City of Suffolk

TMDL Action Plan for Bacteria Reduction

Hoffler Creek, Bleakhorn Creek, Bennetts Creek, Knotts Creek, Shingle Creek, Chuckatuck Creek, The Upper Nansemond River, and the Western Branch of the Elizabeth River.

Prepared by the City of Suffolk, Virginia

6/25/2016

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MS4 General Permit No. VAR040029

This document identifies strategies that the City of Suffolk has already implemented or is considering for implementation to reduce bacterial loads to local waterways.

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Introduction

This document represents the City of Suffolk's Action Plan to comply with the Total Maximum Daily Load (TMDL) of bacteria established by the Virginia Department of Environmental Quality (DEQ) for eight waterways within or adjacent to the City of Suffolk. It has been prepared as required by The City of Suffolk's General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4) (General Permit No. VAR040029).

The City of Suffolk currently utilizes a variety of practices to limit bacteria leaving the City's storm sewer system, right of way, and public facilities. As additional information is obtained from water monitoring, advances in technology, and the implementation of this plan; an iterative approach will be used to modify the program as appropriate.

This plan has been prepared by City of Suffolk staff, and should be considered a fluid document. It is expected that this plan will be revised periodically to reflect changing goals, new technologies, and a better understanding of the complex interactions in the ever changing biospheres that make up our local waterways.

Background

The Virginia Department of Environmental Quality routinely monitors and tests waters within the Commonwealth to evaluate their condition. The Virginia Water Quality Standards state that *"all state 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 be reasonably expected to inhabit them; wildlife; and the production of edible and marketable natural resources (e.g., fish and shellfish)."*

If DEQ determines that a waterway does not meet Virginia's water quality standards, the water is deemed "impaired". Impaired waters are listed on the Virginia Water Quality Assessment 305(b)/303(d) Integrated Report that is issued every other year to meet the requirements of the U.S. Clean Water Act sections 305(b) and 303(d) and the Virginia Water Quality Monitoring, Information and Restoration Act. The City of Suffolk has seven such impaired waterways within jurisdictional boundaries, and an additional waterway outside of Suffolk's jurisdictional boundaries, that receives stormwater discharges from Suffolk through adjacent jurisdictions.

DEQ performs studies on impaired waterways to determine the total maximum daily load that the water can assimilate and still meet water quality standards. These studies assign waste load allocations (WLAs) to permitted point sources of pollution. WLAs are limits of a pollutant that a permittee must address to the maximum extent practicable by implementing different strategies and best management practices (BMPs).

The City of Suffolk holds a phase II MS4 permit with the State of Virginia. Under this permit any water leaving the MS4 regulated service area through the City-owned conveyance system such as pipes or open ditches is considered a point source discharge and is subject to WLAs.

The City of Suffolk is located in the heart of the Hampton Roads region of Southeastern Virginia. The City is bounded by the cities of Portsmouth and Chesapeake to the east and by the counties of Isle of Wight and Southampton to the west, the James River to the north and the State of North Carolina to the south. Suffolk, the largest city in Virginia, is comprised of 429 square miles of land with a diverse landscape that includes a mix of rural, suburban, and urban areas. The City's population according to the 2010 census was 84,000 residents. Tidal and non-tidal wetlands cover approximately 94,000 acres of area within the city including the Great Dismal Swamp National Wildlife Refuge.

Within Suffolk's borders are found agricultural as well as urbanized areas rich in open water and wetland areas. Approximately 70% of the City is considered agricultural. The City is divided into three major watersheds; James River Watershed which encompasses approximately 38.3% of the total drainage area of the City, Chowan River Watershed encompassing approximately 31.1% of the City's drainage area, and finally the Dismal Swamp Watershed comprised of approximately 30.6%. The James River Watershed makes up most of northern and downtown Suffolk. It contains the northwestern and central portions of Suffolk and extends to Isle of Wight County. The primary outfalls for this watershed are Chuckatuck Creek and the Nansemond River. Although a large portion of its land mass is zoned for agricultural use, it currently contains the most densely populated regions of the City and ultimately outfalls to the Chesapeake Bay. The City's Chesapeake Bay Preservation Area encompasses approximately 149 square miles with approximately 48 square miles of that area identified as urban and currently regulated under the City's MS4 Stormwater Permit.

Over 50% of the Nansemond River watershed in the City of Suffolk ultimately outfalls into one of several drinking water reservoirs located in the City. These reservoirs are managed and sampled regularly by drinking water staff for the Cities of Portsmouth, Norfolk, and Suffolk. Additionally, they do not experience regular significant releases as they are being managed for drinking water purposes. They are best described as terminal reservoirs that do not contribute significantly to the water quality of the Nansemond River, James River, and the Chesapeake Bay.

The northern half of Suffolk is bisected by the Nansemond River and has numerous tributaries. Five of the waterways identified in this Action Plan drain directly into the Nansemond River. While these waterways are impaired, it should be noted that the Lower Nansemond River is not included on DEQ's list of impaired waterways. The majority of the water leaving the City of Suffolk meets state water quality standards.

The City of Suffolk conducts monthly water monitoring of the Nansemond River and its tributaries to assess water quality and to identify areas of concern for future improvements and efforts. The City is committed to cooperating with DEQ to ensure data quality, and to share monitoring information that could prove valuable in the refinement of water quality models and in determining more appropriate load allocations based on actual conditions.

