

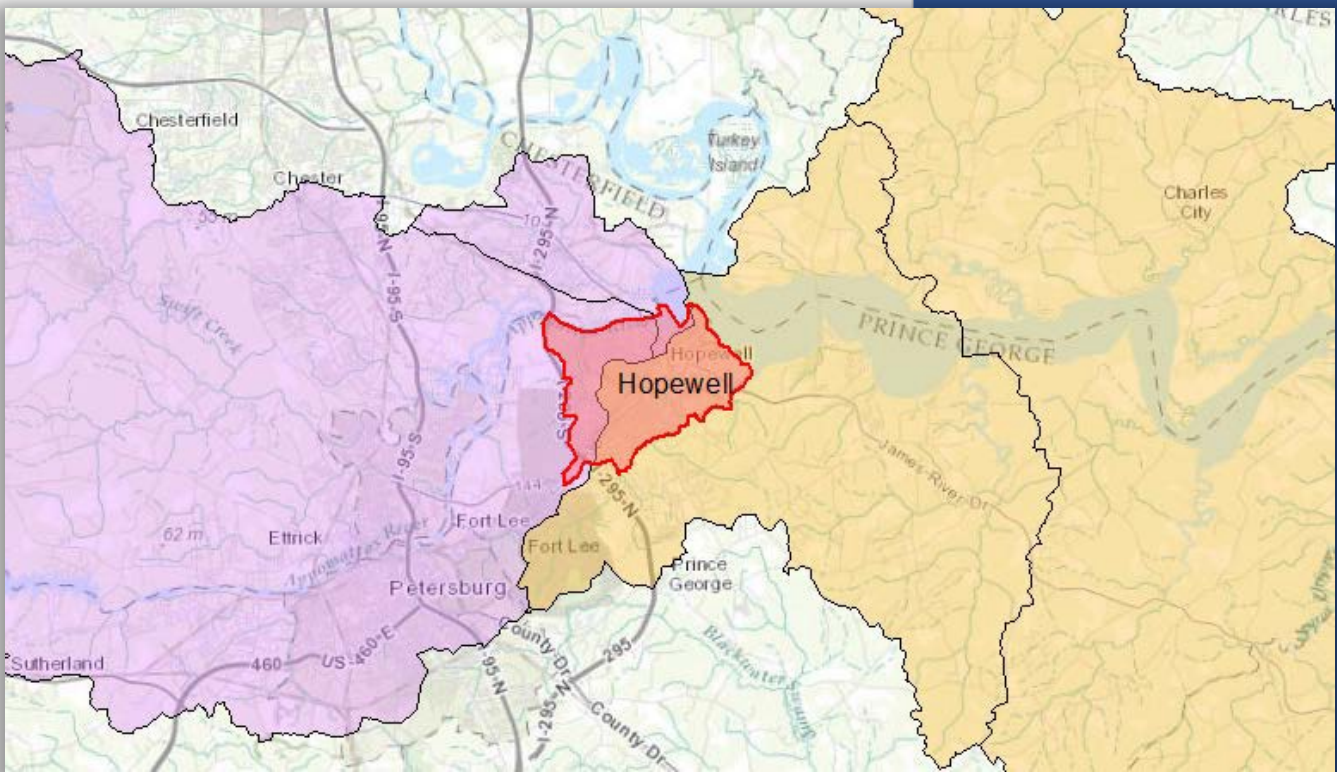


BACTERIA TMDL ACTION PLAN

April 2020

**A Plan to Address the City's Assigned Waste
Load Allocation for the James River and
Appomattox Watersheds' TMDLs**

City of Hopewell
Virginia



This document addresses Part II B of the General Virginia Pollution Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4) (Permit No. VAR040015). This document serves as a City-specific Total Maximum Daily Load (TMDL) Action Plan to identify the best management practices and other interim milestone activities to be implemented to address the bacteria waste load allocation (WLA) assigned to the City's applicable regulated MS4 area in the "Bacteria Total Maximum Daily Load Development for the James River – Hopewell to Westover" approved by the State Water Control Board (SWCB) on April 29, 2009, and "Total Maximum Daily Load Development for the Appomattox River Basin" approved by the SWCB on December 20, 2005.

