Protocols for Verification of Annual BMP Data Submissions

I. Background – The Need for BMP Verification & Assessment

As established by the Chesapeake Bay Program (CBP) partnership, the annual verification review of Best Management Practice (BMP) data submitted by the seven Bay watershed jurisdictions for the model progress assessment is an assessment of the quality of reported information. This assessment of the quality of the BMP data follows the CBP partnership protocols and procedures as described in the 2014 document entitled, Strengthening Verification of BMPs Implemented in the Chesapeake Bay Watershed: A Basin-wide Framework (verification framework document). The data being reviewed by EPA, with assistance from staff at the Chesapeake Bay Program Office (CBPO), include BMPs submitted by jurisdictions through NEIEN (National Environmental Information Exchange Network) and wastewater facility data submitted through the CBPO wastewater application.

In association with the data, reviews of jurisdictions' BMP Verification Program Plans (aka Quality Assurance Program Plans (QAPPs) or BMP Quality Assurance Program Plans) are performed to ensure the QAPPs include descriptions of how the quality of the BMP and wastewater data are assured. The QAPPs should follow protocols outlined in the verification framework document and developed by the CBP partnership, including the Water Quality Goal Implementation Team, its source workgroups, and the BMP Verification Committee and its advisory panel. A wealth of the CBP partnership's verification information can be found at:
https://www.chesapeakebay.net/what/programs/bmp_introduction_to_bmp_verification

According to the verification framework document:

Chesapeake Bay Program Office staff will review the jurisdictions' annual NEIEN-based submissions of implementation progress data for the documentation of verification as part of their routine evaluations of the quality and completeness of the submitted data. The annual progress data reviews will be conducted following the specific guidelines and protocols agreed to by the Bay Program partners through the Watershed Technical Workgroup. Any implementation progress practice data submitted without the required verification documentation will be returned to the jurisdiction for incorporation of required documentation and resubmission.

The essence of a jurisdiction's BMP Verification Program Plan can be found in the "Transparency Addendum" to the "BMP Verification Public Confidence Principle" which states:

Transparency means operating in a way so any outside reviewer can determine what actions were taken, which data were synthesized to generate a report or conclusion, how data was collected and obtained, what measures were employed to ensure data accuracy, who is responsible for data collection and synthesis, who is responsible for ensuring data accuracy, and the methods of data analysis utilized. The measure of transparency will be applied to three primary areas of verification: data collection, data validation, and data reporting. Transparency of the process of data collection must incorporate clearly

defined quality assurance/quality control (QA/QC) procedures, which may be implemented by the data collecting agency or by an independent external party.

Transparency of the data reported should be transparent at the finest possible scale that conforms with legal and programmatic constraints, and at a scale compatible with data input for the Chesapeake Bay Program Partnership's modeling tools. It is recognized that transparency of data reported will vary across verification methods and data collection and reporting programs. This variance, however, should not negate the commitment and obligation to ensure transparency at the highest level possible in collection, synthesis and reporting.

In addition to the BMP verification procedures and protocols developed and approved by the CBP partnership, EPA's authority to conduct verification reviews and assessments is documented in the "Chesapeake Bay Program Quality Assurance Guidelines and Requirements":

In accordance with 40 CFR 30.54 and 3l.45, organizations conducting environmental programs and projects funded by EPA that acquire, generate, compile, or use environmental data and technology are required to establish and implement a quality system. Within the Chesapeake Bay Program . . . Environmental data to assess the efficiency of implemented management practices and environmental model development, calibration, verification, and application also are subject to these requirements.

For more details on managing the quality of environmental data, refer to "EPA QA/R-5, EPA Requirements for Quality Assurance Project Plans" at https://www.epa.gov/quality/epa-qar-5-epa-requirements-quality-assurance-project-plans.

It is important that jurisdictions continue to enhance their verification and compliance programs over time. Data and verification information submitted for the annual progress and verification assessment should follow the CBP partnership's verification framework document. In accordance with that document, QAPPs should be kept up to date as new BMPs are submitted and methods of tracking and reporting are revised to enhance the quality of the data and on-the-ground compliance programs.

