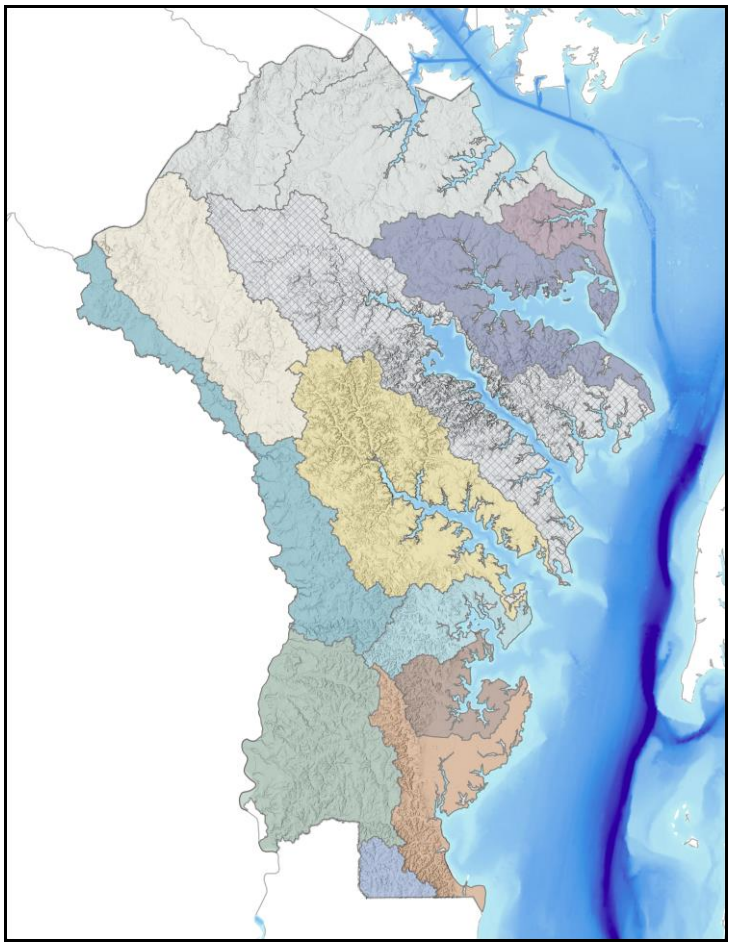
Anne Arundel Countywide TMDL Stormwater Implementation Plan

FY 21 Annual Progress Report

January 2022



Anne Arundel County
Bureau of Watershed
Protection
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FY 21 Annual Progress Report

January 2022

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I. BACKGROUND

Maryland Department of Environment (MDE) issued NPDES Permit No. 20-DP-3316 to Anne Arundel County on November 5, 2021. Part IV.F of this permit requires Anne Arundel County to submit a Countywide Stormwater Total Maximum Daily Load (TMDL) Implementation Plan (Countywide Plan) that addresses all TMDLs with Stormwater Wasteload Allocations (SW-WLAs) listed in Appendix A within one year of permit issuance. The Countywide Plan must be approved by MDE and must annually document progress toward meeting TMDL SW-WLAs. The Countywide Plan is to be based on the Department's analyses or equivalent, and where applicable, document Anne Arundel County water quality analyses. The plan should include:

A. A list of stormwater BMPs, programmatic initiatives, or alternative control practices that will be implemented to reduce pollutants for the TMDL;
B. A description of the County's analyses and methods, and how they are comparable with MDE's TMDL analyses; and
C. Final implementation dates and benchmarks for meeting the TMDL's applicable stormwater WLA. Once approved by the Department, any new TMDL implementation plan shall be incorporated into the Countywide Plan and subject to the annual progress report requirements under Part IV.F of the permit.

Annual progress toward meeting the TMDL SW-WLAs listed in Appendix A of the permit must be documented in the Countywide Plan and 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;
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

II. INTRODUCTION

A. CHESAPEAKE BAY TMDL AND PROGRESS MODELING APPROACH

The Chesapeake Bay TMDL was approved on December 29, 2010 and applies to all of Anne Arundel County. On September 15, 2011 MDE finalized its Phase II Load Allocations and on July 2, 2012 Anne Arundel County submitted its Phase II WIP to MDE. Anne Arundel County's Phase II WIP serves as the restoration plan for the SW-WLAs for the impairments addressed by the Chesapeake Bay TMDL.[1] The final date for meeting the Chesapeake Bay TMDL SW-WLA is 2025, as set by the U.S. Environmental Protection Agency (EPA).

[1] https://mde.maryland.gov/programs/water/TMDL/TMDLImplementation/Pages/WIPPhaseIICountyDocuments.aspx

Chesapeake Bay TMDL progress load reductions are calculated for all completed restoration projects and County programmatic reductions, using an in-house R script. The script follows MDE's guidance document "*Accounting for Stormwater Wasteload Allocation and Impervious Acres Treated; Guidance for National Pollutant Discharge Elimination System Stormwater Permits, August 2014*", individual expert panel reports from CBP, and any communications with MDE that clarify or modify existing credit guidance. Phase 5 edge of tide factors were applied to all BMPs, with the exception of street sweeping and catch basin cleaning practices, and stream restorations and shoreline restorations credited under the default rate.

B. LOCAL NUTRIENT AND SEDIMENT TMDLS AND PROGRESS MODELING APPROACH

Anne Arundel County has one local nutrient TMDL, and eight local sediment TMDLs. The local nutrient TMDL, "*Total Maximum Daily Loads of Nitrogen and Phosphorus for the Baltimore Harbor in Anne Arundel, Baltimore, Carroll and Howard Counties and Baltimore City, Maryland*", was approved by EPA in 2007 and revised by MDE in August 2015. The eight local sediment TMDLs, and their approval dates can be found in Table 1. Anne Arundel County established final dates for meeting the SW-WLAs in the individual sediment and nutrient TMDLs, approved by EPA prior to FY19, as 2025 and 2030, respectively. Individual sediment TMDLs approved in FY19 have a target date of 2030 for meeting the SW-WLA.

Table 1: Anne Arundel County sediment TMDLs

TMDL Watershed	Approval Date
Little Patuxent River, 8 Digit WS 02131105	September 30, 2011
Upper Patuxent River, 8 Digit WS 02131104	September 30, 2011
Patapsco River Lower North Branch, 8 Digit WS 02130906	September 30, 2011
South River, 8 Digit WS 02131003	September 28, 2017
Other West Chesapeake, 8 Digit WS 02131005	February 9, 2018
Middle Patuxent River, 8 Digit WS 02131102	July 2, 2018
Lower Patuxent River, 8 Digit WS 02131101	July 2, 2018
West River, 8 Digit WS 02131004	April 24, 2019

MDE's TIPP spreadsheet tool was used for all local nutrient and sediment TMDL progress modeling. Land cover data from the National Land Cover Database (NLCD) was used to quantify land cover acreage for each TMDL baseline year (either 1995, 2005, or 2009). The backcasting method developed by Baltimore County was applied to NLCD data because NLCD land cover classifications are inconsistent with the Phase 6 Chesapeake Bay Watershed Model land cover classes.

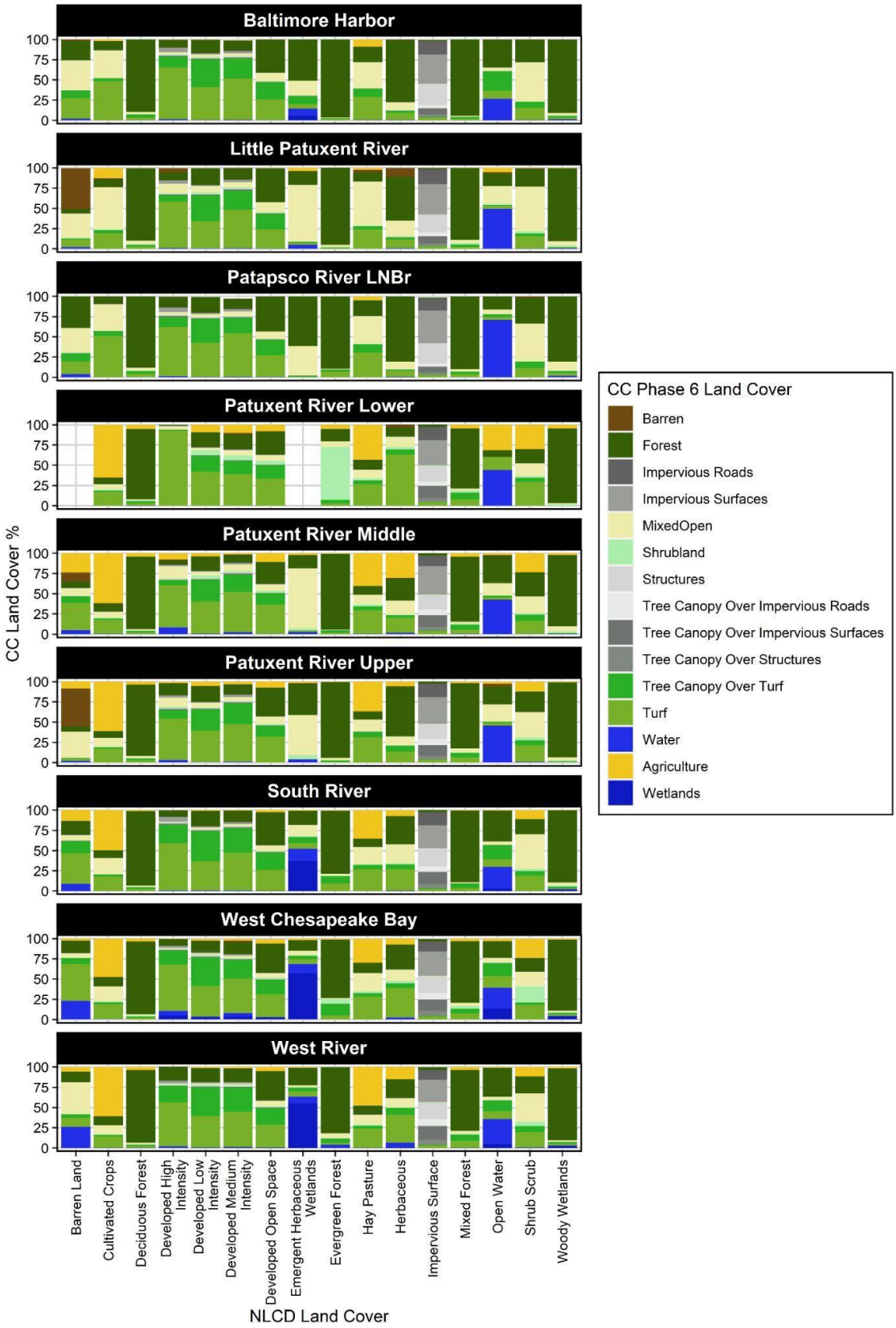

Figure 1: Unique NLCD-CC translations for each Nutrient and Sediment TMDL watershed

Backcasting was achieved by comparing 2013/2014 Chesapeake Conservancy (CC) land cover data, that was modified by MDE, to 2013 NLCD land cover data. Before backcasting, several steps were taken to preprocess both the NLCD and CC data. Firstly, MDE's classification of 'Mixed Open/Agriculture' was disaggregated into 'Mixed Open' and 'Agriculture'. This was achieved by reclassifying 'Mixed Open/Agriculture' to 'Agriculture' where the land cover classification intersected with a parcel having an agricultural assessment. All other occurrences of 'Mixed Open/Agriculture' that did not intersect with a parcel having an agricultural assessment were reclassified as 'Mixed Open'.

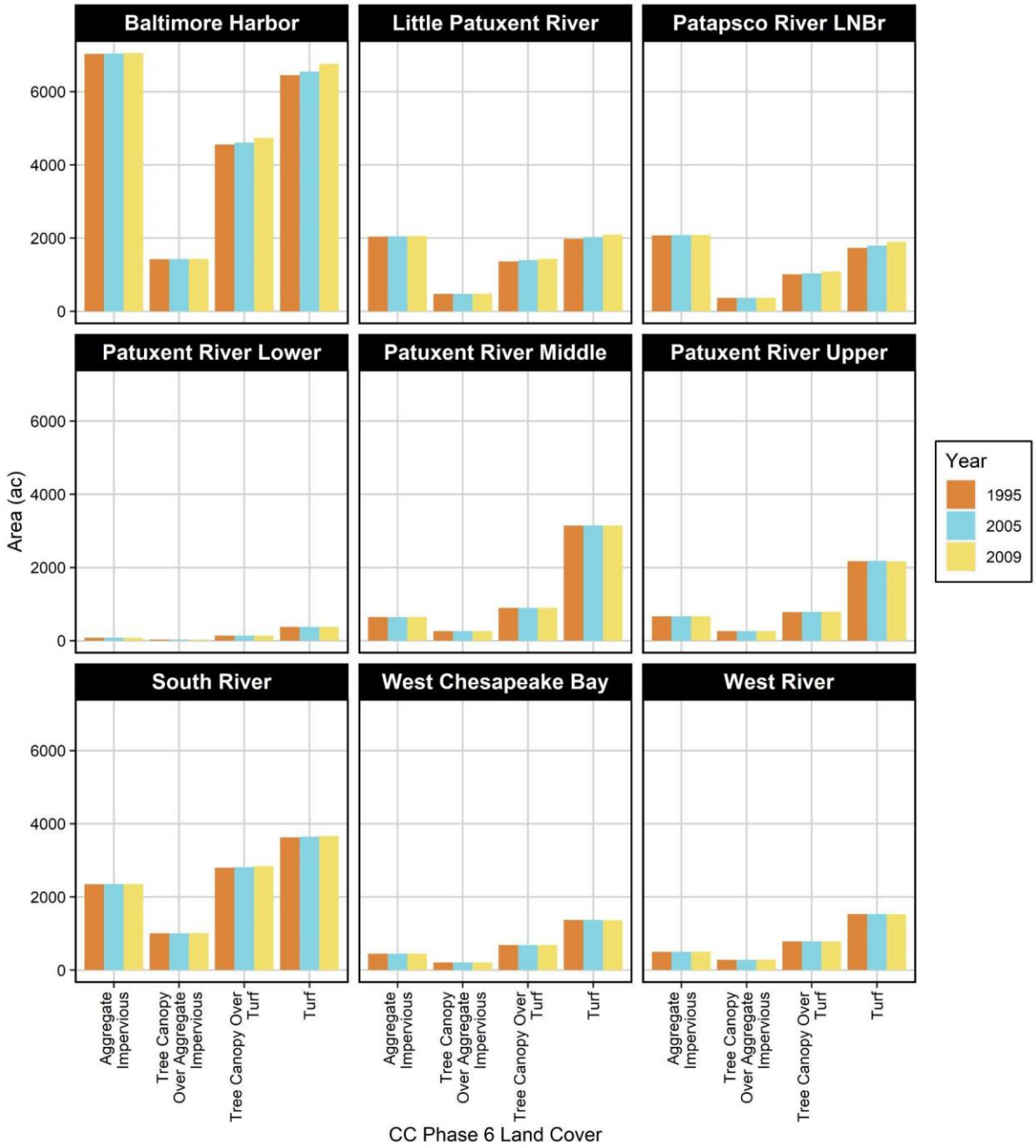

Figure 2: Backcasted MS4 land cover for each Nutrient and Sediment TMDL watershed

NLCD land cover data does not have an 'Impervious' land cover category, but is instead classified as different intensities of 'Developed'. To be consistent with Phase 6 Chesapeake Bay Watershed Model land cover classes, all NLDC land cover data were reclassified as 'Impervious' if it intersected with the County's impervious land cover dataset. The 2007 County impervious data were used for the backcasting, regardless of the baseline year, as it was the earliest impervious dataset that provided an accurate representation of impervious surfaces in the County. Finally, NLCD data were clipped to the extent of the County MS4-regulated area, removing State, Federal, and any other land that does not fall under the County's jurisdiction.

The backcasting method was conducted for each nutrient and sediment TMDL watershed separately. Each TMDL watershed has a unique fingerprint of land cover classes and acreage, therefore the translation of NLCD land cover classes to CC land cover classes is expected to be unique for each watershed. Using both the 2013/2014 NLCD and CC land cover data, for each NLCD land cover category, the percentage of different CC land cover classes within each NLCD land cover class were summarized. Figure 1 shows the results of this comparison for all TMDL watersheds. As seen in Figure 1, the NLCD land cover category 'Mixed Forest' in the South River comprises 88.5% of the CC land cover category 'Forest'. In contrast, the NLCD land cover category 'Developed, High Intensity' in the South River comprises 58.6% Turf, 22.8% Tree Canopy of Turf, and 7.3% Impervious.

For each baseline year, the NLCD land cover acreages were multiplied by the percentages of CC land covers presented in Figure 1, transforming the NLCD land cover to CC land cover classes. Backcasted NLCD land cover data for each TMDL watershed is presented in Figure 2. As shown in Figure 2, urban land cover classes increased between 1995 and 2009, indicating the sensitivity of the backcasting method to land cover change. For each watershed, backcasted 'Aggregate Impervious' and 'Turf' acres were entered into the TIPP Tool to determine the baseline load. Land cover including 'Tree Canopy over Turf' and 'Tree Canopy over Aggregate Impervious' were added as land cover conversions from 'Turf'. In these cases, 'Tree Canopy over Turf' and 'Tree Canopy over Aggregate Impervious' acres were added to the baseline 'Turf' acres.

C. BACTERIA

Anne Arundel County has 19 individual bacteria TMDLs, approved by EPA between November 2005 and August 2011 (Table 2). Pursuant to MDE guidance, compliance for bacteria TMDLs is assessed programmatically by monitoring activities rather than by modeling.

Table 2: Anne Arundel County bacterial TMDLs

TMDL Watershed	Approval Date
Magothy River Mainstem	February 20, 2006
Magothy River/Forked Creek	February 20, 2006
Magothy River/Tar Cove	February 20, 2006
Patapsco River/Furnace Creek	March 10, 2011
Patapsco River/Marley Creek	March 10, 2011
Patapsco River Lower North Branch, 8 Digit WS 02130906	December 3, 2009

TMDL Watershed	Approval Date
Upper Patuxent River, Subsegment of 8 Digit WS 0213114	August 9, 2011
Rhode River/Bear Neck Creek	February 20, 2006
Rhode River/Cadle Creek	February 20, 2006
Severn River Mainstem, Subsegment of 8 Digit WS 02131002	April 10, 2008
Severn River/Mill Creek	April 10, 2008
Severn River/Whitehall & Meredith Creeks	April 10, 2008
South River/Duvall Creek	November 4, 2005
South River, Subsegment of 8 Digit WS 02131003	November 4, 2005
South River/Ramsey Lake	November 4, 2005
South River/Selby Bay	November 4, 2005
W. Chesapeake Bay/Tracy & Rockhold Creeks	February 20, 2006
West River, Subsegment of 8 Digit WS 02131004	February 20, 2006
West River/Parish Creek	February 20, 2006

D. POLYCHLORINATED BIPHENYLS (PCBS)

Anne Arundel County has a total of six PCB TMDLs only two of which have SW-WLAs requiring reductions. These two PCB TMDLs, the Baltimore Harbor, Curtis Creek/Bay and Bear Creek portions of the Patapsco River Mesohaline an the Patuxent River – Tidal Fresh watersheds are shared with other jurisdictions, and were approved by EPA between October 2012 and September 2017 (Table 3). As with Bacteria TMDLs, compliance for PCB TMDLs is assessed programmatically by monitoring activities and not by modeling.

Table 3: Anne Arundel County PCB TMDLs

TMDL Watershed	Approval Date
Baltimore Harbor, Curtis Creek/Bay, and Bear Creek portions of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment	October 1, 2012
Patuxent River – Tidal Fresh	September 19, 2017

Approved nutrient, sediment, bacteria and PCB TMDL restoration plans can be found in Appendix A, Section VIII. Draft TMDL restoration plans can be found in Appendix B, Section IX.

III. FY 21 BMP IMPLEMENTATION

In Fiscal Year (FY) 21, 13 alternative BMPs, 17 upland BMPs, 18 septic connections to WWTP (within bacterial TMDL watersheds only) were implemented, with 504.9 tons of material collected from annual practices including street sweeping and catch basin cleaning (Table 4).
Table 4: FY 21 BMP implementation in Anne Arundel County

BMP Type	Number/Curb Miles/Tons
Surface Sand Filter	1
Infiltration Berm	3
Micro-Bioretention	1
Rain Garden	3
Submerged Gravel Wetland	2
Shoreline Restoration*	6
Step Pool Conveyance System	5
Stream Restoration	7
Extended Detention Shallow Wetland	1
Shallow Wetland	1
Septic Connections to WWTP**	18
Street Sweeping***	337.8
Catch Basin Cleaning***	167.1

* Only applicable to the Chesapeake Bay TMDL. ** Number of connections excludes those outside of Bacterial TMDL watersheds. *** Annual practice totals for FY 21 only. Progress modeling used averages for FY 16-FY 18 and FY 17-FY 18 for street sweeping and catch basin cleaning, respectively.

A summary of interim programmed restoration and planned restoration of future planned BMPs are presented in Appendices C, D, and E, in Sections X, XI, and XII, respectively.