EXECUTIVE SUMMARY

The City of Hopewell is obligated under the Clean Water Act to address water pollution in our streams, creeks, rivers, and the Chesapeake Bay. The extent to which we are obligated to address the pollution is outlined in a series of studies referred to as a *Total Maximum Daily Load*, or **TMDL**. The TMDL is the equivalent of a maximum pollution diet that will maintain the water quality necessary to support aquatic living resources and to protect human health. The practical goal is to ensure that our rivers and streams are safe for fishing, swimming, water supply, and other recreational activities.

The Chesapeake Bay TMDL requires medium and large municipalities in the entire Chesapeake Bay watershed to meet strict limits on discharges from wastewater treatment plants, agricultural land, and urban runoff through the implementation of an **Action Plan**. These Action Plans identify *Best Management Practices*, or **BMPs**, that when implemented to the *Maximum Extent Practicable*, or **MEP**. While these limits were developed with the focus on the Chesapeake Bay, the result of our efforts will also result in cleaner local streams, creeks (Cabin Creek, Cattail Creek, etc.) and Rivers (The Appomattox & James Rivers).

In addition to the Chesapeake Bay TMDL, similar ‘pollution diets’ are developed for specific creeks and rivers. The Virginia Department of Environmental Quality (DEQ) listed segments of the Appomattox River (1996) and the tidal James River (2002) on their biennial 303(d) Total Maximum Daily Load (TMDL) Priority List and Report due to violations of the state’s water quality standard for fecal coliform bacteria, now expressed as *E. coli*. As a consequence, the following TMDLs were developed and approved by the State Water Control Board (SWCB):

- “Bacteria Total Maximum Daily Load Development for the James River – Hopewell to Westover,” (James River TMDL) approved on April 29, 2009, and
- “Total Maximum Daily Load Development for the Appomattox River Basin,” (Appomattox River TMDL) approved on December 20, 2005.

The TMDLs assign to the City *Waste Load Allocations*, or **WLAs**, for bacteria (*Escherichia coli*, or *E.coli*) that meet water quality standards. The expectation of the TMDL is an iterative and adaptive implementation of programmatic BMPs developed to address bacteria.

This Action Plan identifies the likely sources of bacteria, and outlines the implementation of BMPs to reduce bacteria pollution in stormwater runoff that enters the City’s stormwater drainage system, also referred to as a Municipal Separate Storm Sewer System, or **MS4**, and discharges to streams and rivers. The City’s MS4 consists of the entire man-made drainage system, including curb & gutter systems, roadside ditches, storm drain inlets, pipes, and culverts.

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Acronyms

BMP	Best Management Practice
DEQ	Department of Environmental Quality
EPA	Environmental Protection Agency
City	City of Hopewell
MCM	Minimum Control Measure
MS4	Municipal Separate Stormwater Sewer System
MSDS	Material Safety Data Sheets
NPDES	National Pollutant Discharge Elimination System
PEOP	Public Education and Outreach
VSMP	Virginia Stormwater Management Program

1.0 Introduction and Purpose

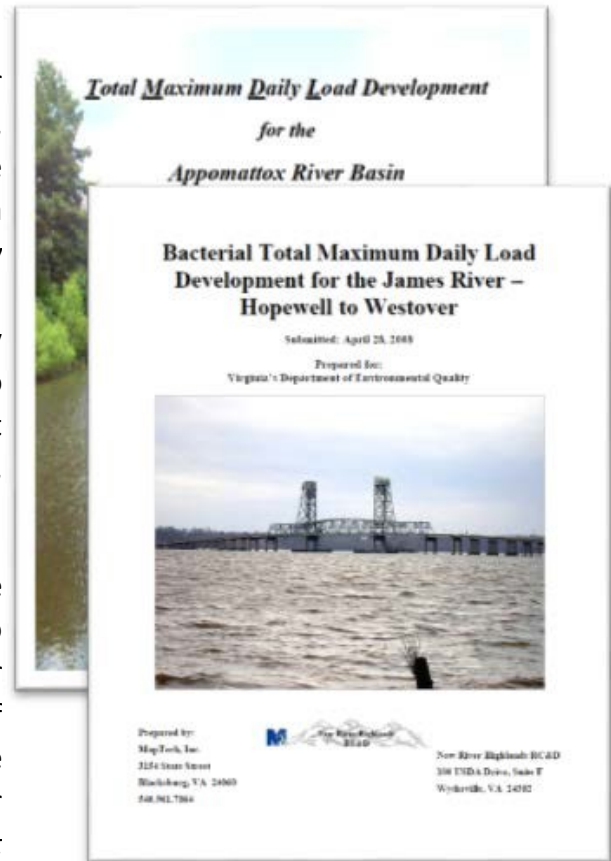
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This Action Plan outlines the implementation of programmatic BMPs developed to address bacteria pollution in stormwater runoff that comes from the City’s stormwater drainage system, also referred to as a Municipal Separate Storm Sewer System, or **MS4**. The City’s MS4 consists of the entire drainage system, including curb & gutter systems, roadside ditches, storm drain inlets, pipes, and culverts.



