CHARLES COUNTY MUNICIPAL STORMWATER RESTORATION PLAN

PLAN TO ACHIEVE STORMWATER
WASTE LOAD ALLOCATIONS

December 2023

Charles County, Maryland

Department of Planning and Growth Management

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1 Introduction

This Charles County Municipal Stormwater Restoration Plan (Restoration Plan) satisfies the requirements of PART IV.F.3.a through c. of the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit 22-DP-3322 MD0068365 dated December 30, 2022, as described in further detail in Section 1.1 below. The Restoration Plan provides progress and planning updates for Charles County's 11 Total Maximum Daily Load (TMDL) stormwater wasteload allocations (SW-WLAs), two of which are for the Chesapeake Bay TMDL. The TMDL SW-WLAs address impairments for nitrogen (TN), phosphorus (TP), sediment (TSS), fecal coliform, and polychlorinated biphenyls (PCBs). The purpose of the Restoration Plan is to continue to track and report annual and cumulative progress and present planned implementation to achieve SW-WLAs originally presented in the County's Municipal Stormwater Restoration Plan (Restoration Plan).

Charles County first developed and submitted to the Maryland Department of the Environment (MDE) a Restoration Plan in June 2016, satisfying the requirements of PART IV.E.2.a. and b. of the County's previous MS4 permit (11-DP-3322 MD0068365) dated December 26, 2014. The Restoration Plan presented a long-term plan to address Charles County's portion of SW-WLAs for all TMDLs approved by the Environmental Protection Agency (EPA) in Charles County as well as achieving impervious restoration treatment goals required of the County's NPDES MS4 permit. The plan included final dates for meeting applicable SW-WLAs, a schedule for implementing structural and nonstructural water quality improvement projects for meeting applicable SW-WLAs, detailed cost estimates, and modeled baseline, progress, and planned pollutant loads and load reductions to document progress toward meeting SW-WLAs. The County had a 30-day public review period and included a comment/response document that addressed public comments as an attachment to the Restoration Plan. MDE provided comments on the Restoration Plan on June 21, 2017. These comments, along with updates based on public review and comment were addressed and the Restoration Plan was resubmitted with the Annual Report in December 2017. MDE provided comments on the SW-WLA Revised Implementation Plan on November 28, 2018. These comments were addressed in the County's Fiscal Year (FY) 2018 NPDES MS4 Annual Report.

The 2017 Restoration Plan presented the projects and programs to be implemented by Charles County to meet the NPDES MS4 requirements for local TMDL SW-WLAs in the Mattawoman Creek (nutrients) and Lower Patuxent River (bacteria) watersheds, and restoration goals for the Chesapeake Bay TMDL and associated impervious surface treatment. The Lower Patuxent River sediment and Port Tobacco sediment TMDLs were not addressed in the Restoration Plan due to the timing of the approval dates for each, which were after the plan was completed. Charles County submitted a Restoration Plan for the Port Tobacco sediment TMDL to MDE on October 9, 2020, after a public meeting and 30-day public comment period was advertised and public meeting held on October 5, 2020. The plan was submitted to MDE and the final version of the plan was completed in 2021. The County's Lower Patuxent River sediment TMDL is discussed further in Section 1.2 below.

This current Restoration Plan updates the previously developed 2017 version with updated modeling methods, includes new BMP types now approved by MDE, updates progress, and includes new plans for adaptive management. This Plan includes lists of projects and programs to meet the new load reductions, describes analysis and modeling methods, and includes final dates and benchmarks. This Plan will be

updated annually to document progress for each TMDL SW-WLA with pollutants reduced and provide updates to projects, programs, costs, and schedules.

A table showing MDE approval dates for each TMDL implementation plan included in the County's Restoration Plan submittals is presented in section 1.2.

1.1 Charles County MS4 Permit

Charles County, along with other medium and large Phase I jurisdictions in Maryland, has been operating its MS4 under an NPDES permit issued by MDE. The County's current MS4 permit (22-DP-3322, MD0068365; MDE 2022a), issued December 30, 2022, requires compliance with pollutant load limits from both the Chesapeake Bay TMDL and local TMDLs with approved SW-WLAs. The County is also required to meet an impervious surface treatment goal of 1,083 impervious acres that have not been treated to the maximum extent practicable (MEP) by the end of the current 5-year permit term (December 29, 2027).

A new requirement of the MS4 permit is the development of a Countywide TMDL Stormwater Implementation Plan that, as described by MDE, addresses any outstanding MDE comments on previous plans, includes lists of projects and programs to meet the load reductions, describes analysis and modeling methods, and includes final dates and benchmarks. Charles County has decided to continue calling this document the 'Restoration Plan' to be consistent with previous County planning efforts. The Plan is to be updated annually to document progress for each TMDL SW-WLA with net pollutants reduced and provide updates to projects, programs, costs, and schedules. An excerpt from the current permit PART IV.F.3. is included here:

> *3. For all TMDLs and WLAs listed in Appendix A [of the County's permit], the County shall annually document, in one Countywide Stormwater TMDL Implementation Plan, updated progress toward meeting these TMDL WLAs. This Countywide Stormwater TMDL Implementation Plan shall include:*
>
> *a. A summary of all completed BMPs, programmatic initiatives, alternative control practices, or other actions implemented for each TMDL stormwater WLA;*
> *b. An analysis and table summary of the net pollutant reductions achieved annually and cumulatively for each TMDL stormwater WLA; and*
> *c. An updated list of proposed BMPs, programmatic initiatives, and alternative control practices, as necessary, to demonstrate adequate progress toward meeting the Department's approved benchmarks and final stormwater WLA implementation dates.*

Per the County's permit, PART IV.F.2., as new TMDLs with SW-WLAs applicable to the County are developed, restoration plans for those pollutants will need to be prepared within one year of EPA approval. Once the implementation plan is approved by MDE, the new TMDL will be incorporated in the Restoration Plan and the information required under PART IV.F.3. will be reported.

When a new MS4 permit is issued in the future, if there are any significant changes in TMDL analyses, methods, or pollutant reductions, the County will update all TMDL implementation plans by the new permit's one year anniversary. The County will then add the MDE approved TMDL implementation plans to the Restoration Plan for annual progress updates for the remainder of the permit term.

The Restoration Plan is organized as follows:

Section 1 Introduction

Section 2 Describes the modeling used to calculate baseline loads, FY23 Progress reductions, and planned reductions presented in this plan.

Section 3 Presents local TMDL progress organized by watershed. Includes summary tables of all completed BMPs implemented for each local TMDL SW-WLA, per permit requirement **PART IV.F.3.a.** and planned BMPs needed to demonstrate adequate progress toward meeting final SW-WLA implementation dates, per **PART IV.F.3.c**. Pollutant loads and load reductions are also summarized for the current reporting year, cumulative progress, and target year, per **PART IV.F.3.b**.

Section 4 Presents summary tables of all Countywide completed BMPs implemented and planned BMPs, per permit requirements **PART IV.F.3.a.** and **PART IV.F.3.c**. Associated load reductions towards the Chesapeake Bay SW-WLAs are also summarized, per **PART IV.F.3.b**.

Section 5 Presents the County's plan and strategies for reaching local and Chesapeake Bay TMDL SW-WLA goals.

1.2 TMDL Allocations

Table 1-1 lists the TMDL report, locations, impairments, and the year MDE approved each County implementation plan developed for EPA-approved TMDLs in Charles County. that will be addressed in this Plan. The TMDLs listed in Table 1-1 shown below are also included in Appendix A of the County's current permit, which lists the TMDLs and SW-WLAs applicable to Charles County. Several additional TMDLs are listed in Appendix A of the permit but are not included in this Plan either because the County has no SW-WLA assigned and therefore no responsibility, or the TMDL is being addressed in a separate plan. These TMDLs are described here.

Patuxent River, Piscataway Creek and Mattawoman Creek, and Tidal Potomac River PCBS TMDLs

Charles County is included in the TMDL for polychlorinated biphenyls (PCBs) in the Potomac River Lower Tidal, Middle Tidal, and Upper Tidal. The percent reduction for these TMDLs in Charles County is 5% and is due to the margin of safety (MOS) built into the TMDL calculation. According to the TMDLs, 5% MOS reduction is expected to be achieved through the proposed 93% reduction in atmospheric deposition; therefore, reduction strategies from the stormwater sector of Charles County are not necessary to meet the overall TMDLs. These TMDLs are not addressed further in this Plan.

Lower Patuxent River Sediment TMDL

The Lower Patuxent River Sediment TMDL was not addressed in the 2017 Restoration Plan because the TMDL was approved on July 2, 2018, after the completion of the Restoration Plan. Charles County began working on the Lower Patuxent River Sediment TMDL Restoration Plan in early 2019 and it was discovered that historic Maryland Biological Stream Survey (MBSS) biological data indicated that streams within the Lower Patuxent River watershed are in good biological condition and a Restoration Plan was unnecessary. Communication with MDE was initiated, and a sampling plan was developed for the County to re-sample

the six previously sampled MBSS sites. In spring and summer of 2019, the County completed MBSS sampling of benthic macroinvertebrate and fish communities and found that the sites remained in good biological condition. A report detailing the findings was submitted to MDE in October 2019.

Additional communication with MDE resulted in the option for the County to pursue delisting its portion of the watershed from the Integrated Report (IR) impairment listing. Following MDE's Delisting Methodology for Biological Assessments in Maryland's Integrated Report, an "Initial Request for Delisting" was submitted to MDE in June 2022, which presented past biomonitoring data as well as the future sampling plan to confirm conditions required for delisting. MDE requested two additional sampling sites, one on Indian Creek and one on an Unnamed Tributary to the Patuxent River, which will provide data on catchments not previously sampled. These sites were sampled for the first time in the spring and summer of 2022 and were sampled again in 2023. PAXL-115-R, which was sampled in 2004 by MBSS and in 2019 by KCI, was re-sampled in 2022 and 2023 to satisfy the delisting requirements that non-Tier II sites be sampled twice within the most recent 10-year period. Assuming biological conditions meet the requirements, it is anticipated that the "Final Justification for Delisting" document will be completed in January 2024.

Indian Creek Bacteria TMDL

The Indian Creek bacteria TMDL was first addressed in the 2017 Restoration Plan. Charles County is currently revising the plan based on the latest MDE TMDL implementation plan guidance for bacteria impairments. See section 3.3 for a summary of the County's plan.

Chesapeake Bay Sediment TMDL

There is no TSS target reduction for the Chesapeake Bay TMDL. Rather, it is assumed that the TSS target will be met if the County meets the TP target.

Table 1-1. Charles County TMDLs

TMDL Report	Location	Impairment	Year Approved by EPA	Year County Implementation Plan Approved by MDE
Lower Patuxent River Bacteria – 7 Shellfish Harvesting Areas	Indian Creek	Fecal Coliform	2005	2017
Lower Patuxent Sediment	8 Digit WS 02131101 / Patuxent River Lower	TSS	2018	N/A[1]
Mattawoman Creek Nutrients	8 Digit WS 02140111 / Mattawoman Creek	TN	2005	2017
		TP		
Patuxent River PCBs	Segmentshed PAXMH / Patuxent River Mesohaline	PCBs	2017	N/A[2]
Piscataway Creek and Mattawoman Creek PCBs	Segmentshed MATTF / Mattawoman Creek Tidal Fresh	PCBs	2019	N/A[2]

Port Tobacco Sediment	8 Digit WS 02140109 / Port Tobacco River	TSS	2019	2021
Tidal Potomac and Anacostia River PCBs	8 Digit WS 02140201 / Potomac River, Upper	PCBs	2007	2017
	8 Digit WS 02140102 / Potomac River, Middle			
	8 Digit WS 02140101 / Potomac River, Lower			
The Chesapeake Bay TMDL	Countywide	TN	2010	2017
		TP		
		TSS		

1. Lower Patuxent Sediment TMDL– County is pursuing watershed de-listing monitoring
2. PCBs TMDLs – implementation plan is not required for County MS4 Phase I urban sector

1.2.1 Local TMDLs

Table 1-2 provides a summary of Charles County's portions of target reductions towards the nutrient and sediment local TMDLs. The County's bacteria TMDLs are excluded from Table 1-2. Per guidance from MDE (2022c), baseline and progress modeling are not required for bacteria TMDLs. Implementation plans developed for bacteria TMDLs under the most recent guidance are focused on source identification, remediation, monitoring, and showing implementation progress over time rather than achieving SW-WLAs by a final target date.

The terms listed below are used throughout the plan and are presented and defined here to assist the reader in understanding the definitions of each and how they were derived:

- **EOS lbs/yr:** An edge of stream (EOS) load is the amount of pollutant that is transported from a source to the nearest stream.
- **EOR lbs/yr:** An edge of river (EOR) load is the amount of pollutant that is transported from a small stream to a large river. A stream-to-river delivery factor is available for each land-river segment of the Bay watershed and can be applied to the EOS loads to account for the fate and transport of nutrients and sediment from a small stream to a large river. Rather than focusing on the loads to the small tributary streams of the watershed, the EOR scale may be more appropriate when the impairment is in the downstream receiving water of the reservoirs, not in the tributary streams (e.g., reservoirs).
- **Baseline Load:** Baseline levels (i.e., land use loads with baseline BMPs) from baseline year conditions in the Montgomery County MS4 source sector using MDE's TMDL Implementation Progress and Planning Tool (TIPP) spreadsheet tool, which is described further in section 2.
- **Target % Reduction:** Percent reductions assigned to Charles County Phase I MS4 stormwater sector (MS4 Permit - Appendix A and WLA Search tool available in MDE's TMDL Data Center; https://wlat.mde.state.md.us/WLASearch.aspx).
- **Target Reduction:** Target reduction translated by multiplying the reduction percent published by the baseline load.

- **SW-WLA:** Allocated loads are calculated from the baseline levels, translated as described above, using the following calculation: Baseline Load – (Baseline Load x Target % Reduction).

