

George Washington Memorial Parkway, Virginia

Phase II Chesapeake Bay TMDL Action Plan

Public Comment Draft – August 13, 2020



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CERTIFICATION

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Phase II Chesapeake Bay TMDL Action Plan George Washington Memorial Parkway, Virginia

August 13, 2020

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Phase II Chesapeake Bay TMDL Action Plan

George Washington Memorial Parkway, Virginia

August 13, 2020

1. Introduction

1.1. Purpose

This Phase II Chesapeake Bay TMDL Action Plan documents how the GWMP intends to meet the Chesapeake Bay TMDL Special Condition of the General Permit for Discharges from Small Municipal Separate Storm Sewer Systems (MS4 permit). The Phase II plan builds on the GWMP's Phase I Chesapeake Bay TMDL Action Plan, dated June 13, 2017.

The National Park Service (NPS) National Capital Region (NCR) operates the George Washington Memorial Parkway (GWMP), which encompasses parks and roadways in Virginia, Maryland, and the District of Columbia. The parkway runs along the Potomac River, protecting the landscape and natural shoreline of the river while offering scenic vistas of Washington, DC and the Great Falls of the Potomac. The GWMP is a historic district listed in the National Register of Historic Places and features many cultural landscapes. In Virginia, these cultural landscapes include: Arlington House; Arlington Ridge Park (contains the U.S. Marine Corps War Memorial and the Netherlands Carillon); Fort Hunt Park; Fort Marcy; Mount Vernon Memorial Highway; and, Spout Run Parkway. In addition to cultural landscapes, the GWMP also features historic properties (those cultural resources listed in the National Register of Historic Places), historic structures, memorials, and archeological sites. Integrity is the authenticity of a property's historic identity or the extent to which a property evokes its appearance during a particular historic period. The National Register identifies seven aspects of integrity: location; design; setting; materials; workmanship; feeling; and, association. Retention of these qualities is essential for a property to convey its significance.

The Virginia Department of Environmental Quality (DEQ) issued the most recent MS4 permit (VAR040111) to the GWMP effective November 1, 2018 (2018 MS4 permit). Part II A of the MS4 permit requires the development and implementation of action plans for impaired waters where a Total Maximum Daily Load (TMDL) assigns a waste load allocation (WLA) to the GWMP that has been approved by the State Water Control Board. A TMDL establishes the maximum amount of a pollutant that can enter a water body without violating water quality standards. A WLA is the portion of the TMDL that is allocated to a permitted source.

In December 2010, the U.S. Environmental Protection Agency (U.S. EPA) established a TMDL for the Chesapeake Bay. Pollutants of concern (POCs) identified for the Chesapeake Bay include total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS). Virginia subsequently adopted a Watershed Implementation Plan (WIP) that establishes the framework for meeting the Chesapeake Bay TMDL. The Virginia WIP states that MS4 permit holders will implement a phased approach for meeting reduction targets over three five-year permit cycles in accordance with the following: 5% by the end of the first permit cycle (June 30, 2018); 40% by the end of the second permit cycle (2023); and, 100% by the end of the third permit cycle (2028).

GWMP exceeded the 5% reduction requirement for the first permit cycle. This Phase II Chesapeake Bay TMDL Action Plan establishes the GWMP's 40% reduction target and identifies the Best Management Practices (BMPs) for achieving the target in accordance with the 2018 MS4 permit, the Chesapeake Bay TMDL Special Condition Guidance developed by DEQ (Guidance Memo No 15-2005) dated May 18, 2015, and other guidance received by DEQ.

1.2. Summary of Required Reductions and BMPs to Achieve Reductions

The GWMP calculated the 5% reduction requirement in its initial Chesapeake Bay TMDL Action Plan. GWMP's 40% reduction calculation is presented in Section 3. The reduction target is based on existing sources as of June 30, 2009. MS4 permittees are also required to offset new sources initiating construction between July 1, 2009 and June 30, 2014 as well as grandfathered projects commencing construction after July 1, 2014. GWMP is not a Virginia Stormwater Management Program (VSMP) authority and did not initiate projects that would qualify as new or grandfathered sources.

Reductions are calculated based on the extent of the MS4 service area within the 2010 Census Urbanized Area (Great Falls Park is outside of the 2010 Census Urbanized Area). GWMP updated its MS4 service area map as part of the Phase II action plan development process. The maps are presented in Appendix A. The updated MS4 service area has a total drainage area of 706.6 acres, consisting of 288.1 impervious acres and 418.5 pervious acres. This results in the following total reductions required to meet the 40% target: 276 pounds/year for TN; 35 pounds/year for TP; and, 29,572 pounds/year for TSS.

GWMP has selected several BMPs to achieve the required POC reductions. These are summarized below and detailed in Section 4 through Section 6.

- Shoreline Management. This includes NPS-initiated projects to stabilize and replant shorelines and to protect eroding marshland.
- Urban Tree Canopy Expansion. This includes urban tree planting projects along the parkway.

- Other BMPs. The GWMP reserves the right to implement other BMPs that are allowed in accordance with DEQ's Guidance Memo No 15-2005. These will be described in the GWMP's MS4 annual reports to DEQ.

