COMMONWEALTH OF VIRGINIA

Department of Environmental Quality

Subject: Guidance Memo No. GM25-2005

To: Banking Program Staff

From: Trisha Beasley, Director of Operations Trisha Beasley

Date: October 22, 2026

Copies: Shoreline Restoration Practitioners and Nutrient Bank Stakeholders

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Summary:
The purpose of this guidance is to provide clarification on the requirements of 9VAC25-900-80: Procedure for application for certification of nutrient credits (Section 80) for shoreline management project applications through the Nonpoint Source Nutrient Trading Program. This guidance supersedes the interim approach document published on November 21, 2024.

Electronic Copy:
Once effective, an electronic copy of this guidance will be available on:

- The Virginia Regulatory Town Hall under the Department of Environmental Quality (http://www.townhall.virginia.gov/L/gdocs.cfm?agencynumber=440);
- The department's website at (https://www.deq.virginia.gov/permits/water/nutrient-trading)

Contact Information:
Please contact Tyler Monteith, Office of Permitting Assistance, (804) 489-1809, Tyler.Monteith@deq.virginia.gov, with any questions regarding the application of this guidance.

Certification:
As required by Subsection B of § 2.2-4002.1 of the APA, the agency certifies that this guidance document conforms to the definition of a guidance document in § 2.2-4101 of the Code of Virginia.

Disclaimer:
This document is provided as guidance and, as such, sets forth standard operating procedures for the agency. However, it does not mandate or prohibit any particular action not otherwise required or prohibited by law or regulation. If alternative proposals are made, such proposals will be reviewed and accepted or denied based on their technical adequacy and compliance with appropriate laws and regulations

Nutrient Reduction Crediting Procedure for Shoreline Management Projects

Overview

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1. Introduction

In 2005, the Virginia General Assembly created the Chesapeake Bay Watershed Nutrient Credit Exchange Program to allow Virginia's point and nonpoint sources of nutrient pollution in the Chesapeake Bay watershed to meet required nutrient reductions through trading (VA Code § 62.1-44.19:12 et seq). Certain credits generated through this program are also transferable for post-construction stormwater water quality compliance purposes in accordance with the Virginia Erosion and Stormwater Management Act (VA Code § 62.1-44.15:35), for compliance with Municipal Separate Storm Sewer System (MS4) Program permits (VA Code § 62.1-44.19:21), and the Virginia Soil and Water Conservation Board's Guidance Document on Stormwater Nonpoint Nutrient Offsets approved on July 23, 2009. Regulations on the certification of nutrient credits (9VAC25-900) became effective on September 1, 2020.

Beginning in the fall of 2022, the Nonpoint Source Nutrient Trading Program (Program) began accepting applications for shoreline management projects. The Program certifies nutrient reductions that can be sold in an off-set market and utilizes the Chesapeake Bay Program's (CBP) "Recommendations of the Expert Panel to Define Removal Rates for Shoreline Management Projects" as the basis for crediting methodologies. However, some credit calculation factors and data methodologies included in the expert panel report allowed States to utilize their own judgement when crediting shoreline management projects. Depending on those determinations, the number of nutrient credits generated by each project can vary significantly.

On November 21, 2024, DEQ developed "Procedures for Nutrient Crediting of Shoreline Management Projects" to serve as an interim approach document to evaluate shoreline management project applications submitted to the Nonpoint Source Nutrient Trading Program until formal guidance was developed. On March 6, 2025, a Stakeholder Advisory Group was convened to advise staff on the drafting of this formal guidance document. The group held two stakeholder meetings where input was provided on the creation of this document. This guidance document supersedes the crediting criteria contained in the interim document developed on November 21, 2024, and will be utilized to evaluate shoreline management projects submitted to the Nonpoint Source Nutrient Trading Program as of the effective date of this guidance. Crediting criteria not outlined in this document should adhere to CBP's *Recommendations of the Expert Panel to Define Removal Rates for Shoreline Management Projects* (amended 2019), including the basic qualifying conditions in Section 4.

