York County Bacteria TMDL Action Plan

Prepared for
Public Works Department
York County, VA
June 28, 2016
Revised January 13, 2017

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List of Abbreviations

ac	Acres
BMP	Best Management Practices
CCTV	Closed Circuit Television
DEQ	Virginia Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
FIB	Fecal Indicator Bacteria
FOG	Fats, Oils, and Grease
FSE	Food Service Establishments
GIS	Geographic Information System
HRPDC	Hampton Roads Planning District Commission
HRSD	Hampton Roads Sanitation District
IDDE	Illicit Discharge Detection and Elimination
I/I	Infiltration and Inflow
LA	Load Allocation
lf	Linear Feet
MOM	Maintenance Operations and Management
MOS	Margin of Safety
MRLC	Multi-Resolution Land Characteristics
MS4	Municipal Separate Storm Sewer Systems
NLCD	National Land Cover Database
NOAA	National Oceanic and Atmospheric Administration
ORI	Outfall Reconnaissance Inventory
POC	Pollutant of Concern
PREP	Pollution Response Program
PS	Pump Station
PWD	Public Works Department
QA/QC	Quality Assurance/Quality Control
RTS	Regional Technical Standards
RTU	Remote Terminal Units
RWWMP	Regional Wet Weather Management Plan
SCADA	Supervisory Control and Data Acquisition
SOC	Special Order of Consent
SOP	Standard Operating Procedure
SSOs	Sanitary Sewer Overflows
SWCB	State Water Control Board
SWM	Stormwater Management
SWPPP	Storm Water Pollution Prevention Plans
TMDL	Total Maximum Daily Load
VDH	Virginia Department of Health
VDH-DSS	Virginia Department of Health - Division of Shellfish Sanitation
VDOT	Virginia Department of Transportation
VPDES	Virginia Pollutant Discharge Elimination System
VSMP	Virginia Stormwater Management Program
WERF	Water Environment Research Foundation
WLA	Waste Load Allocation
YCBC	York County Beautification Committee

Executive Summary

York County (County) developed this Total Maximum Daily Load (TMDL) Action Plan (Plan) as required in the Special Conditions of the 2013-2018 General Permit for Discharges of Stormwater from Small (Phase II) Municipal Separate Storm Sewer Systems (MS4s). This plan requires an evaluation of each locally impaired watershed with an established TMDL within the County MS4 to identify the pollutant loading and Waste Load Allocations (WLAs), and evaluate structural Best Management Practices (BMPs) and programmatic measures to address the required reductions, including identifying measurable goals for reporting purposes. The County is also required to identify Facilities of Concern (FOC), a review of the legal authority to meet the requirements of the Plan, and methods for assessing the effectiveness of the Plan. Table ES-1 provides an overview of the Phase II MS4 Permit Special Condition requirements for local TMDLs and the corresponding section where the requirement is addressed within the report document.

Table ES 1. Overview of the Bacteria Local TMDL Action Plan Document Requirements

General Permit Section	Description of Requirement	Corresponding Section/Appendix of this TMDL Action Plan
I.B	Identification of Pollutants of Concern (POCs) for each watershed	Section 2.3
I.B.1	Identification of WLAs assigned to MS4	Section 3
I.B.2.a	List of legal authorities applicable to reducing the POCs	Section 7
I.B.2.b	List of management practices applicable to reducing the POCs	Section 4
I.B.2.c	Enhancements to public education and outreach and employee training to address POCs	Section 4
I.B.2.d	Assessment of all significant sources of POCs from facilities of concern	Section 5
I.B.2.e	Development and implementation of a method to assess the Plan for its effectiveness	Section 6

There are five approved TMDL documents describing requirements for watersheds within the County. The five documents are:

1. *Total Maximum Daily Loads of Bacteria for Back River in York County and Cities of Hampton, Poquoson, and Newport News, Virginia* prepared by Virginia Institute of Marine Science, dated February 2014.
2. *Total Maximum Daily Loads of Bacteria for Poquoson River and Back Creek in the City of Poquoson and in York County, Virginia* prepared by Virginia Institute of Science, dated February 2014.
3. *Fecal Bacteria Total Maximum Daily Load Development for Warwick River* prepared by MapTech, Inc., dated December 2007.
4. *Bacteria Total Maximum Daily Load (TMDL) Development for the Queen Creek, King Creek, and Felgates Creek Watersheds* prepared by The Louis Berger Group, Inc., dated March 2008.

5. *TMDL Report for Chesapeake Bay Shellfish Waters: Ware Creek, Taskinas Creek, and Skimino Creek Bacterial Impairments in York, James City, and New Kent Counties, VA* prepared by Virginia Department of Environmental Quality, dated January 2010.

Table ES-2 identifies the impaired watersheds addressed within each TMDL report, the Environmental Protection Agency (EPA) and State Water Control Board (SWCB) approval dates, impairments, and the POCs. Current permit requirements state that TMDLs approved through July 1, 2013 must be included in the TMDL Action Plan. This plan addresses bacteria TMDLs approved between July 9, 2008 and June 30, 2014 within ten watersheds throughout the County. In an effort to be proactive, the County elected to include TMDL reports from Poquoson River, Back Creek, and Back River which were approved in June 30, 2014, after the permit cutoff date. A map of the impaired watersheds within the County can be found in Figure 2.1 in Appendix A.

Table ES 2. Watershed TMDL Overview

Report Document	Watershed	EPA Approval Date	SWCB Approval Date	Impairment Listing[1]	Pollutant of Concern[1]
1	Back River	4/24/2014	6/30/2014	Primary Contact and Shellfish Standards	Fecal Coliform,
2	Back Creek	3/19/2014	6/30/2014	Shellfish Standards	Fecal Coliform
	Poquoson River	3/19/2014	6/30/2014	Primary Contact and Shellfish Standards	Enterococcus, Fecal Coliform
3	Baptist Run	2/29/2008	4/28/2009	Primary Contact	Fecal Coliform
	Skiffes Creek[3]	2/29/2008	4/28/2009	Shellfish Standards	Fecal Coliform
	Warwick and James River	2/29/2008	4/28/2009	Shellfish Standards	Fecal Coliform
4	King Creek	4/17/2008	4/28/2009	Primary Contact and Shellfish Standards	Enterococcus, Fecal Coliform
	Felgates Creek[3]	4/17/2008	4/28/2009	Shellfish Standards[2]	Fecal Coliform[2]
	Queen Creek	4/17/2008	4/28/2009	Primary Contact and Shellfish Standards	Enterococcus, Fecal Coliform
5	Skimino Creek[3]	3/25/2010	9/30/2010	Shellfish Standards	Fecal Coliform

[1]Information was sourced from the 2014 DEQ VEGIS interactive map.

[2]The draft 2014 DEQ VEGIS data indicates Felgates Creek bacteria impairment is slated to be delisted as of 2014.

[3]Felgates, Skimino, and Skiffes Creek WLAs were not calculated because the County does not have MS4 service areas draining to these watersheds.

The MS4 service area utilized in the calculation of the County's WLAs is the same as the MS4 service area delineated for the Chesapeake Bay TMDL plan. The Chesapeake Bay TMDL plan used the Urban 2000 census areas as a starting point to define the MS4 service area. Future permit requirements may require updating the MS4 definition with the 2010 census urbanized area. In this case, the County's MS4 service area boundary may change which may impact the County's WLAs.

The existing load and WLA calculations for the County's MS4 service area within each watershed were estimated by duplicating the calculation methodology utilized in each TMDL report. Where calculation methodologies were non-transparent, the closest approximation method was utilized. The

WLAs that were calculated for the County by applying this procedure differ from the WLAs that were assigned to the County by each approved TMDL report.

Section 3 includes all calculations performed to determine the County's WLA's in each watershed. Because each TMDL report determined existing loads and WLAs using varying definitions of the MS4 service area, the County's final WLAs for each impaired watershed were determined using a single MS4 service area definition and do not necessarily match the assigned WLAs in each of the TMDL reports. The County's MS4 area was developed in accordance with the Chesapeake Bay TMDL guidelines and is the same MS4 service area used in the previously developed Chesapeake Bay Action Plan. The WLAs assigned in the TMDL reports are included in Table ES-3 for reference.

Table ES-3 provides a summary of the existing loads, WLAs, and required percentage reductions in each watershed. Felgates, Skiffes, and Skimino Creek calculations are excluded from Table ES-3. The Felgates and Skiffes Creek watersheds did not include MS4 service area. The Skimino Creek watershed has approximately five acres of MS4 service area which is located adjacent to the Queens Creek watershed. The majority of the 5 acres drains to Queens Creek watershed. The remaining MS4 service area is forested and accounts for less than a fourth of a percent of the total watershed area.

Table ES 3. Existing Loads, WLAs, and Required Reductions per Watershed

Watershed	WLA Assigned to York County in TMDL Reports (cfu/yr)	Existing Load (calculated)[2] (cfu/yr)	Waste Load Allocation (calculated)[2] (cfu/yr)	Required Reduction (from calculated values)[2] (%)
Back River	2.70E+13	4.71E+13	3.68E+13	22%
Back Creek	1.33E+13	5.36E+12	4.84E+12	10%
Poquoson River	6.03E+13	2.03E+14	1.27E+14	37%
Baptist Run	3.21E+09	1.42E+11	2.36E+10	96%
Skiffes Creek[1]	7.11E+09	0	0	0%
James River, Warwick River	3.04E+12	1.32E+13	1.55E+12	88%
King Creek	4.37E+10	4.03E+11	1.32E+10	97%
Felgates Creek[1]	3.70E+10	0	0	0%
Queen Creek	5.27E+11	5.32E+12	2.23E+11	96%
Skimino Creek[1]	0	0	0	0%

[1]Watersheds do not contain MS4 service area.

[2]Calculated refers to values that were developed as part of this bacteria TMDL Action Plan

The County evaluated its facilities of concern by identifying all land areas within the MS4 which have an expected pollutant loading that is higher than normal for its land use. The facilities of concern identified within the County are sanitary pump stations. The number of pump stations within each

watershed and MS4 service area is shown in Table ES-4. The locations of these facilities are shown on Figure 5.1 in Appendix A.

Table ES 4. York County Pump/Vacuum Stations Within the MS4 Service Area

Bacteria TMDL Watersheds	Pump/Vacuum Stations
Back Creek	0
Back River	11
Baptist Run	2
Kings Creek	2
Poquoson River	26
Queens Creek	5
Warwick and James River	2
Total	**48**

The County's structural BMPs that went online after 2007 were inventoried and are shown in Table ES-5. The structural BMPs included have various theoretical mechanisms for bacteria removal such as runoff reduction, filtration, sedimentation, UV radiation exposure, etc. The high, medium, and low removal ratings are based on the BMP types' theoretical removal mechanisms. The removal ratings were sourced from the *Stormwater Best Management Practices Manual (*North Carolina Department of Environment and Natural Resources, 2007*)*.

Table ES 5. Number of Existing Public and Privately Maintained BMP Types with Pathogen Removal Abilities by Watershed[2]

Type of BMP and Pathogen Removal Ability		Watershed						
		Back Creek	Back River	Baptist Run	Kings Creek	Poquoson River	Queens Creek	Warwick and James River
High	Bioretention	0	7	1	0	10	1	1
	Sand filter	0	0	0	0	0	0	0
	Infiltration devices	0	7	0	0	12	4	3
Total High Removal BMPs		**0**	**14**	**1**	**0**	**22**	**5**	**4**
Medium	Stormwater wetlands	0	1	0	0	1	0	0
	Wet detention basin	0	1	0	3	12	2	0
	Filter strip	0	0	0	0	0	0	0
	Restored riparian buffer	0	0	0	0	0	0	0
	Dry extended detention basin	0	5	1	2	16	7	0
Total Medium Removal BMPs		**0**	**7**	**1**	**5**	**29**	**9**	**0**
Low	Grassed swale	0	1	0	0	5	0	0
	Permeable pavement system	0	0	0	0	0	0	0
	Rooftop runoff management	0	0	0	0	0	0	0
Total Low Removal BMPs		**0**	**1**	**0**	**0**	**5**	**1**	**0**
Unknown	Manufactured BMP Systems[1]	0	1	0	0	5	2	0
Total Unknown Removal BMPs		**0**	**2**	**0**	**1**	**7**	**5**	**0**

[1]Removal efficiencies were not included in Stormwater Best Management Practices Manual (North Carolina Department of Environment and Natural Resources, 2007).

[2]Total BMPs per watershed were determined by applying a 50-foot buffer to the watershed boundary to account for potential error in the geolocations of BMPs.

The County's planned programmatic BMPs along with their measureable goals for reporting purposes for years 4 and 5 are shown in Table ES-6. Each programmatic measure includes a bacteria reduction element and is explained in more detail in Sections 4.3 to 4.8.

Table ES 6. Programmatic BMPs and Measurable Goals			
BMP	Year 4 Goals	Year 5 Goals	Reporting Criteria
Inspection and O&M Verification for Privately-Owned BMPs	Inspect all private BMPs annually	Inspect all private BMPs annually	Number of BMP inspections annually
Inspection and Maintenance Schedules for County-Owned BMPs	Inspect all County owned BMPs annually	Inspect all County owned BMPs annually	Number of BMP inspections annually
Illicit Discharge Detection and Elimination	Resolve all reported IDDE claims	Resolve all reported IDDE claims	Number of IDDE incidents reported and resolved annually
Dry Weather Outfall Screening	Inspect 60 outfalls	Inspect 60 outfalls	Number of outfalls inspected annually
Septic to Sewer Conversion	Track the number of homes that have converted to sewer system from septic	Track the number of homes that have converted to sewer system from septic	Number of homes connected to the County sewer system annually
Regional Media Campaign	The County will participate in at least 4 public events	The County will participate in at least 4 public events	-Number public events that the County participates in annually -Number of proportionate impressions from askHRgreen
Scoop the Poop Campaign	Track the number of active pet waste stations	Track the number of active pet waste stations	Number of active stations provided by the County
Regional Outreach for Volunteer Opportunities	Track the number of trash bags collected on clean the bay day	Track the number of trash bags collected on Clean the Bay Day	Number of bags of trash from Clean the Bay Day collected
Participate in Regional Committees	Attend a minimum of 12 meetings	Attend a minimum of 12 meetings	Number of meetings attended
York County Beautification Committee	- Track the number of active spots maintained in the County - Track the number of trees given away (if available)	- Track the number of active spots maintained in the County - Track the number of trees given away (if available)	-The number of active spots maintained within the County -The number of trees given away annually, as available from the Department of Forestry
Operations and maintenance for high priority facilities	Track the number of employees trained in SWPPPs annually	Track the number of employees trained in SWPPPs annually	Number of employees trained in the developed SWPPPs annually
Employee training and education	-Track employees requiring training and employees who underwent training to ensure that trainings are kept up to date -Track the number of employees requiring certification and the number of employees holding each certification type	-Track employees requiring training and employees who underwent training to ensure that trainings are kept up to date -Track the number of employees requiring certification and the number of employees holding each certification type	-The number of employees trained annually -The number of employees holding each certification type

In order to assess the effectiveness of the planned BMPs and programmatic measures, the County will utilize sample results from DEQ monitoring stations. A list of the available DEQ monitoring stations within the County boundary per watershed is shown in Table ES-7. The list of stations was sourced from the DEQ draft 2014 datasets. Single sample maximums and geometric means (if available) will be evaluated to establish trends in bacteria counts.

Table ES 7. DEQ Monitoring Stations Within York County[1]	
DEQ Monitoring Station ID	Watershed
8-FEL000.19	Kings Creek
8-KNG004.46	Kings Creek
8-QEN002.47	Queens Creek
8-QEN007.02	Queens Creek
8-QEN007.22	Queens Creek
8-QEN007.65	Queens Creek
8-QEN008.58	Queens Creek
8-YRK001.64	York River-Sarah Creek

[1]Data was sourced from the draft 2014 VEGIS datasets on the DEQ website (http://www.deq.virginia.gov)

In addition, the County will continue to monitor its identified facilities of concern. Facilities of concern identified included pump/vacuum stations within the County's MS4 service area. A review of the legal authority the County has to implement the special conditions bacteria TMDL plan is included in Section 8.

