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Prince George's County
DEPARTMENT OF THE
ENVIRONMENT

December 30, 2015

Restoration Plan for PCB-Impacted Water Bodies in Prince George's County

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Prepared for:
Prince George's County, MD
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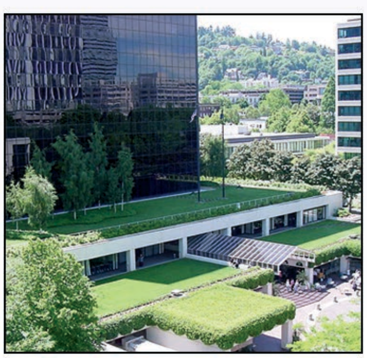

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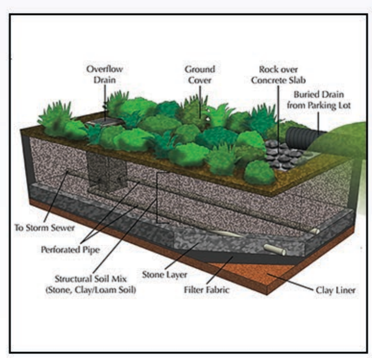

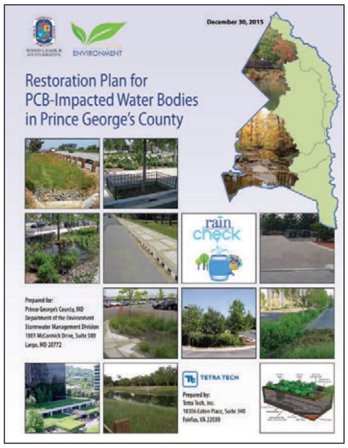

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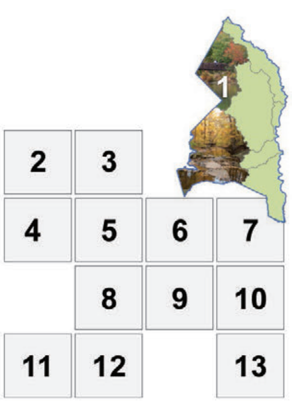

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Acronym List

B-IBI	Benthic Index of Biotic Integrity
BMP	best management practice
BOD	biochemical oxygen demand
CBP	Chesapeake Bay Program
CIP	Capital Improvements Program
COMAR	Code of Maryland Regulations
CWP	Clean Water Partnership
DO	dissolved oxygen
DoE	[Prince George's County] Department of the Environment
DPIE	Department of Permitting, Inspection, and Enforcement
DPW&T	[Prince George's County] Department of Public Works and Transportation
EPA	U.S. Environmental Protection Agency
ESD	environmental site design
GIS	geographic information system
HOA	homeowner association
JBA	Joint Base Andrews
LA	load allocation
lb	pound
MAST	Maryland Assessment and Scenario Tool
MDE	Maryland Department of the Environment
MDP	Maryland Department of Planning
mg/L	milligrams per liter
mL	milliliters
M-NCPPC	Maryland-National Capital Park and Planning Commission
MOS	margin of safety
MPN	most probable number
MS4	municipal separate storm sewer system
MWCOG	Metropolitan Washington Council of Governments
NEB	Northeast Branch
NWB	Northwest Branch
NPDES	National Pollutant Discharge Elimination System
PCB	Polychlorinated biphenyl
P3	Public-Private Partnership Program
ROW	right-of-way
SSO	sanitary sewer overflow
SWM Program	Stormwater Management Program
SWMM	Storm Water Management Model
SWPPP	stormwater pollution prevention plans

TMDL	total maximum daily loads
TNI	Transforming Neighborhoods Initiative
TSS	total suspended solids
UMCES	University of Maryland Center for Environmental Science
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WECR	Watershed Existing Conditions Report
WIP	Watershed Implementation Plan
WLA	wasteload allocation
WSSC	Washington Suburban Sanitary Commission
WTM	Watershed Treatment Model

1 INTRODUCTION

On January 2, 2014, the Maryland Department of the Environment (MDE) issued Prince George's County (the County) a new municipal separate storm sewer system (MS4) permit. An MS4 is a series of stormwater sewers owned by a municipal entity (e.g., the County) that discharges the conveyed stormwater runoff into a water body (e.g., Northeast Branch). The County's new MS4 permit requires that the County develop local restoration plans to address each U.S. Environmental Protection Agency (EPA)-approved total maximum daily load (TMDL) with stormwater wasteload allocations (WLAs). A TMDL can be seen as a *pollution diet* in that it is the maximum amount of a pollutant that a water body can assimilate and still meet water quality standards and designated uses. As a result of the County's new MS4 permit, restoration plans are being developed for all water bodies in the County that are subject to TMDL WLAs associated with the MS4 system. The County's MS4 system has been assigned polychlorinated biphenyl (PCB) WLAs for in the Anacostia River, Mattawoman Creek, Piscataway Creek, and Potomac River watersheds. The locations of these four watersheds are shown in Figure 1-1, and described below.

The Anacostia River watershed is in the northwestern portions of the County, as well as portions of Montgomery County and the District. In Maryland, it includes the municipalities of Berwyn Heights, Bladensburg, Brentwood, Capital Heights, Cheverly, College Park, Colmar Manor, Cottage City, Edmonston, Fairmount Heights, Glenarden, Greenbelt, Hyattsville, Landover Hills, Mount Rainier, New Carrollton, North Brentwood, Riverdale Park, Seat Pleasant, and University Park. The watershed contains a large area of federal land (Beltsville Agricultural Research Center and Greenbelt Park) and state-owned land (University of Maryland).

Mattawoman Creek consists of a 23-mile nontidal river flowing through Prince George's and Charles counties, and a tidal-freshwater estuary in Charles County. The stream runs through a broad floodplain within the Maryland coastal plain and southwest into the Mattawoman Creek estuary, which drains into the Potomac River. In the County, the estuary includes the drainage areas north of Mattawoman Creek, which is about one-fourth of the entire watershed.

The Piscataway Creek watershed lies in the southwestern portions of the County. Because of its rural nature, the watershed does not contain any incorporated municipalities. It does include the communities of Clinton, Camp Springs, and Woodyard, as well as many subdivisions and rural farmettes. The watershed also contains a large area of federal land (Joint Base Andrews [JBA], Law Enforcement Training Center) and some Maryland National-Capitol Park Planning Commission (M-NCPPC) parks.

The Potomac River watershed stretches from West Virginia to the Chesapeake Bay, draining portions of West Virginia, Virginia, Maryland, Pennsylvania, and Washington, DC. From its confluence with the Anacostia River, the Potomac River flows from north to south along the western border of southern Prince George's County. In the County, areas draining to the Potomac River extend from northeast to southwest, with Andrews Air Force Base at the northeastern-most corner and the Charles County line in the southwest. Intersecting the Potomac River drainage area in the County is Piscataway Creek. Communities within the County's Potomac River drainage area include Suitland, Morningside, Temple Hills, and Forest Heights.

Figure 1-1. Location of the Anacostia River, Mattawoman Creek, Piscataway Creek, and Potomac River watersheds.

1.1 Purpose of Report and Restoration Planning

1.1.1 What is a TMDL?

Section 303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (codified at Title 40 of the *Code of Federal Regulations* Part 130) require states to develop TMDLs for impaired water bodies. TMDLs provide the scientific basis for a state to establish water quality-based controls to reduce pollution from both point and nonpoint sources to restore and maintain the quality of the state's water resources (USEPA 1991).

A TMDL (pollution diet) establishes the amount of a pollutant that a water body can assimilate without exceeding its water quality standard for that pollutant and is represented as a mass (e.g., pound) per unit of time (e.g., day). The mass per unit time is called the load. For instance, a TMDL could stipulate that a maximum load of 1,000 pounds of sediment per day could be discharged into an entire stream. The pollution diet for a given pollutant and water body is composed of the sum of individual WLAs for point sources and load allocations (LAs) for nonpoint sources and natural background levels. In addition, the TMDL must include an implicit or explicit margin of safety (MOS) to account for the uncertainty in the relationship between pollutant loads and the quality of the receiving water body. The TMDL components are illustrated using the following equation:

$$\text{TMDL} = \Sigma \text{ WLAs} + \Sigma \text{ LAs} + \text{MOS}$$

A WLA is the portion of the overall pollution diet that is assigned to permitted dischargers, such as the County's MS4 stormwater system. The County's new MS4 permit requires that the County develop local restoration plans to address each EPA-approved TMDL with stormwater WLAs, in this case for PCBs.

Figure 1-2 shows a generalized TMDL schematic. A TMDL identifies the maximum amount of pollutant load that the water body can receive and still meet applicable water quality criteria. The bar on the left represents the current pollutant load (sometimes called the baseline) that exists in a water body before a TMDL is developed. The elevated load causes the water body to exceed water quality criteria. The bar on the right represents the amount that the pollutant load will need to be reduced for the water body to meet water quality criteria. Another way to convey the required load reduction is by identifying the *percent reduction* needed. Table 1-1 presents the percent reductions—as presented on MDE's *TMDL Data Center* website (MDE 2014d)—required for the PCB-impacted water bodies in the County to meet criteria.

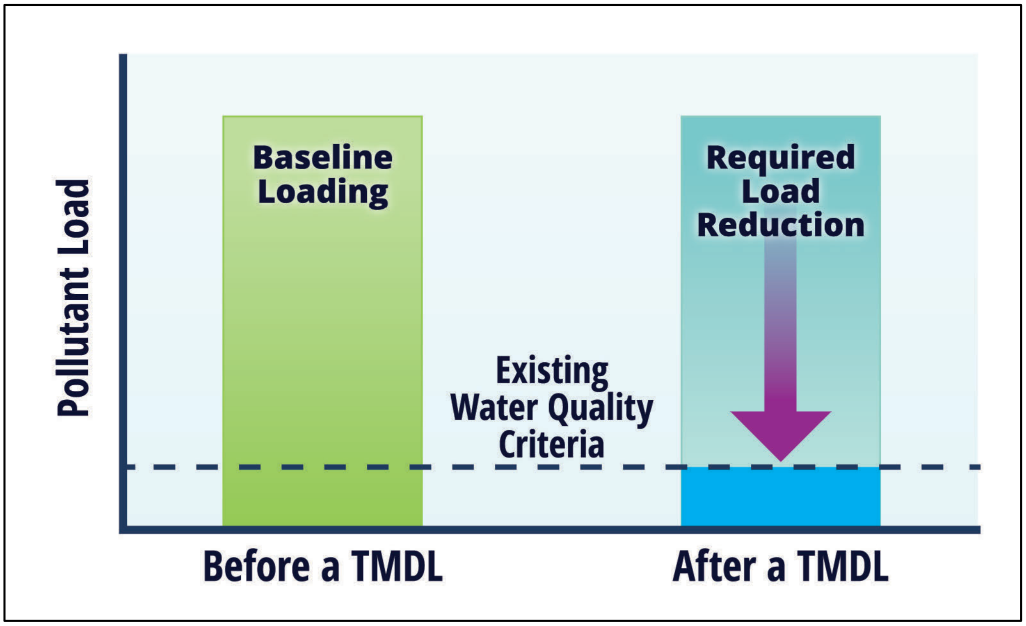


Figure 1-2. Schematic for typical pollution diet (TMDL).

Table 1-1. Required percent reductions to stormwater for PCBs in impacted watersheds in Prince George's County

Water Body	Percent Reduction to Stormwater
Anacostia River (nontidal)	Northeast Branch: 98.64% Northwest Branch: 98.1%
Anacostia River (tidal)	Varies by water body (5%–99%)
Mattawoman Creek	42.5%
Piscataway Creek	Varies by water body (5%–33%)
Potomac River	Varies by water body (5%–99%)

1.1.2 What is a Restoration Plan?

A restoration plan is a strategy for managing the natural resources within a geographically defined watershed. For the County's Department of the Environment (DoE), this means managing urban stormwater (i.e., runoff originating from rain storms) to restore and protect the County's water bodies. Stormwater management is most effective when viewed in the watershed context—watersheds are land areas and their network of creeks that convey stormwater runoff to a common body of water. Successful stormwater management consists of both structural practices (e.g., vegetated roadway swale) and public outreach (e.g., education) at both the public and private levels. The restoration plan development process will address changes that are needed to the County's priorities to comply with water quality regulations, to improve the health of the streams in the County, and to create value for neighborhoods in the County's watersheds.

The overall goals of restoration planning are to:

- Protect, restore, and enhance habitat in the watershed.
- Restore watershed functions, including hydrology, water quality, and habitat, using a balanced approach that minimizes negative impacts.
- Support compliance with regional, state, and federal regulatory requirements.
- Increase awareness and stewardship within the watershed, including encouraging policymakers to develop policies that support a healthy watershed.

This document (the plan) represents the first stage in achieving these goals. This plan is not meant to be a site-level planning, but rather focuses on watershed-based planning. For the Anacostia River, Mattawoman Creek, Piscataway Creek, and Potomac River watersheds, the restoration planning process began with the development of watershed-specific *Watershed Existing Conditions Report* (WECR) for each watershed that reviewed available data and began the process of identifying the causes and sources of pollution. The restoration planning process seeks to:

- Identify causes and sources of pollution.
- Estimate pollutant load reductions.
- Describe management options and identify critical areas.
- Estimate technical and financial assistance needed.
- Develop an education component.
- Develop a project schedule.
- Describe interim, measurable milestones.
- Identify indicators to measure progress.
- Develop a monitoring component.

The plan presents this information in six major sections:

- *Section 2 Watershed Characterization* summarizes the information from the WECR and identifies the causes and sources of pollution.
- *Section 3 Restoration Plan Goals and Objectives* outlines the specific goals and objectives for the Anacostia, Mattawoman, Piscataway and Potomac watersheds and describes the annual PCB load reduction estimates needed to meet the goals and objectives.
- *Section 4 Current Management Activities* identifies the current pollution-reduction activities that the County has installed, the County's programmatic initiatives, and the estimated pollutant load reduction from these activities.
- *Section 5 Strategy Development* documents the approach for identifying and prioritizing management options.
- *Section 6 Implementation Plan* provides details on the proposed management activities, estimated costs, and load reductions, and outlines the proposed schedule, funding and technical resources, and public involvement process for implementation.

- *Section 7 Tracking and Adaptive Management* outlines the approach for tracking and monitoring implementation progress and adaptive management.

1.2 Impaired Water Bodies and TMDLs

MDE has included the Anacostia River, Mattawoman Creek, Piscataway Creek, and Potomac River and their tributaries on its section 303(d) list of impaired streams. Table 1-2 displays the pollutants for which these water bodies are listed and the years that TMDLs were developed to address those listings. In addition, EPA recently (2010) developed an overall TMDL for the Chesapeake Bay watershed for nitrogen, phosphorus, and sediment. The County has developed a Watershed Implementation Plan (WIP) in response to the Chesapeake Bay TMDL (PGC DER 2012b).

Table 1-2. TMDLs developed for PCB-impacted watersheds in Prince George's County

Pollutant	Watershed	Listing Year	TMDL Year
Toxics (polychlorinated biphenyls [PCBs])	Anacostia (nontidal)	2002	2011
PCBs in fish tissue in tidal waters	Anacostia (tidal)	2006	2007
	Potomac (tidal)	2002	2007
Sediment	Anacostia (tidal and nontidal)	1996	2008
Nutrients	Anacostia (tidal and nontidal)	1996	2008
	Mattawoman	1996	2004
Fecal coliform bacteria	Anacostia (nontidal)	2002	2006
	Anacostia (tidal)	2004	2006
	Piscataway	2002	2007
Trash and debris	Anacostia (nontidal)	2006	2010
	Anacostia (tidal)	2006	2010

This restoration plan addresses the TMDLs for PCBs. Plans for trash (EA 2014), nutrients, sediment, and fecal coliform bacteria (Tetra Tech 2015a, 2015b, 2015c) are addressed in separate plans.

1.2.1 Water Quality Standards

Maryland classifies its streams according to the following eight different Use codes (*Code of Maryland Regulations* [COMAR] 26.08.02.08 O):

- Use Class I: Water Contact Recreation, and Protection of Nontidal Warmwater Aquatic Life
- Use Class I-P: Water Contact Recreation, Protection of Aquatic Life, and Public Water Supply Use Class II: Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting
- Use Class II: Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting
- Use Class II-P: Tidal Fresh Water Estuary

- Use Class III: Nontidal Cold Water
- Use Class III-P: Nontidal Cold Water and Public Water Supply
- Use Class IV: Recreational Trout Waters
- Use Class IV-P: Recreational Trout Waters and Public Water Supply

According to the *Code of Maryland Regulations* [COMAR] 26.08.02.08 O, portions of the Anacostia River are coded as Use Classes I, II, III, and IV. The Mattawoman Creek watershed is designated as Use Class I. Piscataway Creek's designated uses are Use Class I in the mainstem and tributaries, and Use Class II in the open water downstream portion. The County's portion of the Potomac River watershed is Use Class II for the mainstem of the Potomac River and embayments, while its tributaries in the County are designated as Use Class I.

Maryland's General Water Quality Criteria states that "the waters of this State may not be polluted by…any material, including floating debris, oil, grease, scum, sludge and other floating materials attributable to sewage, industrial waste, or other waste in amounts sufficient to be unsightly; produce taste or odor; change the existing color to produce objectionable color for aesthetic purposes; create a nuisance; or interfere directly or indirectly with designated uses" [COMAR 26.08.02.03B(2)]. Specific water quality criteria also apply for PCBs. Water quality criteria for toxic substances are found in COMAR 26.08.02.03-2 (*Numerical Criteria for Toxic Substances in Surface Waters*). The PCB human health criterion for consumption of organism and drinking water is 0.00064 micrograms per liter (µg/L), while the aquatic life criterion for freshwater is 0.014 µg/L, and for salt water is 0.03 µg/L. The Maryland impairment threshold for PCBs in fish tissue is 88 parts per billion (ICPRB 2007).

1.2.2 Problem Identification

PCBs are a class of man-made compounds widely used from the 1940s through the 1970s in manufacturing and industrial applications because of their exceptional fire-retardant and insulating properties. They were found to possess certain negative characteristics that led to a ban on their manufacture in the United States in 1979. They have been demonstrated to cause cancer and can negatively affect the immune, reproductive, nervous, and endocrine systems. Other qualities of PCBs make them particularly problematic environmentally. They are hydrophobic and tend to become concentrated in sediment and in fatty tissues of animals. They bioaccumulate and do not break down over time. Small organisms that ingest PCB-contaminated sediment or food are then eaten by larger organisms, contributing to accumulation of PCBs in the tissues of the larger organisms. Consumption of PCB-contaminated fish is a primary pathway of PCB exposure in humans. Although PCBs are no longer manufactured, they continue to exist in the environment and might still be released from legacy pollution through fires or leaks from old PCB-containing equipment, accidental spills, burning of PCB-containing oils, leaks from hazardous waste sites, and so on.

Besides identifying impaired water bodies on the State's Integrated Report, MDE also issues statewide and site-specific fish consumption advisories (ranging from 0 to 4 meals per month) and recommendations (ranging from 4 to 8 meals per month). Current recreational fish consumption advisories suggest limiting the consumption of a number of fish species caught in the Anacostia River and Potomac River due to PCBs (MDE 2014e).

Tidal portions of the Anacostia River and Potomac River have been listed for PCBs in fish tissue. Ambient water column and fish tissue data collected from 2002 to 2007 showed that the existing PCB water quality criteria were not protective of fish tissue concentrations in the tidal Potomac and Anacostia rivers. For the TMDL, target water column concentrations were calculated, using EPA-recommended methods, to be protective of fish tissue concentrations. The TMDLs have assigned load reductions to the tidal and nontidal portions of these streams. In addition, Mattawoman Creek and Piscataway Creek, both of which contribute loads to the tidal Potomac but are not themselves listed as impaired for PCBs, have been assigned load reductions under the TMDL. The PCB impairment in the Northeast Branch (NEB) and Northwest Branch (NWB) of the Anacostia River (nontidal portions) occurred because of exceedance of human health criteria for water column PCBs. It has been estimated that PCBs contaminate 4 percent of the river bottom of the Anacostia River mainstem (MWCOG 2010).

1.2.3 Previous Studies

Several studies related to PCBs and sediment have been developed over the years that characterize the County's PCB-impacted watersheds, possible sources, and implementation activities. Since PCB concentrations in the water column are linked to total suspended solids (TSS) concentrations, sediment-related studies, especially those related to implementation, are important to this effort.

In 2011 the County developed a countywide Chesapeake Bay WIP in response to the 2010 Chesapeake Bay Nutrient and Sediment TMDL. The WIP was finalized in 2012 and laid out a plan for best management practice (BMP) implementation and other restoration activities through 2017 and 2025. In addition to urban stormwater runoff, the WIP covered agricultural practices and upgrades to wastewater systems (i.e., municipal wastewater treatment plants and on-site wastewater systems). Although the WIP addresses all of the County's land areas, many elements of the WIP apply to the PCB-impacted watersheds and will be used to develop the restoration plan. The County's final WIP can be viewed at www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Documents/FINAL_PhaseII_Report_Docs/Final_County_WIP_Narratives/PG_WIPII_2012.pdf.

Anacostia River

Several caged bivalve studies were carried out in the Anacostia River watershed by MDE. In 2005, MDE collected Corbicula fluminea (Asian clams) from a reference site and deployed them in 15 watersheds throughout Maryland, including 4 stations in the Anacostia River watershed (MDE 2005). In 2007, clams were again deployed at 19 stations in the Anacostia watershed. The 2005 data showed that 3 stations had total PCB concentrations 5–13 times that of the reference site. The 2007 data identified a possible hotspot near the Landover Metro station in Lower Beaverdam Creek, with station results at a concentration 338 times higher than the reference site. In 2009, stream surveys were performed in an attempt to bracket the source(s), identifying all storm water influx points 1,100 yards upstream of the possible Landover Metro station hotspot. Two more rounds of sampling in the Lower Beaverdam Creek area were performed in 2009 and 2010. The high PCB concentrations were attributed to the disturbed land surfaces draining the stormwater system in this area, which has a history of extensive industrial activity and was excavated for new construction in 2007.

Hwang and Foster (2008) investigated the loadings and sources of PCBs in the Anacostia River watershed's stormwater runoff by collecting storm and baseflow samples in six branches for the period April–August 2002. Analysis suggested that PCB levels were up to 80 times higher for storm flow than base flow, and that more than 90 percent of total PCB loading is associated with sediment particle transport. In addition, the results suggested that Lower Beaverdam Creek is a larger source than NEB and NWB.

In 2005 the Maryland Department of Natural Resources produced a series of reports on the Anacostia River watershed. These reports include (1) Report on Nutrient Synoptic Surveys in the Anacostia River Watershed, Prince George's County, Maryland, April, 2004 as part of a Watershed Restoration Action Strategy; (2) Anacostia River Stream Corridor Survey; and (3) Characterization of the Anacostia River Watershed in Prince George's County.

The first report looked at data collected during 2004 in the watershed at multiple stations. The report describes a study that found that nutrients did not appear to be a significant problem at that time; however, there were issues with low dissolved oxygen (DO) concentrations. The second report describes a survey that assessed the conditions of the stream channels by looking at several factors such as inadequate stream buffers, channel alterations, trash dumping, exposed pipes and pipe outfalls, and erosion. The last report was an earlier watershed characterization that covers several similar topics to this report.

Mattawoman Creek

The Smithsonian Environmental Research Center (SERC) performed a study in 2000 that focused on nutrient and sediment dynamics in the Mattawoman Creek watershed. SERC performed long-term monitoring within this creek and adjacent watersheds to support this study. The study's primary goal was to characterize the existing conditions and project water quality conditions for several future development scenarios.

The state of Maryland published its Phase I WIP in December 2010 for major basins including Mattawoman Creek. A primary goal was to identify target pollutant load reductions to be achieved by various sources and geographic areas within the state. MDE also published a Phase II WIP in October 2012, which contained detailed plans for meeting the TMDL, including target loads for various counties and the city of Baltimore, for which the individual jurisdictions were responsible. These included municipal WWTPs, urban stormwater, and septic system loads. Baseline loads and reduction targets for these types of loads were identified, along with the targets for agriculture and atmospheric deposition.

The U.S. Army Corps of Engineers (USACE, Baltimore District) developed a watershed management plan for Mattawoman Creek in 2003, in association with Charles County. The USACE Engineer Research and Development Center developed a Hydrological Simulation Program in Fortran (HSPF) model of this watershed. The Baltimore District used this calibrated model to evaluate the water quality impacts of various land use and management practices. The study recommendations included implementing low-impact design techniques to minimize the amount of impervious surfaces in new developments, and examining stormwater retrofit opportunities in existing developments (especially small-scale housing and commercial areas).

MDE developed a comprehensive watershed report in March 2014 (MDE 2014f) to document the biological impairment of the Mattawoman Creek watershed in Charles and Prince George's counties through a biological stressor identification analysis, which uses a case-control, risk-based approach to systematically and objectively determine the predominant cause of reduced biological conditions, thus enabling MDE to effectively direct corrective management action(s). Some key findings of this study are (a) the biological communities in this watershed are likely degraded because of acidity-related stressors caused by atmospheric deposition and natural conditions in areas where the geology has little buffering capacity; (b) the biological communities are likely degraded because of inorganic pollutants (i.e., chlorides), that typically show increasing trends with urbanization and can be seasonal (e.g., salt application in winter); (c) sediment, in-stream habitat, or riparian habitat stressors were identified to be present and/or showing a significant association with degraded biological conditions; and (d) no nutrient stressors were present and/or nutrient stressors showing a significant association with degraded biological conditions.

Piscataway Creek

In 2008 the County commissioned a state-of-the-art watershed analysis of Piscataway Creek entitled *Piscataway Watershed Assessment 2008/2009*. This analysis included several reports relevant to the current study: (1) *TASK 2.A. Land Use Analysis Final Report,* (2) *TASK 2.B. Flow Duration Analysis Final Report, and* (3) *TASK 2.G. Pollutant Loading Analysis Final Report.* The findings of these reports were summarized in the *Piscataway Creek Watershed Characterization 2011,* prepared by the County.

The first report was a thorough land cover analysis that not only characterized the impervious and pervious land covers, but also determined how much impervious area was connected directly to stormwater outfalls through a stormwater network and how much was disconnected impervious area that drains to adjacent turf or field areas.

The second report presented the results of a detailed Stormwater Management Model (SWMM) study that used aquifers to partition runoff into overland and subsurface flow regimes. This model was calibrated to the U.S. Geological Survey (USGS) gauge 1653600 for the 2000 water year, which included Hurricane Floyd. A salient finding of that study was that disconnection was a very important component of the water balance. This study showed great variations in stream power depending upon the extent of connected impervious areas.

The third report used the SWMM partitioning of overland runoff as opposed to subsurface flows to project cumulative pollutant loads. Because many particulate pollutants such as TSS, particulate phosphorus, particulate nitrogen, and fecal coliform are filtered by the soil profile, the runoff volumes conveyed by disconnected pathways are substantially attenuated. By accounting for these variables, the final pollutant loading analysis highlighted major differences in the type and volume of pollutant loads.

Potomac River

Numerous studies and reports have been completed that address the entire Potomac River watershed or subsections of the watershed. An example is the *Maryland Tributary Strategy Middle Potomac River Basin Summary Report for 1985–2005 Data*, which includes the County's portion of the Potomac River drainage area. However, such reports do not address the County's drainage area specifically and are therefore not summarized as part of this effort.

2 WATERSHED CHARACTERIZATION

This section provides a general characterization of the watershed. The main purpose of this section is to give the reader an understanding of different conditions in the watershed. Additional details on watershed characterization can be found in the following reports:

- Anacostia River Watershed Existing Conditions Report (Tetra Tech 2014a)
- Mattawoman Creek Watershed Existing Conditions Report (Tetra Tech 2014b)
- Piscataway Creek Watershed Existing Conditions Report (Tetra Tech 2014c)
- Potomac River Watershed Existing Conditions Report (Tetra Tech 2014d)

2.1 General

Anacostia River

The mainstem of the Anacostia River is 8.4 miles long, beginning at the confluence of the NWB and the NEB and ending at the Potomac River in the District. The Anacostia River watershed spans both Maryland and the District. The nontidal reaches are predominantly in Prince George's and Montgomery counties in Maryland. The lower, tidal portions are mostly in the District; however, a portion of the tidal mainstem extends into the County. The watershed is 173 square miles, 145 of which are in Maryland. In Maryland, the Anacostia River is classified as a *Wild and Scenic River*. The major drainages in the County include NEB, NWB, Lower Beaverdam Creek, Watts Branch, and the tidal drainage.

Mattawoman Creek

Mattawoman Creek is a tidally influenced embayment of the Potomac Estuary. The mainstem consists of a 23-mile nontidal river flowing through Prince George's and Charles counties, and a tidal-freshwater estuary in Charles County. Mattawoman Creek estuary drains into the Potomac River. In the County, the estuary includes the drainage areas north of Mattawoman Creek, which is about one-fourth of the entire watershed (Figure 1-1).

The watershed is a mix of forests, wetlands, and suburban development located 12 miles south of Washington, DC. The urbanization of forests and farmland has altered the watershed's character, especially in the headwaters. The stream runs through a broad floodplain within the Maryland coastal plain and southwest into the Mattawoman Creek estuary, which drains into the Potomac River.

Piscataway Creek

The mainstem of the Piscataway Creek is 18.2 miles long, beginning at JBA and ending at the Potomac River below Washington, DC, across from Mt. Vernon. The watershed is 67.6 square miles. Historically a predominately forested watershed, agriculture dominated through the late 1800s, after which time urbanization began to replace agricultural land uses. Currently, the northern portion of the watershed is almost fully developed and includes JBA and the communities of Clinton and Camp Springs, as well as widespread medium- and low-density residential development. The land use to the south is mostly forested, with some open and row-crop agricultural land. There is extensive low-density residential development, with some commercial and light industrial. Butler Branch (a tributary to Piscataway Creek) flows through Louise F. Cosca Regional Park and forms a lake within the park. To the south, the land is more forested and agricultural, but is being encroached by many new home estates. To the south along Indian Head Highway (Route 210) there is extensive suburban development.

Potomac River

From its confluence with the Anacostia River, the Potomac River flows from north to south along the western border of southern Prince George's County (Figure 1-1). In the County, areas draining to the Potomac River extend from northeast to southwest, with Andrews Air Force Base at the northeastern-most corner and the Charles County line in the southwest. Intersecting the Potomac River drainage area in the County is Piscataway Creek. Communities within the County's Potomac River drainage area include Suitland, Morningside, Temple Hills, and Forest Heights.

2.2 Hydrology

Weather is an important factor in the hydrology of a region and is the driving factor in stormwater runoff. For the County, the National Weather Service Forecast Office (2014b) reports a 30-year average annual precipitation of 39.74 inches. No strong seasonal variation in precipitation exists. On average, winter is the driest with 8.48 inches, and summer is the wettest with 10.44 inches (National Weather Service Forecast Office 2014a). Evapotranspiration accounts for water that evaporates from the land surface (including water bodies) or is lost through plant transpiration. Evapotranspiration varies throughout the year because of climate, but is greatest in the summer. Potential evapotranspiration (Table 2-1) is the environmental demand for evapotranspiration.

Table 2-1. Average monthly (1975–2004) potential evapotranspiration (inches)

January	February	March	April	May	June
0.60	0.86	1.69	2.74	3.86	4.30
July	**August**	**September**	**October**	**November**	**December**
4.59	4.01	2.85	1.88	0.98	0.62

Source: Northeast Regional Climate Center (NRCC) 2014

Anacostia River

The Anacostia River watershed is composed of 15 named water bodies: NWB, Sligo Creek, Paint Branch, Little Paint Branch, Indian Creek, Upper Beaverdam Creek, Still Creek, Brier Ditch, NEB, Lower Beaverdam Creek, Watts Branch, Fort Dupont Tributary, Pope Branch, Hickey Run, and the tidal river. With the exception of Hickey Run, Fort Dupont Tributary, and Pope Branch, all of the subwatersheds have a portion in the County. The majority of the land in the watershed is drained by MS4 outfalls. In the Maryland portion of the watershed, 9,500 acres drain directly to the Anacostia River and tributaries, and the remaining 82,600 acres are drained via MS4 outfalls. The County has 44,000 acres of MS4 drainage (MDE and DDOE 2010). The tributary system of the Anacostia River is described as flashy, meaning there is a quick rise in stream level because of rainfall (MWCOG 2010). The flashiness can be attributed to the large proportion of developed and impervious land surfaces.

Mattawoman Creek

The Mattawoman Creek watershed is made up of nine subwatersheds in accordance with the Maryland Department of Natural Resource's 12-digit watershed designation. Some of the major tributaries include Harrison Cut, Piney Branch, Old Woman's Run, Laurel Branch, Timothy Branch, and Marbury Run.

Piscataway Creek

The Piscataway Creek watershed is made up of two major subwatersheds. The mainstem of the Piscataway Creek is 18.2 miles long, beginning at JBA and ending at the Potomac River below Washington, DC. It also comprises Tinkers Creek, which is 9.1 miles long, and originates at JBA. There are also several named tributaries to these mainstem creeks. In the Piscataway Creek watershed, these comprise Burch Branch, Butler Branch, Dower House Branch, and many other unnamed tributaries. In Tinkers Creek, these comprise Meetinghouse Branch, Pea Hill Branch, and Haynes Branch. Below the confluence with Tinkers Creek, the Piscataway becomes tidal for 2.8 miles. The creek and its tributaries follow a dendritic pattern, a branching tree-like effect. The main source to the river in the coastal plain is ground water. Because unconsolidated sediments underlie the region, precipitation usually sinks in easily.

The majority of the land in the northern watershed is drained by MS4 outfalls. The tributary system of Tinkers Creek is described as *flashy*, meaning there is a quick rise in stream level due to rainfall as a result of its high proportion of directly connected impervious area. Its streams have storm flow rates many times higher than that from the rural and forested subwatersheds in the southeast.

Potomac River

Within the Potomac River watershed, the largest tributary to the County is Henson Creek, which runs the length of the drainage area from the northeast border near Andrews Air Force Base to the Potomac River at Henson Creek Park. Hunters Mill Branch joins Henson Creek before the Potomac River. The headwaters of Oxon Run flow through the northern portion of the drainage area before it enters the District of Columbia. In the District, Oxon Run is largely channelized.

2.3 Soils

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service has defined four hydrologic soil groups, providing a means for grouping soils by similar infiltration and runoff characteristics during periods of prolonged wetting. Poorly drained clay soils (Group D) have the lowest infiltration rates, resulting in the highest amount of runoff, while well-drained sandy soils (Group A) have high infiltration rates, with little runoff. Soils in the watershed are also frequently classified as "urban land complex" or "udorthent" soils. These are soils that have been altered by disturbance because of land development activities. Soils affected by urbanization can have a higher density because of compaction during construction activities, and might be more poorly drained. Natural pervious land covers on group B soils generate very little runoff compared to that from disturbed soils.

- The majority of the Anacostia River watershed is underlain by hydrologic group B and C soils. Hydrologic soil group A is the least represented in the watershed.
- The Mattawoman Creek watershed is mostly underlain by hydrologic soil group C soils. Hydrologic soil group A is the least represented in the watershed.
- The Piscataway Creek watershed is underlain by hydrologic group C soils, followed by hydrologic group B soils, with hydrologic group A being the least represented.

- The majority of the Potomac River watershed within the County is underlain by hydrologic group C soils followed by B and D soils.

2.4 Land Use and Land Cover

Land use, land cover, and impervious area are some of the most important factors that influence the amount of pollution entering the County's water bodies. Pollutants loadings, such as sediment and PCBs, vary by land use (e.g., commercial, agriculture, and parks). As impervious area increases, so does the amount of runoff a rain event produces, thus transporting more pollutants to a water body in a shorter period of time.

2.4.1 Land Use Distribution

Maryland Department of Planning (MDP) 2010 land use update (MDP 2010) data are available as geographic information system (GIS) data, and are being used in the restoration plan. Land uses are made of many different land covers, such as roads, roofs, turf, and tree canopy. The proportion of land covers in each land use control the hydrologic and pollutant loading response of such uses. Land use is a critical component of PCB source tracking. Identifying areas of the County in which PCB sources are most likely to be present, such as industrial areas or high-density residential areas with a higher number of transformers, relies upon land use information.

Figure 2-1 shows the 2010 MDP land use for the watershed. Table 2-2 summarizes the areas. A summary is provided below for each of the PCB-impacted watersheds.

Anacostia River

The urban area in the watershed is largely residential land (37 percent), with the majority being low-density residential (24 percent). There are also significant areas of forested land (25 percent), institutional land (such as schools, government buildings, places of worship) (9 percent), and commercial/industrial land (12 percent). The large area of institutional land in the central part of the County is the University of Maryland at College Park. The large forest and agriculture area to the northeast is the Beltsville Agricultural Research Center.