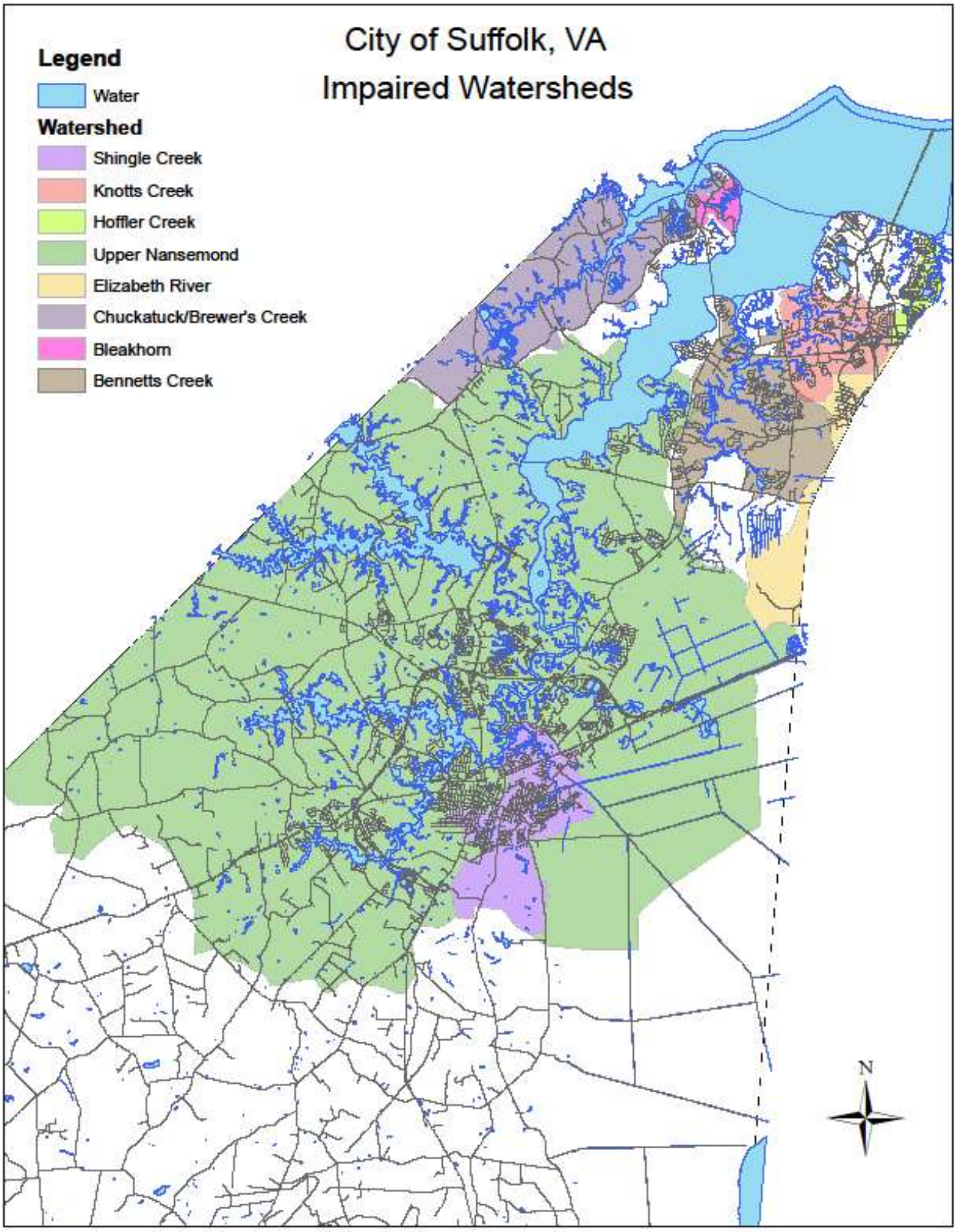


Figure 1: Map showing watersheds in the City of Suffolk with Bacteria impairments.

Table 1: Local TMDLs affecting the City of Suffolk

Bacteria Total Maximum Daily Load (TMDL) Development for the Elizabeth River Watershed

TMDL Project: **Elizabeth River - Western Branch (TMDL #2)**				EPA Approval Date: **7/20/2010**	
Basin: **Lower James River**				SWCB Approval Date: **9/30/2010**	
Parameter	**Impairment**	**WLA (MPN/day)**	**LA (MPN/day)**	**MOS**	**TMDL (MPN/day)**
Enterococcus	Western Branch of Elizabeth River		1.64E+13	Implicit	3.64E+13
	Suffolk MS4 - VAR040029*	***2.08E+11***		*Implicit*	
	1% Future Growth	1.62E+11		*Implicit*	

* - MS4 permit incorrectly shown as VA0090892 in TMDL study.

Shellfish Bacteria Total Maximum Daily Load Development Chuckatuck Creek and Brewers Creek Watershed

TMDL Project: **Chuckatuck and Brewers Creeks**				EPA Approval Date: **7/9/2010**	
Basin: **Lower James River**				SWCB Approval Date: **9/30/2010**	
Parameter	**Impairment**	**WLA (MPN/day)**	**LA (MPN/day)**	**MOS**	**TMDL (MPN/day)**
Fecal coliform	Chuckatuck and Brewers Creeks *		3.12E+13	Implicit	3.17E+13
	Suffolk MS4 - VAR040029	***1.50E+11***		*Implicit*	
	1% Future Growth	*3.17E+11*		*Implicit*	

* - Brewers Creek located entirely in Isle of Wight.

