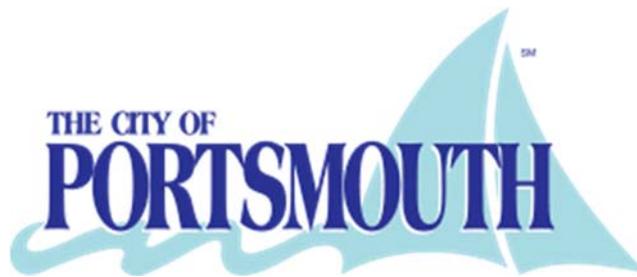


CHESAPEAKE BAY TMDL ACTION PLAN



City of Portsmouth, VA
Permit No. VA0088668

June 19, 2018

Prepared by Arcadis

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- A City of Portsmouth MS4 Program: Task 2.4 Outfall Service Area Delineation
- B City of Portsmouth MS4 Program: Task 4.2 Setting the Baseline
- C City of Portsmouth MS4 Program: Pollutant Reductions from Historical and Redevelopment Stormwater Best Management Practices

1 INTRODUCTION

The City of Portsmouth (City) has developed this Chesapeake Bay Total Maximum Daily Load (TMDL) Action Plan (Plan) for the Chesapeake Bay nutrients and sediment TMDL, as required by the Virginia Stormwater Management Program (VSMP) Individual Municipal Separate Storm Sewer System (MS4) Permit (Permit No. VA0088668), which was effective on July 1, 2016 and expires on June 30, 2021. This Plan was developed to comply with the Chesapeake Bay TMDL Special Condition (Part 1.D of the Permit) and is required to be submitted to the Virginia Department of Environmental Quality (DEQ) no later than 24 months after the effective date of the Permit (by July 1, 2018). The DEQ Chesapeake Bay TMDL Action Plan Guidance Memo (DEQ Guidance Memo)¹ was used to prepare this Plan, which is the first of three permit terms of Chesapeake Bay TMDL Action Plans to be developed by the City to document the planned reductions of total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS) in order to achieve compliance with permit-required load reduction goals.

The City is located within the James River Basin in coastal Virginia and has a total land area of 33 square miles, as shown in Figure 1. The City is bordered on the west by the City of Suffolk, on the south and west by the City of Chesapeake, on the north by the James River, and on the east by the City of Norfolk.

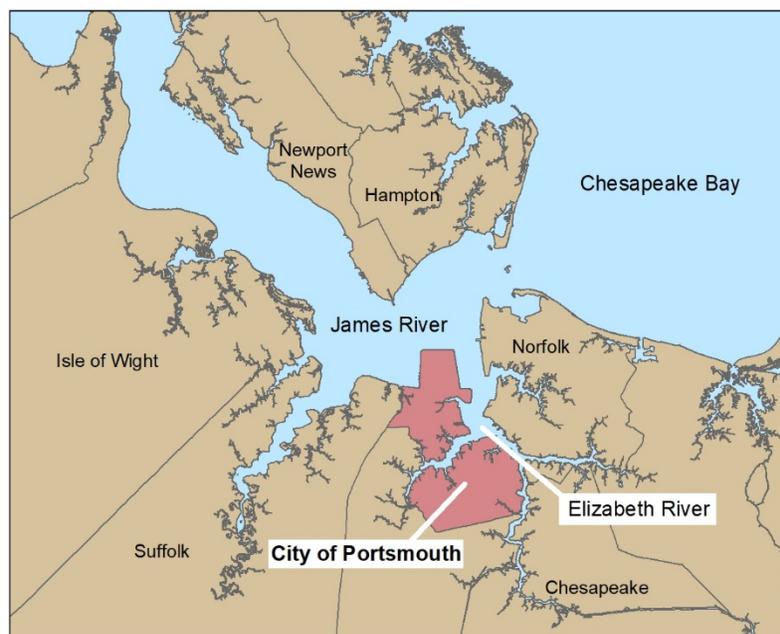


Figure 1. City of Portsmouth

This Plan is organized as follows to address specific MS4 Permit requirements:

- Section 2: Legal Authority for TMDL Implementation:
 - Current Program and Existing Legal Authority (Permit Section I.D.1.b(1b))
 - New or Modified Legal Authority (Permit Section I.D.1.b(1c))
 - Means and Methods to Address Discharges from New Sources (Permit Section I.D.1.b(1-c))

¹ Virginia DEQ Guidance Memo No. 15-2005, dated May 18, 2015

- Section 3: Pollutant Loads and Required Reductions:
 - Definition of the MS4 service area
 - Baseline Annual Pollutant Loads (Permit Section I.D.1.b(1d))
 - Pollutant of Concern Required Reductions (Permit Section I.D.1.b(1e))
 - Additional Source Loads and Required Reductions (Permit Section I.D.1.b(1f), Section I.D.1.b(1g))
- Section 4: Means and Methods to Meet Required Reductions
 - Historic Best Management Practices (BMPs)
 - Redevelopment BMPs
 - Capital Improvement Projects (1st Permit Cycle) (Permit Section I.D.1.b(1c))
 - Implementation Schedule and Estimated Costs (Permit Section I.D.1.b(1f), Section I.D.1.b(1h))
 - Public Comment Process and Comment Received (Permit Section I.D.1.b(1i), Section I.D.1.b(1j))
 - Conclusions
- Section 5: Public Comment Process
- Section 6: Conclusions
- Section 7: Limitations

2 LEGAL AUTHORITY FOR TMDL IMPLEMENTATION

Under the City’s MS4 Permit’s Special Condition for the Chesapeake Bay TMDL, the City of Portsmouth is required to:

- Conduct a review of its currently implemented MS4 program that includes review of the City’s existing legal authorities and the City’s ability to ensure compliance with the Special Condition
- Identify any new or modified legal authority that the City has implemented or needs to implement in order to meet the conditions of the Special Condition

Compliance with the Special Condition represents adequate progress during the current MS4 Permit term towards achieving TMDL waste load allocations consistent with the assumptions and requirements of the Chesapeake Bay TMDL. The Special Condition further defines the compliance expectations for Chesapeake Bay TMDL Action Plan implementation to the maximum extent practicable as well as demonstrating adequate progress. Relevant existing legal authorities include ordinances, permits, orders, contracts, inter-jurisdictional agreements and other enforceable mechanisms.

