Consolidated Total Maximum Daily Load (TMDL) Implementation Plan Report

Prepared for District Department of Energy and the Environment

September 13, 2022

DEPARTMENT OF ENERGY & ENVIRONMENT

GOVERNMENT OF THE DISTRICT OF COLUMBIA
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Prepared on behalf of DOEE by

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Department of Energy and Environment
Water Quality Division – Planning and Reporting Branch
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RESPONSE TO PUBLIC COMMENTS

Consolidated Total Maximum Daily Load Implementation Plan Report (TMDL IP)

Comment 1:
2.4 Use of Adaptive Management in Meeting Permit Requirements - We support the use of an adaptive management strategy to meet permit requirements. This will enable DOEE to utilize the latest advancements in science and technology to achieve waste load allocation goals.
DOEE Response: DOEE thanks and acknowledges Contech Engineered Solutions, LLC for this comment. DOEE will continue to use an adaptive management strategy to meet permit requirements.

Comment 2:
6.3 Updated Projected WLA Attainment Date - Retention-based Structural BMPs are incentivized under the 2013 Stormwater Regulations. An opportunity to further accelerate compliance with the TMDL schedule exists if DOEE would consider amending those regulations to accommodate the use of certain Proprietary Practices, specifically high rate biofiltration and high rate media filtration, in combination with storage/infiltration as a runoff reduction practice.

- Modeled BMP efficiencies for non-runoff based BMPs, like proprietary practices, in Figure 6-1 are based upon Table 9 of Appendix F of the 2015 Comprehensive Baseline Analysis Report. Updated performance summary data for many types of urban BMPs, including proprietary practices like High Rate Biofiltration, High Rate Media Filtration, and Hydrodynamic Separators, can be found in the 2020 Urban BMP Database Performance Summary associated with the International Stormwater BMP Database. https://www.waterrf.org/system/files/resource/2020-11/DRPT-4968_0.pdf
    - High Rate Biofiltration and High Rate Media Filtration are amongst best performers for total suspended solids (TSS) and total phosphorus (TP) reductions.
    - Bioretention continues to show the highest phosphorus median effluent concentrations for all three forms of phosphorus analyzed in the report.
- Multiple high rate biofiltration and high rate filtration proprietary practices have demonstrated greater than 80% TSS removal in field and laboratory studies in accordance with nationally relevant protocols such as the Washington Department of Ecology's Technology Assessment Protocol- Ecology (TAPE) or the New Jersey Department of Environmental Protection's (NJDEP) Certification protocol.

DOEE Response:

DOEE thanks and acknowledges Contech Engineered Solutions, LLC for this comment. This report provides a plan for meeting TMDL goals within the bounds of the existing stormwater regulations. Revisions to the stormwater regulations are made through a process distinct and separate from the TMDL Implementation Plan. Stormwater regulation updates are proposed and new rules adopted, as needed, based on policy directives, stakeholder feedback, and peer reviewed scientific findings/data from academic institutions and Chesapeake Bay Program technical working groups. The stormwater guidebook is typically updated by DOEE's Regulatory Review Division every 3-5 years.

EXECUTIVE SUMMARY

The District's Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) permit (DC0000221, U.S. EPA 2018) requires the District to update its Consolidated Total Maximum Daily Load (TMDL) Implementation Plan (IP), which was developed in 2016 and is hereafter referred to as the "2016 IP." This document reflects that required update, and is hereafter referred to as the "2022 IP."

As required by the MS4 permit, the 2022 IP focuses on incorporating new information into the IP and updating all required elements, including the MS4 wasteload allocation (WLA) inventory, WLA attainment dates, and the achievement of existing programmatic milestones. The 2022 IP summarizes progress to date in implementing best management practices (BMPs) to reduce loads, and provides projections and attainment strategies to guide future implementation.

The 2022 IP builds on – and primarily continues - strategies identified and implemented during development of the 2016 IP. The 2022 IP itself is structured in a similar way to the 2016 IP, although it focuses primarily on summarizing what has been achieved in the six years since the 2016 IP and on how the TMDL implementation program will move forward into the future. Much of the fundamental information on TMDL implementation program development can be found in the 2016 IP.

Overall, the 2022 IP provides a comprehensive review of the achievements of the TMDL implementation program as documented in the 2016 IP, and provides a guide for the future based on adaptive management of that program.

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1. INTRODUCTION

The District of Columbia (DC) owns and operates a Municipal Separate Storm Sewer System (MS4) that is designed to collect and drain stormwater. The District has an EPA-issued MS4 National Pollutant Discharge Elimination System (NPDES) permit that gives it the authority to operate the MS4 and discharge storm water to the Anacostia and Potomac rivers and their local tributaries within the District.

The MS4 covers an area of 19,750 acres. As shown in Figure 1-1 on the next page, the MS4 area surrounds the combined sewer system (CSS) area – an area of the city where stormwater is collected and drained along with sanitary sewage. Both of these sewage systems have outfalls along water bodies where the pollutant load associated with stormwater and, in the case of the CSS, sanitary sewage is discharged. The CSS is operated by DC Water under a separate NPDES permit. Figure 1-1 shows the MS4 and CSS area, as well as the major waterbodies in the District.

The District Department of Energy and Environment (DOEE) developed lists of impaired water bodies (the 303(d) list) across the District during the late 1990s and early 2000s. The listing of these impaired water bodies led to development of a large number Total Maximum Daily Load (TMDL) studies covering a variety of pollutants over all of the District’s water bodies. These TMDL studies allocate the quantity of each pollutant that can be discharged without violating water quality standards (WQS). The allocations assigned to the MS4 are called wasteload allocations, or WLAs.

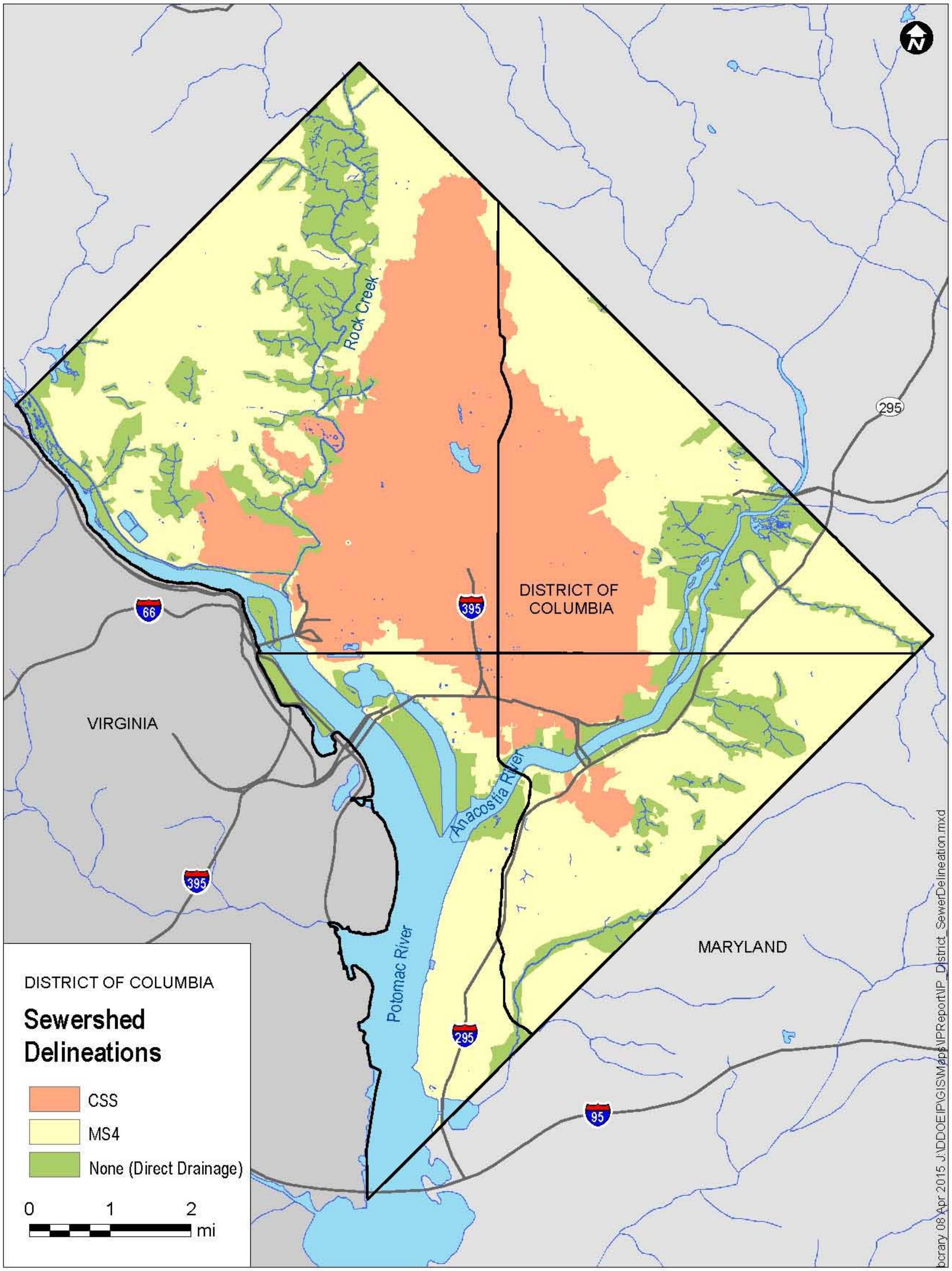

Figure 1-1: Sewershed Delineations for the District of Columbia

As part of its MS4 permit requirements under a previous (2012) permit, DOEE was required to develop a Consolidated TMDL Implementation Plan (or "IP" for short) that included strategies and a proposed timeline for achieving applicable MS4 WLAs. The original Consolidated TMDL IP was published in June 2016 (DOEE, 2016a) and addressed the following permit requirements:

> *The Plan shall include:*
>
> 1. *A specified schedule for attainment of WLAs that includes final attainment dates and, where applicable, interim milestones and numeric benchmarks.*
>   a. *Numeric benchmarks will specify annual pollutant load reductions and the extent of control actions to achieve these numeric benchmarks.*
>   b. *Interim milestones will be included where final attainment of applicable WLAs requires more than five years. Milestone intervals will be as frequent as possible but will in no case be greater than five (5) years.*
> 2. *Demonstration using modeling of how each applicable WLA will be attained using the chosen controls, by the date for ultimate attainment.*
> 3. *An associated narrative providing an explanation for the schedules and controls included in the Plan.*
> 4. *Unless and until an applicable TMDL is no longer in effect (e.g., withdrawn, reissued or the water delisted), the Plan must include the elements in 1-3 above for each TMDL as approved or established.*
> 5. *The current version of the Plan will be posted on the permittee's website.*

The District's current MS4 permit (DC0000221, U.S. EPA 2018) requires the District to update its Consolidated TMDL IP. Specifically, the permit states that the focus of the IP update will be to

- Incorporate any new or revised TMDL (§2.2.5.1);
- Make appropriate adjustments to milestones if analysis indicates that initial milestones are not being met (§2.2.5.3); and
- Incorporate new information.

The 2022 updated IP (or the "2022 IP" for short) addresses these requirements.

It is important to recognize that the 2022 IP, and the process for developing it, builds on a process that was begun during the development of the 2016 IP. As such, much of the structure and components of the 2016 IP, and processes for implementation that were developed and implemented during the development of the 2016 IP are continued in the 2022IP. Fundamental information on the building blocks of the IP and MS4 WLA can be found in the 2016 IP.

DOEE has also utilized the process of adaptive management to develop the 2022 IP. Lessons that have been learned over the last six years regarding effective implementation, TMDL pollutants, BMP performance, and pollutant modeling have been incorporated into the planning and projections, making the overall IP stronger.

The Consolidated TMDL IP is organized as follows:

- **Executive Summary -** The Executive Summary is added to provide an overview of content and to emphasize the key points of the 2022 Consolidated TMDL IP ("2022 IP") in a concise manner.
- **Chapter 1 – Introduction -** The Introduction provides background on the 2022 IP and a forecast of sections and their composition.
- **Chapter 2 - Regulatory Requirements to Update the Consolidated TMDL IP** – summarizes the specific permit requirements to develop the 2022 IP and summarizes the District's regulatory strategy for complying with TMDL implementation-related requirements.
- **Chapter 3 - Changes to the TMDL Inventory** – summarizes the current MS4 WLA inventory and changes to the inventory since the 2016 IP.
- **Chapter 4 - Updates to the Implementation Plan Modeling Tool (IPMT) and Associated Databases** – summarizes the changes to the IPMT to improve modeling and tracking of WLA attainment.
- **Chapter 5 – Current Conditions** – summarizes the current conditions/progress made to date in terms of required load reduction. The section analyzes and summarizes BMP implementation trends and progress to date, as well as the gap between progress made and ultimate WLA attainment. This section also includes a discussion of the progress made against numeric milestones from the previous permit.
- **Chapter 6 – Implementation Plan for WLA Attainment -** describes DOEE's plans for achieving WLAs. This chapter also provides WLA attainment dates, as well as an analysis of how updates to the TMDL inventory, BMP implementation, modeling inputs and the IPMT have impacted these results. Finally, the chapter includes a discussion of how DOEE has used the adaptive management process and the implementation of key programmatic initiatives required under the current permit to accelerate the attainment of WLAs.
- **Chapter 7 – Tracking Progress** – summarizes the methods DOEE uses to track progress towards WLA attainment.
- **Chapter 8 – Public Outreach Plan** – summarizes the methods DOEE uses to communicate the Consolidated TMDL IP, TMDL implementation, and load reduction progress to the public.
- **Chapter 9 – Integration with Other Watershed Plans** – describes how the 2022 IP is integrated with other watershed planning and reporting requirements in the District.
- **Chapter 10 – Funding the IP** – summarizes current funding programs and funding levels, and provides analysis of progress and potential methods for increasing funding.

2. REGULATORY REQUIREMENTS TO UPDATE THE CONSOLIDATED TMDL IP

2.1 Requirement to Update the Consolidated TMDL IP

Section 2.2.5 of the District's MS4 NPDES permit (Permit Number DC0000221, 2018[1])(U.S. EPA, 2018) requires the District to update its 2016 IP (DOEE, 2016a)[2]. The 2016 IP was first published in May 2015 and was updated in August 2016. The permit states that the focus of the IP update will be to incorporate any new or revised TMDL (§2.2.5.1 – addressed in Chapter 3 of this document); make appropriate adjustments to milestones if analysis indicates that initial milestones are not being met (§2.2.5.3 – addressed in Chapter 6 of this document); and incorporate new information - including the results of studies and assessments required in this permit (addressed in Chapter 5 of this document), data on performance of stormwater control measures, improved pollutant estimates, or construction schedules - that informs refinement of benchmarks and milestones (§2.2.5.4 - addressed in Chapter 5 of this document). In addition, the permit renews previous requirements that the IP must include a schedule for attainment of the WLAs (including a final date and interim milestones as necessary) (§2.2.5.1.a); a demonstration using modeling of how the WLAs will be attained (§2.2.5.1.b); and a narrative explaining schedules and controls used in the Consolidated TMDL IP (§2.2.5.1.c). These latter requirements are addressed in Chapter 6 of this document.

2.2 Other TMDL Planning Requirements

In addition to the IP elements required by Section 2.2.5, the permit includes several other TMDL planning and implementation requirements that have been incorporated into the 2022 IP. These include:

- Using Bacterial Source Tracking to update milestones and benchmarks for implementing controls to attain *E. coli* WLAs (§2.2.2.1);
- Conducting an investigation for toxic TMDL pollutants (specifically, chlordane, heptachlor epoxide, dieldrin, DDT, DDE, DDD and PCBs) and updating milestones and benchmarks for implementing controls to attain these WLAs (§2.2.2.2);
- Developing a list of targeted watersheds and targeted implementation approaches for incorporation into the IP (§2.2.2.3);
- Evaluating the District's Stormwater Fee for its adequacy (in tandem with other financing options) in helping to achieve the water quality goals of the permit (§2.2.3);
- Evaluating the District's Stormwater Management regulations (§2.2.4) with the goal of evaluating the impact and feasibility of potential updates that could enhance implementation and load reductions; and
- Reporting on previously established milestones for acres managed, green roof implementation, tree planting, and trash removal (§1.5).

[1] Available for download at: https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/dcsewer_dcms4_permit.pdf

[2] The 2016 Consolidated TMDL IP report is available for download at: https://dcstormwaterplan.org/wp-content/uploads/0_TMDL_IP_080316_Draft_updated.pdf. The appendices are available for download at: https://dcstormwaterplan.org/wp-content/uploads/TMDL_IP_Appendix_A-H.pdf.

Many of these requirements have been reported on previously in MS4 Annual Reports, documentation of technical studies, etc. However, the results of these studies and their impact on load reduction strategies for the IP is discussed in Chapter 6.

With respect to reporting on previously established milestones (§1.5), annual and cumulative progress towards meeting these milestones are provided in the MS4 Annual Reports starting from the beginning of the permit term[3]. For convenience, the milestone information from the MS4 Annual Reports are also presented in Chapter 5 of the 2022 IP. Chapter 6 also shows that the milestones are expected to be 100% met by the end of the permit term in June 2023. However, information on progress towards these milestones is included to help evaluate the effectiveness of current implementation efforts and to help determine the need for updated or increased implementation strategies. This is covered in more detail in the discussion of adaptive management in Subsection 2.4 below.

2.3 Strategy to Meet Permit Requirements

The 2016 addressed all elements required by the previous MS4 permit; those elements are consistent with what is required by the current MS4 permit (e.g., incorporate new or revised TMDLs; incorporate new/updated information as appropriate; make appropriate adjustments to milestones; include a schedule for attainment of the WLAs; demonstrate WLAs attainment through modeling; and include a narrative for schedules and controls). DOEE plans to continue using the same strategy as the foundation for making additional progress towards attaining WLAs during the next permit term (2023-2028) and beyond. DOEE will also continue to adaptively manage implementation to increase effectiveness.

In particular, DOEE will continue to use the Implementation Planning Modeling Tool (IPMT) for planning and tracking purposes. More information on the development of these strategies can be found in Chapter 6 (Implementation Plan: WLA Attainment) of the 2016 IP. The implementation strategies are also discussed in more detail in in Chapter 6 (Implementation Plan: WLA Attainment) of this document.

The 2022 IP continues the implementation strategies that were outlined in the 2016 IP. More information on the development of these strategies can be found in Chapter 6 (Implementation Plan: WLA Attainment) of the 2016 IP. The implementation strategies are also discussed in more detail in Chapter 6 (Implementation Plan: WLA Attainment) of this document.

The 2022 IP also continues the strategies for tracking progress and funding that were outlined in the 2016 IP. Short updates to these components of the IP are provided in Chapter 7 (Tracking Progress) and Chapter 10 (Funding the Implementation Plan) of this document. Changes and updates to the Public Outreach Plan and to the integration of this Plan with other watershed planning efforts are discussed in Chapters 8 (Public Outreach Plan) and 9 (Integration with other Watershed Planning Efforts), respectively, of this Plan.

The District will also leverage the experience gained and the lessons learned during the implementation of the 2016 IP over the last several years to update the 2022 IP. A more detailed discussion of this process is included in the next subsection.

[3] The 2019 MS4 Annual Report is the first Annual Report to cover the current permit term.

2.4 Use of Adaptive Management in Meeting Permit Requirements

An important component of meeting permit requirements for update of the 2022 IP is section 2.2.5.4, which requires the incorporation of new information that informs refinement of benchmarks and milestones. DOEE has implemented a process of adaptive management to meet this permit requirement. DOEE's process of adaptive management includes evaluating multiple aspects of the TMDL implementation process, including the IPMT, to ensure that the 2022 IP includes the most up-to-date information available for modeling and assessing current progress and developing forecasted WLA attainment dates. Updates to the IPMT that have been made since the 2016 IP was finalized are discussed in Chapter 4 (Updates to the Implementation Plan Modeling Tool) of this document. In addition, DOEE regularly evaluates its implementation process to identify and incorporate potential improvements. These program updates are discussed in Chapter 6 (Implementation Plan: WLA Attainment) of this document.

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3. CHANGES TO TMDL INVENTORY

Since the publication of the initial IP (DOEE, 2016a), EPA has approved revisions to two TMDLs. DOEE has also updated its Phase 3 Watershed Implementation Plan (WIP) for the Chesapeake Bay TMDL, which impacts load reduction requirements for that TMDL. Details on these changes are provided below:

- EPA approved the *Revised Metals Allocations and Daily Loads for Rock Creek* (DOEE, 2016b) in November 2016. This TMDL replaced the February 2004 *District of Columbia Final Total Maximum Daily Loads for Metals in Rock Creek* to incorporate revised water quality standards for copper, zinc, and mercury. It also includes daily loading expressions to comply with the *Friends of the Earth* court decision.
- EPA approved the *Total Maximum Daily Loads of Organochlorine Pesticides and Polychlorinated Biphenyls in Broad Branch, Dalecarlia Tributary, Dumbarton Oaks, Fenwick Branch, Klingle Valley Creek, Luzon Branch, Melvin Hazen Valley Branch, Normanstone Creek, Oxon Run, Piney Branch, Pinehurst Branch, Portal Branch, and Soapstone Creek in the District of Columbia* (DOEE, 2016c) in December 2016. Like the revised Rock Creek mainstem metals TMDL, this TMDL was developed to include daily loading expressions for its wasteload allocations and load allocations to address the *Friends of the Earth* decision. DOEE also incorporated additional sampling data that had been collected since the original TMDLs were approved. This TMDL replaces multiple previous TMDLs, including the February, 2004 *District of Columbia Final Total Maximum Daily Loads for Organics and Metals in Broad Branch, Dumbarton Oaks, Fenwick Branch, Klingle Valley Creek, Luzon Branch, Melvin Hazen Valley Branch, Normanstone Creek, Pinehurst Branch, Piney Branch, Portal Branch, and Soapstone Creek*; the August, 2004 *District of Columbia Final Total Maximum Daily Loads for Organics and Metals in Battery Kemble Creek, Foundry Branch, and Dalecarlia Tributary*; and the December, 2004 *Total Maximum Daily Load for Organics, Metals and Bacteria in Oxon Run.* For the latter TMDL, the bacteria loads had been previously revised in 2014.
- DOEE initially published the *District of Columbia's Phase III Watershed Implementation Plan for the Chesapeake Bay* (DOEE 2022) in August 2019 as part of the Bay Program's Midpoint Assessment. The District then amended the WIP in January 2022. The Phase 3 WIP included updated load reduction targets.

It should also be noted that in July 2021, the District issued a draft revised TMDL for organics and metals in the Anacostia watershed entitled *Total Maximum Daily Loads for Organics and Metals in the Anacostia River Watershed*. This TMDL is intended to replace the August 2003 *Total Maximum Daily Loads for Organics and Metals in the Anacostia River, Fort Chaplin Tributary, Fort Davis Tributary, Fort Dupont Creek, Fort Stanton Tributary, Hickey Run, Nash Run, Popes Branch, Texas Avenue Tributary*, *and Watts Branch* and the September 2003 *Total Maximum Daily Loads for Organics and Metals in Kingman Lake*. However, because this TMDL has not yet been approved, it has not been incorporated into this updated IP.

The revisions to the TMDLs and the update of the District's Phase 3 WIP impact the District's MS4 WLA inventory. These changes include:

- The addition of daily load expressions;
- Changes to some numeric expressions of existing annual MS4 WLAs; and

- The exclusion of specific pollutants/WLAs from the revised TMDL compared to the original TMDL if those pollutants or WLAs were determined to no longer be necessary for inclusion in the revised TMDL.

Several examples of these changes and the reasons behind them are provided below:

- Many individual WLAs were removed from the updated TMDLs if sampling undertaken in 2013 and 2014 as part of the TMDL revision process did not show exceedances of screening criteria. As stated in the revised TMDL for organics and metals in Potomac and Rock Creek tributaries:

> *TMDLs were not developed for pollutant(s)-waterbody combinations that did not exceed any numeric water quality criteria. For tributaries hydrologically connected to the Anacostia or Potomac Rivers, where there was no data other than fish tissue data from the mainstem Anacostia or Potomac Rivers, the toxic pollutant(s)-waterbody combinations were placed in Category 3(insufficient data). For waters that are not hydrologically connected to the Anacostia or Potomac River and have no evidence of a toxic pollutant present, those waters are no longer considered impaired for the specific parameter (although they remain identified as impaired based upon the District-wide fish consumption advisory).*

Individual WLAs for DDD and DDE, which had been included in the original TMDLs, were removed from the revised organics and PCBs TMDLs for the Potomac and Rock Creek tributaries. For this TMDL revision, DOEE determined that WLAs for DDT were sufficient to address impairments, and that separate WLAs for DDD and DDE were not warranted.

3.1 Summary of MS4 WLAs

A total of 28 TMDL studies have been developed for impaired waters in the District - 15 for waterbodies in the Anacostia watershed, six (6) for waterbodies in the Potomac watershed, four (4) for waterbodies in the Rock Creek watershed, two (2) that encompass impaired waters in both the Anacostia and the Potomac watersheds, and one that includes waters in both the Potomac and Rock Creek watersheds (note that this list includes both TMDLs that have since been replaced and the TMDLs that replace them. It does not include the revised TMDL for organics and metals in the Anacostia River Watershed, because that TMDL has not yet been approved.) Altogether, these TMDL studies provide allocations for 23 different pollutants[4] in 44 different waterbody segments. In total, the District has 439 WLAs, of which 273 are annual, 150 are daily, 16 are seasonal or monthly, and 3 are non-numeric. A summary of these TMDL studies is provided in Table 3-1 below. The table includes the name of each TMDL study; a sum of the total numeric and non-numeric MS4 WLAs in the TMDL study; a summary of the types of WLA expressions in the study (e.g., annual, daily, or seasonal WLAs); and a summary of the types of pollutants for which there are WLAs. There are also notes for each TMDL study that describe any caveats or discrepancies in the study. Finally, the total numbers of numeric and non-numeric WLAs are provided at the bottom of the table.

[4] Note that there are 23 different pollutants for which TMDLs have been completed, but only 22 pollutants for which MS4 WLAs must be achieved. This is because fecal coliform WLAs have been translated to *E. coli* for the purposes of setting MS4 WLAs.

Table 3-1: TMDL Studies and Current MS4 WLAs[1]

Major Basin	TMDL Name	Number of Numeric MS4 WLAs	Number of Non-numeric MS4 WLAs	WLA Express-ions	Metals	Organics	Nutrients	Sediment	Bacteria	Pesticides	PCBs	Other (Oil and Grease, BOD, Trash)	Notes
Anacostia	District Final Hickey Run TMDL Water Quality Management Plan to Control Oil and Grease, PCB, and Chlordane (1998)	0	3	Non-numeric narrative		X					X	X	3 narrative WLAs
Anacostia	District Final TMDL for Oil and Grease in the Anacostia River (2003)	2 (2 daily)	0	Daily								X	MS4 WLAs not provided; Decision Rationale document provides WLAs, but they include CSO and MS4 loads
Anacostia	District Draft TMDL for Biochemical Oxygen Demand in Fort Davis Tributary (2003)	0	0	N/A								X	EPA Decision Record indicates TMDL/MS4 WLA not required
Anacostia	District TMDL for Organics and Metals in the Anacostia River and Tributaries (2003)	125 (125 annual)	0	Annual	X	X				X	X		Draft revised TMDL for organics and metals in the Anacostia watershed has been completed but has not yet been approved; therefore this TMDL remains in effect

Table 3-1: TMDL Studies and Current MS4 WLAs[1]

Major Basin	TMDL Name	Number of Numeric MS4 WLAs	Number of Non-numeric MS4 WLAs	WLA Express-ions	Metals	Organics	Nutrients	Sediment	Bacteria	Pesticides	PCBs	Other (Oil and Grease, BOD, Trash)	Notes
Anacostia	District Final TMDL for Organics and Metals in Kingman Lake (2003)	13 (13 annual)	0	Annual	X	X				X			Draft revised TMDL for organics and metals in the Anacostia watershed (including Kingman Lake) has been completed but has not yet been approved; therefore this TMDL remains in effect
Anacostia	District Final TMDL for TSS, Oil &Grease, BOD in Kingman Lake (2003)	1 (1 daily)	0	Daily				X				X	EPA Decision Record indicates TMDLs/MS4 WLAs not required for TSS, BOD
Anacostia	District Final TMDL for Total Suspended Solids in Watts Branch (2003)	4 (1 annual, 2 daily, 1 growing season)	0	Annual, Growing Season, Daily				X					
Anacostia	TMDL of Sediment/Total Suspended Solids for the Anacostia River Basin, Montgomery and Prince George's Counties, MD and the District (2007)	26 (5 annual, 8 daily, 13 growing season)	0	Annual, Growing Season, Daily				X					Includes daily and growing season daily WLAs

Table 3-1: TMDL Studies and Current MS4 WLAs[1]

Major Basin	TMDL Name	Number of Numeric MS4 WLAs	Number of Non-numeric MS4 WLAs	WLA Express-ions	Metals	Organics	Nutrients	Sediment	Bacteria	Pesticides	PCBs	Other (Oil and Grease, BOD, Trash)	Notes
Anacostia	TMDL of Nutrients/ BOD for the Anacostia River Basin, Montgomery and Prince George's Counties, MD and the District (2008)	39 (15 annual, 24 daily)	0	Annual, Daily			X					X	
Anacostia	TMDL of Trash for the Anacostia River Watershed, Montgomery and Prince George's Counties, MD and the District (2010)	4 (2 annual, 2 daily)	0	Annual, Daily								X	
Anacostia	E. coli Bacteria Allocations and Daily Loads for the Anacostia River and Tributaries (2014)	30 (10 annual; 20 daily)	0	Annual, Daily					X				Officially Appendix C of previous (2003) TMDL. Replaces 2003 fecal coliform WLAs.
Anacostia	E. coli Bacteria Allocations and Daily Loads for Kingman Lake (2014)	3 (2 daily, 1 monthly)	0	Monthly, Daily					X				Officially Appendix A of previous (2003) TMDL. Replaces 2003 fecal coliform WLAs.
Potomac	District Final TMDL for pH in the Washington Ship Channel (2004)	1 (1 annual)	0	Annual			X						TMDL indicates that no reduction in phosphorus is needed to meet MS4 WLA
Potomac	District Final TMDL for Organics in Tidal Basin and Washington Ship Channel (2004)	20 (20 annual)	0	Annual		X				X	X		

Table 3-1: TMDL Studies and Current MS4 WLAs[1]

Major Basin	TMDL Name	Number of Numeric MS4 WLAs	Number of Non-numeric MS4 WLAs	WLA Express-ions	Metals	Organics	Nutrients	Sediment	Bacteria	Pesticides	PCBs	Other (Oil and Grease, BOD, Trash)	Notes
Potomac	E. coli Bacteria Allocations and Daily Loads for the Potomac River and Tributaries (2014)	18 (6 annual, 12 daily)	0	Annual, Daily					X				Officially Appendix B of previous (2004) TMDL. Replaces 2004 fecal coliform WLAs.
Potomac	E.coli Bacteria Allocations and Daily Loads for Oxon Run (2014)	3 (1 annual, 2 daily)	0	Annual, Daily					X				Officially Appendix B of previous (2004) TMDL. Replaces 2004 fecal coliform WLAs.
Potomac	District Final TMDL for Bacteria in the Chesapeake and Ohio Canal (2014)	3 (1 annual, 2 daily)	0	Annual, Daily					X				Officially Appendix B of previous (2004) TMDL. Replaces 2004 fecal coliform WLAs.
Potomac	E. coli Bacteria Allocations and Daily Loads for the Tidal Basin and the Washington Ship Channel (2014)	6 (2 annual, 4 daily)	0	Annual, Daily					X				Officially Appendix B of previous (2004) TMDL. Replaces 2004 fecal coliform WLAs.
Potomac, Anacostia	TMDL for PCBs for Tidal Portions of the Potomac and Anacostia Rivers in District , MD, and VA (2007)	17 (7 annual, 10 daily)	0	Annual. Daily							X		
Potomac, Anacostia	Chesapeake Bay TMDL for Nitrogen, Phosphorus, and Sediment (2010)	12 (12 annual)	0	Annual			X	X					Load reduction planning targets revised 2019 and finalized 2022

Table 3-1: TMDL Studies and Current MS4 WLAs[1]

Major Basin	TMDL Name	Number of Numeric MS4 WLAs	Number of Non-numeric MS4 WLAs	WLA Express-ions	Metals	Organics	Nutrients	Sediment	Bacteria	Pesticides	PCBs	Other (Oil and Grease, BOD, Trash)	Notes
Potomac, Rock Creek	Total Maximum Daily Loads of Organochlorine Pesticides and Polychlorinated Biphenyls in Broad Branch, Dalecarlia Tributary, Dumbarton Oaks, Fenwick Branch, Klingle Valley Creek, Luzon Branch, Melvin Hazen Valley Branch, Normanstone Creek, Oxon Run, Piney Branch, Pinehurst Branch, Portal Branch, and Soapstone Creek in the District of Columbia (2016)	82 (41 annual, 41 daily)	0	Annual, Daily		X					X		Replaces 2004 Potomac Tributaries metals and organics TMDL; 2004 Oxon Run metals, organics, and bacteria TMDL (metals and organics components only); and 2004 Rock Creek tributaries metals and organics TMDL
Rock Creek	E. coli Bacteria Allocations and Daily Loads for Rock Creek (2014)	6 (2 annual, 4 daily)	0	Annual, Daily					X				Officially Appendix B of previous (2004) TMDL. Replaces 2004 fecal coliform WLAs.
Rock Creek	Revised Metals Allocations and Daily Loads for Rock Creek (2016)	24 (8 annual, 16 daily)	0	Annual	X								Officially Appendix C of previous (2004) TMDL.

Table 3-1: TMDL Studies and Current MS4 WLAs[1]														
Major Basin	TMDL Name	Number of Numeric MS4 WLAs	Number of Non-numeric MS4 WLAs	WLA Express-ions	Metals	Organics	Nutrients	Sediment	Bacteria	Pesticides	PCBs	Other (Oil and Grease, BOD, Trash)	Notes
Total		439 (273 annual; 150 daily; 15 growing season; 1 monthly)	3										
WLAs Not Required	3 WLAs not required (Fort Davis BOD; TSS, BOD for Kingman Lake)												
[1]Note that multiple TMDL studies have been replaced by revised TMDLs, and thus are not included in this list of current TMDLs. This includes fecal coliform bacteria TMDLs for the Anacostia and tributaries, Kingman Lake, C&O Canal, Oxon Run, Potomac and tributaries, Rock Creek mainstem, and the Tidal Basin and Washington Ship Channel; metals TMDLs for the mainstem of Rock Creek; and organics and metals TMDLs for Potomac tributaries, Oxon Run, and Rock Creek tributaries.													

4. UPDATES TO THE IMPLEMENTATION PLAN MODELING TOOL (IPMT) AND ASSOCIATED DATABASES

4.1 Introduction

A major component of the 2016 Consolidated TMDL IP was the development of an Implementation Plan Modeling Tool (IPMT) to estimate, track and account for pollutant load generation and load reduction across the District. The IPMT, which is based on a Modified Version of the Simple Method for estimating stormwater runoff pollutant loads for urban areas, was designed to use a single, consistent modeling approach for analysis of all of the pollutants of interest that have MS4 WLAs. The development of this tool is explained in Chapter 4 of the 2016 Consolidated TMDL IP.

DOEE's 2018 permit states that "*The Permittee shall continue to update the Consolidated TMDL Implementation Plan modeling tool and associated databases, which shall be used in development of revised plans, schedules or strategies"* (permit §2.2.1). This section describes the changes and updates to the Consolidated TMDL IPMT that have been made since the 2016 TMDL IP was completed.

4.2 Model Components Assessed and Updated

The four main components of the Modified Version of the Simple Method are rainfall, runoff coefficients, drainage areas, and event mean concentrations (EMCs). These components are used to calculate runoff volumes and pollutant loads from entire TMDL segments as well as from individual BMP drainage areas. Of these four components, rainfall and runoff coefficients were updated using the most up-to-date information available. Drainage areas were not updated because there were no changes to the delineations of the TMDL segments. EMCs were not updated because no updated monitoring data were available at the time that this report was prepared.

In addition, the IPMT includes a Best Management Practices (BMP) module that incorporates information on best management practices into the IPMT to calculate the load reductions from BMPs. Several aspects related to BMPs were reviewed based on the most up-to-date information available, including the sediment delivery ratios for in-stream erosion and sediment/nutrient transport and the types of BMPs accepted into the IPMT.

The review, assessment, and update of these components of the IPMT are described below.

4.2.1 Rainfall

Rainfall drives the generation of runoff and pollutant loads. The calculation of runoff and pollutant loads with the Modified Version of the Simple Method is typically based on annual rainfall totals. The 2016 Consolidated TMDL IP used the recorded data at Ronald Reagan Washington National Airport to estimate the average annual rainfall, which was approximately 39.7 inches based on data from 1946 to 2013 but rounded up to 40.0 inches for purposes of the IPMT modeling efforts.

For the 2022 IP Update, the rainfall data at Ronald Reagan Washington National Airport was again evaluated to estimate the average annual rainfall. This time, data from 1946 to 2020 was extracted, and the annual average rainfall was calculated to be 40.3 inches.

Figure 4-1 shown below shows the annual rainfall data from 1946 to 2020. A notable observation of this data is that both the 5-year rolling average and the linear trendline of the data seem to indicate a steady increase in annual rainfall over time, particularly in the last two decades. This trend is supported by climate change literature, with annual rainfall increase projections ranging from five percent to 10 percent over the next century (EPA, 2016; EPA, 2021; UMass, 2016a; UMass, 2016b; ChesapeakeProgress, 2018; NOAA, 2017; NOAA, 2021). Based on this information, the following rainfall values will be used in the IPMT:

- Rainfall for the period of 2000-2020: 40 inches of annual rainfall (used to calculate current runoff and pollutant load reductions.)
- Rainfall for the future (post 2020): 42 inches and 44 inches of annual rainfall (used to calculate future attainment of WLA. Both rainfall values are used to reflect the uncertainty around the future rainfall averages, which could reasonably be expected to increase by 5 to 10 percent (or +2 and +4 inches, respectively, due to climate change.). See Chapter 6 for additional information on how rainfall was used to determine future attainment of WLAs.

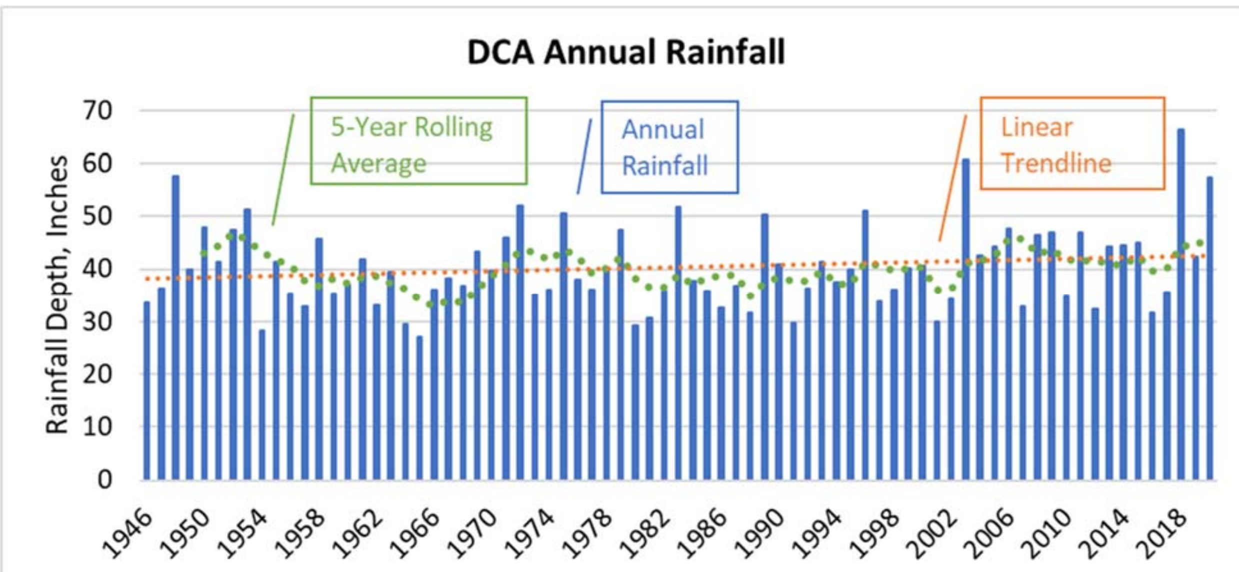

Figure 4-1: Annual Rainfall as Recorded at Ronald Reagan Washington National Airport, 1946-2020

4.2.2 Imperviousness and the Runoff Coefficients

The runoff coefficient, Rvc, used in the IPMT is a composite value that represents the fraction of rainfall that is converted to runoff for the area being modeled. Because the areas being modeled are comprised of different proportions of different land use types, a composite runoff coefficient is calculated to represent the combination of different land use types in the area being modeled. The reference runoff coefficients for different soil groups and land use types recommended for use in the Modified Version of the Simple Method are summarized in Table 4-1 (CWP and CSN, 2008).

Table 4-1: Reference Runoff Coefficients			
Soil Group	Impervious	Turf	Forest
HSG A Soils	0.95	0.15	0.02
HSG B Soils	0.95	0.20	0.03
HSG C Soils	0.95	0.22	0.04
HSG D Soils	0.95	0.25	0.05

Composite runoff coefficients are developed for each TMDL segment based on weighting the relative occurrence of each soil and land cover type, and the appropriate runoff coefficient. In the 2016 IP, the runoff coefficients for the MS4 TMDL segments ranged from 0.43 to 0.86.