Table 1-2. Local TMDL Target Loads

Watershed Name	8-Digit Watershed Number	TMDL Pollutant	Units	Baseline Year	Baseline Load	Target % Reduction	Target Reduction	SW-WLA	Target Year
Mattawoman Creek	02130906	TN	EOR lbs/yr	2000	93,627.5	54.0%	50,558.8	43,068.6	TBD
		TP	EOR lbs/yr	2000	11,524.8	47.0%	5,416.6	6,108.1	2053
Port Tobacco River	02140109	TSS	EOS lbs/yr	2009	13,701,492.2	34.0%	4,658,507.3	9,042,984.8	2039

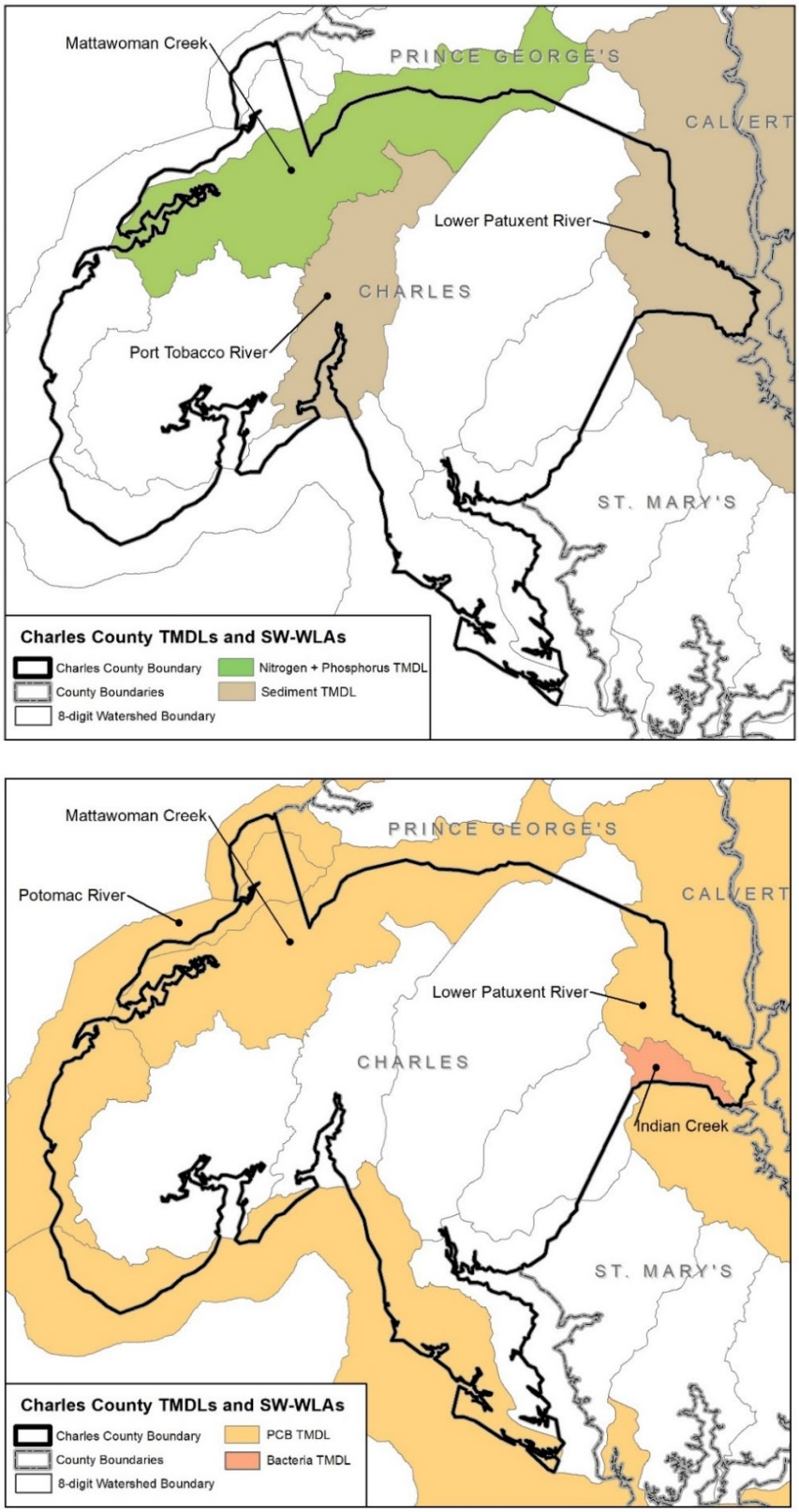

Figure 1-1. Charles County Local TMDLs with SW-WLAs

1.2.2 Chesapeake Bay TMDL

The Chesapeake Bay TMDL, established by the EPA (EPA, 2010), sets pollution limits for TN, TP, and TSS in the Chesapeake Bay Watershed. Compliance with the Chesapeake Bay TMDL is regulated in the MS4 permit through the use of the impervious surface treatment strategy as described in section 1.3 below. The Chesapeake Bay TMDL is listed in Appendix A of the MS4 permit with SW-WLAs for TN and TP presented at the Bay segmentshed scale for informational purposes. Per communication from MDE (MDE, 2022a), countywide implementation or restoration plans developed and tracked at the countywide scale are also acceptable for the current permit term.

Unlike TN and TP, there is no required percent reduction for TSS in the Chesapeake Bay TMDL; rather, it is assumed that the TSS target will be met if the TP target is met. Although a TSS target reduction is not included for the Chesapeake Bay TMDL, the County is presenting the TSS reductions associated with restoration BMPs in this Plan.

Table 1-3 provides a summary of Charles County's portions of target EOT reductions towards the Bay TMDL. The terms listed below are used throughout the plan and are presented and defined here to assist the reader in understanding the definitions of each and how they were derived:

- **EOT lbs/yr:** An edge of tide load (EOT load) is the amount of pollutant that is transported to the tidal waters of the Chesapeake Bay. EOT loads are generally less than EOS loads due to losses during transport from streams to the Bay.
- **2010 Baseline Load:** Baseline levels (i.e., land use loads with baseline BMPs) from 2010 conditions in the Charles County MS4 source sector using CAST, which is described further in section 2. Baseline loads were used to translate the Bay TMDL TN and TP SW-WLAs.
- **Target % Reduction:** Percent reductions assigned to Charles County Phase I MS4 stormwater sector (WLA Search tool available in MDE's TMDL Data Center; https://wlat.mde.state.md.us/WLASearch.aspx). If TP target is met, TSS target will be met.
- **Target Reduction:** Target reduction translated by multiplying the reduction percent published by the 2010 baseline load. If TP target is met, TSS target will be met.
- **SW-WLA:** Allocated loads are calculated from the 2010 baseline levels, translated as described above, using the following calculation: 2010 Baseline Load – (2010 Baseline Load x Target % Reduction).

Table 1-3. Charles County Chesapeake Bay TMDL Target Loads

TMDL Pollutant	2010 Baseline Load EOT lbs/yr	Target % Reduction	Target Reduction EOT lbs/yr	SW-WLA EOT lbs/yr	Target Year
TN	258,985.69	20.24%	52,418.70	206,566.99	2025
TP	35,298.79	38.26%	13,505.32	21,793.47	2025
TSS	42,078,480.26	n/a	n/a	n/a	n/a

1.3 Impervious Restoration

Under the County's current MS4 permit, PART IV.E. Stormwater Restoration, MDE requires the County to meet an impervious surface treatment goal of 1,083 impervious acres that have not been treated to the

MEP by the end of the current permit term. Per the County's permit, the impervious acre restoration requirements and associated pollutant reductions are consistent with Maryland's Phase III Watershed Implementation Plan (WIP) for the Chesapeake Bay TMDL and 2025 nutrient load targets and for local TMDL implementation targets.

The County will complete the impervious analysis based on MEP and report results in the County's annual report to MDE. Although impervious crediting and reporting are not included in this Plan, the County will complete planning with impervious crediting requirements and restoration benchmarks as outlined in Table 1 of the new permit (PART IV.E.7.) in mind.

2 Modeling Approach

MDE's TMDL Implementation Progress and Planning Tool (TIPP) spreadsheet tool (Version: 04/06/2022; MDE, 2022b) was used to assess nutrient and sediment local TMDL FY23 progress and whether goals were met. The tool calculates pollutant load reductions based on the data of existing, programmed, and potential identified MDE approved BMPs that are maintained in the County's NPDES geodatabase. The TIPP was developed by MDE for use by MS4 jurisdictions for local TMDL modeling and planning. The TIPP uses methods associated with Phase 6 of the Chesapeake Bay Watershed Model (CBWM), which is consistent with the MDE 2021 Accounting Guidance. Additional information on the TIPP, including frequently asked questions and live walkthrough and demo, can be found on MDE's website at https://mde.maryland.gov/programs/water/TMDL/DataCenter/Pages/TMDLStormwaterToolkit.aspx.

The Chesapeake Bay Program's Chesapeake Assessment Scenario Tool (CAST; Version Phase 6 – 7.8.0; CBP, 2020) was used to estimate load reductions applied towards the Chesapeake Bay TMDL. CAST uses methods associated with Phase 6 of the CBWM, which is consistent with the MDE 2021 Accounting Guidance. CAST was developed specifically for Bay-scale modeling for the Bay TMDL pollutants and was therefore determined to be the most appropriate Bay TMDL modeling tool. Only MDE approved BMPs were used in the County's CAST scenarios. Model documentation and training materials can be found on the CAST website at https://cast.chesapeakebay.net/.

Per guidance from MDE (2022c), unlike nutrient and sediment TMDLs, bacteria baseline and progress modeling is not a requirement for bacteria TMDLs. Implementation plans developed for bacteria TMDLs under the most recent guidance are focused on source identification, remediation, monitoring, and showing implementation progress over time rather than achieving SW-WLAs by a final target date. Charles County is currently developing separate bacteria TMDL implementation plans. An update on these plans is provided in Section 3.3.

3 Local TMDLs

Completed BMP implementation and loads for FY23 annual progress, FY23 cumulative progress, and planned BMP implementation and loads required to meet all nutrient and sediment SW-WLAs are presented in the sections below for the Mattawoman Creek and Port Tobacco River watersheds.

Progress is assessed by comparing the calculated percent reduction achieved for each TMDL against the MDE published target percent reduction assigned to Charles County. Planned BMPs summarized in the

tables below represent what is needed to achieve individual SW-WLA targets. A list of planned BMPs is provided in Appendix A.

3.1 Mattawoman Creek TMDL for Nitrogen and Phosphorus

Mattawoman Creek is located in northwestern Charles County, Maryland, and drains directly into the Potomac River, which ultimately drains to the Chesapeake Bay (Figure 3-1). Mattawoman Creek divides Charles County to the south and Prince George's County to the north in the upper portion of the creek. The Waldorf urban area is located along the eastern portion of the watershed, with US Highway 301 (Crain Highway) running from the northern extent of the watershed through to the southeastern extent along the eastern boundary. The Town of Indian Head is located in the western portion of the watershed. Mattawoman Creek is approximately 34 miles long from the headwaters to confluence with the Potomac River with approximately 70 square miles of its watershed contained within Charles County.

Charles County is responsible for two TMDLs within the Mattawoman Creek watershed: TN and TP. The County's initial Restoration Plan finalized in 2017 addressed the Mattawoman TMDLs and was completed using the Maryland Assessment Scenario Tool (MAST) based on the Chesapeake Bay Model version 5.3.2. Modeling transitioned to the TIPP model for the FY22 MS4 annual report and the TIPP is used for this current plan as described in earlier sections. Changes in modeling approach, in addition to updates in completed and planned projects have resulted in new results for modeled progress load reductions, planned reductions, and a need to re-evaluate and reset TMDL target end dates along with benchmark milestones.

One major change in the current analysis versus the 2017 analysis is the exclusion of septic systems from the pollutant load estimates including the baseline load, progress load, and future load reductions. There are approximately 3,000 septic systems in the Mattawoman Creek watershed, many of which were installed prior to 1990, which is when a 4-foot minimum required separation distance between the bottom of the system and the water table was established. The original TMDL analysis by MDE did not separate out septic systems specifically in the Mattawoman as a unique source, the loads were distributed to other sectors including the stormwater sector. Because of this, Charles County included septic systems in the 2017 restoration plan for Mattawoman both in terms of baseline loads and taking credit for septic practices. This method was given the approval of MDE. The TIPP model being used currently does include septic sources as a specific load source separate from the stormwater sector, therefore in the current analysis using the TIPP model rather than add baseline loads from septics, the County is modeling without the septic sources and applying the 54% TN reduction to only the stormwater load source.

In addition to septic systems, the County has identified through sanitary sewer pipe inspections and inflow and infiltration studies that exfiltration, leaking, and/or damaged wastewater system pipes, and sanitary system overflows may be contributing untreated wastewater to the watershed from major sanitary sewer lines running through the Mattawoman floodplain. This load source is unaccounted for in the modeling and is likely implicitly included in the stormwater sector.

Developing a practical plan to meet the 54% TN TMDL percent reduction goal within the stormwater sector is proving to be very difficult. In the sections that follow, Charles County will demonstrate some of the challenges to full implementation and present alternative planning scenarios with room for flexibility and adaptive management to close the gap and meet the TMDL.