TMDL Report for Chesapeake Bay Shellfish Waters: Bleakhorn Creek, Bennett Creek, and Knotts Creek Bacterial Impairments in the City of Suffolk

TMDL Project: **Bennetts, Bleakhorn and Knotts Creeks**				EPA Approval Date: **6/3/2010**	
Basin: **Lower James River**				SWCB Approval Date: **9/30/2010**	
Parameter	**Impairment**	**WLA (MPN/day)**	**LA (MPN/day)**	**MOS**	**TMDL (MPN/day)**
Fecal coliform	Bleakhorn Creek		1.46E+10	Implicit	1.73E+10
	Suffolk MS4 - VAR040029	***2.49E+09***		*Implicit*	
	1% Future Growth	*1.73E+08*		*Implicit*	
Fecal coliform	Bennetts Creek		3.00E+11	Implicit	3.64E+11
	Suffolk MS4 - VAR040029	***6.01E+10***		*Implicit*	
	1% Future Growth	*3.64E+09*		*Implicit*	
Fecal coliform	Knotts Creek		3.00E+11	Implicit	3.64E+11
	Suffolk MS4 - VAR040029	***6.01E+10***		*Implicit*	
	1% Future Growth	*3.64E+09*		*Implicit*	

Fecal Bacteria Total Maximum Daily Load Development for the Nansemond River Primary Contact Recreational Use and Shellfish Harvesting Use

TMDL Project: **Upper Nansemond River & Shingle Creek**				EPA Approval Date: **12/4/2006**	
Basin: **Lower James River**				SWCB Approval Date: **7/31/2008**	
Parameter	**Impairment**	**WLA*** (cfu/yr)**	**LA (cfu/yr)**	**MOS**	**TMDL (cfu/yr)**
Enterococcus	Shingle Creek (subwatershed 5)	2.19E+10	1.05E+13	Implicit	1.05E+13
	Suffolk MS4 - VAR040029*	***2.19 E+10***		*Implicit*	
Enterococcus	Nansemond River (upper) (subwatersheds 1,2,5)	9.99E+10	5.80E+13	Implicit	5.81E+13
	Suffolk Schools - VA0021709	***2.18E+09***		*Implicit*	
	Suffolk MS4 - VAR040029*	***6.63E+10***		*Implicit*	
Enterococcus	Nansemond River (Lake Meade Dam) (subwatersheds 1,2,3,5)	9.99E+10	4.26E+13	Implicit	4.27E+13
	Suffolk Schools - VA0021709	***2.18E+09***		*Implicit*	
	Suffolk MS4 - VAR040029*	***6.63E+10***		*Implicit*	
Fecal coliform	Shingle Creek (subwatershed 5)	2.78E+09	1.05E+13	Implicit	1.05E+13
	Suffolk MS4 - VAR040029*	***2.78E+09***		*Implicit*	
Fecal coliform	Nansemond River (All tributaries and subwatersheds)	3.89E+10	9.47E+12	Implicit	9.51E+12
	Suffolk Schools - VA0021709	***1.06E+09***		*Implicit*	
	Suffolk MS4 - VAR040029*	***1.58E+10***		*Implicit*	

* - Permit number was corrected following issuance of TMDL report.

** - Included with Suffolk's MS4 WLA under MOA.

*** - WLAs include 1% for future growth.

Bacteria Total Maximum Daily Load Development for the Hoffler Creek Watershed

TMDL Project: **Hoffler Creek**				EPA Approval Date: **12/14/2011**	
Basin: **Lower James River**				SWCB Approval Date: **6/29/2012**	
Parameter	**Impairment**	**WLA (MPN/day)**	**LA (MPN/day)**	**MOS**	**TMDL (MPN/day)**
Enterococcus	Hoffler Creek		2.57E+11	Implicit	7.96E+11
	Suffolk MS4 - VAR040029	***2.02E+11***		*Implicit*	
	1% Future Growth	*3.00E+09*		*Implicit*	

Potential significant sources of bacteria

The City has identified the dog park at Lake Meade Park as a facility of concern for bacteria pollution. Lake Meade Park is located in the upper Nansemond River, in downtown Suffolk on Lake Meade and the Nansemond River. Although there are no specific outfall locations, it could be assumed that the sheet flow off of the site would be expected to contain higher than normal bacteria loads without practices in place to prevent pollution.

Other bacteria sources throughout the regulated area may include:

- Pet waste
    - Residential areas
    - City Parks and trails
- Illicit discharges and cross connections
- Failing septic systems
- Sanitary sewer overflows (covered by State Water Control Board Special Order by Consent)

Practices to reduce bacteria

Practices to address bacteria pollution on City facilities and throughout the MS4 regulated area are outlined below.

Pet Waste Stations

Pet waste stations are installed at the Lake Meade Dog Park operated by Parks and Recreation. This dog park is in the Upper Nansemond River watershed. Two pet waste stations located within the facility are checked regularly to ensure they are stocked with pet waste bags. Two other dog waste stations are placed along the walking path located on the perimeter of the park. Pet waste stations have been installed on the Seaboard Coastline Trail that runs from the village of Driver to Shoulders Hill Road, located in the Bennetts Creek watershed. Pet waste stations are also located in Bennetts Creek Park and Sleepy Hole Park. Stations on park property are maintained by park rangers, who empty can liners and ensure they stay stocked with pet waste bags.