The runoff coefficients are sensitive to changes in impervious landcover. Between 2008 and 2019, the overall impervious cover in the MS4 increased by approximately 4.3 percent (Figure 4-2) (OCTO 2018 and 2019).

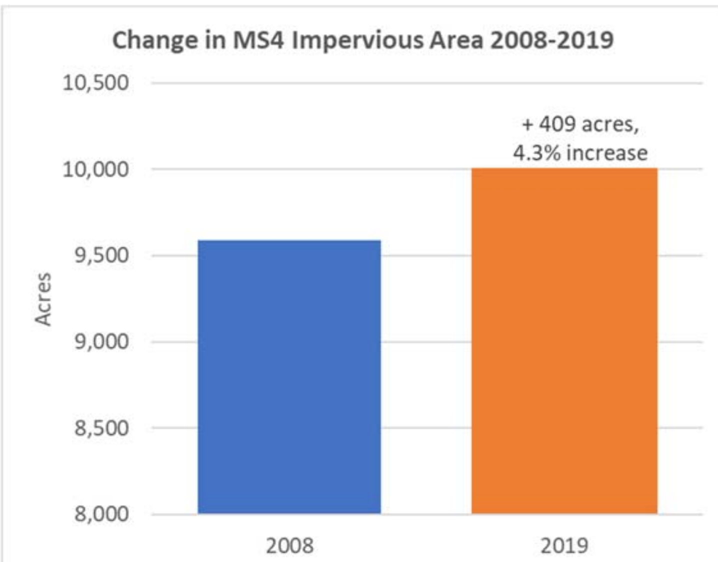

Figure 4-2: Change in Impervious Area in the MS4, 2008-2019

While there is an overall increase in imperviousness across the entire MS4 area, there is variability between MS4 TMDL segments, with some MS4 segments seeing an increase in imperviousness and some seeing a decrease in imperviousness. The composite runoff coefficients for the MS4 TMDL segments on average increased one percent, and vary from 0.42 to 0.83.

Note that while the overall impervious area in the MS4 increased from 2008 to 2019, the overall impervious area that is treated by BMPs also increased, but at a much higher rate. The MS4 impervious area increased by 4.3% between 2008 and 2019 while the MS4 impervious area that is controlled by BMPs increased by 201% between 2008 and 2019. This is shown in Figure 4-3 below.

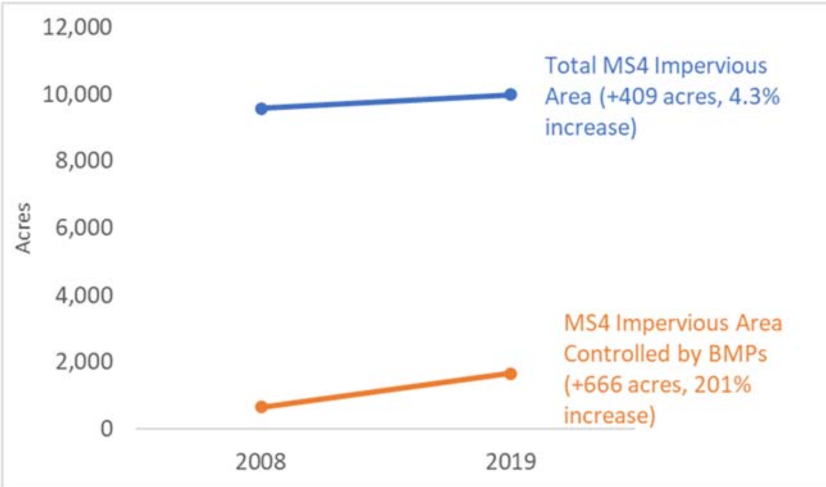

Figure 4-3: Change in Total vs. Controlled Impervious Area in the MS4, 2008-2019

4.2.3 Application of Sediment Delivery Ratios for In-Stream Erosion and Sediment and Nutrient Transport

The IPMT uses sediment delivery ratios (SDR) to calculate how much of the sediment generated by local streams through bed and bank erosion is deposited locally in a stream compared to what is transported to a downstream location of interest. This SDR factor is also applied to the raw estimated stream restoration load reduction to calculate the net load reduction from stream restoration.

For the 2016 IP, sediment delivery ratios provided by the Chesapeake Bay Program were used. For Washington DC, these values included a SDR of 0.181 for sediment delivery from non-coastal plain streams to the Chesapeake Bay, and a SDR of 0.061 for coastal plain streams to the Chesapeake Bay (CWP/CSN, 2014). A SDR of 0.23 for sediment delivery from the Anacostia tributaries to the Anacostia mainstem and a SDR of 0.77 for sediment delivery within Watts Branch were also used, based on information obtained from the 2007 Anacostia TMDL.

In 2020, the Chesapeake Bay Program updated the sediment delivery ratio. For Washington DC, there are now unique stream-to-river and river-to-bay SDRs for 12 different areas in the District (also called "land river segments," see Figure 4-4), and there are now also delivery ratios for TN and TP that did not exist previously.

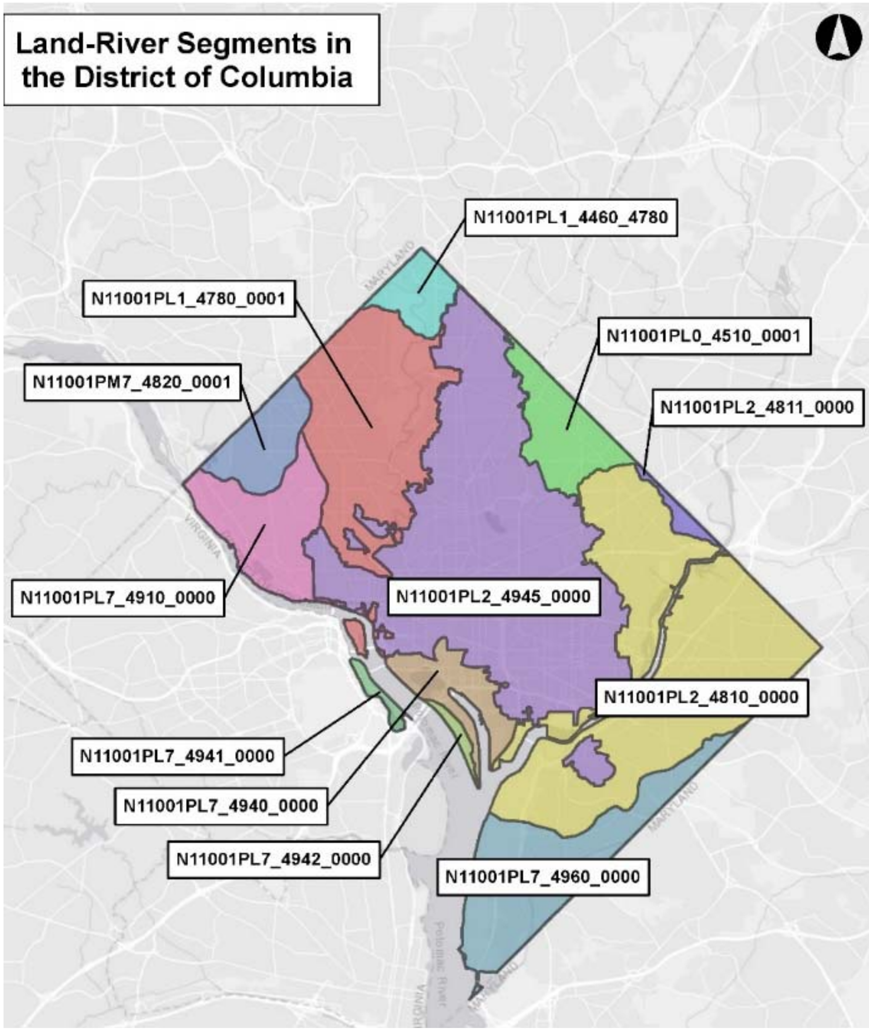

Figure 4-4: Land River Segments in Washington DC

These newer delivery ratios now replace the older delivery ratios used in the IPMT. Table 4-2 below shows the 2016 values and the updated 2020 values and the local streams to which they are applied. On average, the 2020 SDR values have gone up relative to the 2016 SDR values, meaning that more sediment is delivered from streams to the Bay. This is consistent with the changes to the Phase 6 of the Chesapeake Bay Model. Overall, the delivery ratios have limited impact on the modeling results or on meeting WLAs in the IPMT, because the IPMT imposes a "cap" for the calculated load reductions from stream restoration (i.e., load can't reduce by more than the stream generates), and these caps come into effect regardless of the SDRs that are used.

Table 4-2: Delivery Ratios Used in the IPMT for Tributaries with TMDL MS4 WLAs

Land River Segment	Associated Tributaries with TMDLs	Sediment Delivery Ratio		Total Nitrogen Delivery Ratio		Total Phosphorus Delivery Ratio	
		2016 Stream to Bay	2020 Stream to Bay	2016 Stream to Bay	2020 Stream to Bay	2016 Stream to Bay	2020 Stream to Bay
N11001PL0_ 4510_0001	Northwest Branch Tributaries	0.061	1.379	n/a[5]	0.755	n/a	1.274
N11001PL1_ 4460_4780	Fenwick Branch, Portal Branch	0.181	0.586	n/a	0.707	n/a	0.611
N11001PL1_ 4780_0001	Bingham Run, Broad Branch, Dumbarton Oaks, Klingle Valley Run, Luzon Branch, Melvin Hazen Valley Branch, Milkhouse Run, Normanstone Creek, Pinehurst Branch, Piney Branch, Soapstone Creek	0.181	0.413	n/a	0.813	n/a	0.682
N11001PL2_ 4810_0000	Fort Chaplin Tributary, Fort Davis Tributary, Fort Dupont Tributary, Fort Stanton Tributary, Hickey Run, Lower Beaverdam Creek, Nash Run, Pope Branch, Stickfoot Branch, Texas Avenue Tributary, Watts Branch	0.061	0.555	n/a	0.939	n/a	0.878
N11001PL7_ 4910_0000	Battery Kemble Creek, Foundry Branch	0.181	1.000	n/a	1.000	n/a	1.000
N11001PL7_ 4960_0000	Oxon Run	0.181	0.600	n/a	0.920	n/a	0.913
N11001PM7 _4820_0001	Dalecarlia Tributary	0.181	1.044	n/a	0.950	n/a	0.813

[5] There were no nutrient delivery ratios in 2016, so these are marked as n/a.

4.3 BMPs Assessed and Updated

The 2016 IP included modeling capabilities for 13 structural BMPs including green roofs, rainwater harvesting, impervious surface disconnections, permeable pavement, bioretentions, filtering systems, infiltration, open channel systems, ponds, wetlands, storage practices, proprietary practices and tree planting and preservation. The 2016 IP also included modeling for several non-structural BMPs, including phosphorus fertilizer ban regulations, stream restoration, street sweeping, impervious surface removal, coal tar sealant removal, and trash reduction BMPs.

This section describes the changes or updates to the BMP inventory and how BMPs are represented and incorporated into the IPMT.

4.3.1 Review of Historic BMPs

For the 2016 IP, a BMP inventory was developed and then reviewed. During the review process, some of the historical BMPs (i.e.: BMPs installed before 2013) were removed from the inventory because they did not have sufficient characterizing information to be modeled by the IPMT (for example, they had missing coordinates or missing drainage areas), or they had potentially inaccurate data (for example, drainage areas larger than 10,000 square feet). After submission of the 2016 IP, DOEE began an effort to review and verify all BMPs that were removed from the inventory. Incomplete or incorrect BMP records were updated using available plans. A robust and targeted BMP inspection program was also developed to further inspect the historical BMPs and ensure that they were still functioning as intended. BMPs that passed the review, verification, and inspection process were then incorporated into the SGS database.

4.3.2 BMP Retirement

In the 2016 IP, all BMPs installed between 2000 and 2013 (the evaluation period) were included in the IPMT, as long as those BMPs included the required attribute data (such as BMP type, drainage area, coordinates, etc.).

For the 2022 IP, BMPs that have not had an inspection within the last 10 years are removed from analysis by the IPMT. This criterion is consistent with the criterion used by the Chesapeake Bay Program and is intended to remove BMPs that are not maintained and are therefore likely not performing to standards or failing.

4.3.3 Bayscaping BMPs

In 2018, “bayscaping” was approved by the Chesapeake Bay Program as a BMP credit option for meeting Chesapeake Bay TMDL load reduction requirements. Bayscaping is a conservation landscaping practice where areas of turf or impervious surfaces are removed and replaced with perennial meadows using species that are native to the Chesapeake Bay region. The landscaping areas are slightly depressed so they can hold rainfall and, in some cases, treat runoff from adjacent impervious surfaces.

For the 2022 IP Report, bayscaping BMPs were included as an accepted BMP in the IPMT.

4.3.4 Street Sweeping

In September of 2015, the Chesapeake Bay Program released an expert panel report entitled “Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices”. This expert panel report provides a new methodology for calculating the load reductions provided by street sweeping. The updated methodology provides total suspended solids (TSS), total nitrogen (TN), and total phosphorus (TP) pollutant load reductions for different types of street cleaning practices. The load reductions are dependent on the street sweeping technology employed (advanced or mechanical) and on the number of passes in any given street per year. The updated 2015 street sweeping crediting methodology could not be implemented in the 2016 IP because the data to support the calculations (i.e., information on routes, the frequency of street sweeping, and the technology employed) were not available at that time.

In 2019, DOEE started receiving annual street sweeping data that provide the information needed to calculate the load reductions using the methodology from the 2015 expert panel report. The 2015 Chesapeake Bay Program crediting approach is therefore now applied in the IPMT. For purposes of this report, the average of the 2019 and 2020 areas of streets swept were used to calculate the average annual load reductions associated with street sweeping. This load reduction crediting is applied in the IPMT beginning in calendar year 2018. Prior to calendar year 2018, the older crediting approach will continue to be applied, consistent with the data available for the years prior to 2018.

4.3.5 Tree Inventory

The 2016 IP primarily relied on the SGS database to provide the tree planting inventory in the MS4. At that time, the tree inventory in the SGS database was limited to tree plantings that were associated with stormwater permit requirements. Since 2016, the tree inventory was expanded to include the following tree planting efforts:

- Trees that are planted through DOEE's RiverSmart program (now included in the SGS).
- Trees that are planted through the Casey Trees organization (tracked and provided to DOEE by Casey Trees). These data are now imported into the IPMT.
- Street trees that are planted by the DC Department of Transportation's Urban Forestry Division (UFD). This tree database is now imported into the IPMT.

5. ASSESSMENT OF CURRENT CONDITIONS

5.1 Introduction

The Consolidated TMDL IP develops a strategy and a schedule to attain applicable WLAs for each established or approved TMDL. The District's MS4 permit requires modeling to demonstrate how each applicable WLA will be attained. Subtracting the load reductions achieved from BMP implementation from the baseline loads allow a snapshot of progress at any given time, and this progress can be compared to the WLA to determine if more needs to be done, or if the WLA has been achieved (Figure 5-1).

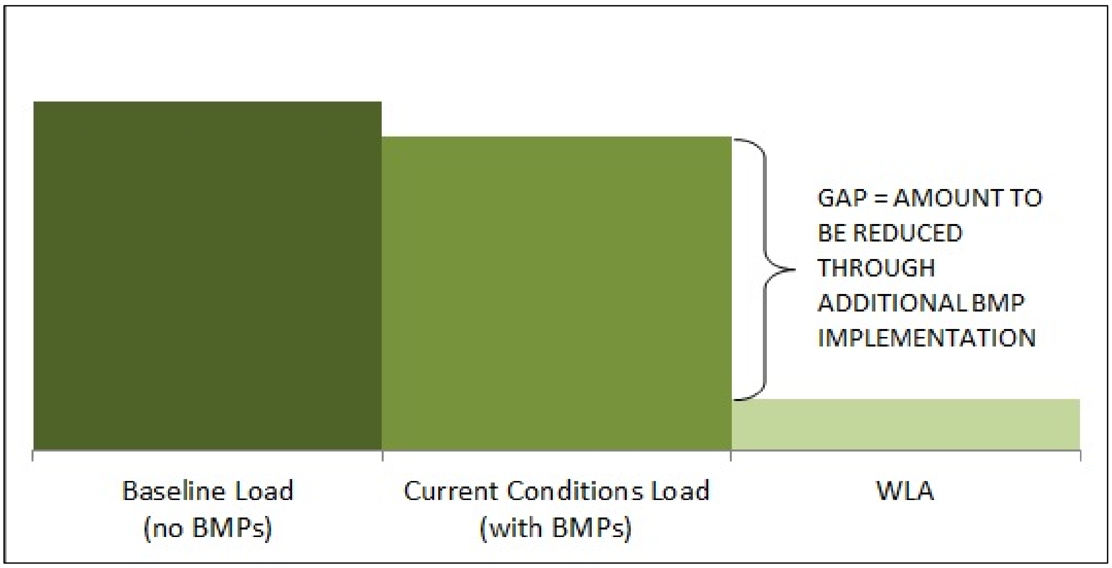

Figure 5-1: Load and Gap Analysis

In order to make this comparison, particularly at a point in time where some progress has already been made, three data points are needed. These are:

- The baseline load, which represents the stormwater loads that occur prior to the addition or implementation of any BMPs intended to achieve the TMDL WLAs. For the purposes of the Consolidated TMDL IP, the baseline loads are fixed values that represent the loads for each MS4 WLA at the beginning of year 2000. The year 2000 is the representative year assumed when the majority of the District's MS4 TMDLs came into effect;
- The current condition load, which reflects the stormwater load after implementation of BMPs, beginning in the year 2000. The current condition load is less than the baseline load due to the impact of BMPs in reducing loads; and
- The WLA, which is the fixed target. Once the current condition load equals the WLA, the WLA has been achieved. When all WLAs are met for all the sources listed in a TMDL, water quality standards are presumed to be achieved.

The baseline loads were determined and presented in Section 5 of the 2016 TMDL IP Report (DOEE, 2016a). There are no changes to the baseline loads in the 2022 TMDL IP Report. Some of the WLAs have changed since 2016. These changes are due to updates or changes to individual TMDL studies, as summarized in Chapter 3.

This chapter describes the current state of BMP implementation, the current condition loads and gap analysis, and a summary of the progress made towards the milestones and benchmarks.

5.2 BMP Implementation (2000-2020)

An inventory of BMPs was compiled from DOEE's Surface and Groundwater System (SGS), the Urban Forestry Administration (UFA) Street Trees database, Casey Trees large parcel tree planting, and from other information received by DOEE (e.g.: street sweeping records), for the time period of 2000 through the end of 2020. The year 2000 represents the TMDL baseline year and the year 2020 represents the most recent full year for which complete BMP information was available at the time of the TMDL IP Report development. BMPs were removed from the inventory if they were installed more than 10 years ago and have had no inspection in the last 10 years. This criterion is consistent with the criterion used by the Chesapeake Bay Program and is intended to remove BMPs that are not maintained. The IPMT also excludes BMPs that do not meet a minimum set of data requirements for quality control (for example, missing coordinates or drainage area). Overall, approximately 1,658 BMPs in the MS4 were removed from the inventory based on the QAQC criteria.

The BMPs are divided into two categories: structural and non-structural BMPs. For the purpose of this report, structural BMPs include the 13 groups of BMPs that can be used to meet the stormwater retention volume and/or peak flow criteria included in the DOEE's 2020 stormwater management guidebook (DOEE, 2020). Non-structural BMPs consist of programmatic, operational, and restoration practices that help prevent or minimize pollutant loading or runoff generation, including stream restoration, street sweeping, trash removal, phosphorus fertilizer ban, and coal tar pavement removal.

5.2.1 Summary of Structural BMPs

Table 5- 1 summarizes the number of BMPs accounted for in the IPMT by watershed for the time period of 2000 through 2020[6]. BMP maps are published each year in the MS4 Annual Report Storymap, available at https://doee.dc.gov/publication/ms4-discharge-monitoring-and-annual-reports. The number of BMPs currently modeled in the 2022 IP is four times the number in the 2016 IP. This large increase is due to a variety of factors, including BMP implementation that has occurred since the last IP through regulated and voluntary efforts; inclusion of historic BMPs that were excluded from the 2016 IP but were included in this IP after being reviewed, verified, and inspected; inclusion of additional BMP types; and inclusion of additional BMP data sources. The changes and additions to the BMP inventory are explained in further detail in Chapter 4.

[6] This table excludes 1,658 BMPs in the MS4 that did not meet the QAQC criteria as explained in Section 5.2.

Table 5-1: Current Conditions: Number and Distribution of MS4 Area BMPs by Watershed (2000-2020)

BMP Type	Total Number in MS4	Number in Anacostia Watershed	Number in Potomac Watershed	Number in Rock Creek Watershed
Bioretention	1,996	1,222	416	358
Filtering Systems	169	91	58	20
Green Roof	427	198	145	84
Impervious Surface Disconnect	97	39	20	38
	514	168	250	96
Open Channel Systems	66	29	26	11
Permeable Pavement Systems	657	360	142	155
Ponds	8	4	4	0
Proprietary Practices	448	194	190	64
Rainwater Harvesting	3,255	1,886	479	890
Storage Practices	45	29	9	7
Tree Planting and Preservation	60,268	30,931	16963	12,374
Wetland	3	1	2	0
Bayscaping	1,222	753	224	245
TOTAL (without trees)	8,907	4,974	1,965	1,968
TOTAL (with trees)	69,175	35,905	18,928	14,342

Figure 5-2 below shows the number of new BMPs installed over time. A few observations can be made from this figure, including:

- The number of BMPs installed over time has grown steadily in the past two decades, in large part due to changes in stormwater program funding or regulations
- The creation of the RiverSmart program and the increase in the stormwater fee in 2008-2009 resulted in a large increase in BMPs, particularly from rain barrels.
- The adoption of the 2013 stormwater regulations also resulted in an increase in BMPs, particularly retention-based BMPs such as bioretention, green roof, and permeable pavement practices.
- Removing BMPs from the inventory if they were installed more than 10 years ago and have had no inspection in the last 10 years has a significant impact on the total number of BMPs that are credited for pollutant load reduction, as shown in the contrast in the number of BMPs pre- and post-2010.
- The types of BMPs installed in the District are currently trending more towards retention-based BMPs, which are the types of BMPs promoted by the 2013 stormwater regulation.

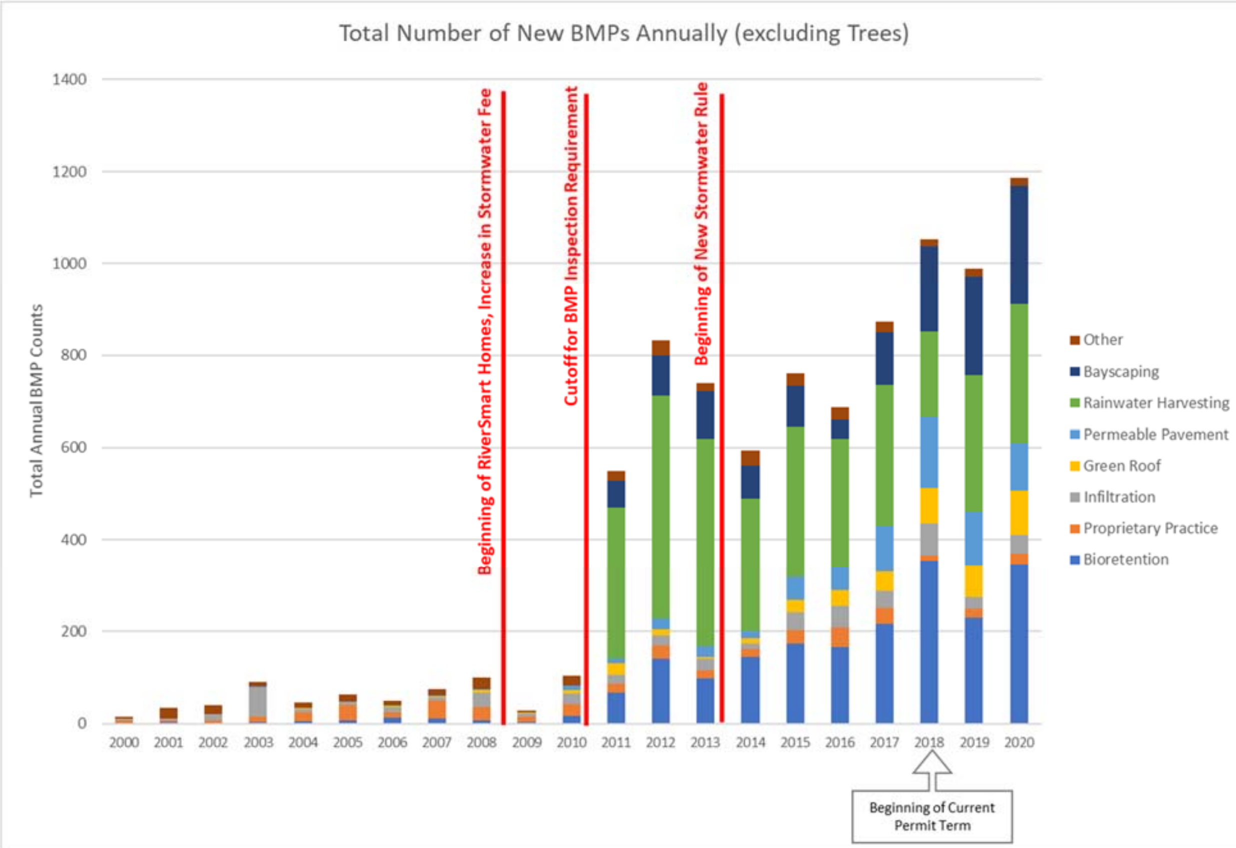

Figure 5-2: Changes in Number and Types of BMPs Implemented over Time[7]

The change in BMP types from the pre-2013 stormwater regulations era to the post-2013 stormwater regulations is also shown in Figure 5-3 below. This figure shows the composition of types of BMPs that were used before and after adoption of the 2013 stormwater regulations. For example, before 2013, 13 percent of all BMPs were bioretention BMPs, whereas after 2013, 27 percent of all BMPs are bioretention BMPs. This figure, similar to in Figure 5-2 above, shows that the types of BMPs installed in the District are currently trending more towards retention-based BMPs, which are the types of BMPs promoted by the 2013 stormwater regulation.

[7] Note that trees are not included in this figure because trees vastly outnumber any type of BMP and would therefore skew the results. For information on the trees, please refer to Table 5-1 above.

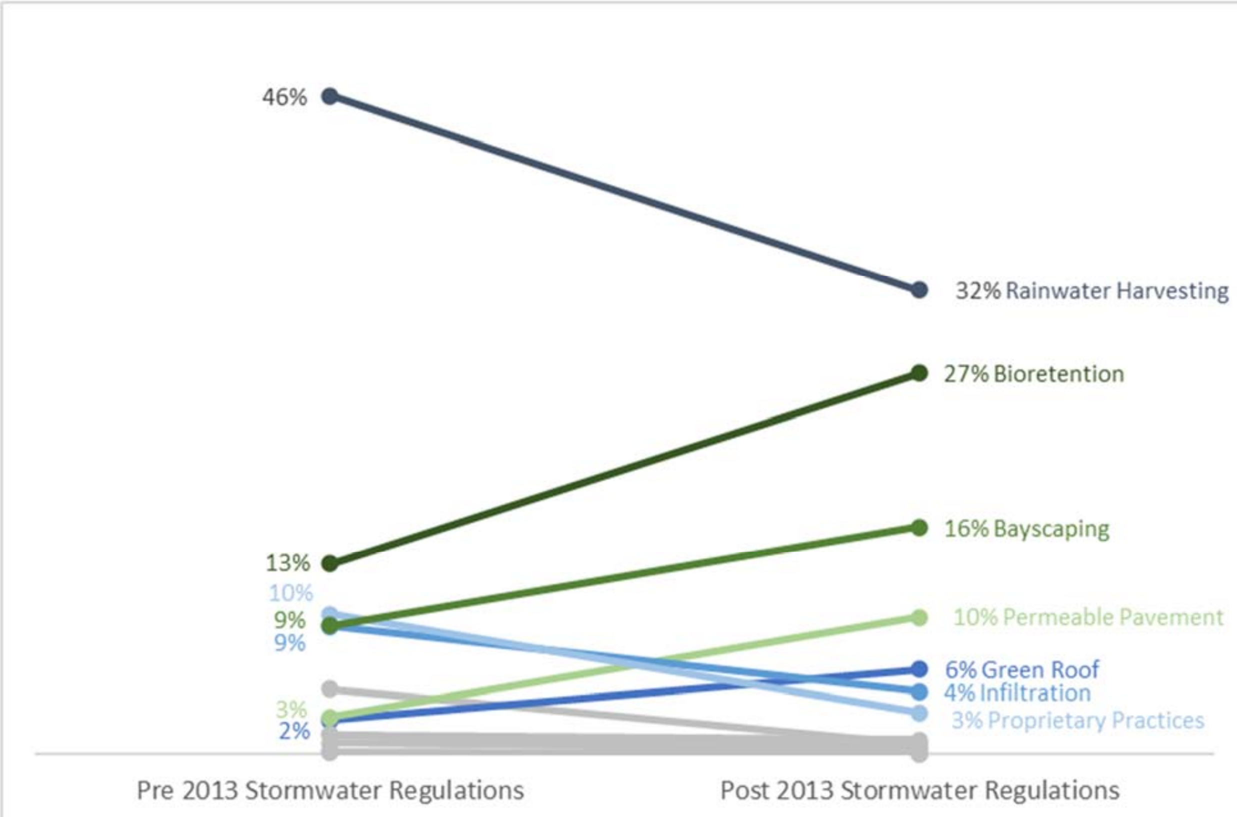

Figure 5-3: Changes in types of BMPs implemented before and after the 2013 stormwater regulations

Table 5- 2 shows each BMP type and the amount of contributing drainage area (CDA) is controlled by BMPs in each MS4 watershed – both in actual area and also as a percent of the total MS4 watershed area. The CDA of BMPs in the 2022 IP is approximately six times larger than what was included in the 2016 IP. The amount of total MS4 area controlled by BMPs is now approximately 9%, compared to the 1.4% shown in the 2016 IP. The increase in CDA relative to what was in the 2016 IP is due to additional BMP implementation that has occurred since the last IP, and inclusion of historic BMPs, new BMP types, or additional BMP sources that were not in the 2016 IP.

Table 5-2: Area Controlled by BMPs in Each MS4 Watershed

BMP	BMP Contributing Drainage Area (sq. ft.)	Percent of Watershed Controlled (%)	BMP Contributing Drainage Area (sq. ft.)	Percent of Watershed Controlled (%)	BMP Contributing Drainage Area (sq. ft.)	Percent of Watershed Controlled (%)
	Anacostia Watershed		Potomac Watershed		Rock Creek Watershed	
Bioretention	9,049,640	1.81	4,369,841	1.12	2,129,199	0.75
Filtering Systems	2,492,188	0.50	2,117,942	0.54	587,562	0.21
Green Roof	1,258,083	0.25	750,734	0.19	296,380	0.11
Impervious Surface Disconnect	22,014	0.00	96,680	0.02	20,461	0.01
Infiltration	1,961,004	0.39	1,971,193	0.50	995,629	0.35
Open Channel Systems	410,302	0.08	584,815	0.15	237,353	0.08
Permeable Pavement Systems	2,217,973	0.44	978,951	0.25	1,238,348	0.44
Ponds	9,543,172	1.90	1,424,989	0.36	0	-
Proprietary Practices	39,568,490	7.89	7,495,821	1.91	2,703,791	0.96
Rainwater Harvesting	1,083,850	0.22	508,336	0.13	238,708	0.08
Storage Practices	2,718,196	0.54	490,758	0.13	144,695	0.05
Tree Planting and Preservation	4,454,064	0.89	2,442,672	0.62	1,781,856	0.63
Wetland	126,759	0.03	12,955	0.00	0	-
Bayscaping	97,602	0.02	28,656	0.01	31,915	0.01
TOTAL (without trees)	**70,549,273**	**14.07**	**20,831,671**	**5.32**	**8,624,041**	**3.06**
TOTAL (with trees)	**75,003,337**	**14.96**	**23,274,343**	**5.94**	**10,405,897**	**3.69**

Figure 5-4 below shows the annual contributing drainage area of new BMPs installed over time. A few observations can be made from this figure, including:

- The total CDA of BMPs installed over time varies annually but has grown steadily in the past two decades, in large part due to changes in stormwater program funding or regulations.
- Large scale BMPs such as ponds add considerable variability in CDA from year to year.
- Smaller scale retention-based BMPs such as bioretention continue to increase the CDA steadily over time.
- The impact of the 2013 stormwater rule, which promotes retention-based BMPs, is noticeable after 2014. The range of annual CDA post stormwater rule is roughly between 82 and 201 acres, whereas in earlier years it was around 15 to 162 acres.

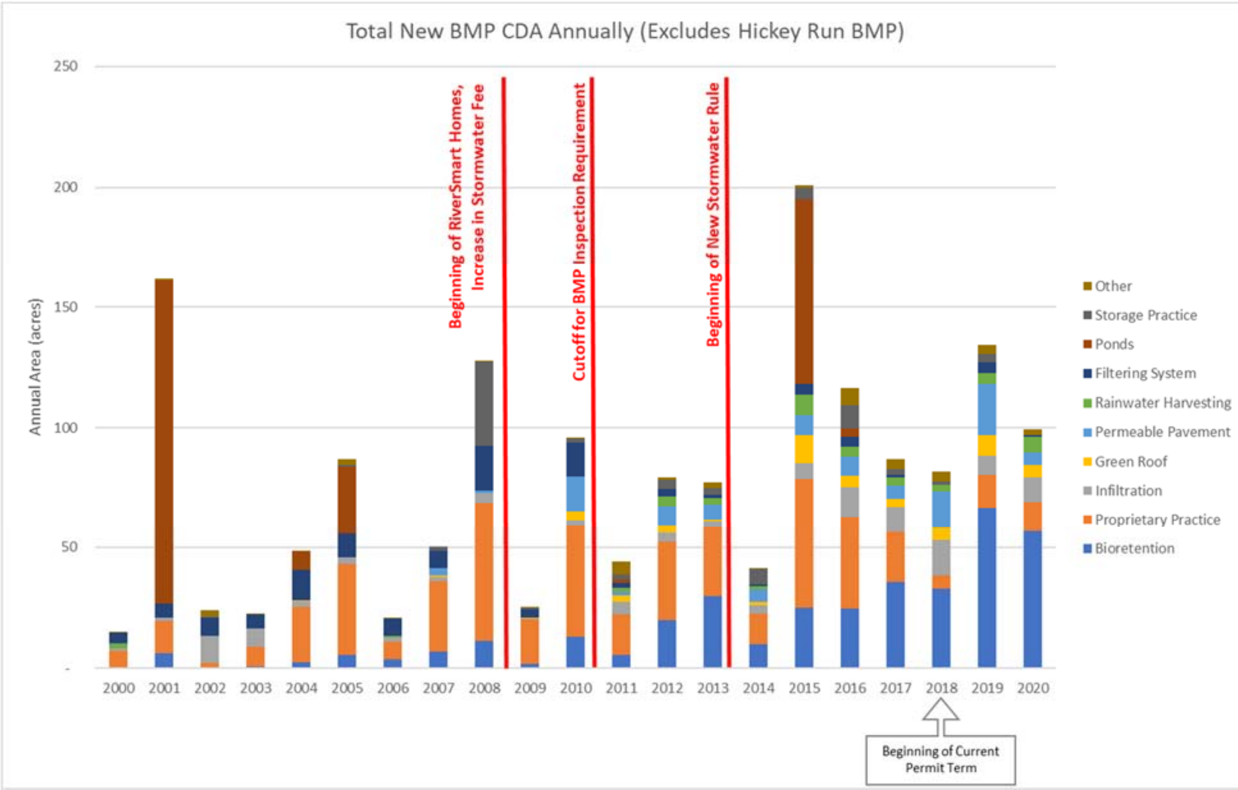

Figure 5-4: Changes in BMP Contributing Drainage Area over time[8]

5.2.2 Summary of Non-Structural BMPs

In addition to the structural BMPs summarized in the previous subsection, the following non-structural BMPs are also included in the 2022 IP. These BMPs are effective at reducing pollutant loads to help meet the MS4 WLAs.

Stream Restoration

Table 5-3 below shows the stream restoration projects that have been implemented in the District since the early 2000's. Five new stream restoration projects were completed since the publication of the 2016 IP. Table 5.3 shows which Chesapeake Bay Program restoration protocols were applied for each project. Information on the restoration protocols is available at https://chesapeakestormwater.net/bmp-resources/urban-stream-restoration/.

[8] This figure excludes the CDA from the Hickey Run BMP, which is a regional-level BMP with a CDA of over 650 acres. This BMP was installed in 2013.

Table 5-3: Stream Restoration Projects

Project Name	Applicable Local TMDL/Tributary	Completion Year	Restored Length (ft.)	CBP Stream Restoration Protocols Applied[9]
Watts Branch - Upper	Watts Branch - Upper	2011	17,952	Interim Rate
Bingham Run	Rock Creek Upper	2012	1,700	Interim Rate
Milkhouse Run	Rock Creek Upper	2012	2,150	Interim Rate
Pope Branch RSCs	Pope Branch	2012	650	Interim Rate
Broad Branch	Broad Branch	2014	3,800	Interim Rate
Broad Branch RSCs	Broad Branch	2014	1,550	Interim Rate
Linnean Gully (Soapstone)	Soapstone Creek	2014	400	Interim Rate
Linnean Park	Broad Branch	2014	2,000	Interim Rate
Park Drive	Texas Avenue Tributary	2014	650	Interim Rate
Nash Run	Nash Run	2016	2,800	Interim Rate
Pope Branch	Pope Branch	2016	8,400	Interim Rate
Springhouse Run	Hickey Run	2017	3,800	Interim Rate
Texas Ave/Alger Park	Texas Avenue Tributary	2017	3,000	1,2,3,4
Spring Valley	Dalecarlia Tributary	2019	2,143	1
Branch Avenue	Oxon Run	2021	884	1,2,5

Street Sweeping

Table 5-4 shows the area (in acres) of streets in the MS4 that were swept using advanced (regenerative air) sweepers and for a certain number of passes per year. This type of tracking aligns with the Chesapeake Bay Program expert panel report entitled "Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices" (CSN, 2015). This advanced technology allows the District to get credit for street sweeping beyond its baseline street sweeping practices. See also Chapter 4 for more information on the street sweeping load reduction methodology.

[9] Interim Rate = Prevented Sediment Credit using the planning rates
Protocol 1 = Prevented Sediment Credit using site-specific rates
Protocol 2 = Hyporheic Exchange Credit
Protocol 3 = Floodplain Reconnection Credit
Protocol 4 = Dry Channel Regenerative Stormwater Conveyance
Protocol 5 = Alternative Prevented Sediment for Outfalls

Table 5-4: Average Annual Area of Streets Swept in the MS4 (acres)

TMDL Segment Name	SCP-1 100x Passes	SCP-2 50-99x Passes	SCP-3 25-49x Passes	SCP-4 10-24x Passes	SCP-5 6-9x Passes	SCP-6 4-5x Passes	Total Area
Anacostia	2.34	7.08	13.55	52.66	62.74	51.65	190.02
Anacostia Lower	0.23	2.27	2.77	8.49	10.37	6.01	30.14
Anacostia Upper	2.11	4.81	10.78	44.17	52.37	45.63	159.88
ANATF_DC	1.26	6.02	13.23	49.12	54.20	40.01	163.84
ANATF_MD	1.23	1.21	3.26	8.94	12.55	15.01	42.21
Battery Kemble Creek	0.00	0.00	0.00	0.03	0.00	0.14	0.17
Broad Branch	0.00	0.00	0.03	2.42	3.17	3.66	9.28
C&O Canal	0.00	0.00	0.00	0.14	0.10	1.26	1.50
Dalecarlia Tributary	0.00	0.00	0.00	0.76	1.71	3.81	6.28
Dumbarton Oaks	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fenwick Branch	0.00	0.00	0.00	0.00	0.20	0.47	0.66
Fort Chaplin Tributary	0.00	0.06	0.10	1.29	1.31	1.14	3.89
Fort Davis Tributary	0.00	0.00	0.00	0.71	0.74	0.60	2.05
Fort Dupont Tributary	0.00	0.15	0.42	0.70	0.38	0.30	1.94
Fort Stanton Tributary	0.04	0.05	0.00	0.33	0.27	0.08	0.76
Foundry Branch	0.00	0.00	0.00	0.05	0.16	0.57	0.79
Hickey Run	0.11	0.64	0.75	3.77	4.60	2.02	11.88
Kingman Lake	0.41	0.36	0.59	2.43	2.29	1.33	7.41
Klingle Valley Run	0.00	0.00	0.00	0.00	0.00	0.39	0.40
Lower Beaverdam Creek	0.00	0.00	0.00	0.23	0.01	0.03	0.27
Luzon Branch	0.00	0.03	1.08	3.35	3.61	4.01	12.08
Melvin Hazen Valley Branch	0.00	0.00	0.00	0.00	0.15	0.08	0.23
Nash Run	0.00	0.00	0.08	1.90	4.32	2.86	9.17
Normanstone Creek	0.00	0.00	0.00	0.00	0.16	1.20	1.36
Northwest Branch	1.23	1.21	3.26	7.78	9.07	11.80	34.35
Oxon Run	1.40	2.69	4.98	10.71	11.47	10.70	41.95
Pinehurst Branch	0.00	0.00	0.00	0.12	0.70	1.49	2.31
Piney Branch	0.00	0.00	0.00	0.00	0.02	0.13	0.15
Pope Branch	0.00	0.07	0.26	0.74	1.08	1.46	3.61
Portal Branch	0.00	0.00	0.00	0.05	0.37	0.28	0.70
Potomac Lower	1.53	3.18	5.65	12.49	16.92	13.61	53.37
Potomac Middle	0.15	0.16	3.14	5.66	4.36	3.75	17.22
Potomac Upper	0.00	0.00	0.00	1.21	2.91	9.34	13.45
POTTF_DC	1.53	3.21	7.56	20.66	30.24	37.28	100.48
POTTF_MD	0.00	0.00	0.00	0.90	1.99	4.35	7.24
Rock Creek Lower	0.00	0.00	0.06	0.33	1.14	4.26	5.78
Rock Creek Upper	0.00	0.03	1.66	7.26	10.92	14.05	33.92
Soapstone Creek	0.00	0.00	0.04	0.41	1.46	1.80	3.71
Texas Avenue Tributary	0.00	0.00	0.00	0.49	0.49	0.13	1.11
Tidal Basin	0.00	0.00	0.72	1.14	0.88	1.33	4.07
Washington Ship Channel	0.15	0.16	1.35	3.83	2.55	1.76	9.79
Watts Branch	0.00	0.08	0.52	10.75	13.01	9.23	33.60
Watts Branch - Lower	0.00	0.02	0.19	2.40	3.43	2.25	8.29
Watts Branch - Upper	0.00	0.06	0.33	8.35	9.58	6.98	25.30

Trash Removal

Trash removal activities have not changed since the 2016 IP, but the amount of trash removed has increased. In the 2016 IP, the average amount of trash removed annually was 91,471 pounds. while for the purposes of the 2022 IP, the average amount of trash removed annually is 137,014 pounds. This complies with DOEE's NPDES permit requirement that 108,347 pounds of trash shall be captured, removed, or prevented from entering the Anacostia River within the MS4 Permit Area each year (permit §1.5.3.2 and 3.7.1.1). Table 5-5 below shows the trash removed between 2017 and 2021.

