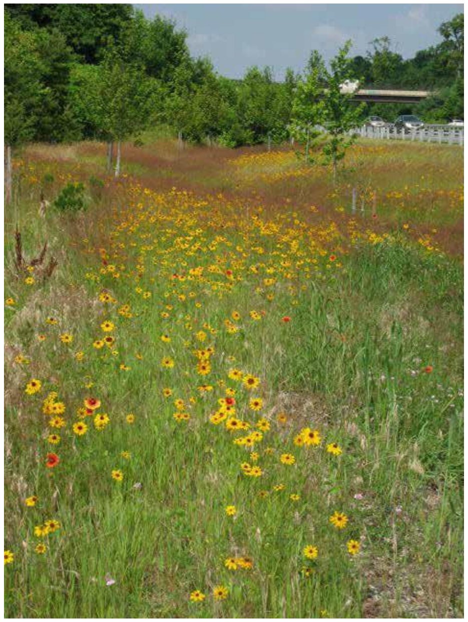
MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

Non-Tidal West River Watershed Sediment TMDL Implementation Plan

April 24, 2020



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NON-TIDAL WEST RIVER WATERSHED SEDIMENT TMDL IMPLEMENTATION PLAN

A. WATER QUALITY STANDARDS AND DESIGNATED USES

Total Maximum Daily Loads (TMDLs) focus on offsetting the impacts of pollutants to waterway designated uses. The Federal Clean Water Act (CWA) established requirements for each state to develop programs to address water pollution including:

- Establishment of water quality standards (WQSs);
- Implementation of water quality monitoring programs;
- Identification and reporting of impaired waters; and
- Development of maximum allowable pollutant loads that when met and not exceeded will restore WQSs to impaired waters, called TMDL documents.

WQSs are based on the concept of designating and maintaining specifically defined uses for each waterbody. **Table 1** lists the designated uses for waterways in the State of Maryland. TMDLs are based on these uses.

One means for the United States Environmental Protection Agency (EPA) to enforce these standards is through the National Pollutant Discharge Elimination System (NPDES) program, which regulates discharges from point sources. The Maryland Department of the Environment (MDE) is the delegated authority to issue NPDES discharge permits within Maryland and to develop WQSs for Maryland including the water quality criteria that define the parameters to ensure designated uses are met.

Table 1: Designated Uses in Maryland

	Use Classes							
Designated Uses	**I**	**I-P**	**II**	**II-P**	**III**	**III-P**	**IV**	**IV-P**
Growth and Propagation of Fish (not trout), other aquatic life and wildlife	✓	✓	✓	✓	✓	✓	✓	✓
Water Contact Sports	✓	✓	✓	✓	✓	✓	✓	✓
Leisure activities involving direct contact with surface water	✓	✓	✓	✓	✓	✓	✓	✓
Fishing	✓	✓	✓	✓	✓	✓	✓	✓
Agricultural Water Supply	✓	✓	✓	✓	✓	✓	✓	✓
Industrial Water Supply	✓	✓	✓	✓	✓	✓	✓	✓
Propagation and Harvesting of Shellfish			✓	✓				
Seasonal Migratory Fish Spawning and Nursery Use			✓	✓				
Seasonal Shallow-water Submerged Aquatic Vegetation Use			✓	✓				
Open-Water Fish and Shellfish Use			✓	✓				
Seasonal Deep-Water Fish and Shellfish Use			✓	✓				
Seasonal Deep-Channel Refuge Use			✓	✓				
Growth and Propagation of Trout					✓	✓		
Capable of Supporting Adult Trout for a Put and Take Fishery							✓	✓
Public Water Supply		✓		✓		✓		✓

Source: http://www.mde.maryland.gov/programs/water/TMDL/WaterQualityStandards/Pages/wqs_designated_uses.aspx

MS4 Permit Requirements

The Maryland Department of Transportation State Highway Administration (MDOT SHA) Municipal Separate Storm Sewer System (MS4) Permit requires coordination with county MS4 jurisdictions concerning watershed assessments and development of a coordinated TMDL implementation plan for each watershed that MDOT SHA has a wasteload allocation (WLA). Requirements from the MDOT SHA MS4 Permit specific to watershed assessments and coordinated TMDL implementation plans include *Part IV.E.1.* and *Part IV.E.2.b.*, copied below.

Watershed Assessments (Permit Part IV.E.1.)

SHA shall coordinate watershed assessments with surrounding jurisdictions, which shall include, but not be limited to the evaluation of available State and county watershed assessments, SHA data, visual watershed inspections targeting SHA rights-of-way and facilities, and approved stormwater WLAs to:

- *Determine current water quality conditions;*
- *Include the results of visual inspections targeting SHA rights-of-way and facilities conducted in areas identified as priority for restoration;*
- *Identify and rank water quality problems for restoration associated with SHA rights-of-way and facilities;*
- *Using the watershed assessments established under section a. above to achieve water quality goals by identifying all structural and nonstructural water quality improvement projects to be implemented; and*
- *Specify pollutant load reduction benchmarks and deadlines that demonstrate progress toward meeting all applicable stormwater WLAs.*

Coordinated TMDL Implementation Plans (Permit Part IV.E.2.b.)

Within one year of permit issuance, a coordinated TMDL implementation plan shall be submitted to MDE for approval that addresses all EPA approved stormwater WLAs (prior to the effective date of the permit) and requirements of Part VI.A., Chesapeake Bay Restoration by 2025 for SHA's storm sewer system. Both specific WLAs and aggregate WLAs which SHA is a part of shall be addressed in the TMDL implementation plans. Any subsequent stormwater WLAs for SHA's storm sewer system shall be addressed by the coordinated TMDL implementation plan within one year of EPA approval. Upon approval by MDE, this implementation plan will be enforceable under this permit. As part of the coordinated TMDL implementation plan, SHA shall:

- *Include the final date for meeting applicable WLAs and a detailed schedule for implementing all structural and nonstructural water quality improvement projects, enhanced stormwater management programs, and alternative stormwater control initiatives necessary for meeting applicable WLAs;*
- *Provide detailed cost estimates for individual projects, programs, controls, and plan implementation;*
- *Evaluate and track the implementation of the coordinated implementation plan through monitoring or modeling to document the progress toward meeting established benchmarks, deadlines, and stormwater WLAs; and*

- *Develop an ongoing, iterative process that continuously implements structural and nonstructural restoration projects, program enhancements, new and additional programs, and alternative BMPs where EPA approved TMDL stormwater WLAs are not being met according to the benchmarks and deadlines established as part of the SHA's watershed assessments*.

B. WATERSHED ASSESSMENT COORDINATION

According to the United States Geological Survey (USGS) (2016):

> *A watershed is an area of land that drains all the streams and rainfall to a common outlet such as the outflow of a reservoir, mouth of a bay, or any point along a stream channel. The word watershed is sometimes used interchangeably with drainage basin or catchment. The watershed consists of surface water--lakes, streams, reservoirs, and wetlands--and all the underlying ground water. Larger watersheds contain many smaller watersheds. Watersheds are important because the streamflow and the water quality of a river are affected by things, human-induced or not, happening in the land area "above" the river-outflow point.*

The 8-digit scale is the most common management scale for watersheds across the State, and therefore is the scale at which most of Maryland's local TMDLs are developed. See **Figure 1** for an illustration of the 8-digit watersheds in Maryland with West River highlightend.