The City also administers a Pet Waste Station Grant program through askHRgreen.org which allows neighborhoods and community associations to apply for one or more pet waste stations to be installed for community use. The pet waste stations are free to communities that agree to maintain them. To date, forty stations have been granted.

Illicit Discharge Detection and Elimination (IDDE)

Public Works investigates reports of illicit discharges from the public and City personnel. Illicit discharges can come from a range of sources and involve numerous pollutants, including bacteria. Once notified of an illicit discharge, staff identifies the source of the discharge and the responsible party. Once the nature of the discharge is determined, the responsible party is required to immediately address the discharge and conduct any necessary cleanup. Septic system failures are referred to the local office of the Virginia Department of Health.

Dry weather screenings are a part of the IDDE program. The MS4 permit requires 50 dry weather outfall screenings per year. In an effort to find and reduce pollution, additional outfall screenings are completed; typically over 100 dry weather screenings are completed each year.

Employee Training Enhancements

The City and Suffolk Public Schools personnel who work in operations and maintenance of City or Schools assets and buildings are trained annually. This training is required to be conducted biennially by the City's Phase II MS4 General Permit, but is typically completed annually. The main areas of this training that pertain to bacteria are proper disposal of garbage and illicit discharge identification and notification. Training covers the following topics (as applicable):

- An overview of our MS4 permit requirements
- The definition of MS4
- Illicit discharge detection and elimination
- Construction site erosion and sediment control
- Defining soil erosion, protecting erodible materials
- How to protect erodible materials
- Disposing of waste properly
- Applying fertilizer and pesticide properly
- Vehicle Maintenance
- Vehicle Washing
- Leaking Equipment
- Drum Storage and Fuel Islands
- Proper salt and stockpile storage

Public Education and Outreach Initiatives

The City of Suffolk, as a member of the Hampton Roads Planning District Commission, participates in askHRgreen.org to create and spread environmental messaging. The messaging is designed to inform area residents and homeowners about simple ways that they can help the environment. One of the message campaigns is "Scoop the Poop" which informs residents of the impact pet waste can have on local waterways. The "Scoop the Poop" campaign includes media spots, print materials, and give-away items that encourage pet owners to clean up after their pets and advises how their actions can help to keep local waterways clean and healthy.

Through askHRgreen.org, the City obtains educational materials and giveaway items that are designed to reinforce positive behaviors, such as cleaning up after pets. The City distributes pet waste bag holders

at multiple public events and to groups that work with pet owners. These giveaways make it easier for pet owners to pick up after their pets in the yard or while out for a walk.

Street Sweeping

The City currently maintains all "curb and gutter" streets with routine scheduled sweeping. All of the Downtown Business Overlay District streets and at least sixteen parking lots in this urban area are swept four days per week. A small sidewalk sweeper is in operation on the same schedule.

Outside of the downtown area, sweepers are operated on a rotating schedule for all curb and gutter areas, with sweeps in most neighborhoods occurring approximately once every six weeks.

Bridge decks and ramps are swept as required, several times per year, with extra sweeps when necessary. The sweepers are also used after significant roadwork, tree trimming operations, and construction activities when necessary. Sweepers pick up improperly disposed bacteria sources such as pet waste and other organics, which aids in the reduction of bacteria entering our waterways.

Sanitary Sewer Find & Fix and Capital Improvements

Sanitary sewer overflows (SSOs) are identified as a potential source of bacteria loads in all of the TMDL reports that this Action Plan addresses. In addition to TMDLs addressing bacteria loads, the City is under a Special Order by Consent (SOBC) that requires the City to maintain a Management, Operations, and Maintenance (MOM) program to eliminate and reduce SSOs within City sanitary sewer systems. The MOM program includes a "Find and Fix" program that consists of the use of a construction contractor to repair identified system defects along with repairs completed by City staff. The majority of the City's sanitary sewer infrastructure is located within the watersheds of the water bodies that have bacteria TMDLs.

The adopted Capital Improvements Plan: FY 2021-2030 provides budget for sanitary sewer extensions and system upgrades. Budgeted funds will provide for the renovation, rehabilitation, and replacement of the City's sanitary sewer system. The City of Suffolk's system currently consists of 152 pump stations and over 300 miles of gravity sewer mains and force mains.

Planned Expenditures							
	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26-30	Total
Sanitary Sewer Extensions	$0	$300,000	$0	$300,000	$0	$900,000	$1,500,000
Sanitary Sewer System Upgrades	$5,610,000	$6,975,000	$6,800,000	$6,650,000	$7,000,000	$35,000,000	$68,035,000

Additionally, the Hampton Roads Sanitation District (HRSD) maintains a sewer conveyance system throughout the City of Suffolk. HRSD provides conveyance from the City's sanitary sewer system to the HRSD wastewater treatment facility located in northern Suffolk. HRSD is also operating under a consent order for bacteria reduction.

FOG Program

The City promotes public awareness of the negative effects fats, oils, and grease (FOG) can have on sanitary sewer systems. FOG builds up on pipe walls and can cause blockages leading to sanitary sewer overflows. Educational materials and outreach campaigns are organized and developed by askHRgreen.org with the participation of member localities. The City of Suffolk distributes materials locally to citizens and participates in regional campaigns run by askHRgreen.org.