Table 5-5: Trash Removal Activities

Trash Removal Activity	Annual Pounds of Trash Reduced (from MS4 Annual Reports)			
	2017	2018/2019	2020	2021
Trash Traps	8,430	6,940	7,129	5,493
Environmental Hotspots	4,524	4,524	2,444	2,444
Clean-up Events	3,951	4,429	1,789	36,595
Skimmer Boats	8,821	8,919	8,656	8,459
Clean Team Program	100,314	106,015	106,506	110,584
Bag Law	272	272	272	272
TOTAL	**126,312**	**131,099**	**126,796**	**163,847**
Average Annual	**137,014**			

Maps of the trash removal activities are published each year in the MS4 Annual Report Storymap, available at https://doee.dc.gov/publication/ms4-discharge-monitoring-and-annual-reports.

Phosphorus Fertilizer Ban

Management of fertilizers in the District was implemented through the Sustainable DC Act of 2012, specifically Subtitle II(A) – Anacostia River Clean Up and Protection Fertilizer Act of 2012. This subtitle restricts the application of fertilizers, implements a public education program, imposes specific labeling requirements on manufacturers, and establishes a fine structure for violations. There have been no changes to the phosphorus fertilizer ban since the 2016 IP. More information on the phosphorus fertilizer ban can be found in Appendix F of the 2015 Comprehensive Baseline Analysis Report (DOEE, 2015a).

Coal Tar Pavement Removal

Under the Comprehensive Stormwater Management Enhancement Amendment Act of 2008, effective July 1, 2009, it is illegal to sell, use, or permit the use of coal tar pavement products in the District. Violators of this ban are subject to a daily fine of up to $2,500. DDOE maintains a tip line for residents to report suspected use of coal tar, and DDOE follows up with inspections of suspected coal tar applications. There have been no changes to the coal tar pavement removal program and no additional coal tar has been identified or removed in the MS4 since the 2016 IP. More information on the coal tar pavement removal program can be found in Appendix F of the 2015 Comprehensive Baseline Analysis Report (DOEE, 2015a).

5.3 Gap Analysis

The gap analysis evaluates the difference between the current condition load and the individual TMDL WLAs, where:

Gap = Current Condition Load – TMDL WLA

As explained in Chapter 3, there are currently 439 individual MS4 WLAs (273 annual; 150 daily; 15 seasonal; 1 monthly). Assessments of progress towards achieving the MS4 WLAs is primarily evaluated using the annual WLAs because it is assumed that the daily, seasonal, and/or monthly expressions will be met when the annual WLAs are also met. Gaps were calculated for 162 out of the 273 WLAs. Gaps were not calculated for the other 111 WLAs for these reasons:

- 79 MS4 annual WLAs were not included in the modeling because the impairments underlying these WLAs were removed or moved to Category 3 in the 2014 IR. These MS4 WLA are for organics and metals for the Anacostia and its tributaries as well as for the Tidal Basin and Washington Ship Channel. The TMDL for organics and metals for the Anacostia and its tributaries is currently being revised and updated and is expected to be finalized in 2022. This TMDL is expected to exclude WLAs for the pollutants removed or moved to Category 3 in the 2014 IR. It is expected that future updates to the organics and metals TMDLs for the Tidal Basin and Washington Ship Channel will similarly exclude WLAs for the pollutants removed or moved to Category 3 in the 2014 IR.
- 28 PCB MS4 annual WLAs were not included in the modeling because these WLAs are to be managed through management plans and source control activities.
- Two *E.coli* MS4 annual WLAs were not included in the modeling because they included allocations from Maryland.
- Two copper MS4 annual WLAs from the Upper and Lower Anacostia were not included in the modeling because the WLAs are known to be incorrect.

Of the 162 annual WLAs remaining, 112 WLAs are unchanged and 50 WLAs are different relative to the values initially published in the 2016 IP. The WLAs that have changed are due to recent changes or updates to individual TMDL studies, as summarized in Chapter 3. Of the 50 WLAs that were updated, 28 have lower WLA values, meaning that they require more load reduction than previously estimated, and 22 have higher WLAs, meaning they require less load reduction than previously estimated.

The baseline loads, current condition loads, WLAs, and gaps for each of these pollutant/impaired waters segment combinations are shown in Appendix A. The subsection below provides a higher level summary of the current gap analysis.

5.3.1 Gap as a Percent Load Reduction

Expressing the gap as a percent load reduction provides a simple way to convey the relative amount of additional load reduction needed to meet WLAs. Figure 5-5 below shows the percent reductions needed to meet the annual WLAs and ranks them in ascending order. The blue bars represent the percent reduction needed for the 162 annual WLAs that were evaluated with the IP Modeling Tool.

The distribution of WLA gaps have changed since the 2016 IP. This is as a result of:

- Some WLA values have increased, making the WLA easier to meet and decreasing the load reduction needed (resulting in smaller percent gaps)
- Some WLA values have decreased, making the WLA harder to meet and increasing the load reduction needed (resulting in larger percent gaps)
- Updating the imperviousness and related runoff coefficient has increased the amount of pollutant load generated by the MS4, and therefore increasing the load reduction needed (resulting in larger percent gaps)
- Adding more BMPs has improved the load reduction achieved, therefore decreasing the load reduction needed (resulting in smaller percent gaps)

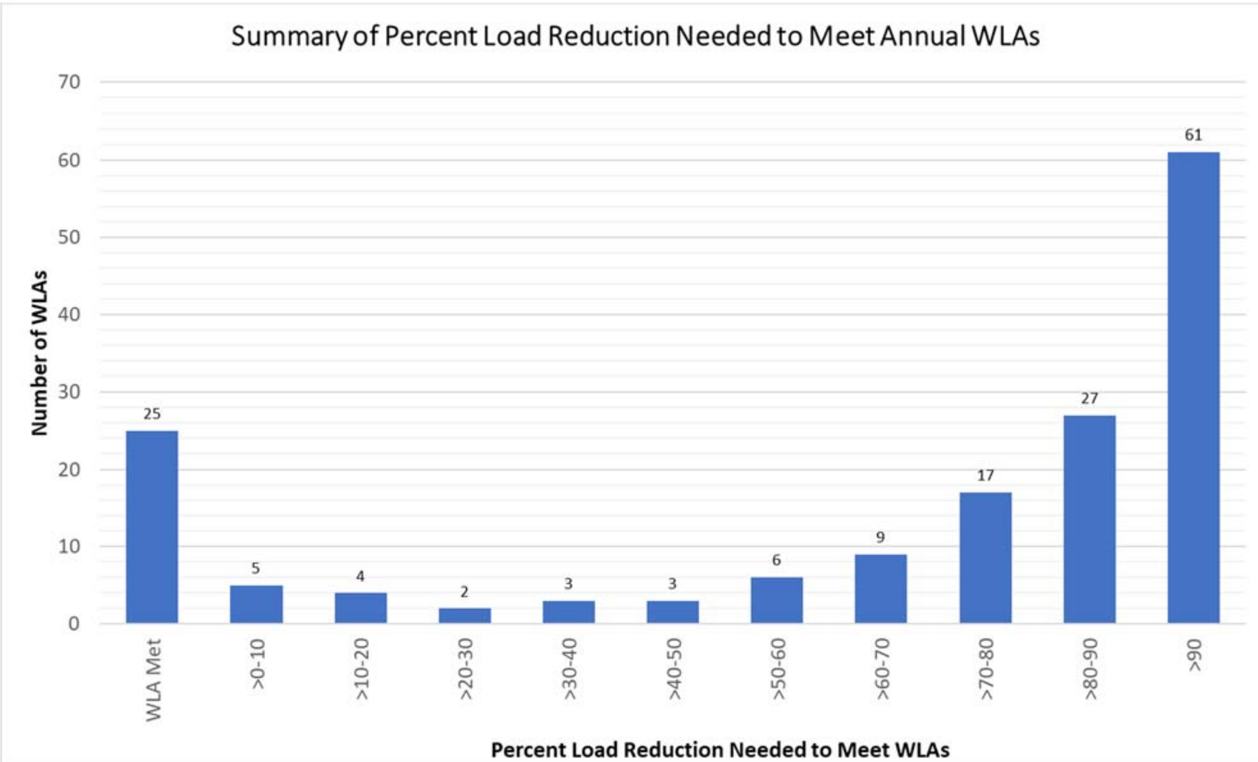

Figure 5-5: Gap Expressed as Percent Reduction Needed to Meet WLA

The large progress made in BMP accounting and implementation since 2016 means that many WLA gaps have decreased over time. However, the benefits of a 4-fold increase in the number of BMPs accounted for in 2022 versus 2016 is sometimes outweighed by the change in WLA or imperviousness (primarily the change in WLA). As a result, not all WLA gaps have decreased since 2016, as shown in Figure 5-6 below. Each dot in the figure represents a WLA. The line connecting dots shows whether the gap for that particular WLA has increased or decreased over time. Overall:

- 42 WLAs have gaps that increased from 2016 to 2020
- 101 WLA have gaps that decreased from 2016 to 2020
- 19 WLAs have gaps that are the same from 2016 to 2020 (these are all for WLA that are “met” in both 2016 and 2020)

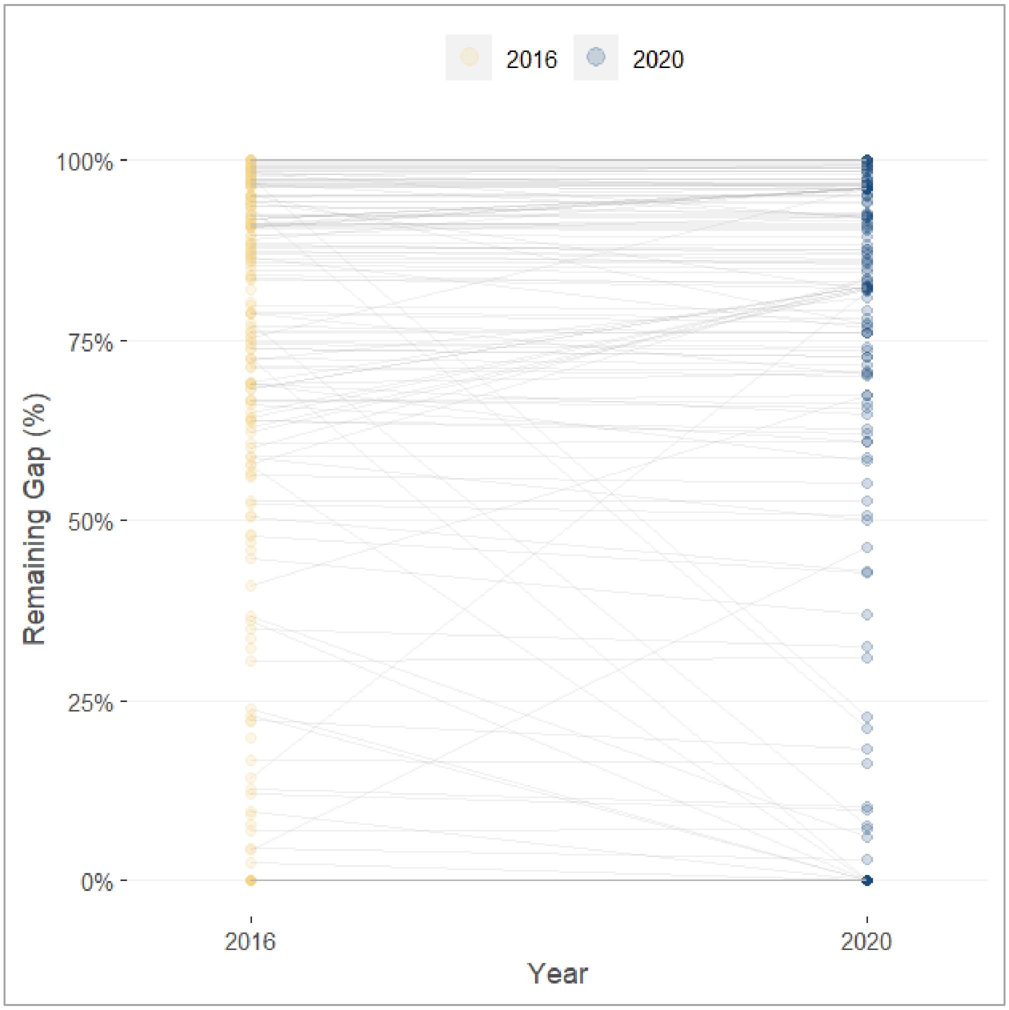

Figure 5-6: Changes in WLA Gaps Between 2016 and 2020.

The current percent load reductions needed to meet the annual WLAs is summarized qualitatively by segment and pollutant in Figure 5-7. The larger and greener the bubble, the larger the percent reduction required to meet the WLA (note that the size and color of the bubbles use sliding scales). Empty squares indicate that the WLA has been achieved. If there is no square, then there is no annual WLA for that pollutant/waterbody combination.

Figure 5-7 below shows that, in addition to being abundant, the WLAs for bacteria and organic pollutants still require the greatest amount of load reductions. The figure also shows that the Anacostia still has the greatest number of WLAs of all watersheds, and that all tributaries, regardless of their location in the MS4, have a multitude of WLAs.

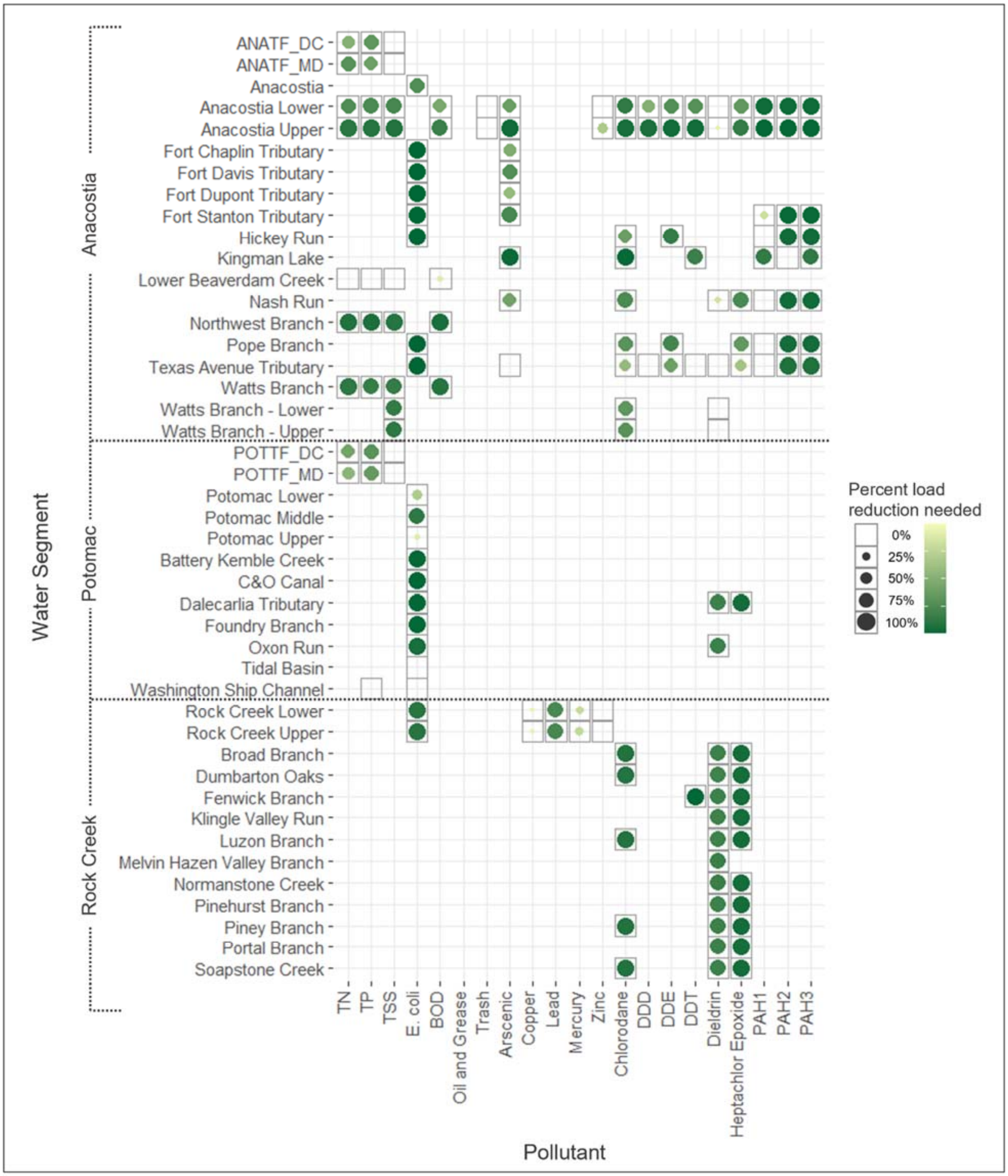

Figure 5-7: Percent Load Reduction Needed to Meet Annual WLAs

5.3.2 Examples of Individual WLA Gap Analysis

The baseline loads, current condition loads, WLAs, and gaps for each of these pollutant/impaired waters segment combinations are shown in Appendix A. The figures below show a few representative graphical illustrations of the current condition gap analysis for a few representative pollutant-segment combinations.

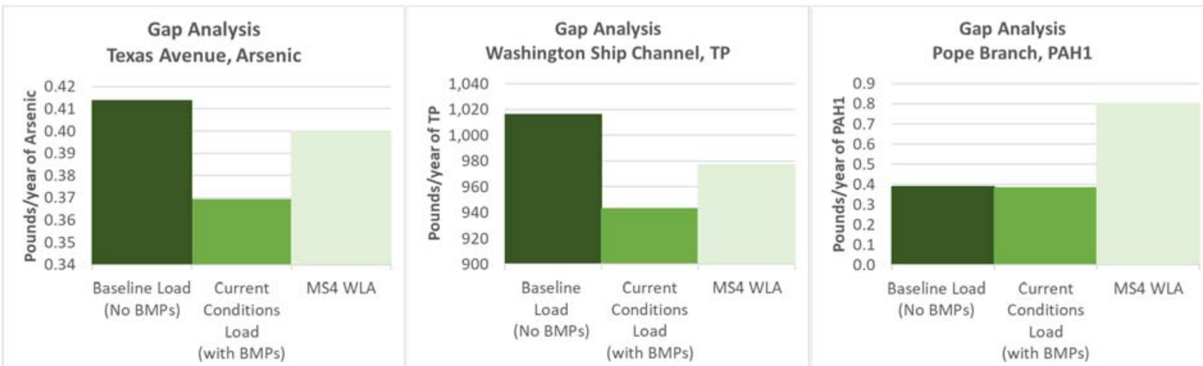

Figure 5-8: Examples of MS4 WLAs That are Currently Being Met

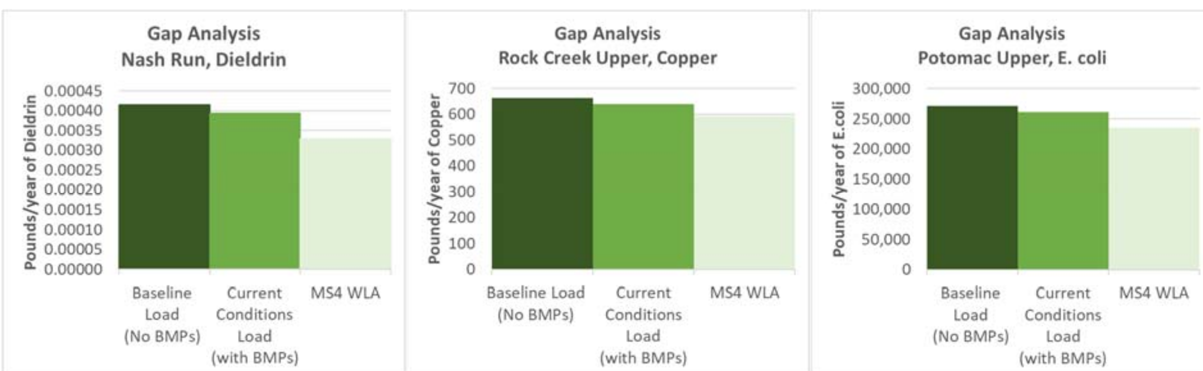

Figure 5-9: Examples of MS4 WLAs That are Close to Being Met

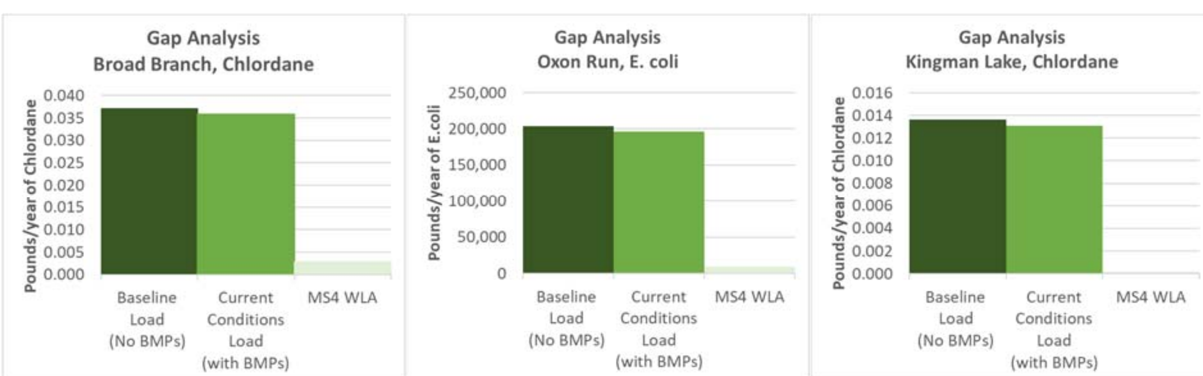

Figure 5-10: Examples of MS4 WLAs That are Far from Being Met

5.4 Progress Against Numeric Milestones

DOEE's NPDES permit includes 5-year numeric milestones, which are based on “acres managed” by BMPs. The permit defines an “acre managed” as one acre of land treated by stormwater control measures to the applicable standard established in the Permittee's stormwater regulations or consistent with the relevant voluntary program. The current permit provides specific numeric milestone targets for each major basin with the MS4 area (Table 1, permit §1.5.3), as shown below in Table 5-6.

Table 5-6: Numeric Milestone Targets

Major Basin	5-Year Target (Acres Managed)
Anacostia River	307
Potomac River	116
Rock Creek	96
Anywhere in the MS4 Permit Area	519
Total	**1,038**

In addition to the numeric milestones shown above, the permit states that at least 62 of the total 1,038 Acres Managed must be located in Public Rights-of Way (PROWs) in the MS4 Permit Area (regardless of major basin).

The numeric milestones apply to the permit term limit (June, 2018 – June, 2023). However, for purposes of the 2022 IP, the numeric milestones were evaluated for the five year period from 01/2016 – 12/2020. This five-year period represents the most complete five-year period available at the time of the development of the 2022 IP. Note that the milestones are also tracked for the permit term in DOEE's MS4 Annual Reports.

The BMPs that are counted towards achievement of the numeric milestones include all of the BMPs from the SGS database, including all of the structural BMPs discussed in Section 5.5.1, and the stream restoration projects discussed in Section 5.5.2. Non-structural BMPs such as trash removal, pesticide ban, coal tar removal, and street sweeping are not included in the “acres managed” calculations since these measures are not typically used to meet DOEE's stormwater regulations.

Figures 5-11 and 5-12 below show the results by watershed and by PROW, respectively. The specific permit numeric milestones are met for each watershed, for the PROW, and for the MS4 as a whole. The blue bars show the amount achieved while the grey bars show the amount required by the permit.

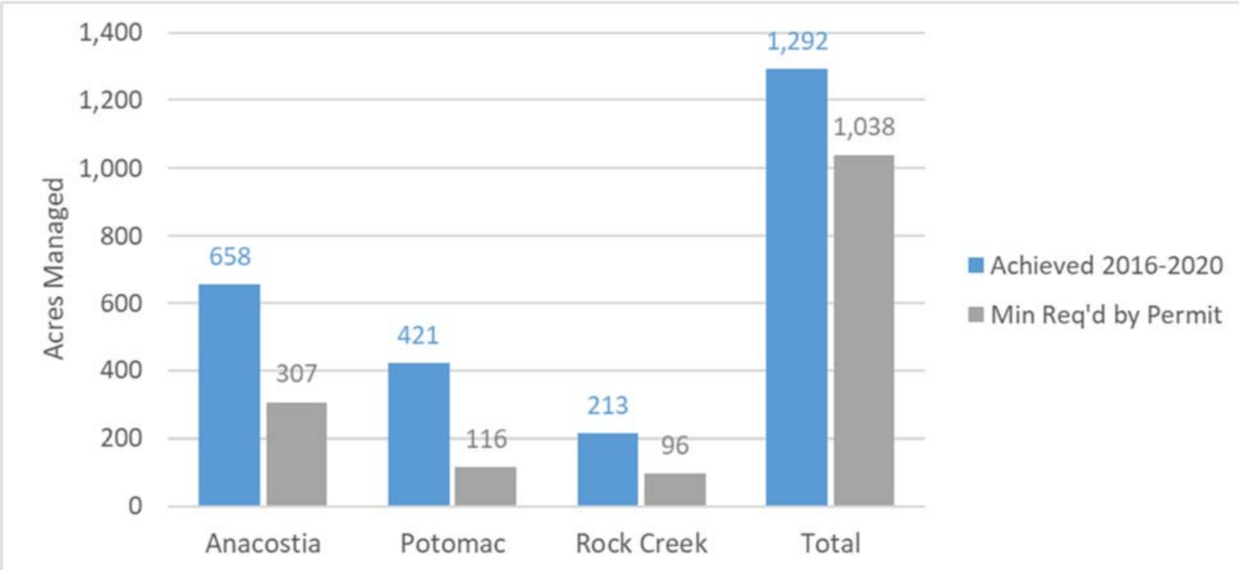

Figure 5-11: MS4 BMP "Acres Managed" by Watershed (2016 - 2020)

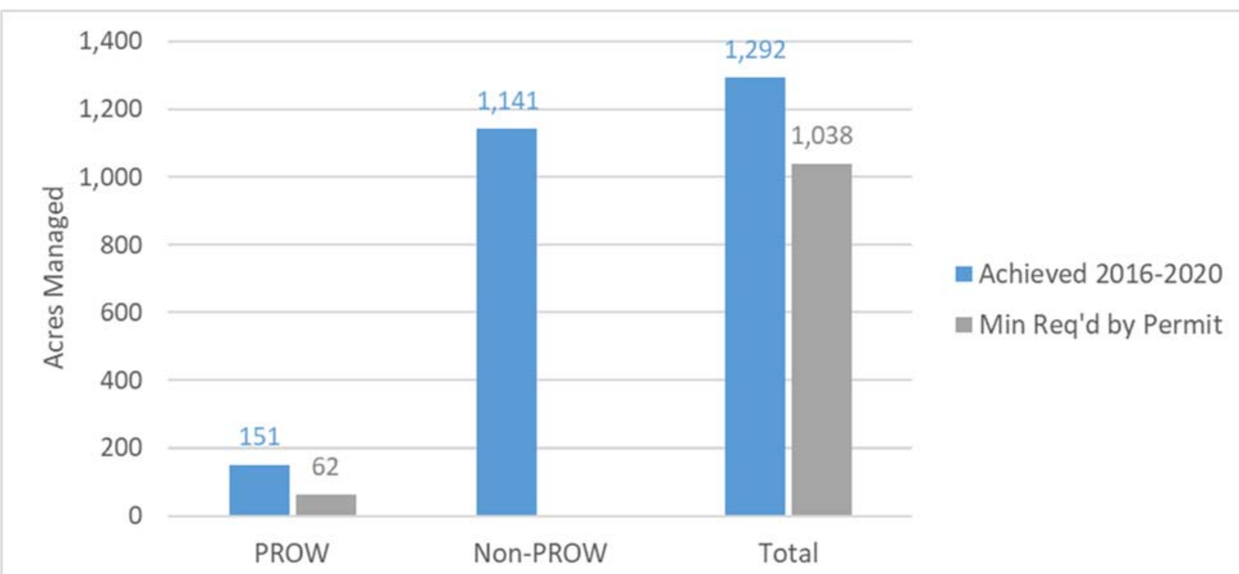

Figure 5-12: MS4 BMP "Acres Managed" in the PROW (2016 - 2020)

5.5 Progress Toward Programmatic Milestones

5.5.1 SRC Program

As part of its evaluation of District Stormwater Management Regulations, DOEE made several changes to the SRC program. One was to update the SRC generating eligibility cutoff date. Now, only projects installed after July 1, 2013 are eligible and must submit their first SRC certification application within 3 years of the project completion. This means that a GI project that was installed more than 3 years ago and has never applied for SRCs will lose its SRC eligibility, thereby reducing the potential supply of SRCs and improving the financial incentives for installation of new GI retrofits in the MS4 area. The regulatory amendments that DOEE proposed in September 2020 would further prioritize SRCs from new, voluntary GI retrofit projects in the MS4 area, which DOEE refers to as High-Impact SRCs. New regulated projects anywhere within the District that have off-site retention requirements are required to purchase these SRCs before any others. The proposed amendments also include removing the 2-year peak discharge requirements for projects in the area of the CSS that will drain to CSO storage tunnels if the project commits to complying off-site with at least 50% High-Impact SRCs. These proposed amendments should continue to incentivize GI installation in the MS4 area.

In addition, in January 2020, DOEE launched an optional subsidy for High-Impact SRC sales by SRC Price Lock Program participants. An important objective of the program was to make High-Impact SRCs, those from new, voluntary GI retrofit projects in the MS4, more competitive with SRCs generated from regulatory over-compliance or from GI built prior to 2013. The SRC Price Lock subsidy addresses the problem of below-market SRCs by providing High-Impact SRC sellers in the SRC Price Lock Program with a small payment from DOEE for each High-Impact SRC sale, which enables these SRC sellers to set a more competitive SRC market price and increase their chances of selling their SRCs on the market. DOEE reported in the 2020 MS4 Annual Report that, in the first year of the program, this subsidy has increased High-Impact SRC sales to developers from 27% to 74% and freed up $193,280 of DOEE funds to be reinvested in the SRC Price Lock Program.

5.5.2 Prioritize Watersheds

Section 2.2.2.3 of the District's MS4 permit requires DOEE to develop a list of targeted watersheds and targeted implementation approaches. The District has used multiple strategies to identify priority watersheds for targeted implementation. As one example, as part of the Phase III WIP for the Chesapeake Bay, the District has identified subwatersheds in which additional nitrogen and phosphorus controls will support local priorities. The District considered the following factors when developing targeted subwatersheds:

- Local water quality: Identified subwatersheds with TMDLs for pollutants that would also be reduced by nitrogen and phosphorus controls, including BOD, nitrogen, phosphorus, sediment, and polyaromatic hydrocarbons (PAHs). PAHs are addressed in the TMDLs for organics.
- Habitat and stream health: Identified subwatersheds with completed or planned stream restoration projects. Practices upland of these restoration sites will reduce erosion and pollution to these streams, protecting the District's investment in habitat and stream health. District also considered areas that drain to tributaries of the Anacostia or Potomac rivers so they would protect local streams in addition to mainstem rivers.

- Climate resilience: Areas identified by the District's Climate Ready DC climate adaption plan as having residents and community assets vulnerable to flooding and extreme heat events associated with climate change.

Another example is the implementation of the District's Project Priority Rating System (PPRS), which describes the process through which DOEE chooses projects for inclusion in applications for the Clean Water Construction grants funded by EPA. A key component of the scoring criteria for Stormwater Green Infrastructure projects is that the project benefits the same priority watersheds identified in the WIP." DOEE provides a link to its priority watersheds at https://dcgis.maps.arcgis.com/apps/webappviewer/index.html?id=d872faed1f8642d190c45befed97c760.

5.5.3 Stormwater Fee Increases

Section 2.2.3 of the District's MS4 permit requires DOEE to evaluate its Stormwater Fee to determine its adequacy for achieving the water quality goals of the permit. A discussion of DOEE's evaluation of its Stormwater Fee is provided in Chapter 10.

5.5.4 TMDL Revisions

As described in Chapter 3, DOEE has updated several TMDLs since the 2016 IP. These TMDL revisions have focused on metals, organics, and PCBs, and were driven by court orders to include daily expressions with the TMDLs. DOEE took advantage of the need to revise these TMDLs by conducting additional sampling to "confirm" whether individual pollutants were causing impairments. The revised TMDLs resulting from this process remove WLAs for pollutants that were not "confirmed" as causing impairment. This addresses the concern that the original toxics TMDLs (e.g., toxics TMDLs for Rock Creek and Potomac tributaries) were not based on sufficient evidence that specific toxics were causing the observed impairments. Thus, the updated TMDL/MS4 WLA inventory that includes these revised TMDLs is more reflective of current data on impairment causes.

5.5.5 Evaluate Changes to District Stormwater Management Regulations

As reported in the District's MS4 2020 Annual Report Attachments, the District evaluated several options for how to improve stormwater management in the District through regulation changes. As required by the District's MS4 permit Section 2.2.4, the District considered the following options:

1. Increasing the on-site stormwater retention standard to 2 inches;
2. Applying a different retention standard to priority watersheds;
3. Lowering the threshold for regulated projects or eliminating exemptions for unregulated projects; and
4. Revising standards in stormwater management, taking into account factors such as sea level rise, extreme weather, and changing precipitation patterns.

After the initial evaluation, DOEE determined that there are two options that represent cost-effective opportunities for enhancing stormwater management. These are discussed below:

<u>Lowering the threshold of regulated projects through the adoption of small area regulations</u> - DOEE lowering the threshold for regulated projects appears to be both feasible and warranted, and DOEE has started researching and developing new regulations.

Revising the peak discharge requirements to better prepare for the increased frequency of relatively large storms due to climate change - DOEE is currently exploring changes to the peak discharge requirement for the 15-year storm in its stormwater management regulations based on the projected increase in the size of that storm.

In addition to researching and developing new regulations to lower the threshold for regulated projects, the District amended its stormwater regulations on January 31, 2020 and proposed additional regulatory updates on September 18, 2020. The January amendments include, among other regulations, three key changes that should increase the installation of new, voluntary GI retrofit projects in the MS4. First, for projects in the CSS that drain to storage tunnels designed to prevent combined sewage overflows (CSOs), DOEE will waive the 50% minimum on-site retention requirement if the project commits to using SRCs from the MS4 to achieve their off-site retention. Second, the regulatory amendments now require projects in the MS4 to purchase SRCs from the MS4 to meet off-site retention requirements. Last, DOEE made changes to the SRC program. These are discussed in the subsection above.

5.5.6 Update Programmatic Milestones

DOEE set programmatic milestones, including numeric milestones for acres managed and numeric benchmarks for load reduction, as part of the 2016 IP. Section 2.2.2 of the District's MS4 permit also includes programmatic milestones, including various studies (e.g., bacteria source tracking and toxics studies); evaluations of the stormwater fee and the stormwater regulations; and development of prioritized watersheds and implementation. An assessment of the status of many of these milestones is provided in this subsection of the IP. DOEE has also reported on these milestones in multiple documents, including the MS4 Annual Report, various individual study reports, and other documents.

As reported section 5.4 above, DOEE is on track to meet the programmatic milestones related to implementing the IP. Achieving these milestones has been an important element in meeting the goals of the IP and continuing to reduce loads, make progress towards meeting MS4 WLAs, and improve water quality in the District.

Through the process of adaptive management, DOEE has also evaluated its existing programmatic milestones as part of updating the IP. This evaluation has focused on whether the existing programmatic milestones are adequate to keep the IP on track to meet its goals into the future. Discussions with EPA Region 3 have been a critical component of this evaluation. DOEE has concluded that the types of programmatic milestones included in the IP are sufficient for ensuring progress in achieving the goals of the IP. In conjunction with EPA, DOEE will continue to re-evaluate the actual numeric targets and specific technical requirements included in these milestones to ensure that they are adequate to ensure progress, and will update the milestones as necessary. Further discussion of the use of the adaptive management process to develop future programmatic milestones is discussed in Chapter 6 of this document.

5.6 Results and Implications for the TMDL Implementation Plan

The major findings of the evaluation of the current conditions are as follows:

- The inventory of existing BMPs has increased by a factor of four and the BMP contributing drainage area has increased by a factor of 6 since the 2016 IP. The majority of these BMPs are recorded in DOEE's SGS database, with the exception of some trees that are recorded in the UFA database. The large increase in BMPs since 2016 is due to more BMPs being implemented and a review of historical BMPs that allowed more BMPs to be recorded in the SGS database.

- The number and contributing drainage area of BMPs installed over time has grown steadily in the past two decades, in large part due to changes in stormwater program funding or regulations
- The creation of the RiverSmart program and the increase in the stormwater fee in 2008-2009 resulted in a large increase in BMPs, particularly from rain barrels.
- The impact of the adoption of the 2013 stormwater rule, which promotes retention-based BMPs, is noticeable after 2014 and resulted in an increase in BMPs, particularly retention-based BMPs such as bioretention, green roof, and permeable pavement practices. The range of annual contributing drainage area post stormwater rule is roughly between 82 and 201 acres, whereas in pre stormwater rule it was around 15 to 162 acres.
- The types of BMPs installed in the District are currently trending more towards retention-based BMPs, which are the types of BMPs promoted by the 2013 stormwater regulation.
- Removing BMPs from the inventory if they were installed more than 10 years ago and have had no inspection in the last 10 years has a significant impact on the total number of BMPs that are credited for pollutant load reduction.
- Several TMDLs were updated since the 2016 IP was published; the overall WLA inventory has decreased from 485 to 439 numeric MS4 WLAs between 2016 and 2022. With respect to annual WLAs, the count has decreased from 206 to 162 MS4 Annual WLAs.
- The gap analysis showed that:
    - 25 of the 162 annual MS4 WLAs have been attained.
    - 42 WLAs have gaps that increased from 2016 to 2020, primarily because of changes to the WLA value or due to the changing conditions in the city (higher imperviousness, BMP retirements, etc.).
    - 101 WLA have gaps that decreased from 2016 to 2020, primarily due to more BMPs going being installed and reducing the pollutant loads.
    - 19 WLAs have gaps that are the same from 2016 to 2020. These are all for WLA that are “met” in both 2016 and 2020).
- Bacteria and organic substances are still the pollutants that require the greatest percent of load reduction to meet WLAs. These pollutants make up the majority of MS4 TMDL WLAs.
- The numeric milestones (“acres managed”) were attained for the period of 2016-2020 and the District is on track to meet the acres managed milestone for the current 2018-2023 permit term.
- The current permit’s programmatic milestones have been completed.

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6. IMPLEMENTATION PLAN: WLA ATTAINMENT

6.1 Introduction

In order to develop and implement a plan to achieve MS4 WLAs as required by its MS4 permit, the District intends to continue implementing, maintaining, and enforcing the existing stormwater management regulations, programs, and practices currently in place. This section presents the specific plan for achieving WLAs and the timeframes over which MS4 WLAs will be achieved. The plan is based on continued implementation of the programmatic and source control efforts, BMP implementation from development and redevelopment activities and the application of the District's 2013 Stormwater Management Rule, and BMP implementation from other programs described in Chapters 5 and 6 of the 2016 IP. As previously stated, the plan is also updated to reflect implementation that has occurred since completion of the 2016 IP. Because of the dispersed nature of ongoing programmatic stormwater management activities implemented throughout the MS4 area, load reduction will take place in all watersheds throughout the MS4 area.

