WATER QUALITY TRADING AND OFFSET PROGRAMS IN THE CHESAPEAKE BAY WATERSHED

2021 Review and Summary

United States Environmental Protection Agency – Region 3
Water Division
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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
BMP	best management practice
CO_2	carbon dioxide
COATS	CO_2 Allowance Tracking System
CWA	Clean Water Act
DEP	Department of Environmental Protection
DEQ	Department of Environmental Quality
DNREC	Delaware Department of Natural Resources and Environmental Control
DOEE	Department of Energy and Environment
DURMM	Delaware Urban Runoff Management Model
EPA	U.S. Environmental Protection Agency
GI	green infrastructure
HUC	hydrologic unit code
lbs	pounds
MDA	Maryland Department of Agriculture
MDE	Maryland Department of the Environment
mg/L	milligrams per liter
MS4	municipal separate storm sewer system
N	nitrogen
NPDES	National Pollutant Discharge Elimination System
NYSDEC	New York State Department of Environmental Conservation
Offv	off-site retention volume
P	phosphorus
PENNVEST	Pennsylvania Infrastructure Investment Authority
RGGI	Regional Greenhouse Gas Initiative
SPDES	State Pollutant Discharge Elimination System
SRC	stormwater retention credit
SWIFT	Sustainable Water Initiative for Tomorrow
SWRv	stormwater retention volume
TMDL	total maximum daily load
VPDES	Virginia Pollutant Discharge Elimination System
VSMP	Virginia Stormwater Management Program
WIP	watershed implementation plan
WLA	wasteload allocation
WWTP	wastewater treatment plant

1.0 INTRODUCTION

The 2010 Chesapeake Bay Total Maximum Daily Load (TMDL) (USEPA 2010) assumes that the seven jurisdictions draining to the Chesapeake Bay (Delaware, Maryland, New York, Pennsylvania, Virginia, West Virginia and Washington, D.C.) will offset any new or increased loadings of nitrogen, phosphorus, or sediment to the Bay. Many states in the Chesapeake Bay watershed have offset programs to achieve that expectation, whereas others manage offsets on an ad hoc basis. Water quality trading programs can also be used to meet TMDL wasteload allocation (WLA) requirements for National Pollutant Discharge Elimination System (NPDES) permitted sources.

As part of its oversight under the Chesapeake Bay Program Partnership's accountability framework, the U.S. Environmental Protection Agency (EPA) maintains oversight of the jurisdictions' trading and offset programs through audits and evaluations. EPA's first review of the jurisdictions' trading and offset programs in 2012 was intended to support the development of each jurisdiction's Phase II Watershed Implementation Plan (WIP) and ensure that the programs were consistent with the Clean Water Act (CWA) and the Chesapeake Bay TMDL. The 2012 review included a comparison of the jurisdictions' trading and offset programs and regulations with the 10 common trading and offset elements outlined in Appendix S of the Chesapeake Bay TMDL. Based on the comparisons with the 10 common elements, EPA made program recommendations applicable to all jurisdictions, as well as program recommendations specific to each individual jurisdiction. EPA's 2012 review resulted in several technical memorandums covering various topics that were then posted on EPA's Chesapeake Bay TMDL website.

EPA reviewed the jurisdictions' trading and offset programs again in 2016. This second review included a summary of specific aspects of each jurisdiction's trading and offset program that could facilitate interstate trades. These specific aspects were based on the 10 common trading and offset elements outlined in Appendix S of the Chesapeake Bay TMDL.

EPA's current review is intended to identify the progress the Chesapeake Bay jurisdictions have made in their trading and offset programs since EPA's last review in 2016. While the current review evaluates some of the same aspects of the trading and offset programs as the past reviews, this document summarizes the current status of each jurisdiction's nutrient trading and offset program while highlighting unique aspects of the various programs.

Virginia and Maryland have made regulatory changes or additions to their trading and offset programs since the 2016 review. As of 2020, Virginia has new regulations for the certification of nonpoint source nutrient credits for the purpose of trading. Maryland adopted new regulations that further expanded its Maryland Water Quality Trading Program in 2018. Washington, D.C. (the District) continues to implement its Stormwater Retention Credit Trading Program and Pennsylvania continues to apply its regulations and policies for water quality offsets and trading in the Chesapeake Bay watershed. Delaware, New York, and West Virginia do not have comprehensive water quality trading programs; however, point sources in these three states can participate and have participated in nutrient trading to meet their Chesapeake Bay TMDL allocations. In addition, Delaware revised its Sediment and Stormwater Regulations in 2019, which now include provisions for trading and offsets to meet the sediment and stormwater post-construction requirements. The current review also highlights the four jurisdictions (Virginia, Maryland, Delaware, and New York) that are part of the Regional Greenhouse Gas Initiative (RGGI) and have carbon trading programs.

As nutrient trading between point sources and nonpoint sources in the Chesapeake Bay jurisdictions continues to become more common, the trading and offset scenarios will continue to evolve. A discussion with the Chesapeake Bay jurisdictions as part of EPA's current trading and offset program review revealed several areas of interest that jurisdictions may be looking to develop in the future.

Specific interests include nutrient and carbon credit stacking, integration of other credit markets (e.g., air quality) with the water quality market, expanded sources of nutrient credits (e.g., reforestation, stream restoration, and oyster aquaculture), and inter-jurisdictional trading.

In the future, jurisdictions might look to include carbon in their trading scenarios through credit stacking, which is the generation of multiple credits, such as water quality and carbon credits, through a single project. Credit stacking could become an option because many of the best management practices (BMPs) that improve water quality by reducing nutrients also have the co-benefit of sequestering carbon dioxide from the atmosphere. This co-benefit creates the possibility for credit generators to receive credits for both the nutrient and carbon reductions resulting from the same practice or project.

In addition to nutrient and carbon stacking, there is potential for the air quality market to integrate with the water quality market through nitrogen reductions. There has been recent discussion of jurisdictions looking to reduce nitrogen in air emissions, which may eventually lead to tradeable credits for the nitrogen reductions. Some jurisdictions feel there is significant potential in gaining credits for atmospheric nitrogen deposition reductions in the Chesapeake Bay watershed. Jurisdictions could be credited for improved air quality or greenhouse gas reduction programs that decrease atmospheric nitrogen deposition on lands in the Bay watershed. There is interest in creating a framework for permanent atmospheric deposition credits that can be used to meet the Chesapeake Bay Program Partnership's 2025 goals. Some jurisdictions hope that the atmospheric deposition credits will provide jurisdictions more reduction opportunities in the future. Examples of greenhouse gas reduction activities that could eventually lead to tradeable nitrogen credits include the use of solar panels or wind energy.

While many jurisdictions are trading and offsetting nutrients between point sources, other jurisdictions are also including nonpoint sources in their trading and offset scenarios. For example, Pennsylvania has included nonpoint source credits since trades began in 2010. One example of a local partnership is Lycoming County, where the Lycoming County Conservation District has been aggregating agricultural BMPs on behalf of local farmers for credit trading with wastewater treatment facilities. Some jurisdictions are also developing methodologies to calculate credits from more non-traditional practices such as reforestation, stream restoration, and oyster aquaculture. Reforestation can generate nutrient credits when landowners convert non-forested land (e.g., cropland, hay, or pasture) to forest through tree planting. Stream restoration generates nutrient credits in linear feet of restored stream when streams are enhanced or restored. Oyster aquaculture producers in tidal waters of the Chesapeake Bay in Maryland are also eligible to generate and sell nutrient credits in the trading market. Oyster farmers stock the waters with oysters, which results in an improvement in water quality because of the filtering ability of oysters. The amount of credits generated depends on the size and number of oysters harvested.

Additional emerging opportunities include the Sustainable Water Initiative for Tomorrow (SWIFT) in the Hampton Roads Sanitation District in Virginia and smart ponds in Maryland. SWIFT is a water treatment project that integrates wastewater treatment and stormwater management. The project was designed to reduce nutrient discharge to the Chesapeake Bay but has the co-benefits of replenishing a decreasing groundwater supply, addressing sea level rise due to land subsidence from groundwater withdrawal, and protecting groundwater from saltwater intrusion. SWIFT takes wastewater that would normally be discharged into tributaries of the Chesapeake Bay and treats it to meet drinking water quality standards. The treated water is then injected into the Potomac Aquifer, which is the primary source of groundwater in eastern Virginia. The resulting nutrient reductions generate nutrient credits that can be traded with participating cities to meet their Municipal Separate Storm Sewer System (MS4) requirements.