2. Definitions

Disclaimer:

Some definitions provided in this guidance are not defined in the Code of Virginia and have been included to provide clarification. These definitions should not be interpreted to change the meaning of any definitions in the Code of Virginia or Certification of Nonpoint Source Nutrient Credits regulation (9VAC25-900). The following words and terms when used in this guidance document have the following meanings unless the context clearly indicates otherwise:

"Annual rate of shoreline erosion" (ft/yr) means the mean shoreline change (ft) for the site divided by the number of years between the current and the 2009 historic shoreline identifiers.

"ASTM" means the American Society for Testing and Materials in reference to soil sampling and processing standard procedures.

"Bulk density" means the mean value of bulk density from soil samples in each stratum.

"Erodible bank height" means the measured vertical distance between the mean high water line and the top of bank based on a site-specific shoreline survey. In circumstances where the mean high water line falls below the observable eroding bank face, the erodible bank height should be measured as the vertical distance between the toe of bank to the top of bank based on a site-specific shoreline survey.

"Expert Panel Report" means the Chesapeake Bay Program *Recommendations of the Expert Panel to Define Removal Rates for Shoreline Management Projects*, Amended by WTWG and WQGIT: June 2017. Further Amended November 2019.

"Fastland erosion" means erosion that occurs along the tidal shoreline above the mean high water line.

"Littoral drift" means the process where wave energy and water currents transport sand and other sediment parallel to the shoreline.

"Mean high water line" means the point on a shoreline which represents the intersection of the fastland with the water surface at the elevation of mean high water. The site-specific mean high water line should be determined by a practicing professional surveyor licensed in the Commonwealth of Virginia.

"Nearshore erosion" means erosion that occurs along the tidal shoreline below the mean high water line.

"Reach" means a segment of a shoreline where influences and impacts, such as wind direction, wave energy, littoral transport, etc., mutually interact.

"Sand reduction factor" means the reduction in eligible prevented sediment credit calculations to account for beneficial sand contributions to tidal waters that is not considered to be a detriment to water quality. This is determined from the site specific soil sampling activities and represents the fraction of the sediment that are fine soil grain size (i.e. silt/clay).

"Shoreline" means the intersection of the land with the water surface. The shoreline shown on figures represents the line of contact between the land and a selected water elevation. In areas affected by tidal fluctuations, this line of contact is the mean high water line.

"Shoreline length" means the length of the area protected by the shoreline management project, measured as a straight line behind the installed structures (first and last, including gaps) between the 25-foot transect intervals (extending from the first structure to the last structure, including any gaps between intermediate structures).

"Strata layers thickness" means the mean thickness for the strata based on 25-foot transect increment measurements.

"Transect location" or "Transect" means 25-foot interval locations perpendicular to the historic shoreline identifier across the entire project length. Shoreline annual erosion rates should be collected at each transect location. Transect location 25-foot intervals are also utilized in measuring shoreline project length. Transect measurements should be reset at the start of each shoreline reach.

"Toe of bank" means the break in slope at the foot of a bank, where the bank meets the channel bed or water's edge.

"Top of bank" means the point where the slope breaks and vegetation along the bank slope is no longer rooted due to active shoreline erosion. Often identified by an abrupt change of slope, this area should not include upland or landward rill or gully erosion.

3. Applicability

This guidance document supersedes the crediting criteria contained in the interim document developed on November 21, 2024, and will be utilized to evaluate tidal shoreline management projects submitted to the Nonpoint Source Nutrient Trading Program as of the effective date of this guidance. This guidance document focuses on credit calculation procedures as they relate to Protocol 1 (Expert Panel report). Additional information regarding credit reductions associated with projects not addressing the critical angle of repose can be found in section 4.*v. Prevented Pollutant Load Calculations*. All crediting criteria not outlined in this document should adhere to the Expert Panel Report. The credit calculation parameters in this document are intended to only apply to shoreline management nutrient bank applications through the Nonpoint Source Nutrient Trading Program for the generation of perpetual nutrient credits.

