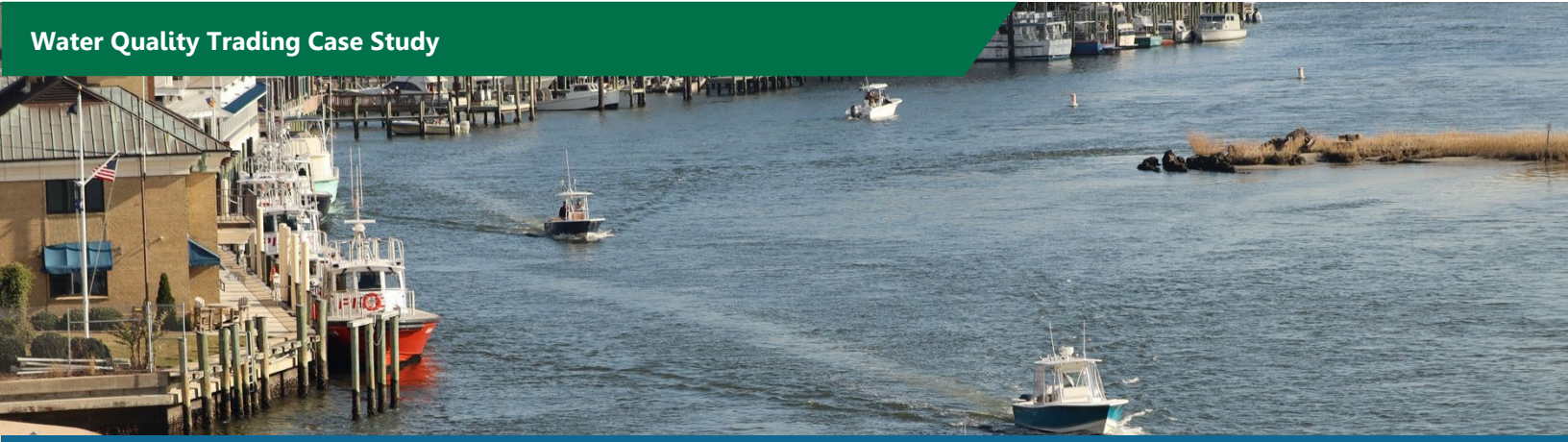

Virginia's Chesapeake Bay Watershed Nutrient Credit Exchange

Overview

Type of Trading

Point Source–Point Source

Point Source–Non-point Source (through the Nutrient Offset Fund)

Pollutant(s) Traded

Total nitrogen (TN)

Total phosphorus (TP)

Basis for Trading

TN and TP wasteload allocations in Virginia Tributary Strategy, Chesapeake Bay TMDL, and Watershed Implementation Plans

Participants

VPDES-permitted dischargers to the Chesapeake Bay and its tributaries and the Virginia Nutrient Credit Exchange Association

In 2005, Virginia adopted legislation (Article 4.02 of the Code of Virginia) that authorized the creation of the Chesapeake Bay Watershed Nutrient Credit Exchange Program to help point and nonpoint sources meet nutrient load reduction goals in Virginia's Chesapeake Bay Tributary Strategy. The exchange program is implemented through the watershed-based Virginia Pollutant Discharge Elimination System (VPDES) general permit for discharges of total nitrogen (TN) and total phosphorus (TP) to the Chesapeake Bay and its tributaries. Section 62.1-44.19:14 of the statute requires the State Water Control Board to issue this general permit. The general permit has been updated several times to reflect new requirements. Virginia DEQ first issued the general permit in 2007 to implement wasteload allocations developed from the Tributary Strategy. Then, EPA's 2010 Chesapeake Bay TMDL established load and wasteload allocations for nitrogen, phosphorus, and sediment, including nutrient wasteload allocations that were more stringent than those in the Tributary Strategy for the York and James River basins. Now in its third term, the general permit includes wasteload allocations for wastewater treatment facilities based on the Tributary Strategy and the Watershed Implementation Plans outlining Virginia's phased implementation strategy for the TMDL. The current general permit became effective on January 1, 2022, and expires on December 31, 2026.

