Chesapeake Bay TMDL Action Plan

Reporting Period: July 1, 2018 – June 30, 2023

Permit Number: VAR040075

In compliance with the Virginia Stormwater Management Program (VSMP) General Permit

CERTIFICATION

I certify under penalty of law that this document 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 and imprisonment for knowing violations.

Eric D Campbell 10/29/2019

Responsible Official Signature Date

VAR040075 City of Harrisonburg, VA

Permit Number MS4 Name

Contact Information

Principal Executive Officer

Title: City Manager

Name: Eric Campbell

Address: 409 South Main Street

Harrisonburg, Virginia 22801

Phone: (540) 432-7701

Email: Eric.Campbell@harrrisonburgva.gov

Duly Authorized Representatives

Title: Environmental Compliance Manager

Name: Rebecca Stimson

Address: 320 East Mosby Road

Harrisonburg, Virginia 22801

Phone: (540) 434-5928

Email: Rebecca.Stimson@harrisonburgva.gov

Title: Stormwater Compliance Specialist

Name: Keith Thomas

Address: 320 East Mosby Road

Harrisonburg, Virginia 22801

Phone: (540) 434-5928

Email: Keith.Thomas@harrisonburgva.gov

Chesapeake Bay TMDL Action Plan

Second TMDL Action Plan Requirements

Legal Authority

Requirements:

Any new or modified legal authorities, such as ordinances, permits, policy, specific contract language, orders, and interjurisdictional agreements, implemented or needing to be implemented to meet the requirements of Part II A 3, A 4, and A5.

Response:

This is the second Chesapeake Bay TMDL Action Plan submittal. All existing legal authorities are noted below. A review has been completed and existing legal authorities are sufficient. Contract language has been established for future temporary and permanent credit purchases. No contract language is secured at this time. Ordinance updates have been made to the Sanitary Sewer Ordinance to incentivize septic system abandonment and connection to the sanitary sewer system.

Existing Legal Authorities, http://www.harrisonburgva.gov/code

- Section 6-5 of the City Code; Stormwater Utility Fee Ordinance
- Section 7-6 of the City Code; Illicit Discharges and Connections Ordinance
- Section 10-4 of the City Code; Erosion and Sediment Control Ordinance
- Design & Construction Standards Manual
- Section 10-7 of the City Code; Stormwater Management Ordinance
- Section 10-2 of the City Code; Subdivision Ordinance
- Section 10-3 of the City Code; Zoning Ordinance
- Some of the above ordinances and documents reference the Virginia Erosion and Sediment Control Regulations and the Virginia Erosion & Sediment Control Handbook

Load and Cumulative Reduction Calculations

Requirements:

An estimate of the annual POC loads discharged from the existing sources as of June 30, 2009, based on the Chesapeake Bay Watershed Model Progress Run 5.3.2. The existing developed acres were calculated by determining the extent of the MS4 regulated service area based on the 2010 Census Urbanized Area (CUA) and delineating the lands within the 2010 CUA served by the MS4 as pervious or impervious as of the baseline date of June 30, 2009. The loading was calculated by multiplying the loading rate by the MS4 regulated area.

Response:

Using the best data available at the time, Table 1 below shows the City's MS4 acreages and Table 2 shows the City's estimate of annual POC loads discharged. The acreages and loading have not changed from the first Chesapeake Bay TMDL Action Plan submittal. An explanation of how subsources were calculated is provided in *Appendix A: Explanation of Estimate Annual POC Loads 2009.* In future years,

the City may update the estimate of annual POC loads when new aerial photography or improved data sources are available.

Table 1: MS4 Acreages[1]	
	Total MS4 (ac)
Impervious	3,010
Pervious	3,547
Forest	281
Total	**6,839**

[1] Acreage methodology found in Appendix A: Explanation of Estimate of Annual POC Loads 2009

Table 2: Calculation Sheet for Estimating Existing Source Loads for the Potomac River Basin[2]				
Pollutant	Subsource	Loading Rate (lbs/ac/yr)	Existing developed lands as of 6/30/09 served by the MS4 within the 2010 CUA (acres)	Loading (lbs/ac/yr)
Nitrogen	Regulated Urban Impervious	16.86	3,010	50,749.60
	Regulated Urban Pervious	10.07	3,547	35,718.29
Phosphorus	Regulated Urban Impervious	1.62	3,010	4,876.20
	Regulated Urban Pervious	0.41	3,547	1,454.27
Total Suspended Solids	Regulated Urban Impervious	1,171.32	3,010	3,525,673.20
	Regulated Urban Pervious	175.80	3,547	623,563.60

[2]Table 2 was taken from *Table 3b: Calculation for Estimating Existing Source Loads and Reduction Requirements for the Potomac River Basin* in the 2018-2023 General Permit.

Total Reductions Achieved as of July 1, 2018

Requirements:

The total reductions achieved as of July 1, 2018, for each pollutant of concern in each river basin. The determination of the total pollutant load reductions necessary was based on the 2013-2018 General Permit methodology, which required the pollutant reductions be determined by multiplying the total existing acres served by the MS4 by the first permit cycle required reduction in loading rate. These required reductions are outlined in Table 3b below. The total reductions achieved are outlined in Table 3 below.

Response:

Using the best data available at the time, below is the City's estimate of Total POC Reductions required during 2013-2018 permit cycle, as well as a summary of the total reductions achieved as of July 1, 2018.