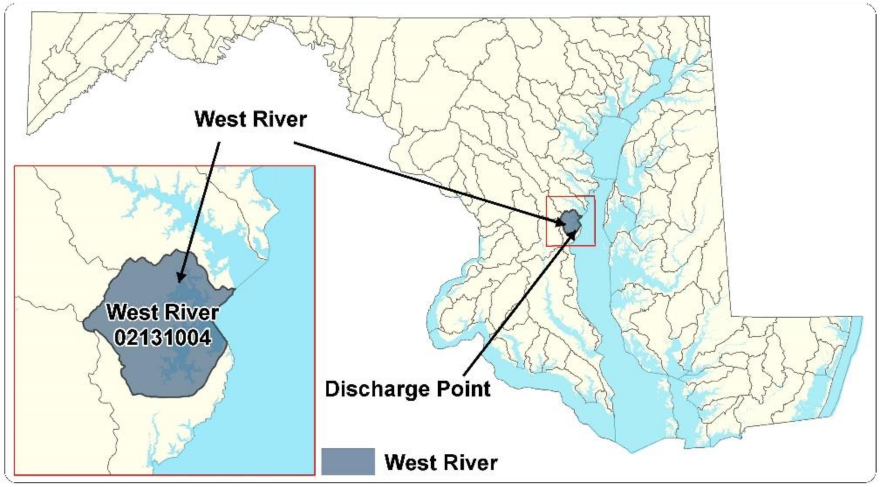

Figure 1: Maryland 8-digit Watershed Example

County Watershed Assessments

Each MS4 county performs detailed assessments of local watersheds as a part of its MS4 permit requirements. These assessments determine current water quality conditions and include visual inspections; the identification and ranking of water quality problems for restoration; the prioritization and ranking of structural and non-structural improvement projects; and the setting of pollutant reduction benchmarks and deadlines that demonstrate progress toward meeting applicable WQSs. MDOT SHA is not required to duplicate this effort, but is required to coordinate with the MS4 jurisdictions to obtain and review watershed assessments. Relying on assessments performed by other jurisdictions avoids redundant analysis and places the responsibility for developing the assessments with the jurisdictions that have a close connection to local communities and watershed groups.

Watershed assessment evaluations conducted by MDOT SHA focus on issues that MDOT SHA can improve through practices targeting MDOT SHA right-of-way (ROW) or infrastructure. This information is used to determine priority areas for best management practices (BMP) implementation and to identify potential project sites or partnership project opportunities. Summaries of these evaluations are included under **Section F**. MDOT SHA watershed assessment evaluations focus on the following:

- Impacts to MDOT SHA infrastructure such as failing outfalls and downstream channels;
- Older developed areas with little stormwater management (SWM) and available opportunities to install retrofits;
- Degraded streams;
- Priority watershed issues such as improvements within a drinking water reservoir, special protection areas, or Tier II catchments;
- Identification of areas most in need of restoration;
- Description of preferred structural and non-structural BMPs to use within the watershed;
- Potential project sites for BMPs; and
- In watersheds with Polychlorinated Biphenyl (PCB) TMDLs, identifying locations of any known PCB sources.

In addition to using information from the county watershed assessments, MDOT SHA also undertakes other activities to identify potential project sites and prioritize BMP implementation including:

- Coordination meetings with each of the MS4 counties to discuss potential partnerships with the mutual goal of improving water quality;
- Visual watershed inspections as described below; and
- Maximizing existing impervious treatment within new roadway projects (practical design initiative).

C. VISUAL INSPECTIONS TARGETING MDOT SHA ROW

MDOT SHA methodically reviews each watershed for potential restoration projects within MDOT SHA ROW to meet the load reductions for current pollutant WLAs. Each watershed is assessed using a grid system in conjunction with detailed corridor assessments. The watershed review process includes two phases to visually inspect each watershed and identify all structural and non-structural water quality improvement projects to be implemented.

Desktop Evaluation

Phase one is a desktop evaluation of the watershed using available county watershed assessments and MDOT SHA data. MDOT SHA has created a grid system of 1.5-mile square cells to track the progress of the visual ROW inspections, allowing prioritized areas to be targeted first. With this grid system, many spatial data sets are reviewed to determine the most effective use of each potential restoration site. The sites are documented geographically and stored in Geographic Information System (GIS). Viable sites are prioritized based on cost-effectiveness and those located within watersheds with the most pollutant reduction needs move forward to the second phase, which is to perform field investigations. Data reviewed includes:

- Aerial imagery;
- Street view mapping;
- Environmental features delineations such as critical area boundary, wetlands buffers, floodplain limits;
- County data such as utilities, storm drain systems, contour and topographic mapping;
- MDOT SHA ROW boundaries;

- Current MDOT SHA stormwater control and restoration practice locations; and
- Drainage area boundaries.

Figure 6, located in **Section F**, illustrates the 1.5-mile grid system for the Non-Tidal West River watershed.

Field Investigations

Phase two is a field investigation of each viable site resulting from the watershed desktop evaluation. MDOT SHA inspects and assesses each site in the field to identify and document existing site conditions, water quality opportunities, and constraints. This information is used to determine potential restoration BMP types as well as estimated restoration credit quantities.

MDOT SHA will continue to prioritize visual inspections in the highest need watersheds. **Figure 2** is an example field investigation summary map that documents observations. A standardized field inspection form is used.

D. BENCHMARKS AND DETAILED COSTS

Benchmarks and deadlines demonstrating progress toward meeting all applicable stormwater WLAs are provided in **Section F**. It contains generalized cost information that includes an overall estimated cost to implement the proposed practices. Detailed costs for specific construction projects are available on MDOT SHA's website (www.roads.maryland.gov) under the Contractors Information Center.