Septic tank pump out

The City operates a mandatory septic tank pump out program within the Chesapeake Bay Preservation Area. The purpose of the Chesapeake Bay Septic System Pump-Out Program is to protect the ground water quality, as well as the water quality of the Bay and its tributaries. Throughout Suffolk, water moves quickly through the soils, reaches the ground water table, and moves laterally into creeks, rivers and ultimately the Bay. Suffolk's high water table and sandy soils result in a considerable amount of ground water inflow into surface waters. Failing septic tanks have the potential to contaminate both surface water and ground water.

The Chesapeake Bay Local Assistance Board, at its June 16, 2008 meeting, determined that Suffolk must begin to implement the septic tank pump out provisions in order to be found "consistent" with the requirements of the Chesapeake Bay Act. The Bay Act is mandatory Virginia Code which requires all private septic systems within the Chesapeake Bay Preservation Area (CBPA) to be pumped out or inspected at least once every five years by a sewage hauler who has been certified by the Virginia Department of Health. This applies to existing homes and businesses, as well as new development.

The City divided the Chesapeake Bay Preservation Area into 5 zones in order to begin the notification process. Each Zone's notification is mailed out at the beginning of a City fiscal year (July 1st), and citizens have until the end of the fiscal year (June 30th of the following year) to comply. The first cycle of the pump out program started July 1, 2009 and was completed June 30, 2013. The third cycle of notifications is underway. This notification cycle will be repeated every five years.

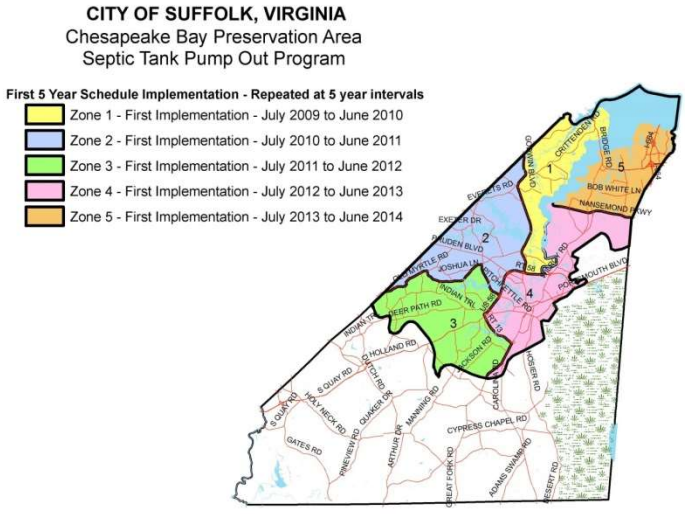


Figure 2: Map depicting the Septic Tank Pump Out Program zones

Legal authorities

In order to eliminate illicit discharges into the City-owned and operated MS4, Suffolk City Council adopted an ordinance prohibiting anything other than stormwater from entering the City-owned storm sewer system. The text of the ordinance and the available enforcement actions are reproduced below.

Sec. 35-52. - Illicit discharges.

(a)It shall be a violation of this chapter to:

(1)Discharge, or cause or allow to be discharged, sewage, industrial waste or other wastes into the storm sewer system, or any component thereof, or onto driveways, sidewalks, parking lots or other areas draining to the storm sewer system; or

(2)Connect, or cause or allow to be connected, any sanitary sewer to the storm sewer system; or

(3)Throw, place or deposit or cause to be thrown, placed or deposited into the storm sewer system anything that impeded or interferes with the free flow of stormwater therein.

(b)Violations of this section are subject to all penalties and provisions described in section 35-53 of this chapter.

(Ord. No. 14-O-050, § 1, 6-4-2014)

Sec. 35-53. - Enforcement.

(a)Violation of this chapter shall result in the following penalties:

(1)A willful violation shall constitute a class 1 misdemeanor. Each day that a continuing violation is maintained or permitted to remain shall constitute a separate offense.

(2)Any person who, intentionally or otherwise, commits any of the acts prohibited by this chapter shall be liable to the city for all costs of monitoring, containment, cleanup, abatement, removal, and disposal of any substance unlawfully discharged into the storm sewer system.

(3)Any person who, intentionally or otherwise, commits any of the acts prohibited by this chapter shall be subject to a civil penalty not to exceed $32,500.00 per violation for each day that a violation of this chapter continues. The courts assessing such penalties may, at its discretion, order such penalties be paid into the treasury of the city for the purpose of abating, preventing, monitoring, or mitigating environmental pollution.

(b)Any violator may be required to restore land to its undisturbed condition or in accordance with a notice of violation, stop work order, or permit requirements. In the event that restoration is not undertaken within a reasonable time after notice, the administrator may take necessary corrective action, the cost of which shall be covered by the performance bond, or become a lien upon the property until paid, or both.

(c)The city may pursue violators of this chapter utilizing all such remedies as provided by law, including but not limited to, such applicable civil and criminal remedies set forth in Section 62.1-44.15:48 of the Act (Code of Virginia, § 62.1-44.15:48), or its successor provision, as the same may be amended and renumbered from time to time. The administrator may issue a summons for collection of the civil penalty and the action may be prosecuted in the appropriate court.

(1)In imposing a civil penalty pursuant to this section, the court may consider the degree of harm caused by the violation and also the economic benefit to the violator from noncompliance.