Another emerging opportunity is smart ponds. A pilot program in Maryland is showing how existing stormwater management ponds can be retrofitted with Continuous Monitoring and Adaptive Control, or smart pond, technology. The smart ponds use sensors to monitor water level and storage volume and use

online forecasts to determine when to perform a controlled release of water prior to an expected high-impact rain event. The ponds can be configured to automatically drain prior to the forecasted rain events. The controlled release allows for increased infiltration and maximum pollutant removal from the incoming stormwater. Nutrient credits generated by the increased pollutant removal can be traded to MS4 permittees to offset nutrient loads from other sources. There continues to be potential for other jurisdictions to begin generating credits from these non-traditional and emerging practices as well.

The jurisdictions have also shown an interest in inter-jurisdictional trading in the Chesapeake Bay watershed to expand potential trading markets. Inter-jurisdictional trading may be especially useful for jurisdictions that do not have a formal trading program or that may have limited opportunities for trading. Inter-jurisdictional trades would lead to the potential for an expanded number of resources and trading partners to help jurisdictions continue to meet the Chesapeake Bay TMDL goals.

Finally, jurisdictions continue to be interested in opportunities to share ideas related to the trading and offset issues, both technical and programmatic. There is consensus that it is useful for all jurisdictions to occasionally gather and discuss trading and offset scenarios that are and are not working for them. Sharing successes, failures, innovative trading and offset approaches, and ideas for the future of trading help the jurisdictions leverage knowledge to support program efficiencies. Consistency in key areas among the jurisdictions' trading and offset programs could also be helpful for any future inter-jurisdictional trading. It is expected that an all-jurisdiction trading and offsets meeting will occur before the end of 2021 during which the Chesapeake Bay jurisdictions can discuss the status of their current trading and offset programs, share innovative trading and offset ideas and programs, and look to the future of trading and offsets in the region.

2.0 DELAWARE WATER QUALITY TRADING AND OFFSET PROGRAM

Delaware's Department of Natural Resources and Environmental Control (DNREC) does not currently have a specific nutrient offset or trading program; however, DNREC is developing trading concepts and some nutrient trading is already occurring on a case-by-case basis. Section 6.2 of Delaware's Phase III Chesapeake Bay Watershed Implementation Plan (WIP) discusses two existing point source – point source trades occurring in Sussex County. The town of Bridgeville's wastewater treatment plant (WWTP) exceeds the nitrogen loads in its NPDES permit, which was issued to be consistent with the Chesapeake Bay total maximum daily load (TMDL), and is not able to support additional growth without upgrades to the facility. Rather than complete upgrades, the Bridgeville WWTP will be taken completely offline by the end of May 2021 and the wastewater redirected to the Seaford WWTP. Bridgeville's allocated nutrient TMDL loads have been transferred to Seaford and Bridgeville's wastewater NPDES permit will be terminated.

Key Characteristics of Delaware's Trading Program

Geographic scope: *State of Delaware*

Key driver(s): *Chesapeake Bay TMDL and stormwater regulations*

Trading scenario: *Point source–point source*

Pollutants: *Total nitrogen and total phosphorus, stormwater*

Status: *Case-by-case basis*

Trade ratios: *N/A*

Highlights: *Point source-point source trades are occurring outside of a specific trading program; Pilot Stormwater Management Offset District underway in Sussex County*

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The former Invista facility, now INV Performance Materials, LLC in Seaford, and the Seaford WWTP entered into a nutrient trade agreement. While Invista/INV Performance Materials operates within its permitted total nitrogen load, the facility was given a zero phosphorus wasteload allocation (WLA) in the Chesapeake Bay TMDL because it does not generate phosphorus; however, there is sometimes a small phosphorus discharge due to natural variation in water. This causes the facility to be out of compliance with the zero phosphorus effluent limit. Invista/INV and the Seaford WWTP entered into a nitrogen-phosphorus trade agreement several years ago, which assigns 1,460 lbs/year of Seaford's total phosphorus WLA to Invista/INV in exchange for 27,431 lbs/year of Invista/INV's total nitrogen WLA. INV Performance Materials and Seaford WWTP are seeking to make this trade permanent moving forward.

In addition to the existing point source trades, Section 13 of Delaware's Sediment and Stormwater Regulations includes stormwater management offset provisions, fees-in-lieu, trading, banking, and the development of stormwater management offset districts to address stormwater offsets in the state. Stormwater management offsets can be used as an alternative to meeting the performance criteria for post-construction stormwater management. With the exception of fees-in-lieu, Delaware requires stormwater management offsets to be applied in the same ten digit hydrologic unit code (HUC) as defined by the U.S. Geological Survey as the permitted site, or an adjacent ten digit HUC within the same eight digit HUC.

According to Delaware's regulations, stormwater management trading allows the use of a "credit" for one project to offset a "debit" condition on another project to gain compliance with the Resource Protection Event volume (RPv), which is the annual runoff volume generated by a Resource Protection Event (i.e., the runoff event produced by a storm having an annual probability of occurrence of 99 percent).

Sussex County is currently proposing the formation of a pilot Offset District, which will establish an Offsets, Banking, and Trading Program to address stormwater impacts in southern Delaware. DNREC has reviewed the proposal and provided feedback to the county. It is expected that the pilot program will continue to develop over the next year.

DNREC also works with municipal separate storm sewer system (MS4) communities to identify projects related to trading, banking, and offsets on a case-by-case basis. Stormwater offsets in Delaware are discussed in more detail below in Section 2.2 Offsets for New Load Growth.

2.1 CO_2 BUDGET TRADING PROGRAM

Delaware is part of the Regional Greenhouse Gas Initiative (RGGI), which is a cooperative effort with ten neighboring states to reduce carbon dioxide (CO_2) emissions from electric power plants with a capacity of 25 megawatts or more. RGGI is implemented through Delaware's CO_2 Budget Trading Program (1147 CO_2 Budget Trading Program).

The RGGI program is a cap and trade system with a regional cap on CO_2 emissions that is reduced every year. Participating states sell their emission allowances at regional quarterly auctions, which are the primary market for CO_2 allowances. A listing of cumulative allowance sales and proceeds is available on the RGGI auction results page.

Allowances may also be bought and sold in a secondary market. The RGGI CO_2 Allowance Tracking System (COATS) tracks the allocation, award and transfer of CO_2 allowances as well as the registration of offset projects. COATS is the trading platform for the secondary CO_2 allowances market.

More information regarding the RGGI and the Delaware CO_2 Budget Trading Program is available at RGGI - Delaware.

2.2 OFFSETS FOR GROWTH (NEW OR INCREASED LOADS)

As part of the implementation of the Chesapeake Bay TMDL, the Chesapeake Bay states are expected to account for any growth – i.e., new or increased loadings of nitrogen, phosphorus and sediment (see Section 10 of the Chesapeake Bay TMDL).

New point source dischargers are expected to offset their entire loading, while existing point source dischargers that increase their loading are expected to offset the entire increase in their loading. New or increased loading from nonpoint sources (or sources other than permitted point source dischargers) are expected to be estimated to calculate the offsets necessary to compensate for the entire estimated increase in pollutant load. The new or increased loadings can be offset by loading reductions and credits generated by other sources through offset programs that are based on the definitions and 10 common elements described in Appendix S of the Chesapeake Bay TMDL (Appendix S).

The 10 common elements are not regulatory requirements but are assumptions in the TMDL meant to ensure that offsets are achieved through reliable controls. The common elements for offset programs are: 1) authority (to implement, monitor and enforce such offsets), 2) offsets baseline (for credit generators), 3) minimum controls (for credit users), 4) eligibility requirements, 5) credit calculation and verification, 6) safeguards, 7) certification and enforcement, 8) accountability and tracking systems, 9) offsets in nutrient-impaired segments must protect water quality standards, and 10) credit banks (roles and operating practices are specified).

Section 6 of Delaware's Phase III Chesapeake Bay WIP outlines a plan to account for any growth. The goals of the Phase III WIP were based on forecasted land uses and populations for the year 2025 to

account for expected growth through 2025. Delaware has several other plans in place to account for growth.

Delaware's Sediment and Stormwater Regulations (effective as of February 2019) provide regulations for offsetting new or increased nutrient loads from new development. All new development projects that disturb areas of 5,000 square feet or more are required to reduce their stormwater runoff from all storms up to the 99th percentile precipitation to an equivalent open space condition up to a maximum one inch of runoff management. Redevelopment projects are required to reduce their annual stormwater runoff and pollutant loads to an equivalent of 15 percent of the existing imperviousness. Any projects that cannot meet the minimum runoff reduction target are required to obtain an offset. Delaware's Nutrient Budget Protocol and Delaware Urban Runoff Management Model (DURMM) are tools that can be used at the local level to assist in calculating necessary offsets. The tools are used for tracking and reporting nutrient loads related to changes in land use. DURMM is used to calculate the volume of stormwater runoff from a proposed development project and the associated nutrient and sediment loads. Information from DURMM is used as input for the Nutrient Budget Protocol, which calculates the total nutrient loads from an area before and after development.