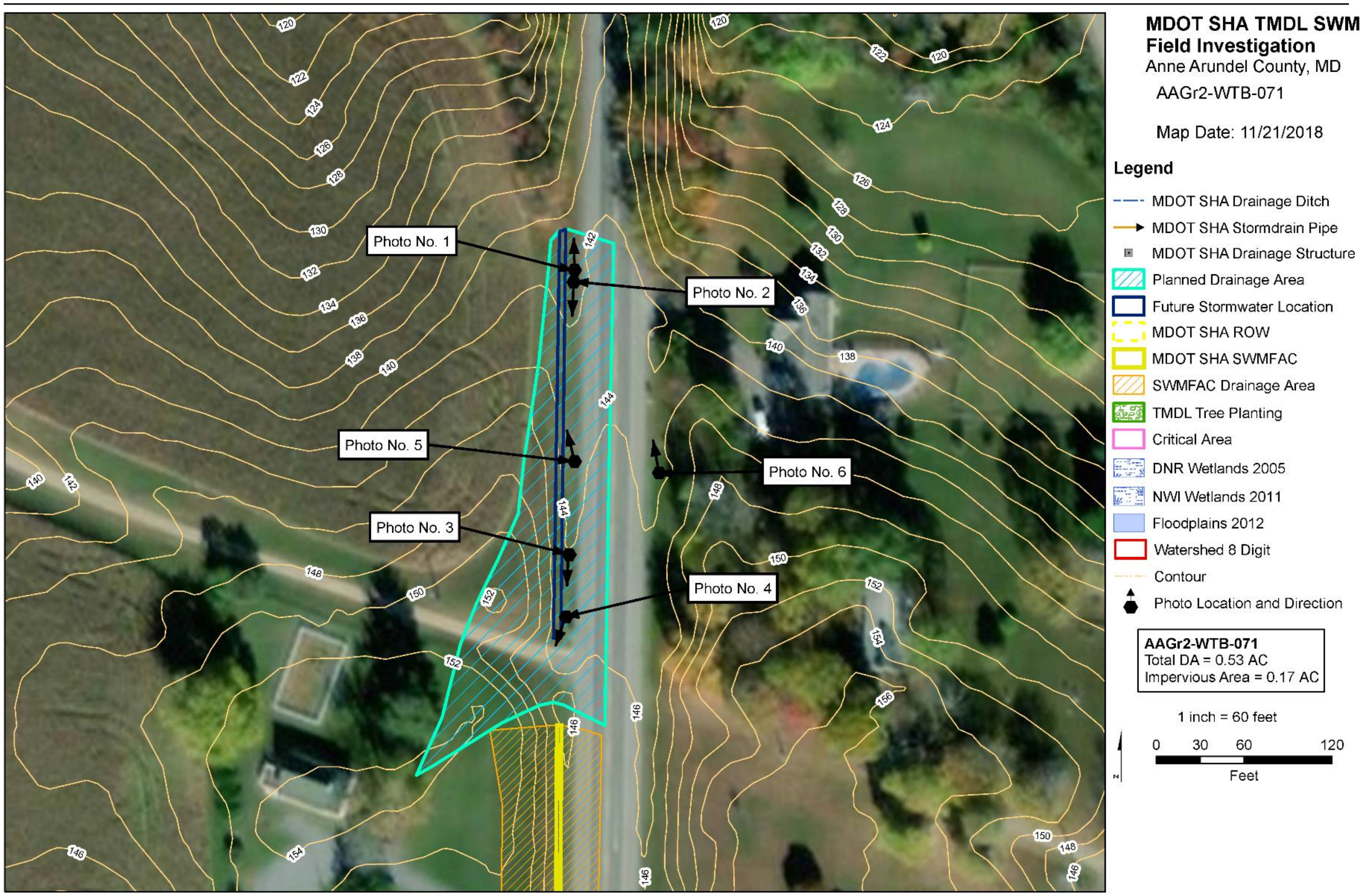

Figure 2: Example Field Investigation Summary Map

E. POLLUTION REDUCTION STRATEGIES

E.1. MDOT SHA TMDL Responsibilities

TMDLs define the maximum pollutant loading that can be discharged to a waterbody and still meet water quality criteria for maintaining designated uses. **Figure 3** illustrates the concept of maximum loading. The green area on the bar depicts the maximum load that maintains a healthy water environment for the pollutant under consideration. When this load is exceeded, the waterway is considered impaired as illustrated by the red portion of the bar. The example waterway needs restoration through implementation of practices to reduce the pollutant loading to or below the TMDL.

Generally, the formula for a TMDL is:

$$TMDL = \sum WLA + \sum LA + MOS$$

Where:

TMDL = total maximum daily load
WLA = wasteload allocation for point sources;
LA = load allocation for non-point sources; and
MOS = margin of safety.

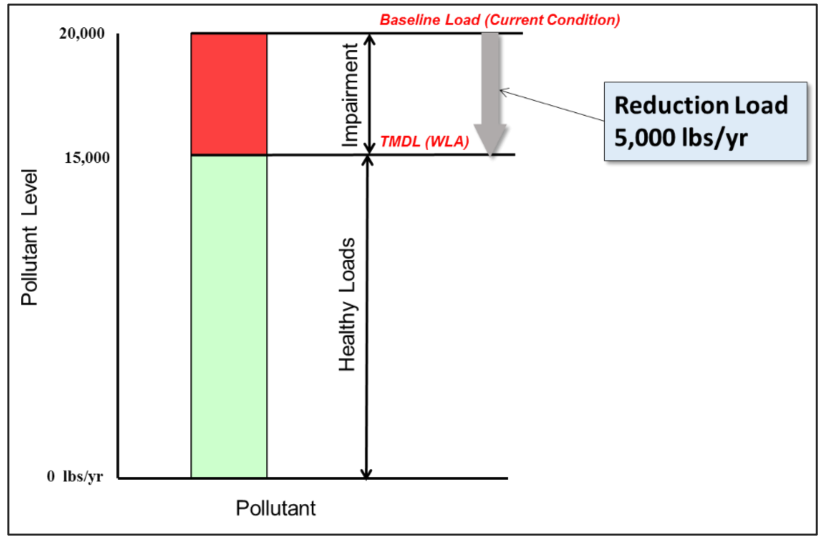

Figure 3: Example Wasteload and Reduction Requirement

Modeling Parameters

MDE requires that pollutant modeling follow the guidance in MDE's *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (MDE, 2014); if other methods are employed, they must be approved by MDE. MDOT SHA developed a restoration modeling protocol that describes the methods used for modeling pollutant load reductions for local TMDLs with MDOT SHA responsibility. This protocol was originally submitted to MDE as Appendix E in the 2016 MDOT SHA MS4 annual report. Updates to this protocol will be periodically implemented and resubmitted for MDE consideration. The most recent updated restoration modeling protocol was submitted in the 2019 Annual Report as Appendix D.

Different modeling methods are used depending upon the pollutants and current reduction practices in use. Brief descriptions of modeling methods are included in the following section, but the *MDOT SHA Restoration Modeling Protocol* (MDOT SHA, 2019) should be consulted for a more detailed explanation.

Aggregated Loads

WLAs may be assigned to each MS4 jurisdiction separately or as an aggregated WLA for all urban stormwater MS4 permittees that combines them into one required allocation and reduction target. The modeling approach developed by MDOT SHA uses MDOT SHA data (both impervious and pervious land as well as BMPs built before the TMDL baseline year, also known as baseline BMPs) to calculate baseline loads and calibrated reduction targets. Following this approach, disaggregation is done for each TMDL.

Available Reduction Practices

MDOT SHA reserves the right to implement new BMPs, activities, and other practices that are not currently available to achieve local TMDL load reduction requirements. MDOT SHA will modify reduction strategies as necessary based on new, approved treatment guidance and will include revised strategies in updates to this implementation plan. MDOT SHA is over programming restoration projects to plan for projects that may drop out of consideration or not make it through to final construction due to site design limitations or any other situation that may result in removing the project from the plan.

E.2. Sediment Pollution Reduction Strategy

E.2.a. Sediment TMDLs Affecting MDOT SHA

There are many EPA-approved sediment TMDLs within Maryland and **Figure 4** is a map showing MDOT SHA sediment TMDL responsibilities by watershed. The following is a list of TMDL documents for sediment with MDOT SHA responsibility that are addressed in this plan:

- *Total Maximum Daily Load of Sediment in the Non-Tidal West River Watershed, Anne Arundel County, Maryland, approved by EPA on April 24, 2019.*

In **Table 2,** the MDOT SHA reduction target for the Non-Tidal West River Watershed sediment TMDL is 24 percent, or 13,323 lbs./yr. The watershed can safely receive 42,191 pounds of sediment by MDOT SHA on a yearly basis without being considered impaired. MDOT SHA's reduction target is found by multiplying the MDOT SHA baseline load by the MDOT SHA reduction target percentage. The MDOT SHA WLA is found by subtracting the MDOT SHA baseline load by the MDOT SHA reduction target load. The projected reduction load achieved is found by modeling the sediment load reduction that will be experienced by the construction of current and future BMPs in the Non-Tidal West River watershed. These BMPs are either currently under construction or are planned to be constructed in the future. It is estimated that these BMPs will reduce sediment loading by 13,323 pounds to the watershed.

Three dates are shown in **Table 2**: the EPA approval date, the baseline year set by MDE, and the Target Year. The baseline year published on the MDE Data Center will be used for MDOT SHA's implementation plan modeling. This usually correlates to the time period when monitoring data was collected for MDE's TMDL analysis. The Target Year is the year MDOT SHA proposes to meet the WLA.