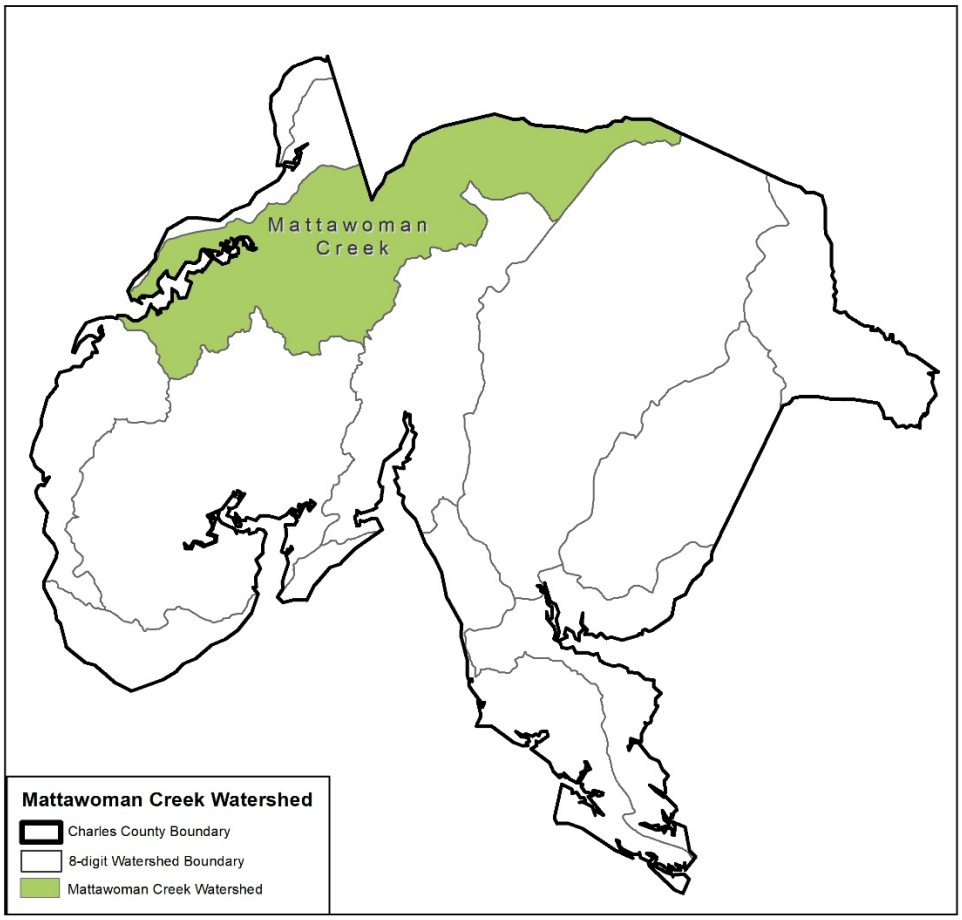

Figure 3-1. Mattawoman Creek Watershed Location

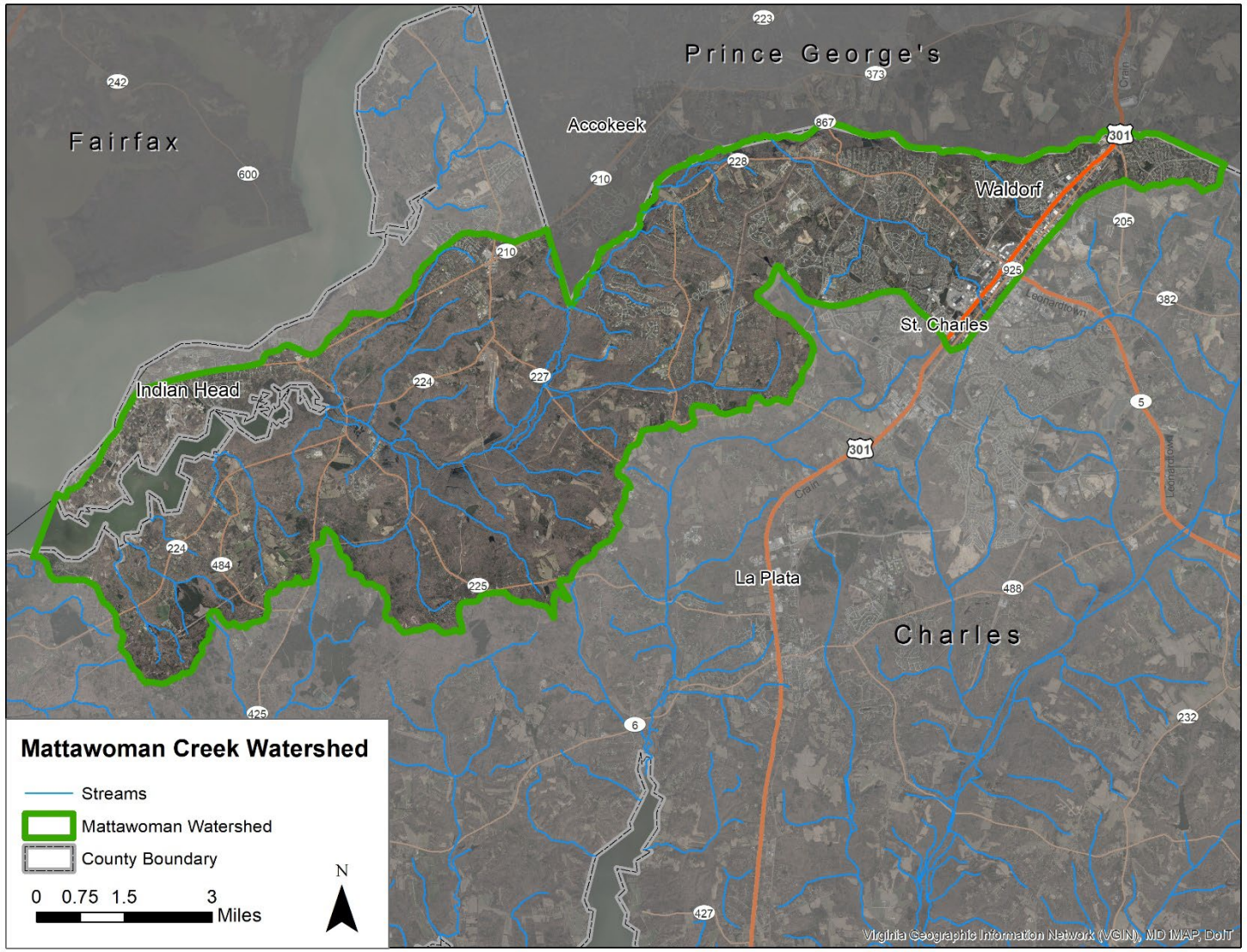

Figure 3-2. Aerial Photography of the Mattawoman Creek Watershed

3.1.1 BMP Implementation

Table 3-1 presents BMP implementation achieved during FY23 (July 1, 2022, through June 30, 2023), as well as cumulative implementation (restoration BMPs implemented after the TMDL baseline year through FY23), planned implementation to meet the TP SW-WLA goal (planned BMPs implemented through the Interim TP Target Year), and total implementation (sum of cumulative progress and planned implementation) for the nutrient local TMDL in the Mattawoman Creek watershed.

Planned BMPs include those BMPs that have been identified as a potential project or strategy through a previous watershed assessment or restoration assessment effort. They generally have a location, a BMP type identified, and some project parameters such as project size, drainage area, length, estimated load reduction and/or impervious surface reduction, and preliminary cost estimate. The primary sources for these planned projects include:

- Watershed Restoration Studies within Charles County Development District (KCI, 2004; KCI, 2007; KCI, 2011)
- Acton-Hamilton Watershed NPDES Watershed Restoration Concept Study (Vista, 2014)
- Stormwater Management Assessments (various school properties) (GMB, 2014a-d)
- Stormwater Management Assessments (Ruth Swann Park) (GMB, 2014e)
- Mattawoman Creek Watershed NPDES: MS4 Retrofit Study (Vista, 2015a)
- Retrofit Plan for Treatment of 20% of the County's Currently Untreated Impervious Surfaces (Vista, 2015c)
- Waldorf Urban Development Corridor Concept (70%) SWM Master Plan Report (BAI, 2016)
- Mattawoman Creek Watershed Assessment (KCI, 2017)

Because projected load reductions from currently planned projects did not achieve the nitrogen and phosphorus target loads in the Mattawoman Creek watershed, a suite of possible BMP types were examined to help achieve the TP required load reduction. These additional BMPs needed to meet the TP load reduction are also included in Table 3-1.

Table 3-1. BMP Implementation for the Mattawoman Creek Nutrients Local TMDLs

BMP	Unit	FY23		Cumulative		Planned		Total	
		Amount	# of BMP	Amount	# of BMP	Amount	# of BMP	Amount	# of BMP
Bioretention	drainage acres	0	0	0	0	326.75	393	326.75	393
Bioswale	drainage acres	0	0	13.61	4	314.91	147	328.52	151
Filter	drainage acres	0	0	280.28	4	707.76	110	988.04	114
Infiltration Practices	drainage acres	0	0	9.76	1	340.86	29	350.62	30
Permeable Pavement	drainage acres	0	0	0	0	60.00	157	60.00	157
Vegetated open channels	drainage acres	0	0	85.92	12	0	0	85.92	12

BMP	Unit	FY23		Cumulative		Planned		Total	
		Amount	# of BMP	Amount	# of BMP	Amount	# of BMP	Amount	# of BMP
Wet ponds and wetlands	drainage acres	0	0	1,008.50	11	1,615.71	144	2624.21	155
Conservation Landscaping	acres converted	0	0	0	0	100.00	5,000	100.00	5,000
Forest planting	acres converted	0	0	0	0	21.76	5	21.76	5
Riparian forest planting	acres converted	0	0	0	0	20.00	7	20.00	7
Urban tree canopy planting	acres converted	0	0	0	0	201.51	20,151*	201.51	20,151*
Street trees	acres converted	0	0	0	0	20.00	2,000*	20	2,000*
Urban soil restoration	acres converted	0	0	0	0	456.07	1,824	456.07	1,824
Stream restoration	linear feet	3,304	2	4,052	3	19,081	10	23,133	13
Inlet cleaning	tons removed	56.08	9	56.08	9	56.08	9	56.08	9
Urban Nutrient Management**	acres treated	6,097.85	n/a	6,097.85	n/a			6,097.85	n/a

*number of trees planted

**Urban Nutrient Management data comes from a statewide number of acres provided to MDE by Maryland Department of Agriculture. These acres are distributed by the CBP WM P6 to County/watershed implementation levels (2021 Progress CAST scenario).

3.1.2 Load Reductions

Table 3-2 below presents pollutant reductions achieved for FY23 annual progress, cumulative reductions for FY23 progress, reductions from Planned BMPs, and total reductions (sum of reductions associated with FY23 progress and planned BMPs) for the nutrient TMDL SW-WLAs in the Mattawoman Creek watershed. The planned BMPs include planned BMPs already identified by the County as well as a suite of BMPs identified for this plan that will be required to meet the TP load reduction goals.

Table 3-2. Progress and Planned Reductions for the Nutrient Local TMDLs in the Mattawoman Creek Watershed

	Mattawoman Creek	
	TN EOR lbs/yr	TP EOR lbs/yr
Baseline Loads and Target Reductions		
TMDL Baseline Year	2000	2000
Baseline Load	93,627.5	11,524.8
Target % Reduction	54.0%	47.0%

Target Reduction	50,558.8	5,416.6
TMDL SW-WLA	43,068.6	6,108.1
FY23 Restoration Reductions (annual treatment from 7/1/2022 through 6/30/2023)		
FY23 Restoration Reduction	4,855.5	690.3
FY23 Restoration % Reduction	5.2%	6.0%
FY23 Progress Reductions (cumulative treatment between 6/30/2000 and 6/30/2023)		
Cumulative Restoration Reduction	8,491.7	1,535.2
Cumulative Restoration % Reduction	9.1%	13.3%
Planned Restoration Reductions		
Planned Restoration Reduction	22,371.5	3,912.7
Planned Restoration % Reduction	23.9%	34.0%
Cumulative Progress + Planned Restoration Reductions		
Cumulative Progress + Planned Restoration Reductions	30,863.2	5,447.9
Cumulative Progress + Planned Restoration % Reduction	33.0%	47.3%

3.1.3 Progress Implementation Benchmark Evaluation

The original restoration plan for the Mattawoman (Charles County, 2017), resulted in an estimated end date of 2035. The County's analysis has transitioned from modeling load reductions using MAST in the 2017 plan to using the TIPP tool in the current Restoration Plan. This transition and current planning levels, along with adjustments to include completion of other TMDLs such as the Port Tobacco Creek sediment TMDL, have resulted in shifts in the total restoration needed, in the overall cost, the end target date, and in the milestone dates.

Milestone dates for Milestone 1 (2033), Milestone 2 (2043), and Interim TP Target Year (2053) were determined for TP and TN as presented in Figure 3-3 and Figure 3-4, respectively, which shows baseline and progress loads (blue bars) and future loads (orange bars) compared to the Mattawoman Creek watershed local TMDL SW-WLA (red line) for TP and TN, respectively.

As mentioned in Section 3.1.1 (see Table 3-1), progress is already underway with the implementation of strategies throughout the watershed. Based on future modeling in the TIPP tool, after implementing the future BMPs described in Section 3.1.1, Charles County will meet its TP SW-WLA for the Mattawoman Creek watershed by the end of FY2053. The TN SW-WLA is discussed below.

Table 3-3: Mattawoman Creek Nutrient Local TMDLs % Reduction Remaining

Local TMDL Watershed Name	Pollutant	Target % Reduction	FY23 Progress % Reduction	% Reduction Remaining	Cost	Target Year	Years Remaining to Complete	Year % Reduction Achieved
Mattawoman Creek	TN	54.0%	7.2%	46.8%	$256,314,339	TBD	TBD	TBD
	TP	47.0%	11.1%	35.9%	$110,572,678	2053	30	TBD

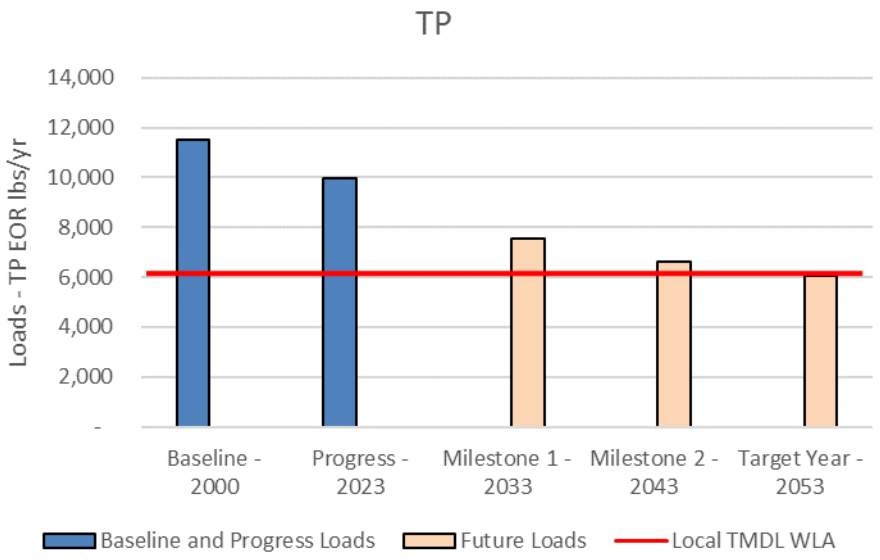

Figure 3-3. Mattawoman Creek TP Progress and Planned Loads

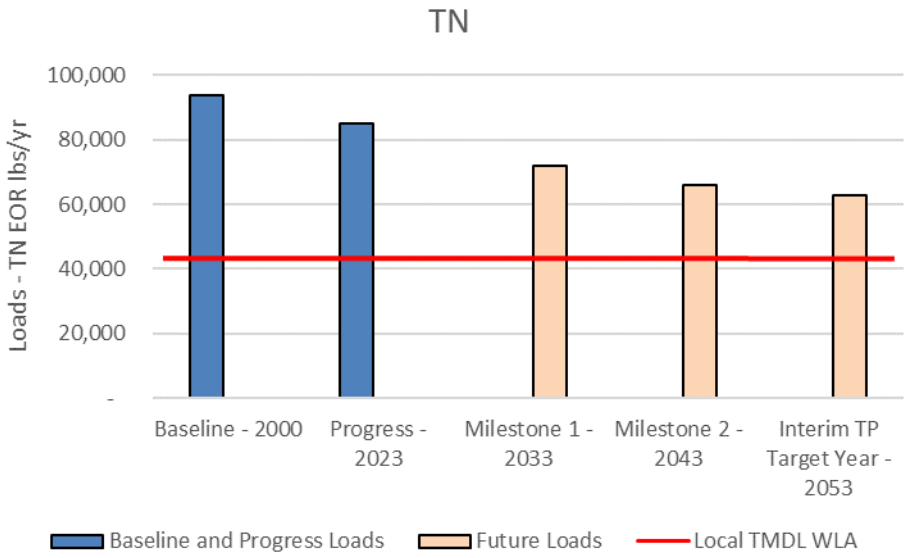

Figure 3-4. Mattawoman Creek TN Progress and Planned Loads

Future BMP implementation in the Mattawoman Creek watershed is shown in Table 3-1. The County's geodatabase lists several future projects in the Mattawoman Creek watershed including stream restoration. Pollutant load reduction modeling results of future implementation for projects currently identified in the County's geodatabase for the Mattawoman Creek watershed resulted in the following reductions: 14.6% reduction in nitrogen and 18.9% reduction in phosphorus.

Additional projects have been identified during various watershed assessments and include stream restoration, tree planting, wet pond retrofits, filtering practices, bioretention, bioswale, and infiltration practices. Pollutant load reduction modeling results for these additional planned projects for the Mattawoman Creek watershed resulted in the following cumulative reductions: 18.5% reduction in nitrogen and 26.0% reduction in phosphorus.