6.2 Implementation Plan Strategies

6.2.1 Implementation Plan for all Pollutants Except Trash and PCBs

The 2016 IP identified the following implementation strategies for reducing MS4 pollutant loads:

- BMP implementation from development and redevelopment activities and the application of the District's 2013 Stormwater Management Rule.
- BMP implementation from voluntary programs, such as DOEE's RiverSmart programs, stream restoration program, and the SRC program.
- Implementation and enforcement of existing programmatic and source control efforts such as street sweeping, public education, and single use product bans.
- Implementation of other potential source reduction programs such BST tracking and pollutant minimization planning (including pollution prevent projects and activities).

These strategies will continue to be used into the future. For more detailed information on the strategies, please refer to Chapter 5.3 of the 2016 IP.

In addition, DOEE is in the process of identifying suitable locations for potential future stormwater retrofit projects in the District that can be implemented over the next several years to help meet MS4 WLA targets. These partially vetted sites will be publicly accessible and may be selected for full design and construction by staff, vendors, sister agencies, grantees, and/or Stormwater Retention Credit (SRC) aggregators to help meet the District's MS4, TMDL, and Chesapeake Bay requirements with the goal of improving water quality in the Anacostia and Potomac Rivers for the benefit of District residents, visitors, wildlife and the environment. A list of 365 projects were identified across the Potomac, Rock Creek, and Anacostia Watersheds. This set of projects, if implemented, could achieve as much as 22.7 million gallons of runoff reduction, over 11,500 pounds of sediment reduction, and over 180 acres of MS4 area managed to the 1.2 inch retention standard. Implementation of these projects will depend on available funding and feasibility of the projects. For more information on these projects, please see: https://storymaps.arcgis.com/stories/c2e9bd50e03c4e089f35073e0113edf7.

6.2.2 Implementation Plan for Trash

DOEE has achieved the trash WLAs through their current trash removal practices, so DOEE will continue with current practices for meeting the Anacostia River Watershed Trash TMDL, described further in Section 5.5.2. The average annual pounds of trash currently removed is 137,014 pounds, which exceeds the TMDL WLA of 108,347 pounds. The District will continue to track and report existing trash removal activities and any new practices along with their respective load reduction calculation methods, as they are implemented.

6.2.3 Implementation Plan for PCBs

As explained in Chapter 6.4 of the 2016 IP, the expectations for MS4 load reductions for the PCB TMDL are different than for other pollutants because the implementation approach focuses on BMP implementation rather than achieving specific numeric WLAs. The focus on the use of use non-numeric water quality-based effluent limitations (WQBELs) and BMPs rather than numeric limits is based on an explicit recognition of the challenges of achieving meaningful numeric goals for PCBs. One of these challenges is that, even if numeric MS4 WLAs are achieved, water quality standards may not be met in the receiving waters because of other ongoing sources of contamination to the water bodies such as PCBs in river sediment and atmospheric deposition.

Based on this, the load reduction plan for PCBs continues to focus on leveraging the BMP planning and implementation developed to address other pollutants to also simultaneously address PCBs. Because the focus for the PCB TMDLs is on BMP implementation instead of numeric WLAs, this plan maximizes effectiveness and efficiency of BMP implementation in the District. Structural and non-structural controls and BMPs that remove TSS, such as most structural BMPs, street sweeping, erosion and sediment control, and other practices, will be effective in reducing PCB loads as well.

DOEE is already implementing actions to address sources of PCBs in the sediment in the Anacostia River. As part of the Anacostia River Sediment Project (https://restoretheanacostiariver.com/arsp-home), DOEE developed the Proposed Plan: Early Action Areas in Main Stem, Kingman Lake, and Washington Channel document (DOEE, 2019) to guide sediment cleanup in the Anacostia River. PCBs are one of the specific pollutants identified for remediation as part of this project.

DOEE will also continue to track stormwater PCB concentrations through MS4 outfall monitoring. PCB concentrations and loads should continue to decrease as additional BMPs are implemented, and atmospheric contributions continue to decline. However, should monitoring show that PCB loads are still an issue, adaptive management principles can be used to change course and develop different tactics to address PCBs.

6.3 Updated Projected WLA Attainment Date

6.3.1 Overview of modeling approach

The future load reductions that will be achieved from the IP strategies were determined using the IPMT. It was also used to project end dates for achieving each MS4 WLA (except for PCBs – see discussion above), as required by the District's MS4 NPDES permit. Load reductions increase over time as more BMPs are implemented. Progress towards achieving WLAs occurs as the amount of load reduction closes the gap for individual MS4 WLAs. When the gap is zero, the WLA is achieved.

Load reductions are based on future projections of BMP implementation to comply with the stormwater regulations, ongoing BMP implementation not associated with the stormwater regulations, and source and programmatic controls. The methodology for estimating these projections remains the same as what was used in the 2016 IP and is explained in detail in the 2015 Final Scenario Analysis Report (DOEE, 2015b). There are two main types of projections used to estimate future load reduction:

- **Load reductions from 2020 through 2040 are based in large part on estimates of areas that will be developed or redeveloped during this time period and will therefore trigger the stormwater regulations**. The projections of areas that will trigger the stormwater regulations were developed using information provided by the DC Office of Planning, as well as data on past BMP implementation. Projections from the DC Office of Planning offer spatially discrete projections, and thus forecasted load reductions during this period are specific to each TMDL segment. The WLA achievement for this timeframe can be projected with a relatively good degree of confidence.
- **Load reductions beyond 2040 are based on spatially redistributed extrapolations of the total projected BMP implementation rates through 2040**. Projections for this timeframe assume that the MS4 area, as a whole, will gradually be retrofitted with BMPs at the same rate as calculated for the period of 2020 through 2040. The 2020-2040 projections, however, are based on spatially discrete forecasts, and long-term development would be biased towards existing development patterns. Therefore, the total 2020-2040 rate was distributed uniformly across all TMDL segments according to the composition of small residential parcels, large residential and commercial parcels, and public right-of-way. These parcel types were chosen because each has a distinct regulatory threshold, and the 2020-2040 forecasts suggest differential rates of development. Under this assumption, the last TMDL segment in the MS4 area will become entirely retrofitted with BMPs by 2134. Because this implementation rate is based on extrapolation of existing trends, projections of WLA achievement are made with a lower level of confidence. Note that even if the entire MS4 area is retrofitted by BMPs, not all WLAs will be attained. As part of this projection, it is assumed that the retrofitted areas will manage 1.2 inches of runoff. However, even after all areas are retrofitted to meet this standard, additional control will be necessary to meet the most stringent WLAs. This is because even the most advanced BMPs are not efficient enough to meet the load reduction required for some TMDL WLAs. In other words, the BMP pollutant reduction efficiency (e.g.: 83.5% of enhanced bioretention with underdrain) is less than the percent pollutant reduction required of some TMDL WLAs (e.g.: 98.64% reduction required for the Chlordane WLA in Kingman Lake). Technological and other strategic advancements are assumed to arise to allow for continued load reduction at the same rate, and thus load reductions are projected beyond the date on which the MS4 is projected to be completely retrofitted. This in turn will allow achievement of all remaining WLAs by 2189. Because this implementation rate is based on further extrapolation of existing trends and assumptions regarding future BMPs and efficiencies, these projections are made with an even lower level of confidence.

6.3.2 Updates to the modeling approach

The 2022 IP instituted three main changes to the modeling approach or inputs for estimating future WLA attainment dates relative to the 2016 IP. These are explained below.

Update to the Representative, System-Wide BMP Efficiency

BMP efficiencies are used in the IPMT to estimate how much stormwater volume and pollutant load is reduced by any given BMP and is typically expressed as a percentage. The BMP efficiency is typically calculated using the following equation:

$$BMP\ Efficiency = \frac{Pollutant\ Load\ Entering\ the\ BMP - BMP\ Load\ Exiting\ the\ BMP}{Pollutant\ Load\ Entering\ the\ BMP}$$

A BMP with a high efficiency reduces more pollutant load in stormwater than a BMP with a low efficiency.

The IPMT estimates the BMP efficiency for any given BMP based on its design characteristics and its design runoff retention depth. This methodology is described in Appendix A, Technical Memorandum: Model Selection and Justification to the Final Comprehensive Baseline Analysis Report document (DDOE, 2015). The individual BMP-specific efficiencies are used to then calculate the volume and load reductions from BMPs that are currently installed and operational.
To estimate future volume and load reductions from BMPs that are not yet constructed, an assumption must be made about the <u>average future BMP efficiency</u> (because it is not known ahead of time what type of BMP [i.e., bioretention, permeable pavement, infiltration trench, or other] might be constructed in the future). In the 2016 IP, this average future BMP efficiency was based on the efficiency of an enhanced bioretention with underdrain practice runoff retention designed to the 1.2-inch design standard, or 83.5 percent. This efficiency was chosen because it is slightly less than the median efficiency of all the retention-based BMPs included in the DOEE Stormwater Management Guidebook (Table 6-1) and therefore represented the best estimate of average future efficiency of runoff retention BMPs. However, runoff retention BMPs only started being promoted and encouraged with the advent of DOEE's 2013 stormwater regulations, so very little historical data existed at the time of the 2016 IP to estimate the representative average BMP efficiency of a typical runoff retention BMP or validate the assumption of 83.5%.

Table 6-1: Efficiencies of Retention Based BMPs Using a 1.2 Inch Design Standard

BMP Type	Efficiency
Enhanced Permeable Pavement without Underdrain	92%
Infiltration Trench	92%
Enhanced Bioretention Without Underdrain	90%
Enhanced Permeable Pavement with Underdrain	87%
Enhanced Bioretention With Underdrain	83.5%
Standard Bioretention	60%
Green Roof	53%
Standard Permeable Pavement	0%

Since 2016, the District's MS4 area has seen much implementation of both retention-based and non-retention based BMPs, and DOEE has tracked these BMPs and their characteristics through the Surface and Groundwater System (SGS) database. This information was reviewed to better estimate the representative, system-wide BMP efficiency. For the 2022 IP, the average efficiency of a representative BMP was reassessed based on the BMP data that DOEE has collected. For runoff-retention BMPs, this includes the BMP type and design retention depth. Using these two pieces of information, the BMP efficiency can be calculated using the runoff reduction efficiency equations that were developed for the 2016 IP and as documented in Table 13 of Appendix F of the 2015 Comprehensive Baseline Analysis Report (DOEE, 2015a). For non-runoff based BMPs, the percent efficiencies are based on published literature values for various BMP types and is documented in Table 9 of Appendix F of the 2015 Comprehensive Baseline Analysis Report (DOEE, 2015a). Modeled BMP efficiencies for all retention-based and non-retention based BMPs are compared in Figure 6-1.

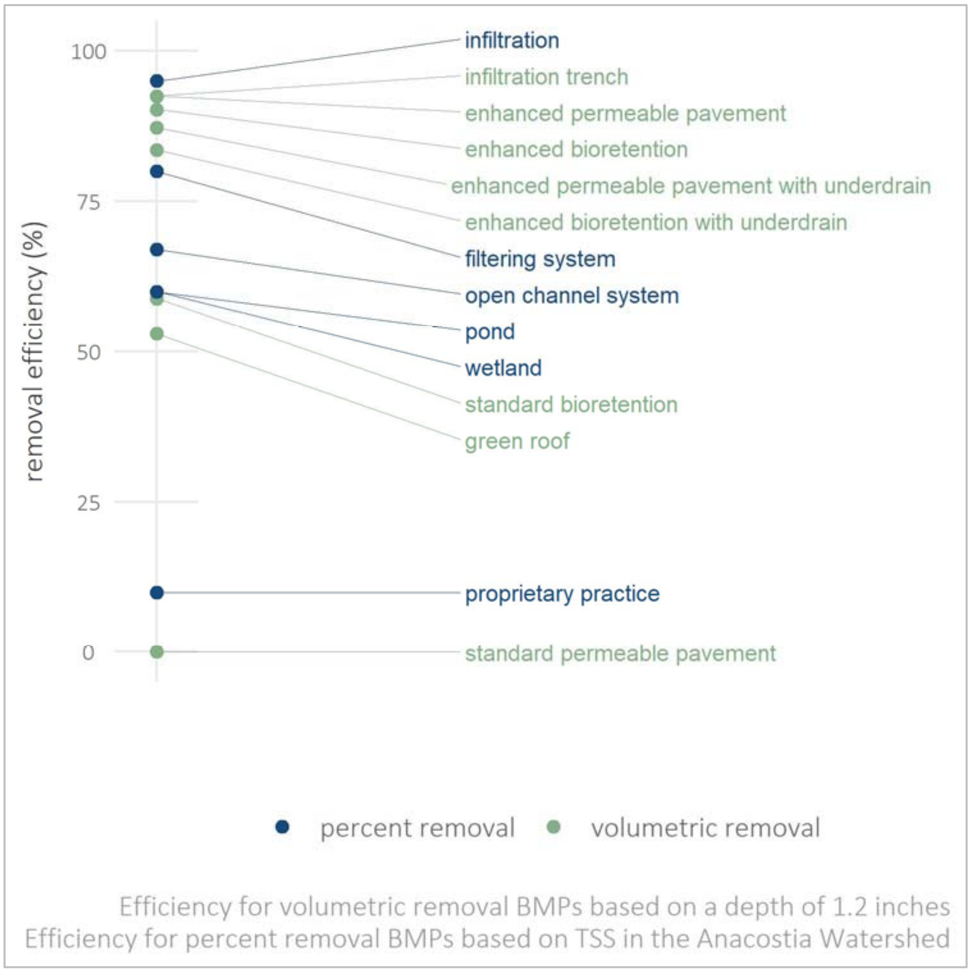

Figure 6-1: Modeled BMP Efficiencies for all Retention-based and Non-retention Based BMPs

To understand the impact of recent BMP selections and installations across the MS4, the average annual efficiency was calculated for BMPs installed since the 2013 stormwater regulations went into effect 2013. The average annual efficiency was calculated using the sum of all modeled loads going into all BMPs and the sum of all modeled loads coming out of all BMPs for a given year. Figure 6-2 below shows the results of this analysis.

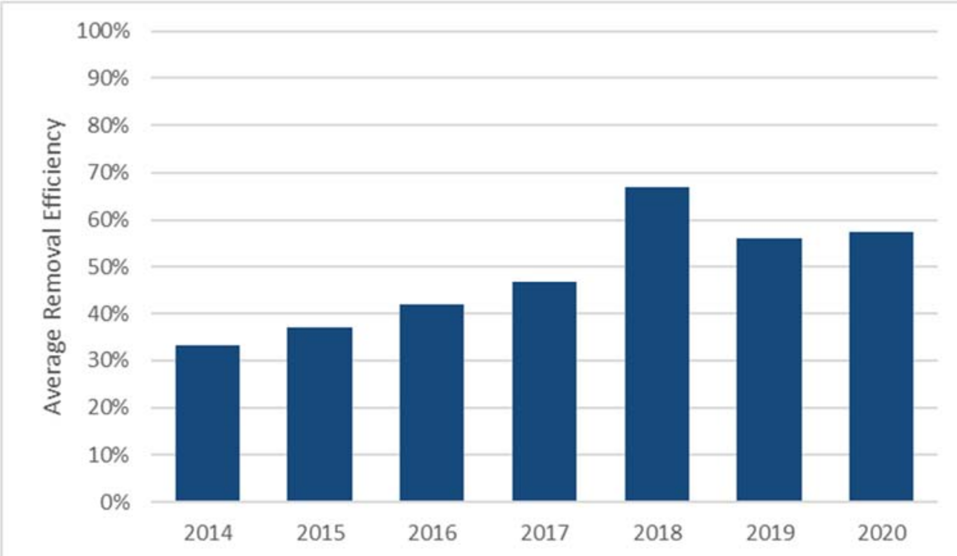

Figure 6-2: Calculated Annual Average BMP Efficiency

The annual average efficiency shows a steady increase over the first few years of the 2013 stormwater regulations. Adaptations to the regulations are known to have taken time while developers were adjusting to new design standards and strategies. Therefore, BMP data from the years 2017-2020, several years after the new regulations were in effect, were used to estimate the average efficiency of BMPs under the 2013 regulations. The load-weighted average efficiency from 2017 through 2020 was 57%. This efficiency replaces the 83.5% efficiency estimate that was used in the 2016 IP forecasts. The use of a lower load removal efficiency in the modeling/projections means that it is expected to take longer to meet all WLAs because less stormwater and pollutant loads will be reduced with the existing BMPs, and thus will require more BMP implementation.

Additional investigation of BMP efficiencies revealed that, on average, the efficiency of unregulated BMPs are lower than the efficiency of regulated BMPs, as shown in Figure 6-3 below. This observation presents an opportunity for DOEE to review its unregulated BMP design protocols to try to increase the overall average efficiency. This opportunity is discussed in more detail in Section 6.4. Note that regulated BMPs in this context means BMPs that were implemented to meet the requirements of the stormwater regulations, whereas unregulated or voluntary BMPs were implemented outside of the stormwater regulations framework. The regulated BMPs must follow DOEE's stormwater rules and have strict runoff retention requirements, whereas unregulated BMPs have more flexibility in setting runoff retention targets.

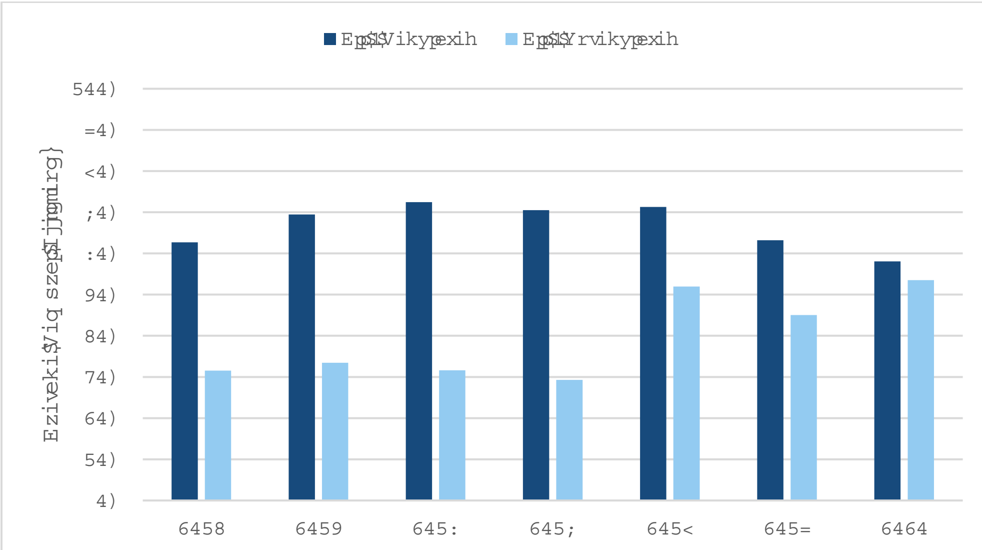

Figure 6-3: Differences in Calculated Annual Average BMP Efficiency for Regulated and Unregulated BMPs

Update to the forecast methodology after 2040

In the 2016 IP, BMP implementation after 2040 was assumed to continue based on 2016-2040 rates of forecasted implementation on parcels zoned as public right-of-way, R1-R4 (small residential parcels), and non R1-R4 (large residential and commercial parcels). BMP implementation was assumed to continue on each of these parcel types until they were 100% retrofitted. The year in which this was forecasted to occur was different for each parcel type. For the 2016 IP, it was assumed that if a parcel type had achieved 100% BMP coverage, then no further reductions would occur on that parcel type until all other parcel types also achieved 100% BMP coverage. This meant that a TMDL segment's forecasted rate of BMP implementation would become lower, proportional to its parcel type composition, as certain parcel types achieved 100% retrofit.

In reviewing the modeling assumptions as part of the adaptive management process, it became clear that this was an overly conservative assumption. For example, properties are sometimes redeveloped at a higher frequency than once every several decades. When redevelopment occurs, newer and more efficient BMP technologies are expected to be implemented. Similarly, BMP lifespans typically range from 5 to 15 years, after which they will need to be replaced. This means that newer and more efficient BMP technology could be implemented on a more frequent basis than what the modeling assumptions had originally assumed. For these reasons, an update was made to the forecast methodology to assume that once a parcel type is completely retrofitted, the load reductions will continue over time at the same rate due to some combination of new technologies, improved BMP efficiencies, or BMP treatment trains that will allow load reduction to continue after this date, until all WLAs across each TMDL segment are met. This specific change in the forecast methodology accelerates the timeline for meeting WLAs.

Update to the overall imperviousness of the MS4

As mentioned in Section 4.2.2, the overall impervious cover in the MS4 increased approximately 4.3 percent between 2008 and 2019. This translates into higher runoff coefficients for some of the TMDL segments, relative to the runoff coefficients that were used in 2016. The higher imperviousness means that it will take longer to meet all WLAs because more stormwater and pollutant loads are generated in the MS4 that will require more BMP implementation.

Update to the WLA values

As mentioned in Chapter 3 and Section 5.3, some MS4 WLAs were updated due to changes or updates to existing TMDLs. In particular, 50 WLA values are different relative to the values initially published in the 2016 IP. Of those, 28 have lower WLA values, meaning that they require more load reduction than previously estimated. The remaining 22 have higher WLAs, meaning they require less load reduction than previously estimated. These changes are incorporated into the WLA attainment projections. For WLAs that require more load reduction than previously estimated, those WLAs will take longer to achieve because more BMP implementation will be required. Conversely, for WLAs that require less load reduction than previously estimated, those WLAs will be achieved faster because less BMP implementation will be required to meet those WLAs.

Sensitivity Analysis

As the sections above indicate, the modeling assumptions and inputs become more uncertain as the timeline stretches out further into the future. It is difficult to predict the level and spatial distribution of development or redevelopment activities that will trigger BMP implementation, or the long-range BMP efficiencies, precipitation patterns, or changes in imperviousness. Changes to the modeling assumptions can shift the projected attainment of WLAs to shorten or lengthen the timeline. For informational purposes, the 2022 IP includes a sensitivity analysis of the modeling assumptions and inputs, and their impacts on the WLA attainment timeline. The results of these are described in more detail in the next section.

6.3.3 Updated WLA attainment timeline

A summary of the timeline in which WLAs are expected to be achieved is provided in Figure 6-4. Twenty-six (26) WLAs are currently attained under the current conditions at the time of the 2022 IP, and additional BMP implementation over time will result in additional WLA attainment. All 162 WLAs are projected to be attained by 2189 using the assumptions and modeling updates described in section 6.3.2.

The projected timeline can be broken down into three timeframes, characterized by differing modeling assumptions:

- The first twenty-years of load reduction projections (2020-2040) are based on recent BMP implementation and discrete development forecasts produced by DC Office of Planning. Therefore, there is a good degree of confidence in the load reductions projected for this period. **By 2040, a total of 30 WLAs are projected to be attained.**
- Load reductions projected for the years 2041-2130 reflect BMP implementation through the year that the entire MS4 is projected to be retrofitted. All projected load reductions from this period are extrapolations of the 2020-2040 projections, however, there is less confidence in the projections for this timeline. Confidence in the projections decreases over time because the rates of implementation are based on current trends and BMP efficiencies are based on current

technologies and regulatory standards. **By 2130, the year in which the entire MS4 is expected to be retrofitted, a total of 69 WLAs are projected to be attained.**

- Load reductions projected for the years 2130-2189 reflect continued redevelopment and stormwater management in the MS4 until all WLAs have been attained. There is a low degree of confidence in the load reductions over this timeline. There is low confidence in these projections because it is assumed that new BMP technologies, regulatory standards, and other management strategies are implemented in a way that continues to the previous rates of load reduction. **By 2189, all 162 WLAs are projected to be attained.**

The dates of attainment for each WLA are shown in Appendix B.

Figure 6-4 shows the dates of attainment by pollutant. Each dot represents a different WLA, and the colors reflect the different pollutant categories (e.g.: grey are toxics, green are metals, etc.). This figure shows that pollutants such as toxics and bacteria, which typically require the most load reduction to meet WLAs (often times higher than a 90 percent load reduction), will take the longest to achieve. DOEE is currently investigating these pollutants and WLAs through additional monitoring and assessments to determine the best path forward to meeting these WLAs.

It is also worth noting that DOEE is currently finalizing a review of toxic impairments. The review consists of analysis of historic and recent water column data for toxic organic and metals pollutants to determine if water quality data support previous assumptions of impairment by specific toxic pollutants. Preliminary results indicate that many presumed toxic impairments are not supported by water quality data. Once these results are finalized, DOEE proposes to remove (alternatively, will evaluate removal of?) any specific existing pollutant causes of impairment documented in the Integrated Report that are not supported by water quality data. Subsequently, DOEE proposes to review existing TMDLs to determine if they should be revised to remove pollutants and MS4 WLAs that are no longer listed as causing impairments in the IR.

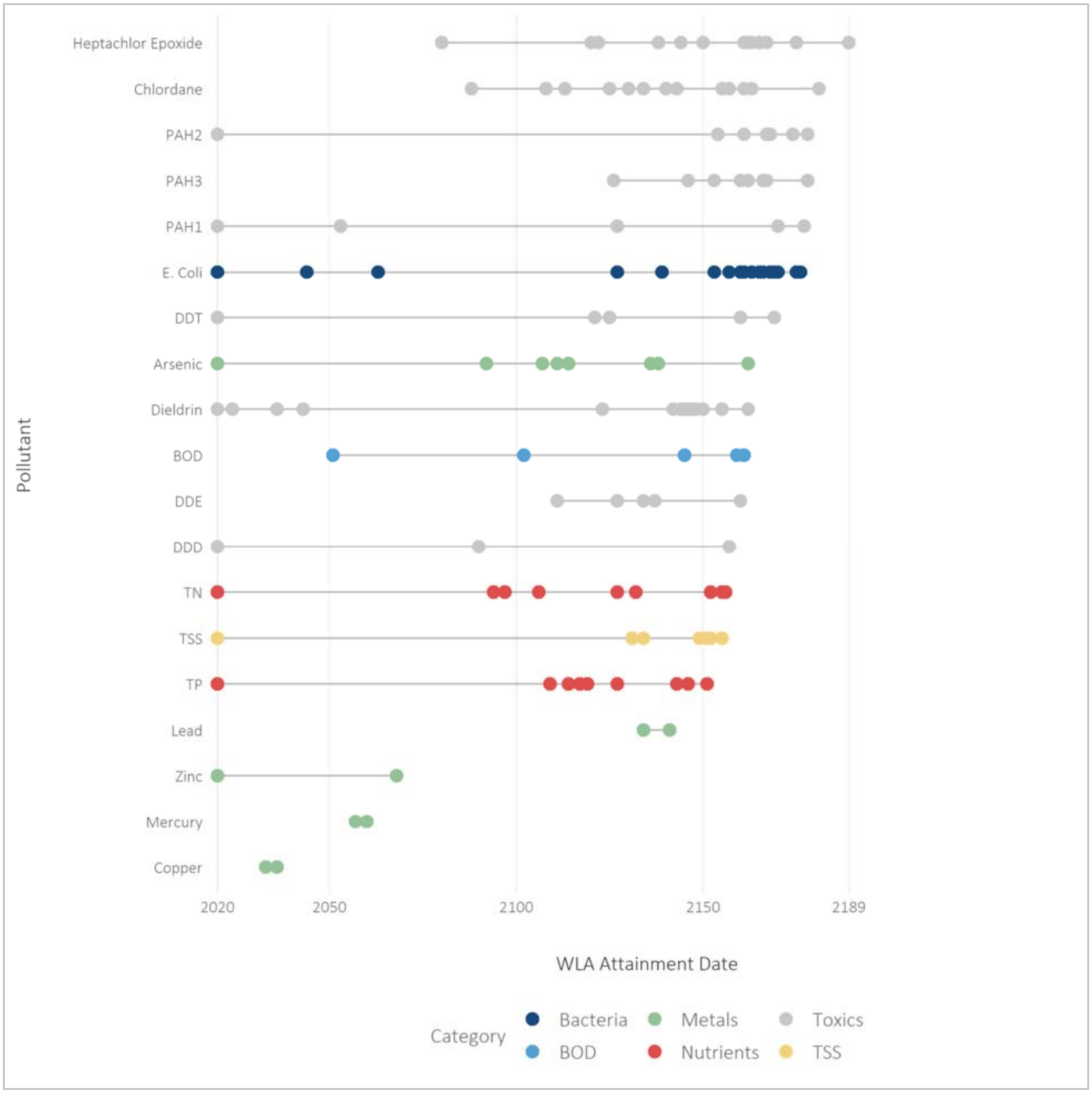

Figure 6-4: Projected WLA by Pollutant Category

Figure 6-5 below shows that the predicted WLA attainment in the 2022 IP is approximately 34 years longer than the WLA attainment date from the 2016 IP (2189 vs 2155). The figure also shows that there are fewer WLAs in 2022 compared to the 2016 IP (as explained in the previous section and in Chapter 3 and 5.3). This change in date is due to several factors described in section 6.3.2, including:

- Using updated WLA values that are different than the values previously used in the 2016 IP (or were removed)
- Using a lower representative BMP efficiency (57% instead of 83.5%).

- Using more recent land cover data that is more impervious, and therefore generates more stormwater volume and pollutant loads.
- Using an updated forecast methodology after 2040.

As noted previously, however, realistic changes to the modeling assumptions can have a dramatic shift in the projected attainment timeline. This WLA attainment forecast and the assumptions behind it are potentially subject to both less conservative and more conservative assumptions, and the WLA timeline may change depending on actual progress achieved over time. For example, a less conservative approach could be taken that assumes more efficient BMPs will be implemented in the future, or at a faster rate of implementation, or more aggressive source control and programmatic efforts will take effect. Conversely, a more conservative approach could be taken that assumes less efficient BMPs, more rainfall due to climate change, or a slower rate of BMP implementation.

It is difficult to predict the aggregate effect of these assumptions on the actual load reductions that will be achieved in the future, but a sensitivity analysis on the modeling assumptions and inputs allows visualization of the potential range of dates for attainment of WLAs. The projected attainment timeline could be shortened to 2130 with less conservative but realistic modeling assumptions, while more conservative modeling assumptions would extend the timeline to 2233. However, for simplicity and based on our current understanding of the MS4 and BMP implementation and performance, it is calculated that the final WLA attainment date will be 2189.

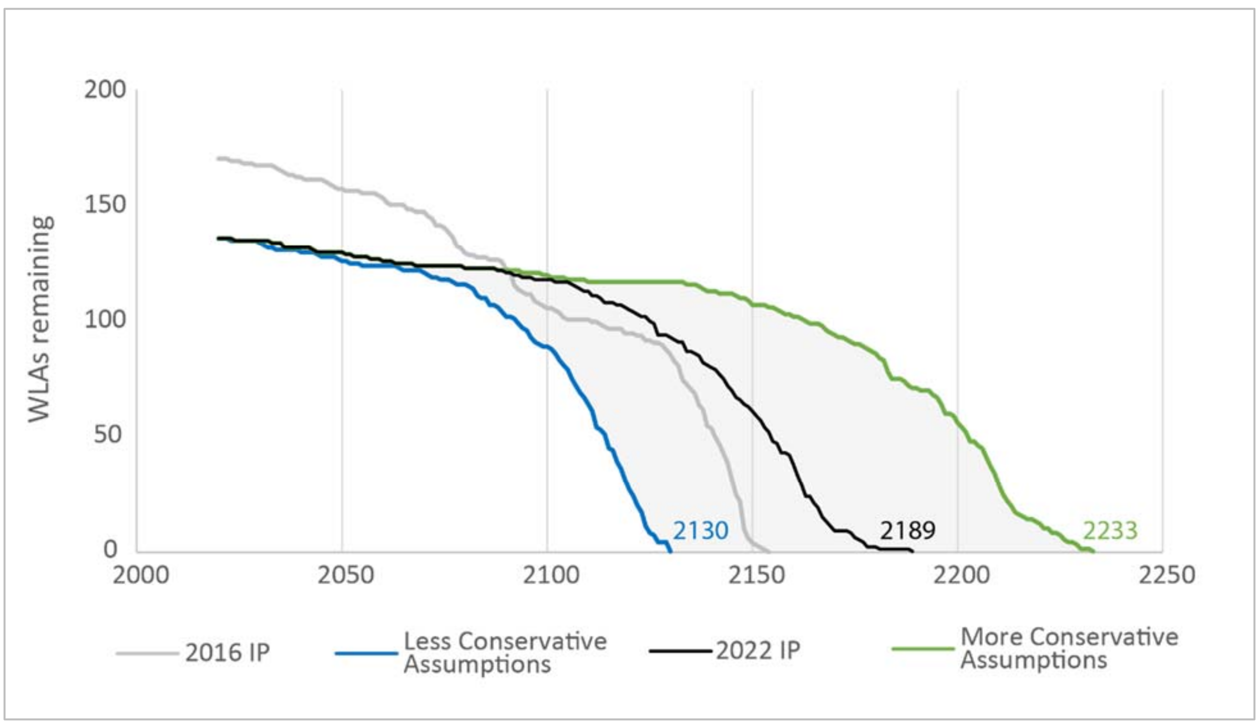

Figure 6-5: Projected WLA Attainment Timeline

6.4 Programmatic Initiatives to Accelerate the Attainment of WLAs

As required by its current MS4 permit, DOEE completed a number of programmatic initiatives with the goal of evaluating the current status of BMP implementation and WLA attainment, and adopting new or updated strategies for reducing loads where practical and/or warranted. Among these programmatic initiatives were various studies of specific pollutants and sources, evaluations of regulatory and funding programs, and development of targeted implementation strategies. Many of these initiatives were discussed in Section 5.5 of this document.

DOEE intends to continue these initiatives and use the results of these initiatives to help steer implementation into the future. Summaries of these initiatives are provided below.

6.4.1 Required Pollutant Studies

A summary of the studies required by the District's MS4 permit and how they will influence future implementation is provided below.

Bacteria/Microbial Source Tracking Study

Section 2.2.2.1 of the District's MS4 permit requires DOEE to complete a bacteria source tracking study. DOEE is undertaking three separate sampling studies to do microbial source tracking (MST) of bacteria sources in its watersheds. Sampling and analysis is underway for two of the studies (one in Rock Creek with two (2) mainstem and one (1) tributary sampling sites; and one in the Anacostia watershed. A third study that will focus on identifying human markers of bacteria is planned for 2022 in the Anacostia watershed.

DOEE intends to use the results of the studies to conduct targeted bacteria source reduction actions, such as eliminating potential sewer cross connections and developing and implementing programs focused on pet waste. These targeted actions should help DOEE continue to make progress in meeting bacteria WLAs.

Toxics Study

Section 2.2.2.2 of the District's MS4 permit requires DOEE to investigate specific toxic pollutants "to identify current sources, including a determination of whether or not these toxic contaminants are largely in situ in the sediments of receiving streams rather than in ongoing MS4 discharges." To address this requirement, DOEE developed the draft *Investigations of Ongoing MS4 Toxic Contaminants to the Anacostia River* report in October 2020. Under this study, DOEE's contractor compiled and evaluated data from previously conducted studies that could be used to better understand the presence of toxic contaminants in Anacostia River surface water. This effort compiled and evaluated data from past and recently conducted studies to better understand the presence of toxic contaminants in the surface water. However, the study concluded that data from recent wet weather surface water studies does not contain many additional detected toxic contaminant concentrations.

DOEE will continue to use the results of its toxics studies to inform possible future activities targeted at reducing toxic load reductions (including source reduction, such as sediment remediation) successfully.

In addition, as discussed in Section 6.3, DOEE is finalizing a separate analysis of toxic pollutants that may result in the removal on specific pollutant causes of impairment, and subsequent revision of TMDLs to remove these pollutant WLAs. This process should help DOEE in focusing on the confirmed toxic WLAs in its watersheds.

6.4.2 Required Programmatic Evaluations

DOEE completed multiple programmatic evaluations, including review of its stormwater regulations, review of its stormwater fee, and development of a process for prioritizing watersheds for implementation, as part of its current permit requirements. These evaluations were discussed in detail in Section 5 of this document.

DOEE intends to use the results of these evaluations to help shape implementation into the future. For example, DOEE continues to use its "Priority Watershed" list and process to drive implementation in priority watersheds. Similarly, DOEE is using its analysis of the stormwater regulations to evaluate the potential to update its regulations to lower the threshold for regulating projects. Another option is to revise the peak discharge requirements to better prepare for the increased frequency of relatively large storms due to climate change.

6.4.3 Additional Programmatic Evaluations

Section 6.2.2. describes the pollutant removal efficiencies of various types of BMPs used to meet WLA load reduction requirements. Investigation of BMP efficiencies revealed that, on average, the efficiency of unregulated BMPs are lower than the efficiency of regulated BMPs, as shown in Figure 6-3 in Section 6.2.2. As a result of this observation, DOEE intends to review and provide internal "best practices" guidance related to unregulated BMP selection and design in order to promote the implementation of BMPs that have higher average pollutant removal efficiencies.

6.5 Adaptive Management

DOEE continues to use adaptive management in implementing the Consolidated TMDL IP. Since the 2016 IP, DOEE has conducted numerous evaluations of its data, processes, and programs to ensure that the Plan is based on the best possible data. Examples of successful uses of adaptive management are the updates to the IPMT and the load modeling methodology and assumptions to ensure that the model is based on the best possible and most updated data and information; and changes to the SRC program to increase financial incentives for installation of new GI retrofits in the MS4.

The adaptive management process will continue to be used as this updated Plan is implemented. DOEE will continue to gather better data on pollutants impairing its watersheds, about BMP and program effectiveness in reducing loads, and about other aspects of implementation. Some of these data gathering exercises may be driven by current and future permit requirements, while others will be developed to address specific needs or data gaps. DOEE will then use these data to ensure that program effectiveness is maximized and that WLA attainment is achieved as effectively, economically, and expeditiously as possible.

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7. TRACKING PROGRESS

The success of the Consolidated TMDL IP depends on the implementation of many individual pollution control activities that are spread out over a long timeline. Tracking progress in a consistent manner over time is critical to this effort. Tracking progress enables program managers and others to assess the pace of implementation and achievement of the planned pollution load reduction goals that are set out in the Consolidated TMDL IP. This breaks up long-term commitments into smaller, more manageable pieces, such as benchmarks and other programmatic measures that are assessed on an annual basis, and milestones that are assessed on a once every five-year basis. Evaluating progress on these shorter timelines provides evidence indicating whether TMDL Implementation is on track to meet projected timeframes for achieving WLAs and allows managers to shift course through adaptive management, as necessary, to ensure that milestones are met and the goals of the IP are achieved in a timely manner.

A robust system of modeling, monitoring, and other programmatic tracking was developed as part of the 2016 IP. This system has been used to evaluate progress towards milestones, benchmarks, and other programmatic targets during the implementation of the IP over the last five-plus years, and it remains in place as part of the 2022 IP Update. The actual progress in implementing the IP and the success of this tracking system was discussed previously in Chapter 5, "Implementation Plan Assessment." The current chapter describes the methodology and plan for continuing to track progress under the 2022 IP Update.

Progress towards meeting the updated IP and achieving WLAs will be tracked using three different methods, including:

- **Modeling:** The IPMT will continue to be used to demonstrate attainment of individual MS4 WLAs. The IPMT was used to evaluate progress made since 2016 (See Chapter 5), and it will continue to be used in the future to track BMP implementation, calculate load reductions over time, and evaluate progress made towards achieving benchmarks and milestones.
- **Monitoring**: DOEE collects datasets on multiple different aspects of District waters and discharges into those waters, including data on the loads from the MS4 system and data on ambient conditions and the health of receiving waterbodies. Monitoring data is useful in helping to confirm improvements in water quality, and, ultimately, achievement of WLAs projected by modeling. Monitoring data can also be helpful in other ways, such as the potential use of wet weather discharge monitoring data (i.e., MS4 outfall monitoring data) to help update the EMCs used in the IPMT or the use of data from future BMP effectiveness studies to ensure that the IPMT is accurately reflecting pollutant removal by BMPs.
- **Other Programmatic Tracking**: DOEE accounts for a wide variety of measures that contribute to achievement of the planned pollution load reduction goals. This includes tracking BMP-specific information like the number of BMPs implemented, the number of BMPs inspected, etc. It also includes the tracking of iterative actions that result in pollutant load reduction, but which may not be quantifiable in terms of actual loads reduced - activities such as site inspections, public education, and or hazardous waste collection. The District's MS4 permit includes requirements to implement and report on achievement of specific targets for acres managed, green roof implementation, tree planting, and trash removal. While progress on these targets is reported in

the District's MS4 Annual Reports, this programmatic tracking is incorporated into the 2022 IP Update to help ensure adequate evaluation of progress towards the IP's goals.

The following subsections describe these three types of progress tracking in more detail. For more information on the initial development of these types of progress tracking see Chapter 7, *Tracking Progress in Meeting MS4 WLAs*, in the 2016 IP.

7.1 Modeling and Use of the IPMT

The IPMT will continue to be the primary method used to track progress toward milestones, benchmarks, and attainment of individual WLAs. As part of this 2022 IP Update and as described in Chapter 6 of this document, the IPMT has been used to evaluate progress to date. This "progress to date" becomes the "Current Condition" for the 2022 IP Update from which to measure progress towards meeting the individual WLAs and closing the load reduction gap. Modeling therefore provides a consistent and straightforward way to track results over time as this gap is closed.