(2)Any civil penalties assessed by a court as a result of a summons issued by the City of Suffolk shall be paid into the Treasury of the City of Suffolk to be used for the purpose of minimizing, preventing, managing, or mitigating pollution of the waters of the locality and abating environmental pollution therein in such manner as the court may, by order, direct.

(d)The remedies set forth in this section shall be cumulative, not exclusive; and it shall not be a defense to any action, civil, or criminal that one or more remedies set forth herein has been sought or granted. (Ord. No. 14-O-050, § 1, 6-4-2014)

Interim Milestones and Assessment of Effectiveness

The City of Suffolk will continue to maintain the previously discussed practices to the maximum extent practicable to reduce the potential for bacteria to reach waterways. Methods for assessment are discussed below.

Pet Waste Stations

Activity: Distribute at least two pet waste stations annually to neighborhoods and community associations.

Assessment: Track the locations of pet waste stations distributed and report annually

Illicit Discharge Detection and Elimination (IDDE)

Activity: Dry weather screenings are conducted throughout the year as weather allows, with a goal of completing 100 per year. Illicit discharges are investigated and addressed immediately upon report or discovery.

Assessment: Track dry weather screening and illicit discharge investigation activities and report annually.

Employee Training Enhancements

Activity: Train City and Public School employees annually.

Assessment: Track and report number of training events and number of attendees.

Public Education and Outreach Initiatives

Activities: Annual Pet Waste ad campaign is run regionally through askHRgreen.org. Distribute educational rack cards and dog waste bag holders at five or more public events per year.

Assessment: Number of impressions for each ad campaign and number of rack cards and dog waste bags distributed annually.

Measurable Goals

The goal of this action plan is to implement the interim milestone activities and complete assessments annually. Programs will be evaluated for effectiveness annually and programmatic changes will be made if needed.

Action Plan Public Comment Period

The following was distributed through a City of Suffolk media release.

SUFFOLK PUBLIC WORKS NOTICE OF PUBLIC COMMENT PERIOD
LOCAL BACTERIA TMDLs ACTION PLAN

SUFFOLK, VA (April 10, 2020) Suffolk Public Works advises that as required by the Department of Environmental Quality (DEQ), your input is requested on the Draft Local Bacteria TMDLs Action Plan. The City of Suffolk has updated this Total Maximum Daily Load (TMDL) Action Plan as required by its General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (Phase II MS4 Permit). The Draft Action Plan can be found on the City website at https://www.suffolkva.us/264/Total-Maximum-Daily-Load-TMDL.

The comment period is open from Friday, April 10, 2020, through Monday, April 27, 2020. Comments may be submitted by email to actionplancomments@suffolkva.us or by mail to the Department of Public Works, Attention: Erin Rountree, 442 West Washington St, Suffolk, VA 23434 by Monday April 27th, 2020.

There were no comments received during the public comment period.

Moving Forward

The City of Suffolk will implement this plan to reduce the potential of bacteria discharge to surface waters to the maximum extent practicable. Progress updates will be included as part of the annual reporting process. Public input is a valuable resource; any comments regarding the action plan can be directed to the City of Suffolk Public Works Department Engineering Division.

City of Suffolk Surface Water Monitoring Program

In 2011 in response to the numerous waterway impairments and TMDL studies being conducted within the municipality, the City of Suffolk initiated a surface water monitoring program and will continue as the budget allows. The program is primarily focused on the Nansemond River, but incorporates other water bodies and tributaries as the need arises. The program is designed to augment the sampling being performed by the Virginia Department of Environmental Quality and Virginia Department of Health Division of Shellfish Sanitation.

This work is currently focused on the Nansemond River and its tributaries. This allows for a more focused data set on the largest river system with bacteria TMDLs in the City, and responds to the majority of input the City receives from concerned citizens and citizen groups. The City believes that by focusing first on the Nansemond River and its tributaries, there is the greatest chance of reducing bacteria loads and restoring the greatest amount of use of the bacteria impaired waterways in Suffolk.

The ultimate objectives of the surface water sampling program are to assist with pollutant source identification and to identify areas in need of extra attention or further study. Also, the monitoring of bacteria concentration trends over time will allow staff to track progress toward water quality goals.

Nansemond River Sampling

Public Works staff conducts monthly sampling at predetermined locations along the Nansemond River and its tributaries. Fifteen sites are sampled in total, with twelve sites along the main stem of the Nansemond River from the mouth at the confluence with the James River, to the headwater at the base of the Lake Meade Dam. Sampling is also conducted with one sampling site each at the Nansemond River tributaries of Bennetts Creek, Western Branch, and Shingle Creek.

Field conditions measured include: water temperature, pH, salinity, water depth, and water clarity (secchi depth). Sample analyses are performed by the Hampton Roads Sanitation District (HRSD) Central Environmental Laboratory. Sample analysis done by the HRSD lab includes: Fecal Coliform, enterococcus, total phosphorus, ammonia, nitrate & nitrite, and total suspended solids.

The City's surface water monitoring program is certified by DEQ as a Level III program, allowing data that is collected to be used to list or delist waters on the 303(d) List. Sampling data is uploaded to the Chesapeake Monitoring Cooperative database for use by the State and public.

Source Tracking

In 2010, a bacteria source tracking study was conducted in the Shingle Creek watershed in partnership with HRPDC and HRSD. Grab samples were primarily collected during wet weather events by staff at varying times during or following a rain event. That method of sampling did not give a clear indication as to when the majority of bacteria was entering the system. Was bacteria entering Shingle Creek with runoff from storm events, and if so, where on the hydrograph were the most significant inputs of bacteria entering the creek, or did loads enter Shingle Creek in a more dispersed and continuous

nature? Due to the consistent presence of human specific markers in the Factory Street area, further investigation in this area was suggested following this initial study.

