COMMONWEALTH OF VIRGINIA

Quality Assurance Project Plan:

Verification Quality Assurance Project Plan for Managing and Reporting BMP Data to the U.S. EPA - Chesapeake Bay Program Office

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Group A – Program Management

A1 – Approval Sheet

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Note: This approval action represents EPA's determination that the document(s) under review comply with applicable requirements of the EPA Region 3 Quality Management Plan [https://www.epa.gov/sites/production/files/2020-06/documents/r3qmp-final-r3-signatures-2020.pdf] and other applicable requirements in EPA quality regulations and policies [https://www.epa.gov/quality]. This approval action does **<u>not</u>** represent EPA's verification of the accuracy or completeness of document(s) under review, and is **not** intended to constitute EPA direction of work by contractors, grantees or subgrantees, or other non-EPA parties.

A1 – Revision History

This table shows changes to this controlled document over time. The most recent version is presented in the top row of the table. Previous versions of the document are maintained by Quality Manager.

Document Control Number	History/ Changes	Effective Date
	Page 1: Updated title page to meet EPA standards Page 2: Updated signature page to meet EPA standards Page 3: Updated TOC Page 7: Updated distribution list and section A4 Page 9: Updated last 2 paragraphs (Section A5) Page 11: Updated data source table with new contact info for agency POCs Page 12: Updated first paragraph of page (Section A6) Page 13: Updated first paragraph of page (Section A7) and DEQ website link in A8, paragraph two Page 15: Updated Section B9 Page 16: Updated Section B9 Page 17: Updated table row regarding DOF practices Page 19: Updated Section B10.3 Page 20: Updated Section B10.3 Page 23-24: Updated QA Documentation Links for DCR, VDOF and DEQ Page 27 and 30: Updated DCR QAPP link in D2 agriculture section Page 34: Natural Sectors section paragraph 5 to reflect current info Page 35: Updated DEQ links in D2 Urban for E&S and Stormwater and added new link to list of MS4 permittees to replace the list in Appendix 8. Page 38: Updated link for VCAP Program Manual Page 39: Updated link for DEQ SLAF Guidelines Pages 44 and 45: Updated DEQ organizational chart	12/01/2021

	Removed Appendix 8 – information now available via web link on page 35	

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A2 – Virginia BMP Verification Program Checklist

	BMP Verification Component	QAPP Section
1	**BMPs Collected**	
	Type (structural, management, annual, etc.)	Appendix 4, A6, D1
	BMP Funding/Cost shared (federal, state, NGO, non-cost shared)	
	Distinct state standards/specifications	
	Matching CBP BMP definition	
2	**Method/System of Verification/Assessment**	
	Description of methods/systems to be used	Appendix 3, D2
	Documentation of procedures used to verify BMPs	
	Instruction manual for system users	
3	**Who will Complete the Verification**	
	Qualification requirements	Appendix 3, D2,A8
	Training requirements	
	Certification requirements	
	CEU follow-up training requirements in the future	
4	**Documentation of Verification Finding**	
	Date of installation	Appendix 3, A6, A7, A9, C1 and D2
	Location (lat/long if applicable)	
	Level of reporting (watershed, HUC, county, site specific, etc.)	
	Units (number, acres, length, etc.) needed for NEIEN	
	Ownership (public, private)	
	Documentation:	
	Pictures	
	Worksheets	
	Electronic Tool	
	Aerial Photos	
	Maps	
	Other	
	Report Generator	
5	**How Often Reviewed (Cycle of review)**	
	1-2 years	Appendix 3, D2
	5 years	
	10 years	
	Other	
6	**Independent Verification of Finding**	

	BMP Verification Component	QAPP Section
	Is this a requirement?	Appendix 3, D2
	Internal Independent	
	External Independent	
	BMP Data Validation	
7	**Quality Assurance/Spot Checking**	
	Who-qualifications/training/certification	Appendix 3, A6, A7, B10.1, B10.2, B10.3, C1 and D2
	Method to select BMP for follow-up check	
	Method to select the number of BMPs to review	
	Other	
8	**Data Entry of BMP Implementation**	
	What is the system?	Appendix 3, B10.1, B10.2, B10.3, C1 and D2
	Who enters data (training/certification)?	
	Does the system connect to NEIEN?	
	System in place prevent double counting	
9	**External Provided Data Validation Meeting CBP Partnership Guidance**	
	Method to validate data	Appendix 3, B10.2, B10.3, C1 and D2
	Who will validate data (training/certification)?	
10	**Historic Data Verification**	
	System to re-certify or remove	Appendix 3, B10.3, C1, D1 and D2
	Who will verify historic data training/certification)?	
	Documentation of action	
	BMP Performance	
11	Does state collect data to assess BMP Performance?	Appendix 3 and D2
	System used to collect BMP performance data?	
	Who collects BMP performance data?	
	Who analyses collected data and report to CBP?	

Source: Derived from Table 7 and Appendix Q in CBP 2014.

A3 – Distribution List

This document is being provided to the Verification Review panel for evaluation and comment and to the following personnel for review and approval.

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The final approved document will be posted to the DEQ Chesapeake Bay TMDL BMP Verification webpage.

A4 – Project / Task Organization

DEQ and other agencies (see section A6 for a complete list) coordinate to generate pollution reduction tracking data. The DEQ NPS Modeling Specialist is responsible for the receipt and preparation of the annual report through the National Environmental Information Exchange Network (NEIEN or EN) to EPA-CBPO and is the designated Project Manager. The DEQ Data Management Analyst and Administrative Data Coordinator assist the NPS Modeling Specialist in compiling and organizing the data by providing overall database expertise and reporting application administrator support. The DEQ Director of the Office of Ecology is the designated Project Quality Assurance Officer ensuring all procedures identified in this project plan are carried out as described and will provide oversight and quality control during the data acquisition and reporting processes. The DEQ Chesapeake Bay Coordinator is the designated Project Quality Assurance Officer and will provide oversight and quality control during the data

acquisition and reporting process. The Chesapeake Bay Grants Administrator is responsible for ensuring all grant deliverables and requirements are met including the requirement for this Quality Assurance Project Plan. The QA Officer also is responsible for maintaining the official approved Quality Assurance Project Plan. Organization chart showing lines of authority and reporting responsibilities are provided in Appendix 1.

A5 – Problem Definition and Background

In 2014, the Chesapeake Bay Program partnership approved the Verification Framework which defined verification 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" and adopted five principles to guide partners' efforts as they build on existing local, state and federal practice tracking and reporting systems and make enhancements to their verification program.

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.

The Partnership agreed that the documentation of each jurisdiction's BMP verification program would build directly upon their existing QAPP, a standing requirement for recipients of

Chesapeake Bay Implementation Grants and Chesapeake Bay Regulatory and Accountability Grants. This document describes the various sources of data, the quality assurance measures taken to acquire and report that data, and the procedures DEQ uses to compile and assure data quality prior to submission to EPA-CBPO.

The Department of Environmental Quality (DEQ) is responsible for reporting annual nonpoint source (NPS) implementation activities, including a digital transfer of NPS Best Management Practice (BMP) information across all NPS sectors via the NEIEN. DEQ is also responsible for transmission of annual wastewater data directly to the EPA-CBPO. DEQ assumed responsibility for the NPS reporting in 2013. Prior to that, the responsibility was with the Department of Conservation and Recreation (DCR).

The EPA, in conjunction with other EN Partners, including the Chesapeake Bay Program partnership, has developed an NPS BMP eXtensible Markup Language (XML) schema that provides a standardized structure and format for the data reporting elements for transmission via the EN. An EN Node is in place at DEQ that enables a direct, digital transfer of the NPS information. The EPA-CBPO creates annual progress scenarios using the provided data. The Chesapeake Assessment and Scenario Tool is used to estimate the anticipated reductions in nitrogen, phosphorus and sediment loadings to Chesapeake Bay and its tidal tributaries. The resulting information, model outputs, are used along with other lines of evidence to assess progress towards meeting the Chesapeake Bay Total Maximum Daily Load (TMDL), as well as the goals outlined in Virginia's Watershed Implementation Plans and Two-year Milestones.

A6 – Project / Task Description

The project objectives are to fulfill EPA-CBPO's annual reporting requirements as outlined in the Bay Grant Guidance by supplying annual nutrient reduction implementation data for the period July 1 through June 30 of the reporting year. This data is provided to EPA-CBPO for inclusion in the annual watershed model progress evaluations on or before December 1 of each year or as otherwise stipulated in the grant documents. Annual progress reporting from DEQ will include all available non-point source BMP implemented during the previous water year (July 1 through June 30) and any updated information such as new inspections, maintenance, or spot check data on non-annual BMPs previously reported. With the Verification Framework fully implemented, BMPs with no documented inspection, maintenance or spot checks to confirm continued function will be dropped from the BMP record at the end of their credit duration by EPA-CBPO.

All reported BMPs are documented in the most recent version of the National Environmental Information Exchange Network (NEIEN) NPS BMP CBP Data Flow Appendix A. DEQ will continue to work with EPA-CBPO to keep information in the Appendix up to date.

The following table lists potential sources of data that may be included in the data capture, aggregation, and reporting associated with this project along with a link to additional details on the programs that drive the implementation of those BMPs that may be reported by the source (see Appendix 2 for a detailed data flow diagram).

Data Source	BMPs Provided	POC
Department of Environmental Quality	Urban Stormwater	Drew Hammond
Department of Environmental Quality	Wastewater	Allan Brockenbrough
Department of Environmental Quality	Erosion & Sediment Control	Drew Hammond
Department of Environmental Quality	Manure Transport	Neil Zahradka
Department of Environmental Quality	319 Grant Projects	Nicole Sandberg
Department of Environmental Quality	SLAF/WQIF Grant Projects	Karen Dolan
Department of Environmental Quality	Bay Grant Projects	Susan Hale
Department of Conservation & Recreation	Agriculture	Darryl Glover
Department of Conservation & Recreation	Agriculture Nutrient Management	Vacant
Department of Conservation & Recreation and Department of Environmental Quality	Manure Transport	Vacant (DCR)Neil Zahradka (DEQ)
Department of Conservation & Recreation	Urban Nutrient Management	Vacant
Department of Conservation & Recreation	Manure Additives	Vacant
Virginia Marine Resources Commission	Oyster Aquaculture	Stephanie Iverson
Virginia Department of Health	Septic	Sonal Iyer
Department of Forestry	Forest Harvesting Practices	Terry Lasher
Virginia Department of Agriculture and Consumer Services	Voluntary and Resource Improvement Agriculture	Darrell Marshall
Virginia Department of Agriculture and Consumer Services	Certified Fertilizer Applicators	Darrell Marshall
Virginia Department of Transportation	Urban Stormwater	Tracey Harmon
Phase 1 MS4s (11 Local Governments)	Urban Stormwater	Derick Winn
Phase 2 MS4s (Regulated portions of Cities, Counties, Towns and Federal, State and Municipal Facilities)	Urban Stormwater	Derick Winn
Bay Act Localities (84 Cities, Counties and Towns)	Septic Pumpout, Erosion & Sediment Control, and Urban Stormwater	Justin Williams
Local Governments (approximately 200 Cities, Counties and Towns)	Urban Stormwater	Vacant
Federal Facilities (approximately 200)	Any	Vacant
NRCS	Agriculture	Olivia Devereux
FSA	Agriculture	Olivia Devereux
Virginia Association of Soil and Water Conservation Districts	Urban Stormwater	Kevin McLean
Alliance for the Chesapeake Bay	Urban Stormwater (residential scale)	Nissa Dean
National Fish and Wildlife Foundation	Any	Jake Reilly

BMPs reported through this project have been determined to meet the Chesapeake Bay Program BMP definitions. The complete list of Bay Program BMPs, their definitions and information about how they are simulated in the WSM are available online in the documentation of the Chesapeake Assessment and Scenario Tool (CAST). The subset of these BMPS that are commonly reported in Virginia can be found in Appendix 4.

Further information regarding the quality assurance, quality control, and management of these datasets can be found in sections A.7, B.9, B.10, and D of this document.

A7 – Quality Objectives and Criteria

DEQ seeks to provide EPA-CBPO with the highest quality data possible and to ensure practices, treatments and technologies resulting in reductions of nitrogen, phosphorus and/or sediment pollutant loads are implemented and operating as intended through time. The intent of this section is to establish the expected minimum standards for data quality and verification for each class of BMPs. Because this project involves the aggregation of data from many diverse sources, DEQ does not have direct involvement or control over much of the original data collection and reporting. As such, data providers will need to document, and improve as necessary, their QA procedures. DEQ does anticipate ongoing improvements to quality assurance actions through time and acknowledges that this document will experience many iterative changes as a result. DEQ will continually work towards implementing a three-tiered data reporting system that will indicate the level of quality assurance and quality control (QA/QC) associated with a given data source. The first and lowest tier will be comprised of sources that have not provided any documentation to DEQ regarding QA/QC procedures. The second tier will include data sources that have some documented QA/QC procedures but not an approved QAPP/SOP; this tier may include, for example, regulatory programs that have established protocols for data collection and reporting. The third and final tier will contain sources that have complete and approved QAPP/SOPs. The intent is to move each reporting source through the tiers over time, as appropriate.

When DEQ receives data from any source, there are certain qualitative accuracy and completeness objectives that are implemented at upload of data into the BMP Warehouse online reporting application. All data is reviewed for completeness (required information is present or

not) and appropriate formatting that can be readily transferred or modified to allow posting to the EN. Required information includes dates of installation, correct information for BMPs such as proper units, and location information indicating that the implementation occurred within Virginia's Chesapeake Bay drainage. More detailed location information consistent with the functional capabilities of the models, such as Hydrologic Unit, City/County or latitude/longitude, will be used as the data is available and allowable. Examination for anomalous data is performed multi-step process that includes comparison to previous years' reported data to insure unit consistency. For example, if millions of acres of BMPs are reported instead of typically thousands of acres, or if nothing is reported from a significant data source, efforts will be made to contact the data provider and confirm or revise the data in question. Additionally during the reporting process CBP provides error reports indicating records that may have passed EN validation but fail processing in CAST.

Every attempt is made to contact missing data providers before internal deadlines lapse. If data is received after established deadlines and it is complete and formatted appropriately, every effort is made to include that information in the annual reporting. DEQ continues to work to develop and refine these qualitative accuracy and completeness procedures; updates will be provided in future iterations of the QAPP.

A8 – Special Training Certifications

DEQ does not anticipate any specialized training and certifications requirements for Verification. Training and certification for DEQ internal data are inherent to the regulatory programs from which the data is generated. Information on the training and certification requirements for these programs are included in the sector specific sections of D2 and additional details can be found by following the links in the table in A6. Programmatic training and certification requirements for the external data providers described in B10.2 are documented in their respective QAPP/SOPs and are summarized in the sector specific sections of D2. Additional details can be accessed, where available, by following the links in the table in D1.

To continue the public education process and communication of these verification expectations, DEQ posts this Verification Program Plan and related updates conspicuously on their Chesapeake Bay website and provides a copy to all data providers. Additionally, EPA has

committed to provide verification training (e.g., webinars, meetings) and support the development and distribution of outreach materials, in cooperation with other Bay Program partners.

A9 – Documentation of Records

Data providers will need to maintain documentation of their own records. Because this project involves the aggregation of data from many diverse sources, DEQ does not have direct involvement or control over much of the original data collection, management, and reporting to DEQ via the BMP Warehouse application. When DEQ receives data from individual sources it has undergone validation by the application at upload to ensure the reporting entity has provided the correct formats, measures, and units for reporting the BMP installation. Where feasible DEQ ensures appropriate quality assurance and verification protocols are in place for the data provider when establishing them as a source of data. Copies of all data sets are stored in DEQ's BMP Warehouse application and associated database. The Virginia Information Technology Agency (VITA) backs up all network drives nightly on servers located at their secure facility in Chesterfield County. All data is retained in perpetuity.

Group B – Data Generation and Acquisition

B1 – Sampling Process Design (Experimental Design)

This section does not apply to this QAPP.

B2 – Sampling Methods

This section does not apply to this QAPP.

B3 – Sample Handling and Custody

This section does not apply to this QAPP.

B4 – Analytical Methods

This section does not apply to this QAPP.

B5 – Quality Control

This section does not apply to this QAPP.

B6 – Instrument / Equipment Testing, Inspection, and Maintenance

This section does not apply to this QAPP.

B7 – Instrument / Equipment Calibration and Frequency

This section does not apply to this QAPP.

B8 – Inspection / Acceptance of Supplies and Consumables

This section does not apply to this QAPP.