Delaware also has farmland and forest conservation and preservation programs that limit impacts from new growth. The Delaware Agricultural Lands Preservation Program allows landowners to sell their development rights to the state, which preserves the land forever for farming, forestry, or other related activities. The Delaware Forestland Preservation Program provides a preservation opportunity for land that is entirely forested. Finally, Delaware's Young Farmers Program helps young farmers with limited financial resources purchase farmland and begin their careers as independent farmers. The program provides 30-year, no-interest loans to qualified young farmers to purchase farmland.

2.3 RESOURCES

Delaware Phase III Chesapeake Bay Watershed Implementation Plan (WIP)

Delaware's Sediment and Stormwater Regulations

Delaware CO_2 Budget Trading Program

Chesapeake Bay Total Maximum Daily Load (TMDL)

Section 10 of the Chesapeake Bay Total Maximum Daily Load (TMDL)

Appendix S of the Chesapeake Bay Total Maximum Daily Load (TMDL)

3.0 DISTRICT OF COLUMBIA WATER QUALITY TRADING AND OFFSET PROGRAM

The District of Columbia (the District) requires large development and redevelopment activities to install runoff-reducing green infrastructure (GI) when they trigger DC's Stormwater Management Regulations. This requirement, called the Stormwater Retention Volume (SWRv), is calculated by determining the volume of stormwater runoff generated (from a 1.2-inch design storm in most cases) at the regulated site. The regulations include compliance flexibility through the Stormwater Retention Credit (SRC) Trading Program, which gives regulated projects the option of meeting their SWRv through installing GI on-site or opting for an off-site retention volume (Offv) and buying SRCs generated from voluntarily-installed GI elsewhere in the District. The majority of projects must meet at least fifty percent (50%) of their SWRv on-site, but projects located in the area of the District that drain to Combined Sewer System storage tunnels have the flexibility to meet 100% of their SWRv off-site by purchasing SRCs generated from GI located in the Municipal Separate Storm Sewer System (MS4) area.

Key Characteristics of the District of Columbia's Trading Program

Geographic scope: *District-wide with key prioritizations for the MS4 area*

Key driver(s): *Stormwater management regulations*

Trading scenario: *Sources within the MS4 area.*

Pollutants: *Runoff volume*

Status: *Active*

Trade ratios: *Limited to the Anacostia Waterfront Development Zone (1.25:1 when using non-Anacostia SRCs)*

Highlights: *Price Lock Program, Aggregator Startup Grants, Site Evaluation Program*

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Participants in the SRC Trading Program can generate credits through the voluntary installation of GI or removal of impervious area. Individuals can self-generate SRCs on their property or partner with an SRC Aggregator financing SRC-generating projects on multiple properties. SRC generators earn revenue by selling SRCs on an open market to developers that must meet their Offv. SRCs can be listed for sale on the Department of Energy and Environment's (DOEE's) SRC and Offv Registry at a privately negotiated price with the buyer.

3.1 PROGRAMS WITHIN THE SRC PROGRAM

The SRC Program includes several innovative aspects, including the SRC Price Lock Program, the SRC Aggregator Startup Grant Program, and the SRC Site Evaluation Program described here.

The SRC Price Lock Program offers guaranteed revenue to eligible participants that generate High-Impact SRCs (from new, voluntary GI in the MS4 area) that provide the highest water quality outcomes for the District. SRC Aggregators can sell their SRCs to DOEE at fixed prices without losing the option to sell to another buyer on the open market at a higher rate. This guaranteed sale of SRCs to DOEE effectively creates a price floor in the SRC market and ensures that SRC Aggregators will always be able to sell their credits, improving access to private capital and spurring investment in voluntary GI that provides high water quality outcomes. To further incentivize High-Impact SRCs, when participants sell their SRCs to regulated development, DOEE helps pay a portion of the purchase price on behalf of the buyer.

Through the SRC Aggregator Startup Grant Program, DOEE encourages the creation of SRC-generating businesses by providing funding up to $75,000 to support work to identify and evaluate GI retrofits' suitability across multiple sites in the MS4 area. SRC-aggregating businesses construct GI to generate SRCs on properties that are owned by others. SRC Aggregators own the SRCs that are generated, which

can then be sold on the open market or to DOEE through the SRC Price Lock Program. Grants are available for projects where essential aspects of GI siting, retrofit feasibility, and/or cost-effectiveness are not currently known. Activities eligible for grant funding include desktop assessment of prospective sites; outreach to property owners; field assessment of prospective sites; field analysis to provide more detailed information on GI feasibility (e.g., utility location, topographic survey, infiltration testing, structural analysis, etc.); and preliminary design of GI.

The SRC Site Evaluation Program is available for property owners with at least half an acre in the MS4 area who are interested in the SRC Program but need technical help to determine whether GI is feasible on their property. The SRC Site Evaluation Program is provided at no cost and results in a site assessment and GI concept designs provided by the Center for Watershed Protection. Financial assistance to construct the GI is not offered through the SRC Site Evaluation Program.

3.2 GENERATION OF CREDITS

Property owners interested in generating SRCs must meet the eligibility requirements and complete the DOEE's SRC certification process. To be eligible to certify SRCs, GI projects must reduce stormwater runoff on a site in the District that does not trigger Stormwater Management Regulations (or must be installed in excess of the regulatory requirement). Participants must:

- Obtain DOEE approval of a Stormwater Management Plan for the GI or impervious surface removal on their property;
- Apply for SRCs within three years of project completion (as of August 1, 2020) and cannot lapse in certification for more than six months;
- Pass DOEE's construction and maintenance inspections; and
- Provide a maintenance contract or plan for the period of SRC certification.

Each certified SRC represents one gallon of GI retention capacity for one year. DOEE will certify up to three years' worth of SRCs at one time but can also certify SRCs in one-year and two-year increments. More information on SRC eligibility and certification can be found in Chapter 7 of DOEE's Stormwater Management Guidebook.

3.3 TRADE IMPLEMENTATION

After DOEE has certified SRCs, the credits can be sold to a regulated developer, banked for future sale or use on another regulated property or, for eligible High-Impact SRCs, sold to DOEE through the SRC Price Lock Program. Program participants can go to the publicly accessible SRC and Registry site to list SRCs for sale and find real-time SRC market data and summaries. The site includes a registry of SRCs for sale, SRC sale prices, SRC sellers, expected availability of new SRCs, interested buyers, participants interested in generating SRCs, and SRC Price Lock funds available, among other information about the SRC market.

The SRC Trading Program website also includes program resources that help to reduce transaction costs for market participants. These resources include:

- An SRC Financial Return Calculator, a planning tool used to estimate the potential revenue from installing a High-Impact SRC-generating GI project;
- A sample contract for the sale of SRCs;
- GIS tools to help evaluate feasibility and suitability of potential project sites;

- FAQs on SRC sand Offv program participation; and,
- Links to training sessions and videos which offer informative looks at the SRC program.

3.4 OFFSETS FOR GROWTH (NEW AND INCREASED LOADS)

As part of the implementation of the Chesapeake Bay TMDL, the Chesapeake Bay states are expected to account for any growth – i.e., new or increased loadings of nitrogen, phosphorus and sediment (see Section 10 of the Chesapeake Bay TMDL).

New point source dischargers are expected to offset their entire loading, while existing point source dischargers that increase their loading are expected to offset the entire increase in their loading. New or increased loading from nonpoint sources (or sources other than permitted point source dischargers) are expected to be estimated to calculate the offsets necessary to compensate for the entire estimated increase in pollutant load. The new or increased loadings can be offset by loading reductions and credits generated by other sources through offset programs that are based on the definitions and 10 common elements described in Appendix S of the Chesapeake Bay TMDL (Appendix S).

The 10 common elements are not regulatory requirements but are assumptions in the TMDL meant to ensure that offsets are achieved through reliable controls. The common elements for offset programs are: 1) authority (to implement, monitor and enforce such offsets), 2) offsets baseline (for credit generators), 3) minimum controls (for credit users), 4) eligibility requirements, 5) credit calculation and verification, 6) safeguards, 7) certification and enforcement, 8) accountability and tracking systems, 9) offsets in nutrient-impaired segments must protect water quality standards, and 10) credit banks (roles and operating practices are specified).

Section 4.7 of the District's Phase III Chesapeake Bay Watershed Implementation Plan (WIP) provides specific details regarding offsetting growth. As with the other Chesapeake Bay jurisdictions, the Phase III WIP goals were based on forecasted 2025 land use and population growth conditions; therefore, the plan to meet the Chesapeake Bay TMDL accounts for expected growth through 2025. The District's wastewater allocations and permit limits are based on design capacity and account for expected growth through 2030.

In addition, the District has accounted for growth of developed land through their stormwater regulations. The District has been built out since 2010; any new development or redevelopment since 2013 falls under the stormwater management regulations, which require stormwater retention as described in the discussion of the SRC Trading Program above. The stormwater management regulations applicable to new development and redevelopment result in the reduction of runoff volumes from projects that disturb 5,000 square feet or more.