IV. CHESAPEAKE BAY TMDL PROGRESS

Anne Arundel County's nitrogen, phosphorus, and sediment target loads (SW-WLAs) for the Chesapeake Bay are 449,641 lbs, 30,147 lbs, and 4,646,000 lbs, respectively (Table 5). These equate to required reductions of 31.6%, 46.7%, and 67.3% for the 2009 baseline loads of nitrogen, phosphorus, and sediment by 2025, respectively (Table 5).

In FY 21, Anne Arundel County's reductions of nitrogen, phosphorus, and sediment were 1%, 3.7%, and 26.2%, respectively (Table 5). Cumulatively, Anne Arundel County's total reduction of nitrogen, phosphorus, and sediment to date is 5.8%, 15.5%, 82.6%, respectively, which was achieved via restoration BMPs as well as annual street sweeping (annual average of 256 curb miles) and annual storm drain cleaning (annual average of 174.5 tons) (Table 5).

Table 5: FY 21 Chesapeake Bay TMDL progress

Parameter	Baseline Load (lbs)	Required Reduction (%)	Completion Year	FY 21 Progress (%)	Cumulative Progress (%)
Nitrogen	657,383	31.6	2025	1%	5.8%
Phosphorus	56,531	46.7	2025	3.7%	15.5%
Sediment	14,218,000	67.3	2025	26.2%	82.6%

V. LOCAL SEDIMENT AND NUTRIENT TMDL PROGRESS

The location of the nine local TMDLs within Anne Arundel County are presented in Figure 3. Each TMDL's nitrogen, phosphorus, and sediment target load (SW-WLAs) is presented in Table 6, along with the completion year, FY 21 progress, FY 21 cumulative progress, and the expected progress by the completion year. Based on the current interim programmed and planned projects (Appendices C and D, Sections X and XI), the SW-WLAs for each TMDL are expected to be met for all local sediment and nutrient TMDLs.

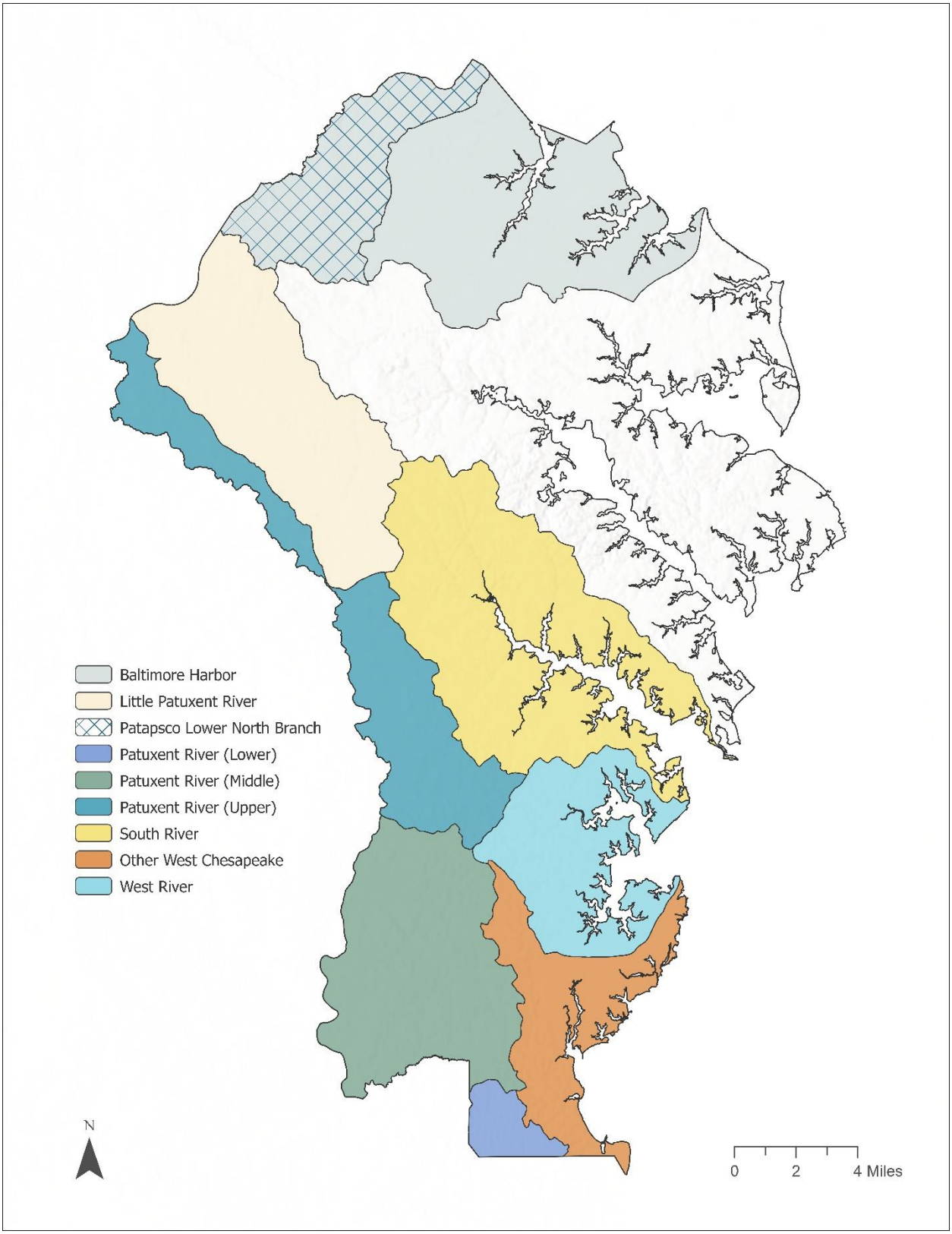

Figure 3: Map of local TSS and nutrient TMDL watersheds

Table 6: Local TSS and nutrient TMDL progress

Watershed	TMDL	Target Load (lbs)	Required Reduction (%)	Completion Year	FY 21 Progress (%)	Cumulative Progress (%)*	Completion Year Progress (%)*
Baltimore Harbor	TP	18,380.3	15%	2030	0.8%	6.6%	29.8%
Baltimore Harbor	TN	232,941.4	15%	2030	<0.1%	2.6%	15.0%
Little Patuxent	TSS	15,047,258	20.5%	2025	2.4%	6.2%	31.4%
Lower Patuxent	TSS	767,132.1	61%	2030	0%	0.0%	69.8%
Middle Patuxent	TSS	6,982,285.2	56%	2030	0%	0.02%	57.5%
Upper Patuxent	TSS	11,314,309.7	11.4%	2025	0%	1.9%	11.9%
Patapsco Lower North Branch	TSS	12,960,021	22.2%	2025	0.1%	6.7%	22.7%
South River	TSS	13,634,211.2	28%	2025	8.3%	29.2%	59.1%
Other West Chesapeake	TSS	7,363,965.3	33%	2030	0.4%	1.1%	34.2%
West River	TSS	7,150,213.7	22%	2030	0%	0.6%	24.6%

* Orange shading indicates TMDL compliance has been achieved in FY21. Light green shading indicates TMDL compliance is expected to be met or exceeded by the completion year.

A. SEDIMENT TMDLS

Required load reductions and progress load reductions for each TSS TMDL watershed are presented in Figure 4. In watersheds such as South River, the FY 21 progress reduction comprises the greatest amount, whereas others, such as Patapsco Lower North Branch, have load reductions equally split between FY 21 progress load reductions, programmed load reductions, and planned load reduction.

Figure 5 shows the breakdown of load reductions by BMP type for FY 21 progress load reductions, programmed load reductions, and planned load reductions. As shown in Figure 5, the majority of load reductions come from stormwater management BMPs and stream restorations.

Within the more rural TMDL watersheds, stream restorations make up the bulk of TSS reductions due to limited stormwater management BMP retrofit opportunities.

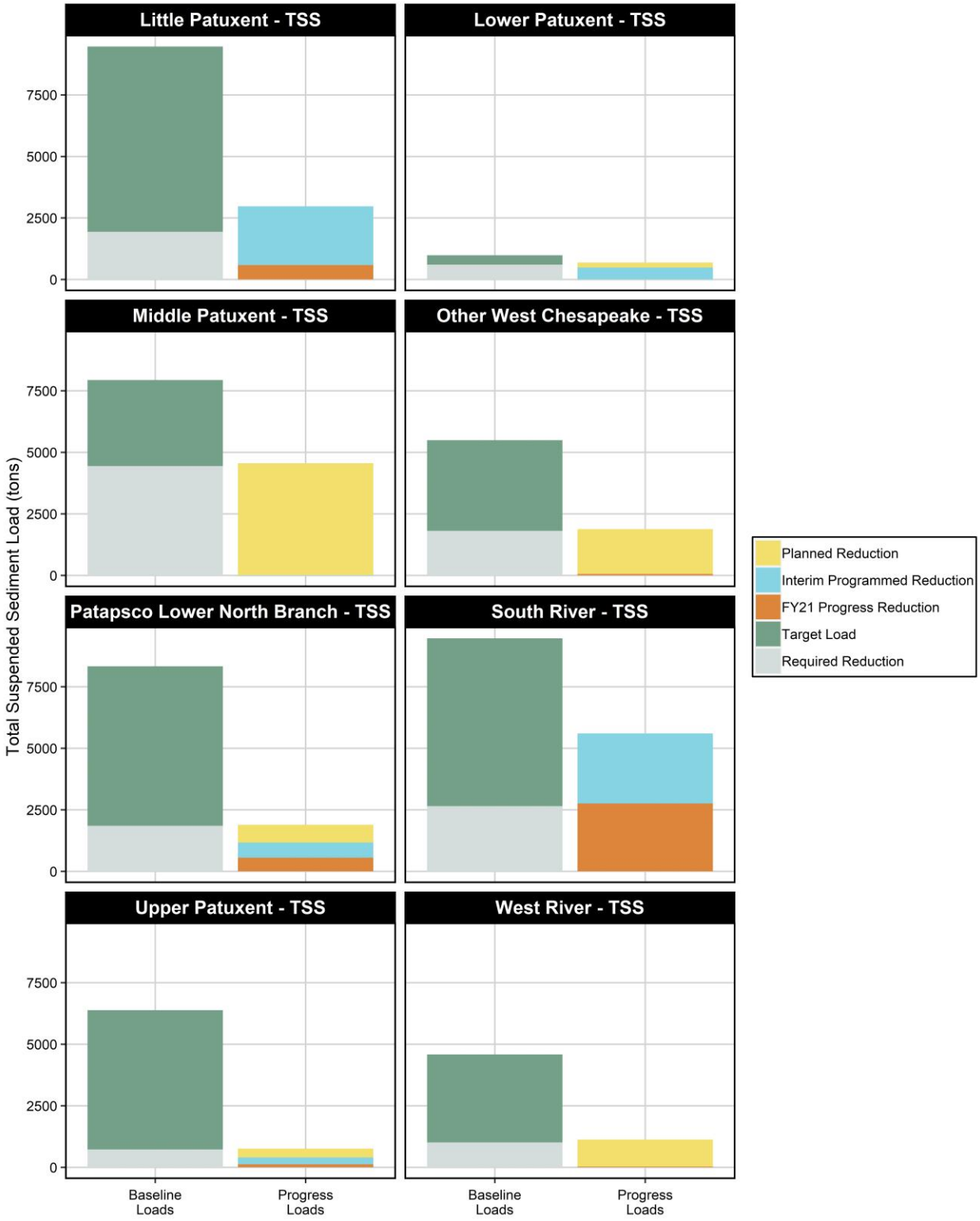

Figure 4: Baseline and progress TSS loads within each TMDL watershed

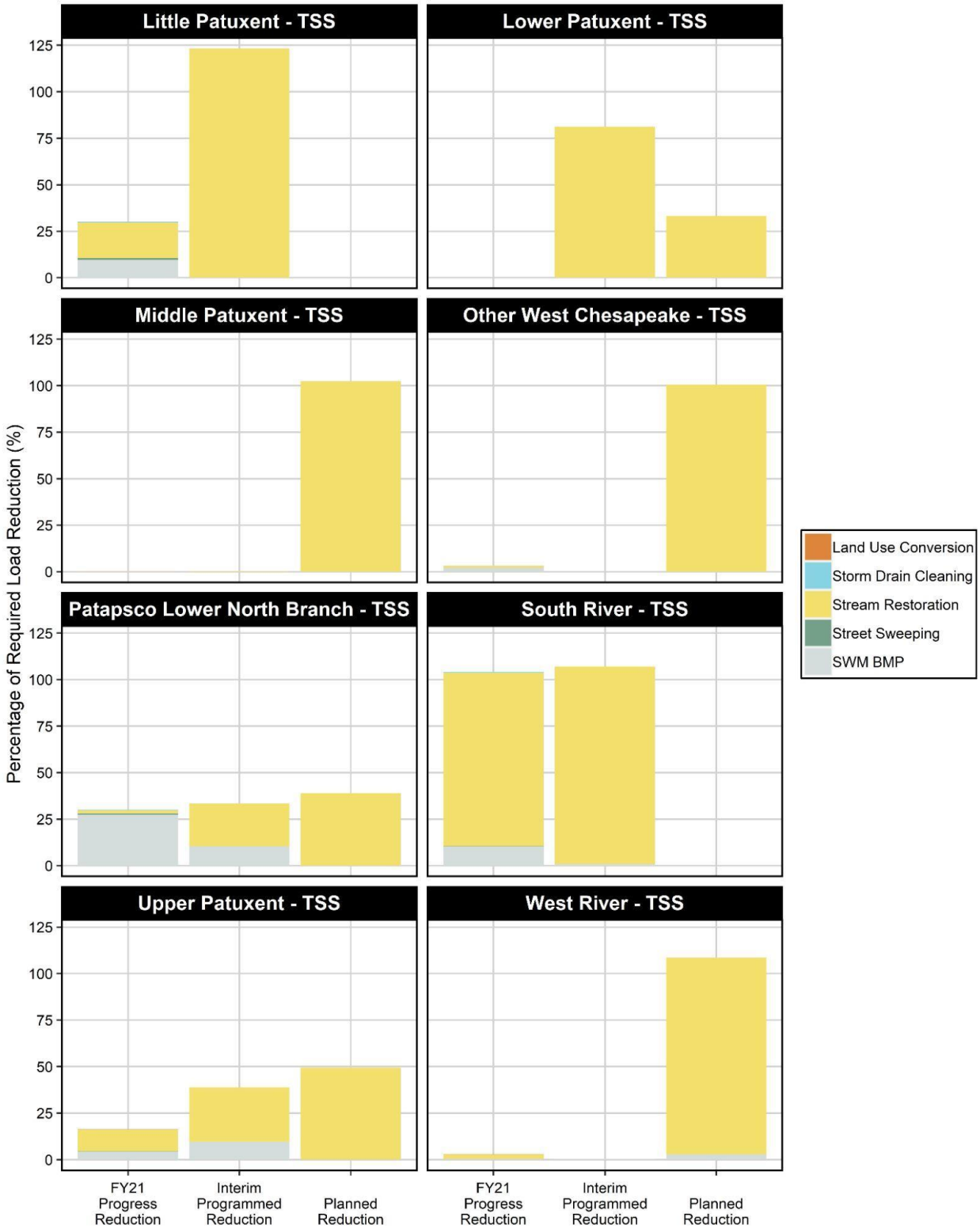

Figure 5: Progress and planned TSS load reductions by BMP type within each TMDL watershed

1. ***Patuxent River (Little Patuxent River, Upper Patuxent River, Middle Patuxent River, and Lower Patuxent River)***

Little Patuxent

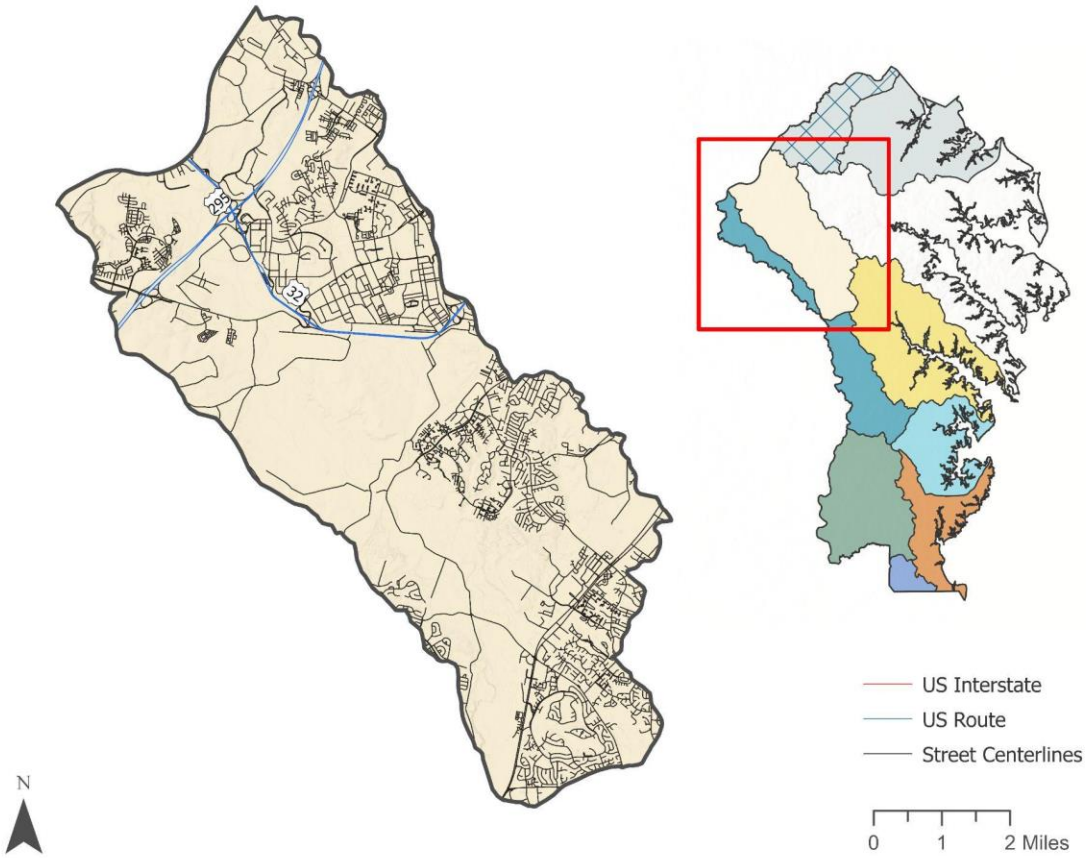

Figure 6: Map of the Little Patuxent TSS TMDL watershed

The Little Patuxent is situated in the western portion of the County, and shares political boundaries with Howard County (Figure 6). Anne Arundel County's portion of the Little Patuxent watershed is approximately 27,752 acres (43.4 square miles) in area and contains approximately 1,200 total miles of stream reaches.

The target sediment load for the Little Patuxent is 15,047,257 pounds per year - a 20.5% reduction from the baseline by 2025. Current FY 21 progress shows a reduction of 1,166,788 pounds (6.16%). Total interim programmed restoration will result in a further 4,777,872 pounds of reduction, resulting in a total of 31.41% reduction by the completion year (Table 6).

The Little Patuxent FY 21 progress reduction (6.16%) was achieved via annual street sweeping (~44 lane miles), annual storm drain cleaning (~33,400 pounds), seven stormwater management practices, and three stream restorations (1,160 linear feet). The interim programmed reduction consists of three stormwater management practices and five stream restorations (3,800 linear feet) and will achieve compliance with the TMDL. See Appendix C and D, Sections X and XI for information on individual projects.

