediment loads to the Bay."

- President Obama's Chesapeake Bay Executive Order Strategy committed relevant federal agencies, including the U.S. Department of Agriculture (USDA) and the U.S. Environmental Protection Agency (EPA), to develop and implement "mechanisms of for tracking and reporting of voluntary conservation practices and other best management practices installed on agricultural lands" by July 2012.

- EPA's Chesapeake Bay TMDL's Appendix S outlined the common elements for the jurisdictions to develop and implement trading and offset programs in conjunction with the requirements of the TMDL.

- Several of the Chesapeake Bay Program's independent advisory committees, including the Scientific and Technical Advisory Committee (STAC) and the Citizen's Advisory Committee (CAC), have consistently requested the partnership to develop and implement an open and transparent process to verify cost-share and non-cost shared BMPs being annually tracked and reported by the jurisdictions to the Chesapeake Bay Program Office (CBPO).

At the bequest of EPA, the partnership's Water Quality Goal Implementation Team (WQGIT) has requested its sector workgroups, including the Agriculture Workgroup (AgWG), to cooperatively develop BMP verification guidance for implementation by the partnership. Since 2012, the AgWG in particular has been focused on developing detailed verification guidance for BMPs implemented on agricultural land uses, researching examples of agricultural verification across the United States and interviewing identified experts in the field, and developing a proto-type management tool to assist partners in evaluating existing verification programs and identifying opportunities for improvements.

**Part 2: Defining Agricultural BMPs**

Partnership approved agricultural BMPs represent the largest and most diverse of conservation practices and land use conversions for any sector currently represented in the Chesapeake Bay Program Partnership's Phase 5.3.2 Watershed Modeling Suite. The diversity of BMPs is reflective of the corresponding diversity of agricultural production and land uses across the Bay watershed, a diversity not replicated by any other sector within the partnership. Consequently, the challenge of providing verification guidance for multiple methods in a simple format lead to the organization of agricultural BMPs into four BMP categories. These generalist BMP categories are based on the respective life spans or permanence on the landscape, as well as their physical presence.

1. *Annual BMPs*: A category of BMPs which have a very limited physical presence on the landscape, lasting as short as several months to a single growing season. In order to retain their nutrient and sediment load reduction benefits, this class of BMPs are required to be re-implemented on an annual basis.

2. *Structural BMPs*: A category of BMPs which have a relatively protracted physical presence on the landscape and can be more easily detected for verification than most

other BMP types. These BMPs are typically more intensive of technical and financial resources to implement, but can achieve both nutrient and sediment load reductions for multiple years if properly maintained and operated.

3. *Management Plan BMPs - Plans*: A limited category of BMPs which have a diverse life span ranging from a single growing season to multiple years. Due to their nature as a management system vs. a physical BMP, this class of BMPs creates the most challenge in implementing an effective verification method. However, these BMPs can generate considerable model credits in reducing nutrient and sediment loads.

4. *Management Plan BMPs - Practices*: This category of BMPs is reflective of conservation practices associated with management systems which are physically present on the landscape. These BMPs typically have moderate to protracted physical life spans and are diverse in their ability to be detected for verification.

**Example Agricultural Best Management Practices by Category**

| Annual | Structural | Management Plan - Plans | Management Plan - Practices |
|---|---|---|---|
| **Conservation Tillage** | **Animal Waste Management Systems** | **Decision/Precision Agriculture** | **Alternative Crops** |
| **Traditional/Commodity Cover Crops** | **Barnyard Runoff Control** | **Enhanced Nutrient Management Plans** | **Continuous No-Till** |
| **Dairy Precision Feeding** | **Bio-filters** | **Horse Pasture Management** | **Grass Buffers** |
| **Manure Transport** | **Mortality Composters** | **Prescribed Grazing** | **Stream-Side Grass Buffers** |
| **Swine Phytase** | **Water Control Structures** | **Soil Conservation and Water Quality Plans** | **Stream-Side Forest Buffers** |

**Part 3: Defining Sources and Oversight of Agricultural BMPs**

The diversity of agricultural BMPs is also reflected in the corresponding diversity of sources of implementation and oversight across the Bay watershed. In general, sources of BMP implementation data and their corresponding maintenance oversight can be grouped into several broad categories with potential overlaps between them on a BMP by BMP basis.

1. *Incentive Program BMPs*: The partnership's primary source of BMP implementation data has historically originated from publicly funded financial incentive or cost-share programs managed by federal, state, and county agencies. BMPs implemented through these programs typically have contractual oversight from certified engineers, planners, and technicians using approved design standards to ensure that the practices are installed and maintained over the life span of the agreement. Verification to some degree typically

accompanies this oversight due to the expenditure of public funds for the cost-share. Consequently, BMPs implemented through public cost-share programs and under contractual agreements are more easily tracked and reported for representation in the partnership models.