The County is required to provide an updated TMDL Action Plan at the end of the current Phase II MS4 permit term in 2018. As more research becomes available, the County may update this plan in an effort to implement the most effective practices.

Section 1

Introduction

York County (County) has developed this local bacteria Total Maximum Daily Load (TMDL) Action Plan (Plan) as required in the Special Conditions of the 2013-2018 General Permit for Discharges of Stormwater from Small (Phase II) Municipal Separate Storm Sewer Systems (MS4s). Current permit requirements state that TMDLs approved through July 1, 2013 must be included in the TMDL Action Plan. This plan addresses bacteria TMDLs approved between July 9, 2008 and June 30, 2014 within ten watersheds throughout the County. In an effort to be proactive, the County elected to include TMDL reports from Poquoson River, Back Creek, and Back River which were approved on June 30, 2014, after the permit cutoff date. The ten watersheds within the County are Back Creek, Back River, Baptist Run, Skiffes Creek, Warwick and James River, Felgates Creek, Kings Creek, Poquoson River, Queens Creek, and Skimino Creek. Specifically, this Plan addresses bacteria loads originating from the MS4 service area within these watersheds. This Plan was developed following the Virginia Department of Environmental Quality (DEQ) draft guidance document (Guidance Document) dated April 2015 and the Phase II MS4 Permit requirements.

The County is located on the James-York Peninsula in coastal Virginia, and has a total land area of 68,352 acres (ac). It is bordered by James City County; the cities of Williamsburg, Newport News, Poquoson, and Hampton; and the York River. Much of the County is suburban or occupied by federal installations, and portions of the County are within the 2000 census urbanized area named “Virginia Beach, Virginia.” The County’s MS4 is permitted under the General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems permit number VAR040028.

This Plan describes the County’s MS4 service area, Waste Load Allocations (WLAs [loading values assigned to point source discharges to a receiving body]), percent and reduction required within each bacteria TMDL watershed, and the planned projects implemented to meet the required reductions. In addition, this Plan includes an evaluation of the current and future legal authority to implement the Plan, and a description of the public comment process. Figure 2.1 depicts the MS4 service area and is provided in Appendix A.

Section 2

MS4 Service Area and Impaired Watersheds

There are ten impaired watersheds in the County with bacteria TMDLs approved between July 9, 2008 and June 30, 2014. The ten watersheds are: Back Creek, Back River, Baptist Run, Skiffes Creek, Warwick and James River, Felgates Creek, Kings Creek, Poquoson River, Queens Creek, and Skimino Creek. In order to develop a strategy to meet the MS4 service area WLAs, the County first evaluated the approved Pollutant of Concern (POC) Load Allocations (LAs) for each watershed. The approved TMDL reports along with the identified POC for each watershed are presented in Section 2.3. An overview of the Virginia guidelines for designated use standards and impairments is included in Section 2.2.

This Plan utilizes a consistent MS4 service area, as previously defined during the development of the Chesapeake Bay TMDL Action Plan. An overview of its development is presented in Section 2.1. Watershed boundary Geographical Information System (GIS) datasets used for the action plan were accessed from Virginia Department of Environmental Quality (DEQ) in July 2015.

2.1 Definition of the MS4 Service Area

The County's MS4 service area utilized in this Plan is the same as previously defined in the first phase Chesapeake Bay TMDL Action Plan. The MS4 service area was delineated in GIS using the guidelines as set forth in the Chesapeake Bay TMDL Special Condition Guidance Document (DEQ, 2015). The MS4 service area can be seen in Figure 2.1 of Appendix A. According to the document, permittees may exclude:

- Lands regulated under any general VPDES permit that addresses industrial stormwater
- Lands regulated under an individual VPDES permit for industrial stormwater discharges
- Forested lands
- Agricultural lands
- Wetlands
- Open waters
- Lands that surface flow out of the system

The specific omitted permits are shown in Tables 2-2, 2-3, and 2-4. These are the current permit holders within each watershed and may vary from the permits included in the individual TMDL reports.

Table 2-1 includes the permit number, facility names, and addresses of individual VPDES permit holders.

Table 2 1. Individual VPDES Permittees					
VA0004103	Dominion: Yorktown Power Station	1600 Waterview Road	Yorktown	Virginia Electric and Power Company	Back Creek
VA0081311	HRSD: York River Sewage Treatment Plant	515 Back Creek Road	Seaford	Hampton Roads Sanitation District	Back Creek
VA0005975	Newport News City: Harwoods Mill Water Treatment	3629 George Washington Mem. Highway	Yorktown	Newport News City: Dept. of Public Utilities	Poquoson River
VA0003018	Plains Marketing LP Yorktown	2201 Goodwin Neck Road	Yorktown	Plains Marketing LP	Back Creek
VA0089826	Water Country USA	176 Water Country Parkway	Williamsburg	SeaWorld Parks LLC	Kings Creek
VA0056537	Williamsburg Water Filtration Plant	618 Waller Mill Road	Williamsburg	Williamsburg Dept. of Public Works and Utilities	Queens Creek
VA0089681	Newport News-Williamsburg International Airport	900 Bland Blvd., Ste. G	Newport News	Peninsula Airport Commission	Poquoson River

Table 2-2 includes the permit number, facility names, and addresses of general VPDES permit holders.

Table 2 2. General VPDES Permittees				
VAR050242	Republic Services of Yorktown	124 Greene Drive	Yorktown	Poquoson River
VAR050304	English Motors LTD	2312 George Washington Highway	Yorktown	Poquoson River
VAR050742	SIMS Metal Management: Tabb	2116 George Washington Memorial Highway	Tabb	Poquoson River
VAR050773	M and J Motors	2024 Route 17	Yorktown	Poquoson River
VAR051313	Blackies	2208 George Washington Memorial Highway	Tabb	Poquoson River
VAR051508	U.S. Naval Weapons Station Yorktown	Cheatham Annex	Yorktown	Kings Creek, Queens Creek
VAR051957	VPPSA: Compost Facility	145 Goodwin Neck Road	Yorktown	Poquoson River
VAR052105	U.S. Navy: Naval Weapons Station Yorktown	State Routes 143 and 238	Yorktown	Kings Creek, Felgates Creek, Baptist Run

Table 2-3 includes the permit number, owner or operator name, designation, and permit type for permit holders of other municipal separate storm sewer systems.

Table 2 3. Other Municipal Separate Storm Sewer Systems					
Permit No.	Owner/Operator	System Name	Designation	Type	Watershed
VAR040130	U.S. Navy: Consolidated MS4s	Camp Peary	Phase II	Federal	Queens Creek, Skimino Creek
VAR040133	Virginia Department of Transportation	VDOT	Phase II	State	All Bacteria TMDL Watersheds

2.2 Virginia Regulations on Designated Use and Impairments

All Virginia waters are designated for the following uses: recreational uses, e.g. swimming and boating; the propagation and growth of a balanced, indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them; wildlife; and the production of edible and marketable natural resources, e.g. fish and shellfish (VDEQ). Waterways may also be considered for primary shellfish harvesting status. The commonwealth of Virginia has adopted numerical regulations for bacteria for each designated use. A waterway is listed as impaired for bacteria if it exceeds the maximum bacteria levels defined for its listed uses. In saltwater and transitional waters, recreational uses are considered impaired when Enterococci counts exceed a monthly geometric mean of 35 Colony Forming Units (CFU)/100 ml. In cases where there are insufficient data to calculate a geometric mean, violation occurs when 10% of the Enterococci samples exceed 104 CFU/100 ml. In freshwaters, recreational uses are considered impaired when *Escherichia coli* counts exceed a monthly geometric mean of 126 CFU/100 ml. In cases where there are insufficient data to calculate a geometric mean, an impairment is determined when 10% of the total samples exceed 235 CFU/100 ml. In shellfish waters, impairment occurs when the geometric mean of fecal coliform concentration exceeds a Most Probable Number (MPN) or Membrane Filter (MF) of 14 per 100 ml. These bacteria regulations for *E. coli,* Enterococci, and Fecal Coliform have been adopted in 2003 and are the governing water quality standards for all data presented in this report.

2.3 Approved TMDLs within York County

Currently, there are five approved TMDL documents describing requirements for watersheds within the County. The five documents are:

1. *Total Maximum Daily Loads of Bacteria for Back River in York County and Cities of Hampton, Poquoson, and Newport News, Virginia* prepared by Virginia Institute of Marine Science, dated February 2014. EPA approval date was 4/24/2014 and SWCB approval date was 6/30/2014.
2. *Total Maximum Daily Loads of Bacteria for Poquoson River and Back Creek in the City of Poquoson and in York County, Virginia* prepared by Virginia Institute of Science, dated February 2014. EPA approval date was 3/19/2014 and SWCB approval date was 6/30/2014.
3. *Fecal Bacteria Total Maximum Daily Load Development for Warwick River* prepared by MapTech, Inc., dated December 2007. EPA approval date was 2/29/2008 and SWCB approval date was 4/28/2009.
4. *Bacteria Total Maximum Daily Load (TMDL) Development for the Queen Creek, King Creek, and Felgates Creek Watersheds* prepared by The Louis Berger Group, Inc., dated March 2008. EPA approval date was 4/17/2008 and SWCB approval date was 4/28/2009.
5. *TMDL Report for Chesapeake Bay Shellfish Waters: Ware Creek, Taskinas Creek, and Skimino Creek Bacterial Impairments in York, James City, and New Kent Counties, VA* prepared by Virginia Department of Environmental Quality, dated January 2010. EPA approval date was 3/25/2010 and SWCB approval date was 9/30/2010.

The land cover used to develop each TMDL is identified in each report. The data was sourced from the 2001 National Land Cover Database (NLCD) or the 2006 National Oceanic and Atmospheric Administration (NOAA) regional land cover database. Table 2-4 shows the name of the watershed, land cover file, impairment listing, and POC.

Table 2 4. Watershed TMDL Overview				
Report Document	Watershed	Land Cover File	Impairment Listing[1]	Pollutant of Concern[1]
1	Back River	2006 NOAA Land Cover Database	Primary Contact and Shellfish Standards	Fecal Coliform
2	Back Creek	2006 NOAA Land Cover Database	Shellfish Standards	Fecal Coliform
	Poquoson River	2006 NOAA Land Cover Database	Primary Contact and Shellfish Standards	Enterococcus, Fecal Coliform
3	Baptist Run	2001 NLCD Land Cover Database	Primary Contact	Fecal Coliform
	Skiffes Creek	2001 NLCD Land Cover Database	Shellfish Standards	Fecal Coliform
	Warwick and James River	2001 NLCD Land Cover Database	Shellfish Standards	Fecal Coliform
4	Kings Creek	2001 NLCD Land Cover Database	Primary Contact and Shellfish Standards	Enterococcus, Fecal Coliform
	Felgates Creek	2001 NLCD Land Cover Database	Shellfish Standards[2]	Fecal Coliform[2]
	Queens Creek	2001 NLCD Land Cover Database	Primary Contact and Shellfish Standards	Enterococcus, Fecal Coliform
5	Skimino Creek	2001 NLCD Land Cover Database	Shellfish Standards	Fecal Coliform

[1]Information was sourced from the 2014 DEQ VEGIS interactive map.

[2]The draft 2014 DEQ VEGIS data indicates Felgates Creek bacteria impairment is slated to be delisted as of 2014.

Felgates and Skiffes Creek watersheds include area within the boundary of the County but do not contain any area designated as MS4 service area. Additionally, the draft 2014 VDEQ GIS datasets indicate that Felgates Creek is slated to be delisted for its bacteria impairment. Skimino Creek included only a small portion of the County's MS4 service area, the majority of which was found to drain to the adjacent Queens Creek watershed. The total MS4 service area within Skimino Creek accounts for less than a fourth of a percent of the total area in the watershed.

During the development of each TMDL, a MS4 service area was defined, though the service area definition was inconsistent between documents. Since the County's MS4 area definition is consistent, and developed in accordance with the Chesapeake Bay TMDL guidelines, the MS4 service area used in the WLA calculations is the same as previously developed for the Chesapeake Bay Action Plan.

The MS4 service area within each impaired watershed was delineated by intersecting the watersheds which contain a bacteria TMDL requirement and the Countywide MS4 service area in GIS. The delineation of the County MS4 service area within each TMDL watershed indicated that MS4 service areas exist in the following watersheds: Queens Creek, Kings Creek, Poquoson River, Back Creek, Baptist Run, Back River, and Warwick and James River. The resulting areas were utilized to evaluate the bacteria load allocation within each watershed. The impaired watershed GIS file was downloaded from the DEQ website in July 2015. The boundaries from this file appear to have some variations from the TMDL watershed boundaries as shown in some of the TMDL reports. As such, there may be differences in the MS4 service area that is within the watershed boundary between the

TMDL reports and this Plan. Refer to Figure 2.1 in Appendix A for a map of the impaired watersheds and the MS4 service area.

Section 3

Bacteria Waste Load Allocations

The following sections define the methodologies used to develop the WLAs and percent reductions required by the MS4 within each watershed. For consistency with the approved TMDL reports, the process used to calculate the WLA matches the methodology in the corresponding document. Where calculation methodologies were non-transparent, the closest approximation method was utilized. The WLAs that were calculated for the County by applying this procedure differ from the WLAs that were assigned to the County by each approved TMDL report.

The WLAs in the TMDL reports were developed by assigning bacteria loading rates to each land cover type. The aggregate load from the combined land area for each MS4 was then designated as the WLA for the municipality. This rationale interprets an MS4 as a point-source load since stormwater enters surface water as a point-source from an outfall, but the definition more closely resembles a load allocation (LA), which is defined as a non-point source land based loading.

Section 3 includes all calculations performed to determine the County's WLA's in each watershed. Because each TMDL report determined existing loads and WLAs using varying definitions of the MS4 service area, the County's final WLAs for each impaired watershed were determined using a single MS4 service area definition and do not match the assigned WLAs in each of the TMDL reports. The County's MS4 area was developed in accordance with the Chesapeake Bay TMDL guidelines and is the same MS4 service area used in the previously developed Chesapeake Bay Action Plan.

3.1 Queens Creek, Kings Creek, and Felgates Creek

In order to calculate the existing loads and required reductions in the Queens Creek and Kings Creek MS4 service area, the methodology described in *Bacteria Total Maximum Daily Load (TMDL) Development for the Queen Creek, King Creek, and Felgates Creek Watersheds* (The Louis Berger Group, Inc., 2008), was applied to the revised MS4 service area within each watershed. Felgates Creek was not included in the analysis because it does not contain MS4 service area. The 2001 USGS NLCD, described in Section 2.3, was intersected with the MS4 service area to calculate specific land use types within the County MS4. The report provided bacteria loading rates from each of the four sources: livestock, wildlife, human, and pets. The source loads were applied to each land use within the MS4 as originally documented in the TMDL report (The Louis Berger Group, Inc., 2008):

- All livestock bacteria originate from agricultural land uses
- 80% of pet waste bacteria originates from urban land uses and 20% from agricultural land uses
- 80% of wildlife loads originate from forested areas, 10% from agricultural land uses, and 10% from urban land uses
- 50% of human bacteria originates from urban land uses and 50% from agricultural land uses

Development of the calculations and assumptions for Queens Creek and Kings Creek were performed based upon the existing watershed information. Though every effort was made to develop a calculation that reproduces the exact values given in the report, minor deviations were noted.

3.1.1 Queens Creek

To calculate the total existing load for the Queens Creek watershed MS4 service area, the total acres in each general land use category and the percentage of the total watershed area that was within the MS4 service area were determined. The total acres per general land use category and associated percentages are shown in Table 3-1.