Mattawoman Creek

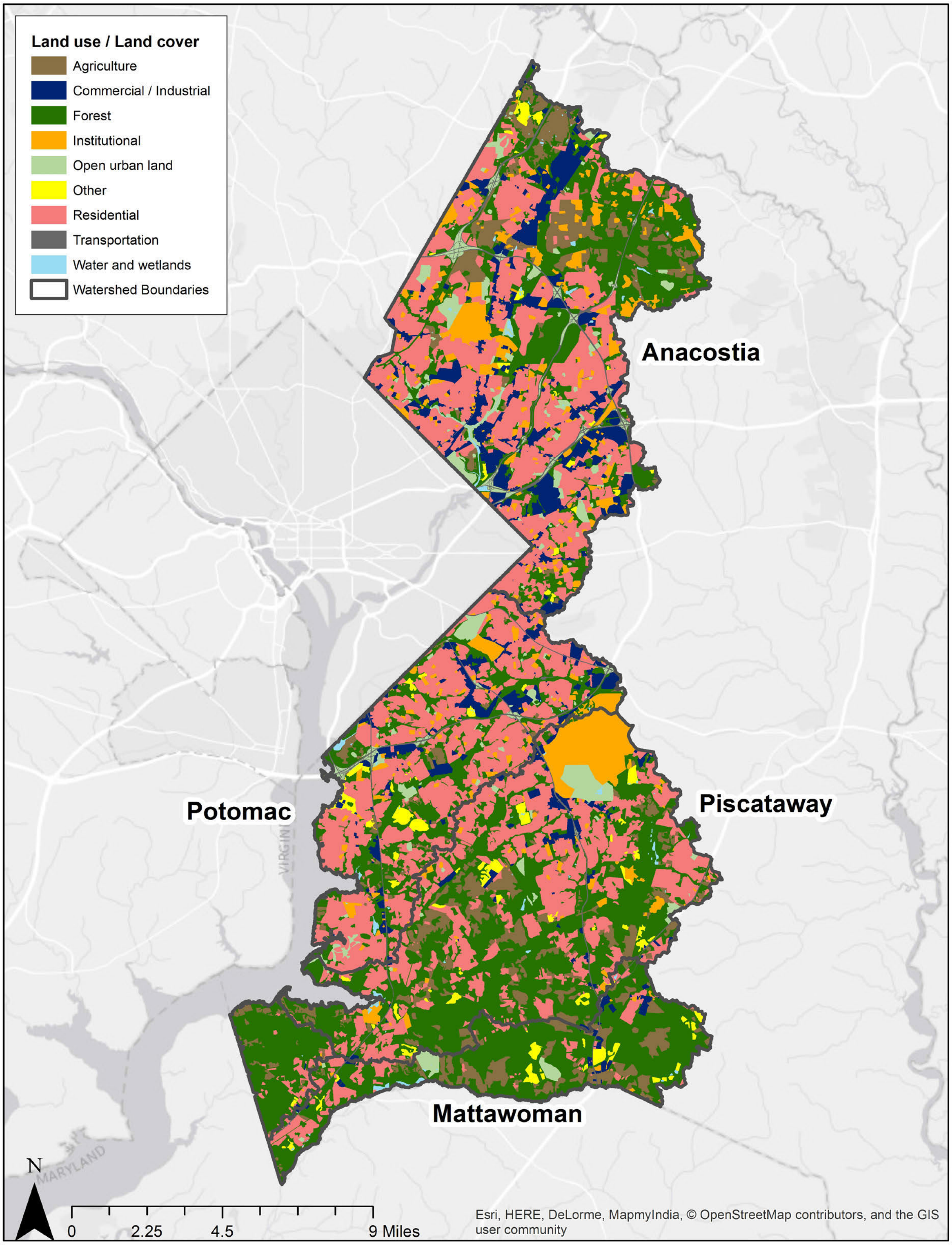
Land cover in the Mattawoman Creek watershed is a mix of urban, suburban, forest, and agricultural uses. The majority of urban and suburban development is seen in the upper subwatersheds—much less in the Prince George's County portion in comparison to the Charles County portion. Forest is the dominant land cover (more than 61 percent), followed by urban and agriculture uses . The urban area in the watershed is largely residential land (62 percent), with the majority being low-density residential (39 percent). However, in terms of the total watershed within the County, the urban land uses constitute about 18 percent. There are also significant areas of forested land (more than 61 percent) and agriculture (16 percent) among the non-urban portion of the County subwatersheds.

Piscataway Creek

The majority of the Piscataway Creek watershed comprises residential development, primarily medium density (less than 0.5-acre lots). The urban area in the watershed is largely residential land (31 percent of the watershed), with the majority being medium-density residential (42 percent of urban land). There are also significant areas of forested land (43 percent); institutional land (such as schools, government buildings, and churches) (8 percent); and commercial/industrial land (2 percent). There is extensive forest along the bottomlands of the mainstem and the lower reaches of Tinkers Creek. Forest and agricultural land uses predominate in the south and in the tidal reaches.

Potomac River

The Potomac River drainage area in the County is primarily urban (62 percent), followed by forest (31 percent). Agriculture is limited in this drainage area (3 percent). Water/wetlands and other land uses (e.g., bare ground or beaches) make up the remaining 3 percent. The urban area in the watershed is largely residential land (72 percent), almost half of which is medium-density residential (46.4 percent). There are also significant areas of forested land (31 percent), institutional land (such as schools, government buildings, and churches) (5 percent), and commercial/industrial land (5 percent).



Source: MDP 2010

Figure 2-1. Land use in the County's PCB-impacted watershed.

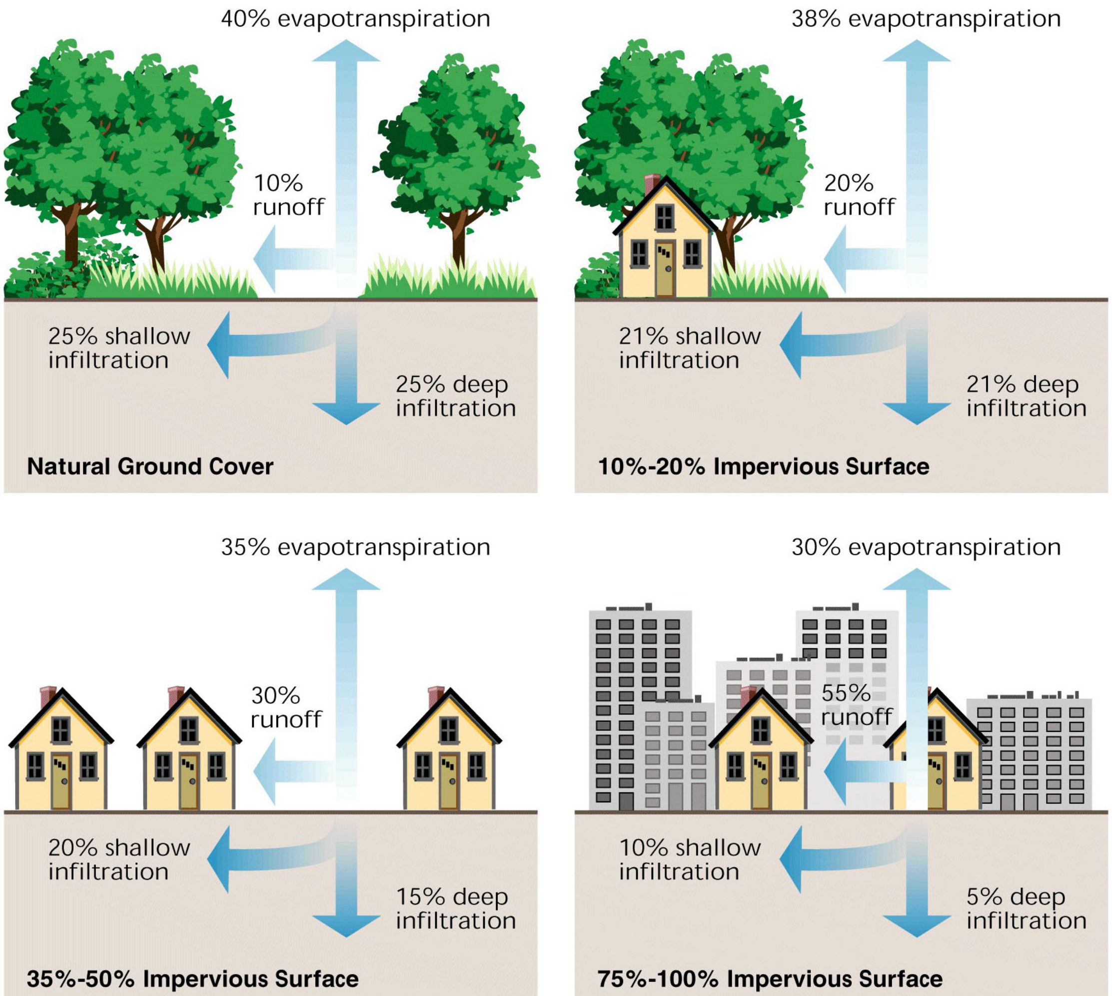
Table 2-2. 2010 MDP land use in Prince George's County's PCB-impacted watersheds

Land Use	Acres	Percent of Total	Percent of Land Use Grouping
Agriculture	**12,561**	**8.52%**	**100.00%**
Agricultural building	124	0.08%	0.99%
Cropland	8,500	5.77%	67.67%
Feeding operations	15	0.01%	0.12%
Large lot subdivision (agriculture)	317	0.22%	2.53%
Orchards/vineyards/horticulture	12	0.01%	0.09%
Pasture	3,546	2.41%	28.23%
Row and garden crops	47	0.03%	0.37%
Forest	**52,561**	**35.65%**	**100.00%**
Brush	1,007	0.68%	1.92%
Deciduous forest	33,677	22.84%	64.07%
Evergreen forest	2,010	1.36%	3.82%
Large lot subdivision (forest)	3,006	2.04%	5.72%
Mixed forest	12,862	8.72%	24.47%
Other	**2,769**	**1.88%**	**100.00%**
Bare ground	2,116	1.44%	76.42%
Beaches	50	0.03%	1.80%
Extractive	603	0.41%	21.78%
Urban	**78,683**	**53.37%**	**100.00%**
Commercial	6,074	4.12%	7.72%
High-density residential	8,863	6.01%	11.26%
Industrial	4,268	2.90%	5.42%
Institutional	10,332	7.01%	13.13%
Low-density residential	9,957	6.75%	12.66%
Medium-density residential	31,890	21.63%	40.53%
Open urban land	5,040	3.42%	6.41%
Transportation	2,258	1.53%	2.87%
Water and wetlands	**856**	**0.58%**	**100.00%**
Water	604	0.41%	70.50%
Wetlands	253	0.17%	29.50%

Source: MDP 2010.

2.4.2 Percent Imperviousness

According to Prince George's County Code, *impervious area* means an area that is covered with solid material or is compacted to the point at which water cannot infiltrate into underlying soils (e.g., parking lots, roads, houses, patios, swimming pools, compacted gravel areas, and so forth) and where natural hydrologic patterns are altered. Impervious areas are important in urban hydrology because the increased paved areas (e.g., parking lots, rooftops, and roads) decrease the amount of water infiltrating into the soils to become ground water (Figure 2-2). Precipitation flows off the impervious area and is shunted quickly to the stream channels in the watershed instead of infiltrating into the ground or reentering the atmosphere through evapotranspiration. During rain events, the increased runoff flow volume not only carries additional pollutants, but it also increases the overall velocity of the runoff and receiving streams. Faster stream flows can erode streambanks, which contributes sediment-associated PCB loading to the water column and makes the water muddy.



Source: Learn NC (http://www.learnnc.org/lp/media/uploads/2010/02/fig3-21.jpg)

Figure 2-2. Example effects on water cycle from increased impervious surfaces.

Impervious areas include several types, including buildings (e.g., roofs), parking lots, driveways, and roads. Each type has different characteristics and contributes to increased runoff and pollutant loadings in different ways. For instance, roads have a higher PCB loading potential to waterways than driveways, because this runoff could include leaks from vehicles carrying PCB containing equipment or waste or transport of PCB-containing sediments by the tires of vehicles that have driven on industrial areas.

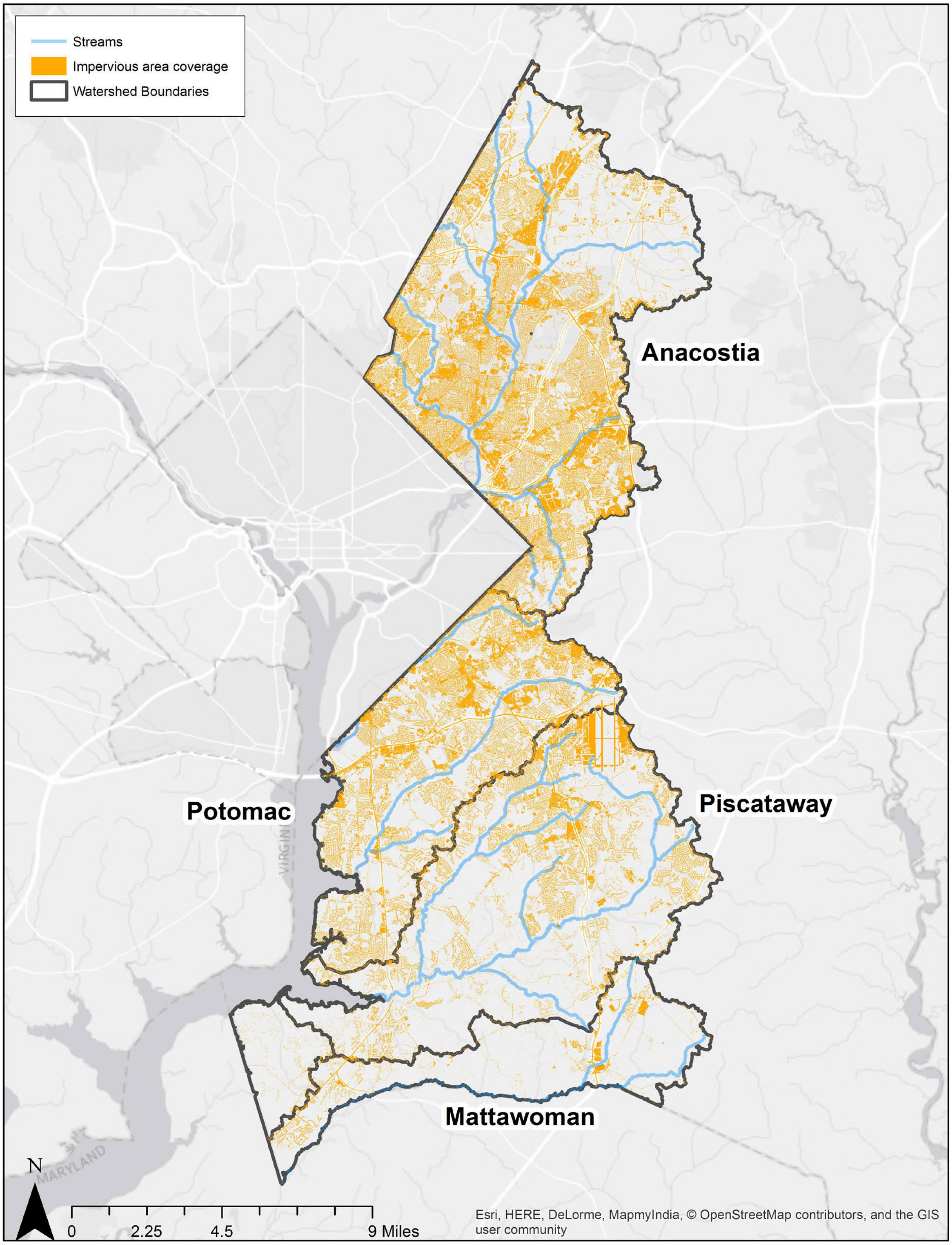
Impervious areas are further classified into two subgroups:, connected and disconnected. On connected impervious land, rainwater runoff flows directly from the impervious surface to stormwater sewers, which in turn flow directly to streams. In disconnected impervious cover areas, rainwater runoff flows over grass, meadows, or forest areas before being intercepted by stormwater sewers, which then flow to streams. Directly connected impervious cover is substantially more detrimental to stream health and quality than disconnected land cover because the highly efficient conveyance system (stormwater pipes) associated with directly connected impervious cover increases the volume and rate of flow and pollutant transport to nearby streams.

Table 2-3 presents the 2009 impervious area information for the PCB-impacted watersheds in the County. These totals include impervious area on state and federal land, as well as outside the MS4 area. The majority of the impervious area in the watershed is composed of roads (28 percent of impervious area), buildings (27 percent of the impervious area), and parking lots (22 percent of the impervious area). Impervious areas are most concentrated in the southwestern portion of the Anacostia and northern and western portions of the Potomac watershed, which corresponds to the location of most of the urban areas. Figure 2-3 shows the extent of impervious area throughout the County's PCB-impacted watersheds.

Table 2-3. Prince George's County PCB-impacted watershed total impervious area

Impervious Type	Area (acres)	Percent of Impervious Area	Percent of Total Watershed Area
Aviation	540.3	1.79%	0.37%
Bridges	91.0	0.30%	0.17%
Buildings	8,086.4	26.83%	14.91%
Driveways	2,508.9	8.32%	4.63%
Gravel surfaces	428.2	1.42%	0.79%
Other	200.6	0.67%	0.37%
Other concrete surfaces	583.7	1.94%	1.08%
Parking lots	6,634.6	22.01%	12.23%
Patios	419.4	1.39%	0.77%
Pools	61.6	0.20%	0.11%
Railroads	8.1	0.03%	0.02%
Roads and highways	8,493.1	28.18%	15.66%
Track and athletic	228.6	0.76%	0.42%
Walkways	1,856.3	6.16%	3.42%
Grand Total	30,141.0	100.00%	55.57%

Source: 2009 impervious area from M-NCPPC 2014.



Source: 2009 impervious area from M-NCPPC 2014.

Figure 2-3. Impervious areas in the County's PCB-impacted watersheds.

2.5 Water Quality and Stream Biology

The TMDL reports provide the water quality information used in their development. These reports were the sole source of PCB water quality data in the County. Table 2-4 presents data summaries for stations within the Anacostia River watershed. Figure 2-4 presents PCB data over time. Levels of total PCBs from data collected on the NWB and the NEB of the Anacostia River appear stable over time. Average values are consistently higher on the NWB site; however, the highest observed value occurred at the NEB site.

Table 2-5 summarizes the PCB data for stations in the Potomac River. The data reflect the results of one sampling event at station NACE_HE_POT in August 1988 in which seven PCB congeners were analyzed, all of which were below the elevated detection limit. There are no PCB water quality data available for the Mattawoman Creek or Piscataway Creek watersheds.

Table 2-4. Summary of available total PCB data in the Anacostia River watershed

Station ID	Station Name/Description	Date		Number of Records	Value (ng/L)		
		Min.	Max.		Min.	Mean	Max.
NWB	Northwest Branch of the Anacostia River	04/13/04	10/07/05	34	0.238	4.30	12.51
NEB0016	Northeast Branch Anacostia River	04/13/04	10/07/05	35	0.10	3.35	15.67

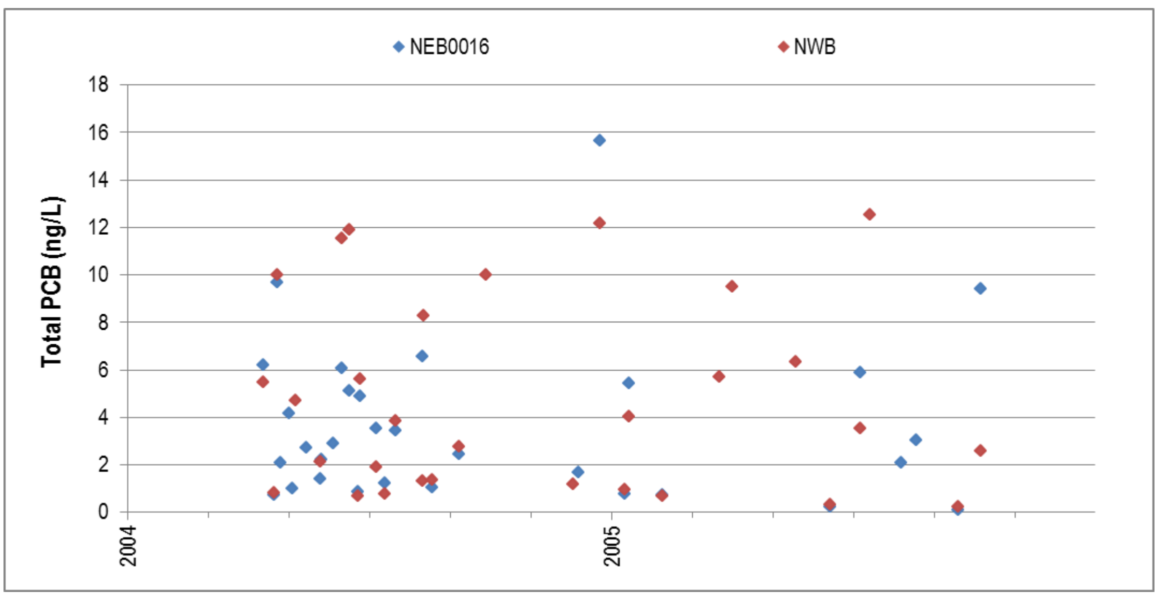


Figure 2-4. Plot of total PCBs over time in the Anacostia River watershed.

Table 2-5. Summary of available PCB data in the Potomac River drainage area

Station ID	Station Name/ Description	Parameter	Date		Number of records	Value (ng/L)		
			Minimum	Maximum		Minimum	Mean	Maximum
NACE_HE_POT	Potomac River West of Rosier Bluff	Aroclor 1016	08/05/88	08/05/88	1	0.100	0.100	0.100
		Aroclor 1221	08/05/88	08/05/88	1	0.100	0.100	0.100
		Aroclor 1232	08/05/88	08/05/88	1	0.100	0.100	0.100
		Aroclor 1242	08/05/88	08/05/88	1	0.100	0.100	0.100
		Aroclor 1248	08/05/88	08/05/88	1	0.100	0.100	0.100
		Aroclor 1254	08/05/88	08/05/88	1	0.200	0.200	0.200
		Aroclor 1260	08/05/88	08/05/88	1	0.200	0.200	0.200

Note: ng/L = nanograms per liter.

In addition to collecting chemical water quality data, the County also has implemented a biological monitoring program to provide credible data and valid, defensible results to address questions related to the status and trends of stream and watershed ecological conditions. Biological monitoring data are used to identify problems; documenta the relationships among stressor sources, stressors, and response indicators; and evaluate environmental management activities, including restoration. Since 1999 two rounds of a Countywide bioassessment study have been completed; the first in 1999-2003 and the second in 2010-2013. Results of the Benthic Index of Biotic Integrity (B-IBI) sampling in the Anacostia River watershed showed that approximately 71 percent of sites are rated as biologically degraded, having B-IBI ratings of Poor to Very Poor. No sites in the Anacostia River were rated Good. Degraded stream miles account for 78 percent of total stream miles in the Anacostia River Basin. Although not statistically significant, the percent of degraded stream miles in the Anacostia River increased 9 percent from the Round 1 assessments to Round 2 assessments. The Round 2 assessment report suggests that, while the County's overall efforts to manage and restore water quality have not resulted in improvements in the Anacostia River watershed, they might have resulted in enabling streams and watersheds to "hold their own" in the face of added development and continued degradational pressures (Millard et al. 2013).

2.6 Pollutant Sources

Although PCBs are no longer manufactured, they continue to exist in the environment and might still be released from legacy pollution through fires or leaks from old PCB-containing equipment, accidental spills, burning of PCB-containing oils, or leaks from hazardous waste sites, for example. They are hydrophobic and tend to become concentrated in sediment, therefore sediment sources, especially in industrial and urban areas, should be considered a potential source of PCBs.

Sources of PCBs in the watershed can be characterized as either point or nonpoint sources. A *point source* is described as a discernible, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters and is permitted through the National Pollutant Discharge Elimination System (NPDES) program. Point sources of PCBs may include wastewater treatment plants, combined sewer overflows, and MS4s. Nonpoint sources are diffuse sources that typically cannot be identified as entering a water body through a discrete conveyance at one location, such as atmospheric deposition, contaminated sediment, runoff from contaminated sites, and groundwater. In the County, all sources of pollutant loading not regulated by NPDES permits are considered nonpoint sources. The majority of permitted sources in the County are part of an MS4.

2.6.1 NPDES-Permitted Facilities

Under the NPDES stormwater program, operators of large, medium, and regulated small MS4s must obtain authorization to discharge pollutants. The Stormwater Phase I Rule (55 FR 47990, November 16, 1990) requires all operators of medium and large MS4s to obtain an NPDES permit and develop a stormwater management program. Medium and large MS4s are defined by the size of the population within the MS4 area, not including the population served by combined sewer systems. A medium MS4 has a population between 100,000 and 249,999; a large MS4 has a population of 250,000 or more. Phase II of the rule extends coverage of the NPDES Storm Water Program to certain small MS4s. Small MS4s are defined as any MS4 that is not a medium or large MS4 covered by Phase I of the NPDES Storm Water Program. Only a select subset of small MS4s, referred to as regulated small MS4s, require an NPDES stormwater permit. Regulated small MS4s are defined as (1) all small MS4s in urbanized areas as defined by the U.S. Census Bureau, and (2) those small MS4s outside an urbanized area that are designated by NPDES-permitting authorities.

The County maintains stormwater pollution prevention plans (SWPPP) for its facilities. There currently are ten County facilities and nine other municipal facilities covered by the NPDES General Industrial permit and which require a SWPPP. The County currently conducts field verification of these facilities to assure that each SWPPP accurately reflects the environmental and industrial operations of the facility. If deficiencies in the SWPPP are noted, the County provides the required technical support to upgrade the plans. The County also monitors all SWPPP implementation activities through its database tracking system and provides MDE with an annual report documenting the status of each County-owned facility SWPPP.

The municipal Phase II MS4 entities in the Anacostia River watershed are:

- Berwyn Heights
- Bladensburg
- Brentwood
- Capitol Heights
- Cheverly
- College Park
- Colmar Manor
- Cottage City
- Fairmount Heights
- Glenarden
- Greenbelt
- Hyattsville
- Landover Hills
- Mount Rainier
- New Carrollton
- Riverdale Park
- Seat Pleasant
- University Park

The municipal Phase II MS4 entities in the Potomac River watershed are:

- District Heights
- Forest Heights
- Morningside

There are no municipal Phase II MS4 entities in the Piscataway Creek or Mattawoman Creek watersheds. For municipal entities such as Pomonkey and Accokeek, the County's Phase I stormwater permit will be the mechanism to support restoration planning and implementation of pollution control measures.

In addition to municipalities, certain federal, state, and other entities are required to obtain Phase II MS4 permits. The County is not responsible for these areas. Table 2-6 presents these permitted entities within the subject watersheds. For this restoration plan development, the County considers municipal school properties and property operated by the Maryland-National Capital Park and Planning Commission (M-NCPPC) as covered under the County's MS4 permit; however, M-NCPPC will be covered under a future MS4 permit issued specifically to M-NCPPC. The County has included those properties in its impervious areas for this restoration plan, given the current cooperation between the parties. In the past, the County has partnered with both MDE and M-NCPPC to install BMPs at public schools and M-NCPPC properties to treat impervious areas.

Table 2-6. Phase II MS4 permitted federal, state, and other entities in the County's PCB-impacted watersheds

Watershed	Agency	Installation/Facility
Anacostia River	Maryland Army National Guard	Multiple Properties
	U.S. Department of the Army	Adelphi Laboratory Center
	Washington Suburban Sanitary Commission	Multiple Properties
	United States Department of Agriculture APHIS-PPQ	National Plant Germplasm and Biotechnology Laboratory
	University of Maryland	College Park Campus
	Maryland Transit Administration	Multiple Properties
	National Aeronautics and Space Administration	Goddard Space Flight Center
	Maryland State Highway Administration	Multiple (outside Phase I jurisdictions)
	Washington Metropolitan Area Transit Authority	Multiple Metrorail Stations
	Maryland Transportation Authority	Multiple Properties
	U.S. Department of the Army, Reserves	Multiple Properties

Watershed	Agency	Installation/Facility
	U.S. Department of Agriculture	Beltsville Agricultural Research Center
	Maryland Department of Transportation Motor Vehicle Administration	Multiple Properties
Mattawoman Creek	Washington Suburban Sanitary Commission	Multiple Properties
	Maryland State Highway Administration	Multiple (outside Phase I jurisdictions)
Piscataway Creek	Federal Law Enforcement Training Center	Cheltenham
	U.S. Department of the Air Force	Andrews Air Force Base
	Maryland State Highway Administration	Multiple (outside Phase I jurisdictions)
	Maryland Transportation Authority	Multiple Properties
Potomac River	U.S. Department of the Air Force	Andrews Air Force Base
	Washington Suburban Sanitary Commission	Multiple Properties
	Maryland Air National Guard	Multiple Properties
	Maryland State Highway Administration	Multiple (outside Phase I jurisdictions)
	Washington Metropolitan Area Transit Authority	Multiple Metrorail Stations

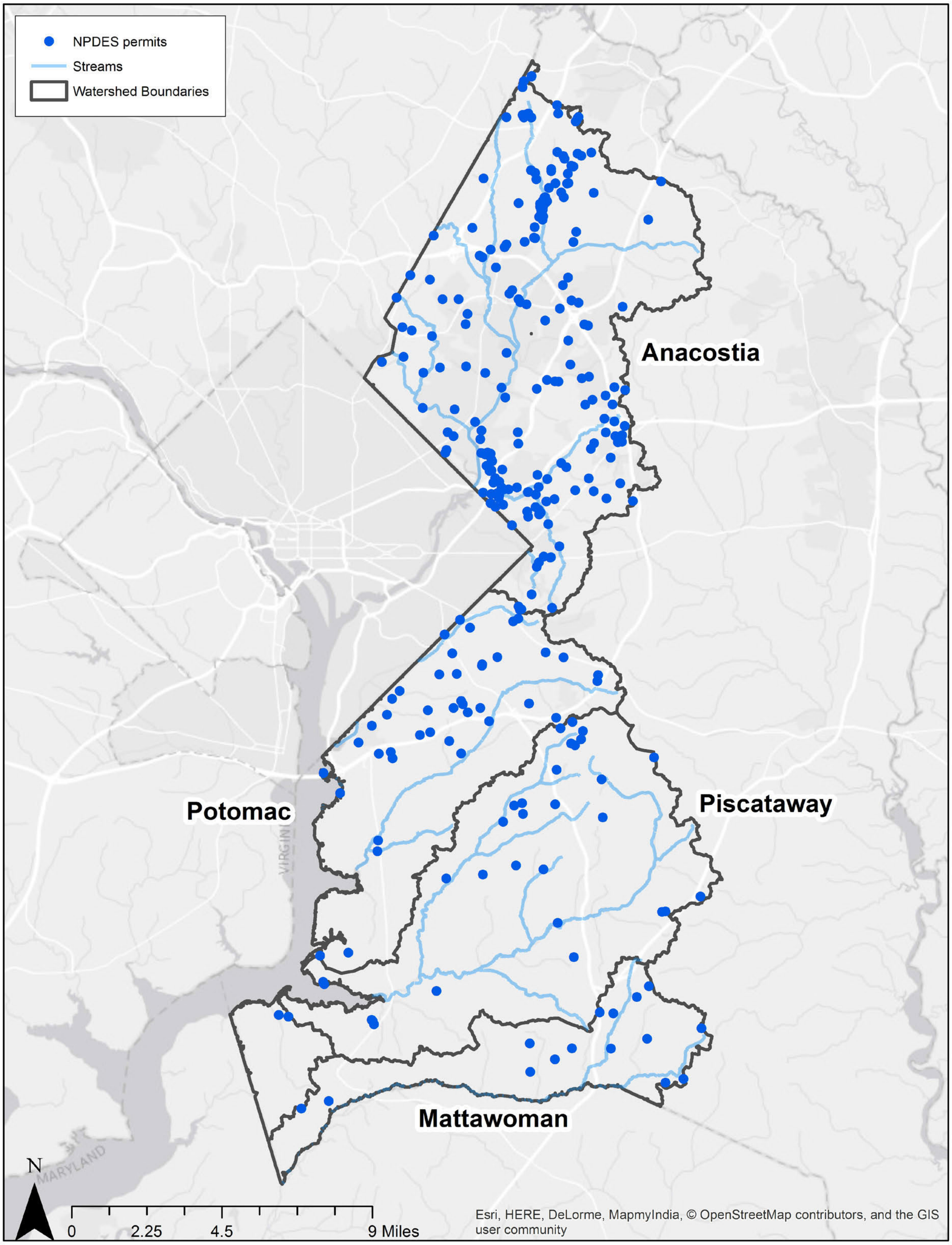
Information on other permitted facilities was available from MDE's website and EPA's Integrated Compliance Information System. The appendices of the WECR reports provide additional details on those facilities. There are 195 privately owned permitted facilities in the Anacostia watershed. Of these, more than half are listed as discharging stormwater.

In the Piscataway Creek watershed there are 32 facilities; of these, 10 are listed as discharging stormwater. Of the 45 permitted facilities in the Potomac River watershed, 11 are listed as stormwater facilities. Other facilities in the PCB-impacted watersheds of the County, including all 14 permitted facilities in the Mattawoman Creek watershed, are permitted for discharging from construction sites, mining facilities, de-watering activities, refuse sites, and swimming pools. The County is not responsible for these facilities meeting their WLAs.

Wastewater facilities might include those publicly owned treatment works providing wastewater treatment and disinfection for sanitary sewer systems, or industrial facilities providing treatment of process waters. In the Anacostia River watershed, two federal facilities are permitted to discharge treated sanitary wastewater in the watershed. In the Mattawoman Creek watershed, one federal facility and one municipal treatment plant within the County are permitted to discharge treated sanitary wastewater in the watershed. In the Piscataway Creek watershed, two facilities are permitted to discharge treated sanitary wastewater into the watershed. There are no wastewater treatment plants in the Potomac River drainage area.

Figure 2-5 displays the locations of the NPDES permits in the County's PCB-impacted watersheds.

Sanitary sewers occasionally unintentionally discharge raw sewage to surface waters in events called sanitary sewer overflows. These events can discharge PCBs in the system, for instance, those that have entered through an industrial floor drain due to a spill, into local waterways. Sanitary sewer overflows can be caused by sewer blockages, pipe breaks, defects, and power failures. Overflows often occur during and after major storm events and are symptomatic of infiltration and inflow of groundwater into sanitary sewer pipes through cracks and breaks. The same cracks allow sewage to percolate into the ground, some of which can seep directly into the streams or into adjacent stormwater collection pipes. The Maryland Reported Sewer Overflow Database contains the bypasses, combined sewer overflows, and sanitary sewer overflows reported to MDE from January 2005 through the most recent update.



Source: Permit information provided by MDE and EPA's ICIS websites. May 2014.

Figure 2-5. NPDES permits in the County's PCB-impacted watersheds.

2.6.2 Nonpoint Sources

Nonpoint sources can originate from rainfall runoff (in non-urban areas) and landscape-dependent characteristics and processes that contribute sediment and associated PCB loads to surface waters. Nonpoint sources include diffuse sources that cannot be identified as entering the water body at a specific location, such as atmospheric deposition, contaminated sediment, runoff from contaminated sites, and groundwater. Because the County is considered a Phase I MS4, for TMDL purposes, all urban areas within the County are considered to be point sources and allocated loads are considered under the WLA component. However, mechanisms under which urban or MS4 PCB loads are generated are the same as other rainfall-driven nonpoint sources.

PCBs can be released to the air from fires, the use of PCB containing equipment, and disposal sites, which then reach water bodies through atmospheric deposition. Atmospheric deposition occurs by two main methods: wet and dry. Wet deposition occurs when rain, fog, and snow wash gases and particles out of the atmosphere. Dry deposition occurs as gases and particles in the atmosphere settle out onto surfaces over time. Pollutants deposited through dry deposition can be washed into streams from trees, roofs, and other surfaces by precipitation. Winds blow the particles and gases contributing to atmospheric deposition over great distances, including geographical (e.g., watersheds) and political boundaries (e.g., state boundaries).

Development in the watershed has altered the landscape from presettlement conditions, which included grassland and forest, to post-settlement conditions, which include cropland, pasture, and urban/suburban areas. This conversion has led to increased runoff and flow into streams versus presettlement conditions, as well as streambank erosion and straightening of meandering streams. The increased erosion not only increases sediment loading to water bodies but also increases loadings of contaminants, such as PCBs, that are adsorbed to sediment particles.

3 Restoration Plan Goals and Objectives

Goals in restoration planning are general statements about the desired condition or outcome of the effort. A successful restoration planning effort also identifies definite objectives, or steps that will be taken to achieve the desired goals. Objectives provide the foundation for watershed restoration and management decisions. This section identifies the specific restoration goals and objectives for the County's PCB-impacted watersheds, describes modeling performed to assist in quantifying certain objectives, and identifies reductions necessary for compliance with regulatory requirements (i.e., TMDLs).

3.1 Watershed Goals and Objectives

The watershed goals and objectives identified here reflect the specific needs of the Anacostia River, Mattawoman Creek, Piscataway Creek, and Potomac River watersheds and might include priorities in addition to regulatory compliance. A goal is represented by a general statement about the desired condition or outcome of the watershed management or restoration strategies. Objectives are specific statements that define what must be true or what actions must be taken for the goals to be achieved. The objectives provide the foundation for watershed restoration and management decisions.

The watershed goals include, but are not limited to, the restoration planning goals outlined in section 1.1, which apply to all watersheds in the County. The overarching goals the subject watersheds are noted below:

- Protect, restore, and enhance habitat in the watershed.
- Restore watershed functions, including hydrology, water quality, and habitat, using a balanced approach that minimizes negative impacts.
- Support compliance with regional, state, and federal regulatory requirements.
- Increase awareness and stewardship within the watershed, including encouraging policymakers to develop policies that support a healthy watershed.
- Protect human health, safety, and property.
- Improve quality of life and recreational opportunities.

The watershed objectives describe more specific outcomes that would achieve the overarching goals. The objectives for the subject watersheds are to:

- Protect land that supports rare and/or threatened high quality terrestrial, wetland, and aquatic habitat.
- Restore hydrology, water quality, and habitat functions in wetlands and streams.
- Implement BMPs and programmatic strategies that restore hydrologic and water quality functions and protect downstream aquatic habitat and designated uses.
- Achieve pollutant load reductions to comply with regulatory requirements as shown in Table 1-1.
- Educate watershed stakeholders and create opportunities for active public involvement in watershed restoration.

- Integrate watershed protection and restoration in policy-making processes at the local level.

The objectives are used to guide the identification and prioritization of management options. For some management options, like structural BMPs, achievement of the hydrology and water quality objectives can be quantified to evaluate effectiveness towards meeting the goals and objectives. For other management options, like programmatic strategies and education, achievement of objectives can be evaluated with a more qualitative approach. The goals and objectives are used to communicate priorities and ensure tangible progress across all stages of restoration planning and implementation.

