# VIRGINIA PENINSULA COMMUNITY COLLEGE

## Chesapeake Bay TMDL Action Plan Phase III

General Permit No. VAR040087

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#### **Executive Summary**

Virginia Peninsula Community College (VPCC) is permitted to discharge stormwater from the college's municipal separate storm sewer systems (MS4s) by maintaining coverage under the General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Small MS4s (MS4 General Permit). In part, the MS4 General Permit requires the college meet special conditions for the Chesapeake Bay Total Maximum Daily Load (TMDL). Included as a special condition is the development of the VPCC Chesapeake Bay TMDL Action Plan (Action Plan) that, in part, identifies means and methods the college will employ to achieve reductions in total phosphorus (TP) and total nitrogen (TN) loadings discharged from the college's regulated campuses. Permittees have been afforded three permit cycles, beginning with the 2013-2018 cycle, followed by the 2018-2023, and finally, the 2023-2028 cycle, to achieve 5%, an additional 35% and finally 100% of the required TP and TN loading reductions, as calculated using loading rates and percent-reduction requirements provided in the MS4 General Permit.

VPCC successfully achieved the pollutant reductions required during the 2013-2018 permit cycle. At the Hampton campus, reduction targets were achieved with the implementation of a street sweeping program that measured material swept and analyzed samples to quantify TP and TN load reductions. At the Historic Triangle campus, an off-campus regional stormwater management facility maintained by James City County provides the entirety (100%) of the required reductions for the campus; and thus, no further practices are required.

DEQ issued new guidance for quantifying pollutant reductions from street sweeping in DEQ Guidance Memo No. 20-2003 (DEQ Guidance), dated November 11, 2020. The new DEQ Guidance dramatically reduced the TN and TP reduction credits that could be achieved by VPCC by street sweeping, resulting in the practice as no longer a feasible option to achieve required pollutant loading reductions. Subsequently, VPCC contracted H2R Engineering, Inc., to perform a compliance reassessment that evaluated all of the potential means and methods that could be implemented at the Hampton Campus. The reassessment identified feasible options and identified the purchase of nutrient (TN and TP) credits as the most cost-effective and feasible option to achieve the entirety of required reductions for all permit cycles, no longer requiring the annual street sweeping program. Credits were purchased by VPCC in September 2023, in accordance with Part II.A.11 of the MS4 General Permit, resulting in full compliance of pollutant reductions.

#### **1.0** Introduction

Virginia Peninsula Community College (VPCC) has developed, implements and enforces a municipal separate storm sewer system (MS4) program designed to reduce the discharge of pollutants from the college's municipal separate storm sewer systems (MS4s) to the maximum extent practicable (MEP) in accordance with the General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Small MS4s (MS4 General Permit). The purpose of the program is to protect water quality and to satisfy the appropriate water quality requirements of the State Water Control Law and its attendant regulations.

Compliance with the MS4 General Permit, in part, includes Special Condition associated with applicable total maximum daily loads (TMDLs) for the Chesapeake Bay. A requirement of the special conditions is the development of a Chesapeake Bay TMDL Action Plan to identify the means and methods the college will implement to achieve required total phosphorus (TP) and total nitrogen (TN) loadings discharged from the college's MS4s at the Hampton and Historic Triangle campuses. Permittees have been afforded three permit cycles, beginning with the 2013-2018 cycle, followed by the 2018-2023, and finally, the 2023-2028 cycle, to achieve 5%, an additional 35% and finally 100% of the required TP and TN loading reductions, as calculated using loading rates and percent-reduction requirements provided in the MS4 General Permit. This Action Plan supersedes previous Action Plans developed during the previous permit cycles and, as required by the MS4 General Permit, includes:

- 1. Loading and cumulative reduction calculations, as specified by the permit (Section 2).
- 2. Pollutant loading reductions achieved as of November 1, 2023, for each pollutant of concern in each applicable river basin, including a list of BMPs to achieve reductions associated with the Chesapeake Bay TMDL, including dates implemented and reductions achieved (**Section 3**).
- 3. The BMPs to be implemented to meet any remainder of the required cumulative reductions by the end of the permit cycle, including BMP type, project name, location, removal efficiencies, calculations of expected pollutant reductions, and an implementation schedule (**Section 4**).
  - Identification of new or modified legal authorities implemented, or needing to be implemented, to achieve the required pollutant loading reductions (**Section 4**).
- A summary of any comments received as a result of an opportunity for public comment for no fewer than 15 days on any additional BMPs proposed in the third phase Chesapeake Bay TMDL action plan (Appendix A).

#### 2.0 MS4 Pollutant Discharge Characterization

Pollutant load and cumulative reduction calculations are provided in this Section for the two Chesapeake Bay river basins within which VPCC MS4 systems discharge. The loading and required reduction calculations are determined using tables provided within the MS4 General Permit and are dependent on the regulated impervious and pervious area draining to the college's MS4s, as summarized in **Table 2.1** and as shown in the mapping provided in **Appendix B**, developed with previous action plan phases. VPCC has two regulated campuses within the Chesapeake Bay watershed, including the:

- ✓ Hampton campus in the York River Basin and the
- ✓ Historic Triangle campus in the James River Basin.

Table 2.1 Summary of regulated impervious and pervious area for the VPCC campuses.

VDCC Commun	MS4 Regulated Area (acres)		
VPCC Campus	Impervious	Pervious	
Hampton campus	38.64	28.06	
Historic Triangle campus	10.23	8.06	

#### 2.1 Pollutant Loadings

Pollutant loading are computed for each campus using the calculation sheets provided in the MS4 General Permit for the respective basin within which each campus resides. The calculation sheets provide the loading rates, as pounds (lbs) per acre (ac) per year (yr), as reflected in **Table 2.2** and **Table 2.3** for computing loads from the Hampton and Historic Triangle campuses, respectively.

<b>Table 2.2</b> Hampton campus	loadings based	d on the Yor	k River Basir	n calculation s	heet provided
in the MS4 General Permit.					

Pollutant	Subsource	Loading Rate (lbs/ac/yr)	Area (acres) <sup>1</sup>	Load (lbs/yr)	Total Load (lbs/yr)
TN	Impervious	7.31	38.64	282	407
111	Pervious	7.65	28.06	215	497
тр	Impervious	1.51	38.64	58	72
11	Pervious	0.51	28.06	14	15

<sup>1</sup> Area served by the Hampton campus MS4 within the 2010 Census Urbanized Area.

Pollutant	Subsource	Loading Rate (lbs/ac/yr)	Area (acres) <sup>1</sup>	Load (lbs/yr)	Total Load (lbs/yr)
TN	Impervious	9.39	10.23	96	150
111	Pervious	6.99	8.06	56	132
тр	Impervious	1.76	10.23	18	$\mathbf{r}$
IP	Pervious	0.50	8.06	4	22

**Table 2.3** Historic Triangle campus loadings based on the James River Basin calculation sheet provided in the MS4 General Permit.

<sup>1</sup> Area served by the Historic Triangle campus MS4 within the 2010 Census Urbanized Area.

#### 2.2 Required Pollutant Reductions

The required cumulative pollutant reductions at each campus are computed for each using the calculation sheets provided in the MS4 General Permit for the respective basin within which each campus resides. The calculation sheets provide the total percentage of the loadings required for the L2 Scoping Run of the Chesapeake Bay Model, as reflected in **Table 2.4** and **Table 2.5**, for computing required reductions from the Hampton and Historic Triangles campuses, respectively. Additional pollutant reductions as a result of: (1) new sources initiating construction between July 1, 2009, through October 31, 2023, with total phosphorus loadings exceeding 0.45 lbs/acre/yr, or (2) grandfathered projects initiating construction after July 1, 2014, with total phosphorus loadings exceeding 0.45 lbs/acre/yr are not necessary since neither occurred at either regulated campus.