2. *Regulatory Permit Program BMPs*: A second important source of BMP implementation data is through federal and state agricultural regulatory programs. Two major types of regulatory programs fall under this category; i.e. permitting and general regulatory oversight. An example of permitting is the federal CAFO program which is normally administered by the state agencies under agreement with U.S. EPA. Agricultural operations meeting the thresholds of the CAFO program are required to develop and submit operational plans, as well as implemented BMPs where needed to address nutrient losses. Federal, state, and/or county agency oversight to verify compliance with the permit requirements may also provide useful BMP verification information.

3. *Regulatory Program BMPs*: The second type within the regulatory category represents a general regulatory oversight of particular agricultural production systems or management practices effecting nutrient and sediment losses. This type of regulatory programs is chiefly the domain of state policies, and is administered by both state and county agencies. Since regulations differ by state, there is a wide diversity of regulatory programs across the Bay watershed. The level of oversight and verification by public agencies also varies widely, with some programs requiring operators to submit report annually followed by detailed inspections and others focusing on responses to complaints and easily identified environmental impacts from major spills or runoff events. The ability to track and report BMP information from general regulatory programs differs due to the level of oversight by public entities.

4. *Performance Equivalent BMPs*: An emerging source of agricultural BMP implementation is from practices that were installed without public cost-share, and may not be part of an operational permit or regulatory oversight program. They are typically financed by the operator, and may or may not meet the practice standards associated with federal and state cost-share programs. BMPs that do not meet a federal or state practice standard but which provide the same level of environmental protection on an annual basis are known as "performance equivalent" (PE) BMPs. Identifying, verifying, tracking, and reporting non-cost shared BMPs is more challenging than the other sources of BMP information for a number of reasons, including voluntary reporting and access by operators, potentially non-standard materials and designs, and at times the absence of an obligation to maintain the practice.

A complicating factor is that overlaps exist between all sources and oversights ob BMPs. Practices that were originally cost-shared can function similarly to non-cost shared BMPs after their contractual obligations are satisfied and they become the sole responsibility of the operator. Both cost-shared and non-cost shared practices can co-exist to satisfy regulatory program requirements. Depending on the

jurisdiction, a significant population of agricultural farms can potentially legally operate outside of federal and state permitting and regulatory oversight programs.

The challenge of providing verification guidance for multiple BMP sources and oversight for the diversity of agricultural production systems found in the Bay watershed can be somewhat daunting. The approach the AgWG can taken is to create a multi-optioned but uniform approach to the range of BMP sources and oversight using the annual environmental benefits as a guide post. Thus as an example, cost-shared and non-cost shared BMPs can both be verified using different methodologies but meet the same verification standard.

**Part 4: Background of Agricultural BMP Verification Developments**

The Water Quality Goal Implementation Team (WQGIT) foresaw the need for providing assistance and guidance to its affiliated sector workgroup in the development of compatible BMP verification guidance documents. Consequently, the BMP Verification Committee and its associated BMP Verification Review Panel were formed. The Committee has since developed the document entitled "Appendix G: Chesapeake Bay Program Partnership's BMP Verification Principles" to provide cross-sector verification guidance. Utilizing the five identified principles, the AgWG has considered a series of potential options for developing agricultural BMP verification guidance. Each potential option considered by the workgroup has been weighed on their individual merits, and both positive and non-positive attributes identified.

1. *Version 1*: Create a uniform BMP verification guidance standard for all practices and programs.

2. *Version 2.1*: Create diverse BMP verification guidance options and identify the levels of confidence for each method. Limit the units of BMP implementation reported by the degree of relative data confidence (e.g. 90% relative data confidence x tracked units = reported units). The standard model BMP effectiveness values would be applied to the reported units.
3. *Version 2.2*: Create diverse BMP verification guidance options and identify the levels of confidence for each method. Limit the model reduction credits for the units of BMP implementation reported by the degree of relative data confidence (e.g. 90% relative data confidence x BMP effectiveness values = modified BMP effectiveness values to be applied).

4. *Version 3*: Create diverse protocol options and apply a standard minimum threshold of relative data confidence to allow 100% of tracked BMP units to be reported and receive 100% of BMP effectiveness values.

In considering the above BMP verification guidance options, the membership of the AgWG identified concerns with Version 1 in that it did not conform to the diversity of agricultural practices and implementation programs across six jurisdictions. Implementing a limited verification guidance standard would likely not offer sufficient capacity to allow adequate BMP implementation reporting. Of the

positive considerations, Version 1 option would provide 100% acceptance of tracked and reported practices and the application of 100% of the model BMP effectiveness values.

In contrast with Version 1, Versions 2.1 and 2.2 offered multiple potential BMP verification guidance options that are more reflective of the diversity of agricultural practices and programs. The multiple verification method options also produce varying levels of relative data confidence between the guidance options, as well as between practice types within a single method. To address the issue of widely varying relative data confidence levels, the Version 2.1 implemented a calculation method to align the verification method's attained level of confidence to the units of reported BMPs. The foremost concern of this method by the AgWG was that by limiting the units of tracked BMPs that could be reported to the CBP models could jeopardize local community support. In addition, the verification literature search and national expert interview process that was implemented by the AgWG did not yield adequate scientific documentation to assign defensible relative data verification levels to all verification method options for all practices.