Upper Patuxent

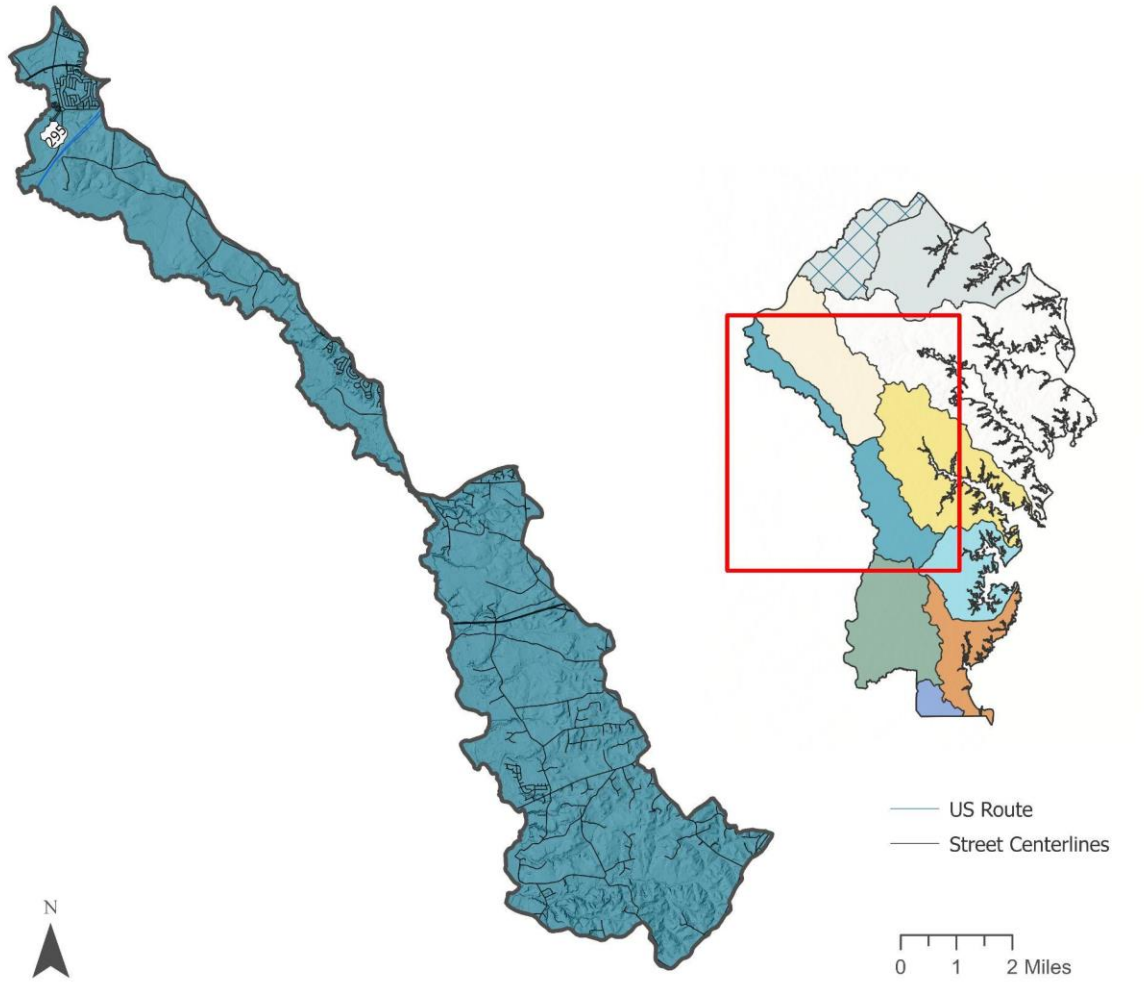

Figure 7: Map of the Upper Patuxent TSS TMDL watershed

The Upper Patuxent is situated in the western portion of the County, and shares political boundaries with Prince George's County along the Patuxent River and a small portion of Howard County (Figure 7). Anne Arundel County's portion of the Upper Patuxent watershed is approximately 22,420 acres (35.0 square miles) in area and contains approximately 90 total perennial miles of stream reaches.

The target sediment load for the Upper Patuxent is 11,314,310 pounds per year - an 11.4% reduction from the baseline by 2025. Current FY 21 progress shows a reduction of 236,988 pounds (1.86%), with a total interim programmed restoration of 563,930 pounds. Planned restoration will result in a further 719,200 lbs of reduction, resulting in a total of 11.90% reduction by the completion year (Table 6).

The Upper Patuxent FY 21 progress reduction (1.86%) was achieved via annual street sweeping (~0.1 lane miles), annual storm drain cleaning (~1,500 pounds), two stormwater management practices, one stream restoration (236 linear feet), and one land use conversion practice (0.12 acres). The interim programmed reduction consists of three stormwater management practices and one stream restoration (2,500 linear feet). The planned reduction consists of two stream restorations (2,900 linear feet) and will achieve compliance with the TMDL. See Appendix C and D, Sections X and XI for information on individual projects.

Lower Patuxent

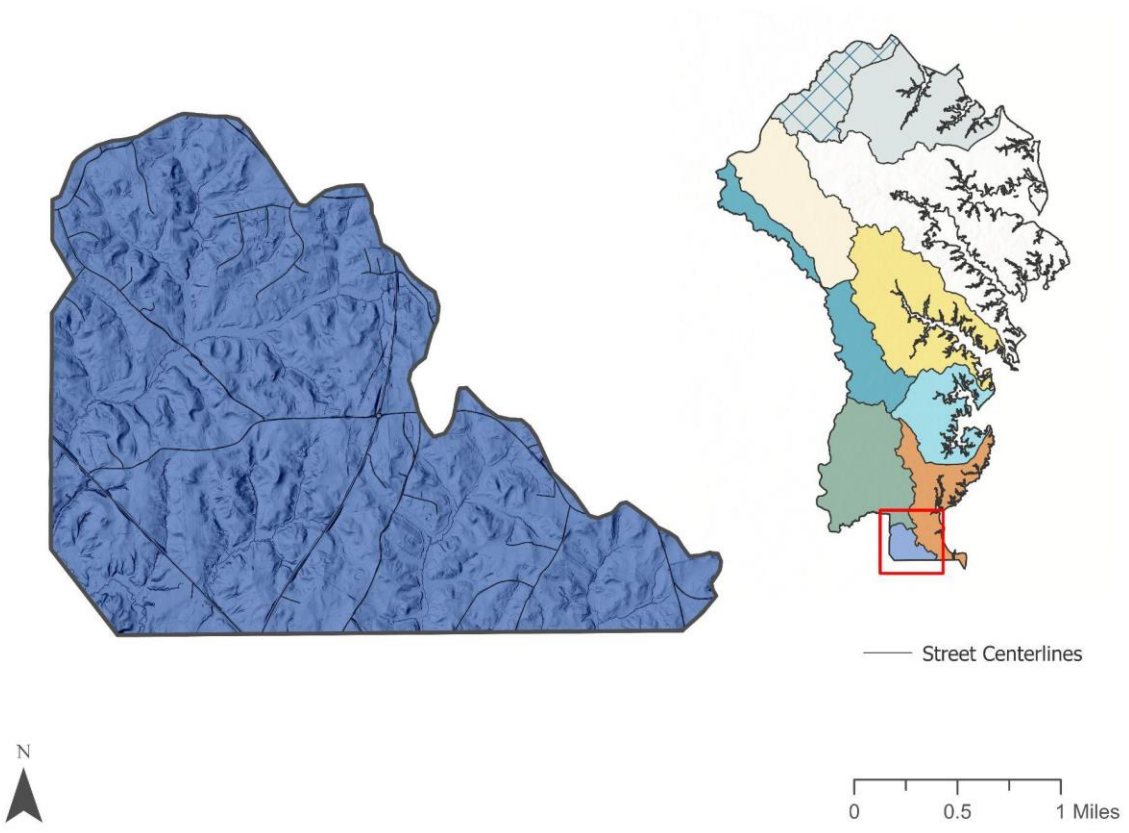

Figure 8: Map of the Lower Patuxent TSS TMDL watershed

The Lower Patuxent is located in the southernmost portion of the county, and shares political boundaries with Calvert County (Figure 8). Only a small portion of the entire Lower Patuxent watershed is located within Anne Arundel County; the rest of the Lower Patuxent watershed extends through Prince George's, Calvert, Charles, and St. Mary's counties until the point of discharge from the Patuxent River into the Chesapeake Bay. The Anne Arundel County portion of the Lower Patuxent watershed is approximately 3,217 acres (5 square miles) and contains approximately 24.7 miles of streams.

The target sediment load for the Lower Patuxent is 767,132 pounds per year - a 61% reduction from the baseline by 2030. Current FY 21 progress shows a reduction of 0 pounds (0%), with a total interim programmed restoration of 973,878 pounds. Planned restoration will result in a further 398,214 lbs of reduction, resulting in a total of 69.7% reduction by the completion year (Table 6).

The Lower Patuxent interim programmed reduction consists of one stream restoration (2,900 linear feet). The planned reduction consists of one stream restoration (1,600 linear feet) and will achieve compliance with the TMDL. See Appendix C and D, Sections X and XI for information on individual projects.

Middle Patuxent

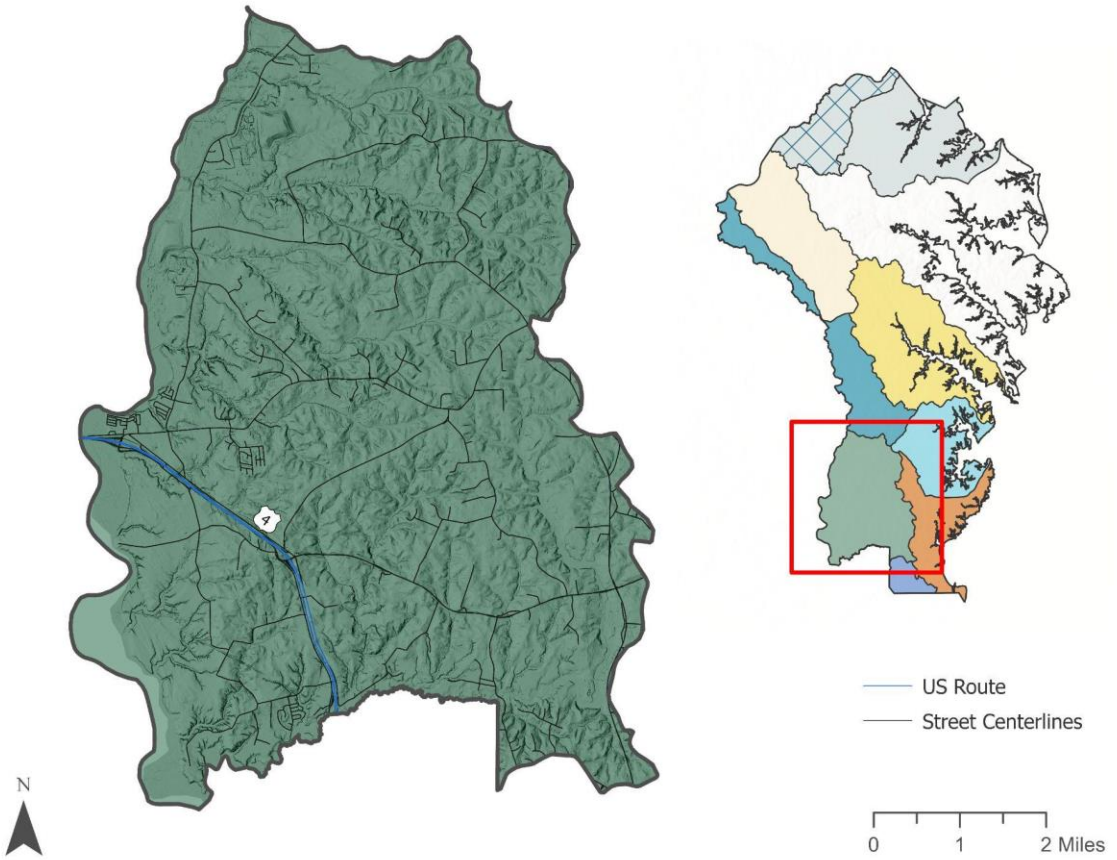

Figure 9: Map of the Middle Patuxent TSS TMDL watershed

The Middle Patuxent watershed is located in the southwest portion of the county, and shares political boundaries with Prince George's County along the Patuxent River to the west, and with Calvert County along Lyons Creek to the south (Figure 9). The Anne Arundel County portion of the Middle Patuxent watershed is approximately 26,490 acres (41.4 square miles) and contains approximately 228 miles of streams.

The target sediment load for the Middle Patuxent is 6,982,285 pounds per year - a 56% reduction from the baseline by 2030. Current FY 21 progress shows a reduction of 3,517 pounds (0.02%), with a total interim programmed restoration of 19,785 pounds. Planned restoration will result in a further 9,094,964 lbs of reduction, resulting in a total of 57.46% reduction by the completion year (Table 6).

The Middle Patuxent FY 21 progress reduction (0.02%) was achieved via annual street sweeping (~1.1 lane miles), annual storm drain cleaning (~880 pounds), and one land use conversion practice (1.38 acres). The interim programmed reduction consists of one outfall restoration. The

planned reduction consists of fifteen stream restorations (36,670 linear feet) and will achieve compliance with the TMDL. See Appendix C and D, Sections X and XI for information on individual projects.

2. Patapsco River Lower North Branch

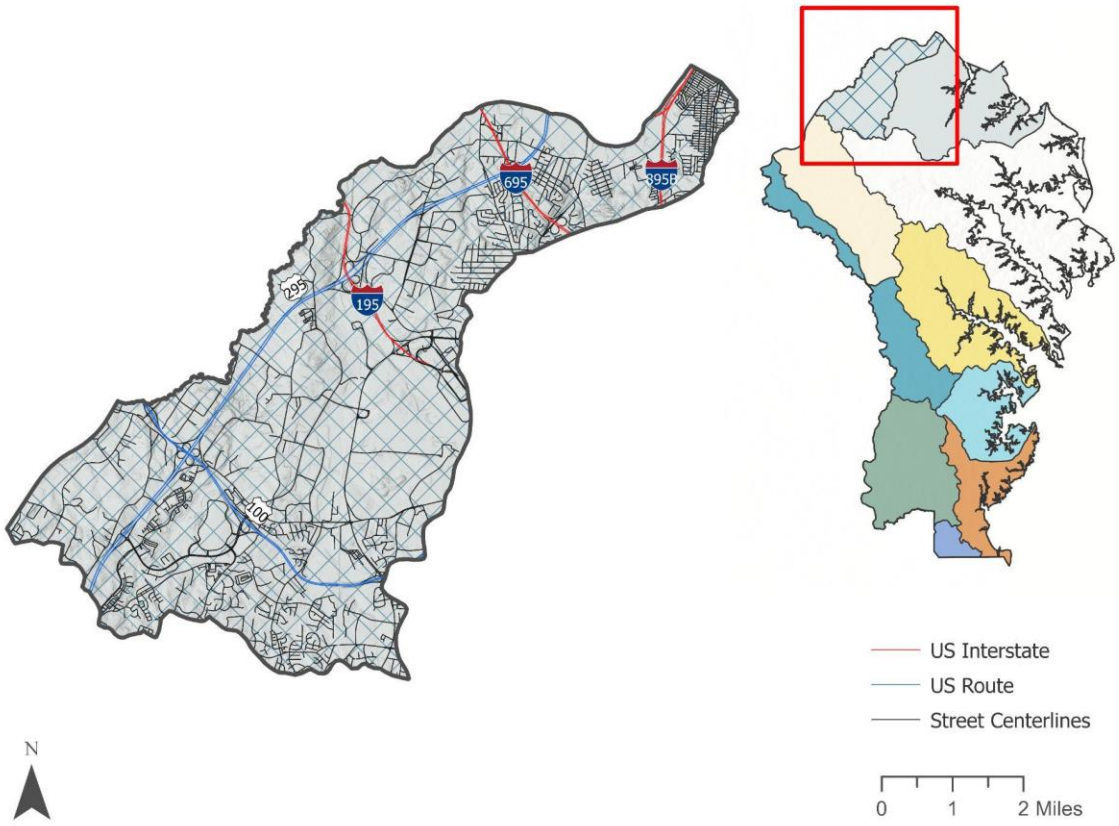

Figure 10: Map of the Patapsco Lower North Branch TSS TMDL watershed

The Patapsco LNB is situated in the northwestern portion of the County, and shares political boundaries with Howard County along Deep Run and Baltimore County along the mainstem of the Patapsco River (Figure 10). The downstream extent of the watershed borders Baltimore City. Anne Arundel County's portion of the Patapsco LNB watershed is approximately 15,270 acres (23.9 square miles) in area and contains approximately 96 miles of streams.

The target sediment load for the Patapsco LNB is 12,960,021 pounds per year - a 22.2% reduction from the baseline by 2025. Current FY 21 progress shows a reduction of 1,110,453 pounds (6.67%), with a total interim programmed restoration of 1,233,946 pounds. Planned

restoration will result in a further 1,442,641 lbs of reduction, resulting in a total of 22.73% reduction by the completion year (Table 6).

The Patapsco LNB FY 21 progress reduction (6.67%) was achieved via annual street sweeping (~33.5 lane miles), annual storm drain cleaning (~24,400 pounds), and twenty stormwater management practices. The interim programmed reduction consists of three stream restorations (13,100 linear feet), two land use conversions (0.33 acres), and eight stormwater management practices. The planned reduction consists of two stream restorations (5,800 linear feet) and will achieve compliance with the TMDL. See Appendix C and D, Sections X and XI for information on individual projects.

3. South River

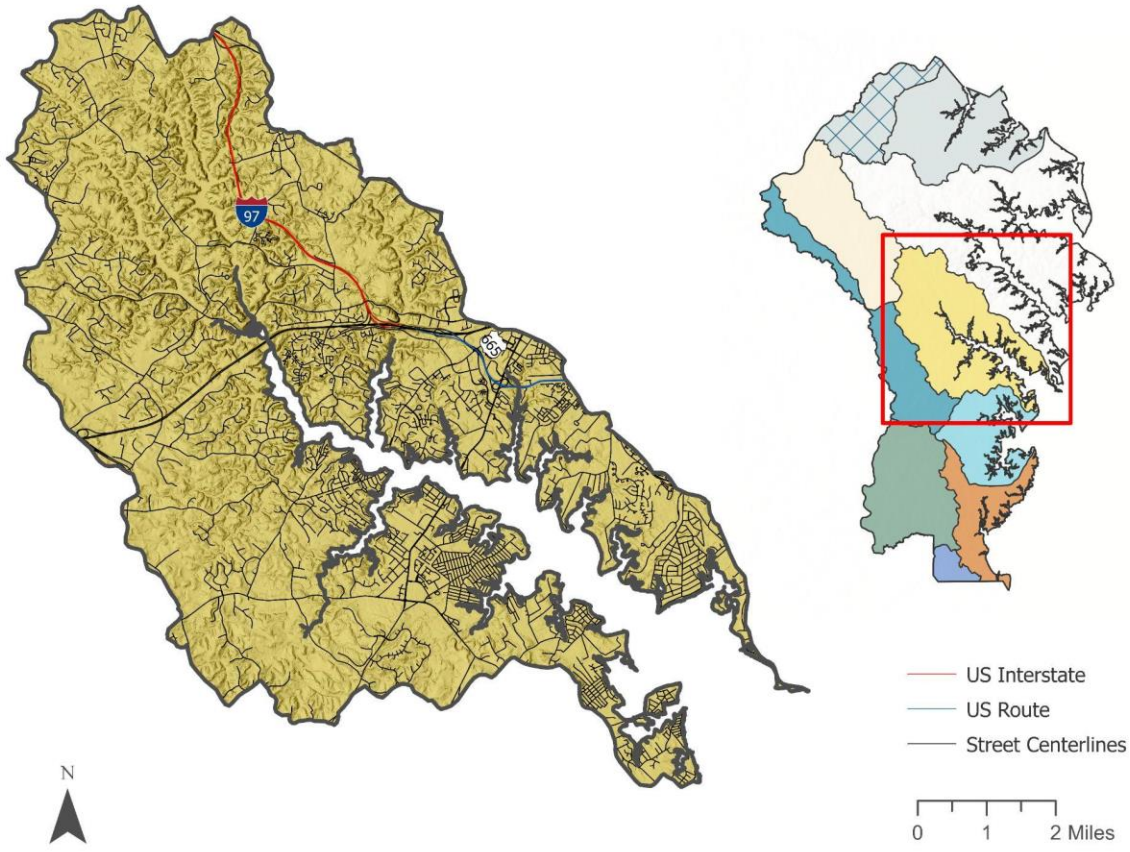

Figure 11: Map of the South River TSS TMDL watershed

The South River is situated in the central portion of the County, and drains directly to the Chesapeake Bay (Figure 11). The watershed comprises approximately 36,514 acres and lies entirely within the County.

The target sediment load for the South River is 13,634,211 pounds per year - a 28% reduction from the baseline by 2025. Current FY 21 progress shows a reduction of 5,521,829 pounds (29.16%), achieving compliance with the TMDL. Additionally, there is a total interim programmed restoration of 5,676,249 pounds, resulting in a total reduction of 59.14% by the completion year (Table 6).

The South River FY 21 progress reduction (29.16%) was achieved via annual street sweeping (~20 lane miles), annual storm drain cleaning (~50,600 pounds), thirty-seven stormwater management practices, one land use conversion (0.26 acres), and fifteen stream restorations (22,700 linear feet), and achieves compliance with the TMDL. The interim programmed reduction consists of nine stream restorations (19,600 linear feet), and three stormwater management practices. See Appendix C and D, Sections X and XI for information on individual projects.