Additional implementation above what has been identified to date is needed to meet the 54% and 47% nitrogen and phosphorus reduction targets, respectively. Because projected load reductions from currently planned projects did not achieve the nitrogen and phosphorus target loads in the Mattawoman Creek watershed, a suite of possible BMP types were examined to help achieve the required TP load reduction. BMP types with the highest nitrogen and phosphorus removal efficiencies were prioritized including stream restoration, urban soil restoration, conservation landscaping, street trees, forest planting, riparian buffer planting, urban tree canopy, permeable pavement, bioswale, wet pond/wetlands, bioretention, filtering practices, and infiltration practices.

Additional BMPs Needed to Achieve Nitrogen SW-WLA

The future BMPs presented in this plan achieve just over half (61%) of the target % reduction resulting in 33.0% TN reduction in the Mattawoman Creek watershed.

Where traditional stormwater BMPs cannot treat the nitrogen load to meet the target, alternative BMPs must be implemented. These would include practices such as stream restoration and land use conversion BMPs (e.g., forest planting, riparian buffer, and tree planting). These types of BMPs also have their limitations in effectiveness for nitrogen reduction. More importantly, there are limited available linear feet of stream to restore or turf acres to convert to forest/tree plantings.

The County modeled a hypothetical future planning scenario to determine how many additional BMPs, above those currently planned for the phosphorus target, are needed to achieve the 54% nitrogen reduction. The results are listed below and demonstrate that this level of implementation is not feasible and may exceed existing amounts of available restoration opportunities (meaning eroded stream length, stormwater sector area etc.) that can realistically be treated in the watershed.

Additional BMPs needed to achieve 54% nitrogen reduction in the Mattawoman Creek watershed:

- 14 SW BMP pond conversions (100 drainage area acres)
- 1,559 new SW BMPs (3,310 drainage area acres)
- 1 stream restoration project (2,000 linear feet)

For example, the drainage area for additional new ponds needed when added to the drainage area for new ponds needed to hit the phosphorus target (3,310 acres) may not be feasible.

The cost to implement the additional BMPs needed to achieve the nitrogen SW-WLA would be $256,314,339, which is $145,741,660 more than the plan to meet the phosphorus SW-WLA.

The County will periodically reevaluate the feasibility of meeting the full 54% nitrogen reduction target as progress moves forward and/or when changes in BMP technologies or crediting methods are implemented. Feasibility assessment will include in depth desktop and potentially additional field

investigation of restorable and treatable areas and streams to determine the full extent of the County's restoration opportunities.

3.2 Port Tobacco TMDL for Sediment

The Port Tobacco River watershed is situated in the central portion of the County, with Mattawoman Creek watershed to the north, Nanjemoy Creek watershed to the west, and Zekiah Swamp watershed to the east (Figure 3-5). The watershed falls entirely within Charles County's boundary. The Port Tobacco River watershed drains directly south into the Port Tobacco River, which drains to the Potomac River, which ultimately leads to the Chesapeake Bay. Communities within the Port Tobacco watershed include La Plata, Pomfret, and Port Tobacco. The Port Tobacco River watershed is approximately 30,100 acres (47.0 square miles) in area and contains approximately 104 total miles of streams. The watershed includes several named streams, including Hoghole Run, Wills Branch, and Jennie Run.

The County's initial Port Tobacco Restoration Plan finalized in 2021 was completed using the Chesapeake Assessment Scenario Tool (CAST) calibrated to the Chesapeake Bay Program Partnership Watershed Model (CBP WM Phase 6). Analysis and updates to the planning for Port Tobacco completed in this current plan are conducted using the TIPP tool as described in earlier sections which have resulted in updates to the modeled progress load reductions, planned reductions and benchmark milestones.

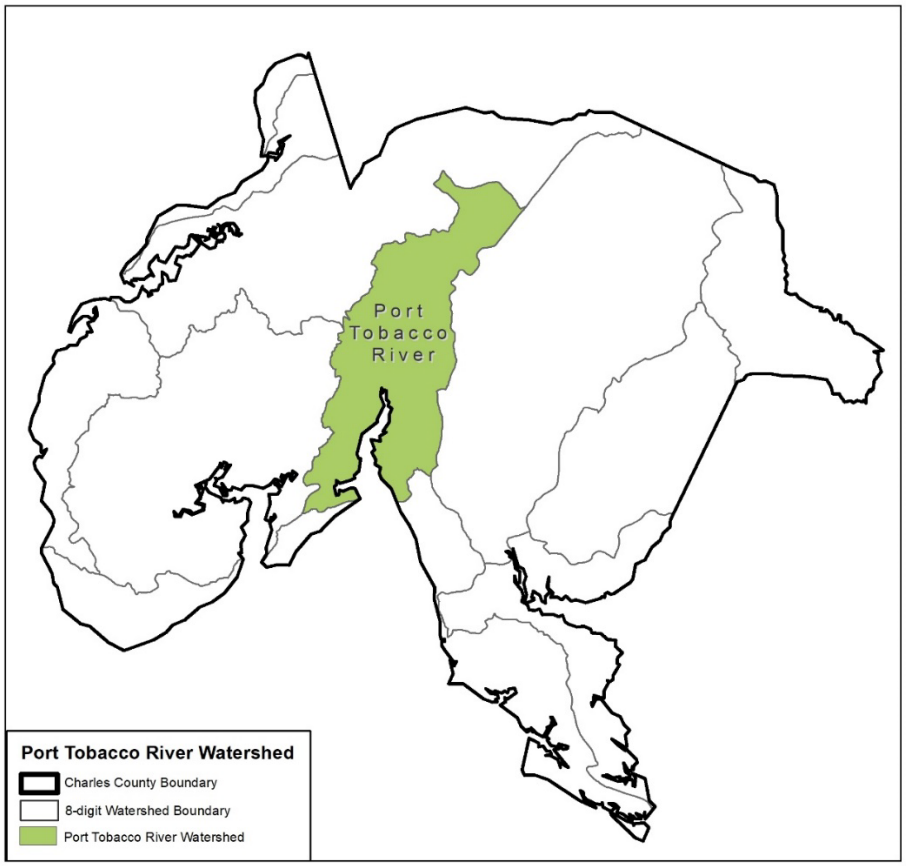

Figure 3-5: Port Tobacco River Watershed Location

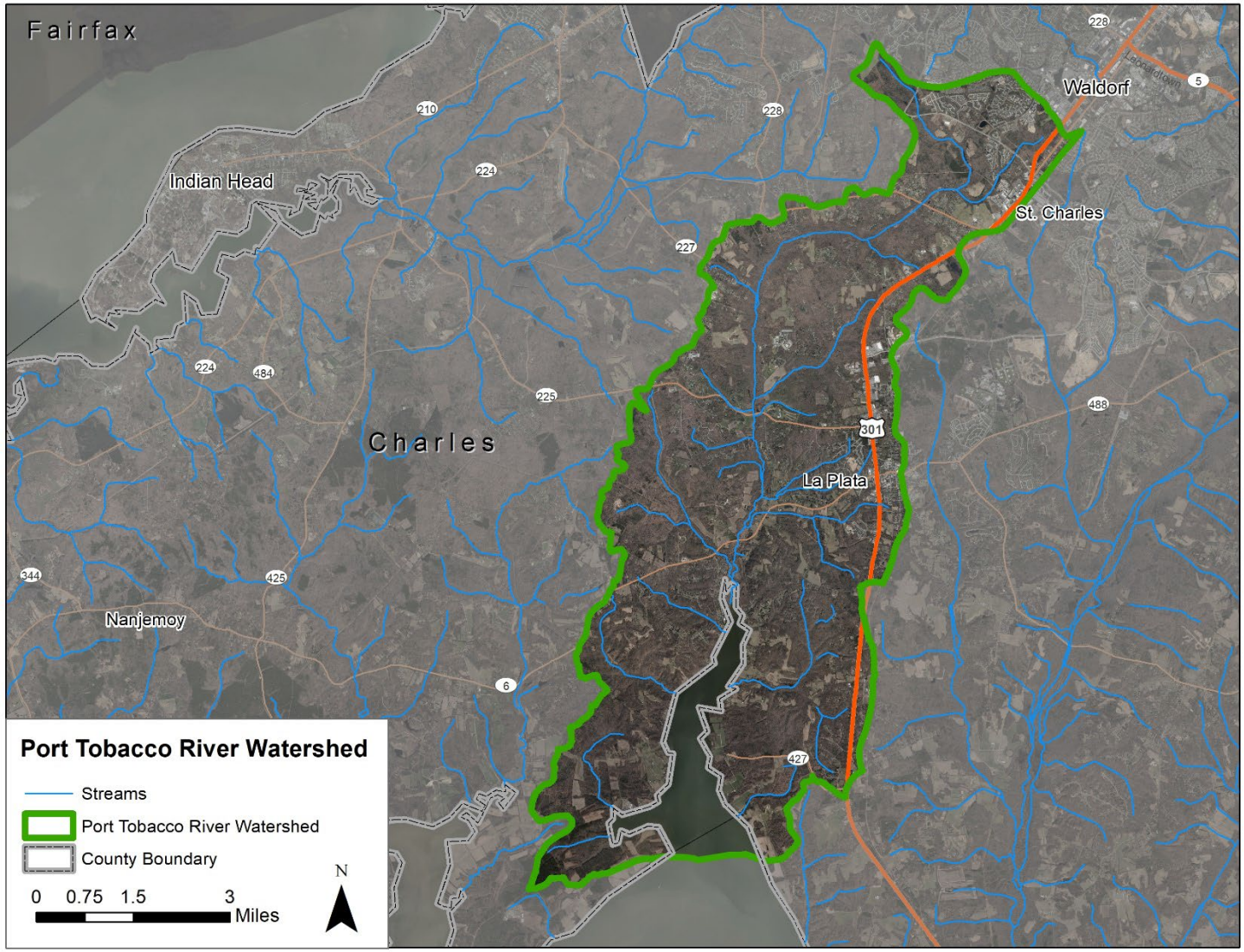

Figure 3-6. Aerial Photography of the Port Tobacco Creek Watershed

3.2.1 BMP Implementation

Table 3-4 below presents restoration BMP implementation achieved during FY23 (July 1, 2022, through June 30, 2023), as well as cumulative implementation (restoration BMPs implemented from the TMDL baseline year through FY23), planned implementation (only BMPs with a 'Planned' status), and total implementation (sum of cumulative progress and planned implementation) for the sediment local TMDL in the Port Tobacco River watershed.

Planned BMPs are those BMPs that have been identified as a potential project or strategy through a previous watershed assessment or restoration assessment effort. They generally have a location, a BMP type identified, and some project parameters such as project size, drainage area, length, estimated load reduction and/or impervious surface reduction, and preliminary cost estimate. The primary sources for these planned projects include:

- Port Tobacco River Watershed NPDES: MS4 Retrofit Study (Vista, 2015c)
- Port Tobacco River Watershed Assessment (KCI, 2015)

Table 3-4. BMP Implementation for the Port Tobacco River Sediment Local TMDL

BMP	Unit	FY23		Cumulative		Planned		Total	
		Amount	# of BMP	Amount	# of BMP	Amount	# of BMP	Amount	# of BMP
Bioretention	drainage acres	0	0	0	0	13.75	2	13.75	2
Bioswale	drainage acres	0	0	0	0	532.92	5	532.92	5
Filter	drainage acres	0	0	0	0	18.36	1	18.36	1
Wet ponds and wetlands	drainage acres	0	0	0	0	421.39	9	421.39	9
Forest planting	acres converted	0	0	0	0	4.30	1	4.30	1
Riparian forest planting	acres converted	0	0	0	0	0.75	1	0.75	1
Urban soil restoration	acres converted	0	0	0	0	0	0	0	0
Stream restoration	linear feet	0	0	0	0	11,563	7	11,563	7

3.2.2 Load Reductions

Table 3-5 below presents pollutant reductions achieved for FY23 annual progress, cumulative reductions for FY23 progress, reductions from Planned BMPs, and total reductions (sum of reductions associated with FY23 progress and planned BMPs) associated with full implementation of the BMPs detailed above in Table 3-4. Based on the current modeling analysis of those BMPs, it is estimated that implementation of

the completed cumulative projects and the planned projects will yield a load reduction of 37%, which is just beyond the required 34% target percent reduction.

Table 3-5. Progress and Planned Reductions for the Sediment local TMDL in the Port Tobacco River Watershed

	Port Tobacco River
	TSS EOS lbs/yr
Baseline Loads and Target Reductions	
TMDL Baseline Year	2009
Baseline Load	13,701,492.2
Target % Reduction	34.0%
Target Reduction	4,658,507.3
TMDL SW-WLA	9,042,984.8
FY23 Restoration Reductions (annual treatment from 7/1/2022 through 6/30/2023)	
FY23 Restoration Reduction	0.0
FY23 Restoration % Reduction	0.0%
FY23 Progress Reductions (cumulative treatment between 6/30/2009 and 6/30/2023)	
Cumulative Restoration Reduction	0.0
Cumulative Restoration % Reduction	0.0%
Planned Restoration Reductions	
Planned Restoration Reduction	5,127,401.3
Planned Restoration % Reduction	37.4%
Cumulative Progress + Planned Restoration Reductions	
Cumulative Progress + Planned Restoration Reductions	5,127,401.3
Cumulative Progress + Planned Restoration % Reduction	37.4%

3.2.3 Progress Implementation Benchmark Evaluation

The original Port Tobacco restoration plan (Charles County, 2021), resulted in an estimated end date of 2035 to meet the TMDL allocated load and load reductions with interim milestones established at 2025 and 2030. The County's analysis has transitioned from modeling load reductions using CAST in the 2021 plan to using the TIPP tool in the current Restoration Plan. This transition and current planning levels, along with adjustments to complete other TMDLs such as the Mattawoman Creek nutrient TMDL, have resulted in a shift in milestone dates to 2028, 2034, and 2039. Planning loads for Milestone 1 (2028), Milestone 2 (2034), and the final Target Year (2039) were determined and are presented in Figure 3-7, which shows baseline and progress loads (blue bars) and future loads (orange bars) compared to the Port Tobacco River watershed local TMDL SW-WLA (red line) for sediment.

As mentioned in Section 3.2.1 (see Table 3-4), progress is already underway with the implementation of strategies throughout the watershed. Based on future modeling in the TIPP tool, after implementing the future BMPs described in Section 3.2.1, Charles County will meet its TSS SW-WLA for the Port Tobacco River watershed by the end of FY2039.