VPDES-permitted facilities meeting specific discharge criteria and discharging nutrients to the Chesapeake Bay or its tributaries, as well as new and expanding facilities, must register for coverage under the general permit. The general permit establishes facility-specific individual waste load allocations based on the Chesapeake Bay total maximum daily load (TMDL) aggregate pollutant loads, watershed implementation plans, and Virginia's Chesapeake Bay Tributary Strategy. The general permit provides separate requirements for existing facilities and for new and expanding facilities

(including those which post-date the Chesapeake Bay TMDL and were not accounted for in the TMDL wasteload allocations and watershed implementation plans). Permittees may achieve nutrient load reductions to meet the wasteload allocations in the general permit through facility upgrades, nutrient credit exchanges or transfer of wasteload allocations between point sources or, in some cases, payment into the Nutrient Offset Fund to acquire credits to offset nutrient loads discharged in excess of the facility's wasteload allocation. Trades can be facilitated by the Virginia Nutrient Credit Exchange Association or occur directly between trading partners. New or expanded facilities may also have additional options to offset their increased mass loads on a case-by-case basis.

Permittees must submit compliance plans, to be updated annually, detailing implementation schedules for activities to reduce TN and TP to meet their individual wasteload allocations in the permit. Compliance plans may be submitted individually or through the Exchange Association.

Benefits

The Exchange Program was adopted, in part, to assist permittees in Virginia's Chesapeake Bay watersheds in meeting the nitrogen and phosphorus reduction goals established pursuant to the Chesapeake 2000 Agreement and subsequent tributary strategies and the Chesapeake Bay TMDL. According to the Exchange Association, its members have achieved 100 percent compliance with their nutrient wasteload allocations during each year of trading (Exchange Association, no date). The compliance "backstop" provided by the Exchange Program is a key benefit for permittees (Brockenbrough, 2023). Facilities that are planning to expand may either upgrade treatment processes to avoid an increase in TN and TP loads or purchase credits under the Exchange Program. Permittees in financially challenged jurisdictions may benefit from this flexibility as it allows those permittees to delay upgrading treatment processes until those upgrades are financially feasible, resulting in considerable cost savings (Brockenbrough, 2023).

The Virginia Department of Environmental Quality (Virginia DEQ) benefits from program efficiencies inherent in implementing the general permit in coordination with the Exchange Program. Maintaining the general permit with all permittees subject to the same permit conditions, schedules, and reporting requirements and with most of the permittees coordinating through the Exchange Association to ensure compliance, is more efficient than issuing and enforcing the nutrient load reduction requirements through more than 100 individual permits (Brockenbrough, 2023).

Summary of Trading Activity

Virginia DEQ publishes an annual notice of all nitrogen and phosphorus credit exchanges. According to the 2020 Nutrient Trades Report, all 20 facilities that exceeded their TN and TP wasteload allocations acquired enough credits to comply with the general permit requirements. In 2020, credits equating to 316,330 pounds of delivered TN and 27,803 pounds of delivered TP were sold through the Virginia Nutrient Credit Exchange Association and from permitted point sources (Virginia DEQ, 2020b). In 2019, TN credit exchanges were similar to 2020 levels (317,258 delivered pounds) and about three times as many TP credits were exchanged (87,664 delivered pounds) (Virginia DEQ 2019b).

As of 2023, most permittees, including those with new and expanding discharges, have been able to comply with their wasteload allocations through acquisition of point source credits. Only one permittee has used nonpoint source credits to offset a new or expanding discharge (Brockenbrough, 2023). (Refer to Trading Mechanisms Section for additional explanation).

Eligible Trading Partners

Every discharger in the Chesapeake Bay watershed that is authorized by a VPDES permit and meets specific discharge criteria is required to register for coverage under the General Permit for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia (General Permit No. VAN000000). All permittees are eligible to participate in trading. The criteria for registration under the general permit include any of the following:

- An existing facility that discharges 100,000 gallons or more per day from a sewage treatment works, or an equivalent load from an industrial facility, directly into tidal waters, or 500,000 gallons or more per day from a sewage treatment works, or an equivalent load from an industrial facility, directly into nontidal waters.
- A facility that discharges 40,000 gallons or more per day from a sewage treatment works, or an equivalent load from an industrial facility, directly into tidal or nontidal waters and that is applying for a new or expanded discharge and subject to an offset requirement in the general permit or to a technology-based requirement.
- A domestic sewage treatment facility discharging greater than 1,000 gallons per day up to and including 39,999 gallons per day, that commenced discharging on or after January 1, 2011 and is subject to an offset requirement in the general permit.