Version 2.2 addressed the issue of widely varying relative data confidence levels by implementing a calculation method similar to Version 2.2. Instead of aligning the verification method's level of confidence to the units of reported BMPs, this version applied the alignment to the model BMP effectiveness values. Version 2.2 allowed all tracked practices to be reported for nutrient and sediment reduction credits, however, the BMP effectiveness values would be reflective of the associated level of data confidence. Verification protocols yielding lower relative data confidence levels would receive reduced compensate model BMP effectiveness credits. The chief concern of the AgWG was that the verification literature search and national expert interview process that was implemented by the workgroup did not yield adequate scientific documentation to assign defensible relative data verification levels to all verification method options for all practices.

The current Version 3 protocol encompasses the positive benefits of Versions 2.1 and 2.2 by incorporating multiple verification method pitons' to address the diversity of agricultural practices and jurisdictions. In contrast to the earlier versions, Version 3 recognizes the widely varying relative data confidence levels between verification method options, as well as between practices within a single method, by establishing an up-front standard confidence level threshold for 100% model BMP effectiveness credit. All protocol options are available to the partnership, but a minimum data confidence threshold is required to be met to allow all tracked BMPs to be reported for full model credit. The verification literature search and national expert interview process that was implemented by the AgWG appears capable to yield adequate scientific documentation to assign a defensible threshold relative data verification levels to all protocol options for all practices. The AgWG recognizes benefits in exceeding the minimum data confidence threshold, and could encourage higher levels by the partnership where possible.

**Part 5: BMP Verification Guidance Matrix Elements: Version 3.6.0**

1. *Agricultural BMP Verification Methods (Column 1)*: Lists identified general categories of verification based on the type of tracking assessment and the type of entity that would be

collecting and verifying the data.

2. *Assessment Method (Column 2)*: Describes in greater detail the general verification method and the entity that would be collecting and verifying the data.

3. *Verification Expectations (Column 3)*: Identifies additional expectations for completing a sufficient verification based on BMP life span and frequency of assessments.

4. *Conservation Practice Category (Column 4)*: The appropriate assessment method and its associated verification confidence level is affected by the type of agricultural BMPs being assessed. The appropriate verification method for annual practices such as cover crops would likely be different from structural or management BMPs. Management BMPs were further subdivided into Plans and Practices due to the same differences as noted above. Each verification protocol method has been reviewed in terms of the conservation practice categories to determine if the assessment method is appropriate and realistically able to achieve a sufficient verification confidence. Categories with an "Eligible" are viewed as appropriate and those with a "Not Eligible" are not. Even if an assessment method is noted as being appropriate for a category of BMPs, significant verification efforts may still be required to meet a sufficient verification confidence, such as increased percentages of QA/QC spot checks or more frequent compliance inspections for example.

5. *Cost-Sharing Information (Columns 5-9)*: These columns denote the potential differences for BMPs designed and financed through federal, state, NGO and private sources for each assessment method. Not all methods are appropriate to track and verify practices implemented, operated, and maintained under these categories.

6. *BMP Performance Information (Columns 10-16)*: This section of the verification matrix describe the ability of each assessment method to verify if the tracked practice meets the appropriate BMP specification, or if it represents a functional equivalent or non-functional equivalent BMP. In addition, the identification of the date of practice implementation is critical to determining if the BMP is considered part of the model calibration period or afterward for reporting purposes.

**Part 6.1: Agricultural Verification In Practice: Incentive Program BMPs**

As noted previously, the partnership's primary source of agricultural BMP implementation data has historically originated from publicly funded financial incentive or cost-share programs managed by federal, state, and county agencies. BMPs implemented through these programs typically have existing defined verification protocols in place during the stages of BMP implementation, and operation and maintenance under the contractual agreements with the participating landowners. The following guidance is provided for consideration by contractual entities in reviewing their existing procedures to ensure adequate data confidence, and equity amongst jurisdictions and programs:

1. *Verification Methods*: Appropriate verification methods will differ depending on the category of agricultural BMPs being considered. Short-term annual BMPs will require a unique approach compared to long-term structural BMPs for example. Consequently, specific verification protocols need to be developed and implemented to address each category of BMPs based on design lifespan and physical presence, and the lifespan of the program's contractual agreement.

2. *Operation and Maintenance*: The correct operation and maintenance of agricultural BMPs is critical to ensuring that the estimated environmental benefits over the lifespan of the practices are realized. This is especially critical for long-term BMPs where the performance benefits might be applied over multiple years vs. months. Adequate verification protocols need to incorporate regular compliance inspection intervals based on the designed lifespan, the unique characteristics of the BMP, and the contractual obligation, taking into account non-controllable factors such as floods or droughts. The principle verification objective is to ensure that BMPs are operated and maintained properly over their designed lifespan to qualify for the associated environmental benefits. Consequently, verification protocols need to define (1) the cycle and extent for field verification of BMPs, (2) the process for removing non-existing or non-operational BMPs from reporting, and (3) the process for bringing improperly maintained BMPs back into operational compliance within one year or less.