Table 3: Calculation Sheet for Determining Total POC Reductions Required During the 2013-2018 Cycle for the Potomac River Basin[3]				
Pollutant	Subsource	Existing developed lands as of 6/30/09 served by the MS4 within the 2010 CUA (acres)	First Permit Cycle Required Reduction in Loading Rate (lbs/acre)	Total Reduction Required First Permit Cycle (lbs)
Nitrogen	Regulated Urban Impervious	3,010	0.08	240.80
	Regulated Urban Pervious	3,547	0.03	106.41
Phosphorus	Regulated Urban Impervious	3,010	0.01	30.10
	Regulated Urban Pervious	3,547	0.001	3.55
Total Suspended Solids	Regulated Urban Impervious	3,010	11.71	35,247.10
	Regulated Urban Pervious	3,547	0.77	2,731.19

[3]Table 3 was taken from *Table 3b: Calculation Sheet for Determining Total POC Reductions Required During this Permit Cycle for the Potomac River Basin* in the 2013-2018 General Permit.

Table 4: Total Reductions achieved during the 2013-2018 Cycle for the Potomac River Basin[4]		
Pollutant	Total Reduction Required First Permit Cycle (lbs)	Total Reduction Achieved
Nitrogen	347.21	823.31
Phosphorus	33.65	2,151.57
Total Suspended Solids	37,978.29	244,410.60

[4]Table 4 was taken from the pollutant reductions achieved by the City of Harrisonburg during the first Chesapeake Bay TMDL Action Plan

BMPs Implemented Prior to July 1, 2018

Requirements:

The list of BMPs implemented prior to July 1, 2018 to achieve reductions associated with the Chesapeake Bay TMDL, including: the date of implementation and the reductions achieved.

Response:

The following practices were implemented prior to July 1, 2018 by the City to meet required reductions. Calculation methodologies for each practices are outlined in the appendices.

Table 5: Street Sweeping[5]	**TP**	**TN**	**TSS**
Street Sweeping Mass Reduced per pound of sediment swept	.001	.0025	0.30
Annual pounds of swept material	1,163,860 lbs/ year		
City of Harrisonburg Street Sweeping Program	814.70 lbs TP/ year	2,036.76 lbs TN/ year	244,410.60 lbs TSS/ year

[5]Table 5 uses the street sweeping mass loading credit methodology per the 2015 Action Plan Guidance. Appendix B and H use the credit methodology outlined in the 2015 Expert Panel Report as it is anticipated that the credit methodology will change in the new Action Plan Guidance.

Table 6: Homeowner BMPs[6]	**TP**	**TN**	**TSS**
2015 City of Harrisonburg Homeowner BMP Credit Program	4.92	71.07	0
2016 City of Harrisonburg Homeowner BMP Credit Program	3.30	39.72	0
2017 City of Harrisonburg Homeowner BMP Credit Program	0.33	3.51	0
2018 City of Harrisonburg Homeowner BMP Credit Program	0.68	7.31	0

[6]Table 6 credit methodologies are outlined in *Appendix D: Calculation of Homeowner BMP Pollutant Removal*

BMPs to be Implemented Prior to Permit Expiration

Requirements:

The list of BMPs to be implemented prior to July 1, 2023 (permit expiration), to meet the cumulative reductions calculated based on the permit methodology and shown below in Table 7.

Table 7: Calculation Sheet for Estimating Existing Source Loads and Reduction Requirements for the Potomac River Basin[7]						
Pollutant	Subsource	Loading (lbs/ac/yr)	MS4 Required Chesapeake Bay total L2 loading rate reduction	40% cumulative reduction required by 6/30/2023	Sum of 40% cumulative reduction required by 6/30/2023 (lb/yr)	Sum of 40% cumulative reduction (lb/yr)
Nitrogen	Regulated Urban Impervious	50,749.60	9%	40%	1,826.95	2,684.19
	Regulated Urban Pervious	35,718.29	6%	40%	857.24	
Phosphorus	Regulated Urban Impervious	4,876.20	16%	40%	312.08	354.25
	Regulated Urban Pervious	1,454.27	7.25%	40%	42.17	
Total Suspended Solids	Regulated Urban Impervious	3,525,673.2	20%	40%	282,053.86	302,631.43
	Regulated Urban Pervious	623,563.60	8.75%	40%	20,577.57	

[7]Table 7 was taken from *Table 3b: Calculation for Estimating Existing Source Loads and Reduction Requirements for the Potomac River Basin* in the 2018-2023 General Permit.

Response:

Appendix H lists a summary of BMPs that are proposed to be implemented to meet the required reductions outlined above in Table 7. Where available more in-depth information, including percent removal efficiencies for each pollutant of concern, is located in the appendix item for each BMP.

Additional BMPs necessary to meet the required reductions will be identified based on the Stormwater Improvement Plan. This TMDL Action Plan will use the adaptive management approach so that if better practices are identified, the City may substitute alternative practices. The City of Harrisonburg reserves tge right to make adjustments to this plan and to substitute any practices and projects that can achieve Pollutant of Concern (POC) reductions. Any substitutions or additions will be reported to DEQ in future annual reports and this TMDL Action Plan submittal. Permanent and temporary water quality trading credits and all planned BMP projects and programs be outlined in *Appendix H: Summary Sheet of Planned BMPs*.

Public Comment for TMDL Action Plan

Requirements:

Prior to submittal of the final action plan, the permittee shall provide an opportunity for public comment on the additional BMPs proposed to meet the reductions not previously approved in the first phase Chesapeake Bay TMDL action plan for no less than 15 days.