Nonpoint sources and regulated dischargers not eligible for coverage under the general permit may generate credits for sale to the Nutrient Offset Fund, subject to baseline requirements described in the Credit Generation section below.

Market Driver

The Chesapeake 2000 Agreement created the impetus to create the trading program and this program has been revised to implement the Chesapeake Bay TMDL. As one of the signatories to the Agreement, Virginia agreed to develop nitrogen and phosphorus load reductions and implement a revised Tributary Strategy to achieve them. The Nutrient Credit Exchange Association estimated it would cost the discharging facilities $1.5 billion to upgrade members' wastewater treatment technology to meet the resulting nutrient wasteload allocations (Commonwealth of Virginia, 2010). Dischargers were concerned about the availability of funding, contractors, and construction resources to make the necessary upgrades, as well as their ability to meet the new load limits while still allowing for economic growth in the region. The Exchange Program was developed to ease the demands and costs of construction while ensuring compliance with the VPDES regulations and the Chesapeake 2000 Agreement.

Subsequent adoption of the Chesapeake Bay total maximum daily load (TMDL) in 2010 resulted in additional nutrient wasteload allocations. Under the general permit, permittees may exchange nutrient credits to meet wasteload allocations derived from both the TMDL and the Tributary Strategy.

Virginia DEQ adjusts the wasteload allocations using a delivery factor that reflects the portion of a permittee's TN or TP load that reaches the Chesapeake Bay. The adjusted allocation is called the delivered wasteload allocation. Delivery factors are calculated using the Chesapeake Bay Program watershed model and are based on the permittee's location in one of five Chesapeake Bay basins: Eastern Shore, James River, Potomac River, Rappahannock River, and York River. VA DEQ maintains registration lists that include individual wasteload allocations for all general permittees. Table 1 presents the total TN and TP wasteload allocations and delivered wasteload allocations for all

permittees in each basin from the 2017 registration lists.[1]

Table 1. Basin Total TN and TP Wasteload Allocations (WLA) and Delivered WLAs*

Watershed	Total Nitrogen		Total Phosphorus	
	WLA	Delivered WLA	WLA	Delivered WLA
Rappahannock	597,007	465,329	45,273	41,730
York	1,099,096	985,106	128,059	127,200
James**	13,270,971	12,225,921	913,312	840,791
Potomac	4,785,846	2,765,192	250,515	176,196
Eastern Shore	37,461	37,461	2,237	2,237

* WLA and delivered WLA amounts are from 2017 registration lists.
** Certain facilities in the James River Basin are subject to reduced wasteload allocations to meet dissolved oxygen water quality criteria in the James River as outlined in the Phase I Watershed Implementation Plan. Facilities with reduced allocations are listed in Title 9 of the Virginia Administrative Code (9VAC) section 25-820-80.

Permittees may choose to meet their applicable wasteload allocations by purchasing credits generated by point sources. The number of credits needed to be purchased in a given year to meet a permittee's wasteload allocation must equal the amount by which the delivered load (actual load multiplied by the delivery factor) exceeds the delivered wasteload allocation (wasteload allocation multiplied by the delivery factor), adjusted by any applicable trading ratios. If insufficient point source credits are available, a permittee may make a payment to the Nutrient Offset Fund to offset its nutrient load in excess of its wasteload allocation. The payment amount is specified in the general permit regulation (9VAC section 820-70) and is adjusted with each permit renewal. The current regulation, which became effective in 2017, establishes Nutrient Offset Fund payment amounts at $5.08 per pound for nitrogen and $11.15 per pound for phosphorus.

Additional legislation requires the establishment of a Phase III Watershed Implementation Plan Enhanced Nutrient Removal Certainty Program beginning in 2023 consisting of lower TN and TP waste load allocations assigned to priority water treatment facilities with schedules for compliance. Reduced wasteload allocations for those projects likely will create additional demand for nutrient credits under the Exchange Program, which may encourage facilities to upgrade treatment to generate credits.

Trading Mechanisms

The Exchange Program is implemented though the general permit. The current general permit became effective on January 1, 2022, and expires on December 31, 2026. The general permit includes the TN and TP annual wasteload allocations, compliance schedules, compliance plans, and monitoring and reporting requirements. The general permit supersedes the requirements of the facilities' individual VPDES permits pertaining to TN and TP, except where site-specific conditions (e.g., local water quality standards, TMDLs, federal effluent guidelines) necessitate more restrictive limits.