4. Other West Chesapeake Bay

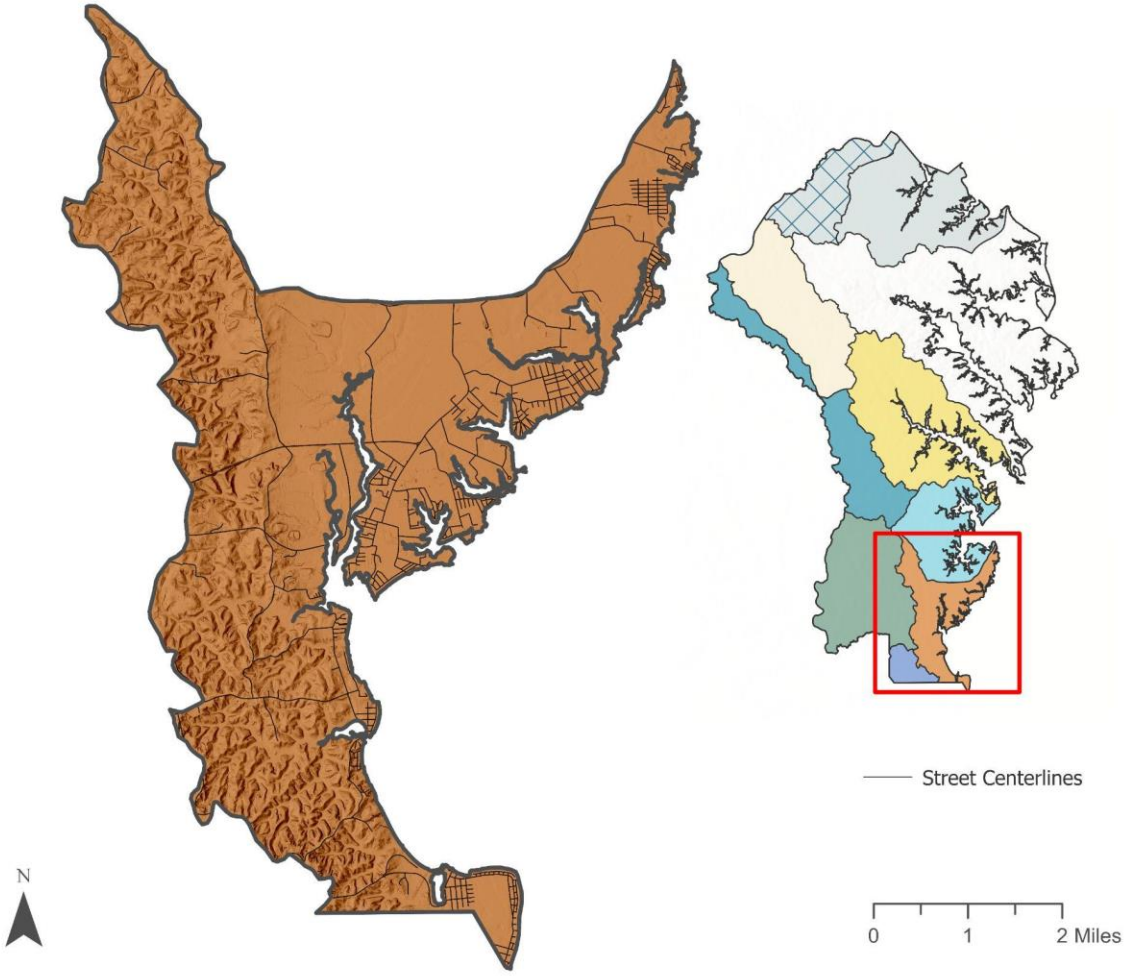

Figure 12: Map of the Other West Chesapeake Bay TSS TMDL watershed

The Other West Chesapeake is situated in the southeastern portion of the County, and shares political boundaries with Calvert County (Figure 12). The Anne Arundel County portion of the Other West Chesapeake watershed is approximately 14,662 acres (22.9 square miles) in area and contains approximately 100 total miles of streams.

The target sediment load for the Other West Chesapeake watershed is 7,363,965 pounds per year - a 33% reduction from the baseline by 2030. Current FY 21 progress shows a reduction of 115,681 pounds (1.05%). Planned restoration will result in a further 3,648,551 lbs of reduction, resulting in a total of 34.25% reduction by the completion year (Table 6).

The Other West Chesapeake watershed FY 21 progress reduction (1.05%) was achieved via annual street sweeping (~0.1 lane miles), annual storm drain cleaning (~2,100 pounds), two stormwater management practices, and one stream restoration (240 linear feet). The planned reduction consists of thirteen stream restorations (14,700 linear feet) and will achieve compliance with the TMDL. See Appendix C and D, Sections X and XI for information on individual projects.

5. West River

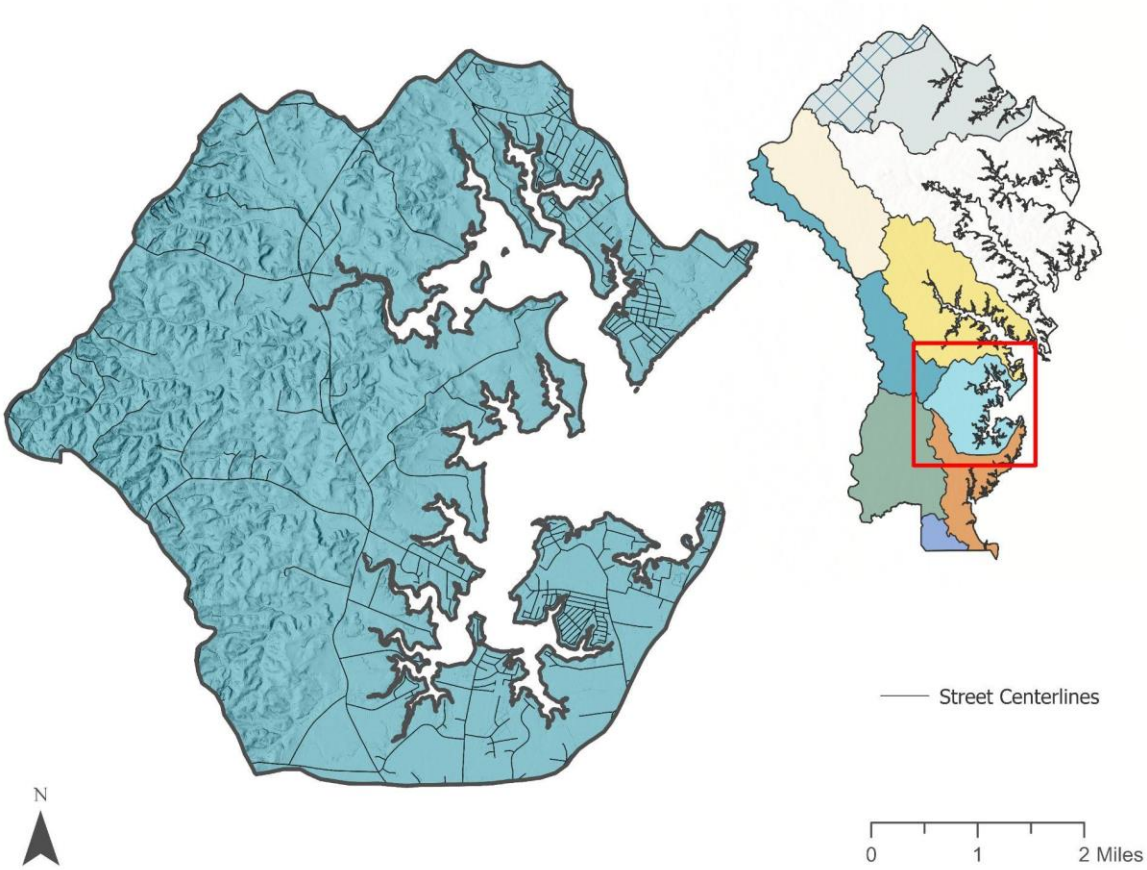

Figure 13: Map of the West River TSS TMDL watershed

The Non-Tidal West River watershed is located in the southeastern part of Anne Arundel County, and consists of two major segments - the West River and the Rhode River (Figure 13). The Non-Tidal West River watershed is approximately 15,623 acres (24.4 square miles) and contains approximately 62 miles of streams, 33 miles of which are perennial streams.

The target sediment load for the West River is 7,150,214 pounds per year - a 22% reduction from the baseline by 2030. Current FY 21 progress shows a reduction of 56,249 pounds (0.6%), with a total interim programmed restoration of 7,103 pounds. Planned restoration will result in a further 2,188,342 lbs of reduction, resulting in a total of 24.56% reduction by the completion year (Table 6).

The West River FY 21 progress reduction (0.6%) was achieved via annual street sweeping (~0.1 lane miles), annual storm drain cleaning (~1,500 pounds), six stormwater management practices, one land use conversion (0.1 acres), and one stream restoration (1,400 linear feet). The interim

programmed reduction consists of two stormwater management practices. The planned reduction consists of seven stormwater management practices and two stream restorations (8,600 linear feet) and will achieve compliance with the TMDL. See Appendix C and D, Sections X and XI for information on individual projects.

B. NUTRIENT TMDLS

Required load reductions and progress load reductions for the Baltimore Harbor TN and TP TMDL are presented in Figure 14 and Figure 15. Figure 16 shows the breakdown of load reductions by BMP type for FY 21 progress load reductions, programmed load reductions, and planned load reductions. As shown in Figure 16, the majority of load reductions come from stormwater management BMPs and stream restorations.

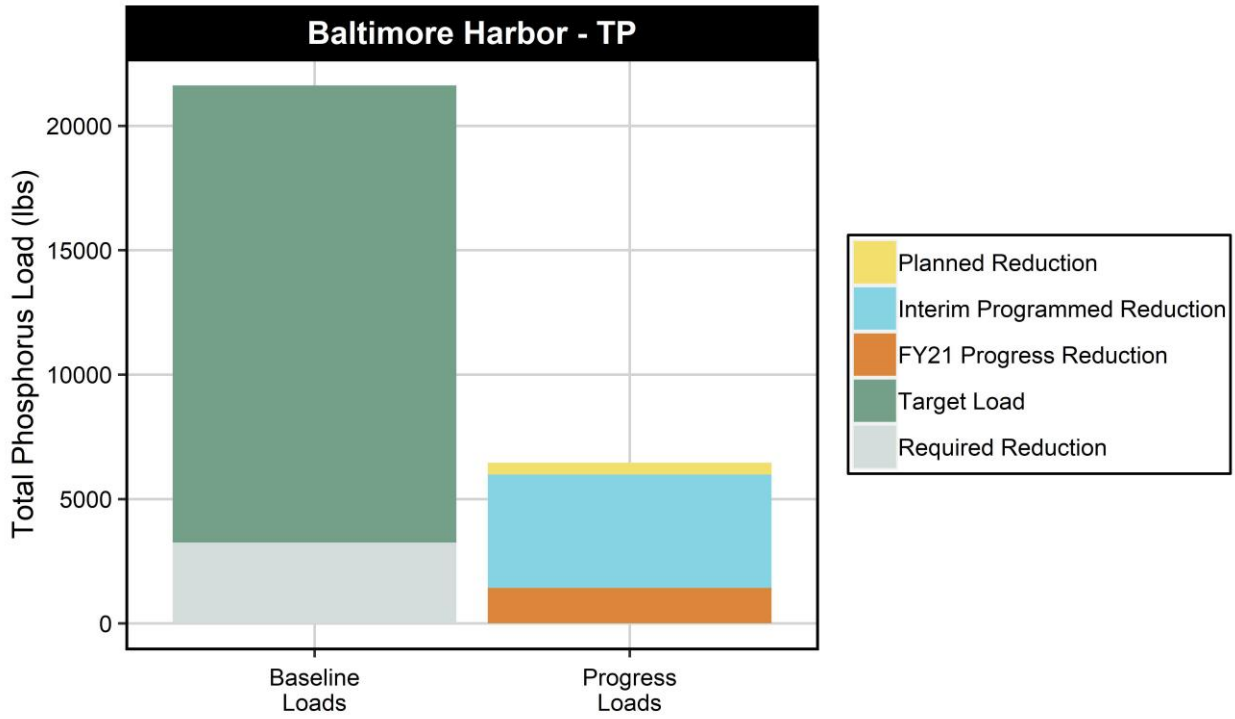

Figure 14: Baseline and progress TP loads for the Baltimore Harbor TMDL watershed

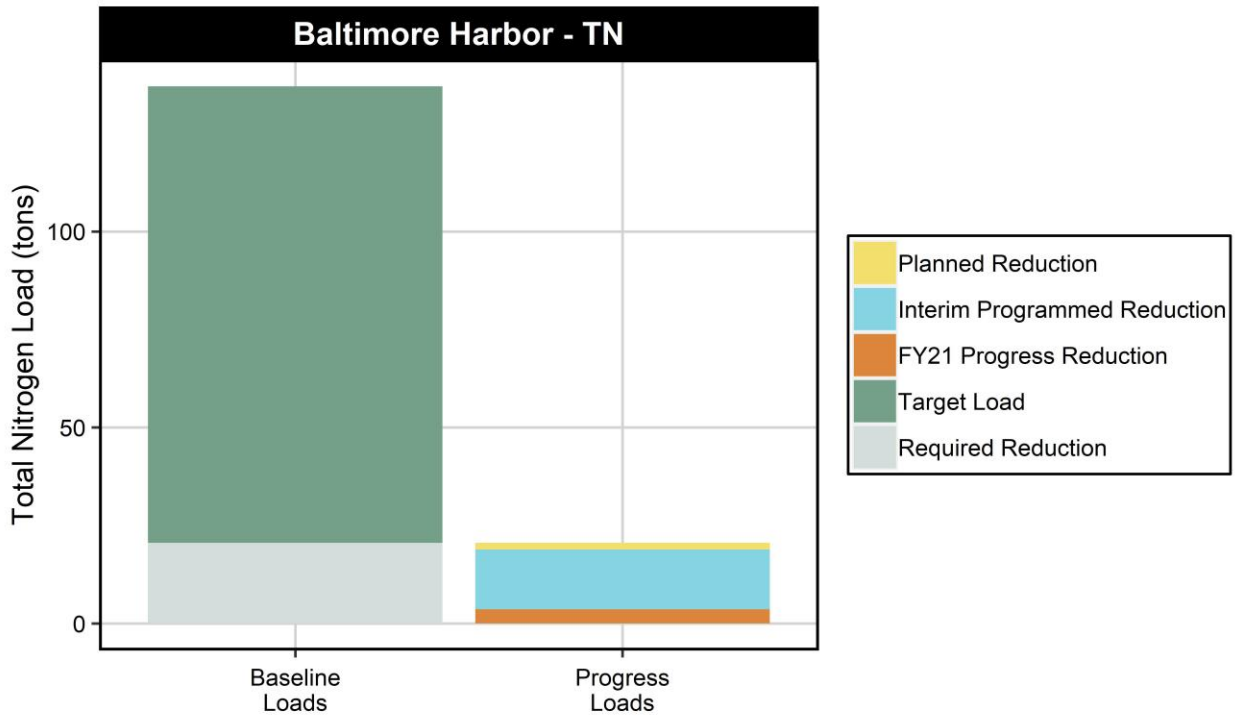

Figure 15: Baseline and progress TN loads for the Baltimore Harbor TMDL watershed

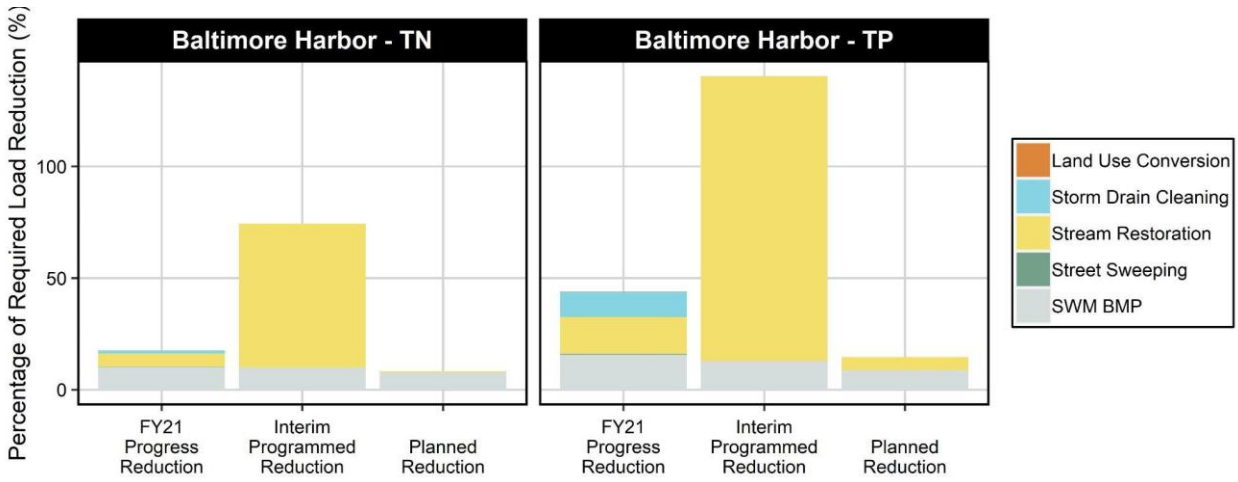

Figure 16: Progress and planned TN and TP load reductions by BMP type for the Baltimore Harbor TMDL

1. Baltimore Harbor

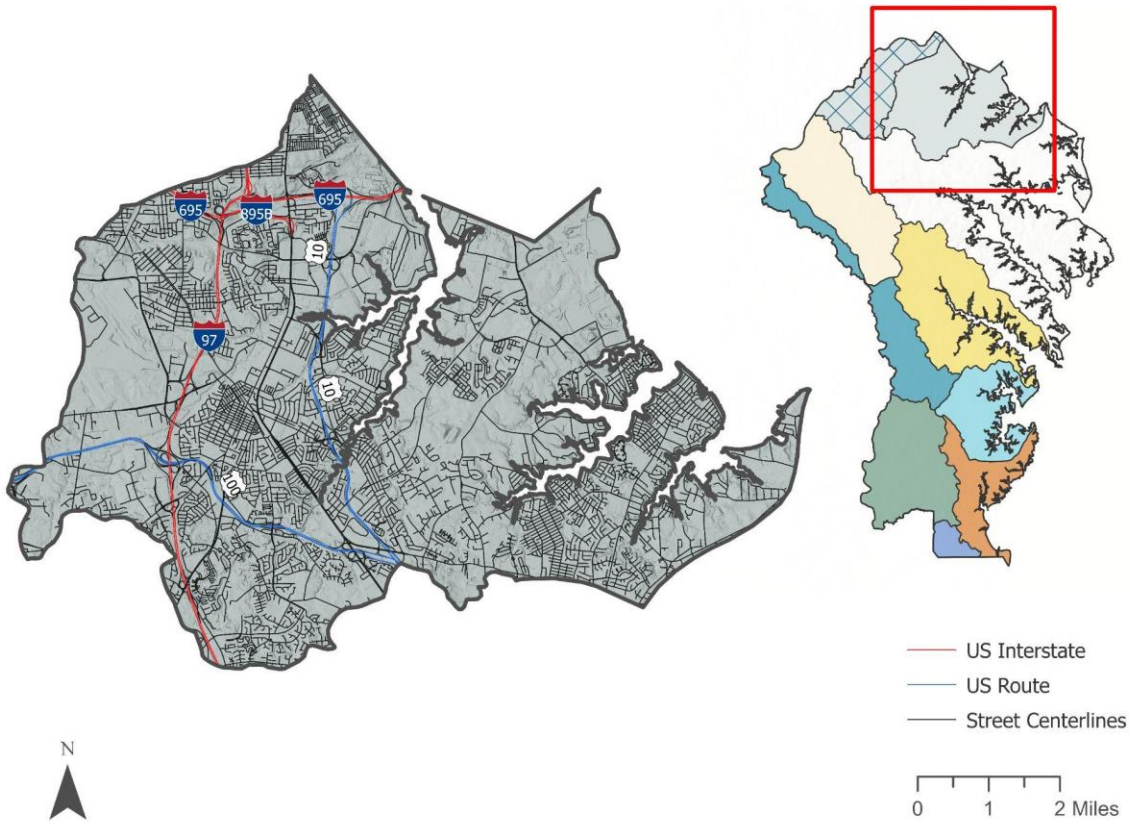

Figure 17: Map of the Baltimore Harbor TN and TP TMDL watershed

The Baltimore Harbor Watershed is situated in the northern portion of the County, and shares political boundaries with Baltimore City, Baltimore, Carroll, and Howard Counties (Figure 17). The Anne Arundel County portion of the Baltimore Harbor watershed is approximately 45,134 acres (70.5 square miles) in area and contains approximately 202 total miles of stream reaches.

The target Total Nitrogen (TN) load for the Baltimore Harbor is 232,941 pounds per year - a 15% reduction from the baseline by 2030. Current FY 21 progress shows a reduction of 7,224 pounds (2.64%), with a total interim programmed restoration of 30,536 pounds. Planned restoration will result in a further 3,363 lbs of reduction, resulting in a total of 15% reduction by the completion year (Table 6).

The target Total Phosphorus (TP) load for the Baltimore Harbor is 18,380 pounds per year - a 15% reduction from the baseline by 2030. Current FY 21 progress shows a reduction of 1,420 pounds (6.57%), with a total interim programmed restoration of 4,557 pounds. Planned

restoration will result in a further 475 lbs of reduction, resulting in a total of 29.84% reduction by the completion year (Table 6).

The Baltimore Harbor FY 21 progress reduction for both TN and TP was achieved via annual street sweeping (~93.7 lane miles), annual storm drain cleaning (~276,500 pounds), forty-eight stormwater management practices, three land use conversions (2.8 acres), and four stream restorations (5,400 linear feet). The interim programmed reduction consists of twenty-three stream restorations (43,500 linear feet), two land use conversions (0.33 acres), and twenty-two stormwater management practices. The planned reduction consists of two stream restorations (2,800 linear feet), and eight stormwater management practices, and will achieve compliance with both the TN and TP TMDLs. See Appendix C and D for more information on individual projects.