Response:

A 15 day public comment period was held September 23 – October 8, 2019. One written comment was received to add storm drain labeling informing they drain to the Chesapeake Bay. One verbal comment was received about flooding concerns on a city street. The Action Plan was not modified in response to these comments.

Additional BMPs proposed will have a 15-day public comment period as a part of the design engineering process. Public comment periods will be noted in Appendix D, as applicable. An opportunity for receipt and consideration of public comment regarding the draft Chesapeake Bay TMDL Action Plan will be provided through the following mediums:

- City Website; www.harrisonburgva.gov
- Be Heard Harrisonburg Website; www.BeHeardHarrisonburg.org
- Harrisonburg Stormwater Facebook Page; www.facebook.com/harrisonburgstormwater
- Advertisements in Local Newspaper, Local Television Station, and Local Radio Station

Comments will be accepted through social media, hardcopy mediums and e-mail.

Appendix A. Explanation of Estimate of Annual POC Loads 2009

The Chesapeake Bay TMDL pollutant removal estimates provided with the Chesapeake Bay TMDL Action Plan is based on the:

- **Impervious area delineation of parcels and railroad right-of-way.** This was completed using 2011 aerial photography and ArcGIS.
- **An estimate of the public right-of-way impervious area.** The estimate of public right-of-way impervious area within the MS4 boundary was calculated by subtracting an inward buffer of 5-feet from the ROW polygon's area.
- **A delineation of forested areas within the City's MS4 area.** This was completed by scanning 2011 aerial photography to delineate 'forested' areas based on the March, 2015 Chesapeake Bay TMDL draft guidance. In the final revised guidance released by VA DEQ in May 2015, the size threshold for forested areas has been reduced.
- **Delineation of MS4 Service Area.** This delineation was completed by mapping city-owned outfalls and the drainage areas entering them.

The Chesapeake Bay TMDL pollutant removal estimates do not include properties owned by VDOT or James Madison University which are covered by their own MS4 permits. Properties that have VPDES Industrial Stormwater permits have not been removed at this time, and will be considered in the future.

In future years, the City may update the estimate of annual POC loads when new aerial photography or other improved data sources are available.

Appendix B: Calculation of Annual Street Sweeping Pollutant Removal

Credit methodology from 2015 Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices

Street Sweeping Estimated Based Upon Current (2016) Operations

SCP-1; Downtown Area: AST – 2 PW 100 Passes/Yr

2016 Street Sweeping Credits Based Upon *Expert Panel Report on Street and Storm Drain Cleaning*							
Lane Miles/Acres	Street Cleaning Practice	Removal Rate (%)			Mass Removed (lbs)		
		TSS	TN	TP	TSS	TN	TP
15.62	SCP-1	21	4	10	4,264.26	9.68	3.01
132.24	SCP-3	11	2	5	18,910.32	40.99	12.76
172.80	SCP-4	6	1	3	13,478.40	26.78	10.01
				Total:	**36,652.98**	**77.45**	**25.78**

SCP-3; Areas A,B,C,D: AST – 1 P2W 25 Passes/Yr

SCP-4; Areas 1,2,3,4: AST – 1 P4W 10 Passes/Yr

AST = assisted sweeper technology; PW = passes/week; SCP = street cleaning practice

Loading & Removal Rates – Using average values from Table 4, Page 17 and Page 5 Pollutant Reductions

Downtown (SCP-1)

TSS: 15.62 miles x 1300 lb/ac/yr = 20,306 lb/yr

20,306 lb/yr x 21% = 4,264.26 lbs TSS/yr

TN: 15.62 miles x 15.5 lb/ac/yr = 242.11 lb/yr

242.11 lb/yr x 4% = 9.68 lbs TN/yr

TP: 15.62 miles x 1.93 lb/ac/yr = 30.14 lb/yr

30.14 lb/yr x 10% = 3.01 lbs TP/yr

Areas A-D (SCP-3)

TSS: 132.24 x 1300/lb/ac/yr = 171,912 lb/yr

171,912 lb/yr x 11% = 18,910.32 lbs TSS/yr

TN: 132.24 x 15.5 lb/ac/yr = 2,049.72 lb/yr

2,049.72 lb/yr x 2% = 40.99 lbs TN/yr

TP: 132.24 x 1.93 lb/ac/yr = 255.22 lb/yr

255.22 lb/yr x 5% = 12.76 lbs TP/yr

Areas 1-4 (SCP-4)

TSS: 172.80 x 1300 lb/ac/yr = 224,640 lb/yr

224,640 lb/yr x 6% = 13,478.40 lbs TSS/yr

TN: 172.80 x 15.5 lb/ac/yr = 2,678.40 lb/yr

2,678.40 lb/yr x 1% = 26.78 lbs TN/yr

TP: 172.80 x 1.93 lb/ac/yr = 333.50 lb/yr

33.50 lb/yr x 3% = 10.01 lbs TP/yr

Appendix C: Calculation of Annual Storm Drain Cleaning Pollutant Removal and Storm Drain Cleaning Standard Operating Procedure

Credit methodology from 2016 Recommendations of the Expert Panel's Final Report to Define Removal Rates for Street and Storm Drain Cleaning Practices

Pollutant Removal Calculations

Annual Billing Statement:

57.7 tons collected 7/01/2015 – 6/20/2016

Total Nitrogen

Wet mass: 57.7 tons x 2,000 = 115,400.00 lbs
Dry weight conversion: 115,400.00 lbs x 0.7 conversion factor = 80,780.00
Total Nitrogen: 80,780 dry weight lbs x 0.0027 mean nutrient enrichment factor = 218.11 lbs