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	Subsource Lo		Total Load	Required	Total Load
Pollutant		Load (lbs/yr) <sup>1</sup>	Reduction	Reduction by	Reduction by
			$(\%)^2$	2028 (lbs/yr) <sup>3</sup>	2028 (lbs/yr) <sup>3</sup>
TN	Impervious	282	9	25.38	20
	Pervious	215	6	12.9	30
ТР	Impervious	58	16	9.28	10
	Pervious	14	7.25	1.02	10

**Table 2.4** Hampton campus required load reductions based on the York River Basin calculation sheet provided in the MS4 General Permit.

<sup>1</sup> From Table 2.2.

<sup>2</sup> Percentage of total load reduction per the L2 Scoping Run of the Chesapeake Bay Model.

<sup>3</sup> Represents 100% of the total load reduction, rounded per permit instruction.

			Total Load	Required	Total Load
Pollutant	Subsource	Load (lbs/yr) <sup>1</sup>	Reduction	Reduction by	Reduction by
			$(\%)^2$	2028 (lbs/yr) <sup>3</sup>	2028 (lbs/yr) <sup>3</sup>
TN	Impervious	96	9	8.64	10
111	Pervious	56	6	3.36	12
тр	Impervious	18	16	2.88	2 17
1P	Pervious	4	7.25	0.29	5.17

**Table 2.5** Historic Triangle campus required load reductions based on the James River Basin calculation sheet provided in the MS4 General Permit.

<sup>1</sup> From Table 2.3.

<sup>2</sup> Percentage of total load reduction per the L2 Scoping Run of the Chesapeake Bay Model.

<sup>3</sup>Represents 100% of the total load reduction, rounded per permit instruction.

#### **3.0** Pollutant Reduction – Phase I and II Implementation

VPCC's Phase I and II Chesapeake Bay TMDL Action Plans identified the means and methods to achieve the 5% and 40% cumulative pollutant reduction targets as follows:

- Hampton campus: annual implementation, verification of effectiveness, and documentation of street sweeping efforts.
- ✓ Historic Triangle campus: achieved with historical water quality BMP maintained by James City County that treats the entirety of the campus (credits allocated from County).

The following subsections present the total reductions achieved by July 1, 2018, at each campus and describe the BMPs implemented to achieve reductions.

#### 3.1 Hampton Campus

VPCC implemented street sweeping during the previous permit cycles towards achieving TN and TP reductions targets during both the 2013-2018 and the 2018-2023 permit cycles. However, DEQ issued new guidance for quantifying pollutant reductions from street sweeping in DEQ Guidance Memo No. 20-2003 (DEQ Guidance), dated November 11, 2020. Subsequently, VPCC contracted H2R Engineering, Inc., to perform a compliance reassessment that evaluated all of the potential means and methods that could be implemented at the Hampton Campus. The new DEQ Guidance dramatically reduced the TN and TP reduction credits that could be achieved by VPCC by street sweeping, resulting in the practice as no longer a feasible option to achieve required pollutant loading reductions, especially to achieve the 40% cumulative reduction target required by the 2018-2023 permit cycle.

VPCC achieved at least 5% of the total required reductions, as was required during the permit cycle that expired in 2018. VPCC's Phase I Action Plan specified the total annual mass of material that would be required to be annually collected to achieve the 5% target based on the Mass Loading Approach (MLA), as described in the Virginia Department of Environmental Quality (DEQ) Chesapeake Bay Action Plan Guidance Memo (VDEQ 2015). Using the MLA computation methods, VPCC's 2017-2018 MS4 annual report demonstrated that street sweeping far exceeded the 5% target of the total reduction requirement based on a total of 19.7 tons of material collected for the reporting year, as reflected in **Table 3.1**. VPCC continued annual sweeping during the 2018-2023 permit cycle to maintain compliance of the 5% reductions until

purchase of nutrient credits for the full 100% cumulative reduction requirements were purchased, described further in Section 4.