VI. BACTERIA TMDLS PROGRESS

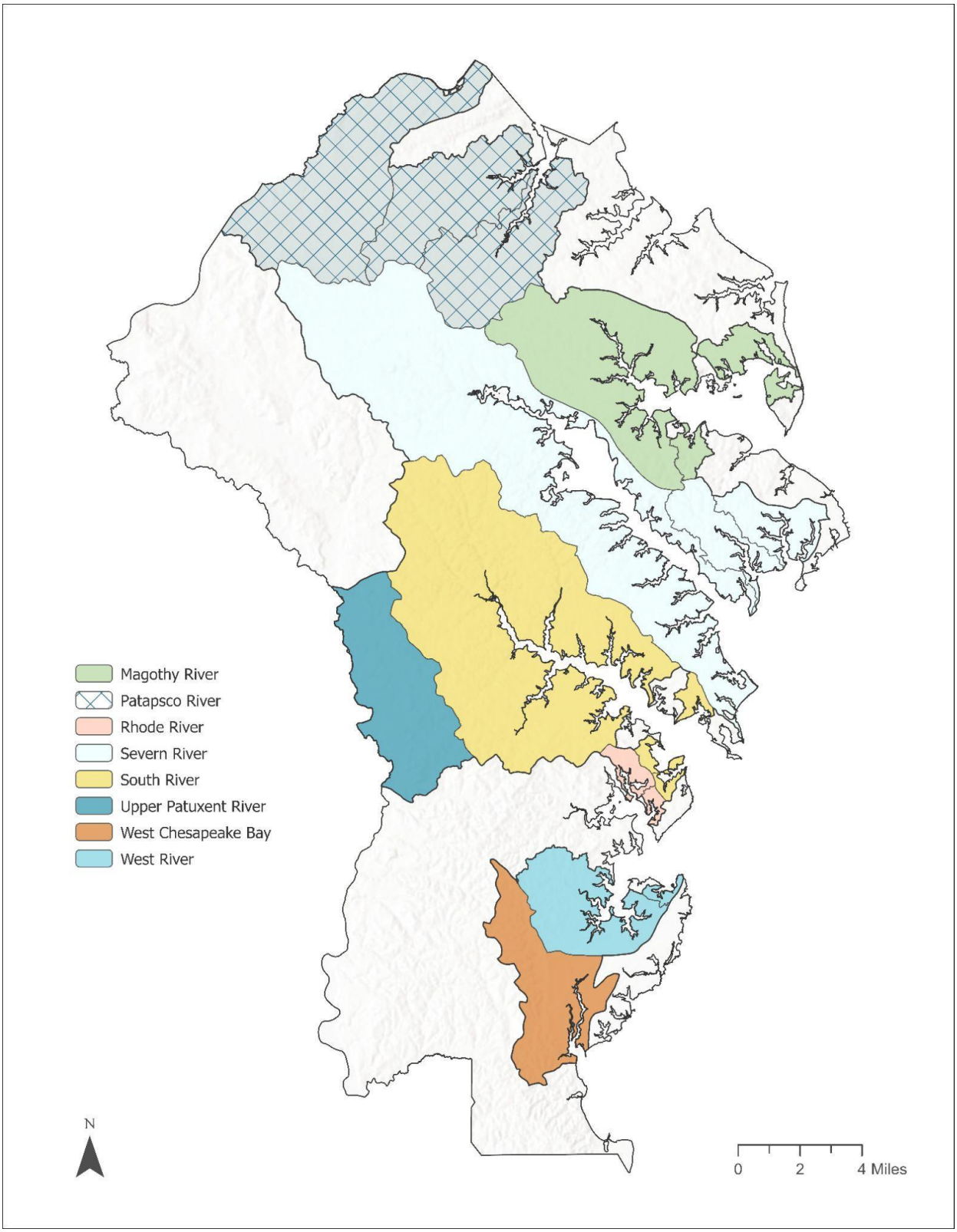

Figure 18: Map of the Bacterial TMDL watersheds in Anne Arundel County

The location of the 19 waterways with EPA-approved TMDLs associated with bacteria impairments are presented in Figure 18. Fecal coliforms are identified as the cause of impairment in 15 of the 19 waterways. E. coli and Enterococci are identified as the impairments in the remaining four watersheds (Table 7).

Table 7: List of bacterial TMDLs in Anne Arundel County

Location	Approval Date	Impairment	% Reduction Required*
Magothy River Mainstem	February 20, 2006	Fecal coliform	12.8
Magothy River/Forked Creek	February 20, 2006	Fecal coliform	26.3
Magothy River/Tar Cove	February 20, 2006	Fecal coliform	0.0
Patapsco River/Furnace Creek	March 10, 2011	Enterococci	77.7
Patapsco River/Marley Creek	March 10, 2011	Enterococci	75.7
Patapsco River Lower North Branch, 8 Digit WS 02130906	December 3, 2009	E. coli	20.7
Upper Patuxent River, Subsegment of 8 Digit WS 0213114	August 9, 2011	E. Coli	22.3
Rhode River/Bear Neck Creek	February 20, 2006	Fecal coliform	43.3
Rhode River/Cadle Creek	February 20, 2006	Fecal coliform	72.2
Severn River Mainstem, Subsegment of 8 Digit WS 02131002	April 10, 2008	Fecal coliform	19.0
Severn River/Mill Creek	April 10, 2008	Fecal coliform	86.0
Severn River/Whitehall & Meredith Creeks	April 10, 2008	Fecal coliform	90.0
South River/Duvall Creek	November 4, 2005	Fecal coliform	45.6
South River, Subsegment of 8 Digit WS 02131003	November 4, 2005	Fecal coliform	29.5
South River/Ramsey Lake	November 4, 2005	Fecal coliform	59.3
South River/Selby Bay	November 4, 2005	Fecal coliform	0.0
W. Chesapeake Bay/Tracy & Rockhold Creeks	February 20, 2006	Fecal coliform	81.6
West River, Subsegment of 8 Digit WS 02131004	February 20, 2006	Fecal coliform	35.3
West River/Parish Creek	February 20, 2006	Fecal coliform	53.1

*Based on the MDE published TMDL documents for bacteria impaired watersheds in Anne Arundel County and Anne Arundel County's *Total Maximum Daily Load Restoration Plan for Bacteria, February 2017.* Percent reductions required for the Patapsco and Upper Patuxent are for the Anne Arundel County portion only.

Due to the number of bacteria TMDLs, and because the four source categories (pet waste, wildlife, human, and livestock) were represented in all the impaired waterbodies, Anne Arundel County chose to develop a single consolidated implementation plan to address all 19 bacteria TMDLs.[2]

[2] www.aacounty.org/departments/public-works/wprp/watershed-assessment-and-planning/chesapeake-bay-tmdl/index.html

A. RESTORATION STRATEGIES

Two restoration strategies are implemented in Anne Arundel County to achieve bacteria TMDL compliance. The first strategy addresses the human sources of bacteria (Tier A strategies) originating from effluent from poorly maintained septic systems, sanitary sewage overflows (SSOs), and illicit discharges of wastewater into storm drains. The second strategy addresses non-human sources of bacteria (Tier B strategies) originating from as pet, wildlife, and livestock excrement.

1. Tier A Strategies

The County's Illicit Discharge Detection and Elimination (IDDE) program requires that approximately 150 outfalls are evaluated each year. In FY 21, the County evaluated a total of 210 outfalls and confirmed two (2) outfalls that had illicit discharge.

The County has a program to upgrade the sanitary sewer system to improve its reliability. These upgrades aim to abate SSOs and reduce the discharge of human bacteria to surface water. In FY 21, four (4) sewer pumping station (SPS) were upgraded in watersheds with a bacteria TMDL. There are currently 19 active SPS upgrade projects in watersheds with a bacteria TMDL that are scheduled to be completed in future fiscal years.

The County aims to retire 20-40 septic systems per year, and replace these systems with connection to the sanitary sewer system. In FY 21, the County retired 18 septic systems in watersheds with a bacteria TMDL. Following the efforts of the Septic Task Force, DPW developed and requested new legislation to allow septic system connections in eligible areas to be provided with a subsidy and an option to defer a portion of their assessment. Eligible areas were defined to include areas in the Health Department's Onsite Wastewater Management Problem Areas, and locations within the Critical Area. Four separate pieces of legislation were passed between the end of 2019 and during 2020 to put the elements of the program into place. Additionally, in 2021 the "Our WAAter" initiative was launched with a goal of connecting 200 residential septic systems per year over a 20-year period.

For more information regarding Tier A Strategies please refer to Appendix F in Section XIII of this document.

2. Tier B Strategies

The County has a program to implement new stormwater management practices and retrofit pre-2002 stormwater management facilities. This program concurrently treats stormwater from impervious surfaces and reduces pollutants such as bacteria. 191 projects have been completed in watersheds with a bacteria TMDL between 2012 and 2021, with six (6) of those projects being completed in FY 21.

The County continued to highlight proper pet waste management practices through its social media outlets, and at community events and presentations throughout FY 21. The County retained a consultant to develop pet waste outreach messaging that results in behavioral change

and proper pet waste disposal. A pilot campaign was launched in two communities in watersheds with a bacteria TMDL. To date, the outreach effort has resulted in an online survey, a focus group, and the development of a campaign slogan and various multi-media educational and outreach materials. In FY 21, the County continued to make pet waste stations available to interested communities, resulting in the installation of eight (8) stations (all within bacteria TMDL watersheds). Investigation into new potential areas for pet waste station installation, including County parks, will continue in FY 22.

The County, along with Maryland Department of Natural Resources (MDNR), continues to provide support to the Anne Arundel County Watershed Stewards Academy (WSA), which trains and certifies Master Watershed Stewards to engage in educational outreach and implement water quality improvement projects throughout their community. One such program WSA manages is the Backyard Buffers program, which provides landowners with free native trees and shrubs. The County also partners with WSA on the "Replant Anne Arundel" tree planting initiative in an effort to combat forest canopy loss. WSA programs resulted in the planting of 4,375 native trees in FY 21.

For more information regarding Tier B Strategies please refer to Appendix F in Section XIII of this document.

3. Monitoring

The County has several bacteria monitoring programs in place to assess impairment in local waterways and to confirm water quality improvements as a result of BMP and programmatic implementation. The County bacteria monitoring programs includes the NPDES MS4 Assessment of Controls monitoring at the Parole Plaza outfall and Church Creek, the County Department of Health's monitoring of public bathing beaches, monitoring in the Marley and Furnace Creek watersheds, monitoring in two residential communities in conjunction with a pilot pet waste outreach campaign, and monitoring in the Rhode River/Bear Neck Creek. The County also currently monitors bacteria as part of post-restoration storm and baseflow monitoring at two CIP restoration projects - Furnace Branch and Cowhide Branch - both of which are located in bacteria TMDL watersheds.

For more information on these bacterial monitoring programs, please refer to Appendix F in Section XIII of this document.

Moving forward, the County intends to focus future bacteria reduction efforts in TMDL watersheds where SW-WLAs have not yet been met, to the greatest extent possible. The County will continue to collaborate with MDE and other jurisdictions to investigate the effectiveness of BMPs to reduce bacteria where such opportunities exist.

B. MAGOTHY RIVER (MAINSTEM, FORKED CREEK, AND TAR COVE)

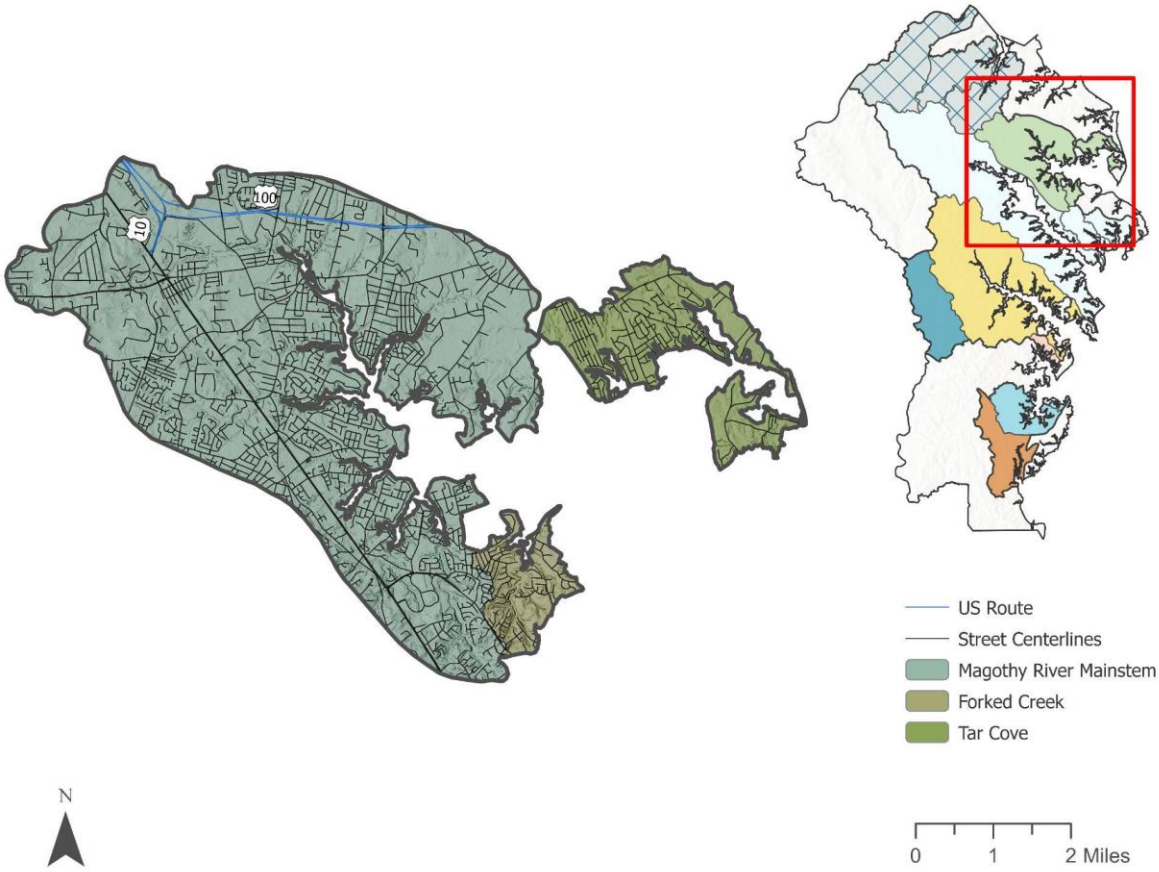

Figure 19: Map of the Magothy Bacterial TMDL watershed

The Magothy River Watershed is located in the northeastern portion of the County near Pasadena and Severna Park (Figure 19). The Magothy River flows southeast into the Chesapeake Bay near Gibson Island. Forked Creek is a small tidal creek located along the south shoreline of the river near its mouth and has a mainstem approximately 2.5 miles long. Tar Cove is on the opposite (north) shoreline, adjacent to Sillery Bay. The primary land use category in all three watersheds is residential. All three watersheds are impaired by fecal coliforms.

Restoration BMPs:
Mainstem: 35 complete, 7 planned
Forked: 3 complete, 1 planned
Tar: 1 complete

C. PATAPSCO RIVER (PATAPSCO LOWER NORTH BRANCH, FURNACE CREEK, AND MARLEY CREEK)

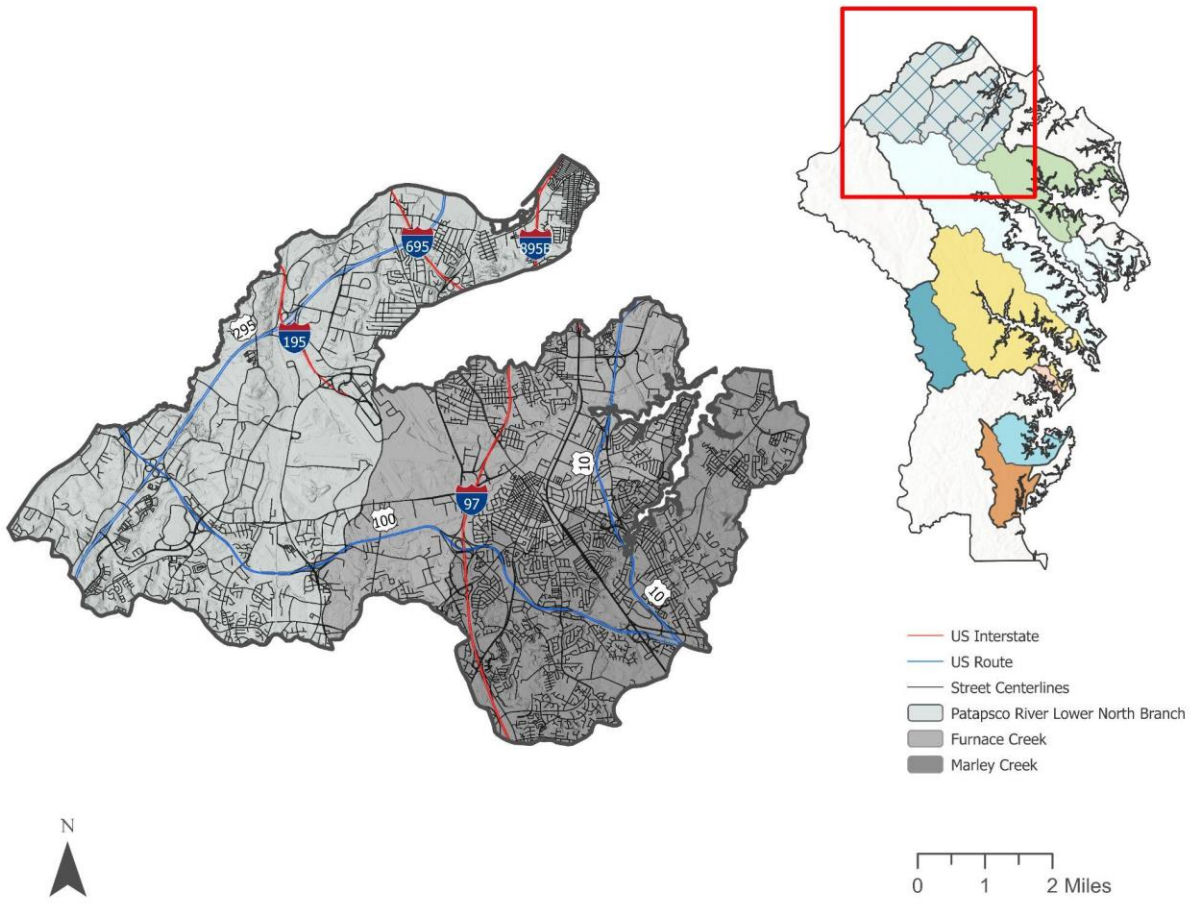

Figure 20: Map of the Patapsco Bacterial TMDL watershed

Anne Arundel County's portion of the Patapsco Lower North Branch (LNB) watershed is approximately 15,270 acres (23.9 square miles) in area and contains approximately 96 miles of streams (Figure 20). The Patapsco River LNB is generally non-tidal, and is one of two bacteria TMDL watersheds impaired by E. coli.

Furnace Creek and Marley Creek are tidal creeks in the northern portion of the County, a few miles east of Baltimore-Washington International airport. These two watersheds are similar in size (8,579 acres for Furnace Creek, 8,737 acres for Marley Creek), and are highly urbanized with much residential development. The Marley Creek and Furnace Creek watersheds are both impaired by enterococci.

<u>Restoration BMPs:</u>
LNB: 19 complete, 9 planned
Furnace: 7 complete, 6 planned

Marley: 10 complete, 4 planned

D. UPPER PATUXENT RIVER

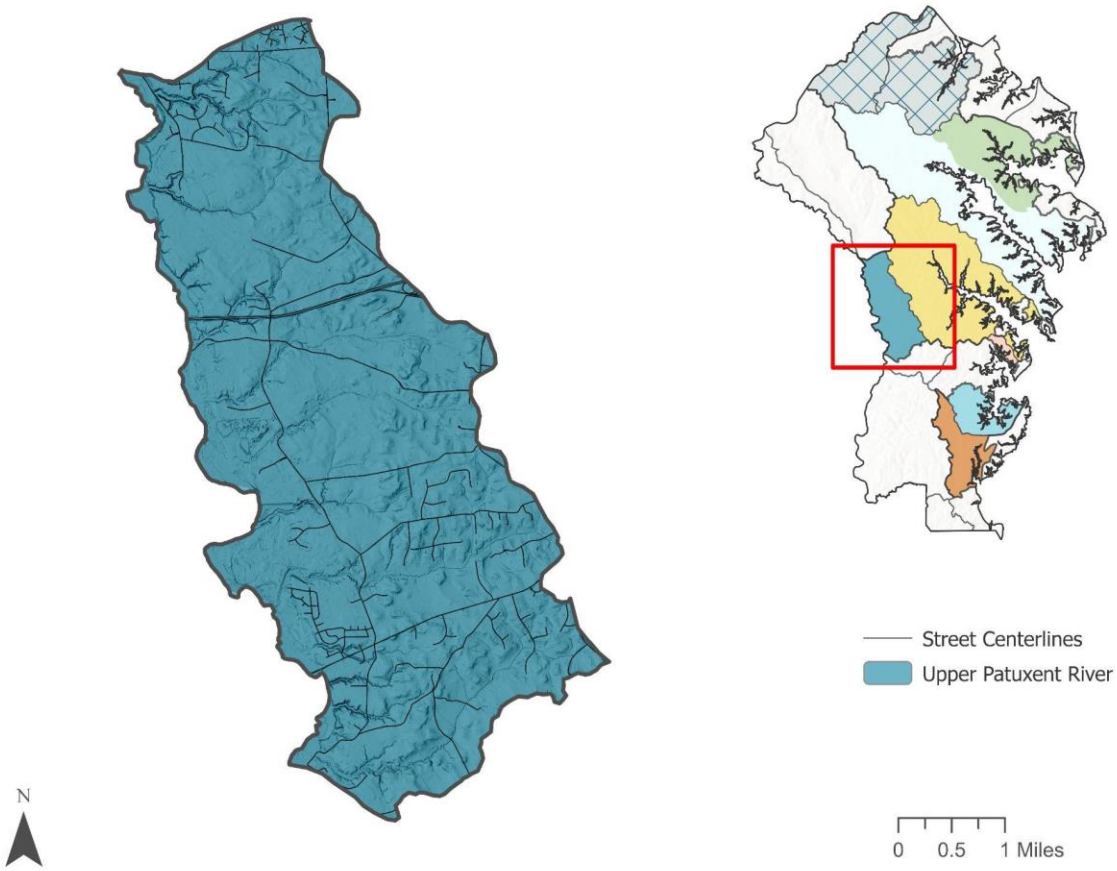

Figure 21: Map of the Upper Patuxent Bacterial TMDL watershed

The Upper Patuxent is situated in the western portion of the County (Figure 21). Anne Arundel County's portion of the Upper Patuxent watershed is approximately 22,420 acres (35.0 square miles) in area and contains approximately 90 total miles of perennial stream. The Upper Patuxent Watershed is one of two bacteria watersheds that are impaired by E. coli.