Table 3 1. Land Use Within Queens Creek Watershed

General Land Use Category	Land Use	Acres in Watershed[1]	Acres in TMDL Service Area[1]	TMDL Service Area/ Watershed Area
Urban	Developed, Open Space	1,766.8	360.9	25%
	Developed, Low Intensity	679.8	201.1	
	Developed, Medium Intensity	266.7	97.2	
	Developed, High Intensity	73.9	34.0	
Agriculture	Pasture/Hay	130.8	0.0	3%
	Grassland/Herbaceous	24.1	19.8	
	Cultivated Crops	420.4	0.1	
Forest	Deciduous Forest	5,398.1	195.8	4%
	Evergreen Forest	1,217.0	42.4	
	Mixed Forest	1,146.2	99.9	
	Shrub/Scrub	379.2	19.1	
Water/Wetland	Open Water	460.6	1.5	2%
	Woody Wetlands	841.4	15.8	
	Emergent Herbaceous Wetlands	620.3	21.6	
Other	Barren Land	0.1	0.1	100%

[1]Values were developed using the watershed area and MS4 service area produced in GIS.

The calculations for total daily load and WLA in the MS4 service area used the values for total load and WLA from each source in the watershed provided by the report, *Bacteria Total Maximum Daily Load (TMDL) Development for the Queen Creek, King Creek, and Felgates Creek Watersheds* (The Louis Berger Group, Inc., 2008). Referenced values are shown in Table 3-2.

Table 3 2. Queens Creek Total Existing Loads and WLAs from TMDL Report		
Source	Existing Load (MPN/day)[1]	WLA (MPN/day)[1]
Livestock	4.13E+12	1.11E+11
Wildlife	1.98E+12	1.98E+12
Human	1.11E+13	0.00E+00
Pet	1.69E+13	4.54E+11

[1]Values were sourced from the reference TMDL report.

To determine the total existing load and WLA from each source type in the MS4 service area, calculations were performed consistently with the source assumptions outlined above and using the ratio of the MS4 service area to total watershed area.

The existing load, WLA, and the percent required reductions are shown in Table 3-3. A reduction of 96 percent is required by the County in the Queens Creek MS4 service area to achieve the TMDL.

Table 3 3. Queens Creek MS4 Service Area: Existing/WLAs, Required Reductions			
Load Source	Existing Load (MPN/day)[1]	WLA (MPN/day)[1]	Required Reduction (%)
Livestock	1.43E+11	3.84E+09	97
Wildlife	1.26E+11	1.26E+11	0
Human	1.57E+12	0.00E+00	100
Pet	3.48E+12	9.35E+10	97
Total	5.32E+12	2.23E+11	96

[1]Values were developed using the MS4 service area produced in GIS and the methods described in this section.

3.1.2 Kings Creek

The methodology used to calculate the Queens Creek total existing load was also applied to the Kings Creek watershed MS4 service area. First, the total acres in each general land use category and the percentage of the total watershed area within the MS4 service area were determined. The total acres per general land use category and the percentages are shown in Table 3-4.

Table 3 4. Land Use Within Kings Creek Watershed MS4 Service Area				
General Land Use Category	Land Use	Acres in Watershed[1]	Acres in TMDL Service Area[1]	TMDL Service Area / Total Watershed Area
Urban	Developed, Open Space	834.0	224.5	26%
	Developed, Low Intensity	314.4	80.7	
	Developed, Medium Intensity	123.1	29.3	
	Developed, High Intensity	32.3	1.7	
Agriculture	Pasture/Hay	5.0	0.0	0%
	Grassland/Herbaceous	0.0	0.0	
	Cultivated Crops	78.2	0.0	
Forest	Deciduous Forest	1,967.0	64.5	4%
	Evergreen Forest	456.1	18.1	
	Mixed Forest	372.6	17.5	
	Shrub/Scrub	22.4	2.3	
Water/Wetland	Open Water	96.9	0.0	1%
	Woody Wetlands	298.0	6.4	
	Emergent Herbaceous Wetlands	194.3	0.6	
Other	Barren Land	2.4	0.0	0%

[1]Values were developed using the watershed area and MS4 service area produced in GIS.

The calculations for total daily load and WLA in the MS4 service area used the values for total load and WLA from each source in the watershed provided by the report, *Bacteria Total Maximum Daily Load (TMDL) Development for the Queen Creek, King Creek, and Felgates Creek Watersheds* (The Louis Berger Group, Inc., 2008). The values from the report are shown in Table 3-5.

Table 3 5. Kings Creek Total Existing Loads and WLA from TMDL Report		
Source	Existing Load (MPN/day)[1]	WLA (MPN/day)[1]
Livestock	2.91E+11	1.86E+08
Wildlife	2.52E+11	2.37E+11
Human	1.07E+12	0.00E+00
Pet	1.22E+12	7.81E+08

[1]Values were sourced from the reference TMDL report.

To determine the total existing load and WLA from each source type in the MS4 service area, calculations were performed consistent with the source assumptions outlined above and using the ratio of the MS4 service area to total watershed area.

The existing load, WLA, and the percent required reductions are shown in Table 3-6. A reduction of 97 percent is required by the County in the Kings Creek MS4 service area to achieve the TMDL.

Table 3 6. Kings Creek MS4 Service Area: Existing/WLAs, Required Reductions			
Load Source	Existing Load (MPN/day)[1]	WLA (MPN/day)[1]	Required Reduction (%)
Livestock	0.00E+00	0.00E+00	0
Wildlife	1.38E+10	1.30E+10	6
Human	1.38E+11	0.00E+00	100
Pet	2.52E+11	1.61E+08	100
Total	4.03E+11	1.32E+10	97

[1]Values were developed using the MS4 service area produced in GIS and the methods described in this section.

3.1.3 Felgates Creek

The bacteria WLAs for Felgates Creek were not calculated because the County does not have a MS4 service area within the Felgates Creek watershed. While the watershed is primarily located within the County, the only urbanized area, as defined by the 2000 or 2010 census, is designated to other permittees (e.g., industries). Additionally, Felgates Creek appears to be slated to be delisted for its shell fishing fecal coliform bacterial impairment based on the draft 2014 water quality data sourced from DEQ.

3.2 Poquoson River and Back Creek

In order to calculate the existing loads and percent reductions required in the Poquoson River MS4 service areas, the methodology developed in *Total Maximum Daily Loads of Bacteria for Poquoson River and Back Creek in the City of Poquoson and in York County, Virginia* (Virginia Institute of Marine Science, 2014) was applied to the revised MS4 service area within the watershed. In this report, the WLAs were calculated by using a weighted land-based approach. The report assumes the load allocation for the MS4 is the impervious area portion of the urban land use located within the census designated urban areas. Urban lands are defined as high-, medium- or low- intensity residential areas. The method for determining the MS4 areas in the report differs from the MS4 definition as stated in Section 2.1. Each MS4 permit WLA was calculated by multiplying the LA for each land cover by the proportion of urban areas within the watershed.

The approach described was developed to recreate the WLA values using \ impervious to pervious acreage and ratios as reported within in the TMDL document. This method produced values which approximate the TMDL document values.

The MS4 areas per watershed are summarized in Tables 3.7 and 3.8 for Back Creek and Poquoson River.

3.2.1 Poquoson River

In order to determine the Poquoson River existing load, WLA, and percent required reduction for the County MS4 service area, the method using area ratios described above was applied. The results are shown in Table 3-7. A 37 percent reduction is required for the County's MS4 service area to achieve the TMDL. The TMDL report (Virginia Institute of Marine Science, 2014) indicates that 66 percent of the total loading in the Poquoson River watershed is due to wildlife sources.

Table 3 7. Poquoson River Watershed: MS4 Service Area					
Watershed	Area	Total Acres	Existing Load (Counts per year)	WLA (Counts per year)	Reduction
Poquoson River	MS4 service area[1]	5,619.2	2.03E+14	1.27E+14	37%
	Entire Watershed[2]	14,661.2	5.30E+14	3.32E+14	37%

[1]Values were developed using the MS4 service area produced in GIS

[2]Values were sourced from the reference TMDL report

3.2.2 Back Creek

In order to determine the Back Creek existing load, TMDL, and percent required reduction for the County MS4 service area, the same method was applied to the Poquoson River watershed. The results are shown below in Table 3-8. A reduction of 10 percent is required for the County's MS4 service area to achieve the TMDL. The TMDL report (Virginia Institute of Marine Science, 2014) indicates that 79 percent of the total loading in the Back Creek watershed is due to wildlife sources.

Table 3 8. Back Creek Watershed: MS4 Service Area					
Watershed	Area	Total Acres	Existing Load (Counts per year)	WLA (Counts per year)	Reduction
Back Creek	MS4 service area[1]	93.6	5.36E+12	4.84E+12	10%
	Entire Watershed[2]	1,458.8	8.36E+13	7.54E+13	10%

[1]Values were developed using the MS4 service area produced in GIS

[2]Values were sourced from the reference TMDL report

3.3 Back River

In order to calculate the existing loads and percent reductions required in the Back River MS4 service area, information from the report, *Total Maximum Daily Loads of Bacteria for Back River in York County and Cities of Hampton, Poquoson, and Newport News, Virginia* (Virginia Institute of Marine Science, 2014) was used. The TMDL WLAs were calculated by using a weighted land-based approach.

The aforementioned report does not define the MS4 service area explicitly, but it was authored by the same agency as the corresponding document for the Poquoson and Back Creek watersheds (documented in Section 3.2). Both documents appear to follow the same methodology. Therefore, an assumption was made that the same terms were used to define the MS4 service area for both reports. That definition is as follows: The MS4 service area is the urban land use portion of the total MS4 regulated area. Urban land use is defined as being the sum of high, low, and medium intensity residential areas. The method for determining the MS4 areas in the report differs from the MS4 definition as stated in Section 2.1. Each individual permit area was given a WLA by multiplying the total loading by the percentage calculated from dividing the urban areas by the total land area in each jurisdiction.

In order to determine the Back River existing load, WLA, and percent required reduction for the County MS4 service area, the method using area ratios described above was applied. The results are shown in Table 3-9. A 22 percent reduction is required for the County's MS4 service area to achieve the TMDL.

Table 3 9. Back River Watershed: MS4 Service Area					
Watershed	Area	Total Acres	Existing Load (Counts per year)	TMDL (Counts per year)	Reduction
Back River	MS4 service area[1]	2,216.2	4.71E+13	3.68E+13	22%
	Entire Watershed[2]	3,650.2	7.76E+13	6.07E+13	22%

[1]Values were developed using the MS4 service area produced in GIS

[2]Values were sourced from the reference TMDL report

3.4 Warwick River

The report, *Fecal Bacteria Total Maximum Daily Load Development for Warwick River* (MapTech, Inc., 2007), was referenced to determine the WLAs for the County in the Baptist Run, Skiffes Creek, and Warwick and James River watersheds. The TMDL WLAs in the report were determined using a land use based approach where all non-permitted source loads were assigned to pervious areas and permitted source loads were assigned to the impervious areas. The report defined the MS4 service area as all impervious area in the watershed. The MS4 service area used in this TMDL action plan as defined in Section 2.1 includes pervious and impervious surfaces within the permit area and the WLA developed in this section accounts for loading rates from both.

The TMDL report consolidates NLCD land use types as shown in Table 3-10.

Table 3 10. Consolidated Land Use Legend	
Land Use Classification from Report	Land Use Category from 2001 NLCD
LIR	Developed, Open Space
	Developed, Low Intensity
HIR	Developed, Medium Intensity
Commercial	Developed, High Intensity
Pasture	Pasture/Hay
	Grassland/Herbaceous
LAX	Pasture land near streams
Cropland	Cultivated Crops
Forest	Deciduous Forest
	Evergreen Forest
	Mixed Forest
	Shrub/Scrub
Water	Open Water
Wetlands	Woody Wetlands
	Emergent Herbaceous Wetlands
Barren	Barren Land

3.4.1 Baptist Run

The County's WLA in the Baptist Run watershed were determined by grouping the land uses within the MS4 service area within the watershed as shown in Section 3.4 and adhering to the following strategy. Since loading rates were calculated based on impervious and pervious areas, the acres in the County's MS4 service area in the Baptist Run watershed were separated as shown in Table 3-11. Because the pasture acres in the MS4 service area consisted of entirely grassland/herbaceous land use, it was assumed that there was no livestock access to stream land use.

Table 3 11. Baptist Run Watershed: MS4 Service Area (Pervious/Impervious)

Land Use Classification	Total Acres[1]	Pervious Acres[1]	Impervious Acres[1]
Barren	0.0	0.0	0.0
LIR	47.8	43.0	4.8
HIR	1.1	0.9	0.2
Commercial	0.7	0.4	0.3
Cropland	4.2	4.2	0.0
Pasture	0.1	0.1	0.0
Forest	54.0	54.0	0.0
Wetlands	3.5	3.5	0.0
Water	0.0	0.0	0.0
LAX	0.0	0.0	0.0

[1]Values were developed using land areas produced in GIS.

The loading rates from the report are shown below in Table 3-12.

Table 3 12. Baptist Run Watershed: Existing and WLA from the Report

Source	Existing Load (Counts per year)[1]	WLA (Counts per year)[1]
Barren	3.99E+08	4.39E+07
LIR	2.75E+11	2.75E+09
HIR	1.05E+09	1.16E+08
Commercial	6.84E+08	7.52E+07
Cropland	8.07E+09	7.26E+08
Pasture	9.84E+09	8.85E+08
Forest	4.06E+11	4.47E+10
Wetlands	2.47E+10	2.72E+09
Water	0.00E+00	0.00E+00
LAX	1.70E+09	1.53E+08
Permitted Sources	3.89E+09	3.89E+09

[1]Values were sourced from the reference TMDL report.

The existing loads, WLAs, and percent required reductions were determined by taking the ratio of the MS4 service area to the total watershed area and multiplying it by the loads as calculated by the report. Permitted sources account for all impervious acres. All other loads are from pervious acres. Section 5.4.1 of the TMDL report *Fecal Bacteria Total Maximum Daily Load Development for Warwick River* (MapTech, Inc., 2007), includes an additional scenario called a Stage I management scenario. The scenario removed wildlife loading, which is indicated by the report to be on land cover types barren, commercial, forest, HIR, and wetlands, from the TMDL equation. It further states that this scenario may be used as a goal for implementation. Table 3-13 shows the existing loads, WLAs, and percent reduction required from the County. Reductions from land cover types which were associated with wildlife loading were removed from the table, as per recommendation from the report for implementation stages. The total required reduction is 83 percent to achieve the TMDL.

Table 3 13. Baptist Run MS4 Service Area: Existing/WLAs, Required Reductions

Load Source	Existing Load (Counts per year)[1]	WLA (Counts per year)[1]	Required Reduction (%)
Barren	0.00E+00	0.00E+00	0%
LIR	1.19E+11	1.19E+09	99%
HIR	1.41E+08	1.41E+08	0%
Commercial	6.00E+07	6.00E+07	0%
Cropland	9.47E+08	8.52E+07	91%
Pasture	8.50E+06	7.65E+05	91%
Forest	1.83E+10	1.83E+10	0%
Wetlands	2.21E+09	2.21E+09	0%
Water	0.00E+00	0.00E+00	0%
LAX	0.00E+00	0.00E+00	0%
Permitted Sources	1.57E+09	1.57E+09	0%
Total	1.42E+11	2.36E+10	83%

[1]Values were developed using the MS4 service area produced in GIS and the methods described in this section

It is understood that the majority of loading is human based resulting from septic systems, straight pipes, cross connections, and sewer overflows. However, applying a broad land based human load to account for small pockets of developed land over the entire watershed may not accurately represent the County's overall loading in the Baptist Run watershed.