Table 3-6. Port Tobacco Sediment Local TMDL % Reduction Remaining

Local TMDL Watershed Name	Pollutant	Target % Reduction	FY23 Progress % Reduction	% Reduction Remaining	Cost	Target Year	Years Remaining to Complete	Year % Reduction Achieved
Port Tobacco River	TSS	34.0%	0.0%	34.0%	$16,974,191	20439	16	TBD

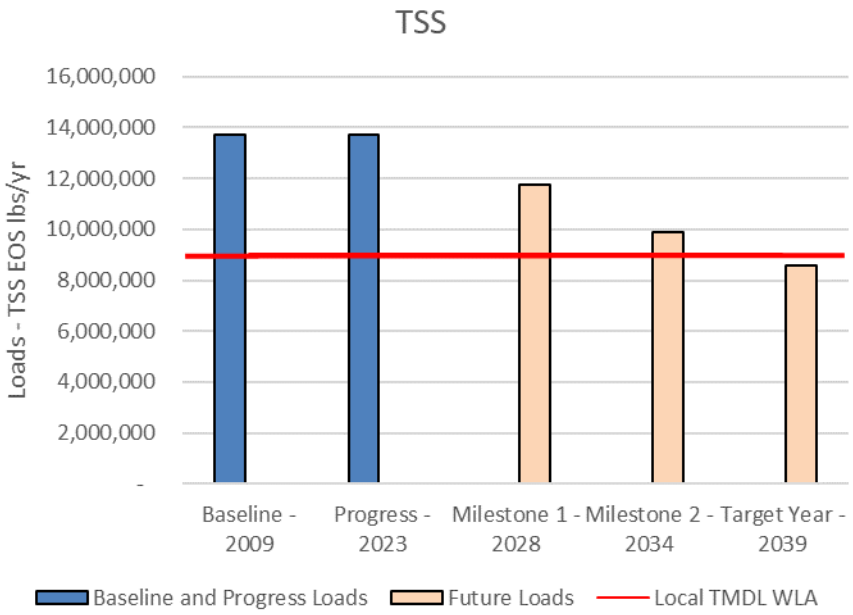

Figure 3-7. Port Tobacco River TSS Progress and Planned Loads

3.3 Lower Patuxent Bacteria TMDL (Indian Creek)

Charles County is preparing a bacteria TMDL plan following MDE's Bacteria Implementation Plan Guidance published in February 2022 (MDE, 2022c). The bacteria plan is focused on identifying the bacteria sources (spatially and by source type) through desktop analysis and monitoring. Once potential sources are identified and confirmed, they will be addressed, and monitoring will continue so that trends and ideally a reduction can be detected. The County's bacteria TMDL plan will be submitted to MDE in early 2024 for agency review.

The County researched and compiled data under a Desktop Source Identification, with results documented in a Data Compilation Results technical memorandum listing the datasets researched and compiled to support the analysis. Data sources compiled include spatial data, monitoring data, data related to human sources, and data to describe potential non-human sources. Data fall into general categories related to land use, municipal stormwater infrastructure, municipal sanitary sewer systems,

on-site disposal systems, landfills, wildlife, pet related elements such as dog parks, illicit discharges, and data to characterize potential exposures such as water contact recreation areas and beaches.

Currently the County is doing a review and analysis of the compiled spatial and monitoring data to identify potential sources of bacteria contamination, both by type or source and by location. For each source, the implementation plan will identify a strategy or strategies to address the source, specifics of implementation, an analysis of cost and resources needed to address, a schedule with milestones to track completion, and how implementation will be measured and/or monitored for success. An associated monitoring plan is being developed with the goal of confirming existing sources, identifying new sources, assessing trends and evaluating impairment status.

4 Chesapeake Bay TMDL

Countywide completed BMP implementation and loads for FY23 annual progress and FY23 cumulative progress are presented in the sections below. Progress is assessed by comparing the calculated percent reduction achieved for TN and TP against the MDE published percent reductions assigned for Charles County's portion of the Chesapeake Bay TMDL. As stated in section 1.2.2., unlike TN and TP, there is no required percent reduction for TSS in the Chesapeake Bay TMDL; rather, it is assumed that the TSS target will be met if the TP target is met. Although a TSS target reduction is not included for the Chesapeake Bay TMDL, the County is presenting the TSS reductions associated with restoration BMPs in this Plan.

Planned BMP implementation and loads are also summarized in the tables below and are presented in two ways: 1) planning up to the 2025 Chesapeake Bay TMDL target year; and 2) planning associated with achieving the TP SW-WLA in 2053.

4.1 BMP Implementation

Table 4-1 presents Countywide BMP implementation achieved during FY23 (July 1, 2022, through June 30, 2023), as well as cumulative implementation (restoration BMPs implemented after the TMDL baseline year through FY23), planned implementation for BMPs with a projected implementation date before 2025, and total implementation through the 2025 Chesapeake Bay TMDL target year (sum of cumulative progress and planned implementation up to 2025). Table 4-2 presents Countywide cumulative BMP implementation through FY23 summed with planned implementation for BMPs with a projected implementation date through 2053, the scenario used to meet the Mattawoman TP reduction target.

The primary sources for these planned projects include:

- Gilbert Swamp Watershed Assessment (KCI Technologies, 2018a)
- Mattawoman Creek Watershed Assessment (KCI Technologies, 2017)
- Mattawoman Creek Watershed NPDES: MS4 Retrofit Study (Vista Design, Inc, 2015a)
- Nanjemoy Creek Watershed Assessment (KCI Technologies, 2018b)
- Port Tobacco River Watershed Assessment (KCI Technologies, 2015)
- Port Tobacco River Watershed NPDES: MS4 Retrofit Study (Vista Design, Inc, 2015b)
- Potomac River and Nanjemoy Creek Watersheds MS4 Retrofit Investigation (Bayland Consultants and Designers, Inc, 2015a)
- Lower Patuxent River Watershed Assessment (KCI Technologies, 2016)
- Upper, Middle, and Lower Potomac River Watershed Assessment (KCI Technologies, 2018c)
- Wicomico River Watershed Assessment (KCI Technologies, 2018d)

- Zekiah Swamp Watershed Assessment (KCI Technologies, 2018e)
- Upper Zekiah Swamp Watershed NPDES: MS4 Retrofit Study (Bayland, 2015b)
- Urban Flood Analysis: Zekiah Watershed (Charles County, Maryland, 2023)
- Assessment and Shoreline Management Plan for Reaching NDPES MS4 Goals (SMRC&D, 2018)

Table 4-1. BMP Implementation for the Chesapeake Bay TMDL Through 2025

BMP	Unit	FY23		Cumulative		Planned to 2025		Total	
		Amount	# of BMP	Amount	# of BMP	Amount	# of BMP	Amount	# of BMP
Bioretention	drainage acres	0	0	0.18	1	1.82	1	2.00	2
Bioswale	drainage acres	0	0	13.61	4	0	0	13.61	4
Filter	drainage acres	0	0	314.41	5	0	0	314.41	5
Impervious surface reduction	acres converted	0	0	0	0	0	0	0	0
Infiltration Practices	drainage acres	0	0	9.76	1	0	0	9.76	1
Vegetated open channels	drainage acres	0	0	111.33	19	0	0	111.33	19
Wet ponds and wetlands	drainage acres	0	0	1,288.66	14	224.38	6	513.04	20
Conservation Landscaping	acres converted	0	0	0	0	0	0	0	0
Forest planting	acres converted	0	0	0	0	0	0	0	0
Riparian forest planting	acres converted	0	0	0	0	0	0	0	0
Urban tree canopy planting	acres converted	0	0	1.47	1	0	0	0	0
Shoreline restoration	linear feet	0	0	34,349	101	580	4	34,929	105
Stream restoration	linear feet	3,304	2	6,084	5	17,334	9	23,418	14
Inlet cleaning	tons removed	115.13	71	115.13	71	115.13	71	115.13	71

Table 4-2: BMP Implementation for the Chesapeake Bay TMDL Through 2053

BMP	Unit	Cumulative		Planned to 2053		Total	
		Amount	# of BMP	Amount	# of BMP	Amount	# of BMP
Bioretention	drainage acres	0.18	1	386.60	407	386.78	408
Bioswale	drainage acres	13.61	4	870.90	157	884.51	161
Filter	drainage acres	314.41	5	727.62	112	1,042.03	117
Impervious surface reduction	acres converted	0	0	62.68	3	62.68	3
Infiltration Practices	drainage acres	9.76	1	340.86	29	350.62	30
Permeable Pavement	drainage acres	0	0	60.00	157	60.00	157
Vegetated open channels	drainage acres	111.33	19	0	0	111.33	19
Wet ponds and wetlands	drainage acres	1,288.66	14	2,965.92	164	4,254.58	178
Conservation Landscaping	acres converted	0	0	100.00	5,000	100.00	5,000
Forest planting	acres converted	0	0	42.98	14	42.98	14
Riparian forest planting	acres converted	0	0	31.75	12	31.75	12
Urban tree canopy planting	acres converted	1.47	1	200.25	20,025*	201.72	20,026*
Street tree planting	acres converted	0	0	20.00	2,000*	20.00	2,000*
Shoreline restoration	linear feet	34,349	101	20,587.77	15	54,936.77	116
Stream restoration	linear feet	6,084	5	25,666	16	31,750	21
Inlet cleaning	tons removed	115.13	71	115.13	71	115.13	71

*number of trees planted

4.2 Load Reductions

Table 4-3 below presents Countywide pollutant reductions achieved for FY23 annual progress, cumulative reductions for FY23 progress, reductions from planned BMPs with a projected implementation date through 2025, and total reductions (sum of reductions associated with FY23 progress and planned BMPs)

for the nutrient and sediment TMDL SW-WLAs in the Chesapeake Bay watershed. These represent the modeled reductions related to the BMPs listed above in Table 4-1.

Further, Table 4-3 also includes the reductions related to the implementation described in above in Table 4-2 representing the planned reductions for implementation after 2025 and associated with achieving the TP SW-WLA in 2053.

Table 4-3. Progress and Planned Reductions for the Chesapeake Bay TMDL

	Chesapeake Bay TMDL		
	TN EOT lbs/yr	TP EOT lbs/yr	TSS EOT lbs/yr
Baseline Loads and Target Reductions			
Baseline Year	2010	2010	2010
Baseline Load	258,985.69	35,298.79	42,078,480.26
Target % Reduction	20.24%	38.26%	n/a
Target Reduction	52,418.70	13,505.32	n/a
TMDL SW-WLA	206,566.99	21,793.47	n/a
FY23 Restoration Reductions (7/1/2022 through 6/30/2023)			
FY23 Restoration Reduction	2,806.32	681.96	965,780.93
FY23 Restoration % Reduction	1.1%	1.9%	2.3%
FY23 Progress Reductions (7/1/2010 through 6/30/2023)			
FY23 Progress Reduction	6,206.26	1,638.75	2,561,172.43
FY23 Progress % Reduction	2.4%	4.6%	6.1%
Planned Restoration Reductions through 6/30/2025			
2025 Planned Restoration Reduction	6,833.63	1,623.00	2,191,165.84
2025 Planned Restoration % Reduction	2.6%	4.6%	n/a
Cumulative Progress + 2025 Planned Restoration Reductions			
Cumulative Progress + 2025 Planned Restoration Reductions	13,039.89	3,261.75	4,752,338.27
Cumulative Progress + 2025 Planned Restoration % Reduction	5.0%	9.2%	n/a
Planned Restoration Reductions through 6/30/2053			
2025 Planned Restoration Reduction	22,470.76	5,592.83	9,388,014.40
2025 Planned Restoration % Reduction	8.7%	15.8%	n/a
Cumulative Progress + 2053 Planned Restoration Reductions			
Cumulative Progress + 2025 Planned Restoration Reductions	28,677.02	7,231.58	11,949,186.83
Cumulative Progress + 2025 Planned Restoration % Reduction	11.1%	20.5%	n/a

5 Restoration Plan

The County plans to implement a variety of projects and programs to meet the NPDES MS4 requirements for local TMDL SW-WLA in the Mattawoman Creek, Port Tobacco River, and Indian Creek watersheds, and restoration goals for the Chesapeake Bay TMDL. This updated Stormwater Restoration Plan outlines the BMPs required, associated cost to meet these goals, and establishes benchmarks for the County to assess progress over time.

To support implementation of the plan, and to identify additional opportunities, the County has developed the following list of current or near-future studies and strategies to explore and undertake:

Planned Project Prioritization

Charles County has developed a method to prioritize projects for future implementation based on multiple factors. A complete description of the prioritization method is included in Appendix B. This section provides a brief summary of the methods. Final results are presented in Appendix A. The prioritization involved a matrix made up of a series of parameters, or metrics, which evaluated each project and allowed for discrimination between the facilities. Metrics include project benefits, including proximity to priority funding area, impervious in drainage area, infiltration capacity, enhanced tree canopy, conserved forest in easement, local TMDL addressed, and community benefits, as well as project constraints, including routine and structural maintenance, verification and inspection requirements, cost per pound of pollutant reduced, cost per impervious credit, and ownership. Each planned project identified by the County to date was scored for each metric. Quantitative metrics were scored based on results of the preliminary design and cost estimates (e.g. impervious area treated, pollutant removal). Other metrics were scored more qualitatively based on professional judgment and assessment of each project site (e.g. community benefits, enhanced tree canopy, maintenance). Each project was ranked based on the total score and the final prioritization was determined. The final prioritized list of projects is presented in Appendix A.

Structural Stormwater and Alternative Practice BMP Implementation

- Implement identified planned projects in Mattawoman Creek and Port Tobacco River watersheds according to the prioritization results (prioritization methods discussed below and in Appendix B, results listed in Appendix A). In the event that some projects may ultimately not be implemented due to site, cost, or property ownership constraints, additional projects will need to be identified to provide treatment.
- Through watershed assessments and/or impervious surface treatment analyses, identify specific sites for additional planned projects needed in the Mattawoman Creek watershed to help achieve the TP TMDL:
    - 6,000 linear feet stream restoration
    - 456 acres of urban soil restoration
    - 100 acres of conservation landscaping
    - 2,000 street trees and 20,000 urban tree canopy trees
    - 20 acres of forest planning and 20 acres of riparian buffer planting
    - 60 acres of permeable pavement
    - 300 drainage area acres of bioswales

  - 800 drainage area acres of dry pond retrofits
  - 300 drainage area acres of new wet ponds/wetlands
  - 300 drainage area acres of bioretention
  - 300 drainage area acres of filtering practices
  - 300 drainage area acres of infiltration practices

- Consider the load reduction and cost analysis of these additional planned projects presented in Table 5-1. This table presents the additional planned projects needed in the Mattawoman Creek watershed to help achieve the TP TMDL. Cost estimates are primarily derived from other MS4 municipality's completed and planned project costs and cost estimates by BMP type. The percent of TN/TP Reduction Goal columns present the percent of the 54% TN and 47% TP reduction goal that each BMP type would achieve if fully implemented according to plan. If full implementation of these BMPs were to be achieved, these projects would represent approximately 45% of the 47% TP TMDL goal. BMP types with the lowest cost per TN/TP pound removed should be prioritized, however a variety of BMP types and varying corresponding costs are planned due to feasibility of the large degree of implementation needed to achieve the TMDL goals.
- When selecting and implementing planned projects, evaluate and consider potential loss of ecosystem function and eventual encroachment of non-native plant species onto the project site. Incorporate techniques, methods, and long-term management plans to minimize these impacts. For example, if evaluating potential stream restoration projects first consider and the opportunity for self-recovery of stream channel stability as discussed in this report: *The Self-Recovery of Stream Channel Stability in Urban Watersheds due to BMP Implementation* found at: https://cbtrust.org/wp-content/uploads/Self_Recovery_of_Stream_Channel_Stability_Final_Draft_03-23-21.pdf). Additionally, for planning stream restorations follow the latest guidance, *"Maintaining Forests in Stream Restoration Corridors*" found at: https://owl.cwp.org/mdocs-posts/maintaining-forests-in-stream-corridor-restoration-a-best-practices-guide-for-projects-in-pennsylvania-maryland-and-virginia/.
- When selecting and implementing planned projects that have a forest component such as forest removal or forest planting, coordinate with forest agencies to improve long-term success. Consider the thermal impact of the projects on adjacent ecosystems and plan for enhancement.