3.5 RESOURCES

Stormwater Retention Credit (SRC) Trading Program

SRC Price Lock Program

SRC Aggregator Startup Grants

Stormwater Retention Credit Eligibility and Certification Process

Stormwater Management Guidebook

SRC and Offsite Retention Volume (Offv) Registry

SRC Program Resources

Chesapeake Bay Total Maximum Daily Load (TMDL)

Section 10 of the Chesapeake Bay Total Maximum Daily Load (TMDL)

Appendix S of the Chesapeake Bay Total Maximum Daily Load (TMDL)

The District of Columbia's Phase III Chesapeake Bay Watershed Implementation Plan (WIP)

4.0 MARYLAND WATER QUALITY TRADING AND OFFSET PROGRAM

Maryland initiated a nutrient trading program in 2008 with issuance of the Maryland Policy for Nutrient Cap Management and Trading in Maryland's Chesapeake Bay Watershed (referred to as Phase I), the *Guidelines for the Generation of Agricultural Nonpoint Nutrient Credits* (Phase II-A), and the *Guidelines for Agricultural Nonpoint Credit Purchases* (Phase II-B). Phase I established principles and guidelines for trading in Maryland and specified procedures for point source–point source trading between wastewater treatment plants (WWTPs). Phases II-A and II-B addressed point source–nonpoint source trading.

In 2015, Maryland released the *Maryland Nutrient Trading Policy Statement*, seeking to develop a new cross-sector trading program to achieve the Bay Partnership's 2025 goals. To that end, the Maryland Department of the Environment (MDE) and Department of Agriculture (MDA) finalized regulations establishing the Maryland Water Quality Trading Program in July 2018. The Trading Program was developed through consultation with the Maryland Water Quality Trading Advisory Committee, comprising over 30 stakeholders.

MDA's Trading Program requires that credits traded in impaired waterbodies must be generated within the same waterbody or upstream of the credit user's discharge to ensure protection of local water quality. MDE requires a National Pollutant Discharge Elimination System (NPDES) permittee discharging in a given watershed, defined as the Chesapeake Bay TMDL segment, to purchase credits from within that same watershed.

Maryland authorizes water quality trading between agricultural, stormwater (including municipal separate storm sewer systems [MS4s]), wastewater, and onsite sewage disposal sectors through point source–point source and point source–nonpoint source trading.

Key Characteristics of Maryland's Trading Program

Geographic scope: *Upstream of targeted waterbody in the Potomac, Patuxent, Eastern Shore and Western Shore River basins, including the Maryland portion of the Susquehanna River basin*

Key driver(s): *Chesapeake Bay TMDL*

Trading scenario: *Point source–point source and point source–nonpoint source*

Pollutants: *Total nitrogen, total phosphorus, sediment*

Status: *Active*

Trade ratios: *Uncertainty, edge of tide and reserve ratios*

Highlights: *Credits generated in same waterbody or upstream, certification process, online tools to facilitate trading*

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4.1 TRADING BASELINE

Maryland's Trading Program establishes sector-specific baseline requirements for nonpoint sources, wastewater point sources, stormwater point sources, nonregulated sources, and onsite sewage disposal systems. Generally, all baselines must be consistent with the Chesapeake Bay TMDL or a local TMDL, if more restrictive.

4.2 TRADE RATIOS

Maryland's Trading Program specifies three types of trade ratios applicable to all trades. An uncertainty ratio is applied to compensate for discrepancies in estimated pollutant reductions and provide a margin of safety for nonpoint to point source trades. An edge of tide ratio is applied to all credits to normalize

loads based on delivery to the mainstem of the Chesapeake Bay. A reserve ratio of at least 5 percent is applied to each credit to create a pool of credits that can be used by the state to provide a margin of safety to compensate for project failure and/or underperformance and improve overall water quality.

4.3 GENERATION OF CREDITS

Maryland allows credits to be generated by implementing BMPs that are approved by the Chesapeake Bay Program partnership. Credit life is one year, and a credit may be used only during the year in which it is generated. Credits may be traded only after they have been verified and certified. Certification is the process used by MDE and MDA to quantify credits. Credits may be certified for more than one year but must be applied annually. MDA certifies all eligible agricultural credit generating practices. MDE certifies credits generated by any Chesapeake Bay Program partnership-approved non-agricultural practice. Upon certification, MDE enters the certified credits into a central registry.

4.4 TRADE IMPLEMENTATION

MDA and MDE have established and maintain the following online tools to facilitate trading:

- The Maryland Nutrient Tracking/Trading Tool to calculate credits for agricultural credit generators.
- Credit generation calculators for other sectors
- A series of guidelines on how the process works in Maryland
- A central registry to document, catalogue, and track credit trades.
- A marketplace to exchange information between credit generators and potential buyers.

Since 2018, MDE has certified nine trades: two between a wastewater source and an industrial NPDES permittee, three between a wastewater source and an MS4, two involving nonpoint stormwater sources to NPDES, and two involving oyster aquaculture to an MS4 and a private entity. MDE is in the process of certifying credits from a number of wastewater, stormwater, oyster aquaculture and other best management practices (BMPs). In addition, MDA is currently updating the existing Maryland Nutrient Tracking/Trading Tool to include a carbon component that, when added to the tool's nutrient and sediment crediting capacity, will move Maryland closer to providing a comprehensive ecosystem marketplace. A BETA version is expected by June 2021.

For more information about Maryland's trading program, visit

Maryland Water Quality Trading Program,

Maryland Nutrient Trading Program, and

Maryland Water Quality Trading Advisory Committee (WQTAC).

4.5 CO_2 BUDGET TRADING PROGRAM

Maryland is part of the Regional Greenhouse Gas Initiative (RGGI), which is a cooperative effort with ten neighboring states to reduce carbon dioxide (CO_2) emissions. In 2007, MDE adapted the RGGI Model Rule to Maryland regulations, resulting in the Maryland CO_2 Budget Trading Program (COMAR 26.09). The program applies to any fossil fuel-fired power plant with a capacity of 25 megawatts or more.

The RGGI program is a cap and trade system with a regional cap on CO_2 emissions that is reduced every year. Participating states sell their emission allowances at regional quarterly auctions, which are the

primary market for CO_2 allowances. A listing of cumulative allowance sales and proceeds is available on the RGGI auction results page. Maryland's CO2 Budget Trading Program does not require participation in the auctions, but Maryland has participated in all quarterly auctions to date. Maryland does not hold any additional auctions outside of the regional quarterly auctions.

Allowances may also be bought and sold in a secondary market. The RGGI CO_2 Allowance Tracking System (COATS) tracks the allocation, award and transfer of CO_2 allowances as well as the registration of offset projects. COATS is the trading platform for the secondary CO_2 allowances market.

In addition to CO_2 trading, MDE awards CO_2 offset allowances for projects that demonstrate real, additional, verifiable, enforceable and permanent avoidance of CO_2 emissions or reduction of atmospheric CO_2 levels.

More information regarding the RGGI and the Maryland CO_2 Budget Trading Program is available at RGGIElements (maryland.gov).

MDA is also developing a Healthy Soils Program to promote the further adoption of conservation practices that foster soil health and build soil carbon stocks. Since many water quality practices can also sequester carbon, there is the potential to generate carbon credits from the same activities used to generate nutrient credits. Work is underway to create a menu of recommended practices that can be applied for both nutrient and sediment reductions as well as carbon sequestration. These recommended practices will be included in the updated Maryland Nutrient Tracking/Trading Tool discussed above.

Maryland is also looking to receive permanent credits for nitrogen reductions from atmospheric deposition as part of its Chesapeake Bay TMDL implementation efforts. A presentation by MDE at the Chesapeake Bay Water Quality Goal Implementation Team meeting in November 2020 presented Maryland's goal to take credit in its Chesapeake Bay Watershed Implementation Plan (WIP) for greenhouse gas reduction programs that reduce nitrogen from atmospheric deposition in the Chesapeake Bay watershed. If this goal is achieved, the nitrogen credits could become part of Maryland's trading program as well.

4.6 OFFSETS FOR GROWTH (NEW AND INCREASED LOADS)

As part of the implementation of the Chesapeake Bay TMDL, the Chesapeake Bay states are expected to account for any growth – i.e., new or increased loadings of nitrogen, phosphorus and sediment (see Section 10 of the Chesapeake Bay TMDL).

New point source dischargers are expected to offset their entire loading, while existing point source dischargers that increase their loading are expected to offset the entire increase in their loading. New or increased loading from nonpoint sources (or sources other than permitted point source dischargers) are expected to be estimated to calculate the offsets necessary to compensate for the entire estimated increase in pollutant load. The new or increased loadings can be offset by loading reductions and credits generated by other sources through offset programs that are based on the definitions and 10 common elements described in Appendix S of the Chesapeake Bay TMDL (Appendix S).