The TMDLs assigned the City a waste load allocation (WLA) for bacteria discharges to both watersheds for the pollutant *Escherichia coli*, commonly abbreviated as *E. coli*. The WLAs represent the allowable bacteria load from the City's MS4 to prevent instances of exceedance of bacteria discharge water quality standards. The City was assigned the following WLAs with the James River TMDL:

- 9.51E+10 colony forming units per year (cfu/yr) to Bailey Creek
- 8.18E+12 colony forming units per year (cfu/yr) to Bailey Bay, Bailey Creek (tidal), Cattail Creek (tidal) Creek
- 1.41E+13 colony forming units per year (cfu/yr) to James River (Tidal)

And the following WLA from the Appomattox River TMDL:

- 1.44E+12 cfu/yr in the Appomattox River TMDL.

For both TMDLs, the expectation from the Commonwealth for Hopewell to achieve these WLAs is through iterative implementation of programmatic BMPs. Hopewell's programmatic BMPs applicable to the pollutant of concern are described in the following section. Only failing to implement the programmatic BMPs described herein would be considered a violation of the MS4 General Permit.

1.1 Total Maximum Daily Loads

A TMDL is the total maximum daily load, or the amount of pollutant a water body can assimilate and still meet water quality standards for its designated use. Typically, TMDLs are represented numerically in three main components:

- Wasteload Allocations (WLA) for point source contributions and MS4 Permit operators
- Load Allocations (LA) for non-point source contributions and natural background sources
- Margin of Safety (MOS)

Point source pollution is any single identifiable source from which pollutants are discharged. If point source discharges, including a permitted MS4, are present in the TMDL watershed, then any allocations assigned to that permittee must be in the form of a WLA. The City's MS4 outfalls are defined as point source discharges and therefore fall under this category in the TMDL. Pollution that is not from an identifiable source, such as a pipe or a ditch, but rather originates from multiple sources over a relatively large area, are considered to be non-point source pollution. These sources are typically categorized into agricultural, livestock, and wildlife, with Load Allocations (LAs) assigned for each. The Margin of Safety (MOS) is a required component that accounts for the modeling uncertainty in the response of the waterbody to loading reductions and is implicitly incorporated into a TMDL computation. The TMDL is expressed by the following equation:

$$\text{TMDL} = \sum \text{WLA} + \sum \text{LA} + \text{MOS}$$

The TMDL represents the sum of calculable sources plus a margin of safety that is required to not exceed the state water quality standard for recreation of a 30-day geometric mean of 126 cfu/100 ml and an instantaneous water quality standard of 235 cfu/100 ml. The cfu/ml unit represents a volumetric concentration of viable bacteria cells that can multiply under controlled conditions.

1.2 MS4 General Permit TMDL Special Conditions

The City operates its regulated MS4 within a portion of the James River and Appomattox River bacteria TMDL watersheds and is therefore subject to the TMDL WLAs assigned in the TMDL. The TMDL special conditions listed in the MS4 General Permit require the City to develop a TMDL Action Plan that may be implemented in multiple phases over more than one permit cycle using the adaptive iterative approach provided adequate progress is achieved in the implementation of BMPs designed to reduce pollutant discharges in a manner that is consistent with the assumptions and requirements of the TMDL.