3.4.2 Warwick and James River

The County's WLA in the Warwick and James River watershed was determined by grouping the land uses within the MS4 service area within the watershed as shown in Section 3.4 and following the same strategy as shown in Section 3.4.1. The Warwick and James River watershed overlaps the Baptist Run watershed. All Areas presented in this section to calculate the County's WLA were determined from land area that is within the Warwick and James watershed minus land areas that are within the Baptist Run watershed. Since loading rates were calculated based on impervious and

pervious areas, the acres in the County's MS4 service area in the Warwick and James River watershed were separated as shown in Table 3-14. Because the pasture acres in the MS4 service area consisted of entirely grassland/herbaceous land use, it was assumed that there was no livestock access to stream land use.

Table 3 14. Warwick and James River Watershed: MS4 Service Area (Pervious/Impervious)

Land Use Classification	Total Acres[1]	Pervious Acres[1]	Impervious Acres[1]
Barren	0.0	0.0	0.0
LIR	109.0	98.1	10.9
HIR	6.9	5.5	1.4
Commercial	0.0	0.0	0.0
Cropland	33.1	33.1	0.0
Pasture	0.0	0.0	0.0
Forest	50.5	50.5	0.0
Wetlands	1.0	1.0	0.0
Water	0.0	0.0	0.0
LAX	0.0	0.0	0.0

[1]Values were developed using land areas produced in GIS.

The loading rates from the report are shown below in Table 3-15.

Table 3 15. Warwick and James River Watershed: Existing and WLA from the Report

Source	Existing Load (Counts per year)[1]	WLA (Counts per year)[1]
Barren	1.49E+13	9.51E+12
LIR	1.24E+15	1.24E+13
HIR	1.68E+13	1.08E+13
Commercial	4.22E+12	2.70E+12
Cropland	1.12E+13	1.01E+12
Pasture	4.46E+13	4.01E+12
Forest	1.56E+14	1.00E+14
Wetlands	1.66E+14	1.06E+14
Water	0.00E+00	0.00E+00
LAX	2.54E+12	2.29E+11
Permitted Sources	3.04E+12	3.04E+12

[1]Values were sourced from the reference TMDL report.

The existing loads, WLAs, and percent required reductions were determined by taking the ratio of the MS4 service area to the total watershed area and multiplying it by the loads as calculated by the report. Permitted sources account for all impervious acres. All other loads are from pervious acres. Section 5.4.1 of the TMDL report *Fecal Bacteria Total Maximum Daily Load Development for*

Warwick River (MapTech, Inc., 2007), includes an additional scenario called a Stage I management scenario. The scenario removed wildlife loading, which is indicated by the report to be on land cover types barren, commercial, forest, HIR, and wetlands, from the TMDL equation. It further states that this scenario may be used as a goal for implementation. Table 3-16 shows the existing loads, WLAs, and percent reduction required from the County. Reductions from land cover types which were associated with wildlife loading were removed from the table, as per recommendation from the report for implementation stages. The total required reduction is 88 percent to achieve the WLA.

Table 3 16. Warwick and James River MS4 Service Area: Existing/WLAs, Required Reductions

Load Source	Existing Load (Counts per year)[1]	WLA (Counts per year)[1]	Required Reduction (%)
Barren	0.00E+00	0.00E+00	0%
LIR	1.12E+13	1.12E+11	99%
HIR	2.96E+10	1.90E+10	36%
Commercial	0.00E+00	0.00E+00	0%
Cropland	3.47E+11	3.13E+10	91%
Pasture	0.00E+00	0.00E+00	0%
Forest	6.21E+11	3.98E+11	36%
Wetlands	6.57E+10	4.19E+10	36%
Water	0.00E+00	0.00E+00	0%
LAX	0.00E+00	0.00E+00	0%
Permitted Sources	9.45E+11	9.45E+11	0%
Total	1.32E+13	1.55E+12	88%

[1]Values were developed using the MS4 service area produced in GIS and the methods described in this section

It is understood that the majority of loading is human based resulting from septic systems, straight pipes, cross connections, and sewer overflows. However, applying a broad land based human load to account for small pockets of developed land over the entire watershed may not accurately represent the County's overall loading in the Warwick and James River watershed.

3.4.3 Skiffes Creek

The TMDL report *Fecal Bacteria Total Maximum Daily Load Development for Warwick River* (MapTech, Inc., 2007) includes a WLA for the County in the Skiffes Creek watershed. Though the Skiffes Creek watershed does include area within the County boundary, the County does not have MS4 service area within the watershed.

3.5 Skimino Creek

An existing document, *TMDL Report for Chesapeake Bay Shellfish Waters: Ware Creek, Taskinas Creek, and Skimino Creek Bacterial Impairments in York, James City, and New Kent Counties, VA* (DEQ, 2010), was referenced to determine WLAs for the Skimino Creek watershed area.

The County's MS4 service area within Skimino Creek includes two commercial developments of approximately 5 acres. The larger development drains into an existing stormwater BMP, which is

located in Queens Creek watershed. The smaller land area consists of half of a parcel, which is partially developed and the remaining area is forested. The developed area appears to drain to the roadway outside of the Skimino Creek watershed. These two developments combined consist of less than 0.25 percent of the total Skimino Creek watershed area. As such, the existing load and WLAs were not calculated for this watershed.

Section 4

Strategies to Reduce Pollutants of Concern

Projects, programs, and structural BMPs have a known ability to reduce bacteria levels in runoff and are part of the County's plan to help reach its reduction goals. The implemented projects, programs, and structural BMPs will be evaluated based on their measurable goals on an annual basis as part of the County's assessment plan.

Unlike the Chesapeake Bay TMDL action plan guidance, there is not a prescribed methodology for calculating bacteria load reductions for projects and programs. Current available research does not support a purely quantitative approach to bacteria reduction due to unknown factors and limited research into bacteria reduction capabilities. According to the document *Pathogens in Urban Stormwater Systems*:

> "There are significant limitations associated with use of currently available models to accurately predict FIB loading and reductions associated with various management measures. These limitations are due to multiple factors such as limited understanding of fate and transport mechanisms in the natural environment, scale-related issues, limited data sets for model calibration and verification, and variable performance of stormwater control practices."

Because of these limitations, a semi-quantitative approach to bacteria reduction tracking and reporting is presented. The quantitative elements primarily relate to the degree of implementation of various practices, rather than the bacteria load reduced. Each project or program is discussed in terms of its potential for bacteria reduction and measurable metrics indicating the level of implementation within the County.

The MS4 Phase II Permit does not currently require milestones or a schedule to meet the final WLA but rather focuses on actions during the remaining years in the current permit term. The following sections outline projects and programs which the County is currently implementing for the purpose of reducing bacteria sources within its MS4.

4.1 Types of Projects and Programs

Source controls for Fecal Indicator Bacteria (FIB) are the first strategies that should be pursued when FIB impairments are identified (Pathogens in Urban Stormwater Systems, 2014). Examples of source controls are:

- Pet waste control programs
- Implementing Illicit Discharge Detection and Elimination (IDDE) programs
- Investigate and identify leaking/aging sewer infrastructure
- Identify failing septic systems and implement maintenance regulations
- Implement a reporting hotline for illegal dumping and educate the public on applicable laws
- Implement maintenance schedules for stormwater BMPs and stormwater conveyance system
- Encourage site designs that minimize directly connected impervious areas

- Implement public education programs to reduce dry weather flow from storm sewers related to irrigation practices, car washing, power washing, etc.
- Support shelters and services to reduce homelessness

Public education and outreach to citizens and businesses is an overarching source control practice that is necessary for other types of source controls to be effective. Education and outreach activities may include brochures, posters, websites, event attendance, utility bill inserts, television advertisements, articles in homeowner association newsletters and other approaches that effectively reach citizens and promote behavioral changes (Pathogens in Urban Stormwater Systems, 2014).

4.2 Structural BMPs

Information about structural BMPs and their capabilities in terms of sediment, nutrient, and bacteria removal was referenced from the *Stormwater Best Management Practices Manual* (North Carolina Department of Environment and Natural Resources, 2007). The manual provides detailed BMP descriptions and summarizes the theoretical nutrient, sediment, and bacteria removal abilities of many BMPs. In terms of bacteria removal abilities, most stormwater BMPs utilize passive reduction mechanisms. Table 4-1, referenced from *Urban Waterways Removal of Pathogens in Stormwater* (Hathaway, 2008), describes several example BMP types and their theoretical pathogen removal mechanisms.

Table 4 1: BMP Descriptions and Theoretical Removal Mechanisms

BMP Type	Description	Treatment Mechanisms Relevant to Pathogen Removal
Dry Detention Basin	Fills during storm events, retains runoff for 1 to 2 days, and then slowly, but completely, drains. Remains dry between precipitation events. Primarily used for peak flow mitigation	Drying, sun exposure, sedimentation
Wet pond	Influent runoff theoretically replaces runoff captured from previous events (plug flow). Retains runoff for 1 or 2 days and then slowly drains. Maintains permanent pool. Used for peak flow mitigation and water quality improvement.	Sun exposure, sedimentation
Stormwater Wetland	Fills during storm events, retains runoff for 1 or 2 days as it slowly drains. Maintains permanent pool and has shallower water and more vegetation than wet pond. Normally used for water quality improvement, but can be used for peak flow mitigation.	Sun exposure, sedimentation, some drying
Sand Filter	Runoff first enters a sedimentation chamber before flowing through a column of soil. Sand chamber is dry between events.	Drying, sedimentation, filtration
Bioretention	Similar to sand filter, runoff enters system and passes through a soil media, where it is filtered. May pond 6 to 12 inches. Primarily a water quality BMP. System is dry between events.	Drying, sun exposure, sedimentation, filtration
Grassed Swales	Runoff flows through an engineered, grassed channel used to convey it from one location to another.	Sedimentation, sun exposure, drying
Proprietary Devices	Use baffles, settling chambers, filtration, and other means to separate floatable solids and promote sedimentation. Primarily intended for water quality.	Varies based on manufacturer: normally sedimentation and sometimes filtration

According to *Pathogens in Urban Stormwater Systems,* the dominant passive removal mechanisms for FIB include natural inactivation (factors affecting the rate of natural inactivation are sunlight, water temperature, and exposure to air), predation, inert filtration and sedimentation, and sorption and chemical inactivation. The BMPs listed in Table 4-2 are rated in terms of low, medium, and high removal ability based on design factors that contribute to pathogen removal. The pathogen removal

scores were referenced from the *Stormwater Best Management Practices Manual (*North Carolina Department of Environment and Natural Resources, 2007*)*.

The list of BMPS in Table 4-2 includes both public and private BMPs that are completed and went online from 2007 to present. The year 2007 was used as a starting point since that was the first year after the bacteria baseline levels in streams were calculated and run through modeling scenarios for the majority of the TMDL reports. All BMPs that existed prior to 2007 were in place during the bacteria testing period and the baseline bacteria load calculations account for their presence.

The projects are displayed on watershed specific maps, Figures 4.2-1 through 4.2-6, in Appendix A. There are a total of 106 BMPs built after 2007.

Table 4 2. Number of Existing Public and Privately Maintained BMP Types with Pathogen Removal Abilities by Watershed[1]

Type of BMP and Pathogen Removal Ability		Watershed						
		Back Creek	Back River	Baptist Run	Kings Creek	Poquoson River	Queens Creek	Warwick and James River
High	Bioretention	0	7	1	0	10	1	1
	Sand filter	0	0	0	0	0	0	0
	Infiltration devices	0	7	0	0	12	4	3
Total High Removal BMPs		**0**	**14**	**1**	**0**	**22**	**5**	**4**
Medium	Stormwater wetlands	0	1	0	0	1	0	0
	Wet detention basin	0	1	0	3	12	2	0
	Filter strip	0	0	0	0	0	0	0
	Restored riparian buffer	0	0	0	0	0	0	0
	Dry extended detention basin	0	5	1	2	16	7	0
Total Medium Removal BMPs		**0**	**7**	**1**	**5**	**29**	**9**	**0**
Low	Grassed swale	0	1	0	0	5	0	0
	Permeable pavement system	0	0	0	0	0	0	0
	Rooftop runoff management	0	0	0	0	0	0	0
Total Low Removal BMPs		**0**	**1**	**0**	**0**	**5**	**1**	**0**
Unknown	Manufactured BMP Systems[1]	0	1	0	0	5	2	0
Total Unknown Removal BMPs		**0**	**2**	**0**	**1**	**7**	**5**	**0**

[1]Removal efficiencies were not included in *Stormwater Best Management Practices Manual* (North Carolina Department of Environment and Natural Resources, 2007).

[2]Total BMPs per watershed were determined by applying a 50-foot buffer to the watershed boundary to account for potential error in the geolocations of BMPs.

The total acres treated by BMPs per watershed are shown in Table 4-3. Overall, there are 1,082 acres treated in the MS4 service area, which is over ten percent of the County's total MS4 service area. Additionally, over half of the MS4 acres in Kings Creek watershed are draining to a BMP.

Table 4 3: Total Acres Treated by BMPs per Watershed

Watershed	Total MS4 Area in Watershed (acres)	Area Treated by BMPs[1] (acres)	Percent of Total MS4 Area Treated
Back River	2,216	165	7%
Baptist Run	111	2	2%
Kings Creek	446	278	62%
Poquoson River	5,619	484	9%
Queens Creek	1,109	148	13%
Warwick and James River	201	5	2%
Total	**9,702**	**1,082**	**11%**

[1]Acres treated are from BMPs constructed 2007 to present.

Planned BMPs

In addition to the BMPs listed in Table 4.2, the County has stormwater BMP projects planned for future implementation. Table 4.4 lists the planned municipal BMPs, the year the project will go into design, and the watershed that the project will be constructed in.

Table 4 4. Planned BMPs

Stormwater Project	Design Year	Watershed
Poquoson Headwaters Pond and Stream Restoration	2017	Poquoson
Charles Brown Park Stream Restoration	2018	Baptist Run
Siege Lane Pond	2018	Baptist Run
Goodwin Neck Pond and Stream Restoration	2018	Poquoson
NNWW Best Pond	2018	Baptist Run

The County's goal is to continue design on new BMP projects.

Inspection and O&M Verification for Privately-Owned BMPs

The two elements of the County's private BMP strategy are BMP maintenance agreements and inspection activities. The County requires an agreement between the BMP owner and the municipality that outlines the maintenance schedules for each BMP. Inspecting and maintaining BMPs ensures the BMPs optimal performance in terms of water quality. The County implements inspection activities for all privately owned BMPs in accordance with written policies and procedures. The County is required to inspect privately-owned BMPs once every five years, however they have implemented a program to inspect BMPs more frequently to ensure proper performance.

The measurable goal for this activity is to inspect all private BMPs annually.

Inspection and Maintenance Schedules for County-Owned BMPs

The County conducts inspection and maintenance activities for each county-owned BMP. The inspections are conducted based on schedules and procedures developed in accordance with Stormwater Management (SWM) regulations. Inspecting and maintaining BMPs ensures the BMPs' optimal performance. The County is required to inspect privately-owned BMPs once every year.

The measurable goals for this activity is to inspect all County owned BMPs annually.

4.2.1 BMPs Implemented as Part of the Chesapeake Bay TMDL Action Plan

As part of the Chesapeake Bay TMDL Action Plan, the County will implement five stormwater BMPs that fall within the MS4 service area and a bacteria TMDL watershed. Several BMPs are on school or municipal property. The BMPs are:

- York County H-1 Regional BMP at the Sports Complex located in the Poquoson River watershed. The BMP treats 83 acres.
- Greensprings Stream Restoration located in the Queens Creek watershed. The drainage area to the stream restoration is 79 acres.
- Dare Elementary School Constructed Wetland and Stream Restoration located in the Poquoson River watershed. The wetland treats 64 acres and the drainage area to the stream restoration is 98 acres.
- Edgehill South Stream Restoration located in the Poquoson River watershed. The drainage area to the stream restoration is 295 acres.