3.2 Watershed Treatment Model (WTM) Modeling

MDE's *TMDL Data Center* website (MDE 2014d) provides technical guidance for developing restoration plans for WLAs (MDE 2014b). Part of this guidance allows entities to calculate updated load estimates using specific land-use and other data for restoration planning. The guidance allows entities to use their own data to develop loads if they retain the percent reduction specified in the respective TMDL between baseline loads and the allocations for the applicable pollutants (MDE 2014b). Baseline conditions, as defined by MDE, represent the impaired conditions that the watershed was under during TMDL development. The percent reduction of pollutants is based on loads needed to achieve the applicable water quality standards in specific water bodies.

Using MDE's guidance, the County used a County-modified Watershed Treatment Model (WTM) to calculate new loads for the implementation model baseline. The purpose of the implementation model was not to recalculate the WLA as defined in the TMDL documents and the MDE *TMDL Data Center*, but to convert the TMDL load reduction from the original TMDL model to an implementation model (WTM) that can be effectively used in the planning of restoration activities. The level of effort (load reduction percentage) to meet water quality standards is kept the same between the two models. WTM was modified to include more specific land-use types as well as to differentiate between connected and disconnected impervious areas to calculate more precisely loads generated from different land-use types. Therefore, the modified WTM provides the County the ability to specifically identify the land uses and land covers that produce the larger loads and target BMPs and other restoration measure to those land uses. This approach will allow the County to make better decisions on where a specific type of restoration activity should be implemented and to improve implementation planning.

Because the TMDLs in the County have been established in different years, the County opted to use one set of common data to establish *implementation model* baseline loads for all pollutants addressed in this restoration plan. Therefore, *baseline loads* in this plan refers to the pollutant loads calculated using the modified WTM (implementation model) with the most recent land use (MDP 2010) and impervious cover (M-NCCP 3009) data available. This method provides a more accurate depiction of loadings from County land and establishes a common set of baseline data, which aids in the restoration planning process. The WTM baseline loads have been compared to both Maryland Assessment and Scenario Tool (MAST)[1] and TMDL baseline loads and are discussed in a technical memorandum provided to the County (Tetra Tech 2015d). Load

[1] http://www.mastonline.org/ (Accessed September 2, 2014).

reductions from BMPs that have been implemented since the TMDLs were issued are only accounted for after these baseline loads have been established. Section 4.3.2 describes the process of assigning load reduction credits for currently installed BMPs.

Building on previous work in the Piscataway Creek watershed, the County's contractor developed a methodology to provide a realistic breakdown of land cover-specific loads to facilitate the restoration planning process. It is important to understand the substantial differences between land use and land cover. *Land use* refers to how land is being used, such as for commercial or agricultural purposes. *Land cover* refers to what covers the ground, such as parking lots, buildings, or agricultural fields. Land use analysis lumps many different types of land covers into a single use category. It can be an effective measure for estimating watershed runoff responses only where the differences in land covers between land uses (e.g., commercial versus residential) are much greater than the differences in land covers within a particular land use category. For instance industrial land covers can be quite different and range from roof-dominated warehouses to junkyards. This is often the case, particularly with institutional or industrial uses that can include a variety of different land covers. In contrast, land cover analysis can be very useful for predicting watershed runoff responses, in particular those associated with impervious areas, because impervious cover—particularly connected impervious cover—increases both flow and pollutant transport. Therefore, a vital aspect of this analysis was to develop an accurate estimate of land cover, including accurate estimates of impervious and pervious source areas. For this reason, WTM analyses that include land cover will be beneficial during BMP implementation because the ability to target specific BMPs to appropriate land covers can maximize load reductions and reduce costs. In contrast, using land use is a coarser approach. A brief discussion of the WTM process is presented below; a more detailed description was provided to the County in a technical memorandum (Tetra Tech 2015d).

In the loading analysis, the County's GIS information and WTM routines were applied together to estimate subwatershed loads at the edge of the stream. The WTM is a spreadsheet-based tool that evaluates loads from a range of sources and estimates reductions from a suite of treatment options. GIS data were used to identify different impervious and pervious source areas and to identify impervious areas as connected or disconnected (Caraco 2013).

The watershed baseline loads were calculated using a modified version of WTM (based on Ver. 2013 obtained from the Center for Watershed Protection) on a countywide scale to maintain consistency across the County. The watershed scale was used because of the number of watersheds that have current TMDLs. The model was adapted to allow for adjusting the effects of hydrology and land cover to refine runoff loading rates. Applying the WTM model in this way produces a greater degree of accuracy in subwatershed loads than would be possible with a simple approach using land use. This precision not only highlights most impaired subwatersheds with greater accuracy but also allows for detailed, BMP-specific loads to be calculated in support of the restoration planning process.

This approach followed the methodology from the County's Piscataway Watershed Report (PGC DER 2012a), which used a calibrated EPA Stormwater Management Model (SWMM) to determine runoff sources and flows and the WTM model to partition runoff into directly connected impervious areas, disconnected impervious areas, and pervious receiving areas, with separate allocations for rural and natural areas. The Piscataway SWMM results were also used to calibrate flows in the Piscataway Creek WTM model. The results from the previous Piscataway Creek model were used to adjust the appropriate parameters in the WTM model to more accurately evaluate the effects of hydrologic partitioning and of different land covers. Coefficients in the Piscataway Creek WTM model were adjusted so that the WTM-computed runoff matched the SWMM runoff values from the Piscataway SWMM model. These coefficients were then applied in the countywide WTM model.

Loading rates and concentrations from different land covers in the countywide WTM model were derived from the literature and were then applied to obtain mass loads in each subwatershed. Initial concentrations were based on the National Stormwater Quality Database (Maestre and Pitt 2005) and data gathered by Tetra Tech (2014) for the Chesapeake Bay Program (CBP). The WTM loads were calibrated to match the baseline loadings in the MAST, which is a planning tool developed for MDE and the CBP to support implementation of the Chesapeake Bay TMDL for nutrients and sediment. These loadings were also compared to the baseline loads in the respective TMDLs for biochemical oxygen demand (BOD) and bacteria. Table 3-1 presents the final calibrated average concentrations allocated to the various land cover types and surface conditions used in the countywide WTM. . In a technical memorandum to the County, Tetra Tech (2015d) provided a detailed explanation of how the concentrations were determined.

Table 3-1. Calibrated average concentrations in WTM by land cover type

Primary sources		Average Concentrations				
Category	Land cover	Total nitrogen (mg/L)	Total phosphorus (mg/L)	TSS (mg/L)	BOD (mg/L)	Fecal coliform bacteria (MPN/100 mL)
Connected impervious areas	Aviation	1.90	0.15	30	5.5	200
	Drives	2.20	0.35	70	12.5	5,000
	Gravel	1.80	0.20	110	7.5	1,000
	Other	1.80	0.20	60	7.5	5,000
	Parking	2.20	0.35	60	15.0	7,500
	Railroad	1.80	0.15	100	7.5	1,000
	Roads	2.20	0.30	60	12.5	5,000
	Roofs	1.60	0.12	15	7.5	1,500
	Walks	2.20	0.30	40	12.5	7,500
Disconnected impervious areas	Aviation	3.80	0.30	60	5.5	1,000
	Drives	4.40	0.70	140	12.5	25,000
	Gravel	3.60	0.40	220	7.5	5,000
	Other	3.60	0.40	120	7.5	25,000
	Parking	4.40	0.70	120	15.0	37,500
	Railroad	3.60	0.30	200	7.5	5,000
	Roads	4.40	0.60	120	12.5	25,000
	Roofs	3.20	0.24	30	7.5	7,500
	Walks	4.40	0.60	80	12.5	37,500
Pervious areas	Turf	1.75	0.35	50	2.5	5,000
	Field	1.50	0.15	25	1.5	5,000
	Crops	10.00	0.50	250	12.0	15,000

Primary sources		Average Concentrations				
Category	Land cover	Total nitrogen (mg/L)	Total phosphorus (mg/L)	TSS (mg/L)	BOD (mg/L)	Fecal coliform bacteria (MPN/100 mL)
	Woods	1.25	0.05	15	0.8	500
	Wetlands	1.00	0.05	15	0.8	2,500
	Open Water	1.50	0.05	15	0.8	200
	Barren	2.00	0.90	400	3.0	1,000

Note: mg/L = milligrams per liter; MPN = most probable number; mL = milliliter

The WTM modeling method allows for a more precise determination of the loads at a subwatershed level and can be used to identify the loads originating from the different municipal, state, and federal entities. The analyses were conducted at different spatial levels. The first evaluated the subwatershed in its entirety, establishing all the subwatershed loads from runoff, or the baseline loads within the County boundary. The next level of analysis focused on the urban MS4 area, which comprises the source areas regulated by the County's MS4 permit. It excludes rural and natural areas. The last level of analysis partitioned the MS4 areas into their respective county, municipal, state, and federal ownerships. In this manner, it was possible to highlight the sources of the pollutant loads, as well the loads coming from each type of ownership. This approach allows a fair allocation of the obligations needed to meet the TMDL WLAs. The calibrated WTM land-cover-specific loading model was also applied at the smaller site-level scale for a BMP drainage area, ensuring consistency in meeting the TMDL WLAs and estimating reductions that would be achieved with the planned BMPs.

PCBs were not modeled in WTM. Their sources are usually hotspots from legacy contamination and are highly associated with soils and sediment. Tetra Tech reviewed the tidal Potomac TMDL and found that the model developers had determined that after multiple types of multiple linear regressions, the data showed that TSS predicted PCB3+ concentrations better than did other variables (Haywood and Buchanan 2007) Regression equations were developed for three zones: DC Urban, Near DC, and Elsewhere (Table 3-2). PCB3+ loads were converted to total PCBs by dividing by 0.92 (Haywood and Buchanan 2007).

Table 3-2. TSS/PCB regression equations by location

Zone	Area	Equation	Correlation coefficient (R^2)
DC Urban	Watts Branch, Beaverdam Creek	$[PCB3+] = 0.855 \times [TSS]^{0.9702}$	0.61 (n = 30)
Near DC	Remainder of Anacostia River watershed, Oxon Run, Potomac drainages north of Piscataway Creek mouth	$[PCB3+] = 0.3290 \times [TSS]^{0.5059}$	0.63 (n = 94)
Elsewhere	Piscataway Creek, Mattawoman Creek, Potomac drainages south of Piscataway Creek mouth	$[PCB3+] = 0.0458 \times [TSS]^{0.5008}$	0.52 (n = 25)

Source: Haywood and Buchanan 2007.

3.3 Implementation Model Load Reductions

Table 3-3 presents the WTM baseline loads using recent land use and impervious data from the portions of the PCB-impacted watersheds that are in the County's MS4 area. The loadings in Table 3-3 do not exactly match the local watershed TMDLs, even though WTM was calibrated to MAST and the local TMDLs. As discussed in the previous section, the loadings in this restoration plan were determined using WTM, which follows MDE guidance (MDE 2014b) allowing counties to use local data to determine urban loads for implementation purposes. This method also accounts for the loads from a more accurate and more recent urban footprint than the TMDL, so the baseline loads in this plan will not exactly match those in the TMDL documents.

Table 3-3 also presents the percent reduction from MDE's *TMDL Data Center*. This percent reduction was applied to the WTM-calculated baseline load to determine the implementation load reduction target. That target and the amount by which the loads need to be reduced (using WTM) are also presented in Table 3-3. These loads represent the urban area that is regulated by the County's MS4 permit. They represent the loadings without currently implemented BMPs and programmatic efforts, and thus represent the baseline loads in the implementation model for the watershed. The loads reduced by current BMPs and other practices are discussed in the next section.

Table 3-3. WTM MS4 baseline and implementation loads and WLAs for the PCB-impacted watersheds in Prince George's County

Watershed	Unit	Implementation Model Baseline from WTM	Percent Reduction from MDE *TMDL Data Center*	Implementation Model Target Load	Required Implementation Model Reduction from WTM
Anacostia River	lb/year	1.41	98.1%–99.9%	1.50E-02	1.39 E+00
Mattawoman Creek	lb/year	1.01E-04	42.5%	5.78E-05	4.27E-05
Piscataway Creek	lb/year	4.28E-04	5.0%–33.0%	2.97E-04	1.31E-04
Potomac River	lb/year	3.55E-03	5.0%–99.0%	6.89E-04	2.86E-03

Notes:
lb = pound; PCB loads have different percent reductions in different portions of the watersheds. The table above combines these areas.

4 CURRENT MANAGEMENT ACTIVITIES

Current management activities to specifically address PCB loadings do not exist. However, since PCB concentrations in the water column are linked to TSS concentrations, a reduction in the sediment loads entering the tidal County's watersheds are expected to result in lower PCB concentrations. Therefore, in accordance with MDE guidance (MDE 2014c), current management activities that address sediment are considered to be a means of PCB removal as well.

When rain falls, the resulting runoff flows off roofs, lawns, driveways, and roads into a network of stormwater sewers that discharge directly to the streams. This stormwater flow picks up sediments and other pollutants from roofs and lawns, along with those from driveways and roadways, and transports them into the waterways of the County in areas where there is no stormwater treatment. Many areas of the County (including much of the Anacostia River watershed) were developed before the adoption of stormwater regulations and practices in the 1970s and 1980s. In these older developments, no stormwater management facilities exist. The County enacted a stormwater management ordinance in 1971 and the State adopted a statewide stormwater law and regulations in 1983. Newer development in the County, including redevelopment built since 1971, is required to provide water quality treatment for this urban runoff using a wide range of stormwater practices. During the initial years of stormwater regulation, these practices were somewhat crude and simple—such as dry ponds—but have continuously improved. Today, *environmental site design* (ESD)—the approach to stormwater management required by MDE—is based on the use of landscape-based practices such as rain gardens and bioswales, and is considered an ecologically sustainable approach to stormwater management. The County is currently installing these types of BMPs. Those BMPs that reduce sediment will also reduce PCBs. This section details the BMPs that are installed in the County as well as current programmatic activities.

4.1 Existing BMPs

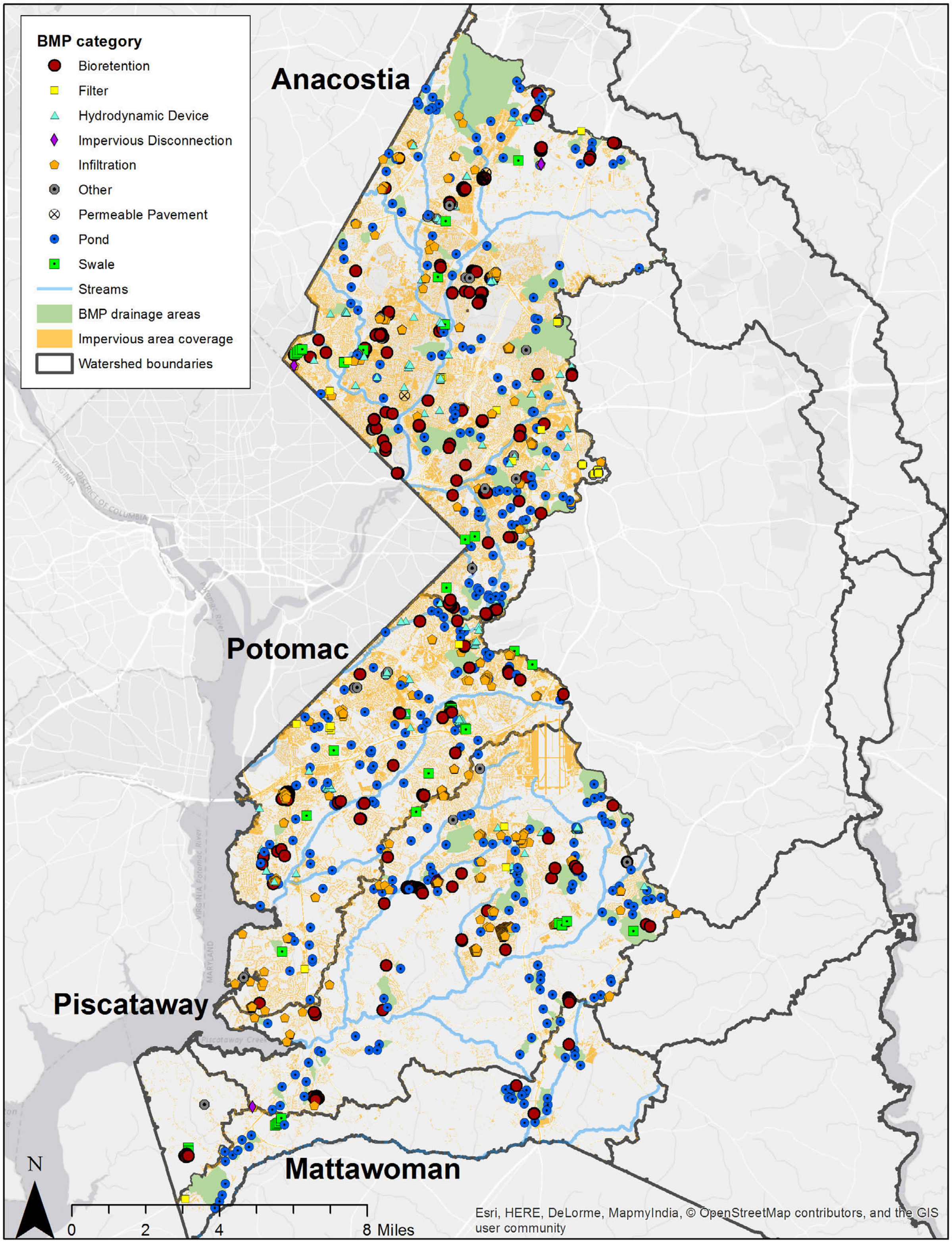
Table 4-1 presents the list of documented existing County structural BMPs in the County's PCB-impacted watersheds as of October 2015. Figure 4-1 presents the locations of the BMPs in the County. Stormwater ponds are the most-implemented BMP. Bioretention systems[2] are the second-most-implemented practices. They tend to treat smaller areas, but with greater pollutant removal efficiency. Infiltration practices are the third-most-implemented BMP As can be seen in Table 4-1, there are 15 BMPs for which the specific type is not known. The County is actively updating their BMP geodatabase with new information.

[2] A bioretention system is a green stormwater BMP that was developed by Prince George's County in 1993 and has become the most widely used stormwater practice in the nation and many other countries.

Table 4-1. List of BMP types in the County's PCB-impacted watersheds

BMP Type	Total Number	Total w/ Known DA	Total Known Acres Treated	Avg. Acres Treated
Bioretention	275	173	307.5	7.7
Filter	28	16	19.3	8.9
Hydrodynamic device	155	144	128.7	2.5
Impervious Disconnection	33	32	0.6	0.0
Infiltration	552	474	171.2	2.0
Other	42	23	59.9	9.1
Permeable Pavement	15	6	0.7	0.1
Pond	356	318	9,553.6	128.0
Swale	50	18	36.4	6.5
Total	**1,506**	**1,204**	**10,277.9**	**165.0**

Source: DoE, October 2015.
Note: DA=drainage area.



Source: BMPs (October 2015) and impervious cover (June 2014) are from DoE

Figure 4-1. BMPs in the County's PCB-impacted watersheds.

4.2 Programmatic Practices

Besides installing BMPs, the County has initiated a wide range of programmatic stormwater management initiatives over the years to address existing water quality concerns. These initiatives are further described in this section, including the contributions that these programs make to water quality protection and improvement.

Many of the County's stormwater-related programmatic initiatives target more than one topic area. Listed below are programs administered by various departments within the County government or its partners that either directly or indirectly support water quality improvement related to PCBs.

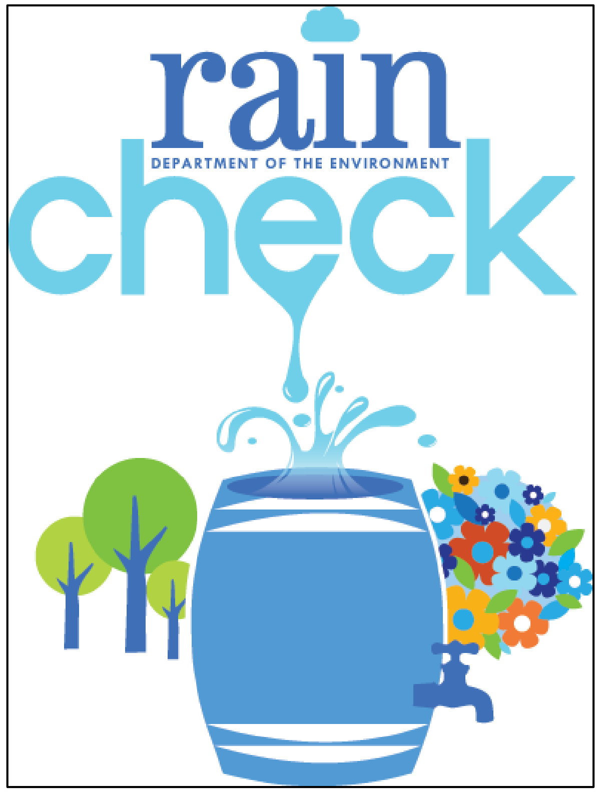
- Stormwater Management Program
- Clean Water Partnership (CWP)
- Rain Check Rebate and Grant Program
- Alternative Compliance Program
- Countywide Green/Complete Streets Program
- Storm Drain Maintenance: Inlet, Storm Drain and Channel Cleaning
- Illicit Connection and Enforcement Program
- Cross Connections Elimination

As required under NPDES regulations, the County must operate an overall stormwater program that addresses six minimum control measures—public education and outreach, public participation/involvement, illicit discharge detection and elimination, construction site runoff control, post-construction runoff control, and pollution prevention/good housekeeping. To meet that requirement, the County administers various programs and initiatives, many of which have goals that will help achieve pollution reductions in response to PCB TMDL requirements. Stormwater-specific program initiatives are designed to reduce flow volumes and pollutant loads reaching surface waters by facilitating the implementation of practices to retain and infiltrate runoff. Stormwater-specific programs include the following:

- *Stormwater Management Program (SWM Program)*. The SWM Program is responsible for performing detailed assessments of existing water quality. The SWM Program is also responsible for preparing design plans and overseeing the construction of regional stormwater management facilities and water quality control projects. These activities contribute to annual load reductions through improved planning and assessment and implementation of BMPs that reduce pollutant loading. The County is continuously improving its geospatial information for stormwater sewer locations, impervious cover, BMP locations and drainage areas, and other watershed information.
- *Clean Water Partnership* (*CWP*). This partnership was formally called the Public Private Partnership (P3) Program. The County recently initiated the CWP to assist in addressing the restoration requirements of the Chesapeake Bay WIP program. The CWP program is initially focusing on right-of-way (ROW) runoff management for older communities, which are inside the Capital Beltway. The program is expected to be responsible for providing water quality treatment for 2,000 acres of impervious land over the next 3 years at a total cost of approximately $64 million ($14 million the first

year followed by $25 million each of the following 2 years). The CWP will span 30 years. The second phase of restoration activities will start after 2017 and will include new acreage goals for restoration.

- *Rain Check Rebate and Grant Program.* The Rain Check Rebate and Grant Program,[3] administered by the DoE, allows property owners to receive rebates for installing County-approved stormwater management practices and was established in 2012 through County Bill CB-40-2012 and started in 2013. Homeowners, businesses, and nonprofit entities (including housing cooperatives and places of worship) can be reimbursed for some of the costs of installing practices covered by the program. Installing practices at the individual property level helps reduce the volume of stormwater runoff that enters the storm drain system, as well as the amount of pollutants in the runoff. In addition, property owners implementing these techniques through the program will reduce their Clean Water Act Fee if the practice is maintained for 3 years. This program has only recently started, and thus there are no current load reductions from it. In the first year of the program, there were 40 projects identified, treating 2 acres of impervious area. The expected acreage that will be treated using this program has not yet been estimated.



- *Alternative Compliance Program.* The Alternative Compliance Program, administered by DoE, allows tax-exempt religious and nonprofit organizations to receive reductions to their Clean Water Act Fee if they adopt stormwater management practices. The organizations have three options and can use any combination to receive credits. The options are (1) provide easements so that the County can install BMPs on their property; (2) agree to take part in outreach and education to encourage others to participate in the Rain Check Rebate and Grant Program and create an environmental team for trash pickups, tree planting, recycling, planting rain gardens, etc.; and (3) agree to use good housekeeping techniques to keep clean lots and to use lawn management companies that are certified in the proper use of fertilizers. This program has only recently started, and thus there are no current load reductions from it. The acreage that will be treated using this program has not yet been estimated. The County has identified approximately 800 potential facilities that could participate in this

[3] http://www.princegeorgescountymd.gov/sites/StormwaterManagement/RainCheck/Pages/default.aspx (Accessed August 29, 2014)

program. As of October 2015, it had received 130 applications and was working with 30 of the applicants to identify suitable BMP opportunities. The County has been working to compile a suite of outreach materials from various sources that congregations and nonprofits can use to educate their members. In terms of targeting specific areas, Corvias Solutions—who is designing and constructing the projects under option 1 for the Clean Water Partnership—uses the following three criteria to prioritize potential target areas: 1) located in a Transforming Neighborhoods Initiative (TNI) area, 2) located in a high-priority watershed, and 3) located near other work being done by Corvias (in an effort to reduce costs). Over the next few years, the County intends to reach out to all identified facilities.

- *Countywide Green/Complete Streets Program.* The Department of Public Works and Transportation (DPW&T) initiated a countywide Green/Complete Streets Program in 2013 as a strategy for addressing mounting MS4 and TMDL treatment requirements. The program identifies opportunities to incorporate stormwater control measures, environmental enhancements, and community amenities within the DPW&T's capital improvement projects. The types of projects that can contribute to pollutant load reductions include low impact design, alternative pavements, and landscape covers. No projects have been completed as of the date of this document; however, some projects are in the design phase and will go into construction in fiscal year 2015. The acreage that will be treated using this program has not yet been estimated.
- DPW&T has implemented a program to identify existing untreated rural roadways that might qualify for untreated impervious baseline reduction and/or water quality emulation of ESD to the maximum extent possible through existing sheetflow conditions and hydrologic disconnectedness. GIS will be used to identify the roadways that will be credited and considered removed from the County's total untreated impervious surface area. The process entails a desktop and field verification to ensure that the roadways qualify per the document, *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (MDE 2014a), which allows for watershed restoration credit for existing open section rural roadways. This program does not affect restoration planning, since the program does not produce load reductions. It reduces the number of impervious acres recognized in the MS4 permit. A portion of the projects, however, focuses on identifying additional BMP opportunities. Any new BMP opportunity can be credited towards this restoration plan once it is implemented.
- *Storm Drain Maintenance: Inlet, Storm Drain and Channel Cleaning.* These are systematic water quality-based storm drain programs where routine inspections and cleanouts are performed on targeted infrastructure with high sediment and trash accumulation rates. Municipal inspections of the storm drain system can be used to identify priority areas. DPW&T inspects and cleans 69 major channels on a on a 3- year cycle. In 2013,DPW&T performed maintenance on 23,396 linear feet of concrete channel and 15,281 linear feet of earthen channel.
- *Illicit Connection and Enforcement Program.* In partnership with the County's Comprehensive Community Cleanup Program, DoE conducts field screening and outfall sampling. This program is designed to revitalize, enhance, and help maintain unincorporated areas of the County, providing a wide range of clean up and maintenance services to a community over a 2-week to 1-month period. Outfall

sampling serves to detect and eliminate stormwater pollutants and support clean and healthy communities. DoE's *Investigation, Inspection and Enforcement Program* investigates incoming complaints on the County's Water Pollution Line (95-CLEAN). Enforcement actions associated with violations involving the improper storage of materials and/or dumping on private property are the responsibility of the Department of Permitting, Inspections, and Enforcement (DPIE) as authorized under the Zoning Ordinance, Housing and Property Codes. Illegal dumping on public property is the responsibility of DPW&T. Environmental enforcement; including for disturbed areas, grading, sediment and erosion control, and pollution, is authorized under Subtitle 32 with the enforcement authority assigned to the DPW&T. The prevention of human exposure to sewage is administered by the Health Department in accordance with the on-site sewage disposal systems regulations. The control of hazardous chemicals or substances is governed by the Fire Safety Code. Where appropriate, the County also refers enforcement cases to MDE. It is difficult to estimate the load reduction from illicit discharge correction because their location and size are unknown until reported. Their correction is expected to help reduce loads to local water bodies.

- *Cross-Connections Elimination.* Another potential source of PCBs is the cross-connection, or a place where a facility's sewers are directly connected to the storm sewer instead of the sanitary sewer. These connections can be discovered by means of dye testing, smoke tracing, and chemical signatures. An aggressive program to discover and eliminate cross-connections could also reduce some PCB loads. The County has a program to detect these illicit discharges into the County's stormwater system, and thus into the County's water bodies. It is difficult to estimate the load reduction from eliminating cross-contamination because the location and size of the connections are unknown until reported. Their disconnection is expected to help reduce pollutant loads to local water bodies.

4.2.1 Public Education Programs

DoE seeks every opportunity to promote environmental awareness, green initiatives, and community involvement to protect natural resources and promote clean and healthy communities. The County also integrates water quality outreach as a vital component of watershed restoration projects. To reduce stormwater pollutants, the County is required to integrate outreach and education into County services and programs.

During the 2012 reporting year, DoE hosted 37 environmental events and participated in an additional 40 events led by regional, local, and nonprofit environmental organizations. At those events, DoE staff provided handouts, answered questions, made presentations, promoted programs such as the Rain Check Rebate and Grant Program, and displayed posters and real-world examples of stormwater pollution prevention materials (e.g., sample rain barrels, samples of permeable pavement, etc.) The County also published a series of brochures to raise stormwater pollution awareness and educate the residential, business, and industrial sectors on their role in preventing stormwater pollution. These brochures provide a brief and informative overview of a single topic, providing helpful, nontechnical information on water quality topics, including measures that can be taken to prevent harm to the County's water resources. Topics include stormwater BMPs such as rain gardens, cisterns, pavement removal.

4.3 Estimated Load Reductions

The main purpose of implementing BMPs is to remove pollutants near their source and prevent pollutant loads from entering and degrading water bodies. Different types of BMPs remove pollutants with differing degrees of effectiveness, often called pollutant removal efficiencies. To estimate pollutant reductions achieved through BMP implementation, it is necessary to know the removal efficiency. Stormwater treatment ponds tend to have lower pollutant load removal efficiencies (but can treat stormwater drained from larger land areas), while bioretention systems and infiltration practices tend to have higher removal efficiencies (but can only treat stormwater drained from smaller land areas). The first step in determining the estimated load reduction is to determine the load reduction efficiencies. The second step is to perform the load reduction calculation. The third step is to calculate PCB load reduction from TSS using the regression method described in Section 3.2.

4.3.1 BMP Pollutant Load Reduction Removal Efficiencies

MDE's *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (MDE 2014a) incorporates recent CBP recommendations for sediment load reduction removal efficiencies associated with BMP implementation. By using these removal efficiencies in its reduction calculations, the County is consistent with regionwide efforts to meet the Chesapeake Bay TMDL. Because PCB removal efficiencies are not available, the percent removal efficiencies for TSS provided in the MDE guidance was relied upon to give a relative indication of PCB removal efficiency. Because the correlation between TSS and PCB varies by location, the TSS efficiency is best used to determine the amount of sediment removed, which can then be converted to PCBs using the regression method described in Section 3.2.

The TSS removal efficiencies of the BMP practices (based on treating 1 inch of runoff) in the restoration plan are provided in Table 4-2. Pollutant removal efficiency increases as more runoff volume is treated. Removal efficiencies for additional treatment volumes are provide in Table 4-3. Table 4-3 also illustrates that runoff reduction practices consistently reduce pollutant loads at a higher efficiency than structural practices, at all treatment volumes. Where runoff reduction or ESD practices are used, or other acceptable runoff reduction practices predominate, the ESD/ runoff reduction curves should be used. Otherwise, the stormwater treatment or structural practices curves should be used.

Table 4-2. TSS removal efficiencies of BMPs (based on treating 1 inch of runoff)

BMP Type	ESD Practice?	TSS
Runoff reduction practices		
Green roofs	Yes	70%
Porous pavement	Yes	70%
Nonstructural practices[1]	Yes	70%
Rainwater harvesting	Yes	70%
Submerged gravel wetlands	Yes	70%
Landscape infiltration	Yes	70%
Infiltration berms	Yes	70%
Dry well	Yes	70%
Micro-bioretention	Yes	70%
Rain gardens	Yes	70%
Swales, dry	Yes	70%
Enhanced filters	Yes	70%
Infiltration basin & trench	Yes	70%
Bioretention filters	Yes	70%
Stormwater treatment practices		
Retention pond (wet pond)	No	66%
Wetlands[2]	No	66%
Filtering Practices[3]	No	66%
Wet Swales	No	66%

BMP Type	ESD Practice?	TSS
Alternative Practices		
Landscape (impervious area reduction)	No	84%
Planting trees or forestation on previous urban	No	57%
Planting trees or forestation on impervious urban	No	93%
Stream restoration	No	248 lb/ft/yr[4]
Impervious to pervious	No	57%
Regenerative step pool conveyance	No	70%
Street sweeping – mechanical	No	10%
Street sweeping – regen/vacuum	No	25%
Load reductions from street debris (lb reduced per ton of debris)		
Street sweeping – mechanical[5]	No	420
Street sweeping – regen/vacuum[5]	No	420
Catch basin cleaning[6]	No	420
Storm drain vacuuming[6]	No	420
Structural practices not meeting MDE Manual Performance Criteria. Cannot be used to meet restoration requirements.		
Detention structure (dry pond)	No	10%
Extended detention structure, dry	No	60%
Extended detention structure, wet	No	60%
Storm filter	No	80%
Oil/grit separator	No	10%
Underground storage	No	10%

Sources: MDE 2014a (except practices not meeting MDE guidance, which were obtained from MAST);
Notes:
[1] Nonstructural practices include rooftop disconnection, disconnection of nonrooftop runoff, and sheetflow to conservation areas.
[2] Wetlands include shallow wetland, extended detention shallow wetland, pond/wetland system, and pocket wetland.
[3] Filtering practices include surface sand filter, underground sand filter, perimeter sand filter, organic filter, and pocket sand filter.
[4] The TSS load reduction for stream restoration depends on if the restoration activity is in the Coastal Plain and if the value is at the edge-of-field or edge-of-stream. For the Coastal Plain, the edge-of-stream reduction is 15.13 lb/ft/yr. The sediment delivery ratio is 0.061, making the edge-of-field load 248 lb/ft/yr. Outside the Coastal Plain, the edge-of-stream reduction is 44.88 lb/ft/yr. The sediment delivery ratio is 0.181, making the edge-of-field load 248 lb/ft/yr.
[5] These reductions are for high-density urban streets that are swept at least twice a month. These values are expected to change as the result of a recent Chesapeake Bay expert panel report, which is expected to be released in early 2016.
[6] These reductions are for high-density urban areas, where storm drains are routinely maintained.

Table 4-3. TSS removal rates for ESD/runoff reduction and structural practices

Runoff Depth Treated (inches)	TSS	
	Runoff reduction	Structural practices
0.00	0%	0%
0.25	40%	37%
0.50	56%	52%
0.75	64%	60%
1.00[1]	70%	66%
1.25	76%	71%
1.50	80%	74%
1.75	83%	77%
2.00	86%	80%
2.25	88%	83%
2.50	90%	85%

Note:
[1] Typical scenario for redevelopment projects treating 50% of existing surface area.

4.3.2 Load Reduction from Current BMPs and Load Reduction Gap

A systematic identification of current BMPs (as of October 2015) and their locations was conducted. Once identified, their TSS load reduction was quantified and converted to PCB load reduction by using the regression method described in section 3.2. The information available for most BMPs included drainage area (i.e., total land area flowing to a specific BMP [e.g., a dry pond]). Load reductions for the existing BMPs were calculated with WTM using the BMP drainage area land cover, and land-cover-specific pollutant loading rate. This provided the loading attributed to the BMP drainage area. That loading was then multiplied by the BMP pollutant removal efficiency to determine the amount of sediment load reduction attributed to that specific BMP. The location information was used to determine which regression equation to use to convert the TSS loads to PCB loads.

The load reduction calculation only included BMPs that have been implemented since the TMDL water quality data were collected. For instance, the PCB TMDL was developed in 2011, while the water quality data for it were collected in 2005. Therefore, any BMP or other practice implemented or established before 2005 was not included. Any BMP or practice implemented or established after 2005 was included in the PCB load reduction calculation.

The amount of load reduction that is needed after accounting for load reductions from current practices is called the *load reduction gap*. This concept is illustrated in Figure 4-2. The load reductions from current BMPs and practices and the load reduction gap are provided in Table 4-4.

Figure 4-3 shows the graphical representation of the WTM baseline loads, implementation target load, required implementation load reduction, load reduction (from baseline loads) due to current BMPs, and the reduction gap. The WLA implementation target load and required implementation reduction equal the baseline loading (with slight differences due to rounding), while the current BMP reductions and the reduction gap equal the required reduction.