Total Phosphorus

Wet mass: 57.7 tons x 2,000 = 115,400.00 lbs
Dry weight conversion: 115,400.00 lbs x 0.7 conversion factor = 80,780.00
Total Phosphorus: 80,780 dry weight lbs x 0.0006 mean nutrient enrichment factor = 48.47 lbs

Flusher Truck Operation and Inspection Procedure

Daily Procedure

Start of Day

1. Fill out pre-trip inspection forms to assess the flusher truck for any maintenance needs.
2. If no maintenance needs are noted, drive to designated section of the City (See Main Route & Residential Map for the City of Harrisonburg) to begin work.
3. Remove the drop inlet (D.I.) manhole lid, observe the D.I.
    a. During winter season, the flusher crew inspects D.I.'s using the D.I. Inspection Form.
    b. During the summer months, the flusher crew may inspect *and* clean out D.I.'s

Daily Inspections

4. Mark whether the D.I. was cleaned out at the time of inspection.
5. Note the amount of debris that was/is present in the D.I. and mark LOW, MODERATE, or CRITICAL in the *Debris* section of the D.I. Inspection Form.
    a. LOW: Minimum to no debris, the D.I. does not need to be cleaned each year, there is no observed risk of clogging.
    b. MODERATE: Average amount of debris, the D.I should be cleaned each year, but there is minimal risk of clogging.
    c. CRITICAL: Large amount of debris, the D.I. should be monitored and cleaned out regularly, the amount of debris poses a risk of clogging.
6. Note if vegetation is growing out the facility. Mark YES or NO in the *Vegetation* section of the D.I. Inspection.

a. If the vegetation was not removed at the time of inspection and needs to be sprayed, mark YES on the D.I. Inspection Form in the *Vegetation Needs Future Spraying* section.

7. Look at the structural components of the D.I. and note if there is any damage by marking LOW, MODERATE, or CRITICAL in the *Structural Damage* section of the D.I. Inspection Form.
    a. LOW: No damage, structure is aging normally.
    b. MODERATE: Minor damage, does not compromise the structure performance.
    c. CRITICAL: Significant damage, D.I. needs to be replaced within the year.
8. If there are surrounding issues in the nearby pavement, curbing, etc., note YES that there are *Other Issues that Require Supervisor to Review* on the D.I Inspection Form.
9. Continue to the next D.I. until the truck is full.

Emptying the Truck

1. Dewater solid material from the liquids using the dewatering plate.
2. Empty the liquids into the designated sanitary sewer manhole. The three Public Utilities approved location are at manholes near the following:
    a. East Market Street Location
    b. West Market Street Location
    c. Public Utilities Facility
3. Continue collecting material, dewatering, and discharging liquids into the sanitary sewer system until the flusher truck is full of only dewatered solid material.
4. Take dewatered solid material to the landfill. Be sure to collect the landfill ticket at the weight station.

End of Day

5. Return to the Public Works facility.
6. Wash the tank of the truck using the internal spray bar system and the hand wash pressure washer (affixed to the truck).
7. Park flusher truck in the Public Works garage.

Cityworks Process

- If *Structural Damage* is marked as MODERATE or CRITICAL, Sly will be alerted through Cityworks.
- If *Other Issues Require Supervisor Review* Sly will be alerted through Cityworks.

Appendix D: Calculation of Residential Credit Pollutant Reduction

Calculation methodology submitted in September 29, 2016 Annual Report submittal and was received by DEQ on December 8, 2016.

2015

Roof area draining to disconnected downspouts: **204,026.6 sq. ft.**
Roof area draining to rain barrel: **27,836.80 sq. ft.**
Lawn area managed under Homeowner Nutrient Management Agreement: **3,154,787.80 sq. ft.**

Total Nitrogen

Roof Drain Disconnections:

[((204,026.6 sq. ft. / 43,560 acre) * 16.86 loading rate) * 0.45 removal rate] * 100% compliance factor = 35.54 lbs TN/yr

Rain Barrels:

[((27,836.80 sq. ft. / 43,560 acre) * 16.86 loading rate) * 0.28 removal rate] * 90% compliance factor = 2.72 lbs TN/yr

Nutrient Management:

[((3,154,787.80 sq. ft. / 43,560 acre) * 10.07 loading rate) * 0.06 removal rate] * 75% compliance factor = 32.82 lbs TN/yr

Total Phosphorus

Roof Drain Disconnections:

[((204,026.6 sq. ft. / 43,560 acre) * 1.62 loading rate) * 0.52 removal rate] * 100% compliance factor = 3.95 lbs TP/yr

Rain Barrels:

[((27,836.80 sq. ft. / 43,560 acre) * 1.62 loading rate) * 0.33 removal rate] * 90% compliance factor = 0.31 lbs TP/yr

Nutrient Management:

[((3,154,787.80 sq. ft. / 43,560 acre) * 0.41 loading rate) * 0.03 removal rate] * 75% compliance factor = 0.67lbs TP/yr

2016

Roof area draining to disconnected downspouts: **146,417.00 sq. ft.**
Roof area draining to rain barrel: **19,648.00 sq. ft.**
Lawn area managed under Homeowner Nutrient Management Agreement: **1,182,182.00 sq. ft.**

Total Nitrogen

Roof Drain Disconnections:

[((146,417.00 sq. ft. / 43,560 acre) * 16.86 loading rate) * 0.45 removal rate] * 100% compliance factor = 25.50 lbs TN/yr

Rain Barrels:

[((19,648.00 sq. ft. / 43,560 acre) * 16.86 loading rate) * 0.28 removal rate] * 90% compliance factor = 1.92 lbs TN/yr

Nutrient Management:

[((1,182,182.00 sq. ft. / 43,560 acre) * 10.07 loading rate) * 0.06 removal rate] * 75% compliance factor = 12.30 lbs TN/yr

Total Phosphorus

Roof Drain Disconnections:

[((146,417.00 sq. ft. / 43,560 acre) * 1.62 loading rate) * 0.52 removal rate] * 100% compliance factor = 2.83 lbs TP/yr

Rain Barrels:

[((19,648.00 sq. ft. / 43,560 acre) * 1.62 loading rate) * 0.33 removal rate] * 90% compliance factor = 0.22 lbs TP/yr

Nutrient Management:

[((1,182,182.00 sq. ft. / 43,560 acre) * 0.41 loading rate) * 0.03 removal rate] * 75% compliance factor = 0.25 lbs TP/yr

2017

Roof area draining to disconnected downspouts: **15,736 sq. ft.**

Roof area draining to rain barrel: **630 sq. ft.**

Lawn area managed under Homeowner Nutrient Management Agreement: **67,643.00 sq. ft.**

Total Nitrogen

Roof Drain Disconnections:

[((15,736 sq. ft. / 43,560 acre) * 16.86 loading rate) * 0.45 removal rate] * 100% compliance factor = 2.74 lbs. TN/yr.

Rain Barrels:

[((630 sq. ft. / 43,560 acre) * 16.86 loading rate) * 0.28 removal rate] * 90% compliance factor = 0.06 lbs. TN/yr.

Nutrient Management:

[((67,643.00 sq. ft. / 43,560 acre) * 10.07 loading rate) * 0.06 removal rate] * 75% compliance factor = 0.70 lbs. TN/yr.

Total Phosphorus

Roof Drain Disconnections:

[((15,736 sq. ft. / 43,560 acre) * 1.62 loading rate) * 0.52 removal rate] * 100% compliance factor = 0.30 lbs. TP/yr.

Rain Barrels:

[((630 sq. ft. / 43,560 acre) * 1.62 loading rate) * 0.33 removal rate] * 90% compliance factor = 0.01 lbs. TP/yr.

Nutrient Management:

[((67,643.00. ft. / 43,560 acre) * 0.41 loading rate) * 0.03 removal rate] * 75% compliance factor =0.01 lbs. TP/yr

2018

Roof area draining to disconnected downspouts: **29,925.00 sq. ft.**

Roof area draining to rain barrel: **6890 sq. ft.**

Lawn area managed under Homeowner Nutrient Management Agreement: **137,122.00 sq. ft.**

Total Nitrogen

Roof Drain Disconnections:

[((29,925.00 sq. ft. / 43,560 acre) * 16.86 loading rate) * 0.45 removal rate] * 100% compliance factor = 5.21 lbs. TN/yr.

Rain Barrels:

[((6890 sq. ft. / 43,560 acre) * 16.86 loading rate) * 0.28 removal rate] * 90% compliance factor = 0.67 lbs. TN/yr.

Nutrient Management:

[((137,122.00 sq. ft. / 43,560 acre) * 10.07 loading rate) * 0.06 removal rate] * 75% compliance factor = 1.43 lbs. TN/yr.

Total Phosphorus

Roof Drain Disconnections:

[((29,925.00 sq. ft. / 43,560 acre) * 1.62 loading rate) * 0.52 removal rate] * 100% compliance factor = 0.58 lbs. TP/yr.

Rain Barrels:

[((6890 sq. ft. / 43,560 acre) * 1.62 loading rate) * 0.33 removal rate] * 90% compliance factor = 0.08 lbs. TP/yr.

Nutrient Management:

[((137,122.00 ft. / 43,560 acre) * 0.41 loading rate) * 0.03 removal rate] * 75% compliance factor =0.03 lbs. TP/yr

Program Totals

Total Nitrogen = 121.60 lbs.

Total Phosphorus = 9.23 lbs.

Sample Property Calculation of Residential Credit Pollutant Reduction

Sample Property A

Roof area draining to disconnected downspouts: **1,600 sq. ft.**
Roof area draining to rain barrel: **660 sq. ft.**
Lawn area managed under Homeowner Nutrient Management Agreement: **10,111 sq. ft.**

Nitrogen Load Reduced

Roof Drain Disconnection
Nutrient Loading: 16.86
Removal Rate: 0.45
Compliance Factor: 100%

lbs TN/yr = [(Acres of Impervious Area * Nutrient Loading) * Removal Rate] * Compliance Factor
lbs TN/yr = [((1600 sq. ft. / 43560 acre) * 16.86)*0.45]*1.00
lbs TN/yr. = 0.28 lbs.