4.3 Illicit Discharge Detection and Elimination

York County Stormwater Program section maintains a Standard Operating Procedure (SOP) for identifying, tracking and evaluating illicit discharges at stormwater outfalls as part of their Illicit Discharge Detection and Elimination (IDDE) program. As a part of the current Phase II MS4 permit, the County is mapping stormwater outfalls and inspecting for IDDE, including dry weather flow detection. Mapping of the outfalls are ongoing, as this permit requirement is due to DEQ as part of the 2016 VSMP report. As of August 2015, no illicit discharges have been documented during outfall evaluation.

Additional illicit discharges are documented when they are discovered and resolved by the County. Numbers presented in Table 4-5 are based on records documented within the County's annual VSMP reports. Relevant documentation is integrated into GIS and the Hansen CMMS for record maintenance. Statistics were based on incidents logged during the respective fiscal years.

Table 4 5: York County Illicit Discharge Summary		
Fiscal Year	IDDE Reported	IDDE Resolved
2011	5	5
2012	11	11
2013	15	15
2014	30	30
2015	15	15

Under the December 2014 Consent Order, the County is still responsible for implementation of a sanitary sewer MOM program. The County is currently enacting this program as a routine function of the Utility Division. Sanitary sewer service areas not addressed by HRSD as part of the Regional Wet Weather Management Plan (RWWMP) will likely become part of the County MOM program in the future.

The County's goal is to resolve all IDDE incidents.

Dry Weather Outfall Screening

As part of the County's IDDE program, field testing and an Outfall Reconnaissance Inventory (ORI) will be conducted annually. The ORI program will consist of performing dry weather screening of a minimum of 50 outfalls in the MS4 (or if there are less than 50 outfalls, all outfalls in the MS4). The ORI form includes sections to record the outfall condition and the condition of the flow (if present). Minimizing dry weather flows, in addition to removing illicit discharges, helps to reduce bacteria by maintaining a dry environment in the storm system.

The County's goal is to inspect 60 outfalls annually.

4.4 Sewer Inspection and Rehabilitation

The County provides sanitary sewer services to approximately 20,000 customers within its municipal limits. The Utility Division of the County's Public Works Department (PWD) plans, designs, operates, and maintains the locality sanitary sewer system. The locality collection system conveys wastewater to the Williamsburg and York River Wastewater Treatment Plants, which are operated by HRSD.

Wastewater infrastructure problems are mitigated through a process of risk assessment, inspection, and rehabilitation. The main focus is Infiltration and Inflow (I/I) reduction. Defects that allow infiltration during wet weather events can also have potential for sewage exfiltration under dry weather conditions. Therefore, resolving I/I problems has potential to reduce bacteria sources under both wet and dry flow conditions.

Smoke testing identifies inflow sources such as structural damage in sewer pipes or manholes, cross connections including roof leaders, foundation drains, yard drains, storm sewers, and undocumented connections. Inflow sources have a direct influence on wet weather peak flows, which can result in overflows. The County has conducted smoke testing, in conformance with widely used industry guidance, on all portions of the gravity collection system.

Manhole inspections are also an important component of the gravity sewer assessment due to the susceptibility of manholes to structural defects and I/I that may contribute to sanitary sewer

overflows (SSOs). Over the course of Special Order of Consent(SOC) investigations, the County has checked/inspected approximately 80% of active sanitary manholes.

In addition, closed circuit television (CCTV) inspection is performed to confirm the location and magnitude of issues such as structural problems, points of I/I, capacity issues, and blockages within the gravity sewer system. Current MOM goals include CCTV inspections of all public gravity mains every 10 years at a general pace of 20 miles inspected annually.

Sanitary assets are typically delineated by sewer catchment service area, but have been attributed spatially by watershed for comparison of inspection program statistics. Numbers presented by watershed include sanitary components based on the likely area to be impacted by an overflow or breakage at a given asset, with deference to network connectivity. Summary results of inspection activities are provided in Table 4-6. Although private and HRSD assets are also present within York County, only County owned infrastructure was included in the table listing.

Table 4 6. Sanitary Sewer Evaluation Activities

Category		Overall York County[1]	Bacteria TMDL Watersheds[1]							
			Back Creek	Back River	Baptist Run	Kings Creek	Poquoson River	Queens Creek	Skimino Creek	Warwick and James River
Sanitary Sewer Assets	Gravity Pipe (lf)	~1,250,000	0	253,380	13,048	77,802	573,509	183,324	7,196	26,115
	Number of Manholes	~6,500	0	1,280	65	454	2,761	934	49	121
	Vacuum Sewers (lf)	~330,000	23,515	0	0	0	227,053	Unk [3]	0	0
	Number of Pump Stations	71	0	11	2	3	27	14	2	1
	Number of Vacuum Stations	7	0	0	0	0	5	1[3]	0	0
SOC Inspection Activities	Smoke Testing (lf)	Virtually all gravity portions of the York County owned public system have been smoke tested.								
	Number of MH Surveys	5,082	0	913	49	383	2,276	777	35	121
	Cleaning & CCTV (lf) [2]	338,448	0	42,596	3,279	9,485	183,521	73,066	0	21,016
Smoke Defects	Number Recorded	1,068	0	216	30	63	388	246	0	52
	Number Resolved	720	0	140	25	51	237	179	0	32
Manholes	Number with Mod/Severe Infiltration	750	0	56	4	47	485	99	0	20
	Number of Rating 4/5	66	0	0	0	8	37	19	0	0
CCTV Results	Linear Feet of Gravity Main with at Least One Rating QR 4/5	85,496	0	7,002	2,338	3,470	49,823	18,080	0	1,068

[1] Data was spatially assigned per bacteria TMDL Watershed area. Overall totals include assets outside of bacteria TMDL watersheds. Sanitary GIS data as of January 2015. Skiffs Creek and Felgates Creek have no County owned sanitary assets.

[2] Assumes light cleaning of pipe segment prior to CCTV and accounts for full pipe length regardless of survey abandonment.

[3] Unknown system details for Queens Lake Community Septic to Sewer Conversions.

The County has performed considerable repair work in recent years to improve the stability and performance of the wastewater collection system. The County continues to execute routine maintenance and critical infrastructure repairs to reduce potential for leaks and overflows within the system. Additional rehabilitation activities conducted by HRSD are anticipated under the future

regional wet weather management plan effort. The potential impacts of wastewater infrastructure improvements and maintenance to water quality will continue to be evaluated.

The County has remained proactive in their sewer inspection and rehabilitation program. Additional rehabilitation of sewer systems in the Baptist Run watershed are currently underway.

4.5 Septic to Sewer Conversion

Septic systems are an important source to consider for human bacteria and the County is choosing to focus its efforts on the reduction of direct human source bacteria to surface waters. According to the document *Pathogens in Urban Stormwater Systems,* identification and removal of human sources of FIB is expected to be most beneficial in terms of reducing human health risks in recreational waters. The suggested first step in addressing FIB impairments is to inventory the various FIB sources specific to the watershed, and prioritize human FIB sources first, given the greater public health risks they may present. The risk presented by fecal contamination from nonhuman sources has been shown in some cases, to be potentially less than the risk presented by fecal contamination from human sources.

Failing on-lot wastewater systems, primarily septic systems, are a potential source of poorly or untreated sewage into either the storm sewer system or directly to receiving waters. Septic systems and piping can leak and/or allow stormwater to enter and displace sewage/septage into the ground where it can leak into a nearby storm sewer pipe, onto the ground where it is transported via overland flow, or into the groundwater where the pathogens may be transported to a surface receiving water (Pathogens in Urban Stormwater Systems, 2014).

The County is conducting an ongoing septic to sewer conversion program as part of pollutant reduction efforts for the Chesapeake Bay TMDL. These activities are concurrently beneficial to bacteria TMDL reduction goals for the York County MS4 service area. Between July 2009 and June 2015, 773 homes have been connected to the County's sanitary collection system. These were geocoded by address and attributed by watershed boundaries. Table 4-7 presents the septic to sewer conversion actions that fall within the MS4 service area.

Table 4 7. York County Septic to Sewer Conversions

Bacteria TMDL Watersheds	Number of Septic Conversions	w/in MS4 service area [1]
Back Creek	1	0
Back River	36	36
Baptist Run	0	0
Kings Creek	0	0
Poquoson River	132	97
Queens Creek	334	321
Warwick and James River	0	0
Total	503	454

[1] Spatial assignment using MS4 service area boundary with a 50 ft. buffer.

The County has been proactive in its efforts to continue septic to sewer conversions and is completing the connection of an additional 212 homes in the Queens Creek watershed during the 2017 calendar year.

Furthermore, the County is planning potential additional conversion projects for future years as shown in Table 4-8. Completion of planned future projects will depend on available funding.

Table 4 8. Potential Future York County Septic to Sewer Conversions

Bacteria TMDL Watersheds	Number of Septic Conversions	Design Year
Poquoson	10	2018
Poquoson	72	2019
Queens Creek	35	2019
Poquoson	14	2019
Poquoson	38	2019
Kings Creek	7	2019
Poquoson	98	2021
Queens Creek	75	2022
Poquoson	98	2023
Total	447	

Measurable goals for this activity is to track the number of homes connected to the County sewer system annually.

4.6 Public Education and Outreach

A component of the County's public outreach and education program includes presenting online materials on the locality website and on a website called askHRgreen.org. "AskHRgreen.org is a public awareness program of the 17 local governments in Hampton Roads administered through the Hampton Roads Planning District Commission (HRPDC), which encourages environmental stewardship among all residents in southeastern Virginia. Work on the initiative began in July 2010 as the askHRgreen.org Executive Committee started to consolidate individual programs begun by HRPDC's HR CLEAN, HR FOG, HR STORM and HR WET committees into one comprehensive, regional awareness campaign. The idea is to develop a central, go-to resource for everything green in Hampton Roads—from earth-friendly landscaping ideas and pointers for keeping local waterways "debris-free" to recycling tips and simple steps to make local living easy on the environment."

The County contributes to the content and maintenance of askHRgreen.org website. Activities for public outreach and education related to either the locality website or askHRgreen.org are listed in the following subsections.

Regional Media Campaign

The County will participate in the askHRgreen.org regional media campaign to address high-priority issues which provides information and a message about stormwater via print, television (local municipal access, cable, and local affiliate), radio, and social media.

The County will distribute educational materials developed through askHRgreen.org to residents at local farmers markets, libraries, County buildings, and Home Owners Associations (HOAs). Examples of educational materials distributed are pens (which contain stormwater information), brochures, and pamphlets provided by askHRgreen.org.

The measurable goal for this activity is the County will participate in at least 4 public events. Additionally, the County will report on the proportionate number of impressions from media campaigns such as from television and radio of the County's population to the total population of the Hampton Roads area.

Fats, Oils, and Grease (FOG) Campaign

Materials related to the FOG campaign will be distributed as part of the regional media campaign. Educating citizens on the impact of fats, oils, and grease in the sewer systems can have an impact on the number of FOG-related SSOs. SSOs represent one of the main sources of human fecal bacteria potentially reaching surface waters. This program will utilize the same goal as the regional media campaign.

Scoop the Poop Campaign

The County implements a Scoop the Poop campaign which makes Scoop the Poop information and giveaways available where citizens receive animal licenses and at pet-related events. The next two years of the permit term will be used to evaluate the effectiveness of the current campaign. Additionally, the County makes stations available to residents to install. Reducing pet waste in a watershed reduces a large source of fecal bacteria from entering surface waters.

The measurable goal associated with this activity is to track the number of active pet waste stations.

Regional Outreach for Volunteer Opportunities

The County will post a volunteer opportunity on the askHRgreen.org calendar for Clean the Bay Day. Clean the Bay Day gathers volunteers from throughout Virginia to come together for an annual "Spring Cleaning:" of the Chesapeake Bay. Volunteers can register for a locality and will be assigned a location for litter removal.

A measurable goal for this activity is to track the number of bags of trash collected.

Participate in Regional Committees

The County participates in regional committee meetings on subjects about stormwater, scoop-the-poop campaigns, and joint environmental.

A measurable goal for this activity is to attend 12 meetings annually.

4.7 York County Beautification Committee

The York County Beautification Committee (YCBC) is a group of citizen volunteers who are appointed by and report to the Board of Supervisors. The Recycling and Beautification Coordinator, a County staff member, administers the work of the committee and serves as its liaison to the County. Funding for activities comes from the Virginia Department of Environmental Quality through the Litter Prevention and Recycling Grants Program, as well as other fundraising activities taken on by the Committee itself. The purpose of the County Beautification Committee is to "promote a cleaner, more attractive York County and increase awareness of environmental issues among York County citizens." To accomplish these goals, the Beautification Committee conducts or supports several programs throughout each year.

- Adopt-A-Spot program: The Adopt-A-Spot Program was created by the Recycling and Litter Prevention office as a supplement to Virginia's Adopt-a-Highway Program. Groups and/or individuals are encouraged to play active and ongoing roles in beautifying, cleaning and maintaining the County's public spaces, including creeks and storm drains. Adopt-A-Spot activities might include removing litter, graffiti and/or weeds, maintaining a storm drain, and/or other forms of general upkeep. In certain locations, special landscaping features such as grass,

plants, and flowers may even be added if they meet with Virginia Department of Transportation (VDOT) and/or property owner specifications. Similar to the popular "Adopt-A-Highway" program sponsored by VDOT, organizations and individuals receive public recognition of their work through the prominent display of a sign "on the spot".

- Tree giveaways and plantings: Each year, in celebration of Earth Day and Arbor Day, the YCBC gives out hundreds of tree seedlings as available from the Department of Forestry. The committee is also responsible for the beautiful daffodils along Routes 17, 171, and 134 in the County. The Committee purchases the bulbs, selects the sites, and then works with VDOT to have them planted. To date, the number of daffodils planted as part of this project has reached into the thousands.

Measurable goals for these activities are:

- The number of active spots maintained within the County
- The number of trees given away annually, as available from the Department of Forestry

4.8 Pollution Prevention/Good Housekeeping

The County currently implements operations and maintenance activities, Storm Water Pollution Prevention Plans (SWPPP), employee education and training, and tracking in the pollution prevention and good housekeeping program. The programs elements are described in the following subsections.

Operations and Maintenance Activities

The County currently implements an O&M BMP for high-priority facilities.

The high-priority facility BMP includes several elements. The first step is to identify any municipal high-priority facilities that have the potential to discharge stormwater pollutants. The second step is to develop and implement SWPPPs for the identified high-priority facilities. Once SWPPPs are completed, employee training programs can be implemented at each facility.

The measurable goal is the number of employees trained in the developed SWPPPs annually.

Employee Education and Training

The County's employee education and training elements, along with their measurable goals, are identified in Table 4-9.

Table 4 9. BMPs Associated with Employee Education and Training	
BMP	**Description**
IDDE Training for Field Personnel	Provide training to field personnel in the recognition of illicit discharges. Illicit discharge prevention is an important step in reducing sources of bacteria.
Streets and Parking Lot Maintenance Training	Provide training to Streets and Landscape Divisions for road, street, and parking lot maintenance. Proper maintenance of streets and landscapes can reduce sediment and organic matter from entering the storm system, which reduces bacteria mobilization mediums.
Public Works Facilities Training	Provide training to Public Works personnel on good housekeeping and pollution prevention practices. Good pollution prevention practices can help to reduce sources of bacteria.
E&SC and SWM Training	Ensure that plan reviewers, inspectors, and program administrators obtain the appropriate certifications as required under the Erosion and Sediment Control Law. Increased education on sediment control can help increase good sediment control practices. Sediment can serve as a medium for bacteria mobilization.
Parks and Recreation Employee Training	Provide training to Parks and Recreation personnel on good housekeeping and pollution prevention practices. Good pollution prevention practices can help to reduce sources of bacteria.
Emergency Response Employee Training	Provide training and certification in spill response to emergency response employees. Good pollution prevention practices can help to reduce sources of bacteria.