The MS4 General Permit requires that this Action Plan include the following elements:

- The name and approval date of the applicable TMDL;
- The wasteload allocated to City of Hopewell, and the corresponding percent reduction;
- The identification of the potential significant sources of *E.coli* discharging to the MS4. For the purposes of this action plan, a potential *significant* source of *E.coli* means the source of a discharge where the potential pollutant loading is greater than the average pollutant loading for the land use.
- A list of best management practices and controls, beyond those required within the six minimum control measures of the MS4 General Permit, that are applicable to reductions in *E.coli* discharge from the MS4;
- Enhancement of the Hopewell Public Education and Outreach Plan (PEOP) and employee training program to promote methods to eliminate and reduce discharges of *E.coli* into the MS4; and
- A schedule of the anticipated actions planned for implementation during this permit term (2023)

1.3 Hopewell's Bacteria TMDL Action Plan

The purpose of Hopewell's Action Plan for the James River and Appomattox River bacteria TMDLs is to address each of the MS4 General Permit special conditions noted in Section 1.2 above. As an adaptive and iterative approach to meet surface water quality goals, the Action Plan may be revised from time to time to reduce *E.coli* discharges from the City's MS4 to the maximum extent practicable (MEP). The Action Plan is incorporated, by reference, into Hopewell's MS4 Program Plan, which outlines the BMPs that address the entirety of the conditions set forth in the MS4 General Permit.

2.0 Hopewell’s Applicable Bacteria TMDLs

The James River and Appomattox River TMDLs assign a WLA for the pollutant *Escherichia coli*, commonly abbreviated as *E. coli*. This particular bacteria is typically found in the lower intestines of warm-blooded organisms. Certain strains of the bacteria can be harmful and can survive for a limited amount of time outside of a host. Fecal contamination from these organisms, if ingested by another host, can cause serious poisoning. A WLA was calculated for existing point sources, including MS4 permit operators, along with LAs and the MOS to meet the water quality standard and reduce the risk of waterborne illness. The TMDLs were established based on scenarios where no violations of either the *E. coli* geometric mean standard or the instantaneous *E. coli* standard would occur. The selected scenarios include reductions from various land uses such as agriculture, commercial and residential uses, straight pipes, livestock and sanitary sewer overflows. Percent reductions for each source vary based on contributing tributaries to each river. The general approach for the determination of the WLA for each TMDL is described in the further detail in the following sub-sections.

2.1 James River TMDL

According to the TMDL, Hopewell is the only permitted MS4 in the James River – Hopewell to Westover study area that contributes bacteria to surface waters. For the purposes of the TMDL development, it was assumed that all impervious land within the boundaries of Hopewell and the study area drain to an MS4 outfall. All *E. coli* from these areas was allocated to the MS4 with the area for each study watershed shown in Table 1.

Table 1. Impervious land areas used to calculate the MS4 WLAs for the James River TMDL.

Impairment	Total Drainage Area (acres)	Hopewell City Impervious Area (acres)
Bailey Creek	9,044	87
Bailey Bay, Bailey Creek (Tidal), Cattail Creek (Tidal)	13,264	6297
James River (Tidal)	52,633	9547
Powell Creek	10,279	0

Implementation of the TMDL is presented as 2 stages, with the first stage focused on a 100% reduction in straight pipes, defined as sanitary sewer pipes directly discharging to surface waters, sewer leaks and overflows. The final stage, or TMDL scenario, also calls for reductions in the following sources: direct livestock, agriculture and residential (pets and septic system). Reductions are summarized in Table 2. It is noted that no reductions were proposed for wildlife sources. Reductions applicable to Hopewell are those from the following sources: straight pipes (including sanitary sewer leaks and overflows) and human and pet land based sources (septic system failures and pet waste)

Table 2. Percent reduction to existing bacteria loads for the James River TMDL.

Impairment		Livestock Direct	Agriculture Land Based	Human Direct (Straight Pipes)	Human & Pet Land Based (Low Density Residential)
Bailey Creek	Stage I	0	0	100	0
	Final TMDL	95	42	100	48
Bailey Bay, Bailey Creek (tidal), Cattail Creek (tidal)	Stage I	0	0	100	0
	Final TMDL	0	0	100	72
James River (Tidal)	Stage I	0	0	100	0
	Final TMDL	0	0	100	0

2.2 Appomattox River TMDL

According to the TMDL, there are four permitted MS4s in the Appomattox River basin: Chesterfield County, Colonial Heights City, Hopewell City and Petersburg City. In allocating the TMDL, loads were based on each municipality’s share of the contributing urbanized area of the impairment. Modeling scenarios conducted with the TMDL demonstrated difficulty in achieving the water quality standard. For example, the model predicted violations of the water quality standards assuming reductions of 100% in all anthropogenic land-based loads, 100% reduction in sewer overflows and uncontrolled residential discharges, 100% reduction in direct livestock deposition, and a 0% reduction in wildlife direct and land-based loading to the stream. Therefore, the TMDL recommends a staged approach that seeks to address sources with the largest impact while continuing monitoring to evaluate improvements (i.e. livestock exclusion from streams). Additionally, the TMDL recommends reducing the human bacteria loading from failing septic systems and straight pipes as a focus during the first stage because of its health implications. Stage I implementation for the impaired study segment including a WLA for Hopewell is summarized in Table 3.

Table 3. Stage I percent reduction to existing bacteria loads for the Appomattox River TMDL.

Appomattox River (3)	Direct Livestock	NPS Pasture/Livestock/Cropland	NPS Res./Urban	Straight Pipe/Sewer Overflow
Stage I	0	50	50	100

3.0 Pollutant Load Characterization in the City of Hopewell

The City resides adjacent to the point of confluence of the Appomattox and James Rivers, at the most downstream portion of the TMDL study area for the Appomattox, and at the most upstream point of the tidally-influenced impaired section of the James River. The adjoining study area for the James River – City of Richmond Bacteria TMDL is upstream of Hopewell and the Appomattox confluence. Mapping depicting the bacteria TMDL watersheds within the City provided in Figure 1.