<u>Restoration BMPs:</u>
None

E. RHODE RIVER (BEAR NECK CREEK AND CADLE CREEK)

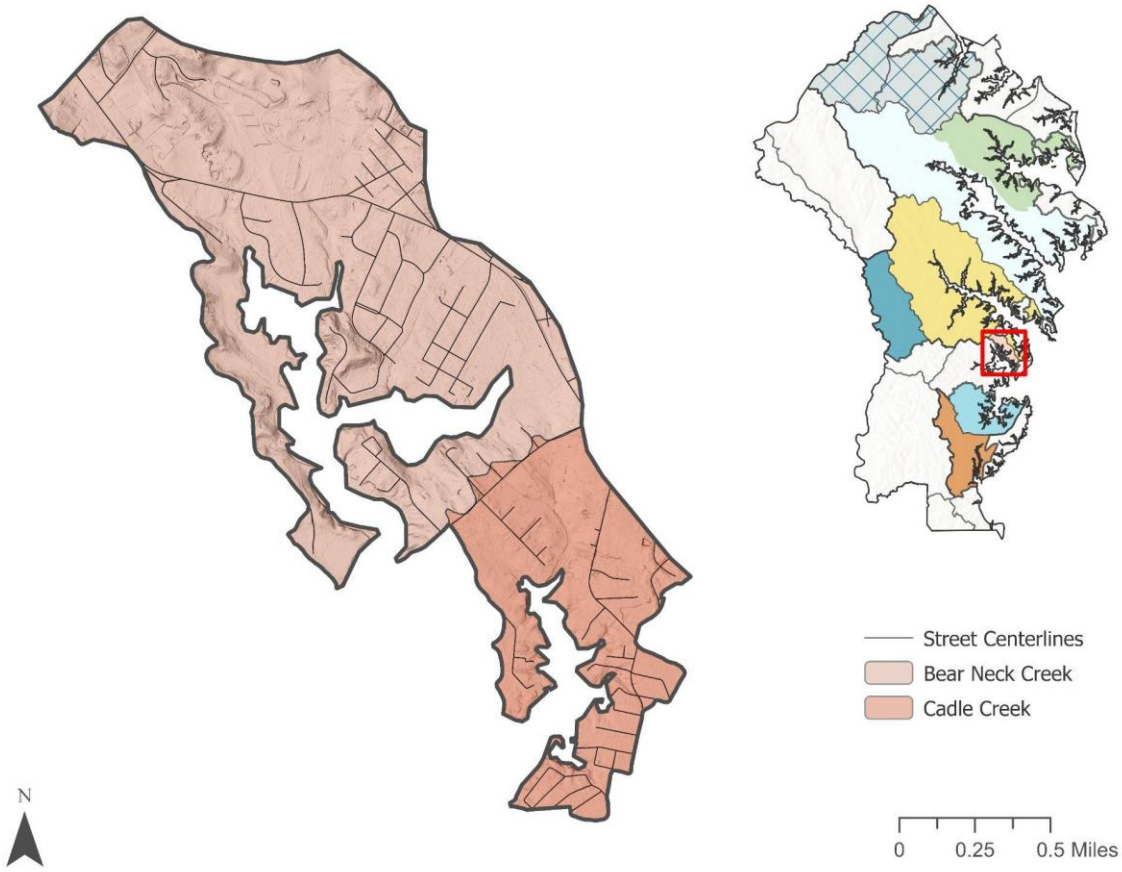

Figure 22: Map of the Rhode Bacterial TMDL watershed

Bear Neck Creek and Cadle Creek are located in the Rhode River Watershed, in the southeastern part of Anne Arundel County (Figure 22). The Bear Neck Creek Watershed is 880 acres with 50 percent of its land use being residential, mainly consisting of the community of Mayo. The Cadle Creek Watershed is 320 acres, with approximately 70 percent of the land use is residential and 20 percent is impervious.

<u>Restoration BMPs:</u>
Bear Neck: 5 complete
Cadle: None

F. SEVERN RIVER (MAINSTEM, MILL CREEK, AND WHITEHALL AND MEREDITH CREEKS)

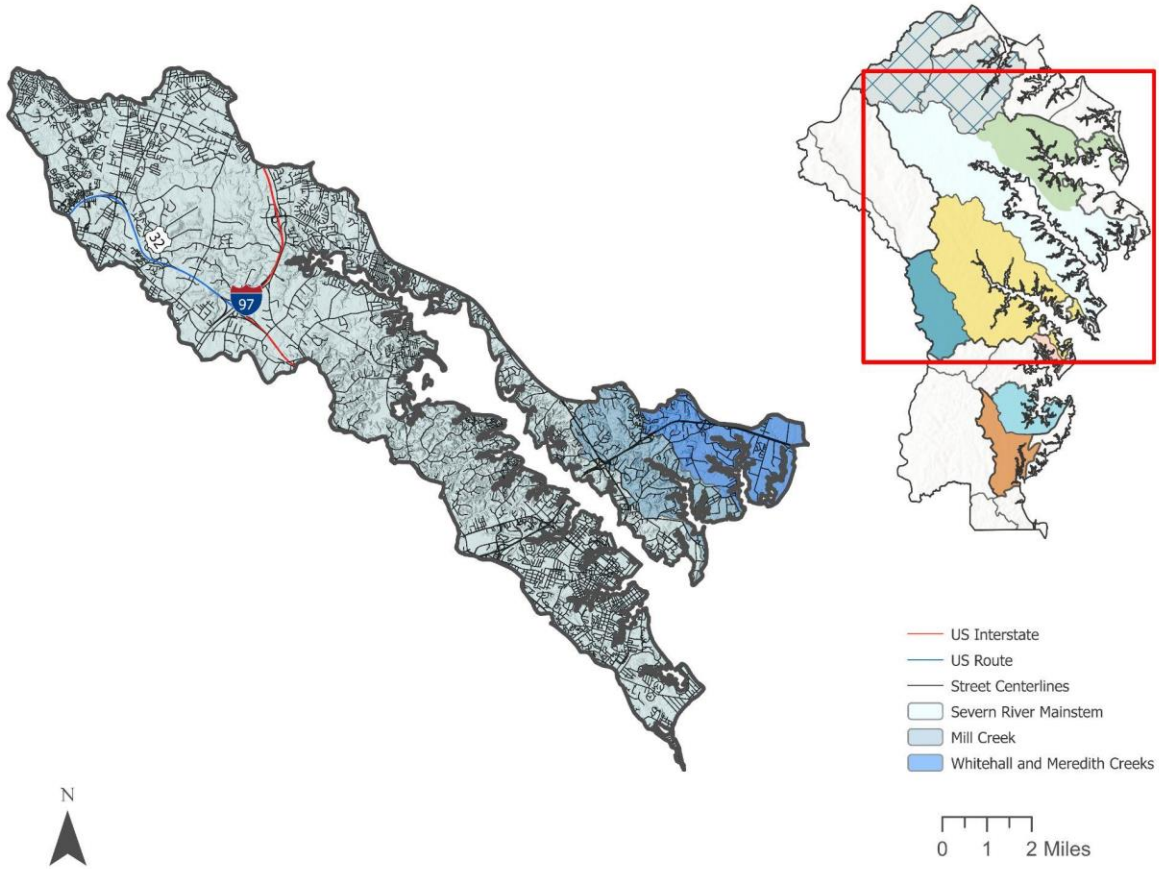

Figure 23: Map of the Severn Bacterial TMDL watershed

The Severn River Mainstem flows from northwest to southeast across the center of the County, from the community of Severn at the headwaters to the city of Annapolis near the mouth (Figure 23). The total watershed area is 37,011 acres, and the dominant land uses are residential at 44 percent and forested at 35 percent. Mill Creek, Whitehall Creek, and Meredith Creek are all located a few miles northeast of the Severn River's mouth and discharge into the Chesapeake Bay just west of the Bay Bridge.

<u>Restoration BMPs:</u>
Severn: 30 complete, 3 planned
Mill: 6 complete, 1 planned
Whitehall: 3 complete, 0 planned

G. SOUTH RIVER (MAINSTEM, DUVALL CREEK, RAMSEY LAKE, SELBY BAY)

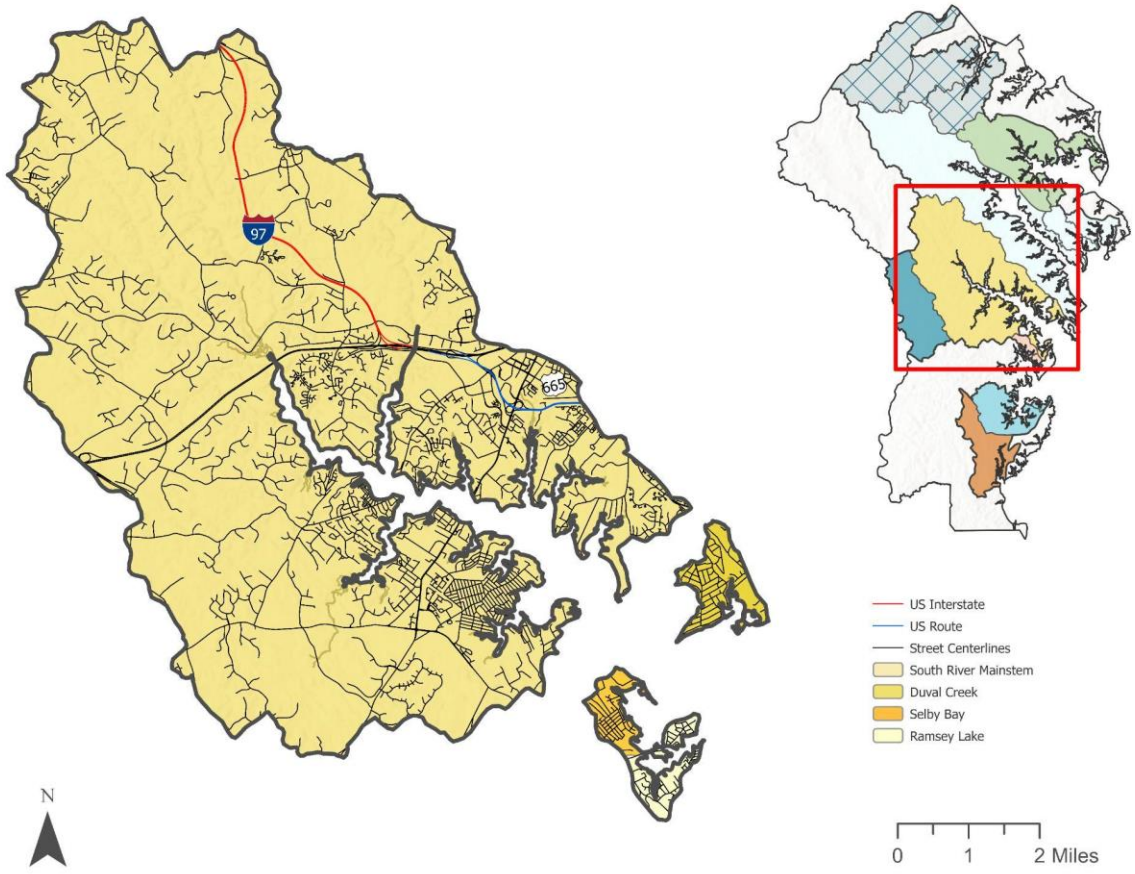

Figure 24: Map of the South Bacterial TMDL watershed

The South River Watershed has four impaired waterways with approved bacteria TMDLs: the South River Mainstem, Duvall Creek, Ramsey Lake, and Selby Bay (Figure 24). The South River is located immediately south of the Severn River in the central portion of the County. Like the Severn, it flows from northwest to southeast. The headwaters are near the town of Crownsville. The mouth, where it discharges to the Chesapeake Bay, is near Thomas Point Park. Duvall Creek, Ramsey Lake, and Selby Bay are small embayments near the mouth of the South River.

<u>Restoration BMPs:</u>
South: 31 complete, 3 planned
Duval: 3 complete, 0 planned
Selby: 0 complete, 0 planned
Ramsey: 0 complete, 0 planned

H. WEST CHESAPEAKE BAY (TRACY AND ROCKHOLD CREEKS)

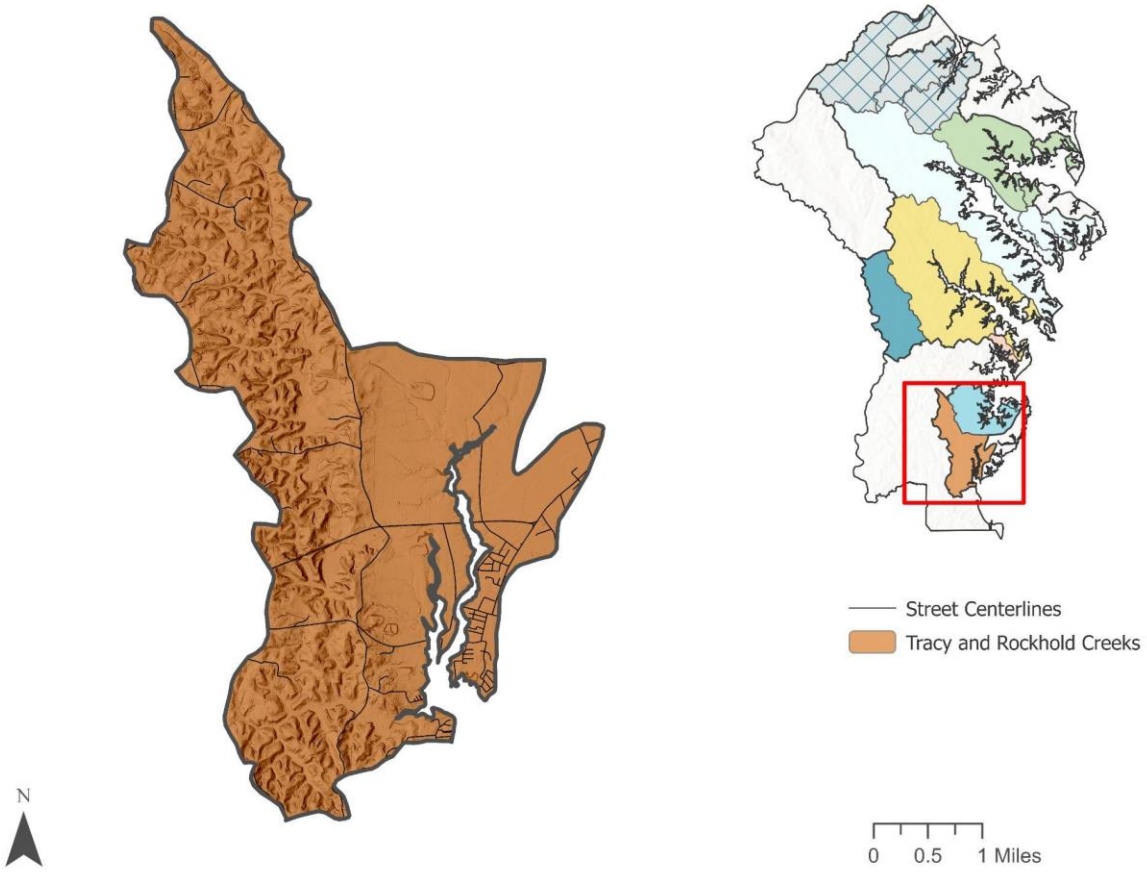

Figure 25: Map of the Other West Chesapeake Bay Bacterial TMDL watershed

Tracy and Rockhold Creeks, situated in the southeastern portion of the County (Figure 25), have a combined watershed area of 7,962 acres, about half of which is forest.

Restoration BMPs:
Tracy: 1 complete, 0 planned

I. WEST RIVER (MAINSTEM AND PARISH CREEK)

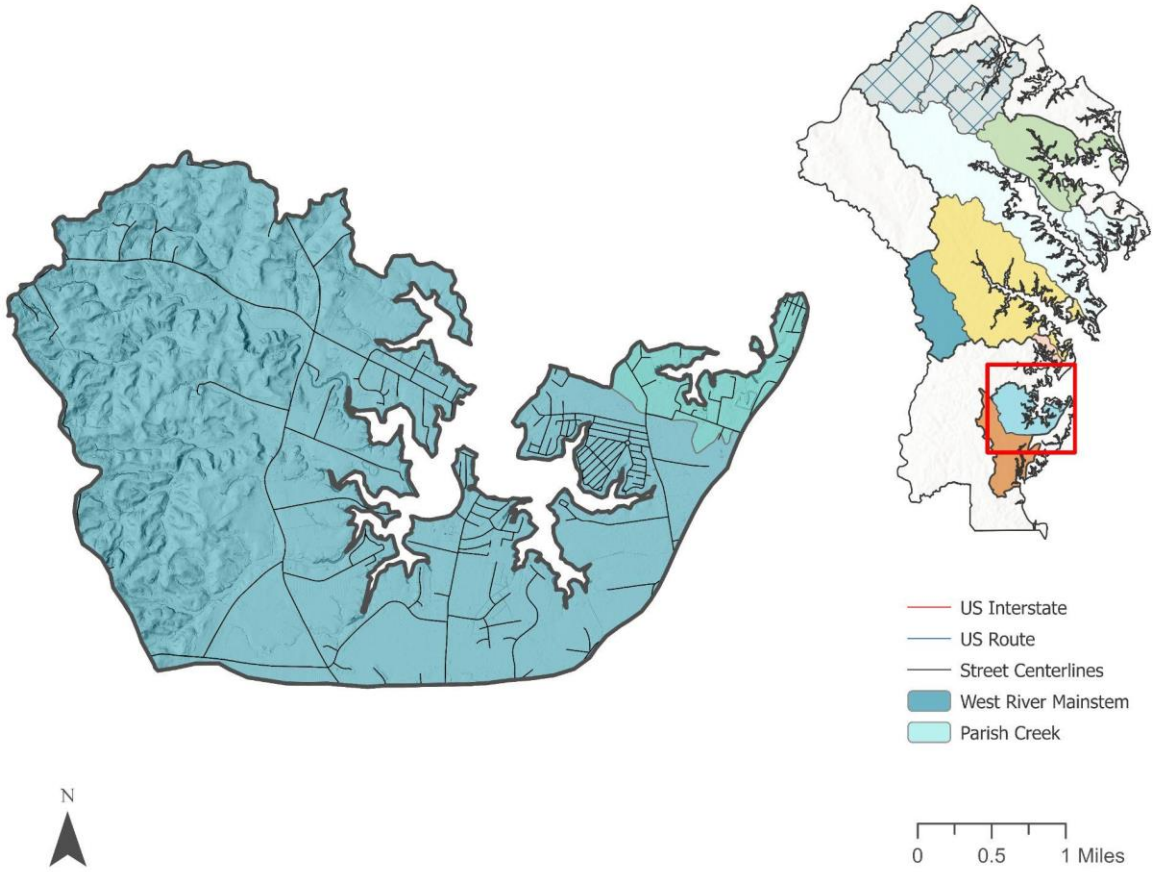

Figure 26: Map of the West Bacterial TMDL watershed

The West River is a tidal estuary and river system in the southeast portion of the County near the town of Galesville (Figure 26). Parish Creek is a small estuary east of the West River, near the town of Shadyside. Parish Creek drains an area of 324 acres.

Restoration BMPs:
West: 1 complete, 2 planned
Parish: 0 complete, 0 planned

VII. PCB TMDLS PROGRESS

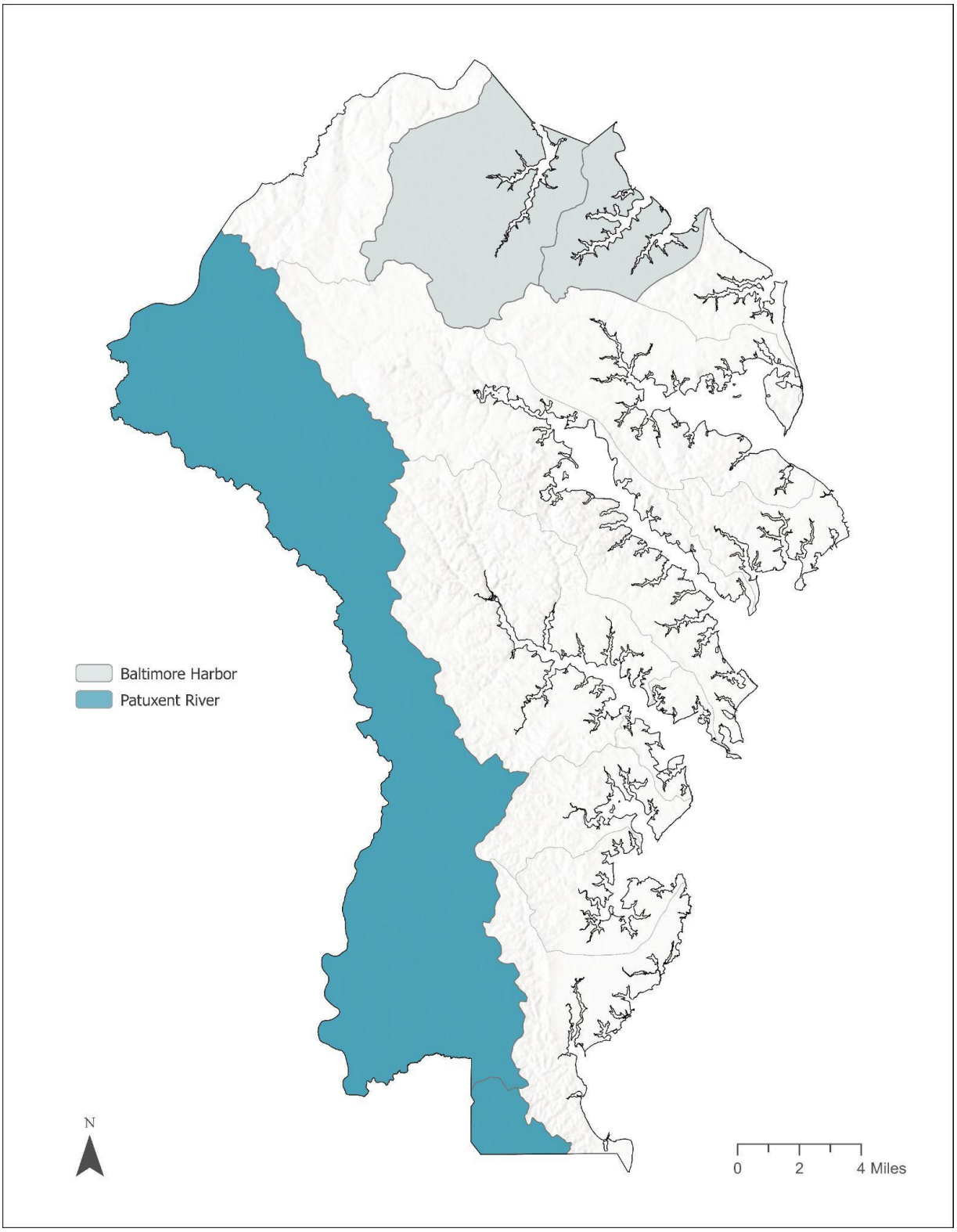

Figure 27: Map of the PCB TMDL watersheds in Anne Arundel County

A. BALTIMORE HARBOR

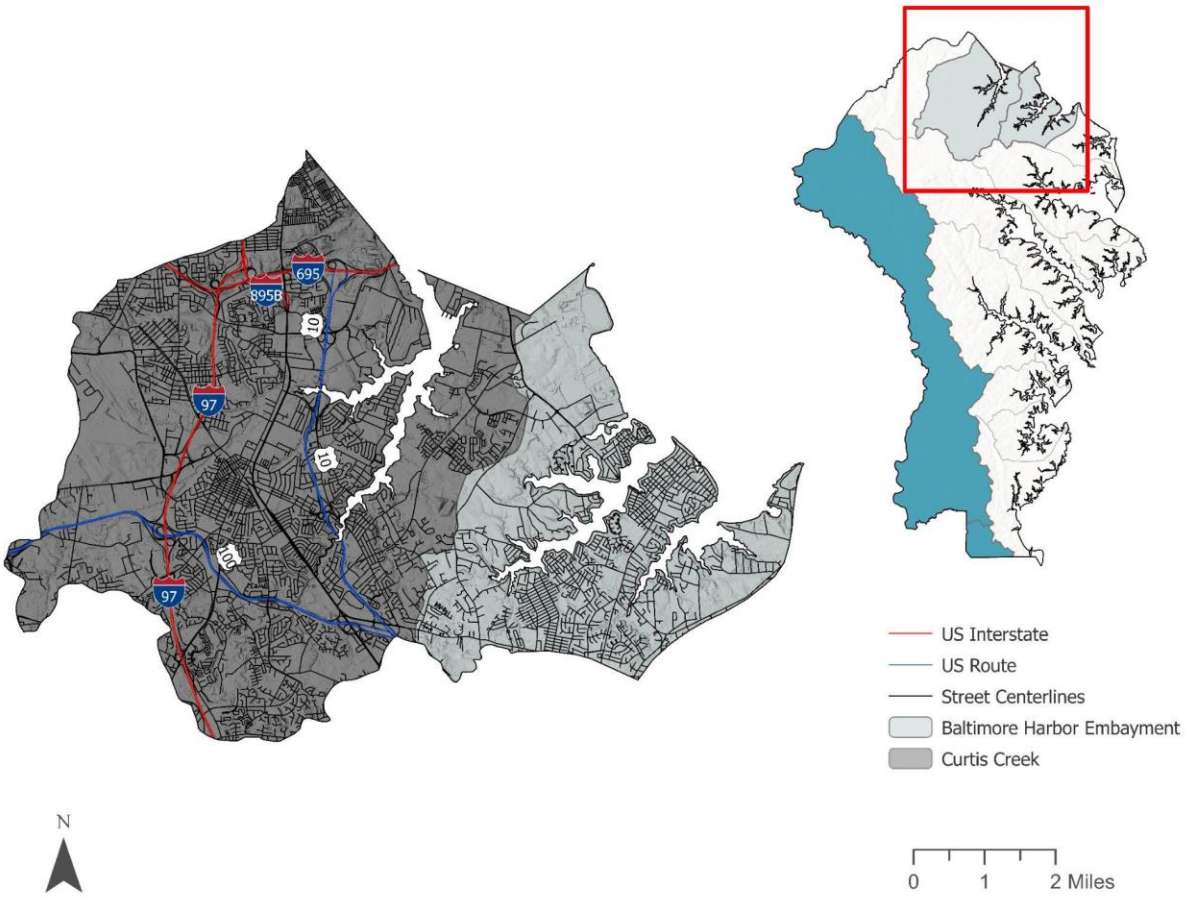

Figure 28: Map of the Baltimore Harbor PCB TMDL watershed

In 2012, the EPA approved a TMDL for Polychlorinated Biphenyls (PCBs) for the Baltimore Harbor, Curtis Creek/Bay, and Bear Creek portions of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment (Figure 28). The PCB TMDL addresses PCBs in fish tissue for the Baltimore Harbor Embayment, and PCBs in fish tissue and sediment for Curtis and Bear Creeks. The percent required reduction in PCBs by 2025 is 93.5% for Curtis Creek and 91.1% for Baltimore Harbor.

Anne Arundel County submitted its Baltimore Harbor and Curtis Creek/Bay Polychlorinated Biphenyls (PCB) TMDL Restoration Plan as part of the County's 2016 MS4 Annual Report and in 2019 completed the development of a targeted PCB Action Strategy. Following completion of the action strategy the County engaged in collaboration with MDE's Integrated Water Planning Program staff, and University of Maryland, Baltimore County (UMBC) staff, to develop a trackback-style monitoring strategy utilizing passive samplers to measure time-integrated freely dissolved PCB water column concentration to further investigate watershed sources of PCB. An

agreement was reached in which MDE would provide funding for field personnel, while UMBC would provide training, materials and analysis towards the monitoring effort.

Phase 1 of the monitoring effort began in September 2020 with the deployment of passive surface water PCB sampling devices at 17 locations within the Baltimore Harbor PCB TMDL watershed, as well as two reference locations outside of the TMDL watershed. In November 2020, sediment grab samples were also collected at each of the 19 sites and in early December 2020, the passive samplers were retrieved. During FY 21 analysis of both surface water and sediment was conducted by UMBC staff. The results of the Phase I monitoring are presented in the *PCB Source Tracking in Anne Arundel County, January 12, 2022* report included in Appendix G, Section XIV.

Results of the 2020 sampling will be used to determine Phase II sampling locations in a focused effort to identify geographic sources of PCBs. A plan for Phase II monitoring will be developed after MDE issues its final guidance on PCB TMDL monitoring in 2022.

B. PATUXENT RIVER

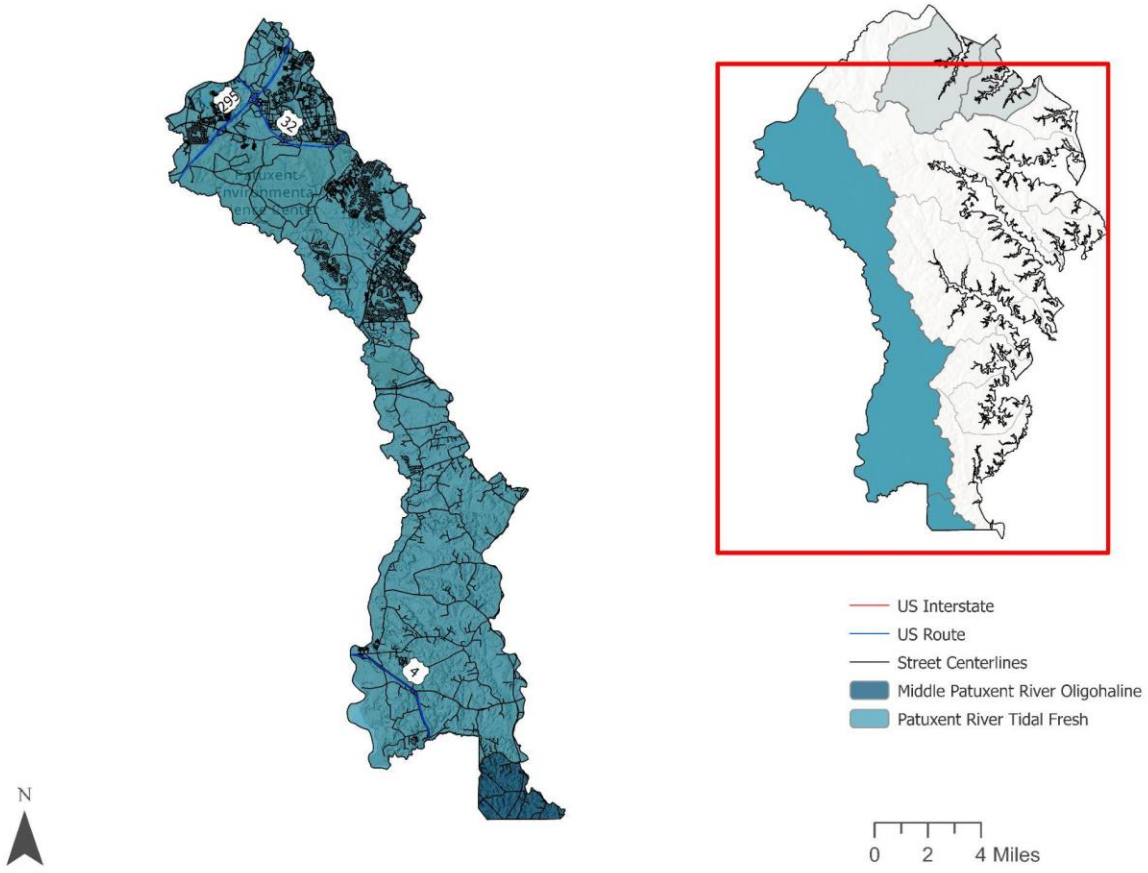

Figure 29: Map of the Patuxent PCB TMDL watershed

The Total Maximum Daily Load of Polychlorinated Biphenyls in the Patuxent River Mesohaline, Oligohaline and Tidal Fresh Chesapeake Bay Segments was approved by EPA September 19, 2017 and requires a 99.9 % reduction in PCB loads (Figure 29). In 2020, Anne Arundel County submitted a draft restoration plan for the Tidal Fresh portion of the watershed that lies within the boundary of Anne Arundel County for MDE review. Subsequent comments and responses to those comments occurred from November 2020 through July 2021.

It is anticipated and generally understood that a 99.9% reduction in PCB loading may not be feasible given the current limited understanding of PCB sources, the ubiquitous presence of PCBs in watershed soils, and the limitations of stormwater systems to control PCB loading. Therefore, MDE is looking to local jurisdictions to document annual progress on PCB source tracking and programmatic implementation. Initiation of source tracking along with programmatic strategies identified within the plan will initiate PCB load reductions and demonstrate progress towards the goal. The plan will be reviewed and potentially revised annually based on monitoring results and implementation and load reduction progress.

Currently, the County is working with MDE to finalize the plan and, per MDE guidance, will await publication of the MDE PCB Monitoring Guidance document (early 2022) prior to completing a revised monitoring plan that is an integral component of the restoration plan.

During FY 21, at the encouragement of MDE, the County initiated a multijurisdictional collaboration with Howard County, Montgomery County and Prince Georges County and Maryland State Highway (SHA) all of whom are subject to the Total Maximum Daily Load of Polychlorinated Biphenyls in the Patuxent River Mesohaline, Oligohaline and Tidal Fresh Chesapeake Bay Segments. An initial meeting was held virtually on October 21, 2021 to discuss interest in collaborating on, and participating in, a watershed based PCB source tracking monitoring program. Participants at that meeting expressed interest, but acknowledged that additional discussion was needed before a commitment could be made. On October 29, 2021 MDE hosted a virtual meeting to discuss PCB source tracking monitoring guidance at which time MDE recommended that local jurisdictions defer any further discussion or action until MDE issued its final PCB Monitoring Guidance in early 2022.

VIII. APPENDIX A

See documents provided in 'ApprovedRestorationPlans.zip'

IX. APPENDIX B

See documents provided in 'DraftRestorationPlans.zip'

X. APPENDIX C

Watershed	Status	Type	TN (lbs)	TP (lbs)	TSS (lbs)	MDE ID
Middle Patuxent	Implemented	Land Use Conversion	11	2	1,988	AA19APY000004
Baltimore Harbor	Implemented	Land Use Conversion	8	1	115	AA20APY000002
West River	Implemented	Land Use Conversion	1	0	533	AA17APY000477
Baltimore Harbor	Implemented	Land Use Conversion	1	0	253	AA14APY000001
South River	Implemented	Land Use Conversion	2	0	889	AA18APY001015
Upper Patuxent	Implemented	Land Use Conversion	3	1	1,026	AA19APY000003
Baltimore Harbor	Implemented	Land Use Conversion	1	0	103	AA20APY000003
Baltimore Harbor	Programmed	Land Use Conversion	0	0	66	AA21APY000001
Patapsco LNB	Programmed	Land Use Conversion	0	0	169	AA21APY000001
Baltimore Harbor	Programmed	Land Use Conversion	4	0	366	AA21APY000002
Patapsco LNB	Programmed	Land Use Conversion	4	0	772	AA21APY000002
Baltimore Harbor	Implemented	Storm Drain Cleaning	568	365	124,428	
Little Patuxent	Implemented	Storm Drain Cleaning	69	44	15,036	
Middle Patuxent	Implemented	Storm Drain Cleaning	2	1	397	
Patapsco LNB	Implemented	Storm Drain Cleaning	50	26	10,999	
South River	Implemented	Storm Drain Cleaning	104	67	22,771	
Upper Patuxent	Implemented	Storm Drain Cleaning	3	2	682	
West Chesapeake	Implemented	Storm Drain Cleaning	4	3	951	
West River	Implemented	Storm Drain Cleaning	3	2	682	
Baltimore Harbor	Programmed	Stream Restoration	6	1	17,600	AA19RST000001
Little Patuxent	Implemented	Stream Restoration	264	111	454,000	AA18RST000014
South River	Implemented	Stream Restoration	145	139	377,814	AA19RST000005
Baltimore Harbor	Implemented	Stream Restoration	19	17	62,000	AA15ALN000002
Patapsco LNB	Implemented	Stream Restoration	19	17	62,000	AA15ALN000002
South River	Implemented	Stream Restoration	83	75	272,800	AA16ALN000014
West River	Implemented	Stream Restoration	796	125	46,364	AA16ALN000021
South River	Implemented	Stream Restoration	62	56	205,096	AA16ALN000030
South River	Implemented	Stream Restoration	48	43	157,976	AA16ALN000013
South River	Implemented	Stream Restoration	23	20	74,400	AA16ALN000007

Watershed	Status	Type	TN (lbs)	TP (lbs)	TSS (lbs)	MDE ID
South River	Implemented	Stream Restoration	83	75	274,784	AA16ALN000005
Little Patuxent	Implemented	Stream Restoration	76	69	250,728	AA17ALN000005
Little Patuxent	Implemented	Stream Restoration	11	10	37,200	AA17ALN000006
Baltimore Harbor	Implemented	Stream Restoration	1,683	167	871,057	AA17ALN000009
South River	Implemented	Stream Restoration	30	27	99,200	AA18ALN000028
Baltimore Harbor	Programmed	Stream Restoration	113	27	356,069	AA18ALN000015
South River	Implemented	Stream Restoration	53	48	173,600	AA18ALN000009
South River	Implemented	Stream Restoration	225	204	744,000	AA18ALN000020
South River	Implemented	Stream Restoration	2,446	697	1,327,869	AA19ALN000006
Upper Patuxent	Implemented	Stream Restoration	245	66	171,500	AA18ALN000006
Baltimore Harbor	Implemented	Stream Restoration	696	321	610,000	AA18ALN000017
Upper Patuxent	Programmed	Stream Restoration	570	90	425,400	AA18ALN000018
Baltimore Harbor	Implemented	Stream Restoration	33	30	109,120	AA18ALN000027
South River	Implemented	Stream Restoration	2,016	316	653,341	AA19ALN000004
Baltimore Harbor	Programmed	Stream Restoration	59	14	70,200	AA19ALN000003
Baltimore Harbor	Programmed	Stream Restoration	1,250	89	1,071,800	AA19ALN000002
Baltimore Harbor	Programmed	Stream Restoration	212	60	493,000	AA19ALN000001
Little Patuxent	Programmed	Stream Restoration	300	255	1,623,585	AA19ALN000007
Baltimore Harbor	Programmed	Stream Restoration	1,171	171	245,240	AA19ALN000030
Baltimore Harbor	Programmed	Stream Restoration	230	22	91,230	AA19ALN000031
Baltimore Harbor	Programmed	Stream Restoration	162	24	86,640	AA19ALN000032
Baltimore Harbor	Programmed	Stream Restoration	11	3	6,710	AA19ALN000033
Baltimore Harbor	Programmed	Stream Restoration	684	49	20,880	AA19ALN000034
Baltimore Harbor	Programmed	Stream Restoration	367	17	7,140	AA19ALN000035
Baltimore Harbor	Programmed	Stream Restoration	223	26	71,770	AA19ALN000036
Baltimore Harbor	Programmed	Stream Restoration	156	18	123,430	AA19ALN000037
Baltimore Harbor	Programmed	Stream Restoration	52	6	33,070	AA19ALN000038
South River	Programmed	Stream Restoration	240	28	123,455	AA19ALN000008
Baltimore Harbor	Programmed	Stream Restoration	2,738	1,096	2,048,019	AA19ALN000023