3. *Existing Program Verification Protocols*: The primary source of implemented agricultural BMPs being reported have originated from federal, state, or local public agencies through a variety of incentive programs which incorporate differing levels of inspections and verification. These existing program verification protocols should form the foundation of a verification system for the Chesapeake Bay TMDL. In some cases, sufficient oversight and inspections may not require any or minimal adjustments to achieve the level of data confidence that is being established by the partnership. In other cases, more significant program verification adjustments may be required due to the level of uncertainty. In either case, the modification of an existing verification protocol should attempt to minimize the amount of additional administrative and financial burden expected of the affected agency.

4. *Record Reviews vs. Visual Inspections*: Visual inspections for confirming that BMPs are present, appropriately maintained, and are being operated as designed during the contractual period is a common element found within most if not all incentive program verification protocols. Visual inspections are vital, but are most effective when coupled with reviews of office and/or farm records. Record reviews are applicable for all BMP categories, but are especially critical for determining implementation of management plans, including nutrient application management and grazing management plans. Integrating a review of office and/or farm records coupled with visual observations is recommended to obtain a higher confidence level of assured environmental BMP performance. Conversely, record reviews alone are not considered a sufficient verification method.

5. *Technical Training*: The technical proficiency of public agency staff or NGO staff conducting inspections and record reviews of implemented agricultural BMPs cannot be under-rated. Ensuring that inspectors are adequately trained and technically certified for the practice they are verifying is a basic element of QA/QC protocols. Verification protocols need to address the training and qualifications of the public or private entity staff that will be engaged with the verification process to ensure quality inspections and the reporting of properly maintained and operated conservation systems.

6. *BMP Installation Verification*: Agricultural BMPs that are implemented through incentive programs with public or private funds typically if not in all cases incorporate inspections during and/or after installation to ensure the practice has been correctly implemented according to appropriate standards and specifications. USDA-NRCS has established practice standards and specifications for most agricultural practices, but in some instances states may set the standard, especially in conjunction with state specific program or regulatory requirements. Chesapeake Bay Program approved BMPs may closely mirror these standards and specifications in how they are defined and the associated environmental benefits, but not in all cases. Verification protocols need to specifically address how the installation verification process will identify properly report BMPs which meet or exceed the standards and specifications of the appropriate CBP BMP if different than existing USDA or state standards.

7. *Verification Frequency Cycle*: Public and private Incentive programs typically exhibit more variations in their existing verification protocols in regards to post-implementation design compliance during the ensuing contractual agreement period. Short-term annual BMPs such as cover crops can present additional challenges for contractual entities to re-inspect the practices within the designed lifespan, and they typically are implemented under abbreviated contractual agreement periods. Long-term BMPs such as engineered structures provide a designed lifespan for up to 25 years, and are associated with multi-year contractual agreements for ensuring proper operation and maintenance. Programmatic verification protocols need to incorporate compliance inspection intervals for all BMPs based on the designed lifespan, the unique characteristics of the BMP, and the contractual obligation period. The compliance inspection frequency may consequently vary from annual inspections per practice to a multi-year cycle within the contractual lifespan. The verification objective is to ensure that BMPs are being operated and maintained properly over their designed lifespan to qualify for the associated environmental performance benefits.

8. *Jurisdictional Verification Priorities*: The Chesapeake Bay Program's BMP Verification Subcommittee and the BMP Verification Expert Panel have acknowledged that fully implementing the elements of this verification guidance for all BMPs could result in limited financial and technical resources being diverted away from BMP implementation. Public and private entities engaged with agricultural BMP incentive programs are encouraged to direct their BMP verification and data validation efforts in direct proportion to the environmental benefits which a BMP contributes towards the TMDL pollutant reduction for a jurisdiction's

agricultural source sector. Thus, agricultural BMPs which provide the greatest pollutant reductions for each jurisdiction's agricultural source sector should receive the highest priority for implementing statistically significant verification protocols to generate the highest confidence levels.

9. *Jurisdictional Data Validation Oversight*: Chesapeake Bay jurisdictional reporting agencies need to incorporate a process for validating county and private sources of BMP implementation data being reported to the jurisdiction. A data validation process that provides an adequate level of confidence in the verified data should include a statistically valid analysis of inspection records coupled with visual spot-checks or joint field compliance inspections. This will verify reported BMPs meet or exceed the standards and specifications of the appropriate CBP BMP if different than existing USDA or state standards. and that they are operated and maintained to support environmental performance estimates. The data validation protocol needs to be transparent and publically accessible to so that stakeholders can be confident of the validity of the reported data.

10. *BMP Offsets, Mitigation, and Trading*: Agricultural verification protocols need to include special procedures for identifying and separately managing practices which are tied to offset, mitigation, and trading programs. BMPs which are implemented to address environmental impacts caused by other developmental activities elsewhere in the watershed. Implementing special programmatic verification procedures will prevent data reporting errors due to a "double-counting" effect with other sectors or programs. BMPs tied to offsets, mitigation, and trading programs typically have their own specific verification protocols to achieve their intended programmatic environmental objectives.