Permittees must comply with applicable wasteload allocations specified for each facility in registration lists maintained by Virginia DEQ. As described in the overview section permittees have several options to comply with their wasteload allocations depending on whether the general permit classifies them as existing or new and expanding facilities. In either case the permittee may choose to purchase water quality credits, or trade.

Owners of multiple facilities have the option of combining the nutrient wasteload allocations of those

[1] The 2022 General Permit established new TN and TP delivery factors that will be phased in in 2026.

facilities to create an aggregate nutrient cap. Combining allocations allows the owner to meet the overall aggregate cap by collectively managing the nutrient loads of each individual facility.

The permit establishes the conditions by which credits may be exchanged or offsets may be acquired. In general, credits must be applied in the same tributary and in the same calendar year that they are generated. In all cases, Nutrient Offset Fund payments may only be used to comply with a wasteload allocation if sufficient credits are not available in the Exchange or through direct trades between permittees to meet a facility's requirement.

Permittees can trade with one another directly or can voluntarily participate in the Exchange Association, which coordinates and facilitates nutrient credit trading among its members. The Exchange Association also maintains and annually submits an updated compliance plan on behalf of its members. Membership in the Exchange Association is open to all permittees, including new and expanding facilities with applicable wasteload allocations. Currently, 73 owners of 105 treatment facilities participate in the Exchange Association (Exchange Association, n.d.).

Credit Generation

When a permittee discharges less than its annual TP or TN wasteload allocation, the difference (in pounds) between the wasteload allocation and the actual discharged load is available for conversion to saleable credits using an applicable delivery factor. Delivery factors are calculated using the Chesapeake Bay Watershed Model. Credits are expressed as pounds per year of delivered TN or TP load.

The State Water Control Law (Code of Virginia section 62.1-44.19:20) establishes criteria for baselines that must be met before generation of nonpoint source credits that would be exchanged through the Nutrient Offset Fund. This law states that for agricultural practices, applicable baselines are the "actions necessary to achieve a level of reduction assigned in the Virginia Chesapeake Bay TMDL Watershed Implementation Plan or approved TMDLs." For land use conversion, the baseline for credit generation is also based on the TMDL-assigned load reduction for the pre-conversion land use. Baselines for other nonpoint source credit-generating practices are established based on the TMDL and the best available scientific and technical information.

Pollutant Trading Ratios

The Exchange Program uses delivery factors to calculate the number of credits that must be exchanged between individual point sources. The delivery factors account for discharge location within the watershed and nutrient attenuation during riverine transport. These facility-specific delivery factors are calculated using the Chesapeake Bay Watershed Model, with the maximum ratio capped by Virginia DEQ at 1.00.

In general, credits must be exchanged in the same basin where they are generated; however, Eastern Shore facilities may also acquire credits from Potomac Basin facilities at a trading ratio of 1:1 or from Rappahannock River basin facilities at a trading ratio of 1.3:1.

In addition to using the delivery factor described above, offsets purchased from nonpoint source best management practices are traded at the ratio of 2 pounds reduced by the best management practice for every 1 pound the new or expanding facility proposes to discharge (i.e., a 2:1 uncertainty ratio).

Monitoring and Assessment

Permittees are required to monitor their discharges for TN, TP, and effluent flow. Each permittee is required to submit an annual discharge monitoring report. Due by February 1 of each year, these reports indicate the facility's annual mass load of TN and TP discharged during the previous calendar year. Permittees that meet their wasteload allocation through purchase of point source credits or payments to the Nutrient Offset Fund must complete an annual credit exchange notification form stating that sufficient credits were acquired to satisfy the permittee's compliance obligations.

Virginia DEQ's annual Nutrient Trades reports include the previous year's annual mass loads of TN and TP, the delivered total loads of nitrogen and phosphorus, and the number of nitrogen and phosphorus credits acquired or exchanged for all facilities exchanging credits.

Challenges

Although permittees actively participate in trading through the Exchange Program, the structure of the program can incentivize bilateral trading outside the exchange if demand for credits is low. Within the exchange, credit buyers purchase credits at the price set by the exchange and the proceeds from credit sales are shared among all participants that generate credits. Therefore, if credit generation far exceeds the demand for credits, the price received by credit sellers through the exchange is low. In this case, a bilateral trade outside of the exchange might result in a lower price for buyers and higher proceeds for sellers (Brockenbrough, 2023).

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