Watershed	Status	Type	TN (lbs)	TP (lbs)	TSS (lbs)	MDE ID
South River	Implemented	Stream Restoration	22	20	72,664	AA15ALN000003
Little Patuxent	Programmed	Stream Restoration	1,765	487	1,825,740	AA19ALN000019
South River	Programmed	Stream Restoration	200	57	184,361	AA19ALN000020
South River	Programmed	Stream Restoration	760	124	200,299	AA19ALN000021
West Chesapeake	Implemented	Stream Restoration	73	20	38,312	AA21ALN000015
South River	Implemented	Stream Restoration	536	37	160,185	AA19ALN000022
South River	Implemented	Stream Restoration	23	20	74,400	
Little Patuxent	Programmed	Stream Restoration	897	326	620,053	AA19ALN000029
Baltimore Harbor	Programmed	Stream Restoration	42	38	138,880	AA19ALN000039
Patapsco LNB	Programmed	Stream Restoration	42	38	138,880	AA19ALN000039
South River	Programmed	Stream Restoration	68	96	341,893	AA20ALN000004
South River	Implemented	Stream Restoration	526	144	275,410	AA20ALN000009
South River	Programmed	Stream Restoration	101	10	19,672	AA20ALN000010
South River	Programmed	Stream Restoration	239	91	309,607	AA21ALN000006
South River	Programmed	Stream Restoration	93	82	140,403	AA20ALN000001
Baltimore Harbor	Programmed	Stream Restoration	0	0	0	AA21ALN000016
Baltimore Harbor	Programmed	Stream Restoration	9,819	756	643,076	AA21ALN000019
Patapsco LNB	Programmed	Stream Restoration	9,819	756	643,076	AA21ALN000019
Baltimore Harbor	Programmed	Stream Restoration	8,245	1,513	2,203,742	AA21ALN000023
South River	Programmed	Stream Restoration	2,652	872	3,324,000	AA20ALN000002
South River	Programmed	Stream Restoration	344	460	991,196	AA20ALN000013
Baltimore Harbor	Programmed	Stream Restoration	159	32	283,869	AA21ALN000009
Baltimore Harbor	Programmed	Stream Restoration	532	123	296,000	AA21ALN000008
Baltimore Harbor	Programmed	Stream Restoration	20	18	65,720	AA21ALN000018
Patapsco LNB	Programmed	Stream Restoration	20	18	65,720	AA21ALN000018
Baltimore Harbor	Programmed	Stream Restoration	226	40	135,000	AA21ALN000020
Baltimore Harbor	Programmed	Stream Restoration	5	1	3,668	AA21ALN000021
Middle Patuxent	Programmed	Stream Restoration	23	10	19,785	AA21ALN000022
Lower Patuxent	Programmed	Stream Restoration	1,110	511	973,878	AA21ALN000026

Watershed	Status	Type	TN (lbs)	TP (lbs)	TSS (lbs)	MDE ID
Little Patuxent	Programmed	Stream Restoration	563	64	178,580	AA21ALN000027
Little Patuxent	Programmed	Stream Restoration	314	163	529,220	AA21ALN000028
Baltimore Harbor	Implemented	Street Sweeping	45	10	39,523	
Little Patuxent	Implemented	Street Sweeping	32	25	39,667	
Middle Patuxent	Implemented	Street Sweeping	0	0	1,132	
Patapsco LNB	Implemented	Street Sweeping	14	4	28,886	
South River	Implemented	Street Sweeping	8	2	10,896	
Upper Patuxent	Implemented	Street Sweeping	0	0	112	
West Chesapeake	Implemented	Street Sweeping	0	0	68	
West River	Implemented	Street Sweeping	0	0	87	
Baltimore Harbor	Implemented	SWM BMP	2	0	210	AA19RST000004
Baltimore Harbor	Programmed	SWM BMP	72	9	14,371	AA16RST000064
Patapsco LNB	Programmed	SWM BMP	62	10	29,427	AA16RST000064
Baltimore Harbor	Implemented	SWM BMP	26	3	5,591	AA14RST000106
West River	Implemented	SWM BMP	7	1	2,604	AA17RST000020
South River	Implemented	SWM BMP	27	6	8,518	AA15RST000095
South River	Implemented	SWM BMP	10	2	3,223	AA15RST000090
South River	Implemented	SWM BMP	20	3	4,651	AA16RST000091
South River	Implemented	SWM BMP	23	4	4,197	AA16RST000092
South River	Implemented	SWM BMP	99	13	25,190	AA16RST000094
South River	Programmed	SWM BMP	22	3	4,550	AA19RST000003
South River	Implemented	SWM BMP	27	4	5,318	AA16RST000093
Baltimore Harbor	Implemented	SWM BMP	48	6	10,486	AA16RST000017
South River	Implemented	SWM BMP	57	8	11,472	AA16RST000089
Little Patuxent	Implemented	SWM BMP	7	3	2,760	AA16RST000010
South River	Implemented	SWM BMP	3	0	518	AA18RST000043
Baltimore Harbor	Implemented	SWM BMP	20	3	4,118	AA16RST000011
Patapsco LNB	Implemented	SWM BMP	17	3	8,442	AA16RST000011
Baltimore Harbor	Implemented	SWM BMP	36	5	7,191	AA16RST000071

Watershed	Status	Type	TN (lbs)	TP (lbs)	TSS (lbs)	MDE ID
South River	Implemented	SWM BMP	17	3	3,567	AA16RST000007
South River	Implemented	SWM BMP	26	4	5,493	AA16RST000006
Baltimore Harbor	Implemented	SWM BMP	227	22	29,449	AA16RST000016
Baltimore Harbor	Implemented	SWM BMP	79	7	10,448	AA16RST000082
Baltimore Harbor	Implemented	SWM BMP	46	6	8,656	AA16RST000014
Baltimore Harbor	Programmed	SWM BMP	337	43	76,014	AA19RST000010
Little Patuxent	Implemented	SWM BMP	19	7	6,004	AA16RST000015
Patapsco LNB	Implemented	SWM BMP	5	1	2,558	AA16RST000015
Little Patuxent	Implemented	SWM BMP	2	1	365	AA16RST000029
Upper Patuxent	Implemented	SWM BMP	68	20	30,354	AA16RST000029
South River	Implemented	SWM BMP	16	3	5,144	AA16RST000028
West River	Implemented	SWM BMP	7	2	3,773	AA16RST000028
Baltimore Harbor	Implemented	SWM BMP	40	5	7,960	AA16RST000020
Patapsco LNB	Implemented	SWM BMP	34	5	16,298	AA16RST000020
South River	Implemented	SWM BMP	60	8	13,525	AA16RST000001
South River	Implemented	SWM BMP	27	5	8,940	AA16RST000013
South River	Implemented	SWM BMP	4	1	826	AA18RST000032
South River	Implemented	SWM BMP	1	0	230	AA18RST000031
South River	Implemented	SWM BMP	2	0	458	AA18RST000052
Baltimore Harbor	Programmed	SWM BMP	77	7	9,947	AA19RST000028
Baltimore Harbor	Implemented	SWM BMP	2	0	376	AA17RST000014
Baltimore Harbor	Implemented	SWM BMP	3	0	475	AA17RST000013
Baltimore Harbor	Implemented	SWM BMP	2	0	334	AA17RST000012
Baltimore Harbor	Implemented	SWM BMP	39	5	8,013	AA16RST000024
Patapsco LNB	Implemented	SWM BMP	33	5	16,393	AA16RST000024
Baltimore Harbor	Implemented	SWM BMP	80	10	16,130	AA16RST000023
Baltimore Harbor	Implemented	SWM BMP	15	2	2,905	AA16RST000026
Baltimore Harbor	Implemented	SWM BMP	23	2	2,939	AA16RST000034
Baltimore Harbor	Implemented	SWM BMP	37	5	7,678	AA16RST000025

Watershed	Status	Type	TN (lbs)	TP (lbs)	TSS (lbs)	MDE ID
Baltimore Harbor	Implemented	SWM BMP	4	1	1,077	AA16RST000030
Patapsco LNB	Implemented	SWM BMP	4	1	2,196	AA16RST000030
South River	Implemented	SWM BMP	242	48	80,056	AA16RST000035
Baltimore Harbor	Programmed	SWM BMP	168	21	38,266	AA19RST000011
Patapsco LNB	Programmed	SWM BMP	143	22	78,114	AA19RST000011
Baltimore Harbor	Implemented	SWM BMP	112	14	23,823	AA16RST000060
Patapsco LNB	Implemented	SWM BMP	96	15	48,712	AA16RST000060
Baltimore Harbor	Programmed	SWM BMP	132	12	17,740	AA16RST000065
Baltimore Harbor	Implemented	SWM BMP	65	8	14,960	AA16RST000063
Baltimore Harbor	Programmed	SWM BMP	77	7	10,389	AA17RST000005
Baltimore Harbor	Programmed	SWM BMP	104	10	13,709	AA17RST000007
South River	Programmed	SWM BMP	102	13	26,261	AA16RST000069
Little Patuxent	Implemented	SWM BMP	244	90	83,505	AA16RST000070
South River	Implemented	SWM BMP	4	1	796	AA16RST000008
Baltimore Harbor	Implemented	SWM BMP	77	10	14,588	AA16RST000041
Baltimore Harbor	Implemented	SWM BMP	145	14	16,554	AA17RST000050
South River	Implemented	SWM BMP	60	13	17,439	AA16RST000038
Baltimore Harbor	Implemented	SWM BMP	150	19	28,912	AA16RST000036
Baltimore Harbor	Implemented	SWM BMP	65	8	13,295	AA16RST000037
Baltimore Harbor	Implemented	SWM BMP	46	4	6,740	AA16RST000072
Baltimore Harbor	Implemented	SWM BMP	158	20	31,022	AA17RST000035
Patapsco LNB	Implemented	SWM BMP	136	22	63,525	AA17RST000035
Baltimore Harbor	Implemented	SWM BMP	49	6	9,302	AA16RST000045
Baltimore Harbor	Programmed	SWM BMP	131	12	19,126	AA17RST000022
Patapsco LNB	Programmed	SWM BMP	112	13	39,024	AA17RST000022
Baltimore Harbor	Programmed	SWM BMP	101	13	21,097	AA19RST000012
South River	Implemented	SWM BMP	6	1	1,264	AA18RST000051
South River	Implemented	SWM BMP	159	27	66,232	AA16RST000039
Baltimore Harbor	Implemented	SWM BMP	196	25	38,866	AA17RST000010

Watershed	Status	Type	TN (lbs)	TP (lbs)	TSS (lbs)	MDE ID
Baltimore Harbor	Implemented	SWM BMP	5	0	901	AA16RST000075
Patapsco LNB	Implemented	SWM BMP	4	0	1,833	AA16RST000075
Baltimore Harbor	Implemented	SWM BMP	10	1	1,572	AA16RST000078
Patapsco LNB	Implemented	SWM BMP	8	1	3,201	AA16RST000078
Baltimore Harbor	Implemented	SWM BMP	5	0	829	AA16RST000081
Patapsco LNB	Implemented	SWM BMP	4	0	1,687	AA16RST000081
Baltimore Harbor	Implemented	SWM BMP	13	1	2,326	AA17RST000030
Patapsco LNB	Implemented	SWM BMP	11	1	4,729	AA17RST000030
Baltimore Harbor	Implemented	SWM BMP	9	1	1,447	AA16RST000079
Patapsco LNB	Implemented	SWM BMP	8	1	2,948	AA16RST000079
Baltimore Harbor	Implemented	SWM BMP	15	1	2,512	AA16RST000080
Patapsco LNB	Implemented	SWM BMP	12	1	5,108	AA16RST000080
Baltimore Harbor	Implemented	SWM BMP	0	0	73	AA17RST000031
Patapsco LNB	Implemented	SWM BMP	0	0	149	AA17RST000031
South River	Implemented	SWM BMP	17	3	3,387	AA18RST000021
South River	Implemented	SWM BMP	66	13	21,733	AA18RST000004
South River	Implemented	SWM BMP	90	13	16,757	AA18RST000024
Baltimore Harbor	Programmed	SWM BMP	229	29	55,044	AA18RST000018
Patapsco LNB	Programmed	SWM BMP	195	29	112,309	AA18RST000018
Baltimore Harbor	Implemented	SWM BMP	332	43	62,877	AA16RST000061
Patapsco LNB	Implemented	SWM BMP	284	46	128,919	AA16RST000061
Little Patuxent	Implemented	SWM BMP	74	21	16,689	AA16RST000056
Baltimore Harbor	Programmed	SWM BMP	314	30	40,227	AA18RST000022
Patapsco LNB	Programmed	SWM BMP	269	32	82,475	AA18RST000022
Baltimore Harbor	Implemented	SWM BMP	11	1	2,229	AA16RST000048
Baltimore Harbor	Implemented	SWM BMP	135	17	28,594	AA16RST000054
Baltimore Harbor	Implemented	SWM BMP	86	11	17,570	AA16RST000042
Baltimore Harbor	Implemented	SWM BMP	53	7	13,335	AA16RST000055
Baltimore Harbor	Implemented	SWM BMP	122	16	26,467	AA17RST000023

Watershed	Status	Type	TN (lbs)	TP (lbs)	TSS (lbs)	MDE ID
Baltimore Harbor	Programmed	SWM BMP	60	6	8,646	AA17RST000001
Patapsco LNB	Programmed	SWM BMP	51	6	17,649	AA17RST000001
Baltimore Harbor	Programmed	SWM BMP	37	3	5,724	AA17RST000002
Patapsco LNB	Programmed	SWM BMP	31	3	11,658	AA17RST000002
Baltimore Harbor	Programmed	SWM BMP	53	5	7,179	AA17RST000003
Patapsco LNB	Programmed	SWM BMP	45	5	14,673	AA17RST000003
South River	Implemented	SWM BMP	1	0	192	AA18RST000025
South River	Implemented	SWM BMP	3	0	650	AA18RST000026
South River	Implemented	SWM BMP	4	1	843	AA18RST000027
Baltimore Harbor	Programmed	SWM BMP	62	6	9,268	AA19RST000023
Baltimore Harbor	Programmed	SWM BMP	192	18	24,804	AA19RST000024
West Chesapeake	Implemented	SWM BMP	109	38	76,184	AA18RST000034
Baltimore Harbor	Programmed	SWM BMP	5	1	692	AA18RST000028
Baltimore Harbor	Programmed	SWM BMP	138	13	17,235	AA19RST000001
Little Patuxent	Implemented	SWM BMP	288	113	121,321	AA18RST000011
Upper Patuxent	Implemented	SWM BMP	56	16	33,313	AA18RST000011
Baltimore Harbor	Implemented	SWM BMP	977	121	247,298	AA18RST000010
Patapsco LNB	Implemented	SWM BMP	841	125	508,367	AA18RST000010
South River	Implemented	SWM BMP	5	1	1,391	AA17RST000019
West River	Implemented	SWM BMP	1	0	729	AA18RST000037
West River	Implemented	SWM BMP	2	1	1,004	AA18RST000038
West River	Implemented	SWM BMP	1	0	427	AA18RST000039
West River	Implemented	SWM BMP	0	0	0	AA18RST000040
West River	Implemented	SWM BMP	0	0	46	AA18RST000041
South River	Implemented	SWM BMP	6	1	1,463	AA18RST000013
Little Patuxent	Implemented	SWM BMP	635	176	139,513	AA18RST000014
South River	Implemented	SWM BMP	23	4	8,169	AA18RST000012
Little Patuxent	Programmed	SWM BMP	1	0	78	AA18RST000016
Upper Patuxent	Programmed	SWM BMP	296	64	84,670	AA18RST000016

Watershed	Status	Type	TN (lbs)	TP (lbs)	TSS (lbs)	MDE ID
Upper Patuxent	Programmed	SWM BMP	109	24	31,635	AA18RST000045
Upper Patuxent	Programmed	SWM BMP	75	16	22,225	AA18RST000046
Baltimore Harbor	Implemented	SWM BMP	176	23	34,320	AA16RST000043
Baltimore Harbor	Implemented	SWM BMP	38	5	7,950	AA16RST000044
Baltimore Harbor	Implemented	SWM BMP	105	13	22,193	AA16RST000066
Patapsco LNB	Implemented	SWM BMP	90	14	45,382	AA16RST000066
South River	Implemented	SWM BMP	2	0	753	AA18RST000036
Baltimore Harbor	Implemented	SWM BMP	186	23	49,178	AA18RST000005
Patapsco LNB	Implemented	SWM BMP	174	26	105,967	AA18RST000005
South River	Implemented	SWM BMP	4	1	1,547	AA19RST000006
South River	Implemented	SWM BMP	17	2	3,800	AA19RST000005
South River	Implemented	SWM BMP	12	2	3,543	AA19RST000025
Baltimore Harbor	Implemented	SWM BMP	53	7	11,354	AA16RST000062
Patapsco LNB	Implemented	SWM BMP	45	7	23,211	AA16RST000062
Baltimore Harbor	Implemented	SWM BMP	46	6	9,254	AA16RST000047
Patapsco LNB	Implemented	SWM BMP	39	6	18,944	AA16RST000047
South River	Implemented	SWM BMP	564	105	210,120	AA19RST000026
Baltimore Harbor	Programmed	SWM BMP	66	8	14,256	AA20RST000001
Baltimore Harbor	Programmed	SWM BMP	89	11	18,609	AA21RST000008
Baltimore Harbor	Programmed	SWM BMP	107	14	21,568	AA21RST000009
South River	Implemented	SWM BMP	8	1	1,445	AA20RST000005
South River	Programmed	SWM BMP	52	8	10,551	AA21RST000001
Little Patuxent	Programmed	SWM BMP	1	0	339	AA21RST000002
Little Patuxent	Programmed	SWM BMP	1	0	277	AA21RST000003
South River	Implemented	SWM BMP	3	0	887	AA21RST000004
West River	Programmed	SWM BMP	14	3	4,552	AA21RST000005
West River	Programmed	SWM BMP	9	2	2,551	AA21RST000006
Baltimore Harbor	Programmed	SWM BMP	1,501	136	189,616	AA21RST000007
West Chesapeake	Implemented	SWM BMP	0	0	166	AA21RST000015

XI. APPENDIX D

Watershed	Status	Type	TN (lbs)	TP (lbs)	TSS (lbs)
Baltimore Harbor	Planned	Stream Restoration	147	133	485,311
Baltimore Harbor	Planned	Stream Restoration	65	58	213,330
Baltimore Harbor	Planned	SWM BMP	105	9	13,479
Baltimore Harbor	Planned	SWM BMP	789	71	103,636
Baltimore Harbor	Planned	SWM BMP	601	55	73,124
Baltimore Harbor	Planned	SWM BMP	502	44	79,213
Baltimore Harbor	Planned	SWM BMP	341	31	39,070
Baltimore Harbor	Planned	SWM BMP	317	29	38,833
Baltimore Harbor	Planned	SWM BMP	256	23	30,087
Baltimore Harbor	Planned	SWM BMP	241	21	35,487
Lower Patuxent	Planned	Stream Restoration	120	109	398,214
Middle Patuxent	Planned	Stream Restoration	198	180	655,960
Middle Patuxent	Planned	Stream Restoration	162	147	536,399
Middle Patuxent	Planned	Stream Restoration	148	135	490,569
Middle Patuxent	Planned	Stream Restoration	100	90	329,294
Middle Patuxent	Planned	Stream Restoration	146	132	483,079
Middle Patuxent	Planned	Stream Restoration	124	112	408,406
Middle Patuxent	Planned	Stream Restoration	223	202	736,396
Middle Patuxent	Planned	Stream Restoration	149	135	491,412
Middle Patuxent	Planned	Stream Restoration	273	248	904,158
Middle Patuxent	Planned	Stream Restoration	212	192	701,220
Middle Patuxent	Planned	Stream Restoration	268	243	886,451
Middle Patuxent	Planned	Stream Restoration	271	246	896,024
Middle Patuxent	Planned	Stream Restoration	229	208	758,855
Middle Patuxent	Planned	Stream Restoration	108	98	356,550
Middle Patuxent	Planned	Stream Restoration	139	126	460,189
Patapsco LNB	Planned	Stream Restoration	147	133	485,311
Patapsco LNB	Planned	Stream Restoration	290	262	957,330
Upper Patuxent	Planned	Stream Restoration	128	116	421,600

Watershed	Status	Type	TN (lbs)	TP (lbs)	TSS (lbs)
Upper Patuxent	Planned	Stream Restoration	90	82	297,600
West Chesapeake	Planned	Stream Restoration	52	48	173,228
West Chesapeake	Planned	Stream Restoration	71	65	235,526
West Chesapeake	Planned	Stream Restoration	133	121	440,597
West Chesapeake	Planned	Stream Restoration	68	61	223,448
West Chesapeake	Planned	Stream Restoration	106	96	349,655
West Chesapeake	Planned	Stream Restoration	19	17	62,645
West Chesapeake	Planned	Stream Restoration	62	57	206,088
West Chesapeake	Planned	Stream Restoration	34	31	112,766
West Chesapeake	Planned	Stream Restoration	127	115	419,864
West Chesapeake	Planned	Stream Restoration	136	123	448,111
West Chesapeake	Planned	Stream Restoration	101	91	332,320
West Chesapeake	Planned	Stream Restoration	117	106	386,533
West Chesapeake	Planned	Stream Restoration	78	71	257,771
West River	Planned	Stream Restoration	255	231	843,200
West River	Planned	Stream Restoration	390	354	1,289,600
West River	Planned	SWM BMP	38	8	12,453
West River	Planned	SWM BMP	9	2	2,389
West River	Planned	SWM BMP	47	9	14,798
West River	Planned	SWM BMP	32	6	10,398
West River	Planned	SWM BMP	32	7	10,986
West River	Planned	SWM BMP	4	1	1,587
West River	Planned	SWM BMP	8	2	2,931

XII. APPENDIX E

See documents provided in 'AACountyFY21TIPPSpreadsheets.zip'

XIII. APPENDIX F

See documents provided in 'BacterialTMDLDocuments.zip'

XIV. APPENDIX G

See documents provided in 'PCBTMDLDocuments.zip'