**Part 6.2: Agricultural Verification In Practice: Regulatory Permit Program BMPs**

The partnership's regulatory agricultural permit programs represent an important source of agricultural BMP implementation data managed by federal or state agencies. BMPs implemented under oversight of permitting programs typically have existing well defined verification protocols in place during the stages of BMP implementation, operation, and maintenance during the operational permit period. The following guidance is provided for consideration by federal and state permitting agencies in reviewing their existing procedures to ensure adequate data confidence, and equity amongst jurisdictions and programs:

1. *Verification Methods*: Appropriate verification methods will differ depending on the category of agricultural BMPs being considered. Short-term annual BMPs will require a unique approach compared to long-term structural BMPs for example. Consequently, specific verification protocols need to be developed and implemented to address each category of BMPs based on design lifespan and physical presence, and the operational permit lifespan of the permitting program.

2. *Operation and Maintenance*: The correct operation and maintenance of agricultural BMPs is critical to ensuring that the estimated environmental benefits over the lifespan of the practices are realized. This is especially critical for long-term BMPs where the performance benefits might be applied over multiple years vs. months. Adequate verification protocols need to incorporate regular compliance inspection intervals based on the designed lifespan, the unique characteristics of the BMP, and the operational permit lifespan, taking into account non-controllable factors such as floods or droughts. The principle verification objective is to ensure that BMPs are operated and maintained properly over their designed lifespan to qualify for the associated environmental benefits. Consequently, verification protocols need to define (1) the cycle and extent for field verification of BMPs, (2) the process for removing non-existing or non-operational BMPs from reporting, and (3) the process for bringing improperly maintained BMPs back into operational compliance within one year or less.

3. *Existing Program Verification Protocols*: Federal and state regulatory permit programs are an important source of implemented agricultural BMPs being reported which incorporate differing levels of prescribed permit compliance inspections and verification. These existing program verification protocols should form the foundation of a verification system for the Chesapeake Bay TMDL. In some cases, sufficient oversight and inspections may not require any or minimal adjustments to achieve the level of data confidence that is being established by the partnership. In other cases, more significant program verification adjustments may be required due to the level of uncertainty. In either case, the modification of an existing verification protocol should attempt to minimize the amount of additional administrative and financial burden expected of the affected agency.

4. *Record Reviews vs. Visual Inspections*: Visual inspections for confirming that BMPs are present, appropriately maintained, and are being operated as designed during the operational permit period is a common element found within most if not all permit program verification protocols. Visual inspections are vital, but are most effective when coupled with reviews of office and/or farm records. Record reviews are applicable for all BMP categories, but are especially critical for determining implementation of management plans, including nutrient application management and grazing management plans. Integrating a review of office and/or farm records coupled with visual observations is recommended to obtain a higher confidence level of assured environmental BMP performance. Conversely, record reviews alone are not considered a sufficient verification method.

5. *Technical Training*: The technical proficiency of federal or state agency staff conducting permit compliance inspections and record reviews of implemented agricultural BMPs cannot be under-rated. Ensuring that inspectors are adequately trained and technically certified for the practice they are verifying is a basic element of QA/QC protocols. Verification protocols need to address the training and qualifications of the public agency staff that will be engaged with the verification process to ensure quality inspections and the reporting of properly maintained

and operated conservation systems.

6. *BMP Installation Verification*: Agricultural BMPs that are implemented as part of regulatory permit programs typically if not in all cases incorporate inspections during and/or after installation to ensure the practice has been correctly implemented according to appropriate standards and specifications and permit requirements. USDA-NRCS has established practice standards and specifications for most agricultural practices, but in some instances states may set the standard, especially in conjunction with state specific permit program or regulatory requirements. Chesapeake Bay Program approved BMPs may closely mirror these standards and specifications in how they are defined and the associated environmental benefits, but not in all cases. Verification protocols need to specifically address how the installation verification process will identify properly report BMPs which meet or exceed the standards and specifications of the appropriate CBP BMP if different than existing USDA or state standards.

7. *Verification Frequency Cycle*: Regulatory permit programs typically have existing verification protocols in regards to multi-year post-implementation design compliance during the operational permit lifespan. Short-term annual BMPs such as cover crops can present additional challenges for permitting agencies to inspect the practices within the designed lifespan. Long-term BMPs such as engineered structures provide a designed lifespan for up to 25 years, and are associated with multi-year operational and maintenance plans for ensuring proper operation and maintenance. Programmatic verification protocols need to incorporate compliance inspection intervals for all BMPs based on the designed lifespan, the unique characteristics of the BMP, and the operational permit period. The compliance inspection frequency may consequently vary from annual compliance inspections to a multi-year cycle within the permit period, however, annual compliance inspections are recommended if possible. The verification objective is to ensure that BMPs are being operated and maintained properly over their designed lifespan to qualify for the associated environmental performance benefits.

8. *Jurisdictional Verification Priorities*: The Chesapeake Bay Program's BMP Verification Subcommittee and the BMP Verification Expert Panel have acknowledged that fully implementing the elements of this verification guidance for all BMPs could result in limited financial and technical resources being diverted away from BMP implementation. Public agencies administering agricultural permit programs are encouraged to consider their BMP verification and data validation efforts in direct proportion to the environmental benefits which a BMP contributes towards the TMDL pollutant reduction for a jurisdiction's agricultural source sector. Thus, agricultural BMPs which provide the greatest pollutant reductions for each jurisdiction's agricultural source sector should receive the highest priority for implementing statistically significant verification protocols to generate the highest confidence levels.