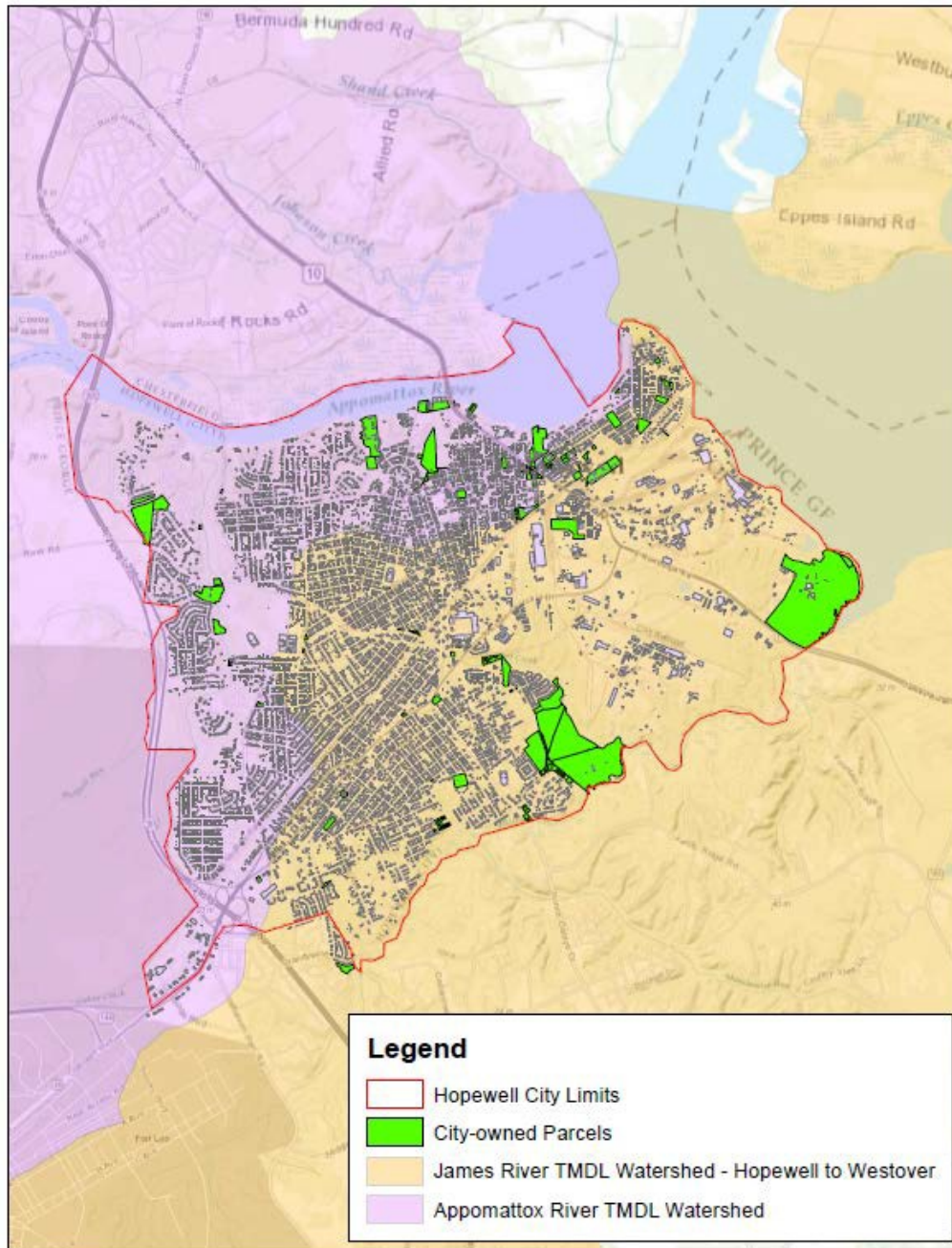


Figure 1. James River and Appomattox TMDL watersheds in Hopewell.

A review of the TMDLs and the City's MS4 Program Plan resulted in the characterization related to potential *E.coli* sources described in the following sub-sections.

3.1 Potential Significant Sources of E.coli

In reference to Tables 2 and 3, of the sources considered by the TMDLs, the following are considered to be the potentially significant sources of *E.coli* and applicable to the City and further considered in the following sub-sections:

- Domestic pets (urban runoff);
- Illicit connections and discharges to the MS4 (sanitary sewer and septic systems); and
 - Sanitary sewer system overflows and leaks;
 - Failing septic systems;
 - Straight pipe discharges; and
 - Improper recreational vehicle (boat) operation (head pump out);

It is noted that agricultural and livestock sources are not considered applicable sources to the City's MS4. Further, the TMDL does not include wildlife source reductions and as such, wildlife sources are not considered an applicable source evaluated herein.

3.1.1 Domestic Pets

The TMDLs assumed that an average of 0.534 dogs and 0.598 cats resided in each household in the City and constituted the primary pets that contributed potential bacteria loading. As of the 2010 Census, the population of the City of Hopewell is 22,653, and the number of households can be estimated to be 9,967, resulting in an estimate of approximately 5,322 dogs and 5,960 cats. Information from the City suggests a smaller number of pets, though actual dog and cat numbers are not available. Waste loading associated with these animals is largely confined to residential areas, but it may also be assumed that waste can enter waterways along adjoining streets and in areas frequented by dog owners, such as parks, trails, and recreation areas where dogs are permitted.

3.1.2 Illicit Connections and discharges to the MS4

Sanitary sewer system overflows and leaks: The City owns, operates, and maintains a sewer collection system consisting of 127 miles of gravity sewer lines, 2,300 manholes, and 22 pump stations, and a wastewater treatment plant (WWTP). The system services industrial, commercial, and residential properties in the City, and flows are directed to the Hopewell Water Renewal WWTP. This is a regional facility that also collects waste water from parts of Prince George County, Fort Lee, and the Federal Correctional Complex.

The City does not have a combined sewer system and therefore does not have any documented combined sewer overflows (CSO); however, the oldest portions of the system were built in 1929 and the overall system is subject to overflows and leakage due to clogged or damaged pipes.

Failing septic systems: Older septic systems and those not properly maintained can create bypass flows of sanitary waste to the surface that may flow overland to streams. The City policy is to convert 100% of the septic systems to public sewer; however, the conversion is not mandatory unless the system is determined to be failing.