During the next part of the study, HRSD Staff installed automated sampling equipment at a large culvert that conveys Shingle Creek under Factory Street. This equipment included a flow meter placed at the culvert and sample collection equipment that pulled water samples from the stream directly below the flow meter. The auto sampler was programmed to take 12 samples at set time intervals during periods of increased flow characteristic of storm events. Suffolk staff collected samples from the auto sampler following storm events, as well as a grab sample. Samples were chosen based on their location on the hydrograph and analyzed for E. coli and Enterococcus by the HRSD lab.

In 2014, sampling was conducted during four storm events, which gave some indication of a first flush phenomenon of bacteria loads. Results of this study were not conclusive enough to determine sources of bacteria loads but led to another microbial source tracking study.

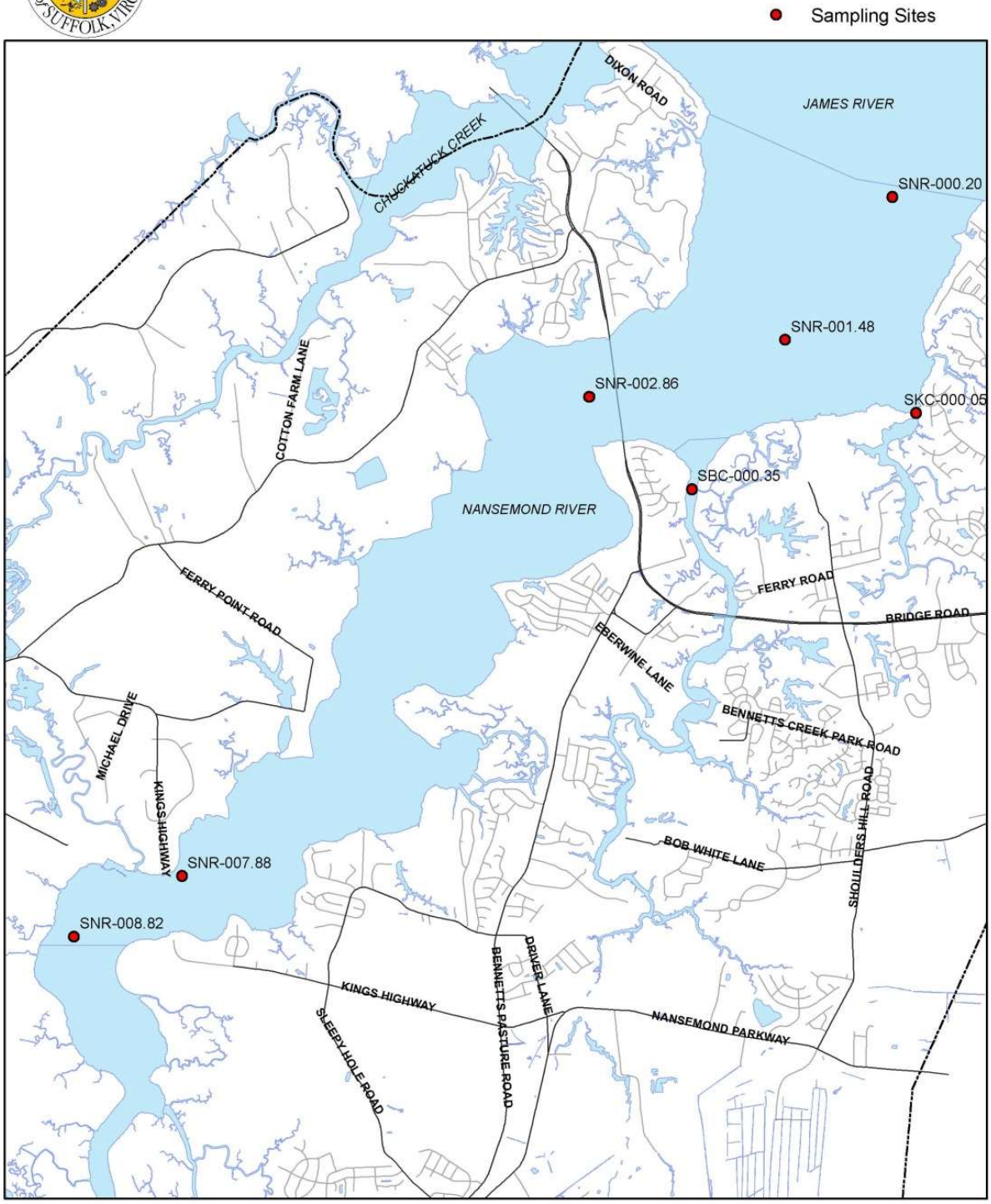
The second microbial source tracking study began in early 2016 and compared genetic markers and concentrations during dry and wet weather flows at multiple points within the stormwater system upstream of the Factory Street culvert. This method of sampling was designed to locate which runs of storm sewer potentially were experiencing intrusion from the sanitary sewer system. As a result of this study, the City identified and repaired the compromised sewer infrastructure in this area.