9. *Jurisdictional Data Validation Oversight*: Chesapeake Bay jurisdictional reporting agencies need to incorporate a process for validating county sources of BMP implementation data being reported to the jurisdiction as part of permit compliance inspections. A data validation process that provides an adequate level of confidence in the verified data should include a statistically valid analysis of inspection records coupled with visual spot-checks or joint field compliance inspections. This will verify reported BMPs meet or exceed the standards and specifications of the appropriate CBP BMP if different than existing USDA or state standards. and that they are operated and maintained to support environmental performance estimates. The data validation protocol needs to be transparent and publically accessible to so that stakeholders can be confident of the validity of the reported data.

10. *BMP Offsets, Mitigation, and Trading*: Agricultural verification protocols need to include special procedures for identifying and separately managing practices which are tied to offset, mitigation, and trading programs. BMPs which are implemented to address environmental impacts caused by other developmental activities elsewhere in the watershed. Implementing special programmatic verification procedures will prevent data reporting errors due to a "double-counting" effect with other sectors or programs. BMPs tied to offsets, mitigation, and trading programs typically have their own specific verification protocols to achieve their intended programmatic environmental objectives.

11. *EPA Federal Verification Oversight*: Jurisdictional permit programs based on federal regulatory requirements may have existing EPA verification oversight to ensure the local implementation of a federal permitting programs. Verification protocols should note the oversight role of EPA in periodically reviewing the implementation and management of permits by the local agency under federal authority.

**Part 6.3: Agricultural Verification In Practice: Regulatory Program BMPs**

The partnership's regulatory agricultural programs represent another important source of agricultural BMP implementation data managed by state regulatory agencies. BMPs implemented under the requirements of jurisdictional regulatory programs typically have existing but varied verification protocols in place for BMP implementation, operation, and maintenance over the design lifespan of the practice. The following guidance is provided for consideration by state regulatory agencies in reviewing their existing procedures to ensure adequate data confidence, and equity amongst jurisdictions and programs:

1. *Verification Methods*: Appropriate verification methods will differ depending on the category of agricultural BMPs being considered. Short-term annual BMPs will require a unique approach compared to long-term structural BMPs for example. Consequently, specific verification protocols need to be developed and implemented to address each category of BMPs based on design life span and physical presence of the practice required by a regulatory program.

2. *Operation and Maintenance*: The correct operation and maintenance of agricultural BMPs is critical to ensuring that the estimated environmental benefits over the lifespan of the practices are realized. This is especially critical for long-term BMPs where the performance benefits might be applied over multiple years vs. months. Adequate verification protocols need to incorporate regular compliance inspection intervals based on the designed practice lifespan and the unique characteristics of the BMP, taking into account non-controllable factors such as floods or droughts. The principle verification objective is to ensure that BMPs are operated and maintained properly over their designed lifespan to qualify for the associated environmental benefits. Consequently, verification protocols need to define (1) the cycle and extent for field verification of BMPs, (2) the process for removing non-existing or non-operational BMPs from reporting, and (3) the process for bringing improperly maintained BMPs back into operational compliance within one year or less.

3. *Existing Program Verification Protocols*: State regulatory programs are an important source of implemented agricultural BMPs being reported which incorporate widely differing levels of prescribed compliance inspections and verification. These existing program verification protocols should form the foundation of a verification system for the Chesapeake Bay TMDL. In some cases, sufficient oversight and inspections may not require any or minimal adjustments to achieve the level of data confidence that is being established by the partnership. In other cases, more significant program verification adjustments may be required due to the level of uncertainty.

4. *Record Reviews vs. Visual Inspections*: Visual inspections for confirming that BMPs are present, appropriately maintained, and are being operated as designed is a common element found within most if not all regulatory program verification protocols. The frequency and completeness of the inspections can vary widely between jurisdictional regulatory programs however. Visual inspections are vital, but are most effective when coupled with reviews of office and/or farm records. Record reviews are applicable for all BMP categories, but are especially critical for determining implementation of management plans, including nutrient application management and grazing management plans. Integrating a review of office and/or farm records coupled with visual observations is recommended to obtain a higher confidence level of assured environmental BMP performance. Conversely, record reviews alone are not considered a sufficient verification method.

5. *Technical Training*: The technical proficiency of state or county agency staff conducting regulatory compliance inspections and record reviews of implemented agricultural BMPs cannot be under-rated. Ensuring that inspectors are adequately trained and technically certified for the practice they are verifying is a basic element of QA/QC protocols. Verification protocols need to address the training and qualifications of the public agency staff that will be engaged with the verification process to ensure quality inspections and the reporting of properly maintained and operated conservation systems.