Additional information on the establishment of the CBP partnership's verification procedures and protocols can be found in the verification framework document. The BMP Verification Review Panel that developed the Verification Framework was dissolved once they completed their work.

This document serves as the EPA and Chesapeake Bay Program office guide for verification assessment, and is publicly shared so that the process is transparent.

II. EPA Progress and Verification Assessment

Much of the verification analysis described below has been conducted for over 15 years. Similar calculations and reviews were done for each model progress scenario, in coordination

with the jurisdictions. The findings are typically documented, emailed, and discussed among staff at the CBPO and jurisdictional agencies.

The key difference with the introduction of CBP partnership-approved verification protocols and procedures is that the exchanges between EPA, CBPO, and jurisdictions are more formal and transparent. EPA documents potential BMP and point source verification issues, questions, and concerns associated with a jurisdiction's reported data and communicates this assessment to each of the jurisdictions. Often these assessments request written responses from the jurisdictions to resolve any outstanding issues and concerns. This documentation typically becomes part of a jurisdiction's BMP Verification Program Plan that are publicly available.

The analysis by EPA and CBPO staff to assess the quality of submitted BMP data includes assessments for the following information:

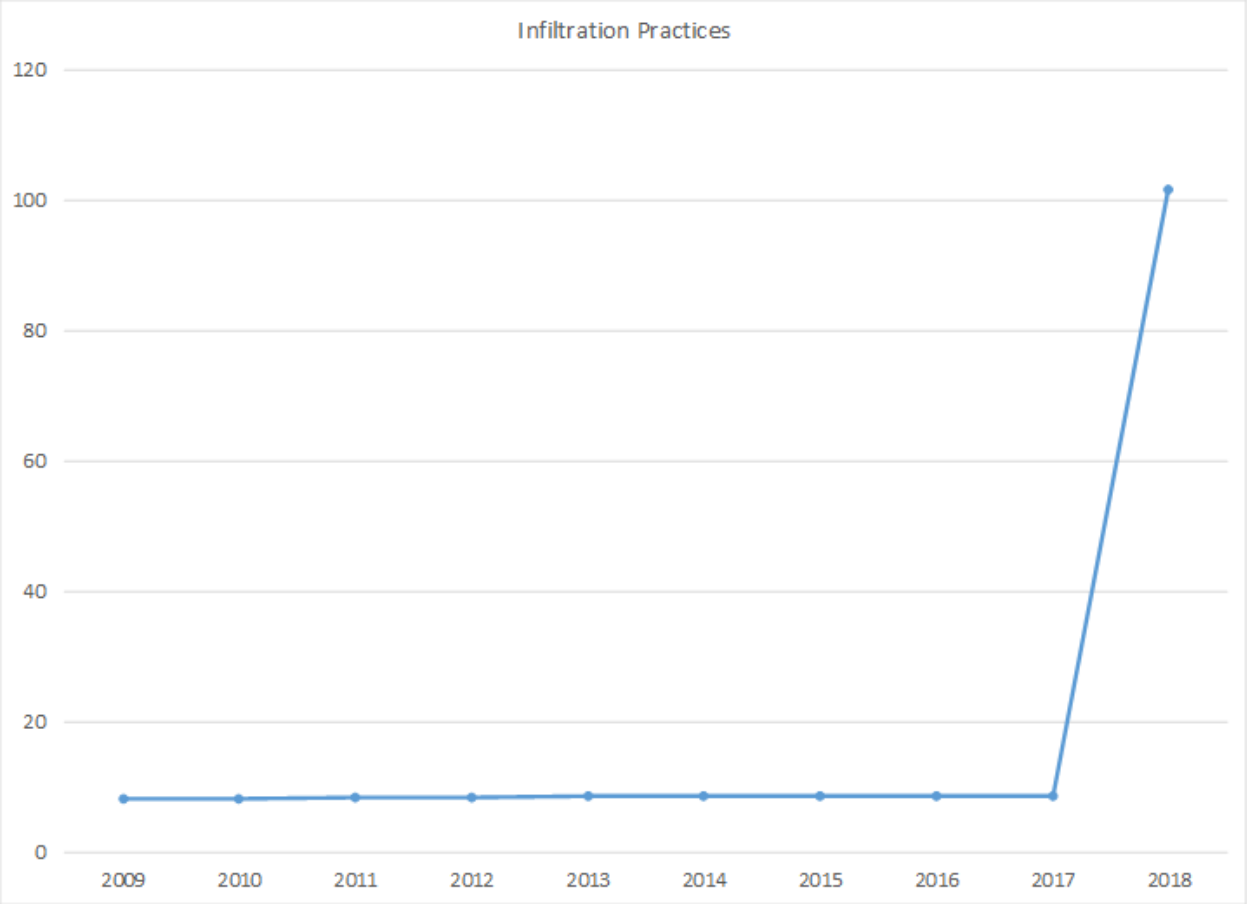
1) over- and under-reported implementation rates
2) newly reported BMPs
3) reported dates for implementation and inspection