The measurable goals for these activities are:

- Track employees requiring training and employees who underwent training to ensure that trainings are kept up to date
- Track the number of employees requiring certification and the number of employees holding each certification type

Section 5

Facilities of Concern

Facilities of concern are defined as any area that has a higher than normal bacterial load for its land use and is owned and/or operated by the municipality. Some examples of facilities of concern are dog parks, equine facilities, and sewer pump stations.

According to the York County Department of Parks, Recreation, and Tourism, the County does not contain any municipal dog parks, fish cleaning stations, equine facilities, and police dog or equine training facilities. An evaluation of the County's GIS data indicated that municipal owned pump stations are located within the MS4 service area. County Sanitary Sewer Pump/Vacuum Stations can be found in Table 5-1 with locations on Figure 5.1 in Appendix A.

Table 5 1. York County Pump/Vacuum Stations Within the MS4 Service Area

Bacteria TMDL Watersheds	Pump/Vacuum Stations
Back Creek	0
Back River	11
Baptist Run	2
Kings Creek	2
Poquoson River	26
Queens Creek	5
Warwick and James River	2
Total	**48**

Section 6

Methods of Assessment and Schedule of Milestones

As part of the Phase II MS4 permit special conditions, the County must develop and implement methods to assess the TMDL action plan for its effectiveness in reducing the pollutants of concern as described in Section 2.3 and include an assessment of the facilities of concern as described in Section 5.

6.1 Evaluating Programmatic Measures and Schedule of Milestones

The County will assess the effectiveness of its programmatic BMPs as described in Sections 4.3 to 4.8 by tracking measurable goals for each activity. At a minimum, the County will ensure funding for projects and programs which are included in Table 6-1. Table 6-1 shows a list of the County's programmatic measures and their associated measurable goals throughout the permit term.

Table 6 1. Schedule of Milestones and Reporting Criteria			
BMP	Year 4 Goals	Year 5 Goals	Reporting Criteria
Inspection and O&M Verification for Privately-Owned BMPs	Inspect all private BMPs annually	Inspect all private BMPs annually	Number of BMP inspections annually
Inspection and Maintenance Schedules for County-Owned BMPs	Inspect all County owned BMPs annually	Inspect all County owned BMPs annually	Number of BMP inspections annually
Illicit Discharge Detection and Elimination	Resolve all reported IDDE claims	Resolve all reported IDDE claims	Number of IDDE incidents reported and resolved annually
Dry Weather Outfall Screening	Inspect 60 outfalls	Inspect 60 outfalls	Number of outfalls inspected annually
Septic to Sewer Conversion	Track the number of homes that have converted to sewer system from septic	Track the number of homes that have converted to sewer system from septic	Number of homes connected to the County sewer system annually
Regional Media Campaign	The County will participate in at least 4 public events	The County will participate in at least 4 public events	-Number public events that the County participates in annually -Number of proportionate impressions from askHRgreen
Scoop the Poop Campaign	Track the number of active pet waste stations	Track the number of active pet waste stations	Number of active stations provided by the County
Regional Outreach for Volunteer Opportunities	Track the number of trash bags collected on clean the bay day	Track the number of trash bags collected on Clean the Bay Day	Number of bags of trash from Clean the Bay Day collected
Participate in Regional Committees	Attend a minimum of 12 meetings	Attend a minimum of 12 meetings	Number of meetings attended
York County Beautification Committee	- Track the number of active spots maintained in the County - Track the number of trees given away (if available)	- Track the number of active spots maintained in the County - Track the number of trees given away (if available)	-The number of active spots maintained within the County -The number of trees given away annually, as available from the Department of Forestry
Operations and maintenance for high priority facilities	Track the number of employees trained in SWPPPs annually	Track the number of employees trained in SWPPPs annually	Number of employees trained in the developed SWPPPs annually
Employee training and education	-Track employees requiring training and employees who underwent training to ensure that trainings are kept up to date -Track the number of employees requiring certification and the number of employees holding each certification type	-Track employees requiring training and employees who underwent training to ensure that trainings are kept up to date -Track the number of employees requiring certification and the number of employees holding each certification type	-The number of employees trained annually -The number of employees holding each certification type

6.2 Monitoring

For the purpose of assessing the effectiveness of the TMDL action plan, the County will utilize the long-term monitoring station results from the DEQ monitoring stations. It is assumed that DEQ sampling methods meet the level of monitoring analysis required by the Phase II MS4 Permit. The County will evaluate instantaneous single sample values and geometric mean sampling data when available. The instantaneous samples will be analyzed to determine percentage of exceedances over the previous years. Additionally, the sampling data may be evaluated for long-term trends to assess the effectiveness of currently implemented programs. Table 6-2 displays the current DEQ monitoring stations that test for bacteria within the County. The data was sourced from the DEQ website using the draft 2014 data.

Table 6 2. DEQ Monitoring Stations Within York County	
DEQ Monitoring Station ID	Watershed
8-FEL000.19	Kings Creek
8-KNG004.46	Kings Creek
8-QEN002.47	Queens Creek
8-QEN007.02	Queens Creek
8-QEN007.22	Queens Creek
8-QEN007.65	Queens Creek
8-QEN008.58	Queens Creek
8-YRK001.64	York River-Sarah Creek

It is likely that there will be a lag time (time between implementation of BMPs and response in surface water quality) before the County will see a reduction in the bacteria counts from their efforts in each impaired watershed. The lag time may vary between water bodies depending on the individual characteristics of each stream and watershed.

6.3 Assessment of Facilities of Concern

The facilities of concern identified in Section 5 are pump/vacuum stations owned and operated by the County within the MS4 service area. Each station is visited at least twice each week. During each visit, the pump station crew records any maintenance activities they perform as well as run time for each pump, run time for the generator, if one exists, and general condition information. As part of the County's Management Operations and Maintenance (MOM) Report, daily monitoring protocols for the pump stations are included. The utilities department has a Supervisory Control and Data Acquisition (SCADA) System that monitors the daily operations of all of the County's pump stations. The SCADA uses three main tower locations for each individual station's Remote Terminal Units (RTU) to communicate through telemetry. The central computer is located in the DPW Administration Building or 911 Center.

In addition to the daily monitoring through SCADA, the County has pump station SOPs for pump and haul operations, sewer spills, and force main breaks. The detailed sheets for these SOPs can be found in Appendix C.

The County's maintenance program for its pump/vacuum stations conforms to the regulations as provided by the Virginia Department of Health (VDH) Sewage Collection and Treatment (SCAT) regulations.

6.4 Annual Reporting Requirements

Under Section 5 of the Phase II MS4 Permit special conditions, the County is required to submit on an annual basis:

- TMDL Action Plans with the appropriate annual report and in accordance with the associated schedule identified in the state permit
- A report on the implementation of the TMDL Action Plans and associated evaluation, including the results of any monitoring conducted as part of the evaluation

Additionally, the County will evaluate the effectiveness of its TMDL action plan using DEQ monitoring station results and measurable goals from the implemented programmatic measures.

Section 7

Legal Authority for TMDL Implementation

The Phase II MS4 Permit requires that the Plan document the current program and legal authority, new or modified legal authority, and the means and methods to address discharges from new sources.

7.1 Current Program and Existing Legal Authority

The County revised its ordinances in 2003 to be in compliance with the Virginia Stormwater Management Program (VSMP) requirements. In addition, the County maintains a Phase II MS4 Permit and an inter-jurisdictional agreement with the City of Newport News. The following components of the County's MS4 program will be utilized to meet the Special Condition:

- Code of the County of York, Virginia
  - Chapter 10: Erosion and Sediment Control Ordinance
  - Chapter 23.1: Wetlands
  - Chapter 23.2: Chesapeake Bay Preservation Area
  - Chapter 23.3: Stormwater Management Ordinance
  - Chapter 24.1: Zoning
- Permits
  - DEQ Permit Number VAR040028 - General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems
- Inter-jurisdictional Agreements
  - Leasing Agreement with City of Newport News for Lease of the H-1 Regional BMP at Sports Complex
- Other Enforceable Mechanisms
  - Eminent Domain

7.2 New or Modified Legal Authority

No new legal authority is planned during this permit term to achieve compliance with the Phase II MS4 Permit.

Section 8

Conclusion

York County has developed this TMDL Action Plan as required in the Phase II MS4 Permit. The WLAs developed under this action plan were formulated using TMDL report documents sourced from DEQ and reproducing the methodology provided within to the maximum extent practicable.

It is understood that the TMDL values calculated for the County may not represent the County's actual bacteria contribution to surface waters. The interconnectivity of surface waters to multiple MS4s and other land uses outside of the MS4 coupled with the lack of definitive removal rates for individual BMPs makes it nearly impossible to predict whether the actions of the County will reduce FIB concentrations in the stream to use standard levels. Additionally, current research points to the fact that the majority of conventional stormwater controls in the BMP Database (i.e. stormwater wetlands, wet ponds, bioretention) do not appear to be able to reduce FIB concentrations to primary contact stream standards (Pathogens in Urban Stormwater, 2014).

Per permit requirements, the County will continue to implement BMPs in an effort to reduce FIB loading to surface waters. The County is required to provide an updated TMDL Action Plan at the end of the current Phase II MS4 permit term in 2018. As more research becomes available, the County may update this plan in an effort to implement the most effective practices. Modifications to this plan will be documented in Appendix B.

Section 9

Limitations

This document was prepared solely for York County in accordance with professional standards at the time the services were performed and in accordance with the contract between York County and Brown and Caldwell dated January 9, 2015. This document is governed by the specific scope of work authorized by York County; 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 York County and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

Section 10

References

DEQ Virginia Department of Environmental Quality, http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityStandards/DesignatedUses.aspx (4/07/16).

Jon M. Hathaway, E.I., William F. Hunt. 2008. Urban Waterways Removal of Pathogens in Stormwater.

MapTech, Inc., Fecal Bacteria Total Maximum Daily Load Development for Warwick River, Virginia Department of Environmental Quality, 2007.

North Carolina Department of Environment and Natural Resources, Stormwater Best Management Practices Manual, 2007

The Louis Berger Group, INC., Bacteria Total Maximum Daily Load (TMDL) Development for the Queen Creek, King Creek, and Felgates Creek Watersheds, Virginia Department of Environmental Quality, 2008

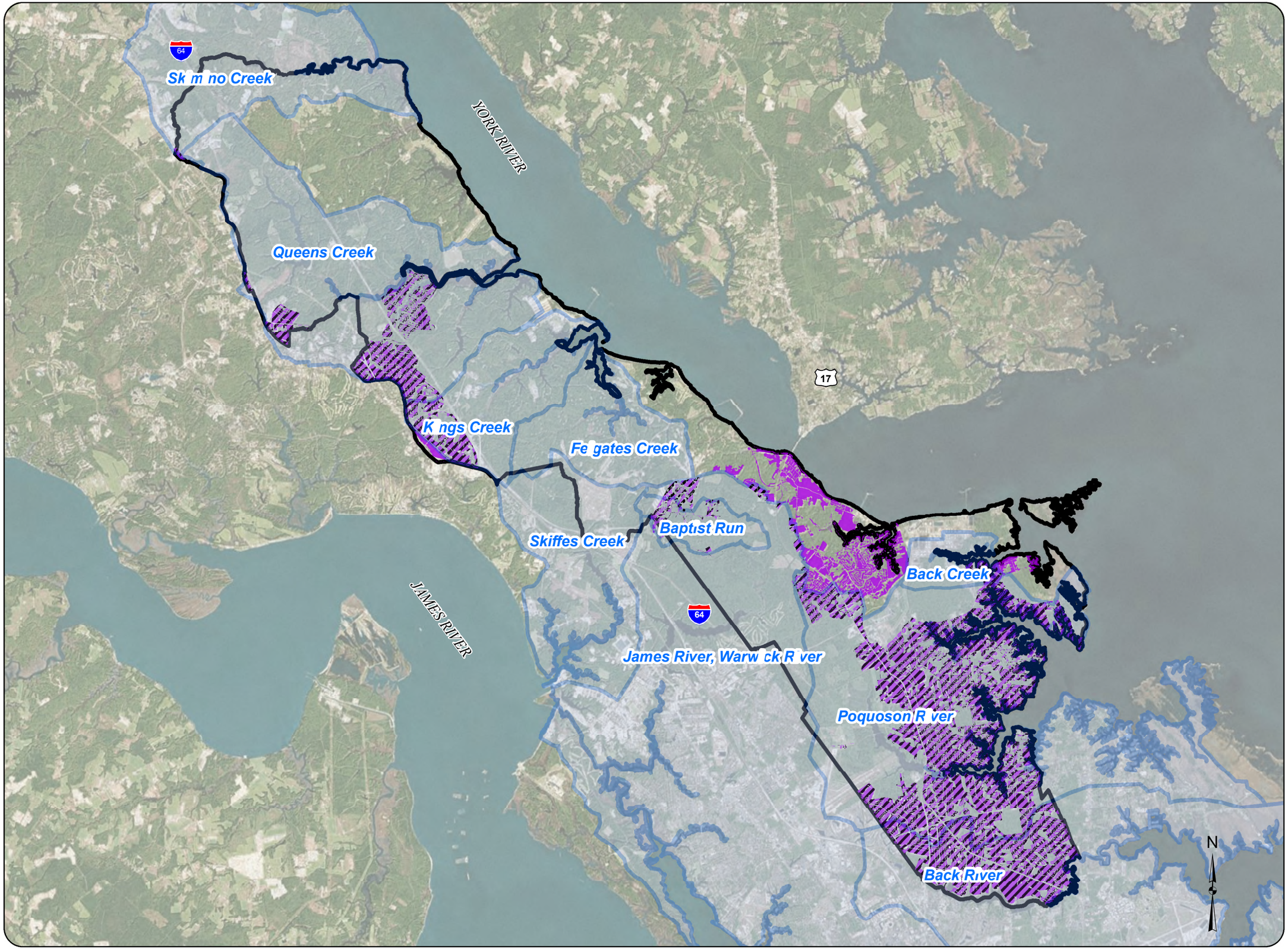
Urban Water Resources Research Council, Pathogens in Wet Weather Flows Technical Committee, Environmental and Water Resources Institute, American Society of Civil Engineers. 2014. Pathogens in Urban Stormwater Systems.