The 10 common elements are not regulatory requirements but are assumptions in the TMDL meant to ensure that offsets are achieved through reliable controls. The common elements for offset programs are: 1) authority (to implement, monitor and enforce such offsets), 2) offsets baseline (for credit generators), 3) minimum controls (for credit users), 4) eligibility requirements, 5) credit calculation and verification, 6) safeguards, 7) certification and enforcement, 8) accountability and tracking systems, 9) offsets in nutrient-impaired segments must protect water quality standards, and 10) credit banks (roles and operating practices are specified).

Section VI of Maryland's Phase III Chesapeake Bay WIP indicates that Maryland does not have a specific program or regulations in place to offset growth from new loads. Any growth in Maryland due to new loads is currently offset on an ad hoc basis through accelerated pollutant reductions in the wastewater and agricultural sectors. Maryland also has land conservation, preservation, and growth management programs that limit impacts from new growth. An example of Maryland's growth management is the Stormwater Management Act of 2007 that requires environmental site design be implemented to the maximum extent practicable on new development. This is done through the use of nonstructural BMPs and other site design techniques to reduce pollutant loads from stormwater.

Maryland's Phase III WIP also identifies a four-pronged strategy to account for growth. The first part of the strategy was to use Maryland's projected 2025 land use and population conditions, rather than current conditions, to determine the nutrient and sediment reduction targets for the TMDL. The second part of the strategy focused on including existing and proposed conservation and protection efforts, such as agricultural and forest conservation and growth management, in future land use scenarios for projecting growth in the Bay model. The inclusion of these programs allows Maryland to be credited for the resulting nutrient load reductions to offset a portion of future projected load growth. Next, Maryland incorporated strategies for increasing resource protection programs in the Phase III WIP because conservation is more cost effective than restoration to protect valuable ecosystems and associated land uses. Finally, Maryland believes that the expected load reductions under the Phase III WIP will offset any new loads from growth beyond 2045. Maryland plans to use continuous progress evaluations and an adaptive management process to confirm that any new loads do not exceed the TMDL targets.

4.7 RESOURCES

Guidelines for the Generation of Agricultural Nonpoint Nutrient Credits (Phase II-A)

Guidelines for Agricultural Nonpoint Credit Purchases (Phase II-B)

Maryland Nutrient Trading Policy Statement 2015

Maryland Water Quality Trading Program 2018

Water Quality Trading Program Home

Maryland Nutrient Trading Program

Maryland Water Quality Trading Advisory Committee (WQTAC)

Maryland Chesapeake Bay Watershed Implementation Plans (WIPs)

Chesapeake Bay Total Maximum Daily Load (TMDL)

Maryland CO_2 Budget Trading Program

Regional Greenhouse Gas Initiative - Maryland

5.0 NEW YORK WATER QUALITY TRADING AND OFFSET PROGRAM

The New York State Department of Environmental Conservation (NYSDEC) does not currently have a nutrient trading or offset program; however, Section 6.9 of New York's Phase III Chesapeake Bay Watershed Implementation Plan (WIP) describes trading and offset concepts that can be applied to the wastewater sector on a case-by-case basis or as the foundation for a future comprehensive trading or offset program if there is a need. Any future trading or offset program would apply to State Pollutant Discharge Elimination System (SPDES) permitted point sources to address short-term growth at existing facilities. New York will evaluate new or expanding point sources with the need to offset new or increased loads on a case-by-case basis. New York will include documentation and control requirements of any trading or offsets for new or expanding point sources in SPDES permits.

Key Characteristics of New York's Trading Program

Geographic scope: *Chesapeake Bay watershed in New York (Susquehanna River and the Chemung River watersheds)*

Key driver(s): *Chesapeake Bay TMDL*

Trading scenario: *Point source–point source*

Pollutants: *Total nitrogen and total phosphorus*

Status: *Case-by-case basis*

Trade ratios: *no*

Highlights: *Existing concepts that can be applied to development of a future trading program*

Contact information:

New York State Department of Environmental Conservation

5.1 TRADING BASELINE AND IMPLEMENTATION

Trading and offsets between point sources would be based on the individual wasteload allocations for existing municipal and industrial wastewater facilities in the Chesapeake Bay Total Maximum Daily Load (TMDL).

The calculation of trading and offset nutrient reduction values for sources other than wastewater treatment plants, can be determined through the Chesapeake Bay watershed model as well as alternative methods scientifically documented by NYSDEC with Environmental Protection Agency concurrence.

New York will describe any offset calculations for new or increased loadings from SPDES facilities in the fact sheet associated with the draft SPDES permit and there will be an opportunity for public notice and comment. SPDES permits that contain trades or offsets will include requirements to ensure the credits will be generated.

5.2 CO_2 BUDGET TRADING PROGRAM

New York is part of the Regional Greenhouse Gas Initiative (RGGI), which is a cooperative effort with ten neighboring states to reduce carbon dioxide (CO_2) emissions from electric power plants with a capacity of 25 megawatts or more. RGGI is implemented through New York's CO_2 Budget Trading Program (6 NYCRR Part 242).

The RGGI program is a cap and trade system with a regional cap on CO_2 emissions that is reduced every year. Participating states sell their emission allowances at regional quarterly auctions, which are the primary market for CO_2 allowances. A listing of cumulative allowance sales and proceeds is available on the RGGI auction results page.

Allowances may also be bought and sold in a secondary market. The RGGI CO_2 Allowance Tracking System (COATS) tracks the allocation, award and transfer of CO_2 allowances as well as the registration of offset projects. COATS is the trading platform for the secondary CO_2 allowances market.

More information regarding the RGGI and the New York CO_2 Budget Trading Program is available at RGGI - NYSDEC.

5.3 OFFSETS FOR GROWTH (NEW AND INCREASED LOADS)

As part of the implementation of the Chesapeake Bay TMDL, the Chesapeake Bay states are expected to account for any growth – i.e., new or increased loadings of nitrogen, phosphorus and sediment (see Section 10 of the Chesapeake Bay TMDL).

New point source dischargers are expected to offset their entire loading, while existing point source dischargers that increase their loading are expected to offset the entire increase in their loading. New or increased loading from nonpoint sources (or sources other than permitted point source dischargers) are expected to be estimated to calculate the offsets necessary to compensate for the entire estimated increase in pollutant load. The new or increased loadings can be offset by loading reductions and credits generated by other sources through offset programs that are based on the definitions and 10 common elements described in Appendix S of the Chesapeake Bay TMDL (Appendix S).

The 10 common elements are not regulatory requirements but are assumptions in the TMDL meant to ensure that offsets are achieved through reliable controls. The common elements for offset programs are: 1) authority (to implement, monitor and enforce such offsets), 2) offsets baseline (for credit generators), 3) minimum controls (for credit users), 4) eligibility requirements, 5) credit calculation and verification, 6) safeguards, 7) certification and enforcement, 8) accountability and tracking systems, 9) offsets in nutrient-impaired segments must protect water quality standards, and 10) credit banks (roles and operating practices are specified).

New York does not have specific offset programs or regulations but Section 9 of New York's Phase III Chesapeake Bay WIP addresses expected growth from new sources in the Chesapeake Bay watershed. The goals of New York's Phase III WIP were based on forecasted land uses and populations for the year 2025 to account for expected growth through 2025. The numbers of animals and production acres in the agricultural sector in New York are expected to decline through 2025. The human population is also declining in the watershed, therefore, New York does not expect loads from the wastewater sector to increase. Any future growth may be offset with facility optimization or the potential implementation of a trading and offset program for wastewater as described above. NYSDEC expects a small amount of nutrient and sediment load growth from new sources in the developed sector. These new loads will be offset with improved agricultural and stormwater best management practice reporting and implementation.

5.4 RESOURCES

New York Phase III Chesapeake Bay Watershed Implementation Plan (WIP)

Chesapeake Bay Total Maximum Daily Load (TMDL)

Section 10 of the Chesapeake Bay Total Maximum Daily Load (TMDL)

Appendix S of the Chesapeake Bay Total Maximum Daily Load (TMDL)

New York CO_2 Budget Trading program (6 NYCRR Part 242)

Regional Greenhouse Gas Initiative - New York

6.0 PENNSYLVANIA WATER QUALITY TRADING AND OFFSET PROGRAM

Pennsylvania's Department of Environmental Protection (DEP) initiated a nutrient water quality trading program in 2005 with issuance of a nutrient trading policy. In 2010, Pennsylvania DEP published regulations for water quality offsets and trading in the Chesapeake Bay watershed (25 Pa. Code § 96.8). As part of their efforts to implement the Chesapeake Bay total maximum daily load (TMDL), Pennsylvania DEP published additional guidance for implementing the nutrient trading program in the *Phase 2 Watershed Implementation Plan Nutrient Trading Supplement* (Phase 2 WIP NT Supplement) in 2015. Pennsylvania DEP's primary purpose for the program is to provide a cost-efficient option for National Pollutant Discharge Elimination System (NPDES) permittees in the Chesapeake Bay watershed to meet their TMDL wasteload allocations. Pennsylvania DEP developed the program with significant stakeholder input.