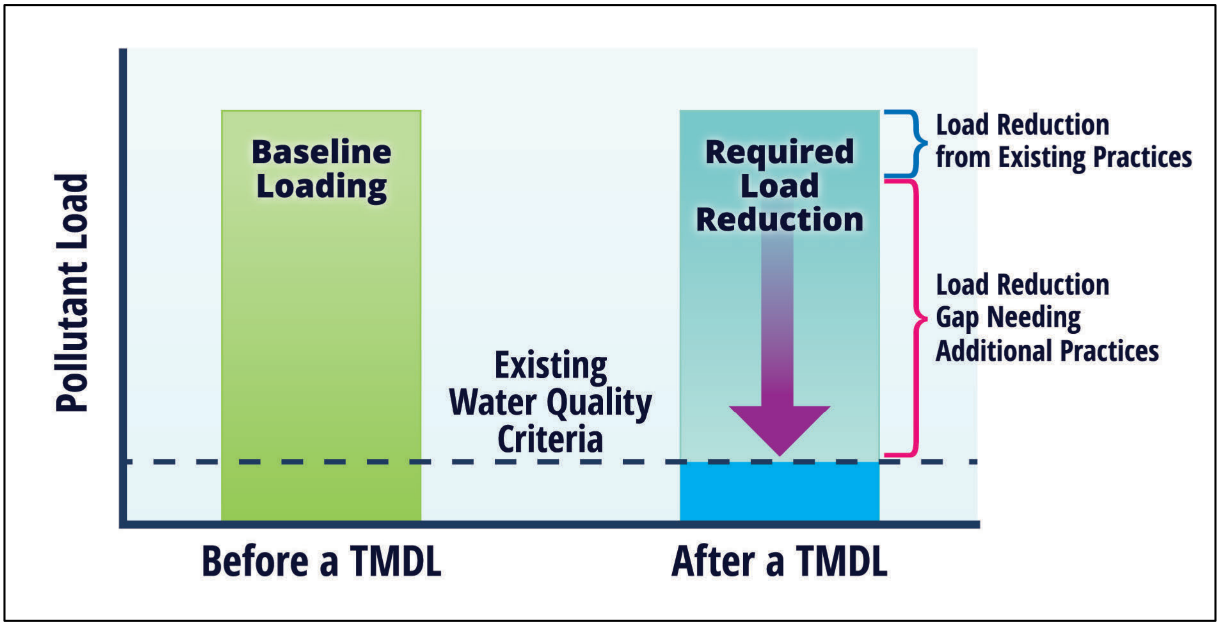


Figure 4-2. Schematic for typical pollution diet (TMDL) showing existing load reduction credits.

Table 4-4. PCB load reductions from current BMPs compared to required load reductions for the County's MS4 area

Watershed	Unit	Implement-ation Model Baseline from WTM	Percent Reduction from MDE *TMDL Data Center*	Implement-ation Model Target Load	Required Implementation Model Reduction from WTM	Reduction from Current BMPs	Remaining Reduction or *Reduction Gap*	Percent of Required Load Reduction Satisfied by Current BMPs
Anacostia	lb/year	1.41E+00	98.1%–99.9% (98.9% avg)	1.50E-02	1.39E+00	4.12E-03	1.39E+00	0.3%
Mattawoman	lb/year	1.01E-04	42.5%	5.78E-05	4.27E-05	1.15E-05	3.20E-05	27.0%
Piscataway	lb/year	4.28E-04	5.0%–33.0% (30.5% avg)	2.97E-04	1.31E-04	4.09E-05	9.37E-05	31.3%
Potomac	lb/year	3.55E-03	5.0%–99.0% (80.6% avg)	6.89E-04	2.86E-03	2.80E-04	2.58E-03	9.8%

Note:
PCB loads have different percent reductions within different areas of the watersheds. The table above combines these areas.

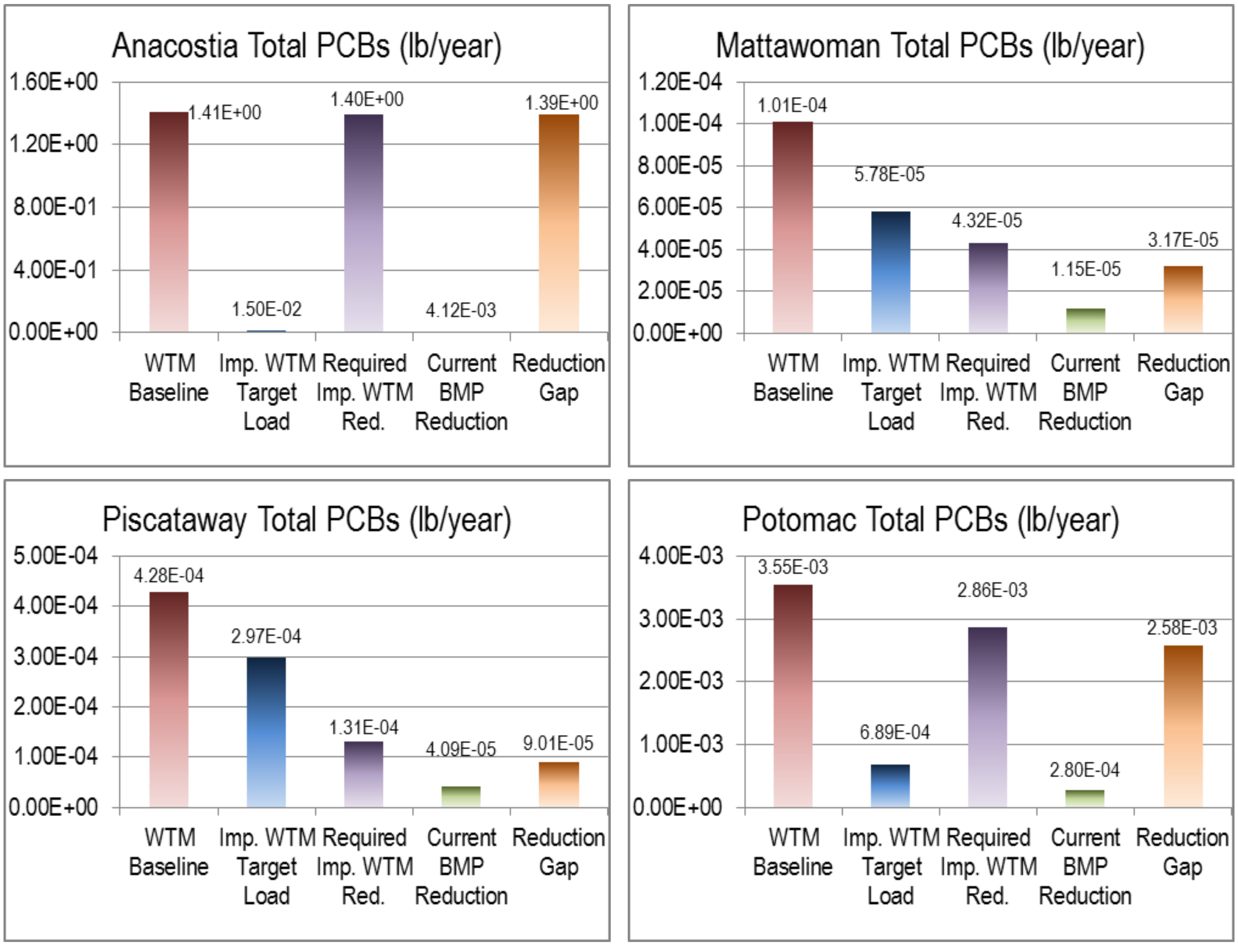


Figure 4-3. Comparisons of WTM baseline loads, implementation target load, required implementation load reduction, load reduction from current BMPs, and reduction gap for the PCB-impacted watersheds.

5 Strategy Development

The watershed restoration activities in the PCB-impacted watersheds will require an unprecedented level of effort, which represents a very challenging and costly management approach. Consequently, the County has developed a strategy that includes five major components to achieve the goals of the restoration plan:

- Use WTM to evaluate the ability of existing BMPs and programmatic initiatives to meet the local TMDL WLAs and then identify and quantify future BMPs and programmatic initiatives necessary to meet the local TMDL WLAs.
- Develop cost estimates associated with the implementation of identified BMP practices and initiatives.
- Develop timelines associated with the deployment of identified BMP practices and initiatives to determine if the timelines required by the TMDL program can be achieved.
- Identify opportunities for BMP practices and programmatic initiatives and develop cost estimates.
- Identify the financial and technical resources required and develop achievable timelines for the deployment of BMP practices and programmatic initiatives that can best meet TMDL program requirements.

This section describes the overall restoration strategy for the PCB-impacted watersheds. The recommended specific planned actions, cost estimates, and a proposed schedule as well as descriptions of the financial and technical resources available to support implementation are described in section 6 of this document.

5.1 Systematic and Iterative Evaluation Procedure

The procedure summarized in Figure 5-1 was developed to provide for the systematic evaluation of the number and general location of BMPs and programmatic practices that will be required to achieve the targeted pollutant reduction by subwatershed. The flow chart is not a representation of the order in which the County will implement restoration practices, but is the procedure used to evaluate the amount of necessary restoration activities (e.g., programmatic goals, impervious area that will need to be treated) to meet load reduction goals. The major steps in the systematic evaluation procedure are:

1. Determine baseline pollutant loads from WTM (section 3.2)
2. Calculate reductions from existing BMPs implemented since TMDL water quality data were collected (section 4.1 and section 4.3)
3. Calculate reductions from existing programmatic practices (section 4.2 and section 4.3)
4. Determine proposed strategy management options and calculate their load reductions (section 5.1.1 and section 5.1.2)
    a. New programmatic strategies
    b. Existing BMP retrofits to enhance load reductions
    c. Load reductions from public ROW projects
    d. Load reductions from public institutional projects
    e. Load reductions from commercial/industrial land uses

    f. Load reductions from residential properties Perform subwatershed prioritization (section 5.2)
5. PCB source tracking
6. Finalize the restoration plan (section 6)

The first step consists of analyzing pollutant loads using the WTM and then establishing the watershed baseline pollutant load. The TMDL-established load reduction percentages are applied to the baseline pollutant loads to calculate the implementation reductions and establish the initial gap in pollutant load targets. The results of this step are discussed in section 3.3 of this restoration plan.

The second step consists of calculating the additional load reductions from existing BMPs implemented since TMDL water quality data were collected. The load reductions from existing programmatic strategies are then calculated in the third step. These two load reductions are combined and subtracted from the baseline loads to generate a revised load reduction gap. The results of these analyses are discussed in section 4.3.2.

The load reductions from steps 2 and 3 were not sufficient to meet the targeted reductions, and thus it was necessary to systematically progress onwards with step 4 until the targeted removal amounts are achieved. The first step in the systematic and iterative evaluation procedure to reduce the gap between required implementation reduction and estimated WTM load reduction (Figure 5-1) is to identify new or enhanced programmatic initiatives (section 5.1.1) followed by implemented BMPs to treat stormwater runoff from impervious surfaces (section 5.1.2).

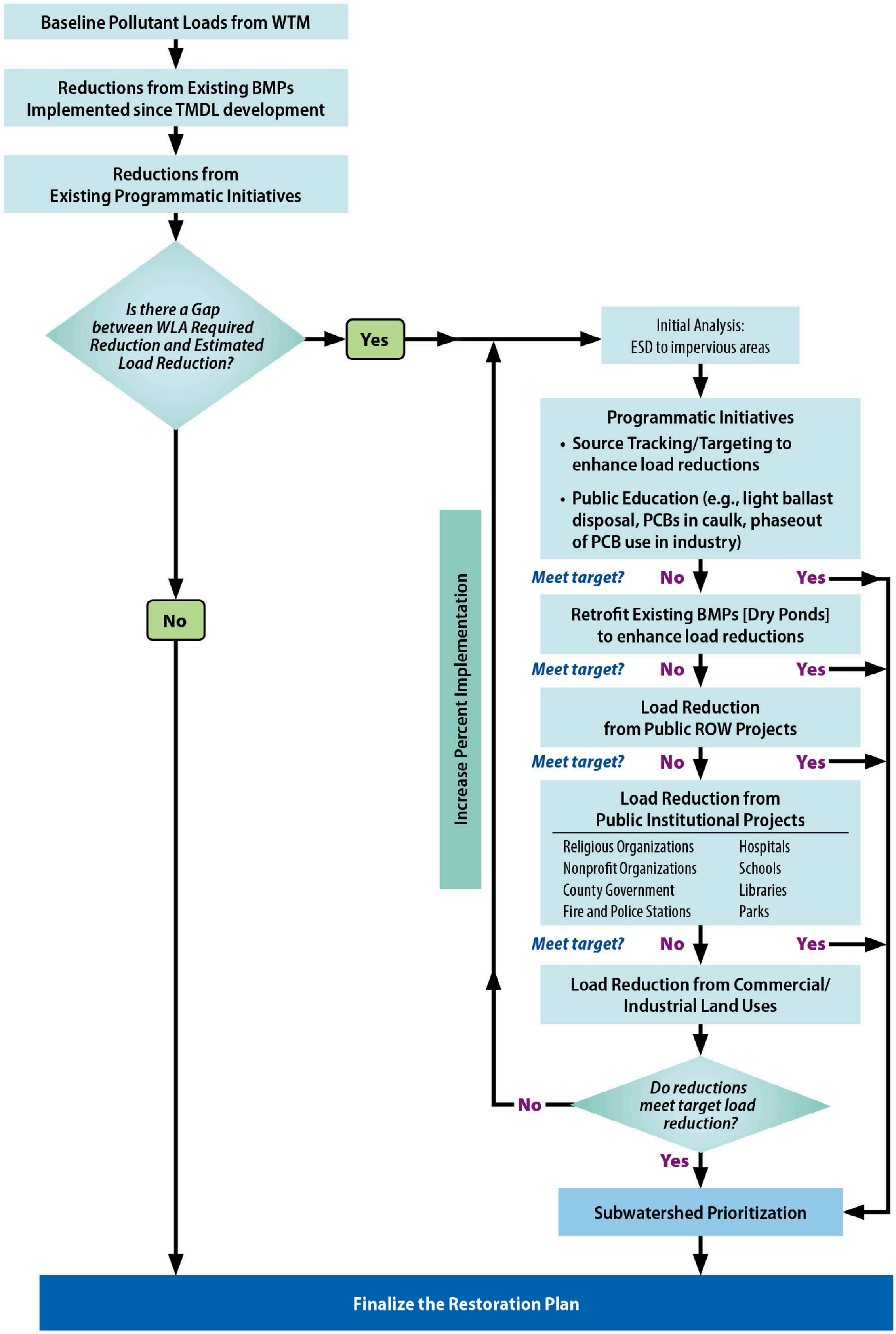


Figure 5-1. Restoration evaluation procedure.

5.1.1 Programmatic Initiatives

Current stormwater practices (section 4.2) were analyzed to determine, where possible, their contribution to the necessary PCB load reductions. The existing programmatic practices are expected to continue and will be supplemented with additional practices to make up the programmatic strategies for this restoration plan, which include PCB source tracking, monitoring, targeted PCB load reductions, and public education.

The primary strategy for additional and targeted PCB reduction is the development of a source tracking and elimination program that traces the contamination back to its source and removes it from the system. The source tracking program identifies areas where PCB sources have been documented or are likely to exist. These areas will be assessed to target BMPs (e.g., stormwater ponds) and waterways where PCBs are most likely to have been carried by stormwater. Sediments in these BMPs and waterways will then be sampled and analyzed to determine PCB concentrations. If present above the action level, the PCB-impacted sediments will be removed from the system and the County will take credit for the PCB load reduction. The details of such a program are expanded upon below. Ideally, the originating source of PCBs can be immediately identified and corrected during the source removal/remediation phase.

Source Tracking/Targeting

PCB sources in the County are most likely diffuse, and difficult to pinpoint. There are, however, several Superfund sites in the County where hazardous waste is known to be present. Assessments at some of these sites have determined that PCBs are present. Table 5-1lists the Superfund sites in the County and identifies those where PCBs are a known or suspected contaminant. In the absence of a significant, known source, such as a Superfund site, the primary pathway by which PCBs enter the County's waterways is through washoff of contaminated sediment from urban and industrial areas. The contaminant migrates as the suspended sediment is transported downstream; a process that is heightened during increased stream flow. The diffuse nature of this contamination makes finding the sources difficult.

Table 5-1. Superfund sites in Prince George's County

Site Name	City	PCBs
Andrews Air Force Base	Andrews AFB	X
Beltsville Agricultural Research Center (USDA)	Beltsville	X
Brandywine DRMO	Andrews	X
Chillum Gasoline Release	Chillum	
Chillum PERC	Chillum	
Laurel Chlorine Cylinder	Laurel	
Nazcon Concrete	Beltsville	
Roger's Electric Company	Cheverly	X
Windsor Manor Road	Brandywine	

Source Targeting is the locating and identifying of watershed sources of PCBs. The foundation of the source targeting will be the gathering, compiling, and assessing of existing PCB data within the watershed. Numerous forms of existing data will be gathered including:

- Documented soil contamination
- Known PCB spills
- Storage/handling/disposal of PCB-containing equipment
- Manufacturing of PCB-containing materials
- Local, state, or independent monitoring data
- Stormwater ponds (or other sediment-trapping BMPs)
- Ancillary data (current and historical industrial/commercial/residential land use, NPDES permits, and associated SIC codes with PCB potential, etc.)

Records Analysis: Several federal, state, and county data sources might be available to provide information on facilities handling PCBs, as well as spills that might have occurred. The County will review the records associated with these sources to identify facilities from which PCB contamination might be originating that were not previously identified. The data will also help prioritize sites identified. For example, if spill reports are associated with a particular facility identified in the NPDES GIS analysis, this facility will be prioritized for sampling in the next phase of the program. The available datasets that this source tracking effort will focus on are:

- EPA Transformer Registration Database
- PCB Activity Database (PADS)
- Toxic Release Inventory Database (TRI)
- Federal and state spill records

EPA maintains an inventory of all in-use PCB transformers in the country in its Transformer Registration database. This, especially in conjunction with the ROW land use analysis, will identify areas where leaks might have been or currently are releasing PCBs. EPA also maintains the PCB Activity Database (PADS), which identifies generators, transporters, commercial stores, and/or brokers and disposers of PCBs. This information will be reviewed, in conjunction with the industrial/commercial land use and NPDES GIS analyses, to identify facilities with a high potential for PCB contamination. The Toxics Release Inventory (TRI) is a publicly available EPA database that contains information on toxic chemical releases and other waste management activities, including those related to PCBs. As with PADS data, TRI information will be reviewed to identify facilities with a higher potential for PCB contamination in the County's PCB-impacted watersheds.

In addition to aiding in the prioritization of sites identified, the records found in these databases can also aid in tracing the ultimate source of PCBs. Once contaminated stream sediments or BMPs are identified, the County will use these datasets to identify facilities where likely active or legacy sources are located.

GIS Analysis: A Geographic Information System (GIS) could be employed to facilitate data storage as well as to perform geospatial analyses of the existing data. A desktop GIS analysis can quickly and cost-effectively identify areas where PCB sources most likely exist. All potential sources of PCBs identified during the records analyses would be mapped, along with BMP locations, into the GIS. The County's BMP coverage geographically displays BMPs where sediment is collected and identifies the BMP type. Targeting BMPs in areas where PCBs are likely to be found narrows the amount of fieldwork and sampling costs associated with source tracking. This can be done using a number of existing GIS sources, including:

- Public ROW coverage
- Commercial/industrial land use coverage
- NPDES permits coverage (PCB-related SIC codes)
- Landfills coverage

The ROW is public space that is owned and maintained by the County along roads. These areas have a high density of substations and transformers that might contain PCBs, particularly in industrial, commercial, and high-density urban areas. BMPs receiving runoff from such ROW areas will be a priority focus area if there are no access restrictions involved. Using GIS, these ROW areas will be identified and the resulting set of sites will be targeted for a first round of sampling and source investigation.

Commercial and industrial areas also have a high potential for PCB contamination above background levels. The County's 2010 land use coverage is the most recent dataset that identifies industrial areas and high-density urban areas. This coverage will be used to filter the BMPs that receive runoff from commercial and industrial areas, providing a second set of BMPs to be targeted for sampling and source investigation. In addition, historic land use data might identify areas that were historically industrial but have been since developed into parks or residential developments.

The NPDES permit coverage created from State data displays all NPDES-permitted dischargers. There are 316 of these in the County's PCB-impacted watersheds. However, not all dischargers likely handle PCBs. Those with the potential to do so will be identified via the facility's SIC code, narrowing the dataset to facility types that may be associated with PCBs. Table 5-2 displays the SIC codes most likely to be associated with PCBs. Next, the BMPs that receive runoff from this subset of permits will be identified, yielding another set of BMPs with a high potential for PCB contamination; which will be targeted for the next round of sampling and source investigation.

Table 5-2. SIC codes and facility types likely associated with PCBs

SIC Code(s)	Facility Type
26 & 27	Paper and allied products
30	Rubber and misc. plastics
33	Primary metal industries
34	Fabricated metal products
37	Transportation equipment
49	Electrical, gas, and sanitary services

SIC Code(s)	Facility Type
5093	Scrap recycling
1221 & 1222	Bituminous coal
3612	Transformers
3731 & 3732	Ship/boat building/repair
4011	Railroad transportation
5015	Automobile salvage yards

Sewer Tracking: The County will consider the use of sewer tracking to identify hotspots, guided by the approach demonstrated by the Camden County Municipal Utility Authority in Camden, New Jersey as part of a PCB TMDL (Belton et al. 2008). The goal of this study was to develop appropriate sampling and analytical techniques for tracking down hot spots of contamination in the collection system and to identify potential sources.

Clam and Fish Tissue Monitoring: Existing MDE clam and fish tissue data will be used to identify PCB hotspots in the Anacostia River watershed. The County will develop a monitoring plan in the remaining PCB-impacted watersheds to identify areas where PCB concentrations are above background levels. This will serve to identify sites, such as BMPs or streambeds, where sediment removal will result in PCB load reduction that can be credited toward the TMDL. It will also serve to aid in the tracking of upstream sources.

Site Sampling: The available monitoring data will be used to identify PCB hotspots. If hot spot is identified, the County will take extra precautions not to disturb the sediment or will contain the potentially-PCB contaminated sediment onsite to prevent it from entering County water bodies. DoE will inform the DPIE of the hot spot locations. DPIE will then identify any construction permits that require sediment movement in these areas. These proactive measures will ensure that DPIE issues grading permits so that PCB-containing sediment is not disturbed during construction, thus potentially releasing PCB-laden sediment into the County's water bodies.

For any sites where a continuing environmental release of PCBs to the watershed stream system likely exists, the County will apply best professional judgment to decide whether or not to monitor a site and will rely on MDE for data on PCBs. Once priority BMPs or stream sediments have been identified using the GIS analysis and records search, a sampling and analysis plan will be developed. A sampling and analysis plan would specify the sample locations, sample numbers, analytical methods, and quality control requirements. In accordance with MDE guidance, samples will be analyzed using EPA Method 1668, which, while costly (approximately $900 per sample for analysis), measures total PCBs on a congener (chemical constituent) basis and has the low detection level necessary to identify the low concentrations associated with a diffuse source. The ability to identify a specific congener can aid in identifying a source because congeners can be specific to a particular use or industry.

Site-specific PCB mitigation levels will be developed for each identified area. If PCBs are found above the site mitigation level, the County will document and justify its decision on whether PCB load reduction remediation will be undertaken.

Because considerable effort and funding would be required to investigate potential sites, source tracking will be targeted by prioritizing critical areas and sites within those areas. Section 5.2 describes the subwatershed prioritization process.

Backtracking to Source: The following steps will be followed to identify and backtrack from hotspots to potential upland sources of PCBs.

- If a BMP or stream contains contaminated sediments above the site-specific mitigation level, the County will investigate the drainage area to attempt to track the source of PCBs back to an active or legacy source.
- If, through the tracing of sources upstream from a contaminated BMP or stream site, a source (legacy or active) is identified, the County will sample the source to determine its significance.

- If the level of contamination is above the mitigation levels, the County will work with MDE, EPA, and the property owner to abate the source and remediate any contaminated material in accordance with federal, state, and local regulations.

PCB Load Reduction

The County will decide whether to remediate the area once the contaminated sediment (in a BMP or stream) or a source has been identified. If the PCB concentration of the material removed is less than 50 ppm, in most cases the material may be disposed of in a municipal landfill or equivalent. In general, Toxic Substances Control Act (TSCA) regulations identify three principal disposal methods for PCBs greater than 50 ppm:

- Incineration in a TSCA-approved facility.
- Disposal in a TSCA-approved chemical waste landfill.
- Disposal by an EPA-approved alternative method. The requirements for disposal vary by the type of material and concentration. Remediation is highly site-specific, and the County will work with MDE and EPA in all cleanup efforts.

If the County decides to proceed with remediation, the area will be capped or dredged/excavated. If the contaminated sediments are removed through dredging or excavation, the amount of PCBs removed from the system will be calculated (amount of sediment removed × PCB concentration), and counted as a credit toward the necessary TMDL PCB load reduction.

Generally, the party responsible for the contamination pays for cleanup. Therefore, the County's source tracking efforts to determine the source of PCBs that have migrated from the original site of contamination and into BMPs, the sewer collection system, or stream sediments will be a critical component of the restoration plan. The County will make every effort to identify and hold liable the party responsible for the release. In addition, the County and/or responsible party might, where eligible, work with MDE's Voluntary Cleanup Program (VCP) on site cleanup. The purpose of the VCP is to encourage the investigation of eligible properties with known or perceived controlled hazardous substance contamination, protect public health and the environment, accelerate cleanup of properties, and provide liability releases and finality to site cleanup. The VCP works hand in hand with the Brownfields Revitalization Incentive Program administered by the Maryland Department of Business and Economic Development. It provides incentives including tax credits, loans, and grants for the redevelopment of eligible brownfield properties in participating jurisdictions.

Public Education

DoE seeks every opportunity to promote environmental awareness, green initiatives, and community involvement to protect natural resources and promote clean and healthy communities. The County also integrates water quality outreach as a vital component of watershed restoration projects. To reduce stormwater pollutants, the County is required to integrate outreach and education into County services and programs. To that end, the County proposes the following public education and outreach programs that will serve to reduce PCB loadings in the County.

Light ballasts: PCB light ballasts are considered a universal waste by Maryland. Universal wastes are certain hazardous wastes that present a limited hazard and must be managed separately from general trash. This encourages alternative methods for disposal of these types of hazardous wastes. A public education program, targeting older institutions and residential areas, will be instituted to raise awareness of the existence of PCB light ballasts, the hazard associated with their use and improper disposal, how to identify them, and how to properly dispose of them. This program will also encourage the elimination of PCB light ballasts throughout the County because the improper disposal of ballasts originating in any part of the County might affect the PCB-impacted watersheds.

Industrial Facilities: While PCBs are no longer produced in the United States, they continue to be used in older equipment. The County will develop a public education program targeting industrial and commercial facilities where PCB-containing equipment is used. The outreach will encourage the phase out and, ultimately, the proper disposal of PCB-containing equipment. This will greatly reduce the risk of accidental PCB releases to the environment. The County will work to develop a survey to identify facilities that handle PCBs and a brochure that describes the types of equipment and materials that contain PCBs, as well as proper disposal methods and appropriate points of contact for more information.

Handling PCBs in Caulk During Renovation: PCBs were used widely in caulks and sealants in the construction and renovation of schools and buildings until the 1970s. EPA recommends that PCB-containing caulk be removed during renovations and repairs and that steps be taken to prevent the release of PCBs to the environment during such activities. The County will develop a public education program targeting the construction industry that raises awareness of the presence of PCBs in building materials and the steps that should be taken to minimize dust and contaminated waste during construction/renovation activities.

5.1.2 BMP Identification and Selection

MDE currently groups urban BMPs into two types: structural and ESD practices (MDE 2009). The MDE ESD practices are:

- *Alternative Surfaces.* Green Roofs, Permeable Pavements, Reinforced Turf
- *Nonstructural Practices.* Disconnection of Rooftop Runoff, Disconnection of Nonrooftop Runoff; Sheetflow to Conservation Areas
- *Micro-scale Practices.* Rainwater Harvesting, Submerged Gravel Wetlands, Landscape Infiltration, Infiltration Berms, Dry Wells, Micro-Bioretention, Rain Gardens, Swales, and Enhanced Filters

The MDE 2000 *Stormwater Design Manual* (MDE 2000) documents the structural BMPs, which include wet ponds, wetlands, filtering practices, infiltration practices, and swales. MDE also describes nonstructural BMPs—not to be confused with the nonstructural ESD practices—that include programmatic, educational and pollution prevention practices that, when implemented, work to reduce pollutant loadings. Examples of nonstructural BMPs include implementation of strategic disconnection of impervious areas in a municipality (MDE 2009), street sweeping, homeowner and landowner education campaigns, and nutrient management (e.g., fertilizer usage).

The County has implemented and will continue to implement ESD, structural BMPs, and nonstructural practices to meet its programmatic goals and responsibilities including MS4 permit compliance, TMDL WLAs, flood mitigation, and others.

The steps presented in Figure 5-1 were followed when WTM (section 3.2) was used to identify specific retrofits and BMPs for treating impervious surfaces as described below.

- Existing BMP retrofits to enhance load reductions
- Load reductions from public ROW projects
- Load reductions from public institutional projects
- Load reductions from commercial/industrial land uses
- Load reductions from residential properties

The initial focus of BMP identification and selection targets retrofitting (i.e., improving) the first generation of stormwater practices—such as dry ponds, which are not very effective—and bringing them into conformance with current water quality standards. If the load reduction goals were not met, the focus shifts to treating the impervious surfaces throughout the MS4 areas of the watershed.

The impervious areas are split into four categories: public ROW, public institutional, commercial/industrial, and residential. There is a varying degree of difficulty in implementing BMPs on each type of surface. Similarly, there is a varying degree of difficulty in implementing BMPs within each type. To accommodate these variations, the County first considered which BMPs might be *relatively easy* to implement on each type of surface for the initial cycle compared to the BMPs that would be necessary for the required load reduction. The initial assumption is that 50 percent of each land use type will be retrofitted *relatively easily*. If gaps still exist in necessary load reductions after the first cycle, then in the next cycle, an additional 20 percent of each type will be retrofitted. In the third cycle, a further 20 percent will be retrofitted. If a gap still exists after the third cycle and a fourth cycle is needed, then the remaining 10 percent will be retrofitted. This process is being used solely for planning level purposes. During implementation, the County could use different percentages based on actual implementation opportunities.

The first type of impervious surface to be treated is public ROWs. If load reduction gaps still exist, then the next step is to determine if institutional properties (e.g., religious institutions, government offices, and facilities and municipally owned organizations [i.e., libraries, fire stations, and schools]) could help to fill the remaining gap. Next, the focus shifts to commercial and industrial land and finally to residential land. These land-use types were prioritized according to increasing complexity for planning and implementation of stormwater controls. For example, a ROW is least complex because it is public property and typically constitutes about 15–20 percent of total impervious area within a subwatershed. Stormwater controls within a ROW can be retrofitted with moderate effort. This process is repeated for each cycle.

The County recognizes that significant outreach, education, and establishment of standards (ordinances) and/or direct grant programs will be needed to support widespread implementation of stormwater controls on private properties (e.g., commercial, industrial, and residential).

WTM Modeling for BMP Identification

The WTM (described in section 3.2) was modified to include the ability to quantify the number of acres of treated impervious area required to meet the County's implementation load reduction goals. The modifications allow WTM to use different factors—such as looking at land use in addition to land cover—that are necessary to follow the procedure laid out in Figure 5-1. For instance, the updated version of WTM accounts for load reductions and impervious area treated from current BMPs in the watershed. Other modifications account for load reductions from dry pond retrofits (along with their impervious area treated) and potential reductions from programmatic initiatives. These modifications established the main purpose of the modified WTM: to determine the amount of impervious area that requires treatment to meet the County's implementation reduction targets. Besides the overall load reductions from past and projected restoration activities, WTM calculates the estimate cost of the practices using the cost information that is discussed in Section 6.2.

For implementation planning, users can first identify programmatic activities (e.g., pet waste campaigns, street sweeping, tree planting) and determine the load reductions from these practices. A description of the load reduction process is available in a technical memorandum (Tetra Tech 2015d). Next users can identify the percent of ROW impervious area for treatment. If the watershed is not meeting its reduction goals, then the user can identify a percent of institutional land impervious area for treatment, and so forth down the flow chart in Figure 5-1. These percentages are identified at the watershed scale and then disaggregated to the subwatershed scale. The modified WTM setup allows users to assign a greater percent of ESD implementation to subwatersheds that are ranked higher, as described in section 5.2. The ranking categorizing the subwatersheds into quartiles is based on each subwatershed's generation of pollutants. In the WTM, the user can assign a different utilization factor to each quartile. For instance, the top quartile (the top 25 percent) can be assigned a utilization factor of 100 percent. If the subwatershed is slated to treat 70 percent of its 100 acres of ROW impervious area, then WTM would calculate the load reductions from 70 acres of treatment. If the same subwatershed was in a quartile with an assigned utilization factor of 80 percent, then WTM would calculate the load reduction from 56 impervious acres (100 acres × 70% overall ESD implementation for ROW × 80% utilization factor = 56 acres).

The modifications made to WTM allow the user to look at different options for programmatic activities (e.g., pet waste campaigns) and ESD placements in different land uses and different subwatersheds. They enable the user to quickly look at different options, not only to minimize the number of impervious acres in different land uses that need to be treated in each subwatershed (e.g., ROW, institutional), but also to help minimize the overall cost. As the restoration process continues, WTM can be used to help refine future activities. A detailed description of the process is available in a technical memorandum (Tetra Tech 2015d).

For the treated land cover areas, WTM separates directly connected impervious areas (direct runoff) from disconnected impervious areas. During this initial evaluation, only ESD practices that treat connected impervious surfaces and their upslope, disconnected areas were included. The disconnected impervious areas have reduced flow rates but have picked up pollutants by flowing over pervious turf surfaces. In addition to loads from the impervious surface, the runoff generally has higher pollutant concentrations, even though the volume decreases. Some of the disconnected runoff loads are conveyed runoff that has infiltrated to the subsurface. During the modified WTM development, the disconnected pervious land cover concentrations were adjusted to match TMDL and MAST loadings, thus accounting for the contribution of subsurface loads.

When the BMP drainage area loads were computed, the loads from connected impervious areas are likewise separated from disconnected areas. Although the disconnected areas treated are defined by their impervious surface area, the disconnected loads are represented by the entire disconnected area, including pervious turf cover. Most runoff from pervious surfaces follows subsurface pathways. This results in decreased effective concentrations for particulate pollutants such as TSS. Therefore, the loads treated from disconnected areas are both from impervious and pervious area.

For BMP drainage areas, geospatial data shows that the proportion of pervious area is often several times that of impervious area. However, unlike disconnected impervious areas, pervious source areas have much lower runoff volumes, thus resulting in lower loads than impervious areas. Therefore, the pervious area contributions to overall load from a land use are relatively minor and are not represented in the WTM. Therefore, the load reductions by BMPs in connected impervious areas are slightly understated by WTM computations, resulting in a conservative implementation load reduction and providing an implicit margin of safety in the restoration plan.

Retrofit of Existing BMPs

Existing BMPs were evaluated to see if any practices could be retrofitted with more efficient practices to achieve larger pollutant load reductions. For example, dry ponds can be retrofitted to increase their load reductions. A dry pond reduces nitrogen only by 5 percent, phosphorus and sediments by 10 percent, and BOD by 27 percent. Converting dry ponds to the wet pond efficiency practice (providing reductions of 33 percent for nitrogen, 52 percent for phosphorus, 66 percent for sediments, and 63 percent for BOD) will improve pollution reduction. These are simple solutions that can be achieved at reasonable costs and in a short time span.

DPW&T currently implements stormwater management facility restoration and environmental enhancement projects under the Deficient Ponds Program. Prioritizing and selecting projects is based on the review of consultant inspection report findings and detailed site inspections conducted by DPW&T. The program focuses on facilities that were identified as having moderate or severe problems. Typically, these retrofits do not increase potential removal efficiencies, however, the County intends to address water quality enhancements in dry ponds identified as candidates for retrofits. Some of these ponds were designed under now-outdated design criteria. Improvements, such as retrofitting to current ESD standards, would increase their pollutant reduction potential.

Where ponds are dredged in areas where PCB contamination is likely, the dredged material can be analyzed for PCBs. If the material contains PCBs, the total amount of PCBs removed from the system can be quantified and credited toward the TMDL. Due to the high cost of PCB analysis, best professional judgment should be used when determining whether or not to test for PCBs at a particular site. Section 5.1.1 discusses source tracking and prioritization for more details on identifying areas most likely to contain PCBs.

Rights of Way

The ROW is public space along roads that is owned and maintained by the County. There is a high potential for PCB contamination in these areas due to the presence of electrical transformers, which can leak. It represents a high-priority area for restoration and will be a major focus of the County watershed restoration efforts. In general, the urban densities increase inside the Washington Beltway to the Washington, DC boundary and decrease outside the Beltway. Roads can be classified as either closed (roads bounded by curbs or gutters) or open (roads bounded by lawns and other vegetation without the presence of curbs or gutters). The local roads which serve these communities can be organized into a number of groupings which include:

- Urban open section with no sidewalk
- Urban closed section with curb and gutter, but no sidewalk
- Urban closed section with curb, gutter, and sidewalk
- Suburban open section with no curb, gutter, or sidewalk
- Suburban closed section with curb, gutter, and sidewalk

County ROWs can be present along each of these road groupings. Examples of these different groupings are presented in Figure 5-2. Each grouping has its own set of potential BMPs. Table 5-3 is a matrix of each road grouping and potential BMPs. Appendix A shows examples of select BMPs. The BMP designs will follow the criteria given in the MDE Design Manual (MDE 2000, 2009).

Urban open section with no sidewalk: Mt. Rainier–Varnum.

Urban closed section with curb and gutter but no sidewalk: Capitol Height–Balboa Avenue.

Urban closed section with curb, gutter, and sidewalk: Mt Rainier–39th Place.

Suburban open section with no curb, gutter, or sidewalk: Glen Dale–Dubarry Street.

Suburban closed section with curb, gutter, and sidewalk: Kettering–Herrington Drive.

Source: Google Maps

Figure 5-2. Examples of urban road groupings.

Table 5-3. Potential BMP types per urban road grouping

Potential BMP	Urban Open Section with No Sidewalk	Urban Closed Section with Curb and Gutter but No Sidewalk	Urban Closed Section with Curb, Gutter, and Sidewalk	Suburban Open Section with No Curb, Gutter, or Sidewalk	Suburban Closed Section with Curb, Gutter, and Sidewalk
Permeable pavement or sidewalks	X	X	X	X	X
Permeable pavement shoulder instead of grass shoulder/buffer	X			X	
Curbside filter systems		X	X		X
Curb extension with bioretention or bioswale		X	X		X
Curb cuts to direct runoff to an underground storage/infiltration or detention device		X	X		X
Grass swales and bioswales				X	
Bioretention or bioswales to convert right-of-way to a green street				X	X
Infiltration trenches with underdrains				X	

For open suburban sections, MDE's requirements for nonrooftop disconnection should first be evaluated to determine if the street can be considered disconnected and thus be counted as treated.