The 2018 MS4 permit requires the GWMP to report total POC reductions achieved prior to July 1, 2018 to meet the 5% reduction target and to then demonstrate how the GWMP will achieve additional reductions to meet the 40% reduction target. Table 1.A summarizes required reductions, reductions achieved prior to July 1, 2018, additional reductions planned through the end of the second permit cycle, and anticipated percent progress toward achieving the 100% reduction target.

Table 1.A – Summary of Required Reductions and Implemented and Planned BMPs

	Total Nitrogen (lbs/year)	Total Phosphorus (lbs/year)	Total Suspended Solids (lbs/year)
Existing Source Reductions to Meet 40% Target	276	35	29,572
+ New Source Offsets	-	-	-
+ Grandfathered Offsets	-	-	-
= Total Required Reductions and Offsets	276	35	29,572
- BMPs Prior to July 1, 2018 ¹	-	-	-
- BMPs July 1, 2018 and On	473	83	322,575
= Remainder/(Excess) Toward 40% Target	(197)	(48)	(293,003)
Progress Toward 100% Target	68.6%	94.9%	436.3%

Any reductions in excess of 40%, whether identified in this plan or reported to DEQ in the GWMP's MS4 annual reports, will be applied to the third permit cycle requirements.

1.3. Permit Compliance Crosswalk

Table 1.B provides each of the requirements for this action plan from Part II A 11 of the 2018 MS4 permit and the specific sections where the requirements are addressed.

¹ Note that street sweeping was used under prior DEQ guidance and will not be used moving forward.

Table 1.B – Action Plan and Permit Compliance Crosswalk

Action Plan Section	MS4 Permit	MS4 Permit Requirement
Section 2	Part II A 11 a	Any new or modified legal authorities, such as ordinances, permits, policy, specific contract language, orders, and interjurisdictional agreements, implemented or needing to be implemented to meet the requirements of Part II A 3, 4, and 5.
Section 3	Part II A 11 b	The load and cumulative reduction calculations for each river basin calculated in accordance with Part II A 3, 4, and 5.
Section 5	Part II A 11 c	The total reductions achieved as of July 1, 2018 for each pollutant of concern in each river basin.
Section 5 and Appendix B	Part II A 11 d	A list of BMPs implemented prior to July 1, 2018 to achieve reductions associated with the Chesapeake Bay TMDL including: (1) The date of implementation; and, (2) The reduction achieved.
Section 6 and Appendix C	Part II A 11 e	The BMPs to be implemented by the permittee prior to the expiration of this permit to meet the cumulative reductions calculated in Part II A 3, 4, and 5, including as applicable: (1) Type of BMP; (2) Project name; (3) Location; (4) Percent removal efficiency for each pollutant of concern; and, (5) Calculation of the reduction expected to be achieved by the BMP calculated and reported in accordance with the methodologies established in Part II A 8 for each pollutant of concern.
Section 8 and Appendix D	Part II A 11 f	A summary of any comments received as a result of public participation required in Part II A 12 below, the permittee's response, identification of any public meetings to address public concerns, and any revisions made to the Chesapeake Bay TMDL Action Plan as a result of public participation.

2. Program and Legal Authority

The GWMP has prepared an MS4 Program Plan (updated June 2020) that documents implementation of all MS4 permit requirements, including the programmatic and legal authorities required for program implementation. The MS4 Program Plan can be found at <https://www.nps.gov/gwmp/learn/scienceresearch.htm>. Table 2.A provides a summary of elements of the six minimum control measures (MCMs) implemented by the GWMP that relate to controlling total nitrogen, total phosphorus, and total suspended solids.

Table 2.A – MS4 Program Plan Components Related to the Chesapeake Bay TMDL

Minimum Control Measure	MS4 Program Plan Elements Related to Controlling TN, TP, and TSS
Public Education and Outreach on Stormwater Impacts	The GWMP has identified Chesapeake Bay nutrients as one of its three high-priority topics for public education. Plan elements include signage and media materials on Twitter and Facebook.
Public Involvement and Participation	The GWMP has designed a program to engage the public by maintaining stormwater program information on its Science and Research website, soliciting public comment through its Planning, Environment, and Public Comment web-based system, and the following public activities: <ul style="list-style-type: none">• Volunteer cleanups;• Public presentation of the “River Friendly Living” video;• Participation on local stormwater management program panels; and,• Attendance at stormwater management conferences or partnerships with local environmental groups.
Illicit Discharge Detection and Elimination	The GWMP has implemented an Illicit Discharge Detection and Elimination (IDDE) program designed to prevent, identify, and eliminate sources of pollutants, including nutrients and sediment.
Construction Site Stormwater Runoff Control	The GWMP has implemented a program to conduct site inspections at construction sites with land disturbance of greater than 2,500 square feet.
Post-Construction Stormwater Management	The GWMP will maintain a list of BMPs implemented to address stormwater quality and develop inspection procedures, as needed.

Minimum Control Measure	MS4 Program Plan Elements Related to Controlling TN, TP, and TSS
Pollution Prevention and Good Housekeeping for Municipal Operations	The GWMP has designed a program to prevent pollution from GWMP facilities through the development of stormwater pollution prevention plans (SWPPPs), standard operating procedures (SOPs), and training.