The IPMT uses specific information on BMPs to calculate load reduction. This includes:

- Type of BMP
- Location of BMP
- Implementation date
- Area controlled by the BMP
- Design stormwater volume retained by the BMP

The District's Surface and Groundwater System (SGS, formerly the Stormwater Database) is the primary database for recordation of stormwater management plans, soil erosion and sediment control plans, green area ratio plans and other detailed information on green infrastructure and BMPs associated with regulated and non-regulated (voluntary) activities. BMP information is updated and tabulated in this database as the facilities are planned, inspected and become operable. In addition to the SGS, there are several other sources of BMPs that are used in the IPMT, including:

- The District Department of Transportation's Urban Forestry Division (UFD) database of street trees.
- DOEE's inventory of trash reduction BMPs and coal tar removal projects
- DC Department of Public Works records on street sweeping activities

DOEE is continuously working on expanding, improving, and updating the SGS database and its recording capabilities to include all District BMPs into a single consolidated database.

Data on BMPs and other programmatic information is input into the IPMT to model progress in meeting MS4 WLAs and achieving the goals of the IP. The IPMT is applied on an annual basis across the entire MS4 area to quantify the load reduction achieved each year with the new BMPs that have been put in place and become operational. For tracking purposes, this annual quantification of load reduction is compared directly against the benchmarks established for each of the MS4 WLAs. As described in Section 6.6 of the 2016 IP (DOEE, 2016a), benchmarks have been set as the average annual amount of pollutant reduction that must be achieved in order to meet the WLA by the date projected by the modeling. Thus, comparing the load reduced in a given year against the annual benchmark provides an indicator to help determine if sufficient progress is being made over time. Data on BMPs is also used to quantify the acres managed milestone for the MS4. DOEE's 2018 MS4 Permit defines an acre managed as one acre of land treated by stormwater control measures to the applicable standard established in the Permittee's stormwater regulations or consistent with the relevant voluntary program. The acres managed milestone is the primary metric by which progress on the IP, and compliance with the permit, is evaluated.

7.2 Monitoring

For the purposes of the tracking progress of the IP, the primary monitoring data used to track the achievement of WLAs is the monitoring and tracking of BMP implementation data, as described above under 7.1, Modeling. Monitoring and tracking BMP implementation is necessary to provide the IPMT with the required input data to evaluate achievement of WLAs. Other monitoring data will be used to supplement BMP monitoring information and provide additional information on achieving the goals of the IP. This includes wet weather discharge monitoring (i.e., MS4 outfall monitoring data) and other types of data (see below). MS4 outfall monitoring data provides direct evidence of pollutant loads from individual MS4 outfalls. However, since not every pollutant for which there is a MS4 WLA is monitored at every MS4 outfall, MS4 outfall monitoring data cannot be used to evaluate the achievement of WLAs directly. Instead, it can be used as an indicator – for example, to determine if loads of specific pollutants are decreasing over time, as would be expected with the implementation of additional BMPs and as is necessary to achieve WLAs. Other monitoring data, such as receiving water quality monitoring, Aquatic Life Use Support assessment, fish tissue analysis, geomorphological assessment, physical habitat assessment, and trash monitoring, can also be used as indicators to evaluate improvements in water quality and habitat conditions that would be expected as progress is made in achieving WLAs.

For additional information on how specific types of monitoring data are used in tracking progress on the IP, please see Section 7.3 of the 2016 IP.

7.3 Other Programmatic Tracking

As described above, the primary metric that DOEE tracks to evaluate progress on the IP is acres managed. The requirement to report acres managed is included in the District's NPDES permit. Other programmatic data for which reporting is required by the permit includes green roof implementation, tree planting, and trash removal.

In addition to programmatic tracking required by the permit, the initial IP also identified multiple other programmatic elements that are useful in assessing progress, including BMP inspections, IDDE inspections, miles of streets swept, number of catch basins inspected and cleaned, and Stormwater Pollution Prevention Plans implemented. All of these programmatic elements contribute to better stormwater management, which ultimately leads to reductions in pollutant loading and progress towards achieving individual WLAs and the entire IP. Thus, even though they cannot be used directly to evaluate progress in meeting WLAs, they are an important to the overall goals of the IP, and it will continue to be important to report on them to provide additional context for progress in achieving the District's TMDL and IP-related requirements.

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8. PUBLIC OUTREACH PLAN

A public outreach plan that engaged key stakeholders and the general public was developed and implemented during the development of the Consolidated TMDL IP in 2016. This plan focused on informing stakeholders and the public regarding the available data, the tools, and the methods for developing and implementing the Consolidated TMDL IP. Soliciting and addressing stakeholder feedback and informing the public regarding TMDL planning was critical in building support for implementation efforts. The plan included hosting public meetings and participating in "roadshows" with environmental organizations and regional partners like the DC Environmental Network (DCEN) and MWCOG to present a summary of the Consolidated TMDL Implementation Plan. DOEE also developed a Consolidated TMDL IP website at https://dcstormwaterplan.org/ to provide information on the TMDL planning and implementation process.

Since 2016, DOEE's primary outreach efforts have been through website updates and the MS4 Annual Report StoryMaps. Section 5.3 of the District's MS4 permit, Reporting to the Public, includes a requirement to maintain the website as a repository of the most recent or updated version of all documents, reports, and assessments, including the Consolidated TMDL Implementation Plan Report (§ 5.3.2 Website Information Repository). Section 5.3 also includes a requirement to develop and maintain a web-based graphical interface to support the MS4 Annual Report (§ 5.3.1 Stormwater Program Dynamic Web-based Graphical Interface). This graphical user interface is specifically designed to provide data and information to District residents and other stakeholders in a useful and accessible format. The graphical user interface is required to provide the following types of information:

- A GIS-referenced set of maps that include the locations of all stormwater control measures in the MS4 Permit Area, sortable by type/function, drainage area, storage volume and installation date;
- Data on stormwater retention credits certified in the MS4 Permit Area;
- Statistics on implementation of specific types of management practices, such as green roofs and trees;
- TMDL WLAs by stream segment and by pollutant; and
- Monitoring locations linked to monitoring data.

DOEE has implemented an ArcGIS StoryMap format to meet this requirement and posts MS4 Annual Report StoryMaps on its website[10]. For example, the 2021 Annual Report StoryMap[11] provides information on the MS4 program, stormwater pollution and control, stormwater pollution prevention, stormwater pollution modeling, public education and outreach, TMDL planning and implementation, monitoring, and provides a new "project highlight" each year.

The StoryMaps are published each year in January, and subsequently advertised through DOEE's social media outlets. Since 2021, DOEE is also tracking the number of views to the StoryMaps.

The District also continues to develop and implement outreach programs in accordance with its permit. Section 3.10 of the District's MS4 permit requires the District to conduct targeted public education to

[10] https://doee.dc.gov/publication/ms4-discharge-monitoring-and-annual-reports
[11] https://storymaps.arcgis.com/collections/792b0984eab54a998838569915e1d619?item=1

"measure the understanding and adoption of selected targeted behaviors among the targeted audiences." The purpose of these outreach and education efforts is to engage and educate the general public regarding stormwater and pollution issues and to impact public behavior to reduce stormwater impacts and minimize pollution. Specific components of the outreach and education include information on:

- General sources of stormwater pollution and impacts of stormwater flows into surface waters
- Source control practices and environmental stewardship actions in landscaping and rainwater reuse
- A household hazardous waste education and outreach program to control illicit discharges to the MS4
- Vehicle maintenance stormwater control measures, including car washing practices
- Stormwater control measures for removing ice from sidewalks and roads
- Meaningful watershed educational experiences and other education for District youth and teachers
- Litter Prevention Campaign

Another method for by which the public is engaged in stormwater management and pollution reduction is through the Watershed Stewards program. DOEE hosts a Watershed Stewards Academy, which is an 8-week hands-on certification course offered twice a year to District residents seeking to address local pollution problems in their local watersheds. Watershed Stewards serve as resource people and community leaders in the effort to clean up local waterways, coordinate efforts to infiltrate stormwater, and reduce pollution sources within sub-watersheds. Among the topics included in the Academy are stormwater management, pollution reduction strategies, rainscaping techniques, and stream restoration.

DOEE includes summaries of its public outreach efforts as part of a written MS4 Annual Report that supplements the StoryMap. This written report is also available on DOEE's website https://doee.dc.gov/publication/ms4-discharge-monitoring-and-annual-reports and is in the format of a form that DOEE updates and posts annually. The form includes a summary of targeted public education in the reporting year. For example, in the 2021 written document, DOEE reports on:

- Number of views of the District stormwater website
- Number of retweets of District tweets on stormwater topics
- For pet waste, number of bag dispensers/ disposal containers
- Number of pet waste signs installed
- Number of RiverSmart audits completed
- Number of RiverSmart Practices Installed
- Stormwater Retention Credits generated by the RiverSmart Program.
- Number of District youth receiving environmental training
- Number of District teachers receiving environmental training
- Number of participants in environmental boat tours

The report also includes short written summaries of what has been achieved in the environmental education training program and the litter prevention campaign for the plan year.

DOEE also continues to maintain the Consolidated TMDL IP website at https://dcstormwaterplan.org/. This website includes previous reports, documents, and meeting records that were published during the 2016 TMDL IP planning and implementation process. This website will also be updated with the 2022 TMDL IP Update report.

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9. INTEGRATION WITH OTHER WATERSHED PLANNING EFFORTS

The Consolidated TMDL Implementation Plan functions as the District's watershed implementation plan for the purposes of meeting requirements of the CWA Section 319 Nonpoint Source (NPS) Management Program. As such, this Plan supersedes the Oxon Run WIP (2010), the Rock Creek WIP (2010), and the Anacostia River WIP (2011). It identifies waterbody impairments, technically appropriate implementation projects, and timelines that guide DOEE in its work. It also includes a process for prioritizing subwatersheds for NPS implementation in the District.

The Consolidated TMDL IP addresses EPA's nine essential elements for watershed planning. These elements, commonly called the "a through i criteria" are important for the creation of thorough, robust, and meaningful watershed plans and incorporation of these elements into the plan is of particular importance in receiving funding for implementation. EPA has clearly stated that to ensure that Section 319-funded projects make progress towards restoring waters impaired by nonpoint source pollution, watershed-based plans that are developed or implemented with Section 319 funds to address 303(d)-listed waters must include at least the nine elements. While the Plan described herein is focused on MS4 point sources, EPA recommends including these nine elements in all watershed plans because they provide a quantitative framework for the planning process that leads to water quality improvements and restoration to attain water quality standards.

The planning elements (summarized below in the order presented by EPA) are:

a. An identification of the causes and sources that will need to be controlled to achieve the load reductions estimated in the plan and to achieve any other watershed goals identified in the plan, as discussed in element (b) immediately below.
b. An estimate of the load reductions expected for the management measures described under element (c) below, recognizing the natural variability and the difficulty in precisely predicting the performance of management measures over time.
c. A description of the management measures that will need to be implemented to achieve the load reductions estimated under element (b) above, as well as to achieve other watershed goals identified in the plan, and an identification of the critical areas in which those measures will be needed to implement this plan.
d. An estimate of the amount of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon, to implement this plan.
e. An information/education component used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the recommended management measures.
f. A schedule for implementing the management measures identified in this plan that is reasonably expeditious.
g. A description of interim programmed restoration for determining whether management measures or other control actions are being implemented.
h. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether the plan needs to be revised.

i. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under element (h) immediately above.

Much of the information on causes and sources of impairment for the pollutants covered in this Plan (element a) comes from the original listings documented in the Integrated Reports, as well as the TMDL studies. The expected load reductions (element b), management measures (element c), schedule milestones (elements f and g) and load reduction criteria (element h) are covered in detail in this Plan. This Plan also includes discussions of financing (element d), education and public participation (element e), and monitoring (element i). These elements and the IP Plan sections in which they are addressed are shown in Table 9-1 below.

Table 9-1: Cross Reference of 2016 IP with EPA's Nine Essential Elements for Watershed Planning

Requirement	Met?	Page/Section Reference* and Comments
A. Identification of Causes & Sources of Impairment (overall)	**Yes**	
a. Sources of impairment are identified and described.	Yes	Pg. 18-23 and Appendices A and G of 2016 IP
b. Specific sources of impairment are geographically identified (i.e., mapped)	Yes	Appendix C of the 2016 IP
c. Data sources are accurate and verifiable, assumptions can be reasonably justified		Pg. 44 of the 2016 IP
B. Expected Load Reductions (overall)	**Yes**	
a. Load reductions achieve environmental goal (e.g., TMDL allocation)	Yes	Appendix D of the 2016 IP
b. Desired load reductions are quantified for each source of impairment identified in Element A	Yes	Appendix D of the 2016 IP
c. Expected load reductions are estimated for each management measure identified in Element C and overall watershed.	Yes	Pg. 45-54 of the 2016 IP. Also see Final Scenario Analysis document available at https://dcstormwaterplan.org/documents-and-deliverables/ for further detail on projected load reductions resulting from management measures
d. Data sources and/or modeling process are accurate and verifiable, assumptions can be reasonably justified	Yes	Pg. 44-54 of the 2016 IP
C. Proposed Management Measures (overall)	**Yes**	
a. Specific management measures are identified and rationalized	Yes	Pg. 65 - 73 of 2016 IP
b. Proposed management measures are strategic and feasible for the watershed	Yes	Pg. 65 - 73 of 2016 IP
c. Critical/Priority implementation areas have been identified	Yes	Pg. 100 of 2016 IP

Table 9-1: Cross Reference of 2016 IP with EPA's Nine Essential Elements for Watershed Planning		
Requirement	**Met?**	**Page/Section Reference* and Comments**
d. The extent of expected implementation is quantified (e.g., x miles of streambank fenced, etc.)	Yes	Pg. 71 - 73 of 2016 IP
D. Technical and Financial Assistance Needs (overall)	**Yes**	
a. Cost estimates reflect all planning and implementation costs	Yes	Pg. 127-135 of 2016 IP
b. Cost estimates are provided for each management measure	Yes	Pg. 127-135 of 2016 IP
c. All potential Federal, State, Local, and Private funding sources are identified	Yes	Pg. 128-132 of 2016 IP
d. Funding is strategically allocated - activities are funded with appropriate sources (e.g., NRCS funds for BMP cost share)	Yes	Pg. 127-132 of 2016 IP
E. Information, Education, and Public Participation Component (overall)	**Yes**	
a. A stakeholder outreach strategy has been developed and documented.	Yes	Pg. 117-118 of 2016 IP
b. All relevant stakeholders are identified and procedures for involving them are defined.	Yes	Pg. 117-118 of 2016 IP
c. Educational/Outreach materials and dissemination methods are identified.	Yes	Pg. 117-118 of 2016 IP
F/G. Schedule and Milestones (overall)	**Yes**	
a. Implementation schedule includes specific dates and expected accomplishments	Yes	Pg. 76-77, 84-88, 95-100 and Appendix D of 2016 IP
b. Implementation schedule follows a logical sequence	Yes	Pg. 75-100 of 2016 IP
c. Implementation schedule covers a reasonable time frame	Yes	Pg. 75-100 and Appendix D of 2016 IP
d. Measurable milestones with expected completion dates are identified to evaluate progress	Yes	Pg. 76-77, 84-88, 95-100 and Appendix D of 2016 IP
e. A phased approach with interim milestones is used to ensure continuous implementation	Yes	Pg. 75-100 and Appendix D of 2016 IP
H. Load Reduction Evaluation Criteria (overall)	**Yes**	
a. Proposed criteria effectively measure progress toward load reduction goal	Yes	Pg. 45-54 and 109-116 of 2016 IP. Also see Comprehensive Baseline Analysis and Final Scenario Analysis documents available at https://dcstormwaterplan.org/documents-

Table 9-1: Cross Reference of 2016 IP with EPA's Nine Essential Elements for Watershed Planning		
Requirement	**Met?**	**Page/Section Reference* and Comments**
		and-deliverables/ for further detail on approach to crediting specific BMPs
b. Criteria include both: quantitative measures of implementation progress and pollution reduction; and qualitative measures of overall program success (including public involvement and buy-in)	Yes	Pg. 109-116 of 2016 IP
c. Interim WQ indicator milestones are clearly identified; The indicator parameters can be different from the WQ standard violation	Yes	Pg. 84-88 and Appendix F of 2016 IP
d. An Adaptive Management approach is in place, with threshold criteria identified to trigger modifications	Yes	Pg. 104 of 2016 IP
I. Monitoring Component (overall)	**Yes**	
a. Monitoring plan includes an appropriate number of monitoring stations	Yes	Pg. 111-115 of the 2016 IP and Pg. 19-43 of Revised Monitoring Program. Revised Monitoring Program document available at https://dcstormwaterplan.org/documents-and-deliverables/
b. Monitoring plan has an adequate sampling frequency	Yes	Pg. 111-115 of the 2016 IP and Pg. 19-43 of Revised Monitoring Program. Revised Monitoring Program document available at https://dcstormwaterplan.org/documents-and-deliverables/
c. Monitoring plan will effectively measure evaluation criteria identified in Element 8	Yes	Pg. 109-116 of the 2016 IP
*References are to sections of the 2016 IP because the 2022 IP focuses on updates to the program/plan that was developed and implemented through the 2016 IP. Thus the 2022 IP does not follow the same structure and crosswalk with EPA planning elements.		

10. FUNDING THE IMPLEMENTATION PLAN

The methods for funding the Consolidated TMDL IP were included in the 2016 Plan and remain fundamentally the same for the updated IP. Implementation occurs both through BMPs directly funded by the District government, as well as through BMPs funded by private entities to comply with the District's Stormwater Regulations or other requirements.

The following subsections summarize the available public funding sources, non-public funding from compliance with the Stormwater Regulations, the current funding available for direct BMP implementation, the overall IP funding plan, and evaluation of additional funding for the IP through analysis of the current Stormwater Fee.

10.1 Public Funding Sources

The currently allocated public resources that fund the IP include:

- The Enterprise Fund (funds generated from the stormwater fee)
- The Anacostia River Clean Up and Protection Fund (funds generated from the "Bag Law")
- EPA Clean Water Act Grants (Clean Water State Revolving Fund and Section 319 grants)
- EPA Chesapeake Bay Program Funds (Chesapeake Bay Implementation and Regulatory and Accountability Program grants)

The following subsections provide short summaries of the public funding and other investments that will drive implementation and load reduction. For full discussions of these funding sources and funding programs, see the 2016 Consolidated TMDL IP (DOEE 2016a).

10.1.1 Enterprise Fund

The Enterprise Fund and the District's stormwater fee were established in 2000, and the stormwater fee was subsequently updated to be based on impervious surface in 2009. The Enterprise Fund receives revenue from the District's stormwater fee. The revenue from this fee is intended to address costs of implementing the MS4 Permit, including costs to manage and treat pollutants in stormwater runoff.

The stormwater fee generates approximately $13 million in revenue per year. DOEE uses most of this revenue to address MS4 programmatic requirements (e.g., the MS4 permit's monitoring requirements; staff time for inspection and enforcement, IDDE, etc.; permit reporting and administration). Revenue from the stormwater fee supports over 60 full-time equivalent staff within DOEE, whose work addresses permit requirements such as inspection and enforcement efforts, stream and stormwater outfall monitoring, programs to incentivize green infrastructure, and permit reporting and administration. Fee revenue also provides for contractual support to address permit requirements for planning, monitoring, and analysis. Sizeable portions are also distributed directly to other District agencies such as DDOT, DPW and DGS to fund stormwater grey and green infrastructure projects and other source control activities under interagency MOUs. The amount that is available for direct investment in BMPs and other pollution controls is approximately $3.65 million per year.

10.1.2 The Anacostia River Clean Up and Protection Fund

This fund was established by the Anacostia River Clean Up and Protection Act (DC 2009), and is frequently referred to as the "Bag Law." The Bag Law generates approximately $2.0 million in revenue per year. This revenue is used by the District to fund a variety of activities including installing and maintaining trash retention projects, stream restoration projects, and watershed educational programs. The amount that is available for direct investment in new practices to keep trash and other pollutants out of District waterways is approximately $1.0 million per year.

10.1.3 Clean Water State Revolving Fund

The Clean Water State Revolving Fund (CWSRF) is a congressionally authorized loan program administered by EPA that provides low interest loans to municipalities, water agencies and other entities to help communities achieve the goals of the Clean Water Act. The District receives approximately $6 million in CWSRF funds each year, with approximately $3.1 million typically dedicated for green infrastructure projects. The remaining funds are utilized by DC Water for grey infrastructure improvements. In the case of the District, the CWSRF funds are treated as a grant, not a loan, and repayment is not required. DOEE receives approximately $7M annually in CWSRF funds, of which $3-5M are spent on stormwater capital projects (both green and grey infrastructure) to reduce pollutant loads to waterways.

The Bipartisan Infrastructure Law (BIL) will be providing significant additional funding to the CWSRF over the next five years to advance green and gray infrastructure in the District; more than $50 million of federal funds will require over $10 million of local match. As with the traditional CWSRF program, projects will be selected for funding from the Project Priority Lists each year.

10.1.4 Section 319 Grants

EPA awards Section 319 grants to states under the Clean Water Act for the implementation of nonpoint source management programs. The District receives approximately $1.0 million in Section 319 grant funds each year. Approximately one-half of this funding, or $600,000 per year, is available for direct investment in watershed and water quality oriented projects.

Section 319 funds are restricted for use in nonpoint source control – not MS4 stormwater management. Consequently, much of this funding is directed toward stream and outfall restoration projects. However, while stream restoration may not directly reduce pollutant loads from the MS4 system, it has the benefit of improving stream health, which is one of the ultimate goals of meeting MS4 WLAs. DOEE is also taking credit for "acres managed" for stream restoration projects, which helps in achieving one of the IP milestone metrics.

10.1.5 Chesapeake Bay Implementation Grants

The Chesapeake Bay Implementation Grants (CBIGs) are authorized under the Chesapeake Bay Agreement and administered by the EPA Chesapeake Bay Program. This federal funding source is given to states and the District for the purpose of implementing pollution management and control programs that primarily address nutrients (nitrogen and phosphorus) and sediment, the major pollutants affecting the quality of the Chesapeake Bay.

The District receives approximately $1.2 million in CBIG funds granted to DOEE each year. Nearly half of this amount is directed toward supporting the RiverSmart Communities Program. This program provides financial and technical assistance to District non-profit organizations and houses of worship interested in installing green infrastructure on their properties.

10.1.6 Chesapeake Bay Regulatory and Accountability Program Grants

The Chesapeake Bay Regulatory and Accountability Program (CBRAP) provides grants to support regulatory and accountability programs aimed at improving water quality in the Chesapeake Bay. CBRAP funds are authorized by Congress and administered by EPA. The funds are intended to be used for a variety of purposes, to include development and implementation of:

- Regulatory monitoring, tracking, reporting and verification activities.
- Trading and offset programs.
- Technical and compliance assistance and guidance for Watershed Implementation Programs.

The District receives approximately $700,000 in CBRAP funds each year. While this funding is used to support implementation, none of the funding is available for direct investment in BMPs and other pollution control measures.

10.1.7 Other Competitive Grants

DOEE evaluates opportunities to apply for competitive grant funds from Federal agencies and non-governmental organizations on an ongoing basis. However, these funds are not considered a core part of DOEE's funding plan for TMDL implementation or stormwater management, as neither their availability nor DOEE's ability to successfully compete for them is guaranteed.

10.1.8 Tree Fund

Through a Memorandum of Understanding (MOU), DDOT will transfer $650,000 to DOEE to plant up to 3,500 trees in FY22. This MOU represents a commitment by both agencies to continue tree planting on private properties and public spaces throughout the District. The new Request for Applications for Tree Canopy Restoration Grant as the primary vehicle to utilize these funds was published on August 28, 2020, and the two-year grant was awarded on November 9, 2020.

Through a grant with Casey Trees, trees are planted through the RiverSmart Homes Program, the Tree Rebate Program and by additional direct installation on other private and public lands (e.g., multifamily residential, cemeteries, universities, National Park lands, DC Parks and Recreation, DC Public Schools school yards, and other District lands).

10.1.9 Other District Programs

Although not tracked directly, the District does utilize other sources of funds to invest in BMPs and pollution control including green infrastructure. General funds are used for capital projects and improvements by a number of District agencies, including DDOT road reconstruction projects, public facilities construction by DGS, DC Housing Authority projects, etc. All public projects must comply with the District's stormwater management regulations, and projections.

10.2 Direct Implementation Through Private Development

10.2.1 Development / Redevelopment to Comply with Stormwater Management

The District achieves a major part of its load reductions through regulations requiring stormwater control and BMP implementation when lands are developed or re-developed. These regulations, as codified in the is 2013 Stormwater Management Rule, affect public as well as privately–owned land, and includes portions of the PROW. The cost of implementing these BMPs will be absorbed by those doing the development and redevelopment. Experience in the District shows that approximately 80 percent of the projected total stormwater volume reduction achieved towards the IP's required progress is achieved through BMPs funded to comply with these regulations.

10.2.2 Other Funding Mechanisms

The Stormwater Retention Credit (SRC) Trading Program helps to leverage private investment for green infrastructure (GI) practices that restore the District's streams and rivers. Properties in the District can generate SRCs by voluntarily installing GI or by removing impervious surfaces. The owner of a regulated site may achieve a portion of the stormwater retention volume off-site by purchasing Stormwater Retention Credits (SRCs) from another site, generating SRCs elsewhere at another site they own, or paying an In-Lieu Fee (ILF) to the District government. This provides flexibility to developers and incentivizes voluntary GI projects in the District. When a developer in the CSS purchases SRCs generated in the MS4, this essentially shifts funding to build and maintain GI from the CSS to the MS4. DOEE continues to prioritize investing in GI in the MS4 due to the CSS area ultimately being treated by the DC Clean Rivers Program.

DOEE has made a significant investment to accelerate green infrastructure retrofits in the MS4 by establishing the Stormwater Retention Credit (SRC) Price Lock Program. Green infrastructure totaling 22.5 acres has been installed through the SRC Price Lock Program, with another 1.2 acres in design, permitting, and/or construction.

To participate in the SRC Price Lock Program, SRC generators must build new, voluntary green infrastructure in the MS4. Participants have the option to sell their SRCs to DOEE at fixed prices for the first 12 years of SRC certification. This program offers certainty about the revenue from selling SRCs. All SRCs purchased through this program are retired and removed from the market, meaning they cannot be resold. DOEE has made $11.5 million available solely for SRC purchases.

10.3 Summary of Current Funding

The District currently pays for its investment in stormwater management and pollution control under the MS4 program with funds from seven separate sources. In addition, there are several other District programs that provide and invest funds in stormwater management and pollution control activities where the specific amount of funding for these purposes is not easily tracked. The seven current sources of funding are summarized in Table 10-. As shown, almost $11 million is available annually for direct investment in BMPs and other pollution control measures. This investment in BMPs is for stormwater management retrofits that are not otherwise required by the District's stormwater management regulations.

Table 10-1: Current Sources and Levels of MS4 Funding For Direct Investments in BMPs and Other Pollution Control Measures

Funding Source	Funding ($) Available for Direct Investment in Pollution Controls
Enterprise Fund	3,650,000
Anacostia River Clean Up and Protection fund	1,000,000
Clean Water State Revolving Fund	3,100,000
Section 319 Grants	600,000
Chesapeake Bay Implementation Grants	1,200,000
Chesapeake Bay Regulatory and Accountability Program Grants	700,000
DDOT Tree Fund	650,000
Total:	**10,900,000**

In addition to these funds, the investment in BMPs by regulated projects under the District's 2013 Stormwater Management Rule (including public projects) is projected to be many times greater than the investment from publicly funded BMPs and will include commitment of additional public resources for compliance with stormwater management regulations for publicly funded projects.

10.4 Overall Plan for Achieving and Funding Implementation

Achieving the pollutant load reductions and MS4 WLAs within this IP requires BMP implementation on a vast scale. Public funding and public land for BMP implementation can only meet a small proportion of what is needed to achieve WLAs. Therefore, the District relies on the 2013 Stormwater Management Rule, which extends BMP implementation beyond what can be achieved through public funding and on public land. Approximately 80 percent of the projected total stormwater volume reduction achieved towards the IP's required progress is through the construction and operation of BMPs projected to occur due to development and redevelopment in the MS4 area as a result of the District's Stormwater Regulations. Remaining implementation – the approximately 20 percent of the projected total stormwater volume reduction towards the IP's required progress that consists of ongoing BMP implementation from drivers and programs other than the stormwater regulations - is financed by a variety of funding sources, primarily consisting of those described above. The annual level of funding is currently expected to remain constant over time or to grow at a slow rate due to inflation. As discussed above, this funding is derived from many sources and it is used to administer, manage and advance the MS4 program. The available funding for this is approximately $9 million per year. Use of these funds will be for stormwater retrofits that are not otherwise required by the District's stormwater management regulations, through:

- RiverSmart Programs
- DOEE-funded Stream Restoration
- DOEE-funded Green Infrastructure Projects
- DDOT BMP Projects

In addition, DOEE continues to invest in and execute existing programmatic activities and stormwater infrastructure that contributes to load reductions. These types of programs include:

- Catch basin cleaning
- Street sweeping
- Ongoing source control efforts
- Illicit Discharge Detection and Elimination (IDDE)
- Coal tar ban
- Household hazardous waste collection
- Fertilizer control
- Leaf collection
- Education and outreach on stormwater issues
- Operation and maintenance of District-owned BMPs
- Single use product ban (Plastic straws, stirrers, and Styrofoam)
- Stormwater pollution prevention program
- Trash reduction activities (clean-up events, clean team program, and others)

10.5 Re-evaluation of the District's Stormwater Fee

Section 2.2.3 of the District's MS4 permit requires the District to complete an evaluation of the adequacy of the District's Stormwater Fee for achieving the water quality goals of the permit. This evaluation must also include an assessment of how the Stormwater Fee works in tandem with other financing options. The District completed this analysis and reported on findings as part of the 2020 MS4 Annual Report.

As summarized in the 2020 MS4 Annual report, the Stormwater Fee currently generates approximately $13.5 million each year in revenue. The Fee is charged based on a property's amount of impervious surfaces and appears on a property's DC Water bill. DC Water bills and collects the Fee on behalf of DOEE. The current monthly rate is $2.67 per 1,000 square feet (Equivalent Residential Unit, or ERU) of impervious surface. Commercial properties are billed based on individual assessments of impervious surface, while residential properties are billed according to a tiered structure.

The amount of revenue generated by the Stormwater Fee has remained flat since 2010. The monthly charge per ERU has also not changed since 2010, when the tiered structure for residential billing was introduced.

As part of the 2016 IP, the pollutant load reductions and water quality improvements that would be realized by the District's current level of funding, investment and implementation of green infrastructure were evaluated, and this analysis was used to forecast a schedule for achieving TMDL WLAs. Based on the evaluation done at this time, the current level of funding provided by the Stormwater Fee was determined to be adequate to achieve the permit's water quality goals. In addition, as part of the evaluation of the Stormwater Fee conducted to fulfill permit Section 2.2.3, DOEE concluded that increasing the Stormwater Fee was infeasible at the current time. It should be noted that the fee evaluation was conducted throughout 2020 while the financial impact of COVID 19 was still unclear but was anticipated to be substantial. However, DOEE will continue to evaluate opportunities to increase the fee on an ongoing basis.

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APPENDIX A: RESULTS OF GAP ANALYSIS

TMDL Segment	Parameter Name	Units	TMDL Allocation	Baseline Loads	Current Load	Current Gap	Percent Reduction Needed to Meet Allocation
Anacostia	**E. coli**	Billion MPN/year	2.30E+05	9.48E+05	8.72E+05	6.42E+05	73.6
Anacostia Lower	**Arsenic**	lbs/year	3.41E+00	1.02E+01	9.14E+00	5.73E+00	62.7
Anacostia Lower	**BOD**	lbs/year	9.84E+04	2.38E+05	2.20E+05	1.22E+05	55.3
Anacostia Lower	**Chlordane**	lbs/year	7.80E-03	6.51E-02	6.00E-02	5.22E-02	87.0
Anacostia Lower	**DDD**	lbs/year	8.70E-03	1.99E-02	1.77E-02	8.97E-03	50.8
Anacostia Lower	**DDE**	lbs/year	2.11E-02	8.81E-02	7.77E-02	5.66E-02	72.8
Anacostia Lower	**DDT**	lbs/year	5.70E-02	2.27E-01	2.00E-01	1.43E-01	71.6
Anacostia Lower	**Dieldrin**	lbs/year	3.50E-03	1.92E-03	1.80E-03	0.00E+00	0.0
Anacostia Lower	**Heptachlor Epoxide**	lbs/year	2.00E-03	6.34E-03	5.92E-03	3.92E-03	66.2
Anacostia Lower	**PAH1**	lbs/year	1.06E-01	4.36E+00	4.07E+00	3.97E+00	97.4
Anacostia Lower	**PAH2**	lbs/year	6.41E-01	2.75E+01	2.51E+01	2.45E+01	97.5
Anacostia Lower	**PAH3**	lbs/year	4.09E-01	1.78E+01	1.55E+01	1.51E+01	97.4
Anacostia Lower	**Total Nitrogen**	lbs/year	5.17E+03	2.20E+04	1.99E+04	1.48E+04	74.1
Anacostia Lower	**Total Phosphorus**	lbs/year	5.09E+02	2.52E+03	2.14E+03	1.63E+03	76.2
Anacostia Lower	**Trash**	lbs/year	2.45E+04	2.40E+04	0.00E+00	0.00E+00	0.0
Anacostia Lower	**TSS**	lbs/year	9.28E+04	4.86E+05	4.23E+05	3.30E+05	78.0
Anacostia Lower	**Zinc**	lbs/year	1.34E+03	8.01E+02	7.08E+02	0.00E+00	0.0
Anacostia Upper	**Arsenic**	lbs/year	1.44E+00	4.84E+01	4.54E+01	4.40E+01	96.8
Anacostia Upper	**BOD**	lbs/year	1.82E+05	1.13E+06	1.09E+06	9.05E+05	83.3
Anacostia Upper	**Chlordane**	lbs/year	1.41E-02	3.09E-01	2.96E-01	2.82E-01	95.2
Anacostia Upper	**DDD**	lbs/year	5.20E-03	9.44E-02	8.80E-02	8.28E-02	94.1
Anacostia Upper	**DDE**	lbs/year	1.27E-02	4.18E-01	3.88E-01	3.75E-01	96.7
Anacostia Upper	**DDT**	lbs/year	3.40E-02	1.08E+00	9.99E-01	9.65E-01	96.6
Anacostia Upper	**Dieldrin**	lbs/year	8.20E-03	9.12E-03	8.84E-03	6.39E-04	7.2
Anacostia Upper	**Heptachlor Epoxide**	lbs/year	4.10E-03	3.01E-02	2.92E-02	2.51E-02	85.9
Anacostia Upper	**PAH1**	lbs/year	1.93E-01	2.07E+01	2.01E+01	1.99E+01	99.0
Anacostia Upper	**PAH2**	lbs/year	1.14E+00	1.31E+02	1.24E+02	1.23E+02	99.1
Anacostia Upper	**PAH3**	lbs/year	7.30E-01	8.44E+01	7.75E+01	7.67E+01	99.1
Anacostia Upper	**Total Nitrogen**	lbs/year	1.05E+04	1.04E+05	9.89E+04	8.84E+04	89.4
Anacostia Upper	**Total Phosphorus**	lbs/year	9.66E+02	1.20E+04	1.06E+04	9.64E+03	90.9
Anacostia Upper	**Trash**	lbs/year	8.39E+04	9.92E+04	0.00E+00	0.00E+00	0.0
Anacostia Upper	**TSS**	lbs/year	1.69E+05	2.31E+06	2.11E+06	1.94E+06	92.0
Anacostia Upper	**Zinc**	lbs/year	2.39E+03	3.80E+03	3.53E+03	1.14E+03	32.4

TMDL Segment	Parameter Name	Units	TMDL Allocation	Baseline Loads	Current Load	Current Gap	Percent Reduction Needed to Meet Allocation
ANATF_DC	**Total Nitrogen**	lbs/year	4.95E+04	1.04E+05	9.94E+04	4.99E+04	50.2
ANATF_DC	**Total Phosphorus**	lbs/year	3.48E+03	1.19E+04	1.07E+04	7.18E+03	67.3
ANATF_DC	**TSS**	lbs/year	3.89E+06	2.32E+06	2.12E+06	0.00E+00	0.0
ANATF_MD	**Total Nitrogen**	lbs/year	1.01E+04	3.51E+04	3.43E+04	2.41E+04	70.5
ANATF_MD	**Total Phosphorus**	lbs/year	1.45E+03	4.02E+03	3.72E+03	2.27E+03	61.0
ANATF_MD	**TSS**	lbs/year	2.61E+06	7.75E+05	7.48E+05	0.00E+00	0.0
Battery Kemble Creek	**E. coli**	Billion MPN/year	7.04E+01	8.20E+03	7.97E+03	7.90E+03	99.1
Broad Branch	**Chlordane**	lbs/year	2.79E-03	3.71E-02	3.59E-02	3.31E-02	92.2
Broad Branch	**Dieldrin**	lbs/year	1.86E-04	1.09E-03	1.06E-03	8.74E-04	82.5
Broad Branch	**Heptachlor Epoxide**	lbs/year	1.34E-04	3.61E-03	3.50E-03	3.36E-03	96.2
C&O Canal	**E. coli**	Billion MPN/year	9.59E+01	4.48E+04	4.20E+04	4.19E+04	99.8
Dalecarlia Tributary	**Dieldrin**	lbs/year	2.00E-04	1.15E-03	1.13E-03	9.25E-04	82.2
Dalecarlia Tributary	**E. coli**	Billion MPN/year	4.01E+02	9.89E+04	9.57E+04	9.53E+04	99.6
Dalecarlia Tributary	**Heptachlor Epoxide**	lbs/year	1.44E-04	3.80E-03	3.71E-03	3.57E-03	96.1
Dumbarton Oaks	**Chlordane**	lbs/year	5.34E-05	6.35E-04	6.32E-04	5.79E-04	91.6
Dumbarton Oaks	**Dieldrin**	lbs/year	3.56E-06	1.87E-05	1.86E-05	1.51E-05	80.9
Dumbarton Oaks	**Heptachlor Epoxide**	lbs/year	2.57E-06	6.18E-05	6.15E-05	5.90E-05	95.8
Fenwick Branch	**DDT**	lbs/year	1.28E-04	2.12E-02	2.06E-02	2.05E-02	99.4
Fenwick Branch	**Dieldrin**	lbs/year	3.15E-05	1.79E-04	1.75E-04	1.44E-04	82.0
Fenwick Branch	**Heptachlor Epoxide**	lbs/year	2.27E-05	5.92E-04	5.78E-04	5.55E-04	96.1
Fort Chaplin Tributary	**Arsenic**	lbs/year	3.80E-01	8.30E-01	8.05E-01	4.25E-01	52.8
Fort Chaplin Tributary	**E. coli**	Billion MPN/year	1.32E-03	1.34E+04	1.29E+04	1.29E+04	100.0
Fort Davis Tributary	**Arsenic**	lbs/year	1.00E-01	3.78E-01	3.67E-01	2.67E-01	72.8
Fort Davis Tributary	**E. coli**	Billion MPN/year	8.17E-04	6.11E+03	5.93E+03	5.93E+03	100.0
Fort Dupont Tributary	**Arsenic**	lbs/year	1.70E-01	3.25E-01	2.97E-01	1.27E-01	42.8
Fort Dupont Tributary	**E. coli**	Billion MPN/year	2.34E-03	5.26E+03	4.77E+03	4.77E+03	100.0
Fort Stanton Tributary	**Arsenic**	lbs/year	5.00E-02	2.35E-01	2.22E-01	1.72E-01	77.5
Fort Stanton Tributary	**E. coli**	Billion MPN/year	1.08E-03	3.80E+03	3.58E+03	3.58E+03	100.0
Fort Stanton Tributary	**PAH1**	lbs/year	7.80E-02	1.01E-01	9.53E-02	1.73E-02	18.2