B9 – Non-direct Measurements

Current data submissions include two classes of BMPs derived from non-direct measurements, Tillage practices and some Urban Nutrient Management.

Tillage practices, which include Low Residue Tillage, Conservation Tillage, and High Residue Tillage Management, are based on survey results from Conservation Technology Information Center (CTIC) historically and from a Virginia specific transect tillage survey which began in 2016 with a planned 5-year recurrence. Through progress year 2018 the methodology used to interpolate the CTIC 2004 or 2007 data through the model calibration period of 2014 was utilized in which the interpolated data from the previous year reporting was supplemented with new implementation directly measured through implementation of cost-share practices to provide implementation percentages for each tillage BMP. Row crop land in Virginia was surveyed in 2015 and early 2016 to update existing rates of conservation tillage practice, which were last determined in 2004 or 2007 on a county by county basis by the CTIC. The surveyors measured the amount of residue they encounter and classifying it as <30% crop residue, 30-59%, or 60% and greater. These levels correspond with the Bay Program BMP definitions for Conservation and High Residue Tillage at the time. For Progress year 2019 and 2020 the methodology for reporting tillage BMPs changed from use of interpolated data to the use of the tillage transect survey results directly. In the next iteration of the Virginia transect tillage survey, data will be collected to include Low Residue Tillage practice that is represented as residue from 15-30%. And the results will be the basis for the reporting of tillage BMPs until any ensuing tillage surveys are conducted.

The surveys were conducted in the manner in which the previous CTIC tillage surveys were, except that we only recorded six crop types being grown on the surveyed fields as opposed to the 23 or so crop types that CTIC recorded. Our statistical goal was to be 90% certain that our derived rates of conservation tillage per survey unit are within ±5% of the actual on-the-ground rate. For our results to meet this statistical goal requires a minimum number of survey collection points, and that number is influenced by the estimate of the conservation tillage rate we expect to occur in each survey unit based on previous knowledge (the rate established from the 2004/2007 surveys). The surveys are planned to be updated every five years and are reported to DEQ by DCR. However, due to COVID 19 restrictions the planned update to the Virginia tillage survey did not occur. Therefore, the 2021 progress will contain the same information as provided in 2020.

Urban nutrient management relies in part on non-directly measured information. The Virginia Department of Agriculture and Consumer Services (VDACS) has regulations requiring the certification of commercial fertilizer applicators. The training and certification of these individuals includes elements of urban nutrient management. The resulting certified applicators commit to following turf nutrient management standards on their contracted acreage without having to develop formal nutrient management plans for that land. Commercial Applicators with more than 100 acres under management are required to report to VDACS. These acres are reported as Urban Nutrient management just as if they had plans in place and coordinated with DCR in the reporting of total urban nutrient management plan acres.

B10.1 – Data Management: DEQ Internal Data

DEQ internal program data is derived from regulatory requirements or grant programs. The regulatory programs include expectations of data quality assurance and the use of inspections and audits as a means for verifying them. The grant data is collected in accordance with grant guidance and contractual agreements. These agreements currently include some quality assurance requirements.

DEQ Program	BMP Types
Urban Stormwater (MS4, VSMP, Bay Act, Industrial Stormwater)	Urban Stormwater
VPDES Wastewater	Discharge Data
Erosion & Sediment Control	Erosion & Sediment Control

Land Application	Manure Transport
319 Grant Projects	Any
SLAF/WQIF Grant Projects	Urban Stormwater
Bay Grant Projects	Any

The internal data is stored in DEQ Agency network databases and documents as it is received. These databases are secured and backed up daily on external and network drives, creating a dual redundant backup of all reported information. These data handling and backup procedures follow state information technology standards. The internal DEQ data for annual BMP reporting is drawn from these sources during the annual progress data collection process. The data is selected based on the date implemented based on the progress year established in the Chesapeake Bay Program. Quality assurance checks are conducted to identify and correct any data inconsistencies or outliers. The internal data then proceeds to follow the process described in section B10.3.

B10.2 – Data Management: External Data

The table below provides a list of all external data sources that may provide data to DEQ for reporting to EPA-CBPO through NEIEN. The source organization and sector BMPs are indicated.

Data Source	**BMPs Provided**
Department of Conservation & Recreation	Agriculture
Department of Conservation & Recreation	Agriculture Nutrient Management
Department of Conservation & Recreation	Manure Transport
Department of Conservation & Recreation	Urban Nutrient Management
Department of Conservation & Recreation	Manure Additives
Department of Conservation & Recreation	Shoreline Management
Virginia Marine Resources Commission	Oyster Aquaculture
Virginia Department of Health	Septic
Department of Forestry	Forestry Practices
Virginia Department of Agriculture and Consumer Services	Voluntary and Resource Improvement Agriculture
Virginia Department of Agriculture and Consumer Services and Department of Conservation & Recreation	Urban Nutrient Management
Virginia Department of Transportation	Urban Stormwater
Phase 1 MS4s (11 Local Governments)	Urban Stormwater
Phase 2 MS4s (Regulated portions of Cities, Counties, Towns and Federal, State and Municipal Facilities)	Urban Stormwater

Data Source	BMPs Provided
Bay Act Localities (84 Cities, Counties and Towns)	Septic Pumpout, Erosion & Sediment Control, and Urban Stormwater
Local Governments (approximately 200 Cities, Counties and Towns)	Urban Stormwater
Federal Facilities (approximately 200)	Any
NRCS	Agriculture
FSA	Agriculture
Virginia Association of Soil and Water Conservation Districts	Urban Stormwater (residential scale)
Alliance for the Chesapeake Bay	Urban Stormwater (residential scale)
National Fish and Wildlife Foundation	Any

DEQ receives BMP data from individual sources when they upload data into the BMP Warehouse reporting application. This application reviews the data for completeness and format and ensures appropriate quality assurance. Before uploading data verification protocols are in place for the data provider. Copies of all data sets are stored in DEQ's BMP Warehouse application and associated database. The Virginia Information Technology Agency (VITA) backs up all network drives nightly on servers located at their secure facility in Chesterfield County. All data is retained in perpetuity.

DEQ has invested significant effort pursuing a 1619 Conservation Cooperator agreement with USDA. Unfortunately, the efforts have been unsuccessful to date. As a result, DEQ must rely on aggregated data provided through a USDA agreement with USGS. Absent detailed USDA data, the information cannot be examined for elimination of duplicate records with respect to DCR's Virginia Agricultural Cost-Share (VACS) BMP dataset. Per agreement with the Bay Program, Virginia will report both VACS and NRCS datasets since the minor amounts of duplication between the systems is less of an error than not reporting the NRCS data at all. DEQ will obtain data from USGS and submit it through the BMP Warehouse to CBPO via EN.

B10.3 – Data Management: Reporting to EPA-CBPO

DEQ developed the BMP Warehouse, an online reporting application linked to a network database and reporting application, to collect, link, store, and report all provided sources of BMP data. The BMP Warehouse improves data accessibility, automates most quality assurance and data validation processes, expedites conversion to XML and allows for management of BMP credit durations by allowing a BMP record's inspection information to be updated and reported.

The system enables DEQ to notify data providers of BMPs approaching the end of their creditable life, and to solicit updates to those records demonstrating dates of any recent maintenance, inspections or spot checks. During the BMP upload process, some QA/QC functions and an automated feedback procedure for data providers was deployed for internal and external use in 2016. Additional functionality to translate BMP data for reporting through EN has been completed. All subsequent submittals of BMP data will be done using this system. Until July 2021 all BMPs implemented via the Virginia Agricultural Cost Share Program (VACS) have been hard coded within the BMP Warehouse application. Specifically each VACS BMP code is mapped and handled by computer code not accessible to the DEQ BMP Warehouse administrators. DCR's ability to add new codes to the VACS program has far outpaced the ability of DEQ's IT procurement and internal IT governance rules to keep up resulting in a backlog of VACS codes and associated records. The recent upgrade to the BMP Warehouse application allows the DEQ site admin to make the needed code changes to allow this backlog to be reported and future code changes to be made at any time and no longer dependent on procurement. Additionally there were data input errors in some VACS codes that resulted in records not being transformed and reported this includes over 10,000 records of various cover crop between 2012 and 2020. These transform errors have also been addressed in the application as part of these upgrades and those records will be able to be processed and reported as well. The net result of these upgrades is that many records accumulating in the system over the past few years will now be reportable and passed on via the NEIEN with the 2021 annual progress reporting. This will create a slug of new data but it will be of implementation that has occurred over several years. Virginia also has reported several instances of animal waste storage facility BMPs as number of systems. With the recent upgrades the animal units treated by the system will now be available for reporting. So several existing records currently reported as 1 system that is currently assumed by CBP to represent 1 animal unit will have the correct number of animal units reported. Similarly DEQ will now be able to add additional supplementary measures such as lengths and widths to buffer and exclusion buffer records as well as the animal units excluded. This might appear as a jump in reporting of that BMP but it is really getting the proper measures and units attributed correctly.

With the new administrative features the situations that existed that created a backlog of unmapped BMP codes and or transformation error will no longer exist so DEQ does not

anticipate such a situation occurring again with the VACS data. In addition to the data being cleared out of the system DEQ will be completely reorganizing our XML instance file submissions that contain the BMP history currently on file with EPA at the CBP node. The former configuration of the BMP Warehouse application had an upper limit of 5,000 BMP records that can be submitted in any single XML instance file. As part of the 2021 upgrades DEQ is exploring expanding that capacity. With the current 5,000 record limit DEQ requires 90 instance files to provide the history up through progress year 2020. With the new limit we hope to reorganize the current records into fewer larger XML files and use the new administrative function in CAST to deactivate the 90 files that exist now so they can be replaced by the new reorganized and larger files. Additionally the VACS code WP-4B was previously mapped and reported as Barnyard Runoff Controls. Based on guidance from DCR this BMP should have been mapped to Loafing Lot Management Systems. Therefore, the Commonwealth will now be reporting this practice code as Loafing Lot Management Systems and updating the historical submissions where possible to include this change in BMP name mapping. In additionally there will be more USDA NRCS practice codes reported for 2021 since there are now several codes that were moved from draft to release status. This will result in those code being reported by the Commonwealth for the first time.

All internal and external data providers upload their data to the BMP Warehouse. QA/QC checks are run during the upload to ensure data includes all required fields for reporting. Records are also checked to avoid duplicate reporting. If data QA/QC issues are found, the entire data submission is rejected. The BMP Warehouse system generates an email to the data provider highlighting the errors and includes an attached spreadsheet detailing the records with errors and the nature of the error(s). Once corrected, the data provider resubmits the dataset through the same process. When all data is complete and no duplicate records are included, the data is added to the BMP Warehouse database. All records implemented within the Chesapeake Bay drainage of Virginia and that are accepted by CBPO are transformed by the application into the correct XML statements and made ready for submission via the EN. In preparation for annual progress reporting, all new BMP installation records reported into the BMP Warehouse are queried for a given reporting year (July 1 – June 30). The resulting XML file is transmitted to EPA via established protocols. Additionally updated records with new inspection/maintenance dates are also made available for re-submission by the BMP Warehouse reporting application. Existing

and reported records are associated with an existing EN submission ID. The submission ID's with associated updated records are re-submitted providing updated files containing the modified BMP record(s). This would also include removal of any record found to be duplicative or otherwise in error. The most recent guidance documents for EN data inputs are used for this work. The schemas, Appendix A, codes list and other guidance is available from the Chesapeake Bay Program. VITA backs up the BMP Warehouse data nightly on servers located at their secure facility in Chesterfield County, Virginia. All data is retained in perpetuity.

Group C – Assessment and Oversight

C1 – Assessments and Response Actions

The quality objectives and criteria described in section A7 and the data management procedures described in B10, which collectively describe DEQ's data validation procedures along with the verification procedures outlined in section D are used to evaluate the quality of internal and external data sets. If data sets are missing, incomplete, are received in an unusable format, or fail to meet the verification requirements for the appropriate BMP class, attempts are made to contact the data provider and explain what issues exist in the provided data that prohibit its collection in the BMP Warehouse application and inclusion in the annual progress data exchange. Every attempt is made to resolve identified data issues before the reporting deadlines occur. In the event that data issues are not resolved and the data cannot be loaded into the application DEQ will continue to work with the data provider to possibly correct the data for reporting in subsequent progress reporting cycles.

The historical record of BMPs will be evaluated annually to determine which BMPs are approaching the end of their credit duration. Beginning in 2021, the BMP Warehouse will generate and send email notifications to organizations with BMPs that are either out of their lifespan (credit duration) or will be within 6 months of the date on the email. The email will include a spreadsheet attachment detailing the expired and/or expiring practices and solicit updates to those records demonstrating dates of any recent maintenance, inspections or spot checks. BMPs with no documented inspection, maintenance or spot check based, statistically derived BMP verification rate will be dropped from the BMP record at the end of their credit duration by CBP during the annual progress scenario development.

C2 – Reports to Management

This section does not apply to this QAPP.

Group D – Data Validation and Usability

D1 – Data Review, Verification, and Validation

The following table provides the list of potential internal and external providers of practices implemented within Virginia and which may be reported by DEQ for nutrient and sediment pollutant load reduction credit in accordance with the Chesapeake Bay Program Partnership's Verification Principals. Because DEQ is an aggregator of data from many diverse sources, DEQ does not have direct involvement or control over much of the original data collection and reporting. Therefore, the table includes a link to the originating organization's internal quality assurance procedures (where available). Over the coming years, DEQ will work with data providers to document, and improve as necessary, their QA procedures. The QA procedures of the data providers is supplemented by the quality objectives and criteria described in section A7 and the data management procedures described in B10, which collectively describe DEQ's data validation procedures. Data verification standards are outlined in section D2. Any dataset that fails to meet these standards for validation and verification will result in exclusion of that data from the DEQ reporting of practices, treatments and technologies resulting in reductions of nitrogen, phosphorus and/or sediment pollutant loads in the Chesapeake Bay.

Data Source	**BMPs Provided**	**QA Documentation Link**
Department of Environmental Quality	Urban Stormwater	DEQ QAPP
Department of Environmental Quality	Wastewater	DEQ QAPP and Regulations
Department of Environmental Quality	Erosion & Sediment Control	DEQ QAPP
Department of Environmental Quality	Manure Transport	DEQ QAPP
Department of Environmental Quality	319 Grant Projects	DEQ QAPP
Department of Environmental Quality	SLAF/WQIF Grant Projects	DEQ QAPP
Department of Environmental Quality	Bay Grant Projects	DEQ QAPP
Department of Conservation & Recreation	Agriculture	DCR QAPP
Department of Conservation & Recreation	Agriculture Nutrient Management	DCR QAPP

Department of Conservation & Recreation	Manure Transport	DCR QAPP
Department of Conservation & Recreation	Urban Nutrient Management	DCR QAPP
Department of Conservation & Recreation	Manure Additives	DCR QAPP
Department of Conservation & Recreation	Shoreline Management	DCR QAPP
Virginia Marine Resources Commission	Oyster Aquaculture	VMRC Regulatory Guidance
Virginia Department of Health	Septic	VDH SOP
Department of Forestry	Forest Harvesting Practices	DOF SOP
Virginia Department of Agriculture and Consumer Services	Voluntary and Resource Improvement Agriculture	Included in DCR QAPP*
Virginia Department of Agriculture and Consumer Services	Urban Nutrient Management	VDACS SOP (Planned)
Virginia Department of Transportation	Non-MS4 Urban Stormwater	VDOT SOP (Planned)
Phase 1 MS4s (11 Local Governments)	Regulated Urban Stormwater	Regulatory Guidance
Phase 2 MS4s (Regulated portions of Cities, Counties, Towns and Federal, State and Municipal Facilities)	Regulated Urban Stormwater	Regulatory Guidance
Bay Act Localities (84 Cities, Counties and Towns)	Septic Pumpout, Erosion & Sediment Control, and Urban Stormwater	Septic Pumpout Guidance, Erosion & Sediment Control Guidance, Urban Stormwater Guidance
Local Governments (approximately 200 Cities, Counties and Towns)	Urban Stormwater	BMP Warehouse
Federal Facilities (approximately 200)	Any	BMP Warehouse
NRCS	Agriculture	BMP Warehouse
FSA	Agriculture	BMP Warehouse
Alliance for the Chesapeake Bay	Urban Stormwater (residential scale)	BMP Warehouse
Virginia Association of Soil and Water Conservation Districts	Urban Stormwater (residential scale)	BMP Warehouse
National Fish and Wildlife Foundation	Any	BMP Warehouse

D2 – Verification and Validation Methods

The table in Appendix 3, based on the Jurisdictional Verification Protocol Design Table from the Verification Framework document, outlines DEQs verification expectations for all practices, treatments and technologies reported for nitrogen, phosphorus and/or sediment pollutant load

reduction credit through the Bay Program. The verification program design includes scientifically rigorous and defensible, professionally established and accepted methods to assure reported BMPs are in place and functioning prior to reporting and that function remains intact through time. Varying methods are used for different BMP groups based on the specific traits of that group and to ensure the cost-effectiveness of the program. While different BMP groups have different verification procedures or frequencies, the overall framework strives to achieve equity in the measurement of functionality and effectiveness of implemented BMPs among and across the source sectors.