Key Characteristics of Pennsylvania's Trading Program

Geographic scope: *Susquehanna and Potomac Basins in the Chesapeake Bay watershed, Pennsylvania*

Key driver(s): *Chesapeake Bay TMDL*

Trading scenario: *Point source–point source and point source–nonpoint source*

Pollutants: *Total nitrogen and total phosphorus*

Status: *Active*

Trade ratios: *Edge of segment, delivery, reserve, and uncertainty ratios*

Highlights: *Certification, verification, and registration processes*

Contact information:

RA-EPPANutrientTrad@pa.gov

Pennsylvania Department of Environmental Protection

6.1 TRADE RATIOS

Four types of trade ratios may be used in Pennsylvania to calculate credits. Edge of segment ratios are applied to account for the amount of a pollutant expected to reach the surface waters at the boundary of a Chesapeake Bay Watershed Model segment through surface runoff and groundwater flows. Delivery ratios are derived from the Chesapeake Bay Watershed Model and are applied to all pollutant reduction activities to account for attenuation between the location of the activity and the Chesapeake Bay. A 10 percent reserve ratio is applied to all credits generated and set aside for Pennsylvania DEP's credit reserve to address pollutant reduction failures and uncertainty. For credits generated by nonpoint sources, an additional 3:1 ratio is applied to address uncertainty associated with the practice-based credit calculation methodology.[1]

6.2 TRADING BASELINE

Baseline, as defined under 25 Pa. Code §96.8, is "the compliance activities and performance standards that must be implemented to meet current environmental laws and regulations". "The baseline for point sources is the most stringent of an applicable technology-based effluent limitation or a TMDL wasteload allocation." The Phase 2 WIP NT Supplement specifies additional baseline requirements for point source discharges as 6.0 mg/L for total nitrogen and 0.8 mg/L for total phosphorus.

PADEP considers the baseline for nonpoint sources is the set of requirements in regulations applicable to the source at the location where the credits or offsets are generated, and the pollutant load associated with that location as of January 1, 2005. In addition to baseline, 25 Pa. Code §96.8 also defines

[1] PA implemented this trading ratio as a result of a number of NPDES permit objections EPA made due to concerns that those permits would have authorized meeting effluent limits via the purchase of credits generated by nonpoint sources whose baseline was inconsistent with the Bay TMDL.

additional threshold requirements that must be met by an agricultural operation at the location where the credits are generated. The Phase 2 WIP NT Supplement specifies additional requirements for agricultural nonpoint sources in the form of an additional 3:1 uncertainty ratio to be applied to the number of credits generated once the defined baseline compliance and threshold is reached, and additional requirements for generation of credits from hauling of poultry manure and manure destruction and conversion technologies. The additional Phase 2 WIP NT Supplement requirements for agricultural nonpoint sources were implemented as an interim step until Pennsylvania DEP can develop a performance-based or other approved method-based tool to use to establish baseline eligibility for nonpoint sources.

6.3 GENERATION OF CREDITS

Pennsylvania's offset and trading program involves a three-step process to generate credits: certification, verification, and registration. Once credits are certified, verified, and registered, they may be used for compliance with effluent limitations in NPDES permits.

Certification means Pennsylvania DEP has approved a pollutant reduction activity to generate credits. Pennsylvania DEP has provided a mass certification to all significant sewage point source discharges within the Chesapeake Bay watershed subject to annual mass load effluent limitations (referred to as cap loads) in their NPDES permits. Potential nonpoint source generators must submit a request for credit certification (including credit calculations and a verification plan) to Pennsylvania DEP. All certification requests are published in the *PA Bulletin* for a 30-day public comment period. If Pennsylvania DEP certifies the activity, a notice of the certification is published in the *PA Bulletin,* beginning a 30-day appeal process.

Verification means that Pennsylvania DEP has confirmed that a certified generator's pollutant reduction activity has generated credits during the compliance year based on the generator's approved verification plan included in their certification application and that the generator may sell those verified credits. Credit generators must submit a verification request for each compliance year (i.e., October 1–September 30).

Registration means Pennsylvania DEP has approved the sale of credits upon review of an agreement between a buyer and seller. Registration is Pennsylvania DEP's mechanism to track verified credits before they are used to comply with NPDES permit effluent limitations. Registered credits may be applied to meet NPDES permit cap load requirements, resold, or retired for the benefit of the Chesapeake Bay.

6.4 TRADE IMPLEMENTATION

Pennsylvania DEP's nutrient offset and trading program is very active, with many trades each year. Trading primarily occurs between point sources, though some point source–nonpoint source trades also occur. A summary of nutrient trading transactions for compliance years 2013 through 2020 is provided on Pennsylvania DEP's Nutrient Credit Reports website. During the truing period (October 1 – November 28), that site also contains a list of available credits that is updated at least daily as offsets and trades occur.

Trading partners implement trades through direct communication. Pennsylvania Infrastructure Investment Authority (PENNVEST) nutrient credit auctions were available from compliance years 2010 through 2018. The auctions were originally established to reduce risks for buyers and sellers and to help create a stable nutrient credit offset and trading market but were discontinued due to lack of use. Historical information related to PENNVEST auction trading can be found on the PENNVEST IHS Markit Auction website.

For more information about Pennsylvania's trading program, including credit generation requirements and the trading process, visit Pennsylvania's Nutrient Trading website.

6.5 OFFSETS FOR GROWTH (NEW AND INCREASED LOADS)

As part of the implementation of the Chesapeake Bay TMDL, the Chesapeake Bay states are expected to account for any growth – i.e., new or increased loadings of nitrogen, phosphorus and sediment (see Section 10 of the Chesapeake Bay TMDL).

New point source dischargers are expected to offset their entire loading, while existing point source dischargers that increase their loading are expected to offset the entire increase in their loading. New or increased loading from nonpoint sources (or sources other than permitted point source dischargers) are expected to be estimated to calculate the offsets necessary to compensate for the entire estimated increase in pollutant load. The new or increased loadings can be offset by loading reductions and credits generated by other sources through offset programs that are based on the definitions and 10 common elements described in Appendix S of the Chesapeake Bay TMDL (Appendix S).

The 10 common elements are not regulatory requirements but are assumptions in the TMDL meant to ensure that offsets are achieved through reliable controls. The common elements for offset programs are: 1) authority (to implement, monitor and enforce such offsets), 2) offsets baseline (for credit generators), 3) minimum controls (for credit users), 4) eligibility requirements, 5) credit calculation and verification, 6) safeguards, 7) certification and enforcement, 8) accountability and tracking systems, 9) offsets in nutrient-impaired segments must protect water quality standards, and 10) credit banks (roles and operating practices are specified).

Pennsylvania does not currently have specific programs or regulations in place to offset load growth from new sources outside of the existing offset and trading regulations (25 Pa. Code §96.8); however, Section 8 of Pennsylvania's Phase III Chesapeake Bay WIP describes actions Pennsylvania is taking to offset such load growth.

Like other Bay states, the nutrient and sediment targets in Pennsylvania's Phase III WIP were based on the 2025 projections for land use and population; therefore, growth is accounted for in the Chesapeake Bay suite of modeling tools through 2025. It is likely that these forecasted numbers will change as new information becomes available and the growth projection can be updated as necessary.

In addition to including Pennsylvania's forecasted 2025 conditions in the Chesapeake Bay Watershed Model, Pennsylvania plans to manage future growth through conserving valuable land uses such as forests, wetlands and farmland. Pennsylvania will continue to work with local land trusts and state and private agencies to create conservation easements with a statewide goal of conserving 20,000 acres of forest through 2025, part of which will be in the Chesapeake Bay watershed. Pennsylvania's wetlands are excluded from development in the Phase III WIP scenario. Pennsylvania preserves agricultural land through the state's Farmland Preservation Program. An annual rate of farmland preservation based on historical data is assumed through 2025 and these acres are excluded from development. Pennsylvania will continue to engage counties and local governments in future land conservation. Efforts will be made to conserve and limit development in riparian areas, as well as to update local planning and zoning ordinances to conserve critical forests and habitats.

In addition, Pennsylvania's Riparian Buffer Requirements (§102.14) require that where existing riparian buffers cannot be protected, existing riparian buffers must be converted to riparian forested buffer or a new riparian forest buffer must be established.