TMDL Segment	Parameter Name	Units	TMDL Allocation	Baseline Loads	Current Load	Current Gap	Percent Reduction Needed to Meet Allocation
Fort Stanton Tributary	**PAH2**	lbs/year	9.00E-03	6.36E-01	6.00E-01	5.91E-01	98.5
Fort Stanton Tributary	**PAH3**	lbs/year	6.00E-03	4.10E-01	3.85E-01	3.79E-01	98.4
Foundry Branch	**E. coli**	Billion MPN/year	6.85E+01	1.13E+04	1.10E+04	1.09E+04	99.4
Hickey Run	**Chlordane**	lbs/year	1.42E-02	3.96E-02	3.75E-02	2.33E-02	62.2
Hickey Run	**DDE**	lbs/year	6.90E-03	5.36E-02	4.78E-02	4.09E-02	85.6
Hickey Run	**E. coli**	Billion MPN/year	6.31E-03	1.00E+05	8.96E+04	8.96E+04	100.0
Hickey Run	**PAH1**	lbs/year	3.88E+00	2.66E+00	2.56E+00	0.00E+00	0.0
Hickey Run	**PAH2**	lbs/year	4.70E-01	1.68E+01	1.56E+01	1.51E+01	97.0
Hickey Run	**PAH3**	lbs/year	3.00E-01	1.08E+01	9.46E+00	9.16E+00	96.8
Kingman Lake	**Arsenic**	lbs/year	3.97E-02	2.14E+00	2.04E+00	2.00E+00	98.1
Kingman Lake	**Chlordane**	lbs/year	1.78E-04	1.37E-02	1.31E-02	1.29E-02	98.6
Kingman Lake	**DDT**	lbs/year	7.77E-03	4.75E-02	4.51E-02	3.73E-02	82.8
Kingman Lake	**PAH1**	lbs/year	1.20E-01	9.15E-01	8.81E-01	7.61E-01	86.4
Kingman Lake	**PAH2**	lbs/year	7.08E+00	5.78E+00	5.53E+00	0.00E+00	0.0
Kingman Lake	**PAH3**	lbs/year	4.50E-01	3.73E+00	3.52E+00	3.07E+00	87.2
Klingle Valley Run	**Dieldrin**	lbs/year	2.64E-05	1.54E-04	1.46E-04	1.20E-04	82.0
Klingle Valley Run	**Heptachlor Epoxide**	lbs/year	1.90E-05	5.09E-04	4.83E-04	4.64E-04	96.1
Lower Beaverdam Creek	**BOD**	lbs/year	4.03E+02	4.50E+02	4.49E+02	4.57E+01	10.2
Lower Beaverdam Creek	**Total Nitrogen**	lbs/year	4.50E+01	4.15E+01	4.14E+01	0.00E+00	0.0
Lower Beaverdam Creek	**Total Phosphorus**	lbs/year	6.00E+00	4.76E+00	4.67E+00	0.00E+00	0.0
Lower Beaverdam Creek	**TSS**	lbs/year	1.20E+03	9.18E+02	9.07E+02	0.00E+00	0.0
Luzon Branch	**Chlordane**	lbs/year	2.13E-03	2.73E-02	2.67E-02	2.46E-02	92.0
Luzon Branch	**Dieldrin**	lbs/year	1.42E-04	8.07E-04	7.89E-04	6.47E-04	82.0
Luzon Branch	**Heptachlor Epoxide**	lbs/year	1.03E-04	2.66E-03	2.60E-03	2.50E-03	96.0
Melvin Hazen Valley Branch	**Dieldrin**	lbs/year	2.19E-05	1.37E-04	1.33E-04	1.11E-04	83.5
Nash Run	**Arsenic**	lbs/year	8.60E-01	2.20E+00	2.08E+00	1.22E+00	58.7
Nash Run	**Chlordane**	lbs/year	3.20E-03	1.41E-02	1.33E-02	1.01E-02	76.0
Nash Run	**Dieldrin**	lbs/year	3.29E-04	4.15E-04	3.93E-04	6.43E-05	16.4
Nash Run	**Heptachlor Epoxide**	lbs/year	3.10E-04	1.37E-03	1.30E-03	9.88E-04	76.1
Nash Run	**PAH1**	lbs/year	1.59E+00	9.43E-01	8.93E-01	0.00E+00	0.0
Nash Run	**PAH2**	lbs/year	1.92E-01	5.95E+00	5.63E+00	5.44E+00	96.6
Nash Run	**PAH3**	lbs/year	1.23E-01	3.84E+00	3.62E+00	3.50E+00	96.6

TMDL Segment	Parameter Name	Units	TMDL Allocation	Baseline Loads	Current Load	Current Gap	Percent Reduction Needed to Meet Allocation
Normanstone Creek	**Dieldrin**	lbs/year	3.49E-05	2.17E-04	2.12E-04	1.77E-04	83.6
Normanstone Creek	**Heptachlor Epoxide**	lbs/year	2.52E-05	7.16E-04	7.00E-04	6.75E-04	96.4
Northwest Branch	**BOD**	lbs/year	1.44E+04	2.95E+05	2.84E+05	2.70E+05	94.9
Northwest Branch	**Total Nitrogen**	lbs/year	1.96E+03	2.72E+04	2.61E+04	2.42E+04	92.5
Northwest Branch	**Total Phosphorus**	lbs/year	1.62E+02	3.12E+03	2.84E+03	2.67E+03	94.3
Northwest Branch	**TSS**	lbs/year	5.24E+04	6.02E+05	5.69E+05	5.17E+05	90.8
Oxon Run	**Dieldrin**	lbs/year	4.02E-04	2.37E-03	2.31E-03	1.91E-03	82.6
Oxon Run	**E. coli**	Billion MPN/year	9.52E+03	2.03E+05	1.96E+05	1.86E+05	95.1
Pinehurst Branch	**Dieldrin**	lbs/year	4.75E-05	2.74E-04	2.69E-04	2.21E-04	82.3
Pinehurst Branch	**Heptachlor Epoxide**	lbs/year	3.43E-05	9.03E-04	8.88E-04	8.53E-04	96.1
Piney Branch	**Chlordane**	lbs/year	1.28E-04	1.70E-03	1.62E-03	1.49E-03	92.1
Piney Branch	**Dieldrin**	lbs/year	8.51E-06	5.00E-05	4.80E-05	3.95E-05	82.3
Piney Branch	**Heptachlor Epoxide**	lbs/year	6.15E-06	1.65E-04	1.58E-04	1.52E-04	96.1
Pope Branch	**Chlordane**	lbs/year	1.70E-03	5.77E-03	5.69E-03	3.99E-03	70.1
Pope Branch	**DDE**	lbs/year	1.60E-03	7.81E-03	7.66E-03	6.06E-03	79.1
Pope Branch	**E. coli**	Billion MPN/year	1.67E-03	1.46E+04	1.43E+04	1.43E+04	100.0
Pope Branch	**Heptachlor Epoxide**	lbs/year	1.90E-04	5.62E-04	5.54E-04	3.64E-04	65.7
Pope Branch	**PAH1**	lbs/year	8.04E-01	3.87E-01	3.81E-01	0.00E+00	0.0
Pope Branch	**PAH2**	lbs/year	9.30E-02	2.44E+00	2.40E+00	2.31E+00	96.1
Pope Branch	**PAH3**	lbs/year	5.90E-02	1.58E+00	1.54E+00	1.48E+00	96.2
Portal Branch	**Dieldrin**	lbs/year	1.19E-05	6.75E-05	6.63E-05	5.44E-05	82.1
Portal Branch	**Heptachlor Epoxide**	lbs/year	8.60E-06	2.23E-04	2.19E-04	2.10E-04	96.1
Potomac Lower	**E. coli**	Billion MPN/year	2.65E+05	3.98E+05	3.83E+05	1.18E+05	30.9
Potomac Middle	**E. coli**	Billion MPN/year	1.24E+04	1.04E+05	1.00E+05	8.80E+04	87.7
Potomac Upper	**E. coli**	Billion MPN/year	2.35E+05	2.71E+05	2.61E+05	2.57E+04	9.9
POTTF_DC	**Total Nitrogen**	lbs/year	5.31E+04	1.31E+05	1.27E+05	7.44E+04	58.4
POTTF_DC	**Total Phosphorus**	lbs/year	4.13E+03	1.50E+04	1.39E+04	9.75E+03	70.2
POTTF_DC	**TSS**	lbs/year	7.64E+06	2.20E+06	1.93E+06	0.00E+00	0.0
POTTF_MD	**Total Nitrogen**	lbs/year	8.32E+03	1.58E+04	1.55E+04	7.19E+03	46.4
POTTF_MD	**Total Phosphorus**	lbs/year	5.96E+02	1.82E+03	1.69E+03	1.10E+03	64.8
POTTF_MD	**TSS**	lbs/year	1.53E+06	2.30E+05	1.95E+05	0.00E+00	0.0
Rock Creek Lower	**Copper**	lbs/year	2.09E+02	2.31E+02	2.22E+02	1.32E+01	5.9

TMDL Segment	Parameter Name	Units	TMDL Allocation	Baseline Loads	Current Load	Current Gap	Percent Reduction Needed to Meet Allocation
Rock Creek Lower	**E. coli**	Billion MPN/year	1.01E+04	1.09E+05	1.04E+05	9.41E+04	90.3
Rock Creek Lower	**Lead**	lbs/year	1.55E+01	6.98E+01	6.65E+01	5.11E+01	76.8
Rock Creek Lower	**Mercury**	lbs/year	6.30E-01	8.32E-01	7.99E-01	1.69E-01	21.1
Rock Creek Lower	**Zinc**	lbs/year	6.04E+02	4.45E+02	4.26E+02	0.00E+00	0.0
Rock Creek Upper	**Copper**	lbs/year	5.93E+02	6.63E+02	6.41E+02	4.80E+01	7.5
Rock Creek Upper	**E. coli**	Billion MPN/year	2.87E+04	3.12E+05	3.01E+05	2.73E+05	90.5
Rock Creek Upper	**Lead**	lbs/year	4.39E+01	2.00E+02	1.93E+02	1.49E+02	77.2
Rock Creek Upper	**Mercury**	lbs/year	1.78E+00	2.38E+00	2.30E+00	5.24E-01	22.8
Rock Creek Upper	**Zinc**	lbs/year	1.72E+03	1.28E+03	1.23E+03	0.00E+00	0.0
Soapstone Creek	**Chlordane**	lbs/year	1.45E-03	1.93E-02	1.88E-02	1.73E-02	92.3
Soapstone Creek	**Dieldrin**	lbs/year	9.67E-05	5.70E-04	5.55E-04	4.59E-04	82.6
Soapstone Creek	**Heptachlor Epoxide**	lbs/year	6.98E-05	1.88E-03	1.83E-03	1.76E-03	96.2
Texas Avenue Tributary	**Arsenic**	lbs/year	4.00E-01	4.00E-01	3.56E-01	0.00E+00	0.0
Texas Avenue Tributary	**Chlordane**	lbs/year	1.30E-03	2.55E-03	2.27E-03	9.74E-04	42.8
Texas Avenue Tributary	**DDD**	lbs/year	6.99E-03	7.79E-04	6.93E-04	0.00E+00	0.0
Texas Avenue Tributary	**DDE**	lbs/year	1.20E-03	3.46E-03	3.07E-03	1.87E-03	60.9
Texas Avenue Tributary	**DDT**	lbs/year	4.01E-02	8.89E-03	7.89E-03	0.00E+00	0.0
Texas Avenue Tributary	**Dieldrin**	lbs/year	1.74E-04	7.53E-05	6.72E-05	0.00E+00	0.0
Texas Avenue Tributary	**E. coli**	Billion MPN/year	1.36E-03	6.47E+03	5.75E+03	5.75E+03	100.0
Texas Avenue Tributary	**Heptachlor Epoxide**	lbs/year	1.40E-04	2.49E-04	2.22E-04	8.16E-05	36.8
Texas Avenue Tributary	**PAH1**	lbs/year	6.13E-01	1.71E-01	1.52E-01	0.00E+00	0.0
Texas Avenue Tributary	**PAH2**	lbs/year	7.10E-02	1.08E+00	9.62E-01	8.91E-01	92.6
Texas Avenue Tributary	**PAH3**	lbs/year	4.50E-02	6.97E-01	6.19E-01	5.74E-01	92.7
Tidal Basin	**E. coli**	Billion MPN/year	5.53E+04	2.58E+04	2.54E+04	0.00E+00	0.0
Washington Ship Channel	**E. coli**	Billion MPN/year	1.83E+05	6.66E+04	6.33E+04	0.00E+00	0.0
Washington Ship Channel	**Total Phosphorus**	lbs/year	9.77E+02	1.02E+03	9.43E+02	0.00E+00	0.0
Watts Branch	**BOD**	lbs/year	1.43E+04	1.68E+05	1.61E+05	1.47E+05	91.1
Watts Branch	**Total Nitrogen**	lbs/year	1.73E+03	1.55E+04	1.48E+04	1.31E+04	88.3
Watts Branch	**Total Phosphorus**	lbs/year	2.48E+02	1.78E+03	1.60E+03	1.36E+03	84.5

TMDL Segment	Parameter Name	Units	TMDL Allocation	Baseline Loads	Current Load	Current Gap	Percent Reduction Needed to Meet Allocation
Watts Branch	**TSS**	lbs/year	4.84E+04	3.43E+05	3.21E+05	2.73E+05	84.9
Watts Branch - Lower	**Chlordane**	lbs/year	3.70E-03	1.19E-02	1.14E-02	7.68E-03	67.5
Watts Branch - Lower	**Dieldrin**	lbs/year	3.68E-04	3.52E-04	3.40E-04	0.00E+00	0.0
Watts Branch - Lower	**TSS**	lbs/year	1.12E+04	8.90E+04	8.05E+04	6.93E+04	86.1
Watts Branch - Upper	**Chlordane**	lbs/year	9.60E-03	3.40E-02	3.29E-02	2.33E-02	70.8
Watts Branch - Upper	**Dieldrin**	lbs/year	9.45E-04	1.00E-03	9.74E-04	2.86E-05	2.9
Watts Branch - Upper	**TSS**	lbs/year	2.96E+04	2.54E+05	2.41E+05	2.11E+05	87.7

APPENDIX B: FORECASTED ATTAINMENT FOR ALL WLAS

TMDL Segment	Major Watershed	Pollutant	Forecasted Attainment Date
Texas Avenue Tributary	Anacostia	Arsenic	2020
Texas Avenue Tributary	Anacostia	DDD	2020
Texas Avenue Tributary	Anacostia	DDT	2020
Anacostia Lower	Anacostia	Dieldrin	2020
Texas Avenue Tributary	Anacostia	Dieldrin	2020
Watts Branch - Lower	Anacostia	Dieldrin	2020
Tidal Basin	Potomac	E. coli	2020
Washington Ship Channel	Potomac	E. coli	2020
Hickey Run	Anacostia	PAH1	2020
Nash Run	Anacostia	PAH1	2020
Pope Branch	Anacostia	PAH1	2020
Texas Avenue Tributary	Anacostia	PAH1	2020
Kingman Lake	Anacostia	PAH2	2020
Lower Beaverdam Creek	Anacostia	TN	2020
Lower Beaverdam Creek	Anacostia	TP	2020
Washington Ship Channel	Potomac	TP	2020
ANATF_DC	Anacostia	TSS	2020
ANATF_MD	Anacostia	TSS	2020
Lower Beaverdam Creek	Anacostia	TSS	2020
POTTF_DC	Potomac	TSS	2020
POTTF_MD	Potomac	TSS	2020
Anacostia Lower	Anacostia	Zinc	2020
Rock Creek Lower	Rock Creek	Zinc	2020
Rock Creek Upper	Rock Creek	Zinc	2020
Watts Branch - Upper	Anacostia	Dieldrin	2024
Rock Creek Lower	Rock Creek	Copper	2033
Rock Creek Upper	Rock Creek	Copper	2036
Anacostia Upper	Anacostia	Dieldrin	2036
Nash Run	Anacostia	Dieldrin	2043
Potomac Upper	Potomac	E. coli	2044
Lower Beaverdam Creek	Anacostia	BOD	2051
Fort Stanton Tributary	Anacostia	PAH1	2053
Rock Creek Lower	Rock Creek	Mercury	2057
Rock Creek Upper	Rock Creek	Mercury	2060
Potomac Lower	Potomac	E. coli	2063
Anacostia Upper	Anacostia	Zinc	2068
Texas Avenue Tributary	Anacostia	Heptachlor Epoxide	2080
Texas Avenue Tributary	Anacostia	Chlordane	2088

TMDL Segment	Major Watershed	Pollutant	Forecasted Attainment Date
Anacostia Lower	Anacostia	DDD	2090
Fort Dupont Tributary	Anacostia	Arsenic	2092
ANATF_DC	Anacostia	TN	2094
POTTF_MD	Potomac	TN	2097
Anacostia Lower	Anacostia	BOD	2102
POTTF_DC	Potomac	TN	2106
Fort Chaplin Tributary	Anacostia	Arsenic	2107
Hickey Run	Anacostia	Chlordane	2108
ANATF_MD	Anacostia	TP	2109
Anacostia Lower	Anacostia	Arsenic	2111
Texas Avenue Tributary	Anacostia	DDE	2111
Watts Branch - Lower	Anacostia	Chlordane	2113
Nash Run	Anacostia	Arsenic	2114
ANATF_DC	Anacostia	TP	2114
POTTF_MD	Potomac	TP	2117
POTTF_DC	Potomac	TP	2119
Pope Branch	Anacostia	Heptachlor Epoxide	2120
Kingman Lake	Anacostia	DDT	2121
Anacostia Lower	Anacostia	Heptachlor Epoxide	2122
Dumbarton Oaks	Rock Creek	Dieldrin	2123
Pope Branch	Anacostia	Chlordane	2125
Anacostia Lower	Anacostia	DDT	2125
Kingman Lake	Anacostia	PAH3	2126
Anacostia Lower	Anacostia	DDE	2127
Anacostia	Anacostia	E. coli	2127
Kingman Lake	Anacostia	PAH1	2127
ANATF_MD	Anacostia	TN	2127
Anacostia Lower	Anacostia	TP	2127
Watts Branch - Upper	Anacostia	Chlordane	2130
Watts Branch - Lower	Anacostia	TSS	2131
Anacostia Lower	Anacostia	TN	2132
Dumbarton Oaks	Rock Creek	Chlordane	2134
Hickey Run	Anacostia	DDE	2134
Rock Creek Lower	Rock Creek	Lead	2134
Anacostia Lower	Anacostia	TSS	2134
Fort Davis Tributary	Anacostia	Arsenic	2136
Pope Branch	Anacostia	DDE	2137
Fort Stanton Tributary	Anacostia	Arsenic	2138
Kingman Lake	Anacostia	Arsenic	2138
Dumbarton Oaks	Rock Creek	Heptachlor Epoxide	2138

TMDL Segment	Major Watershed	Pollutant	Forecasted Attainment Date
Potomac Middle	Potomac	E. coli	2139
Kingman Lake	Anacostia	Chlordane	2140
Rock Creek Upper	Rock Creek	Lead	2141
Klingle Valley Run	Rock Creek	Dieldrin	2142
Piney Branch	Rock Creek	Dieldrin	2142
Nash Run	Anacostia	Chlordane	2143
Watts Branch	Anacostia	TP	2143
Dalecarlia Tributary	Potomac	Dieldrin	2144
Soapstone Creek	Rock Creek	Dieldrin	2144
Nash Run	Anacostia	Heptachlor Epoxide	2144
Anacostia Upper	Anacostia	BOD	2145
Fenwick Branch	Rock Creek	Dieldrin	2145
Portal Branch	Rock Creek	Dieldrin	2146
Hickey Run	Anacostia	PAH3	2146
Anacostia Upper	Anacostia	TP	2146
Melvin Hazen Valley Branch	Rock Creek	Dieldrin	2147
Broad Branch	Rock Creek	Dieldrin	2148
Pinehurst Branch	Rock Creek	Dieldrin	2148
Watts Branch	Anacostia	TSS	2149
Oxon Run	Potomac	Dieldrin	2150
Anacostia Upper	Anacostia	Heptachlor Epoxide	2150
Northwest Branch	Anacostia	TP	2151
Northwest Branch	Anacostia	TSS	2151
Anacostia Upper	Anacostia	TN	2152
Anacostia Upper	Anacostia	TSS	2152
Hickey Run	Anacostia	E. coli	2153
Rock Creek Lower	Rock Creek	E. coli	2153
Texas Avenue Tributary	Anacostia	PAH3	2153
Hickey Run	Anacostia	PAH2	2154
Texas Avenue Tributary	Anacostia	PAH2	2154
Piney Branch	Rock Creek	Chlordane	2155
Normanstone Creek	Rock Creek	Dieldrin	2155
Northwest Branch	Anacostia	TN	2155
Watts Branch - Upper	Anacostia	TSS	2155
Watts Branch	Anacostia	TN	2156
Anacostia Lower	Anacostia	Chlordane	2157
Soapstone Creek	Rock Creek	Chlordane	2157
Anacostia Upper	Anacostia	DDD	2157
C&O Canal	Potomac	E. coli	2157
Northwest Branch	Anacostia	BOD	2159

TMDL Segment	Major Watershed	Pollutant	Forecasted Attainment Date
Anacostia Upper	Anacostia	DDE	2160
Anacostia Upper	Anacostia	DDT	2160
Foundry Branch	Potomac	E. coli	2160
Pope Branch	Anacostia	PAH3	2160
Watts Branch	Anacostia	BOD	2161
Broad Branch	Rock Creek	Chlordane	2161
Rock Creek Upper	Rock Creek	E. coli	2161
Klingle Valley Run	Rock Creek	Heptachlor Epoxide	2161
Pope Branch	Anacostia	PAH2	2161
Anacostia Upper	Anacostia	Arsenic	2162
Luzon Branch	Rock Creek	Dieldrin	2162
Piney Branch	Rock Creek	Heptachlor Epoxide	2162
Anacostia Upper	Anacostia	PAH3	2162
Anacostia Upper	Anacostia	Chlordane	2163
Battery Kemble Creek	Potomac	E. coli	2163
Texas Avenue Tributary	Anacostia	E. coli	2163
Dalecarlia Tributary	Potomac	Heptachlor Epoxide	2163
Soapstone Creek	Rock Creek	Heptachlor Epoxide	2163
Pope Branch	Anacostia	E. coli	2165
Fenwick Branch	Rock Creek	Heptachlor Epoxide	2165
Portal Branch	Rock Creek	Heptachlor Epoxide	2165
Dalecarlia Tributary	Potomac	E. coli	2166
Anacostia Lower	Anacostia	PAH3	2166
Broad Branch	Rock Creek	Heptachlor Epoxide	2167
Pinehurst Branch	Rock Creek	Heptachlor Epoxide	2167
Anacostia Upper	Anacostia	PAH2	2167
Fort Stanton Tributary	Anacostia	PAH3	2167
Oxon Run	Potomac	E. coli	2168
Fort Stanton Tributary	Anacostia	PAH2	2168
Fenwick Branch	Rock Creek	DDT	2169
Fort Dupont Tributary	Anacostia	E. coli	2169
Fort Stanton Tributary	Anacostia	E. coli	2170
Anacostia Upper	Anacostia	PAH1	2170
Anacostia Lower	Anacostia	PAH2	2174
Fort Davis Tributary	Anacostia	E. coli	2175
Normanstone Creek	Rock Creek	Heptachlor Epoxide	2175
Fort Chaplin Tributary	Anacostia	E. coli	2176
Anacostia Lower	Anacostia	PAH1	2177
Nash Run	Anacostia	PAH2	2178
Nash Run	Anacostia	PAH3	2178

TMDL Segment	Major Watershed	Pollutant	Forecasted Attainment Date
Luzon Branch	Rock Creek	Chlordane	2181
Luzon Branch	Rock Creek	Heptachlor Epoxide	2189

APPENDIX C: TMDL FACT SHEETS

INTRODUCTION

This Appendix provides summaries of each TMDL that has been developed for District waters. TMDL information is presented in fact sheet format for easy reference. The fact sheets include information such as the name of the TMDL document; the approval date; summaries of the modeling approach and event mean concentrations (EMCs) used in the modeling; summaries of numeric point source MS4 wasteload allocations (WLAs) and nonpoint source Load Allocations (LAs); notes on implementation expectations; and lists of reference documents.

It should be noted that multiple TMDLs in the District have undergone revision or replacement over time. For example, the 2001 BOD and 2002 TSS TMDLs for the Anacostia River in the District were replaced by the 2008 BOD/Nutrients and the 2007 TSS TMDLs, respectively, for the larger Anacostia watershed in the District and Maryland. In these cases, WLAs and LAs in the older TMDLs were superseded by WLAs and LAs in the newer TMDLs. However, the older TMDLs are still retained in this Appendix for historical and completeness purposes. In a different case, all fecal coliform TMDLs in the District were revised to *E. coli* as a result of change in water quality standards. For these TMDLs, WLAs and LAs replacing fecal coliform with *E. coli* were included by revising the original TMDL to include new appendices with the updated allocations. In the fact sheets for these TMDLs, there are notes indicating that the original fecal coliform WLAs and LAs have been replaced with *E. coli* WLAs and LAs. Yet a third situation occurred with a number of organics and pesticides TMDLs, where completely new TMDL documents were developed to replace the original TMDLs. This process resulted in multiple older TMDL studies being consolidated into one updated TMDL study. Finally, the District has published draft TMDL studies (e.g., *Total Maximum Daily Loads for Organics and Metals in the Anacostia River Watershed*) that are not included in this Appendix because they are not yet finalized.

A short summary of changes in TMDLs, WLAs and LAs over time is presented below. These changes are reflected in the fact sheets that follow.

- 2001 BOD and 2002 TSS TMDLs for the Anacostia River in the District were replaced by the 2008 BOD/Nutrients TMDL for the Anacostia Watershed in the District and Maryland and the 2007 TSS TMDL for the Anacostia Watershed in the District and Maryland, respectively.
- All fecal coliform WLAs and LAs in original bacteria TMDLs replaced by *E. coli* WLAs and LAs. This was done on a TMDL-by-TMDL basis.
- Metals WLAs and LAs in the 2004 TMDL for Metals in the Rock Creek Mainstem were revised in 2016.
- Organics WLAs and LAs in the 2004 TMDL for Metals and Organics in Oxon Run were replaced by updated organics WLAs and LAs in the *Total Maximum Daily Loads of Organochlorine Pesticides and Polychlorinated Biphenyls in Broad Branch, Dalecarlia Tributary, Dumbarton Oaks, Fenwick Branch, Klingle Valley Creek, Luzon Branch, Melvin Hazen Valley Branch, Normanstone Creek, Oxon Run, Piney Branch, Pinehurst Branch, Portal Branch, and Soapstone Creek in the District of*

*Columbia (*aka the *"*Revised TMDL for Organics and PCBs in Potomac and Rock Creek Tributaries"*).*

- Metals WLAs and LAs in the 2004 TMDL for metals and organics in Oxon Run are no longer valid because the *"*Revised TMDL for Organics and PCBs in Potomac and Rock Creek Tributaries" found that metals were no longer impairing Oxon Run.
- The 2004 Total Maximum Daily Loads for Organics and Metals in Battery Kemble Creek, Foundry Branch, and Dalecarlia Tributary is no longer valid. The *"*Revised TMDL for Organics and PCBs in Potomac and Rock Creek Tributaries" updated organics WLAs and LAs and found that metals were no longer impairing the Dalecarlia Tributary. This revised TMDL also found that organics and metals were no longer impairing Battery Kemble Creek or Foundry Branch.

Anacostia Watershed

List of Tables

Table B- 1. Hickey Run TMDL Water Quality Management Plan to Control Oil and Grease, PCB & Chlordane	
BACKGROUND	
Issue Date	1998
Author	DC DoH
303(d) Listing	1996
Impairments and Pollutant Causes	Class D: Protection of human health related to consumption of fish and shellfish. Causes of impairment: oil and grease, pH, pathogens, and other pollutants. (Reference: 1)
Impairment Notes	N/A
Sources of Pollutants	Chronic discharge of oil and by-products, runoff, and polluted groundwater. (Reference: 1)
MODELING	
Modeling approach	N/A
EMCs	Because of the nature of the discharges, EMCs could not be estimated even with available monitoring data. (Reference: 1)
ALLOCATIONS	
Allocation notes	There was no specific WLA or LA developed for oil and grease, but in accordance with D.C. WQS the allowable concentration of oil and grease in D.C. waters is 10 mg/L for class C waters. This is the concentration at which a visible sheen occurs. (Reference: 1)
	Water quality monitoring data indicates that PCB and chlordane are below the detection limits in the water column, but because these pollutants have been a major concern in the District regarding public health, it is the policy in the District not to allow any discharge of PCB or chlordane into the waters. (Reference: 1)
IMPLEMENTATION	
Implementation	The TMDL for oil and grease will be implemented through management actions focusing on identifying and controlling sources. The TMDLs for chlordane and PCBs will be implemented by prohibiting the discharge of these pollutants into Hickey Run. (Reference: 1)
Other issues	
REFERENCES AND IMPORTANT DOCUMENTS	
1	Hickey Run TMDL Water Quality Management Plan to Control Oil and Grease, PCB & Chlordane, DC DoH, January 1998

Table B- 2. Total Maximum Daily Load for BOD in Upper and Lower Anacostia		
BACKGROUND		
Issue Date	2001	
Author	DC DoH	
303(d) listing	1996 and 1998	
Impairments and Pollutant Causes	Mainstem Anacostia, Upper and Lower segments: Protection of human health related to consumption of fish and shellfish. Causes of impairment: BOD, Nitrogen, and Phosphorus. (Reference: 1)	
Impairment Notes		
Sources of Pollutants	CSOs, SSOs, direct drainage, and Upstream sources. (Reference: 1)	
MODELING		
Modeling Approach	Modeling framework includes four components, the Tidal Anacostia Model (TAM), Water Quality Simulation Program (WASP), Water Transport, and the Sediment Diagenesis Model. (Reference: 1)	
EMCs	The daily input load for each of the eight modeled constituents for each model segment were generally calculated differently for each of the five different sources of flow, and were often calculated differently for each constituent. (Reference: 3)	
ALLOCATIONS		
WLAs	No MS4 WLAs	
Annual Ave. LAs (lbs/year)	Upper Anacostia	• BOD= 81083 • Nitrogen= 29196 • Phosphorus= 4887
	Lower Anacostia	• BOD= 51724 • Nitrogen= 15319 • Phosphorus= 2631
Allocation Notes	No MS4 WLAs provided (stormwater allocations included direct drainage). Superseded by 2008 Anacostia Watershed Nutrients and BOD TMDL. (Reference: 1)	
IMPLEMENTATION		
Implementation	TMDL cites Chesapeake Bay Agreement, which states "By 2010, the District of Columbia, working with its watershed partners, will reduce pollution loads to the Anacostia River in order to eliminate public health concerns and achieve the living resources, water quality, and habitat goals of this and past agreements" as an existing agreement that demonstrates a commitment and a completion date for “implementation of those activities necessary the load reductions allocated in this TMDL” (Reference: 1)	
Other Issues		
REFERENCES AND IMPORTANT DOCUMENTS		

Table B- 2. Total Maximum Daily Load for BOD in Upper and Lower Anacostia	
1	Final TMDL for BOD in the Upper and Lower Mainstream Anacostia, DC DOH, August 2001
2	Decision Rationale Total Maximum Daily Loads Anacostia River Watershed For Biochemical Oxygen Demand, U.S. EPA, 2001
3	"The Tam/WASP Model: A Modeling Framework for the Total Maximum Daily Allocation in the Tidal Anacostia River -- Final Report," Oct. 2000, Ross Mandel and Cherie L. Schultz

Table B- 3. Total Maximum Daily Loads Upper Anacostia River Lower Anacostia River District of Columbia Total Suspended Solids	
BACKGROUND	
Issue Date	2002
Author	EPA
303(d) Listing	1996 and 1998
Impairments and Pollutant causes	Mainstem Anacostia, Upper and Lower segments: Protection and propagation of fish, shellfish, and wildlife. Cause of impairment: total suspended solids (TSS). (Reference: 1)
Impairment Notes	The mainstem Anacostia does not support protection and propagation of fish, shellfish and wildlife based on water clarity problems caused by high TSS concentrations. (Reference: 1)
Sources of Pollutants	Tributaries, stormwater runoff, CSOs, direct surface runoff. (Reference: 1)
MODELING	
Modeling Approach	TAM for hydrodynamics, WASP TOXI5 for sediment transport and concentrations. (Reference: 1)
EMCs	EMCs documented in Table 2-5 of ICPRB Modeling Report. Report states that 94 mg/L TSS concentrations for most subsheds were based on provisional DC Water LTCP modeling results, while 227 mg/L for Pope Branch, Fort Dupont, and Nash Run were based on Pope Branch monitoring data. (Reference: 2)
ALLOCATIONS	
Seasonal Ave. LAs (tons/growing season)	• Upper Anacostia= 113.3 • Lower Anacostia= 34.3
Seasonal Ave. LAs (lbs/day/growing season)	• Upper Anacostia= 1000.0 • Lower Anacostia= 400.0
Allocation Notes	MS4 stormwater loads were considered nonpoint sources for this TMDL and were included with the NPS LAs. MOS for all allocations is implicit. (Reference: 1)
IMPLEMENTATION	
Implementation	No specific implementation plan in TMDL. (Reference: 1)
Other Issues	Notes that DC SWMP "should provide additional mechanisms for achieving the load reductions identified in this TMDL." (Reference: 1)
	Difference in TMDL endpoints between EPA TMDL and DOH TMDL, primarily due to new WQS adopted by DC but not submitted for public notice as final standards during EPA review of DOH TMDL. Load reduction percentages - 83-86% in DOH TMDL, versus 77% in EPA TMDL - were similar. (Reference:3)
REFERENCES AND IMPORTANT DOCUMENTS	

Table B- 3. Total Maximum Daily Loads Upper Anacostia River Lower Anacostia River District of Columbia Total Suspended Solids	
1	Total Maximum Daily Loads Upper Anacostia River Lower Anacostia River District of Columbia Total Suspended Solids, U.S. EPA, 2002
2	Calibration of the TAM/WASP Sediment Transport Model - Final Report, ICPRB, 2001/rev 2003
3	Decision Rationale: Total Maximum Daily Loads Total Suspended Solids Upper Anacostia River Lower Anacostia River District of Columbia, U.S. EPA *(date?)*

Table B- 4. Total Maximum Daily Load for Fecal Coliform Bacteria in Anacostia and Tributaries		
BACKGROUND		
Issue Date	Original fecal coliform TMDL 2003; E. coli revision 2014	
Author	DC DoH (original fecal coliform TMDL); DDOE (E. coli revision)	
303(d) listing	1998, 2002	
Impairments and Pollutant Causes	Primary Contact Recreation. Causes of impairment: Fecal Coliform (Fort Chaplin, Fort Dupont, Fort Stanton, Nash Run, Popes Branch, Texas Ave. Tributary, and Watts Branch lower). (Reference: 1998, 2002 303(d) lists)	
	Protection and Propagation of Fish, Shellfish, and Wildlife. Cause of impairment: Fecal coliform (Hickey Run). (Reference: 1998, 2002 303(d) lists)	
Impairment Notes	Endpoints for TMDL are defined as bacteria concentrations to meet Class A and B designated uses	
Sources of Pollutants	CSOs, SSOs, Stormwater runoff, and direct deposits. (Reference: 1)	
MODELING		
Modeling Approach	MS4 loads estimated using MOUSE hydrology and SSWS sheds from DC Water LTCP. Mainstem water quality modeled using TAM/WASP. Tributary loads modeled using the Watts Branch HSPF model and the DC Small Tributaries Model. (Reference: 1). Translation from fecal coliform to E. coli done using DC translator tool (Reference: 4).	
EMCs	Original fecal coliform WLAs: Mainstem: 28,265 MPN/100 mL; Tributaries 17,300 MPN/100 mL (Reference: 2, pp. 19-20)	
ALLOCATIONS		
E. coli Annual Ave. WLAs (MS4) (MPN/100ml/year)	• Anacostia= 2.30E14 • Fort Stanton= 1.08E6 • Fort Davis= 8.17E5 • Fort Dupont= 2.34E6 • Fort Chaplin= 1.32E6 • Hickey Run= 6.31E6	• Nash Run= 2.23E6 (includes MD loads) • Pope Branch= 1.67E6 • Texas Ave. Tributary= 1.36E6 • Watts Branch= 1.20E7 (includes MD loads)

Table B- 4. Total Maximum Daily Load for Fecal Coliform Bacteria in Anacostia and Tributaries		
E. coli Daily Ave. WLAs (MS4) (MPN/100ml/day)	• Anacostia= 6.56E11 • Fort Stanton= 2.95E3 • Fort Davis= 2.24E3 • Fort Dupont= 6.41E3 • Fort Chaplin= 3.62E3 • Hickey Run= 1.73E4	• Nash Run= 6.11E3 (includes MD loads) • Pope Branch= 4.57E3 • Texas Ave. Tributary= 3.72E3 • Watts Branch= 3.28E4 (includes MD loads)
E. coli Daily Max. WLAs (MS4) (MPN/100ml/day)	• Anacostia= 1.50E13 • Fort Stanton= 9.17E3 • Fort Davis= 6.96E3 • Fort Dupont= 1.99E4 • Fort Chaplin= 1.13E4 • Hickey Run= 5.37E4	• Nash Run= 1.90E4 (includes MD loads) • Pope Branch= 1.42E4 • Texas Ave. Tributary= 1.16E4 • Watts Branch= 1.02E5 (includes MD loads)
E. coli Annual Ave. LAs (MPN/100ml/year)	• Anacostia= 8.10E12	
E. coli Daily Ave. LAs (MPN/100ml/day)	• Anacostia= 6.71E10	
E. coli Daily Max. LAs (MPN/100ml/day)	• Anacostia= 4.33E11	
Fecal coliform Annual Ave. WLAs (MS4) (MPN/100ml/year)	All fecal coliform WLAs replaced by E. coli WLAs	
Fecal coliform LAs (MPN/100ml/year)	All fecal coliform LAs replaced by E. coli LAs	
Allocation notes	Original fecal coliform WLAs and LAs replaced by E. coli WLAs and LAs through addition of new Appendix C in 2013 (Reference: 4). Original tributary fecal coliform WLAs appear to be calculated incorrectly. Translator incorrectly applied to tributaries, so E. coli WLAs for tributaries should be redone.	
IMPLEMENTATION		

Table B- 4. Total Maximum Daily Load for Fecal Coliform Bacteria in Anacostia and Tributaries	
Implementation	TMDL cites Chesapeake Bay Agreement, which states "By 2010, the District of Columbia, working with its watershed partners, will reduce pollution loads to the Anacostia River in order to eliminate public health concerns and achieve the living resources, water quality, and habitat goals of this and past agreements" as an existing agreement that demonstrates a commitment and a completion date for "implementation of those activities necessary the load reductions allocated in this TMDL" (Reference: 1)
Other Issues	
REFERENCES AND IMPORTANT DOCUMENTS	
1	Final TMDL for Fecal Coliform Bacteria in Anacostia River and Tributaries, DC DOH, August 2003
2	Amended Decision Rationale Total Maximum Daily Loads Anacostia River Watershed For Fecal Coliform Bacteria, U.S. EPA, 2003
3	Final Memo Summarizing DC Bacteria Data and Recommending a DC Bacteria Translator (Task 2), LimnoTech, 2011.
4	Appendix C, E. coli Bacteria Allocations and Daily Loads for the Anacostia and Tributaries, February 2013. New appendix to original "Final TMDL for Fecal Coliform Bacteria in Anacostia River and Tributaries" document (DC DOH, 2003).