Rain Barrel
Nutrient Loading: 16.86
Removal Rate: 0.28
Compliance Factor: 100%

lbs TN/yr = [(Acres of Impervious Area * Nutrient Loading) * Removal Rate] * Compliance Factor
lbs TN/yr = [((660 sq. ft. / 43560 acre) * 16.86)*0.28]*1.00
lbs TN/yr = 0.07

Nutrient Management
Nutrient Loading: 10.07
Removal Rate: 0.06
Compliance Factor: 75%

lbs TN/yr = [(Acres of Pervious Area * Nutrient Loading) * Removal Rate] * Compliance Factor
lbs TN/yr = [((10,111 sq. ft. / 43560 acre) * 10.07)*0.06]*0.75
lbs TN/yr = 0.11

Total Nitrogen Load Reduced
lbs TP/yr = Roof Drain Disconnection + Rain Barrel + Nutrient Management
lbs TN/yr = 0.28 lbs TN/yr + 0.07 lbs TN/yr + 0.11 lbs TN/yr
lbs TN/yr = 0.46

Phosphorus Load Reduced

Roof Drain Disconnection
Nutrient Loading: 1.62
Removal Rate: 0.52
Compliance Factor: 100%

lbs TP/yr = [(Acres of Impervious Area * Nutrient Loading) * Removal Rate] * Compliance Factor
lbs TP/yr = [((1600 sq. ft. / 43560 acre) * 1.62)*0.52]*1.00
lbs TP/yr = 0.03 lbs

Rain Barrel
Nutrient Loading: 1.62
Removal Rate: 0.33
Compliance Factor: 100%

lbs TP/yr = [(Acres of Impervious Area * Nutrient Loading) * Removal Rate] * Compliance Factor
lbs TP/yr = [((660 sq. ft. / 43560 acre) * 1.62)*0.33]*1.00
lbs TP/yr = 0.01

Nutrient Management
Nutrient Loading: 0.41
Removal Rate: 0.03
Compliance Factor: 75%

lbs TP/yr = [(Acres of Pervious Area * Nutrient Loading) * Removal Rate] * Compliance Factor
lbs TP/yr = [((10,111 sq. ft. / 43560 acre) * 0.41)*0.03]*0.75
lbs TP/yr = 0.00

Total Phosphorus Load Reduced
lbs TP/yr = Roof Drain Disconnection + Rain Barrel + Nutrient Management
lbs TP/yr = 0.03 lbs TP/yr + 0.01 lbs TP/yr + 0.00 lbs TP/yr
lbs TP/yr = 0.04

Appendix E: Homeowner BMP Inspection Program & Non-Compliance Determination

Year 1	Year 2.5	Year 5
Application Verification Process	On-Site Inspections	Re-Application Verification Process

Year 1

As a part of the application package, residential property owners take multiple steps to validate that their BMPs exist and function properly at the time of submittal. The application package is reviewed and verified by Public Works staff. Site visits and desktop analysis using Google Earth features are both utilized on an as-needed basis to ensure application information is accurate.

Validation Steps Taken by Applicants at the Time of Initial Application:

- Pictures must be taken of Rain Barrels and Downspout Disconnections no more than 60 days prior to application submittal.
- Application must be filled out and signed.
    - Signature of Agreement; *I hereby certify the above information to be true and correct to the best of my knowledge. I agree that pollutant credits approved by the City of Harrisonburg as Stormwater Utility Fee Credits will no longer be available for any other use, including Virginia Stormwater Management Program requirements.*
- Lawncare Agreement must be filled out and signed.
    - Signature of Agreement; *Upon signing this document, I agree to follow the selected responsible lawn care maintenance items for the extent of the Agreement and for the total land area listed in this Agreement.*
- Maintenance Agreement must be filled out and signed.
    - (Maintenance Agreement Language) Commitment to Operation and Maintenance of Facility; The Property Owner(s), including any homeowners association, shall adequately operate, inspect, and maintain the stormwater management BMP facilities in accordance with the specific operation, inspection, and maintenance requirements set forth in the attachment to the maintenance agreement.
    - Signature of Agreement; *Upon signing this document, The City and the Property Owner(s) agree to the terms and conditions as outlined above and as described in the appropriate Stormwater Utility Fee Credit Manual for Non-Residential or Residential effective on the date signed.*

Maintenance Schedule and Guidelines are available for all BMPs to property owners on the stormwater utility fee website. These fact sheets include a schedule of maintenance tasks associated with each practice. A maintenance record is also available for the homeowner to log any maintenance activities. This maintenance record is required for submittal as part of the five year re-application.

Year 2.5

The City of Harrisonburg will spot-inspect 20% of the residential properties by year 2.5. Letters will be sent to the pool of properties notifying property owners of their upcoming inspection (or phone calls/emails), as is required in the signed maintenance agreement. Staff will have a right to enter the property as is outlined in the maintenance agreement. An inspection report will be completed by staff and kept on file with the credit application information (see attachment). If inspection violations/issues are

noted, a formal letter will be sent to the property owner. If violations are not corrected within 90 days after notification is sent, the approved credits for the insufficient BMP will be removed.

2015 Credit Application Pool	164 Approved Applications	33 Inspections (20%)
2016 Credit Application Pool	147 Approved Applications	29 Inspections (20%)

Year 5

The Stormwater Utility Fee Credit Program allows applicants credit for five years from the date of application approval.

Validation Steps Taken by Applicants at the Time of Re-Application:

- Pictures must be taken of Rain Barrels and Downspout Disconnections within 60 days of re-application.
- Re-Application must be filled out and signed.
    - Signature of Agreement; *I hereby certify the above information to be true and correct to the best of my knowledge. I agree that the BMPs approved by the City of Harrisonburg as Stormwater Utility Fee Credits are maintained properly and functioning as designed.*
- *Maintenance Record filled out and submitted (in compliance with maintenance agreement)*
    - (Maintenance Agreement Language) Required Documentation; The Property Owner(s) shall document any maintenance, landscaping, and repairs performed to the on-site stormwater management BMP facilities on the City's Maintenance Record form and provide a copy of said Maintenance Record to the City or its representatives upon request. Regular inspection by the Property Owner(s) is encouraged, but submittal of inspection forms to the City is not required.