2.1 Current Program and Existing Legal Authority

The City of Portsmouth Department of Engineering and Technical Services, Stormwater Compliance is responsible for the overall implementation of the MS4 Permit and reporting requirements. The City has adopted a MS4 Program Plan that documents its capabilities for implementation of all MS4 Permit requirements, including the programmatic and legal authorities required to meet the Chesapeake Bay TMDL Special Condition. The full MS4 Program Plan can be found online at <https://www.portsmouthva.gov/DocumentCenter/View/3202/MS4-Program-Plan>. The following components of the City’s MS4 Program will be utilized to meet the Special Condition:

- The Stormwater Management Ordinance (Chapter 31.2), Erosion and Sediment Control Ordinance (Chapter 11), Chesapeake Bay Preservation Act Ordinance (Chapter 9.1), Water, Sewers and Sewage Disposal Ordinance (Chapter 38), Fire Prevention Code (Chapter 13), and Garbage and Refuse Code (Chapter 16) provide the authority to control pollutant discharges to the MS4.
- The City has authority as authorized by state law and as stated in local ordinances, including options for escalating enforcement steps as appropriate in the City's exercise of its enforcement discretion as the regulator of covered third party activities. Local enforcement authority includes:
 - Stormwater Management Ordinance (Chapter 31.2): see § 31.2-21. Enforcement and § 31.2-23. Pollution of the Stormwater System.
 - Erosion and Sediment Control Ordinance (Chapter 11): see § 11-7. Violations, Penalties, Legal Remedies.
 - Water, Sewers, and Sewage Disposal Ordinance (Chapter 38): see § 38-2. Violations of Chapter.
 - Fire Prevention Code (Chapter 13): § 13-83. Enforcement and § 13-84. Violations.
 - Chesapeake Bay Preservation Act Ordinance (Chapter 9.1): § 9.1-13. Enforcement
- Contracts and interjurisdictional agreements:
 - To the extent authorized by state law, the City has authority to enter and carry out contracts and, in event of breach of any contract by a counterparty, to enforce such contracts according to the provisions.
- The City has authority to conduct inspections and monitoring related to implementing the permit requirements, including but not limited to:
 - Stormwater Management Ordinance (Chapter 31.2): § 31.2-13. Monitoring and Inspections.
 - Erosion and Sediment Control Ordinance (Chapter 11): § 11-6. Monitoring, Reports and Inspections.
 - Water, Sewers and Sewage Disposal Ordinance (Chapter 38): § 38-53. Right of entry and access to premises.
 - Fire Prevention Code (Chapter 13): § 8.1-9. Investigation.
 - City Portsmouth Code of Ordinances

2.2 New or Modified Legal Authority

No new legal authority or modifications to the existing legal authority are necessary in order to meet the Special Condition requirements.

2.3 Means and Methods to Address Discharges from New Sources

The MS4 Permit requires that the means and methods that will be utilized to address discharges into the MS4 from new sources be described in the Plan. New sources, by definition, means pervious and impervious urban land uses served by the MS4 that are developed or redeveloped on or after July 1, 2009.

The City's Stormwater Management Ordinance was developed from the model ordinance provided by DEQ and was reviewed and approved by DEQ. New sources within the City are required to utilize an average land cover of 16 percent or less for the design of post-development stormwater management facilities in accordance with the Stormwater Management Ordinance (Chapter 31.2). Subdivision and site plans submitted to the City are reviewed by DEQ-certified Plan Reviewers within the City's Engineering &

Technical Services Department to insure compliance with all applicable ordinances. BMP maintenance agreements are required for each development or single-family homes that require BMPs, and BMPs are inspected by City personnel at least once a year. In addition, the City has required that all development and redevelopment meet the 16 percent average land cover condition as part of the Chesapeake Bay Preservation program since 2014.

3 POLLUTANT LOADS AND REQUIRED REDUCTIONS

The calculation of pollutant loads and first permit cycle required reductions of nutrients and sediment (Pollutants of Concern) was based on the MS4 service area that was delineated in accordance with the definition of *Regulated Land*, which refers to the conveyances and drainage area served by the permittee's MS4. This section includes the following:

- **Definition of the MS4 Service Area:** This section includes a brief description of the methodology followed to define the MS4 service area, including excluded areas and sources of data used in the delineation.
- **Baseline Annual Pollutant Loads:** This section includes the breakdown of baseline (2009) land use within the MS4 service area and the TN, TP and TSS loads from regulated lands based on the 2009 Edge of Stream (EOS) loading rates for the James River Basin that are included in Table 1 of the City's MS4 Permit.
- **Pollutant of Concern Required Reductions:** This section includes the first permit cycle TN, TP and TSS reductions that must be achieved based on the 2009 land use within the MS4 service area, and the first permit cycle reduction loading rates contained in Tables 1 and 2 of the MS4 Permit. Note that since the MS4 Permit supersedes the DEQ Guidance Memo (GM 15-2005) and also contains more precise loading rates, the rates presented in the permit are used in the calculations presented in this plan.
- **Additional Source Loads and Required Reductions:** This section includes information about grandfathered projects and increased loads from new sources initiating construction between July 1, 2009 and June 30, 2014.

3.1 Definition of the MS4 Service Area

The City of Portsmouth is required to map their MS4 service area and each MS4 outfall, and maintain a database of outfall information, including:

- Individual identification (ID) number
- Local watershed name
- Sixth order Hydrologic Unit Code (HUC) and receiving water
- Latitude and longitude in decimal degrees

The MS4 service map and outfall information were submitted to DEQ in electronic format by December 30, 2017. The City consulted with CH2M, Inc. (CH2M) in 2017 to develop the outfall service area delineation. A copy of the Technical Memorandum prepared to document the methodology and results of this effort is included in **Appendix A**.

3.1.1 Summary of MS4 Outfall Delineation Methodology

An ESRI-automated ArcGIS software tool, ArcHydro, was used to update the outfall drainage area delineations that were developed in the 1990's and recently updated using Light Detection and Ranging (LiDAR) data. LiDAR data allows for better topographic resolution, which aids in drainage area delineation. CH2M in coordination with the City developed a digital elevation model (DEM), based on the latest LiDAR data, for use with ArcHydro.

The drainage areas were categorized to help optimize the outfall service area analysis. Each drainage area was identified as being located within or outside the preliminary MS4 service area boundary. If the drainage area was located outside the boundary, it was removed from the analysis. If the drainage area was located within the preliminary MS4 service boundary, it was designated as flowing or not flowing to an outfall. Drainage areas that were determined as flowing to an outfall were given a downstream outfall ID as provided in the LGIM. When drainage area runoff flowed directly into a stream it was noted in the Outfall ID attribute field. Small drainage areas assigned to the same outfall ID were merged to create a larger total service area for each designated outfall.

New MS4 outfalls were added for storm sewer outfall pipes or ditches found in the field and not included in the City's GIS data. New MS4 outfalls were also added for streets that do not have a pipe or ditch outfall. For street drainage systems that consist of curb and gutter, a MS4 outfall was added in the GIS at the street centerline where the street gutters end and the runoff discharges by sheet flow to surface waters. For streets that do not have curb and gutter, a MS4 outfall point was added at the low point of the street where the runoff would sheet flows to surface waters. The outfall information required by the MS4 Permit including watershed name, sixth order HUC, and latitude and longitude was added to the GIS data for submittal to DEQ.

3.1.2 Summary of Current MS4 Boundary

The total MS4 service area is approximately 13,842 acres and there are 560 MS4 outfalls. The MS4 service area boundary and the MS4 outfalls are shown on Figure 2. The VDOT and Navy properties were excluded from the City's MS4 service area and the MS4 interconnection points were identified, when possible.