In addition to abiding by the Virginia Stormwater Management Program Regulations and the Virginia Erosion and Sediment Control Program Regulations, the [NPS 2006 Management Policies](#), specifically Sections 4.6.3 – 4.6.6, provide NPS policies related to the protection of water quality, floodplains, wetlands, and watershed and stream processes. In summary these management policies direct NPS to:

- Protect, maintain and/or restore the quality of surface and groundwaters within the parks, consistent with federal, state, and local laws and regulations;
- Protect, preserve, and restore the natural resources and functions of floodplains;
- Avoid adverse wetland impacts to the extent practicable; and
- Protect watershed and stream features by avoiding impacts on watershed and riparian vegetation and by allowing natural fluvial processes to take place.

Section 4.8.2.4 of the 2006 Management Policies discusses the management of soil resources aimed to prevent unnatural erosion, contamination, and to "prevent or at least minimize adverse, potentially irreversible impacts on soils."

The GWMP has reviewed its MS4 Program Plan and legal authorities and finds that no additional legal authorities are required for compliance with the "Chesapeake Bay TMDL Special Condition" at this time.

3. Load and Cumulative Reduction Calculations

The following sections describe the methodology used by the GWMP to determine the existing POC load and cumulative target reduction calculations in accordance with Part II A 3, 4, and 5 of the 2018 MS4 permit.

3.1. MS4 Service Area Delineation

Reductions are calculated based on the extent of the MS4 service area within the 2010 Census Urbanized Area. The GWMP has prepared a map of outfall locations in the park. The MS4 area map is based on the park property map and the map was updated in 2019 to remove the following areas: Virginia Pollutant Discharge Elimination System (VPDES) industrial stormwater permittees; direct drainage not flowing through a storm drain; forest; wetlands; and, open water. Great Falls Park was also removed because it is outside of the 2010 Census Urbanized Area.

The GWMP excluded one site subject to a VPDES industrial stormwater permit². This VPDES stormwater industrial permit is for the GWMP Maintenance Yard (Permit VAR051790).

The GWMP's MS4 service area map is presented in Appendix A. Based on the above analysis, the GWMP has determined that a total of 706.6 acres is served by the regulated MS4.

3.2. Pervious and Impervious Surface Delineation

A GIS approach was used to determine the GWMP's regulated urban impervious and regulated urban pervious acres. Planimetric impervious cover is based on GIS data developed by NPS. Impervious cover surfaces include buildings, roads, parking lots, sidewalks, recreational surfaces, and other similar features.

To calculate the 2009 impervious regulated area, the 2009 planimetric impervious cover features were clipped using the MS4 boundary polygon layer and the resulting acres were totaled. Regulated pervious acres were calculated by subtracting the regulated impervious acres from the total MS4 acres.

Based on the above analysis, the GWMP has determined that the 706.6 acres in the MS4 service area is divided into 288.1 impervious acres and 418.5 pervious acres.

² In accordance with DEQ Guidance Memo No 15-2005, this includes land regulated under any General VPDES permit that addresses industrial stormwater, including the General VPDES Permit for Stormwater Associated with Industrial Activity (VAR05), the General VPDES Permit for Concrete Products Facilities (VAG11), and the Nonmetallic Mineral Processing General Permit (VAR84).

3.3. Reduction Requirements

The GWMP is located within the Potomac River Basin. Therefore, reduction requirements are calculated in accordance with Part II A 3, Table 3b of the 2018 MS4 permit.

Table 3.A presents the estimated existing source loads and the 40% reduction requirement in accordance with the MS4 permit and the Chesapeake Bay TMDL Special Conditions Guidance.

Table 3.A – Calculation Sheet for Estimating Existing Source Loads and Reduction Requirements for the Potomac River Basin

Pollutant	Subsource	A. Loading Rate (lbs/ac/yr)	B. Existing Developed Land 2009 (acres)	C. Loading (lbs/yr)	D. MS4 Required Bay Total L2 Loading Rate Reduction	E. Percentage of L2 Required Reduction by 2023	F. 40% Cumulative Reduction Required by 2023	G. Sum of 40% Cumulative Reduction (lbs/yr)
TN	Imp.	16.86	288.1	4,857	9%	40%	174.87	276
TN	Perv.	10.07	418.5	4,214	6%	40%	101.14	
TP	Imp.	1.62	288.1	467	16%	40%	29.87	35
TP	Perv.	0.41	418.5	172	7.25%	40%	4.98	
TSS	Imp.	1,171.32	288.1	337,457	20%	40%	26,997	29,572
TSS	Perv.	175.80	418.5	73,572	8.75%	40%	2,575	

3.4. New Source Offset

Part II A 4 of the 2018 MS4 permit requires the GWMP to offset 40% of increases from new sources initiating construction between July 1, 2009 and June 30, 2014 that disturb one acre or greater as a result of the utilization of an average land cover condition greater than 16% impervious cover for the design of post-development stormwater management facilities. The GWMP had no new development in this time period that requires offset.

3.5. Grandfathered Projects Offset

Part II A 5 of the 2018 MS4 permit requires the GWMP to offset any grandfathered projects that disturb one acre or greater that begin construction after July 1, 2014 and where the project utilizes an average land cover condition greater than 16%. The GWMP has no grandfathered projects that require offset.

3.6. Total Reduction and Offset Requirements

Table 3.B presents the total reduction and offset requirements that the GWMP must achieve during the second MS4 permit cycle.