Non-Compliance Factor

With the intensive verification processes in place for rain barrels and downspout disconnections, a 90% compliance factor was used in calculating TMDL Action Plan credits. It may be necessary to adjust this number according to the inspection results after year 2.5. Any changes will be included in the TMDL Action Plan update.

In determining a compliance factor for nutrient management plans, it was decided that a 75% non-compliance factor was suitable to account for those that do not adhere to the provisions set forth in the Nutrient Management and Lawncare Agreement. It is difficult to compare a non-compliance factor for agricultural-based activities vs. homeowner-based activities.

It may be necessary to adjust this number according to the inspection results after year 2.5. Any changes will be included in the TMDL Action Plan update.

Appendix F: Calculation of Septic System to Sanitary Sewer System Connection Credit

Credit methodology taken from Virginia Department of Environmental Quality – email from Jamie Bauer December 2016

Verified septic system to sanitary sewer system connections:
39 connections from 2006-2019
2012-2016 U.S. Census Bureau Persons per household:
2.7 Persons per household

The assumed average load of TN at the edge of the septic drain field is 9 lbs TN/year/person with an attenuation factor from edge of drain field to edge of stream resulting in a TN load of 3.6 lbs TN/year/person at the edge of stream.

Total Nitrogen
3.6 lb/TN/year/person * 2.7 persons/household = 9.72 lbs TN/year/household
TN Credit = 9.72 lbs TN/year/household * 39 households = 400 lbs TN

Table 1. Properties that have connected from a septic system to the sanitary sewer system

Septic to Sanitary Sewer Connection Install Date	Address	Date House Built	Sewer Connection Install Date	Tap #	Account
2006	140 WEST MOSBY RD	1959	2/15/2006	1310	2510330100-0
2006	346 FRANKLIN ST	1912	6/5/2006	1456	1610637100-0
2006	1045 SMITHLAND RD	1957	10/24/2006	1588	4210290900-0
2006	674 E ROCK ST	2005	2/14/2006	1308	0511700000-0
2006	2370 RAMBLEWOOD RD	2004	8/29/2006	1549	3811270000-0
2006	965 CIRCLE DR	1994	5/17/2006	1432	2811084000-0
2007	1015 SMITHLAND RD	2001	6/26/2007	1762	4210290800-0
2007	1199 PORT REPUBLIC RD	1966	7/10/2007	1786	4011576070-0
2007	320 PEAR ST	1922	8/13/2007	1829	2510352500-0
2007	445 PEAR ST	1940	6/25/2007	1756	2510332700-0
2007	2255 RAMBLEWOOD RD	UK	9/26/2007	1882	3911430450-0
2007	960 GREENDALE RD	1973	11/1/2007	1898	3911460000-0
2008	215 PEAR ST	1952	12/17/2008	2665	2510332505-0
2008	513 1/2 W MARKET ST	1930	7/22/2008	2401	4411630100-0
2008	675 STONE SPRING RD	1900	8/20/2008	2458	3811435100-0
2008	906 COUNTRY CLUB RD	UK	10/3/2008	2597	0710671000-0
2008	1832 COLLEGE AVE	2002	10/2/2008	2596	6210499790-0
2008	1410 VIRGINIA AVE	1920	9/16/2008	2558	6010093300-0
2008	1316 SMITHLAND RD		7/25/2008	2402	4210290618-0
2009	384 E WOLFE ST	1915	4/7/2009	2707	0510541000-0
2010	211 DIXIE AVE	1946	11/1/2010	3234	3111090040-0
2010	864 CHICAGO AVE	1979	9/3/2010	3218	4911640005-0
2011	606 PEAR ST	1973	6/3/2011	3352	2510332650-0
2011	610 PEAR ST	1968	6/1/2011	3353	2510332680-0
2011	778 CIRCLE DR	1988	6/13/2011	3355	2812488825-0
2011	960 PORT REPUBLIC RD	UK	5/19/2011		
2013	1161 SHARON LN	1950	8/5/2013	3690	6010864050-0
2013	715 N MAIN ST	1900	2/28/2013	3558	0211470020-0
2013	2310 RAMBLEWOOD RD	1989	7/5/2013		
2014	2170 RESERVOIR ST	1968	2014		
2014	1229 WOODCREST CI	1962	2014		

2015	641 VINE ST	1930	2015		
2016	991 SUMMIT AVE	NA	10/26/2016	4094	6310364700-0
2017	2260 RAMBLEWOOD RD	1950	10/13/2017		
2017	670 GARBERS CHURCH RD	1960			
2017	340 BETTS RD				
2018	321 PAUL ST	NA	12/6/2018		
2019	747 Foley Rd	NA	4/25/2019		
2019	1241 Smithland Rd		4/29/2019		
2019	1641 W Market St		5/29/2019		

Appendix G: Calculation of Tree Planting Pollutant Removal

Credit Methodology from Recommendations of the Expert Panel to Define BMP Effectiveness for Urban Tree Canopy Expansion (2016).