Each jurisdiction is notified through email of its results of the BMP and point source data assessment. Typically, jurisdictions are asked for more-detailed written explanations of the quality of data that potentially could be in error – more detailed than information in their QAPP that is part of the EPA review process. Generally, EPA is looking for trends in reported implementation, BMP project information, and modeled nutrient and sediment loads that seem illogical and where there is no explanation for the anomalies in the jurisdiction's BMP Verification Program Plan, which is part of the QAPP. The full guidelines for the QAPP are in the BMP Verification Framework Appendix Q.

A. <u>Newly Reported BMPs</u>

Regarding the assessment of reported BMP implementation, EPA is reviewing data for BMPs that are reported for the first time in the 30+ year historic BMP record. For each of these occurrences across all sectors and jurisdictions, the relevant BMP Verification Program Plan is reviewed to ensure it includes information regarding the quality of the BMP data.

Figure 1. Example of Newly Reported BMPs as a Potential Verification Issue



According to Section 3 of the verification framework document, there are nine recommendations directed towards the jurisdictions in documenting their BMP verification programs. These recommendations apply to new and historic BMPs being reported for the annual progress submissions. In addition, the verification framework document encourages jurisdictions to consult the following four products developed by the BMP Verification Review Panel when documenting BMP verification and compliance programs:

- The Chesapeake Bay Program BMP Verification Program Design Matrix (Table5)
- The Jurisdictional BMP Verification Program Development Decision Steps for Implementation (Table 6)
- The State Verification Protocol Components Checklist (Table 7)
- The Jurisdictional Verification Protocol Design Table (Table 8)

The elements above are what EPA and CBPO staff are looking for in the jurisdictions' BMP Verification Program Plans during the annual evaluation and assessment of the quality of the BMP data being submitted.

Regarding the data, there should be listings of all program sources of the BMP data and detailed explanations of methods of tracking, reporting, and verifying for each BMP,

including calculations that are performed between receival of raw data and data reported through NEIEN. For newly reported BMPs, the QAPP should answer the questions of why the BMPs have not been previously reported. For example, does the newly reported information represent new on-the-ground implementation or a new source of data, or both? For example, reporting of stormwater performance standard BMPs was a new method of reporting with insufficient detail in prior records to create historic implementation. These stormwater BMPs were historically reported as other BMPs, which results in a decrease or cessation of the older stormwater BMPs and a sudden appearance of the stormwater performance standard BMPs. This is to be expected and follows the recommendations made in the Stormwater Performance Standard Expert Panel Report.