4. Protocol 1 Prevented Sediment - Nutrient Reduction Crediting Calculations

i. Identification of Shoreline Reaches

Shoreline reaches are defined as a segment of shoreline where the erosion processes and responses mutually interact. Shoreline management projects should be broken into homogenous, representative reaches that take into consideration changes to the following site conditions:

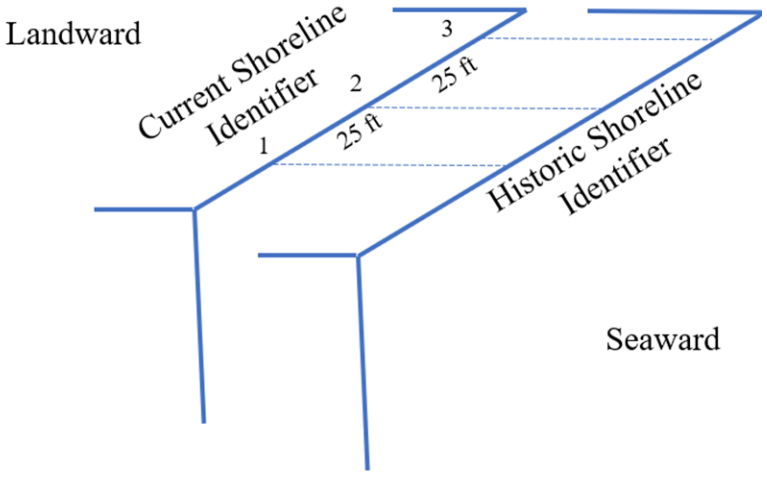
- Changes in shoreline erosion and accretion rates, as well as identifying sources of sediment supply

- Changes in wave direction leading to differences in littoral drift
- Changes in soil stratum profiles and bank heights
- Changes in potential and active nutrient loading sources from upland land uses
- Additional factors influencing erosion including groundwater seepage, freezing and thawing, surface runoff, or other processes

Applicants should clearly identify shoreline reaches in the application, along with justification for how these reaches were selected. In order to determine the total nutrient credits generated by the entire project, applicants should calculate the number of credits generated by each reach and then aggregate those individual reach totals. Additional information on reach assessments can be found in *Appendix D: Shoreline Management in Chesapeake Bay: A Comprehensive Approach in the CBP Recommendations of the Expert Panel to Define Removal Rates for Shoreline Management Projects (amended 2019).* Failure by an applicant to provide justification of shoreline reach determination identified in this section of the application may delay DEQ's ability to verify appropriate shoreline reaches.

ii. Average Annual Erosion Rate Calculation

The annual rate of shoreline erosion is a critical calculation that has the potential to greatly influence prevented nutrient calculations in shoreline management projects. The annual rate of shoreline erosion is calculated by measuring the distance between a historic and a current shoreline, at 25-foot transect intervals. The 25-foot transect intervals should reset at the start of each shoreline reach. The shoreline change for all 25-foot transects within a reach are then averaged. This reach average shoreline change is then divided by the number of years between the two datasets to generate an annual rate of shoreline erosion in feet per year, for each reach. See Figure 1 below for a visual representation of identifying and calculating annual rate of shoreline erosion.



$$Annual\ Shoreline\ Erosion\ Rate, \frac{ft}{yr} = \frac{Mean\ Shoreline\ Change, ft}{[Current\ Shoreline\ Year - Historic\ Shoreline\ Year]}$$

Figure 1. Visual representation of how to determine annual rate of shoreline erosion by reach

The components of this calculation should utilize the following criteria:

a. Current Shoreline Identification

A consistent geomorphic point of reference is a critical factor for accurate measurement of shoreline erosion rates. For the purpose of crediting shoreline management projects through the Nonpoint Source Nutrient Trading Program, the top of bank should be utilized as the geomorphic point of reference for shoreline identification.

