Other West Chesapeake Watershed

2020 Sediment TMDL Annual Assessment Report

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Prepared For

Anne Arundel County
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List of Acronyms

BIBI	Benthic Index of Biotic Integrity
BMP	Best Management Practice
BSID	Biological Stressor Identification
BWPR	Bureau of Watershed Protection and Restoration
CAST	Chesapeake Assessment Scenario Tool
CBP	Chesapeake Bay Program
COMAR	Code of Maryland Regulations
CWA	Clean Water Act
DPW	Department of Public Works
EOS	Edge of Stream
EOT	Edge of Tide
EPA	United States Environmental Protection Agency
FIBI	Fish Index of Biotic Integrity
FY	Fiscal Year
LA	Load Allocation
MBSS	Maryland Biological Stream Survey
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
MPHI	Maryland Physical Habitat Index
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometer Turbidity Units
PSU	Primary Sampling Unit
RBP	Rapid Bioassessment Protocol
SPSC	Step Pool Storm Conveyance
STB	Stream Bed and Bank
SW-WLA	Stormwater Wasteload Allocation
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
WLA	Wasteload Allocation
WM P6	Watershed Model Phase 6
WQIP	Water Quality Improvement Projects

1 Introduction

1.1 Background

The Anne Arundel County Department of Public Works (DPW) Bureau of Watershed Protection and Restoration (BWPR) has developed and is currently implementing restoration plans to address local water quality impairments for which a Total Maximum Daily Load (TMDL) has been established by the Maryland Department of the Environment (MDE) and approved by the U.S. Environmental Protection Agency (EPA). A TMDL establishes a maximum load of a specific single pollutant or stressor that a waterbody can assimilate and still meet water quality standards for its designated use class.

Under the Federal Clean Water Act (CWA), the State of Maryland is required to assess and report on the quality of waters throughout the state. Where Maryland's water quality standards are not fully met, Section 303(d) requires the state to list these water bodies as impaired waters. States are then required to develop a TMDL for pollutants of concern for the listed impaired waters. The Other West Chesapeake watershed has a listing in Maryland's Integrated Report of Surface Water Quality [303(d) list and 305(b) Report] for sediment pollution. An approved total suspended solids (TSS; sediment) TMDL for the Other West Chesapeake watershed from urban stormwater sources was approved by the EPA on February 9, 2018. Additional stormwater wasteload allocations (SW-WLAs) for the Other West Chesapeake watershed TMDL apply to several jurisdictions including Calvert County, Maryland Department of Transportation State Highway Administration, and other National Pollutant Discharge Elimination System (NPDES) regulated stormwater. Anne Arundel County BWPR developed a TMDL restoration plan drafted in 2019 and finalized in January of 2020 (Anne Arundel County, 2020) after review and comment from MDE and the general public. The Anne Arundel County portion of the Other West Chesapeake watershed is also called the Herring Bay watershed, and both names were used in the Restoration Plan.

Responsibility for Other West Chesapeake sediment reduction is divided among the contributing jurisdictions. The TMDL loading targets, or allocations, are also divided among the pollution source categories, which in this case includes non-point sources (termed load allocation or LA) and point sources (termed wasteload allocation or WLA). The WLA consists of loads attributable to regulated process water or wastewater treatment, and to regulated stormwater. For the purposes of the TMDL and consistent with implementation of the NPDES Municipal Separate Storm Sewer System Discharge Permit (MS4), stormwater runoff from MS4 areas is considered a point source contribution.

Anne Arundel County's current MS4 permit (11-DP-3316, MD0068306) issued by the MDE in February of 2014 requires the development of restoration plans for each stormwater WLA approved by EPA prior to the effective date of the permit (permit section IV.E.2.b). This plan satisfies this permit requirement and provides the loading target, recommended management measures, load reduction estimates, schedule, milestones, cost estimates and funding sources, and the tracking and monitoring approaches to meet the SW-WLA. The *Other West Chesapeake Sediment TMDL Restoration Plan* (the Restoration Plan) (Anne Arundel County, 2020) satisfied the permit planning requirement and this *2020 Other West Chesapeake Watershed Sediment TMDL Annual Assessment Report* satisfies the progress documentation requirement for fiscal year (FY) 2020.

1.2 Watershed Description

The Other West Chesapeake watershed is one of 12 major watersheds in Anne Arundel County, Maryland, and is situated in the southeastern portion of the County (Figure 1). The watershed shares

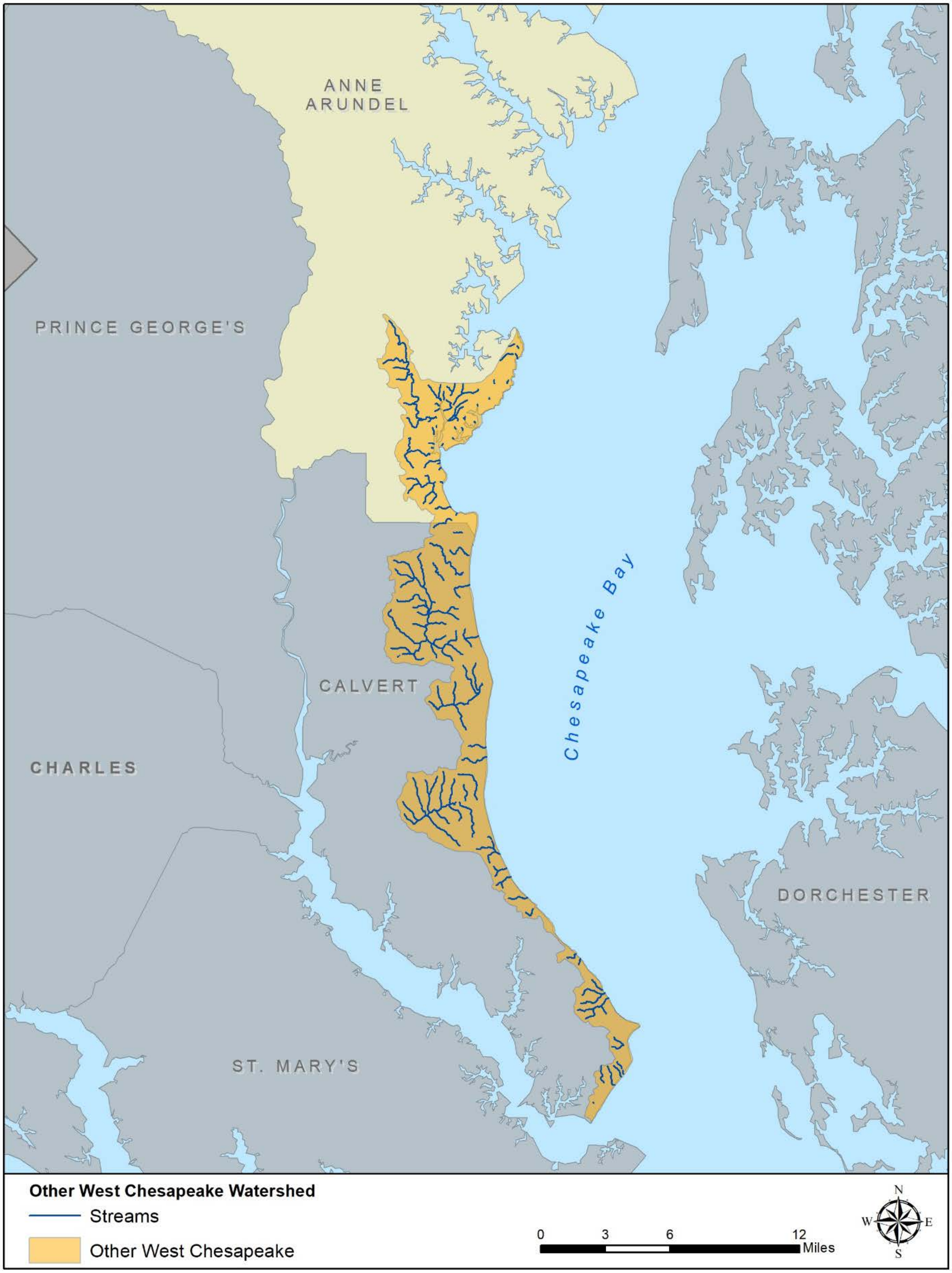

Figure 1: Watershed Location Map

political boundaries with Calvert County. The Other West Chesapeake watershed drains directly to the east into Herring Bay, which leads to the Chesapeake Bay. Communities within the Other West Chesapeake watershed include Deale, Shadyside, Rose Haven, and Fairhaven.

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 watershed includes several named streams, including, among others, Tracys Creek, Deep Creek, Rockhold Creek, Parker Creek, Carrs Creek, and Red Lyon Creek.

1.3 TMDL Allocation and Planned Loads Summary

This section describes the derivation of the TMDL reduction targets. The SW-WLA in the sediment TMDL was developed by MDE using the Chesapeake Bay Program Watershed Model Phase 5.3.2 (CBP WM P5.3.2). Baseline, progress, and planned loads were modeled in development of the Other West Chesapeake Restoration Plan using Chesapeake Assessment Scenario Tool (CAST) CBP WM P6, version 2017.

MDE is currently working on a new local TMDL modeling system that will be available in the future to report progress toward nutrient and sediment load reductions. It is anticipated that this new spreadsheet model will be used for FY2021 modeling, so additional changes are anticipated to the baseline, permit, and progress loads and load reductions with the FY2021 reporting.

CAST, created by the Chesapeake Bay Program, is a web-based pollutant load estimation tool that calculates pollutant loads and reductions calibrated to the Chesapeake Bay Program Partnership Watershed Phase 6 Model. Because the TMDL was developed under an older version of the model, the SW-WLA needed to be translated into a CAST-compatible target load. In order to do this, the 2009 baseline sediment load was re-calculated in CAST by modeling baseline BMPs in Other West Chesapeake on top of baseline impervious and pervious Anne Arundel County Phase I MS4 acres.

The required percent reduction assigned to the Anne Arundel County Phase I MS4 source (33%) in the local TMDL was then applied to the new baseline load to calculate required sediment reduction. The required sediment reduction was then subtracted from the new baseline load to calculate the CAST-compatible target SW-WLA. Sediment loads required for the Other West Chesapeake Anne Arundel County Phase I MS4 source are shown in Table 1, which compares results presented in the Restoration Plan (P6 with stream bed and bank [STB] loads pro-rated according to the ratio of Anne Arundel County MS4 area to the total area in the watershed) with re-modeled results for the annual assessment (P6 with STB loads disaggregated following calculations provided by the CBP). Section 1.5 contains details on the modeling specifics.

Table 1: Sediment Loads Required for the Other West Chesapeake Local TMDL

Model	2009 Baseline Load (lbs/yr)	Required Reduction %	Required Reductions (lbs/yr)	TMDL Load Allocation (SW-WLA) (lbs/yr)
P6 – pro-rated STB loads	3,895,399	33%	1,285,482	2,609,917
P6 – disaggregated STB loads	8,186,442	33%	2,701,526	5,484,916

1.4 Planned Reductions

Table 2, provides a concise summary of the loads and reductions at important timeline intervals including the 2009 baseline, 2020 progress, and 2030 final planning intervals. These terms and dates are used throughout the Restoration Plan and explained in more detail in the following sections. They are presented here to assist the reader in understanding the definitions of each, how they were derived, and to provide an overall summary demonstrating the percent reduction required and percent reduction achieved through full implementation of the Restoration Plan. Sediment loads and wasteload allocations are presented as tons/year in the *Total Maximum Daily Load of Sediment in the Non-Tidal Other West Chesapeake Watershed, Anne Arundel and Calvert Counties, Maryland,* but will be discussed as lbs/year in this report. All loads presented below were calculated in CAST.

- **2009 Baseline Load**: Baseline level (i.e., land use loads with baseline best management practices [BMPs]) from 2009 conditions in the Other West Chesapeake watershed. Baseline load was used to calculate the stormwater allocated sediment loads, or SW-WLA.
- **2020 Progress Load and Reduction**: Progress load and load reduction achieved from stormwater BMP implementation through 2020.
- **2030 Allocated Load**: Allocated load was calculated from the 2009 baseline level, calibrated to CBP WM P6 as noted above, using the following calculation: 2030 Allocated Load = 2009 Baseline – (2009 Baseline x 0.33).
- **2030 Planned Load and Planned Reduction**: Load and reduction that will result from implementation of planned BMPs.

Table 2: Other West Chesapeake Local TMDL Allocated and Planned Loads

	Sediment (tons/year)	Sediment (lbs/year)
2009 Baseline Load	4,093	8,186,442
2020 Progress Load	4,068	8,135,710
2020 Progress Reduction	25	50,732
TMDL Allocated Load	2,742	5,484,916
2030 Planned Load*	4,068	8,135,710
2030 Planned Reduction	25	50,732
Required Percent Reduction	33%	33%
Planned Percent Reduction	0.6%	0.6%

*It is assumed that stormwater runoff from new development will be treated to the maximum extent practicable to achieve 90% sediment removal and Accounting for Growth policies will address the remaining 10%.

1.5 Modeling Methods

1.5.1 Overview

The baseline, progress, and planned pollutant loads for the Other West Chesapeake watershed were determined using CAST, which calculates nitrogen, phosphorus, and sediment loads and reductions calibrated to the Chesapeake Bay Program Partnership Phase 6 Watershed Model (CBP WM P6).

CAST estimates load reductions for point and nonpoint sources including agriculture, urban, forest, and septic loading. Load reductions are not tied to any single BMP, but rather to a suite of BMPs working in concert to treat the loads. The Chesapeake Bay Program Partnership Watershed Model calculates reductions from all BMPs as a group, much like a treatment train. Reductions are processed in order, with land use change BMPs first, load reduction BMPs next, and BMPs with individual effectiveness values last. The overall the load reduction can vary depending on which BMPs are implemented.

CAST provides analysis and load output at two different scales: Edge-of-Stream (EOS) and Edge-of-Tide (EOT). Edge-of-tide loads incorporate in-stream processes, such as nutrient uptake by algae or other aquatic life and generally result in lower delivered loads from the upstream source to the receiving water body, which in this case is the Chesapeake Bay. The EOT scale is used in Bay TMDL modeling. This TMDL is for impairments in the freshwater tributary streams; therefore, the County's plan focuses on reducing loads delivered from upland and instream tributary sources. As a result, EOS estimates are more appropriate and are used for the modeling analysis.

The Restoration Plan also used CAST for modeling; however, the plan used a different approach to disaggregate stream bed and bank loads than what is presented in this annual assessment report. To derive the stream loads allocated to the County's urban stormwater sector in the Restoration Plan, the stream bed and bank loads calculated by CAST for each TMDL watershed (which included land from multiple MS4 Counties) were pro-rated according to the ratio of Anne Arundel County MS4 area to total area in the watershed, and then these calculated stream bed and bank loads were assigned to the County's urban stormwater sector. Since the Restoration Plan was completed in January 2020, the Chesapeake Bay Program has provided calculations to the MS4s that disaggregate stream bed and bank nutrient and sediment loads using the same principals used by CAST. This methodology was used in the annual assessment modeling and is described in detail in section 1.5.2 below.

Pollutant load reductions achieved by stream restoration and annual practices (e.g., street sweeping and inlet cleaning) were calculated outside of CAST following MDE's 2020 accounting guidance (MDE, 2020) and Bay Program methods. Stream restoration projects were credited using project specific load reductions calculated using the Bay Program's Protocol method, when available. Planned stream restoration load reductions were modeled using 248 lbs TSS per linear foot. Sediment reduction credit for vacuum-assisted street sweeping were calculated based on a sweeping frequency of 1 pass every two weeks and the annual number of miles swept averaged over the span of the 5-year permit term. Sediment reductions for inlet cleaning were calculated based on the annual aggregate load collected (assumed sediment was 40% organic and 60% inorganic material) and averaged over the span of the 5-year permit term.

1.5.2 Stream Bed and Bank Disaggregation

The Phase 6 Chesapeake Bay Program Model provides a separate load source for stream bed and bank loads, while the P5.3.2 model included these stream loads implicitly in the upland load sources. The stream bed and bank load includes stream loads from streams located in agriculture, natural, MS4, and non-regulated developed land areas, and therefore was disaggregated for a single source sector to determine the stream load attributed to the County's stormwater sector that should be included under the SW-WLA for this TMDL.

The stream bed and bank load was disaggregated using calculations provided by the Chesapeake Bay Program using the same principals used by CAST to calculate the total stream bed and bank load. The calculation for TSS disaggregation is as follows:

TSS STB load = ((Scenario EOS without STB TSS / CAL EOS without STB TSS) * STB base TSS) + (4/3 * Scenario Impervious TSS)

Where:
EOS = edge-of-stream
STB = stream bed and bank load source
TSS = total sediment
CAL = calibration average

This equation is used to calculate the stream bed and bank load for a given scenario outside of CAST. Load reductions associated with stream restoration practices are applied directly to the stream bed and bank loads in CAST. As a result, stream restoration practices are modeled in a spreadsheet outside of CAST and the calculated load reductions are subtracted from the disaggregated stream bed and bank load to determine the total disaggregated stream bed and bank load for a given scenario (i.e. baseline, progress, planned).

1.5.3 Practice Level

This section briefly describes each practice and includes a summary of the typical sediment reductions achieved with each type.

1.5.3.1 Modeled in CAST

- **Bioretention** — An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. Rain gardens may be engineered to perform as a bioretention.
- **Bioswales** —An open channel conveyance that functions similarly to bioretention. Unlike other open channel designs, there is additional treatment through filter media and infiltration into the soil.
- **Dry Detention Ponds** – Depressions or basins created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow. These devices are designed to improve quality of stormwater using features such as swirl concentrators, grit chambers, oil barriers, baffles, micropools, and absorbent pads to remove sediments, nutrients, metals, organic chemicals, or oil and grease from urban runoff.
- **Dry Extended Detention Ponds** - Depressions created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow or groundwater infiltration following storms. They are similar in construction and function to dry detention basins, except that the duration of detention of stormwater is designed to be longer, allowing additional wet sedimentation to improve treatment effectiveness.
- **Impervious Surface Reduction** - Reducing impervious surfaces to promote infiltration and percolation of runoff storm water. Disconnection of rooftop and non-rooftop runoff, rainwater harvesting (e.g., rain barrels), and sheetflow to conservation areas are examples of impervious surface reduction.
- **Infiltration** — A depression or trench to form a shallow basin where sediment is trapped and stormwater infiltrates into the soil. No underdrains are associated with infiltration basins and trenches, because by definition these systems provide complete infiltration. Design

specifications require infiltration basins and trenches to be built in good soil; they are not constructed on poor soils, such as C and D soil types. Yearly inspections to determine if the basin or trench is still infiltrating runoff are planned. Dry wells, infiltration basins, infiltration trenches, and landscaped infiltration are all examples of this practice type.

- **Outfall Enhancement with Step Pool Storm Conveyance (SPSC)** – The SPSC is designed to stabilize outfalls and provide water quality treatment through pool, subsurface flow, and vegetative uptake. All County SPSC are completed at the end of outfalls, prior to discharging to a perennial stream. The retrofits promote infiltration and reduce stormwater velocities. This strategy is modeled in CAST as filtering practices. Some SPSCs sites qualified for Protocol 5 load reductions. Protocol 5 load reductions were added to modeling results outside of CAST when applicable.
- **Stormwater Retrofits –** Stormwater retrofits may include converting dry ponds, dry extended detention ponds, or wet extended detention ponds into wet pond structures, wetlands, infiltration basins, or decommissioning the pond entirely to install SPSC (step pool storm conveyance). Stormwater retrofits were modeled in CAST by calculating the net treatment (retrofit BMP vs. original BMP) for retrofit BMPs of the same CAST BMP type category (e.g., wet pond) within the same land river segment. If a net calculation was not required (i.e., original CAST BMP type category was different than the retrofit CAST BMP type category), the original BMP treatment was removed from the baseline BMPs carried over into progress and planned scenarios and replaced with treatment from the more effective retrofit BMP. This procedure prevents over counting stormwater BMP treatment.
- **Urban Filtering** - Practices that capture and temporarily store runoff and pass it through a filter bed of either sand or an organic media. There are various sand filter designs, such as above ground, below ground, perimeter, etc. An organic media filter uses another medium besides sand to enhance pollutant removal for many compounds due to the increased cation exchange capacity achieved by increasing the organic matter. These systems require yearly inspection and maintenance to receive pollutant reduction credit.
- **Urban Tree Plantings** - Urban tree planting is planting trees on urban pervious areas at a density that would produce a forest-like condition over time. The intent of the planting is to eventually convert the urban area to forest. If the trees are planted as part of the urban landscape, with no intention to covert the area to forest, then this would not count as urban tree planting
- **Vegetated Open Channels** - Open channels are practices that convey stormwater runoff and provide treatment as the water is conveyed. Runoff passes through either vegetation in the channel, subsoil matrix, and/or is infiltrated into the underlying soils.
- **Wet ponds or wetlands** — A water impoundment structure that intercepts stormwater runoff then releases it at a specified flow rate. These structures retain a permanent pool and usually have retention times sufficient to allow settlement of some portion of the intercepted sediments and attached pollutants. Until 2002 in Maryland, these practices were generally designed to meet water quantity, not water quality objectives. There is little or no vegetation within the pooled area nor are outfalls directed through vegetated areas prior to open water release. Nitrogen reduction is minimal, but phosphorus and sediment are reduced.

The effectiveness for each of these practices are found in Table 3.

Table 3: Typical Sediment Reduction from Stormwater BMPs and Restoration Practices

BMP	Sediment Reduction
Bioretention A/B soils	80%
Bioretention C/D soils	55%
Bioswales	80%
Dry Detention Ponds	10%
Dry Extended Detention Ponds	60%
Impervious Surface Reduction[1]	-
Infiltration	95%
Outfall Enhancement with SPSC[2]	80%
Stream Restoration[3]	248 lbs/linear ft
Urban Filtering	80%
Urban Tree Plantings[1]	-
Vegetated Open Channels	70%
Wet Ponds or Wetlands	60%
Inlet Cleaning – Organic	400 lbs/ton removed
Inlet Cleaning – Inorganic	1,400 lbs/ton removed
Street Sweeping – 1 pass/2 weeks	11%

Sources: MDE, 2020; and, CAST documentation

[1] Calculated as a land use change to a lower loading land use

[2] Outfall enhancement with SPSC modeled as filtering practices in CAST

[3] Stream restoration listed with revised interim rate, now termed the 'planning rate'; some stream restoration projects used Bay Program Protocols to calculate load reductions.

1.5.3.2 Modeled using MDE Guidance

Inlet cleaning, street sweeping, and urban stream restoration load reductions are modeled outside of CAST using MDE's 2020 accounting guidance and Bay Program methods. The methods are compatible with Phase 6 of the Bay Model.

- **Inlet Cleaning -** Storm drain cleanout practice ranks among the oldest practices used by communities for a variety of purposes to provide a clean and healthy environment, and more recently to comply with NPDES stormwater permits. Nutrient reduction credit is based on the mass of material collected, at the rate of 400 lbs TSS per ton of organic material and 1,400 lbs TSS per ton of inorganic material (MDE, 2020). Data for the mass removed was reported by the County's Bureau of Highways. The total mass of material collected by the inlet cleaning program each year is distributed proportionately across all of the inlets cleaned and then summed at the watershed scale. The County's inlet cleaning program is now at maturity and while amounts of material collected each year may vary, the current level of effort will be maintained in the foreseeable future
- **Street sweeping** — Starting Fiscal Year 2015, Anne Arundel County enhanced their street sweeping program which now includes sweeping curb-miles and parking lots within the Other West Chesapeake (Anne Arundel County DPW, 2015; Figure 2). This enhanced program targets impaired watersheds and curbed streets that contribute trash/litter, sediment, nutrients, and other pollutants. Load reductions for this assessment are calculated using the length/area of street swept and 11% reduction efficiency for TSS for street swept every two weeks using vacuum sweepers (MDE, 2020). Data for the curb miles swept and frequency (1 pass/2 weeks)

was reported by the County's Bureau of Highways. The County's street sweeping program is now at maturity and while amounts of material collected each year may vary, the current level of effort will be maintained in the foreseeable future.

- **Urban Stream Restoration** – Stream restoration in urban areas is used to restore the urban stream ecosystem by restoring the natural hydrology and landscape of a stream, helping to improve habitat and water quality conditions in degraded streams. These projects were modeled outside of CAST using load reductions at the rate of 248 lbs TSS per linear foot (MDE, 2020) for older projects that pre-dated full adoption of the Bay Program's protocol methods, and for future projects where a planning rate is appropriate for use before the full design is complete and protocol calculations are developed. Project specific load reductions calculated using the Bay Program's Protocol method were used when available.

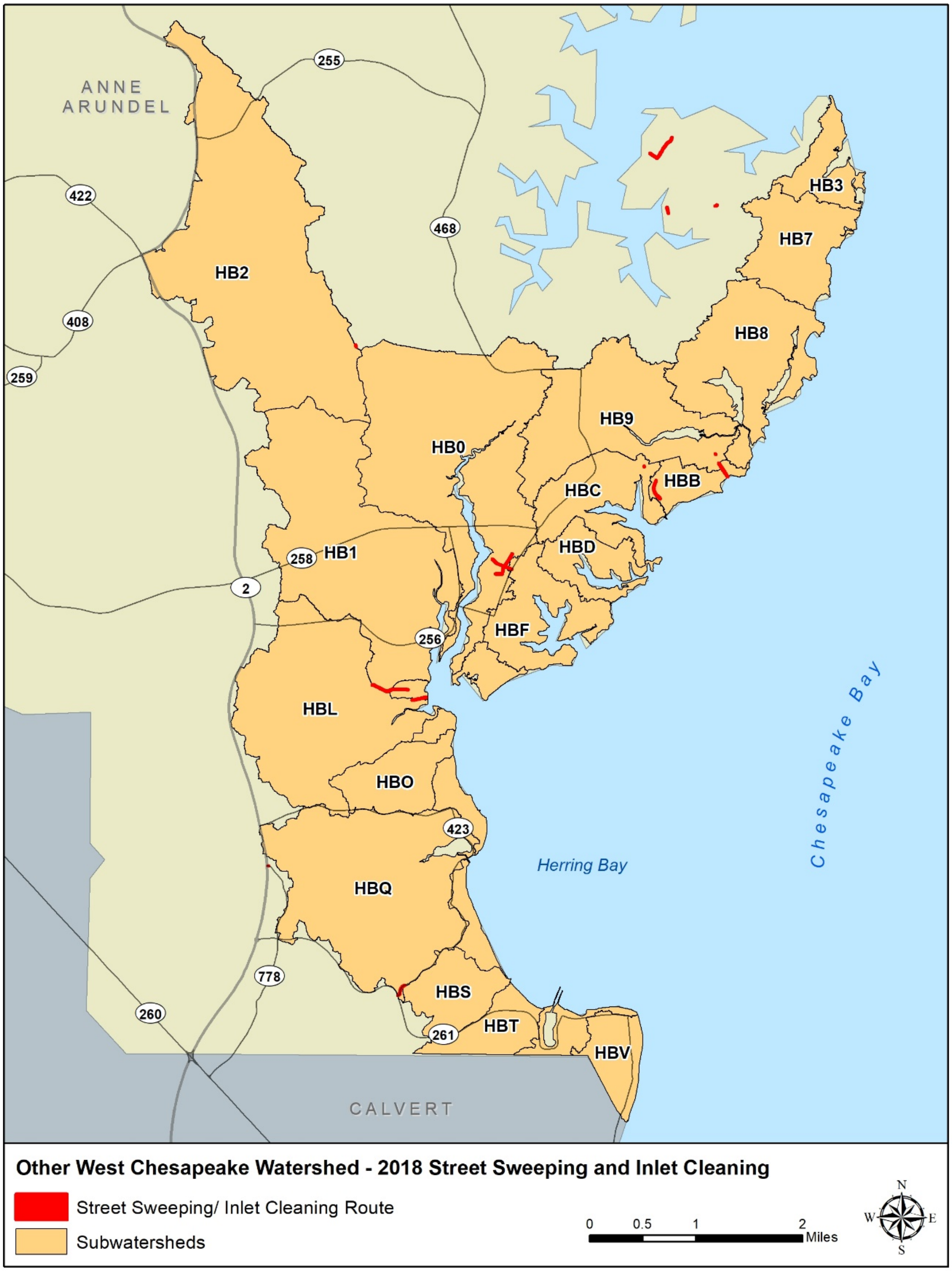

Figure 2: Street Sweeping and Inlet Cleaning Routes in the Other West Chesapeake Watershed

2 2020 Progress Summary

The following section summarizes the County's implementation efforts, the resulting load reductions achieved, and the costs of program implementation.

2.1 Implementation Results

Project implementation information extracted from CAST for the 2009 Progress Scenario used to develop baseline loads is presented in Table 4. Implementation up through the end of FY2020 is detailed in Table 5. Information on completed projects and programs is gleaned primarily from the County's MS4 geodatabase. All 2020 implementation is included in the database. In 2018 the County completed a comprehensive record review of stormwater BMPs. The County's MS4 Geodatabase has been updated to incorporate the results of the review.

Shoreline Restoration

One shoreline restoration project was completed in the watershed in FY2020 (Jack Creek Park Shoreline). Shoreline restoration, however, does not receive load reduction credit towards a TMDL at the edge-of-stream (EOS) scale, since these TMDLs are written to address the watershed's tributary streams, rather than the main water body on which the shoreline restoration would occur.

Inlet Cleaning

A total of 2 inlet cleaning records using storm drain vacuuming were recorded in FY2020. A total of 2.14 tons of material was collected during that period.

Street Sweeping

Building upon on the County's enhanced street sweeping program, 0.2 curb miles were swept in the watershed during FY2020. The total mass of material collected by the street sweeping program during the same time was 0.3 tons. Total mass reported for FY2020 is the average of annual mass removed for FY2016 through FY2020. It is noted that while average mass of material collected is presented here and in the following tables to demonstrate implementation levels, load reduction calculations are based on curb miles swept and frequency.

The total cost of the practices and programs implemented in FY2020 is $4,516,663.

Table 4: Baseline BMP Implementation

BMP	Unit	2009 Baseline
Structural Permanent Practices		
Runoff Reduction Performance Standard	acre	3.22
Stormwater Treatment Performance Standard	acre	169.03
Bioretention	acre	2.71
Bioswale	acre	1.81
Dry Ponds	acre	4.03
Extended Detention Dry Ponds	acre	11.79
Impervious Surface Reduction	acre	1.40

BMP	Unit	2009 Baseline
Infiltration	acre	30.52
Filtering Practices	acre	2.10
Urban Forest Planting	acre	2.45
Wet Ponds or Wetlands	acre	5.29
Annual Practices		
Inlet Cleaning	inlets/yr	0.0
Street Sweeping	lbs /yr	0.0

Table 5: Current BMP Implementation through FY2020

BMP	Unit	CY2010 - FY2019 Restoration[3]	FY2020 Restoration[3]	FY2020 Progress[4]	FY2020 Restoration Cost[5]
Structural Permanent Practices					
Bioretention	acre	0	0	0	
Dry Ponds	acre	0	0	0	
Extended Detention Dry Ponds	acre	0	0	0	
Impervious Surface Reduction	acre	0	0	0	
Infiltration	acre	0	0	0	
Shoreline Stabilization[1]	linear ft	1,216	1,600	2,816	$4,511,312
Stormwater Retrofits[2]	acre	0	0	0	
Vegetated Open Channels	acre	0	0	0	
Wet Ponds or Wetlands	acre	28.85	0	28.85	
Urban Stream Restoration	linear ft	0	0	0	
Outfall Enhancement with SPSC	acre	0	0	0	
Annual Practices					
Inlet Cleaning[6]	Inlets/yr	NA	2	2	$5,017
Street Sweeping[7]	lbs /yr	NA	635	635	$334
				Total FY2020 Cost	$4,516,663

Source: BWPR urban BMP, WQIP and MDE MS4 FY20 geodatabase

[1] Shoreline restoration projects do not receive load reduction credit towards EOS TMDLs.

[2] Includes projects that convert dry ponds into wet ponds. Stormwater retrofits are modeled by decreasing acreage for dry ponds and increasing acreage for wet ponds.

[3] Restoration completed in each specific period, i.e. CY2010-FY2019 and FY2020.

[4] Total cumulative restoration accounting for the full CY2010-FY2020 period.

[5] Cost of projects and programs for the FY2020 period only. Only costs using County funds are included.

[6] Number of inlets refers to the number of inlet cleaning records from the County's MS4 geodatabase.

[7] Value listed here is the lbs of material removed, not specifically the fine TSS sediment; FY2020 is the average of annual reported values for FY2016 through FY2020.

2.2 Load Reduction Results

The implementation summarized in Table 5 above resulted in the load reductions presented here in Table 6. Through FY2020, the County has achieved a 0.6% reduction in TSS with a goal of 33.0% reduction.

Table 6: FY2020 Progress Reductions Achieved

Baseline Load and TMDL SW-WLA	TSS-EOS lbs/yr
2009 Baseline Scenario Load	8,186,442
Required Percent Reduction	33.0%
Required Reduction	2,701,526
Local TMDL SW-WLA	5,484,916
2020 Results	**TSS-EOS lbs/yr**
Progress Scenario Load	8,135,710
Progress Reduction Achieved	50,732
Percent Reduction Achieved	0.6%

3 Comparison of 2020 Progress and Planned Implementation

This section describes the current progress of both implementation and load reductions in comparison to the planned totals and progress that was expected by FY2020.

3.1 Implementation

Table 7 compares implementation of completed restoration BMPs through FY2020 (FY2020 Progress) with the total planned levels of implementation that were derived in the initial Restoration Plan (Anne Arundel County, 2020) as well as with the planned restoration BMPs through FY2024 from the County's MS4 geodatabase. It is noted that the Restoration Plan modeling methods differed slightly to methods used in this annual assessment, therefore the planned restoration BMPs identified to meet the TMDL goal may no longer be sufficient.

One shoreline restoration project was completed by the end of FY2020 and more shoreline restoration projects are planned. Shoreline restoration implementation has surpassed the goal set in the Restoration Plan (Anne Arundel County, 2020), however shoreline restoration does not receive load reduction credit for TMDLs written at the EOS scale. Wet ponds and wetlands are almost halfway to full implementation.

Estimates of inlet cleaning and street sweeping implementation in the development of the plan were based the average pounds removed in the watershed in FY2017 and FY2018. Future levels of implementation are assumed to be similar. The plan then called for a level of treatment consistent with the progress rate of 916 inlets per year. The number cleaned in the current reporting period is 2. This level of inlet cleaning is removing less than 1% of the material estimated to be removed annually in the Restoration Plan. Street sweeping is occurring at the rate prescribed in the Restoration Plan.

Table 7: Restoration BMP Implementation - Current FY2020 and Planned FY2024 Implementation Levels

BMP	Units	FY2020 Progress	Total Planned Restoration[1]	Total Planned – FY2024[2]	Percent Complete[3]
Bioretention	acre	0	30.0	0	0%
Bioswale	acre	0	30.0	0	0%
Impervious Surface Reduction	acre	0	5.0	0	0%
Infiltration	acre	0	30.0	0	0%
Shoreline Restoration	linear foot	2,816	2,016	3,175	140%
Stormwater Retrofits	acre	0	0	0	NA
Wet Ponds or Wetlands	acre	28.9	58.8	0	49%
Urban Stream Restoration	linear foot	0	2,000	0	0%
Urban Tree Planting	acre	0	50.0	0	0%
Outfall Enhancement with SPSC	acre	0	30.0	0	0%
Annual Practices					
Inlet Cleaning	inlets/yr	2	916	916	<1%
Street Sweeping	curb-miles	0.2	0.2	0.2	100%

[1] Planned restoration totals used in 2020 Restoration Plan and CAST modeling.
[2] Planned restoration totals through FY2024 from County's current MS4 geodatabase and used in CAST modeling.
[3] Compares implementation progress through FY2020 to planned restoration totals through FY2024.

To track progress, the 2025 implementation milestone first reported in the 2016 plan was compared against the 2020 progress reported here in this assessment. Table 8 presents the strategies that are planned for the 2021-2030 milestone period with a comparison to the practices that were completed for 2020.

Table 8: Implementation Milestones Comparison

BMP	Unit	2020 Progress	2021-2030 Planned Restoration
Wet Ponds or Wetlands	acre	28.9	0
Shoreline Restoration	linear foot	2,816	4,275
Annual Practices			
Inlet Cleaning	inlets/yr	2	916
Street Sweeping	curb-miles	0.2	0.2

3.2 Load Reductions

This section compares the required and planned sediment load reductions against the progress made through FY2020. Values given in Table 9 include the load reductions for each period (generally the milestone years) and the resulting load. Actual reductions are shown for 2020 and planned results are provided for the 2030 period. The planned reductions in this case refer to projects that are in the County's database and are moving forward with implementation, and does not refer to the total planned projects and reductions that were presented in the initial TMDL restoration plan. All values shown (reductions, loads, percent reduction) are the cumulative values, not the year over year changes.

Overall, the results indicate that on a TMDL allocated goal of 33.0%, the County has achieved a 0.6% reduction, which translates to 1.8% progress towards the reduction goal. This level of progress is expected, however, since the Restoration Plan was finalized at the end of January 2020 and this annual assessment reports BMP implementation through the end of June 2020.

Only shoreline restoration projects are currently planned in the watershed. Because shoreline restoration projects do not receive load reduction credit towards a TMDL written at the EOS scale additional strategies for load reduction are needed. The County is evaluating the potential for achieving additional load reductions in this watershed through the implementation of land conversion BMPs including: forest planting, conservation landscaping, impervious surface reduction, tree canopy plantings and forest conservation. Implementation of these and other strategies will be necessary to achieve the TMDL goal.

MDE is currently working on a new local TMDL modeling tool that will be available in the future to report progress toward load reductions. It is anticipated that this new spreadsheet model will be used for FY2021 modeling, so additional changes are anticipated to the baseline, permit, and progress loads and load reductions in the FY2021 report.

Table 9: Planning and Target Sediment Load Comparison (lbs/year)

Milestone Year	Actual Load Reduction	Actual Load	Actual % Reduction from Baseline	Planned Load Reduction	Planned Load	Planned % Reduction From Baseline
2009 Baseline	-	8,186,442	-	-	-	-
2020 Progress	50,732	8,135,710	0.6%	-	-	-
2030 Allocated	-	-	-	2,701,526	5,484,916	33.0%
2030 Planned	-	-	-	50,732	8,135,710	0.6%

4 Monitoring

Official monitoring for Integrated Report assessments and impairment status is the responsibility of the State; however, the County has many on-going monitoring programs that can support the State's efforts. In addition, MDE has stressed specifically for sediment impairments the connection between in-stream biological health and meeting the intent of the sediment TMDL goals.

To determine the specific parameters to be monitored for tracking progress, one must understand the approach used for the initial listing. The Other West Chesapeake was originally listed for sediments in 1996 as a suspended sediment listing. In 2002, the State began listing biological impairments on the Integrated Report, at the 8-digit scale, based on a percentage of stream miles degraded and whether they differ significantly from a reference condition watershed (<10% stream miles degraded). The biological listing is based on Benthic and Fish Indices of Biotic Integrity (BIBI/FIBI) results from wadeable streams from assessments conducted by the Maryland Department of Natural Resources (MDNR) Maryland Biological Stream Survey (MBSS). The Other West Chesapeake watershed was listed for biological community impairment in 2002.

MDE then utilized its Biological Stressor Identification (BSID) process to identify the probable or most likely causes of poor biological conditions. For sediment specifically, the BSID identified 'altered habitat, and increased runoff from residential and historical agricultural landscapes have resulted in changes to stream geomorphology and subsequent elevated suspended sediment in the watershed'. Overall, the results indicated flow/sediment and in-stream habitat related stressors as the primary stressors causing impacts to biological communities.

Based on the results of the BSID, MDE replaced the biological impairment listing with a listing for total suspended solids (TSS). The 2014 final and 2018 draft integrated reports lists 'Habitat Evaluation' as the indicator, and 'Anthropogenic Land Use Changes' as the source. It is noted that the *Decision Methodology for Solids for the April 2002 Water Quality Inventory (updated in February of 2012)*[1], makes a specific distinction between two different, although related 'sediment' impairment types in free flowing streams:

1. **TSS**: The first type is an impact to water clarity with impairment due to TSS using turbidity measured in Nephelometer Turbidity Units (NTUs). Although numeric criteria have not been established in Maryland for TSS, MDE uses a threshold for turbidity, a measurement of water clarity, of a maximum of 150 NTUs and maximum monthly average of 50 NTU as stated in Maryland COMAR regulations (26.08.02.03-3). Turbidity also may not exceed levels detrimental to aquatic life in Use I designated waters.
2. **Sedimentation / siltation**: The second type is an impact related to erosional and depositional impacts in wadeable streams. The measures used are biocriteria and the critiera for Use I streams (the protection of aquatic life and growth and propagation of fish (other than trout) and other aquatic life).

With these two sediment impairments in mind the Other West Chesapeake, which is listed as impaired for TSS, would seem to be a water clarity issue; however the methodology used for listing (biological and

[1] http://www.mde.state.md.us/programs/Water/TMDL/Integrated303dReports/Documents/Assessment_Methodologies/AM_Solids_2012.pdf

habitat measures related sediment deposition) seems to point to an in-stream sediment deposition problem. In all likelihood both types of impairment, water clarity and sedimentation, are factors and both should be incorporated into monitoring programs to track changes in the watershed condition over time.

Anne Arundel County's Watershed Bureau of Protection and Restoration (BWPR) has several on-going monitoring programs that target measures of water clarity and sedimentation. These programs are described here.

4.1 Countywide Biological Monitoring

4.1.1 Background and Goals

Biological monitoring and assessment provide a direct measure of the ecological health of a stream. Stream organisms are continuous monitors of both short- and long-term water quality and other environmental factors and provide direct indicators of the quality of a stream. Advantages of using benthic macroinvertebrates include their generally restricted mobility and often multi-year life cycles, allowing them to integrate the effects of both chemical and physical perturbations over time. When hydrologic regimes of streams are altered, the physical nature of the habitat changes due to accelerated erosion and deposition of channel soils and other materials. This changes the capacity of a stream to support a healthy biota. Changes in the quality of the water resource are reflected as changes in the structural and functional attributes of the macroinvertebrate assemblage. Biological monitoring and assessment results can be used to detect impairment of the biological community and to assess the severity of impacts from both point source (PS) and nonpoint source (NPS) pollution. When coupled with information on chemical and physical stressors, these types of exposure-and effect data can be used to improve water quality assessments. Over the past several decades, biological monitoring and assessment of aquatic communities along with characterization of their chemical and physical habitats have increased with application of these data to watershed management policies and practices.

Historically, many municipalities have been hampered in their ability to recommend and implement pollution control and remediation efforts because the chemical, physical, and biological condition of most of their water resources have not been adequately characterized. To expand its monitoring program, Anne Arundel County developed a stream monitoring program consisting of chemical, physical, and biological assessment techniques to document and track changes in the condition of stream resources County-wide. Problems resulting from chemical contamination and physical habitat alteration are reflected by changes in the aquatic biota. Therefore, inclusion of a biological monitoring component is providing Anne Arundel County with the relevant indicators for assessing the condition of, and managing, its water resources.

In 2004, a Countywide Biological Monitoring and Assessment Program for Anne Arundel County, Maryland was developed to assess the biological condition of the County's streams at multiple scales (i.e., site-specific, primary sampling unit (PSU), and countywide). Under the Countywide Biological Monitoring and Assessment program, biology (i.e., benthic macroinvertebrates) and stream habitat, as well as geomorphological and water quality parameters, are assessed at approximately 240 sites throughout the entire County over a 5-year period using a probabilistic, rotating-basin design.

Round 1 of the County's Biological Monitoring and Assessment Program occurred between 2004 and 2008, and Round 2 took place between 2009 and 2013. During 2017, Round 3 monitoring was initiated and fish sampling and additional water quality parameters were added. Field data collection in Other West Chesapeake is scheduled for completion in 2021. Annual reports and Round summary reports are available for review at: http://www.aacounty.org/departments/public-works/wprp/ecological-assessment-and-evaluation/biological-monitoring/biological-monitoring-reports/index.html

The primary goals of the program are to assess the current status of biological stream resources, establish a baseline for comparison with current and future assessments, and to relate them to specific programmatic activities. The County currently uses a combination of chemical sampling, geomorphic assessment, storm water sampling, and biological sampling to assist in its environmental management decision-making process. This combination of monitoring greatly assists the County in assessing progress toward achieving Stormwater Wasteload allocations set forth in Sediment TMDLs. The biological monitoring program's stated goals are applicable at three scales; Countywide, Watershed-wide, and Stream-specific, and include the following components.

- Status: describe the overall stream condition
- Trends: how has the overall stream condition changed over time
- Problem identification/prioritization: identify the impaired and most degraded streams
- Stressor-response relationships: identify anthropogenic stressors and their biological response
- Evaluation of environmental management activities: monitor the success of implemented programs and restoration/retrofit projects

4.1.2 Methods

Both field sampling and data analysis methods were developed for the program to be directly comparable to Department of Natural Resources' Maryland Biological Stream Survey (MBSS), and complementary to those in place in Prince George's, Montgomery, and Howard Counties in Maryland (Hill and Stribling, 2004). Primary data collected include site location (latitude and longitude), pH, dissolved oxygen, water temperature and conductivity, benthic macroinvertebrate index of biotic integrity (BIBI), and physical habitat index (PHI) following MBSS methodologies (Kazyak, 2001; DNR, 2007) and EPA's Rapid Bioassessment Protocol (EPA RBP). Biological data were analyzed using the revised (2005) version of the MBSS Coastal Plain BIBI (Southerland et al., 2005).

A more detailed description of the sampling and analysis methods can be found in the annual Biological Monitoring and Assessment Program Annual Reports (Crunkleton, et al., 2013; Crunkleton, et al., 2012; Crunkleton, et al., 2011; Crunkleton, et al., 2010; Victoria, et al., 2011). Specific information regarding the sampling and analysis methods, including the standard operating procedures (SOPs), can be found in the Documentation of Method Performance Characteristics for the Anne Arundel County Biological Monitoring Program (Hill et al., 2010) and the Quality Assurance Project Plan for Anne Arundel County Biological Monitoring and Assessment Program (Hill et al., 2011).

The Other West Chesapeake watershed is made up of one PSU – Herring Bay. Ten sampling sites were sampled in each PSU in Round 1 and Round 2 of sampling, while changes to the sampling design in Round 3 resulted in sampling eight (8) sites in each PSU.

Following these procedures, the County is collecting several parameters related to water clarity and sediment deposition at each site.

- Water Quality Measures and Observations
    - Turbidity (measured), observations of general water clarity and color
    - Grab samples analyzed for nutrients, metals, DOC, TOC, and chloride
- Biological Measures

  - Benthic macroinvertebrates (BIBI)
  - Fish (FIBI)
- Habitat Measures
  - General: bar formation and substrate, presence/absence of substrate type
  - PHI: epibenthic substrate, instream habitat
  - RBP: epifaunal substrate / available cover, pool substrate characterization, sediment deposition, channel alteration
- Geomorphic Measures
  - Particle size analysis using modified Wolman pebble counts at 10 transects proportioned by channel bed features

4.1.3 Results

The Other West Chesapeake watershed wholly overlaps with the Herring Bay PSU that was sampled in 2005 and 2010. The Herring Bay PSU is scheduled for monitoring again in the County's rotating framework in 2021. Results from Rounds 1 and 2 are summarized at the PSU scale with mean BIBI and habitat ratings (PHI and RBP) presented in Table 10.

Table 10: Countywide Biological Monitoring Results

PSU Name	Round	PSU Code	Year Sampled	Drainage Area (acres)	BIBI Rating	PHI Rating	RBP Rating
Herring Bay	1	15	2005	14,595	P	D	PS
Herring Bay	2	15	2010	14,595	F	PD	PS

BIBI Ratings: G = Good, F = Fair, P = Poor, VP = Very Poor
PHI Ratings: MD = Minimally Degraded, PD = Partially Degraded, D = Degraded, SD = Severely Degraded
RBP Ratings: C = Comparable, S = Supporting, PS = Partially Supporting, NS = Non-Supporting

4.1.3.1 Biological

Results of the Round 1 and Round 2 sampling efforts are presented at the individual site level in Table 11 and Figure 3. During Round 1, all sampling was completed in 2005. Forty percent of the sites in the watershed were rated as "Poor," 30% rated "Very Poor," 20% rated "Good" and the remaining 10% were rated "Fair." Overall, the watershed received a mean BIBI score of 2.80 ± 1.07 and a corresponding biological condition rating of "Poor."

A total of 10 sites were sampled in 2010 during Round 2. Forty percent of the sites in the watershed were rated as "Fair," 30% rated as "Poor," 20% rated "Good" and 10% rated as "Very Poor." The mean BIBI score was 3.17 ± 1.00, resulting in an overall rating of "Fair." Individual sites had BIBI scores ranging from 1.57 (Very Poor) to 4.71 (Good).

Table 11: BIBI Data for Round 1 (2005) and Round 2 (2010)

Site ID	Year	Number of Taxa	Number of EPT Taxa	Percent Ephemeroptera	No. of Ephemeroptera Taxa	Percent Intolerant Urban	Number Scraper Taxa	Percent Climbers	BIBI	Rating
15-05	2005	12	3	0.00	0	21.4	0	2.0	1.86	Very Poor
15-20A	2005	19	3	0.00	0	34.8	1	3.5	2.71	Poor
15-04	2005	18	2	0.00	0	72.0	1	2.0	2.71	Poor
15-06	2005	15	3	0.00	0	6.9	0	1.0	1.86	Very Poor
15-19A	2005	15	0	0.00	0	38.4	0	5.1	2.14	Poor
15-12A	2005	19	3	0.00	0	16.2	1	6.7	2.43	Poor
15-07	2005	10	1	0.00	0	1.0	0	68.0	1.57	Very Poor
15-11A	2005	16	6	9.00	2	5.0	3	8.0	3.86	Fair
15-03	2005	22	8	12.12	1	20.2	2	12.1	4.43	Good
15-01	2005	22	6	18.42	1	21.1	3	9.6	4.43	Good
R2-15-01	2010	22	5	5.6	2	7.4	2	1.9	3.86	Fair
R2-15-02	2010	27	3	0.0	0	21.1	1	9.2	3.00	Fair
R2-15-03	2010	21	2	0.0	0	31.6	0	1.7	2.43	Poor
R2-15-05	2010	10	2	0.0	0	32.7	0	5.5	2.14	Poor
R2-15-07	2010	14	4	10.8	2	45.9	2	0.0	3.57	Fair
R2-15-08	2010	28	4	2.6	2	12.2	0	2.6	3.29	Fair
R2-15-09	2010	24	7	39.3	3	50.5	3	0.9	4.71	Good
R2-15-10	2010	23	5	31.4	2	38.1	1	3.8	4.43	Good
R2-15-12A	2010	19	3	0.0	0	41.7	1	2.8	2.71	Poor
R2-15-13A	2010	10	2	0.0	0	22.6	0	0.9	1.57	Very Poor

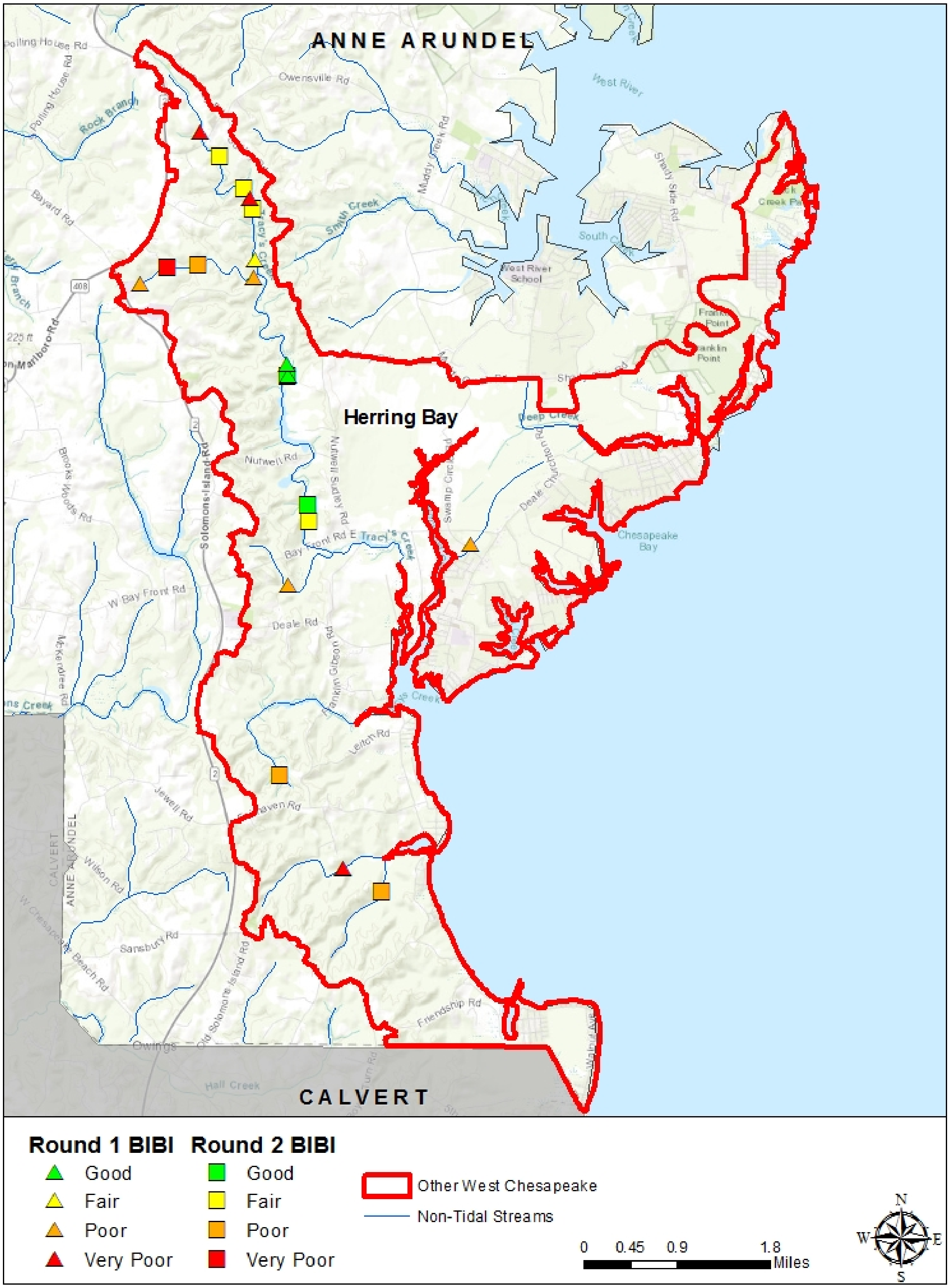

Figure 3: Biological Sampling Results from Round 1 (2005) and Round 2 (2010).

4.1.3.2 Physical Habitat

During Round 1, all sampling was completed during the spring index period of 2005. Results of the Round 1 sampling are presented in Table 12 and Figure 4. The PHI rated 30% of sites "Partially Degraded," 50% as "Degraded," and 20% "Severely Degraded." Overall, the watershed received a mean PHI score of 60.2 ± 9.4 and a corresponding rating of "Degraded," with individual sites ranging from 44.8 (Severely Degraded) to 72.5 (Partially Degraded).

In 2010, all sites were equally split between "Partially Degraded" (50%) and "Degraded" (50%) narrative ratings. The mean PHI score for the PSU was 66.3 ± 7.3 (Partially Degraded), with individual sites ranging from 56.8 – 76.8.

Table 12: Physical Habitat Index Data from Round 1 (2005) and Round 2 (2010).

Station	Year	Remoteness Score	Percent Shading	Epifaunal Substrate	Instream Habitat	# Woody Debris/Rootwads	Bank Stability	PHI	Narrative Rating
15-01	2005	64.46	68.32	30.98	46.96	100.00	98.32	68.17	Partially Degraded
15-03	2005	85.64	84.56	44.72	59.43	70.24	90.37	72.49	Partially Degraded
15-04	2005	71.68	84.56	35.82	50.63	100.00	89.45	72.02	Partially Degraded
15-05	2005	71.68	84.56	26.57	32.52	64.80	52.44	55.43	Degraded
15-06	2005	36.34	63.55	28.80	24.92	95.30	100.00	58.15	Degraded
15-07	2005	75.02	91.34	32.69	38.56	68.31	82.67	64.76	Degraded
15-11A	2005	48.32	78.67	32.78	47.82	90.39	75.28	62.21	Degraded
15-12A	2005	71.68	63.55	35.86	28.86	48.93	77.46	54.39	Degraded
15-19A	2005	57.72	73.32	23.66	41.01	49.64	50.00	49.23	Severely Degraded
15-20A	2005	24.93	63.55	23.81	30.16	55.83	70.71	44.83	Severely Degraded
R2-15-01	2010	80.78	91.34	27.02	33.22	53.74	54.77	56.81	Degraded
R2-15-02	2010	32.31	91.34	41.22	42.83	73.03	70.71	58.57	Degraded
R2-15-03	2010	43.08	99.94	69.58	71.10	86.11	89.45	76.54	Partially Degraded
R2-15-05	2010	37.70	91.34	54.51	50.99	70.01	83.67	64.70	Degraded
R2-15-07	2010	43.08	78.67	56.37	54.28	72.54	44.72	58.28	Degraded
R2-15-08	2010	80.78	99.94	37.81	37.48	64.15	63.25	63.90	Degraded
R2-15-09	2010	37.70	73.32	73.84	59.90	84.45	83.67	68.81	Partially Degraded
R2-15-10	2010	32.31	84.56	70.22	57.79	70.50	86.61	67.00	Partially Degraded
R2-15-12A	2010	86.16	84.56	56.86	51.11	64.00	89.45	72.02	Partially Degraded
R2-15-13A	2010	64.62	99.94	66.19	60.22	80.21	89.45	76.77	Partially Degraded

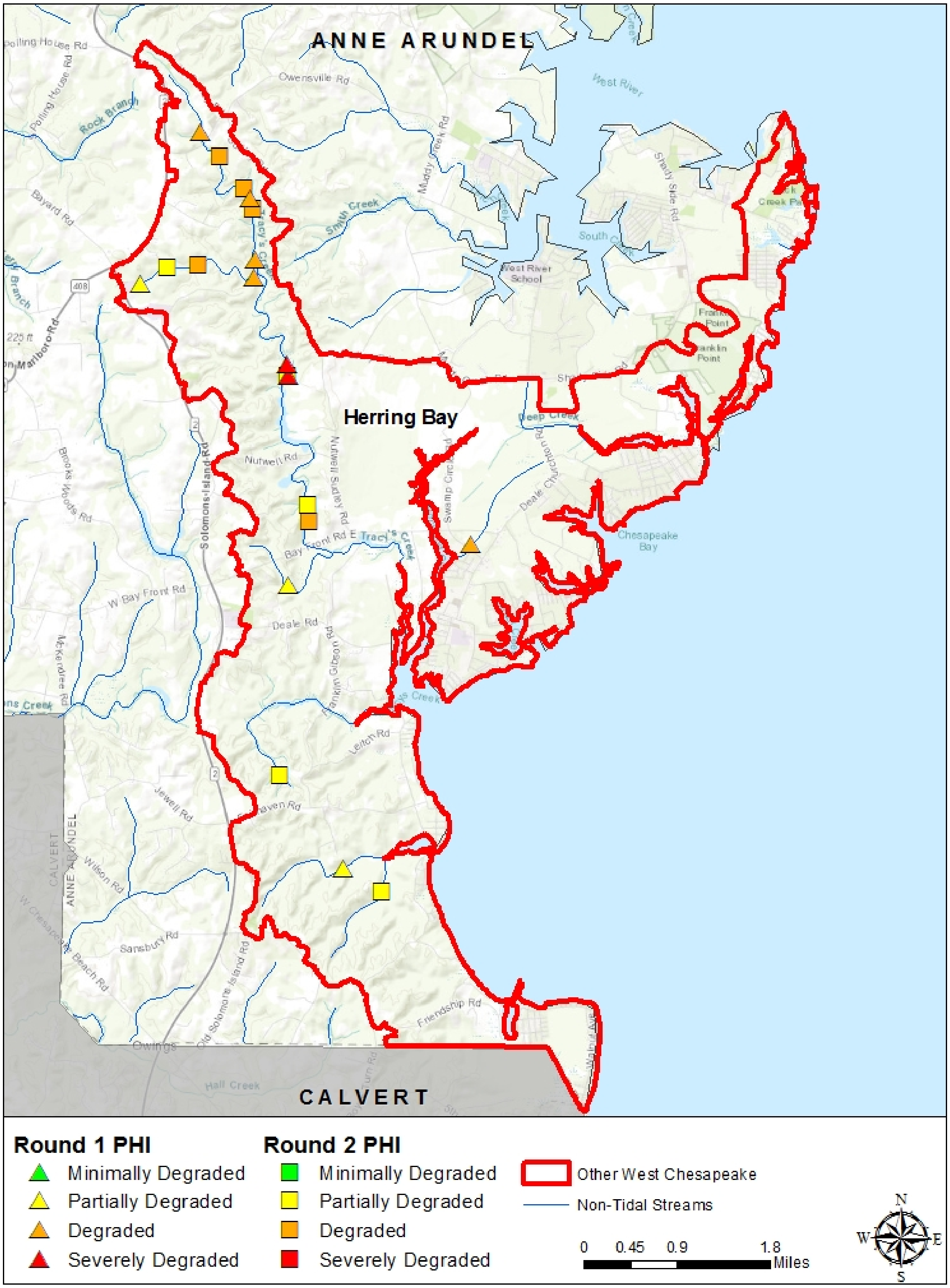

Figure 4: Physical Habitat Assessment Results from Round 1 (2005) and Round 2 (2010).

4.1.4 Conclusions

At the completion of Round 2, analyses were performed to compare statistical differences between mean index values (i.e., BIBI, PHI) from two time periods (e.g., Round 1 and Round 2) to determine if any changes in PSU scores were statistically significant. The report authors used the method recommended by Schenker and Gentleman (2001), which is the same method used by the MBSS to evaluate changes in condition over time, and is considered a more robust test than the commonly used method, which examines the overlap between the associated confidence intervals around two means (Hill et. al, 2014). Despite an increase in mean BIBI scores from 2.80 in Round 1 to 3.17 in Round 2, the increase was not statistically significant using a 95% confidence interval. These results suggest there has not been a measurable increase in the average BIBI condition across this portion of the Other West Chesapeake watershed from 2005 to 2010. However, future sampling efforts in Round 3 of the program will be able to better detect trends in biological condition over time due to a number of fixed (i.e., repeat) sites that have been incorporated into the sampling design.

4.2 Targeted Restoration Monitoring Program

In addition to the Countywide Program, the County implements a targeted biological monitoring program. This program utilizes the same techniques and procedures as use in the Countywide Program, but the sites are not randomly selected. There are two general approaches to site selection in the targeted work. First, the County samples a collection of long term sites every year, the number of which has varied over the years. Currently, there are 34 sites in the program, 18 of which are past or proposed stream restoration sites that the County tracks to see how the stream insect community has changed, or will change, over time while one site is a minimally disturbed stream reach that is used as a reference reach. Most of the sites in this group have only been monitored post-restoration. Another 15 sites are allocated to the Sawmill Creek Project (SCP) with the purpose of tracking changes in the aquatic biological integrity, as well as several abiotic factors, in Sawmill Creek and its tributaries over a period of five years (2017-2021). The goal of this project is to ascertain which factor, or combination of factors, are contributing to the watershed's unexpected biological integrity.

A more detailed description of the Targeted Biomonitoring Program, including the latest published summary report can be found here:
https://www.aacounty.org/departments/public-works/wprp/targeted%20biomonitoring/index.html
and here:
https://www.aacounty.org/departments/public-works/wprp/ecological-assessment-and-evaluation/2016%20Targeted%20Site%20Summary%20Report_Final.pdf

The other group of sites, varying in number from year to year, is established on reaches planned for future restoration work. The intent is to create a baseline of biological conditions to justify project implementation by providing permitting agencies evidence that biological and habitat impairments exist within a reach of interest.

5 Conclusion

This Other West Chesapeake TMDL Annual Assessment report documents the progress achieved through the end of FY2020. The assessment includes a report on the project and program implementation completed in the current report year and cumulatively through FY2020. The report summarizes the modeled and calculated pollutant load reductions and loads achieved through the implemented programs. Further, the report compares the implementation levels and load reductions against the overall goals, specifically the SW-WLA, and the planned milestone targets as outline in the 2020 Restoration Plan (Anne Arundel County, 2020).

Anne Arundel County spent $4,516,663 in FY2020 in capital and operational costs in the Other West Chesapeake Watershed. With those funds, the County is completing restoration projects and implementing programmatic practices including inlet cleaning and street sweeping. While load reductions are at only 0.6% on a total goal of 33.0%, the Restoration Plan was only just completed at the end of January 2020 and this assessment report documents implementation through the end of June 2020. The County will need additional planned projects to meet the goal of the TMDL before the 2030 end date. Biological stream monitoring data thus far with two rounds completed in 2005 and 2010 indicates a watershed that is in poor to fair biological health. The Herring Bay subwatershed (PSU 15) is scheduled to be monitored again in the County's rotating framework in 2021 which will provide a check on overall biological conditions.

MDE is currently working on a new local TMDL modeling tool that will be available in the future to report progress toward load reductions. It is anticipated that this new spreadsheet model will be used for FY2021 modeling, so additional changes are anticipated to the baseline, permit, and progress loads and load reductions in the FY2021 report.

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