Table 3.B – Total Reduction and Offset Requirements

Reductions and Offsets	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)
Existing Source Reductions to Meet 40% Target	276	35	29,572
+ New Source Offsets	-	-	-
+ Grandfathered Offsets	-	-	-
= Total Reductions and Offsets	276	35	29,572

4. Overall Pollutant Reduction Strategy

The GWMP's overall strategy for achieving POC reductions includes a combination of BMPs as described below:

- **Shoreline Management Projects.** This includes GWMP-initiated shoreline management projects to stabilize shorelines and marshes. The methodology described in the "Recommendations of the Expert Panel to Define Removal Rates for Shoreline Management Projects," as amended in November 2019 was used by the GWMP to calculate pollutant reduction credit.
- **Urban Tree Canopy Expansion:** This includes planting of urban trees in the park. GWMP utilized the draft DEQ Chesapeake Bay TMDL guidance, dated March 30, 2020 to calculate pollutant reduction credit outside of the MS4. The GWMP will make adjustments as necessary if the draft table changes.
- **Other BMPs.** The GWMP reserves the right to implement other BMPs that are allowed in accordance with DEQ's Guidance Memo No 15-2005. The guidance document specifically references the work of the Chesapeake Bay Urban Stormwater Workgroup, which includes credits for urban nutrient management and homeowner best management practices such as rainwater harvesting, downspout disconnection, permeable hard-scapes, tree planting, and impervious cover removal. Any reductions will be described in the GWMP's MS4 annual reports to DEQ.

5. BMPs Implemented During the First Permit Cycle

Progress made toward achieving pollutant reductions during the first permit cycle is documented in this section.

The GWMP achieved pollutant reductions during the first permit cycle as a result of its street/parking lot sweeping program. The reductions, as presented in Table 4 of the initial Chesapeake Bay TMDL Action Plan, are summarized in Table 5.A.

Table 5.A – Initial Permit Cycle Pollutant Reduction from Street Sweeping

Pollutant	Pre-Sweeping Pollutant Load (lbs/year)	Removal Efficiency	Pollutant Reduction (lbs/year)
Total Nitrogen	880.9	0.05	44
Total Phosphorus	114.4	0.06	6.9
Total Suspended Solids	74,360	0.25	18,590

Table 5.B documents that the GWMP exceeded the 5% pollutant reduction target during the first permit cycle using the 2015 DEQ guidelines for street sweeping. Based on communications with DEQ, the methodology described in Appendix V.G of the Chesapeake Bay TMDL Special Conditions Guidance will be replaced by the methodology described in Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices (May 19, 2016). As a result, the GWMP's program no longer meets the minimum requirements for credit and this credit will be set to zero in planning for the second permit cycle (see Section 6). The GWMP will continue to assess its program. Any changes that result in credit will be documented to DEQ in MS4 annual reports.

Table 5.B – Summary of Compliance with First Permit Cycle Requirements

BMPs	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)
Street/Parking Lot Sweeping	44.0	6.9	18,590
Other BMPs	-	-	-
Total BMPs	44	6.9	18,590
First Permit Cycle (5%) Reductions and Offsets (using updated MS4 area)	35	4.4	3,696


6. BMPs Implemented or Planned for the Second Permit Cycle

This section describes the BMPs that have been or will be implemented during the second permit cycle to achieve the cumulative 40% POC reduction target as required in Part II A 11 e of the 2018 MS4 permit.

6.1. Shoreline Management

Since the end of the previous permit cycle, GWMP is implementing two shoreline management projects: Roaches Run wetland enhancement and the Dyke Marsh wetland restoration. Additional detail about these projects is provided in Figure 6.A. Table 6.A. summarizes the pollutant reductions calculated for these projects. Detailed pollutant reduction calculations are provided in Appendix B.

Figure 6.A – Description of GWMP Shoreline Management Projects

Roaches Run Wetland Enhancement	Description
	<p>The wetland enhancement involves planting native vegetation in the Roaches Run Waterfowl Sanctuary to enhance the function of freshwater wetlands. Three acres will be planted with completion scheduled for September 2020. Replanting (if needed due to mortality) will be conducted in June 2021. Completion of this project will be documented in MS4 annual reports.</p>

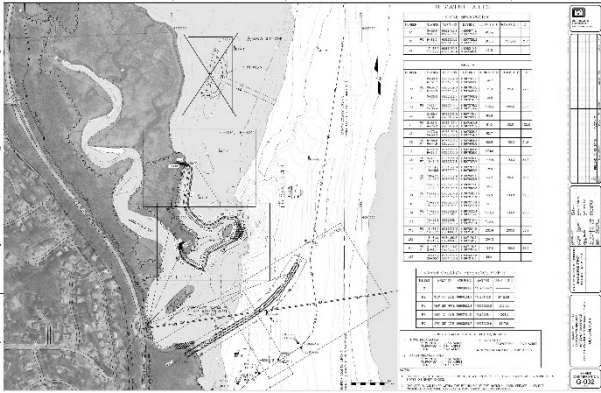
Dyke Marsh Wetland Restoration, Phase I	Description
	<p>Studies found that erosion in the marsh averages between six and eight feet per year. Phase I of this project involves vegetation planting and the construction of a breakwater and stone sill to prevent erosion. Construction and planting of 5.45 acres of vegetation was completed in January 2020.</p> <p>Progress on Phase II of this project will be provided in MS4 Annual Reports.</p>

Table 6.A – Summary of Reductions from GWMP Shoreline Management Projects

	Project	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)
Achieved During First Permit Cycle		0.00	0.00	0.00
Planned for Second Permit Cycle	<i>Roaches Run Wetland Enhancement</i>	138	8	10,439
	<i>Dyke Marsh Wetland Restoration Phase I</i>	335	75	312,126
	Subtotal	473	83	322,565
Total		473	83	322,565

6.2. Urban Tree Canopy

The GWMP plans to take credit for tree planting along the parkway. The NPS is planning to plant 154 trees along Boundary Channel in the fall of 2022. Progress will be documented in MS4 Annual Reports. The credit for this practice was calculated based on draft guidance provided by DEQ on March 30, 2020. The calculation is provided in Appendix B.