In order to establish the most current shoreline identifier, applicants should conduct a present day shoreline survey to identify the location of the top of bank, toe of bank, and the mean high water line across the entire project length. The shoreline survey submitted with the application should contain the stamp of a practicing professional surveyor (licensed in the Commonwealth of Virginia) signifying that a practitioner assumes professional responsibility for the accuracy of the location of these geomorphic reference points (i.e., mean high water line). In addition to the certified survey, applicants should also provide time stamped aerial imagery, as close to the survey date as possible, in order to validate the present shoreline identification. Failure by an applicant to prove the components identified in this section in the application may delay DEQ's ability to establish and verify the most current shoreline identifier.

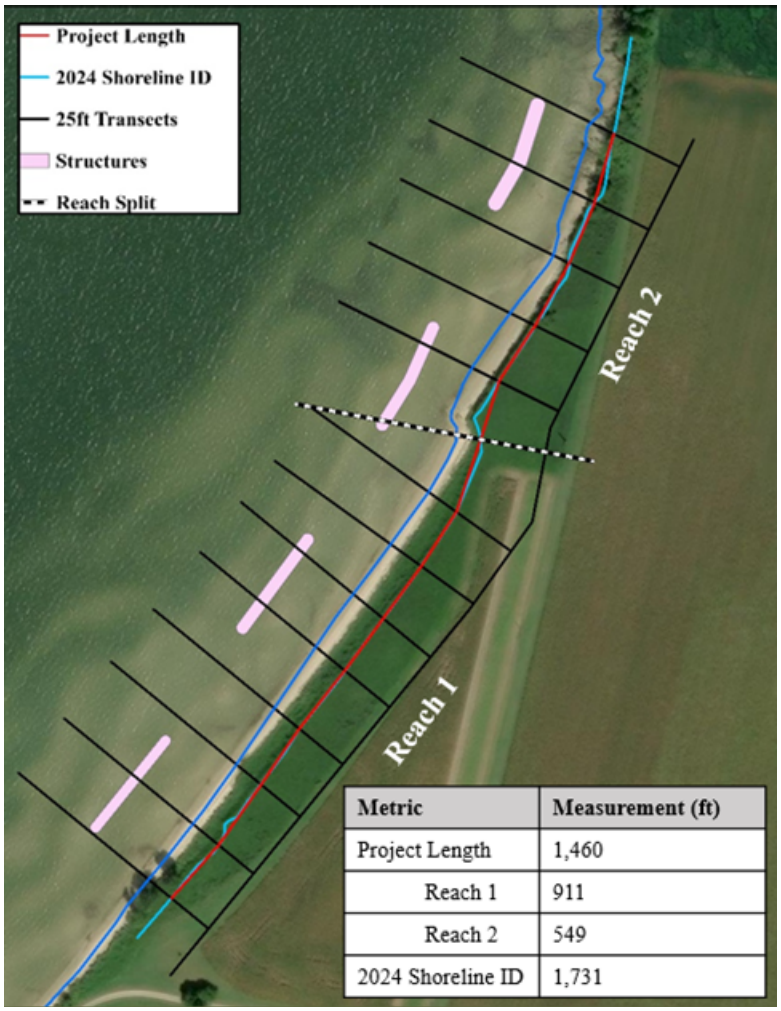
b. Historical Shoreline Identification

Applicants should utilize the 2009, 12-inch resolution Virginia Geographic Information Network (VGIN) orthophotography as the baseline shoreline imagery for identifying top of bank and establishing the baseline historical shoreline location for calculating average annual erosion rates. Applications should include a historical conditions map with the shoreline top of bank digitized on the reference VGIN imagery overlaying the same 25-foot transect intervals as the present-day shoreline identifier. In addition to VGIN imagery, applicants may reference Near-Infrared (NIR) or Normalized Difference Vegetation Index (NDVI) imagery to assist in the identification of the top of bank location.