Table 5-1. Load Reduction and Cost Analysis of Additional Planned Projects Needed to Achieve Mattawoman Creek TP TMDL

BMP Type	Unit	Amount	Total Cost	# of Projects	TN EOR Reduction	TP EOR Reduction	% of TN Reduction Goal	% of TP Reduction Goal	$/TN Pound Removed	$/TP Pound Removed
Stream Restoration	linear feet	6,000	$2,810,437	4	360.19	252.72	0.71%	4.67%	$7,803	$11,121
Urban Soil Restoration	acres	456	$3,580,150	1,824	1,606.21	203.40	3.18%	3.76%	$2,229	$17,602
Conservation Landscaping	acres	100	$47,800	5,000	279.29	27.01	0.55%	0.50%	$171	$1,770
Street Trees	acres	20	$240,011	2,000	34.32	6.31	0.07%	0.12%	$6,993	$38,027
Forest Planting	acres	20	$240,000	4	118.39	18.62	0.23%	0.34%	$2,027	$12,891
Riparian Buffer	acres	20	$240,000	7	153.09	25.66	0.30%	0.47%	$1,568	$9,353
Urban Tree Canopy	acres	200	$2,400,109	20,000	340.87	51.43	0.67%	0.95%	$7,041	$46,668
Permeable Pavement	acres	60	$8,439,512	157	512.09	55.87	1.01%	1.03%	$16,480	$151,059
Bioswale	acres	300	$27,337,528	145	2,128.09	295.88	4.21%	5.46%	$12,846	$92,395
Wet Pond/Wetland Retrofit	acres	800	$6,625,210	110	1,621.40	473.40	3.21%	8.74%	$4,086	$13,995
Wet Pond/Wetland New	acres	300	$2,484,454	12	608.03	177.53	1.20%	3.28%	$4,086	$13,995
Bioretention	acres	300	$16,828,609	388	2,128.09	295.88	4.21%	5.46%	$7,908	$56,877
Filtering Practice	acres	300	$10,539,876	101	1,216.05	236.70	2.41%	4.37%	$8,667	$44,528
Infiltration Practice	acres	300	$5,771,629	27	2,432.10	335.33	4.81%	6.19%	$2,373	$17,212
		Total	$87,585,322	29,780	13,538.22	2,455.73	26.78%	45.34%	n/a	n/a

Full Delivery of Water Quality Improvement Projects

In 2023, the County posted an initial request for proposals from qualified water quality improvement contractors to carry out the implementation of new water quality improvement practices (to include design, permitting, land acquisition, construction, and potentially maintenance) on private properties throughout the County. The goal is to lead the County's clean water efforts associated with impervious surface requirements of the County's MS4 permit and for TMDL compliance.

The County desires to treat the most equivalent impervious acres to the maximum extent practicable (MEP) and secure the greatest pollutant load reductions possible. The budget associated with the initial program solicitation is $2,500,000 and the timeframe for the selected contractor for completing the work is three years from contract execution. Based on success and future funding availability additional requests for proposals may be posted.

Intra-County Partnerships

- Track projects implemented through the Resilience Authority of Charles County, MD, Inc. (RA) for applying credits towards TMDLs. For example, the RA is pursuing and receiving grant funding for projects such as tree plantings, and design and installation of stormwater parks and retrofits to address flooding and water quality.
- Coordinate with the RA on additional partnership opportunities for restoration projects.
- Evaluate projects identified in the Drainage Improvement Program for achieving credits towards TMDLs.

Forest Conservation

- Pursue implementation of a Forest Conservation Watershed Program for the purpose of preventing conversion to land uses with higher pollutant loadings. This BMP is eligible for impervious surface restoration credits and tracking towards local TMDLs and potentially the Bay TMDL in the future. The County has a budget of $1,006,000 per year beginning in FY2025 for establishing new forest conservation easements for this purpose.
- The County is communicating with MDE on MDE's efforts to add Forest Conservation into the Bay model as an approved and creditable BMP.

Inlet Cleaning

Continue to expand the inlet cleaning program. The County has allotted more budget towards the inlet cleaning program- increasing the budget from $120,000 in FY23 to $150,000 in FY24.

Swale Studies

The County conducted a 2023 study of the existing open section drainage swales within Swan Point to assess their compliance with the grass swale requirements from MDE (M-8 Best Management Practice),

based on methodology established in the Existing Water Quality Grass Swale Identification Protocol approved by MDE on May 18, 2016 (SHA, 2016). With proper documentation and routine triennial BMP maintenance inspections, the baseline credit reduction for the impervious surface treatment by the grass swales would reduce the County's impervious restoration requirement in its NPDES permit.

The County plans to use this study as a template to replicate across other areas and watersheds of the County.

Redevelopment / Land Use Planning

- Investigate and consider options for incentives to encourage redevelopment projects to manage stormwater beyond the 50% minimum State requirement.
- Investigate and consider options for incentives to encourage use of pervious paving and green roofs to maximize redevelopment potential in the Waldorf Urban Revitalization Corridor.

Urban Soil Restoration

- Implement a pilot urban soil restoration project as the first step in initiating a grant program for this purpose. Develop supplemental educational materials regarding urban turf management for property owners to reduce runoff and its impacts. The pilot study may involve a desktop assessment to identify target neighborhoods/lots, field assessments, and outreach to homeowners.
- Investigate and consider expanding the County's existing partnership with Chesapeake Bay Trust in the Outreach and Restoration Grant Program for implementation of urban soil restoration and meadow planting grants.

Private Shoreline Restoration

- Investigate and consider creating a County program to incentivize private landowners to implement shoreline restoration projects with restoration credits available to the County.
- Investigate the level of effort and costs associated with collecting site data of private shoreline restoration projects for the County to claim restoration credits associated with these projects.

Structural Stormwater BMP Inspection and Maintenance

- Perform engineering inspections and bathymetric surveys for stormwater ponds over 20 years old for the following purposes:
    - Identify any needed repairs not easily identifiable during the County's routine maintenance inspections.
    - Determine water quality treatment provided for baseline credit reduction or impervious surface treatment. Although MDE no longer tracks the baseline, this information is critical to the County's understanding and operation of the stormwater system to target funding for priority infrastructure needs.
    - Ensure capacity for new development where applicable, to support the development review and permitting process. Up-to-date bathymetric surveys are not currently

required for the permitting process but would ensure expectations can be met without further stormwater facility expansion.

Oyster Harvesting

In 2022, the Board of Charles County Commissioners and Wicomico River Oyster Cooperative, LLC entered into an eight-year Water Quality Credit Agreement. Under the agreement, the County will pay approximately $50,000 per year for five consecutive years to plant oyster spat on shell. Beginning in year three or four and continuing through year eight, oysters are to be harvested and water quality credits will be applied towards the County's Municipal Stormwater Permit restoration requirements. Under this agreement, approximately 14 million oyster spat on shell were planted during June 2022 and approximately 13 million oyster spat on shell were planted during May 2023. Both plantings occurred at the Wicomico River Oyster Cooperative, LLC's aquiculture lease location.

The expert panel report *Nitrogen and Phosphorus Reduction Associated with Harvest of Hatchery-Produced Oysters and Reef Restoration: Assimilation and Enhanced Denitrification* (Cornwell et al., 2023) will be used to determine which protocol is used to calculate exact water quality credits resulting from this oyster harvesting effort at a later date. This BMP is not currently accounted for in the Chesapeake Bay TMDL BMP implementation and load reductions tables presented in Section 4.

Accounting for Nitrogen Loads from Sanitary Sewer Infrastructure and On-Site Septic Systems

This Plan presents BMP implementation to meet the Mattawoman TP SW-WLA at an Interim TP Target Year of 2053. As described in section 3.1.3, developing a practical plan to meet the 54% TN TMDL percent reduction goal within the stormwater sector is proving to be very difficult. The additional BMPs needed to achieve the full TN SW-WLA include 14 SW BMP pond conversions (100 drainage area acres), 1,559 new SW BMPs (3,310 drainage area acres), 1 stream restoration project (2,000 linear feet). Watershed limitations, such as available linear feet of eroded stream to restore, turf acres to convert to forest/tree plantings, stormwater ponds available for retrofit, and available drainage area for additional new BMP facilities, exist in the Mattawoman Creek watershed, making BMP implementation to meet the TN TMDL potentially unfeasible with current or standard treatment methods.

One opportunity that the County plans to investigate further is the TN load attributed to damaged and/or leaking sanitary sewer pipe infrastructure and septic systems. The wastewater and septic load sources are not accounted for separately in the TMDL and may be implicitly included in the stormwater sector loads and required reductions. The County has identified through sanitary sewer pipe inspections and inflow and infiltration studies that exfiltration, leaking, and/or damaged wastewater system pipes, and sanitary system overflows may be contributing untreated wastewater to the watershed from major sanitary lines running through the Mattawoman floodplain. Reductions associated with septic and/or wastewater upgrades and repairs may help achieve the TN SW-WLA.

Miscellaneous

- Perform analysis of stormwater management easements to identify meadow pollinator planting opportunities. Develop associated maintenance agreements for implementing this practice.
- Continue supporting USGS gages to enhance ability to measure flow and calculate pollutant loads.

- Explore use of floating wetlands in new or existing stormwater facilities or lakes to provide additional nutrient uptake.

Adaptive Management

The County will take an adaptive management approach and will reevaluate treatment needs as feasibility studies progress. The County will continue to track the overall effectiveness of the various BMP strategies and will adapt the suite of solutions based on the results. New technologies are continuously developed and evaluated to determine their pollutant control efficiencies. The County will also continue to monitor changes in regulations and policy that could impact the program. Charles County will continue to work with technical, outreach, and funding partners to ensure that the County's waterways are protected and restored, stormwater impacts are reduced, and that the County is doing its part for the restoration of the Chesapeake Bay.

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Appendix A

Charles County Future Implementation Project List – Currently Planned or Under Construction Projects

8 Digit Watershed Name	Site Name	Construction Purpose	MDE BMP Description	Unit	Treatment	Cost ($)	Status	Projected Implementation Year
Gilbert Swamp	Oak Ridge Park (East)	REST	Stream Restoration	Linear Feet	900.00	1,500,000	P	2026
Gilbert Swamp	Oak Ridge Park (West)	REST	Stream Restoration	Linear Feet	3,240.00	1,500,000	P	2025
Mattawoman Creek	Acton Village Westdale	REST	Stream Restoration	Linear Feet	728.00	1,248,810	UC	2023
Mattawoman Creek	Marbella	REST	Stream Restoration	Linear Feet	2,396.00	1,816,398	P	2024
Mattawoman Creek	Marbella (Outfalls #2 & #3)	REST	Outfall Stabilization	Linear Feet	219.00	46,325	P	2024
Mattawoman Creek	Ruth B Swann Northern	REST	Stream Restoration	Linear Feet	2,081.00	1,697,700	P	2025
Mattawoman Creek	Ruth B Swann Trib	REST	Stream Restoration	Linear Feet	1,644.00	877,140	UC	2024
Mattawoman Creek	Ruth B Swann Trib (Outfalls #1 - #6)	REST	Outfall Stabilization	Linear Feet	687.00	119,610	UC	2024

8 Digit Watershed Name	Site Name	Construction Purpose	MDE BMP Description	Unit	Treatment	Cost ($)	Status	Projected Implementation Year
Port Tobacco River	College Of Southern Md (3 parts)	REST	Stream Restoration	Linear Feet	1,330.00	1,369,580	UC	2024
Port Tobacco River	Port Tobacco	REST	Stream Restoration	Linear Feet	1,743.00	1,972,800	P	2025
Port Tobacco	Locust Grove	REST	Stream Restoration	Linear Feet	1,184.00	810,500	P	2026
Port Tobacco River	Wilton Court	CONV	Extended Detention Structure, Wet	DA Acres	35.00	117,390	P	2024
Potomac River M tidal	South Hampton-Amherst	REST	Step Pool Storm Conveyance	DA Acres	16.92	522,388	P	2025
Potomac River M tidal	South Hampton-Greenville	CONV	Extended Detention Structure, Wet	DA Acres	14.19	598,958	P	2025
Potomac River M tidal	South Hampton-Sir Douglas	CONV	Extended Detention Structure, Wet	DA Acres	14.04	184,214	P	2025
Potomac River M tidal	South Hampton-Walden	CONV	Extended Detention Structure, Wet	DA Acres	13.64	226,320	P	2025

8 Digit Watershed Name	Site Name	Construction Purpose	MDE BMP Description	Unit	Treatment	Cost ($)	Status	Projected Implementation Year
Wicomico River	Wicomico River Oyster Cooperative, LLC	REST	Oyster Harvesting	Number Oyster Spat	13 million/year	250,000	P	2025-2030
Zekiah Swamp	Walter Mitchell	REST	Bioretention	DA Acres	1.82	75,000	P	2025
Zekiah Swamp	Walter Mitchell	REST	Stream Restoration	Linear Feet	860.00	887,655	P	2025
Zekiah Swamp	White Oak Village Pond	CONV	Extended Detention Structure, Wet	DA Acres	269.12	867,880	P	2024
Zekiah Swamp	White Plains Golf Course	REST	Retention Pond (Wet Pond)	DA Acres	142.00	366,069	P	2026
Zekiah Swamp	Milton Somers Stream Restoration	REST	Stream Restoration	Linear Feet	1,125.00	1,261,665	P	2025
Zekiah Swamp	Milton Somers Pond Retrofit	REST	PWED	DA Acres	39.89	420,555	P	2025