Table B- 5. Total Maximum Daily Load for Metals and Organics in Anacostia and Tributaries

BACKGROUND			
Issue Date	2003		
Author	DC DoH		
303(d) listing	1996 and 1998		
Impairments and Pollutant Causes	Mainstem Anacostia, Upper and Lower segments: Protection of human health related to consumption of fish and shellfish. Causes of impairment: arsenic, copper, lead, zinc, heptachlor epoxide, dieldrin, chlordane, DDD, DDE, DDT, PAH1, PAH2, PAH3, total PCBs. (Reference: 6)		
	Anacostia Tributaries: Protection and propagation of fish, shellfish, and wildlife. Causes of impairment: Metals and Organics (Nash Run, Popes Branch, Texas Avenue Tributary); Metals (Fort Chaplin, Fort Davis, Fort Dupont); Organics (Fort Stanton, Hickey Run, Upper and Lower Watts Branch). See above for list of specific metals and organics causing impairments. (Reference: 1)		
Impairment Notes	Anacostia and tributaries do not support fish consumption use based on public health advisory published by DC Commissioner of Health in 1994 (Source: Integrated Report). Organics and metals of concern identified from fish tissue and sediment analysis in Anacostia mainstem (Reference: 1).		
Sources of Pollutants	Upstream, CSO, and stormwater (Reference: 1)		
MODELING			
Modeling Approach	DC Small Tributaries Model; TAM/WASP Toxics Screening Level Model		
EMCs	EMCs documented in Table 2b, p. 11, Small Tributaries Model Report, ICPRB July 2003. Small Tributaries Model Report states that "Storm flow concentrations were obtained by averaging the DC Water LTCP separate sewer system EMCs (DC WASA, 2000a; 2000b) with means of the recent DC MS4 monitoring results; except arsenic, which was based on MS4 monitoring data." (Reference: 3)		
ALLOCATIONS			
Annual Ave. WLAs (MS4) (lbs/year)	Upper Anacostia	• Arsenic= 1.44 • Copper= 3.88E2 • Lead= 3.88E2 • Zinc= 2.39E3 • Chlordane= 0.0141 • DDD= 0.0052 • DDE= 0.0127	• DDT= 0.034 • Dieldrin= 0.0082 • Heptachlor Epoxide= 0.0041 • PAH1= 0.193 • PAH2= 1.144 • PAH3= 0.73
	Lower Anacostia	• Arsenic= 3.41 • Copper= 2.19E2 • Lead= 2.19E2 • Zinc= 1.34E3 • Chlordane= 0.0078 • DDD= 0.0087 • DDE= 0.0211	• DDT= 0.057 • Dieldrin= 0.0035 • Heptachlor Epoxide= 0.002 • PAH1= 0.106 • PAH2= 0.641 • PAH3= 0.409

Table B- 5. Total Maximum Daily Load for Metals and Organics in Anacostia and Tributaries			
Annual Ave. WLAs (MS4) (lbs/year)	Fort Chaplin	• Arsenic= 0.38 • Copper= 18.29	• Lead= 7.67 • Zinc= 135.2
	Fort Davis	• Arsenic= 0.10 • Copper= 4.73	• Lead= 1.95 • Zinc= 42.4
	Fort Dupont	• Arsenic= 0.17 • Copper= 7.66*	• Lead= 3.56 • Zinc= 228.9*
	Fort Stanton	• Arsenic= 0.05 • Copper= 2.48 • Lead= 1.05 • Zinc= 91.1 • Chlordane= 0.0002 • DDD= 0.00009 • DDE= 0.0001	• DDT= 0.00015 • Dieldrin= 0.000023 • Heptachlor Epoxide= 0.00002 • PAH1= 0.078 • PAH2= 0.009 • PAH3= 0.006
	Hickey Run	• Chlordane=0.0142 • DDD= 0.03259* • DDE= 0.0069 • DDT= 0.00687* • Dieldrin= 0.000758*	• Heptachlor Epoxide= 0.00074* • PAH1= 3.882 • PAH2= 0.470 • PAH3= 0.300
	Nash Run (DC loads)	• Arsenic= 0.86 • Copper= 52.93* • Lead= 19.65 • Zinc= 320.1* • Chlordane= 0.0032 • DDD= 0.00139* • DDE= 0.0029*	• DDT= 0.00286* • Dieldrin= 0.000329 • Heptachlor Epoxide= 0.00031 • PAH1= 1.594 • PAH2= 0.192 • PAH3= 0.123
	Pope Branch	• Arsenic= 0.52* • Copper= 25.67* • Lead= 10.82 • Zinc= 163.2* • Chlordane= 0.0017 • DDD= 0.001* • DDE= 0.0016	• DDT= 0.00161* • Dieldrin= 0.00025* • Heptachlor Epoxide= 0.0019 • PAH1= 0.804 • PAH2= 0.093 • PAH3= 0.059
	Texas Ave. Tributary	• Arsenic= 0.40 • Copper= 19.78 • Lead= 8.31 • Zinc= 138.2 • Chlordane= 0.0013 • DDD= 0.00699 • DDE= 0.0012	• DDT= 0.04011 • Dieldrin= 0.000174 • Heptachlor Epoxide= 0.00014 • PAH1= 0.613 • PAH2= 0.071 • PAH3= 0.045

Table B- 5. Total Maximum Daily Load for Metals and Organics in Anacostia and Tributaries			
	Watt Branch (DC Upper Branch)	• Chlordane= 0.0096 • DDD= 0.00396* • DDE= 0.0079* • DDT= 0.000396* • Dieldrin= 0.000945	• Heptachlor Epoxide= 0.00088* • PAH1= 4.372* • PAH2= 0.525* • PAH3= 0.335*
	Watt Branch (DC Lower Branch)	• Chlordane= 0.0037 • DDD= 0.00154* • DDE= 0.0031* • DDT= 0.000154* • Dieldrin= 0.000368	• Heptachlor Epoxide= 0.00034* • PAH1= 1.701* • PAH2= 0.204* • PAH3=0.130*
Annual Ave. LAs (lbs/year)	Fort Chaplin	• Arsenic= 0.10 • Copper= 4.67	• Lead= 1.96 • Zinc= 34.5
	Fort Davis	• Arsenic= 0.05 • Copper= 2.57	• Lead= 1.06 • Zinc= 10.8
	Fort Dupont	• Arsenic= 0.68 • Copper= 31.71	• Lead= 14.75 • Zinc= 58.4
	Fort Stanton	• Arsenic= 0.26 • Copper= 12.94 • Lead= 5.47 • Zinc= 23.3 • Chlordane= 0.0009 • DDD= 0.00049 • DDE= 0.0008	• DDT= 0.0008 • Dieldrin= 0.000122 • Heptachlor Epoxide= 0.00010 • PAH1= 0.404 • PAH2= 0.047 • PAH3= 0.030
	Hickey Run	• Chlordane= 0.0000 • DDD= 0.02163 • DDE= 0.0046 • DDT= 0.00456 • Dieldrin= 0.000503	• Heptachlor Epoxide= 0.00049 • PAH1= 2.577 • PAH2= 0.312 • PAH3= 0.199
	Nash Run (DC loads)	• Arsenic= 0.01 • Copper= 0.68 • Lead= 0.25 • Zinc= 81.7 • Chlordane= 0.0000 • DDD= 0.00002 • DDE= 0.0000	• DDT= 0.00004 • Dieldrin= 0.000004 • Heptachlor Epoxide= 0.000004 • PAH1= 0.021 • PAH2= 0.002 • PAH3= 0.002
Annual Ave. LAs (lbs/year)	Popes Branch	• Arsenic= 0.04 • Copper= 1.98 • Lead= 0.83 • Zinc= 41.6 • Chlordane= 0.0001 • DDD= 0.00008 • DDE= 0.0001	• DDT= 0.00012 • Dieldrin= 0.000019 • Heptachlor Epoxide= 0.00001 • PAH1= 0.062 • PAH2= 0.007 • PAH3= 0.005

Table B- 5. Total Maximum Daily Load for Metals and Organics in Anacostia and Tributaries

	Texas Ave. Tributary	• Arsenic= 0.07 • Copper= 3.56 • Lead= 1.50 • Zinc= 35.3 • Chlordane= 0.0002 • DDD= 0.00126 • DDE= 0.0002	• DDT= 0.00722 • Dieldrin= 0.000031 • Heptachlor Epoxide= 0.00003 • PAH1= 0.110 • PAH2= 0.013 • PAH3= 0.008
	Watt Branch (DC Upper Branch)	• Chlordane= 0.0002 • DDD= 0.00009 • DDE= 0.0002 • DDT= 0.000009 • Dieldrin= 0.000021	• Heptachlor Epoxide= 0.00002 • PAH1= 0.097 • PAH2= 0.012 • PAH3= 0.007
	Watt Branch (DC Lower Branch)	• Chlordane= 0.0001 • DDD= 0.00003 • DDE= 0.0001 • DDT= 0.000003 • Dieldrin= 0.000008	• Heptachlor Epoxide= 0.00001 • PAH1= 0.038 • PAH2= 0.005 • PAH3= 0.003
Allocation Notes	Allocations taken from Reference 2 Appendix A.		
	*MS4 WLAs moved to category 3 in 2014 303(d) list		
	Copper WLAs for Upper and Lower Anacostia are incorrect.		
	TMDL also includes Maryland allocations for Nash Run and Watt Branch. (Reference: 1)		
	Original TMDL aggregated MS4 and direct drainage loads together as "stormwater" loads. EPA Decision Rationale developed separate MS4 WLAs.		
IMPLEMENTATION			
Implementation	No specific implementation plan in TMDL. (Reference: 1)		
Other Issues	Tributary impairments based on data from the mainstem Anacostia, not from tributaries themselves		
	Sewershed delineations updated		
	Some EMCs developed based on data from Maryland		
REFERENCES AND IMPORTANT DOCUMENTS			
1	Final TMDL for Organics and Metals in the Anacostia and Tributaries, DC DOH, August 2003		
2	Amended Decision Rationale, Total Maximum Daily Loads, Anacostia River Watershed for Metals and Organics. U.S. EPA, 2003		
3	Small Tributaries Model Report, ICPRB, 2003		
4	DC WASA. 2000a. Study Memorandum 5-5A: CSS and SSWS Monitoring Results, August 1999 - February 2000		
5	DC WASA. 2000b. Study Memorandum 5-5B: CSS and SSWS Monitoring Results, March - July 2000		

Table B- 5. Total Maximum Daily Load for Metals and Organics in Anacostia and Tributaries	
6	2012 Integrated Report to the US Environmental Protection Agency and Congress Pursuant to Sections 305(b) and 303(d) Clean Water Act (P.L. 97-117), DDOE, 2012

Table B- 6. Total Maximum Daily Load for Oil and Grease in the Anacostia River	
BACKGROUND	
Issue Date	2003
Author	DC DoH
303(d) Listing	1998
Impairments and Pollutant Causes	Class A: Primary contact recreation, Class B: Secondary contact recreation and aesthetic enjoyment, and Class C: Protection and propagation of fish, shellfish, and wildlife. (Reference: 1)
	A visible sheen of oil was visible on Hickey Run, a tributary to the Anacostia River. Oil from Hickey Run would enter the Anacostia River and cause exceedances of the criteria. (Reference: 1)
Impairment Notes	Analysis of current data suggests that the Anacostia River is no longer impaired by oil and grease deposited through Hickey Creek and Kingman Lake. (Reference: 1)
Sources of Pollutants	Stormwater point and nonpoint sources, CSOs, MS4. (Reference: 1)
MODELING	
Modeling Approach	Average stormwater flow data was obtained from the TAM/WASP model used in previous Anacostia River TMDLs. (Reference: 2)
EMCs	No EMCs were developed due to reduction in oil and grease concentrations resulting from on-going activities described in the Hickey Run Action Plan (2002). (Reference: 1)
ALLOCATIONS	
Daily Ave. WLAs (MS4) (lbs/day)	• Upper Anacostia= 366.3 • Lower Anacostia= 200.376
LAs	N/A
Allocation Notes	Table 6-3 of the TMDL document also lists upstream stormwater loads from Maryland, as well as CSO waste load allocations. (Reference: 1)
	Anacostia River oil and grease TMDL builds upon the efforts made in previous TMDLs for the watershed. Since there is little in-stream data on the existing oil and grease loadings and their sources within the river, the TMDL loadings required to maintain ambient water quality are based upon the stream's assimilative capacity determined by multiplying the stream's flow and the oil and grease criteria of 10 mg/l. (Reference: 1)
IMPLEMENTATION	

Table B- 6. Total Maximum Daily Load for Oil and Grease in the Anacostia River	
Implementation	Expected implementation of this TMDL focuses on source control. A specific 2001-2003 project (Environmental Education for the Compliance of Auto Repair Shops [EE-CARS]), and Hickey Run BMPs are expected to promote source control of oil and grease in the watershed. (Reference: 1)
Other Issues	
REFERENCES AND IMPORTANT DOCUMENTS	
1	District of Columbia Final TMDL for Oil and Grease in the Anacostia River, DC DOH, October 2003
2	Decision Rationale TMDL for the Anacostia River Watershed and Kingman Lake for Oil and Grease, U.S. EPA, 2003
3	Hickey Run Action Plan, 2002

Table B- 7. Total Maximum Daily Load for Fecal Coliform Bacteria in Kingman Lake	
BACKGROUND	
Issue Date	2003 and revised in 2013
Author	DC DoH; DDOE (revision)
303(d) Listing	1996, 1998
Impairments and Pollutant Causes	Class A: Primary contact recreation. Impairment causes: fecal coliform bacteria. (Reference: 1)
Impairment Notes	N/A
Sources of Pollutants	MS4 (Reference: 1)
MODELING	
Modeling Approach	The analysis was conducted using the Tidal Anacostia Model (TAM) with the underlying assumptions of the Anacostia River Bacterial TMDL. (Reference: 1)
EMCs	28,265 MPN/100 ml (fecal). (Reference: 1)
ALLOCATIONS	
E. coli Monthly Ave. WLAs (MS4) (MPN/100ml/month)	7.05E10
E. coli Daily Ave. WLAs (MS4) (MPN/100ml/day)	2.35E09

Table B- 7. Total Maximum Daily Load for Fecal Coliform Bacteria in Kingman Lake	
E. coli Daily Max WLAs (MS4) (MPN/100ml/day)	7.31E9
Fecal coliform Monthly Ave. WLAs (MS4) (MPN/100ml/day)	All fecal coliform WLAs replaced by E. coli WLAs
E. coli Monthly Ave. LAs (MS4) (MPN/100ml/month)	4.51E10
E. coli Daily Ave. LAs (MPN/100ml/day)	1.50E9
E. coli Daily Max LAs (MPN/100ml/day)	4.67E9
Fecal coliform Monthly Ave. LAs (MPN/100ml/day)	All fecal coliform LAs replaced by E. coli WLAs
Allocation Notes	Original fecal coliform WLAs and LAs replaced by E. coli WLAs and LAs through addition of new Appendix A in 2013 (Reference: 3). The 2003 TMDL only included average monthly loads while the 2014 revision included daily maximum and average allocations. (References: 1 and 2).
	Translator incorrectly applied, so E. coli WLAs should be redone.
IMPLEMENTATION	
Implementation	No specific implementation plan
Other Issues	Two TMDLs have been approved for Kingman lake FC Bacteria, one in 2003 and a revision in 2014. The revision includes daily loads that were not included in the 2003 TMDL. (Reference: 1, 2)
REFERENCES AND IMPORTANT DOCUMENTS	
1	Total Maximum Daily Load for Fecal Coliform Bacteria in Kingman Lake, DC DoH, October 2003
2	Decision Rationale 2014 E. coli Bacteria Allocations and Daily Loads for Kingman Lake, TMDL Revision, District of Columbia, U.S. EPA, July 2014
3	Appendix A: E. coli Bacteria Allocations and Daily Loads for Kingman Lake, 2013
4	Final Memo Summarizing DC Bacteria Data and Recommending a DC Bacteria Translator (Task 2), LimnoTech, 2011

Table B- 8. Total Maximum Daily Loads for Organics and Metals in Kingman Lake		
BACKGROUND		
Issue Date	2003	
Author	DC DoH	
303(d) Listing	1996 and 1998	
Impairments and Pollutant Causes	Class A: Primary contact recreation. Impairment Cause: organics, and metals. (Reference: 1)	
Impairment Notes	Impairment listed because Hickey Run had a visible sheen of oil and grease and is a tributary to the Anacostia River with confluence 300 feet upstream of the inlet to Kingman Lake. (Reference: 1)	
Sources of Pollutants	MS4. (Reference: 1)	
MODELING		
Modeling Approach	TAM/WASP Toxics Screening Level Model (Reference: 1)	
EMCs	EMCs documented in Table 2b, p. 11, Small Tributaries Model Report, ICPRB July 2003. Small Tributaries Model Report states that "Storm flow concentrations were obtained by averaging the DC Water LTCP separate sewer system EMCs (DC WASA, 2000a; 2000b) with means of the recent DC MS4 monitoring results; except arsenic, which was based on MS4 monitoring data." (Reference: 3)	
ALLOCATIONS		
Annual Ave. WLAs (MS4) (lbs/year)	• Arsenic= 3.97E-2 • Copper= 1.00E1* • Lead= 4.87 • Zinc= 2.98E1* • Chlordane= 1.78E-4 • DDD= 1.30E-4* • DDE= 2.87E-4*	• DDT= 7.77E-3 • Dieldrin= 1.12E-4* • Heptachlor Epoxide= 5.39E-5* • PAH1= 1.20E-1 • PAH2= 7.08 • PAH3= 4.50E-1
Annual Ave. LAs (lbs/year)	• Arsenic= 2.54E-2 • Copper= 6.40E1 • Lead= 3.12 • Zinc= 1.90E1 • Chlordane= 1.14E-4 • DDD= 8.32E-4 • DDE= 1.84 E-4	• DDT= 4.96E-3 • Dieldrin= 7.14E-4 • Heptachlor Epoxide= 3.45E-5 • PAH1= 7.68E-1 • PAH2= 4.52 • PAH3= 2.88E-1
Allocation Notes	*MS4 WLAs moved to category 3 in 2014 303(d) list	
	WLAs documented in EPA Decision Document, Table 4. (Reference and 2)	
IMPLEMENTATION		
Implementation	No specific implementation plan.	
Other Issues		
REFERENCES AND IMPORTANT DOCUMENTS		

Table B- 8. Total Maximum Daily Loads for Organics and Metals in Kingman Lake	
1	Total Maximum Daily Loads for Organics and Metals in Kingman Lake, DC DoH, September 2003
2	Decision Rationale Total Maximum Daily Loads Kingman Lake for Organics and Metals, U.C. EPA, October 2003
3	Small Tributaries Model Report, ICPRB, 2003

Table B- 9. Total Maximum Daily Load for TSS, Oil and Grease, and BOD in Kingman Lake	
BACKGROUND	
Issue Date	2003
Author	DC DoH
303(d) Listing	1998
Impairments and Pollutant Causes	Class A: Primary contact recreation. Impairment Causes: TSS, Oil and Grease, and BOD. (Reference: 1)
Impairment Notes	TMDL found no impairments for TSS or BOD, so no MS4 WLAs established for these pollutants.
Sources of Pollutants	MS4 and stormwater, upstream sources from the Anacostia and Hickey Run. (Reference: 1)
MODELING	
Modeling Approach	Assimilative load capacity calculation. (Reference: 2)
EMCs	Shown in table on page 6 of TMDL. (Reference: 1)
ALLOCATIONS	
Daily Ave. WLAs (MS4) (lbs/day)	• Oil and Grease= 1278.35
LAs	No LAs required
Allocation Notes	EPA determined that the TMDL applications for the Anacostia River were more than sufficient in reducing TSS and BOD below impairment levels for Kingman Lake. (References 3 and 4)
IMPLEMENTATION	
Implementation	Implementation includes District managed stormwater load reduction programs (street sweeping, stormwater control regulations, nonpoint source management plan, etc.). (Reference: 1)
Other Issues	The oil and grease TMDL was completed by the district to partially meet the third-year TMDL milestone commitments under the requirements of the 2000 TMDL lawsuit settlement of Kingman Park Civic Association et al. (Reference: 2)
REFERENCES AND IMPORTANT DOCUMENTS	
1	Total Maximum Daily Loads for TSS, Oil and Grease, and BOD in Kingman Lake, DC DoH, October 2003

Table B- 9. Total Maximum Daily Load for TSS, Oil and Grease, and BOD in Kingman Lake	
2	Decision Rationale Total Maximum Daily Loads Anacostia River Watershed and Kingman Lake for Oil and Grease, U.S. EPA, October 2003
3	EPA Justification Not to Require a TMDL for TSS in Kingman Lake, U.S. EPA, October 2003
4	EPA Justification Not to Require a TMDL for BOD in Kingman Lake, U.S. EPA, October 2003

Table B- 10. Total Maximum Daily Load for Biochemical Oxygen Demand in Fort Davis Tributary	
BACKGROUND	
Issue Date	2003
Author	DoH
303(d) Listing	1998
Impairments and Pollutant Causes	Class C: Protection and propagation of fish, shellfish, and wildlife. Cause of impairment: low concentrations of DO. (Reference: 1)
Impairment Notes	At the time of the TMDL, it stated that Fort Davis was not directly classified in the DC water quality standards as a separate waterbody, but was classified for designated uses as a tributary of the Anacostia Rover. Anacostia tributaries must meet DO standards for Class C waters. The basis for the listing Fort Davis was the 1998 Water Quality Assessment report (305(b)) report which indicated an 11.1% violation in DO. The purpose of the TMDL was to determine the limit to which BOD must be reduced and to achieve and maintain the Water Quality Standards for DO, and the DO level that would support the fish population or would not cause fish mortality.
Sources of Pollutants	Four storm sewer outfalls discharging to the Fort Davis Tributary. (Reference: 1)
MODELING	
Modeling Approach	N/A
EMCs	N/A
ALLOCATIONS	
WLAs	N/A. Data was provided for five years representing seasonal variation between 1997 and 2001. This data indicated that the Fort Davis Tributary DO concentrations were within daily average limits throughout the five year period. (Reference: 2)
LAs	N/A
Allocation Notes	No allocations because monitoring data indicated that the Fort Davis Tributary is no longer impaired by low DO. (Reference: 2)
IMPLEMENTATION	
Implementation	No specific implementation plan.
Other Issues	This impairment no longer requires a TMDL per EPA justification document. (Reference: 2)
REFERENCES AND IMPORTANT DOCUMENTS	
1	Draft Total Maximum Daily Load for Biochemical Oxygen Demand in Fort Davis Tributary, DoH, March 2003
2	EPA Justification not to require a TMDL for BOD for the Fort Davis Tributary to the Anacostia River. U.S. EPA, October 2003

Table B- 11. Total Maximum Daily Load for TSS in Watts Branch	
BACKGROUND	
Issue Date	2003
Author	DC DoH
303(d) listing	1996 through 2002
Impairments and pollutant causes	Class C: Protection and propagation of fish, shellfish, and wildlife. Impairment Causes: TSS. (Reference: 1)
Impairment Notes	Instream erosion identified as a cause of impairment.
Sources of pollutants	High TSS levels in Watts are caused almost exclusively from the erosion of its streambanks due to urbanization and stream channelization. (Reference: 1)
MODELING	
Modeling approach	HEC-6 model to simulate scour and re-deposition along Watts Branch. (Reference: 1)
EMCs	227 mg/L used initially to calculate total load. 60 mg/L used after stream erosion was broken out (Reference: 1)
ALLOCATIONS	
Annual Ave. WLAs (MS4) (tons/year)	• Upper Watts Branch= 14.8 • Lower Watts Branch= 5.6
Seasonal Ave. WLAs (MS4) (tons/growing season)	• Upper Watts Branch= 9.9 • Lower Watts Branch= 3.7
Annual Ave. LAs (tons/year)	• Upper Watts Branch= 9.2 • Lower Watts Branch= 3.8
Allocation notes	Instream erosion loads assigned to nonpoint source LA. (Reference: 2)
IMPLEMENTATION	
Implementation	Anacostia Watershed Restoration Agreement. (Reference: 1)
Other issues	
REFERENCES AND IMPORTANT DOCUMENTS	
1	Total Maximum Daily Load for TSS in Watts Branch, DC DoH, June 2003
2	Decision Rationale Total Maximum Daily Loads Watts Branch for TSS, U.S. EPA, December 2003

Table B- 12. Total Maximum Daily Load for Sediment/TSS in Anacostia and Tributaries		
BACKGROUND		
Issue Date	2007	
Author	DDOE, MDE	
303(d) Listing	1996, 1998 (DC)	
Impairments and Pollutant Causes	Class C: Protection and propagation of fish, shellfish, and wildlife. (Reference: 1)	
Impairment Notes	The objectives of the sediment/TSS TMDLs established in this document are 1) to ensure that aquatic life is protected in the tidal and non-tidal waters of the Anacostia; 2) to ensure that MD's and DC's sediment-related water quality standards that support aquatic life are met in their respective portions of the watershed; and 3) to ensure in particular that the numeric criteria for water clarity are met in the tidal waters. The endpoint of the TMDL (the most stringent reduction in sediment loads) is DC's tidal Anacostia water clarity criterion.	
Sources of Pollutants	Direct deposit, MS4, NPDES point sources, CSOs, stream erosion. (Reference 1 and 2)	
MODELING		
Modeling Approach	The modeling framework used for the analysis was a coupled watershed/hydrodynamic/water quality model that includes TAM/WASP, the watershed model (Hydrologic Simulation Program -- FORTRAN, (HSFP)), and the USGS's ESTIMATOR model. (Reference: 1)	
EMCs	94 mg/L for all Anacostia Tributaries in Table 2-5 except for Nash Run, Pope Branch and Fort Dupont. 227 for Nash Run , Fort Dupont, Pope Branch (Reference: 3)	
ALLOCATIONS		
Annual Ave. WLAs (MS4) (tons/year)	• Anacostia Upper= 84.6 • Anacostia Lower= 46.4 • Lower Beaverdam Creek= 0.6	• Northwest Branch= 26.2 • Watts Branch= 24.2
Daily Ave. WLAs (MS4) (tons/day)	• Anacostia Upper= 0.78 • Anacostia Lower= 0.43	• Lower Beaverdam Creek= 0.0016 • Watts Branch= 0.1114
Daily Max WLAs (MS4) (tons/day)	• Anacostia Upper= 18.35 • Anacostia Lower= 10.24	• Lower Beaverdam Creek= 0.0954 • Watts Branch= 3.425
Seasonal Ave. WLAs (MS4) (tons/growing season)	• Anacostia Upper= 60.4 • Anacostia Lower= 33.6 • Lower Beaverdam Creek= 0.4	• Northwest Branch= 20.7 • Watts Branch= 15.5
Seasonal Ave. WLAs (MS4) (lbs/day/growing season)	• Anacostia Upper= 2360.0 • Anacostia Lower= 1320.0	• Lower Beaverdam Creek= 4.0 • Watts Branch= 263.6

Table B- 12. Total Maximum Daily Load for Sediment/TSS in Anacostia and Tributaries		
Seasonal Max WLAs (MS4) (lbs/day/growing season)	• Anacostia Upper= 36700 • Anacostia Lower= 20480	• Lower Beaverdam Creek= 186 • Watts Branch= 6850
Annual Ave. LAs (tons/year)	• Anacostia Upper= 29.8 • Anacostia Lower= 20.7	• Northwest Branch= 0.149 • Watts Branch= 3.129
Allocation Notes	Allocations in the Decision Rationale also include daily maximum, daily average, seasonal maximum, and seasonal average expressions for load allocations. (Reference:2)	
IMPLEMENTATION		
Implementation	TMDL implementation includes DC Water LTCP for the reduction of CSOs and the sediment loads associated with them, and implementation of a stormwater management plan to control the discharge of pollutants from separate storm sewer outfalls in DC. (Reference: 1)	
Other issues	This TMDL replaces the 2002 Anacostia TSS TMDL. (Reference: 2)	
REFERENCES AND IMPORTANT DOCUMENTS		
1	TMDL of Sediment/TSS for the Anacostia River Basin, Montgomery and Prince George's Counties, Maryland and the District of Columbia, MD EPA, June 2007	
2	Decision Rationale TMDL Anacostia River basin watershed for Sediment/TSS, U.S. EPA	
3	Anacostia Sediment Models: Phase 3 Anacostia HSPF Watershed Model and Version 3 TAM/WASP Water Clarity Model, Schultz, Kim, Mandel, Nagle, ICPRB Report 07-10, March 2007.	

Table B- 13. Total Maximum Daily Load of Nutrients/BOD for the Anacostia River Basin	
BACKGROUND	
Issue Date	2008
Author	DDOE, MDE
303(d) Listing	1998 (DC)
Impairments and Pollutant Causes	DC tidal Anacostia designated use; Class C: Protection and propagation of fish, shellfish, and wildlife. This designated use is impaired by low DO. (Reference: 1)
Impairment Notes	The specific water quality impairments addressed in these TMDLs are the violation of DC’s DO criteria in its tidal waters. In addition to resolving the listed impairments, the TMDLs for nutrients and BOD must demonstrate that (1) DO criteria are met for all designated uses in MD and DC portions of the Anacostia; (2) DC chlorophyll a criteria are met in DC's segments in the tidal river; and (3) water clarity standards are met in both MD's and DC's tidal waters. (Reference: 1)
Sources of Pollutants	Stormwater runoff, subsurface drainage, erosion and in-stream scour, industrial and municipal point sources, CSOs. (Reference: 1)

Table B- 13. Total Maximum Daily Load of Nutrients/BOD for the Anacostia River Basin		
MODELING		
Modeling Approach	The modeling framework used for the analysis was a coupled watershed/hydrodynamic/water quality model that includes TAM/WASP, the watershed model (Hydrologic Simulation Program -- FORTRAN, (HSFP)), and the USGS's ESTIMATOR model.	
EMCs	No listed EMCs. The TMDL document states that EMCs were based on monitoring data performed for storm sewer drainage and direct drainage under the MS4 program, and for CSOs performed under the DC Water LTCP. (Reference: 1)	
ALLOCATIONS		
Annual Ave. WLAs (MS4) (lbs/year)	Upper Anacostia	• BOD= 181841 • Nitrogen= 10493 • Phosphorus= 966
	Lower Anacostia	• BOD= 98435 • Nitrogen= 5172 • Phosphorus= 509
	Lower Beaverdam Creek	• BOD= 403 • Nitrogen= 45 • Phosphorus= 6
	Northwest Branch	• BOD= 14421 • Nitrogen= 1955 • Phosphorus= 162
	Watts Branch	• BOD= 14252 • Nitrogen= 1731 • Phosphorus= 248
Daily Ave. WLAs (MS4) (lbs/year)	Upper Anacostia	• BOD= 564 • Nitrogen= 34.70 • Phosphorus= 3.460
	Lower Anacostia	• BOD= 312 • Nitrogen= 16.10 • Phosphorus= 1.610
	Lower Beaverdam Creek	• BOD= 1.10 • Nitrogen= 0.12 • Phosphorus= 0.02
	Watts Branch	• BOD= 39 • Nitrogen= 4.74 • Phosphorus= 0.678
Daily Max WLAs (MS4) (lbs/year)	Upper Anacostia	• BOD= 18330 • Nitrogen= 964 • Phosphorus= 104.2

Table B- 13. Total Maximum Daily Load of Nutrients/BOD for the Anacostia River Basin		
	Lower Anacostia	• BOD= 9588 • Nitrogen= 433 • Phosphorus= 47.6
	Lower Beaverdam Creek	• BOD= 32.30 • Nitrogen= 3.57 • Phosphorus= 0.47
	Watts Branch	• BOD= 1125 • Nitrogen= 138 • Phosphorus= 20.1
Annual Ave. LAs (lbs/year)	Upper Anacostia	• BOD= 66548 • Nitrogen= 4123 • Phosphorus= 361
	Lower Anacostia	• BOD= 29704 • Nitrogen= 1868 • Phosphorus= 162
	Lower Beaverdam Creek	• BOD= 865 • Nitrogen= 54 • Phosphorus= 5
	Northwest Branch	• BOD= 333 • Nitrogen= 21 • Phosphorus= 2
	Watts Branch	• BOD= 6988 • Nitrogen= 433 • Phosphorus= 38
Allocation Notes	CSOs are included in the allocation as well. (Reference: 1)	
	Allocations are not split up into WLAs and Las in the TMDL, but are in the Decision Rationale. (References 1 and 2)	
IMPLEMENTATION		
Implementation	The TMDL states that, owing to EPA's policy to designate MS4 WLAs as point sources and to assign WLAs to MS4s, "This provides regulatory assurances that the urban stormwater sources will be managed to the maximum extent practicable." (Reference: 1)	
Other Issues	This TMDL supersedes the 2001 Anacostia BOD TMDL.	
REFERENCES AND IMPORTANT DOCUMENTS		
1	Total Maximum Daily Loads of Nutrients/Biochemical Oxygen Demand for the Anacostia River Basin, Montgomery and Prince George's Counties, Maryland, and the District of Columbia, MDE, DDOE, 2008	
2	Decision Rationale Total Maximum Daily Loads for Biochemical Oxygen Demand and Nutrients Anacostia River Basin Watershed. U.S. EPA, 2008	

Table B- 14. Total Maximum Daily Loads of Trash for the Anacostia River Watershed , Montgomery and Prince George's Counties, Maryland, and the District of Columbia	
BACKGROUND	
Issue Date	2010
Author	DDOE, MDE
303(d) Listing	2006, 2008
Impairments and Pollutant causes	Mainstem Anacostia, Upper and Lower segments: Secondary contact recreation and aesthetic enjoyment. Cause of impairment: debris, floatables, and trash. (Reference: 1)
Impairment Notes	n/a
Sources of Pollutants	Stormwater runoff, MS4s, CSOs, illegal dumping. (Reference: 1)
MODELING	
Modeling Approach	No modeling to support this TMDL. (Reference: 1)
EMCs	No EMCs were developed, as TMDL allocations are equal to 100% removal of the baseline trash load. (Reference: 1)
ALLOCATIONS	
Annual Ave. WLAs (MS4) (lbs/year to be removed)	• Upper Anacostia= 83868 • Lower Anacostia= 24480
Daily Ave. WLAs (MS4) (lbs/year to be removed)	• Upper Anacostia= 229.8 • Lower Anacostia= 67.1
LAs (lbs/year to be removed)	• Upper Anacostia= 19260 • Lower Anacostia= 1790
Allocation Notes	MOS for all allocations is 5%. (Reference: 1)
IMPLEMENTATION	
Implementation	Adoption of storm drain capture technologies, street sweeping, WASA/USACOE floatables removal program, catch basin cleaning and sweeping, regulatory and housing inspections. (Reference: 1)
Other Issues	Existing trash reduction agreements, partnerships, and plans in DC: MWCOG's Anacostia Restoration Partnership, Alice Ferguson Foundation's 2005 *Potomac River Watershed Trash Treaty*, Anacostia Watershed Society's 2008 *Anacostia Watershed Trash Reduction Plan*. (Reference:1)
REFERENCES AND IMPORTANT DOCUMENTS	
1	Total Maximum Daily Loads of Trash for the Anacostia River Watershed , Montgomery and Prince George's Counties, Maryland, and the District of Columbia, MDE & DDOE, 2010

POTOMAC WATERSHED

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Table B- 15. Total Maximum Daily Load for Fecal Coliform Bacteria in the Potomac River		
BACKGROUND		
Issue Date	Original fecal coliform TMDL 2004; E. coli revision 2014	
Author	DC DoH; DDOE (E. coli revision)	
303(d) Listing	1996, 1998	
Impairments and Pollutant Causes	Class A: Primary contact recreation. Impairment causes: Fecal Coliform Bacteria. (Reference: 1)	
Impairment Notes		
Sources of Pollutants	Sources are ubiquitous and include CSOs, SSO, stormwater runoff, direct deposits, and upstream sources. (Reference: 1)	
MODELING		
Modeling Approach	The models used to generate loads from the drainage basin, convey them through drainage systems, and then predict their contribution to the receiving waters were formulated using a combination of MOUSE hydrology for SSWS direct drainage sewersheds per the DC Water LTCP and the Small Tributary model for tributaries. The in-stream processes were simulated using the EPA's Dynamic Estuary Model (DEM). (Reference: 1)	
EMCs	Original fecal coliform WLAs: SSWS direct drainage: 28,265 MPN/100 mL; Tributaries 17,300 MPN/100 mL (Reference: 2, pp. 9-11).	
ALLOCATIONS		
E. coli Annual Ave. WLAs (MS4) (MPN/100ml/year)	• Battery Kemble Creek= 7.04E10* • Dalecarlia Tributary= 4.01E11* • Foundry Branch= 6.85E10*	• Potomac Lower= 2.65E14 • Potomac Middle= 1.24E13 • Potomac Upper= 2.35E14
E. coli Daily Ave. WLAs (MS4) (MPN/100ml/day)	• Battery Kemble Creek= 3.19E8* • Dalecarlia Tributary= 1.59E9* • Foundry Branch= 3.06E8*	• Potomac Lower= 7.92E11 • Potomac Middle= 6.48E10 • Potomac Upper= 6.97E11
E. coli Daily Max. WLAs (MS4) (MPN/100ml/day)	• Battery Kemble Creek= 9.93E8* • Dalecarlia Tributary= 4.95E9* • Foundry Branch= 9.50E8*	• Potomac Lower= 1.44E13 • Potomac Middle= 1.38E12 • Potomac Upper= 2.98E13
Fecal coliform Annual Ave. WLAs (MS4) (MPN/100ml/year)	All fecal coliform WLAs replaced by E. coli WLAs	
Fecal coliform Annual Ave. LAs (MPN/100ml/year)	All fecal coliform LAs replaced by E. coli LAs	
Allocation Notes	*Translator incorrectly applied, so E. coli WLAs should be redone. In addition, original fecal coliform WLAs for these tributaries appear to be calculated incorrectly. Original fecal coliform WLAs and LAs replaced by E. coli WLAs and LAs through addition of new Appendix C in 2014 (Reference: 7).	

Table B- 15. Total Maximum Daily Load for Fecal Coliform Bacteria in the Potomac River	
IMPLEMENTATION	
Implementation	Implementation includes the Chesapeake Bay Agreement, DC Water LTCP, NPDES permitting authority, and the District's Water Pollution Control Act. (References 1 and 2).
Other Issues	
REFERENCES AND IMPORTANT DOCUMENTS	
1	Total Maximum Daily Load for Fecal Coliform Bacteria in the Potomac River, DC DoH, July 2004
2	Decision Rationale Total Maximum Daily Loads Potomac River Watershed for Fecal Coliform Bacteria, U.S. EPA
3	District of Columbia Small Tributaries Total Maximum Daily Load Model Final Report, prepared for DC DOH by ICPRB, July 2003
4	Final Memo Summarizing DC Bacteria Data and Recommending a DC Bacteria Translator (Task 2), LimnoTech, 2011
5	Appendix C: E. coli Bacteria Allocations and Daily Loads for the Potomac River and Tributaries, DC DOEE, December 2014
6	Decision Rationale, E. coli Total Maximum Daily Loads for the Potomac River and Tributaries, U.S. EPA, December 2014

Table B- 16. Total Maximum Daily Load for Bacteria in Chesapeake and Ohio Canal	
BACKGROUND	
Issue Date	2004; E. coli revision 2014
Author	DC DoH; DDOE (E. coli revision)
303(d) Listing	1998
Impairments and Pollutant Causes	Class A: Primary contact recreation, and Class B: Secondary contact recreation and aesthetic enjoyment.
	Pollutant causes: developed areas, pets, and wildlife. (Reference: 1)
Impairment Notes	
Sources of Pollutants	MS4, direct drainage. (Reference: 1)
MODELING	
Modeling Approach	The Hydrologic Simulation Program-Fortran (HSPF) model was used to establish the TMDL allocations. (Reference: 1)
EMCs	17,300 (fecal coliform)
ALLOCATIONS	

Table B- 16. Total Maximum Daily Load for Bacteria in Chesapeake and Ohio Canal	
E. coli Annual Ave. WLAs (MS4) (MPN/100ml/year)	9.59E10*
E. coli Daily Ave. WLAs (MS4) (MPN/100ml/year)	2.63E8*
E. coli Daily Max. WLAs (MS4) (MPN/100ml/year)	8.17E8*
E. coli Annual Ave. LAs (MPN/100ml/year)	1.43E11*
E. coli Daily Ave. LAs (MPN/100ml/year)	3.91E8*
E. coli Daily Max. LAs (MPN/100ml/year)	1.22E9*
Fecal coliform Annual Ave. WLAs (MS4) (MPN/100ml/year)	All fecal coliform WLAs replaced by E. coli WLAs
Fecal coliform Annual Ave. LAs (MPN/100ml/year)	All fecal coliform LAs replaced by E. coli LAs
Allocation Notes	*Translator incorrectly applied, so E. coli WLAs should be redone.
	Original fecal coliform WLAs and LAs replaced by E. coli WLAs and LAs through addition of new Appendix B in 2013 (Reference: 4).
IMPLEMENTATION	
Implementation	Implementation includes District managed stormwater load reduction programs (street sweeping, stormwater control regulations, nonpoint source management plan, etc.), the Chesapeake 2000 agreement, CHOH regulations, and public participation. (Reference: 1)
Other Issues	This TMDL is required to comply with the previously developed TMDL for fecal coliform in Rock Creek requiring a 95% reduction in fecal coliform in the C&O canal. However (see comment in allocation notes) it was not necessary to reduce loads by the full 95%. (Reference: 1)
REFERENCES AND IMPORTANT DOCUMENTS	
1	TMDL for Bacteria in Chesapeake and Ohio Canal, DoH, October 2004

Table B- 16. Total Maximum Daily Load for Bacteria in Chesapeake and Ohio Canal	
2	Decision Rationale TMDL for Fecal Coliform Bacteria In Chesapeake and Ohio Canal , U.S. EPA, December 2004
3	Final Memo Summarizing DC Bacteria Data and Recommending a DC Bacteria Translator (Task 2), LimnoTech, 2011.
4	Appendix B: E. coli Bacteria Allocations and Daily Loads for the Chesapeake and Ohio Canal, DC DOEE, February 2013
5	Decision Rationale, E. coli Total Maximum Daily Loads for the Chesapeake and Ohio Canal, U.S. EPA, July 2014

Table B- 17. Total Maximum Daily Load for Organics, Metals and Bacteria in Oxon Run	
BACKGROUND	
Issue Date	Original TMDL in 2004; E. coli revision in 2014, Organics and Metals component replaced by 2016 TMDL for Pesticides and PCBs in Potomac River and Rock Creek Tributaries (see Table B-25).
Author	DC DoH; DOEE (E. coli revision)
303(d) listing	1998 through 2004
Impairments and Pollutant Causes	Class A: Primary contact recreation. Impairment Causes: fecal coliform bacteria, metals, and organics. (Reference: 1)
Impairment Notes	
Sources of Pollutants	NPDES permitted discharges, direct deposit, urban runoff, MS4. (Reference: 1)
MODELING	
Modeling Approach	Modified version of the DC small Tributaries TMDL model, also TAM/WASP. (References 1 and 2)
EMCs	EMCs were developed based on land use for the watershed. (Reference: 1)
ALLOCATIONS	
E. coli Annual Ave. WLAs (MS4) (MPN/100ml/year)	• 9.52E+12
E. coli Daily Ave. WLAs (MS4) (MPN/100ml/day)	• 2.61E+10
E. coli Daily Max. WLAs (MS4) (MPN/100ml/day)	• 8.11E+10
Fecal coliform Annual Ave. WLAs (MS4) (MPN/100ml/year)	All fecal coliform WLAs replaced by E. coli WLAs

Table B- 17. Total Maximum Daily Load for Organics, Metals and Bacteria in Oxon Run	
Organics and Metals Annual Ave. WLAs (MS4) (lbs/year)	Replaced by 2016 TMDL for Pesticides and PCBs in Potomac River and Rock Creek Tributaries (see Table B-25).
E. coli Annual Ave. LA (MPN/100ml/year)	• 1.00E+12
E. coli Daily Ave. LA (MPN/100ml/day)	• 2.75E+9
E. coli Daily Max. LA (MPN/100ml/day)	• 8.54E+9
Fecal coliform Annual Ave. LA (MPN/100ml/year)	All fecal coliform LAs replaced by E. coli LAs
Organics and Metals Annual Ave. LAs (lbs/year)	Replaced by 2016 TMDL for Pesticides and PCBs in Potomac River and Rock Creek Tributaries (see Table B-25).
Allocation Notes	The 2014 E. coli TMDL revisions replaced fecal coliform allocation (Reference: 3).
	The 2016 TMDL for Pesticides and PCBs in Potomac River and Rock Creek Tributaries replaced all the metals and organics WLA/LA. See Table B-25.
General Notes	
IMPLEMENTATION	
Implementation	Implementation includes District managed stormwater load reduction programs (street sweeping, stormwater control regulations, nonpoint source management plan, etc.) and is a signatory to the Chesapeake Bay Agreement and a partner in the Chesapeake Bay Program, which seek to significantly reduce nonpoint pollutant loads to the Chesapeake Bay. (Reference: 1)
Other Issues	
REFERENCES AND IMPORTANT DOCUMENTS	
1	Total Maximum Daily Load for Organics, Metals and Bacteria in Oxon Run, DC DoH, December 2004
2	Decision Rationale Total Maximum Daily Loads Oxon Run for Organics, Metals, and Bacteria, U.S. EPA, December 2004
3	Appendix B, E. coli Bacteria Allocations and Daily Loads for Oxon Run, February 2013. New appendix to original TMDL document.