Virginia Department of Environmental Quality, TMDL Report for Chesapeake Bay Shellfish Waters: Ware Creek, Taskinas Creek, and Skimino Creek Bacterial Impairments in York, James City, and New Kent Counties, VA, 2010

Virginia Institute of Marine Science, Total Maximum Daily Loads of Bacteria for Back River in York County and Cities of Hampton, Poquoson, and Newport News, Virginia, Virginia Department of Environmental Quality, 2014

Virginia Institute of Marine Science, Total Maximum Daily Loads of Bacteria for Poquoson River and Back Creek in the City of Poquoson and in York County, Virginia, Virginia Department of Environmental Quality, 2014

Appendix A: Maps



York County

MS4 Service Area

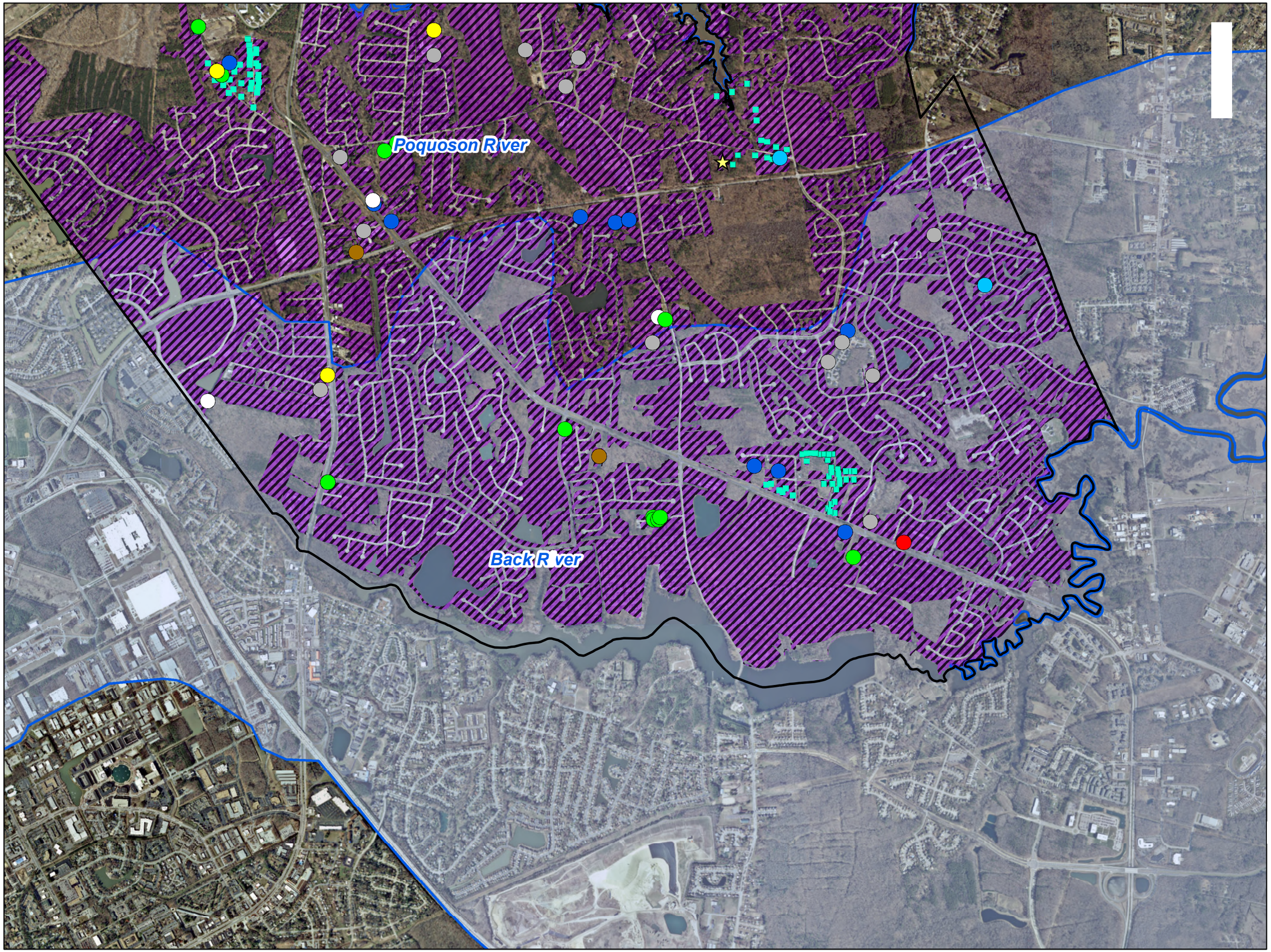
Bacteria TMDL Watersheds

Legend

- Intersection Area
- Bacterial TMDL Watersheds
- MS4 Service Area
- York County Boundary

Figure 2.1

Brown AND Caldwell



York County, Virginia
TMDL Action Planning
Local Bacteria Removal Requirements

Watershed: Back River
BMP Projects and Septic to Sewer Conversions

Legend

- York County Boundary
- Bacteria TMDL Watershed
- MS4 Service Area
- Intersection Area
- Septic-to-Sewer Conversions

York Country BMPs

- Municipal Projects

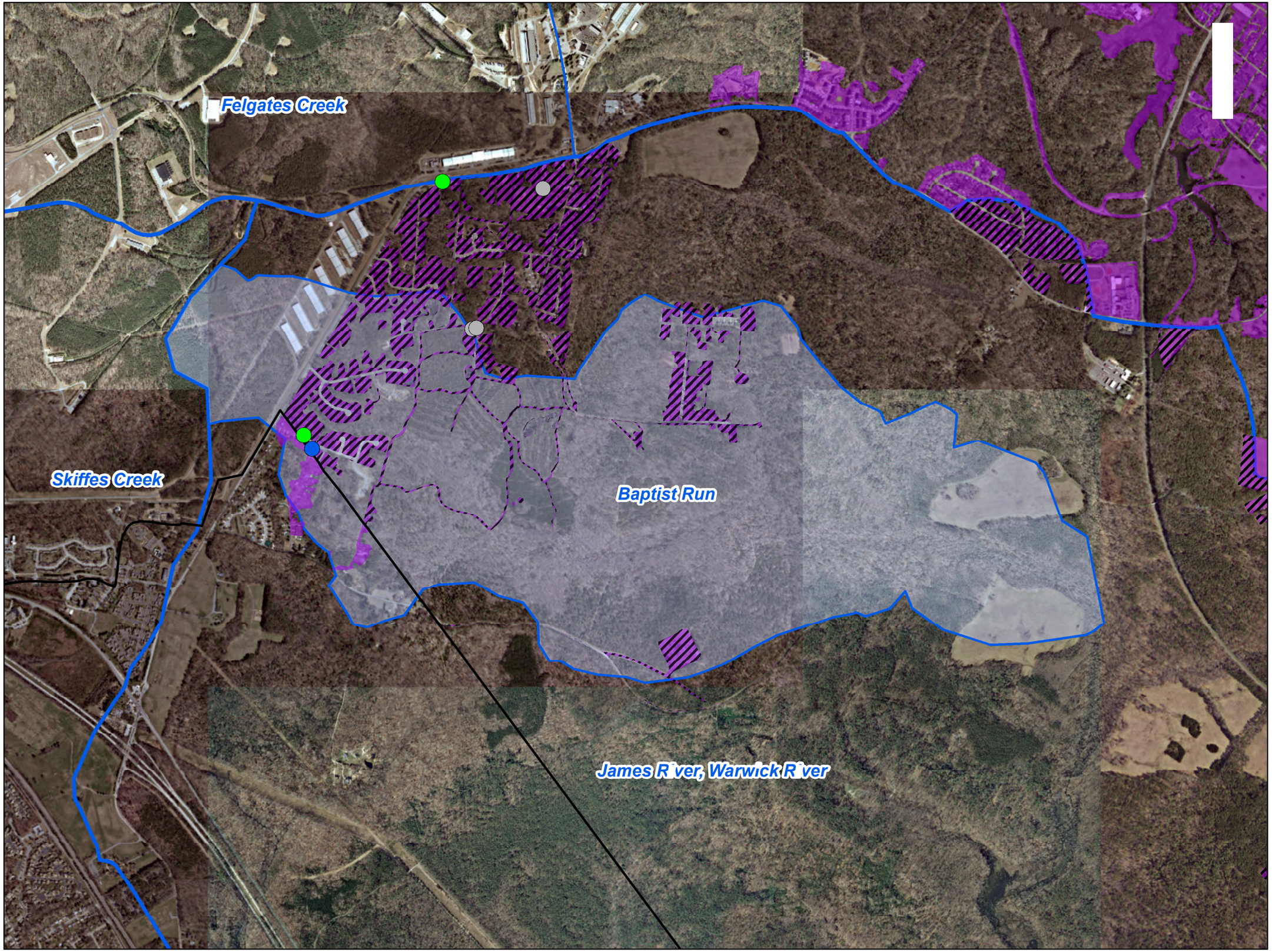
Private Maintained BMPs

- Bioretention Basins
- Constructed Stormwater Wetland
- Detention Basin
- Extended Detention Basin
- General Infiltration Practices
- Grassed Swale
- Manufactured BMP
- Retention Basin

Figure 4.2-1

Brown AND Caldwell

0.25 0.125 0 0.25
Miles



York County, Virginia
TMDL Action Planning
Local Bacteria Removal Requirements

Watershed: Baptist Run

BMP Projects and Septic to Sewer Conversions

Legend

- York County Boundary
- Bacteria TMDL Watershed
- MS4 Service Area
- Intersection Area

York Country BMPs

- Municipal Projects

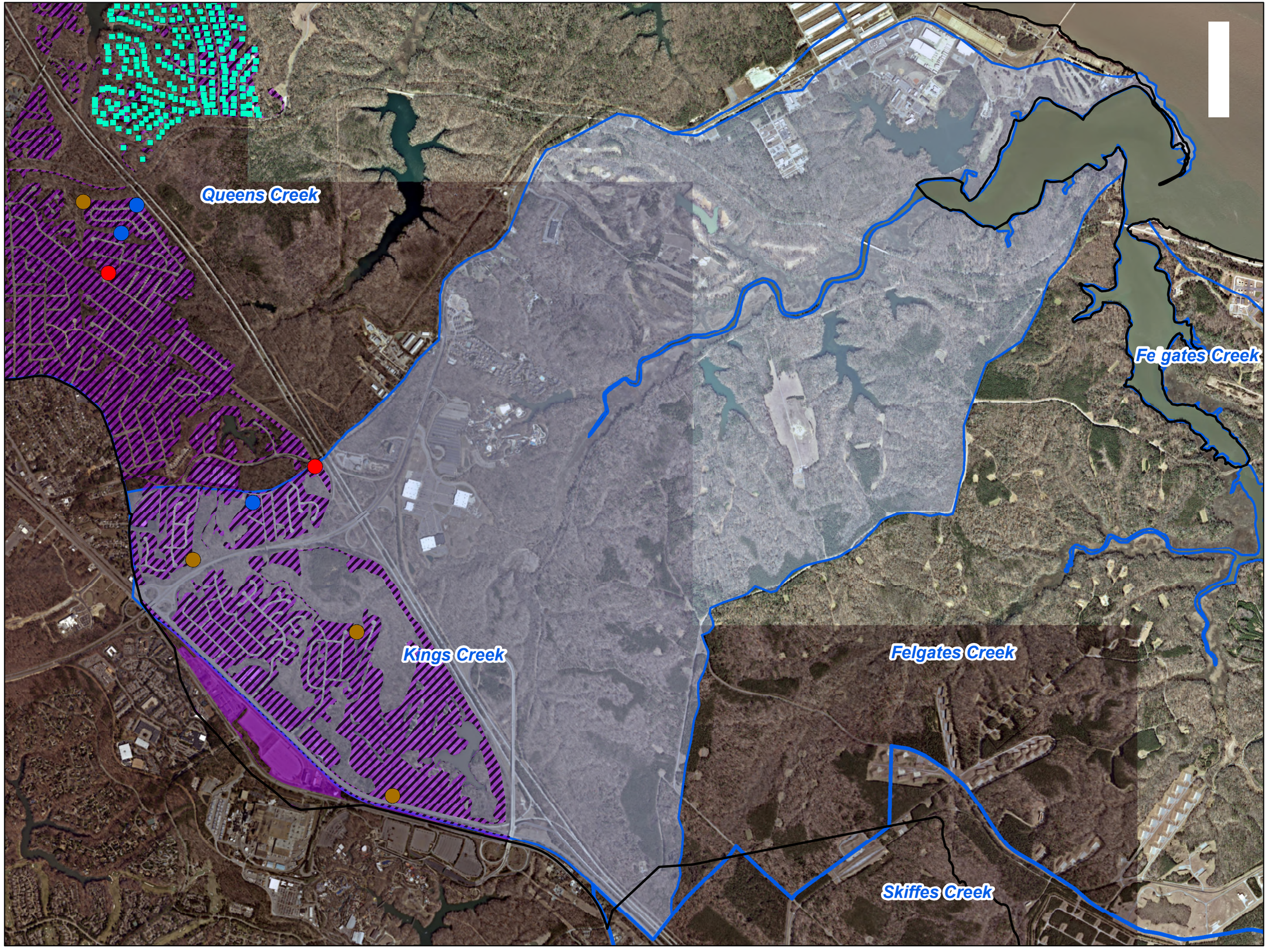
Private Maintained BMPs

- Bioretention Basins
- Constructed Stormwater Wetland
- Detention Basin
- Extended Detention Basin
- General Infiltration Practices
- Grassed Swale
- Manufactured BMP
- Retention Basin

Figure 4.2-2

Brown AND Caldwell

0.25 0.125 0 0.25
Miles



York County, Virginia
TMDL Action Planning
Local Bacteria Removal Requirements

Watershed: Kings Creek

BMP Projects and Septic to Sewer Conversions

Legend

- York County Boundary
- Bacteria TMDL Watershed
- MS4 Service Area
- Intersection Area
- Septic-to-Sewer Conversions

York Country BMPs

- Municipal Projects

Private Maintained BMPs

- Bioretention Basins
- Constructed Stormwater Wetland
- Detention Basin
- Extended Detention Basin
- General Infiltration Practices
- Grassed Swale
- Manufactured BMP
- Retention Basin

Figure 4.2-3

Brown AND Caldwell

0.25 0.125 0 0.25
Miles

Bapt st Run

Back Creek

Poquoson R ver

James R ver, Warwick R ver

Back R ver

York County, Virginia
TMDL Action Planning
Local Bacteria Removal Requirements

Watershed: Poquoson River

BMP Projects and Septic to Sewer Conversions

Legend

- York County Boundary
- Bacteria TMDL Watershed
- MS4 Service Area
- Intersection Area
- Septic-to-Sewer Conversions

York Country BMPs

- Municipal Projects

Private Maintained BMPs

- Bioretention Basins
- Constructed Stormwater Wetland
- Detention Basin
- Extended Detention Basin
- General Infiltration Practices
- Grassed Swale
- Manufactured BMP
- Retention Basin

Figure 4.2-4

Brown AND Caldwell

0.5 0.25 0 0.5
Miles

Skimino Creek

Queens Creek

Kings Creek

Fe gates Creek

York County, Virginia
TMDL Action Planning
Local Bacteria Removal Requirements

Watershed: Queens Creek

BMP Projects and Septic to Sewer Conversions

Legend

- York County Boundary
- Bacteria TMDL Watershed
- MS4 Service Area
- Intersection Area
- Septic-to-Sewer Conversions

York Country BMPs

- Municipal Projects

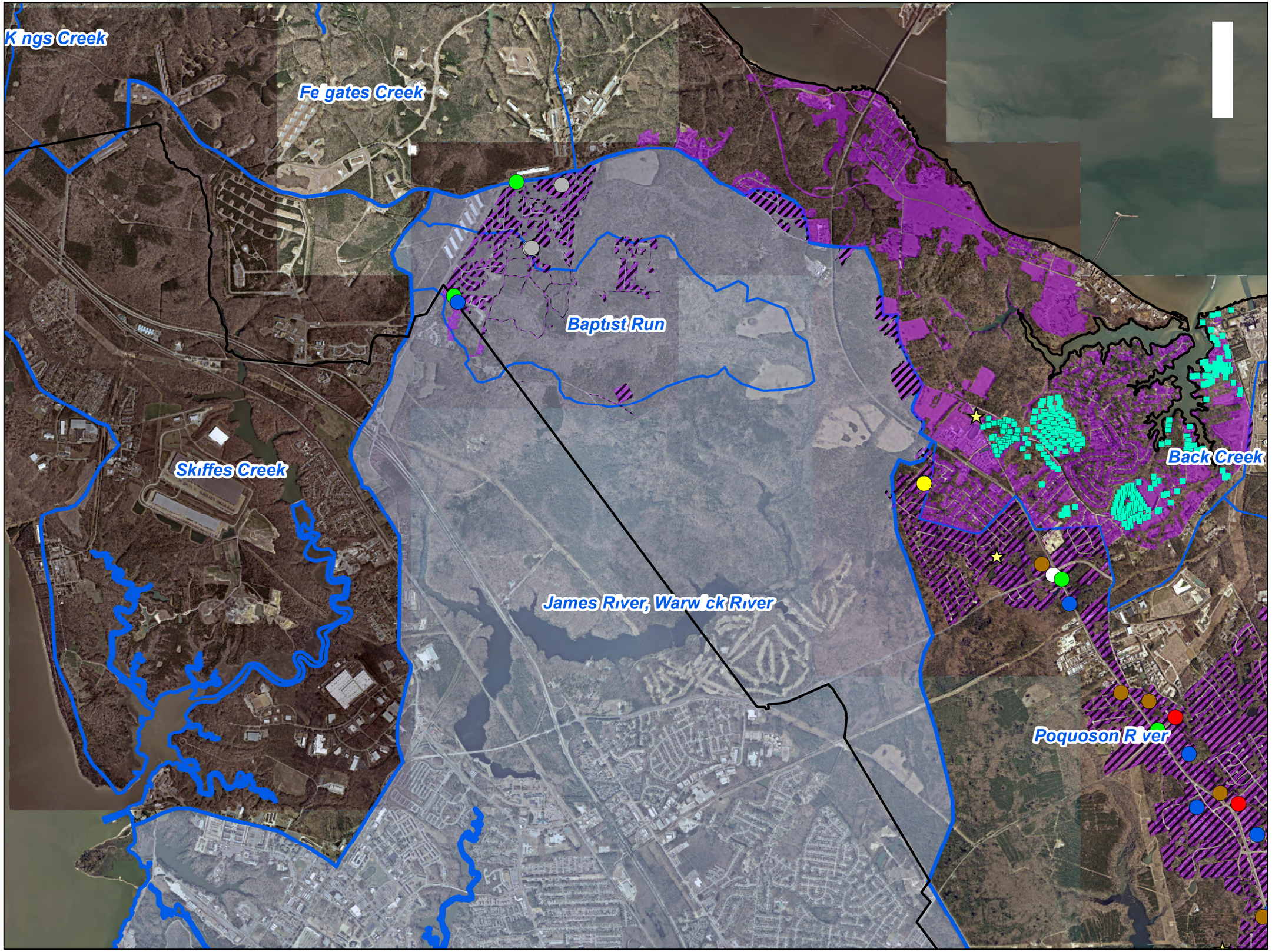
Private Maintained BMPs

- Bioretention Basins
- Constructed Stormwater Wetland
- Detention Basin
- Extended Detention Basin
- General Infiltration Practices
- Grassed Swale
- Manufactured BMP
- Retention Basin