Total Suspended Sediment TMDL

Watershed Number	Watershed or Subsegment Name	Year of EPA TMDL Approval
7	Antietam Creek	2008
8	Back River	2018
17	Bynum Run	2011
18	Cabin John Creek	2011
19	Catoctin Creek	2009
20	Conococheague Creek	2008
21	Double Pipe Creek	2009
24	Gwynns Falls	2010
26	Jones Falls	2011
28	Liberty Reservoir	2014
29	Little Patuxent River	2011
31	Lower Gunpowder Falls	2017
32	Lower Monocacy River (Subsegment)	2009
39	Patapsco River L N Br	2011
44	Patuxent River Lower	2018
45	Patuxent River Middle	2018
46	Patuxent River Upper	2011
52	Potomac River MO Cnty	2012
56	Rock Creek	2011
59	Seneca Creek	2011
62	South River	2017
64	Swan Creek	2016
68	Upper Monocacy River	2009
71	West Chesapeake Bay	2018
72	West River	2019

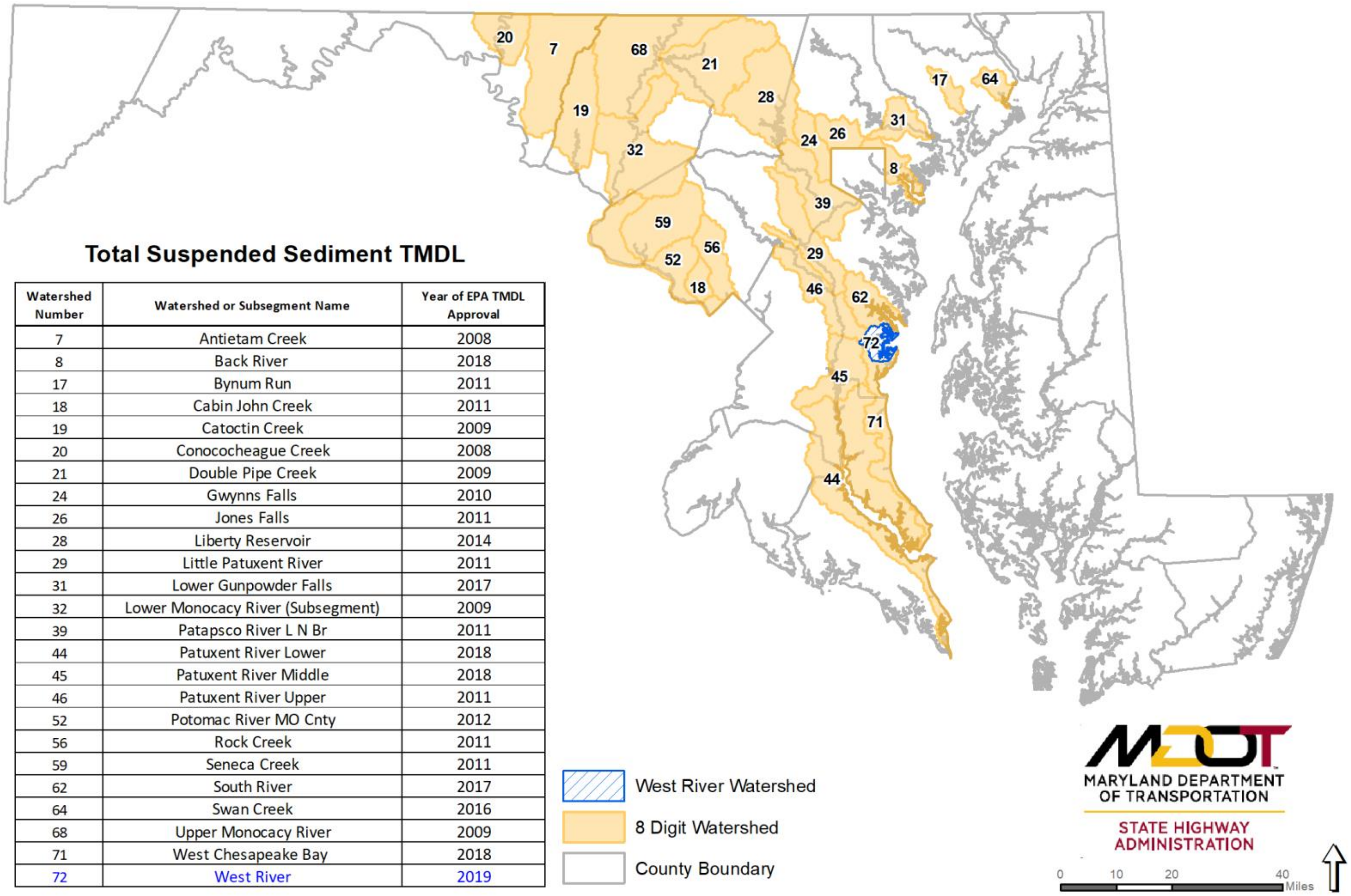

Figure 4: MDOT SHA Sediment TMDL Responsibilities in Local Watersheds

Table 2: MDOT SHA Non-Tidal West River Watershed Sediment Modeling Results

Watershed Name	Watershed Number	County	Pollutant	EPA Approval Date	Baseline Year	Unit	MDOT SHA Baseline Load	MDOT SHA % Reduction Target	MDOT SHA Reduction Target	MDOT SHA Proposed 2020 Interim Reduction	% 2020 Reduction Relative to Reduction Target	MDOT SHA Proposed 2025 Interim Reduction Target	% 2025 Reduction Relative to Reduction Target	MDOT SHA Target Year Reduction Load	% Target Year Reduction Relative to Reduction Target	Target Year
Non-Tidal West River	02131004	AA	Sediment	04/24/2019	2009	Lbs./ yr.	55,514	24.0%	13,323	256	1.9%	256	1.9%	13,323	100.0%	2035

E.2.b. Sediment Sources

Discussions in the TMDL concerning sediment sources focus on types of land use with information derived from the Chesapeake Bay Program Watershed Model (CBPWM). Cropland and regulated urban lands tend to be the most significant sources, followed by other agricultural uses and wastewater sources. Specific sources of each pollutant that could be useful for targeting controls are not included in the TMDL, but MDOT SHA researched a number of other references and determined sources beyond land uses that are summarized in **Table 3**. Sources of sediment include surface erosion from construction sites and cropland as well as stream erosion from high flows during storm events.

MDOT SHA Loading Sources

MDOT SHA-owned land is a small portion of each of the TMDL watersheds and it consists of relatively uniform land uses including roadways and roadside vegetation. In urbanized areas, the MDOT SHA ROW may extend to include sidewalks and portions of driveways. There are also parking areas associated with MDOT SHA land such as park and ride facilities, office complexes, and maintenance facilities.

Of the land uses in **Table 3**, MDOT SHA is a contributor of sediments mostly through urban and natural sources.

Table 3: Nutrient and Sediment Sources from Various References

Land Use	Nutrient Sources	Sediment Sources
Agriculture	Chemical Fertilizer Manure	Soil Erosion
Urban	Pet Waste Lawn Fertilizer Parking Lot, Roof, and Street Runoff	Construction Erosion Parking Lot, Roof, and Street Runoff
Wastewater	Municipal Industrial Failed Septic Systems CSO/ SSO Leaking Sewers	
Natural	Atmospheric Deposition	Stream Erosion Shoreline Erosion
References used to develop this table are MDE, 2014; EPA, 2010; Hoos et al., 2000; and Schueler, 2011.		

E.2.c. Sediment Reduction Strategies

To date, MDOT SHA has used a variety of structural, non-structural, and alternative BMPs in an effort to reduce sediment in the watersheds that have a corresponding TMDL. However, MDOT SHA understands that load reduction activities cannot be limited to just BMP implementation as opportunities to build new BMPs are limited. The use of nutrient credit trading will also be explored as a tool in reaching load reduction targets. When MDOT SHA partners on projects with other MS4 jurisdictions, load splitting can be used as a means to achieve WLA reductions.

BMP Implementation

As a requirement under the MS4 Permit, MDOT SHA must complete the implementation of restoration efforts for 20 percent of its impervious surface area. MDOT SHA has an extensive program to plan, design, and construct BMPs that offset untreated impervious surfaces in MDOT SHA ROW.

MDOT SHA intends to build these BMPs used for impervious restoration in watersheds that have a TMDL where possible. One of the major challenges with using a strategy of building BMPs to meet WLAs is that there can be a lack of feasible ROW for BMP placement opportunities. There are instances where MDOT SHA roadway encompasses a majority of the area in the ROW leaving very little land to construct BMPs. The visual watershed inspection process has indicated areas where BMP placement is possible and where it is not feasible due to utility relocation, land purchases, site access problems, and a host of other issues. Therefore, MDOT SHA is continually seeking new opportunities and partnerships to install BMPs.

Nutrient Credit Trading

In an effort to meet the MDOT SHA WLA in watersheds with limited BMP placement opportunities, MDOT SHA may explore the possibility of nutrient credit trading. It is expected that MS4 jurisdictions will have the ability to purchase pounds of phosphorus, nitrogen, and sediment in a quantity that will allow them to reach their intended WLA. To date no trading partnerships have been pursued. If and when MDOT SHA focuses on trading to meet the sediment WLA in this watershed it will be noted in the Annual Report.

TMDL End Date

Currently, MDOT SHA models BMP implementation for restoration practices that can be placed in the watershed based on the visual watershed inspection process. MDOT SHA's current assessment will reach the reduction target by 2035. MDOT SHA will continue assessing this potential and will adjust the end date as needed. MDOT SHA is over programming restoration projects to plan for projects that may drop out of consideration or not make it through to final construction due to site design limitations or any other situation that may result in removing the project from the plan. After MDOT SHA has evaluated the building of all of the possible BMPs found during the "MDOT SHA Visual Inventory of ROW" detailed in section F.3. of this plan to meet its 24 percent sediment reduction requirement, MDOT SHA will explore the possibility of nutrient credit trading or partnerships, which cannot be modeled at this time. Also, future changes to current BMP removal rates or efficiencies will be reviewed to determine impacts to our anticipated Non-tidal West River sediment WLA end date.

F. MDOT SHA NON-TIDAL WEST RIVER WATERSHED SEDIMENT TMDL IMPLEMENTATION PLAN

F.1. Watershed Description

The West River watershed is associated with three assessment units in Maryland's Integrated Report: a non-tidal watershed (8-digit Basin Code: 02131004) and two estuary portions; West River Mesohaline (WSTMH) and Rhode River Mesohaline (RHDMH), located entirely within Anne Arundel County, Maryland. The drainage area of the entire watershed is approximately 25.5 square miles (16,300 acres) and includes approximately 5.5 square miles (3,550 acres) of tidal water (MDE, 2019).

The designated use of the West River watershed's non-tidal tributaries is Use Class I – Water Contact Recreation and Protection of Nontidal Warmwater Aquatic Life (MDE, 2019).

On the 2018 MDE 303(d) List (MDE, 2018) the following impairments were listed for the Non-Tidal waters within the West River watershed:

- Sulfates; and
- Total Suspended Solids (TSS).

There are 18 centerline miles of MDOT SHA roadway located within the Non-Tidal West River watershed. The associated ROW encompasses 169 acres, of which 81 acres are impervious.

As indicated on the map in **Figure 5** there are no MDOT SHA facilities within the Non-Tidal West River watershed.

F.2. MDOT SHA TMDLs within Non-Tidal West River Watershed

MDOT SHA is included in the sediment TMDL (MDE, 2019), with a reduction requirement of 24 percent, as shown in **Table 2**. This TMDL only applies to the non-tidal portion of the West River watershed. In addition to the sediment TMDL, there is also a Polychlorinated Biphenyls (PCB) TMDL in the West River Mesohaline Chesapeake Bay Segment and a Fecal Coliform TMDL for Restricted Shellfish Harvesting Areas in Bear Neck Creek, Cadle Creek, West River, and Parish Creek for the West River Basin.

F.3. MDOT SHA Visual Inventory of ROW

The MS4 Permit requires MDOT SHA to perform visual assessments. **Section C** describes the MDOT SHA visual assessment process. For each BMP type, implementation teams have performed preliminary evaluations for each grid and/or major State route corridor within the watershed as part of desktop and field evaluations. The grid-system used for the Non-Tidal West River watershed is shown in **Figure 6** which illustrates that seventeen grid cells have been reviewed, encompassing portions of five State route corridors. Results of the visual inventory categorized by BMP type follow.

Structural Stormwater Controls

Preliminary evaluation identified 50 locations as potential new structural stormwater (SW) control locations. Further analysis of these locations resulted in:

- Forty-Nine additional sites deemed potentially viable for new structural SW controls and pending further analysis, may be candidates for future restoration opportunities.

- One site deemed not viable for new structural SW controls and has been removed from consideration.

Tree Planting

Preliminary evaluation identified 17 locations as potential tree planting locations. Further analysis of these locations resulted in:

- Four sites constructed.
- Four additional sites deemed potentially viable tree planting and pending further analysis, may be candidates for future restoration opportunities.
- Nine sites deemed not viable for tree planting and have been removed from consideration.

Stream Restoration

No stream sites were identified in this watershed for restoration.

Grass Swale Rehabilitation

No grass swale sites were identified in this watershed for restoration.

Outfall Stabilization

Preliminary evaluation identified 14 outfalls with potential for stabilization. Further analysis of these sites resulted in:

- Three outfall sites deemed potentially viable for outfall stabilization efforts and pending further analysis, may be candidates for future restoration opportunities.
- Eleven outfall sites deemed not viable for outfall stabilization and have been removed from consideration.

Retrofit of Existing Structural SW Controls

No existing structural SW controls were identified for potential retrofits in this watershed for restoration.

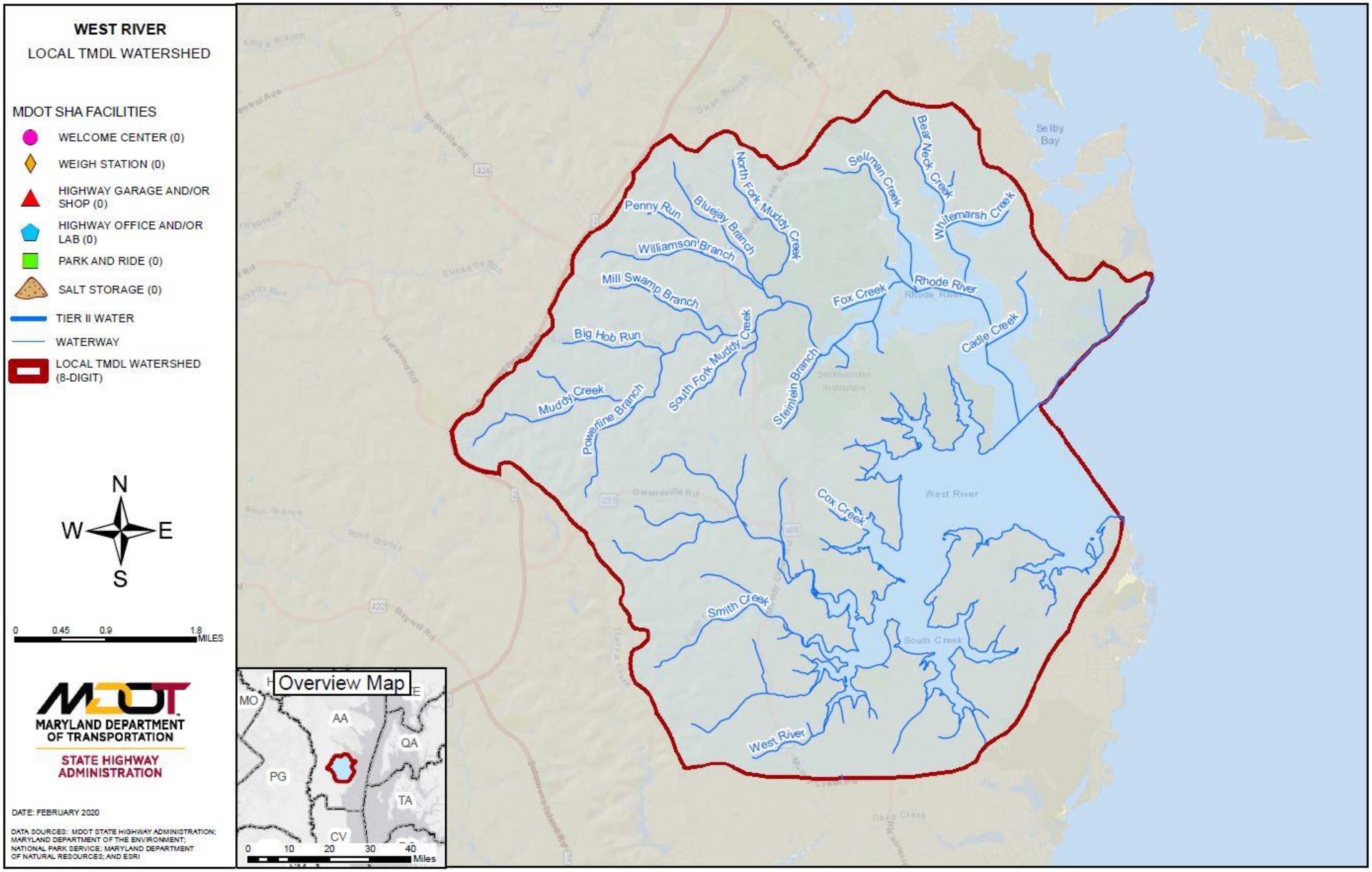

Figure 5: Non-Tidal West River Watershed

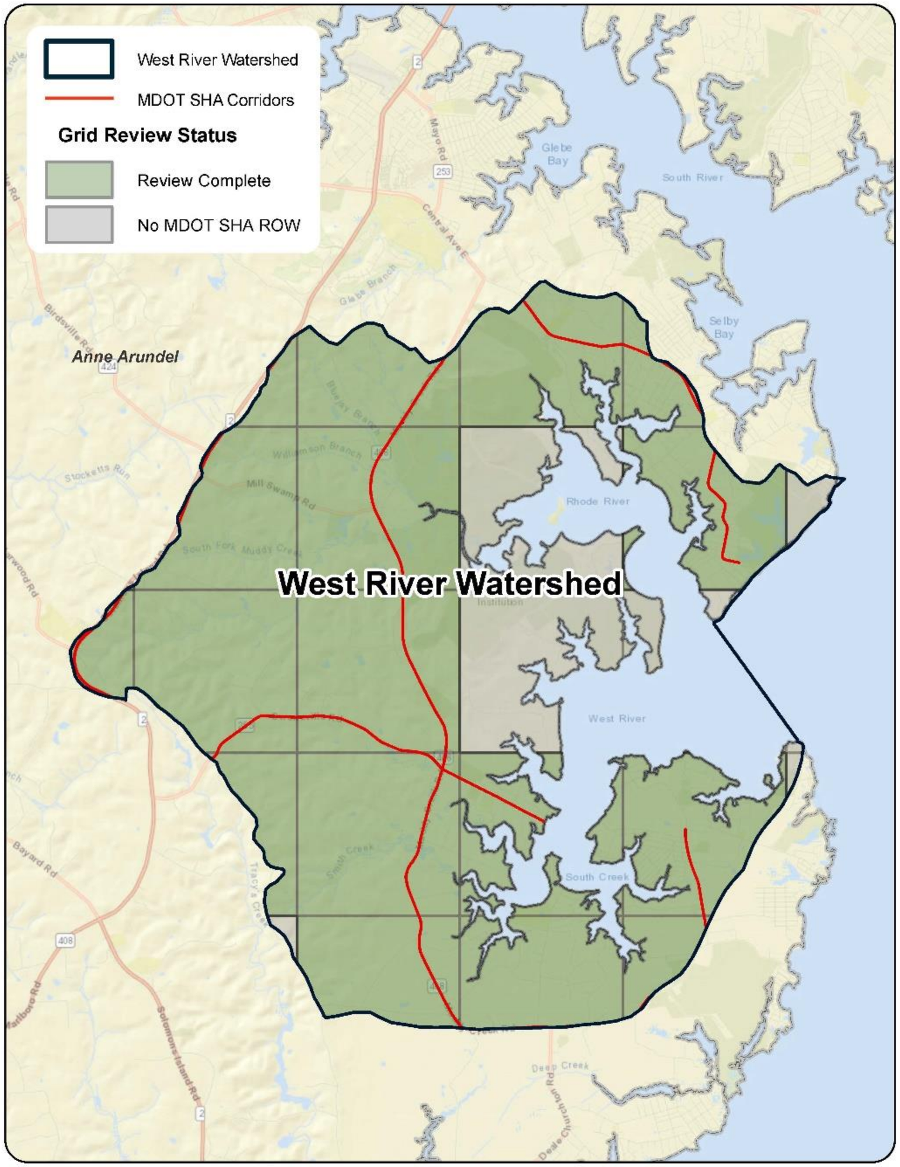

Figure 6: Non-Tidal West River Site Search Grids

F.4. Summary of County Assessment Review

The West and Rhode Watersheds Assessment Comprehensive Summary Report was published in December 2016 as the result of a collaborative effort between the Watershed Protection and Restoration Program within the Anne Arundel County Department of Public Works Bureau of Engineering Watershed Protection and Restoration Program (AA-DPW), LimnoTech, and Versar. The report serves as a systematic assessment of current watershed conditions to support and prioritize watershed management and planning decisions and develop detailed restoration plans (AA-DPW et al., 2016).

The Non-Tidal West River watershed is located within the southwestern portion of Anne Arundel County. The West River watershed is comprised of 13 subwatersheds ranging in size from 191 to 1,386 acres (0.3 to 2.2 square miles).

In the watershed, the majority of soils have a moderately high runoff potential; the remainder of soils are predominately identified as having moderately low runoff potential. In addition, most of the land is classified as not highly erodible land. The fastest development occurred in the Parish Creek subwatershed (subwatershed code: WRA) seeing the fastest development in 2000-2015. The overall highest rate of development occurred from 1940-1999 in the South Creek I (WR8) subwatershed.

Stormwater BMPs in the West River watershed are typically owned by private landowners, the County, or State Agencies such as MDOT SHA. Within the watershed, the majority of BMPs are privately owned (87 percent). Privately owned BMPs include practices such as dry wells, small bioretention cells, and small environmental site design (ESD) facilities. These practices serve to manage runoff from single rooftops or other impervious areas associated with residential properties (AA-DPW et al., 2016).

When evaluated by the percent of the drainage area that BMPs manage or treat in the watershed; private BMPs cover 55 percent, public BMPs cover 27 percent of the managed area, and the MDOT SHA and other state agencies account for the remaining 18 percent of the managed land (AA-DPW et al., 2016).

Three types of prioritization assessments were conducted for the West River watershed in Anne Arundel County: stream restoration, subwatershed restoration, and subwatershed preservation. All three types of assessments utilized a prioritization rating scale of High, Medium High, Medium, or Low.

The stream restoration priority ranking took into consideration many factors including stream habitat, morphology, land cover, infrastructure, and hydrology/hydraulics. Sixty-nine perennial stream reaches were assessed in the thirteen subwatersheds. Out of the sixty-nine, eight were rated as High and seventeen were rated as Medium High priority for restoration. Five of the subwatersheds had more than thirty-three percent of their perennial streams rated as “High” or “Medium High”:

- South Creek 1 (WRA8) had two streams assessed; one rated as “High” the other as “Medium High”
- Gales Creek (WR3) had one stream assessed; rated as “Medium High”
- Lerch Creek 1 (WR5) had four streams assessed; one rated “High” and two rated “Medium High”
- Lerch Creek 2 (WR6) had thirty nine streams assessed; five rated “High” and ten rated “Medium High”
- South Creek 2 (WR9) had one stream assessed; rated as “High”

The subwatershed restoration assessment used indicator ratings that were grouped into one of seven categories including: stream ecology, 303(d) list, septics, BMPs, hydrology/hydraulics, water quality, and landscape. The indicator ratings were weighted and combined to obtain a single restoration rating for each subwatershed. Of the thirteen subwatersheds in the West River watershed, four were rated High priorities for restoration; Tenthouse Creek (WR7), South Creek 1 (WR8), Parish Creek (WRA), and Gales Creek (WR3). Three subwatersheds were rated “Medium High” for restoration; Johns Creek (WR1), Lerch Creek 1 (WR5), and West River Tidal (WR0). The four subwatersheds ranked “High” represent 30.8 percent of the subwatersheds in the West River watershed (AA-DPW et al., 2016).

The subwatershed preservation assessment utilized indicator ratings grouped into one of five categories (stream ecology, future departure of water quality conditions, soils, landscape, and aquatic living resources) that were weighted and combined to obtain a single preservation rating for the subwatersheds. Of the thirteen subwatersheds, four were rated High priorities for preservation; Popham Creek (WR4), West River Tidal (WR0), Cheston Creek (WR2), and Smith Creek 2 (WRC). Three subwatersheds were rated Medium High for preservation; Smith Creek 1 (WRB), Gales Creek (WR3), South Creek 2 (WR9). The four subwatersheds ranked “High” represent 18.2 percent of the subwatersheds in the West River watershed.

F.5. MDOT SHA Pollutant Reduction Strategies

Proposed practices to meet sediment reduction in the Non-Tidal West River watershed are shown in **Table 4**. Projected sediment reductions using these practices are 13,323 lbs. which is a 100 percent progress towards the reduction goal. MDOT SHA also added a treatment buffer into this plan that exceeds the reduction goal, as shown in **Table 4**, to account for an adaptive management approach. MDOT SHA anticipates that some planned projects may not make it through the planning process to final construction due to site or design limitations. Four timeframes are included in the table below:

- BMPs built before the TMDL baseline. In this case, the baseline is 2009;
- BMPs implemented after the baseline through fiscal year 2020; and
- BMPs implemented after fiscal year 2020 through fiscal year 2025; and
- BMPs to be implemented after fiscal year 2025 through the target year, 2035.

MDOT SHA will accomplish the projected reduction to be achieved as a percent of the baseline load presented in **Table 2**.

Estimated costs to design, construct, and implement BMPs within the Non-Tidal West River watershed total $2,971,500. These projected costs are based on an average cost per impervious acre treated derived from cost history for each BMP type. See **Table 5** for a summary of estimated BMP costs.

Table 4: Non-Tidal West River Restoration Sediment BMP Implementation

BMP	Unit	Baseline (Before 2009)	Restoration BMPs			
			2020	2025	Target Year	Restoration Total
New Stormwater	drainage area acres				26.1	26.1
Retrofit	drainage area acres					
Grass Swales	drainage area acres	4.0				
Tree Planting	acres of tree planting		1.8		8.2	10.0
Stream Restoration	linear feet					
Outfall Stabilization	linear feet				730.8	730.8
Inlet Cleaning[1]	dry tons		0.1			0.1
Pipe Cleaning[1]	linear feet		0.4			0.4
Load Reductions	TSS EOS lbs./yr.	988.0	255.9		15,060.0	15,315.9
					Total Projected Reduction	**15,315.9**

[1] Inlet cleaning and pipe cleaning are annual practices.
[2] Cross-jurisdictional BMPs may be a mix of various types of stormwater treatment.

Figure 7 is a map of MDOT SHA's restoration practices in the watershed and includes those that are under design and construction. Inlet cleaning and pipe cleaning are not reflected on this map.

Table 5: Non-Tidal West River Restoration BMP Cost				
BMP	**2020**	**2025**	**Target Year**	**Restoration Total**
New Stormwater			$1,211,000	$1,211,000
Retrofits				
Grass Swales				
Tree Planting	$60,000		$277,000	$337,000
Stream Restoration				
Outfall Stabilization			$1,412,000	$1,412,000
Inlet Cleaning	$1,000			$1,000
Pipe Cleaning	$500			$500
			Total Cost	**$2,971,500**

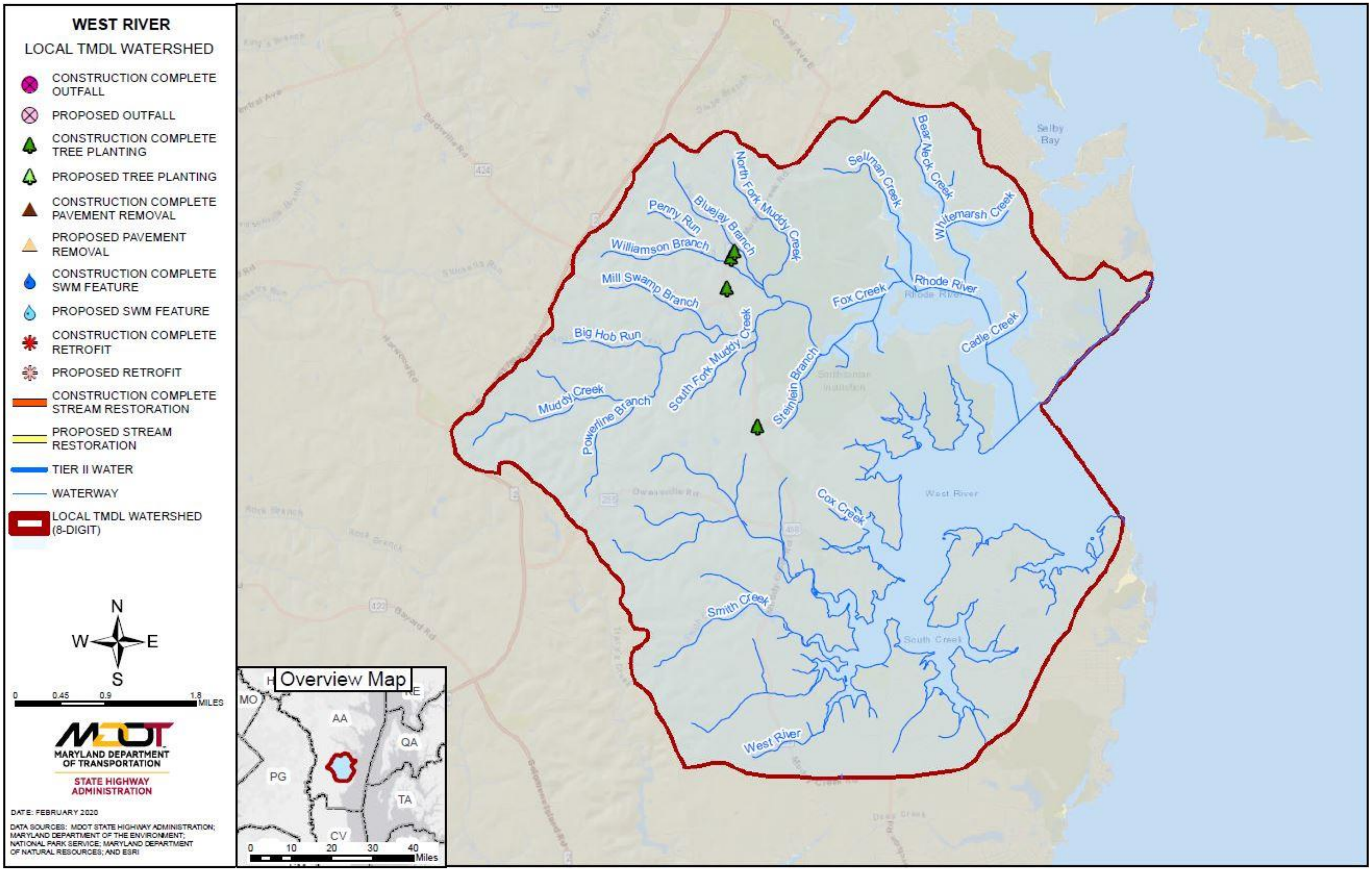

Figure 7: MDOT SHA Programmed Restoration Strategies within the Non-Tidal West River Watershed