Table 1: Tree Planting Projects and Tree Totals

Project Name & Location	Project Date	Total Trees Planted	Canopy Over Impervious	Canopy Over Turf
Rain Garden Planting at Purcell Park	8/01/2007	6	1	5
Pond Planting at Purcell Park	6/01/2009	25	4	21
SVSWCD Planting at Hillandale Park	4/01/2011	350	0	350
Greendale Rd. Planting	4/01/2012	500	20	480
Westover Park Planting	4/01/2012	100	100	0
Arbor Day Planting at Purcell Park	4/01/2013	100	0	100
Public Utility Planting	11/14/2014	450	10	440
Arbor Day Planting at Hillandale Park	4/17/2017	72	0	72
Bluestone Elementary Planting	0/00/2017	235	23	212
Purcell Easement Planting	4/11/2018	200	0	200
VDOF Grant Planting at Purcell Park	4/16/2018	25	5	20
	TOTAL:	**2063**	**163**	**1900**

Total Nitrogen =

Canopy Over Other Impervious: (163 trees * 1/300 acre) * 18.08 lbs. TN/acre/year * 8.5%
= 0.83 lbs. TN/yr
Canopy Over Turf: (1,900 trees * 1/300 acre) * 11.19 lbs TN/acre/year * 23.8%
= 16.87 lbs/TN/yr

Total Phosporus

Canopy Over Other Impervious: (163 trees * 1/300 acre) * 0.69 lbs TP/acre/year * 11%
= 0.04 lbs. TP/yr
Canopy Over Turf: (1,900 trees * 1/300 acre) * 0.86 lbs. TP/acre/year * 23.8%
= 1.30 lbs/TP/yr

Total Sediment

Canopy Over Other Impervious: (163 trees * 1/300 acre) * 2,080 lbs. TSS/acre/year * 7%
= 79.11 lbs. TSS/yr
Canopy Over Turf: (1,900 trees * 1/300 acre) * 760 lbs TSS/acre/year * 5.8%
= 279.17 lbs/TSS/yr

Program Totals

Total Nitrogen = 17.70 lbs/TN/yr
Total Phosphorus = 1.34 lbs/P/yr
Total Sediment = 358.28 lbs/TSS/yr

Methodology from *Recommendations of the Expert Panel to Define BMP Effectiveness for Urban Tree Canopy Expansion (2016).* Loading rates taken from average land use loading rates in the phase 6 watershed model, found on Table 2 (Page 5) of the *Good Recipes for the Bay Pollution Diet* "U-11 Urban Tree Planting Practices" document, shown below in Table 2.

Table 2. Average Land Use Loading Rates in the Phase 6 Watershed Model

Land Use	Total Nitrogen (lbs/acre/year)	Total Phosphorus (lbs/acre/year)	Total Suspended Solids (lbs/acre/year)*
Turf	11.19	0.86	760
Roads	22.87	0.86	1,880
Other Impervious	18.08	0.69	2,080
Forest	1.68	0.08	140

* Sediment loading rates based on MS4 average loading rates. Sediment loading rates for Non-Regulated and CSS acres are slightly different.

[1] Example is based upon average land use loading rates for the draft final Phase 6 Watershed Model. Average loading rates are subject to change.

Appendix H: Summary Sheet of Planned BMPs

Type of BMP	Project Name	Location	Expected Reductions (lbs/yr)			Public Comment Period
			TP	TN	TSS	
Permanent Water Quality Trading Credits[1]	North End Greenway Stream Restoration	Mount Clinton Pike Harrisonburg, VA	117.9	256.1	40,660	N/A
Permanent Water Quality Trading Credits	As Needed	Nutrient Credit Market	18	133.74	pending	N/A
Temporary Water Quality Trading Credits	As Needed	Harrisonburg Rockingham Regional Sewer Authority	73	1,115	151,989	N/A
BMP Retrofit[1]	Thomas Harrison Retrofit Front	Thomas Harrison Middle School 1311 West Market St Harrisonburg, VA 22801	9.01	66	8,245	April 26, 2018 – May 11, 2018
Stream Restoration[1]	Mountain View Drive	Mountain View Drive Harrisonburg, VA	101	100	65,260	N/A
New Street Sweeping Methodology	Street Sweeping (annual)	Harrisonburg, VA	25.78	77.45	36,652.98	N/A
Septic to Sanitary Sewer Connections[3]	Septic to Sanitary Sewer Connections (since 2006)	Harrisonburg, VA	0	400	0	N/A
Storm Drain Cleaning[4]	Storm Drain Cleaning (annual)	Harrisonburg, VA	48	218	0	N/A
Homeowner BMPs[5]	Homeowner BMPs (2015-2016)	Harrisonburg, VA	8.61	115	0	N/A
Tree Planting[6]	Tree Planting (since 2006)	Harrisonburg, VA	1.34	18	358	N/A
Regenerative Stormwater Conveyance	East Market Street	Harrisonburg, VA	54	417	48,010	N/A
		Total	456.64	2,916.29	310,514.98	
		Amount Needed by 2023	354	2,684	303,897.00	
		Deficit	None	None	None	

[1]Credit Calculations are an estimate based on preliminary studies and are subject to change
[2]Credit Calculations outlined in Appendix B: Calculation of Annual Street Sweeping Pollutant Removal
[3]Credit Calculations outlined in Appendix F: Calculation of Septic to Sanitary Sewer Connection Pollutant Removal
[4]Credit Calculations outlined in Appendix C: Calculation of Annual Storm Drain Cleaning Pollutant Removal
[5]Credit Calculations outlined in Appendix D: Calculation of Homeowner BMP Pollutant Removal
[6]Credit Calculations outlined in Appendix D: Calculation of Homeowner BMP Pollutant Removal