In addition to the 2009 baseline VGIN imagery, applicants should provide at least two additional years of aerial imagery, temporally spaced as equally as possible based on availability of aerial imagery, with the digitized top of bank shoreline overlaid on each exhibit. The geomorphic point of reference identified during the current shoreline survey and interim aerial imagery years is to be consistent with the historical shoreline location determination. A final composite exhibit that includes the digitized top of bank shoreline feature in the baseline year (2009), two interim years, and most recently taken aerial imagery, with the digitized 25-foot transects should be provided. Failure by an applicant to provide the components identified in this section in the application may delay DEQ's ability to establish and verify the most current shoreline identifier.

iii. Shoreline Length

The final critical component to calculating prevented pollutant loading from shoreline management projects is the measurement of the protected shoreline length associated with the project area. Measuring a highly sinuous shoreline, as opposed to one that is much more linear in nature, will inflate nutrient reduction crediting rates beyond what is being achieved on site. To avoid crediting additional project linear footage, applicants should identify and measure the protected shoreline length spanning behind the installed structures (and intermediate gaps) parallel to the shoreline. This is accomplished by overlaying the surveyed top of bank with the previously established 25-foot transect intervals used for calculating annual rates of shoreline erosion. The top of bank current shoreline identifier should then be traced as a straight line between each 25-foot transect. This methodology removes the inclusion of sinuous shoreline crediting. This measurement should begin at the start of the first installed structure and terminate at the end of the last installed structure (including intermediate structures and gaps), thereby identifying the project's protected shoreline length. The project's protected shoreline length can then be divided based on a reach by reach basis. An example of this procedure is seen below in Figure 2, identified by the red "Project Length" feature. Failure by an applicant to provide the components identified in this section in the application may delay DEQ's ability to establish and verify the shoreline length.



Metric	Measurement (ft)
Project Length	1,460
Reach 1	911
Reach 2	549
2024 Shoreline ID	1,731

Figure 2: Visual representation of the procedure to determine project length based on protected project area

iv. Bank Height

For calculation procedures under Protocol 1, DEQ will review the measurement of bank height for prevented sediment erosion to only include fastland erosion and not nearshore erosion occurring below the high water line. Utilizing the same soil sampling locations established under section v. below, applicants should measure bank height beginning perpendicular to the surveyed mean high water line and terminating at the elevation of the surveyed top of bank location. If the mean high water line is identified to be lower than the identified toe of bank, where no exposed bank face is visible, then the measurement of bank height should be measured perpendicular to the identified toe of bank and terminating at the elevation of the surveyed top of bank location. In addition to the measurement of bank height, the strata thickness of each identifiable soil layer should also be measured. The bank height measurements at each soil sample location should equal the summation of each observable soil strata thickness. The bank height should then be averaged on a per reach basis. Failure by the applicant to provide the components identified in this section in the application may delay DEQ's ability to establish and verify shoreline bank heights.

v. Soil Sampling Criteria

For nonpoint source nutrient credit certification pursuant to 9VAC25-900, shoreline management projects should utilize site specific soil samples and lab results for undisturbed bulk density, sand content (i.e., grain size analysis), total nitrogen content, and total phosphorus content. All soil sample data included in the application should be produced by a laboratory certified for those parameters under the Virginia Environmental Laboratory Accreditation Program (VELAP; Virginia laboratories), the National Environmental Laboratory Accreditation Program (NELAP), or equivalent state accreditation program (laboratories in other states).

There is high variability in soil test results between sites and between strata, but soil results from the same strata on the same site tend to be relatively uniform. The critical soil sampling factors are (i) that samples are taken for each observable soil strata across the bank height at each soil sampling transect for nutrient content, bulk density, and a sand reduction factor, (ii) that soil sample locations document changes in strata composition across the site on a per reach basis, and (iii) that calculations provide a weighted average of stratum composition. In addition to nutrient and grain size analysis, applicants should measure thickness of each identifiable soil strata layer so the sampled nutrient contents can be directly tied back to the relative thickness of each soil strata. As mentioned in the previous section, the summation of each soil strata thickness should also calculate the shoreline bank height at each soil sampling transect. The data collected at the soil sampling locations should be averaged on a per reach basis.