MDE

Optional Worksheet for MS4 Stormwater WLA Implementation Planning
Version: Short Aug-15
Maryland Department of the Environment-Science Services Administration

Watershed Name	West River
County Name	Anne Arundel
Date	4/24/2020

LOADING RATES FOR UNTREATED LAND		
	Impervious Rate lbs/acre/yr	Pervious Rate lbs/acre/yr
TN	see notes below	
TP		
TSS		

BASELINE YEAR DETAILS	
TMDL Baseline Year Available on TMDL Data Center WLA Search	2009
Implementation Plan Baseline Year If different from TMDL Baseline year, provide explanation in write-up	2009
Impervious Acres in Implementation Baseline Year	75
Pervious Acres in Implementation Baseline Year	74

REDUCTIONS REQUIRED UNDER THE TMDL	
Required reduction % for TN	
Required reduction % for TP	
Required reduction % for TSS	24.0%
Available on TMDL Data Center WLA Search	

				Scenario Name:	**Baseline Year**	**Progress Fiscal Year**			**2020 Q2**	**Target Year**			**2035**	
					2009	Progress Reductions				Future Reductions				
							Reductions achieved between 2009 and 2020 Q2				Planned reductions from 2020 Q2 to 2035			
		BMP Name	**Type**	**Unit**	BMPs installed before 2009	BMPs installed from 2009 to 2020 Q2	TN lbs/year	TP lbs/year	TSS lbs/year	BMPs planned for installation from 2020 Q2 to 2035	TN lbs/year	TP lbs/year	TSS lbs/year	BMP Total
Runoff Reduction Practices	Runoff Reduction (RR) Practices	**Non-Specified RR**	**Cumulative**	Impervious Acres Treated										-
				Pervious Acres Treated										-
		Rain Gardens	Cumulative	Impervious Acres Treated										-
				Pervious Acres Treated										-
		Bioswales	Cumulative	Impervious Acres Treated										-
				Pervious Acres Treated										-
		Grass Swales	Cumulative	Impervious Acres Treated	1.9									1.9
				Pervious Acres Treated	2.2									2.2
		Permeable Pavement	Cumulative	Impervious Acres Treated										-
				Pervious Acres Treated										-
		Urban Filtering Practices (RR)	Cumulative	Impervious Acres Treated										-
				Pervious Acres Treated										-
		Urban Infiltration Practices	Cumulative	Impervious Acres Treated										-
				Pervious Acres Treated										-
	Stormwater Treatment (ST) Practices	**Non-Specified ST**	**Cumulative**	Impervious Acres Treated						10.4			3,777.2	10.4
				Pervious Acres Treated						15.6				15.6
		Urban Filtering Practices (ST)	Cumulative	Impervious Acres Treated										-
				Pervious Acres Treated										-
		Convert Dry Pond to Wet Pond	Cumulative	Impervious Acres Treated	n/a									-
				Pervious Acres Treated	n/a									-
		Dry Detention Ponds and Hydrodynamic Structures	Cumulative	Impervious Acres Treated		n/a				n/a				
				Pervious Acres Treated		n/a				n/a				
		Dry Extended Detention Ponds	Cumulative	Impervious Acres Treated		n/a				n/a				
				Pervious Acres Treated		n/a				n/a				
		Wet Ponds and Wetlands	Cumulative	Impervious Acres Treated										-
				Pervious Acres Treated										-

Alternative Practices	Alternative BMP Classifications	Street Sweeping	Annual **	Acres swept										-
		Pipe Cleaning	Annual **	Dry tons removed		0.4			122.0					0.4
		Inlet Cleaning	Annual **	Dry tons removed		0.1			44.1					0.1
		Impervious Urban Surface Elimination	Cumulative	Impervious Acres converted to pervious										-
		Urban Tree Planting	Cumulative	Acres planted on pervious		1.8			89.8	8.2			320.9	10.0
		Urban Stream Restoration	Cumulative	Linear feet restored										-
		Outfall Stabilization	Cumulative	Linear feet						730.8			10,962.0	730.8
				REDUCTIONS:		**TOTAL**	**0**	**0**	**256**	**TOTAL**	**0**	**0**	**15,060**	

* The acres and reductions in these scenarios should reflect restoration BMPs only. They should not include BMPs on new development that occurred following the implementation plan baseline year.

** Annual practice. Implementation should only include additional efforts beyond the previous scenario. So if 10 miles were swept in the baseline year, and 25 miles were swept in 2009, the 2009 scenario would show 15 miles along with the incremental additional load reduction from that increased effort. The mileage swept in the Target Year will equal the sum of the mileages from the Baseline, 2009, Current and Target Year scenarios. Any decrease in effort will require a negative mileage to be entered.

*** Provide a justification in the write-up for load reductions claimed from this practice

**** Note on redevelopment: load reductions from redevelopment projects should be represented by the specific types of treatment instituted at the redevelopment project in the upland treatment BMPs section. This also assumes no prior treatment at the redevlopment site.

Treated Baseline Load		
TN	TP	TSS
		55,514
This represents the load from the watershed at the baseline year of the implementation plan		

TMDL Reductions		
TN	TP	TSS
0.0%	0.0%	24.0%
From top of worksheet		

Current Load		
TN	TP	TSS
0	0	55,258
This represents the load from the watershed at the time the implementation plan was developed		

Load under full implementation		
TN	TP	TSS
0	0	40,198
This represents the load from the watershed in the year that the plan is fully implemented		
meets TMDL	Legend	Does not meet TMDL

Target Load		
TN	TP	TSS
0	0	42,191
This represents the load that must be achieved when the plan is fully implemeted. It is equal to the baseline reduction times the inverse of the required reduction %		

Notes

- Refer to *MDOT SHA Restoration Modeling Protocol* for a detailed description of modeling methodology.
- For local TMDL watersheds with multiple pollutant listings, treatment and load reductions are presented in separate summary sheets due to varying TMDL baseline years.
- Loading rates have been calculated at the most detailed level feasible: the land-river segments from the Chespeake Bay model / MAST P5.3.2. Therefore, Loading Rates for Untreated Land are not provided in this summary sheet because impervious/pervious rates vary by land-river segment.
- Accurate MDOT SHA data for 2009 land use is unavailable; so baseline loads will be modeled using 2011 land use. This is likely to overstate the amount of land area and imperviousness compared to the TMDL analysis, which will lead to a higher restoration requirement; in other words, a conservative approach. Baseline load reductions are calculated from BMPs constructed prior to TMDL baseline year.
- Instead of presenting reductions between baseline year and permit issuance year, MDOT SHA is presenting FY2020 Quarter 2 progress reductions which are defined as reductions achieved between baseline year and December, 31, 2019.

ABBREVIATIONS

AA	Anne Arundel (County)
AA-DPW	Anne Arundel County, Department of Public Works
BMP	Best Management Practice
CBPWM	Chesapeake Bay Program Watershed Model
CWA	Clean Water Act
EPA	United States Environmental Protection Agency
ESD	Environmental Site Design
GIS	Geographic Information System
LA	Load Allocations
lbs	Pounds (weight)
MD	Maryland
MDE	Maryland Department of the Environment
MDOT SHA	Maryland Department of Transportation State Highway Administration
MOS	Margin of Safety
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
OED	Office of Environmental Design (MDOT SHA)
PCB	Polychlorinated Biphenyl
ROW	Right-of-Way
SW	Stormwater
SWM	Stormwater Management
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
USGS	United States Geological Survey
WLA	Wasteload Allocation
WPD	Water Programs Division (MDOT SHA)
WQSs	Water Quality Standards
yr	Year