

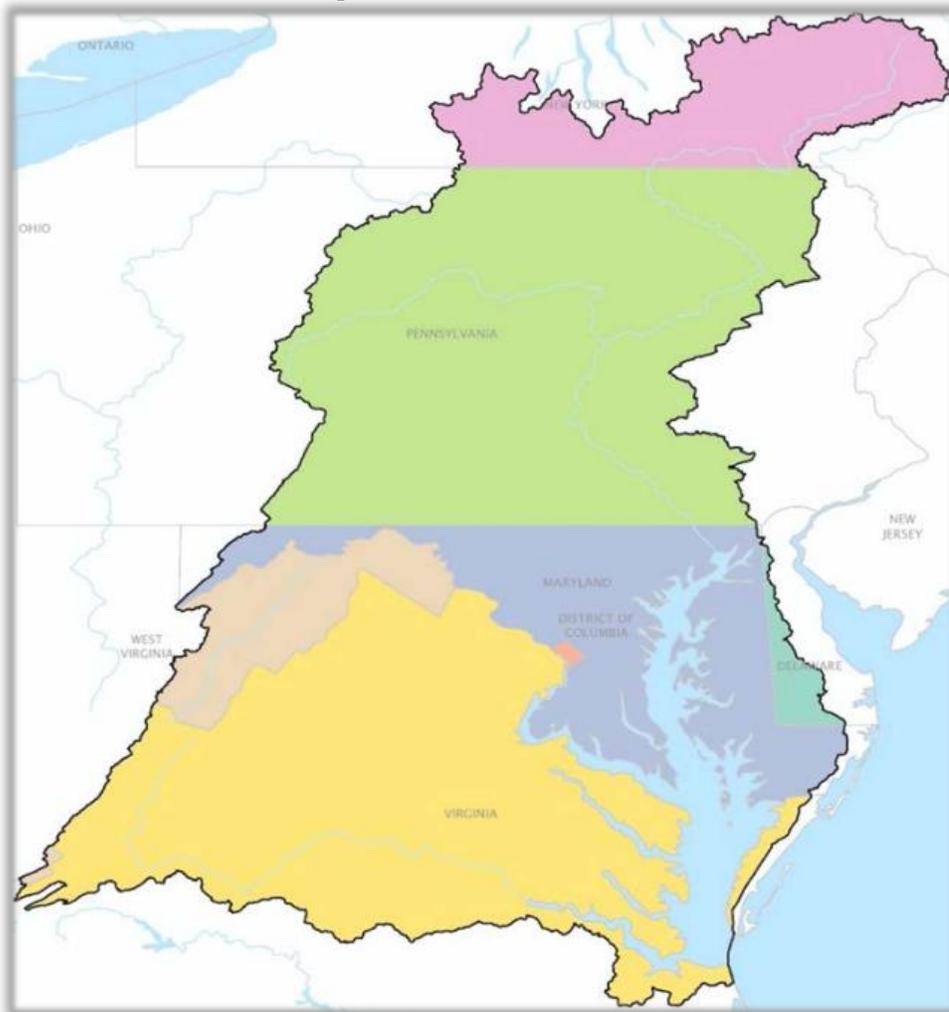


# CHESAPEAKE BAY TMDL ACTION PLAN

(2013-2018 MS4 General Permit)

**A Plan for Achieving a 5%  
Reduction of Existing Loads**

**June 30, 2015**  
Updated December 2015



This plan satisfies the requirements of Section I(C) of the MS4 General Permit (9VAC25-890-40) for Special Conditions for the Chesapeake Bay TMDL. This plan is consistent with the Chesapeake Bay TMDL and the Virginia Phase I and II WIPs to meet the Level 2 (L2) scoping run for existing developed lands as it represents an implementation of 5.0% of L2 as specified in the 2010 Phase I WIP.

City of Hopewell, Virginia



EEE Consulting, Inc.



## EXECUTIVE SUMMARY

The City of Hopewell (Hopewell), is authorized to discharge stormwater from its municipal separate storm sewer system (MS4) under the Virginia Pollutant Discharge Elimination System (VPDES) General Permit for Discharge of Stormwater from Small MS4s (MS4 General Permit). To maintain permit compliance, Hopewell implements an MS4 Program Plan that includes best management practices (BMPs) to address six minimum control measures (MCMs) and special conditions for the Total Maximum Daily Load (TMDL) in which Hopewell has been assigned a wasteload allocation (WLA). The Environmental Protection Agency (EPA) describes a TMDL as a “pollution diet” that identifies the maximum amount of a pollutant the waterway can receive and still meet water quality standards. A WLA is the allocated pollutant load the water body can assimilate and still achieve water quality standards. The WLA can be used to determine the required reduction in pollutants of concern from the MS4s. The MS4 General Permit serves as the regulatory mechanism for addressing the load reductions described in the TMDL, predominantly through the requirement of a TMDL Action Plan.

The Chesapeake Bay TMDL was established by the EPA on December 29, 2010 and assigned WLAs for phosphorus, nitrogen and total suspended solids. In response, the Commonwealth of Virginia developed Watershed Implementation Plans (WIPs) that, in part, identify the MS4 General Permit as a mechanism for enforcing load reductions in urban areas. Subsequently, the Commonwealth included special conditions into the latest MS4 General Permit to address the reductions required by the TMDL for the pollutants of concern. The WIPs intended the reductions to be achieved over the course of three 5-year permit cycles, with the first cycle (2013 – 2018) requiring 5% of the reductions be achieved. Reduction requirements for the following two permit cycles are anticipated to increase substantially, requiring an additional 35% and 60% of the reductions be achieved, respectively.

Hopewell has developed an Action Plan consistent with the Chesapeake Bay Action Plan Guidance Memo (Memo No. 15-2005) provided by the Virginia Department of Environmental Quality (DEQ). The guidance was used to determine the required pollutant load reductions and identify the means and methods for achieving 5% of the reductions required by the current MS4 General Permit. Hopewell has elected to implement and document street sweeping practices that will demonstrate compliance with the first 5% reduction requirements. An estimation of the achieved load reductions is consistent with the Chesapeake Bay TMDL Action Plan guidance “qualifying street lanes method.” The City also presents, as a preview of Phase II of the Action Plan, the “*Marina Connectivity Greenway/BMP Project*” intended to serve as a means to achieve pollutant reductions in the next permit cycle.

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## Acronyms

BMP	Best Management Practice
CGP	Construction General Permit
CUA	Census Urban Area
CWA	Clean Water Act
DEQ	Virginia Department of Environmental Quality
EOS	Edge of Stream
EPA	Environmental Protection Agency
ESC	Erosion and Sediment Control
GIS	Geographic Information System
IDDE	Illicit Discharge Detection and Elimination
LA	Load Allocation
L2	Level 2
MCM	Minimum Control Measure
MEP	Maximum Extent Practicable
MS4	Municipal Separate Storm Sewer System
MS4 GP	General Permit for Discharge of Stormwater from Small MS4s
NMP	Nutrient Management Plan
Hopewell	City of Hopewell
POC	Pollutant of Concern
RLDA	Regulated Land Disturbing Activity
SWPPP	Stormwater Pollution Prevention Plan
SWM	Stormwater Management
TMDL	Total Maximum Daily Load
VAC	Virginia Administrative Code
VPDES	Virginia Pollutant Discharge Elimination System
VSMP	Virginia Stormwater Management Program
WIP	Watershed Implementation Plan
WLA	Wasteload Allocation

## DEFINITIONS

**Best Management Practices (BMPs)** are schedules of activities, prohibitions of practices, maintenance procedures, and other management practices, including both structural and nonstructural practices, to prevent or reduce the pollution of surface waters and groundwater systems.

**Census Urbanized Area (CUA)** are areas identified as urban. MS4 regulations only apply within CUAs.

**Existing Sources** are pervious and impervious urban land uses served by the MS4 as of June 30, 2009.

**Impervious Cover** is a surface composed of material that significantly impedes or prevents natural infiltration of water into soil.

**L2 Scoping Run** is a model run to determine required reductions from urban sources as of June 30, 2009. The L2 reductions are summarized in the following table:

Pollutant of Concern	Regulated Impervious (%)	Regulated Pervious (%)
Nitrogen	9	6
Phosphorus	16	7.25
Sediment	20	8.75

**Municipal Separate Storm Sewer System (MS4)** is a conveyance or system of conveyances otherwise known as a municipal separate storm sewer system (MS4), including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains that are:

- Owned or operated by a federal state, city, town, county, district, association, or other public body, created by or pursuant to state law that discharges to surface waters;
- Designed or used for collecting or conveying stormwater;
- That is not a combined sewer; and
- That is not part of a publicly owned treatment works.

**New Sources** are pervious and impervious urban land uses served by the MS4 developed or redeveloped on or after July 1, 2009.

**Hopewell MS4 Program Plan** is the guiding document of the Hopewell's MS4 Program and includes best management practices to address conditions of the MS4 General Permit.

**Pollutants of Concern (POC)** are total nitrogen ("TN"), total phosphorus ("TP"), and total suspended solids ("TSS").

**Prior Developed Lands** are land that has been previously utilized for residential, commercial, industrial, institutional, recreation, transportation, or utility facilities or structures, and that will have the impervious areas associated with those uses altered during a land-disturbing activity.

**Transitional Sources** are regulated land disturbing activities that are temporary in nature and discharge through the MS4.

## 1.0 INTRODUCTION AND PURPOSE

Mandated by Congress under the Clean Water Act (CWA), the National Pollutant Discharge Elimination System (NPDES) storm water program includes the Municipal Separate Storm Sewer System (MS4), Construction, and Industrial General Permits. In Virginia the NPDES Program is administered by the Department of Environmental Quality (DEQ) through the Virginia Stormwater Management Program (VSMP) and the Virginia Pollutant Discharge Elimination System (VPDES). The City of Hopewell (City) is authorized to discharge stormwater from its MS4 under the VPDES General Permit for Discharge of Stormwater from Small MS4s (MS4 General Permit). As part of the MS4 General Permit authorization, the City developed and implements an MS4 Program Plan with best management practices (BMPs) to address the six minimum control measures (MCMs) and the special conditions for applicable total maximum daily loads (TMDLs), as outlined in the MS4 General Permit. Implementation of these BMPs is consistent with the provisions of an iterative MS4 Program constituting compliance with the standard of reducing pollutants to the "maximum extent practicable" or MEP.

*"Hopewell's MS4 program strives to improve environmental compliance, quality and stewardship through effective management, implementation, and enforcement."*

The City's MS4 Program strives to achieve environmental compliance and be a leading environmental steward through effective management, implementation, and enforcement of sound technical guidelines, criteria and practices for stormwater management and erosion and sediment control. The plan presented herein demonstrates how Hopewell's MS4 Program Plan addresses sediment and nutrients (nitrogen and phosphorus) in its MS4 regulated area consistent with the requirements of the Chesapeake Bay TMDL.

### 1.1 Total Maximum Daily Load

A TMDL is the total amount of a given pollutant that a waterbody can assimilate and still meet water quality standards. Typically, TMDLs are represented numerically in three main components: Waste Load Allocations (WLAs), a Load Allocation (LA), and a Margin of Safety. A WLA is the allocated amount of pollutant from areas discharging through a pipe or other conveyance considered a point source. Point sources include sewage treatment plants, industrial facilities and storm sewer systems. In contrast, an LA is the amount of pollutant from existing non-point sources and natural background sources such as farm runoff and atmospheric deposition. As a point source discharge, MS4s are assigned a WLA representing the annual loading of the pollutant of concern (POC) that can be discharged from its regulated MS4 area.

## **1.2 MS4 General Permit Special Conditions**

Hopewell's MS4 General Permit includes a series of special conditions that must be addressed for permit compliance where Hopewell has been assigned a WLA under the TMDL. The special conditions state that any TMDL approved by the State Water Control Board (SWCB) assigning a WLA to an MS4 must be addressed by the Permittee through the measurable goals of their MS4 Program Plan.

In 1998, large portions of Chesapeake Bay and its tidal tributaries within Virginia were identified as not meeting water quality standards and listed as impaired because of excess nitrogen, phosphorus and sediment. Due to the Chesapeake Bay waters remaining on the impaired waters list, the Environmental Protection Agency (EPA) required that a TMDL be developed, which was subsequently approved on December 29, 2010.

## **1.3 Watershed Implementation Plan and Strategy for MS4s**

The Chesapeake Bay Watershed Implementation Plans (WIPs) are plans that detail how and when the six Chesapeake Bay states and the District of Columbia will meet pollutant allocations. In the Phase I and Phase II WIPs for the Chesapeake Bay TMDL, Virginia committed to a phased approach to reducing nutrients and suspended solids discharging from MS4s. The issuance of the 2013-2018 MS4 General Permit set forth special conditions required by all MS4 General Permit holders within the Chesapeake Bay watershed. In part, the special conditions require the permittee to achieve 5% of the required reductions identified in the so-called Level 2 Scoping Run from existing baseline loads by July 1, 2018. Baseline loads are defined as those occurring on June 20, 2009 and are computed using loading rates provided in the MS4 General Permit.

## **1.4 Hopewell Chesapeake Bay Action Plan**

The Hopewell Action Plan presented herein provides a review of the current MS4 program, which demonstrates Hopewell's ability to ensure compliance with the special conditions and includes the means and methods Hopewell will use to meet 5.0% of the Level 2 (L2) scoping run reduction for existing development during the first MS4 General Permit cycle. This Action Plan was developed to comply with the regulations of the MS4 General Permit (9VAC25-890) and under the advisement of DEQ's Guidance Memo No. 15-2005 (DEQ Guidance), which provides background information and procedures to meet the Chesapeake Bay TMDL special condition requirements.

## 2.0 APPLICABLE OVERVIEW OF HOPEWELL'S MS4 PROGRAM

Hopewell's MS4 Permit covers stormwater discharges from areas included within census urbanized areas (CUAs). Portions of the City included within the CUA is depicted in Appendix A and include most of the City's limits with the exception of a portion of the easterly side of the City. The mapping also shows areas covered under separate VPDES permits and therefore not included in the City's regulated MS4 areas.

The City's collective efforts, as described in the Hopewell MS4 Program Plan, result in significant reduction of pollutants that may be discharged from its regulated MS4. BMPs already included in the City's MS4 Program Plan that address the Chesapeake Bay TMDL POCs, sediment and nutrients, are described in the following sub-sections. Each sub-section is provided to address the referenced special condition in the MS4 General Permit.

### 2.1 Current Program and Existing Legal Authority

Hopewell's current MS4 Program provides appropriate policies and procedures to implement a compliant program aligned with the goals and requirements of the Chesapeake Bay TMDL. The following list identifies laws, programs, and other regulatory mechanisms relied upon by Hopewell that are applicable to reducing nitrogen, phosphorus and sediment. A summary of the applicable MCMs is listed below and addresses the following special condition:

- ✓ *"A review of the current MS4 program implemented as a requirement of this state permit including a review of the existing legal authorities and the operator's ability to ensure compliance with this special condition."* [Section I(C)(2)(a)(1)]
- *Minimum Control Measure 1 (Public Education and Outreach)* – The City's MS4 Program includes a Public Education and Outreach Program (PEOP) that identifies the Chesapeake Bay TMDL POCs as a high priority water quality issue. The PEOP is described in BMP 1.2 of the City's MS4 Program Plan and includes the distribution of educational materials regarding methods to reduce introduction of the POCs into stormwater runoff.
- *Minimum Control Measure 3 (Illicit Discharge Detection and Elimination)* – The IDDE Program includes written procedures to detect, identify, and address non-stormwater discharges, including illegal dumping, to the small MS4 with policies and procedures for when and how to use legal authorities. Hopewell prohibits non-stormwater discharges into the storm sewer system through language provided within the Illicit Discharge Ordinance. IDDE BMPs are described in the MCM 3 BMPs in the Hopewell MS4 Program Plan. The IDDE Program is effective at addressing the POC through staff training, prohibition of illicit discharges, and annual outfall screening.

- *Minimum Control Measure 4 (Construction)* – The Construction Program includes mechanisms to ensure compliance and enforcement on regulated construction sites including:
  1. Stormwater Ordinance
  2. Erosion and Sediment Control Ordinance
  3. Virginia Erosion and Sediment Control Law
  4. Virginia Stormwater Management Program
  5. DEQ’s Erosion and Sediment Control Certification Program
  6. DEQ’s Stormwater Management Certification Program

The Construction Site Runoff Control Program is especially effective at reducing downstream conveyance of sediment from transitional sources. Minimum Control Measure 4 BMPs in the City’s MS4 Program Plan describe construction site runoff control BMPs.

- *Minimum Control Measure 5 (Post-Construction)* – The Post-Construction SWM Program includes requirements to ensure long-term maintenance inspections on both publically and privately owned BMPs. Included among these requirements are written policies and procedures in the Erosion and Sediment Control and Stormwater Management Ordinances. These ordinances also ensure that stormwater management facilities are designed and installed in accordance with appropriate laws and regulations. Implementation of post-construction inspections and maintenance is supplemented with Hopewell’s “Post-Construction BMP Inspection and Maintenance Manual.” MCM 5 BMPs in the Hopewell MS4 Program Plan describe post-construction stormwater management BMPs.

Implementation of this program addresses the following MS4 General Permit special conditions for the Action Plan to include:

✓ *“The means and methods that will be utilized to address discharges into the MS4 from new sources [Section I(C)(2)(a)(3)]*

- *Minimum Control Measure 6 (Good Housekeeping)* – The Good Housekeeping Program includes requirements and procedures ensure that day-to-day operations minimize the exposure of pollutants to rainfall on campus grounds to the maximum extent practicable. The Plan requires applicable City staff to be trained annually with Hopewell’s “Good Housekeeping Pollution Prevention Manual” used as training material. Hopewell also utilizes contract language to ensure that contractors are certified and are applying pesticides and fertilizers in accordance with the Virginia Pesticide Control Act (§ 3.1-249.27 et seq. of the Code of Virginia). The City will utilize, when necessary, enforcement mechanisms from the IDDE Program to ensure compliance with applicable laws and regulations. Hopewell will

also implement and maintain a nutrient management plan (NMP) developed by a certified turf and landscape NMP planner. The NMP will be implemented in accordance with the MS4 General Permit (Section II (6)(c)). MCM 6 BMPs in the Hopewell MS4 Program Plan describe pollution prevention and good housekeeping BMPs.

## 2.2 New or Modified Legal Authorities

Consistent with the MS4 General Permit, Hopewell uses an iterative approach to ensure the City is minimizing the discharge of pollutants through its MS4 to the MEP. The iterative approach is implemented through the annual reporting process with the review of the effectiveness of each MS4 Program Plan BMPs. BMPs are modified, as necessary, to increase effectiveness. If new or modified authorities are identified with the measure of effectiveness as described in the Hopewell MS4 Program Plan annual reporting, they will be reported through the annual report process. The iterative process addresses the following special condition in the MS4 General Permit:

- ✓ *“The identification of any new or modified legal authorities such as ordinances, state and other permits, orders, specific contract language, and inter-jurisdictional agreements implemented or needing to be implemented to meet the requirements of this special condition.”* [Section I(C)(2)(a)(2)]

This adaptive management program, or iterative process, allows policies, practices, procedures or other BMPs to be enhanced, revised or created as necessary. These enhancements may be made in response to self-identified ineffectiveness, changes in regulations, and changes in technology. If new or modified authorities are identified with the measure of effectiveness as described in the Hopewell Program Plan, they will be reported through the annual report process. No new policies and procedures or modifications to existing policies and procedures were identified as necessary to meet the requirements of the special conditions. Means and methods to meet the special conditions are described in Section 4.

### **3.0 POLLUTANT LOADINGS**

The MS4 General Permit requires Hopewell to compute the annual loadings and the required POC load reductions, 5.0% of the L2 Scoping Run reductions, from existing sources as of June 30, 2009. To complete this requirement, Hopewell determined the amount of applicable pervious and impervious land cover within its regulated and input the data into the appropriate loading and reduction tables provided in the MS4 General Permit. The methodology to determine sediment and nutrient loadings and the required reductions are described in the following subsections.

#### **3.1 Baseline Characterization**

Prior to estimating the POC loadings and required reductions, the City first evaluated the extent of their regulated MS4 area. These evaluations were conducted utilizing the DEQ Guidance and a Geographic Information System (GIS) analysis as described in the following subsections.

##### **3.1.1 MS4 Service Area**

Since the entire City is within the TMDL watershed, the service area is simply defined as the intersection of the City's jurisdictional boundary with the 2000 "Richmond, Virginia CUA." The total land area of the City is 6,995 acres. Parts of the City are located outside of the 2000 CUA and, therefore, are not currently required to be used in pollutant loading calculations per the DEQ Guidance. However, it is noted that the CUA expands to include additional areas within the City with the 2010 Census. Loadings from those additional areas are required to be computed during the next permit cycle for determining the subsequent phase of required reductions. The areas applicable for computing pollutant loadings if further refined with the exception of certain properties and land uses as described in the following Sections.

##### **3.1.2 Exclusion of VPDES Permitted Areas**

Per the DEQ Guidance, land regulated under an individual VPDES permit or a general VPDES permit that addresses industrial stormwater may be excluded from the MS4 service area for the purposes of computing pollutant loadings. Individual and general VPDES permittees within the City of Hopewell were identified using DEQ's statewide permittee Microsoft Excel spreadsheets. This included Permittees located in Hopewell both inside and outside of the 2000 CUA. Properties belonging to VPDES permittees were then identified using the City's parcel data and a shapefile with the merged properties was developed. VPDES Permittees located within Hopewell are listed in Table 1 and illustrated in Appendix B. DEQ's Guidance Memo No. 15-2005 also allows for exclusion of the General VPDES Permit for Concrete Products Facilities (VAG11) and the Nonmetallic Mineral Processing General Permit (VAR84); however, the City does not host any such permittees.

**Table 1: Properties in Hopewell Covered under an Individual or General Industrial Stormwater Permit.**

<b>VPDES Permittee</b>	<b>Permit #</b>
James River Genco Limited Liability Corporation	VAR050553
Chemtrade Solutions LLC	VAR050615
Hopewell Iron and Metal Company Incorporated	VAR050636
Action Auto Parts Incorporated	VAR050647
Regional Enterprises Incorporated	VAR050670
Evonik Corporation	VAR051136
Hopewell WWTP	VAR051450
Vireol Bio Energy Limited Liability Company	VAR051941
Airgas Carbonic Dry Ice	VAR051497
Linde LLC - Hopewell	VAR051689
Jordan Point Yacht Haven	VAR051198
Dominion - Hopewell Power Station	VA0082783
Hercules Aqualon Incorporated Division	VA0003492
Honeywell International Incorporated	VA0005291
Hopewell Cogeneration Limited Partnership	VA0079502
RockTenn CP LLC	VA0004642

### 3.1.3 Exclusion of State and Federal Properties

Per the DEQ Guidance, state and federal properties were identified and excluded from the pollutant loading computations since they are not included in the City’s MS4 service area. State and federal properties were identified using the City’s parcel data and totaled approximately 18 acres. State and federal properties are graphically illustrated in Appendix B and include:

- VDOT (interstates and surrounding right-of-way),
- Petersburg National Battlefield Park,
- City Point National Cemetery (National Park Service),

### 3.1.4 Land Cover Exclusions

According to the DEQ Guidance, the following land covers or uses can be excluded from the area used for computing pollutant loadings:

- Forested lands,
- Agricultural lands,
- Wetlands, and
- Open waters.

The City used the 2011 National Land Cover Dataset (NLCD) to quantify these areas. NLCD is a nationally available 30-meter resolution land cover database that provides descriptive data for characteristics of the land surface for thematic classes and percent impervious cover. The 2011 NLCD release was selected since it is the most current release and the closest dataset released in respect to the June 30, 2009 date at which the City’s characteristics are being based. The dataset

also has the same the same resolution (30m x 30m) as the Chesapeake Bay Program Model land use data. An analysis to quantify the land uses listed above found:

- 584.2 acres of forest. The results of the NLCD characterization were reviewed to ensure general agreement with the “forested lands” definition provided in the DEQ Guidance (undeveloped and meeting certain density requirements);
- 296.8 acres of wetlands and 13.6 acres of open water; and
- Minimal area classified as agriculture.

### 3.1.5 Pervious and Impervious Land Cover

Based on the descriptions of the baseline characterization in Section 3.1.1 through 3.1.5, the applicable service area was determined to be those areas within the City that were within the CUA and exclude applicable permitted areas from Table 1, state and federal properties, and forest, wetlands and open water land cover. The 2011 NLCD was then used to determine the pervious and impervious area to be used for computing pollutant loads. The 2011 NLCD land use classification descriptions provide a range for the percentage of imperviousness for each land use. For the purposes of characterizing the study area, the middle value (e.g. a 35% value was used for a range of 20% to 49% imperviousness) was assigned to the respective land cover classification. A map depicting the land use data in the study area is provided in Appendix C and a summary is provided in Table 2.

**Table 2: Summary of Land Cover Classifications within the City’s MS4 Regulated Area.**

NLCD Classification	Total Acres	Regulated Urban Pervious Acres	Regulated Urban Impervious Acres
Open Water*	13.6	0.0	0.0
Developed, Open Space (10% impervious)	1,267.0	1,140.3	126.7
Developed, Low Intensity (34.5% impervious)	1,861.1	1,219.0	642.1
Developed, Medium Intensity (64.5% impervious)	546.3	193.9	352.4
Developed, High Intensity (90% impervious)	159.1	16.0	143.1
Barren	5.5	5.5	0.0
Forest (Deciduous/Evergreen/Mixed)*	584.2	0.0	0.0
Shrub/Scrub	45.1	45.1	0.0
Cultivated Crops	34.4	34.4	0.0
Wetlands (Woody/Emergent Herbaceous)*	296.8	0.0	0.0
<b>Total</b>	<b>4,813.1</b>	<b>2,654.2</b>	<b>1,264.3</b>

\* Excluded land classifications are not assigned a regulated area.

### 3.1.6 Refinement of Service Area

The City reserves the right to further refine its service area as more accurate datasets become available. Future refinement may include re-computations based on more detailed outfall drainage area delineations to develop a better understanding of the areas within the City serviced by the MS4 and a higher resolution land use datasets.

### 3.2 Annual Loadings from Existing Sources

The data summarized in Table 2 was used to estimate pollutant loads from existing sources as of June 30, 2009, using the James River Basin calculation sheet for estimating existing source loads provided in the MS4 General Permit. The calculation sheet was completed as provided in Table 3 which addresses the following special condition:

- ✓ *“An estimate of the annual POC loads discharged from the existing sources as of June 30, 2009, based on the 2009 progress run. The operator shall utilize the applicable versions of Tables ... based on the river basin to which the MS4 discharges by multiplying the total existing acres served by the MS4 on June 30, 2009, and the 2009 Edge of Stream (EOS) loading rate.” [Section I(C)(2)(a)(4)]*

**Table 3: Existing Sources for Hopewell for the James River Basin**

Pollutant	Regulated Urban Land Cover	Total Existing Acres Served by MS4 (06/30/09)	2009 EOS Loading Rate (lbs/acre)	Estimated Total POC Load Based on 2009 Progress Run (lbs)	Total Load (lbs)
Nitrogen	Impervious	1,264.3	9.39	11,872	30,425
	Pervious	2,654.2	6.99	18,553	
Phosphorus	Impervious	1,264.3	1.76	2,225	3,552
	Pervious	2,654.2	0.5	1,327	
TSS	Impervious	1,264.3	676.94	855,855	1,124,142
	Pervious	2,654.2	101.08	268,287	

### 3.3 Annual Loadings from New Sources and Grandfathered Projects

In addition to computing baseline loadings from existing conditions as of June 30, 2009, the special conditions require the determination of offsets for increased loads from development occurring on or after July 1, 2009, including grandfathered projects. No offsets are necessary for new sources since:

- Loadings from new sources are addressed with the water quality criteria in the stormwater management regulations. Water quality criteria for new sources from regulated development between July 1, 2009 and June 30, 2014 was based on an average land cover condition of 16% and therefore appropriate offsets were incorporated within the development project’s stormwater management plan.
- No Hopewell projects are grandfathered.

Since no offsets for new sources are necessary, the following special conditions are addressed:

- ✓ *“A list of future projects and associated acreage that qualify as grandfathered in accordance with 9VAC25-870-48” [Section I(C)(2)(a)(10)]*
- ✓ *“The means and methods to offset the increased loads 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 operator shall offset 5.0% of the calculated increased load from these new sources during the permit cycle.” [Section I(C)(2)(a)(7)]*

- ✓ *“The means and methods to offset the increased loads from projects as grandfathered in accordance with 9VAC25-870-48, that disturb one acre or greater that begin construction after July 1, 2014, where the project utilizes an average land cover condition greater than 16% impervious cover in the design of post-development stormwater management facilities.” [Section I(C)(2)(a)(8)]*
- ✓ *“Implementation of the means and methods to address discharges from new sources in accordance with the minimum control measure in Section II ... related to post-construction stormwater management in new development and development of prior developed lands and in order to offset 5.0% of the total increase in POC loads between July 1, 2009, and June 30, 2014. Increases in the POC load from grandfathered projects initiating construction after July 1, 2014, must be offset prior to completion of the project.” [Section I(C)(3)(c)]*

### 3.4 Required Load Reductions

The MS4 General Permit requires Hopewell to reduce 5.0% of the L2 Scoping Run POC reductions for existing sources as of June 30, 2009. The required load reductions for this permit cycle were calculated using the calculation sheet in the MS4 General Permit for determining POC reductions in the James River Basin. The calculation sheets were modified with the corrected loading rates provided in DEQ’s Guidance. The required load reductions for the City’s MS4 is provided in Table 4 which addresses the special condition to provide:

- ✓ *“A determination of the total pollutant load reductions necessary to reduce the annual POC loads from existing sources utilizing the applicable versions of Tables ....” [Section I(C)(2)(a)(5)]*

**Table 4: Estimated POC Reductions from the City’s MS4 Regulated Area**

<b>Pollutant</b>	<b>Urban Regulated Land Cover</b>	<b>Total Existing Acres Served by MS4</b>	<b>Required Reduction (lbs/acre)</b>	<b>Reduction Required (lbs)</b>	<b>Total Reduction (lbs)</b>
Nitrogen	Impervious	1,264.3	0.042255	53.42	109.08
	Pervious	2,654.2	0.02097	55.66	
Phosphorus	Impervious	1,264.3	0.01408	17.80	22.61
	Pervious	2,654.2	0.0018125	4.81	
TSS	Impervious	1,264.3	6.7694	8,558.55	9,732.30
	Pervious	2,654.2	0.442225	1,173.75	

#### 4.0 MEANS TO ACHIEVE POLLUTANT REDUCTIONS

The DEQ Guidance was used to identify appropriate means and methods for achieving the required reductions computed in Section 3.4. Hopewell determined that the required reductions are best achieved by implementation of a street sweeping program for the current MS4 General Permit cycle, as described in the following sub-sections. The selection of the program, along with the quantification of reductions in the following Section, address the following MS4 General Permit special condition:

- ✓ *“Implementation of means and methods sufficient to meet the required reductions of POC loads from existing sources in accordance with the Chesapeake Bay TMDL Action Plan.” [Section I(C)(3)(d)]*

Reduction credits described in Section 4.1 demonstrate compliance with the reduction requirements for this MS4 General Permit cycle with the understanding that any changes in established BMP efficiencies will not be retroactively applied.

#### 4.1 Street Sweeping

The City of Hopewell will implement street sweeping to meet the 5% load reduction requirements of the Chesapeake Bay TMDL. The “qualifying street lanes method,” as described in the DEQ Guidance, was utilized to determine the extents of the street sweeping efforts necessary to achieve the required reductions (Table 5). Based on the street lanes method, Hopewell is required to street sweep approximately 156 lane miles with a regenerative air or vacuum sweeper in order to meet the 5% reduction requirements.

**Table 5: Required Street Sweeping Lane Miles per the Qualifying Street Lanes Method to achieve the reductions computed in Table 4.**

Baseline Load (Ches. Bay Technical Bulletin #9)		Pick-Up Factor (Table 29 Ches. Bay Technical Bulletin #9)	
Pollutant	Load (lbs/imp. acre/year)	Mechanical Sweeper	Regenerative/Vacuum
Nitrogen	15.4	0.04	0.04
Phosphorous	2	0.04	0.06
**Total Suspended Solids	1300	0.1	0.25
Pollutant	*Required Mechanical Sweeper Mileage	*Required Regenerative/Vacuum Mileage	Regenerative/Vacuum Mileage to Achieve Reductions for N, P and TSS
Nitrogen	146.09	146.09	
Phosphorous	233.17	155.44	<b>155.44</b>
**Total Suspended Solids	61.76	24.71	

\* Results are in lane miles based on a lane width of 10 feet as described in the Chesapeake Bay Technical Bulletin #9

\*\* DEQ’s Guidance Memo No. 15-2005 does not provide a loading rate for sediment for the lane mile method. Loading is based on a conversation with DEQ in December 2015 regarding an appropriate sediment loading rate.

## 5.0 ACTION PLAN

The City will implement street sweeping to achieve the load reductions required for the permit cycle with sweeping performed using a regenerative/vacuum sweeper. A minimum of 156 lane miles will be swept annually.

- ✓ *“The means and methods, such as management practices and retrofit programs that will be utilized to meet the required reductions included in subdivision 2 a (5) of this subsection ... and a schedule to achieve those reductions. The schedule should include annual benchmarks to demonstrate the ongoing progress in meeting those reductions.”* [Section I(C)(2)(a)(6)]

### 5.1 Implementation Actions

It is anticipated that not only will reductions during the current permit cycle be achieved with street sweeping; but that a significant portion of the remaining reductions over future permit cycles will also rely on street sweeping. As such, the City seeks to begin to develop an enhanced street sweeping program. Street sweeping efforts will be enhanced with the following Action Steps, each aimed to increased reduction of sediment loads:

1. Sweep 156 lane miles annually with a regenerative/vacuum sweeper.
2. Develop improved documentation for tracking areas swept, type of sweeper used, man hours, and other information determined as relevant for characterization of collected materials. Improved tracking efforts may include GIS mapping of areas swept and GPS tracking within sweepers.
3. Develop and conduct annual training for staff performing street-sweeping.
4. Conduct sampling of collected street sweeping materials to correlate dry weight and sediment fraction to verify computational methods for determining POC reductions from collected street sweeping material. Alternative computational methods may result from a study of the sampled materials. Sampling and analysis will be based on technically defensible analytical methods.
5. Conduct an assessment to identify target areas based on areas swept that produce the largest yield of sediment collected per acre. The assessment will consider time span between sweeping and weather conditions at the time of sweeping.
6. Assessment of City’s current street sweepers to determine their sediment and nutrient removal efficiencies and cost effectiveness.

The Action Steps identified are intended to serve as a defined method that inherently serves as an adaptive iterative approach.

### 5.2 Implementation Schedule

The City will begin implementing Step 1 of the implementation strategy described in Section 5.1 during the 2015-2016 MS4 General Permit reporting year. Implementation will be documented and improved with the implementation of the remaining steps with the schedule and measurable goals

described in Table 6. The Implementation Actions described in Section 5.1 and the Implementation Schedule in Table 6 address the following special conditions:

- ✓ *“The means and methods, such as management practices and retrofit programs that will be utilized to meet the required reductions included in subdivision 2 a (5) of this subsection ... and a schedule to achieve those reductions. The schedule should include annual benchmarks to demonstrate the ongoing progress in meeting those reductions.” [Section I(C)(2)(a)(6)]*

**Table 6: Schedule for the City’s Chesapeake Bay TMDL Action Plan Street Sweeping Program.**

Step	General Description	Measurable Goal	Completion Date
1	Improve tracking and information on areas swept	Written report and supporting materials for tracking documentation; completed tracking documentation beginning after completion date	July 2016
2	Begin annual training for staff identified in the Written Program	Training materials and documentation of training implementation	July 2016
3	Conduct collected material sampling and analysis	Written report incorporating a summary of relevant sampling data and analysis for computing POC fraction(s)	Oct. 2016
4	Target area identification and sediment reduction assessment	Written reporting building on field collected data from Steps 1 and 3 to target areas for sweeping to maximize POC reduction	July 2017
5	Sweeper evaluation	Written report assessing the effectiveness and appropriateness of the City’s sweepers. The assessment will be utilized in the consideration of future sweeper purchases.	Jan. 2018
6	Implementation of targeted areas for sweeping	Implementation of the identified target areas resulting from Step 4.	Annually, begin July 2018

### 5.3 Implementation Cost

The estimate cost for sweeping 156 lane miles annually with a regenerative/vacuum sweeper is anticipated to be approximately \$25,000 annually by City. Cost estimates will be refined as implementation progresses. The cost estimate addresses the following special condition:

- ✓ *“An estimate of the expected costs to implement the requirements of this special condition during the state permit cycle.” [Section I(C)(2)(a)(11)]*

### 5.4 Supplemental Means and Methods

The Minimum Control Measure BMPs described in Section 2.1 will continue to be implemented by Hopewell as part of the City’s MS4 Program Plan. Continued implementation of these BMPs

demonstrates implementation of the Hopewell Chesapeake Bay Action Plan to the MEP and demonstrates adequate progress satisfying the following special conditions:

- ✓ *“Implementation of nutrient management plans ...”* [Section I(C)(3)(a)]
- ✓ *“Implementation of the minimum control measure ... related to construction site stormwater runoff control in accordance with this state permit shall address discharges from transitional sources.”* [Section I(C)(3)(b)]

### **5.5 Public Comment Period**

Hopewell solicited public comment on the Plan and no comments were submitted for consideration. The opportunity for public comment was provided through the following means:

- ✓ The draft Chesapeake Bay TMDL Action Plan document was made available on the Hopewell municipal website for 14 days. No comments were submitted for consideration.
- ✓ A public hearing was held for discussion opportunities regarding the draft Action Plan. No public attended the hearing.

Solicitation of public comment on the Action Plan addresses the following special condition:

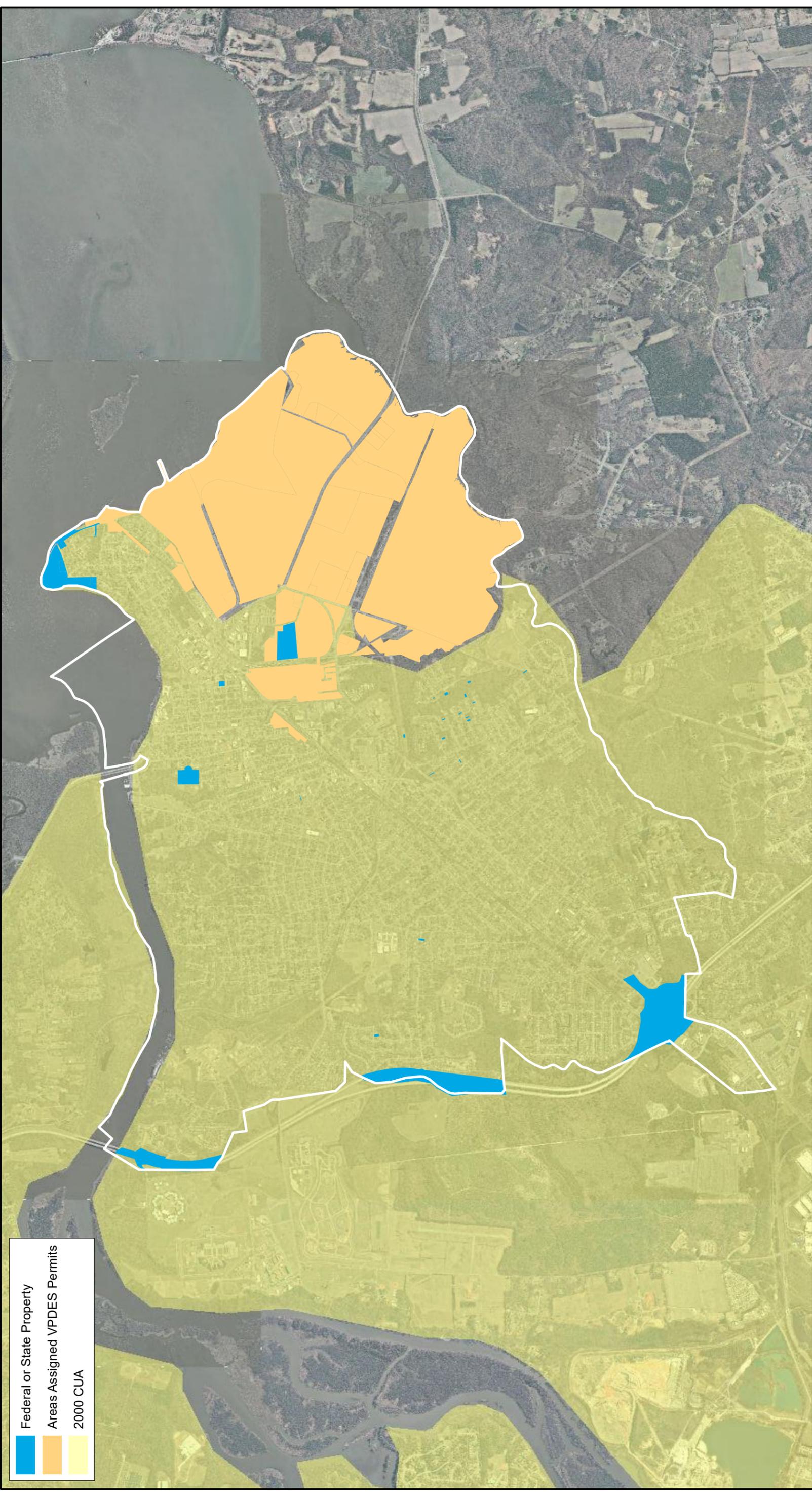
- ✓ *“An opportunity for receipt and consideration of public comment regarding the draft Chesapeake Bay TMDL Action Plan.”* [Section I(C)(2)(a)(12)]

### **5.6 Annual Reporting**

The progress of the Implementation Actions described in Section 5.1 consistent with the Implementation Schedule described in Section 5.2 will be reported annually as part of the MS4 General Permit annual reporting process. Implementation of the plan will address the following special condition:

- ✓ *“Implementation of means and methods sufficient to meet the required reductions of POC loads from existing sources in accordance with the Chesapeake Bay TMDL Action Plan.”* [Section I(C)(3)(b)]

## **Appendix A: Census Urbanized Area**



	Federal or State Property
	Areas Assigned VPDES Permits
	2000 CUA

**CITY OF HOPEWELL**  
**ESTIMATING POC LOADINGS FOR CHESAPEAKE BAY TMDL**  
 [SUMMARY OF LAND]

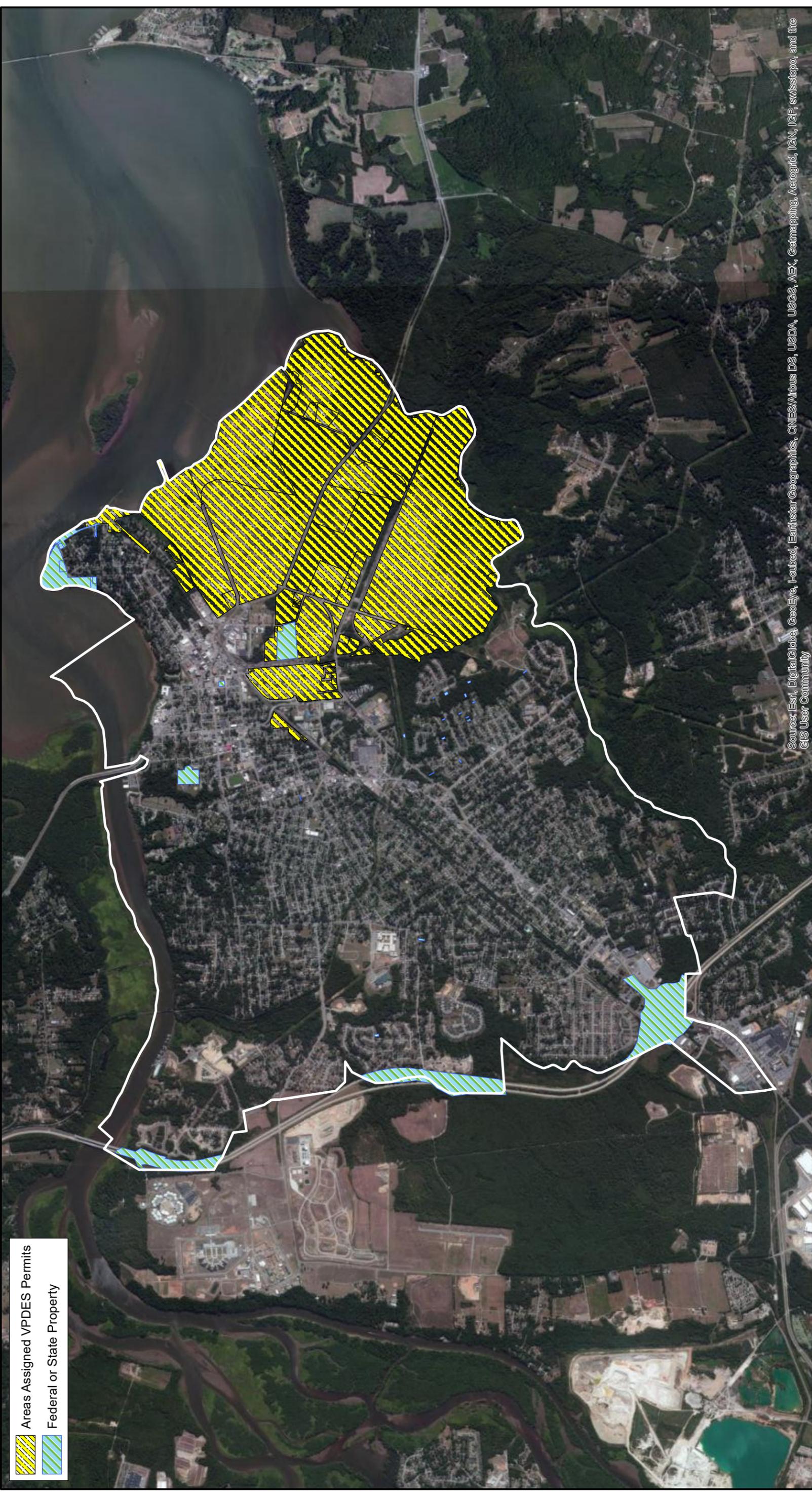


Sources: 2013 VBMP Aerial Imagery  
 Prepared by Ashley Hall, 04.28.2015



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**Appendix B: Applicable VPDES Permitted and Federal & State Properties**



 Areas Assigned VPDES Permits  
 Federal or State Property

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, IGP, swisstopo, and the GIS User Community

**CITY OF HOPEWELL**  
 ESTIMATING POC LOADINGS FOR CHESAPEAKE BAY TMDL  
 [INDUSTRIAL PERMITS]

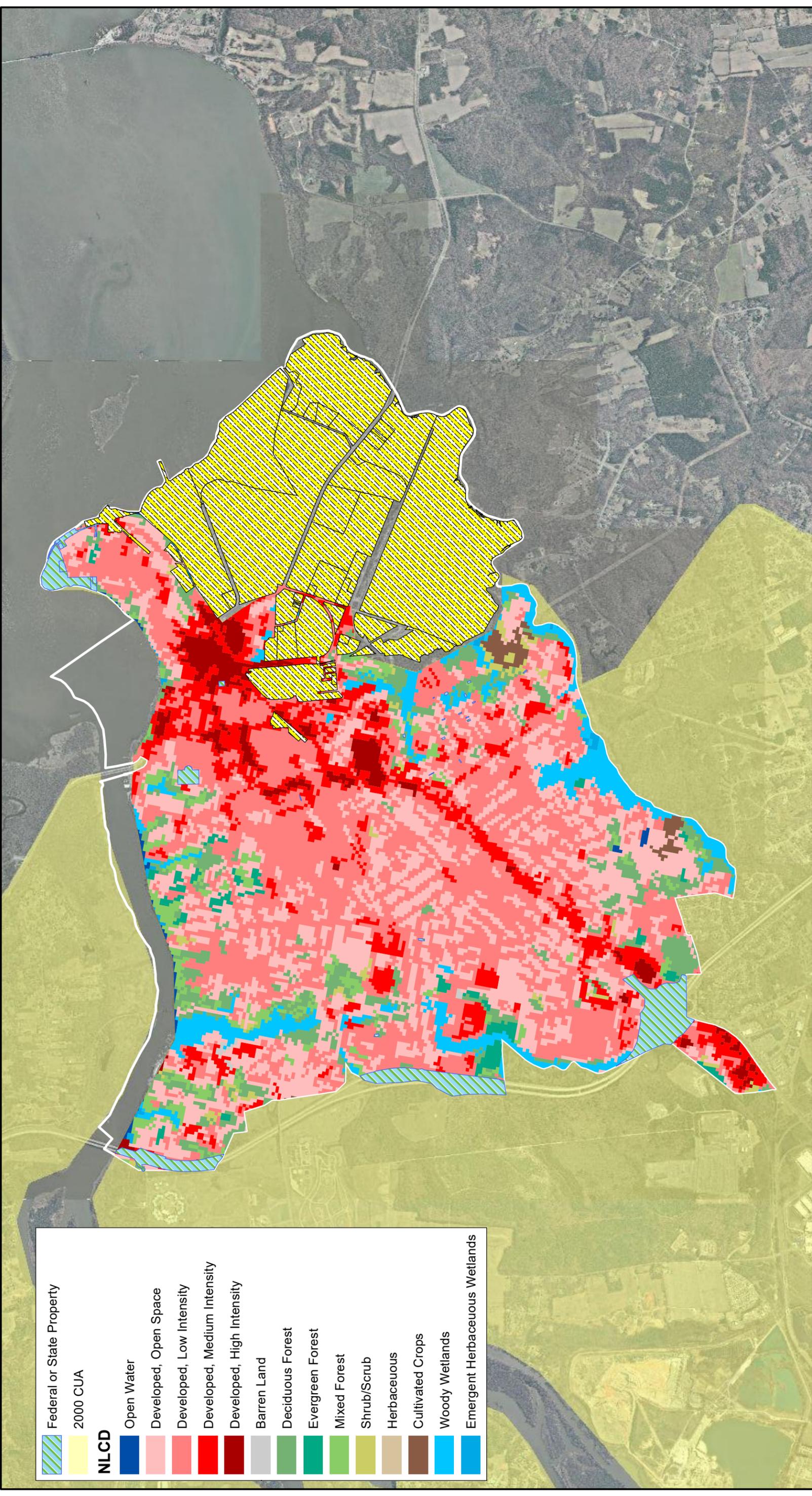


Sources: 2013 VBMP Aerial Imagery  
 Prepared by Ashley Hall, 04.28.2015



 **EEE Consulting, Inc.**  
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**Appendix C: Land Cover Map (2011 NLCD)**



	Federal or State Property
	2000 CUA
<b>NLCD</b>	
	Open Water
	Developed, Open Space
	Developed, Low Intensity
	Developed, Medium Intensity
	Developed, High Intensity
	Barren Land
	Deciduous Forest
	Evergreen Forest
	Mixed Forest
	Shrub/Scrub
	Herbaceous
	Cultivated Crops
	Woody Wetlands
	Emergent Herbaceous Wetlands

**CITY OF HOPEWELL**  
**ESTIMATING POC LOADINGS FOR CHESAPEAKE BAY TMDL**  
 [LAND COVER- NLCD 2011]



Sources: 2013 VBMP Aerial Imagery  
 Prepared by Ashley Hall, 04.28.2015



**3e** **EEE Consulting, Inc.**  
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# Reserved For



## Phase II CITY OF HOPEWELL CHESAPEAKE BAY TMDL ACTION PLAN (2018 - 2023 MS4 General Permit)

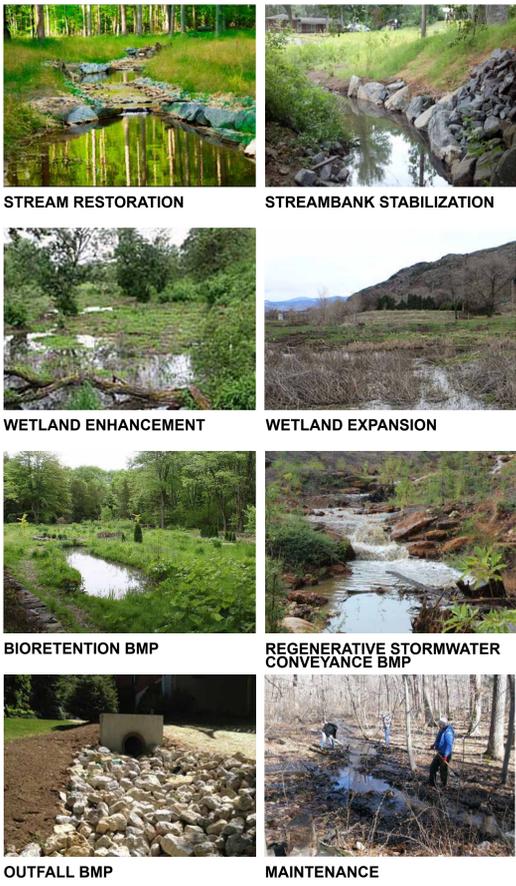
### A Preliminary Plan for Achieving an Additional Reduction of Existing Loads

The City seeks to incorporate a placeholder within the Phase I Action Plan to include computations for the “Marina Connectivity Greenway/BMP Project,” intended to serve as a means to achieve pollutant reductions in future permit cycles. The project is currently in progress; but likely will not be completed in the current permit cycle. POC reductions for the project are provided on the following pages and will provide a significant portion over reductions required in subsequent permit cycles. Estimated reductions for future cycles are provided in the Table below.

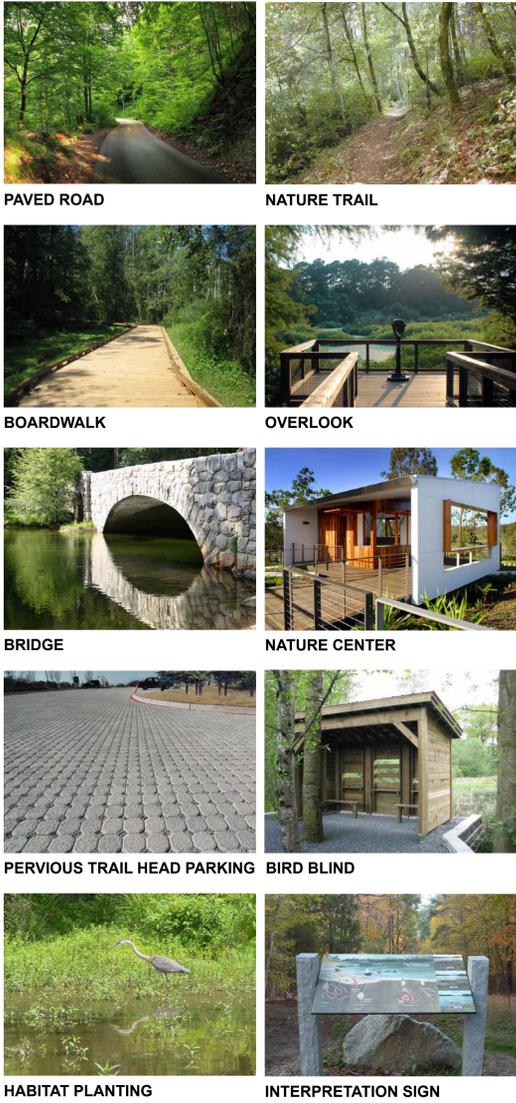
**Table. City of Hopewell current and anticipated future Chesapeake Bay TMDL POC reductions.**

Pollutant	1st Cycle (2013 – 2018)	2nd Cycle (2018 – 2023)	3rd Cycle (2023 – 2028)	Total
	5%	35%	60%	100%
Nitrogen	109.08	763.57	1,308.98	2,181.63
Phosphorus	22.61	158.28	271.34	452.24
TSS	9,732.30	68,126.14	116,787.67	194,646.12

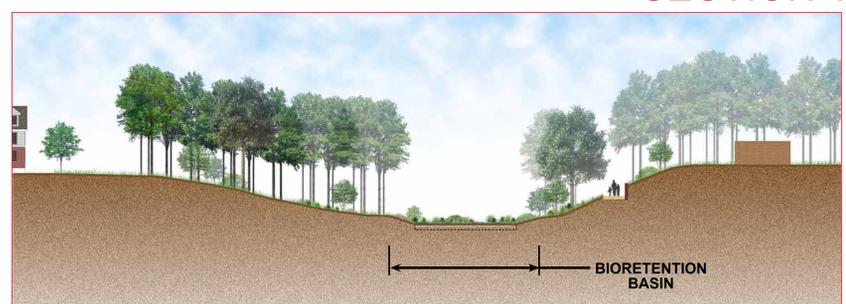
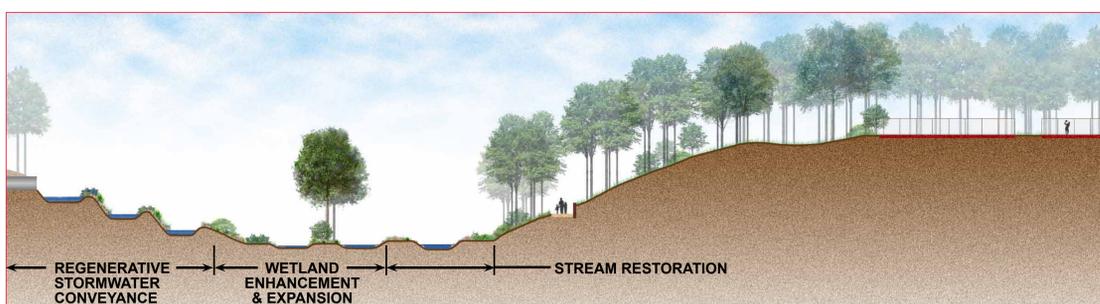
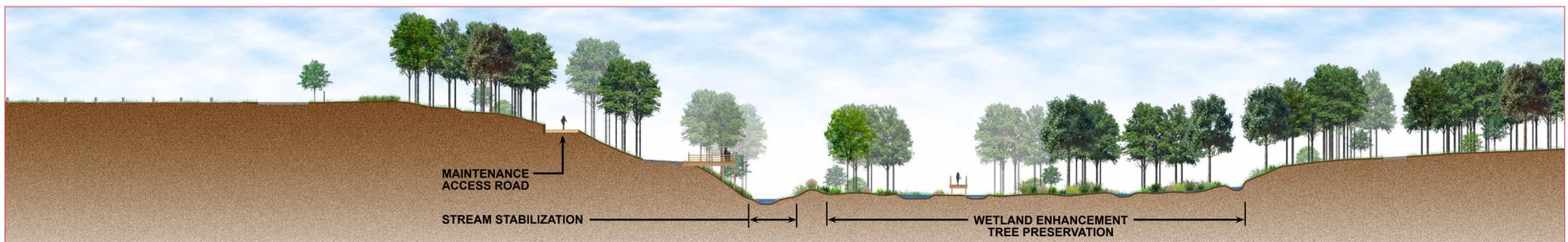
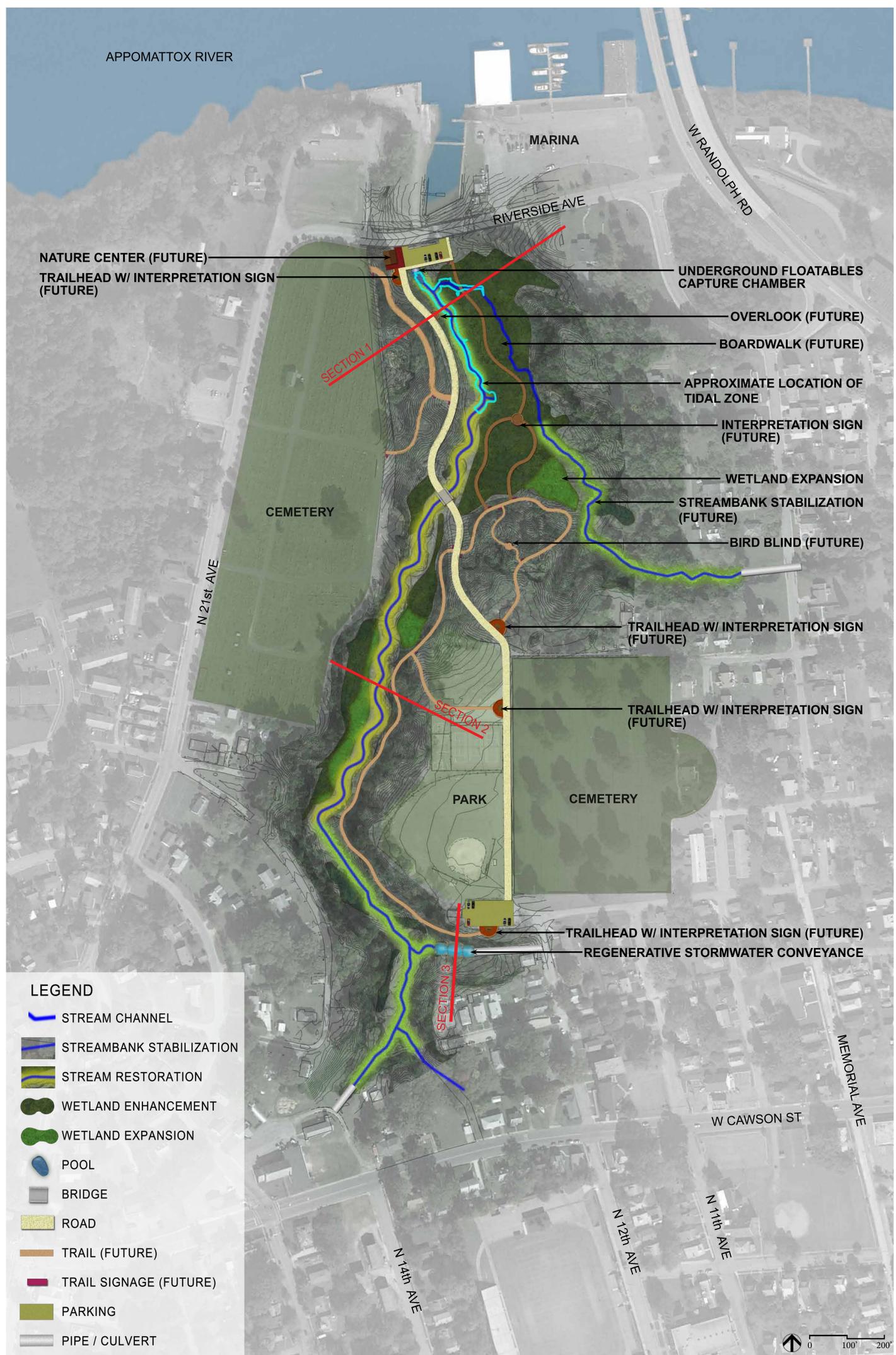
# BMP IMAGES



# RECREATION IMAGES



## IMAGES



# HOPEWELL

# MARINA CONNECTIVITY GREENWAY / BMP PROJECT



Hopewell Marina BMP  
Phosphorus Loading and Proposed Load Reductions for Preferred Alternative

Description	Impervious/Pervious	Acreage	Loading Rate (lbs/acre)	Load (lbs)	Primary BMP	Reduction Efficiency (%)	Load Reduced (lbs)	Source of Reduction Efficiency Data
Tidal Channel	Regulated Urban Impervious	5.7	1.76	10.0	Urban Stream Restoration	Not eligible <sup>1</sup>		
	Regulated Urban Pervious	9.6	0.5	4.8				
9th Street Tributary	Regulated Urban Impervious	34.7	1.76	61.0	Enhanced/Expanded Wetlands	25 <sup>2</sup>	15.3	Chesapeake Bay Program, Established Efficiencies (Table V.C.2)
	Regulated Urban Pervious	28.1	0.5	14.0			3.5	
Transitional Channel	Regulated Urban Impervious	3.4	1.76	5.9	Urban Stream Restoration		30.0	Urban Stream Restoration (Table V.H.1)
	Regulated Urban Pervious	20.4	0.5	10.2			51.6	
Cemetery Outfall	Regulated Urban Impervious	7.6	1.76	13.4	No proposed BMP			
	Regulated Urban Pervious	10.8	0.5	5.4				
Upland Channel	Regulated Urban Impervious	6.7	1.76	11.7	Urban Stream Stabilization		19.2	Urban Stream Restoration (Table V.H.1)
	Regulated Urban Pervious	9.8	0.5	4.9			8.0	
Division Street Outfall	Regulated Urban Impervious	24.7	1.76	43.5	RSC	27 <sup>5</sup>	11.7	Chesapeake Bay Program, Retrofit Curves (Figure 1)
	Regulated Urban Pervious	20.4	0.5	10.2			2.8	
West Broadway Tributary	Regulated Urban Impervious	62.7	1.76	110.4	No proposed BMP			
	Regulated Urban Pervious	51.2	0.5	25.6				
Total	Regulated Urban Impervious	145.5		256.1			76.1	
	Regulated Urban Pervious	150.4		75.2			65.9	
		295.9		331.3			142.1	

- Credit cannot be received for streams that are tidally influenced.
- The full reduction efficiency is reduced by 50% until the benefit of the wetland improvements can be verified.
- A length of 1,200 feet is proposed to be restored.
- The full mass reduction is reduced by 50% for planning level estimates because only stream bank stabilization is proposed on this reach. A length of 800 feet is proposed to be stabilized.
- Runoff depth treated value of 0.1 inches is calculated from a surface area of 9,000 square feet and a depth of 1 foot.

Hopewell Marina BMP with Future Stream Stabilization Improvements  
Phosphorus Loading and Proposed Load Reductions for Preferred Alternative

Description	Impervious/Pervious	Acres	Loading Rate (lbs/acre)	Load (lbs)	Primary BMP	Reduction Efficiency (%)	Load Reduced (lbs)	Source of Reduction Efficiency Data
Tidal Channel	Regulated Urban Impervious	5.7	1.76	10.0	Urban Stream Restoration	Not eligible <sup>1</sup>		
	Regulated Urban Pervious	9.6	0.5	4.8				
9th Street Tributary	Regulated Urban Impervious	34.7	1.76	61.0	Enhanced/Expanded Wetlands	25 <sup>2</sup>	15.3	Chesapeake Bay Program, Established Efficiencies (Table V.C.2)
	Regulated Urban Pervious	28.1	0.5	14.0			3.5	
	Regulated Urban Impervious	34.7	1.76	61.0			149.3 <sup>4</sup>	
	Regulated Urban Pervious	28.1	0.5	14.0			34.4	
Transitional Channel	Regulated Urban Impervious	3.4	1.76	5.9	Urban Stream Restoration		30.0 <sup>3</sup>	Urban Stream Restoration (Table V.H.1)
	Regulated Urban Pervious	20.4	0.5	10.2			51.6	
Cemetery Outfall	Regulated Urban Impervious	7.6	1.76	13.4	No proposed BMP			
	Regulated Urban Pervious	10.8	0.5	5.4				
Upland Channel	Regulated Urban Impervious	6.7	1.76	11.7	Urban Stream Restoration		19.2	Urban Stream Restoration (Table V.H.1)
	Regulated Urban Pervious	9.8	0.5	4.9			8.0 <sup>4</sup>	
Division Street Outfall	Regulated Urban Impervious	24.7	1.76	43.5	RSC	27 <sup>5</sup>	11.7	Chesapeake Bay Program, Retrofit Curves (Figure 1)
	Regulated Urban Pervious	20.4	0.5	10.2			2.8	
West Broadway Tributary	Regulated Urban Impervious	62.7	1.76	110.4	No proposed BMP			
	Regulated Urban Pervious	51.2	0.5	25.6				
Total	Regulated Urban Impervious	145.5		256.1			225.5	
	Regulated Urban Pervious	150.4		75.2			100.3	
	Total	295.9		331.3			325.8	

- Credit cannot be received for streams that are tidally influenced.
- The full reduction efficiency is reduced by 50% until the benefit of the wetland improvements can be verified.
- A length of 1,200 feet is proposed to be restored.
- The full mass reduction is reduced by 50% for planning level estimates because only stream bank stabilization is proposed on this reach. A length of 1200 feet and 800 feet is proposed to be stabilized.
- Runoff depth treated value of 0.1 inches is calculated from a surface area of 9,000 square feet and a depth of 1 foot.

Hopewell Marina BMP  
Nitrogen Loading and Proposed Load Reductions for Preferred Alternative

Description	Impervious/Pervious	Acres	Loading Rate (lbs/acre)	Load (lbs)	Primary BMP	Reduction Efficiency (%)	Load Reduced (lbs)	Source of Reduction Efficiency Data
Tidal Channel	Regulated Urban Impervious	5.7	9.39	53.5	Urban Stream Restoration	Not eligible <sup>1</sup>		
	Regulated Urban Pervious	9.6	6.99	67.1				
9th Street Tributary	Regulated Urban Impervious	34.7	9.39	325.6	Enhanced/Expanded Wetlands	12.5 <sup>2</sup>	40.7	Chesapeake Bay Program, Established Efficiencies (Table V.C.2)
	Regulated Urban Pervious	28.1	6.99	196.3			24.5	
Transitional Channel	Regulated Urban Impervious	3.4	9.39	31.6	Urban Stream Restoration		16.3	Urban Stream Restoration (Table V.H.1)
	Regulated Urban Pervious	20.4	6.99	142.6			73.7	
Cemetery Outfall	Regulated Urban Impervious	7.6	9.39	71.7	No proposed BMP			
	Regulated Urban Pervious	10.8	6.99	75.4				
Upland Channel	Regulated Urban Impervious	6.7	9.39	62.7	Urban Stream Stabilization		14.3	Urban Stream Restoration (Table V.H.1)
	Regulated Urban Pervious	9.8	6.99	68.8			15.7	
Division Street Outfall	Regulated Urban Impervious	24.7	9.39	232.1	RSC	24 <sup>5</sup>	55.7	Chesapeake Bay Program, Retrofit Curves (Figure 2)
	Regulated Urban Pervious	20.4	6.99	142.8			34.3	
West Broadway Tributary	Regulated Urban Impervious	62.7	9.39	589.1	No proposed BMP			
	Regulated Urban Pervious	51.2	6.99	358.1				
Total	Regulated Urban Impervious	145.5		1,366.2			127.0	
	Regulated Urban Pervious	150.4		1,051.3			148.2	
	Total	295.9		2,417.5			275.2	

- 1 Credit cannot be received for streams that are tidally influenced.
- 2 The full reduction efficiency is reduced by 50% until the benefit of the wetland improvements can be verified.
- 3 A length of 1,200 feet is proposed to be restored.
- 4 The full mass reduction is reduced by 50% for planning level estimates because only streambank stabilization is proposed on this reach. A length of 800 feet is proposed to be stabilized.
- 5 Runoff depth treated value of 0.1 inches is calculated from a surface area of 9,000 square feet and a depth of 1 foot.

Hopewell Marina BMP with Future Stream Stabilization Improvements  
Nitrogen Loading and Proposed Load Reductions for Preferred Alternative

Description	Impervious/Pervious	Acreage	Loading Rate (lbs/acre)	Load (lbs)	Primary BMP	Reduction Efficiency (%)	Load Reduced (lbs)	Source of Reduction Efficiency Data
Tidal Channel	Regulated Urban Impervious	5.7	9.39	53.5	Urban Stream Restoration	Not eligible <sup>1</sup>		
	Regulated Urban Pervious	9.6	6.99	67.1				
9th Street Tributary	Regulated Urban Impervious	34.7	9.39	325.6	Enhanced/Expanded Wetlands	12.5 <sup>2</sup>	40.7	Chesapeake Bay Program, Established Efficiencies (Table V.C.2)
	Regulated Urban Pervious	28.1	6.99	196.3			24.5	Urban Stream Restoration
	Regulated Urban Impervious	34.7	9.39	325.6	Urban Stream Stabilization		111.4	Urban Stream Restoration (Table V.H.1)
	Regulated Urban Pervious	28.1	6.99	196.3			67.2	Urban Stream Restoration (Table V.H.1)
Transitional Channel	Regulated Urban Impervious	3.4	9.39	31.6	Urban Stream Restoration		16.3	Urban Stream Restoration (Table V.H.1)
	Regulated Urban Pervious	20.4	6.99	142.6			73.7	Urban Stream Restoration (Table V.H.1)
Cemetery Outfall	Regulated Urban Impervious	7.6	9.39	71.7	No proposed BMP			
	Regulated Urban Pervious	10.8	6.99	75.4				
Upland Channel	Regulated Urban Impervious	6.7	9.39	62.7	Urban Stream Stabilization		14.3	Urban Stream Restoration (Table V.H.1)
	Regulated Urban Pervious	9.8	6.99	68.8			15.7	Urban Stream Restoration (Table V.H.1)
Division Street Outfall	Regulated Urban Impervious	24.7	9.39	232.1	RSC	24 <sup>5</sup>	55.7	Chesapeake Bay Program, Retrofit Curves (Figure 2)
	Regulated Urban Pervious	20.4	6.99	142.8			34.3	
West Broadway Tributary	Regulated Urban Impervious	62.7	9.39	589.1	No proposed BMP			
	Regulated Urban Pervious	51.2	6.99	358.1				
Total	Regulated Urban Impervious	145.5		1,366.2			238.4	
	Regulated Urban Pervious	150.4		1,051.3			215.4	
	Total	295.9		2,417.5			453.8	

- Credit cannot be received for streams that are tidally influenced.
- The full reduction efficiency is reduced by 50% until the benefit of the wetland improvements can be verified.
- A length of 1,200 feet is proposed to be restored for streams.
- The full mass reduction is reduced by 50% for planning level estimates because only streambank stabilization is proposed on this reach. A length of 1,200 feet and 800 feet is proposed to be stabilized.
- Runoff depth treated value of 0.1 inches is calculated from a surface area of 9,000 square feet and a depth of 1 foot.

Hopewell Marina BMP

Total Suspended Solids Loading and Proposed Load Reductions for Preferred Alternative

Description	Impervious/Pervious	Acres	Loading Rate (lbs/acre)	Load (lbs)	Primary BMP	Reduction Efficiency (%)	Load Reduced (lbs)	Source of Reduction Efficiency Data
Tidal Channel	Regulated Urban Impervious	5.7	676.94	3,856.4	Urban Stream Restoration	Not eligible <sup>1</sup>		
	Regulated Urban Pervious	9.6	101.08	971.0				
9th Street Tributary	Regulated Urban Impervious	34.7	676.94	23,470.0	Enhanced/Expanded Wetlands	7.5 <sup>2</sup>	1,760.2	Chesapeake Bay Program, Established Efficiencies (Table V.C.2)
	Regulated Urban Pervious	28.1	101.08	2,838.3			212.9	
Transitional Channel	Regulated Urban Impervious	3.4	676.94	2,277.7	Urban Stream Restoration		9,528.2	Urban Stream Restoration (Table V.H.1)
	Regulated Urban Pervious	20.4	101.08	2,062.5			8,627.8	
Cemetery Outfall	Regulated Urban Impervious	7.6	676.94	5,171.1	No proposed BMP		0.0	
	Regulated Urban Pervious	10.8	101.08	1,090.7			0.0	
Upland Channel	Regulated Urban Impervious	6.7	676.94	4,518.4	Urban Stream Restoration		4,959.5	Urban Stream Restoration (Table V.H.1)
	Regulated Urban Pervious	9.8	101.08	995.3			1,092.5	
Division Street Outfall	Regulated Urban Impervious	24.7	676.94	16,729.7	RSC	29 <sup>5</sup>	4,851.6	Chesapeake Bay Program, Retrofit Curves (Figure 3)
	Regulated Urban Pervious	20.4	101.08	2,065.5			599.0	
West Broadway Tributary	Regulated Urban Impervious	62.7	676.94	42,471.6	No proposed BMP			
	Regulated Urban Pervious	51.2	101.08	5,178.7				
Total	Regulated Urban Impervious	145.5		98,494.8			21,099.5	
	Regulated Urban Pervious	150.4		15,202.0			10,532.2	
		295.9		113,696.8			31,631.7	

- Credit cannot be received for streams that are tidally influenced.
- The full reduction efficiency is reduced by 50% until the benefit of the wetland improvements can be verified.
- A length of 1,200 feet is proposed to be restored.
- The full mass reduction is reduced by 50% for planning level estimates because only streambank stabilization is proposed on this reach. A length of 800 feet is proposed to be stabilized.
- Runoff depth treated value of 0.1 inches is calculated from a surface area of 9,000 square feet and a depth of 1 foot.

Hopewell Marina BMP with Future Stream Stabilization Improvements  
Total Suspended Solids Loading and Proposed Load Reductions for Preferred Alternative

Description	Impervious/Pervious	Acreage	Loading Rate (lbs/acre)	Load (lbs)	Primary BMP	Reduction Efficiency (%)	Load Reduced (lbs)	Source of Reduction Efficiency Data
Tidal Channel	Regulated Urban Impervious	5.7	676.94	3,856.4	Urban Stream Restoration	Not eligible <sup>1</sup>		
	Regulated Urban Pervious	9.6	101.08	971.0				
9th Street Tributary	Regulated Urban Impervious	34.7	676.94	23,470.0	Enhanced/Expanded Wetlands	7.5 <sup>2</sup>	1,760.2	Chesapeake Bay Program, Established Efficiencies (Table V.C.2)
	Regulated Urban Pervious	28.1	101.08	2,838.3			212.9	
	Regulated Urban Impervious	34.7	676.94	23,470.0			38,641.8	
	Regulated Urban Pervious	28.1	101.08	2,838.3			4,673.1 <sup>4</sup>	
Transitional Channel	Regulated Urban Impervious	3.4	676.94	2,277.7	Urban Stream Restoration		9,528.2	Urban Stream Restoration (Table V.H.1)
	Regulated Urban Pervious	20.4	101.08	2,062.5			8,627.8	
Cemetery Outfall	Regulated Urban Impervious	7.6	676.94	5,171.1	No proposed BMP		0.0	
	Regulated Urban Pervious	10.8	101.08	1,090.7			0.0	
Upland Channel	Regulated Urban Impervious	6.7	676.94	4,518.4	Urban Stream Restoration		4,959.5	Urban Stream Restoration (Table V.H.1)
	Regulated Urban Pervious	9.8	101.08	995.3			1,092.5 <sup>4</sup>	
Division Street Outfall	Regulated Urban Impervious	24.7	676.94	16,729.7	RSC		4,851.6	Chesapeake Bay Program, Retrofit Curves (Figure 3)
	Regulated Urban Pervious	20.4	101.08	2,065.5			599.0	
West Broadway Tributary	Regulated Urban Impervious	62.7	676.94	42,471.6	No proposed BMP			
	Regulated Urban Pervious	51.2	101.08	5,178.7				
Total	Regulated Urban Impervious	145.5		98,494.8			59,741.3	
	Regulated Urban Pervious	150.4		15,202.0			15,205.3	
	Total	295.9		113,696.8			74,946.6	

1 Credit cannot be received for streams that are tidally influenced.

2 The full reduction efficiency is reduced by 50% until the benefit of the wetland improvements can be verified.

3 A length of 1,200 feet is proposed to be restored.

4 The full mass reduction is reduced by 50% for planning level estimates because only streambank stabilization is proposed on this reach. A length of 1200 feet and 800 feet is proposed to be stabilized.

5 Runoff depth treated value of 0.1 inches is calculated from a surface area of 9,000 square feet and a depth of 1 foot.