Charles County Future Implementation Project List- Additional Planned Projects

8 Digit Watershed Name	Site Name	MDE BMP Description	Unit	Treatment	Projected Cost ($)	Source Document	Prioritization Ranking
Mattawoman Creek	First Baptist Church of Waldorf	Forest Planting	Acres Planted	3.28	45,839	KCI, 2017	77
Mattawoman Creek	Jenifer School Ln	Forest Planting	Acres Planted	2.10	90,284	KCI, 2017	77
Zekiah Swamp	Samuel A Mudd School	Forest Planting	Acres Planted	2.10	29,357	KCI, 2018e	68
Port Tobacco River	South Potomac Church	Forest Planting	Acres Planted	4.30	138,709	KCI, 2015	67
Mattawoman Creek	Pinefield Rd	Urban Tree Canopy	Acres Planted	0.25	3,557	KCI, 2017	66
Mattawoman Creek	Little Valley Pl	Forest Planting	Acres Planted	1.76	24,561	KCI, 2017	66
Mattawoman Creek	Indian Head Hwy	Forest Planting	Acres Planted	0.93	12,955	KCI, 2017	64
Mattawoman Creek	Pleasant Grove Missionary Baptist Church	Forest Planting	Acres Planted	0.76	10,676	KCI, 2017	64
Zekiah Swamp	Smallwood Village	Forest Planting	Acres Planted	0.90	12,209	KCI, 2018e	64
Mattawoman Creek	Middletown Rd	Forest Planting	Acres Planted	0.55	7,716	KCI, 2017	60
Port Tobacco River	Valley Rd	Riparian Forest Buffer	Acres Planted	0.75	10,605	KCI, 2015	60
Port Tobacco River	Southwinds Drive	Sheetflow to Conservation Areas	DA Acres	9.80	77,237	Vista, 2015b	58

Zekiah Swamp	Malcolm Elementary School	Forest Planting	Acres Planted	6.30	149,821	KCI, 2018e	58
Mattawoman Creek	Racetrack	Submerged Gravel Wetlands	DA Acres	73.88	383,612	Vista, 2015a	57
Mattawoman Creek	Mattawoman Middle School	Infiltration Basin	DA Acres	36.94	932,274	KCI, 2017	54
Mattawoman Creek	Shoppers Parking	Bioretention	DA Acres	4.29	118,430	Vista, 2015a	53
Mattawoman Creek	Fox Chase Apartment	Bioretention	DA Acres	6.71	808,697	KCI, 2017	52
Potomac River	Site 61	Shoreline Restoration	Linear Feet	1,407.00	1,097,933	SMRC&D, 2018	52
Zekiah Swamp	Farm Dr	Riparian Forest Buffer	Acres Planted	1.10	15,090	KCI, 2018e	52
Mattawoman Creek	Walmart	Bioretention	DA Acres	13.40	383,612	Vista, 2015a	51
Port Tobacco River	Port Tobacco Creek- County Project In Design	Stream Restoration	Linear Feet	2,800.00	2,324,841	KCI, 2015	51
Mattawoman Creek	Westdale Court	Structural - Filtering Systems	DA Acres	1.11	55,353	Vista, 2015a	50
Port Tobacco River	Lower Dorchester Lake	Wet Pond - Wetland	DA Acres	256.78	466,642	Vista, 2015b	50
Port Tobacco River	Red Horse Court	Filter	DA Acres	18.36	761,431	Vista, 2015b	50
Mattawoman Creek	Hale Court	Sheetflow to Conservation Areas	DA Acres	37.94	99,121	Vista, 2015a	49
Mattawoman Creek	Westdale Court	Structural - Filtering Systems	DA Acres	1.01	55,353	Vista, 2015a	49

Zekiah Swamp	Kempsford Field Pl	Bioretention	DA Acres	2.60	22,316	KCI, 2018e	49
Mattawoman Creek	Murre Court	Sheetflow to Conservation Areas	DA Acres	14.94	91,397	Vista, 2015a	48
Zekiah Swamp	CCPS Public School Annex	Wet Pond - Wetland	DA Acres	3.10	289,640	Bayland, 2015b	48
Mattawoman Creek	Pembroke Square	Submerged Gravel Wetlands	DA Acres	73.75	691,273	Vista, 2015a	46
Potomac River	Fenwick Rd and Ward Pl	Riparian Forest Buffer	Acres Planted	7.50	102,690	KCI, 2018c	46
Port Tobacco River	Park Ave	Dry Swale	DA Acres	54.82	274,069	KCI, 2015	46
Mattawoman Creek	Meadow Lane	Wet Pond - Wetland	DA Acres	5.41	568,981	Vista, 2015a	45
Port Tobacco River	Race Car Pl	Stream Restoration	Linear Feet	800.00	664,240	KCI, 2015	45
Port Tobacco River	Government Compound	Submerged Gravel Wetlands	DA Acres	8.12	608,243	Vista, 2015b	45
Mattawoman Creek	Butte Place	Structural - Filtering Systems	DA Acres	12.24	125,511	Vista, 2015a	44
Mattawoman Creek	Lacrosse Pond	Structural - Filtering Systems	DA Acres	13.48	182,151	Vista, 2015a	44
Gilbert Swamp	Bowling Dr	Riparian Forest Buffer	Acres Planted	1.40	19,824	KCI, 2018a	44
Port Tobacco River	Valley Rd	Stream Restoration	Linear Feet	3,976.00	3,301,274	KCI, 2015	44
Zekiah Swamp	Thomas Stone HS	Wet Pond - Wetland	DA Acres	36.10	450,551	Bayland, 2015b	44
Zekiah Swamp	CCPS Public Admin	Wet Pond - Wetland	DA Acres	7.90	476,296	Bayland, 2015b	44

	Building/Gwynn Center						
Mattawoman Creek	Community Drive	Submerged Gravel Wetlands	DA Acres	16.27	159,624	Vista, 2015a	43
Mattawoman Creek	Lombard Pond	Submerged Gravel Wetlands	DA Acres	22.52	312,167	Vista, 2015a	43
Mattawoman Creek	Shoppers Ditch	Submerged Gravel Wetlands	DA Acres	7.03	160,267	Vista, 2015a	43
Mattawoman Creek	Tributary to Piney Branch at Ashford Ln	Stream Restoration	Linear Feet	1,984.00	1,626,954	KCI, 2017	43
Port Tobacco River	Mt Carmel Rd	Dry Swale	DA Acres	141.29	837,920	KCI, 2015	43
Potomac River	Site 80	Shoreline Restoration	Linear Feet	1,867.50	1,457,278	SMRC&D, 2018	43
Mattawoman Creek	Athens Place	Structural - Filtering Systems	DA Acres	5.56	103,627	Vista, 2015a	42
Mattawoman Creek	Shoppers World	ESD - Micro-Scale Practices	DA Acres	39.46	1,480,000	Charles County, 2023	42
Potomac River	Neale Sound	Shoreline Restoration	Linear Feet	1,280.00	1,145,155	KCI, 2018c	42
Zekiah Swamp	Malcolm Elementary School	Rain Gardens	DA Acres	2.30	160,911	Bayland, 2015b	42
Mattawoman Creek	Pinefield Center	Submerged Gravel Wetlands	DA Acres	7.21	368,808	Vista, 2015a	41
Gilbert Swamp	Newport Church Rd	Riparian Forest Buffer	Acres Planted	1.00	14,160	KCI, 2018a	41
Mattawoman Creek	Wooster Rd Outfall	Step Pool Storm Conveyance	DA Acres	5.91	93,347	KCI, 2017	41

Port Tobacco River	Mudd Farm Ln	Stream Restoration	Linear Feet	744.00	617,743	KCI, 2015	41
Port Tobacco River	Kennedy Chiropractic	Bioretention	DA Acres	1.06	85,885	KCI, 2015	41
Port Tobacco River	South Campus Pond	Wet Pond - Wetland	DA Acres	17.60	60,763	KCI, 2015	41
Port Tobacco River	Theodore Green Blvd	Submerged Gravel Wetlands	DA Acres	8.64	329,546	Vista, 2015b	41
Potomac River	Site 59	Shoreline Restoration	Linear Feet	193.70	151,151	SMRC&D, 2018	41
Mattawoman Creek	St Partricks Drive	Submerged Gravel Wetlands	DA Acres	3.81	160,267	Vista, 2015a	40
Mattawoman Creek	AMF Waldorf Lanes	Submerged Gravel Wetlands	DA Acres	3.47	165,416	Vista, 2015a	40
Port Tobacco River	Walmart Stream	Stream Restoration	Linear Feet	170.00	141,151	KCI, 2015	40
Potomac River	Site 142	Shoreline Restoration	Linear Feet	843.60	658,292	SMRC&D, 2018	40
Zekiah Swamp	Lambeth Lake, Wakefield Cir. In St. Charles	Wet Pond - Wetland	DA Acres	140.10	321,822	Bayland, 2015b	40
Mattawoman Creek	Silverleaf Street	Dry Swale	DA Acres	9.00	113,281	Vista, 2015a	39
Mattawoman Creek	Tributary to Piney Branch at Ashford Ln	Stream Restoration	Linear Feet	208.00	170,551	KCI, 2017	39
Potomac River	Rock Point Rd	Stream Restoration	Linear Feet	1,106.00	887,955	KCI, 2018c	39
Mattawoman Creek	Bonnie Lane	Step Pool Storm Conveyance	DA Acres	60.39	1,119,940	Vista, 2015a	38
Mattawoman Creek	Verizon Store	Submerged Gravel Wetlands	DA Acres	3.11	213,046	Vista, 2015a	38

Mattawoman Creek	Brookside Place	Structural - Filtering Systems	DA Acres	1.27	143,275	Vista, 2015a	38
Port Tobacco River	Marshall Corner Rd	Dry Swale	DA Acres	137.32	1,002,704	KCI, 2015	38
Mattawoman Creek	Shearwater Drive	Submerged Gravel Wetlands	DA Acres	5.67	183,438	Vista, 2015a	37
Mattawoman Creek	Hallmark Ln Pond	Infiltration Basin	DA Acres	3.92	160,343	KCI, 2017	37
Port Tobacco River	Lakeview Dr	Dry Swale	DA Acres	127.85	383,697	KCI, 2015	37
Potomac River	Site 76	Shoreline Restoration	Linear Feet	2,197.80	1,715,023	SMRC&D, 2018	37
Mattawoman Creek	Berry Hill Manor	Step Pool Storm Conveyance	DA Acres	300.19	2,762,519	Vista, 2015a	36
Mattawoman Creek	Holiday Inn Express	Submerged Gravel Wetlands	DA Acres	1.50	131,303	Vista, 2015a	36
Mattawoman Creek	Crake Ct Pond	Wet Pond - Wetland	DA Acres	32.96	458,857	KCI, 2017	36
Mattawoman Creek	Westdale Court	Bioretention	DA Acres	2.21	297,363	Vista, 2015a	36
Zekiah Swamp	Huntington Circle	Bioretention	DA Acres	0.70	52,767	KCI, 2018e	36
Zekiah Swamp	Robert D. Stethem Memorial Sports Complex	Bioretention	DA Acres	1.60	330,085	KCI, 2018e	36
Mattawoman Creek	US Fuel	Bioretention	DA Acres	0.14	32,388	KCI, 2017	35
Mattawoman Creek	Dash-in Pond	Wet Pond - Wetland	DA Acres	1.83	118,645	KCI, 2017	35
Mattawoman Creek	Bryans Rd Vol Fire Department	Wet Pond - Wetland	DA Acres	1.43	96,799	KCI, 2017	35
Zekiah Swamp	Industrial Park Lake East at Henry Ford Circle	Wet Pond - Wetland	DA Acres	294.90	315,385	Bayland, 2015b	35

Zekiah Swamp	Industrial Park Pond at Jay Gould Ct.	Wet Pond - Wetland	DA Acres	114.30	217,552	Bayland, 2015b	35
Zekiah Swamp	St. Paul's Drive in St. Charles,	Wet Pond - Wetland	DA Acres	95.90	217,552	Bayland, 2015b	35
Gilbert Swamp	Leonardtown Rd	Dry Swale	DA Acres	4.30	30,699	KCI, 2018a	34
Mattawoman Creek	Fleet Ct Pond	Wet Pond - Wetland	DA Acres	10.58	374,612	KCI, 2017	34
Port Tobacco River	Tate Street	Submerged Gravel Wetlands	DA Acres	19.45	388,117	Vista, 2015b	34
Potomac River	Site 81	Shoreline Restoration	Linear Feet	1,471.80	1,394,933	SMRC&D, 2018	34
Port Tobacco River	Channing St	Dry Swale	DA Acres	71.64	294,103	KCI, 2015	33
Port Tobacco River	Site 86	Shoreline Restoration	Linear Feet	331.60	274,142	SMRC&D, 2018	33
Mattawoman Creek	Poplar Court	Submerged Gravel Wetlands	DA Acres	93.09	920,925	Vista, 2015a	32
Potomac River	Lantana Dr	Step Pool Storm Conveyance	DA Acres	17.02	177,150	KCI, 2018c	32
Zekiah Swamp	Pika Industrial Drive	Wet Pond - Wetland	DA Acres	19.90	289,640	Bayland, 2015b	32
Lower Patuxent River	Harley Davidson	Structural - Filtering Systems	DA Acres	1.50	3,112	KCI, 2016	31
Port Tobacco River	Coastal Blvd	Submerged Gravel Wetlands	DA Acres	22.95	207,897	Vista, 2015b	31
Mattawoman Creek	Scenic Meadow St Pond	Wet Pond - Wetland	DA Acres	17.09	463,811	KCI, 2017	30
Potomac River	Site 54/Swan Point	Shoreline Restoration	Linear Feet	3,560.20	2,778,154	SMRC&D, 2018	30
Zekiah Swamp	La Plata Driver Training Facility	Submerged Gravel Wetlands	DA Acres	5.70	321,822	Bayland, 2015b	30

Gilbert Swamp	Gilbert Creek	Stream Restoration	Linear Feet	2,142.00	2,083,224	KCI, 2018a	29
Nanjemoy Creek	Saint Catherines	Dry Swale	DA Acres	0.55	24,098	KCI, 2018b	29
Port Tobacco River	Stanton Pl	Bioretention	DA Acres	12.69	39,741	KCI, 2015	29
Wicomico River	Site 26	Shoreline Restoration	Linear Feet	1,733.30	1,352,557	SMRC&D, 2018	29
Lower Patuxent River	Celestial Ln	Stream Restoration	Linear Feet	3,443.00	2,822,726	KCI, 2016	28
Mattawoman Creek	Montrose Rd Pond	Wet Pond - Wetland	DA Acres	24.83	653,537	KCI, 2017	28
Port Tobacco River	Eller Street	Submerged Gravel Wetlands	DA Acres	42.76	643,644	Vista, 2015b	28
Gilbert Swamp	Oaks Rd	Stream Restoration	Linear Feet	2,193.00	1,820,849	KCI, 2018a	27
Potomac River	Truckstop & Plaza 1	Bioretention	DA Acres	2.88	622,977	Bayland, 2015a	27
Mattawoman Creek	Thomas Road	Step Pool Storm Conveyance	DA Acres	12.51	406,783	Vista, 2015a	26
Mattawoman Creek	Portobello Ct Pond	Wet Pond - Wetland	DA Acres	5.92	175,232	KCI, 2017	26
Nanjemoy Creek	Scotts	Bioretention	DA Acres	0.27	16,272	KCI, 2018b	26
Potomac River	Truckstop & Plaza 2	Bioretention	DA Acres	1.27	281,270	Bayland, 2015a	26
Nanjemoy Creek	Site 103	Shoreline Restoration	Linear Feet	720.30	562,076	SMRC&D, 2018	26
Lower Patuxent River	Harley Davidson	Bioretention	DA Acres	0.08	15,777	KCI, 2016	25
Lower Patuxent River	Harley Davidson	Bioretention	DA Acres	0.67	113,251	KCI, 2016	25
Potomac River	Site 51	Shoreline Restoration	Linear Feet	310.98	242,667	SMRC&D, 2018	25

Nanjemoy Creek	Pisgah General Store 2	Dry Swale	DA Acres	0.07	2,191	KCI, 2018b	24
Zekiah Swamp	Vest Lane	Wet Pond - Wetland	DA Acres	99.50	514,915	Bayland, 2015b	24
Wicomico River	Site 33	Shoreline Restoration	Linear Feet	276.44	215,719	SMRC&D, 2018	23
Wicomico River	SE Davis Construction	Step Pool Storm Conveyance	DA Acres	1.00	3,702,758	KCI, 2018d	23
Potomac River	Keys Pl	Dry Swale	DA Acres	0.13	4,929	KCI, 2018c	21
Nanjemoy Creek	Pisgah General Store 1	Bioretention	DA Acres	0.25	46,491	KCI, 2018b	20
Nanjemoy Creek	Smallwood Church Rd	Stream Restoration	Linear Feet	100.00	80,285	KCI, 2018b	18
Wicomico River	Site 23/Tennyson Point	Shoreline Restoration	Linear Feet	1,013.20	1,042,518	SMRC&D, 2018	15

Appendix B

Charles County Future Implementation Project Prioritization Methods

To support the County's resource allocation decision making process, a prioritization was developed for the planned projects listed in Appendix A. The results indicate which projects are the most beneficial and cost effective relative to the set of projects identified.

The prioritization involved a matrix including a series of parameters, or metrics, which evaluated each planned project and allowed for comparison between the projects. Each planned project identified by the County to date was scored for each metric. Quantitative metrics were scored based on results of the preliminary design and cost estimates (e.g., impervious area treated, pollutant removal). Other metrics were scored more qualitatively based on professional judgment and assessment of each project site (e.g., community benefits, enhanced tree canopy, maintenance). Each project was ranked based on the total score and the final prioritization was determined.

The following describes the methods used.

Metrics

The prioritization uses a series of metrics, or parameters, that describe various attributes of a project. A series of metrics was developed for each of the three categories: Benefits, Constraints, and Cost. Metrics are listed in the following table with a brief description of each.

Prioritization Metrics

Metric	Description
Project Benefits	
Proximity to Priority Funding Area	Distance of project from Priority Funding Area
Impervious Area Treated	Area of impervious surface treated (acres)
Infiltration Capacity	Does the project type allow infiltration?
Enhanced Tree Canopy	Number of trees planted
Conserved Forest in Easement	Acres of forest conservation easement
Address Local TMDL Plan	Does the project address a local TMDL?
Community Benefit	Does the project involve community partnerships or community education?
Project Constraints	
Routine Maintenance Requirements	What is the level of maintenance involved – frequency, expense, equipment?
Structural Maintenance Requirements/ Lifespan	What is the level of structural maintenance involved and the expected lifespan of the project?
Verification and Inspection Requirements	What is the project verification and inspection frequency?
Ownership	Is ownership of the parcels involved held publicly or privately? How many parcels would be involved in the project?
Project Cost	
Cost per Impervious Area Treated	Total cost of the project divided by the impervious area treated; dollars per acre

Metric	Description
Cost per Pollutant Removed	Total cost of the project divided by the amount of pollutant removed; dollars per lb of phosphorus (TP), nitrogen (TN), sediment (TSS)

Scoring

Quantitative metrics were scored based on results of the preliminary design and cost estimates (e.g., impervious area treated, cost per pollutant removal). Other metrics were scored more qualitatively based on professional judgment and assessment of each project site (e.g., community benefits, maintenance). The following describes specifically how each metric was scored.

Project Benefits:

- Proximity to Priority Funding Area:
    - The proximity of each project to a priority funding area (PFA) was calculated. Polygon and line features were measured from the approximate center of the project. Projects located within a priority funding area received a scored a 10. Projects within 0.25 miles of a priority funding area received a score of 5, while projects that had a distance greater than 0.25 miles received a score of 0.

- Impervious Area Treated:
    - Each project's drainage area was analyzed to determine the impervious acres treated. Impervious credit was assessed for alternative BMP types.
    - Projects with the highest impervious surface within the drainage area received the highest score. The impervious acres in the drainage area or impervious credit were ranked and scored based on percentile rank, and projects were scored between a range of 1 to 5.

- Infiltration Capacity:
    - The infiltration capacity of each planned BMP type was analyzed. Projects with the highest infiltration capacity for 1" precipitation received the highest score.
    - BMP types with infiltration capacity received a score of 3, BMP types that have varying infiltration capacity based on site specific conditions or design elements received a score of 2, and BMP types with no infiltration capacity received a score of 0.

- Enhanced Tree Canopy
    - The number of trees to be planted was estimated for each project. Projects with greater tree planting efforts received the highest score.
    - Projects planting over 50 trees received a score of 15, between 20 and 50 trees received a score of 10, between 1 and 19 trees received a score of 5, and projects with no associated tree planting received a score of 0.

- Conserved Forest

  - The acres of forest associated with each project that could possibly be put into forest conservation was estimated. Projects that have more possible conserved forest in easement received the highest score.
  - The acres of conserved forest in easement was ranked and scored based on percentile rank, and projects were scored between a range of 0 to 5.

- Address Local TMDL Plan:
  - Projects located within a local TMDL watershed (Mattawoman and Port Tobacco) received a score of 10, while projects in all other watersheds received a score of 0.

- Community Benefit:
  - Each project was assessed for the ability to build partnerships with other agencies, organizations, businesses, or communities that will provide funding and/or in-kind services for the project. Projects on church or school properties received the highest score of 10.
  - It was assumed that projects in highly visible areas (neighborhoods, parking lots, etc.) could present educational opportunities through signage and received a score of 10.
  - Projects with no community improvement received a score of 0.

<u>Project Restraints:</u>

- Routine Maintenance Requirements:
  - Routine maintenance was researched for each BMP type. Routine maintenance was categorized as any maintenance needs that can be conducted easily by the owner in order to preserve the functions of the BMP. Frequency and level of effort of the maintenance was also considered.
  - If the project requires maintenance one to two times per year, it received a score of 1. If maintenance is only required once a year, it received a score of 3. If maintenance is infrequent, it received a score of 5.

- Structural Maintenance Requirements / Lifespan:
  - Structural maintenance and lifespan of each BMP type was assessed. Structural maintenance was categorized as any large-scale maintenance needs related to preserving the functions of the BMP or project.
  - Projects like stream restoration, shoreline restoration, and tree plantings received a score of 3. All other projects and stormwater BMPs received a score of 1.

- Verification and Inspection Requirements:
  - Projects were first analyzed on their verification year of either five or ten years and then analyzed on their inspection cycle of either three or five years.

  - Projects that had both a ten-year verification and a three-year inspection cycle scored a 5. A five-year verification and a five-year inspection cycle scored a 3. Projects that had both a five-year verification and a three-year inspection cycle scored a 1.

- Ownership:
  - Ownership was assessed by both the number of property owners and the ownership type of either private, public, or mixed.
  - Projects involving only one owner received a score of 10, projects with two owners received a score of 5, and projects with three of more owners received a score of 0.
  - Projects involving only public ownership received a score of 10, projects with a mix of public/private ownership received a score of 5, and projects with only private ownership received a score of 0.
  - Number of owner and ownership type scores were then sum ranked and scored between a range of 0 to 5 for a final ownership score.

Project Cost:

- Cost per Impervious Area Treated:
  - The total cost for each project was evaluated and adjusted to 2023 inflation. Cost was then divided by the impervious acreage to calculate the cost per impervious acres treated. A relative ranking approach (Excel Percentile Rank function) was used to determine a 1 through 5 score based on the resulting percentile.

- Cost per Pollutant Removed:
  - The total cost for each project was evaluated and adjusted to 2023 inflation. Each TMDL pollutant (TN, TP, and TSS) load reduction was divided by the total cost of the project to get the cost per pound of pollutant removed. A relative ranking approach (Excel Percentile Rank function) was used to determine a 1 through 5 score based on the resulting percentile.

Results

Total scores were summed for each project for the benefit, constraint, and cost categories. Projects with higher total scores are considered higher priority. The final prioritized list can be found in Appendix A.

Appendix C

Draft Charles County Municipal Stormwater Restoration Plan Presentation to the Charles County Planning Commission – Comments and Responses

The draft plan is posted at: https://legistarweb-production.s3.amazonaws.com/uploads/attachment/pdf/2207638/Charles_County_Stormwater_Plan_DRAFT_2023.10.03.pdf

The Planning Commission Meeting on October 2, 2023 was recorded and posted at: https://reflect-charlescountymd.cablecast.tv/CablecastPublicSite/show/785?site=1

Notes on questions, comments and responses from the October 2, 2023 Planning Commission meeting:

1) Because there's a long time between now and restoration to be completed, what does it mean in the interim for the health of the watershed and what does it mean for the citizens?

   Response: The timelines for restoration are very long and if more resources could be put toward the restoration, it could shorten them. What we expect from the water quality monitoring, is that as less and less pollutants are delivered we'll see more fish, and less fish consumption advisories. The pollutant reductions needed are estimates, provided by the State stating the amount of pollutants the water bodies can assimilate and not cause impairments to the water chemistry or aquatic resources such as fish and benthics.

   Scientists also study why the water bodies are impaired, to determine the stressors, such as excessive sediment. As monitoring continues the goal is to see improvements in water chemistry and biological resources as the stressors are removed. So there's reality checks on the front and back ends, with estimates in the middle to determine how to best alleviate the stressors.

2) There's continued development pressure related to the Mattawoman Creek and in the watershed, so to what degree do the restoration plans anticipate planned projects and how is new development accounted for in the plans?

   Response: Pollutants from new development are addressed to the maximum extent practicable under current regulations that should capture pollutants created by the new development. The restoration plan addresses areas impacted from previous developments that weren't built to the highest standards currently in place. This plan is trying to fix older stormwater management and repair damaged streams caused by lack of stormwater management in the past. However we know there's no true replacement for forest and wetland in good condition.

3) Since the watersheds cross jurisdictional boundaries how much coordination with the plans is there with the other jurisdictions?

   Response: Every county is assigned a separate load, so not as much coordination is needed. Each county is responsible for addressing its own pollutant sources and reduction goals.

4) This is a draft Charles County stormwater plan, that is sent to MDE. How many months does MDE have to review.

   Response: Once we submit the plan to MDE they typically provide comments in about six months. Then we revise the plan and usually receive approval soon after resubmitting.

5) Is the stormwater restoration plan driven by the State or the County?

   Response: The plan is the County's plan, most of the comments that would be made by the State would be related to not meeting the goals or if the County was not applying the pollutant reduction calculation methods correctly.

6) The County doesn't contribute to the PCBs, however there are surrounding counties that are nearby and do they contribute to PCBs and could affect the Potomac and Patuxent Rivers?

   Response: Yes, adjacent counties have more significant PCB contributions and those jurisdictions have reduction goals. Counties such as Prince George's and Montgomery have PCB reduction goals and are working to address them. Charles County's contributions are small and the State has not required Charles County to make PCB reductions.

7) Are the county's pollutant contributions primarily nitrogen and phosphorus?

   Response: Yes, the County's stormwater program is responsible for reducing nitrogen, phosphorus and sediment loads across the County, as well as bacteria in the Patuxent watershed.

8) How often are the watersheds tested for certain pollutants?

   Response: The Mattawoman Creek is sampled for chemical components by the U.S. Geological Survey about 12 times annually and results are posted online. This captures most of the water coming down from Waldorf and it is a long-term station started in 2000. The other watersheds are monitored for biological data benthic macroinvertebrates and fish, once every five years.

   The County will also be implementing a biological monitoring program in the future to add more data than what is currently being collected.

9) Once the contaminants are found to be too high in the waterways how are they removed or treated?

   Response: The contaminants need to be removed from the rain runoff before getting into the waterways because it's not possible to remove the contaminants once in the waterways. Once contaminants are in waterways they move downstream fairly quickly. Practices to remove pollutants include capturing and filtering the rain runoff at the point of contact on the land.

10) Overall are County waterways getting better or worse?

    Response: The Clean Water Act has been in place since the 1970's and at first addressed the wastewater and industrial sectors, so much improvement can be seen there. Addressing stormwater sector began in the 1990's and the Charles County stormwater permit has been implementing restoration projects since the mid-2000's, so there's been less implementation time to see improvements in the stormwater sector.

11) Is the Mattawoman Creek improved since monitoring began?

    Response: There are various improvements that are captured in the water monitoring data and also declines. There's a lot of variables so caution is needed in evaluating the overall picture.

12) Is the Mattawoman Creek better today than it was in 1980?

    Response: USGS wrote a report on the Mattawoman Creek compiling data over a long period. Generally the findings of that report was positive in light of significant growth in the watershed over the time period.

    The Maryland Department of Natural Resources monitors the streams and has a website for the Maryland Biological Stream Survey which shows where sampling has occurred over the years and the monitoring points are shown in red, yellow or green depicting the quality as poor, fair, or good, respectively. This website would be a good location to investigate for further information on water quality changes over time in various locations.

13) Even though it's a long timeline for restoration, there are large costs associated with this plan that get your attention. These costs are for addressing impervious surface of the past and not the new impervious surface. If the goal is to treat 1,000 acres in about five years, and then you look at building new impervious surfaces such as rail trails, how does the new rail trail affect water quality? Even when we try to do good things such as a rail trail, there are negative consequences.

Response: The rail trails tend to be in natural wooded environments where runoff from impervious surfaces can infiltrate and filter close to the source because of the adjacent buffer areas. Because of this, rail trails are not likely to have a major impact on water quality.

14) Is this plan going out to public comments prior to going to the State?

Response: The draft plan is currently posted on the County's website and the public comment period is open now and for the next thirty days until November 2. Once the County receives public comments, we'll address those comments and then send the plan to the Maryland Department of Environment for review which may take up to six months to receive feedback. The County then addresses their feedback and resubmits the plan to them for final approval. The plan does not require local adoption because it's a technical document and subject to adaptive management. Any budgets needed to implement the plan do need to be locally adopted and approved.

15) Even though the numbers are big in terms of goals and costs, it's important to keep this information out there and available to the public, so we know the true cost of development and sustainability.

16) If we have an excessive storm event, has this been seen to have an impact on the Mattawoman Wastewater Treatment plant?

Response: Because of inflow and infiltration into the trunkline, the Mattawoman Wastewater Treatment plant is being retrofitted to store excessive rainwater and prevent an overflow. Also because pump stations can clog or back up there could be surfacing of sewage at those locations.

The Mattawoman Wastewater discharges into the Potomac River and not the Mattawoman so is not a concern in that way. The primary concern is the trunk line that is in the watershed, which during wet weather infiltration into the line can cause heavy flows at the plant, but during dry weather the opposite can happen meaning what's in the line can come out due to lack of inward pressure. So this is how there could be nitrogen coming out of the lines into the watershed and causing impacts in the watershed.