Finally, Pennsylvania's Permitting of Structures and Activities in Wetlands (§105.18a) requires wetlands to be replaced following the Wetland Replacement Criteria (§105.20a). These replacement

criteria may include requirements to offset wetland impacts above a 1:1 ratio based on area when Pennsylvania determines that the affected wetland area's functions and values have been destroyed or adversely affected. This often results in compensation being provided through additional restoration, enhancement, or rehabilitation of the affected wetland, of nearby wetlands, riparian buffers along streams, or any other form of acceptable aquatic resource restoration.

6.6 RESOURCES

Pennsylvania's Nutrient Trading website

Use of offsets and tradable credits from pollution reduction activities in the Chesapeake Bay Watershed (25 Pa. Code § 96.8)

Phase 2 Watershed Implementation Plan Nutrient Trading Supplement

PENNVEST IHS Markit Auction

Pennsylvania DEP's Nutrient Credit Reports

Chesapeake Bay Total Maximum Daily Load (TMDL)

Section 10 of the Chesapeake Bay Total Maximum Daily Load (TMDL)

Appendix S of the Chesapeake Bay Total Maximum Daily Load (TMDL)

Pennsylvania Phase III Chesapeake Bay Watershed Implementation Plan (WIP)

Riparian Buffer Requirements (§102.14)

Permitting of Structures and Activities in Wetlands (§105.18a)

Wetland Replacement Criteria (§105.20a)

7.0 VIRGINIA WATER QUALITY TRADING AND OFFSET PROGRAM

Virginia initiated its water quality offset and trading program in 2005 when the Virginia General Assembly enacted the Chesapeake Bay Watershed Nutrient Credit Exchange Program. Originally the goals of the program were to meet the Chesapeake Bay 2000 tributary strategy goals and were updated to meet the wasteload allocations of the 2010 Chesapeake Bay TMDL cost-effectively and expeditiously, accommodate continued growth and economic development in the watershed, and incentivize achievement of nonpoint source reduction goals. To achieve these goals, the law required the Virginia Department of Environmental Quality (DEQ) to establish a watershed-based general permit and nutrient trading program.

Key Characteristics of Virginia's Trading Program

Geographic scope: *Eastern Shore Basin, James River Basin, Potomac River Basin, Rappahannock River Basin, and York River Basin in the Chesapeake Bay watershed, Virginia*

Key driver(s): *Chesapeake Bay TMDL*

Trading scenario: *Point source–point source and point source–nonpoint source*

Pollutants: *Total nitrogen and total phosphorus*

Status: *Active*

Trade ratios: *Delivery, uncertainty, and Eastern Shore ratios*

Highlights: *Virginia Nutrient Credit Exchange Association, certification of nonpoint source credits, guidance for agricultural nonpoint source credit generators*

Contact information:

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Virginia Department of Environmental Quality

7.1 GENERAL PERMIT TRADING PROGRAM

Virginia DEQ issued a General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia covering significant existing dischargers and new and expanding dischargers to the Chesapeake Bay watershed in 2006. This watershed General Permit has since been reissued in 2012, 2017 and 2021.

Virginia's wastewater watershed General Permit allows for point source–point source trading for all permittees. Point source–nonpoint source trading is allowed for new and expanded facilities to offset any new or increased total nitrogen or total phosphorus loads.

Permittees may engage in trading independently or through the Virginia Nutrient Credit Exchange Association (Association). The Association was formed in 2005 and consists of 73 owners and 105 treatment facilities in the Chesapeake Bay watershed. It coordinates and facilitates participation in a nutrient credit exchange program for its members. The Association submits annual compliance plan updates on behalf of its members, serves as a nutrient credit clearinghouse for its members, develops standard forms of agreement for buying and selling credits, and coordinates planning to ensure sufficient credits are available for permit compliance.

The Chesapeake Bay watershed in Virginia consists of five tributary basins. The General Permit specifies that purchased credits must be generated within the same tributary, except owners of permitted facilities in the Eastern Shore Basin may purchase credits from owners of permitted facilities in the Potomac and Rappahannock tributaries, subject to an Eastern Shore trading ratio of 1:1 if generated in the Potomac tributary and 1.3:1 if generated in the Rappahannock tributary.

All credits are adjusted by applicable delivery factors that are determined by the geographic location of the facility to account for attenuation during riverine transport between the facility and tidal waters. Credits generated by nonpoint sources are subject to an uncertainty ratio of 2:1 unless the applicant can demonstrate factors that reduce uncertainty (e.g., direct measurement, land conservation with permanent protection).

Permittees may only acquire credits if the credits are generated and applied to a compliance obligation in the same calendar year. Permittees must annually report the mass loads of total nitrogen and total phosphorus discharged by February 1. Based on this information, Virginia DEQ publishes a report by April 1, annually, summarizing annual mass loads and the number of credits generated or required for each facility for the previous calendar year. Permittees must provide certification that they have acquired the credits necessary to achieve compliance for the previous calendar year by June 1. Virginia DEQ then publishes notice of all credit exchanges and purchases for the previous calendar year by July 1.

7.2 NONPOINT SOURCE NUTRIENT CREDITS

Virginia DEQ has published guidance for agricultural nonpoint source credit generators in *Trading Nutrient Reductions from Nonpoint Source Best Management Practices in the Chesapeake Bay Watershed: Guidance for Agricultural Landowners and Your Potential Trading Partners*. The guidance describes most current practices available to generate offsets. It also includes instructions for obtaining certification of nutrient credits. A credit generator must submit an application identifying the best management practice (BMP) enhancements or land conversion and calculation of nutrient reductions achieved, assignment of reductions to the offset broker, assignment of reductions to the VPDES permittee, and project qualification data and documentation. Virginia DEQ uses the U.S. Army Corps of Engineers Regulatory In-lieu Fee and Bank Information Tracking System (RIBITS) database to track the generation, use and retirement of nonpoint source credits.

In January 2020, Virginia DEQ released Guidance Memo No. 20-2001, which is an addendum to Trading Nutrient Reductions from Nonpoint Source Best Management Practices in the Chesapeake Bay Watershed: Guidance for Agricultural Landowners and Your Potential Trading Partners (Addendum). The purpose of the Addendum is to update nutrient and sediment credit values for the conversion of agricultural and developed lands to less-intensive uses for use in the nonpoint source nutrient trading program. Updated nutrient and sediment credit rates are now provided for each HUC 8 within the Chesapeake Bay watershed rather than by each Bay tributary east and west of I-95 and for the Southern Rivers watersheds.

The most recent trading and offset regulation in Virginia is the Certification of Nonpoint Source Nutrient Credits (9VAC25-900) that went into effect on September 1, 2020. 9VAC25-900 establishes standards and procedures pertaining to the certification of nonpoint source nutrient credits that will be placed on Virginia's Nutrient Credit Registry for exchange; it applies to nonpoint source nutrient credits only. It is expected that this regulation will encourage point source to nonpoint source trades and nonpoint to nonpoint source trades in addition to the more common point source to point source trades.

Through the *Certification of Nonpoint Source Nutrient Credits*, nonpoint source credits can be generated from agricultural BMPs, urban stormwater BMPs, management of animal feeding operations (without VPDES permits), land use conversion, and other established or innovative methods of nutrient control or removal. The regulation also includes provisions for the generation of nonpoint source nutrient credits from stream or wetland restoration.

Baseline reductions must be met prior to the generation of nutrient credits in most cases. Baseline practices for agricultural operations include nutrient management planning, livestock stream exclusion, riparian buffers, soil conservation and winter cover crops. Additional practices to generate credits include increased buffers, early planted cover crops and additional reductions in fertilizer applications.

Urban BMPs include practices on new development, redevelopment, and retrofits. Innovative practices include practices that are not currently approved by the Chesapeake Bay Program Partnership or the Virginia Stormwater BMP Clearinghouse.

The regulation also provides conditions for the location of the exchange of nutrient credits within an impaired watershed. Conditions are provided for areas in the Chesapeake Bay watershed with a local total maximum daily load (TMDL), areas in the Southern River watershed with a local TMDL, and areas in impaired watersheds without a local TMDL. In areas without a local TMDL, trading can occur within a hierarchy of locations from upstream of a discharge to within the same tributary watershed.

For more information about Virginia's trading program visit DEQ's Water Quality website and Virginia's Nutrient Credit Exchange Association.

7.3 CO_2 BUDGET TRADING PROGRAM

In April 2019 the Virginia State Air Pollution Control Board approved CO_2 Budget Trading Program General Provisions to reduce and cap carbon dioxide (CO2) emissions from large fossil fuel fired electric power generating facilities. The goal of this regulation is to reduce CO2 emissions from these facilities by 30 percent by 2030. The regulation allows the use of a market-based approach with the exchange of CO2 through a multi-state carbon market.

7.4 OFFSETS FOR GROWTH (NEW AND INCREASED LOADS)

As part of the implementation of the Chesapeake Bay TMDL, the Chesapeake Bay states are expected to account for any growth – i.e., new or increased loadings of nitrogen, phosphorus and sediment (see Section 10 of the Chesapeake Bay TMDL).