Institutional Land Use

Existing institutional land uses also offer many opportunities for BMP retrofits. These land uses include both County and nonprofit organization properties such as schools, libraries, places of worship, parks, government buildings, fire and police stations, hospitals, and other facilities, but exclude roadways. As with ROW, there is a high potential for PCB contamination in these areas due to the presence of electrical transformers, which can leak. Additionally, older institutions might contain pre-1979 fluorescent light ballasts, which contain PCBs that could be released to the environment through breakage or improper disposal. The County has initiated discussions with the board of education and State Highway Administration to coordinate and take advantage of available land for BMP retrofits.

The first step for each identified facility is to evaluate whether the impervious area disconnection credits apply or can be applied with a simple BMP retrofit. Most of the facilities have substantial areas of impervious cover—including rooftops, driveways, and parking areas—that offer opportunities for cost-effective retrofits. A BMP retrofit priority matrix is applied to these sites on the basis of the impervious cover type, as shown in Table 5-4. Table 5-4 looks at practices that are suitable for micro-scale BMPs. For example, it would be unusual to implement a pond or wetland BMP to treat a small roof area, but most of the MDE ESD practices identified in the table would be appropriate for that use. The retrofit priority matrix will help in the selection process and identify the practices that offer the highest pollutant removal at the lowest cost.

Table 5-4. Impervious Area BMP retrofit matrix for institutional areas

BMP Description	Impervious Cover Elements				
	Roofs	Driveways	Parking	Sidewalks	Other[a]
ESD to the MEP from the *Manual*					
Green roofs	X				
Permeable pavements		X	X	X	X
Reinforced turf		X	X		
Disconnection of rooftop runoff	X				
Disconnection of non-rooftop runoff		X	X	X	X
Sheetflow to conservation areas		X	X		
Rainwater harvesting	X				
Submerged gravel wetlands			X		
Landscape infiltration	X	X	X		X
Infiltration berms					
Dry wells	X				
Micro-bioretention		X	X		X
Rain gardens		X	X		
Grass, wet, or bioswale		X	X		X
Enhanced filters	X	X	X	X	X
Structural Practices					
Hydrodynamic structures	X		X		X
Dry extended detention ponds			X		X
Wet ponds/wetlands			X		X
Infiltration practices			X		X
Filtering practices		X	X	X	X
Tree Planting and Reforestation					
Impervious urban to pervious		X	X		X
Impervious urban to forest					
Planting trees on impervious urban		X	X		X
Tree planter		X	X	X	X

Note:
[a] Includes miscellaneous other impervious surfaces (e.g., basketball courts, tennis courts, patios).

Commercial/Industrial Land Use

Numerous commercial and industrial properties are present throughout the County. Because those areas are privately owned, the County has implemented the Rain Check Rebate and Grant Program (section 4.2), administered by DoE, which allows property owners to receive rebates for installing Rain Check-approved stormwater management practices. Homeowners, businesses, and nonprofit entities (including housing cooperatives and places of worship) can recoup some of the costs of installing practices covered by the program. Like the institutional areas, the commercial and industrial areas are characterized by large areas of impervious cover, including roofs, driveways, parking lots, and paved areas. The majority of commercial and industrial facilities are privately owned and some have their own stormwater discharge permits. The County has limited influence on the use of BMPs on commercial and industrial properties to achieve retrofit objectives on these properties, with the exception of the public roads that serve these uses. However, the County has incentives associated with reducing the property's Clean Water Act (stormwater) fee in exchange for the design, construction, and/or maintenance of BMP facilities on these properties. These areas have similar BMPs to those for institutional areas as shown in Table 5-4.

Commercial and industrial properties are constantly undergoing renovation and redevelopment processes in response to current trends and requirements. The County plans to develop a survey of these properties to identify redevelopment trends, which, through partnerships, could be incorporated into the TMDL restoration strategies.

Residential Land Use

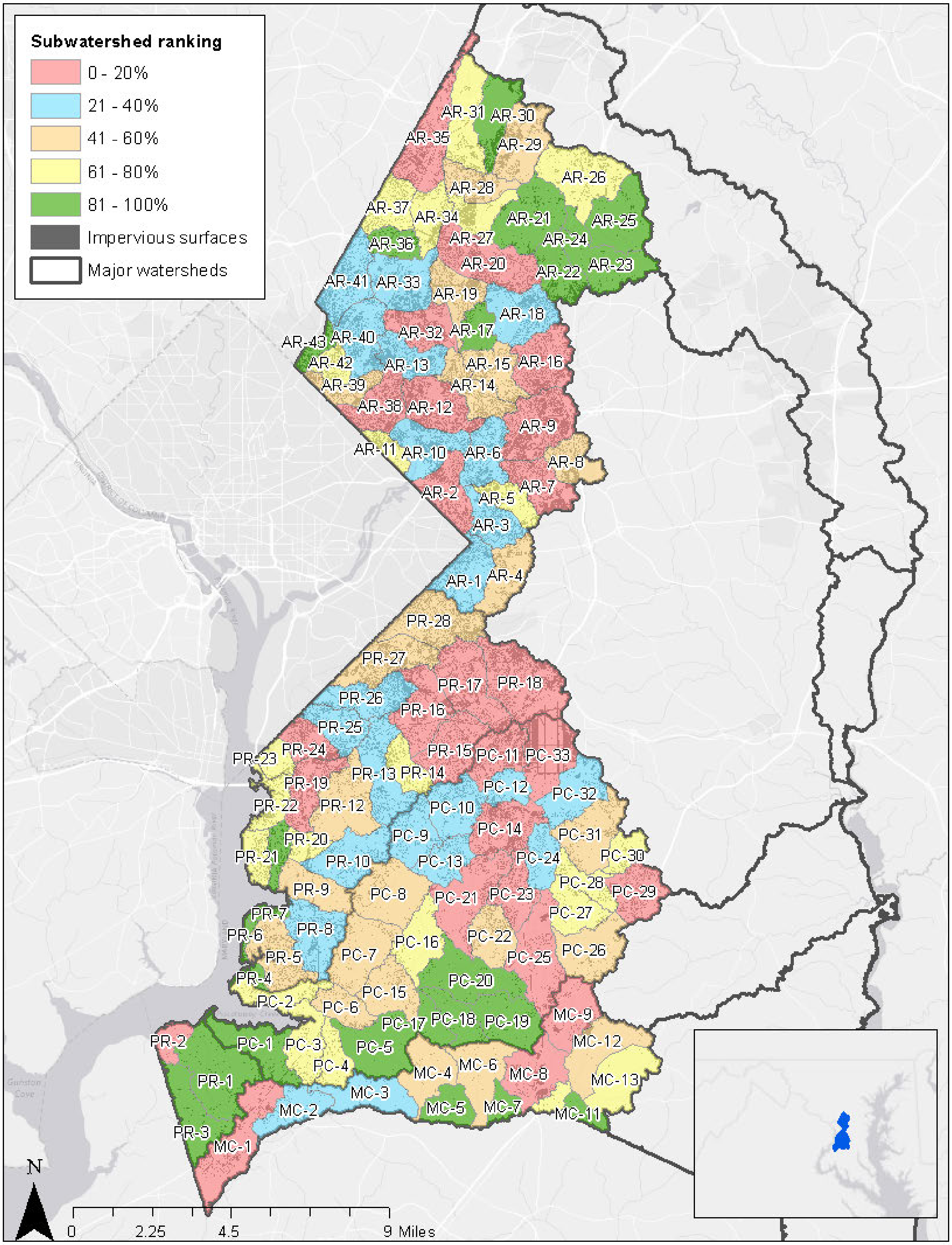
Urban and urbanizing watersheds consist of a variety of land use types that include residential, parks and open space, institutional, commercial, and industrial. Typically the land use type with the largest area is residential, which ranges from high-density residential (such as apartments and townhouses) to low density residential (lots with 2 or more acres). Generally, low-density residential areas are not a significant source of PCB contamination. High-density residential areas can be, due to the presence of electrical transformers, which is addressed in the ROW section above. However, BMP implementation to reduce sediment and runoff in all residential areas can provide additional PCB load reductions, although these are difficult to quantify. Refer to the restoration plans for the subject watersheds for more details regarding BMPs to address residential sediment load reductions.

5.2 Subwatershed Prioritization

The subwatersheds were ranked and prioritized to aid in the selection of BMPs in the areas with the highest required pollutant loading reductions.

The County prioritized the subwatersheds by ranking the necessary total load reductions for each TMDL parameter and then averaging the individual ranks to obtain an overall rank for the subwatershed. The prioritization process ranked the subwatersheds within each of the PCB-impacted watersheds, with the number 1 being the highest priority ranking for each.

Figure 5-3 shows the subwatershed rankings spatially for the PCB-impacted watersheds. The highest ranked watersheds tended to be in areas with the largest amount of impervious cover. The available impervious cover in Table 5-3 represents the impervious area that contributes to the County's MS4 loadings and is available to the County for BMP implementation; therefore, it does not include impervious cover on state or federal land.



Note: Subwatersheds are ranked with 1 being the highest priority subwatershed.

Figure 5-3. Subwatershed prioritization in the PCB-impacted watersheds in Prince George's County.

6 IMPLEMENTATION DISCUSSION

This section describes the County's implementation processes to improve water quality and meet the goals and objectives of the restoration plan. It includes specific planned actions, cost estimates, and a proposed schedule, as well as descriptions of the financial and technical resources available to support and implement the restoration plan. This section also describes how the public will be involved throughout implementation, both in terms of keeping the public informed and by involving them directly in the implementation actions. As part of this plan's adaptive management strategy (section 7.3), DoE will perform a biennial review of programs starting in 2015 to assess restoration progress and public involvement. Part of the review will be to identify ways to improve community involvement and increase the rate of restoration activities (both BMPs and programmatic initiatives).

6.1 Proposed Management Activities

This section presents the implementation portion for the County's PCB-impacted watersheds restoration plan, which is focused on achieving the load reductions presented in section 3.3. Using the procedure outlined in section 5.1, this restoration plan proposes both BMP implementation and programmatic initiatives. The restoration plan creates the overall blueprint for restoration activities in the subject watersheds. Although BMP types and locations are not explicitly specified, the plan will allow the County the flexibility to identify specific locations and to work with partners (e.g., to install BMPs on institutional or private land). It also will allow the flexibility of selecting suitable ESD practices on the basis of factors such as costs, land availability, feasibility, and pollutant-removal efficiencies. Figure 6-1 presents conceptual art of a city block with different ESD practices on institutional, commercial, and residential property. Please note that this figure includes some practices that are not specifically mentioned in the plan, but that could be incorporated into it on the basis of County priorities and future goals, as well as MDE approval.

Credit: EPA OWOW.

Figure 6-1. Conceptual city block with ESD practices.

6.1.1 Restoration Plan Programmatic Initiatives

As previously stated, the County's existing programmatic practices are expected to continue and will be supplemented with additional practices to make up the programmatic strategies for this restoration plan. Many of these strategies rely on public education and outreach. Section 6.6 of this restoration plan deals specifically with public involvement in the restoration implementation process, which includes public education. These activities will first focus on the areas in the watershed that have the most need for load reduction and then will continue throughout the watershed. Load reduction progress will be monitored throughout restoration plan implementation. Programmatic strategies will be modified as needed to ensure continued load reduction.

Existing Practices (from Section 4.2)

The existing practices that could have a quantifiable effect on water quality are in this section. There are other practices listed in section 4.2, however, not all of them have quantifiable load reductions.

- *Clean Water Partnership* (*CWP*) *Program*. The CWP initially focuses on ROW runoff management for older communities, which are inside the Capital Beltway (Interstate 495). The program is expected to be responsible for providing water quality treatment for up to 2,000 acres of impervious land over the next 3 years at a cost of approximately $64 million ($14 million the first year, followed by $25 million each of the following 2 years); however, these numbers might be adjusted. Any BMPs installed as a result of this program would be credited towards the ROW BMPs identified in section 6.1.2.
- *Rain Check Rebate and Grant Program.* This program started in 2013. Forty properties have received the rebate to date. However, for these practices to receive credit for this TMDL restoration plan, they will need to be verified by the County. The acreage that will be treated using this program has not yet been estimated. The restoration plan calls for additional public outreach to inform County residents of this program. Outreach could target homeowner associations, community groups, or neighborhood associations. The County has allocated $3 million for the implementation of the Rain Check Rebate and Grant Program. Currently rebates are capped at $2,000 for residential properties and $20,000 for commercial properties, multifamily dwellings, nonprofit, and not-for-profit groups.[4] The program is currently setup to provide rebates for up to 500 practices per year. If interest in the program results in the possibility of this maximum number being exceeded, the County could increase the 500 per year limit by shifting more funds to cover administrative costs. Any BMPs installed as a result of this program would be credited towards the appropriate BMP group identified in section 6.1.2.

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[4] http://www.cbtrust.org/site/c.miJPKXPCJnH/b.9146461/k.6D3F/Prince_George8217s_Rain_Check_Rebate.htm. (accessed September 2014)

- *Alternative Compliance Program.* This program has only recently started; thus, there are no current load reductions from it. The restoration plan calls for additional outreach to inform County nonprofit organizations of this program. Approximately 10 percent of the religious organizations that agree to provide easements on their properties are expected to install BMPs annually. The Clean Water Act fee database includes an estimated 860 accounts (one religious facility can have multiple accounts) for religious organizations that are eligible for this credit in the Anacostia River watershed. These organizations' properties include approximately 350 acres of treatable impervious area. Therefore, using the 10 percent estimation, about 34.8 acres of impervious area could be treated annually under the Alternative Compliance Program. The Mattawoman Creek watershed has 25 accounts with a total of 10 acres of treatable impervious area, which gives approximately 1 acre that could be treated annually under the program. There are an estimated 240 accounts in the Piscataway Creek watershed with approximately 102 acres, yielding about 10.2 acres of impervious land that could be treated. In the Potomac River watershed, there are 370 accounts with 230 acres, so approximately 23 acres of impervious area could be treated. Any BMPs installed as a result of this program would be credited towards the institutional BMPs identified in section 6.1.2.
- *Countywide Green/Complete Streets Program.* No projects have been completed as of the date of this document; however, some projects are in the design phase and will go into construction in fiscal year 2015. The acreage that will be treated using this program has not yet been estimated. Any BMPs installed under this program would be credited towards the ROW or institutional BMPs as identified in section 6.1.2.
- *Illicit Connection and Enforcement Program.* As part of its BMP inspection and maintenance programs, the County has recently established an illicit discharge detection and elimination initiative. This initiative can have substantial benefits in pollutant reduction. The progress of this initiative will be reported annually and

identified locations will be geo-referenced to be accounted for in the County's TMDL restoration plan.

Proposed Enhancements (from Section 5.1.1)

The procedure for the identification and removal of PCB-contaminated sediments is discussed in section 5.1.1. If contamination is identified, a significant load reduction can occur from removal of contaminated sediments from the system. The load reduction will be calculated when sediments are removed (amount of sediment removed × PCB concentration) and credited toward the PCB TMDL reduction required for the watershed in which it is found.

6.1.2 Restoration Plan BMPs

Given the preceding programmatic measures, a substantial amount of the loads can be removed before allocating structural BMPs. After programmatic initiatives were applied, the general approach in the strategy development was to first upgrade dry ponds (which have a low pollution-reduction efficiency), then install ESD BMPs at public ROW and public areas, such as County government buildings, parks, and schools. If additional PCB load reduction is needed, the plan suggests that the County form partnerships with other entities (e.g., places of worship, commercial centers, industries, and apartment/condominium communities) to install BMPs on private land. Section 5.2.1 identified the potential types of BMPs appropriate for specific land uses.

Table 6-1 presents the number of impervious acres that are projected to require treatment using dry pond retrofits and ESD BMPs in the PCB-impacted watersheds. Appendix B presents the impervious acres for each subwatershed. For the Anacostia, Mattawoman, and Piscataway watersheds, the implementation levels shown are based on what is necessary to satisfy the implementation load reduction goals for other local TMDLs in those specific watersheds and therefore might be greater than needed to solely meet the PCB implementation load reduction goals. The Potomac implementation levels were developed to satisfy the PCB implementation load reduction goals specifically in the Potomac River watershed.

Table 6-1. Needed acres of impervious area treated by dry pond retrofits and ESD practices

Watershed	Number of Dry Pond Retrofits	Dry Pond Retrofit (Impervious Acres Treated)	ESD (Impervious Acres Treated)			
			ROW	Institutional	Commercial/ Industrial	Residential
Anacostia	33	167	2548	599	2,925	3,890
Mattawoman	1	5	63	18	153	150
Piscataway	9	73	414	63	195	255
Potomac	17	102	717	107	309	793
Total	60	346	3,742	786	3,582	5,088

Note: It is assumed that 1 ESD BMP will treat 1 acre of impervious area.

Even though the restoration strategy first looked at ROWs, the County can install BMPs on any land-use type as opportunities arise. In other words, the restoration plan does not limit the County to install BMPs on ROWs to the maximum capacity before moving onto other types of properties. The restoration strategy initially suggests installing BMPs on public ROWs, but the

County can choose to install similar BMPs to treat other land uses (e.g., County facilities) to obtain similar load reductions. In addition, BMPs installed for other purposes, such as redevelopment, can be counted towards the totals in Table 6-1.

6.1.3 Estimated Load Reductions

Calculations to determine the load reductions from BMPs and programmatic initiatives were added to the WTM spreadsheet that was used to determine the implementation load reduction goals (section 3.2). This load reduction analysis was performed using the steps presented in section 5.1. After each step, the estimated load reductions were compared to implementation load reduction goals to determine the remaining load reduction gap. The steps were followed and repeated until the implementation load reduction goal was met by the estimated load reductions. The steps were:

1. Load reductions from current BMPs, along with their impervious drainage area, were input into the WTM and subtracted from the necessary load reduction and available impervious area, respectively.
2. The load reductions from existing programmatic initiatives were subtracted from the necessary load reductions.
3. The load reductions from recommended programmatic initiatives were subtracted from the necessary load reductions.
4. The load reduction difference between dry ponds and wet ponds was subtracted from the necessary load reductions.
5. Proposed BMPs and their associated load reductions and impervious area treated were subtracted from the necessary load reductions. This was first done for ROW, then institutional land, followed by commercial and industrial land, and lastly residential land.

The resultant final load reductions (from programmatic initiatives and BMP implementation)are presented in this section. Load reductions from current BMPs are presented in section 4.3.2.

Programmatic Initiatives

Estimating potential load reductions from programmatic initiatives is challenging since some of the initiatives require public participation and a change in long-standing behaviors. Therefore, several assumptions are required. The County has accounted for the need to re-evaluate the estimated load reductions in the future in its adaptive management approach (section 7.3). This section discusses load reductions from several of the programmatic initiatives result in BMPs being installed. These programs are not discussed in this section because their impacts are reflected in the load reductions from BMPs, as shown later in this section. These BMP-related programs are the Stormwater Management Program, CWP, Rain Check Rebate and Grant Program, countywide Green/Complete Streets Program, Alternative Compliance Program, Flood Awareness campaigns, and Transforming Neighborhoods Initiative.

Although percent removal efficiencies can be determined for BMPs and some programmatic activities, it is not possible to estimate the load reduction capabilities of other programmatic activities, such as storm drain stenciling. The cumulative effects of these activities will help reduce loads entering local water bodies, thus improving their health. The impacts of these activities are not calculated as part of this plan, however, these activities do form an important part of this plan. Most of them serve to educate the public on how they can help improve water quality. The improvements in water quality from these activities will be reflected through adaptive management, where the County will assess the cumulative improvements in the water quality and health of water bodies under the restoration plan.

Proposed BMP Implementation

Table 6-2 represents the load reductions achieved with the dry ponds retrofits (to more efficient BMPs) and with ESD practices implemented on each urban land use type. Appendix B presents the estimated load reduction for each subwatershed by land use.

Table 6-2. Total PCB load reductions (lb/yr) in the PCB-impacted watershed

Watershed	Dry Pond Retrofit	ESD Practices on				Total
		ROW	Institutional	Commercial/ Industrial	Residential	
Anacostia	6.39E-03	2.23E-01	5.45E-02	2.92E-01	3.12E-01	8.87E-01
Mattawoman	7.16E-07	2.20E-05	7.26E-06	2.94E-05	3.99E-05	9.92E-05
Piscataway	8.92E-06	9.77E-05	2.48E-05	4.40E-05	7.52E-05	2.51E-04
Potomac	7.05E-05	9.02E-04	2.71E-04	4.63E-04	8.90E-04	2.60E-03

It is expected that some of the ROW BMPs will be installed by the County's CWP. The CWP is expected to treat 2,000 acres of impervious areas within the next 3 years countywide, but will focus on the older sections of the County, which are inside the Capital Beltway. Similarly, some of the institutional BMPs will be installed as part of the County's Alternative Compliance program, while some BMPs on commercial, industrial, and residential land will be installed as part of the County's Rain Check Rebate and Grant Program. Since these programs have been launched recently, the County does not have long-term data on the estimated number of BMPs or the estimated load reductions from the programs. Once more data is available in subsequent years, such as, installed BMPs, treated land use types, and level of public participation, estimates will be made on the load reductions from these programs.

Estimated Overall Load Reductions

Table 6-3 presents the load reductions for the different restoration activities (BMPs and programmatic initiatives), while Table 6-4 presents the overall load reductions. The most reductions will be obtained by implementing ESD practices on impervious land.

Table 6-3. Comparisons of total PCB load reductions by restoration strategies

Watershed	Existing Practices	Dry Pond Retrofit	ESD Practices
Anacostia	4.12E-03	6.39E-03	8.81E-01
Mattawoman	1.15E-05	7.16E-07	9.85E-05
Piscataway	4.09E-05	8.92E-06	2.42E-04
Potomac	2.80E-04	7.05E-054	2.53E-03

Table 6-4. Total load reductions in the PCB-impacted watersheds in Prince George's County

Water-shed	Unit	Implemen-tation Model Baseline from WTM	Percent Reduction from MDE *TMDL Data Center*	Implemen-tation Model Target Load	Required Implemen-tation Model Reduction from WTM	Reduction from Current BMPs	Remaining Reduction or *Reduction Gap*	Reduction from Restoration Plan Strategies	Remaining Reduction
Anacostia	lb/year	1.41E+00	98.1%–99.9% (98.9% avg)	1.50E-02	1.39E+00	4.12E-03	1.39E+00	8.87E-01	36.44%
Matta-woman	lb/year	1.01E-04	42.5%	5.78E-05	4.27E-05	1.15E-05	3.20E-05	9.92E-05	0.00%
Pis-cataway	lb/year	4.28E-04	5.0%–33.0% (30.5% avg)	2.97E-04	1.31E-04	4.09E-05	9.37E-05	2.51E-04	0.00%
Potomac	lb/year	3.55E-03	5.0%–99.0% (80.6% avg)	6.89E-04	2.86E-03	2.80E-04	2.58E-03	2.60E-03	0.00%

Note: PCB loads have different percent reductions by water body within watersheds. The table above combines these areas.

6.1.4 Additional Measures

Other measures, noted below, can further reduce PCB loads. However, these measures are not considered part of the County's MS4 WLA requirements and, therefore, load reduction estimates were not calculated. Similarly, they are not included in the cost estimate or implementation schedule.

Atmospheric Deposition Reductions

Reducing the use of PCB-containing equipment, as encouraged by the proposed public education initiatives, will reduce PCBs released to the atmosphere, which then enter water bodies through atmospheric deposition. It is difficult to accurately estimate the amount of PCBs released to the atmosphere and, therefore, predict the reduction to atmospheric deposition.

Sewer Repair and Rehabilitation

One source of fecal coliform bacteria to stormwater is aging sewer lines and manholes. There are more than 850 miles of sanitary sewers in the Anacostia River watershed. Of those, there are more than 100 miles of sewers that were installed before 1940 and another almost 300 miles that were built in the 1940s and 1950s. In extreme cases, aging sewer lines result in sanitary sewer overflows, which are quantified in the *Anacostia River Watershed Existing Conditions Report* (Tetra Tech 2014a). As a result, the single most effective measure to reduce sanitary sewer overflows is to repair and rehabilitate existing sewer lines. The Washington Suburban Sanitary Commission (WSSC) is under a 2005 consent decree with EPA to overhaul its sewer lines to reduce sanitary sewer overflows (SSOs) under their Sewer Repair, Replacement and Rehabilitation Program. As part of that program, improvements to leaky sewer lines could dramatically reduce human bacteria loads, along with nutrients, BOD, and sediment. Because this effort is not administered by the County, it is difficult to determine how much rehabilitation would be involved. Its cost would be borne by WSSC. However, loads from sewer overflows and leaks are not part of the County's MS4 load reductions. Loadings from SSOs and other sewer leaks are reflected in water quality monitoring data. These data were used in TMDL development, meaning that loads from SSOs and other sewer leaks are assumed to contribute to the overall load from urban areas (e.g., the County's MS4 area). The WSSC program is mentioned here as part of the overall plan to help the Anacostia River meet its water quality criteria. The correction of SSOs and other sewer leaks will help the overall achievability of the nutrient, BOD, and bacteria TMDLs.

6.2 Cost Estimates

The cost estimates in this section are intended to provide the County and its watershed partners with a general sense of the expenditures and staff resources, within an order of magnitude accuracy, that might be anticipated over the period of implementation. The costs do not account for inflation over the lifetime of this plan. Given the iterative and adaptive nature of the restoration plan and the potential for modifications of proposed activities, the cost estimate should be considered preliminary for the year estimated and in later years should be revisited as the implementation period moves forward and new data become available.

6.2.1 Programmatic Initiatives

Cost for programmatic initiatives are more difficult to determine than BMP costs. Some of the programmatic initiatives are extensions of current County practices. For instance, the ReLeaf Grant Program is one of the County's existing programs with an existing budget. For the CWP, the costs are included in the BMP analysis; the only additional cost to the County is the staff time needed to administer and coordinate the program as part of regular duties. Other programs do not have costs factored into the current County budget.

Provided below are the estimated resources needed for various outreach-related programmatic initiatives that support watershed restoration. Resources will be prorated and split among the different local TMDL restoration plans. Many of the existing County programs are expected to be maintained at their current levels. Some programs are still in the initial phases, so the programmatic costs for those activities will increase. Only County programs that will have increased programmatic funding are discussed in this section. The County programs that are not addressed below include those for which any increase in programmatic costs is only due to annual salary increases, not because of an increase in activity level.

- *Current Outreach Initiatives*
  - *Clean Water Partnership* (*CWP*) *Program*: As discussed in section 4.2.1, the CWP, which focuses on ROW runoff management, will have a total cost of approximately $64 million ($14 million for the first year followed by $25 million for each of the following 2 years). The program operating costs for this program will include three staff engineers for 100 percent of their time.
  - *Rain Check Rebate and Grant Program*: As discussed in section 6.1.2, the County has allocated $3 million to implement the Rain Check Rebate and Grant Program. Funding comes entirely from the revenues generated under the Clean Water Act Fee Program. In addition to the costs for the rebates themselves and County staff time needed to run the program, it is anticipated that the County will need to continually reach out to the public to promote the program and encourage participation. This will primarily be done though community workshops. This program costs the County $300,000 annually in administration.

- *Alternative Compliance Program*: There is opportunity for DoE staff working on this program to cross-market outreach with other related programs such as the Rain Check Rebate and Grant Program and other County programs. The County plans to use two full-time County staff members to reach out and work with 100 nonprofit organizations each year. The County staff will contact prospective nonprofit organization partners and track the program's progress.

Each program has annual operational costs that include staff salaries, outreach materials, and publicity for the program. In addition, the new programs have kick-off year costs for designing the outreach program and its materials. Table 6-5 provides the estimated annual costs for the expanded or new programs and the method by which the costs will be prorated among the watersheds.

Table 6-5. Programmatic costs for the PCB-impacted watersheds

Program	Prorating Method	Countywide: Annual Cost	Anacostia Share	Mattawoman Share	Piscataway Share	Potomac Share
CWP	Total cost prorated by impervious acres of the ROW that will be treated.	$360,000	$242,004	$5,992	$39,307	$68,082
Rain Check Rebate and Grant Program	Total cost prorated by impervious acres of the residential areas that will be treated.	$300,000	$228,700	$8,796	$15,016	$46,612
Alternative Compliance Program	Total cost prorated by impervious acres of the institutional areas that will be treated.	$225,000	$170,006	$5,023	$17,877	$30,221
Total		**$885,000**	**$611,622**	**$640,709**	**$19,811**	**$72,200**

Note: This table does not include costs to implement BMPs. Costs are for staff and outreach materials and publicity.

6.2.2 BMP Implementation

The cost data presented in Table 6-6 are based on the University of Maryland Center for Environmental Science (UMCES) Technical Report Series No. TS-626-11, *Costs of Stormwater Management Practices in Maryland Counties*, prepared for MDE (King and Hagan 2011)[5]. These unit cost estimates (capital and operations and maintenance [O&M]) were developed for the proposed BMPs presented in Section 6.1 by land use type.

[5] The cost-estimating framework used in the report develops full life cycle cost estimates using the sum of initial project costs (pre-construction, construction and land costs) funded by a 20-year county bond issued at 3 percent, plus total annual and intermittent maintenance costs over 20 years. Annualized life cycle costs are estimated as the annual bond payment required to finance the initial cost of the BMP (20-year bond at 3 percent) plus average annual routine and intermittent maintenance costs.

Table 6-6. BMPs costs by application

BMP Type	Life Span (years)	Preconstruction & Construction Cost/Impervious Acre	O&M Unit Cost/ Impervious Acre	Total Life Costs	Annualized Cost/ Impervious Acre
Pond retrofit	20	$11,700	$1,232	$36,340	$1,817
ROW: open section	20	$52,758	$984	$72,240	$3,622
ROW: closed section	20	$55,929	$2,379	$90,213	$5,175
Institutional	20	$51,368	$1,386	$100,949	$3,954
Commercial/industrial	20	$51,368	$1,386	$100,949	$3,954
Residential	20	$17,477	$309	$23,665	$1,183
Stream restoration	20	$50,000	$891	$67,820	$3,391

Stream restoration costs were taken directly from the King and Hagan (2011) report. The remaining BMP group type costs are averages of different specific BMP types. The following is a discussion on the methods used to determine the BMP type costs presented in Table 6-6.

- *Pond Retrofit Costs*. The UMCES cost data provides information for new dry pond construction, but not for retrofitting a dry pond to improve water quality. Pond retrofits would focus on retrofitting dry ponds to wet ponds. For the pond retrofit cost, it was assumed to be equivalent to 30 percent of the cost of a new pond construction.
- *ROW: Open Section*. As previously described, a number of ESD practices can be used on an open section ROW. These were ranked from the lowest cost (impervious disconnection) to the highest cost (permeable pavement). Because this restoration plan does not specify which ESD practices will be used, the final costs were weighted according to an estimated proportion for each practice to arrive at the final cost. There are 1,266 acres of open road section in the County. Based on professional judgment and experience in the County and the State, of that total acreage, 20 percent was assumed to qualify for impervious disconnect credit, 30 percent could be treated with swales or bioswales, 40 percent could be treated with vegetated open channels, and 10 percent would require a permeable pavement practice. Because the UMCES report does not have any values for impervious disconnection, the urban grass filter cost was used as a surrogate. This generated a weighted annualized unit cost of $3,622/impervious acre.
- *ROW: Closed Section*. A similar analysis was conducted for the closed ROW section. The ranking of potential ESD practices ranged from the lowest (tree box) to the highest (permeable pavement). The lowest cost ESD practice, the tree box, will generally not meet the performance criteria as a stand-alone practice, but will need to be coupled with other practices such as bioretention/rain garden practices. Based on professional judgment and experience in the County and the State, it was projected that this combination of practices could manage 40 percent of closed ROW acres and that another 40 percent might require a hydrodynamic device or a similar practice. In addition, it was projected that approximately 15 percent of the areas would require an urban filter, and 5 percent would require a permeable pavement solution. This generated a weighted annualized unit cost of $5,175/impervious acre.

- *Institutional*. The institutional land-use applications were subjected to a similar analysis. As previously described, the institutional land-use applications have a much larger grouping of ESD practice options. The ranking by cost was the same as for open ROW section. The institutional applications also usually have more space available for stormwater practices. In addition, roof areas could be treated using impervious area disconnection coupled with storage devices such as dry wells, landscape planters, or rain gardens. This accounts for 30 percent of the total institutional impervious area. Based on professional judgment and experience in the County and the State, another 45 percent could be treated with landscape-based practices such as bioretention. In addition urban filtering practices might make up 20 percent and another 5 percent could require the use of permeable pavement in parking areas. This generated a weighted annualized unit cost of $3,954/impervious acre.
- *Industrial/Commercial*. The analysis of industrial and commercial applications revealed that these have opportunities similar to the institutional land uses; therefore, the same unit costs developed for the institutional areas apply to industrial and commercial land areas.
- *Residential*. The residential land use has a well-defined range of on-site BMP practices that can be used to manage stormwater. They include all the nonstructural practices documented in the MDE ESD manual (MDE 2009), as well as swales, rain gardens, and permeable pavement for driveways, walks, and patios. Based on professional judgment and experience in the County and the State, it was estimated that practices in the following percentages could be used;
  - Rooftop disconnection 25%
  - Nonrooftop disconnection 10%
  - Bioswales 20%
  - Rain gardens 40%
  - Permeable pavement 5%

  This generated a weighted annualized unit cost of $1,183/impervious acre for residential applications. However since the amount of impervious cover for various residential types ranges from 3000 square feet for 1- acre lots to 1500 square feet for ⅛ acre lots, the following preconstruction and construction and annualized unit costs for the various lot sizes were obtained and used in this cost analysis.

Lot Size	Pre-construction & Construction Costs	Annualized Unit Cost
1 acre	$ 1,165	$ 79
½ acre	$ 794	$ 54
⅓ acre	$ 728	$ 49
¼ acre	$ 728	$ 49
⅛ acre	$ 603	$ 41

- *Life Cycle.* Although individual life cycles can range from 10 to 50 years, the lifetime of on-the-ground BMPs is generally considered to be about 20 years. This period is also reasonable for programmatic strategies because significant changes can occur to a program or practice over its 20-year life span.

Cost estimates for each subwatershed were developed using the selected palette of on-the-ground BMP and programmatic strategies, targeted based on land use types. Cost estimates of on-the-ground BMPs could include costs related to land acquisition, scaled construction, design and permitting, and operation and long-term maintenance. Cost estimates have been established using published Maryland data (in MAST) and local project knowledge to develop County-specific implementation costs. The MAST unit costs ($ per impervious acre treated) were used to develop restoration costs at subwatershed to watershed scales.

6.2.3 Final Costs

The final costs per restoration activity are shown in Table 6-7, along with the estimated load reductions and cost per pound of pollutant reduced.

Table 6-7. Total BMP implementation and programmatic initiatives cost and load reductions by the restoration strategy

Watershed	Parameter	Dry Pond Retrofit	ESD Practices
Anacostia	Impervious acres treated	166.9	9,962.2
	Total cost ($M)	$0.36	$388.30
	Load reduction (lb/yr)	6.39E-03	8.81E-01
	Cost per pound ($/lb)	$56,338,028	$440,749,149
Mattawoman	Impervious acres treated	4.6	383.3
	Total cost ($M)	$0.03	$14.75
	Load reduction (lb/yr)	7.16E-07	9.85E-05
	Cost per pound ($/lb)	$41,899,441,341	$149,746,192,893
Piscataway	Impervious acres treated	72.5	927.1
	Total cost ($M)	$0.32	$40.33
	Load reduction (lb/yr)	8.92E-06	2.42E-04
	Cost per pound ($/lb)	$35,874,439,462	$166,652,892,562
Potomac	Impervious acres treated	102.0	1925.0
	Total cost ($M)	$0.33	$74.38
	Load reduction (lb/yr)	7.05E-05	2.53E-03
	Cost per pound ($/lb)	$4,680,851,064	$29,399,209,486

6.3 Funding Sources

Implementation of the management activities within the proposed schedule will depend largely on available funding and financing options. Funding refers to sources of revenues used to pay for annual operating expenditures, including maintenance and administrative costs; to pay for management activities directly out of current revenues; and to repay debt issued to finance capital improvements. Financing is defined as the initial source of funds to pay for management activities. A comprehensive list of available funding and financing options were reviewed, and the most applicable approaches are summarized in this section.

The County is considering a number of different ways to finance its restoration projects. Typically, the County has issued tax-free municipal bonds to fund projects, which is the preferred method to obtain funding. Optionally, the County can also use private financing and/or group financing. Another option that the County might consider is selling stormwater bonds, where the residents can invest in the program by buying bonds. Although a good option, establishing and administering stormwater bond sales is a time-intensive process and could be cost-prohibitive as a result.

Currently, the County is funding projects through its annual Capital Improvements Program (CIP), which is supported primarily through the sale of bonds. The CIP contains project construction budget projections for the next 6 years. Depending on the project commitments in the CIP, the County purchases bonds to match CIP cost demands. In addition, the stormwater ad valorem tax is collected throughout the County (except for Bowie, which is its own entity) as part of property taxes to help fund stormwater management programs. The tax is applied in two taxing districts: (1) District 1 generally covers the urban portions of the County and has a tax rate of $0.054 per $100 of assessed property value, and (2) District 2 generally covers the rural portions of the County and has a tax rate of $0.013 per $100 of assessed property value. The County uses these funds to predict the amount of annual CIP expenditures using the generated funds. The ad valorem tax annually collects approximately $7 million; however, that total varies year-to-year on the basis of assessed property values. Not all of this money is available for stormwater restoration projects. Some of the collected funds are used to support the DPIE; DPW&T's gray infrastructure projects (infrastructure for stormwater conveyance), and salaries for DoE staff.

In 2013, the County enacted a Clean Water Act Fee that provides a dedicated revenue source for addressing stormwater runoff and improving water quality for regulatory mandates such as the Chesapeake Bay WIP, TMDL Restoration Plans, and the NPDES MS4 Permit (independent of the ad valorem tax and General Fund). The fee is based on a property's assessed impervious surface coverage and provides a mechanism to equitably allocate the fee based on a property's stormwater contribution. Thus, each property contributes a fair and equitable share toward the overall cost of improving water quality and mitigating the impact of stormwater runoff. The fee is expected to collect roughly $14 million of dedicated funding annually. Depending on the rate of restoration activities completed by the CWP and County CIP efforts, the County might reevaluate funding options in the future.

Table 6-8 presents the current CIP budgets for stormwater-related treatment projects countywide. Although the CIP does list some specific projects, many listings are for general restoration activities and do not list specific restoration activity locations; therefore, the CIP expenditures for the entire County, rather than watershed-specific activities, are listed. Some additional funds are dedicated but are not listed in the CIP. The largest of these is the CWP, which will be run by DoE. The program is expected to be responsible for providing water quality treatment to 2,000 acres of impervious land over the next 3 years at a total cost of approximately $64 million ($14 million in the first year, followed by $25 million in each of the following 2 years).

Besides funds from the Clean Water Act Fee, stormwater ad valorem tax, and CIP budget, grants (federal, state, or other) are expected to be an essential contribution to funding; a list is provided in Appendix D. The County has successfully obtained various grants in the past and expects that the trend will continue. The County will continue to aggressively pursue grant opportunities available for restoration projects. In addition to grants, federal and state loans (e.g., state revolving fund) might be an option for helping to fund part of the TMDL restoration process. In addition, the County encourages government entities (e.g., municipalities) and private organizations (e.g., watershed groups, nonprofits) to identify and apply for grant opportunities.

Table 6-8. Current capital improvement project (CIP) budget for Prince George's County

Project Type	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20
	Allocated Cost ($1,000s)						
Local TMDL restoration activities	0	650	1,000	1,700	1,700	1,700	1,700
NPDES compliance	3,398	8,287	8,230	6,670	6,670	6,670	2,170
Chesapeake Bay WIP-related water quality	1,453	6,728	0	0	0	0	0
DPW&T stormwater management	16,996	10,250	12,010	13,160	14,260	14,260	14,260
Stream restoration	2,481	1,650	1,000	0	0	0	0
Other identified project	2,550	2,415	3,190	490	0	0	0
Contingency fund	1,000	1,000	1,000	1,000	1,000	1,000	0
Total	**27,878**	**30,980**	**26,430**	**23,020**	**23,630**	**23,630**	**18,130**
Project Type	**Funded by Grants ($1,000s)**						
NPDES compliance and Restoration (including WIP)	12,122	26,185	18,810	.15,070	14,770	14,770	14,770
DPW&T stormwater management	23,000	14,800	16,000	17,000	17,000	17,000	17,000
Stream restoration	2,150	1,800	175	4,600	2,100	2,100	010,100
Contingency fund	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Total	**24,000**	**15,800**	**17,175**	**22,600**	**20,100**	**34,870**	**42,870**

Note: FY = fiscal year, which runs July through June. For example, fiscal year 2014 ran July 1, 2013, through June 30, 2014.

It is expected that the current funding sources and funding will remain consistent over the life of this restoration plan. Projecting the current and projected 5-year capital budget (2014–2019), the County expects to have $ 21 million a year from the Clean Water Act fees and ad valorem tax (or $ 105 million total over the 5-year period) for restoration activities. The County will sell bonds as needed and will use revenues to pay the interest. The available money will need to be split across multiple restoration plans, including the Chesapeake Bay WIP; however, many of the activities in the WIP can be counted towards the local restoration plans. Similarly, this PCB-impacted water body restoration plan has restoration activities that overlap with the Anacostia River, Mattawoman Creek, and Piscataway Creek restoration plans.[6] The MS4-responsible budgetary requirements of the different restoration plans are:

[6] For more information on the County's water body restoration plans, see Tetra Tech 2015a; *Restoration Plan for the Anacostia River Watershed in Prince George's County;* Tetra Tech 2015b, *Restoration Plan for the Mattawoman Creek Watershed in Prince George's County;* and Tetra Tech 2015c, *Restoration Plan for the Piscataway Creek Watershed in Prince George's County.*

- Anacostia River watershed: $401 million
- Piscataway Creek watershed: $39 million
- Mattawoman Creek watershed: $14 million
- Upper Patuxent River watershed: $4 million
- Rocky Gorge Reservoir watershed: $0.2 million
- PCB-Impaired water bodies: $69 million (Potomac River portion only)
- Chesapeake Bay WIP (countywide): $727 million (for comparison to local plans)

For the purposes of this plan, funding by the County can be allocated proportionally to the funding required by each restoration plan. The County reserves the right to shift funding, in certain years, to areas in other watersheds that require large amounts of load reductions or where restoration opportunities arise. By doing so, the County will shift year-to-year reduction goals, but will not change the final restoration activity completion date, which was determined using the estimated annual budget for restoration activities.

6.4 Implementation Schedule

This section provides the implementation schedule for the BMP and programmatic strategy necessary to meet the TMDL compliance milestones. The timeframe to secure the necessary funding for each individual BMP is not incorporated in the implementation schedules. There is no mandated end date to the local TMDL restoration plans; however, the County understands that the public prefers an expedited restoration process. The County also shares the urgency. However, the lack of new BMPs with better efficiencies and site opportunities for restoration activities that can occur each year might be limited. Regardless, the County and its watershed partners are committed to finding site opportunities and expediting the planning, design, and construction phases for management activity to the maximum extent practicable.

Several factors contribute to the overall schedule. First, the County is bound by its permit requirements to retrofit (e.g., treat) 20 percent of the untreated impervious area in its MS4 area by the end of the permit cycle (current permit ends on January 2, 2019). Another factor in the implementation schedule is the Phase II WIP for the Chesapeake Bay TMDL. In addition, the County has initiated the CWP, which is initially focusing on ROW runoff management for older communities, which are inside the Washington Beltway. The program is expected to be responsible for providing water quality treatment to 2,000 acres of impervious land over the next 3 years. The County also anticipates restoring an additional 2,000 acres through its CIP and other efforts. These will form the basis of the main interim milestones of this restoration plan.

Planning for public education and outreach campaigns will begin when this restoration plan is finalized. To be successful, the campaigns will need to be ongoing and not be one-time activities. Industrial and commercial facility campaigns will initially focus on the areas with the highest concentrations of facilities. Similarly, PCB light ballast education will begin in areas with the most old institutions. The County will aim to target the entire County by the end of its current permit cycle.

Another major factor in the implementation schedule is the availability of funding. From Table 6-8, the annual countywide planned water quality improvement expenditures range from $18 million to $31 million. However, these funds will be spread out across watersheds because the County is responsible for implementing the Chesapeake Bay WIP and the restoration plans for the Anacostia River, Piscataway Creek, Mattawoman Creek, Rocky Gorge Reservoir, Upper Patuxent River, and PCB-impacted watersheds. Therefore, the annual projected impervious acres that will be treated will be spread throughout the County.

To help determine the schedule, the total required impervious acres to be treated were totaled for all the local restoration plans. The percent total acres for each restoration plan was then calculated (Table 6-9) so that implementation would be proportionally done on the basis of required impervious area retrofits. The County estimates, that on average, 1,000 impervious acres per year will be treated (after an initial ramp up period); therefore, these annual acres will be split between the different TMDL watersheds. However, the County reserves the right to prioritize specific watersheds to address areas with higher load reduction requirements first. For instance, the CWP will be focusing on the older areas of the County, since they were developed before stormwater management controls were enacted. As a result, the percentages in Table 6-9 were adjusted for the initial years and the remaining years were then proportioned on the basis of remaining impervious areas to be treated (Table 6-10).

Factoring the implementation of the other restoration plans, this restoration plan will be fully implemented by FY2030. The impervious acres identified in this plan will have been treated with BMPs and all programmatic activities will have been implemented by FY2030. Table 6-10 presents the estimated annual goals (milestones) for impervious area treated. While, the County estimates it will annually treat 1,000 impervious acres (after an initial ramp up period), there will be slight fluctuations in the annual amount with the annual average of 1,000 impervious acres. The County will aim to exceed the annual average so that restoration efforts can be completed prior to FY2030.

Table 6-11 presents the overall target milestone timeline for this restoration effort. This schedule will be continuously monitored by the County to access ways to increase the rate of implementation and to ensure practices are occurring as planned.

Table 6-9. Impervious area goals to be treated by local restoration plan

	Anacostia River	Mattawoman Creek	Upper Patuxent River	Piscataway Creek	Rocky Gorge Reservoir	PCB Watersheds[a]	Total
Impervious area to be treated in MS4 areas	10,129	388	140	1,000	4	2,027	13,688
Percent of total impervious (connected and disconnected) in MS4 areas	74.0%	2.8%	1.0%	7.3%	0.0%	14.8%	100%

Note:
[a] Because the PCB watersheds overlap with several other watersheds, the acres in this table only includes impervious areas that are not in the other watersheds.

Table 6-10. Annual impervious area (acres) goals/milestones to be treated by local restoration plans

Fiscal Year	Annual Impervious Acres	Anacostia River	Mattawoman Creek	Upper Patuxent River	Piscataway Creek	Rocky Gorge Reservoir	PCB Watersheds[a]	Cost ($M)
2016	750	562.5	20.4	7.3	52.7	0.2	106.8	$28.99
2017	850	637.5	23.2	8.4	59.7	0.3	121.0	$32.85
2018	950	712.5	25.9	9.3	66.7	0.3	135.3	$36.72
2019	1,000	737.7	28.6	10.3	73.7	0.3	149.3	$38.60
2020	1,000	737.7	28.6	10.3	73.7	0.3	149.3	$38.60
2021	1,000	737.7	28.6	10.3	73.7	0.3	149.3	$38.60
2022	1,000	737.7	28.6	10.3	73.7	0.3	149.3	$38.60
2023	1,000	737.7	28.6	10.3	73.7	0.3	149.3	$38.60
2024	1,000	737.7	28.6	10.3	73.7	0.3	149.3	$38.60
2025	1,000	737.7	28.6	10.3	73.7	0.3	149.3	$38.60
2026	1,000	737.7	28.6	10.3	73.7	0.3	149.3	$38.60
2027	1,000	737.7	28.6	10.3	73.7	0.3	149.3	$38.60
2028	950	700.8	27.2	10.3	70.0	0.3	141.9	$36.67
2029	800	590.2	22.9	8.3	58.9	0.3	119.5	$30.88
2030	388	286.2	11.1	4.0	28.6	0.1	58.0	$14.98
Total	13,688	10,129	387.9	140	1,000	4.3	2,027	$528.50

Note:

[a] Because the PCB watersheds overlap with several other watersheds, the acres in this table only includes impervious areas that are not in the other watersheds.

Table 6-11. Countywide target timeline for local TMDL restoration plans

Target	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030
Public Outreach															
Increase public outreach for Rain Check Rebates, Alternative Compliance, and other programs. (Continuous outreach that rotates throughout the County)	✓	✓													
Establish public outreach campaigns for pet waste and lawn care	✓	✓													
Public outreach (e.g., campaigns for pet waste and lawn care, education and outreach on Alternative Compliance and Rain Check Rebates)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Measure progress/reevaluate public outreach campaigns		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BMP Implementation															
BMP planning and design	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BMP implementation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NPDES MS4 Permit															
MS4 requirement: 20% of untreated impervious cover	✓	✓	✓	✓	✓										
Projected MS4 requirement: 20% of untreated impervious cover						✓	✓	✓	✓	✓					
Monitoring															
Complete Round 3 of the countywide biological monitoring.	✓	✓	✓			✓	✓	✓			✓	✓	✓		
Complete selection of water quality representative chemical monitoring station in Anacostia watershed	✓														
Results of representative chemical monitoring in Anacostia watershed		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tracking and Reporting															
Update County geodatabase with new BMP, programmatic, and monitoring information	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MS4 Annual Report	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

6.5 Technical Assistance

Overall success of the restoration will depend on the concerted effort of the County as well as many regional agencies, municipalities, community leaders, and local landowners. Each watershed partner (e.g., federal, state, and local governments, nonprofits, business owners, and private landowners) has its own important role to play in the restoration process. The proposed management actions will require significant time and resources on behalf of all of these organizations. Technical and other in-kind assistance from the watershed partners and the public will be an important component of the plan implementation. Technical assistance will be especially important for addressing impediments to implementation, including permitting challenges, technological limitations, lack of available BMP and ESD sites, and poor public compliance with educational campaigns. In addition, new BMP technologies are being developed that will help lower costs, decrease the BMP footprint, and increase removal efficiencies. Some of this research is being performed by Dr. Allen Davis at the University of Maryland. These technologies need to be approved and assigned removal efficiencies by MDE and the CBP in a timely manner. In addition to approving new BMP technologies, the County looks to MDE to continue issuing grants for stormwater restoration activities and to help in performing water quality monitoring in high-priority watersheds in the County.

Many sites that are suitable for BMP implementation and PCB removal are not County-owned. Without forming partnerships and being granted access, the County will only be able to install BMPs on property it has direct access to, such as ROW or on County government-owned land. The County will need to seek partnerships with other organizations (e.g., nonprofit organizations, and businesses) to perform restoration on private lands. For example, a shopping center owner could partner with the County to gain assistance with installing BMPs. This could range from technical assistance to partnering to install a BMP that treats the parking area of the shopping center and the County ROW. In addition to County-owned and private land, some federal and state properties are available within the County. These state and federal agencies have their own load reductions they will need to meet. The County will explore ways to work with state and federal agencies to conduct joint restoration activities that will help reduce loadings from both County land and either state or federal land.

The County will involve the public in the restoration process (section 6.6). The County welcomes and appreciates any ideas the public can provide; after all, people who live and work in the watersheds are the most familiar with it. They can act as the eyes and ears of the County on a day-to-day basis. During the implementation of the restoration plans, the County will work closely with community leaders to ensure that they participate in the selection of projects to improve water quality in their communities. The County will look into having regular meetings with interested parties. The meetings will be used to obtain feedback on the restoration strategies as well as information on restoration opportunities. The public can further stay informed on the County's progress through the County's annual MS4 report to MDE. This report will be posted on the County's website and will contain information on BMP implementation, public outreach events, and other County programs that will help meet TMDL goals. In addition, the County welcomes public ideas on restoration activities, as well as potential BMP types or locations. The BMPs identified by the Anacostia Watershed Restoration Partnership are in the restoration toolbox of potential restoration activities and thus, they will be considered for implementation on a case-by-case basis as the restoration process moves into the implementation phase.

Besides staying informed, the public has a very important role to play in the restoration process. Homeowners could take pledges to clean up after pets and practice environmentally friendly lawn care. In addition, the public can participate in the Rain Check Rebate and Grant Program and nonprofits can participate in the Alternative Compliance Program. Nonprofit organizations and private landowners can aid in the restoration process by installing BMPs (e.g., rain barrels, rain gardens, permeable pavement) on their properties and following recommendations on pet waste and lawn care to help minimize their impact to the overall pollution loading to the County's water bodies. . Installing BMPs on private properties decreases the owners Clean Water Act fee. Although these small practices might seem insignificant, the overall load reductions can be significant if enough nonprofit organizations and private landowners aid in the restoration process. Organizations such as homeowners associations, neighborhood associations, and business organizations can also help by promoting the programmatic initiatives outlined in this restoration plan.

The County has already initiated several projects, including:

- *Engagement and Collaboration with Civic and Homeowner Associations.* DoE will continue to reach out to local civic and homeowner associations (HOAs) through presentations and other outreach tactics. For example, DoE recently conducted several environmentally focused presentations for civic associations that focused on the Rain Check Rebate and Grant Program and Tree ReLeaf. In addition, presentations at local libraries in targeted communities are also fostering participation in these programs by homeowners. HOAs are an important part of the process and the County is committed to engaging them. The County has an agreement with the Chesapeake Bay Trust to provide grants and to work with HOAs to figure out their needs and the programs that would directly benefit them.
- *Stormwater Stewardship Grant Program.* To reduce stormwater pollution from residential areas, particularly urban and suburban areas, it will be critical that DoE find ways to build partnerships and collaborate more with HOAs. Through the Prince George's County Stormwater Stewardship Grant Program, the Chesapeake Bay Trust currently funds implementation requests for construction of water quality improvement projects. The Trust also funds citizen engagement and behavior change projects implemented by a variety of nonprofit groups, including HOAs. Grants ranging from \$20,000 to \$200,000 are available for water quality projects: grants from \$5,000 to \$50,000 are available for citizen engagement and behavior change projects. Projects must accomplish on-the-ground restoration that will result in improvements in water quality and watershed health (reduction in loads of nutrients or sediment) or significantly engage members of the public in stormwater issues by promoting awareness and behavioral change. Another goal of the grant program is to encourage participation by multicultural communities on projects that improve watershed health and expand ecological awareness.
- *Technical Assistance for the Alternative Compliance Program.* The County's Alternative Compliance Program allows qualified tax-exempt religious organizations or other 501(c) nonprofit organizations to qualify for a reduction in the Impervious Area Fee portion of the Clean Water Act Fee for the property owned by the organization. There are three options that the organizations can use to receive the fee reduction:

- *Provide Easements.* For a 50 percent reduction in the fee, the property owner provides a temporary right-of-entry agreement to the County to install BMPs on property owned by the organization. To continue receiving the impervious area fee credit, installed BMPs must be maintained by the property owner of record and are subject to inspection by the DoE. DoE is conducting three pilot studies at places of worship.
- *Outreach and Education.* For a 25 percent reduction in the fee, the property owner agrees to take part in the County's outreach and education campaign to encourage other property owners to participate in the County's Rain Check Rebate and Grant Program for restoration. The property owner also agrees to create an environmental green team or ministry. Some examples of activities that an environmental green team or ministry could perform include tree planting, trash pickup, on-site recycling and better waste management, rain garden planting, and good housekeeping efforts to maintain clean lots.

At the time of this document's publication, 55 organizations had applied for the Alternate Compliance Program; most expressed interest in participating in all three options. The County is working with eight of them to identify suitable BMP opportunities. For each option, the applicant must sign a memorandum of understanding that explains the agreement with the County.

6.6 Public Outreach and Involvement

To both supplement and support the on-the-ground BMPs and cross-agency programmatic efforts, the County will need to have a robust public outreach and involvement program that spans all the divisions within DoE and incorporates activities by other County agencies and departments. Public outreach can increase public awareness of stormwater issues and ultimately change pollution-generating behaviors to pollution-preventing behaviors, promote the voluntary installation of stormwater practices by property owners, and foster partnerships with other local agencies and organizations to maximize pollutant-reduction achievements. Public outreach can also increase support for BMP retrofits, stream restoration projects, and other on-the-ground work. Public involvement in the implementation activities will also help to ensure that the most appropriate BMP locations, amounts, and types are selected to meet project needs and communities' and stakeholders' wishes.

As part of the public outreach and involvement in the restoration planning, the County has set up a website (http://www.princegeorgescountymd.gov/sites/StormwaterManagement/Services/Streams-Watersheds/Restoration-Planning/Pages/default.aspx) and held public meetings on the restoration process. Two public meetings were held in July 2014 to introduce the restoration planning process and to seek public feedback and suggestions. In addition, the County held a public hearing in November 2015 to present the restoration plans to the public and to receive public comments.

Current outreach programs are discussed in section 4.2, and proposed outreach and education activities are specified in section 6.1.1. Beyond these targeted efforts, the County will work with watershed partners to ensure that the public is informed of implementation progress and that active public involvement is pursued throughout the process.

6.6.1 Outreach to Support Implementation Activities

Outreach should specifically target TMDL pollutants and pollutant-generating behaviors, and will be carried out using the following broad methods:

- *Target Audience Analysis.* The County is made up of a diverse population in terms of age, race, culture, language, education, and income. The County will be looking at different languages and cultures throughout the County trying to learn how those populations best receive information, what events they attend, etc. The County will be focusing on the best way to reach diverse groups with different messaging and methods to make sure that they are getting the message and acting on it.

  The County will seek ways to conduct research about various target audiences to learn what barriers (perceived or actual) exist that currently prevent more widespread adoption of pollutant-reducing behaviors. Understanding the audience you are trying to reach is invaluable. In addition, information gained from the research will help establish baseline conditions, such as what the public knows or does not know, what the public does or does not do, and, most importantly, what the County might be able to do to encourage change. Research can be carried out through surveys, interviews, focus groups, and literature reviews. Having a better understanding of what kinds of messages and methods are best for each audience and each pollutant will help ensure that the outreach undertaken has a greater likelihood of success.

  Plans are underway to conduct a countywide public survey to learn more about the community's level of environmental awareness and people's concerns. Questions aimed at understanding existing stormwater awareness, behaviors, and obstacles will be included in that survey at a minimum. The types of questions that could be asked in the survey include:

  - Do you currently take steps to reduce runoff from your property?
  - Have you heard about the Rain Check Rebate and Grant Program? If so, how did you hear about it?
  - Of the following list of reasons, which is the primary reason you have not taken steps to reduce stormwater runoff?
    - Stormwater runoff is not a problem in my community
    - Too much work
    - Too expensive
    - I don't know what to do
    - Practices are not attractive
    - HOA would not approve
- *Inventory Existing County Outreach Programs.* The County has initiated the planning for the creation of an inventory of existing programs in and around Prince George's County that are working towards the shared goals of environmental stewardship or stormwater pollution reduction and already have ongoing or planned outreach efforts. The County's inventory will be categorized by mission, geographic coverage, specific focus issue(s), partnership status and potential, mutual benefits, and other elements. This inventory will not only keep the County from duplicating efforts of other groups or agencies, but will also help identify and fill in any noticeable gaps in issues or geographic coverage of existing programs and partners.
- *Develop and Implement Targeted Outreach Components as Part of an Outreach Toolbox.* Campaigns and materials that focus specifically on the following topics could be developed:
  - Residential and community stormwater management and implementation (including roof and parking area runoff).
  - Alternative compliance (aimed at following up with places of worship and other nonprofit organizations to promote participation).
  - Elimination of PCB-containing transformers and equipment at industrial and commercial facilities.
  - Proper disposal of PCB-containing fluorescent light ballasts.

  Each campaign will include, at a minimum, goals, objectives, target audiences, key messages, delivery techniques, metrics, potential partnerships, and priority neighborhoods. The campaigns will include messages on what citizens should be doing (e.g., using fertilizer only if soil tests dictate a need) and also what they should not be doing (e.g., spilling fertilizer on sideways and driveways). Messages will also emphasize points that show how even small actions can add up to large problems, and, vice versa, to large solutions. A contractor work order to support campaign development is in the planning stage.
- *Enhance and Grow Partnerships.* The County's numerous partnerships with groups such as Master Gardeners, Chesapeake Bay Trust, and MWCOG will continue to be fostered and supported so that outreach efforts piggybacking on the efforts undertaken by these groups can continue to grow. In addition, new partnerships with groups such

Anacostia Watershed Society, Potomac Riverkeepers, landscapers and nursery supply chains, HOAs, local boy or girl scout chapters, veterinarians, and others should be developed or fostered to help broaden stormwater outreach and reach citizens that have not been reached in the past.

Although the results of outreach and involvement efforts are very difficult to quantify in terms of pollutant reductions, these activities will make a difference by slowly changing the mindsets and behaviors of County residents over time.

6.6.2 Public Involvement to Support Implementation Activities

The public is an important part of the restoration process and can personally become involved in many ways.

Community organizations and citizens groups can participate in restoration activities in several ways. They can get involved with local nonprofit groups with which the County is currently partnering. The County will be using nonprofits to help find grant opportunities so the non-profits do not have to wait for the County programs. The additional funding will enable quick upgrades or installation of BMPs throughout various municipalities. In addition, groups can help by identifying potential projects and assisting with public outreach on a variety of water quality topics, such as the upcoming litter and pet waste campaigns. Groups can meet with homeowner associations and other civic leaders to relay the messages that will be pushed with the campaigns and participate in community trash pickups or the Rain Check Rebate Program.

This section lists several recommendations that the County could either implement itself or seek community partners to implement to cut down on the demand on the County's resources and staff's limited time.

- *Identify and Promote Opportunities for Organizations and Citizens' Groups to Become More Involved in Implementation Efforts*. During the public involvement process for the development of this restoration plan, the County heard from several citizens and watersheds groups that are very interested in providing on-the-ground support for BMP implementation projects, programmatic initiatives, or other outreach efforts to support implementation. To this end, the County proposes one of the follow two options:
  - Option 1: A quarterly meeting in which the County invites representatives from watershed groups and local active civic associations for a "Community Collaboration Day." Up to five groups will be invited to each meeting (different groups will be invited to each meeting). At these meetings, the County will provide details on what has been accomplished thus far, what projects they are currently underway, and the County's plans for the next 6 months to a year. Each group in attendance will be asked to give a snapshot of their activities and their plans. Each group will be given the opportunity to have the County's ear privately for 20 minutes to collaborate with County staff and make some preliminary plans for working together. Groups could be provided a 1-page worksheet upon arrival at the meeting to fill out to help make the focused discussion more productive. For example, the Anacostia Watershed Society's Watershed Stewards Academy requires that each student take a 12-session course and then complete a capstone neighborhood project to become a Master Watershed Steward. The County could work with the society to identify priority

areas and BMPS for such capstone projects. While each group meets separately with the County, the other groups can meet and discuss how they can work together on various projects.

- Option 2: A brief email survey developed by the County to send to all local watershed/citizen groups asking them to select specific items on which they need from the County in order to make progress toward stormwater pollution reduction goals. Sample questions are listed below:
  - Check the topics on which your citizen group could use professional advice:
    - BMP siting in a specific community/neighborhood
    - Best practices for stream cleanups
    - Technical support for GIS applications
- In addition, the County will identify several different ways in which citizens and organizations can support implementation directly, such as the following:

  Monitoring

  - Suggest specific locations for biological or water quality monitoring activities to be carried out based on surrounding land uses/changes, historic water quality problems, public desires, etc.

  BMP Installation

  - Civic or environmental groups can work directly with an organization or commercial business that has a significant amount of untreated impervious surface such as large parking lots, large building footprint, etc. The groups can help obtain a commitment from the business to participate in the Rain Check Rebate and Grant Program, Alternative Compliance Program, or otherwise install stormwater BMPs on the property. Group members can offer technical assistance and volunteer labor hours to support installation and/or maintenance. The participating civic or environmental group should discuss the selected location and BMP type with the County prior to working with the property owner.
  - Citizen groups can seek out and secure commitments from neighborhood/homeowner associations to designate at least one common area such as a park, walking trail, or playground in which to incorporate a stormwater BMP through the Rain Check Rebate and Grant Program or otherwise. Groups can follow up with property owners to ensure that they are following through with plans and, once installed, keeping up with maintenance and publicizing the practices and the Rain Check Rebate and Grant Program to property owners/residents.
  - Citizen volunteers can provide technical support for the County's Rain Check Rebate and Grant Program by assisting in visual inspections of residential properties on which BMPs have been installed. Citizen volunteers can be trained to complete the inspection checklist used for the postinstallation site visits. In addition, volunteers can also provide maintenance checkups on a yearly basis.

- Apply for grants to implement projects under the Chesapeake Bay Trust's Stormwater Stewardship Grant Program.
- Citizens can inform the County about development issues in their area, so that the County can help communities identify and install the best erosion and settlement control BMPs for the areas.

The County welcomes any suggestions from the public regarding potential BMP types or locations. The BMPs identified by the Anacostia Watershed Restoration Partnership are in the restoration toolbox of potential restoration activities and thus, they will be considered for implementation on a case-by-case basis as the restoration process moves into the implementation phase.

Community Outreach

- Publicize and promote the Rain Check Rebate Program, Alternative Compliance Program, and other programs in organization newsletters and by word of mouth at meetings and events.
- Volunteer or suggest locations for stormwater audits carried out by the County.

- *Form Watershed Action Teams.* The County could develop watershed-specific advisory teams to garner support in identifying places for green infrastructure practices and retrofits, review plans, help identify partners and volunteers for monitoring, or conduct other watershed-specific tasks. Such teams would help meet goals related to outreach, implementation, and public involvement.
- *Semiannual Public Meetings to Inform Citizens of Implementation Progress and Results.* Similar to the July public meetings held in Laurel and Largo to announce the start of the restoration plan development process, the County could hold semiannual meetings after the restoration plans are developed and are being implemented. The meetings would inform interested parties about restoration progress. Members of the community could be tapped to lead the teams. Team leaders would be responsible for activities such as setting up meetings, communicating with members, and taking notes during meetings. These meetings could be held as informal morning *coffee chats* at a local coffee shop, library, or outside at a public park. Meetings could also be held at a BMP installation site to unveil a newly installed BMP and inform the public of implementation progress. Such meetings could be viewed as ribbon-cutting ceremonies, drawing in members of press for more widespread coverage.
- *Online Transparent Progress Reporting.* Pictures are worth a thousand words. The County could consider developing an infographic, updated quarterly, which provides program statistics such as the number of BMPs installed or retrofitted in a certain period and cumulatively. When citizens click on the infographic they could then be asked if they have a comment or other feedback they would like to provide via email to the County about its progress and results. Progress information should also be provided through County Click (311) and email blasts. In addition, as mentioned in section 7.1, the County is working to develop a new geo-referenced database for project installation, location, type, etc. This database will be online and available for citizen groups to gain a better sense of how best to dovetail on-the-ground efforts.

- *Conduct a Resource Capacity Analysis.* The County could analyze what staffing and resources would be needed to implement one or more of the above recommendations. Then, the County could determine which activities are feasible in the short-term, medium-term, and long-term timeframes. Finally, to reduce the burden on County resources while also increasing project ownership at the community level, the County could consider which activities could be supported by existing or new partners.

7 TRACKING AND ADAPTIVE MANAGEMENT

Through its permit, the County is required to "[e]valuate and track the implementation of restoration plans through monitoring or modeling to document the progress toward meeting established benchmarks, deadlines, and stormwater WLAs." The County will address this requirement through its annual MS4 report and through additional environmental monitoring. The overall intent of the County is to go beyond simply tracking implementation of this restoration plan; instead, the County will evaluate how well the implemented plans are resulting in improved conditions. The County's monitoring and assessment approach will include three parts, which are further described in this section:

(1) Implementation tracking will document restoration activities, such as BMP installation or public outreach.

(2) Biological monitoring will evaluate the effectiveness of the TMDL/watershed restoration in providing the environmental characteristics that allow overall ecological conditions to improve.

(3) Water chemical monitoring will document how well those techniques are controlling stressors and reducing pollution.

7.1 Implementation Tracking

To assess reasonable compliance, the County will need to develop an effective process to track and report load reductions to gauge progress towards meeting overall load-reduction goals. The main way to track and report BMP implementation and programmatic initiatives is through the County's MS4 Annual Report. DoE submits this report yearly to MDE with material collected in partnership with DPW&T and the DPIE. The County's permit specifies the information that is to be included in the annual report, which includes BMP implementation, illicit discharge detection and elimination, trash and litter control measures, public outreach and education initiatives, watershed assessments, and funding. The annual report will continue to be the main tracking and reporting mechanism to MDE.

With the approval of the restoration plans, the County is required to include additional information in the annual report with regarding TMDL compliance. With each annual report, the County will report progress towards meeting its MS4 WLAs by describing how it measured the effectiveness of the program. The annual report will include the estimated net change in pollutant load reductions from all completed structural and nonstructural water quality improvement projects, and enhanced stormwater management programs. Estimated load reductions will be calculated in a manner that is consistent with the loads used in this restoration plan. The report will also compare load reductions and costs to benchmarks and milestones, revised cost estimates, and plans for increasing implementation or activities if benchmarks and milestones are not being met. Therefore, the County will be able to determine if it is meeting its restoration goals and, if not, adjust its program accordingly.

The annual report is accompanied by supplemental data about BMPs, funding, and water quality. Urban stormwater BMPs are included as part of the annual report in a geo-referenced database that is submitted to MDE. The database includes details such as the project locations, types of

BMPs, drainage area delineation, and acres of impervious surface treated. County staff will update the database as new projects are completed and approved. The annual report also includes a geo-referenced database for all stream restoration and stream bank stabilization projects. It includes the location, details, phase, drainage area, and impervious area treated for each project. DPW&T is responsible for tracking street sweeping and inlet cleaning activities. The number of curb miles swept and tons of waste collected through street sweeping are tracked and reported in the MS4 Annual Report. The County also tracks and annually reports the number of inlets cleaned. The annual report also lists the education and outreach activities from the previous year. The County will post its MS4 report and appendices for the public to view after the report is submitted to MDE each year in early January.

The County will track all future restoration activities (including public outreach activities) and will enter location information into the geodatabase for viewing on a map. Currently, some restoration practices (e.g., tree planting) are not included in the geo-referenced database. A geodatabase to track stormwater implementation policy decisions, maintenance responsibilities, watershed location, and types of BMPs will help the County make critical decisions on stormwater controls during a project's concept plan stage. In addition, the County hopes to develop a data center where all of these activities can be reported. While that process could take a couple of years to build and put into operation, once it is completed, this tool will be centralized so that all partners—nonprofits, community organizers, cities, and towns—can report on their progress in installing BMPs, so the County can account for all activities.

7.2 Monitoring Approach

DoE recognizes that effective environmental monitoring requires long-term commitment to routine and consistent sampling, measurement, analysis, and reporting. Although some of the monitoring requirements for this TMDL implementation originate with MDE, others are the result of the County's interest in providing additional meaningful information to policymakers and the public. Biological indicators will continue to be used to document and communicate ecological conditions at subwatershed and countywide scales (Tetra Tech 2014a). Other types of monitoring will contribute to understanding whether restoration activities are leading to the elimination, reduction, or otherwise effective management of pollutants within the County; helping meet interim restoration plan load reductions; and demonstrating if changes should be made to the County's restoration strategies. All monitoring will be performed in accordance with a quality assurance project plan (including sample collection standard operating procedures) to ensure that the data are of known quality for use in restoration planning. The purpose of the monitoring is to track progress in addressing watershed concerns and improving watershed conditions through restoration plan implementation. The County will evaluate options for the appropriate monitoring program in consultation with MDE. Regardless of the County's monitoring program, the official monitoring for the state's Integrated Report assessments and impairment status will remain MDE's responsibility. MDE conducts cyclic watershed monitoring on a 5-year schedule.

7.2.1 Biological Monitoring

Biological condition, as measured by routine sampling and subsequent analyses with the Maryland Department of Natural Resources' benthic index of biotic integrity (B-IBI), reflects cumulative characteristics of stream ecosystem conditions. It is often impossible to understand

and isolate the effects of single, individual stressors (i.e., external factors that cause stress to exposed organisms); however, eliminating, reducing, or otherwise managing stressors and their sources will lead to overall healthier streams. 'Cumulative,' in the sense used here, implies a buildup of physical, chemical, and hydrologic stressors in the watershed over time. The biota present in streams reflects those organisms with the capacity for survival and reproduction in the presence of that cumulative stressor load.

Since 1999 the County has been implementing biological monitoring and assessment of streams and watersheds countywide. Sampling at an individual stream location includes benthic macroinvertebrates, physical habitat quality, and *in situ* water quality (pH, conductivity, temperature, and dissolved oxygen). The first round of monitoring (Round 1) was from 1999–2003, and sampled those indicators at each of 257 sites throughout the County (approximately 50–55 sites per year). Round 2 sampling (2010–2013) occurred for the same number of sites distributed throughout the County, but at different individual locations. Site locations were selected for each round using a stratified random process. The variables used to stratify sites were wadeable, nontidal streams, generally first through fourth order based on the Strahler system and 1:100,000 map scale. Distribution of sample locations were more heavily weighted to smaller first and second order streams.

The approach presented here assumes continuation of routine, countywide monitoring of biological condition for wadeable streams into Round 3 and beyond with potentially additional effort being applied to data analyses related to physical habitat characteristics, altered hydrology, and water chemistry. This will not only provide insight into those stressors most likely causing biological degradation, but could also help in identifying sources of stressors where additional BMP or green infrastructure would be beneficial.

The stepwise progression presented below can be applied to any watershed in the County. The County will focus its efforts on areas of rapid BMP implementation through the CWP.

Additional and more detailed analyses of conditions and data in individual subwatersheds can help associate stream biological health with implementation of BMPs (and programmatic initiatives) so that the County can adjust its restoration strategy, if needed. The evaluation of changes in biological health is focused on the County's framework of subwatersheds, although for assessments it is possible to group into the broader scales of the major watersheds (Patuxent River [Lower, Middle, and Upper], Anacostia River, Mattawoman Creek, Piscataway Creek, and Potomac/non-Anacostia River, and Western Branch), as well as countywide.

- *Step 1*. Record percent biological degradation of subwatershed A from the most recent biological assessment report (Round 2 [R2] in Millard et al. [2013]), noting intensity of impairment and known or most probable sources of pollution or other stressors.
- *Step 2*. Compare percent biological degradation of subwatershed A from subsequent monitoring (Round 3 [R3]) and determine whether there has been positive change/an improvement (A:R2 > A:R3), negative change/further degradation (A:R2 < A:R3), or no change (A:R2 = A:R3). Use 90 percent confidence intervals as provided in biological assessment reports to document relative significance of changes. This procedure constitutes a trend analysis for assessing changes in biological condition.

Countywide biological monitoring is a routine part of the County's current monitoring strategy and occurs in 3-year cycles, for which funding is in place for 2015–2017. The monitoring is currently part of the County's standard budget expenditures, and countywide costs range from $175,000 to $200,000 per year of each cycle. The County plans to continue with its 3-year cycle approach and will have a 2-year gap between cycles until after restoration activities are completed, which is expected to be in 2030. As a result, the last round of biological monitoring should occur in 2035–2037. After that, biological monitoring should occur at a 5-year interval. During the life of this restoration plan, the total cost for countywide biological monitoring and assessment would be between $2.6 and $3 million.

7.2.2 Water Quality Monitoring

Measurement and analysis of physicochemical factors will complement the biological monitoring and will help identify those stressors most likely causing degradation. The contaminants of most concern in the County are total nitrogen, total phosphorus, TSS, BOD, fecal coliform bacteria, and PCBs. These data will be collected using MDE-approved methods and laboratories. Both dry-weather and wet-weather water quality monitoring will be conducted.

For any sites where a continuing environmental release of PCBs to the watershed stream system likely exists, the County will apply best professional judgment to decide whether or not to monitor a site and will rely on MDE for data on PCBs. Once priority BMPs or stream sediments have been identified using the GIS analysis and records search, a sampling and analysis plan will be developed. A sampling and analysis plan would specify the sample locations, sample numbers, analytical methods, and quality control requirements. In accordance with MDE guidance, samples will be analyzed using EPA Method 1668, which, while costly (approximately $900 per sample for analysis), measures total PCBs on a congener (chemical constituent) basis and has the low detection level necessary to identify the low concentrations associated with a diffuse source. The ability to identify a specific congener can aid in identifying a source because congeners can be specific to a particular use or industry.

Monitoring will not be conducted on a specific BMP to assess its load reduction. The proposed BMP types have established pollutant removal efficiencies and only new and innovative BMPs will need to be individually monitored to assess their load reduction capabilities. Instead, water quality monitoring will be conducted at a subwatershed scale at a stream site downstream of restoration practices. Currently, the County does not have the resources to perform water quality monitoring in each subwatershed. If monitoring were to be conducted for each subwatershed, then funding availability for implementing restoration activities would be substantially reduced. For this reason, the subwatersheds with the highest amount of predicted load reductions, and thus with the most potential for restoration practices, will be assigned the highest priority for this monitoring.

The County will use the monitoring data to access the overall load reductions from upstream activities in a watershed with a large amount of planned activity. The data will also be reviewed to access trends, for example:

- Was improvement gradual?
- Did loadings significantly decrease in one year?

- What were the practices installed in the previous year and how do they relate to load reductions in the stream?

There is natural variability in stream water quality. Looking into smaller watersheds with less amounts of implementation activities could make it difficult to separate improvements from natural variability. By looking at a watershed with larger scale implementation, the improvements as a direct result of the implementation should be more easily identified. The County can look at the observed load reductions in the stream, compare them to the projected load reductions from WTM, and adjust the restoration strategies, as needed. The adjustments would not only be for the monitored watershed, but also would be applied countywide in the restoration plans. Adjustments could take the form of additional BMPs, using different types of BMPs, or adding more education and outreach.

This restoration plan recommends the monitoring of one priority subwatershed. Monitoring at the selected subwatershed should begin within 1 year of finalizing this plan. Field reconnaissance and final selection of the monitoring location should be completed within 6 months of finalizing this plan. The County will request that MDE aid in the monitoring and will request permission to move the County's current NPDES monitoring locations in Bear Branch watershed (part of the Upper Patuxent River watershed) to a priority area in the Anacostia River watershed. The NPDES required chemical monitoring is currently part of DoE's annual budget. The monitoring currently includes nitrate plus nitrite, total Kjeldahl nitrogen, total phosphorus, BOD, TSS, and *E. coli* bacteria.

7.3 Adaptive Management Approach

The implementation process represents the BMPs and strategies that will address current restoration needs of the watershed using the best available information. As implementation progresses, the adaptive management strategy will respond and change as part of the iterative adaptive management approach. It will be important for the County, MDE, and watershed partners to work together on this adaptive management approach to ensure successful implementation. Adaptive management is important in addressing the PCB TMDL, as the sources of contamination are generally unknown in both number and size. The adaptive management approach calls for the identification of hot spots and subsequent source tracking to hone in on the sources of PCB contamination contributing to the hot spots. As sources are identified (or if none are found), hot spots in lower priority watersheds can then be investigated.

In the Anacostia River bacteria TMDL document (MDE 2006), MDE recognized that:

> The uncertainty of BMP effectiveness for bacteria, reported within the literature, is quite large. As an example, pet waste education programs have varying results based on stakeholder involvement. Additionally, the extent of wildlife reduction associated with various BMP methods (e.g., structural, nonstructural, etc.) is uncertain. Therefore, MDE intends for the required reductions to be implemented in a staged process that first addresses those sources with the largest impact on water quality and human health risk [e.g., hot spots], with consideration given to ease of implementation and cost. The iterative implementation of BMPs in the watershed has several benefits: tracking of water quality improvements following BMP implementation through follow-up stream monitoring; providing a mechanism for developing public support through periodic

updates on BMP implementation; and helping to ensure that the most cost-effective practices are implemented first.

PCBs present a similar problem in that there are no BMP effectiveness values for PCBs, so the process described above applies to this the PCB WLAs as well.

The adaptive management approach for this restoration plan involves testing, monitoring, evaluating applied strategies, analyzing and interpreting biological assessments at multiple spatial scales, and incorporating new knowledge into management approaches that are based on scientific findings. Adaptive management allows for fine-tuning of actions to increase effectiveness and for adopting new, more-effective strategies (in terms of both removal efficiencies and cost) as they become available. WTM (section 3.2) will aid in evaluating different management scenarios and can be updated to run scenarios using revised BMP efficiencies or different programmatic assumptions.

The County expects to use that strategy in implementing this restoration plan. As shown in Table 6-4, the PCB WLAs for the Anacostia River watershed will not be met through current technologies, despite the different programmatic activities and nearly 100 percent of its impervious area treated with BMPs. The County is required to reduce PCB by over 98 percent. To help fill the reduction gap, the County will work with MDE to identify additional methods for PCB reductions.

The interim milestones defined in the implementation schedule (section 6.4) will help guide the adaptive management process. To evaluate whether interim milestones have been achieved, expected load reductions from implementation progress will be compared to monitoring results and BMPs listed in the tracking database. If the expected improvements have been achieved (i.e., reduced loads), then implementation will continue as planned. To continue project implementation and increase public support, the County will publicize existing projects' success and accomplishments. If the monitoring does not show the expected improvements, then the implementation plan will be reevaluated and new actions will be identified to more successfully achieve pollutant reductions.

In the case of the PCB-impacted watersheds, adaptive management is used to assess whether the actions identified as necessary are the correct ones and whether they are working to solve the identified obstacles to the plan implementation. Although the restoration plan was developed using the best available data, unanticipated circumstances might arise. For instance, the installed BMPs might not operate at the level of pollutant removal that was expected (e.g., either higher or lower removal efficiencies are seen). In addition, a natural disaster could affect the plan's implementation. If BMPs are being implemented at a slower rate than is called for in the restoration plan, the adaptive management process will look at the reasoning behind the lag in implementation and either correct it or propose additional activities to compensate for the lag. Potential reasons for the lags could be a lack of available land, delays in obtaining the necessary permits to construct BMPs, being denied permission to build a BMP on private land, and lapses in funding. In addition, this restoration plan depends on finding and containing hot spots. Without the support of the public and private entities in certain initiatives, the County will need to adapt and revise this restoration plan.

Several aspects of this restoration plan will aid in the adaptive management process:

- This restoration plan was developed using subwatersheds. The smaller area in individual subwatersheds provides a more defined area to identify where BMPs should be implemented and to plan for public outreach activities. The smaller watersheds also make it easier to adjust and modify the restoration plan, if needed, and to identify additional local measures.
- This plan has ambitious expectations regarding the cost and timeframe to install BMPs and implement strategies. Part of the adaptive management strategy is to help reduce the schedule and long-term costs. It is anticipated that future advances in technology will provide more effective reduction measures or that will reduce the schedule and cost of existing measures, thus reducing the long-term cost of this plan.
- The County will use adaptive management to use the most appropriate restoration practices at the best locations. This means that the County will look across land uses to determine locations to get cost-effective load reductions. The County reserves the right to use alternative restoration activities, such as land preservation, if the opportunity arises and the alternative practice will produce greater load reductions than ESD practices or a similar load reduction at a lower cost.
- The County expects that future BMP-related research could result in revised pollution reduction efficiencies or many advances in technology in the coming years due to new regulations. These advances could decrease cost, decrease the footprint of the BMP, and increase load reduction efficiencies. Some of the advances could come from proprietary technologies, which the County will consider using on the basis of their cost and performance.
- There are several unknown sources of PCBs that are difficult to quantify. These sources include illicit sewer connections, SSOs, cross-connections, septic leaks, and atmospheric deposition. There are expected PCB load reductions from these, however they are not quantifiable. These activities include (but are not limited to) reductions from WSSC's Sewer Repair, Replacement, and Rehabilitation (SR3) Program; the removal of illicit connections; and reductions of emissions that lead to atmospheric deposition. Load reductions from these activities will decrease the overall amount of BMPs that will need to be installed, thus decreasing cost and moving up the date of compliance.
- The biological assessment results will be interpreted at multiple spatial scales as *degraded/not degraded* (for specific stream sites) and *percent degradation* (for subwatersheds, basins, and countywide). The County will use these results as the principal indicator of stressor reduction effectiveness. A lack of positive response will be taken as evidence that stressor loads continue to affect the stream biota and that additional or more intensive stormwater management is necessary to achieve ecologically meaningful pollutant reductions

An additional advantage of this adaptive management approach is that it provides a logical means of reprioritizing funding to areas of the County where water bodies need more attention. That is, where stressor (i.e., pollutant) sources are active and controls have not been attempted or are less than successful, increased effort at stressor control can be targeted. Regular and routine monitoring by the County, MDE, and watershed partners will help make these determinations.

There are BMPs in the County where drainage area, type, and/or installation data are unknown; once the information is available, load reductions from those BMPs could also be counted toward the County's overall load reduction goal. During BMP credit calculations, BMPs without known drainage areas were given the average drainage area for that BMP type. As a result, some drainage areas could have been either slightly over- or underestimated, and correction to the credit calculations will result in more defensible numbers. If updated credit calculations lead to reconsideration of certain aspects of this restoration plan, the County will make the required modifications. The reconciliation process will be part of the adaptive management approach and changes will be made to the plan as necessary.

Restoration plan progress will be formally reviewed by MDE. All responsible parties and partnership organizations will be convened to review progress, receive feedback from MDE, and discuss any necessary adjustments to the implementation process. County departments will meet on a more frequent basis to discuss progress, obstacles, successes, and changing needs so that adaptation strategies can be continually refined. The County will reevaluate this plan during its next permit cycle. This evaluation will take advantage of an updated BMP inventory, new BMP technologies, experiences with the new programmatic initiatives, and more recent water quality data.

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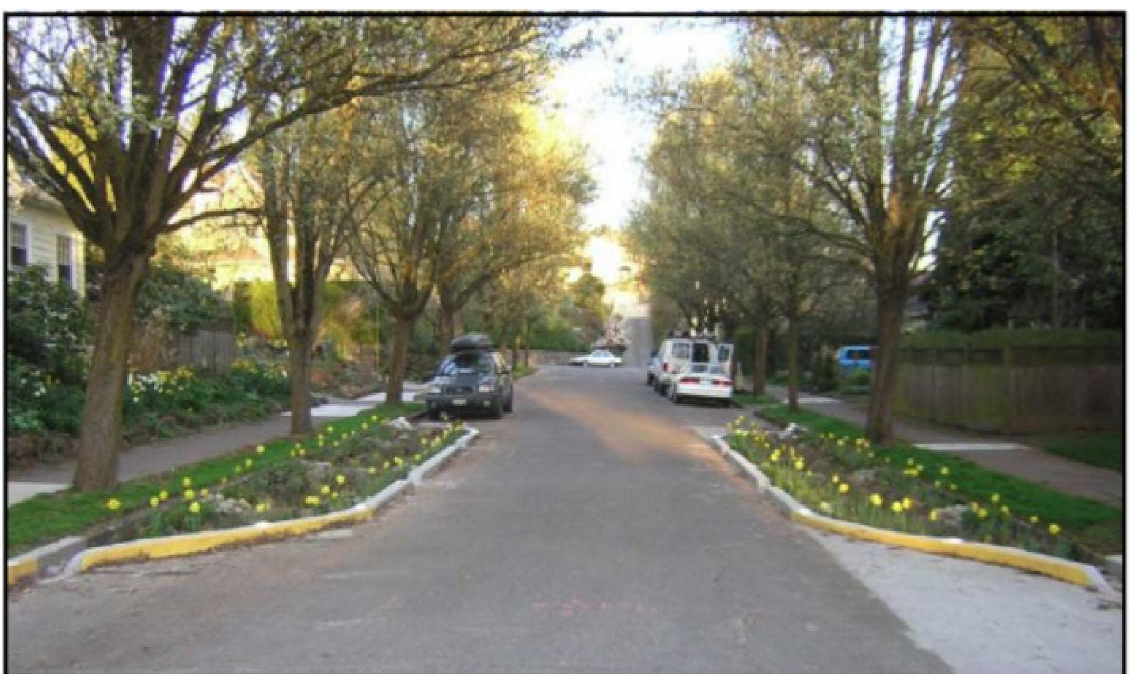
APPENDIX A: BMP EXAMPLES

Bioretention or bioswales to convert right-of-way to a green street

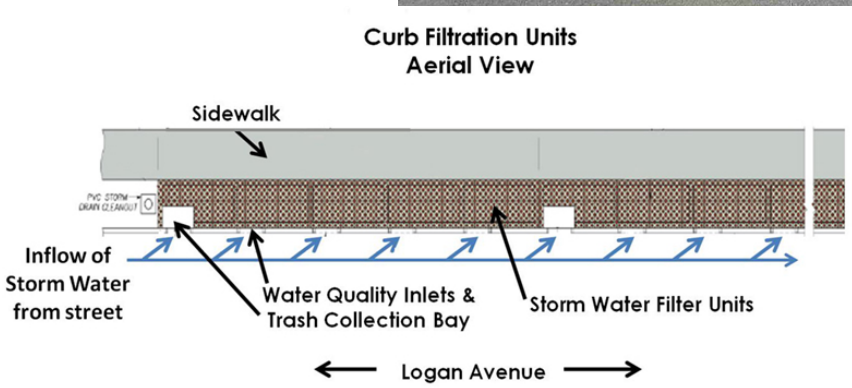
Source: U.S. Environmental Protection Agency (top); New York City Department of Environmental Protection (middle and bottom)

Curb extension with bioretention or bioswale



Source: U.S. Environmental Protection Agency (top); Portland Bureau of Environmental Services (bottom)

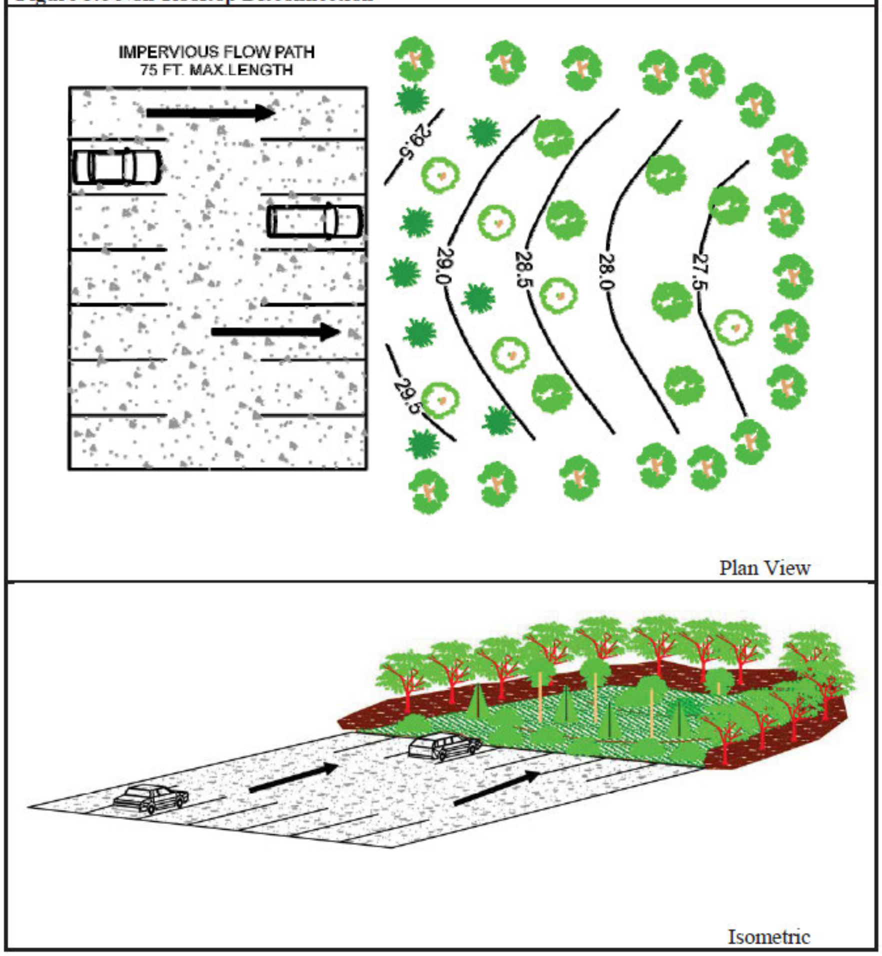
Curbside filter systems



Source: Delaware Department of Transportation (top); City of San Diego (middle); City of Portland (bottom)

Disconnection of non-rooftop runoff

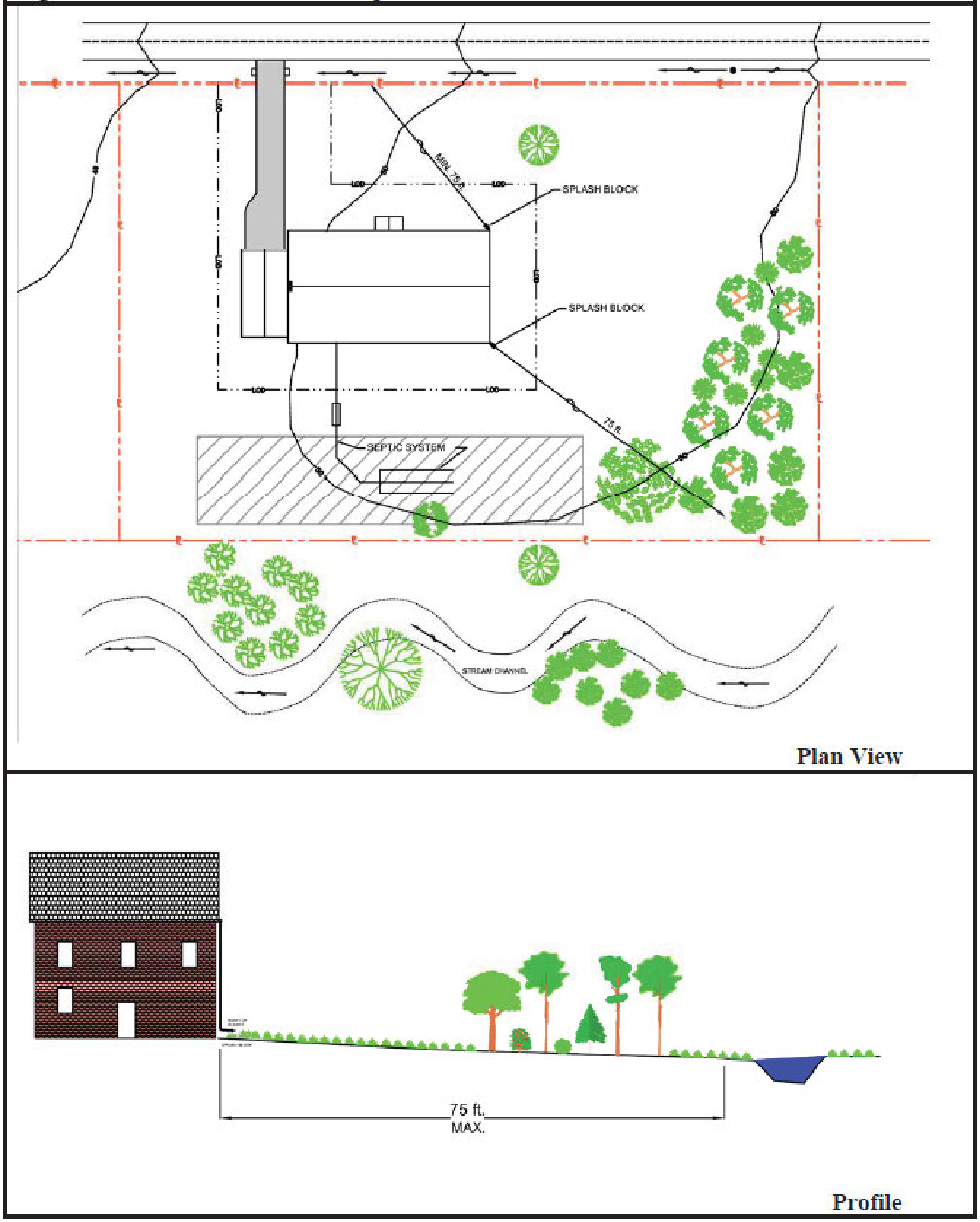
Figure 5.6 Non-Rooftop Disconnection



Source: Maryland Department of the Environment (top); Ecosite, Inc. (bottom)

Disconnection of rooftop runoff

Figure 5.4 Disconnection of Rooftop Runoff

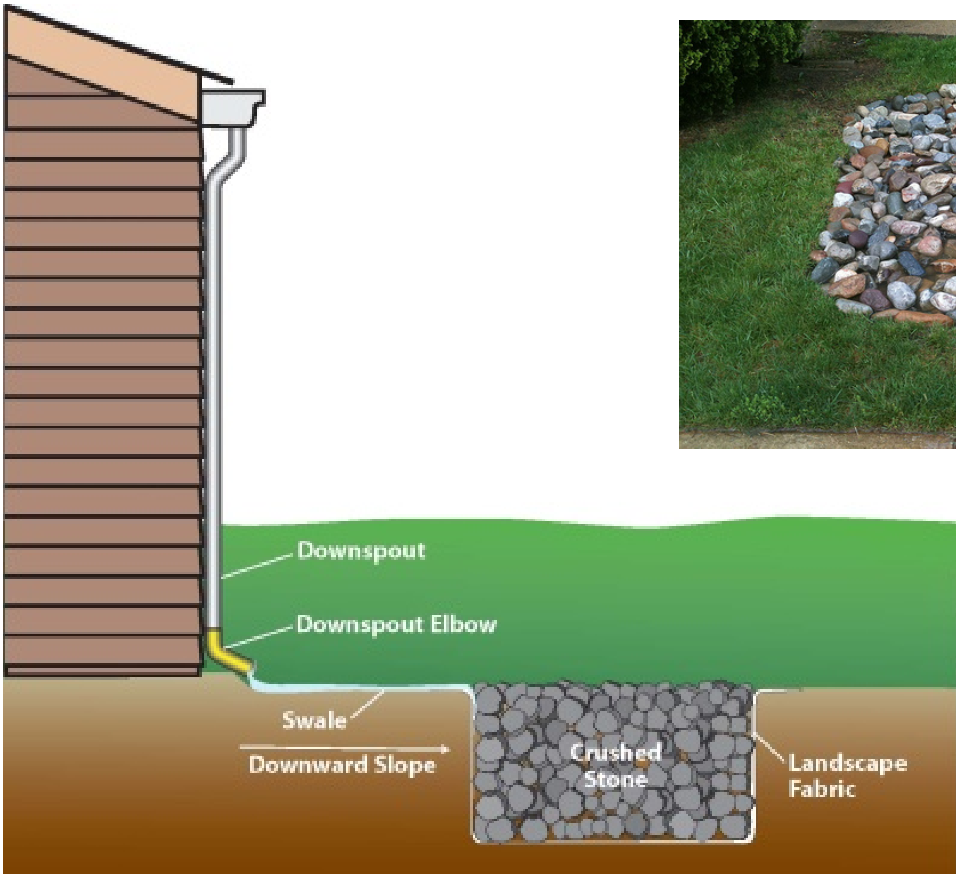


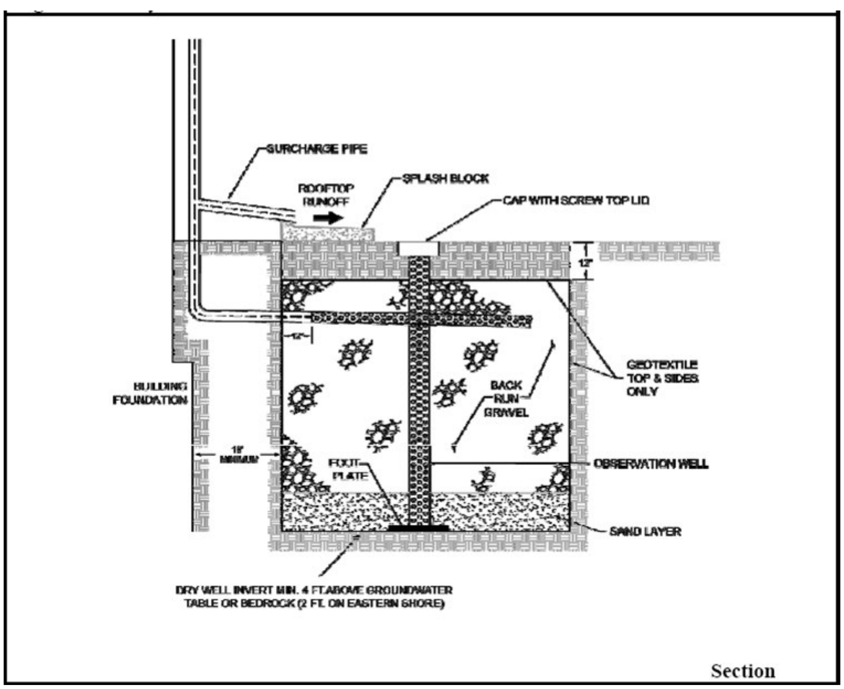
Source: Maryland Department of the Environment

Dry extended detention ponds

Source: Tetra Tech, Inc.

Dry wells

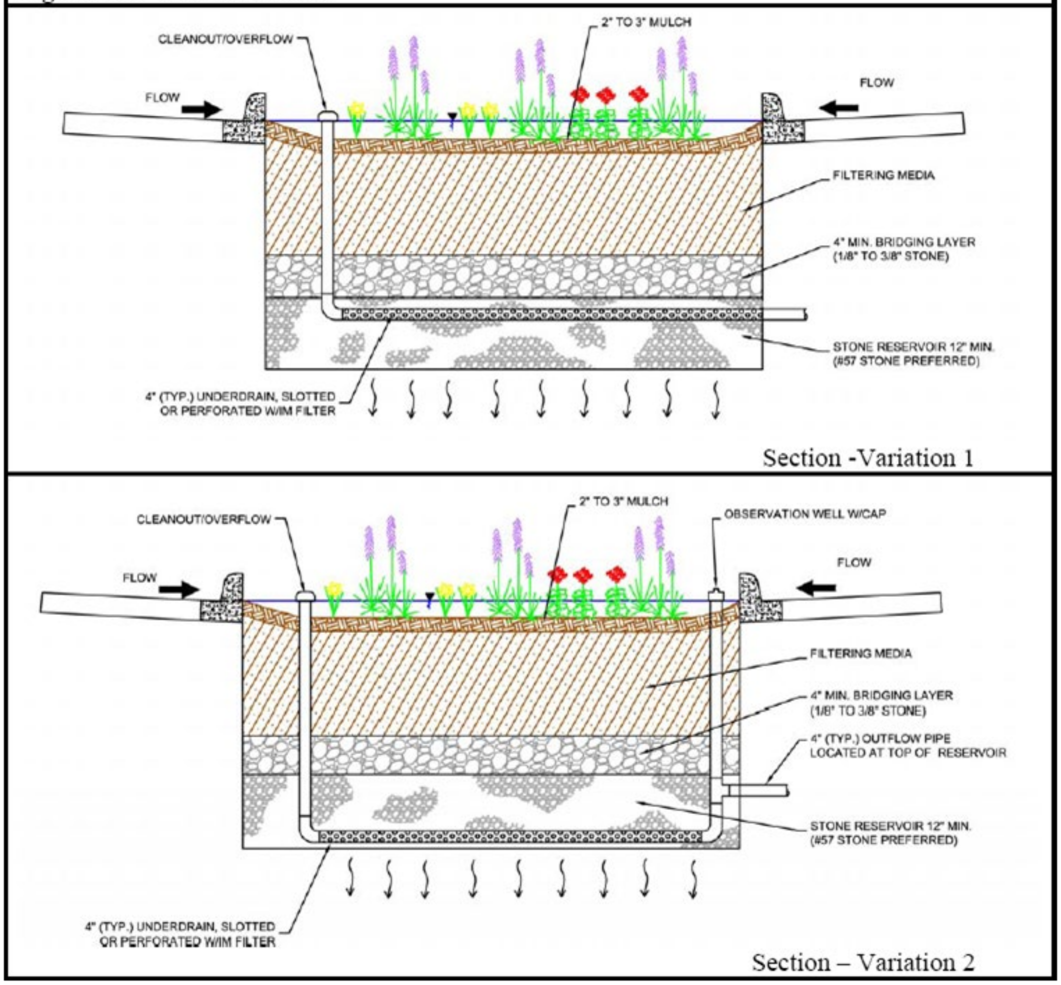




Source: Philadelphia Water Department (top); Maryland Department of the Environment (top right and bottom)

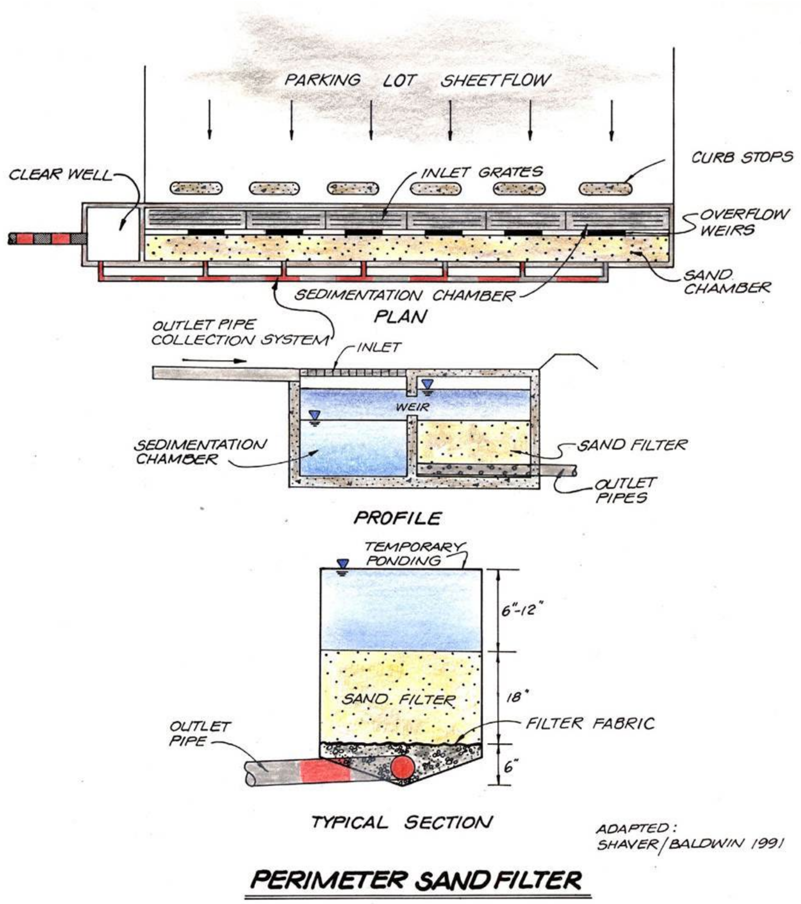
Enhanced filters

Figure 5.20 Enhanced Filters



Source: Maryland Department of the Environment

Filtering practices



Source: Maryland Department of the Environment

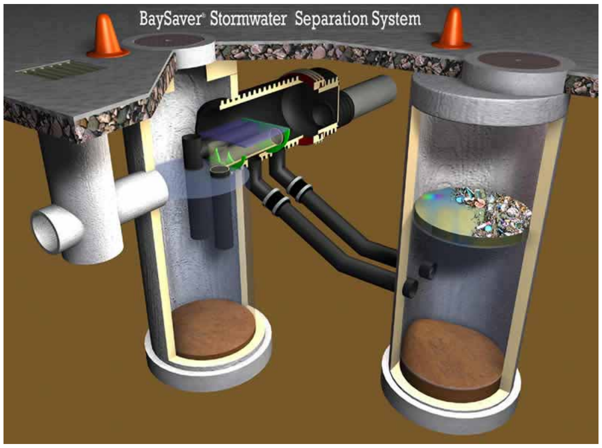
Grass, wet, or bioswale

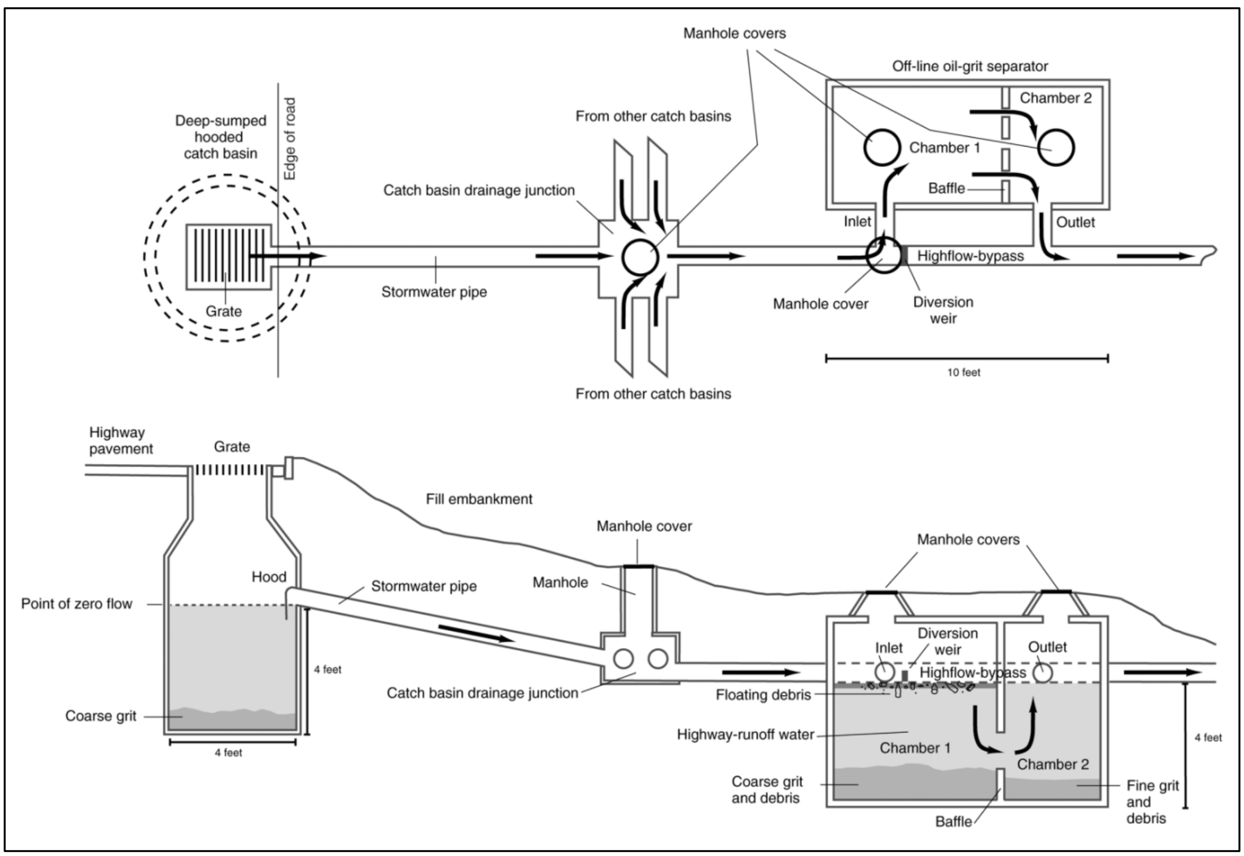
Source: Tom Liptan, Portland Bureau of Environmental Services (***top***); U.S. Environmental Protection Agency (bottom)

Green roofs

Source: Tetra Tech, Inc.

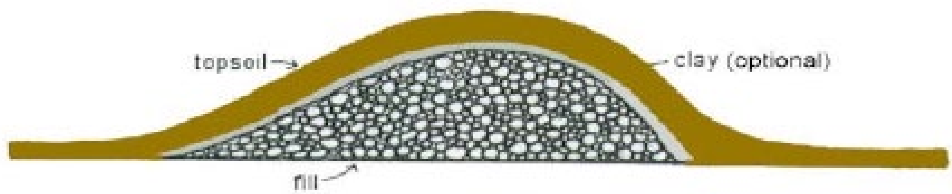
Hydrodynamic structures



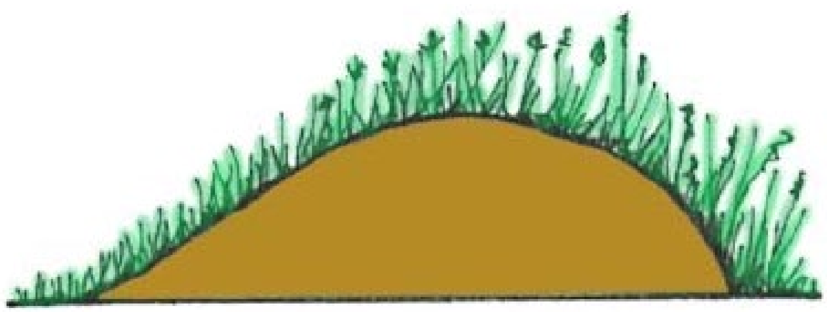


Source: Baysaver Technologies, Inc. (top left) and Contech Engineered Solutions (top right); U.S. Geological Survey (bottom)

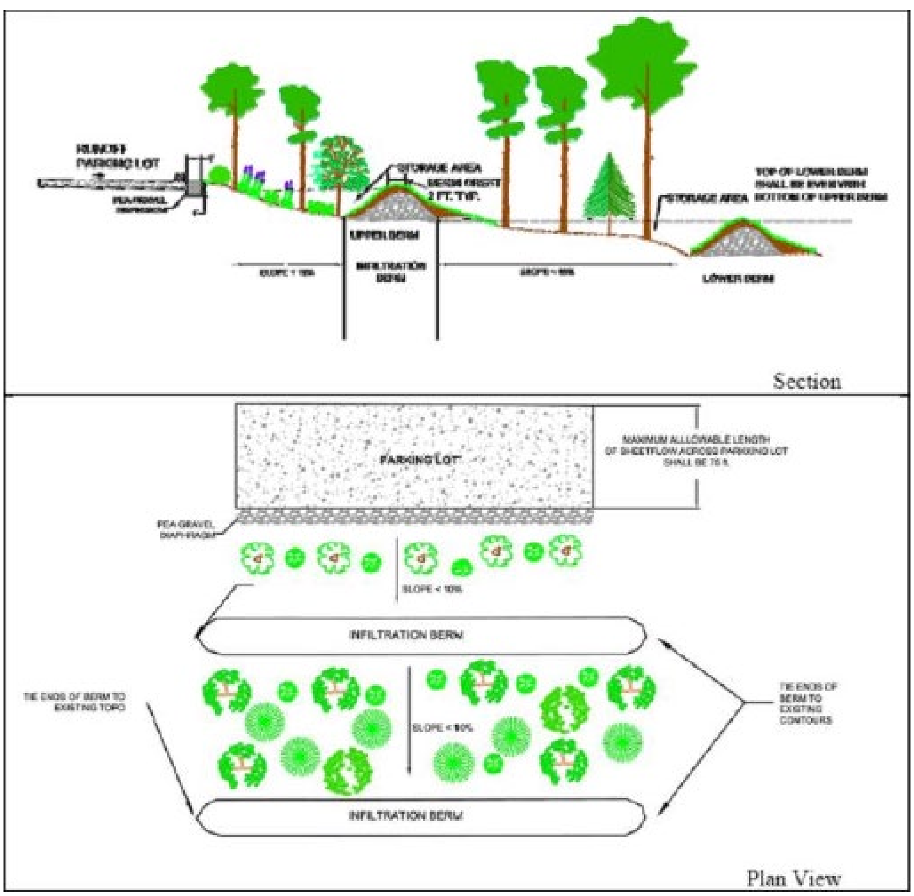
Infiltration berms



ideal substrate layers for a berm

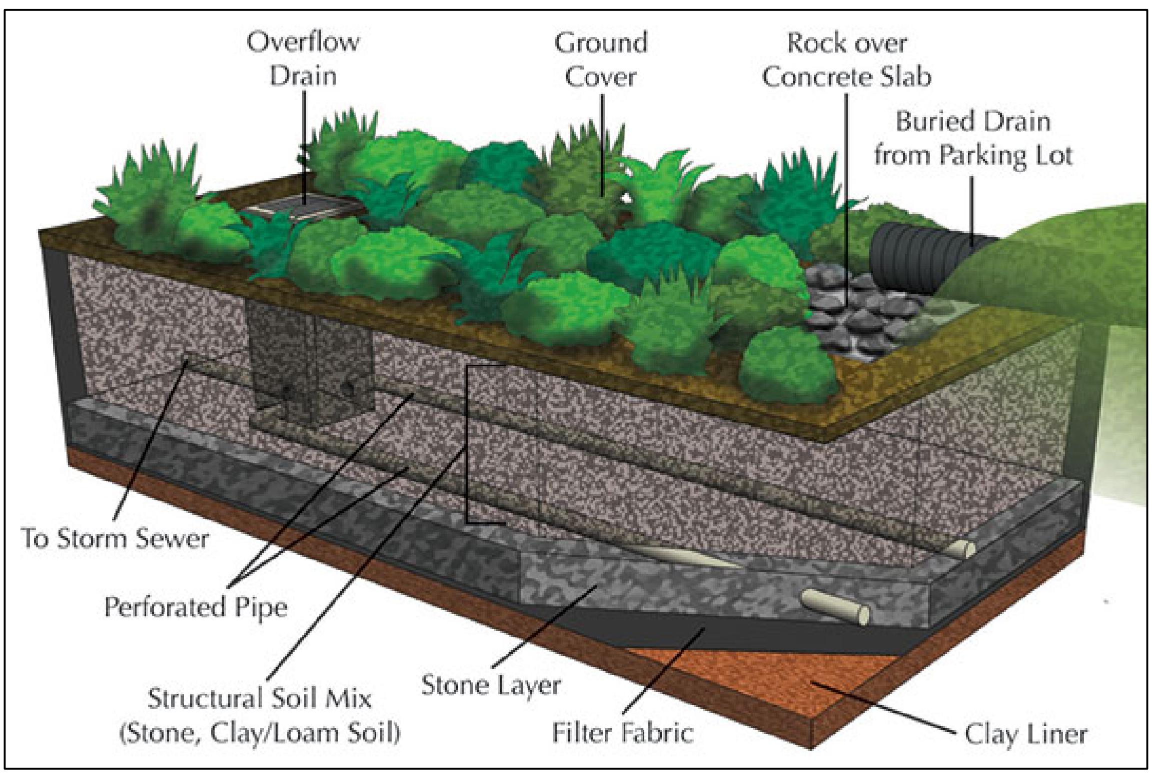


desirable shape for a berm



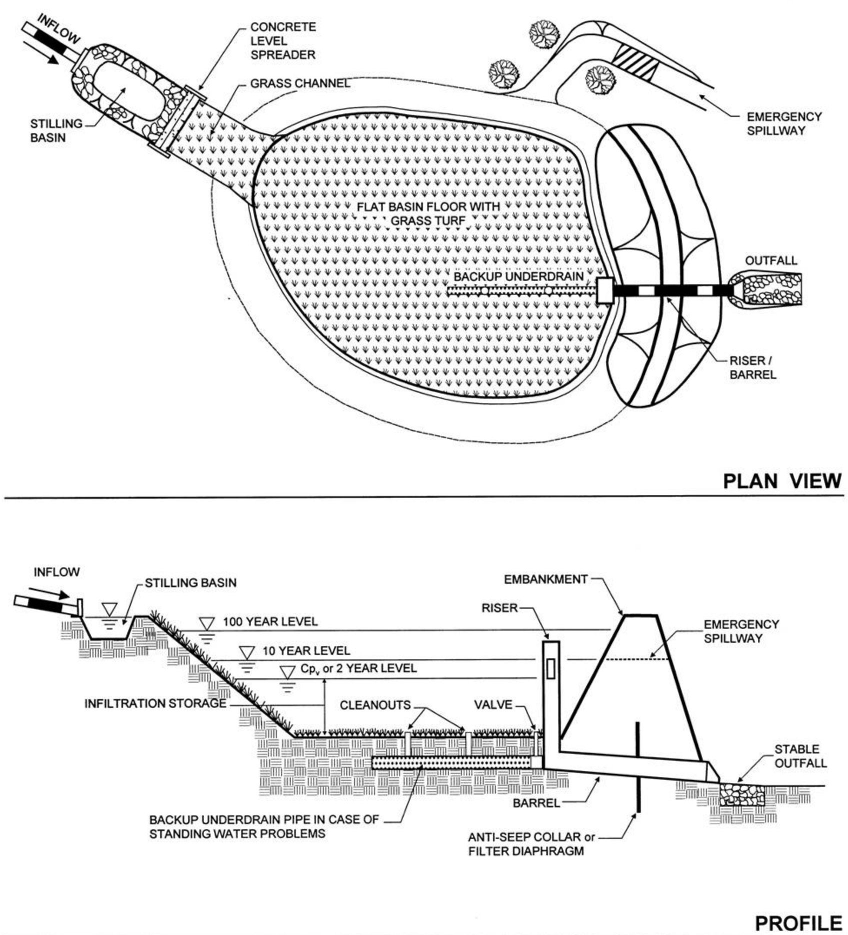
Source: Pennsylvania Department of Environmental Protection, Stormwater Best Management Practices Manual (top and middle); Maryland Department of the Environment (bottom)

Infiltration practices



Source: University of Maryland Extension, College of Agriculture and Natural Resources (top); Center for TMDL and Watershed Studies, Virginia Tech (bottom)

Infiltration trenches with underdrains



Source: Center for Watershed Protection (top) and Maryland Department of the Environment (bottom)

Landscape infiltration

Source: Tom Liptan, Portland Bureau of Environmental Services(top), Ecosite,Inc. (bottom)

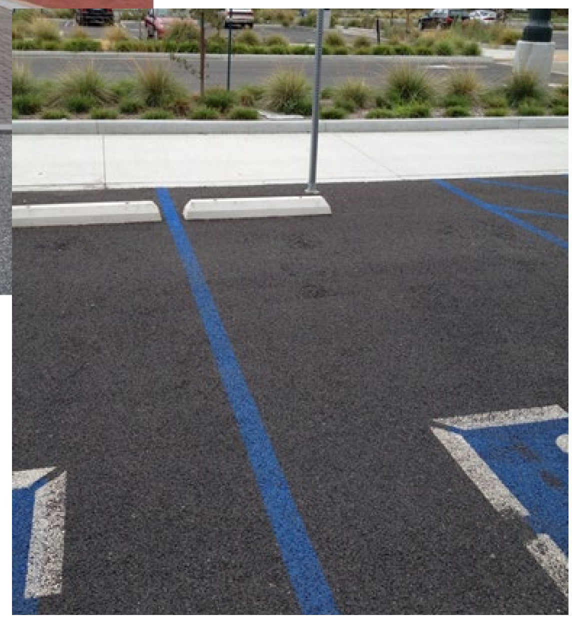
Micro-bioretention

Source: Prince George's County, MD

Permeable pavement shoulder instead of grass shoulder/buffer

Source: U.S. Environmental Protection Agency (top); City of Berkeley, CA Department of Public Works (bottom)

Permeable pavements / sidewalks



Source: Tetra Tech, Inc. (top and middle), U.S. Environmental Protection Agency (bottom)

Rain gardens

Source: U.S. Environmental Protection Agency (top); Montgomery County, MD Department of Environmental Protection (bottom)

Rainwater harvesting

Source: U.S Environmental Protection Agency (top); Tetra Tech, Inc. (middle) Montgomery County, MD Department of Environmental Protection (bottom)

Reinforced turf

Source: PERFO®

Sheet Flow to Conservation Areas

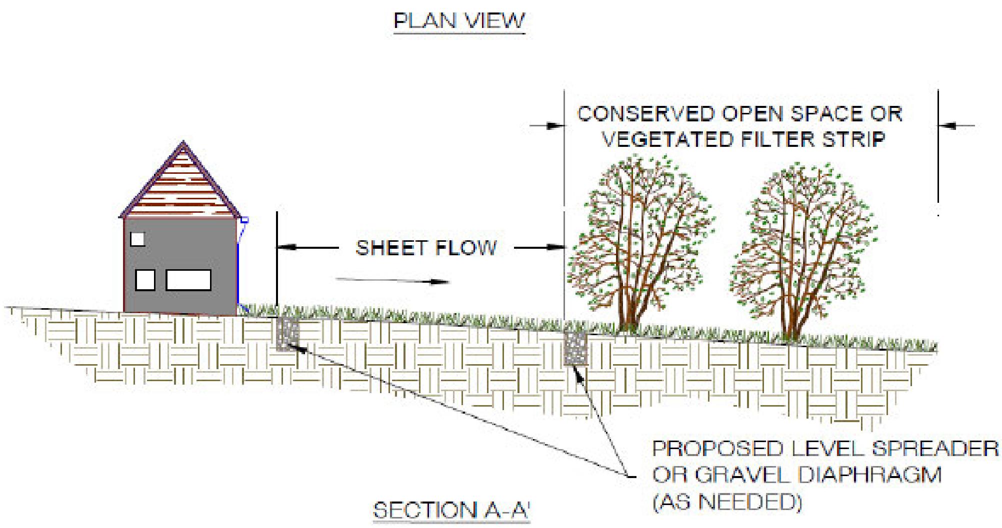
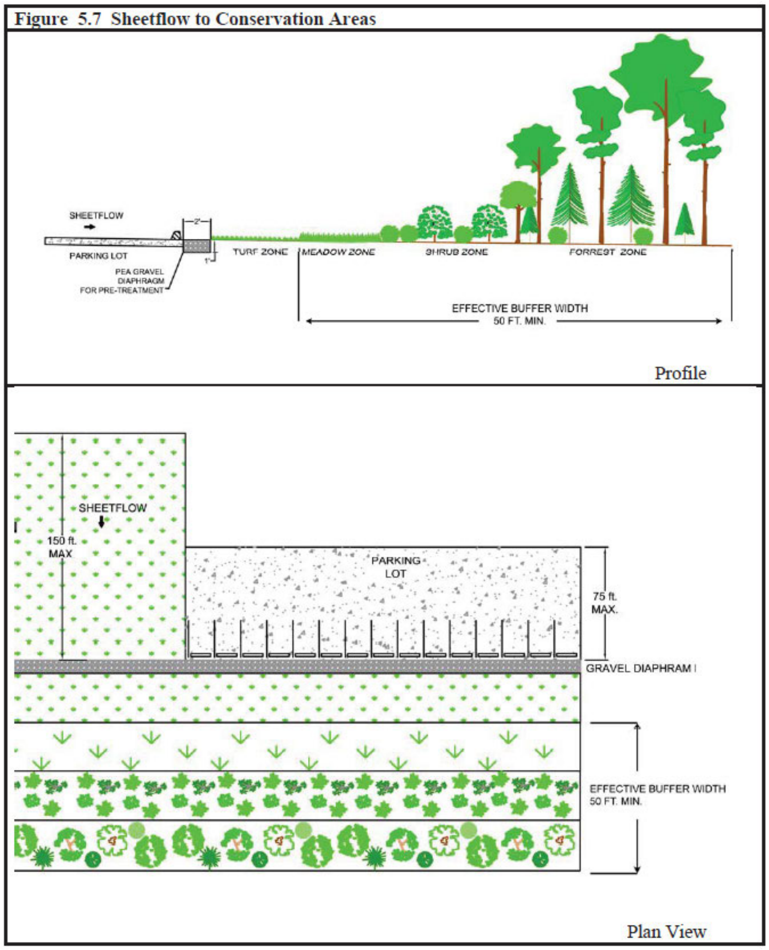
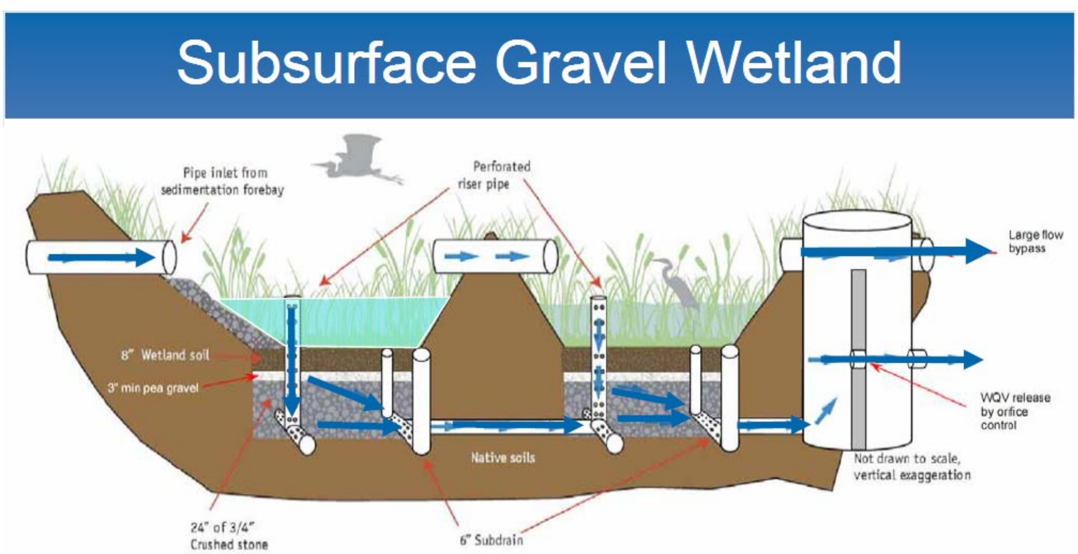


Figure 5.7 Sheetflow to Conservation Areas



Source: Virginia Department of Conservation and Recreation, BMP Standards and Specifications (top); Maryland Department of the Environment (bottom)

Submerged gravel wetlands



Source: Maryland Department of the Environment (top); University of New Hampshire Stormwater Center (middle, bottom)

Swales

Source: Fairfax County, VA (top); California Department of Transportation (bottom)

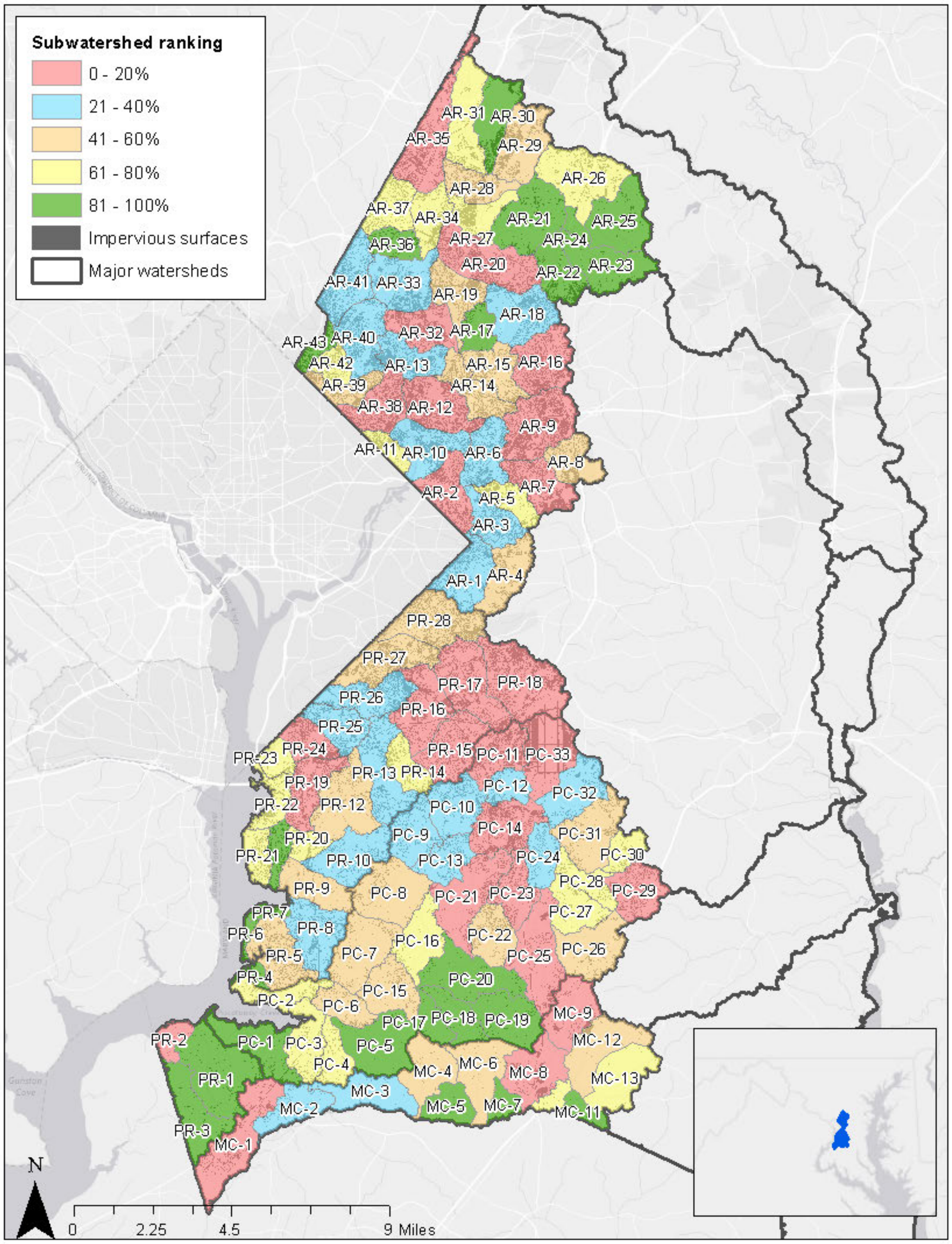
Tree planter / Planting trees on impervious urban

Source: U.S. Environmental Protection Agency

Wet ponds/wetlands

Source: Montgomery County, MD Department of Environmental Protection (top); U.S. Environmental Protection Agency (bottom)

APPENDIX B: IMPERVIOUS AREA TO BE TREATED BY LAND USE AND SUBWATERSHED



Note: Subwatersheds are ranked with 1 being the highest priority subwatershed.

Figure B-1. Subwatershed prioritization in the PCB-impacted watersheds in Prince George's County.

Table B-1. Amount of impervious area by land use per subwatershed in the Anacostia River watershed

Subwatershed	Area (acres)	Impervious Area Treated			
		ROW (acres)	Institutional (acres)	Commercial/ Industrial (acres)	Residential (acres)
AR-1	1,047.8	93.4	18.2	39.4	184.3
AR-10	792.8	26.4	6.5	85.7	30.2
AR-11	360.9	25.1	2.8	29.9	41.5
AR-12	1,417.4	144.3	39.0	233.2	219.9
AR-13	876.4	86.4	24.4	108.2	112.7
AR-14	892.1	108.3	21.2	42.7	151.9
AR-15	755.8	60.9	25.2	29.2	117.1
AR-16	1,450.5	97.1	25.2	53.3	130.0
AR-17	126.9	14.0	0.0	0.0	27.2
AR-18	749.6	41.1	9.6	56.5	93.8
AR-19	859.9	87.9	22.0	127.7	109.4
AR-2	995.4	125.6	28.2	150.6	117.3
AR-20	1,189.7	117.9	28.3	63.0	227.1
AR-21	57.0	4.4	1.1	0.0	6.7
AR-22	213.1	3.6	3.6	0.1	18.2
AR-23	113.9	3.3	0.4	0.0	3.8
AR-24	0.9	0.0	0.0	0.0	0.3
AR-25	7.6	0.5	0.0	0.0	0.6
AR-26	508.1	26.9	7.7	0.2	55.2
AR-27	328.3	29.7	6.3	163.1	14.6
AR-28	762.1	70.8	8.9	114.0	94.3
AR-29	834.4	47.6	1.6	200.5	46.7
AR-3	897.1	103.8	15.2	75.3	137.2
AR-30	286.2	21.5	1.2	131.9	7.0
AR-31	431.3	26.4	9.7	32.7	27.7
AR-32	667.3	79.1	44.5	28.4	86.5
AR-33	520.3	38.0	11.5	51.5	58.8
AR-34	301.9	14.2	0.0	26.3	32.4
AR-35	1,246.2	60.4	21.1	73.7	160.3
AR-36	146.4	9.8	0.0	0.0	25.5
AR-37	540.1	34.7	10.9	2.7	89.6
AR-38	1,135.2	145.4	10.2	61.8	237.5
AR-39	564.8	59.2	15.7	50.8	99.3
AR-4	758.2	57.3	18.1	40.0	88.1

Subwatershed	Area (acres)	Impervious Area Treated			
		ROW (acres)	Institutional (acres)	Commercial/ Industrial (acres)	Residential (acres)
AR-40	963.5	97.9	11.0	56.9	176.6
AR-41	1,197.4	101.2	26.4	40.9	216.4
AR-42	473.6	57.8	14.7	21.0	83.7
AR-43	319.5	37.8	1.1	19.1	63.9
AR-5	607.0	23.7	13.5	111.4	33.0
AR-6	1,003.9	100.0	8.7	94.4	124.9
AR-7	1,025.9	99.6	47.7	115.3	141.6
AR-8	567.6	51.8	12.6	56.8	91.3
AR-9	1,310.1	113.8	25.0	337.1	105.8
Total	**29,304.0**	**2,548.3**	**599.1**	**2,925.1**	**3,889.8**

Table B-2. Amount of impervious area by land use per subwatershed in the Mattawoman Creek watershed

Subwatershed	Area (acres)	Impervious Area Treated			
		Right-of-way (acres)	Institutional (acres)	Commercial/ Industrial (acres)	Residential (acres)
MC-1	776.2	22.2	1.6	9.6	43.1
MC-10	38.5	1.0	0.1	1.9	1.1
MC-11	19.3	0.6	0.0	0.0	0.7
MC-12	101.4	1.8	1.2	35.3	4.8
MC-13	23.0	0.3	0.0	0.0	3.0
MC-2	393.9	9.1	0.0	2.0	48.5
MC-3	309.5	2.1	0.4	0.1	5.1
MC-4	74.8	1.3	0.0	0.0	4.1
MC-5	21.7	0.5	0.0	0.0	1.0
MC-6	123.4	0.7	0.0	0.0	3.1
MC-7	51.7	0.0	0.0	0.0	0.0
MC-8	289.1	9.7	10.5	37.9	13.3
MC-9	412.4	13.9	4.0	66.0	21.9
Total	**2,635.2**	**63.1**	**17.7**	**152.8**	**149.7**

Table B-3. Amount of impervious area by land use per subwatershed in the Piscataway Creek watershed.

Subwatershed	Subwatershed Group	Total Area (acres)	Impervious Area Treated			
			Right-of-way (acres)	Institutional (acres)	Commercial/ Industrial (acres)	Residential (acres)
PC-1	Not in TMDL	n/a	n/a	n/a	n/a	n/a
PC-10	Tinkers	893.0	34.9	2.7	18.2	6.1
PC-11	Tinkers	312.8	12.6	1.9	31.2	2.0
PC-12	Tinkers	67.0	3.1	0.1	4.3	0.5
PC-13	Tinkers	543.5	21.2	2.7	2.7	3.6
PC-14	Tinkers	1,179.1	44.0	7.2	92.7	7.1
PC-15	Main Stem	516.8	11.8	0.4	0.1	11.1
PC-16	Main Stem	257.9	7.6	0.1	1.9	6.6
PC-17	Main Stem	82.2	1.1	0.0	0.0	1.4
PC-18	Main Stem	197.4	2.9	0.0	0.0	5.2
PC-19	Main Stem	217.0	2.9	0.0	3.0	4.6
PC-2	Not in TMDL	n/a	n/a	n/a	n/a	n/a
PC-20	Main Stem	290.2	3.8	0.0	2.4	6.6
PC-21	Main Stem	780.7	26.9	7.2	4.6	32.3
PC-22	Main Stem	558.1	26.3	1.6	2.8	25.3
PC-23	Main Stem	777.2	18.2	6.5	4.0	16.9
PC-24	Main Stem	591.6	25.5	1.9	1.4	25.7
PC-25	Main Stem	856.5	20.2	14.9	4.2	20.5
PC-26	Main Stem	219.2	5.8	0.0	4.6	4.8
PC-27	Main Stem	111.2	1.7	0.0	0.0	2.1
PC-28	Main Stem	295.9	3.3	0.0	0.0	2.7
PC-29	Main Stem	898.1	21.8	0.9	0.0	16.6
PC-3	Not in TMDL	n/a	n/a	n/a	n/a	n/a
PC-30	Main Stem	256.8	11.9	0.2	0.0	10.5
PC-31	Main Stem	572.6	17.6	1.3	0.0	17.6
PC-32	Main Stem	504.3	7.1	1.2	9.0	11.4
PC-33[a]	Main Stem	n/a	n/a	n/a	n/a	n/a
PC-4	Not in TMDL	n/a	n/a	n/a	n/a	n/a
PC-5	Not in TMDL	n/a	n/a	n/a	n/a	n/a
PC-6	Not in TMDL	n/a	n/a	n/a	n/a	n/a
PC-7	Tinkers	589.2	23.6	0.1	0.6	4.1
PC-8	Tinkers	661.1	24.1	7.9	5.9	3.5
PC-9	Tinkers	792.9	34.2	4.5	1.2	6.6
TOTAL	**Main Stem/Tinkers**	**13,022.0**	**413.9**	**63.0**	**194.9**	**255.4**

Note: [a] Subwatershed consists entirely of federal property.

Table B-4. Amount of impervious area by land use per subwatershed in the Potomac River watershed

Subwatershed	Area (acres)	Impervious Area Treated			
		ROW (acres)	Institutional (acres)	Commercial/ Industrial (acres)	Residential (acres)
PR-1	380.4	5.9	0.9	0.9	9.3
PR-10	869.8	41.0	1.8	10.3	31.5
PR-11	250.2	6.5	0.3	3.3	10.8
PR-12	889.8	27.3	2.8	5.9	31.2
PR-13	1,035.2	30.4	7.7	16.0	46.5
PR-14	579.4	14.9	4.6	2.3	17.2
PR-15	1,306.1	57.2	10.5	5.9	56.0
PR-16	1,045.7	28.8	5.5	41.2	33.5
PR-17	1,237.0	46.2	10.8	22.9	67.8
PR-18	1,444.3	58.9	7.8	71.2	65.4
PR-19	987.5	31.6	9.0	12.1	34.0
PR-20	472.4	12.4	2.3	0.9	11.4
PR-21	554.2	29.7	0.9	0.0	26.3
PR-22	297.3	12.2	0.5	6.8	10.4
PR-23	6.1	0.1	0.0	0.7	0.0
PR-24	566.5	23.0	1.7	20.9	25.2
PR-25	788.8	33.0	7.3	5.3	42.6
PR-26	1,008.8	58.2	9.3	30.7	54.1
PR-27	774.4	37.5	5.5	14.9	49.4
PR-28	1,552.2	49.3	12.3	23.1	70.1
PR-3	119.0	1.7	0.0	1.1	3.2
PR-4	87.0	2.9	0.0	0.0	3.1
PR-5	1,275.4	60.1	1.3	0.3	56.3
PR-6	63.5	1.9	0.0	0.0	2.9
PR-7	155.8	4.3	0.1	0.0	4.8
PR-8	1,079.6	33.4	3.1	9.8	21.3
PR-9	306.5	8.4	0.6	2.3	8.4
Total	**19,133.0**	**716.8**	**106.5**	**308.9**	**792.7**

Appendix C: Comparisons of Load Reductions to Chesapeake Bay TMDL

The Chesapeake Bay and local TMDLs each establish target load reductions for nitrogen, phosphorus, and TSS; the County is required to meet the most stringent of each of the reductions. In 2011, the County received a Chesapeake Bay WLA and percent reduction for the entire County, which MDE disaggregated into watersheds in the MDE *TMDL Data Center*.

The total nitrogen, total phosphorus, and TSS loads for the County's main watersheds were determined using the calibrated implementation model (WTM) that was developed as part of this restoration plan. The purpose of the implementation model was not to recalculate the WLA as defined in the TMDL documents and by the MDE *TMDL Data Center*, but to convert the TMDL load reduction from the original TMDL model to an implementation model that can be effectively used in planning restoration activities. The level of effort (load reduction percentage) to meet water quality standards is kept the same between the two models.

Table C-1 shows the load reduction needed to reach the County's WLA for both the local TMDLs and the Chesapeake Bay TMDL as calculated by WTM. Both sets of required reductions used the same baseline loadings from WTM; then the percent of necessary reduction from the MDE *TMDL Data Center* and the respective local TMDLs were applied to that baseline loading.

The comparison found that the required load reductions established by the local TMDLs for the Anacostia River and Mattawoman Creek watersheds are more stringent than the required overall total nitrogen and TSS load reductions for the County's portion of the Chesapeake Bay WLA. Required load reductions from the local TMDLs would not be sufficient for the County's portion of the total phosphorus Chesapeake Bay WLAs. Therefore, the County will need to implement additional restoration activities elsewhere in the County to meet phosphorus WLAs for the Chesapeake Bay TMDL.

Table C-1. Comparison of required load reductions using WTM: Chesapeake Bay TMDL and local TMDLs

Watershed	Chesapeake TMDL-Required Load Reductions Calculated Using WTM (lb/yr)			Local TMDL-Required Load Reductions Calculated Using WTM (lb/yr)		
	Nitrogen	Phosphorus	TSS	Nitrogen	Phosphorus	TSS
Anacostia River	56,693	13,932	1,876,139	227,917	28,573	5,200,998
Mattawoman Creek	1,779	754	134,487	9,329	1,083	n/a
Lower Patuxent River	5,127	1,224	177,401	n/a	n/a	n/a
Middle Patuxent River	3,527	814	105,450	n/a	n/a	n/a
Upper Patuxent River	11,771	2,785	503,515	n/a	18	188,692

Watershed	Chesapeake TMDL-Required Load Reductions Calculated Using WTM (lb/yr)			Local TMDL-Required Load Reductions Calculated Using WTM (lb/yr)		
	Nitrogen	Phosphorus	TSS	Nitrogen	Phosphorus	TSS
Piscataway Creek	25,336	6,022	758,703	n/a	n/a	n/a
Potomac River	43,576	8,912	784,156	n/a	n/a	n/a
Western Branch	30,612	6,922	706,167	n/a	n/a	n/a
Total	178,422	41,365	5,046,018	237,246	29,674	5,389,690

Notes:
n/a: This watershed did not have a local TMDL for the listed parameter; therefore, there is no required load reduction.
The phosphorus and TSS calculations in this table are not adjusted for streambank erosion, as was done in the local TMDL plans. The conversions factors, which vary by watershed, are unknown for most watersheds.

The impervious area treated by BMPs identified in the WIP were compared with the impervious area treated by the local TMDL restoration plans, as presented in Table C-2. The impervious areas treated were pulled directly from the WIP and local TMDL restoration plans. It can be seen from this comparison that overall, the impervious area treated in the restoration plans is greater than the impervious area treated as determined in the WIP. This is true especially for the ESD practices.

Table C-2. Comparison of impervious area treated for the Chesapeake Bay WIP and local TMDL restoration plans

Watershed	Impervious Area Treated from Chesapeake WIP (acres)			Impervious Area Treated from Local TMDL Restoration Plans (acres)		
	ESD	Non-ESD	Stream Restoration[a]	ESD	Non-ESD	Stream Restoration[a]
Anacostia River	1,333	3,050	1,123	9,962	167	750
Mattawoman Creek	25	58	21	383	5	0
Lower/Middle Patuxent River	38	86	32	n/a	n/a	n/a
Upper Patuxent River	192	440	162	102	42	0
Piscataway Creek	265	607	224	927	73	0
Potomac River	408	935	344	1,926	102	0
Western Branch	418	956	352	n/a	n/a	n/a
Total	2,679	6,131	2,258	13,300	388	750

Notes:
n/a: This watershed did not have a local TMDL; therefore, no BMPs have been identified.
[a] 1 linear foot of stream restoration is considered as 0.01 impervious acre equivalent (MDE 2014a).

Table C-3 presents the required load reductions for the WIP (using WTM) compared to the local TMDL restoration plan load reductions for BMPs and other restoration practices (e.g., street sweeping, nutrient management). Table C-3 has load reductions identified for the watersheds that had a local TMDL, even if it did not have required load reductions for a parameter. For instance, Piscataway Creek has a local TMDL for bacteria, but load reductions for nitrogen, phosphorus, and TSS are listed because the BMPs required to reduce bacteria loads also will reduce nitrogen, phosphorus, and TSS loads.

As shown, the load reductions from the BMPs and other restoration practices in TMDL restoration plans are greater than the required load reductions from the Chesapeake Bay TMDL to total nitrogen and TSS, however additional total phosphorus reductions are necessary.

Table C-3. Comparison of Chesapeake Bay TMDL required load reductions using WTM and load reductions from BMPs from local TMDL restoration plans

	Chesapeake TMDL-Required Load Reductions Calculated Using WTM (lb/year)			Load Reductions from BMPs and Other Restoration Practices Identified in Local TMDL Restoration Plans Calculated Using WTM (lb/yr)		
Watershed	**Nitrogen**	**Phosphorus**	**TSS**	**Nitrogen**	**Phosphorus**	**TSS**
Anacostia River	56,693	13,932	1,876,139	199,915	32,195	25,609,036
Mattawoman Creek	1,779	754	134,487	7,068	1,202	215,470
Lower Patuxent River	5,127	1,224	177,401	n/a	n/a	n/a
Middle Patuxent River	3,527	814	105,450	n/a	n/a	n/a
Upper Patuxent River	11,771	2,785	503,515	6,817	1,055	197,547
Piscataway Creek	25,336	6,022	758,703	17,075	1,983	365,044
Potomac River	43,576	8,912	784,156	25,283	3,587	666,370
Western Branch	30,612	6,922	706,167	n/a	n/a	n/a
Total	178,422	41,365	5,046,018	256,158	40,022	27,053,467

Notes:
n/a: This watershed did not have a local TMDL; therefore, no BMPs were identified.
The phosphorus and TSS in this table are not adjusted for streambank erosion, as was done in the local TMDL plans. The conversions factors, which vary by watershed, are unknown for most watersheds.

APPENDIX D: FUNDING OPPORTUNITIES

- Chesapeake Bay Trust
  - Demonstration scale, community-based, on-the-ground restoration projects: Stream bank stabilization; BMPs (LID), wetland creation and enhancement
  - Watershed Assistance Grant Program: Technical planning and design assistance
  - Outreach and Community Engagement Grant Program: Implements community-led stewardship efforts
- National Fish and Wildlife Foundation Chesapeake Bay Stewardship Fund
  - Competitive grant programs: *Innovative Nutrient and Sediment Reduction* and *Small Watersheds*
- National Fish and Wildlife Federation Five Star and Urban Waters Restoration Grant Program
  - Coastal, wetland, and riparian restoration
  - Focus on education and training encouraging a diverse group of community partners
- Chesapeake Wildlife Heritage
  - Provides technical assistance and project labor for wetland, riparian buffer, and other related creation and restoration projects.
- Maryland Landowner Incentive Program
  - Competitive grants for private land owners
  - Funds reforestation, grassland and forest buffers
- Urban Waters Small Grants
  - Engages communities with environmental justice concerns
  - Provides education and resources through $40,000–$60,000 grants
- American Forests Global ReLeaf
  - Reforestation on public lands (>20 acre plantable areas)
  - Provides funding, cost-sharing, technical assistance, site prep, seedling purchase
- EPA Environmental Education Model Grant
  - The Environmental Education Regional Grant Program aims to increase public awareness and knowledge about environmental issues. The program provides skills for participants to make informed environmental decisions and perform actions to help the environment.
- EPA Clean Water State Revolving Fund
  - Provides low-interest and flexible-term loans to help communities meet the goals of the Clean Water Act.