Straight pipe discharges: When older properties adjacent to streams experience failing septic systems, the inexpensive solution is to simply re-plumb the septic connection to a straight pipe discharging to the stream. While the incidence of this might be low, the resulting discharge is a significant shock loading to the local stream. A more common occurrence is the connection of a basement bathroom or washing machine to a sump pump discharge line that discharges to the adjacent stream or drainage system.

Improper disposal of materials and waste into the MS4: Stormwater Program personnel routinely respond to citizens that call to report improper management or disposal of household trash, yard clippings, and other debris that results in illicit discharges to the MS4. The presence and accumulation of household trash and debris often attracts rodents, wildlife, and feral cats that contribute fecal bacteria to the pollutant load already contained in these materials.

4.0 Best Management Practices to Address *E. coli*

Hopewell's collective efforts to address pollutant loads from the regulated MS4 are described in detail in the City's MS4 Program Plan. These efforts result in significant reduction in potential pollutants that may enter and/or be discharged from the MS4. The MS4 General Permit Local TMDL Special Condition provides strategies specifically designed to reduce the load of bacteria to the MS4. The following strategies have been selected as being applicable to Hopewell's MS4 and the significant sources of bacteria as listed in Section 3 above. Of the BMPs already included in the City's MS4 Program Plan, only those that are proposed to be expanded beyond the requirements of the MS4 Program Plan to address *E. coli* are included in this Action Plan.

4.1 Domestic Pets: Scoop the Poop Signage and Pet Waste Stations

The City currently has two existing ordinances that address provisions related to reducing the potential for bacteria to reach the City's MS4: Chapter 6 – Animals and Fowl, and Zoning Ordinance Article XV-A:

Chapter 6 – Animals and Fowl contains prohibitions on keeping livestock within 100 yards of any residence except that of the owner, and swine within 500 yards of any residence or stream, and keeping fowl or domestic chickens anywhere in the City without proper sanitary conditions. Chapter 6 also includes provisions for keeping dogs that includes requiring the immediate removal of defecated material from public or private property and disposal in a safe and sanitary manner.

Zoning Article XV-A – Chesapeake Bay Preservation Area Overlay District includes specific provisions to protect and maintain riparian buffers and provide un-manicured vegetative buffers

(natural or planted) adjacent to streams and wetlands. These areas when left in a natural state provide filtering of wildlife and domestic pet bacteria.

In addition to the continued enforcement of these ordinances, the City proposes to continue and expand the implementation of the ***Scoop the Poop and Pet Waste Station*** initiative.

The City Stormwater Program facilitated the placement of Scoop the Poop signs and pet waste bags and disposal containers at 10 City Park locations to address bacteria as it relates to pet waste. City Stormwater Program staff work in partnership with the Recreation and Parks Department to monitor the bag supply and the disposal containers. The signs and pet waste stations are at the following locations:

1. Atwater Soccer Complex - North Corner of Main Parking lot
2. Atwater Soccer Complex - Near Field #1 along Fence on Atwater Road
3. Atwater Park - Inside of Split Rail Fence near entrance to park from Parking area.
4. Crystal Lake Park - Along Walkway near pond, close to Main Parking area
5. Crystal Lake Park - Along walking Trail between Pavilions #1 and #2
6. Mathis Park - Along the Trail near Foot Bridge
7. Mathis Park - Along the Trail heading toward Field #
8. Hopewell City Marina - Near Boat Ramp
9. City Park - Upper Park Area
10. City Park - Lower Park Area

Reporting: The frequency of maintenance to the pet waste stations, including replacement of bags and emptying of disposal receptacles will be included in the MS4 Program Plan Annual Report.

4.2 Illicit Connections and Illicit Discharges: Sanitary sewer system overflows and leaks

Historically the sanitary sewer system within the City has experienced a high number of overflows due to infiltration and inflow during heavy rain events. In 2007 Hopewell Water Renewal initiated an aggressive abatement program and conducted flow monitoring and smoke testing throughout the City. Based on the findings, sub-areas of the system network were targeted for prioritized repair and rehabilitation. Water Renewal has since budgeted \$2 million each year for improvements in the collection area. In 2013, the system experienced 13 reported overflows, and in 2014 the system experienced four.

The City will continue to rehabilitate and repair the sanitary sewer system with dedicated funds each year to reduce the number of system overflows. HRWTF indicates that all high priority areas that were developed from the evaluation study in 2007 have been addressed and that medium priority areas and older infrastructure repair are currently being completed. Approximately 8,200 linear feet of sanitary sewer line was rehabilitated or replaced in the last reporting year.

Reporting: The linear feet of sanitary sewer lines rehabilitated or replaced each year will be reported in the MS4 Program Plan Annual Report.

4.3 Illicit Connections and Illicit Discharges: Prevention of Septic System Failures

The City will continue to promote the conversion of septic systems to public sewer. City records indicate that 56 properties continue to use a septic system. Septic systems in the City continue to be reduced as new connections to the public sewer are made. Older systems may still be repaired by their owners if they can continue to work as designed. Based on available records, approximately 28 properties have been converted from septic to public sewer since 2017.

This BMP includes an action plan to update the City's database of properties with active septic systems and educate the property owners on how to determine if their septic system is failing:

1. Coordinate list of active systems with Water Renewal;
2. Cross reference with City Real Estate Assessors office;
3. Cross reference with Department of Development CBPA Septic Pump Out Program;
4. Contact property owners to confirm status of septic system;
5. Provide property owners with educational materials:
 - a. Pump Out Program (if applicable);
 - b. Information on inspection and proper care of a septic system; and
 - c. Procedures to connect to public sewer.

Reporting: Number of properties contacted and copy of letter and copies of educational materials provided, as well as the number of any systems converted to public sewer will be included in the Annual Report.

4.4 Illicit Connections and Illicit Discharges: Elimination of Straight Pipe Discharges

There are no known straight pipe discharges to surface waters within the City. As previously described, the City's IDDE Program includes a proactive approach to reduce illicit discharges with annual outfall screening to seek out and remove non-stormwater discharges into the MS4. As part of MCM 3 of the City's MS4 Program Plan, Stormwater Program personnel will continue the annual outfall screening and add new outfalls to mapping as they are discovered. In the case that annual dry-weather screening should identify an illicit discharge, including sewage, the existing policies and procedures call for an IDDE investigation and enforcement of the City's IDDE Ordinance to eliminate the discharge.

In an additional effort to eliminate any straight pipes, Hopewell staff will be conscientious of straight pipe discharges during the assessment phase of our recently implemented Outfall and Gully Stabilization Projects. These assessments involve a survey of significant drainage gullies that convey stormwater from the drainage systems serving the upland developed areas of the city to the receiving water bodies.

Reporting: The reporting of outfall inspections and the IDDE Program in the MS4 Program Plan Annual Report will be expanded to include the identification and elimination of any

straight pipes

4.5 Enhanced Public Education and Outreach Plan

The increase in frequency of calls reporting illegal dumping and other illicit discharges indicates the effectiveness of the MS4 Program Plan Public Education & Outreach Program (PEOP). The PEOP will now be enhanced emphasize bacteria as a pollutant of concern. Bacteria is already included in the PEOP High Priority Stormwater Issue #3: *Dirty Runoff = Dirty Creeks*; however, the PEOP will be updated to include additional messages and outreach materials with a specific focus on bacteria, including pet waste, marina pump-out facilities at the two marina's located within the City, message will be the Pet Waste and that

Hopewell's PEOP also identifies City staff as a target audience and calls for biennial training as required by the MS4 General Permit. The training material and Hopewell's Good Housekeeping/Pollution Prevention Manual will be updated to similarly include the emphasis on bacteria.as a pollutant of concern.

Reporting: The MS4 Program Annual Report will include all updates to the PEOP and staff training curriculum.

5.0 Implementation to the Maximum Extent Practicable

Hopewell will implement the MS4 Program components described in Section 4 to reduce the potential of *E.coli* discharge to surface waters to the Maximum Extent Practicable (MEP). The assessment of effectiveness of the programmatic BMPs is reported through the MS4 Program Plan annual report.