6. *BMP Installation Verification*: Agricultural BMPs that are implemented as part of regulatory programs may not automatically incorporate inspections during and/or after installation to ensure the practice has been correctly implemented according to appropriate standards and specifications and regulatory requirements. An example of when a regulatory compliance inspection would typically be implemented as part of a BMP installation would be in the case of operational complaint response or non-compliance remediation activity. USDA-NRCS has established practice standards and specifications for most agricultural practices, but in some instances states may set the standard, especially in conjunction with state specific regulatory requirements. Chesapeake Bay Program approved BMPs may closely mirror these standards and specifications in how they are defined and the associated environmental benefits, but not in all cases. Verification protocols need to specifically address how the installation verification process will identify properly report BMPs which meet or exceed the standards and specifications of the appropriate CBP BMP if different than existing USDA or state standards.

7. *Verification Frequency Cycle*: Regulatory programs have varying verification protocols in regards to multi-year compliance inspections during the practice lifespan. Short-term annual BMPs such as cover crops can present additional challenges for regulatory agencies to inspect the practices within the designed lifespan. Long-term BMPs such as engineered structures provide a designed lifespan for up to 25 years, and are associated with multi-year operational and maintenance plans for ensuring proper operation and maintenance. Regulatory verification protocols need to incorporate compliance inspection intervals for all BMPs based on the designed lifespan and the unique characteristics of the BMP. The compliance inspection frequency may consequently vary from annual compliance inspections to a multi-year cycle, however, annual compliance inspections for a statistically valid subsample are recommended. The verification objective is to ensure that BMPs are being operated and maintained properly over their designed lifespan to qualify for the associated environmental performance benefits.

8. *Jurisdictional Verification Priorities*: The Chesapeake Bay Program's BMP Verification Subcommittee and the BMP Verification Expert Panel have acknowledged that fully implementing the elements of this verification guidance for all BMPs could result in limited financial and technical resources being diverted away from BMP implementation. Public agencies administering agricultural regulatory programs are encouraged to consider their BMP verification and data validation efforts in direct proportion to the environmental benefits which a BMP contributes towards the TMDL pollutant reduction for a jurisdiction's agricultural source sector. Thus, agricultural BMPs which provide the greatest pollutant reductions for each jurisdiction's agricultural source sector should receive the highest priority for implementing statistically significant verification protocols to generate the highest confidence levels.

**9.** *Jurisdictional Data Validation Oversight*: Chesapeake Bay jurisdictional reporting agencies need to incorporate a process for validating county sources of BMP implementation data being reported to the jurisdiction as part of regulatory compliance inspections. A data validation

process that provides an adequate level of confidence in the verified data should include a statistically valid analysis of inspection records coupled with visual spot-checks or joint field compliance inspections. This will verify reported BMPs meet or exceed the standards and specifications of the appropriate CBP BMP if different than existing USDA or state standards. and that they are operated and maintained to support environmental performance estimates. The data validation protocol needs to be transparent and publically accessible to so that stakeholders can be confident of the validity of the reported data.

10. *BMP Offsets, Mitigation, and Trading*: Agricultural verification protocols need to include special procedures for identifying and separately managing practices which are tied to offset, mitigation, and trading programs. BMPs which are implemented to address environmental impacts caused by other developmental activities elsewhere in the watershed. Implementing special programmatic verification procedures will prevent data reporting errors due to a "double-counting" effect with other sectors or programs. BMPs tied to offsets, mitigation, and trading programs typically have their own specific verification protocols to achieve their intended programmatic environmental objectives.

11. *EPA Federal Verification Oversight*: Jurisdictional regulatory programs tied to federal regulatory requirements may have existing EPA verification oversight to ensure the local implementation of a federal regulation. Verification protocols should note the potential oversight role of EPA in periodically reviewing the implementation and management of jurisdictional regulatory authorities.

**Part 6.4: Agricultural Verification In Practice: Performance Equivalent BMPs**

As noted previously, an emerging source of agricultural BMP implementation is from practices that were installed without public cost-share, and may not be part of an operational permit or regulatory oversight program. They are typically financed by the operator, and may or may not meet the practice standards associated with federal and state cost-share programs. BMPs that do not meet a federal or state practice standard but which provide the same level of environmental protection on an annual basis are known as "performance equivalent" (PE) BMPs. Identifying, verifying, tracking, and reporting PE BMPs is more challenging than the other sources of BMP information for a number of reasons, including voluntary reporting and access by operators, potentially non-standard materials and designs, and at times the absence of an obligation to maintain the practice. The following guidance is provided for consideration by contractual entities in reviewing their existing procedures to ensure adequate data confidence, and equity amongst jurisdictions and programs:

1. *Verification Methods*: Appropriate verification methods will differ depending on the category of agricultural BMPs being considered. Short-term annual BMPs will require a unique approach compared to long-term structural BMPs for example. Consequently, specific verification protocols need to be developed and implemented to address each category of BMPs based on design lifespan and physical presence.