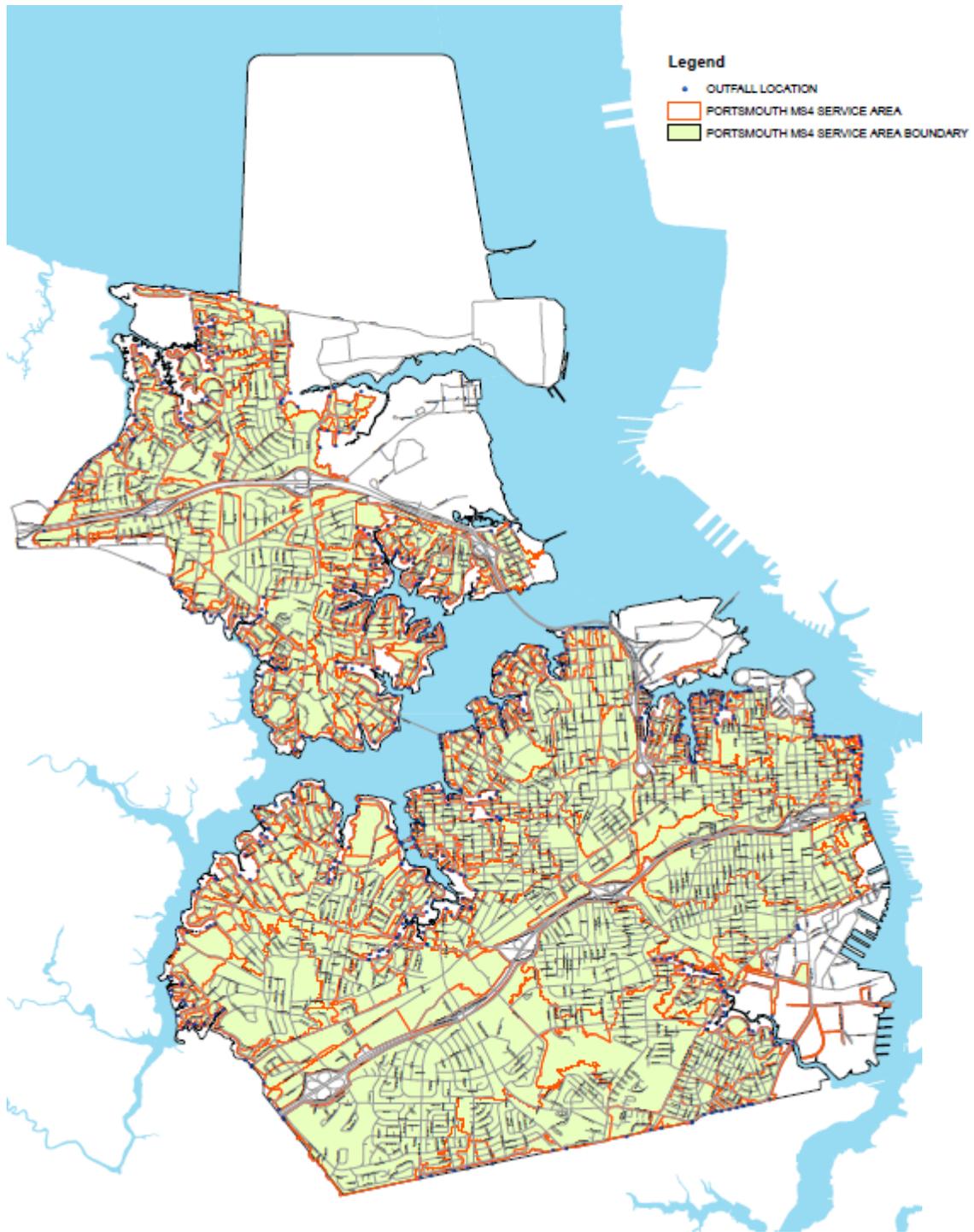


Figure 2. City of Portsmouth MS4 Service Area

3.2 Baseline Annual Pollutant Loads

The baseline (2009) annual pollutant loading rates, as documented in the City's MS4 Permit and the DEQ Guidance Memo, were estimated by the Chesapeake Bay Program using the Watershed Model Phase

5.3.2. The annual pollutant loads were calculated using the 2009 land cover conditions within the delineated MS4 service area.

3.2.1 Land Cover within the MS4 Service Area

City-maintained impervious cover GIS files were used to estimate the total acreage of impervious cover within the MS4 boundary. The impervious cover layer included building footprints and paved areas such as roads, driveways, and parking lots. The digital geospatial land cover data were not available for the year 2009; therefore, land cover data from the year 2013 was used and modified to account for land cover changes between 2009 and 2013.

Land cover categories that may qualify for exclusion under the Chesapeake Bay TMDL Special Condition guidance are: lands regulated under any general or individual VPDES permit that addresses industrial stormwater, lands regulated under any general or individual VSMP permit for MS4s, forested land, agricultural lands, wetlands, and open waters.

The Virginia Information Technologies Agency (VITA) and construction data provided by the City was used to identify forest land cover within the City of Portsmouth. These data were further refined to isolate those forested areas that are a minimum tree density of 30 meters by 30 meters (900 square meters) in size. Per the DEQ Guidance Memo, forested areas that are 900 square meters or greater in size can be excluded from the urban cover calculations.

Properties with active individual and general VSMP and VPDES permits in 2017 were removed from the MS4 service boundary submitted to the Virginia DEQ in December 2017. These areas include properties owned by the Navy, Wheelabrator, Third Capital Inc., P-Town Recycling, Chesapeake, and the Virginia Department of Transportation.

The United States Fish and Wildlife Service National Wetlands Inventory (NWI) for Virginia was used to identify the wetland locations in the City. The wetlands data is dated 2017 and was vetted for accuracy to 2009 conditions by comparing it to 2009 VITA imagery in GIS. All stormwater best management practices (BMPs) from 2009 that could be classified as open water were identified and excluded from the regulated lands.

A breakdown of the land cover within the City’s MS4 service area is included in Table 1. The technical memorandum, prepared by CH2M, which documents the detailed methodology followed to develop the breakdown of 2009 land use within the City’s MS4 service area is provided in **Appendix B**.

Table 1. Breakdown of 2009 Land Use in City MS4 Service Area

Land Cover within MS4 Service Area	Total Acres
Regulated Urban Impervious	6,345.51
Regulated Urban Pervious	6,989.73
Forested Land, Wetlands and Open Water Area*	506.72
Total MS4 Service Area	13,841.86

*Areas excluded from baseline loading and reduction calculations

3.2.2 Baseline Pollutant Load Calculations

The 2009 regulated impervious and pervious cover presented in Table 1 along with the pollutant loading rates from the City's MS4 Permit were used to calculate the 2009 baseline pollutant loading for TN, TP and TSS. Table 2 contains the estimated total TN, TP and TSS loads based on the 2009 Progress Run.

Table 2. Existing Source Loads from City MS4 Service Area

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/2009)	2009 EOS Loading Rate (lbs/ac/yr)	Estimated Total POC Load Based on 2009 Progress Run (lb/yr)	Total POC Load (lb/yr)
Regulated Urban Impervious	Nitrogen	6,345.51	9.574666034	60,756.12	108,592.16
Regulated Urban Pervious		6,989.73	6.843763814	47,836.04	
Regulated Urban Impervious	Phosphorus	6,345.51	1.786015931	11,333.18	14,802.39
Regulated Urban Pervious		6,989.73	0.496330705	3,469.22	
Regulated Urban Impervious	Total Suspended Solids	6,345.51	703.4240675	4,463,583.07	5,188,862.57
Regulated Urban Pervious		6,989.73	103.763636	725,279.49	

Note: Detail information on loading rates can be found in Appendix B

3.3 Pollutant of Concern Required Reductions

The pollutant load reduction rates in the City of Portsmouth MS4 Permit were used to calculate the required pollutant reduction requirements for the first permit cycle. As specified in the Virginia Phase I Watershed Improvement Plan, the required first-phase pollutant reductions are 5 percent of the total required reductions specified in the L2 scoping run. The second permit cycle will require an additional 35 percent of the total reduction goal and the third permit cycle will require the reduction of the remaining 60 percent of the total goal. The City has developed projects to achieve the required pollution reductions for the first permit phase as detailed in Section 4 of this Plan. The total required reductions and first-phase reductions, for the City's MS4 service area are identified in Table 3.

Table 3. First Permit Cycle Pollutant Reduction Requirements

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	First Permit Cycle Required Reduction in Loading Rate (lbs/acre/yr)	Total Reduction Required for First Permit Cycle by Subsource (lbs/yr)	Total Reduction Required for First Permit Cycle (lbs/yr)
Regulated Urban Impervious	Nitrogen	6,345.51	0.043085977	273.40	416.91
Regulated Urban Pervious		6,989.73	0.020531291	143.51	
Regulated Urban Impervious	Phosphorous	6,345.51	0.014288127	90.67	103.24
Regulated Urban Pervious		6,989.73	0.001799199	12.58	
Regulated Urban Impervious	TSS	6,345.51	7.034240675	44,635.83	47,808.93
Regulated Urban Pervious		6,989.73	0.453965907	3,173.10	

Note: Detail information on loading rates can be found in Appendix B

3.4 Additional Source Loads and Required Reductions

In addition to the required pollution reductions for existing development, the City must account for any increased pollutant loads from new sources (Special Condition 6 and grandfathered projects (Special Condition 7). For the first permit cycle Plan, the City is required to provide additional treatment to remove 15 percent of the net increase in pollutant loads from new sources initiating construction between July 1, 2009 and June 30, 2014 and grandfathered projects, in accordance with 9 VAC 25-870-48.

Special Condition 6 and Special Condition 7 are MS4 Permit requirements that apply to all projects that initiated construction between July 1, 2009, and June 30, 2014, meeting the following requirements:

- Greater than 1 acre land disturbance;
- Increase in the pollutant loads from existing condition; and
- An impervious land cover condition greater than 16 percent for the design of post-development stormwater management facilities

To account for the additional loads from new sources constructed between July 1, 2009 and June 30, 2014 and grandfathered projects with a final impervious land cover condition greater than 16 percent, the City must reduce an additional 15% of their first permit cycle reduction requirements.

The City has required that all new projects meet the 16 percent land cover requirements since 2014, as indicated in the Legal Authority Review in Section 2. Thus, no projects require additional pollutant load reductions under Special Condition 6 or Special Condition 7 as defined in the City's MS4 Permit.

As stated in the City's MS4 permit, the means and methods to reduce an additional 15% from the first permit load reduction obligation is used to offset increased loads from new sources initiating construction between July 1, 2009 and June 30, 2014 and grandfathered projected in accordance with 9 VAC 25-870-48, 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. This

results in 0.75% increase in load reduction from the first permit cycle load reduction obligation. Table 4 below shows the revised reduction required with the additional 15% reduction.

Table 4. First Permit Cycle Pollutant Reduction Requirements with additional 15% reduction

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	Reduction Required for Existing Sources for First Permit Cycle by Subsource (lbs/yr)	Reduction Required for Existing and New Sources with Additional 15% Reduction for First Permit Cycle by Subsource (lbs/yr)	Total Reduction Required for Existing and New Sources for First Permit Cycle (lbs/yr)
Regulated Urban Impervious	Nitrogen	6,345.51	273.40	314.41	479.45
Regulated Urban Pervious		6,989.73	143.51	165.03	
Regulated Urban Impervious	Phosphorous	6,345.51	90.67	104.27	118.73
Regulated Urban Pervious		6,989.73	12.58	14.46	
Regulated Urban Impervious	TSS	6,345.51	44635.83	51,331.21	54,980.27
Regulated Urban Pervious		6,989.73	3173.10	3,649.06	

4 MEANS AND METHODS TO MEET REQUIRED REDUCTIONS

The City's MS4 Permit requires that the Plan identify the means and methods to meet the required nutrient and sediment reductions for the first permit cycle. The means and methods used by the City to meet the first-phase required reductions include the construction of structural best management practices (BMPs) and as well as the accounting for historical BMPs that were constructed within the MS4 service area between January 1, 2006 and July 1, 2009. The pollutant load reduction calculations that are presented in this Plan follow the DEQ approved methodologies contained in the DEQ Guidance Memo and the loading rates found in the DEQ MS4 permit. Table 6 includes a summary of the first permit cycle projects, the total calculated nutrient and sediment reduction credits, and the location of detailed information and calculations within this Plan. All reductions above the required first permit cycle goals will be applied to the second permit cycle requirements, as documented in Table 5.

Table 5. Summary of Planned Projects and Historic BMPs for 1st Permit Cycle

Project Name	TN Load Reduction (lbs/yr)	TP Load Reduction (lbs/yr)	TSS Load Reduction (lbs/yr)	Location of Detailed Information
Victory Blvd Level II Wet Pond BMP Retrofit	49.20	16.05	4,151.64	Section 4.3.1
Churchland Wet Swale	13.60	0.85	793.63	Section 4.3.2
Beaton Drive Level I Wet Pond	25.86	7.28	4,050.36	Section 4.3.3
Court Street Green Street	31.65	5.52	2,804.03	Section 4.3.4
Green Lake #3 Wet Pond	80.02	20.35	20521.941	Section 4.3.5
1st Permit Cycle Reductions from Projects	200.33	50.05	32,321.57	
Reductions from Historic BMPs	117.89	34.01	19,335.59	Section 4.1
Reductions from Redevelopment BMPs	169.69	45.88	22,416.54	Section 4.2
1st Permit Cycle Reductions from BMPs	287.58	79.89	41,752.13	
Total Reductions Provided	487.91	129.94	74,073.70	
Total Required Reductions	479.45	118.73	54,980.27	
Credit Carried Over to 2nd Permit Cycle	8.46	11.21	19,093.43	

4.1 Historical BMPs

The DEQ Guidance Memo states that permittees may receive credit for previously unreported BMPs that were installed on or after January 1, 2006 and prior to July 1, 2009. The following information must be included in the first Chesapeake Bay TMDL Action Plan in order to receive credit for these BMPs:

- An affirmative statement that a complete list, to the maximum extent practicable, of historic BMPs was submitted to the DEQ by September 1, 2015.
- Appropriate calculations for the BMPs that the permit is claiming credit towards its required POC load reductions.

The City of Portsmouth submitted to DEQ a list of 62 BMPs that were constructed between January 1, 2006 and July 1, 2009 by the September 1, 2015 deadline. The list received from the DEQ with the 62 sites with BMPs installed between 2006 and 2009. A new list of historical BMPs was assembled using the City's Tidemark data with the assumption that any BMPs determined to qualify as historical BMPs would have been included on the City's original list. The new list has 30 BMPs installed between 2006 and 2009. Each BMP was evaluated for pollutant reduction capacity using the techniques outlined in the Guidance, Appendix V.A. The Chesapeake Bay Program (CBP) efficiencies were applied to this set of BMPs as the current Virginia Stormwater BMP Clearinghouse (Clearinghouse) design criteria were not implemented until 2015. A summary of the credits received from Historic BMPs are shown in Table 6 below.

Table 6. Summary of Load Reduction Credits from Historic BMPs

Type of Historic BMPs	Number of BMPs	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	TSS Reduction (lbs/yr)
Bioretention	5	3.2	0.9	399.41
Dry Pond	3	1.45	0.48	185.23
Enhanced Detention	1	1.12	0.19	218.5
Extended Dry Detention	5	22.13	3.94	4,712.84
Filtrerra	2	2.73	0.67	335.06
Grass Swale	3	0.61	0.09	185.38
Infiltration	1	8.28	1.48	630.91
Other (Storm Filter)	1	0.08	0.14	12.06
Wet Pond	9	78.29	26.12	12,656.2
Total	30	117.89	34.01	19,335.59

4.2 Redevelopment BMPs

Part III.3.1. of the DEQ Guidance Memo states that permittees may claim credits for pollutant reductions resulting from redevelopment projects completed after July 1, 2009. The City considers ‘redevelopment’ as construction on prior developed lands. Properties that have had demolition activity but were not developed within 5 years of that activity are considered new development. All redevelopment activities for which a BMP was installed result in a reduction in POC loads, so all BMPs installed for redevelopment after July 1, 2009 are included in the pollutant reduction calculations.

A list was compiled of all BMPs installed in the City after July 1, 2009. This list was checked against all construction in the City between 2004 and 2018, for construction activities at the same site address to determine if the demolition occurred within 5 years of the BMP construction.

After the redevelopment sites were identified, data was collected for the POC loading calculations for the BMP drainage areas. Data to complete pollutant load reductions was gathered from Tidemark and site plans (when available) and supplemented with GIS BMP data and aerial photography when necessary. Each site was considered individually for impervious cover within the BMP drainage area and BMP type. BMP type was then correlated with a practice from the CBP or Clearinghouse to assign a reduction efficiency. Efficiencies from both the CBP and Clearinghouse were compared and either the CBP or Clearinghouse efficiency was applied based on available data, and which efficiency provided the highest nutrient removal. BMPs installed before the implementation of the current Clearinghouse types in 2015

were assessed using only CBP efficiencies. The Clearinghouse does not provide TN removal efficiencies for proprietary BMPs, nor TSS efficiencies for any BMPs, so CBP efficiencies were used in these cases. Table 7 provides a summary of the pollutant reduction credits that the City can claim for redevelopment BMPs that were constructed after July 1, 2009.

Table 7. Summary Load Reduction Credits from Redevelopment BMPs

	Total TN Credit (lbs/yr)	Total TP Credit (lbs/yr)	Total TSS Credit (lbs/yr)
Bioretention C/D soils, underdrain	32.91	9.01	4,050.87
Dry Detention Ponds	1.93	0.71	276.11
Dry Detention Ponds and Hydrodynamic Structures	6.69	4.88	556.93
Dry Extended Detention Ponds	12.8	2.15	2,445.23
Filtering Practices	42.01	11.24	5,820.85
Infiltration Practices w/o Sand, Veg.	2.81	0.5	213.9
Permeable Pavement w/o Sand, Veg. - A/B soils, underdrain	9.8	1.49	733.54
Permeable Pavement w/o Sand, Veg. - C/D soils, underdrain	3.62	0.76	417.74
Vegetated Open Channels A/B soils, no underdrain	11.98	1.2	544.18
Vegetated Open Channels C/D soils, no underdrain	2.81	0.51	986.16
Wet Ponds and Wetlands	42.33	13.43	6371.03
Total	169.69	45.88	22,416.54

4.3 Capital Improvement Projects (1st Permit Cycle)

Five projects have been identified by the City for this Plan:

- Victory Boulevard Level II Wet Pond Retrofit
- Churchland Wet Swale
- Beaton Drive Wet Pond
- Court Street Green Streets
- Green Lakes Level I Wet Pond

These projects consist of new BMPs and retrofits to existing BMPs. The projects were constructed after June 30, 2009, or are currently in planning, design, or construction. In total, these projects exceed the first-phase reduction requirement. All projects listed have funds approved as a part of the adopted Capital Improvement Plan (CIP), some projects have been awarded 50% funding through the Stormwater Local Assistance Fund (SLAF) and others have been approved to received funding from the Virginia Clean Water Revolving Loan Fund. The general location of all projects is shown on Figure 3, and the following sections provide details on each project and all assumptions used in the credit calculations.

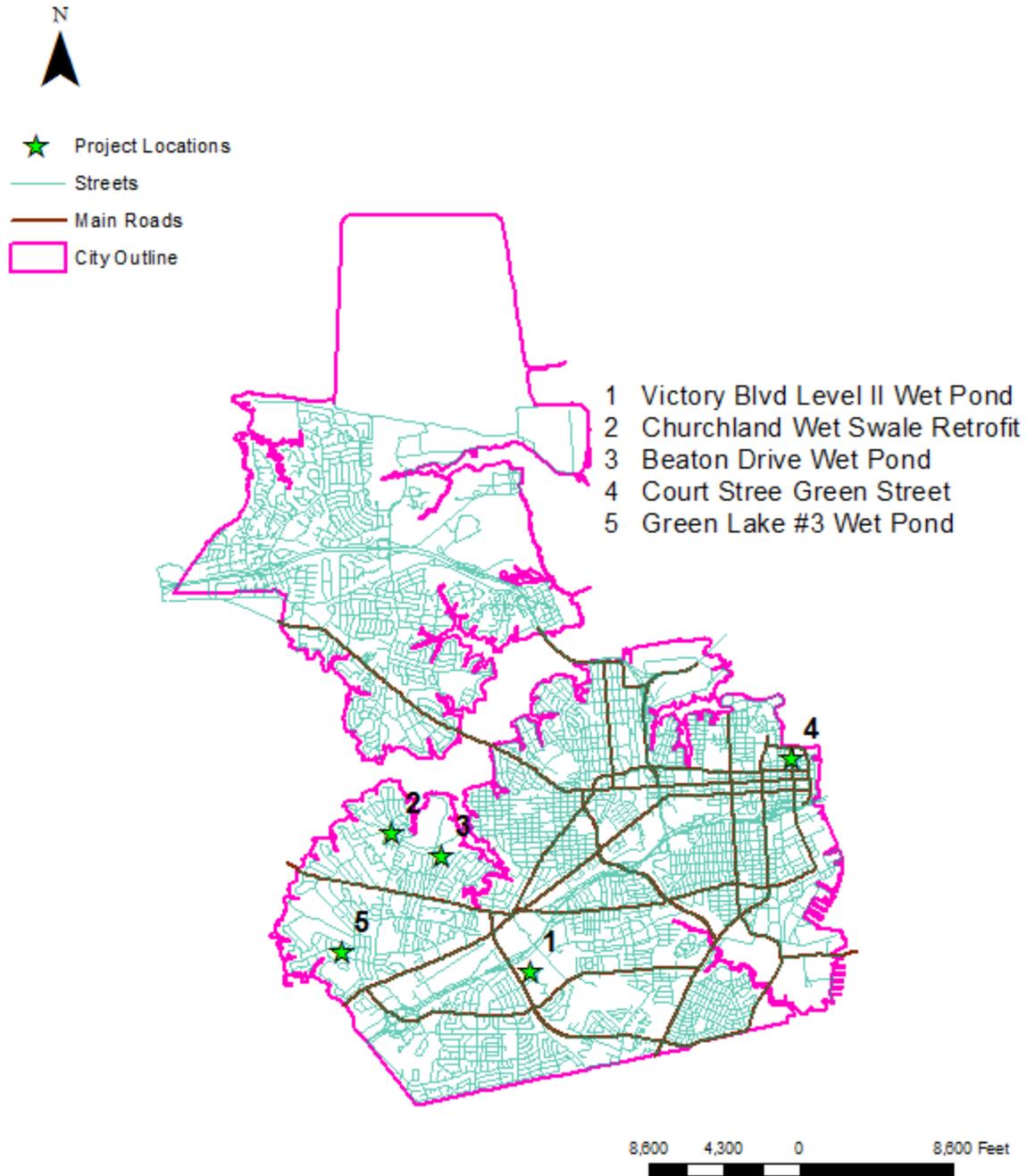


Figure 3. Locations of 1st Permit Cycle CIP Projects

4.3.1 Victory Boulevard Level II Wet Pond Retrofit

This project consists of the conversion of an existing pond into a Level II Wet Pond. The existing wet pond was built in 2003 and is located on a large undeveloped lot adjacent to the Tidewater Community College (TCC) campus off Victory Boulevard. The site is owned by the City of Portsmouth Economic Development Authority, so no land acquisition is required. The contributing drainage area for the pond is 46.84 acres with 32.76 acres of impervious and 14.08 acres of managed turf. This project will address the

Chesapeake Bay TMDL and is needed to reduce pollutant loading on the Chesapeake Bay and helps restore the quality of the bay. This project will also address the City of Portsmouth's MS4 permit requirements.

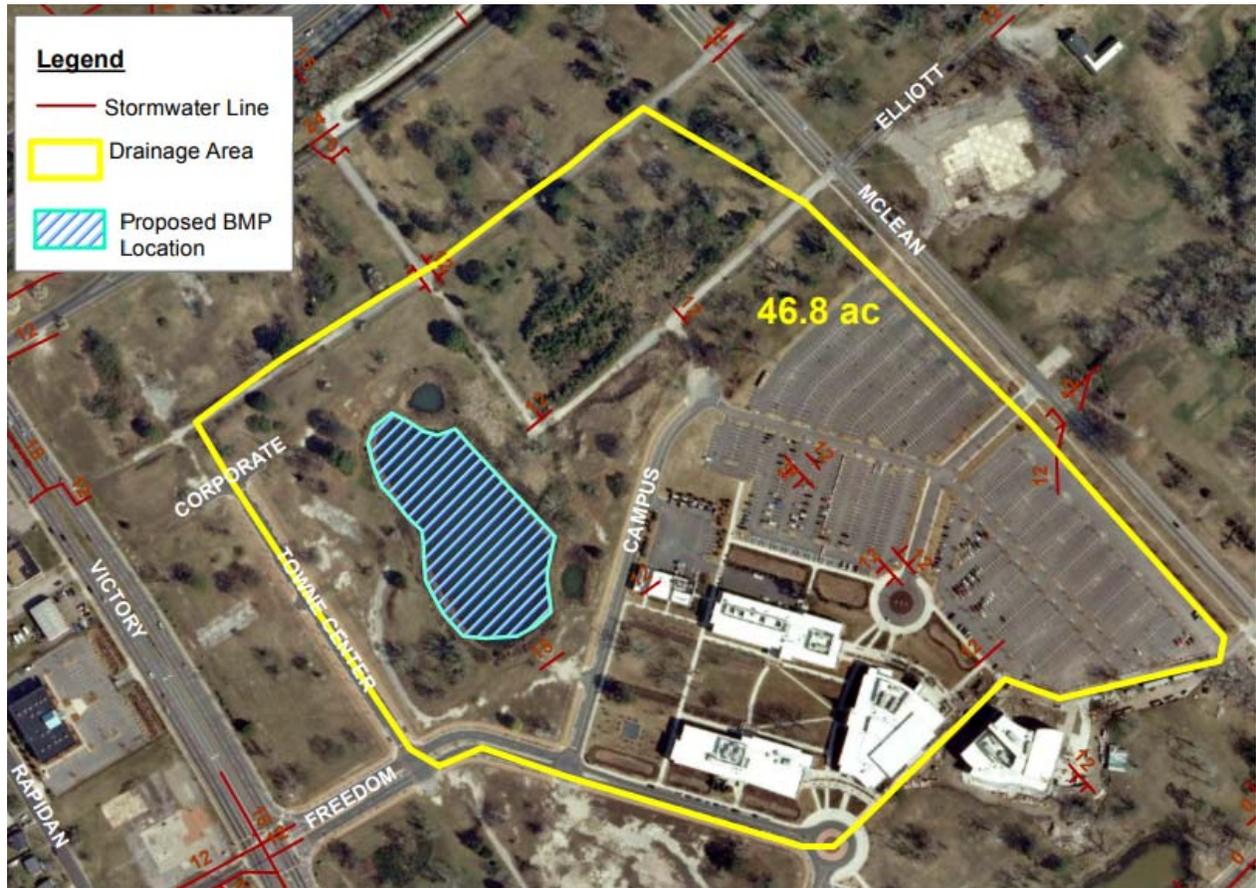


Figure 4. Victory Boulevard Level II Wet Pond Retrofit Drainage Area

Table 8. Summary of Load Reduction Credits for Victory Boulevard Level II Wet Pond Project

Determine Initial Pollutant Loading	
Drainage Area (Acres)	
Impervious	32.76
Pervious	14.08
Forest	0.00
Total	46.84
Starting Loads (lbs/yr) ¹	
TN	410.03
TP	65.50
TSS	24,505.16

Starting Efficiency²		
TN		20%
TP		45%
TSS		60%
Downward Modification³		
		10%
Revised Starting Efficiency		
TN		18.0%
TP		40.5%
TSS		54.0%
TSS Reduction Rate Calculation		
Runoff Storage (acre-feet) ⁴	RS	2.89
Impervious Acres (acres)	IA	32.76
Runoff Depth Treated (inches)	RD	1.06
Restored Removal Efficiency⁵		
TN		30%
TP		65%
TSS		71%
Calculate Total POC Reductions for Project		
Efficiency Improvement		
TN		12%
TP		25%
TSS		17%
Load Reduction (lbs/yr)		
TN		49.20
TP		16.05
TSS		4,151.64
Notes: ¹ EOS Loading Rate from City permit used to calculate starting loads		
² Chesapeake Bay Program Established Efficiencies for Wet Ponds for starting efficiencies		
³ Used downward modification to account for missing forebays		
⁴ Runoff Storage taken from VRRM spreadsheet		
⁵ TN and TP Restored Efficiencies from BMP Clearinghouse, Level II Wet Pond; Retrofit Equations used for TSS		

4.3.2 Churchland Wet Swale

This project involves the construction of a Level II Wet Swale in the Churchland area. The existing property is an old railroad right-of-way owned by the City of Portsmouth and existing land cover consists

of managed turf and impervious. The drainage area is 8.99 acres with 1.89 of impervious and 7.10 acres of managed turf. This project will address the Chesapeake Bay TMDL and is needed to reduce pollutant loading on the Chesapeake Bay and helps restore the quality of the Bay. This project will also address the City of Portsmouth's MS4 permit requirements. There were also two city projects and one private development project that was used for additional TP reductions. The Churchland Bridge Project had required reductions of 1.15lbs/year Phosphorus, the Portside projects 0.48lbs/year and .28 lbs/year from the Cottage place projects.



Figure 5. Churchland Wet Swale Retrofit Drainage Area

Table 9. Summary of Load Reduction Credits for Churchland Wet Swale Retrofit

Determine Initial Pollutant Loading	
Drainage Area (Acres)	
Impervious	1.89
Pervious	7.10

Forest		0.00
Total		8.99
Starting Loads (lbs/yr) ¹		
TN		66.69
TP		6.90
TSS		2,066.19
Calculate Total POC Reductions for Project		
TSS Reduction Rate Calculation		
Runoff Storage (acre-feet) ²	RS	0.2798
Impervious Acres (acres)	IA	1.89
Runoff Depth Treated (inches)	RD	1.78
Removal Efficiency³		
TN		35%
TP		40%
TSS		78%
Load Reduction (lbs/yr)		
TN		13.60
TP		0.85
TSS		793.63
Notes: ¹ EOS Loading Rate from City permit used to calculate starting loads		
² Runoff Storage taken from VRRM spreadsheet		
³ TN and TP Restored Efficiencies from BMP Clearinghouse for Wet Swale Retrofit 2; Retrofit Equations used for TSS		

4.3.3 Beaton Drive Level I Wet Pond

This project consists of the construction of a new Level I Wet Pond. The new pond will be constructed on a vacant City-owned parcel at the intersection of Beaton Drive and Sykes Avenue, so no land acquisition will be required. This project will also help to address flooding issues in the neighbourhood. The contributing area for the pond is 16.4 acres of residential area with 6.24 acres of impervious and 10.16 acres of managed turf. This project will address the Chesapeake Bay TMDL and is needed to reduce pollutant loading on the Chesapeake Bay and helps restore the quality of the Bay. This project will also address the City of Portsmouth's MS4 permit requirements.



Figure 6. Beaton Drive Level I Wet Pond Drainage Area

Table 10. Summary of Load Reduction Credits for Beaton Drive Wet Pond

Determine Initial Pollutant Loading	
Drainage Area (Acres)	
Impervious	6.24
Pervious	10.16
Forest	0.00
Total	16.40
Starting Loads (lbs/yr) ¹	
TN	129.28
TP	16.19
TSS	5,443.60

Calculate Total POC Reductions for Project

TSS Reduction Rate Calculation

Runoff Storage (acre-feet) ²	RS	0.6845
Impervious Acres (acres)	IA	6.24
Runoff Depth Treated (inches)	RD	1.32

Removal Efficiency³

TN	20%
TP	45%
TSS	74%

Load Reduction (lbs/yr)

TN	25.86
TP	7.28
TSS	4,050.36

Notes: ¹EOS Loading Rate from City permit used to calculate starting loads

²Runoff Storage taken from VRRM spreadsheet

³TN and TP Restored Efficiencies from BMP Clearinghouse for Wet Swale Retrofit 2; Retrofit Equations used for TSS

4.3.4 Court Street Green Streets

The City of Portsmouth has identified Court Street, located in downtown Portsmouth in the Olde Town Historic District, as an opportunity for conversion to a Green Street to improve water quality, reduce runoff volume, and enhance public space. This is a pilot project for the City to see if Green Streets could be incorporated into the downtown historic districts without impacting any of the cultural and historical features of the area. WSP has conducted a field investigation and gathered information including GIS and available survey information from the City to delineate the contributing drainage area and determine the land cover. The overall drainage area is 5.40 acres.



Figure 7. Court Street Green Streets Rendering

Table 11. Summary of Load Reduction Credits for Court Street Green Streets

Determine Initial Pollutant Loading			
Drainage Area (acres)			
		Permeable Pavers 1	Bioretention 1
Impervious		3.00	2.40
Pervious		0.00	0.00
Forest		0.00	0.00
Total		3.00	2.40
Starting Loads (lbs/yr)¹			
TN		28.72	22.98
TP		5.36	4.29
TSS		2,110.27	1688.22
Determine Removal Efficiency			
TSS Reduction Rate Calculation			
Runoff Storage (acre-feet) ²	RS	0.2375	0.1900
Impervious Acres (acres)	IA	3.00	2.40
Runoff Depth Treated (inches)	RD	0.95	0.95

Removal Efficiency ³			
TN	59%	64%	
TP	59%	55%	
TSS	74%	74%	
Load Reduction (lbs/yr)			TOTAL
TN	16.95	14.71	31.65
TP	3.16	2.36	5.52
TSS	1,557.81	1,246.21	2,804.03
Notes: ¹ EOS Loading Rate from City permit used to calculate starting loads			
² Runoff Storage taken from VRRM spreadsheet			
³ TN and TP Restored Efficiencies from BMP Clearinghouse for Permeable Pavers 1 and Bioretention 1, respectively;			
Retrofit Equations used for TSS			

4.3.5 Green Lake #3 Wet Pond

This project is the proposed retrofit of Green Lake #3 into a Level 1 Wet Pond. The existing lake is not currently reported as BMP for the City of Portsmouth and is only achieved about 38% phosphorus removal efficiency. With dredging, bank stabilization and the addition of forebays this lake can be converted into a 50% efficient Level I wet pond. This project will also address issues with the outfall structure of the lake. This project will address the Chesapeake Bay TMDL and its need to reduce the pollutant loading on the Chesapeake Bay and helps restore the quality of the bay. It will also address the City of Portsmouth's MS4 permit requirements.