Table 6.B – Summary of Reductions from Urban Tree Canopy

	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)
Achieved During First Permit Cycle	0.00	0.00	0.00
Planned for Second Permit Cycle (Boundary Channel)	0.41	0.09	9.63
Total	0.41	0.09	9.63

6.3. Street/Parking Lot Sweeping

As indicated in Table 6.C, the GWMP is not currently proposing to take credit for its street sweeping program. While the GWMP did take credit during the first permit cycle, this credit has been removed as a result of a change in DEQ's credit calculation methodology. Any changes to the program that result in pollutant reduction credit will be reported in the GWMP annual reports to DEQ.

Table 6.C – Summary of Reductions from Street Sweeping

	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)
Achieved During First Permit Cycle	0.00	0.00	0.00
Planned for Second Permit Cycle	To be determined.	To be determined.	To be determined.
Total	0.00	0.00	0.00

6.4. Other BMPs

The GWMP will report other BMPs as provided for in the Chesapeake Bay TMDL Special Condition Guidance in MS4 annual reports to DEQ.

Table 6.D – Summary of Reductions from Other BMPs

	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)
Achieved During First Permit Cycle	0.00	0.00	0.00
Planned for Second Permit Cycle	To be determined.	To be determined.	To be determined.
Total	0.00	0.00	0.00

7. Compliance Summary

Tables 7.A and 7.B demonstrate how the GWMP will meet the required reductions from Section 3 for each POC with the BMPs described in Sections 6.1 through 6.4.

Table 7.A – Compliance Summary – Table

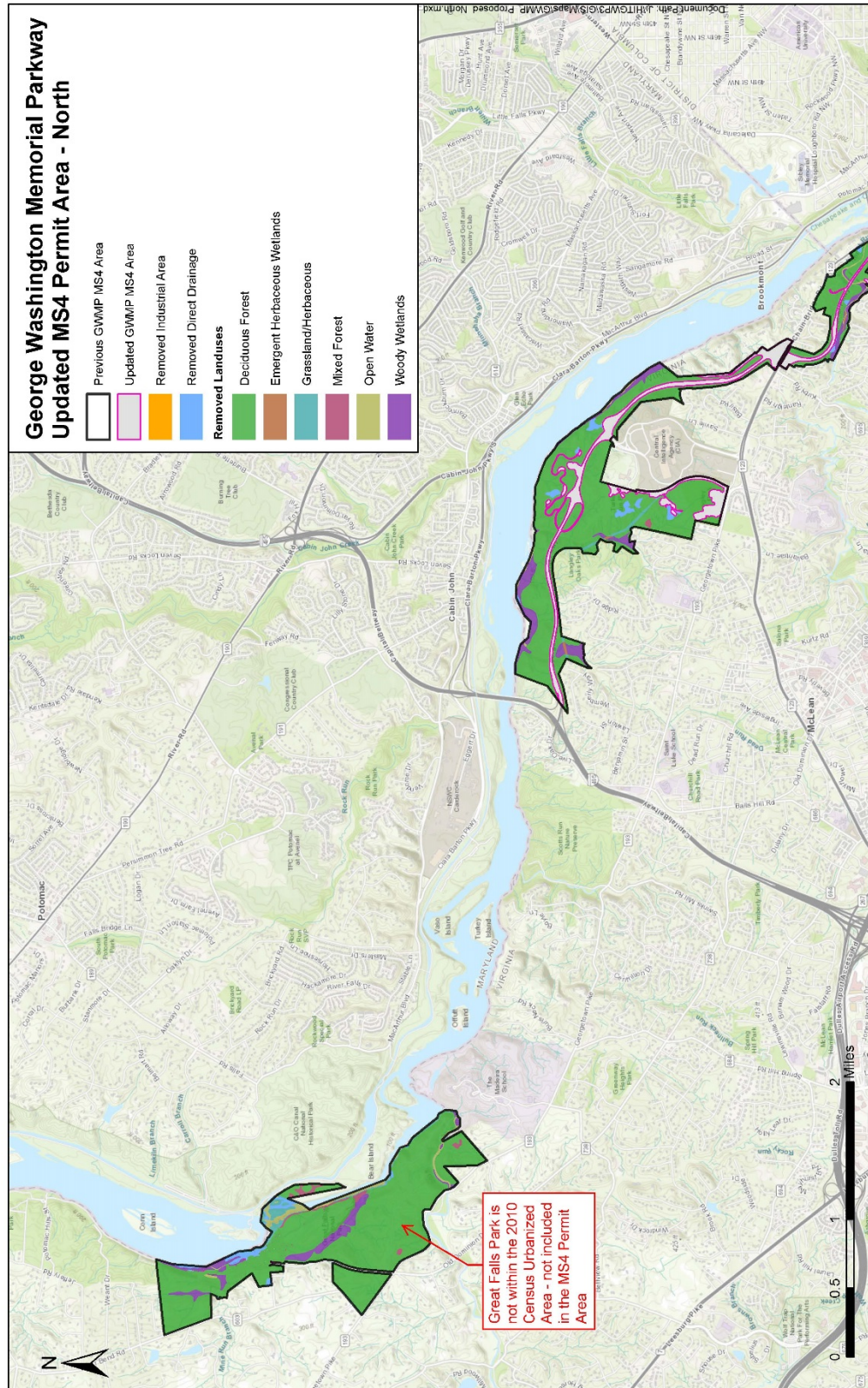
	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)
Reductions from Existing Sources to Meet 40% Target	276	35	29,572
+ New Source Offsets	-	-	-
+ Grandfathered Offsets	-	-	-
= Total Reductions and Offsets	276	35	29,572
- Actual and Planned BMPs from Sections 5 and 6	473	83	322,575
<i>Shoreline Management</i>	<i>473</i>	<i>83</i>	<i>322,565</i>
<i>Urban Tree Canopy</i>	<i>0.41</i>	<i>0.09</i>	<i>9.63</i>
<i>Street/Parking Lot Sweeping</i>	-	-	-
<i>Other BMPs</i>	-	-	-
= Remainder/(Excess)	(197)	(48)	(293,003)
Progress Toward 100% Target	68.6%	94.9%	436.3%

8. Public Comments

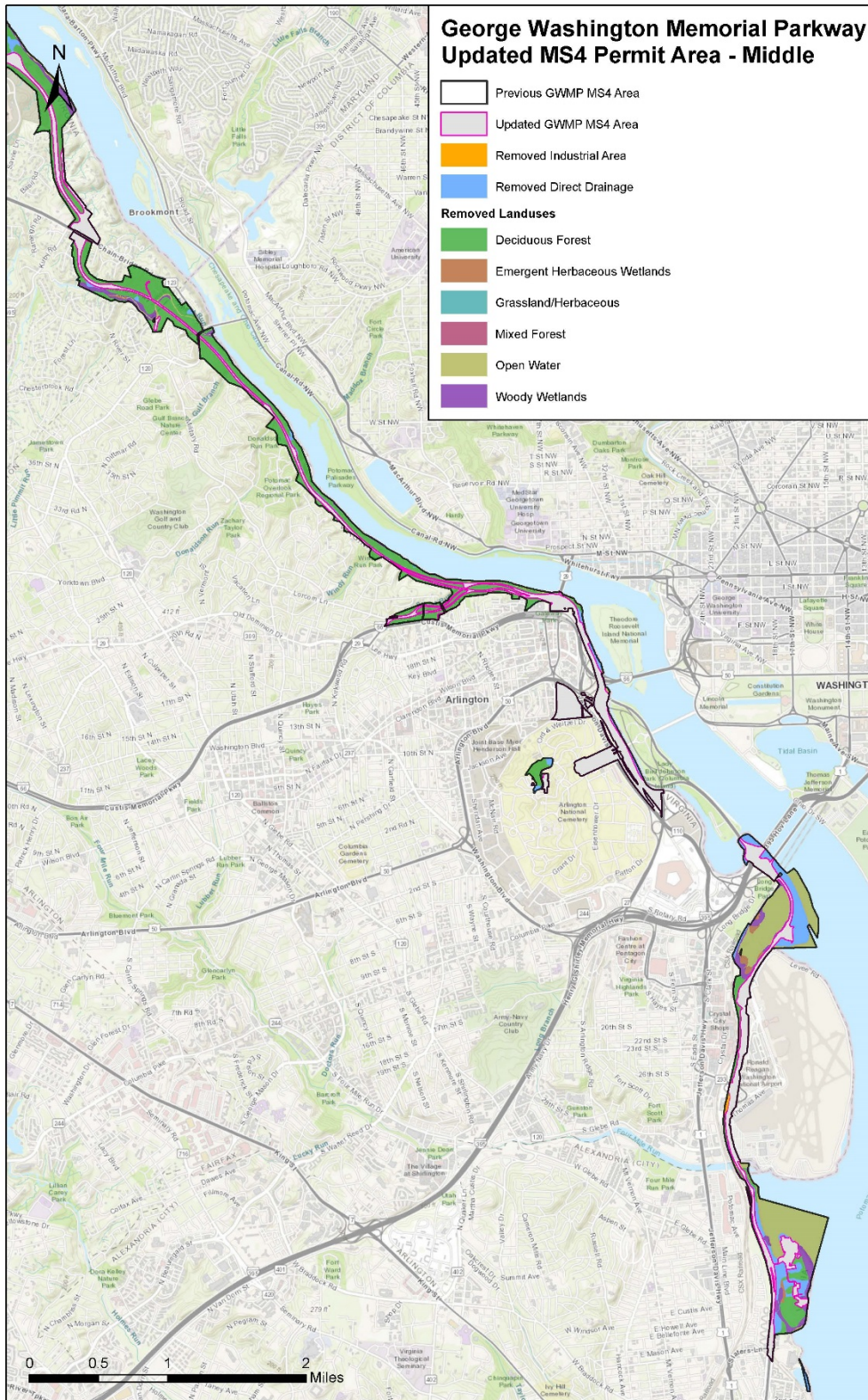
In accordance with Part II A 11 f of the 2018 MS4 permit, the GWMP provided an opportunity for public comment on this plan. The plan was posted on the GWMP's website and a public notice was distributed with instructions for how to provide comments. XXX comments were received by the XXXX deadline. An image of the public notice and the webpage are provide in Appendix C.

Appendix A – GWMP MS4 Service Area Delineation

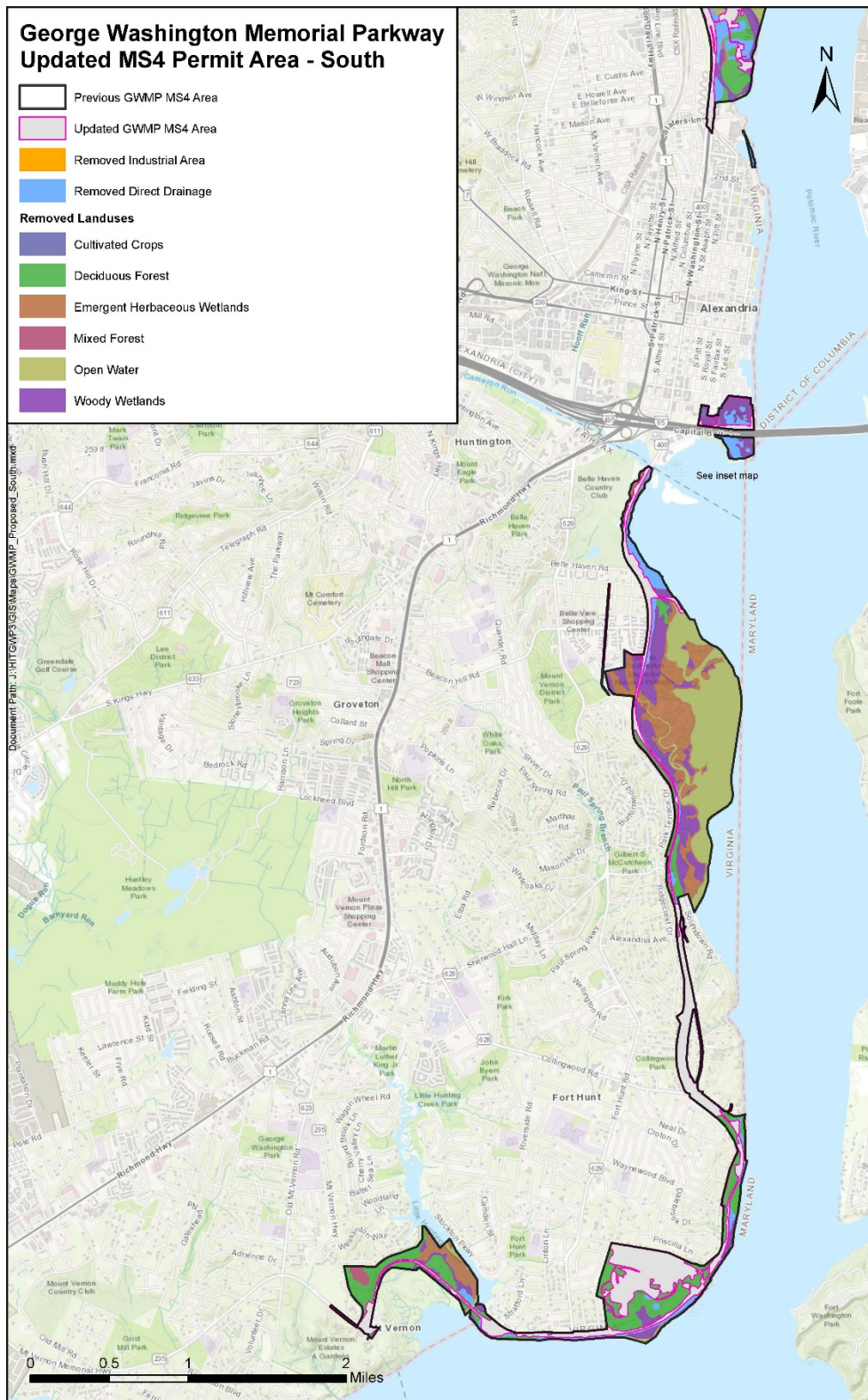
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Appendix B

Calculations and Supporting Documents for BMPs Implemented and Planned During the Second Permit Cycle

Summary of BMPs Planned During the Second Permit Cycle

Project Name	Credit Calculation Type	Pollutant Reduction (lbs/yr)		
		TN	TP	TSS
Roaches Run Wetland Enhancement	Shoreline Management (Protocols 2, 3, 4)	138	8.38	10,439
Boundary Channel Tree Planting	Urban Tree Canopy Expansion	0.41	0.09	9.63
Dyke Marsh Wetlands Restoration (Phase I)	Shoreline Management (Protocols 1,2, 3, 4)	335	75	312,126
	Total Pollutant Reduction	473	83	322,575
	40% Reduction Requirement	276	35	29,572
	Reductions in excess of 40% requirement	197	48	293,003
	100% Reduction Requirement	690	87	73,929
	Reductions in excess of 100% requirement	-217	-4	248,646

Roaches Run Wetland Enhancement

Roaches Run Wetland Enhancement

Project is a wetland enhancement that involves planting native vegetation in Roaches Run Waterfowl Sanctuary to enhance the function of freshwater wetlands. The additional vegetation is designed to enhance existing waterfowl, wading bird, and shorebird habitat within the waterfowl sanctuary. The additional habitat will also benefit multiple multiple wetland resources such as benthic invertebrates, fisheries, and improve overall water quality within the sanctuary and in the Potomac River.

Area of plantings: 3 acres

	TN	TP	TSS
Protocol 2 (Denitrification) - rate (lbs/ac/yr)	85		
Project Protocol 2 reduction (lbs/yr)	255		
Protocol 3 (Sedimentation) - rate (lbs/ac/yr)		5.289	6,959
Project Protocol 3 reduction (lbs/yr)		15.867	20877
Protocol 4 (Marsh Redfield Ratio) - rate (lbs/ac/yr)	6.83	0.3	
Project Protocol 4 reduction (lbs/yr)	20.49	0.9	
Total Reduction (lbs/yr)	275.49	16.77	20877

Pollutant	Protocol 1 Reduction (lbs/yr)	Protocol 2 Reduction (lbs/yr)	Protocol 3 Reduction (lbs/yr)	Protocol 4 Reduction (lbs/yr)	Total Pollutant Load Reduction (lbs/yr)¹	Pollutant Reduction MS4 Credit²
TN	NA	255	NA	20.49	275.49	138
TP	NA	NA	15.87	0.90	16.77	8.38
TSS	NA	NA	20877	NA	20,877	10,439

¹ This practice has 3 acres of vegetation.

² Project is outside of MS4 service area, credit was reduced by 50%

Boundary Channel Tree Planting

Boundary Channel Planting

Number of plantings from revised planting plan (mix of trees and shrubs) - described as an invasive species removal project
154

Number of planting acres (300 trees/acre)
0.513

	TN	TP	TSS
Land use loading rates - Potomac (lbs/ac/yr)	6.61	1.51	646.73
Project existing load (lbs/yr)	3.39	0.78	331.99
Pollutant load reduction (canopy over turf)	23.8%	23.8%	5.8%
Project pollutant load reduction (lbs/yr)	0.81	0.18	19.26
Baseline adjustment for project outside of MS4	50%	50%	50%
MS4 pollutant reduction (lbs/yr)	0.41	0.09	9.63

Dyke Marsh Wetlands Restoration – Phase I

In 2009, NPS partnered with USGS to investigate the state of Dyke Marsh. USGS found that the post-mined marsh is rapidly shrinking as a result of erosion caused primarily by storm waves driven northward up the Potomac River. Erosion in the marsh averages between 6 and 8 feet per year. USGS found that without intervention, this unique ecosystem would be entirely lost by 2035.

With the available project funding, work includes a breakwater, construction of a stone sill to prevent erosion and vegetation planting. This design has been set up to allow for expandability. Remaining construction work that cannot be completed could be identified as future phases of the project to be constructed as more NPS funding becomes available.

The breakwater will help protect the existing marsh from erosion and will help re-establish the marsh's ability to regenerate naturally. This project will provide a storm buffer for the historic and scenic George Washington Memorial Parkway, a natural filter to clean the Potomac River, and habitat for a variety of plants and wildlife.

Protocol 1 - Prevented Sediment

Length:	1549	ft	length of breakwater structure
Recession rate	6	ft/yr	USCOE project webpage & USGS study
Bank height	2	ft	Existing grade at start of breakwater (Sta 0+00 to Sta 2+00) is 2' above mean low water
Soil bulk density	93.6	lb/cf	default rate
Volume:	1,739,837	lbs/yr	
Sand Reduction Factor	0.337		
Final Protocol 1 TSS reduction	586,325	lbs/yr	

	TN	TP
Rates/lb of TSS	0.00029	0.000205
Protocol 1 TN and TP Reduction lbs/yr)	170.03	120.2

Area of plantings: 5.45 acres

	TN	TP	TSS
Protocol 2 (Denitrification) - rate (lbs/ac/yr)	85		
Project Protocol 2 reduction (lbs/yr)	463.25		
Protocol 3 (Sedimentation) - rate (lbs/ac/yr)		5.289	6,959
Project Protocol 3 reduction (lbs/yr)		28.83	37,927
Protocol 4 (Marsh Redfield Ratio) - rate (lbs/ac/yr)	6.83	0.3	
Project Protocol 4 reduction (lbs/yr)	37.22	1.64	
Total Reduction (lbs/yr)	500.47	30.47	37,927

Pollutant	Protocol 1 Reduction (lbs/yr)	Protocol 2 Reduction (lbs/yr)	Protocol 3 Reduction (lbs/yr)	Protocol 4 Reduction (lbs/yr)	Total Pollutant Load Reduction (lbs/yr) ¹	Pollutant Reduction MS4 Credit (lbs/yr) ²
TN	170.03	463.25	NA	37.22	670.50	335
TP	120.20	NA	28.83	1.64	150.67	75
TSS	586,325	NA	37,927	NA	624,252	312,126

¹ This practice was 1,549 linear feet, had an erosion rate of 6 ft/yr, had a bank height of 2 feet, and had 5.45 acres of vegetation.

Appendix C

Public Comments

XXX comments were received on the plan by the XXX deadline. The following are images of the public notices and website.