Soil sampling transects should be approximately evenly distributed along the length of the project area. If soil sampling transects cannot be evenly distributed, the applicant should provide justification as to how their transects are representative of the project area. At least two soil sampling transects should be located within each identified reach. At least one soil sample should be collected from each soil strata at each soil transect approximately at the center of each stratum, to the greatest extent possible, as illustrated in Figure 3 below.

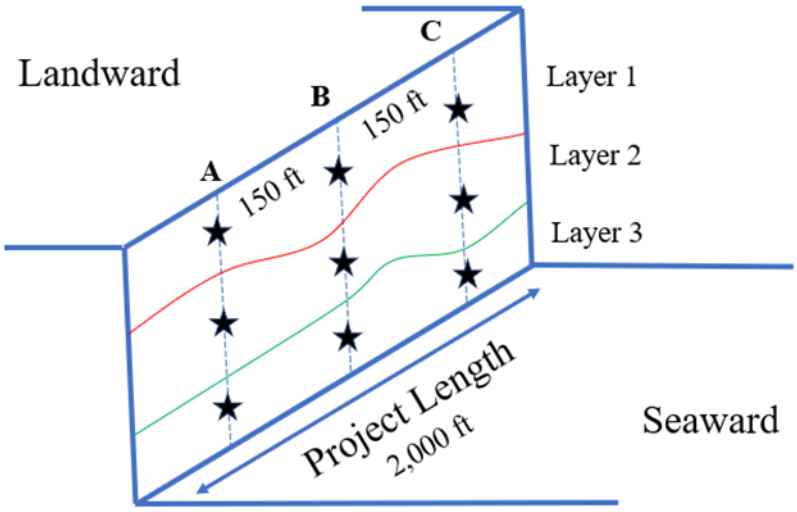


Figure 3. Identification of soil sampling transects conducted on a per reach basis. A, B, and C represent sampling transects for the determination of strata layer thickness, where the star symbology indicates soil sample locations.

The following soil sampling minimum transect frequencies are recommended based on the project's protected shoreline length:

- Less than 1,500 feet - transect every 100 feet
- Between 1,500 feet and 2,500 feet - transect every 150 feet
- Greater than 2,500 feet - transect every 200 feet

This frequency is intended to capture significant changes in soil data that may occur due to geological and/or land use changes while not being overly cumbersome. The following criteria should also be considered during soil sampling:

- Soil samples should be obtained from the actively eroding face of the bank. The exposed bank face should be "cleared" to expose a fresh swath of strata.
- Visual identification of soil strata/horizons is appropriate to determine how many layers/strata are in the bank being assessed. Once layers are defined, the relative thickness of each stratum, for each reach, relative to the total bank height, should be calculated. Measurement of strata thickness should be performed at the same transects where the soil sampling occurs. Photo documentation for soil strata at each assessment location and location of sample should be GPS located.
- Soil samples should be obtained from each observable soil strata at each soil sampling transect. A soil stratum is defined as a distinct soil layer with a unique color and texture as determined by field staff at the time of sampling. To the greatest extent practicable, samples should be obtained within the middle of the strata.
- Sloughed bank material from the eroding face should not be included in the soil sampling. If sloughed material is present along the entire reach, completely

obscuring the strata, the material should be manually removed with a shovel until the intact face is exposed.

- Appropriate soil sampling tools such as soil core rings and bulk density cup and cap tools should be utilized.
- Use of soil sampling/processing standard procedures is recommended, for example, as detailed in the American Society for Testing Materials (ASTM) Standard Practice for Sampling Soils or Natural Resource Conservation Service (NRCS) Field Book for Describing and Sampling Soils.

vi. Prevented Pollutant Load Calculations

Total load reduction credits for shoreline management best management practices (BMPs) are determined by four protocols:

- Protocol 1. Credit for prevented sediment
- Protocol 2. Denitrification in vegetated areas
- Protocol 3. Sedimentation in vegetated areas
- Protocol 4. Marsh Redfield ratio for vegetated areas