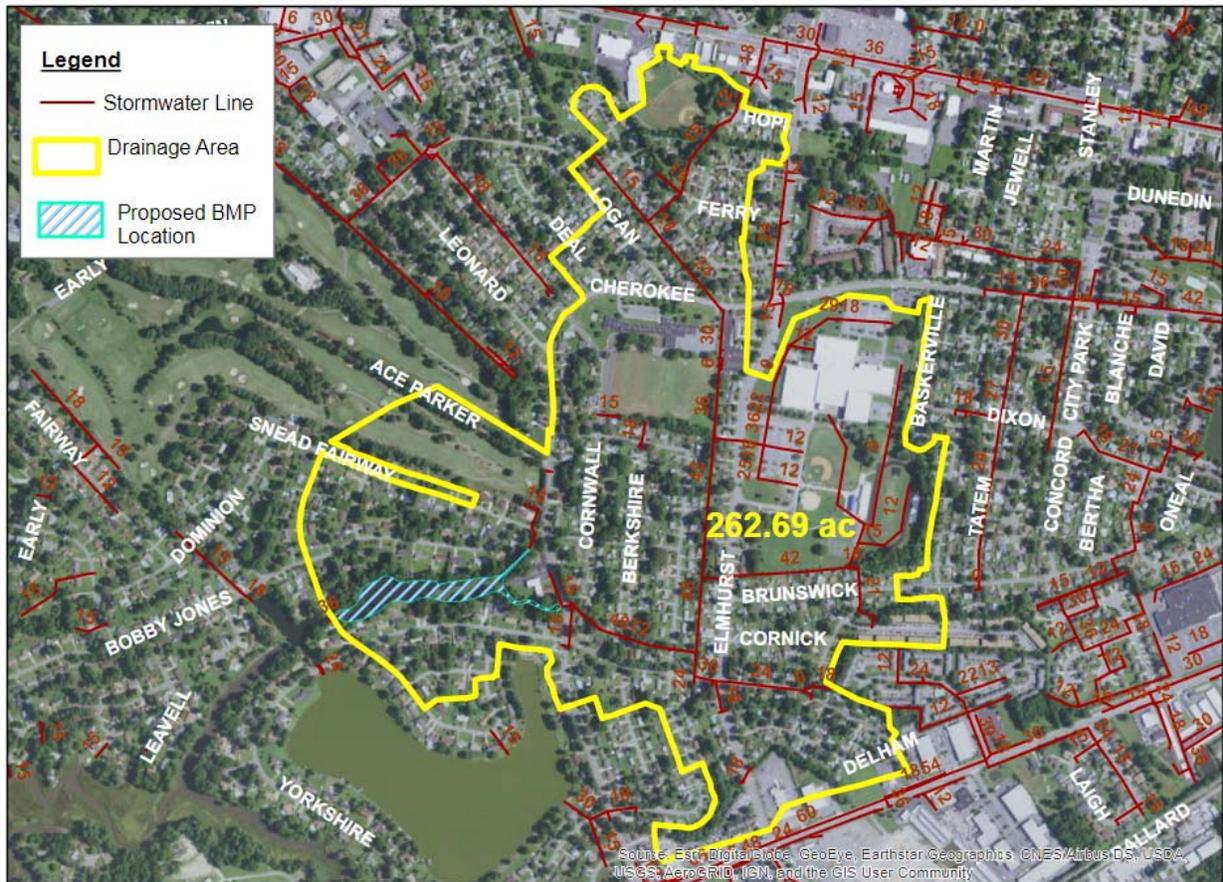


Figure 8. Green Lake #3 Wet Pond Drainage Area

Table 12. Summary of Load Reduction Credits for Green Lake

Determine Initial Pollutant Loading	
Drainage Area (acres)	
Impervious	74.23
Pervious	188.46
Forest	0.00
Total	262.69
Starting Loads (lbs/yr) ¹	
TN	2,000.50
TP	226.11
TSS	71,770.46

Determine Removal Efficiency²		
Starting Efficiency		
TN		20%
TP		45%
TSS		60%
Downward Modification³		
		20%
Revised Starting Efficiency		
TN		16.0%
TP		36.0%
TSS		48.0%
TSS Reduction Rate Calculation⁴		
Runoff Storage (acre-feet)	RS	9.80
Impervious Acres (acres)	IA	74.23
Runoff Depth Treated (inches)	RD	1.58
Restored Removal Efficiency		
TN		20%
TP		45%
TSS		77%
Calculate Total POC Reductions for Project		
Efficiency Improvement		
TN		4%
TP		9%
TSS		29%
Load Reduction (lbs/yr)		
TN		80.02
TP		20.35
TSS		20,521.91
Notes: ¹ EOS Loading Rate from City permit used to calculate starting loads ² Chesapeake Bay Program Established Efficiencies for Wet Ponds for starting efficiencies ³ Used downward modification to account for missing forebays and volume deficiencies ⁴ Runoff Storage taken from VRRM spreadsheet, 427,010 ft ³ ⁵ TN and TP Restored Efficiencies from BMP clearinghouse, Level I Wet Pond; Retrofit Equations used for TSS		

4.3.6 Current CIP Budget and Schedule

City of Portsmouth’s budget includes a Storm Water Fund to address flooding and improve water quality. Funding is needed to address MS4 requirements, aging infrastructure and flooding projects. Table 13 shows the Storm Water Fund budgets for the last three fiscal years. The CIP is funded through a Storm Water Utility Fee. The current budget includes a \$1.25 increase to the current Equivalent Residential Unit (ERU) Rate to fund CIP projects. Per FY2018 adopted budget, both residential and commercial properties are charged \$10.50 per ERU per month. This rate is based on amount of impervious area on each property, where one ERU is 1,877 square feet of impervious area. Residential properties are charged for one ERU while commercial properties are billed on their actual amount of impervious.

Table 13. Summary of Annual Budgets for Storm Water Fund

Storm Water Fund Budgets	
FY 2016 Actual	\$7,178,793
FY 2017 Adopted	\$7,511,211
FY 2018 Adopted	\$9,356,434
Note: FY 2018 Adopted Budget https://www.portsmouthva.gov/DocumentCenter/View/2819/FY-2018-Adopted-Budget	

4.4 Implementation Schedule and Estimated Costs

Per Sections I.D.1.b(1f) and I.D.1.b(1h) of the MS4 Permit, the Chesapeake Bay TMDL Action Plan must include an estimate of the expected costs to implement the requirements of the Chesapeake Bay Special Condition during the state permit cycle. Table 14 contains a summary of the estimated costs for design and construction of each of the projects included in this Action Plan for the first permit cycle.

Table 14. Estimated Costs for Design and Construction of Projects Included

Project Name	Year to Complete Construction	Total Cost ¹	Source of Costs
Victory Blvd Level II Wet Pond Retrofit		\$ 488,000	SLAF/VCWRLF
Churchland Wet Swale ²		\$ 147,433.30	SLAF/City
Beaton Drive Wet Pond		\$ 157,200	SLAF/VCWRLF
Court Street Green Street		\$ 1,116,019	G3 Grant /VCWRLF
Green Lake #3 Level 1 Wet Pond		\$ 683,336	VCWRLF
¹ Costs include design and construction costs.			
² Added 30% design fee to total cost			

5 PUBLIC COMMENT PROCESS

A draft version of this plan was published for a public comment period of approximately four weeks and no comments were received.

6 CONCLUSIONS

The City developed this Chesapeake Bay TMDL Action Plan as required in the City's MS4 Permit, referenced in Section 1 of this Plan, and in accordance with the DEQ Chesapeake Bay TMDL Action Plan Guidance Document dated May 18, 2015. With this Plan the City concludes that the first permit term pollutant reduction requirements calculated in Section 3 are met by the projects and other load reductions identified in Section 4 of this Plan.

During the second permit term, the City will be required to meet an additional thirty-five percent reduction of the identified pollutants to the maximum extent practicable. The existing projects identified in this first permit cycle Plan exceed the required five percent reductions, and the additional reductions will be applied toward achieving the additional 35 percent reductions required by the second permit term. Portsmouth will evaluate street sweeping, catch basin and storm drain cleaning, tree planting and other non-structural BMPs to develop pollutant removal credits that can be applied in the second permit term. The City will continue to implement compliance projects, and the Plan will be updated as needed through dated revisions to this plan.

7 LIMITATIONS

This document was prepared solely for and by the City of Portsmouth in accordance with professional standards at the time the services were performed, and in accordance with the contract between the City of Portsmouth and Arcadis. This document is governed by the specific scope of work authorized by the City; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by the City and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

APPENDIX A

City of Portsmouth MS4 Program: Task 2.4 Outfall Service Area Delineation



APPENDIX B

City of Portsmouth MS4 Program: Task 4.2 Setting the Baseline



APPENDIX C

City of Portsmouth MS4 Program: Pollutant Reductions from Historical and Redevelopment Stormwater Best Management Practices