One approach to grouping and assessing BMPs for verification, identified in the guidance, uses estimates of the potential nutrient and sediment reductions associated with BMPs based on Watershed Implementation Plans to stratify or prioritize practices. The guidance also provides a default sampling rate of 10% for re-inspecting the practices. The default sampling rate was intended as a placeholder, pending the development of scientifically defensible, statistical sampling protocols. While both of these approaches are included in the guidance, they do not represent the only viable approaches to designing a Verification Protocol. The verification framework specifically allows for jurisdictional flexibility in designing their verification protocols, as long as the five Verification Principals remain sound. Virginia has elected to group BMPs by sector, delivery program and risk rather than the default breakout and prioritization used in the guidance. Furthermore, Virginia has taken the time to develop a statistically valid sampling approach for a number of BMPs. This approach has been reviewed by the Statistical Design Review Team (SDRT), an independent team of experts in statistical sample design, appointed by the Verification Review Panel. The SDRT has confirmed that Virginia's statistical sampling approach is valid and when implemented will produce results that have a minimum of 90% confidence $\pm$ a 5% margin of error. In other words, when we evaluate a sample of the population, we will know that there is a 90% chance that the results are within 5% of the correct answer for the entire population. This confidence interval exceeds the expectations established in the guidance of 80% and serves as a strong example for the expected confidence other model inputs (e.g. Land use) should strive to achieve.

Additional details relating to the statistical sampling and Virginia's overall approach to Verification can be found throughout the narrative of this document and is summarized in

Appendix 3. Additional details and calculations associated with the statistical sampling approach can be found in Appendix 5.

The development of Verification Protocols is intended to be an iterative and adaptive process. The Verification Framework and Bay Grant Guidance calls for the quality Assurance Plans to be reviewed and updated annually, as needed. As new BMPs are approved, or implementation programs evolve, the document will be updated to reflect those changes. The same is true of the statistical sampling approach. The sample findings will guide future adaptation of the sampling approach, including potential re-stratification. Should a few BMP types or geographic areas show higher failure rates, the sampling approach will be adjusted adaptively. Should the sample data reveal increasing trends in BMP failure rates, it may indicate the need to reconsider the broader Verification approach. The key is that this approach begins to build a robust data collection capability that can, with great confidence, ensure reported BMPs are functioning as intended through time as well as empower science based decision making and adaptation in the future.

Agriculture

Verification procedures for BMPs in the agriculture sector are outlined in Appendix 3, Table 1. The BMPs are subdivided into verification groups based primarily on the risk of failure as demonstrated by the spot check histories for each type of BMP, as well as program type (cost-share, voluntary, regulatory, cooperative), credit duration, and applicability to the Chesapeake Bay Watershed Implementation Plan. Details of this grouping can be found in Appendix 4, Table 1. The result is nine verification groups, each with specific procedures for initial inspection, follow-up checks and lifespan/sunset provisions. Additionally, any agricultural BMPs required in CAFO/AFO permits are subject to compliance inspections associated with those programs. These regulatory compliance inspections are independent of and in addition to this verification protocol and will serve to add additional confidence in the BMPs installed on CAFO/AFO sites.

Onsite initial inspections for 100% of practices are the standard for all but three of the agricultural verification groups. These onsite inspections are performed by the implementing agencies, typically DCR, SWCDs and NRCS. Records of the initial onsite inspections are captured in the reporting agency's databases, along with the appropriate reportable measures for

the installed practice. Information on data management by these agencies are, or will be, included in each reporting agency's QAPP or SOP. Links to these documents can be found in the table in section D1.

The three practice groups that do not have 100% initial onsite inspections are tillage practices, manure transport and feed additives. Tillage practice reporting will be based on a transect survey, described in section B9 of this plan. The transect survey approach was reviewed by the SDRT and found to be sufficient for use in the Bay Program modeling system. Manure transport reporting will be based on weigh station tickets from manure haulers and transport records required in the Poultry General Permit (9VAC25-630). These classes of BMPs do not lend themselves to traditional onsite inspections to ensure implementation, but these alternate measures represent a reasonable approach to satisfying the Verification requirements.

Several alternative approaches are used for the follow-up inspections to ensure reported BMPs are still in place and functioning as intended through time. Annual practices typically do not have follow-up checks. Four of the nine verification groups fall into this category: Cover Crops, Tillage Practices, Manure Transport and Feed Additives. However, cover crops will receive two inspections, once at planting, and a second time once established.

Nutrient Management Plans are reported as an annual BMP in the Bay model, but the plans typically have a 3-year life. Each year, plans that are within their active life are reported to the Bay Program for credit. More details on this procedure can be found in the DCR QAPP. Certified planners conduct follow-up inspections of Nutrient Management Plans at the time of plan renewal. Farmer records of yields and nutrient applications are compared against the Nutrient Management Plan and standards for nutrient management as promulgated in Standards and Criteria.

Stratified random sampling will be used to spot check the BMPs in three verification groups as part of the follow-up inspection process. The statistical sample size calculations can be found in Appendix 5 and utilized the sampling calculator provided by Raosoft. The number of practices data in Appendix 5 originated from the DCR cost-share tracking database. It should be noted that these numbers represent only one of the potential data providers in the agricultural sector, and the numbers are not static; this data is a snapshot in time. More BMPs are installed every day and

every day other BMPs drop out of the contractual period thereby changing their verification group. The purpose of Appendix 5 is to demonstrate how BMPs are grouped, give a sense for the numbers of practices in each data group and to establish the method for identifying the necessary sample size to achieve a 90% confidence interval with a ±5% margin of error.

The calculation of statistical sample size and confidence intervals requires some assumption or prior knowledge (data) of the size of the population and the anticipated pass/fail rate of the sample (response distribution). The existing Virginia Cost-Share Program has a strong database of all practices installed through the history of the program and documented results from past spot checks that have found an average 97% compliance rate for practices within the contractual period. This data is included in Appendix 6.

Practices that are installed under State or Federal Cost-Share programs and have contracts requiring maintenance are divided into three BMP Types for the purpose of verification. The three BMP Types in this group are Structural, Land Management and CREP. The BMPs that comprise each of these groups can be found in Appendix 4, Table 1. The spot-check data support using a response distribution of 97/3 for the practices that are within the contractual period. It should be noted that failure to maintain BMPs during the contractual period also carries the potential for financial penalty to the producer. This requirement to repay cost-share funds if practices are not maintained serves as a significant deterrent to non-compliance. Additionally, cost-shared practices are designed and installed following strict standards and there is robust initial inspection (100% onsite initial verification) to ensure the practices, as built, meet those strict design standards. Even with the historical spot check data and these additional lines of evidence that reduce the probability of failure, to be conservative, the assumed response distribution used in calculating the confidence interval for the three verification groups under State or Federal Cost-Share in Contractual Period is 90/10. The resulting sampling rates and procedures for each of the BMP verification types in this group are documented in Appendix 3, Table 1.

The next BMP Group includes those practices that were designed and installed in accordance with the strict standards of agricultural cost-share programs, but no longer have a contractual maintenance requirement. These could be practices that used State or Federal Cost-Share

programs, but have fallen out of the contractual period, as well as voluntary practices installed in accordance with the program standards and specifications but without the financial assistance or contractual stipulations of the State or Federal Cost-Share programs. Practices in this group are split into two types, structural and Land Management. CREP is not included in this group because the practices in the CREP type are specific to participation in that Cost-Share program. The BMPs that comprise the types in this group can be found in Appendix 4, Table 1. Based on the robustness of the design, construction and initial verification of the practices in this group, they are assumed to have a relatively low rate of failure, but higher than that of practices within the contractual period. However, because this group does not have any history of spot checks, the statistical sample calculations in Appendix 5 use a 50/50 response distribution, the most conservative assumption possible. The resulting sampling rates and procedures for each of the BMP verification types in this group are documented in Appendix 3, Table 1.

The third verification BMP grouping in the agricultural sector that uses statistical sampling for follow-up inspections includes all practices that meet the Bay Program approved definitions of Resource Improvement Practices. In general, these are BMPs that are similar to a cost-shared BMP, but do not meet the same design and construction standards. Despite this fact, these BMPs have been determined during the initial onsite inspection to be functioning and producing a resource improvement. Typically, these practices have been voluntarily installed at the producers' full expense. These practices have shorter credit durations in the modeling system that will result in the removal of the practice from the models unless a re-inspection is conducted. The high level of producer initiative and investment in the practices in this group lends itself to a high likelihood that the practices will be continually maintained. However, because of the uncertainty in the design and lack of contractual maintenance, the statistical sample calculations in Appendix 5 for this group assume a 50/50 response distribution. This group also separates out practices into Structural and Land Management types as described in Appendix 4, Table 1. To date, Virginia has not reported any BMPs that would fall into this grouping. The resulting sampling rates and procedures for each of the BMP verification types in this group are documented in Appendix 3, Table 1.

The final grouping in the agricultural sector is for practices that may be part of a Resource Management Plan. This agricultural certainty program includes a compliance inspection every 3

years for all practices required for the RMP certificate. These inspections would be in addition to the other verification requirements described in this section.

The spot check failure rate calculations and the resulting sampling design will be reevaluated triennially, incorporating the results obtained from the previous samples. The goal of the verification program is to strive for a 90% confidence level with a margin of error of ±5% for sample based follow-up inspections. This confidence interval exceeds the expectations established in the guidance of 80% and is in line with the expected confidence of other model inputs (e.g. Land use).

Unless the practices are re-inspected to verify continued operation and those records updated information is submitted via EN protocols, the Bay Program using approved credit durations will be removing reported BMPs for all verification groups in the agricultural sector during annual progress run preparation. DCR plans to conduct 100% re-inspections for all BMPs prior to the end of their credit duration. While this is encouraged for other providers of agricultural BMP data, it is not a requirement for satisfying the verification standard.

Additional details on the training and certification of the individuals conducting agricultural BMP initial inspections, verification spot checks or writing nutrient management plans can be found in the DCR QAPP.

Forestry

Verification procedures for BMPs in the Forest sector are outlined in Appendix 3, Table 3. The two BMPs included in this sector can be found in Appendix 4, Table 3. The forest harvesting BMP is an annual practice in the Bay Program modeling systems. This practice requires operators to notify the Virginia Department of Forestry (VDOF) of the operation that then allows VDOF to conduct inspections in accordance with the Virginia silvicultural water quality law. Based on these inspections the Department of Forestry provides DEQ with data on the total acres of harvested forest in Virginia's Bay Watershed. The VDOF then randomly selects 240 sites to monitor BMPs that have been applied to the sites through a vigorous evaluation process and have forest harvesting practices in place and functioning. The percentage BMP scores are then applied to all harvested acres in the watershed and acres under BMPs are then reported to the Bay Model through the NEIEN. This practice is an annual BMP in the modeling system, so for the purpose

of verification, the VDOF holds annual training sessions for its BMP auditors to ensure consistency in reporting as well as spot checks on the monitored sites by the Water Quality Program Manager. Sites that are monitored for BMPs are evaluated during the first six months, post-harvest, to verify that the BMPs are in-place. Follow-up inspections are not required because the lifespan for the forest harvesting BMPs are one year, and new sites are evaluated annually. Forest Harvesting BMPs are evaluated to a 95% confidence interval (CI) which more than meet the 80% CI required by the Bay Program.

Reporting of the Forest Conservation BMP requires documentation of appropriate local ordinances requiring the preservation of trees when parcels are developed and the acres of forest conserved as a result. The extent of forest conservation must meet the Bay Program definition in order for the practice to be reportable. These ordinances remain in effect until changed or removed and areas of forest conserved under such ordinances would likely remain in perpetuity even if the ordinance were rescinded. The Bay Program credit duration for this practice of one year is inappropriate and this BMP should be treated as a permanent practice.

There are BMPs included in the agricultural and urban sectors that involve trees, such as riparian forest buffers, but these practices will be verified in accordance with the protocols specific to those sectors. The proposed site inspections for these forest related practices include consideration of the common maintenance issues related to water quality for such practices (e.g. tree survival, channelization).

In addition to the verification protocols described in Appendix 3, the VDOF has a Memorandum of Understanding with FSA, NRCS and DCR to provide technical assistance in support of Riparian Forest Buffer establishment projects. VDOF's role is to provide a planting plan to include species selection, planting density, and site preparation if needed (either mechanical, chemical, or both). During the planting operation or shortly thereafter, a VDOF forester will perform a planting quality check to insure that the trees were planted according to the plan and correctly planted, including species size and type, planting density, installation of tree shelters and mats (if required) and appropriate competition control. Two years post planting, a VDOF forester will again perform an inspection to check on planting survival, competition from planted seedlings and to determine any maintenance that may be required. This information is provided

to the landowner as well as the agency that is providing the cost-share funding for the project. Any planting failures would be required to be re-planted at that point. The agency that provided the cost-share (NRCS, FSA, DCR through SWCD's) would then be responsible to perform periodic (5-year) spot checks for continued maintenance of the project through the contract period. VDOF partners with those agencies to perform some of these spot checks as time allows. VDOF has also been involved through a technical service agreement to re-visit CRP/CREP Projects to insure adequate tree density for CREP Re-enrollment, this is likely to occur annually as projects come up for re-enrollment. In addition to the cost-share practices that fall under this agreement, planting quality inspection and survival inspection are identified as standard operating procedure for all DOF buffer planting projects as well as hardwood open field planting projects in the Commonwealth.

Analyses of Virginia localities' urban tree canopy (UTC) to determine where and what BMPs are needed was carried out at the request of VDOF in collaboration with the participating localities and funded by the Chesapeake Bay Program, the USDA Forest Service, the Virginia Department of Conservation and Recreation, the Virginia Coastal Zone Management Program at the Department of Environmental Quality and the National Oceanic and Atmospheric Administration. VDOF and the Virginia Geospatial Extension Program (VGEP) at Virginia Tech's Department of Forest Resources and Environmental Conservation performed the analysis in consultation with the Center for Environmental Applications and Remote Sensing (CEARS) and the Spatial Analysis Laboratory (SAL) of the University of Vermont.

The goal of the project was to apply the USDA Forest Service's UTC assessment protocols to the participating localities. These analyses were conducted based on year 2008 data. Under the program, localities first conduct an Urban Tree Canopy assessment to set a baseline tree canopy from which they can establish an Urban Tree Canopy target, BMPs and timelines for implementation of that target. To-date, 19 communities have completed tree canopy assessments and several of those having set targets for canopy improvements along with favored BMPs to meet those targets. The Chesapeake Bay Forestry Workgroup is currently working on a Tree Canopy assessment tool that could be utilized by localities with VDOF assistance. This tool is expected to be available by 2017.

Lastly, VDOF currently provides urban forestry management related training through workshops and conferences. A future goal is to Train DOF employees to assist localities in assessing a community's tree composition and distribution and their associated ecosystem services.

Natural Sector Practices

Verification protocols for stream restoration and wetland practices are included in the appropriate source sector. Specifically, protocols for urban stream restoration and wet ponds/wetlands are included in the urban sector. Non-urban Stream Restoration, Stream Access Control (Stream Crossings) and agricultural wetland restoration are included in the agricultural sector protocols. In all cases, stream restoration and wetland practices will have an initial onsite inspection. Follow-up inspections will vary based on the specifics of the installation. Practices owned by MS4s would be inspected annually. Those in MS4 areas that are privately owned would be inspected every five years. Practices installed in an agricultural setting, would be subject to a statistical sampling based approach to account for practice failures as well as an inspection of every practices as it approaches the end of its credit duration.

Stream restoration practices are a highly regulated activity, typically requiring permit coverage from both state and federal agencies. The oversight provided by these permitting programs is in addition to and strengthens the onsite verification protocols described in this document. Inspection checklists are commonly used as part of state regulatory inspections. Where appropriate, these tools will be adapted for use specifically for inspection of stream restoration projects to ensure follow-up inspections consider both the continued presence of the structures as well as their function to control nutrient and sediment loads. Virginia will continue to explore methods for assessing the functionality of streams after stream restoration. Once complete, these BMP specific procedures will be posted to the DEQ website and links to the documents added to this Verification Plan.

Practices reported as wet ponds/wetlands in the urban sector are typically designed to address the storm water flows and loads originating from the drainage area to the facility. These designs may or may not include wetlands as part of the functional design of the system. Where wetlands are part of the practice functional design, storm flows and inundation durations are factored into the wetland sighting, species selections, planting densities and other design characteristics.

Agricultural wetland restoration projects can be designed for different purposes. Some designs may focus on waterfowl habitat while others have a more water quality focus. When implemented through the Virginia Agricultural Cost-Share Program, the practice design and construction standards are specified in the DCR Cost-Share manual. NRCS practice standards, 657 (Wetland Restoration) and 658 (Wetland Creation) may also apply.

Shoreline management practice incorporating living shoreline techniques could also be seen as restoring or protecting wetlands. These practices will also follow the protocols of the sector, agriculture or urban, where the practice is implemented and reported. Follow-up inspections of wetland related practices will consider both the continued presence of the systems as well as their function to control nutrient and sediment loads. DEQ made corrections to the BMP Warehouse application allowing reporting beginning in 2019 of shoreline BMPs with multiple measures such as protocol TN, TP, or TSS. Previously DEQ reported all records as either urban or agricultural shoreline management with a single measure of linear feet because the BMP Warehouse application was not configured to produce multiple measures tied to a single state unique tracking ID. For progress year 2019 DEQ will expunge all current records and replace them with the correct multiple measure shoreline reporting. Overall linear feet for the previously reported records will not change but instead of a general shoreline management DEQ will be differentiating those records into the appropriate versions (vegetated, Non-vegetated) of agricultural and urban shoreline management including all pertinent measures.

Oyster aquaculture BMPs are reported by the Virginia Marine Resources Commission (VMRC). VMRC provides reported oyster harvest from private grounds and off bottom cages reported in bushels. DEQ uses a VMRC estimate of 400 oysters per bushel to convert bushels to number of oysters. VMRC also recommended reporting all as 3-inch class oysters based on the size groupings in the oyster expert panel report. As an annual BMP in the model, there is no re-verification inspection required. There is also a 90% triploid/10% diploid assumption based on oyster seed production. Due to the schedule for reporting and processing oyster harvest data by VMRC, the reported oyster aquaculture is based on a 3-year rolling average of the harvest.

Urban

Verification procedures for BMPs in the urban sector are outlined in Appendix 3, Table 2. The BMPs are subdivided into verification groups based on the type of practice (management, structural, annual, and land conversion), program type (cost-share, voluntary, regulatory, cooperative), credit duration, and the risk for failure. Details of this grouping can be found in Appendix 4, Table 2. The result is ten verification groups, each with specific procedures for initial inspection, follow-up checks and lifespan/sunset provisions.

Many of the BMPs implemented in the urban sector are required by permits or regulatory programs. These include practices implemented for compliance with MS4 permits, the construction general permit and the Virginia's Stormwater Management Program (VSMP). Each of these programs and permits include requirements for BMPs to be properly installed and maintained. For MS4s, the permit requires the development of an MS4 Program Plan (see Section II.B.5.d.) that describes the procedures for implementing the program. The program plans include the specific policies and procedures for ensuring practices are properly designed and installed and for conducting inspections. Each MS4 is required to post its current Program Plan on their website. DEQ maintains a list of MS4 permittees and their associated websites. The construction General Permit requires practices be installed and maintained in accordance with the Virginia Erosion & Sediment Control Handbook and the Erosion and Sediment Control Law and Regulations. The VSMP has practice design standards and specifications described in the Virginia Stormwater Management BMP Clearinghouse, with additional information on program requirements in the Virginia Stormwater Management Handbook, Volumes I & II.

If erosion and sediment control is outside the usual initial inspection process, DEQ will acquire the permitted allowed disturbed acres from the Stormwater Construction General Permit database and multiply those records by 0.4 to estimate the universe of actual disturbed acreage associated with construction activities and report that information to CBP in August. This will constitute the universe of construction-disturbed acres to be simulated and will be aggregated at the city/county scale for the annual progress run. DEQ will apply a 0.75 compliance factor to those city/county total disturbed acres as having ESC level 2 applied and report this with the annual BMP progress reporting. In addition, if a locality provides actual ESC BMP reporting via the BMP Warehouse application their actual reporting will be substituted and reported in place of

the process described above using the factors as detailed.

Onsite initial inspections are the standard for all but two of the urban verification groups. Street sweeping and storm drain cleanout practice reporting will be based on weigh station reports indicating the date and weight of material collected or by vehicle logs documenting the area swept. The second practice without onsite initial inspection is the Urban Phosphorus Fertilizer Reduction practice. This credit is based on the established regulations prohibiting phosphorus in lawn maintenance fertilizer. Beginning with the progress data submission in December 2016, the preliminary default credit for this practice was replaced with documented changes in non-agricultural fertilizer sales data for phosphorus through the Fertilizer Tonnage Reporting System (FTRS). Additional information on the FTRS is included in this section. These two classes of BMPs do not lend themselves to traditional onsite inspections to ensure implementation, but these alternate measures represent a reasonable approach to satisfying the Verification requirements. Only BMPs satisfying the Bay Program BMP definitions will be reported, even though regulatory programs may accept additional implementation information to satisfy their permitting requirements.

Virginia's Commercial Fertilizer Law requires distributors of regulated products (commercial fertilizers, specialty fertilizers, soil amendments, and horticultural growing media) to submit (i) statistical tonnage reports, (ii) inspection fee reports, and (iii) payment of inspection fees. Distributors are required to report to Virginia Department of Agriculture and Consumer Services (VDACS), the tons of regulated products sold to a non-licensee during the fiscal year (July 1 – June 30). Also required is submission of an inspection fee of $0.25/ton or $35.00, whichever is greater. If zero tons have been distributed during the fiscal year, submission of the report accompanied by the minimum inspection fee ($35.00) is still required.

Statistical tonnage data and inspection fee payments can now be submitted online using FTRS. VDACS deployed the FTRS in June 2016. FTRS is an online reporting tool for the collection of fertilizer distribution data in Virginia. The online reporting system streamlines and improves the ability of fertilizer distributors to submit data and allows VDACS to produce summary reports of distribution data; this summary data is made available to the public and posted on the VDACS website.

The FTRS can be accessed from the VDACS website. Fertilizer distributors must create an account to submit data; a VDACS registrant number is required to gain access to the system. Once an account has been created, the fertilizer distributor may enter fertilizer tonnage data via FTRS. The reporting system allows for reporting of fertilizer tonnage by fertilizer code. This is a numeric code that corresponds to a specific fertilizer grade (example: 10-10-10 or 24-0-0). If the fertilizer grade is unknown, the data can be entered using the nitrogen, phosphorus and potash percentages contained in the fertilizer product. Additional fields include "Container" which indicates bagged, bulk or liquid and "Usage" which is farm or non-farm. Once all fields are populated, the entry is saved and the user proceeds to enter the next record. In addition, data can also be uploaded to FTRS using an Excel spreadsheet. A spreadsheet template can be downloaded from the FTRS website populated off-line then uploaded to the system. Annual fertilizer reports are generated using the reporting tool. Reports can be based on nutrient application at the locality level.

Several alternative approaches are used for the follow-up inspections to ensure reported BMPs are still in place and functioning as intended. Annual practices typically do not have follow-up checks. BMPs installed under regulatory programs and permits include a requirement that a maintenance agreement be recorded with the parcel's land records. This requirement for long-term maintenance of permanent stormwater management facilities is specified in 9VAC25-870-112. Additionally, MS4s are required to inspect BMPs they own annually and all other practices that are privately owned every 5 years. These regulatory programs also include compliance and enforcement processes that ensure the regulatory requirements are being followed. When program compliance inspections reveal BMPs that are not properly maintained, the permittees are typically given no more than 90 days to resolve the issues and provide documentation of such actions to the inspectors. Collectively, these procedures ensure the proper initial implementation and continued operation of the BMPs installed pursuant to these regulatory programs. As such, this class of BMPs is expected to be maintained in perpetuity. DEQ will continue its oversight of inspection and maintenance requirements for practices in urban regulated sector to ensure practices remain in place and functioning.

BMPs installed in areas with no regulatory requirement represent a unique challenge. In the non-regulated urban sector BMP reporting is voluntary, as is BMP inspection. For these practices,

DEQ will utilize the BMP warehouse database to notify the BMP reporting source of the need for re-inspections as BMPs exceeding or approach the end of their credit duration. The notification will recommend a re-inspection to verify continued performance and provide the procedures for reporting data documenting such re-inspections. Inspection updates provided by reporting sources will be used to update data records and extend credit life.

Two relatively new programs provide additional inroads to verification in the unregulated urban sector. The Virginia Conservation Assistance Program (VCAP) provides cost-share and technical assistance to residential property owners for implementation of urban stormwater BMPs. The VCAP program is administered by the Virginia Association of Soil and Water Conservation Districts and implemented by the local Soil and Water Conservation Districts throughout the Bay watershed. The program includes homeowner consent that allow SWCD access to the property for the purpose of inspecting installed BMPs as well as funding for Districts to conduct follow-up inspections for Verification. This program is eligible on both regulated and non-regulated urban lands.

The program provides a mechanism to satisfy the verification re-inspection requirements. To ensure on-going maintenance, SWCD technical staff are responsible for conducting annual spot checks of twenty-five percent (25%) of all active contracts executed in their Districts. District staff also ensure that participants adhere to the VCAP maintenance agreement. Appendix C of the VCAP Program Manual includes guidance on data collection for BMP reporting to the Chesapeake Bay Program.

The Stormwater Local Assistance Fund (SLAF) provides cost-share assistance through grants to local governments for urban BMP implementation. SLAF targets larger projects implemented by the local government recipients. To date, the vast majority of these projects have been by MS4 localities where verification is already a regulatory requirement. The program provides new inroads for verification for projects in non-regulated areas. The SLAF grant agreements have a provision that requires the development of a “Responsibilities and Maintenance Plan” that includes maintenance and inspection schedules and responsible parties for the useful service life of the installed facility. Additionally, the grant agreements require Grantee’s rights of access for facilities on privately owned property as well as provisions requiring the maintenance plan be

recorded in the land records for the property in accordance with 9VAC25-870-112 for long-term maintenance of permanent stormwater management facilities.

Statistical sampling will be used to spot check the Urban Nutrient Management Plan and Urban Nutrient Management Certified Applicator groups. The statistical sample size calculations can be found in Appendix 5. The sample size will be reevaluated at least triennially, incorporating the results obtained from the previous samples. The goal of the verification program is to strive for a 90% confidence level with a margin of error of ±5% for sample based follow-up inspections. In other words, when we evaluate a sample of the population, we will know that there is a 90% chance that the results are within 5% of the correct answer for the entire population. This confidence interval exceeds the expectations established in the guidance of 80% and serves as a strong example for the expected confidence other model inputs (e.g. Land use) should strive to meet. A list of SLAF eligible Chesapeake Bay Program BMPs and established efficiencies is included in the SLAF Program Guidelines.

With the exception of BMPs installed pursuant to regulatory requirements, the Bay Program approved credit durations will be used as the basis for removing reported BMPs by CBPO for all verification groups in the urban sector unless the practices are re-inspected to verify continued operation and historical reporting updated via established EN protocols. Training and certification of personnel involved in the design, installation, inspection and maintenance of urban practices is conducted through program specific training for Virginia Stormwater Management Program authorities and Virginia's Erosion and Sediment Control Program. Additional information on the specific certifications offered through these programs can be found on the DEQ Training and Certification Website.

Wastewater, CSO, and Onsite

Verification procedures for BMPs in the Wastewater, CSO, and Onsite, sectors are outlined in Appendix 3, Table 3. The BMPs are subdivided into verification groups based on the sector, type of practice (management, structural, annual, land conversion), program type (cost-share, voluntary, regulatory, cooperative), credit duration, and the risk for failure. Details of this grouping can be found in Appendix 4, Table 3. The wastewater and CSO sectors are included in this section of Verification Protocol Design Table as well, although they are not typically

thought of or reported as BMPs. The result is seven verification groups, each with specific procedures for initial inspection, follow-up checks and lifespan/sunset provisions.

A separate QAPP has been developed for Virginia Pollutant Discharge Elimination System permitted point source dischargers in the Chesapeake Watershed. The draft QAPP is currently under CBP review. The QAPP will be posted to the DEQ website upon CBP approval.

Combined Sewer Overflows (CSOs) are not a BMP, but data regarding the regulated area draining to CSOs along with the frequency and estimated volumes of overflow events are used in the modeling system. Implementation and verification of actions to reduce the impact of CSOs follows the CSO Control Plans and applicable regulations. DEQ reviews and approves plans and specifications that result from implementation of Long-Term Control Plans for CSO localities, in accordance with Virginia's Sewage Collection and Treatment Regulation ("SCAT"; 9VAC25-790). Procedures and requirements to secure a Certificate to Construct (CTC) and Certificate to Operate (CTO) post-construction are described in Section 50 of the SCAT Regulation.. Maintenance is verified through periodic inspections and annual reports submitted in accordance with VPDES Permit Regulation (9VAC25- 31) requirements. As CSO control projects are completed, the model data is updated through the Bay Program modeling team.

For the verification groups in the onsite septic sector, the annual practice of septic tank pump-out does not require any follow-up checks for the purpose of verification. Initial on-site inspections performed by licensed onsite sewage service providers are standard for the remaining two approved practices – connection to sewer and AOSS including all nitrogen reducing systems. The Virginia Onsite Sewage and Water Services program, through regulations, requires that onsite septic systems be installed and inspected by licensed installers and operators according to Virginia's Sewage Handling and Disposal Regulations (12VAC5-610). State Environmental Health Specialists employed by VDH in local health districts perform on-site inspections for 10% of all newly installed onsite sewage systems and perform a file review of 100% of permitted onsite septic system construction and repair projects.

Operation and maintenance (O&M) inspections for all installed nitrogen reducing systems with a design flow of less than 1,000 GPD are required annually. Inspections are performed and reported by licensed operators and tracked by state officials using a statewide environmental

health database. All systems with a design flow greater than 1,000 GPD require an inspection and effluent sampling frequency that is less than annual per Virginia's Regulations for Alternative Onsite Sewage Systems (12VAC5-613). Issues or critical malfunctions identified during the annual inspection are typically corrected immediately. An updated policy is currently under development to implement civil penalties for homeowners with nitrogen reducing systems who do not submit annual inspection reports. The civil penalties include notices of alleged regulatory violation, fines, and civil court proceedings if fines are left unpaid and the system remains uninspected. This updated policy is anticipated to be in effect by mid-2016. BMP data are collected by VDH staff in the local health districts and maintained in a statewide environmental health database. Data quality is reviewed by VDH data management staff on a district-by-district basis, and regular requests for data cleanup are coordinated with VDH district staff. An Onsite Quality Assurance Policy was developed by VDH staff in 2007 and guides local health departments in standard data collection, data entry into the statewide environmental health database, and requires quarterly reporting on metrics to improve data quality.

Duplication of reported nitrogen reduction BMPs is unlikely to occur, as VDH is the only agency that collects and tracks data for nitrogen reducing onsite septic systems. Currently, there are no standard procedures for processing and reviewing O&M inspection reports submitted by licensed service providers. VDH will include procedures for reviewing O&M reports in its new standardized process for all onsite staff. The anticipated timeline for the process is four years. The policy may include information for the O&M report review by local health departments to ensure reports contain accurate information, onsite sewage systems are functioning properly, and reports are correctly associated with existing permits in the statewide environmental health database. VDH is also currently updating its QA policy that was originally developed in 2007.

VDH reports pump-outs that occur across the Commonwealth. Septic tank pumping is regularly the first step in correcting a failing onsite sewage system, and VDH uses repair permits logged in the statewide environmental health database as a proxy for the number of septic tank pump-outs . An alternate possibility is to solicit this data directly from wastewater treatment facilities, which may track the amount of septage dumped at the facility by pump-out trucks. VDH will explore this option to determine if this method of tracking may provide a more accurate estimate of pump-outs.

Documentation of connection to public sewer service is logged in the statewide environmental health database when an onsite sewage system is abandoned. Additionally, localities and individual wastewater treatment facilities may report public sewer connections to VDH or DEQ. VDH will continue to work with DEQ and localities to improve the reporting process for public sewer connections to increase the accuracy of reporting in this BMP category. All onsite septic sector BMPs are reported annually to DEQ using a data template with approved EN BMP names.

The Virginia Department of Professional and Occupational Regulation (DPOR) oversees certification and licensure for professionals in the onsite sewage sector. Designations include Alternative and Conventional Onsite Sewage System Installers, Operators, and Soil Evaluator (18VAC160-40). DPOR also provides oversight of Professional Engineers (18VAC10-20), which must design and approve most alternative onsite sewage systems (AOSS) (Regulations for Alternative Onsite Sewage Systems, 12VAC5-613-40). Design requirements for onsite BMPs are found in policy (GMP 2013-01). Initial on-site inspection of installed onsite sewage systems is performed by state officials for 10% of new systems, while inspections by licensed installers and system designers ensures proper design and installation of the remaining 90%. Manufacturers, professional organizations, and Virginia Department of Health (VDH) routinely offer training to licensed service providers on the proper design, installation, and maintenance of onsite wastewater systems.

Annual operation and maintenance of nitrogen reducing systems comprises another aspect of BMP verification for the onsite septic sector. Regular trainings are offered to licensed service providers by multiple organizations across the state, including the Virginia Onsite Wastewater Recyclers Association (VOWRA), National Onsite Wastewaters Association (NOWRA), State Onsite Regulators Alliance (SORA), and National Association of Wastewater Technicians (NAWT). VDH coordinates with Virginia Tech to offer training on operation and maintenance of nitrogen reducing onsite sewage systems to wastewater works operators working towards additional licensure as an alternative onsite sewage system operator.

Additionally, targeted trainings developed by VDH are offered to Environmental Health employees covering Chesapeake Bay TMDL requirements, nitrogen reduction from onsite sewage systems, and operation and maintenance regulations and reporting. VDH is currently

developing a training policy for all Environmental Health staff at VDH to standardize onsite septic practices statewide.

For the remaining verification groups, onsite initial inspections are the standard. Many of the verification groups in the onsite and extraction sectors are annual practices that do not need any follow-up checks for the purpose of verification. For the remainder, follow-up inspections to ensure reported BMPs are still in place and functioning as intended are driven by the onsite program regulations.

D3 – Reconciliation with User Requirements

This section does not apply to this QAPP.

Appendix 1 – DEQ Organizational Chart

OFFICE OF ECOLOGY
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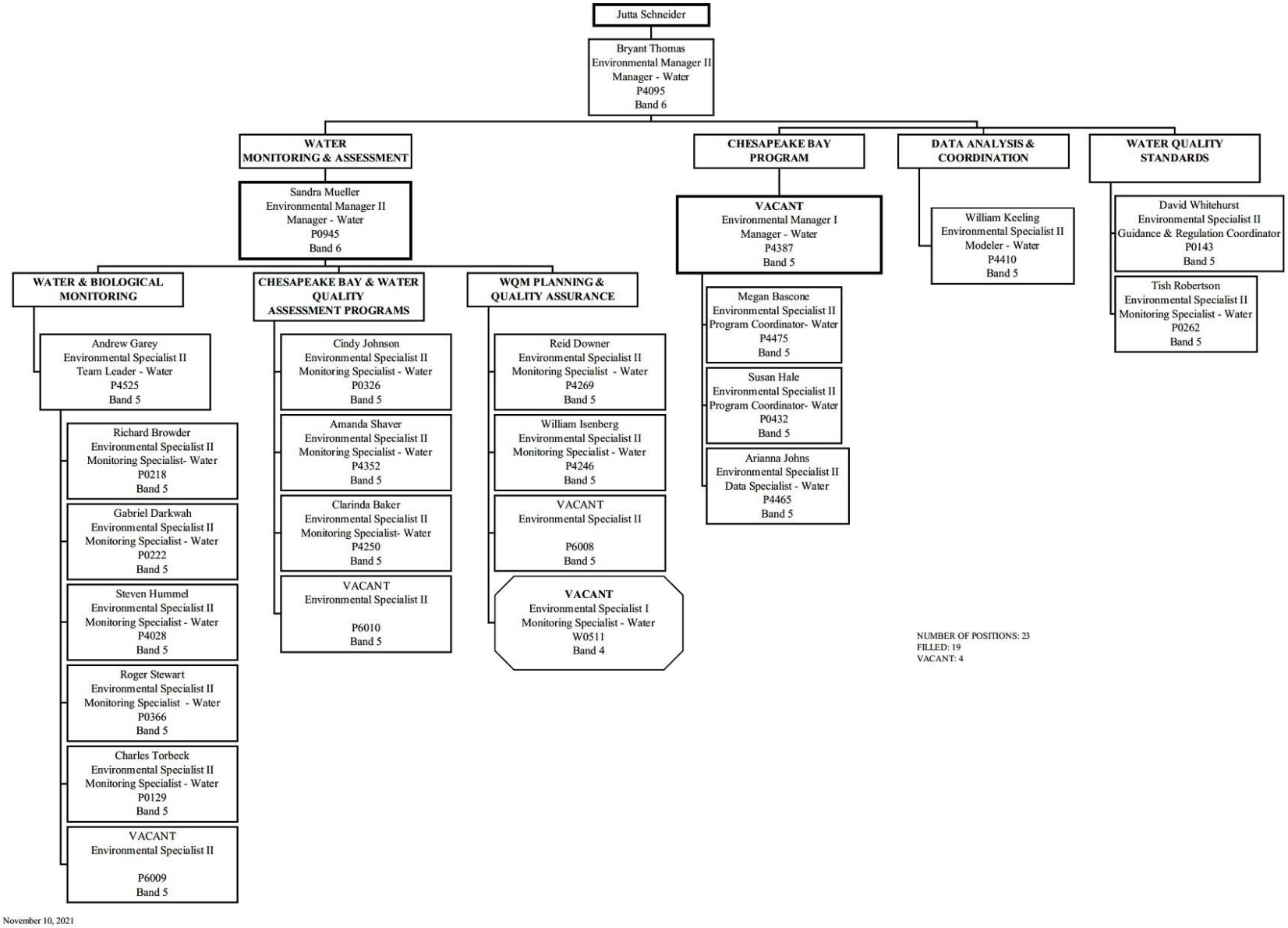
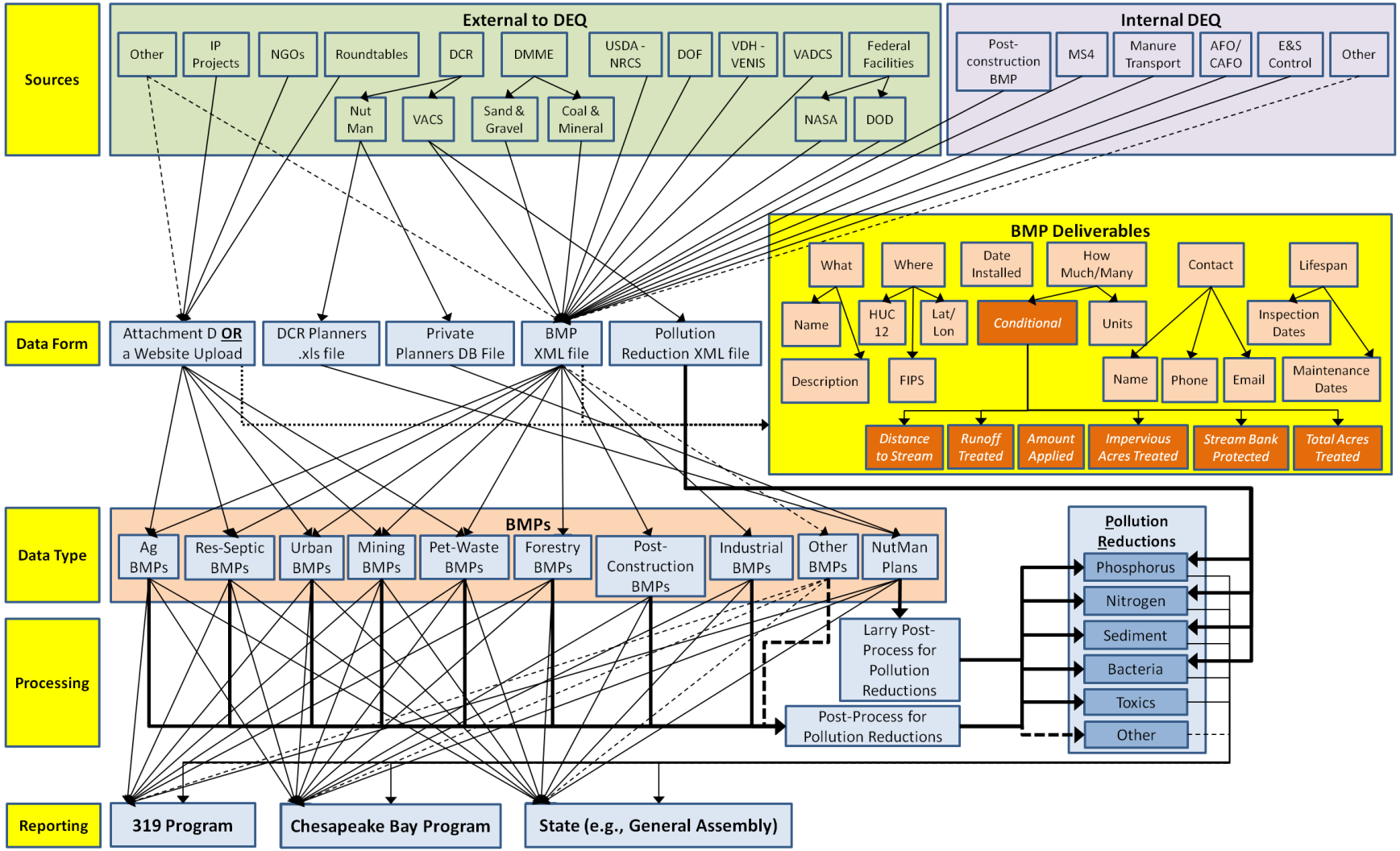


November 10, 2021

Appendix 2 – Internal and External Data Flow



Appendix 3 – Verification Protocol Design Table 1: Agriculture

A. Sector	**B. Data Grouping**	**C. BMP Type**		**D. Initial Inspection** *(Is the BMP there?)*				***E. Follow-up Check*** *(Is the BMP still there?)*		**F. Lifespan/Sunset**
			Method	Frequency	Who inspects	Documentation	Follow-up Inspection	Statistical Sub-sample	Response if Problem	*(Is the BMP no longer there?)*
Agriculture	State or Federal Cost-Share Cover Crops	Annual	Onsite	100% at planting	DCR, SWCD, NRCS	VACS Database, NRCS	Onsite	100% at establishment to ensure required cover is achieved	Practices that fail to establish sufficient cover are disallowed and not reported as cover crops	Annual
Agriculture	Tillage Practices	Annual	Transect Survey	Every 5 years	DCR, SWCD or Certified Planner	VACS Database	N/A	N/A	N/A	Annual
Agriculture	State or Federal Cost-Share In Contractual Period	Structural	Onsite	100%	DCR, SWCD, NRCS	VACS Database, NRCS	Onsite	Statistical sample of 2% per year 100% Re-inspection of practices one year prior to end of contract is encouraged.	Practices found not functioning as intended are issued a 60 day Corrective Action Agreement to restore BMP function. If CAA not completed, BMP is deemed failed in survey. Sample failure rate will be applied to type population to remove practices from the reporting record.	Per CBP approved Credit Duration: Re-inspection regimen ensures practices are sampled during credit duration and encourages all practices be inspected prior to end of contractual period or Credit Duration to re-verify and extend.
Agriculture	State or Federal Cost-Share In Contractual Period	Land Management	Onsite	100%	DCR, SWCD, NRCS	VACS Database, NRCS	Onsite	Statistical sample of 5% per year 100% Re-inspection of practices one year prior to end of contract is encouraged.	Practices found not functioning as intended are issued a 60 day Corrective Action Agreement to restore BMP function. If CAA not completed, BMP is deemed failed in survey. Sample failure rate will be applied to type population to remove practices from the reporting record.	Per CBP approved Credit Duration: Re-inspection regimen ensures practices are sampled during credit duration and encourages all practices be inspected prior to end of contractual period or Credit Duration to re-verify and extend.
Agriculture	State or Federal Cost-Share In Contractual Period	CREP	Onsite	100% Forestry verification during first 2 years	NRCS, VDOF	NRCS	Onsite	Statistical sample of 5% per year (NRCS) 100% Re-inspection of practices one year prior to end of contract is encouraged.	Practices found not functioning as intended are issued a 60 day Corrective Action Agreement to restore BMP function. If CAA not completed, BMP is deemed failed in survey. Sample failure rate will be applied to type population to remove practices from the reporting record.	Per CBP approved Credit Duration: Re-inspection regimen ensures practices are sampled during credit duration and encourages all practices be inspected prior to end of contractual period or Credit Duration to re-verify and extend.

A. Sector	B. Data Grouping	C. BMP Type		D. Initial Inspection *(Is the BMP there?)*				*E. Follow-up Check (Is the BMP still there?)*		F. Lifespan/Sunset
			Method	Frequency	Who inspects	Documentation	Follow-up Inspection	Statistical Sub-sample	Response if Problem	*(Is the BMP no longer there?)*
Agriculture	State or Federal Cost-Share Out of Contractual Period or Voluntary meets program design standards	Structural	Onsite	100%	DCR, SWCD, NRCS or Certified Planner	VACS Database	Onsite	Statistical sample of 4% per year 100% Re-inspection of structural and land use change practices one year prior to end of credit duration is encouraged.	Practices components found not functioning as intended are deemed failed in the survey. Sample failure rate will be applied to group population to remove practices from the reporting record.	Per CBP approved Credit Duration: Re-inspection regimen ensures practices are sampled during credit duration and encourages all practices be inspected prior to end of contractual period or Credit Duration to re-verify and extend.
Agriculture	State or Federal Cost-Share Out of Contractual Period or Voluntary meets program design standards	Land Management	Onsite	100%	DCR, SWCD, NRCS or Certified Planner	VACS Database	Onsite	Statistical sample of 7.5% per year 100% Re-inspection of structural and land use change practices one year prior to end of credit duration is encouraged.	Practices components found not functioning as intended are deemed failed in the survey. Sample failure rate will be applied to group population to remove practices from the reporting record.	Per CBP approved Credit Duration: Re-inspection regimen ensures practices are sampled during credit duration and encourages all practices be inspected prior to end of contractual period or Credit Duration to re-verify and extend.
Agriculture	Voluntary Resource Improvement (Does not meet program design standards, but adequately provides the desired resource improvement)	Structural	Onsite Visual Indicators	100%	DCR, SWCD or Certified Planner	VACS Database	Onsite	Statistical sample of 5% per year 100% Re-inspection of structural and land use change practices one year prior to end of credit duration is encouraged.	Practices found not meeting the visual indicators are deemed failed in the survey. Sample failure rate will be applied to group population to remove practices from the reporting record.	Per CBP approved Credit Duration: Re-inspection regimen ensures practices are sampled during credit duration and encourages all practices be inspected prior to end of contractual period or Credit Duration to re-verify and extend.
Agriculture	Voluntary Resource Improvement (Does not meet program design standards, but adequately provides the desired	Land Management	Onsite Visual Indicators	100%	DCR, SWCD or Certified Planner	VACS Database	Onsite	Statistical sample of 10% per year 100% Re-inspection of structural and land use change practices one year prior to end of credit duration is encouraged.	Practices found not meeting the visual indicators are deemed failed in the survey. Sample failure rate will be applied to group population to remove practices from the reporting record.	Per CBP approved Credit Duration: Re-inspection regimen ensures practices are sampled during credit duration and encourages all practices be inspected prior to end of contractual period or Credit Duration to re-verify and extend.

A. Sector	B. Data Grouping	C. BMP Type		D. Initial Inspection *(Is the BMP there?)*				*E. Follow-up Check (Is the BMP still there?)*		F. Lifespan/Sunset
			Method	Frequency	Who inspects	Documentation	Follow-up Inspection	Statistical Sub-sample	Response if Problem	*(Is the BMP no longer there?)*
	resource improvement)									
Agriculture	Manure Transport	Annual	Report with weight records	100%	DCR, DEQ	DCR and DEQ databases	N/A	N/A	N/A	Annual
Agriculture	Feed Additives	Annual	Cooperative Agreement	100%	DCR	DCR databases	Manure/Litter Sampling required by permit and associated with Nutrient Management Plan development	Manure P concentrations are compared against pre-Phytase baseline data to calculate reductions.	Reported treatment levels are adjusted accordingly.	It is expected that this group of BMPs will be discontinued in the Phase 6 model.
Agriculture	Nutrient Management Plans	Annual	Onsite Plan Development	100%	Certified Planner	NutMan Database	Onsite, Farmer interview, yield and fertilizer/manure application records evaluation	100% DCR and DCR Contractor Developed Plans at time of plan renewal or revision in 2016 to establish baseline data. Program design to be adjusted based on initial findings.	Frequency of sampled plan acres found to have not been implemented consistent with nutrient management planning standards will be used to discount implemented BMPs included in future reporting.	Currently, all practices within the plan effective dates are reported. Typical plan is effective for 3 years, but may be revised several times within that period. Reporting discount rate to be reassessed annually based on previous 3 years results
Agriculture	Resource Management Plans (with RMP Certificate)	Group	Onsite Implementation Certification	100%	Certified Planner, SWCD, DCR	VACS Database, RMP module	Triennial onsite compliance evaluation	100% Triennial	Practices found not functioning as intended are issued a 90 day Corrective Action Agreement to restore BMP function. If CAA not completed, RMP Certificate is revoked and BMP(s) removed from the reporting record.	BMPs associated with RMPs are tracked, reported and verified as described above for each BMP Grouping.

Appendix 3 – Verification Protocol Design Table 2: Urban

A. Sector	B. Data Grouping	C. BMP Type		D. Initial Inspection *(Is the BMP there?)*				*E. Follow-up Check (Is the BMP still there?)*		F. Lifespan/Sunset
			Method	Frequency	Who inspects	Documentation	Follow-up Inspection	Statistical Sub-sample	Response if Problem	*(Is the BMP no longer there?)*
Urban	BMP installed pursuant to MS4 Permit requirement (does not include BMP installed to meet VSMP requirements under the Construction GP).	Group	Onsite	100%	Locality or Facility	Locality or Facility database, MS4 Annual Report/Bay TMDL Action Plan	MS4 conducts onsite inspections and maintenance per VPDES MS4 permit requirements.Annual for MS4 owned.Quinquennial for privately owned within MS4.	DEQ MS4 program conducts inspections, audits and review of annual reports to ensure compliance is maintained.	CAA, NOV or Consent Order	BMPs implemented in MS4s must be maintained in accordance with permit conditions. Non-MS4 owned BMPs have maintenance agreements with the BMP owners recorded with land records. As such, this class of BMPs is expected to be maintained in perpetuity. Reported BMPs will be reduced to account for identified non-compliance with the above maintenance requirements.
Urban	BMP installed pursuant to Bay Act requirement	Group	Onsite	100%	Bay Act Locality	Bay Act Locality records (site plans, inspection reports, maintenance agreements), Bay Act Annual Report	Locality conducts or requires documentation of owner inspection quinquennially.	DEQ Bay Act program conducts locality program evaluations and review of annual reports to ensure compliance is maintained.	CAA, NOV or Consent Order	BMPs implemented in Bay Act Localities must be maintained in accordance with permit conditions. BMP maintenance agreements with the BMP owners are recorded with land records. As such, this class of BMPs is expected to be maintained in perpetuity. Reported BMPs will be reduced to account for identified non-compliance with the above maintenance requirements.
Urban	BMP installed to meet VSMP requirements under the Construction GP	Group	Onsite	100%	VSMP Authority (Locality and DEQ)	CGPS Database	Locality conducts quinquennial inspections.	DEQ Construction GP program conducts inspections, locality program evaluation to ensure compliance is maintained.	CAA, NOV or Consent Order	BMPs implemented per VSMP regulations must be maintained in accordance with permit conditions. BMP maintenance agreements with the BMP owners are recorded with land records. As such, this class of BMPs is expected to be maintained in perpetuity. Reported BMPs will be reduced to account for identified non-compliance with the above maintenance requirements.
Urban	BMP installed with no regulatory requirement (e.g. more stringent local VSMP requirements, unregulated urbanized area	Low Risk of Failure	Onsite	100%	Locality or Facility	Locality or Facility database	Reporting source will be notified of BMPs approaching the end of their credit duration recommending a reinspection to verify continued performance.	N/A	Inspection updates provided by reporting sources will be used to update data records and extend credit life. If no updates are received, credit	Per CBP approved Credit Duration.: If system is not inspected, maintained or is otherwise abandoned, it will be removed from the reporting record.

A. Sector	B. Data Grouping	C. BMP Type		D. Initial Inspection *(Is the BMP there?)*				*E. Follow-up Check (Is the BMP still there?)*		F. Lifespan/Sunset
			Method	Frequency	Who inspects	Documentation	Follow-up Inspection	Statistical Sub-sample	Response if Problem	*(Is the BMP no longer there?)*
	choosing to install BMPs)								durations will require removal of the record from the reporting system.	
Urban	Homeowner BMPs	Group	Onsite	100%	Locality, SWCD, PDC or NGO	SMART	Reporting source will be notified of BMPs approaching the end of their credit duration recommending a reinspection to verify continued performance.	N/A	Inspection updates provided by reporting sources will be used to update data records and extend credit life. If no updates are received, credit durations will require removal of the record from the reporting system.	Per CBP approved Credit Duration.: If system is not inspected, maintained or is otherwise abandoned, it will be removed from the reporting record.
Urban	Street Sweeping and Storm Drain Cleanout conducted outside of MS4 Permit	Annual	Report with weight records	100%	Locality, Facility, VDOT	Locality or Facility database	N/A	N/A	N/A	Annual
Urban	Erosion and Sediment Control (during construction)	Annual	Onsite	100%	Locality, DEQ, Standard and Specs Holder	Locality database, DEQ CGPS database (> 1 acre), Standard & Specs Holder	N/A	N/A	N/A	Annual

A. Sector	B. Data Grouping	C. BMP Type		D. Initial Inspection *(Is the BMP there?)*				*E. Follow-up Check (Is the BMP still there?)*		F. Lifespan/Sunset
			Method	Frequency	Who inspects	Documentation	Follow-up Inspection	Statistical Sub-sample	Response if Problem	*(Is the BMP no longer there?)*
Urban	Urban Nutrient Management Plan	Annual	Onsite Plan Development	100%	Certified Planner, Certified Applicator	NutMan Database	Onsite compliance evaluation for acres under active plans	Statistical sample of 2% of acres with active plans each year conducted by certified plan developer. 50% of those will be joint evaluations by certified plan developer and DCR program staff.	Reduce reporting based on rates determined from sample.	Annual, plans typically written for 3-5 years
Urban	Urban Nutrient Management Certified Applicator	Annual	Onsite Applicator	100%	Certified Applicator	VDACS Certified Applicator database	Compliance evaluation for certified applicators, including fertilizer records check	Statistical sample of 50% of companies to evaluate reported acres under management and fertilizer records, conducted by certified planner, DCR or VDACS program staff.	Reduce reporting based on rates determined from sample.	Annual
Urban	Urban Phosphorus Fertilizer Reduction	Annual	State Fertilizer Sales Data	100%	State Regulatory Agency	VDACS Database	N/A	N/A	N/A	Annual

Appendix 3 – Verification Protocol Design Table 3: Wastewater, Onsite, Forest and Extractive

A. Sector	**B. Data Grouping**	**C. BMP Type**		**D. Initial Inspection** *(Is the BMP there?)*				***E. Follow-up Check*** *(Is the BMP still there?)*		**F. Lifespan/Sunset**
			Method	Frequency	Who inspects	Documentation	Follow-up Inspection	Statistical Sub-sample	Response if Problem	*(Is the BMP no longer there?)*
Wastewater CSO & Onsite	Significant Wastewater	Discharge Loads	VPDES significant facilities sample in accordance with the VPDES watershed general permit. All laboratory analysis are performed by laboratories certified under the Virginia Environmental Laboratory Accreditation Program (VELAP) administered by the Virginia Division of Consolidate Laboratory Services (DCLS), a National Environmental Laboratory Accreditation Conference (NELAC) recognized accreditation body. DEQ VPDES Inspectors verify monitoring protocols as part of regular compliance inspections.	N/A	N/A	N/A	N/A	N/A	N/A	N/A

A. Sector	B. Data Grouping	C. BMP Type		D. Initial Inspection *(Is the BMP there?)*				*E. Follow-up Check (Is the BMP still there?)*		F. Lifespan/Sunset
			Method	Frequency	Who inspects	Documentation	Follow-up Inspection	Statistical Sub-sample	Response if Problem	*(Is the BMP no longer there?)*
Wastewater CSO & Onsite	Non-Significant Wastewater	Discharge Load Estimates	Nutrient loads from nonsignificant facilities are estimates provided by DEQ using a percentage of the wasteload allocations included in the TMDL. Virginia is working on sampling protocols to help verify the reported nonsignificant loads.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wastewater CSO & Onsite	Combined Sewer Overflows (CSOs)	Discharge Load Estimates	Nutrient loads from CSOs are estimates. Improvements resulting from implementation of Long-Term Control Plans for CSO localities and associated maintenance is verified through periodic inspections and annual reports submitted in accordance with VPDES Permit Regulation (9 VAC 25- 31) requirements.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wastewater CSO & Onsite	Onsite Pumpouts	Annual	Onsite Certified Entity	100%	Locality, Facility	Locality or Facility database	N/A	N/A	N/A	Annual

A. Sector	B. Data Grouping	C. BMP Type		D. Initial Inspection *(Is the BMP there?)*				*E. Follow-up Check (Is the BMP still there?)*		F. Lifespan/Sunset
			Method	Frequency	Who inspects	Documentation	Follow-up Inspection	Statistical Sub-sample	Response if Problem	*(Is the BMP no longer there?)*
Wastewater CSO & Onsite	Onsite Connection to Sewer	Group	Onsite Certified Entity	100%	Locality, VDH, WWTP Operator	Multiple possible data sources	N/A	N/A	N/A	Per CBP approved Credit Duration.
Wastewater CSO & Onsite	AOSS including all nitrogen reducing onsite systems	Group	Onsite Certified Entity, VDH	100%	VDH	VDH VENIS Database	Onsite Certified Entity	Annual Maintenance Required per regulation	Issues identified during annual maintenance inspection are typically repaired immediately. Failure to repair would result in condemnation and discontinued use.	Per CBP approved Credit Duration. If system is not maintained or is otherwise abandoned, it will be removed from the reporting record.
Forest & Extractive	Forest Harvesting Practices	Annual	Onsite	100%	DOF Foresters	DOF Database	N/A	N/A	N/A	Per CBP approved Credit Duration. Harvested forest acres discounted based on identified non-compliance rate.
Forest & Extractive	E&S on Extractive	Annual	Onsite Regulatory Compliance Monitoring	100%	DMME	DMME Database	Onsite Regulatory Compliance Monitoring	Throughout active extractive period	NOV or Special Order or Notice of Non-compliance per 4-VAC 25.31	Per CBP approved Credit Duration. Active extractive acres discounted based on identified non-compliance rate.
Forest & Extractive	Forest Conservation	Based on local requirements mandating forest conservation on new development sites	Onsite	100%	Locality	Locality	N/A	N/A	N/A	Reporting of this BMP requires documentation of appropriate local ordinances requiring the preservation of trees when parcels are developed. Once established, the ordinance remain in effect until changed or removed and areas of forest conserved under the ordinance would likely remain in perpetuity. As such, this BMP will be treated as a permanent practice.

A. Sector	**B. Data Grouping**	**C. BMP Type**		**D. Initial Inspection** *(Is the BMP there?)*				***E. Follow-up Check*** *(Is the BMP still there?)*		**F. Lifespan/Sunset**
			Method	Frequency	Who inspects	Documentation	Follow-up Inspection	Statistical Sub-sample	Response if Problem	*(Is the BMP no longer there?)*
Forest & Extractive	Mine Reclamation	Group	Onsite	100%	DMME	DMME Database	Onsite	Reclaimed sites are monitored for two growing seasons to ensure successful establishment of vegetation and BMP function.	Permits remain in force and associated surety bonds are held until DMME determines the reclamation was successful.	Reclaimed sites have a very low probability of failure once established and verified through two growing seasons. As such, this BMP will be treated as a permanent practice.

Appendix 4 – Best Management Practices Verification Crosswalk
Table 1: Agriculture

Agriculture Practices	*BMP Short Name*	*BMP Long Name*	*Credit Duration*	*BMP Type*	*Data Source(s)*	*Program Type(s)*	*Verification Group*
Nutrient Management Core	nmcoren	Nutrient Management Core N	1	Management	DCR	Cost Share/Voluntary/ Regulatory	Nutrient Management Plans
Nutrient Management Core	nmcorep	Nutrient Management Core P	1	Management	DCR	Cost Share/Voluntary/ Regulatory	Nutrient Management Plans
Nutrient Management Rate	nmraten	Nutrient Management N Rate	1	Management	DCR	Cost Share/Voluntary/ Regulatory	Nutrient Management Plans
Nutrient Management Rate	nmratep	Nutrient Management P Rate	1	Management	DCR	Cost Share/Voluntary/ Regulatory	Nutrient Management Plans
Nutrient Management Timing	nmtimen	Nutrient Management N Timing	1	Management	DCR	Cost Share/Voluntary/ Regulatory	Nutrient Management Plans
Nutrient Management Timing	nmtimep	Nutrient Management P Timing	1	Management	DCR	Cost Share/Voluntary/ Regulatory	Nutrient Management Plans
Nutrient Management Placement	nmplacen	Nutrient Management N Placement	1	Management	DCR	Cost Share/Voluntary/ Regulatory	Nutrient Management Plans
Nutrient Management Placement	nmplacep	Nutrient Management P Placement	1	Management	DCR	Cost Share/Voluntary/ Regulatory	Nutrient Management Plans
Conservation Tillage	ConserveTill	Conservation Tillage	1	Management	DCR	Survey	Tillage Practices
High Residue Tillage	HRTill	High Residue Tillage Management	1	Management	DCR	Survey/Cost Share	Tillage Practices
Reduced Tillage	LowResTill	Reduced Tillage	1	Management	DCR	Survey/Cost Share	Tillage Practices
Cover Crop	CoverCropTradWLO	Cover Crop	1	Annual	USDA	Cost Share/Voluntary	Federal Cost-Share Cover Crops
Cover Crops	(All Cover Crops)	Cover Crops		Annual	DCR	Cost Share/Voluntary	State Cost-Share Cover Crops
Commodity Cover Crop	CoverCropComNormal	Commodity Cover Crop- Standard	1	Annual	DCR	Cost Share/Voluntary	State or Federal Cost-Share Cover Crops
CREP Streambank protection	GrassBuffExcl	Exclusion Fence with Grass Buffer	10	Management	USDA/DCR	Cost Share/Voluntary	State or Federal Cost-Share Cover Crops
Streambank protection (fencing)	GrassBuffExcl	Exclusion Fence with Grass Buffer	10	Management	USDA/DCR	Cost Share/Voluntary	State or Federal Cost-Share Cover Crops
CREP Grazing land protection	PrecRotGrazing	Prescribed Grazing	10	Management	USDA/DCR	Cost Share/Voluntary	State or Federal Cost-Share Cover Crops

Agriculture Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
Stream Exclusion With Grazing Land Management	GrassBuffExcl	Exclusion Fence with Grass Buffer	10	Management	USDA/DCR	Cost Share/Voluntary	State or Federal Cost-Share Cover Crops
Stream Exclusion With Grazing Land Management	PrecRotGrazing	Prescribed Grazing	10	Management	USDA/DCR	Cost Share/Voluntary	State or Federal Cost-Share Cover Crops
CREP Riparian Forest Buffer	ForestBuffers	Forest Buffers	10	Management	USDA/DCR	Cost Share/Voluntary	State or Federal Cost-Share Cover Crops
Woodland buffer filter area	ForestBuffers	Forest Buffers	10	Management	USDA/DCR	Cost Share/Voluntary	State or Federal Cost-Share Cover Crops
CREP Grass filter strips	GrassBuffers	Grass Buffers	10	Management	USDA/DCR	Cost Share/Voluntary	State or Federal Cost-Share Cover Crops
Grass filter strips	GrassBuffers	Grass Buffers	10	Management	USDA/DCR	Cost Share/Voluntary	State or Federal Cost-Share Cover Crops
Stream Access Control with Fencing	GrassBuffExcl	Exclusion Fence with Grass Buffer	10	Structural	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Pasture Alternative Watering	OSWnoFence	Alternative Water System	10	Structural	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Water Control Structures	WaterContStruc	Water Control Structures	10	Structural	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share

Agriculture Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
							Out of Contractual Period
NonUrban Stream Restoration	NonUrbStrmRest	Non Urban Stream Restoration	10	Structural	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
NonUrban Shoreline Erosion Control	shoreag	Ag Shoreline Management	10	Structural	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Livestock Waste Management Systems	AWMS	Animal Waste Management System	15	Structural	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period

Agriculture Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
Poultry Waste Management Systems	AWMS	Animal Waste Management System	15	Structural	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Amendments for the Treatment of Agricultural Waste	LitAmend	Amendments for the Treatment of Agricultural Waste	1	Structural	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Livestock Mortality Composting	MortalityComp	Composting Facility	15	Structural	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Poultry Mortality Composting	MortalityComp	Composting Facility	15	Structural	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period

Agriculture Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
Barnyard Runoff Control	BarnRunoffCont	Barnyard Runoff Control	10	Structural	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Loafing Lot Management	LoafLot	Loafing Lot Management	10	Structural	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Exclusion Fence with Forest Buffer	ForestBuffExcl	Exclusion Fence with Forest Buffer	10	Land Management	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Prescribed Grazing	PrecRotGrazing	Prescribed Grazing	10	Land Management	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period

Agriculture Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
Horse Pasture Management	HorsePasMan	Horse Pasture Management	10	Land Management	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Forest Buffers	ForestBuffers	Forest Buffers	10	Land Management	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Forest Buffers	ForestBuffNarrow	Narrow Forest Buffer	10	Land Management	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Wetland Restoration	WetlandRestoreFloodplain	Wetland Restoration	15	Land Management	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period

Agriculture Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
Land Retirement	LandRetireOpen	Land Retirement	10	Land Management	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Land Retirement	LandRetirePas	Land Retirement	10	Land Management	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Grass Buffers	GrassBuffers	Grass Buffers	10	Land Management	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Grass Buffers	GrassBuffNarrow	Narrow Grass Buffer	10	Land Management	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period

Agriculture Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
Tree Planting	TreePlant	Tree Planting	10 or 15*	Land Management	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Conservation Plans	ConPlan	Conservation Plans		Land Management	DCR/USDA	Cost Share/Voluntary	State or Federal Cost-Share In Contractual Period or Voluntary (meets program design standards) or State or Federal Cost-Share Out of Contractual Period
Manure Transport	ManureTransport	Manure Transport	1	Annual	DEQ/DCR	Cost Share/Voluntary/Regulatory	Manure Transport
Resource Improvement BMPs	(All RI Practices)	(All RI Practices)	3-10	Structural/Management	DCR/VDACS	Voluntary	Voluntary Resource Improvement (Does not meet program design standards, but adequately provides the desired resource improvement)

Appendix 4 – Best Management Practices Verification Crosswalk
Table 2: Urban

Urban Practices	*BMP Short Name*	*BMP Long Name*	*Credit Duration*	*BMP Type*	*Data Source(s)*	*Program Type(s)*	*Verification Group*
Wet Ponds & Wetlands	WetPondWetland	Wet Ponds and Wetlands	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement BMP installed pursuant to Bay Act requirement (or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
Dry Ponds	DryPonds	Dry Detention Ponds and Hydrodynamic Structures	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
Extended Dry Ponds	ExtDryPonds	Dry Extended Detention Ponds	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement

Urban Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
Infiltration Practices	Infiltration	Urban Infiltration Practices w/o Sand, Veg. - A/B soils, no underdrain	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
Infiltration Practices	InfiltWithSV	Urban Infiltration Practices w/ Sand, Veg. - A/B soils, no underdrain	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
Filtering Practices	Filter	Urban Filtering Practices	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement

Urban Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
BioRetention	BioRet	Biorentention - with underdrain with AB Soils	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
BioRetention	BioRetNoUDAB	Bioretention/raingardens - A/B soils, no underdrain	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
BioRetention	BioRetUDAB	Bioretention/raingardens - A/B soils, underdrain	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement

Urban Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
BioRetention	BioRetUDCD	Bioretention/raingardens - C/D soils, underdrain	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
BioSwale	BioSwale	Bioswale	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
Permeable Pavement	PermPavNoSVNoUDAB	Permeable Pavement	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement

Urban Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
Permeable Pavement	PermPavNoSVUDAB	Permeable Pavement	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
Permeable Pavement	PermPavNoSVUDCD	Permeable Pavement	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
Permeable Pavement	PermPavSVNoUDAB	Permeable Pavement	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement

Urban Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
Permeable Pavement	PermPavSVUDAB	Permeable Pavement	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
Permeable Pavement	PermPavSVUDCD	Permeable Pavement	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
Vegetated Open Channels/Vegetated Treatment Area	VegOpChanNoUDAB	Vegetated Open Channels/Vegetated Treatment Area	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement

Urban Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
Vegetated Open Channels/Vegetated Treatment Area	VegOpChanNoUDCD	Vegetated Open Channels/Vegetated Treatment Area	10	Structural	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
Urban Stream Restoration	UrbStrmRest	Urban Stream Restoration	10	Structural	Locality	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
Urban Shoreline Erosion Control	shoreurb	Urban Shoreline Management	10	Structural	Locality/DCR	Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement

Urban Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
Reduction of Impervious Surface	ImpSurRed	Reduction of Impervious Surface	10	Land Conversion	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
Urban Forest Buffers	ForestBufUrban	Urban Forest Buffers	10	Land Conversion	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
Urban Tree Planting	UrbanTreePlant	Urban Tree Planting	10	Land Conversion	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement

Urban Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
Urban Forest Planting	UrbanForPlant	Urban Forest Planting	10	Land Conversion	Locality/DEQ	Cost Share/Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or BMP installed pursuant to Bay Act requirement or BMP installed to meet VSMP requirements under Construction GP or BMP installed with no regulatory requirement
Street Sweeping or Storm Drain Cleanout	SCP1 to SPC11	Street Cleaning Practice 1 to 11	1	Annual	Locality	Voluntary/Regulatory	BMP installed pursuant to MS4 Permit requirement or Street Sweeping and/or Storm Drain Cleanout conducted outside of MS4 Permit
Erosion and Sediment Control	EandS1	Erosion and Sediment Control Level 1	1	Management	Locality/DEQ	Regulatory	Erosion and Sediment Control (during construction)
Erosion and Sediment Control	EandS2	Erosion and Sediment Control Level 2	1	Management	Locality/DEQ	Regulatory	Erosion and Sediment Control (during construction)
Erosion and Sediment Control	EandS3	Erosion and Sediment Control Level 3	1	Management	Locality/DEQ	Regulatory	Erosion and Sediment Control (during construction)
Urban Nutrient Management	UrbanNMPlan	Urban Nutrient Management Plan	1	Management	DCR	Cooperative/Regulatory/Cost Share/Voluntary	Urban Nutrient Management Plan or Urban Nutrient Management Certified Applicator
Urban Nutrient Management	UrbanNMPlanHR	Urban Nutrient Management Plan	1	Management	DCR	Cooperative/Regulatory/Cost Share/Voluntary	Urban Nutrient Management Plan or Urban Nutrient

Urban Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
							Management Certified Applicator
Urban Nutrient Management	UrbanNMPlanLR	Urban Nutrient Management Plan	1	Management	DCR	Cooperative/Regulatory/Cost Share/Voluntary	Urban Nutrient Management Plan or Urban Nutrient Management Certified Applicator
Urban Phosphorus Fertilizer Reduction	UrbanPLegislation	Urban Phosphorus Legislation	1	Annual	VDACS	Regulatory	Urban Phosphorus Fertilizer Reduction
Homeowner BMPs	(All Homeowner Practices)	(All Homeowner Practices)	5/1	Structural/Management	Locality/Alliance/ SWCD	Voluntary	Homeowner BMPs

Appendix 4 – Best Management Practices Verification Crosswalk
Table 3: Onsite, Forestry and Extractive

Onsite Practices	*BMP Short Name*	*BMP Long Name*	*Credit Duration*	*BMP Type*	*Data Source(s)*	*Program Type(s)*	*Verification Group*
Septic Connections	SepticConnect	Septic Connection	100	Structural	VDH	Voluntary/Regulatory	Connection to Sewer
Septic Denitrification	SepticDeCon	Septic Denitrification	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticDeCon	Septic Tank Advanced Treatment	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticDeCon	RMF	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticDeCon	IFAS	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticDeCon	Proprietary Ex Situ	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticDeEnhance	IFAS Elevated Mound	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticDeEnhance	IFAS Shallow Pressure	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticDeEnhance	Proprietary Ex Situ Elevated Mound	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticDeEnhance	Proprietary Ex Situ Shallow Pressure	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticDeEnhance	RMF Elevated Mound	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticDeEnhance	RMF Shallow Pressure	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticEffEnhance	Septic Effluent Elevated Mound	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticEffEnhance	Septic Effluent Shallow Pressure	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticSecCon	Constructed Wetland Septic	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticSecCon	IMF	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticSecCon	NSF 40	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems

Onsite Practices	BMP Short Name	BMP Long Name	Credit Duration	BMP Type	Data Source(s)	Program Type(s)	Verification Group
Septic Denitrification	SepticSecEnhance	Constructed Wetland Elevated Mound	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticSecEnhance	Constructed Wetland Shallow Pressure	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticSecEnhance	IMF Elevated Mound	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticSecEnhance	IMF Shallow Pressure	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticSecEnhance	NSF 40 Elevated Mound	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Denitrification	SepticSecEnhance	NSF 40 Shallow Pressure	10	Structural	VDH	Voluntary/Regulatory	AOSS including all nitrogen reducing systems
Septic Pumping	SepticPump	Septic Tank Pumpout	1	Annual	Locality/VDH	Voluntary/Regulatory	Pumpouts
Forest and Extractive Practices	**BMP Short Name**	**BMP Long Name**	**Credit Duration**	**BMP Type**	**Data Source(s)**	**Program Type(s)**	**Verification Group**
Forest Harvesting Practices	ForHarvestBMP	Forest Harvesting Practices	1	Management	DOF	Regulatory	Forest Harvesting Practices
Forest Conservation Act	ForestCon	Forest Conservation	1	Management	Locality	Regulatory	Forest Conservation
Dirt&Gravel Road E&S	DirtGravelDSA	Dirt & Gravel Road Erosion & Sediment Control - Driving Surface Aggregate + Raising the Roadbed	10	Structural	DOF/DMME/Locality	Voluntary/Regulatory	Dirt and Gravel Roads
Dirt&Gravel Road E&S	DirtGravelDSAOut	Dirt & Gravel Road Erosion & Sediment Control - with Outlets	10	Structural	DOF/DMME/Locality	Voluntary/Regulatory	Dirt and Gravel Roads
Dirt&Gravel Road E&S	DirtGravelnoDSA	Dirt & Gravel Road Erosion & Sediment Control - Outlets only	10	Structural	DOF/DMME/Locality	Voluntary/Regulatory	Dirt and Gravel Roads

Appendix 5 – Stratified Random Sampling Calculations

Sector	Data Grouping	BMP Type	Number of Practices	Response Distribution	Verification Sample	Resulting Confidence and Error
Agriculture	State or Federal Cost-Share In Contractual Period	Structural	6054	Assumed 90/10 pass/fail	2% = 121	90% ± 4.44
Agriculture	State or Federal Cost-Share In Contractual Period	Land Management	3436	Assumed 90/10 pass/fail	5% = 172	90% ± 3.67
Agriculture	State or Federal Cost-Share In Contractual Period	CREP	3232	Assumed 90/10 pass/fail	5% = 162	90% ± 3.78
Agriculture	State or Federal Cost-Share Out of Contractual Period or Voluntary meets program design standards	Structural	-	Assumed 50/50 pass/fail	4%	TBD
Agriculture	State or Federal Cost-Share Out of Contractual Period or Voluntary meets program design standards	Land Management	-	Assumed 50/50 pass/fail	7.5%	TBD
Agriculture	Voluntary Resource Improvement (Does not meet program design standards, but adequately provides the desired resource improvement)	Structural	-	Assumed 60/40 pass/fail	5%	TBD
Agriculture	Voluntary Resource Improvement (Does not meet program design standards, but adequately provides the desired resource improvement)	Land Management	-	Assumed 50/50 pass/fail	10%	TBD
Urban	Urban Nutrient Management Plan	Annual	15,000	Assumed 50/50 pass/fail	2% = 300	90% ± 4.70
Urban	Urban Nutrient Management Certified Applicator	Annual	300	Assumed 50/50 pass/fail	50% = 150	90% ± 4.76

The sample size and confidence interval calculations in this table were developed using the following website:
http://www.raosoft.com/samplesize.html
These calculations have been evaluated and confirmed to be accurate by the Statistical Design Review Team.

Appendix 6 – Historical BMP Failure Rates from DCR Spot Checks (1998-2015)

Row Labels	Total Number of BMPs	Total Number of Spot Checks on Individual BMP	Number of Inactive/Destroyed BMPs	Failure Rate
Structural	**6054**	**1628**	**44**	**2.7%**
AWMS	**784**	**259**	**4**	**1.5%**
Animal Mortality Incinerator	1	1	0	0.0%
Animal waste control facilities	760	258	4	1.6%
Voluntary Animal waste control facilities	23	0	0	0.0%
Barn Runoff Control	**95**	**31**	**0**	**0.0%**
Loafing lot management system	91	31	0	0.0%
Voluntary Loafing lot management system	4	0	0	0.0%
Exclusion Fencing	**283**	**52**	**0**	**0.0%**
Agricultural Sinkhole Protection	16	5	0	0.0%
Livestock Exclusion with Reduced Setback	49	2	0	0.0%
Livestock Exclusion with Riparian Buffers for TMDL Imp.	218	45	0	0.0%
Exclusion Narrow Buffer	**48**	**15**	**1**	**6.7%**
Livestock Exclusion with Reduced Setback for TMDL Imp.	48	15	1	6.7%
Exclusion with Buffer	**878**	**177**	**12**	**6.8%**
Stream Exclusion - Maintenance Practice	325	39	7	17.9%
Streambank protection (fencing)	526	138	5	3.6%
Voluntary Streambank Protection	27	0	0	0.0%
Exclusion with Buffer and Prescribed Grazing	**3428**	**931**	**23**	**2.5%**
Stream Exclusion With Grazing Land Management	3304	931	23	2.5%
Voluntary Stream Exclusion With Grazing Land Management	124	0	0	0.0%
Exclusion with Buffer Continuation (new lifespan)	**1**	**0**	**0**	**0.0%**
Maintenance of Stream Exclusion Fencing	1	0	0	0.0%
Mortality Composter	**272**	**101**	**3**	**3.0%**
Composter Facilities	272	101	3	3.0%
Non-urban Stream Restoration	**50**	**18**	**0**	**0.0%**
Streambank Stabilization	45	18	0	0.0%
Voluntary Maintenance of Stream Exclusion Fencing	5	0	0	0.0%
Non-WIP Practice	**9**	**5**	**0**	**0.0%**
Stream Channel Stabilization	1	1	0	0.0%
Stream Crossing & Hardened Access	8	4	0	0.0%
Pasture Fence	**159**	**19**	**1**	**5.3%**
Stream Exclusion with Grazing Land Management for TMDL Imp.	113	8	0	0.0%
Stream Protection - TMDL	46	11	1	9.1%
Water Control Structure	**47**	**20**	**0**	**0.0%**
Sediment retention, erosion or water control structures	47	20	0	0.0%

Row Labels	Total Number of BMPs	Total Number of Spot Checks on Individual BMP	Number of Inactive/Destroyed BMPs	Failure Rate
Land Management	**3436**	**758**	**28**	**3.7%**
Forest Buffer	**119**	**40**	**2**	**5.0%**
Woodland buffer filter area	119	40	2	5.0%
Grass Buffer	**23**	**14**	**1**	**7.1%**
Grass filter strips	21	13	1	7.7%
Herbaceous Riparian Buffer - Maintenance Practice	2	1	0	0.0%
Horse Pasture Management	**7**	**1**	**0**	**0.0%**
Small Acreage Grazing System	5	1	0	0.0%
Small Acreage Grazing System (TMDL)	2	0	0	0.0%
Land Retirement	**2758**	**543**	**21**	**3.9%**
Fescue Conversion/Wildlife Option	55	1	0	0.0%
Field Borders/Wildlife Option	115	6	0	0.0%
Filter Strips/Wildlife Option	7	3	0	0.0%
Idle Land/Wildlife Option and Idle Tobacco Land	60	5	0	0.0%
Long Term Vegetative Cover on Cropland	2466	505	21	4.2%
Sod waterway	52	23	0	0.0%
Voluntary Permanent Vegetative Cover on Cropland	3	0	0	0.0%
Prescribed Grazing	**99**	**8**	**0**	**0.0%**
Extension of CREP Watering Systems	35	3	0	0.0%
Grazing Land Management	29	2	0	0.0%
Pasture Management	19	1	0	0.0%
Support for Extension of CREP Watering Systems - TMDL	15	2	0	0.0%
Voluntary Grazing Land Management	1	0	0	0.0%
Tree Planting	**430**	**152**	**4**	**2.6%**
Aforestation of erodible crop and pastureland	422	152	4	2.6%
Forested Riparian Buffer - Maintenance Practice	6	0	0	0.0%
Voluntary Reforestation of erodible crop and pastureland	2	0	0	0.0%

Row Labels	Total Number of BMPs	Total Number of Spot Checks on Individual BMP	Number of Inactive/Destroyed BMPs	Failure Rate
CREP	**3232**	**141**	**6**	**4.3%**
Exclusion Fencing	**1**	**0**	**0**	**0.0%**
CREP Agricultural Sinkhole Protection	1	0	0	0.0%
Exclusion with Buffer	**170**	**15**	**1**	**6.7%**
CREP Streambank protection	38	1	0	0.0%
Streambank protection (fencing)	132	14	1	7.1%
Exclusion with Buffer and Prescribed Grazing	**1239**	**93**	**3**	**3.2%**
CREP Grazing land protection	301	11	0	0.0%
Stream Exclusion With Grazing Land Managemen	938	82	3	3.7%
Forest Buffer	**1621**	**8**	**2**	**25.0%**
CREP Riparian Forest Buffer Planting	1618	8	2	25.0%
Woodland buffer filter area	3	0	0	0.0%
Grass Buffer	**201**	**25**	**0**	**0.0%**
CREP Grass filter strips	45	3	0	0.0%
Grass filter strips	156	22	0	0.0%
Voluntary Exclusion Not Meeting Spec	**105**	**0**	**0**	**0.0%**
Exclusion Narrow Buffer	**105**	**0**	**0**	**0.0%**
Voluntary Stream Exclusion	105	0	0	0.0%

Appendix 7 – Sector Specific Questions from the Verification Program Plan Evaluation Form

Agriculture

Will agriculture BMPs be identified and verified according to the recommended verification categories (Visual Assessment-Single Year, Visual Assessment-Multi-Year, and Non-Visual Assessment)? Generally, yes. Agricultural BMPs have been re-grouped and typed by their historical spot check failure rates. Appendix 3 and the narrative in D2 describe protocols for the initial inspection as well as the follow-on inspections.

Will agriculture BMPs be identified and verified according to oversight categories (non-cost shared, cost-shared, regulatory, and permitted)? Yes, BMPs are grouped and typed by the programs that drive their implementation and historical spot check failure rates.

Does the program define the frequency of verification assessments for initial and subsequent years of implementation and reporting? (For priority BMPs, onsite visits are recommended for 10% of BMPs per year) Yes. Appendix 3 and the narrative in D2 describe protocols for the initial inspection as well as the follow-on inspections.

If an alternative strategy to sub-sampling is utilized than the strategy outlined in the sector guidance, is it properly identified and appropriately justified? Yes. The sampling design is described in Appendix 3 and justified in the narrative of D2. Appendix 5 documents the sampling design calculations. The Statistical Design Review Team approved the calculations.

Does the program identify a process where BMP assessment methods would change with a change in BMP oversight (i.e. cost-shared contractual BMP to non-contractual BMP)? Yes. This is part of the BMP grouping breakout.

Does the program identify the difference in sub-sampling for subsequent years for BMPs under a CAFO permit oversight? (I.e. 20% compared to 10/5%) No. All permit driven inspection and compliance actions are in addition to the verification procedures established in the Agricultural sector.

Are the assessment methods utilized to verify BMPs based on type and category of oversight clearly explained and consistent with the sector guidance? For the most part, yes. Some additional work is needed to document the specific field inspections procedures for BMP verification. These procedures will be completed by the end of 2017.

Does the program identify the level of verification effort in relation to TMDL sector nutrient and sediment reduction goals? No. Virginia opted not to use the WIP based reductions by BMP to guide verification actions. Instead, Virginia has elected to group BMPs by sector, delivery program and risk. This is allowable under the Verification Framework guidance that gives jurisdictions flexibility in designing their Verification Programs.

For on-site non-visual assessments of plans for Nutrient Management, does the program identify the assessment methods utilized to verify each component of the plans, the degree of compliance with the CBP-defined practice standards, and the ability to track and report data on compliance levels of each component or standard? Yes. Farmer records of yields and nutrient applications are compared against the Nutrient Management Plan and standards for nutrient management to determine compliance with CBP definitions.

Is the intensity of verification efforts prioritized in proportion to a practices contribution to the overall TMDL pollution reduction in the jurisdiction's WIP? No. Virginia opted not to use the WIP based reductions by BMP to guide verification actions. Instead, Virginia has elected to group BMPs by sector, delivery program and risk. This is allowable under the Verification Framework guidance that gives jurisdictions flexibility in designing their Verification Programs.

Does the program make an effort to increase the transparency of its BMP verification programs? If so, what steps have been proposed? Agricultural BMP verification data is accessible online to the extent allowable by law. This data service will be enhanced to make it more user friendly in the future.

Forestry

Is the intensity of verification efforts prioritized in proportion to a practices contribution to the overall TMDL pollution reduction in the jurisdiction's WIP? No. Virginia has elected to group BMPs by sector, delivery program and risk rather than the practices' reduction contribution in the WIP. This is allowable under the Verification Framework guidance that gives jurisdictions flexibility in designing their Verification Programs.

Do verification methods for cost-shared agricultural riparian buffers utilize and build upon the existing verification programs for cost-shared contracts? Yes.

Are the frequency of site-checks consistent with the following recommendation from the sector guidance: Two visits within the first 4 years, spot-checked between years 5-10, and spot checked between years 10-15 to determine contract continuation? If not, are they sufficient to ensure scientific rigor? Yes, though the procedures for CREP practices and those implemented through other programs vary somewhat. Are CREP partners involved in the reenrollment process? Yes, but this is not a Verification issue.

Do proposed site inspection methods focus on common maintenance issues specifically related to water quality standards such as channelization or concentrated flows? Yes, among others.

Do statistical sampling methods document how they demonstrate a clear improvement over the current sampling rate? (The recommended rate is 80% confidence in reported practices) While the approach may deviate from previous sampling rate, the 80% confidence is far exceeded. Our target is 90% ± 5% margin of error.

Are the baseline acres for each practice tracked in order to ensure there is a net gain in acres across a county or watershed segment over time? No. This is not a requirement for reporting existing BMPs in the Bay Model.

Are tree canopy and riparian buffer acres re-assessed every 5 years to ensure net gain in tree canopy acres and riparian buffer acres over time? Tree canopy is not a current BMP in the Bay Model and there is no requirement for net gain to report a riparian buffer. The loss of tree canopy is accounted for in the land use change model.

Does the program rely upon qualified local forestry partners for tracking, reporting, and maintenance for expanded tree canopy practices? Tree canopy is not a current BMP in the Bay Model. Local forestry partners are engaged in implementation, tracking and reporting of forestry related BMPs.

Do existing and planned forest harvesting inspection programs track total acres or rate of implementation of forest harvesting BMPs? Both. Do they require site-visits to ensure proper installation? Yes.

Stormwater

Is the existing MS4 permit inspection and maintenance framework the foundation of the jurisdiction's program? Yes

Is field performance verification scheduled for every other MS4 permit cycle? How often? Every year for MS4 owned facilities and every 5 years for privately owned facilities.

Does the program link the timing of visual inspections to the length of credit durations for urban stormwater practices? Not directly, the permits were issued prior to the establishment of credit durations.

Will MS4 communities be assessing their entire BMP populations within two permit cycles? Yes, more frequently in fact. If so, will they address pre-2000 BMPs prior to pre-1990 BMPs? No.

What is the defined amount of time a locality/federal facility has to take corrective maintenance or rehabilitation to bring a sub-standard BMP back into compliance? Typically, 90 days.

Does the program address proper installation, whether or not the practice meets the design standards, and whether it functions in the hydrologic manner in which it was designed prior to submitting the BMP for credit? Yes

Is the program consistent with the Bay Program-approved reporting standards? Yes, for the most part. Do they allow appropriate flexibility for practices that do not lend themselves to the NEIEN geographic reporting requirements?

Are verification efforts prioritized according to a practice's contribution to the overall TMDL pollutant reduction in a state's urban source sector? No. The practices are verified regardless of their pollution reduction significance.

Will the jurisdiction provide spot checks on a subset of local and federal facility BMP project files to validate the reported BMP data? A review of the maintenance and inspection procedures is part of the MS4 compliance monitoring strategy.

Does the program address semi-regulated communities by following one of the three options provided in the sector guidance? Yes. Our Construction GP and VSMP regulations require ongoing maintenance and that the requirement for such maintenance is recorded in the property records.

Are the fastest-growing semi-regulated communities prioritized? All are required to meet the same standard regardless of the growth rates.

Stream Restoration

Is a professionally appropriate checklist or other tool used to assess the design of the project and whether the project was installed according to the design? Yes, inspections always utilize the engineering plans as the basis for inspection.

Does the verification program seek to identify the key features that relate to stream function? Yes

Is a professionally appropriate checklist or other tool used to assess post-construction performance? This varies based on the party responsible for verification. We will be working to develop additional inspection tools and checklists for all BMPs.

Is the frequency of field verification defined? Yes

Are inspections required two years after the initial construction and once every five years after that? It depends on the circumstances of the installation. Practices owned by MS4s would exceed this expectation. Those in MS4 areas that are privately owned would be close to this standard. Practices installed in an agricultural setting, would use a statistical sampling based approach to account for practice failures.

Does the program require a post-construction certificate to ensure that the project was installed properly, meets its functional restoration objectives, and is hydraulically and vegetatively stable? Projects require a post-construction inspection to ensure it was installed properly and that inspection is always documented, but there is no standard for issuing a certificate to that effect.

What is the defined amount of time a locality/federal facility has to take corrective maintenance or rehabilitation to bring a sub-standard BMP back into compliance? Typically, 90 days.

Are separate procedures necessary, and if so, identified for verifying restoration projects built for the purpose of nutrient trading within a state or to offset new loads elsewhere in the watershed? Additional procedures would be required for practices used in trading. These are in the trading certification regulations and include financial assurance, among others.

Is the program consistent with the Bay Program-approved reporting standards as far as reporting units, geographic location, and removal rates? Yes. In order to be reported for credit in the model, Bay Program-approved reporting standards would need to be followed.

Wastewater

Does program require significant wastewater treatment facilities to monitor and report monthly flows and loads via DMRs? There are numerous requirements to calculate and report permit limitations as monthly values in the *VPDES Permit Regulation* (9 VAC 25-31). The most applicable monthly DMR requirements for Chesapeake Bay Significant Dischargers regarding nutrients are prescribed in the *General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed* (9 VAC 25-820), particularly Section 70 (*General Permit*).

Does program require significant facilities to submit annual loading reports where trading or general permit conditions apply to a facility and when annual WIP reporting applies? Under the *General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed* (9 VAC 25-820), waste load allocations for Significant Dischargers are expressed as annual mass load limits for total nitrogen and total phosphorus. Every covered discharger is required (9 VAC 25-820-70.F.) to report, annually on or before February 1, the mass loads of total nitrogen and the total phosphorus discharged by the permitted facility during the previous calendar year. Provisions in the *Watershed General Permit Regulation* also require annual compliance plan updates, registration statements, and identification of nutrient credits generated or acquired for compliance.

An annual load report is published by DEQ and made accessible on-line by April 1st each year, grouped by major Bay tributary. Nutrient credit exchanges and trades made for General Permit compliance are also published by DEQ and made accessible on-line by July 1st of each year.

For non-significant wastewater treatment facilities, will NPDES DMR be used to report load reductions from BMPs (i.e. upgrades and offsets of new or expanding facilities)? Under the *Regulation for Nutrient Enriched Waters and Dischargers Within the Chesapeake Bay Watershed* (9 VAC 25-40), Section 70 (*Strategy for Chesapeake Bay Watershed*) specifies that technology-based effluent concentration limits are to be placed in the individual permit for any non-significant discharger that installs nutrient control technology whether by new construction, expansion or upgrade. The limits are based on the technology installed by the facility and expressed as annual average concentrations; the stringency of the limits depends on the size and location of the discharge (above or below the fall line). If the non-significant discharge is expanding, then registration under the *General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed* (9 VAC 25-820) is also required and the annual load reporting provisions apply.

Will non-significant facilities be tracked against aggregate waste-load allocations with loads reported annually via the mechanisms documented in the jurisdiction's WIPs? Periodically, during routine reissuance, nutrient monitoring requirements are added to non-significant dischargers' VPDES permits. Data are used to confirm validity of assumed default concentrations used to generate Permitted Design Capacity calculations, which are the allowable "caps" on nutrient loads for non-significant dischargers, based on total design flow and nutrient concentrations typical of secondary treatment facilities. Eventually, as nutrient discharge data are uploaded to EPA's Integrated Compliance Information System (ICIS) and EPA completes its Chesapeake Bay Point Source database project, the data will be used to update DEQ's annual progress reports.

Will Combined Sewer Overflows (CSOs) undergo construction verification to ensure proper design, installation and maintenance? DEQ reviews and approves plans and specifications that result from implementation of Long-Term Control Plans for CSO localities, in accordance with Virginia's *Sewage Collection and Treatment Regulation* ("SCAT"; 9 VAC 25-790). Procedures and requirements to secure a Certificate to Construct (CTC) and Certificate to Operate (CTO) post-construction are described in Section 50 of the SCAT Regulation. Maintenance is verified through periodic inspections and annual reports submitted in accordance with *VPDES Permit Regulation* (9 VAC 25- 31) requirements.

Are plans in place to ensure that CSOs receive sufficient post-construction monitoring and inspection, and that they are being properly tracked and reported? These activities are covered under the annual report submitted by CSO localities in accordance with *VPDES Permit Regulation* (9 VAC 25- 31) requirements.

Are Onsite treatment system verification procedures based on existing state regulations or do they follow the set of minimum elements for verification based on existing state programs in Delaware (DE), Maryland (MD) and Virginia (VA)? Both. The maintenance/inspection of nitrogen reducing systems is in regulation. The data management and validation components are driven by policy.

Are proper checks in place to ensure the design and installation on-site BMP systems will be done and reported by certified service providers and verified in the permitting processes? Yes

Is the frequency of maintenance and inspection of onsite systems annual, or otherwise consistent with the recommendations from Table B-17 of the Onsite Wastewater Treatment Expert Panel report? Yes, for the

nitrogen reducing systems. In Bay Act areas, conventional systems, which are not a BMP, also have quinquennial maintenance requirements.

Wetlands

Were a combination of site assessments and groundwater flow equations used to determine the changes in surface ponding? These issues are typically assessed as part of the design of a practice as well as the as the post-construction inspection.

Were remote sensing technologies used to determine the area of effect? Typically, not. Usually site-surveying techniques are used to determine size and location of practices.

For rehabilitation projects, were hydraulic models of stream flow used in combination with topographic data to determine the area of effect? Was validation completed through site visits during storm flow? Rehabilitation projects are not a reportable BMP in the Bay Model.

Were appropriate field indicators used to check for periodic soil saturation or inundation? Yes, site assessments include evaluation of soils and vegetation to ensure saturation/inundation. Does the program use the suggested checklist for field verification? This depends on the reporting source. We will be working to develop additional inspection tools and checklists for all BMPs.

Are post-construction site visits mentioned and do they check for the following: predominance of native wetland vegetation; was the project completed as designed; that the hydrology is as planned; and that structures are operating properly? Yes

Will the installing agency provide a post-construction certification? Projects require a post-construction inspection to ensure it was installed properly and that inspection is always documented, but there is no standard for issuing a certificate to that effect.

Does the verification program use the monitoring requirements for financial assistance programs? When applicable. Which ones? Whichever financial assistance program was used to fund the project.

Will a project file be maintained by the installing agency for each restoration project installed? Yes

Is onsite monitoring required within three years following construction? It depends on the circumstances of the installation. Practices owned by MS4s would exceed this expectation with annual inspections throughout the lifespan. Those in MS4 areas that are privately owned would be close to this standard with inspections every 5 years at a minimum. Practices installed in an agricultural setting, would use a statistical sampling based approach to account for practice failures.

Is aerial imagery used for remote observation of long-term monitoring of wetland BMPs? Likely yes for some projects, but not as a standard for all projects.