Table B- 17. Total Maximum Daily Load for Organics, Metals and Bacteria in Oxon Run	
4	Final Memo Summarizing DC Bacteria Data and Recommending a DC Bacteria Translator (Task 2), LimnoTech, 2011.

Table B- 18. Total Maximum Daily Loads for pH in Washington Ship Channel	
BACKGROUND	
Issue Date	2004
Author	DC DoH
303(d) listing	1998
Impairments and pollutant causes	pH measurements violate standards for Class A (primary contact recreation); Class B: (secondary contact recreation and aesthetic enjoyment); and Class C (protection and propagation of fish, shellfish, and wildlife) designated uses.
Impairment Notes	P. 6 of TMDL states that pH exceedances are caused by algal activities, which are in turn related to high nutrients. Thus, TMDL completed for phosphorus.
Sources of pollutants	MS4, direct drainage, and also affected by the Potomac and Anacostia Rivers. (Reference: 1)
MODELING	
Modeling approach	Chesapeake Bay water quality model, a simple analytical approach. (Reference: 2)
EMCs	None used.
ALLOCATIONS	
Annual Ave. WLAs (MS4) (lbs/year)	977
Annual Ave. LAs (lbs/year)	408
Allocation notes	MS4 WLA is above existing phosphorus loads, so no reduction is needed to meet WLA. (Reference: 1)
IMPLEMENTATION	
Implementation	None needed. Upstream phosphorus reductions will achieve TMDL. (Reference: 1)
Other issues	
REFERENCES AND IMPORTANT DOCUMENTS	
1	Total Maximum Daily Loads for pH in Washington Ship Channel, DC DoH, December 2004
2	Decision Rational Total Maximum Daily Loads for pH in Washington Ship Channel. U.S. EPA, December 2004

Table B- 19. Total Maximum Daily Load for Bacteria in Tidal Basin and Washington Ship Channel	
BACKGROUND	
Issue Date	Original TMDL 2004, E. coli revision 2014
Author	DC DoH; DDOE (E. coli revision)
303(d) listing	1998
Impairments and pollutant causes	Tidal Basin and Washington Ship Channel: Primary contact recreation. Cause of impairment: bacteria as measured by fecal coliform. (Reference: 1)
Impairment Notes	While the current use of the waterbodies is Class B (secondary contact recreation and aesthetic enjoyment), the designated uses also includes Class A (primary contact recreation), and so Class A uses must be achieved. (Reference: 1)
Sources of pollutants	Separate storm, Direct Runoff, Direct Deposits. (p. 10, Reference 1)
MODELING	
Modeling approach	EFDC, a 3D hydrodynamic, sediment transport, and water quality model. (Reference: 1)
EMCs	Appendix A states that "Storm water loads were calculated using event mean concentrations. The storm water runoff was estimated by multiplying the precipitation rate, infiltration loss percentage, and the drainage area. For TSS and fecal coliform in the storm water, event mean concentrations (EMC) of 94 mg/L and 28265 MPN/100ml were used, respectively." (Reference: 1)
ALLOCATIONS	
E. coli Annual Ave. WLAs (MS4) (MPN/100ml/year)	• Tidal Basin= 5.53E13 • Washington Ship Channel= 1.83E14
E. coli Daily Ave. WLAs (MS4) (MPN/100ml/day)	• Tidal Basin= 5.10E11 • Washington Ship Channel= 1.69E12
E. coli Daily Max. WLAs (MS4) (MPN/100ml/year)	• Tidal Basin= 3.21E12 • Washington Ship Channel= 1.06E13
E. coli Annual Ave. LAs (MPN/100ml/year)	• Tidal Basin= 4.48E13 • Washington Ship Channel= 7.67E13
E. coli Daily Ave. LAs (MPN/100ml/day)	• Tidal Basin= 4.13E11 • Washington Ship Channel= 7.08E11
E. coli Daily Max. LAs (MPN/100ml/year)	• Tidal Basin= 2.60E12 • Washington Ship Channel= 4.45E12

Table B- 19. Total Maximum Daily Load for Bacteria in Tidal Basin and Washington Ship Channel	
Fecal coliform Annual Ave. WLAs (MS4) (MPN/100ml/year)	All fecal coliform WLAs replaced by E. coli WLAs
Fecal coliform Annual Ave. LAs (MPN/100ml/year)	All fecal coliform LAs replaced by E. coli LAs
Allocation notes	TMDL identifies separate stormwater system and sets an allocation, but the Decision Rationale identifies the separate stormwater as an MS4 WLA. (References 1 and 2)
	The Decision Rationale also combines Direct Runoff and Direct Deposits into the LA. (Reference: 2)
	The Margin of Safety for all allocations is 10%. (Reference: 1)
	The 2014 E. coli TMDL revisions replaced fecal coliform allocation (Reference: 3).
IMPLEMENTATION	
Implementation	No specific implementation plan in TMDL. (Reference: 1)
Other issues	Stormwater quality is not a likely source of water quality violations in the Tidal Basin or Ship Channel because 1) the model simulation revealed that stormwater quality does not cause water quality violations, and 2) there was a known cross connection originating from a major rest area facility that is in the process of being fixed. (Reference: 1)
REFERENCES AND IMPORTANT DOCUMENTS	
1	Total Maximum Daily Loads for Bacteria in Tidal Basin and Washington Ship Channel, DoH, December 2004
2	Decision Rationale: Total Maximum Daily Loads for Bacteria in Tidal Basin and Washington Ship Channel, EPA, December 2004
3	Appendix B, E. coli Bacteria Allocations and Daily Loads for the Tidal Basin and Washington Ship Channel, February 2013. New appendix to original TMDL document.
4	Final Memo Summarizing DC Bacteria Data and Recommending a DC Bacteria Translator (Task 2), LimnoTech, 2011.

Table B- 20. Total Maximum Daily Load for Organics in Tidal Basin and Washington Ship Channel	
BACKGROUND	
Issue Date	2004
Author	DoH
303(d) listing	1998

Table B- 20. Total Maximum Daily Load for Organics in Tidal Basin and Washington Ship Channel			
Impairments and pollutant causes	Tidal Basin and Ship Channel: primary contact recreation. Cause of Impairment: chlordane, DDT, endosulfan, heptachlor epoxide, hexachlorobenzene, total PAHs, and total PCBs. (Reference: 1)		
Impairment Notes	List of chemicals evaluated was based on fish tissue and sediment analysis in the Anacostia River. (Reference: 1)		
Sources of pollutants	Stormwater, direct drainage, water quality conditions in the Potomac and Anacostia (Reference: 1)		
MODELING			
Modeling approach	EFDC, a 3D hydrodynamic, sediment transport, and water quality model. (Reference: 1)		
EMCs	Appendix A states "Storm water loads were calculated using event mean concentrations. The storm water runoff was estimated by multiplying the precipitation rate, infiltration loss percentage, and the drainage area. For TSS in the storm water, an event mean concentration (EMC) of 94 mg/L was used. The event mean concentrations used for various organics are the same as what were used in the DC Small Tributaries Model" (Reference: 1). EMCs are summarized in Tables 2a and 2b, p. 11, Small Tributaries Model Report, ICPRB July 2003 (Reference 3).		
ALLOCATIONS			
Annual Ave. WLAs (MS4) (lbs/year)	Tidal Basin	• Chlordane=3.980E-3* • DDD=3.372E-3* • DDE=3.980E-3* • DDT=3.980E-3* • Dieldrin=3.260E-4*	• Heptachlor Epoxide=7.419E-4* • PAH1=7.403E-1* • PAH2=2.091E-1* • PAH3=2.091E-1* • TPCB=3.141E-4
	Ship Channel	• Chlordane=1.315E-2* • DDD=1.115E-2* • DDE=1.315E-2* • DDT=1.315E-2* • Dieldrin=1.077E-3*	• Heptachlor Epoxide=2.452E-3* • PAH1=2.446* • PAH2=6.910E-1* • PAH3=6.910E-1* • TPCB=9.788E-4
Annual Ave. LAs (lbs/year)	Tidal Basin	• Chlordane=3.223E-3 • DDD=2.732E-3 • DDE=3.223E-3 • DDT=3.223E-3 • Dieldrin=2.641E-4	• Heptachlor Epoxide=6.010E-4 • PAH1=5.996E-1 • PAH2=1.694E-1 • PAH3=1.694E-1 • TPCB=2.534E-4

Table B- 20. Total Maximum Daily Load for Organics in Tidal Basin and Washington Ship Channel			
	Ship Channel	• Chlordane=5.524E-3 • DDD=4.681E-3 • DDE=5.524E-3 • DDT=5.524E-3 • Dieldrin=4.525E-4	• Heptachlor Epoxide=1.030E-3 • PAH1=1.027 • PAH2=2.902E-1 • PAH3=2.902E-1 • TPCB=4.104E-4
Allocation notes	*MS4 WLAs moved to category 3 in 2014 303(d) list		
	TMDL identifies separate stormwater system and sets an allocation, but the Decision Rationale identifies the separate stormwater as an MS4 WLA. (Reference: 1)		
IMPLEMENTATION			
Implementation	No specific implementation plan for MS4 WLAs included in TMDL.		
Other issues			
REFERENCES AND IMPORTANT DOCUMENTS			
1	Total Maximum Daily Loads for Organics in Tidal Basin and Washington Ship Channel, DoH, 2004.		
2	Decision Rationale: Total Maximum Daily Loads for Organics in Tidal Basin and Washington Ship Channel, EPA, 2004		
3	Small Tributaries Model Report, ICPRB, 2003		

Table B- 21. Total Maximum Daily Loads for Organics and Metals in Battery Kemble Creek, Foundry Branch, and Dalecarlia Tributary	
BACKGROUND	
Issue Date	2004
Author	DC DoH
303(d) Listing	1996, 1998, and 2002
Impairments and Pollutant Causes	Impairment: Protection and Propagation of Fish, Shellfish and Wildlife. Impairment causes: Metals, Organics, Bacteria, Dissolved Oxygen (depending on the specific tributary). P. 3 of the TMDL states “Because of general lack of data in the District’s tributaries, the list of chemicals of concern for this TMDL were determined from data derived from fish tissue and sediment analysis in the Anacostia River.”
Impairment Notes	Chemicals of concern were determined through fish tissue and sediment analysis. (Reference: 1)
Sources of Pollutants	NPDES MS4 outlets and direct runoff. (Reference: 1)
MODELING	
Modeling Approach	DC Small Tributaries TMDL Model
EMCs	EMCs are in Tables 2a and 2b, p. 11, Small Tributaries Model Report, ICPRB July 2003 (Reference 3).
ALLOCATIONS	

Table B- 21. Total Maximum Daily Loads for Organics and Metals in Battery Kemble Creek, Foundry Branch, and Dalecarlia Tributary		
Annual Ave. WLAs (MS4) (lbs/year)	Battery Kemble Creek	WLAs no longer valid. Waterbody was found to no longer be impaired by organics or metals.
	DC Dalecarlia Tributary	Revised WLAs are now included in the *Total Maximum Daily Loads of Organochlorine Pesticides and Polychlorinated Biphenyls in Broad Branch, Dalecarlia Tributary, Dumbarton Oaks, Fenwick Branch, Klingle Valley Creek, Luzon Branch, Melvin Hazen Valley Branch, Normanstone Creek, Oxon Run, Piney Branch, Pinehurst Branch, Portal Branch, and Soapstone Creek in the District of Columbia* document (See Table 26 below).
	Foundry Branch	WLAs no longer valid. Waterbody was found to no longer be impaired by organics or metals.
Annual Ave. LAs (lbs/year)	Battery Kemble Creek	LAs no longer valid. Waterbody was found to no longer be impaired by organics or metals.
	DC Dalecarlia Tributary	Revised LAs are now included in the *Total Maximum Daily Loads of Organochlorine Pesticides and Polychlorinated Biphenyls in Broad Branch, Dalecarlia Tributary, Dumbarton Oaks, Fenwick Branch, Klingle Valley Creek, Luzon Branch, Melvin Hazen Valley Branch, Normanstone Creek, Oxon Run, Piney Branch, Pinehurst Branch, Portal Branch, and Soapstone Creek in the District of Columbia* document (See Table 26 below).
	Foundry Branch	LAs no longer valid. Waterbody was found to no longer be impaired by organics or metals.
Allocation Notes		

ROCK CREEK WATERSHED

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Table B- 22. Total Maximum Daily Load for Fecal Coliform Bacteria in Rock Creek	
BACKGROUND	
Issue Date	Original TMDL 2004; E. coli revision 2014
Author	DC DoH; DDOE (E. coli revision)
303(d) Listing	1998
Impairments and Pollutant Causes	Class A: Primary contact recreation and Class B: Secondary contact recreation. Impairment Causes: Increased levels of Fecal Coliform Bacteria. (Reference: 1)
Impairment Notes	
Sources of Pollutants	Pollutant sources are ubiquitous but include CSOs, SSOs, stormwater runoff, and direct deposits. (Reference: 1)
MODELING	
Modeling Approach	Two components make up the model: 1) the Land Models developed for the DC Water LTCP and 2) EPA's SWMM model. (Reference: 1)
EMCs	28,265 (Table 5, EPA Decision Rationale Document (Reference 2).
ALLOCATIONS	
E. coli Annual Ave. WLAs (MS4) (MPN/100ml/year)	• Rock Creek Upper= 2.870E13 • Rock Creek Lower= 1.010E13
E. coli Daily Ave. WLAs (MS4) (MPN/100ml/day)	• Rock Creek Upper= 8.620E10 • Rock Creek Lower= 3.450E10
E. coli Daily Max. WLAs (MS4) (MPN/100ml/day)	• Rock Creek Upper= 2.920E12 • Rock Creek Lower= 9.080E11
E. coli Annual Ave. LAs (MPN/100ml/year)	• Rock Creek Upper= 1.550E12 • Rock Creek Lower= 2.030E13
E. coli Daily Ave. LAs (MPN/100ml/day)	• Rock Creek Upper= 1.300E10 • Rock Creek Lower= 1.700E11
E. coli Daily Max. LAs (MPN/100ml/day)	• Rock Creek Upper= 8.390E10 • Rock Creek Lower= 1.100E12
Fecal coliform Annual Ave. WLAs (MS4) (MPN/100ml/year)	All fecal coliform WLAs replaced by E. coli WLAs
Fecal coliform Annual Ave. LAs (MPN/100ml/year)	All fecal coliform LAs replaced by E. coli LAs

Allocation Notes	The 2013 E. coli TMDL revisions replaced fecal coliform allocation (Reference: 3).
IMPLEMENTATION	
Implementation	No specific implementation plan for MS4 WLA included in TMDL document. (Reference: 1)
Other Issues	
REFERENCES AND IMPORTANT DOCUMENTS	
1	Total Maximum Daily Load for Fecal Coliform Bacteria in Rock Creek, DC DoH, February 2004
2	Decision Rationale Total Maximum Daily Loads for Fecal Coliform Bacteria in Rock Creek, U.S. EPA, February 2004
3	Appendix B, E. coli Bacteria Allocations and Daily Loads for Rock Creek, February 2013. New appendix to original TMDL document.
4	Final Memo Summarizing DC Bacteria Data and Recommending a DC Bacteria Translator (Task 2), LimnoTech, 2011.

Table B- 23. Total Maximum Daily Load for Metals in Rock Creek	
BACKGROUND	
Issue Date	2004, revised 2016
Author	DC DoH, revised by DOEE
303(d) Listing	1998
Impairments and Pollutant Causes	Class A: Primary contact recreation and Class B: Secondary contact recreation. Impairment Causes: Lead, zinc, and mercury and potentially cadmium and copper. (Reference: 1)
Impairment Notes	The District of Columbia's Section 303(d) list does not specifically identify the and metals impairing Rock Creek's water quality. A general lack of data in the Rock Creek watershed required that fish tissue and sediment analysis in the Anacostia River serve as the basis for the selection of the pollutants of concern. Analysis of available water quality data suggested the need for a limited number of TMDLs. Many of the pollutants of concern most likely do not contribute to the impairment of Rock Creek or they have been banned and future loadings of these pollutants of concern should be minimal. It was decided that TMDLs were required for lead, zinc, and mercury while insufficient data to determine whether or not TMDLs were required for cadmium and copper. A wet weather monitoring program was implemented to determine whether or not cadmium and copper TMDLs are required. During all sampling events, concentrations of cadmium were significantly below all existing water quality standards. However, copper concentrations found within Rock Creek indicated possible violations of water quality standards. Therefore, TMDLs were completed for copper, lead, mercury, and zinc, but not for cadmium (Reference: 1).

Table B- 23. Total Maximum Daily Load for Metals in Rock Creek		
Sources of Pollutants	CSOs, urban stormwater runoff, and potentially habitat modification and stream bank destabilization. (Reference: 1)	
MODELING		
Modeling approach	The model was based on previous SWMM models of Rock Creek constructed for the DC Water LTCP and the District's Bacteria TMDLs in Rock Creek. (Reference: 1)	
EMCs	EMCs are given in Table 5 of the Decision Rationale (Reference: 2)	
ALLOCATIONS		
Annual Ave. WLAs (MS4) (lbs/year)	Rock Creek Upper	• Copper= 592.67 • Zinc= 1716.67 • Lead= 43.90 • Mercury= 1.78
	Rock Creek Lower	• Copper= 208.64 • Zinc= 604.32 • Lead= 15.45 • Mercury= 0.63
Daily Ave. WLAs (MS4) (lbs/day)	Rock Creek Upper	• Copper= 1.62 • Zinc= 4.70 • Lead= 0.12 • Mercury= <0.01*
	Rock Creek Lower	• Copper= 0.57 • Zinc= 1.65 • Lead= 0.04 • Mercury= <0.01*
Daily Max WLAs (MS4) (lbs/day)	Rock Creek Upper	• Copper= 56.21 • Zinc= 162.81 • Lead= 4.16 • Mercury= 0.17
	Rock Creek Lower	• Copper= 18.56 • Zinc= 53.76 • Lead= 1.37 • Mercury= 0.06
Annual Ave. LAs (lbs/year)	Rock Creek Upper	• Copper= 1.34 • Zinc= 3.88 • Lead= 0.10 • Mercury= <0.01*
	Rock Creek Lower	• Copper= 1.05 • Zinc= 3.03 • Lead= 0.08 • Mercury= <0.01*

Table B- 23. Total Maximum Daily Load for Metals in Rock Creek		
Daily Ave. LAs (lbs/day)	Rock Creek Upper	• Copper= <0.01* • Zinc= 0.01 • Lead= <0.01* • Mercury= <0.01*
	Rock Creek Lower	• Copper= <0.01* • Zinc= 0.01 • Lead= <0.01* • Mercury= <0.01*
Daily Max LAs (lbs/day)	Rock Creek Upper	• Copper= 0.02 • Zinc= 0.05 • Lead= <0.01* • Mercury= <0.01*
	Rock Creek Lower	• Copper= 0.01 • Zinc= 0.04 • Lead= <0.01* • Mercury= <0.01*
Allocation Notes	*Allocation value listed as <0.01 in TMDL	
IMPLEMENTATION		
Implementation	No specific implementation plan for MS4 WLA included in TMDL document. (Reference: 1)	
Other Issues		
REFERENCES AND IMPORTANT DOCUMENTS		
1	Total Maximum Daily Load for Metals in Rock Creek, DC DoH, February 2004	
2	Decision Rationale Total Maximum Daily Loads Rock Creek for Metals, U.S. EPA, February 2004	
3	Revised Total Maximum Daily Load for Metals in Rock Creek, DOEE, September 2016	

MULTIPLE WATERSHEDS

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Table B- 24. Chesapeake Bay TMDL for Nitrogen, Phosphorus and Sediment		
BACKGROUND		
Issue Date	2010	
Author	U.S. EPA	
303(d) Listing	2008	
Impairments and Pollutant Causes	TMDL addresses only the restoration of aquatic life uses for the Bay and its tidal tributaries and embayments that are impaired from excess nitrogen, phosphorus, and sediment pollution. (Reference: 1)	
Impairment Notes		
Sources of Pollutants	Pollutant causes: wastewater facilities, industrial discharge facilities, CSOs, SSOs, NPDES permitted stormwater, and CAFOs. (Reference: 1)	
MODELING		
Modeling Approach	The two major components of the Chesapeake Bay TMDL modeling framework are the Phase 6.0 Chesapeake Bay Watershed Model, and the Chesapeake Bay Water Quality and Sediment Transport Model. (Reference: 1)	
EMCs	The Bay Watershed Model Version 6.0 uses edge-of-field erosion rates for different land use types to establish loads from different land use types (i.e.: xx pounds of TN per acre of xx commercial land). EMCs were not used, but values of 2.0 mg/L for TN and 0.27 mg/L for TP are cited in the CBP documentation.	
ALLOCATIONS		
Annual Ave. WLA (MS4) (lbs/year)	ANATF_DC:	• TN= 49511 • TP= 3480 • TSS= 3889750
	ANATF_MD:	• TN= 10118 • TP= 1451 • TSS= 2612503
	POTT_DC	• TN= 53080 • TP= 4132 • TSS= 7638787
	POTT_MD	• TN= 8318 • TP= 596 • TSS= 1528839
Annual Ave. LA. (lbs/year)	ANATF_DC:	• TN= 3333 • TP= 221 • TSS= 272853
	ANATF_MD:	• TN= 680 • TP= 87 • TSS= 137629
	POTT_DC	• TN= 6258 • TP= 473 • TSS= 710937

Table B- 24. Chesapeake Bay TMDL for Nitrogen, Phosphorus and Sediment		
	POTT_MD	• TN= 20 • TP= 1 • TSS= 3328
Allocation Notes	Modeling was done on a very large scale (64,000 sq. mile watershed scale), and so allocations to sectors (such as MS4) on a small (jurisdictional) scale may not match allocations done at a smaller modeling scale.	
IMPLEMENTATION		
Implementation	The District has developed Phase I, Phase II, and Phase III Watershed Implementation Plans describing how it will attain its goals. It also sets Two-Year Milestones on a regular basis to help track progress. DDOE is required to report progress to the Bay Program on a regular basis. The implementation targets are to meet 60% of the sediment and nutrient reduction goals by 2017, and 100% by 2025. (Reference: 1, 2)	
Other Issues	TMDL was prompted by insufficient progress and continued poor water quality in the Chesapeake Bay and its tidal tributaries and responds to consent decrees in Virginia and the District from the late 1990s. (Reference: 1)	
	This TMDL is a compilation of 92 smaller TMDLs developed within the Chesapeake bay watershed. (Reference: 1)	
REFERENCES AND IMPORTANT DOCUMENTS		
1	Chesapeake Bay TMDL for Nitrogen, Phosphorus and Sediment, U.S. EPA, 2010	
2	Chesapeake Bay TMDL Phase III Watershed Implementation Plan, DC DOEE, November, 2020	

Table B- 25. Total Maximum Daily Loads of PCBs for Tidal Portions of the Potomac and Anacostia Rivers in DC, Maryland, and Virginia	
BACKGROUND	
Issue Date	2007
Author	Interstate Commission on the Potomac River Basin for DDOE, MDE and VDEQ
303(d) Listing	1996 and 1998, 2003 for the Anacostia
Impairments and Pollutant Causes	Class D: Protection of human health related to the consumption of fish and shellfish. Pollutant Causes: elevated levels of PCBs in fish tissue. (Reference: 1)
Impairment Notes	
Sources of Pollutants	Upstream sources, direct drainage, WWTPs, CSOs, atmospheric deposition, and contaminated sites. (Reference: 1)
MODELING	
Modeling Approach	Hydrodynamics were modeled with a 1D branched version of DYNHYD5 coupled to a modified version of WASP5/TOXI5. (Reference: 3)
EMCs	
ALLOCATIONS	

Table B- 25. Total Maximum Daily Loads of PCBs for Tidal Portions of the Potomac and Anacostia Rivers in DC, Maryland, and Virginia		
Annual Ave. WLAs (MS4) (g/year)	• Anacostia Upper= 1.76 • Anacostia Lower= 0.612 • Oxon Run= 1.09 • Potomac Lower= 5.41	• Potomac Middle= 7.42 • Potomac Upper= 1.46 • Washington Ship Channel= 0.0824
Daily Ave. WLAs (MS4) (mg/day)	• Anacostia Upper= 4.82 • Anacostia Lower= 1.68 • Potomac Lower= 14.80	• Potomac Middle= 20.3 • Potomac Upper= 4.00
Daily Max WLAs (MS4) (mg/day)	• Anacostia Upper= 300 • Anacostia Lower= 125 • Potomac Lower= 924	• Potomac Middle= 1130 • Potomac Upper= 197
Annual Ave. LAs (g/year)	• Anacostia Upper= 0.262 • Anacostia Lower= 0.173 • Oxon Run= 0.232 • Potomac Lower= 0.923	• Potomac Middle= 0.843 • Potomac Upper= 0.141 • Washington Ship Channel= 0.093
Allocation Notes	The TMDLs developed in this document replace the previously developed 2003 Anacostia TMDL. (Reference: 1)	
	TMDL also includes CSO allocations, and daily maximum expressions of the LA. (Reference: 1)	
IMPLEMENTATION		
Implementation	P. 21 of the TMDL states that "Upon approval of the TMDL "NPDES-regulated municipal stormwater and small construction storm water discharges effluent limits should be expressed as Best Management Practices (BMPs) or other similar requirements, rather than as numeric effluent limits" (US EPA 2002)." Further, p. 41 of the TMDL states that "Following the approval of the TMDL for the tidal Anacostia and Potomac River estuary, the water quality-based effluent limitations (WQBELs) in NPDES permits that are issued, reissued, or modified after the TMDL approval date must be consistent with the WLAs (CFR 2007b). EPA's NPDES regulations at 40 CFR 122.44(k) allow permits to use non-numeric, BMP-based WQBELs under certain conditions. The regulation, in subsections 3 and 4, states that BMP based WQBELs can be used where "Numeric effluent limitations are infeasible; or [t]he practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA."" This section goes on to state that "The jurisdictions intend to use non-numeric WQBELs to comply with the WLA provisions of the TMDL because BMPs are appropriate and reasonably necessary to achieve water quality standards and to carry out the goals of the CWA for the tidal Potomac PCB TMDL. This approach will first entail additional data collection from selected NPDES permitted facilities to better characterize PCB discharges. Where warranted, non-numeric, BMPs will be implemented. These BMPs are intended to focus on PCB source tracking and elimination at the source, rather than end-of-pipe controls." (Reference: 1)	
Other issues	This document is the result of a consent decree that requires the District of Columbia to complete a PCB TMDL by September 30, 2007. (Reference: 1)	

Table B- 25. Total Maximum Daily Loads of PCBs for Tidal Portions of the Potomac and Anacostia Rivers in DC, Maryland, and Virginia	
REFERENCES AND IMPORTANT DOCUMENTS	
1	Total Maximum Daily Loads of PCBs for Tidal Portions of the Potomac and Anacostia Rivers in DC, Maryland, and Virginia, Interstate Commission on the Potomac River Basin, September 2007
2	Decision Rationale Total Maximum Daily Loads for PCBs Tidal Potomac and Anacostia River Watershed, U.S. EPA, October 2007
3	PCB TMDL Model for the Potomac River Estuary, LimnoTech, 2007

Table B- 26. Total Maximum Daily Loads of Organochlorine Pesticides and Polychlorinated Biphenyls in Broad Branch, Dalecarlia Tributary, Dumbarton Oaks, Fenwick Branch, Klingle Valley Creek, Luzon Branch, Melvin Hazen Valley Branch, Normanstone Creek, Oxon Run, Piney Branch, Pinehurst Branch, Portal Branch, and Soapstone Creek in the District of Columbia	
BACKGROUND	
Issue Date	2016
Author	DOEE
303(d) Listing	1998
Impairments and Pollutant Causes	Impairment: Class C: Protection and Propagation of Fish, Shellfish and Wildlife; Class D: Protection of Human Health related to Consumption of Fish, Shellfish. Impairment causes: Metals, Organics (depending on the specific tributary).
Impairment Notes	Original impairments were based on very limited data and were based on fish tissue data collected from the mainstem Anacostia River and Potomac River. Samples were collected in 2013 in the listed tributaries as part of larger effort to confirm the impairments for metals and toxics across the District. (Reference: 1)
Sources of Pollutants	NPDES MS4 outlets and direct runoff. (Reference: 1)
General Notes	This TMDL replaces the Total Maximum Daily Loads for Organics and Metals in Battery Kemble Creek, Foundry Branch, and Dalecarlia Tributary; the organics and metals component of the Total Maximum Daily Load for Organics, Metals and Bacteria in Oxon Run, and the Total Maximum Daily Load for Organics and Metals in Rock Creek Tributaries. This TMDL was developed to address a lawsuit requiring daily expressions of loads. As part of the TMDL revision process, additional sampling was done to confirm impairments, and thus the need for specific TMDLs in specific waterbodies. This resulted in differences in TMDLs and MS4 WLAs for specific pollutants in specific waterbodies compared to the original TMDLs.

Table B- 26. Total Maximum Daily Loads of Organochlorine Pesticides and Polychlorinated Biphenyls in Broad Branch, Dalecarlia Tributary, Dumbarton Oaks, Fenwick Branch, Klingle Valley Creek, Luzon Branch, Melvin Hazen Valley Branch, Normanstone Creek, Oxon Run, Piney Branch, Pinehurst Branch, Portal Branch, and Soapstone Creek in the District of Columbia			
MODELING			
Modeling Approach	DC Small Tributaries Pesticide TMDL Model		
EMCs	EMCs are in Table 2.5, p. 24, Small Tributaries Pesticide Model Report, ICPRB April 2016 (Reference 3).		
ALLOCATIONS			
Annual Ave. WLAs (MS4) (lbs/year)	Broad Branch	• Chlordane= 2.79E-03 • Dieldrin= 1.86E-04	• Heptachlor Epoxide= 1.34E-04 • TPCB= 2.20E-04
	DC Dalecarlia Tributary	• Dieldrin= 2.00E-04	• Heptachlor Epoxide= 1.44E-04
	Dumbarton Oaks	• Chlordane= 5.34E-05 • Dieldrin= 3.56E-06	• Heptachlor Epoxide= 2.57E-06 • TPCB= 4.22E-06
	Fenwick Branch	• DDT= 1.28E-04 • Dieldrin= 3.15E-05	• Heptachlor Epoxide= 2.27E-06 • TPCB= 3.73E-05
	Klingle Valley Run	• Dieldrin= 2.64E-05	• Heptachlor Epoxide= 1.90E-05 • TPCB= 3.12E-05
	Luzon Branch	• Chlordane= 2.13E-03 • Dieldrin= 1.42E-04	• Heptachlor Epoxide= 1.03E-04 • TPCB= 1.69E-04
	Melvin Hazen Valley Branch	• Dieldrin= 2.19E-05	• TPCB= 2.60E-05
	Normanstone Creek	• Dieldrin= 3.49E-05	• Heptachlor Epoxide= 2.52E-05 • TPCB= 4.14E-05
	Oxon Run	• Dieldrin= 4.02E-04	
	Pinehurst Branch	• Dieldrin= 4.75E-05	• Heptachlor Epoxide= 3.43E-05 • TPCB= 5.62E-05
	Piney Branch	• Chlordane= 1.28E-04 • Dieldrin= 8.51E-06	• Heptachlor Epoxide= 6.15E-06 • TPCB= 1.01E-05
	Portal Branch	• Dieldrin= 1.19E-05	• Heptachlor Epoxide= 8.60E-06 • TPCB= 1.41E-05

Table B- 26. Total Maximum Daily Loads of Organochlorine Pesticides and Polychlorinated Biphenyls in Broad Branch, Dalecarlia Tributary, Dumbarton Oaks, Fenwick Branch, Klingle Valley Creek, Luzon Branch, Melvin Hazen Valley Branch, Normanstone Creek, Oxon Run, Piney Branch, Pinehurst Branch, Portal Branch, and Soapstone Creek in the District of Columbia			
	Soapstone Creek	• Chlordane= 1.45E-03 • Dieldrin= 9.67E-05	• Heptachlor Epoxide= 6.98E-05 • TPCB= 1.15E-04
Daily Maximum Ave. WLAs (MS4) (lbs/day)	Broad Branch	• Chlordane= 5.18 E-04 • Dieldrin= 3.45E-05	• Heptachlor Epoxide= 2.49E-05 • TPCB= 4.09E-05
	DC Dalecarlia Tributary	• Dieldrin= 3.71E-05	• Heptachlor Epoxide= 2.68E-05
	Dumbarton Oaks	• Chlordane= 8.36E-06 • Dieldrin= 5.57E-07	• Heptachlor Epoxide= 4.02E-07 • TPCB= 6.60E-07
	Fenwick Branch	• DDT= 2.44E-05 • Dieldrin= 5.98E-06	• Heptachlor Epoxide= 4.32E-06 • TPCB= 7.09E-06
	Klingle Valley Run	• Dieldrin= 4.69E-06	• Heptachlor Epoxide= 3.39E-06 • TPCB= 5.56E-06
	Luzon Branch	• Chlordane= 3.72E-04 • Dieldrin= 2.48E-05	• Heptachlor Epoxide= 1.79E-05 • TPCB= 2.94E-05
	Melvin Hazen Valley Branch	• Dieldrin= 4.09E-06	• TPCB= 4.85E-06
	Normanstone Creek	• Dieldrin= 6.41E-06	• Heptachlor Epoxide= 4.63E-06 • TPCB= 7.59E-06
	Oxon Run	• Dieldrin= 7.18E-05	
	Pinehurst Branch	• Dieldrin= 9.20E-06	• Heptachlor Epoxide= 6.65E-06 • TPCB= 1.09E-05
	Piney Branch	• Chlordane= 2.27E-05 • Dieldrin= 1.51E-06	• Heptachlor Epoxide= 1.09E-06 • TPCB= 1.79E-06
	Portal Branch	• Dieldrin= 2.30E-06	• Heptachlor Epoxide= 1.66E-06 • TPCB= 2.73E-06
	Soapstone Creek	• Chlordane= 2.56E-04 • Dieldrin= 1.71E-05	• Heptachlor Epoxide= 1.23E-05 • TPCB= 2.02E-05

Table B- 26. Total Maximum Daily Loads of Organochlorine Pesticides and Polychlorinated Biphenyls in Broad Branch, Dalecarlia Tributary, Dumbarton Oaks, Fenwick Branch, Klingle Valley Creek, Luzon Branch, Melvin Hazen Valley Branch, Normanstone Creek, Oxon Run, Piney Branch, Pinehurst Branch, Portal Branch, and Soapstone Creek in the District of Columbia

Annual Ave. LAs (lbs/year)	Broad Branch	• Chlordane= 1.06E-03 • Dieldrin= 7.06E-05	• Heptachlor Epoxide= 5.10E-05 • TPCB= 8.37E-05
	DC Dalecarlia Tributary	• Dieldrin= 5.47E-07	• Heptachlor Epoxide= 3.95E-05
	Dumbarton Oaks	• Chlordane= 3.51E-04 • Dieldrin= 2.34E-05	• Heptachlor Epoxide= 1.69E-05 • TPCB= 2.77E-05
	Fenwick Branch	• DDT= 6.83E-05 • Dieldrin= 1.68E-05	• Heptachlor Epoxide= 1.21E-05 • TPCB= 1.99E-05
	Klingle Valley Run	• Dieldrin= 1.30E-05	• Heptachlor Epoxide= 9.39E-06 • TPCB= 1.54E-05
	Luzon Branch	• Chlordane= 3.68E-04 • Dieldrin= 2.57E-05	• Heptachlor Epoxide= 1.86E-05 • TPCB= 3.05E-05
	Melvin Hazen Valley Branch	• Dieldrin= 1.51E-05	• TPCB= 1.79E-05
	Normanstone Creek	• Dieldrin= 1.42E-05	• Heptachlor Epoxide= 1.03E-05 • TPCB= 1.69E-05
	Oxon Run	• Dieldrin= 1.14E-04	
	Pinehurst Branch	• Dieldrin= 3.84E-05	• Heptachlor Epoxide= 2.77E-05 • TPCB= 4.55E-05
	Piney Branch	• Chlordane= 1.47E-04 • Dieldrin= 9.78E-06	• Heptachlor Epoxide= 7.06E-06 • TPCB= 1.16E-05
	Portal Branch	• Dieldrin= 3.55E-06	• Heptachlor Epoxide= 2.56E-06 • TPCB= 4.20E-06
	Soapstone Creek	• Chlordane= 4.76E-04 • Dieldrin= 3.17E-05	• Heptachlor Epoxide= 2.29E-05 • TPCB= 3.76E-05
Daily Maximum Ave. LAs (lbs/day)	Broad Branch	• Chlordane= 8.99E-05 • Dieldrin= 5.99E-06	• Heptachlor Epoxide= 4.33E-06 • TPCB= 7.10E-06

Table B- 26. Total Maximum Daily Loads of Organochlorine Pesticides and Polychlorinated Biphenyls in Broad Branch, Dalecarlia Tributary, Dumbarton Oaks, Fenwick Branch, Klingle Valley Creek, Luzon Branch, Melvin Hazen Valley Branch, Normanstone Creek, Oxon Run, Piney Branch, Pinehurst Branch, Portal Branch, and Soapstone Creek in the District of Columbia

	DC Dalecarlia Tributary	• Dieldrin= 3.48E-06	• Heptachlor Epoxide= 2.51E-06
	Dumbarton Oaks	• Chlordane= 5.43E-05 • Dieldrin= 3.62E-06	• Heptachlor Epoxide= 2.62E-06 • TPCB= 4.29E-06
	Fenwick Branch	• DDT= 7.26E-06 • Dieldrin= 1.78E-06	• Heptachlor Epoxide= 1.29E-06 • TPCB= 2.11E-06
	Klingle Valley Run	• Dieldrin= 1.41E-06	• Heptachlor Epoxide= 1.02E-06 • TPCB= 1.67E-06
	Luzon Branch	• Chlordane= 2.30E-05 • Dieldrin= 1.53E-06	• Heptachlor Epoxide= 1.11E-06 • TPCB= 1.82E-06
	Melvin Hazen Valley Branch	• Dieldrin= 1.63E-06	• TPCB= 1.93E-06
	Normanstone Creek	• *Dieldrin= 1.33E-06*	• *Heptachlor Epoxide= 9.57E-07* • *TPCB= 1.57E-06*
	Oxon Run	• Dieldrin= 9.51E-06	
	Pinehurst Branch	• Dieldrin= 4.13E-06	• Heptachlor Epoxide= 2.98E-06 • TPCB= 4.89E-06
	Piney Branch	• Chlordane= 1.77E-05 • Dieldrin= 1.18E-06	• Heptachlor Epoxide= 8.53E-07 • TPCB= 1.40E-06
	Portal Branch	• Dieldrin= 1.95E-07	• Heptachlor Epoxide= 1.41E-07 • TPCB= 2.31E-07
	Soapstone Creek	• Chlordane= 4.52E-05 • Dieldrin= 3.01E-06	• Heptachlor Epoxide= 2.18E-06 • TPCB= 3.57E-06
Allocation Notes			
IMPLEMENTATION			
Implementation	No specific implementation plan included in TMDL.		
Other Issues			
REFERENCES AND IMPORTANT DOCUMENTS			

Table B- 26. Total Maximum Daily Loads of Organochlorine Pesticides and Polychlorinated Biphenyls in Broad Branch, Dalecarlia Tributary, Dumbarton Oaks, Fenwick Branch, Klingle Valley Creek, Luzon Branch, Melvin Hazen Valley Branch, Normanstone Creek, Oxon Run, Piney Branch, Pinehurst Branch, Portal Branch, and Soapstone Creek in the District of Columbia	
1	Total Maximum Daily Loads of Organochlorine Pesticides and Polychlorinated Biphenyls in Broad Branch, Dalecarlia Tributary, Dumbarton Oaks, Fenwick Branch, Klingle Valley Creek, Luzon Branch, Melvin Hazen Valley Branch, Normanstone Creek, Oxon Run, Piney Branch, Pinehurst Branch, Portal Branch, and Soapstone Creek in the District of Columbia, DOEE, October 2016
2	Decision Rationale Total Maximum Daily Loads of Organochlorine Pesticides and Polychlorinated Biphenyls in Broad Branch, Dalecarlia Tributary, Dumbarton Oaks, Fenwick Branch, Klingle Valley Creek, Luzon Branch, Melvin Hazen Valley Branch, Normanstone Creek, Oxon Run, Piney Branch, Pinehurst Branch, Portal Branch, and Soapstone Creek in the District of Columbia, U.S. EPA, 2016
3	Small Tributaries Pesticide Model Report, ICPRB, 2016