Pollutant	Reduction Required for the Phase I Action Plan (5% of total)	Reduction Provided by street sweeping in 2017-2018 <sup>1</sup>
TN	1.75	69.02
TP	0.53	27.61
TSS	191.97	8,282.82

 Table 3.1 Hampton campus Phase I Chesapeake Bay TMDL Action Plan compliance summary.

<sup>1</sup> Based on total material swept of 19.7 tons using the Mass Loading Approach (VDEQ 2015) and as provided in 2017-2018 annual reporting.

#### 3.2 Historic Triangle Campus

Consistent with the DEQ Guidance, certain credits from historic water quality BMPs can be credited towards pollutant load reductions requirements. Specifically, permittees can receive full credit from BMPs that were:

- Initially installed on or after January 1, 2006 and prior to July 1, 2009, and;
- Constructed to address water quality within the permittee's regulated service area.

The entirety of the Historic Triangle campus is treated by a regional water quality BMP, as described in the Thomas Nelson (now Virginia Peninsula) Community College Historic Triangle Campus 2013-2028 Stormwater Master Plan (Historic Triangle Master Plan), and known as the Warhill Pond. The BMP is designed as a "wet extended detention pond" and was completed in October 2006. The Historic Triangle Master Plan, available by request, includes the water quality computations for the BMP that are summarized in **Appendix C** for the purposes of this Action Plan. A description of the computational rationale is described as follows:

Computations, as described in the Historic Triangle Master Plan, demonstrate that the total required phosphorus reductions required for the Historic Triangle campuses 15-year build-out (representative of the campuses' full build-out) is estimated to be 18.92 pounds. Computations also show that 23.34 pounds of TP reductions are available to the campus from the regional BMP, a surplus of 4.42 pounds (23.34 – 18.92). The additional pollutant removal is a result of a BMP with an efficiency higher than would be necessary to achieve reductions required by the Virginia Stormwater Management Program

(VSMP) regulations and a build-out that results in less impervious cover than originally incorporated into the design of the BMP.

- A letter provided by James City County states that the County is agreeable to allowing the remaining phosphorus credits provided by the BMP be used towards the reductions required for the campus as part of the TNCC Chesapeake Bay Action Plan. Therefore, it is established that 4.42 pounds of phosphorus are available for use towards Chesapeake Bay TMDL reduction requirements.
- iii. The DEQ Guidance allows for full credit for BMPs constructed between January 1, 2006 and prior to July 1, 2009. Although the regional BMP treating the Historic Triangle campus was designed to treat the current build-out (built after January 1, 2006 and July 1, 2009) and for the full future build-out, only the credit for the current build-out is taken in this Action Plan. Using the Simple Method, the Historic Triangle Master Plan finds that the BMP provides 1.45 lbs of phosphorus reduction per impervious acre. Since the buildout between January 1, 2006 and prior to July 1, 2009 equals 9.12 impervious acres, 13.22 lbs of phosphorus are available for full credit towards the required Chesapeake Bay reductions. Corresponding nitrogen and TSS removal from the BMP is found to be 22.89 and 5,564.9 ponds, respectively.

A summary of required reductions and reductions achieved by the regional BMP are summarized in **Table 3.2**. Reductions achieve the 100% cumulative required by the L2 Scoping Run. As a result, no other practices are required for this campus to address the required reductions.

<b>Table 5.2</b> Instone Thangle campus I hase I netion I fan comphance summary.						
Pollutant	Reductions Required for the Phase I (5% of total) (lb./yr)	Reductions Required by 2028 (100% of total) (lb./yr)	Reduction Provided from County from the Warhill Pond to VPCC (lb./yr)	Reductions Applied by VPCC to Address the Chesapeake Bay TMDL <sup>1</sup> (lb./yr)		
TN	0.56	12	22.89	12		
TP	0.15	3.17	13.22	3.17		

<b>Table 3.2</b> Historic Triangle campus Phase I Action Plan compliance sum	mary.
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<sup>1</sup> Achieves 100% of required reductions. Computations provided in Appendix C with additional supporting information in the Thomas Nelson (now Virginia Peninsula) Community College Historic Triangle Campus 2013-2028 Stormwater Master Plan. Remaining credits intended for future development on campus.