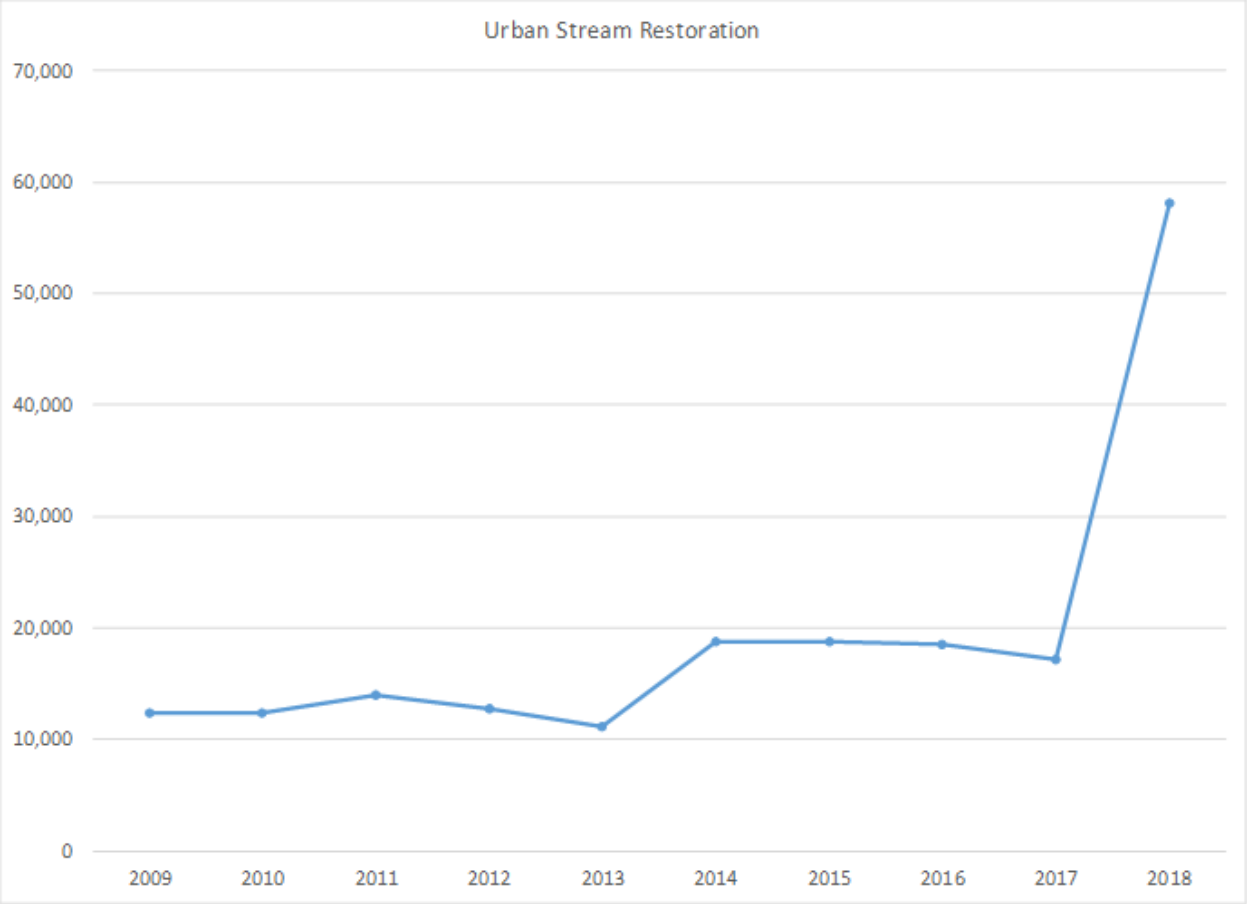
BMPs reported through NEIEN for the annual model progress scenario as new or re-inspected that do not have approved or adequate verification protocols reflected in the jurisdiction's QAPP, will not be credited in the simulation, per the verification framework document. For example, for Nutrient Application Management, there needs to be detailed descriptions of the sources of raw data, compliance programs associated with those sources, and any calculations done on the raw data before submissions through NEIEN – for each component of the BMP, core, and the three supplements related to rate, timing, and placement of nutrients. In other words, how are raw data used and calculations done to determine the degree to which landowners are following their Nutrient Management Plans – for each CBP partnership-defined element of the BMP for both Nitrogen and Phosphorus-based Plans? What, exactly, are the methods and equations for calculations from raw data to the acres reported to NEIEN under Nutrient Application Management for each element?

Similar to the load analysis, the BMP assessment looks at two versions of the reported BMP changes. One is the current progress scenario where the BMP first appears. The BMP has not been reported for published versions of previous years' progress scenarios. The second is re-run versions of previous years' progress scenarios that accommodate changes in reported historic BMP implementation that may have been submitted with the current progress scenario.

B. <u>Reported BMP Implementation Rate Changes</u>

Another component of EPA's verification analysis includes is over-reporting of BMPs. In the past, BMPs were flagged where the latest annual rate of cumulative implementation is more than double the prior year's amount. The spatial scale of the calculation is a jurisdiction's land area in the Chesapeake Bay watershed as a whole. The analysis looks specifically at CAST's "BMP Summary Report" for each of the scenarios. As with the load analysis and newly reported BMPs, the same rules of potential over-reporting are applied to every BMP and every jurisdiction.

Figure 2. Example of Over-Reporting as a Potential Verification Issue



The implementation rate change may be more or less than "double" for a particular year depending on the potential of flagged instances across all BMPs and all jurisdictions. For instance, the assessment would likely not yield meaningful results and responses if 50+ BMPs were highlighted in a jurisdiction. If this was the case, the identifying point would be increased.

As with all elements of the BMP verification analysis, the assessment is done in two ways. One way compares the BMP change from the published or official versions of previous years' progress scenarios, which are publicly accessible. The second analysis compares the BMP change from running all years of BMP submittal through the current version of CAST. This set of scenarios accommodates changes in reported historic BMP implementation that may have been submitted with the current progress scenario.

In addition to over-reporting, EPA is looking for BMPs that have been reported by a jurisdiction in the past but are now missing from their submission. These are identified to ensure a jurisdiction is aware of the potential error in reporting. Often, the BMPs are missing from an early version of the model scenario because the data source has not yet been reported to the collecting agency or the agency forwarding the information through NEIEN.

The highlighted BMPs that have potential of being over- or under-reported without explanations in the jurisdiction's QAPP – are identified in an email for a jurisdiction's formal response. There may be logical explanations for the sudden increase in the reported rate of implementation. The documentation to jurisdictions asks if the greater increase represents stronger programs or new funding sources. These types of management actions can yield significant water quality improvements in local and tidal waters from new implementation. If the sudden increase represents new numbers in the model that were already implicitly accounted for in the calibration of the model, providing credit again would be multiple-counting.

C. Implementation and Inspection Dates for Reported BMPs

Another element of reported data that is assessed for quality are the dates associated with the BMPs. These dates are related to initial implementation of BMPs and inspections and maintenance after installation to assure the BMPs are there and functioning at expected levels. Specifically, EPA is looking at NEIEN records, within the annual reporting period, to quantify the repetition of implementation dates and/or inspection dates.

The Jurisdictional Verification Protocol Design Table (Table 8) in the verification framework document illustrates how verification programs carry out an initial inspection for answering the question "is the BMP in place?" and then follow-up checks carried out at the appropriate frequency to answer the question "is the BMP still in place and operating correctly?" throughout the lifespan of the practice.

The Design Table prompts jurisdictions to provide documentation on procedures in place which prompt the need for conducting a follow-up check of a BMP at the end of its approved lifespan. It also calls on jurisdictions to document procedures for removing BMPs which go beyond their lifespan and are not follow-up checked to confirm the BMP is still in place and operational.

For significantly repeated dates, such as 500+ instances of a particular date across several BMPs for a given spatial scale, EPA is essentially asking if the implementation and/or inspection dates are accurate and, if not, why are dates not being tracked and reported for the associated BMPs? EPA acknowledges that NRCS and FSA BMPs are always aggregated and provided to jurisdictions with repeated dates. The QAPP should specifically list the BMPs and their sources for which this condition applies.

There are reasons why this condition could exist. It could be that programs do not have records of specific dates, but there are documented assurances the on-the-ground management activity occurred during the BMP reporting period. This is an example of what would need to be explained in a jurisdiction's QAPP.

What is important is that the explanations for potential errors in the data are accurate and publicly documented. An example of what would not be acceptable is BMPs from an inventory of a site that do not have implementation dates that can be substantiated. In other words, there is no way of knowing when the BMPs were installed – whether they are already implicitly accounted for in the calibrated model or not – and the inventory is reported for the

current progress year. The expectation is that BMPs are reported with an installation date for when they were implemented, not the date they were observed.

The Design Table in the verification framework document calls for jurisdictions to clearly document the systems and processes the jurisdiction uses to confirm the initial inspections and follow-up checks were conducted, prevent double counting, and quality assure the reported data before it is accepted by the jurisdiction. BMP data is often reported to a jurisdiction from a multitude of sources outsides of state agencies. Jurisdictions need to have written procedures in place for assuring the quality of the data for which they are now accountable. The jurisdictions are prompted to document any additional steps taken by the jurisdictions in properly recording the accepted data prior to its reporting through the jurisdiction's NEIEN node.

D. Annual Rate of Implementation for Reported BMPs

The newly implemented annual and cumulative BMPs will be assessed by evaluating the reported records (in amount, such as acres, reported) from NEIEN. This allows the change in reporting, or annual rate of implementation, to be tracked from year to year. This analysis answers the question of, Did we implement more or less for just that year.

E. Modeled Load Changes

Part of the verification assessment is reviewing jurisdiction-wide nutrient loads by major source. The rates of change of the loads covers the period beginning in model-year 2009, the starting point of the Chesapeake Bay Total Maximum Daily Load (Bay TMDL). The analysis quantifies load increases and decreases for each major source sector from the previous year's model-estimated loads – as percent changes. The spatial scale of the calculation is a jurisdiction's land area in the Chesapeake Bay watershed as a whole.

For changes that are significant and not explained in a jurisdiction's QAPP, EPA asks for a written explanation about what a jurisdiction attributes the load changes to. In the past, "significant" has been defined as being an increase or decrease greater than 2% but this can change from year to year depending on the year used as a reference point. The 2% was chosen because the average annual load change –for all sources combined – was 2.4% when last reviewed. The 2% is simply a guide for identifying why a particular sector (or all sources combined) showed strength. The percent change is calculated as a change from the prior year's official progress scenario as (prior – current) / prior. Whichever percentage change was used in the analysis, it is the same for every source and for every jurisdiction in order to provide equity in the measure.

The analysis looks at two versions of the annual load changes. The first compares the load change from the published versions of previous years' progress scenarios. These are the "official" versions of the progress scenario that have been published through CAST (https://cast.chesapeakebay.net/, the CBP partnership's Phase 6 Watershed Model) and the Chesapeake Bay Program web site, for example Chesapeake Progress at https://www.chesapeakeprogress.com/clean-water/watershed-implementation-plans. The public has access to these final versions of the annual progress scenarios and can make the same comparisons among model loads.

The second analysis compares the load change from the current year's progress BMPs to prior years progress scenarios that are not official. The non-official scenarios are run through the most current, approved version of CAST and accommodates changes in reported historic BMP implementation that may have been submitted with the current progress data.

F. Schedule for Verification of Annual BMP Data Submissions

EPA does a preliminary review for verification purposes of BMP data received by the annual December 1 deadline. Jurisdictions can begin submitting the data through NEIEN in September of each year. By mid-December, emails with findings of the preliminary verification analyses are sent to jurisdictions that meet the submission deadline for final QA/QC BMP data. The deadline for responses to the potential verification issues is generally during the second week of January. Specific dates are documented in EPA CBPO's annual Grant and Cooperative Agreement Guidance.

The deadline to complete the annual model assessment of progress is the end of the first week of February. The final opportunity for jurisdictions to revise BMP and wastewater data for the progress scenario – including updates to BMP Verification Program Plans/QAPPs – is prior to this date.

Typically, there are approximately 10+ draft versions of the annual model progress assessment run through CAST. The scenario inputs and outputs for each version are shared with jurisdictions through CAST at http://cast.chesapeakebay.net . There are ten types of reports available to review. In addition, validation reports of BMP data submitted through NEIEN for each draft version of the progress scenario are available on the CAST-NEIEN portal.

It is important to note that, according to EPA CBPO's Grant Guidance, in the event that data are not submitted on time, are inaccurate, or do not use the appropriate NEIEN or wastewater formats for the CBPO to calculate annual progress, the CBPO will use the previous year's data submitted by a jurisdiction or will not account for implementation of the BMP or control measures. EPA and the CBPO will continue to work closely with each of the jurisdictions over each progress and verification cycle to ensure the quality of the data follows the CBP partnership's verification protocols and procedures.

Annual Progress & Verification Process