New point source dischargers are expected to offset their entire loading, while existing point source dischargers that increase their loading are expected to offset the entire increase in their loading. New or increased loading from nonpoint sources (or sources other than permitted point source dischargers) are expected to be estimated to calculate the offsets necessary to compensate for the entire estimated increase in pollutant load. The new or increased loadings can be offset by loading reductions and credits generated by other sources through offset programs that are based on the definitions and 10 common elements described in Appendix S of the Chesapeake Bay TMDL (Appendix S).

The 10 common elements are not regulatory requirements but are assumptions in the TMDL meant to ensure that offsets are achieved through reliable controls. The common elements for offset programs are: 1) authority (to implement, monitor and enforce such offsets), 2) offsets baseline (for credit generators), 3) minimum controls (for credit users), 4) eligibility requirements, 5) credit calculation and verification, 6) safeguards, 7) certification and enforcement, 8) accountability and tracking systems, 9) offsets in nutrient-impaired segments must protect water quality standards, and 10) credit banks (roles and operating practices are specified).

Virginia does not currently have specific programs or regulations in place to offset growth from new loads outside of the existing offset and trading regulations summarized above. However, Section 5.3 of Virginia's Phase III Chesapeake Bay Watershed Implementation Plan (WIP) presents additional actions Virginia is taking to offset growth from new loads. Virginia used forecasted 2025 land use and population as base conditions for the starting point of its Phase III WIP; therefore, the plan to meet the Chesapeake Bay TMDL accounts for expected growth through 2025. Virginia will use adaptive management through its two-year milestone evaluation process to address any changes to the forecasted 2025 base conditions.

In addition, Virginia DEQ revised the Virginia Stormwater Management Program (VSMP) regulation for water quality design criteria requirements (9VAC25-870-63) to require more stringent post-development stormwater management as of July 2014. The revised VSMP regulation has a goal of no net increase in nutrients from new development. These post-development regulations currently meet the

requirement to offset future growth resulting from development under the Chesapeake Bay TMDL; however, if additional reductions are necessary, they may be provided through Initiative 48 of the Phase III WIP. Initiative 48 states that Virginia will initiate a review of the VSMP regulation's post-development water quality design criteria requirements and the review will be used to determine if the design criteria continue to meet the offset requirement of the TMDL. Virginia is prepared to amend the VSMP regulation if it is found that the design criteria are no longer meeting the Chesapeake Bay TMDL offset requirements.

7.5 RESOURCES

Chesapeake Bay Watershed Nutrient Credit Exchange Program

General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia

Virginia Nutrient Credit Exchange Association

Trading Nutrient Reductions from Nonpoint Source Best Management Practices in the Chesapeake Bay Watershed: Guidance for Agricultural Landowners and Your Potential Trading Partners

Trading Nutrient Reductions from Nonpoint Source Best Management Practices in the Chesapeake Bay Watershed: Guidance for Agricultural Landowners and Your Potential Trading Partners - Addendum

Certification of Nonpoint Source Nutrient Credits

Virginia DEQ Water Quality

CO_2 Budget Trading Program General Provisions

Virginia's Phase III Chesapeake Bay Watershed Implementation Plan (WIP)

Chesapeake Bay Total Maximum Daily Load (TMDL)

Section 10 of the Chesapeake Bay Total Maximum Daily Load (TMDL)

Appendix S of the Chesapeake Bay Total Maximum Daily Load (TMDL)

Water Quality Design Criteria Requirements

8.0 WEST VIRGINIA WATER QUALITY TRADING AND OFFSET PROGRAM

West Virginia does not have a formal nutrient trading or offset program and does not intend to establish one during the implementation period of its Phase III Chesapeake Bay WIP. West Virginia does not rely on offsets or trading to achieve its Phase III WIP Planning Targets. However, offsets may be needed to address increased loads from point sources.

Key Characteristics of West Virginia's Offset Program

Geographic scope: *Chesapeake Bay watershed in West Virginia*

Key driver(s): *Chesapeake Bay TMDL*

Offset scenario: *Point source–point source*

Pollutants: *Total nitrogen and total phosphorus*

Status: *Case-by-case basis for point sources*

Nitrogen and phosphorus exchanges: *Equal to exchange rates in the Chesapeake Bay watershed model*

Highlights: *Offsets are occurring outside of a specific program; West Virginia's Trading/Offset Tracking List is provided to EPA on an annual basis*

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8.1 OFFSETS FOR GROWTH (NEW AND INCREASED LOADS)

As part of the implementation of the Chesapeake Bay TMDL, the Chesapeake Bay states are expected to account for any growth – i.e., new or increased loadings of nitrogen, phosphorus and sediment (see Section 10 of the Chesapeake Bay TMDL).

New point source dischargers are expected to offset their entire loading, while existing point source dischargers that increase their loading are expected to offset the entire increase in their loading. New or increased loading from nonpoint sources (or sources other than permitted point source dischargers) are expected to be estimated to calculate the offsets necessary to compensate for the entire estimated increase in pollutant load. The new or increased loadings can be offset by loading reductions and credits generated by other sources through offset programs that are based on the definitions and 10 common elements described in Appendix S of the Chesapeake Bay TMDL (Appendix S).

The 10 common elements are not regulatory requirements but are assumptions in the TMDL meant to ensure that offsets are achieved through reliable controls. The common elements for offset programs are: 1) authority (to implement, monitor and enforce such offsets), 2) offsets baseline (for credit generators), 3) minimum controls (for credit users), 4) eligibility requirements, 5) credit calculation and verification, 6) safeguards, 7) certification and enforcement, 8) accountability and tracking systems, 9) offsets in nutrient-impaired segments must protect water quality standards, and 10) credit banks (roles and operating practices are specified).

The goals of West Virginia's Phase III WIP were based on forecasted land uses, animals, and populations for the year 2025 to account for expected growth through 2025. This approach, coupled with biannual Chesapeake Assessment Scenario Tool updates to refine 2025 projections, adequately accounts for growth and/or changing load contributions. West Virginia's Phase III WIP contrasts with the Phase II WIPs that were planned on past land use, animals, and populations and for which greater emphasis was required to address new and increased loads from growth and other changing conditions.

The West Virginia Phase III WIP provides nutrient loads for all point sources in existence at the time of its development that are consistent with Chesapeake Bay TMDL wasteload allocations. Point sources must maintain compliance with Phase III WIP loads in perpetuity or offset new or expanded loads. Offset scenarios are evaluated on a case-by-case basis and are documented and controlled through the

NPDES permit requirements. The West Virginia Phase III WIP specifies that offsets must be based upon new activities that generate new loads.

Most offsetting actions that occurred over the Phase II WIP implementation period were point source to point source scenarios where the validity of the offset was easily accomplished through the NPDES permits of the exchanging parties. One past scenario involved the expansion of point source loading via offsets provided by nonpoint source activity. Requirements to accomplish the nonpoint source offset were included in the point source's NPDES permit. Although future offsetting of increased point source loading by nonpoint source activity remains possible, point source to point source activities are expected to be most prevalent.

The calculation of the offset nutrient reduction value can be determined, case-by-case, through the Chesapeake Bay watershed model. Offsets will be based upon delivered loads to account for variability in delivery. Pollutant equivalency will be ensured by using N:P exchange ratios provided by the Phase 6 watershed model. Certainty will be provided by enforceable NPDES permit conditions that are subject to EPA review. Any offset calculations for new or increased loadings from NPDES facilities are described in the fact sheets associated with draft NPDES permits for which there is an opportunity for public notice and comment. All offsets have and will continue to be tracked and reported.

The wasteload allocations provided for wastewater treatment plants (WWTPs) are based on design flows and most existing facilities currently operate at flows that are less than design flows. As such, West Virginia does not anticipate a large need for offsets prior to 2025. Many past actions were associated with the assimilation of small sewage treatment facilities by larger publicly owned facilities that gained control of and banked the loads of the assimilated facility to counter future growth needs. If the needs become greater, the implementation of advanced wastewater treatment will allow more flow to be treated while maintaining established loads. NPDES permits require WWTPs to develop plans of action to address growth when the average flow of treated wastewater reaches 90 percent of design flow.

Based upon existing conditions and past experience, West Virginia is confident that it can accomplish Phase III WIP expectations in a manner acceptable to EPA and in compliance with the Chesapeake Bay TMDL without a formal program.

8.2 RESOURCES

Chesapeake Bay Total Maximum Daily Load (TMDL)

Section 10 of the Chesapeake Bay Total Maximum Daily Load (TMDL)

Appendix S of the Chesapeake Bay Total Maximum Daily Load (TMDL)

West Virginia's Phase II Chesapeake Bay Watershed Implementation Plan (WIP)

West Virginia's Phase III Chesapeake Bay Watershed Implementation Plan (WIP)