#### 4.0 Achievement of Cumulative (100%) Loading Reductions

As previously discussed, DEQ issued new guidance for quantifying pollutant reductions from street sweeping during the 2018-2023 permit cycle and a compliance reassessment based on the new guidance found street sweeping not a viable option to achieve pollutant reduction targets. The compliance reassessment evaluated all available alternative options, as specified in the MS4 General Permit and is available upon request.

Due to physical constraints and cost-effectiveness comparisons with other options, the reassessment identified the purchase of nutrient (TN and TP) credits as the most cost-effective and feasible option to achieve the entirety of required reductions for all permit cycles, no longer requiring the annual street sweeping program. Credits were purchased by VPCC in September 2023, in accordance with Part II.A.11 of the MS4 General Permit, resulting in full compliance of pollutant reductions. The MS4 Nutrient Credit Acquisition Form is provided in Appendix D. A compliance summary demonstrating the cumulative reductions achieved for each campus and within each river basin is provided in **Table 4.1** 

Campus	Pollutant	Total Reductions Required (lb /vr) <sup>1</sup>	Reduction Achieved	Practices to Achieve Reductions
Hampton	TN	38	74.96	Nutrient Credit
	TP	10	10.4	Acquisition
Historic Triangle	TN	12	12	Regional Wet Extended
	TP	3.17	3.17	Detention (Warhill Pond)

 Table 4.1 Cumulative (100%) loading reduction compliance summary.

<sup>1</sup> Rounded to the significant figure required by permit.

VPCC utilizes the legal authority provided by the laws and regulations of the Commonwealth of Virginia to control discharges to and from the college MS4s through the MS4 General Permit, college policies and specific contract language, as applicable. No new or modified legal authorities were implemented, or needing to be implemented, to achieve the required pollutant loading reductions.

#### Appendix A: Summary of any Comments Received

(This Action Plan is provided on the VPCC Stormwater Webpage. If any comments received, see comments and responses following this page) **Appendix B: Supporting Mapping** 





**Appendix C: Warhill Pond Computations for Historic Triangle Campus** 

Background: The regional BMP treating the entirety of the Historic Triangle campus treats a total of 187.72 acres, including an intended full buildout of the watershed that includes 58.77 acres of impervious cover, resulting in a watershed that is 31.3% imperviousness. The design allocated 25.22 acres of the built-out impervious cover to the Historic Triangle campus. Water quality computations are based on the Simple Method that is based on impervious cover and was the applicable computational method at the time of the development. The phosphorus loading to the BMP and the achieved reductions (based on the BMP receiving a 60% removal efficiency credit) is computed as:

$$L_{removed TP} = \{ [0.05 + (0.009 \times I_{post})] \times DA \times 2.28 \} \times 0.60$$

Where:

*L<sub>removed</sub>* = Post-development load reduction achieved by the BMP (pounds per year)

*I*<sub>post</sub> = Post-development % impervious cover to BMP (percent in whole number)

DA = Drainage area to BMP (acres)

0.60 = Pollutant removal fraction for BMP (retention pond)

Therefore:

$$L_{removed TP} = \{[0.05 + (0.009 \times 31.3)] \times 187.72 \times 2.28\} \times 0.60 = 85.2 \text{ pounds TP per year}$$

Since the BMP is designed to treat a full buildout of 58.77 impervious acres, the total reduction is divided by the total acres to be treated to determine the phosphorus reduction per acre as:

 $L_{removed TP/acre} = \frac{85.2 \text{ ponds per year}}{58.77 \text{ acres}} = 1.45 \text{ pounds TP per acre per year}$ 

The water quality BMP serves as treatment for 9.12 acres of impervious cover built between January 1, 2006 and prior to July 1, 2009. Therefore, the following phosphorus load reduction is credited towards the Historic Triangle campus Chesapeake Bay reductions requirements:

#### $L_{removed TP} = 9.12 \ acres \times 1.45 \ pounds \ per \ acre = 13.22 \ lbs TP \ per \ year$

To determine the nitrogen and sediment reductions achieved, the total phosphorus load to the BMP is first found as:

 $L_{post TP} = \{[0.05 + (0.009 \times 31.3)] \times 187.72 \times 2.28\} = 142 \text{ pounds TP per year}$ 

Next, *Table 4: Ratio of Phosphorus Loading Rate to Nitrogen and Total Suspended Solids Loading Rates for Chesapeake Bay Basins,* as provided in the MS4 General Permit, is used to determine the nitrogen and phosphorus loads in the James River basin to the BMP as:

$$L_{post TN} = 142 \text{ pounds TP } \times 5.2 \frac{pounds TN}{pound TP} = 738.4 \text{ pounds of TN per year}$$
$$L_{post TSS} = 142 \text{ pounds TP } \times 420.9 \frac{pounds TSS}{pound TP} = 59,767.8 \text{ pounds of TSS per year}$$

With the loads to the BMP computed, the achieved reductions are determined based on the removal efficiencies for nitrogen (20%) and sediment (60%) provided in DEQ's Chesapeake Bay Guidance as:

 $L_{removed TN} = 738.4$  pounds of TN per year  $\times 0.2 = 147.68$  pounds of TN per year

 $L_{removed TSS} = 59,767.8$  pounds of TSS per year  $\times 0.60 = 35,860.68$  pounds of TSS per year

Following a similar approach as the determination of phosphorus reductions, the total loadings removed are divided by the total impervious acres considered for the full buildout of the drainage area to the BMP (58.77 acres) as:

 $L_{removed TN} = \frac{147.68 \text{ pounds of TN per year}}{58.77 \text{ acres}} = 2.51 \text{ pounds TN per imp. acre}$  $L_{removed TSS} = \frac{35,860.68 \text{ pounds of TSS per year}}{58.77 \text{ acres}} = 610.19 \text{ pounds TSS per imp. acre}$ 

The water quality BMP serves as treatment for 9.12 acres of impervious cover built between January 1, 2006 and prior to July 1, 2009. Therefore, the following nitrogen and sediment load reductions are credited towards the Historic Triangle campus Chesapeake Bay reductions requirements:

 $L_{removed TN} = 9.12 \ acres \times 2.51 \ pounds \ per \ acre = 22.89 \ lbs TN \ per \ year$ 

 $L_{removed TSS} = 9.12 \ acres \times 610.19 \ pounds \ per \ acre = 5,564.90 \ lbs TSS \ per \ year$ 

Appendix D: DEQ Nutrient Credit Acquisition Form

### MS4 Nutrient Credit Acquisition Form

Pursuant to Code of Virginia sections § 62.1-44.19:21.A and Part II.A.10 of the General VPIDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems, the below named Permittees hereby certify that credits have been transferred between their two facilities as outlined below in full or partial satisfaction of compliance obligations:

Facility generating credits:	Hays Fe	iame - York-	041	VAN
Facility acquiring credits:	cility acquiring credits: Virginia Peninsula Community Colle		llege	VAR_040087
	Facility Name		Registration No.	
Credits Transferred				
Compliance Year:		2023	_	
Delivered Total Nitrogen Credits :		74.96	lbs	
Delivered Total Phosphorus Credits :		10.40	_ibs	

I certify under penalty of law that this notification and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violation.

Facility generating credits: Principal Executive Officer or Authorized Agent:

Typed or Printed Name C Sign ture 804 - 836 - 6636 Area Code:Phone Number G ////2-3

Date

Facility acquiring credits: Principal Executive Officeror Authorized Agent:

Steven R. Carpenter

inted Name

757-825-2717

Area Code/Phone Number

09/15/2023

Date