This guidance document focuses on Protocol 1 for prevented pollutant load calculations, which are calculated using the formulas from the Expert Panel Report. The Expert Panel Report recommends taking a 50% credit reduction for projects that do not address the project's critical angle of repose. The Expert Panel Report also acknowledges that tidal shoreline management projects that do not adequately address the critical angle of repose are at a continued risk of erosion due to wave action and usual storm events, which impact the base of the bank. The Expert Panel felt that projects not addressing the critical angle of repose are at risk for failure. Nonpoint Source Nutrient Trading Program project site selection should prioritize the ability to grade the bank to address the critical angle of repose. If site constraints do not allow for bank grading, please consult with DEQ staff regarding project eligibility.

All factors included in the equations represent averages from the data collected from each identified reach, with the exception of shoreline length. Bulk density, soil nutrient content, and grain size analysis data are to be averaged at the soil strata level by reach.

The annual rate of shoreline erosion on a per reach basis is calculated as follows:

$$Annual\ Shoreline\ Erosion\ Rate, \frac{ft}{yr} = \frac{Mean\ Shoreline\ Change, ft}{[Current\ Shoreline\ Year - Historic\ Shoreline\ Year]}$$

In order to calculate the total prevented pollutant load for a project, the site-specific soil sampling data are to be incorporated on a per reach basis as follows:

Prevented Sediment Load (lbs/yr)

$$\left\{\left[\left(\text{strata 1 bulk density, } \frac{lbs}{ft^3} \times \text{ strata 1 thickness, } ft \times \text{ strata 1 sand factor}\right) + \left(\text{strata 2 bulk density, } \frac{lbs}{ft^3} \times \text{strata 2 thickness, } ft \times \text{ strata 2 sand factor}\right) + \ldots\right] \times (\text{reach length, } ft) \times \left(\text{avg annual rate of erosion, } \frac{ft}{yr}\right)\right\}$$

Prevented Total Phosphorus (TP) Load (lbs/yr)

$$\left\{\left[\left(\text{strata 1 bulk density, } \frac{lbs}{ft^3} \times \text{ strata 1 thickness, } ft \times \text{ strata 1 phosphorus content, } lbs\right) + \left(\text{strata 2 bulk density, } \frac{lbs}{ft^3} \times \text{strata 2 thickness, } ft \times \text{ strata 2 phosphorus content, } lbs\right) + \ldots\right] \times (\text{reach length, } ft) \times \left(\text{avg annual rate of erosion, } \frac{ft}{yr}\right)\right\}$$

Prevented Total Nitrogen (TN) Load (lbs/yr)

$$\left\{\left[\left(\text{strata 1 bulk density, } \frac{lbs}{ft^3} \times \text{ strata 1 thickness, } ft \times \text{ strata 1 nitrogen content, } lbs\right) + \left(\text{strata 2 bulk density, } \frac{lbs}{ft^3} \times \text{strata 2 thickness, } ft \times \text{ strata 2 nitrogen content, } lbs\right) + \ldots\right] \times (\text{reach length, } ft) \times \left(\text{avg annual rate of erosion, } \frac{ft}{yr}\right)\right\}$$

After calculating the prevented pollutant load for each of the three pollutants, for each reach, the totals should be summed to calculate a project-wide prevented pollutant load. Applicants should provide credit calculation sheets that allow DEQ staff to verify credit calculations in a stepwise procedure. The above information in this guidance document is intended to streamline the application review process for DEQ staff. Failure to provide the components identified in this guidance may delay DEQ's ability to verify credit calculation procedures included in shoreline management project applications through the Nonpoint Source Nutrient Trading Program.

5. Additional Resources

- Expert Panel Report
  - https://www.chesapeakebay.net/files/documents/Final_Shoreline-Management_RPT__APPENDICES_12-18-19.pdf
- VIMS Shoreline Change Data
  - https://vims-wm.maps.arcgis.com/apps/webappviewer/index.html?id=cd5cf9b788d0407fb9ba5ffb494e9bae