2. *Operation and Maintenance*: The proper operation and maintenance of agricultural BMPs is critical to ensuring that the estimated environmental benefits over the lifespan of the practices are realized. This is especially critical for long-term BMPs where the performance benefits might be applied over multiple years vs. months. Adequate verification protocols need to incorporate regular compliance review intervals based on the designed lifespan, and the unique characteristics of the BMP, taking into account non-controllable factors such as floods or droughts. The principle verification objective is to ensure that BMPs are operated and maintained properly over their designed lifespan to qualify for the associated environmental benefits. Consequently, verification protocols need to define (1) the cycle and extent for field verification of BMPs, (2) the process for removing non-existing or non-operational BMPs from reporting, and (3) the process for bringing improperly maintained BMPs back into operational standard within one year or less.

3. *Existing Program Verification Protocols*: The process of verifying PE BMPs is a relatively new area of piloted development by the partnership, so existing program verification protocols are currently limited in forming the foundation of a verification system for the Chesapeake Bay TMDL. In some cases, sufficient oversight and inspections may not require any or minimal adjustments to achieve the level of data confidence that is being established by the partnership. In other cases, more significant program verification adjustments or completely new protocols may be required due to the level of uncertainty or non-existence. The modification of an existing protocol or the development of a new verification protocol should attempt to minimize the amount of additional administrative and financial burden expected of the affected agency.

4. *Record Reviews vs. Visual Reviews*: Visual reviews for confirming that BMPs are present, appropriately maintained, and are being operated as designed is a common element found within most verification protocols. Visual reviews are vital, but are most effective when coupled with reviews of office and/or farm records. Record reviews are applicable for all BMP categories, but are especially critical for determining implementation of management plans, including nutrient application management and grazing management plans. Integrating a review of office and/or farm records coupled with visual observations is recommended to obtain a higher confidence level of assured environmental BMP performance. Conversely, record reviews alone are not considered a sufficient verification method.

5. *Technical Training*: The technical proficiency of public agency staff or NGO staff conducting practice reviews and record reviews of implemented agricultural BMPs cannot be under-rated. Ensuring that the reviewers are adequately trained and technically certified for the practice they are verifying is a basic element of QA/QC protocols. Verification protocols need to address the training and qualifications of the public or private entity staff that will be engaged with the verification process to ensure quality reviews and the reporting of properly maintained and operated conservation systems.

6. *BMP Installation Verification*: Agricultural BMPs that are not implemented privately typically will not incorporate reviews during and/or after installation to ensure the practice has been correctly implemented according to appropriate standards and specifications. An example of exception is when technical design assistance is provided by a public agency without public financial assistance. USDA-NRCS has established practice standards and specifications for most agricultural practices, but in some instances states may set the standard, especially in conjunction with state specific program or regulatory requirements. PE BMPs may not follow these prescribed standards which can impact their functional design lifespan. Chesapeake Bay Program approved BMPs may closely mirror these standards and specifications in how they are defined and the associated environmental benefits, but not in all cases. Verification protocols need to specifically address how the installation verification process will identify properly report BMPs which meet or exceed the standards and specifications of the appropriate CBP BMP if different than existing USDA or state standards.

7. *Verification Frequency Cycle*: PE verification protocols need to incorporate review intervals for all BMPs based on the designed lifespan and the unique characteristics of the BMP. The compliance review frequency may consequently vary from annual reviews per practice to a multi-year cycle within the practice lifespan. The verification objective is to ensure that BMPs are being operated and maintained properly over their designed lifespan to qualify for the associated environmental performance benefits.

8. *Jurisdictional Verification Priorities*: The Chesapeake Bay Program's BMP Verification Subcommittee and the BMP Verification Expert Panel have acknowledged that fully implementing the elements of this verification guidance for all BMPs could result in limited financial and technical resources being diverted away from BMP implementation. Public and private entities engaged with agricultural PE BMP verification programs are encouraged to direct their BMP verification and data validation efforts in direct proportion to the environmental benefits which a BMP contributes towards the TMDL pollutant reduction for a jurisdiction's agricultural source sector. Thus, agricultural BMPs which provide the greatest pollutant reductions for each jurisdiction's agricultural source sector should receive the highest priority for implementing statistically significant verification protocols to generate the highest confidence levels.

**9.** *Jurisdictional Data Validation Oversight*: Chesapeake Bay jurisdictional reporting agencies need to incorporate a process for validating county and private sources of BMP implementation data being reported to the jurisdiction. A data validation process that provides an adequate level of confidence in the verified data should include a statistically valid analysis of practice records review coupled with visual spot-checks or joint field reviews. This will verify reported BMPs meet or exceed the annual performance standards of the appropriate CBP BMP if different than existing USDA or state standards, and that they are operated and maintained to support environmental performance estimates. The data validation protocol needs to be transparent and publically accessible to so that stakeholders can be confident of the validity of

the reported data.

**10.** *BMP Offsets, Mitigation, and Trading*: Agricultural verification protocols need to include special procedures for identifying and separately managing practices which are tied to offset, mitigation, and trading programs. BMPs which are implemented to address environmental impacts caused by other developmental activities elsewhere in the watershed. Implementing special programmatic verification procedures will prevent data reporting errors due to a "double-counting" effect with other sectors or programs. BMPs tied to offsets, mitigation, and trading programs typically have their own specific verification protocols to achieve their intended programmatic environmental objectives.