In 2017, the bacteria source tracking study that was completed in the upper reaches of Shingle Creek during 2016 was used as a model and was extended to the upper Nansemond River watershed. The project is being conducted in partnership with Hampton Roads Sanitation District (HRSD) and the Virginia Department of Health Division of Shellfish Sanitation (VDH DSS), using up-to-date molecular methods and a more targeted approach. Approximately 315 outfalls were selected for investigation and three dry weather screenings were conducted at each outfall. Flowing outfalls were sampled and analyzed for enterococcus bacteria and the human specific HF-183 genetic marker. The results from this screening helped identify failing septic systems as well as issues with the sewer infrastructure that may be contributing to bacteria in the watershed. Sites with positive results for HF-183 were identified for further investigation and necessary repairs have been made or are ongoing. Sampling continues on a biannual or quarterly basis at key sites in the watershed to monitor the storm system and ensure the longevity of repairs.

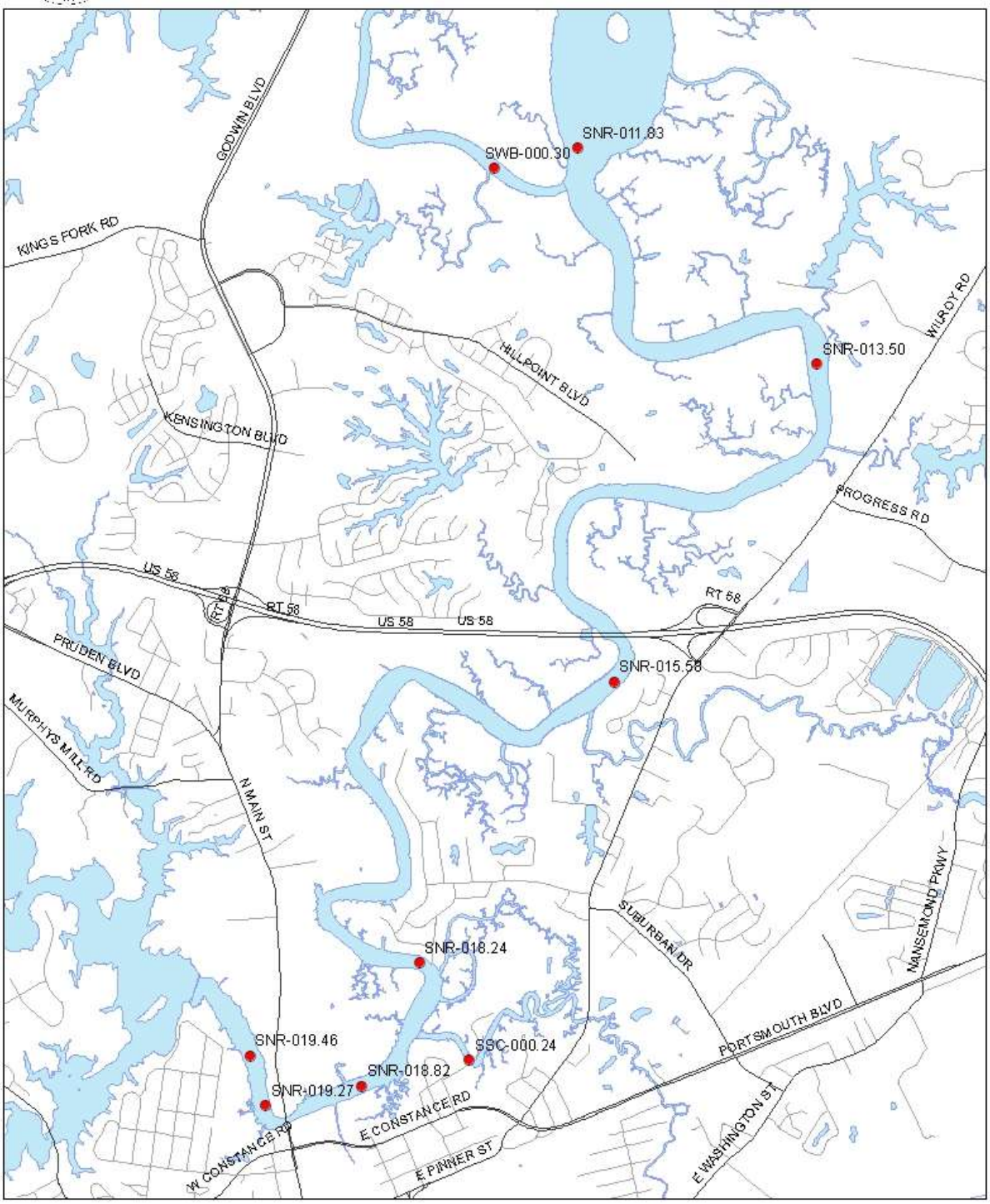
Data collected by other groups

Outside groups such as the Nansemond River Preservation Alliance (NRPA), the Virginia Department of Health Division of Shellfish Sanitation (VDH DSS), and Hampton Roads Sanitation District (HRSD) also collect water sampling data from Suffolk waterways.

Lower Nansemond River



Upper Nansemond River



Helpful Links and Documents

General water quality and TMDL information
http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs.aspx

Approved TMDL Reports
http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLDevelopment/ApprovedTMDLReports.aspxnt.aspx

Approved TMDL Implementation Plans
http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLImplementation/TMDLImplementationPlans.aspx

DEQ Special Order by Consent
http://www.deq.virginia.gov/Portals/0/DEQ/Enforcement/FinalOrders/HRSDandLocality-CO-Sept262007.pdf