Figure 4.2-5

Brown AND Caldwell

0.5 0.25 0 0.5
Miles



York County, Virginia
TMDL Action Planning
Local Bacteria Removal Requirements

Watershed: James River, Warwick River

BMP Projects and Septic to Sewer Conversions

Legend

- York County Boundary
- Bacteria TMDL Watershed
- MS4 Service Area
- Intersection Area
- Septic-to-Sewer Conversions

York Country BMPs

- Municipal Projects

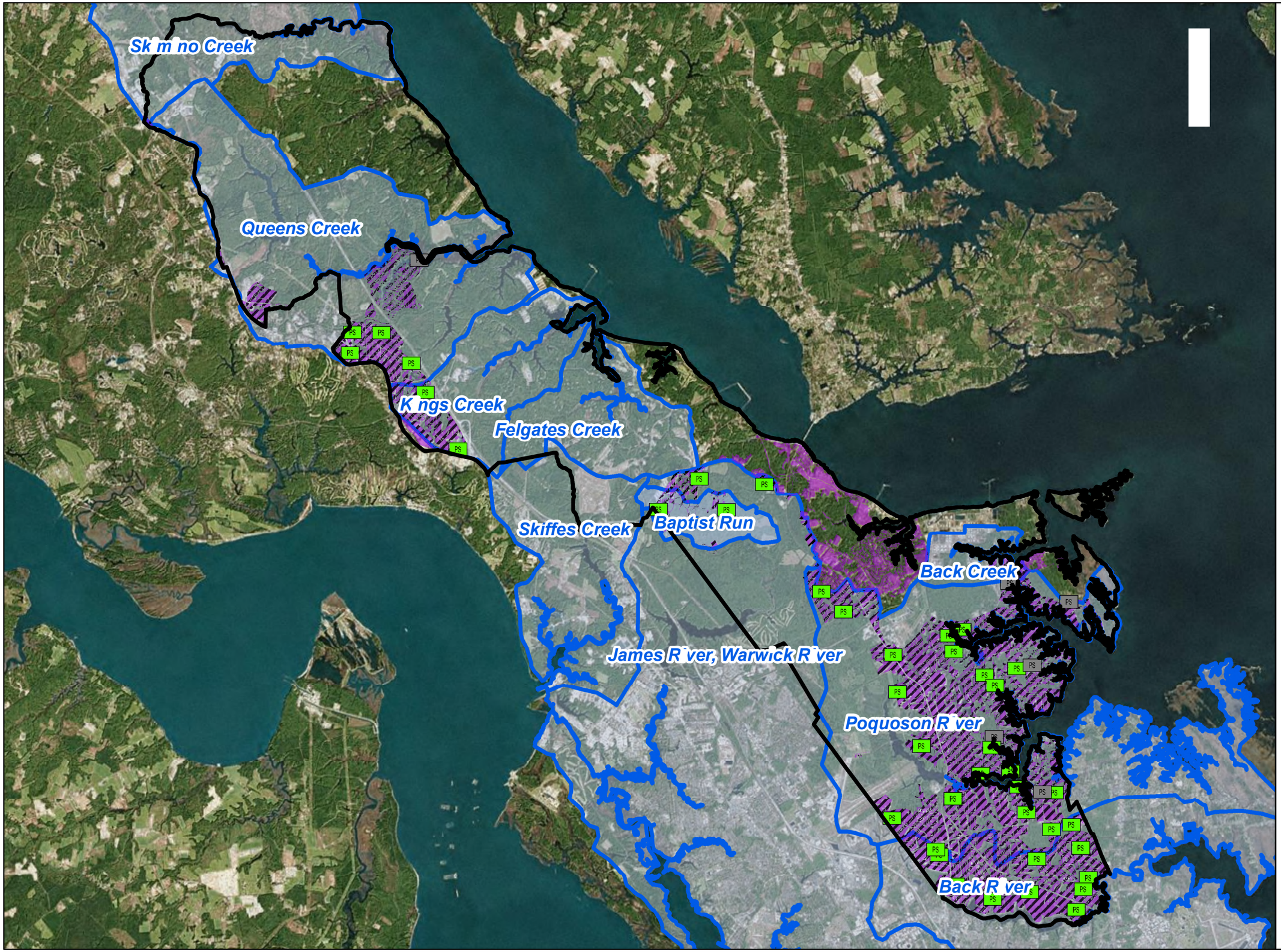
Private Maintained BMPs

- Bioretention Basins
- Constructed Stormwater Wetland
- Detention Basin
- Extended Detention Basin
- General Infiltration Practices
- Grassed Swale
- Manufactured BMP
- Retention Basin

Figure 4.2-6

Brown AND Caldwell

0.45 0.225 0 0.45
Miles



York County, Virginia
TMDL Action Planning
Local Bacteria Removal Requirements

Facilities of Concern

Legend

- York County Boundary
- Bacteria TMDL Watershed
- MS4 Service Area
- Intersection Area

Types of Stations

- PS Pump Station
- PS Vacuum Station

Figure 5.1

Brown AND Caldwell

1.5 0.75 0 1.5
Miles

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Appendix B: Modifications to the Plan

Modifications to the Plan

January 13, 2017 Modifications

This plan was modified to incorporate the following comments from DEQ:

DEQ General Comment: *"The Waste Load Allocation (WLA) assigned to the MS4 as an aggregate or individual needs to be listed in the action plan to reflect the WLAs assigned to each TMDL as listed in the table above (provided in the letter from DEQ). It is unclear where the loads listed in ES-3 of the plan came from and are not the WLAs assigned to York County."*

> Response: The WLAs presented in the five (5) approved bacteria TMDL reports were developed using an inconsistent definition of the MS4 service area. The WLAs calculated as part of the County's plan were calculated using a consistent MS4 service area that was developed in compliance with the guidelines as set forth in the Chesapeake Bay TMDL Special Condition Guidance Document. The specific steps used to calculate the County's WLA are documented in Section 3 of the County's TMDL Action Plan. An additional column was added to Table ES-3 in the executive summary to reflect the WLAs that were assigned as part of the bacteria TMDL reports. Additional text was added to the executive summary to describe the steps taken in the calculation of the County's WLAs in each watershed.

DEQ Comment Part I.B.2.b.: *"Identify and maintain a list of all additional management practices that have been implemented. The plan provides existing BMPs but does not address practices that are additional and will be done in the future."*

> Response: Table 4.4 in Section 4.2 lists additional BMP projects that are planned for future implementation. The table indicates the project type, year of design, and watershed where the project will be constructed. The County is also making additional efforts to perform septic-to-sewer conversions throughout the municipality in an effort to remove potential sources of direct human bacteria. As stated in Section 4.5 of the Action Plan, this year the County is in the process of completing an additional 212 septic-to-sewer conversions in the Queens Creek watershed. The County plans to continue their efforts with additional septic-to-sewer projects throughout future years as shown in Table 4.8 of the Action Plan.

DEQ Comment Part I.B.2.e.: *"Develop and implement a method to access the TMDL action plan for effectiveness. There are measureable goals provided for each BMP in table 6-1, however, most goals are enumerating inspections or other activities and no specific goal or number is provided. More detail for measuring goals should be provided."*

Response: Table 6-1 has been revised to provide more clarity and measurable goals for each applicable measure. It was clarified that:

- The County will inspect all BMPs annually, going above and beyond the minimum requirements for private BMPs
- The County will inspect 60 outfalls, going above and beyond the minimum requirement of 50 outfalls
- The County will track the septic-to-sewer conversions and is actively planning additional conversions throughout the permit term as seen in section 4.5

The County is currently focusing its efforts on human sources of bacteria. Septic tanks, when not properly maintained, can be a direct source of human fecal bacteria entering stormwater runoff. Septic-to-sewer conversions have the potential to remove direct sources of human fecal bacteria from entering surface waters. The schedule for future implementations can be found in Table 4-

8. In addition, the County is actively conducting surveys of potential areas that may be good candidates for septic-to-sewer conversion projects. Progress on conversions to the sanitary sewer system will be reported as part of the County's annual report.

Furthermore, the County is planning on implementing additional structural BMPs as indicated in Table 4-4. Progress on project design and implementation will be reported as part of the County's annual report.

Appendix C: SOPs for Facilities of Concern

Pump Station SOPs

SOP FOR SEWER SPILLS AT PUMP/LIFT STATIONS

Upon notification or discovery of an overflow, the following procedures will apply.

- Verify that both pumps are running. If not, place both pumps in the hand position.
- If pumps will not run in the hand position, contact one of the utilities electricians or the operations supervisor. If neither is available, contact SEI @ 766-8400 and request a service technician.
- Once pumps are running, verify discharge rate and operating pressure(s). This should be available from the DC 6000 Data Recorder if equipped. If not equipped, observe the check valve levers for upward movement and observe operating pressure(s) on the pump discharge gauges. If the pressure exceeds or is near the station shut-off pressure contact HRSD to report. **NOTE:** The normal operating conditions will be noted on the control panel.
- If the pumps are discharging, monitor the wet well level to verify the level is subsiding. If the level fails to subside, initiate pumping and hauling using vendor list, supplied in the EDS/Utilities on-call manual…
- Contact the operations supervisor and at least one other crew member for assistance.
- Coordinate with the construction crew personnel to Vactor and recover all liquid possible. Once liquid has been recovered, lime the entire affected area. Record the estimated volume in gallons recovered.

SOP FOR FORCE MAIN BREAKS

Upon notification of a force main break, the following procedures will apply.

- Report force main break to Chief of Utility Operations.
- Notify EDS Mechanical Division and ask them to report to the pump station.
- Mechanical personnel shall shut pump station down and close all necessary valves to stop flow. This may require coordination with HRSD for isolation of the break. NOTE: Use provided contact numbers if necessary.
- Mechanical crew personnel shall set up pump and haul and assist where required.
- Construction & Mechanical crews shall review force main drawings that are provided at each station to determine size and type of force main.
- Construction crew personnel shall report force main size and type back to the Mechanical Supervisor, Construction Supervisor and or repair crew Equipment Operator.
- Construction crew personnel will report to the force main break site and evaluate the problem.
- Construction crew personnel will dispatch Vactor Combination Unit to recover all liquid possible. Once liquid has been recovered lime the entire area.
- Construction crew personnel will gather all pertinent information such as addresses for miss utilities emergency marks, any erosion that may affect walkways, roadways, or any other hazards that my affect the public or the construction crew that will be responding to make the repair.
- Construction crew Equipment Operator or appointed crew member will call miss utilities to have excavation site marked for emergency repair. 1-800-552-7001
- All information will be reported to the Operations Supervisors and repair crew Equipment Operator.
- Construction crew personnel will also report back to the Operations Supervisor or Equipment Operator and advise them as to materials needed to make the repair, also, any special tools or equipment that may be required to complete the repair.
- Once repair crew is on site the Operations Supervisor or Equipment Operator will brief all personnel on any safety concerns or any special setup procedures that may be required to include, overhead power line or other overhead utilities that may affect the excavation site.
- Construction crew will set up proper traffic control devices and flagger stations if required.
- Take inventory of all materials to insure we have what we need to complete the repair.
- Pothole all marked utilities prior to excavation.
- Begin repair of force main.
- After repair has been made, contact Mechanical personnel to open all closed valves and start ONE PUMP ONLY. Check for any leaks on repair prior to back filling excavation site. Once determined there are no leaks, backfill site to standards and do site cleanup.
- Operation Supervisor will report all necessary information to Chief of Utility Operations for spill report. Information required for spill report as follows:

Responsible Party:

Address of SSO Site:

Time & Date SSO Started:

Time & Date SSO Under control:

Description of work done to stop SSO:

What caused the SSO?

How were we notified?

Volume of SSO (Cubic Ft, Length x Width x Depth):

Amount of SS recovered (Gallons, Vacuumed):

Corrective Action Taken, Future Plans:

SOP for Pump and Haul Operations

To improve the accuracy of service area wet weather flow analysis for stations involved in pump & haul operations, the following information is requested for future pump & haul activities:

Station pumped from:

Start time of pumping:

Stop time of pumping:

Volume pumped (truck size, in gallons, multiplied by number of loads):

Receiving Station:

Start time of dump:

Time of last dump:

Times to the nearest minute will be adequate. The preferred time source is a network, such as a wireless carrier (cell phone clock), rather than a vehicle's radio clock, an individual's watch, or a mobile computer.

SOP FOR SEWER SPILLS AT PUMP/LIFT STATIONS

Upon notification or discovery of an overflow, the following procedures will apply.

- Verify that both pumps are running. If not, place both pumps in the hand position.
- If pumps will not run in the hand position, contact one of the utilities electricians or the operations supervisor. If neither is available, contact SEI @ 766-8400 and request a service technician.
- Once pumps are running, verify discharge rate and operating pressure(s). This should be available from the DC 6000 Data Recorder if equipped. If not equipped, observe the check valve levers for upward movement and observe operating pressure(s) on the pump discharge gauges. If the pressure exceeds or is near the station shut-off pressure, contact HRSD to report. **NOTE:** The normal operating conditions will be noted on the control panel.
- If the pumps are discharging, monitor the wet well level to verify the level is subsiding. If the level fails to subside, initiate pumping and hauling using vendor list, supplied in the EDS/Utilities on-call manual…
- Contact the operations supervisor and at least one other crew member for assistance.
- Coordinate with the construction crew personnel to Vactor and recover all liquid possible. Once liquid has been recovered, lime the entire affected area. Record the estimated volume in gallons recovered.

Operation Supervisor will report all necessary information to Chief of Utility Operations for spill report. Information required for spill report as follows:

Responsible Party:

Address of SSO Site:

Time & Date SSO Started:

Time & Date SSO Under control:

Description of work done to stop SSO:

What caused the SSO?

How were we notified?

Volume of SSO (Cubic Ft, Length x Width x Depth):

Amount of SS recovered (Gallons, Vacuumed):

Corrective Action Taken, Future Plans: