City of Alexandria, Virginia

Bacteria
Total Maximum Daily Load (TMDL)
Action Plan

For compliance with 9VAC25-890, General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems, Permit No. VAR040057

June 17, 2015
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1. Introduction

This action plan was first developed and submitted by the City in 2015 in response to the Special Conditions included in the City of Alexandria's (City) General Virginia Pollutant Discharge Elimination System (VPDES) Municipal Separate Storm Sewer System (MS4) Permit, effective July 1, 2013 (2013 MS4 permit), as well as, the local TMDL Guidance memo dated issued by Virginia Department of Environmental Quality (VDEQ) in 2015. The *Non-Tidal Four Mile Run Action Plan* submitted to VDEQ in 2015 was updated to include all of the current bacteria TMDLs within the City to create a comprehensive *Bacteria TMDL Action Plan*. The 2013 MS4 permit included the requirement for the City to develop action plans to address TMDLs where a wasteload allocation (WLA) has been assigned to the MS4. This action plan was subsequently updated in 2016, 2020, and 2022. This action plan is included as an attachment to the City's *MS4 Program Plan*. This action plan identifies best management practices, measurable goals and milestones, and evaluation measures; assesses all significant sources; and includes a method to assess effectiveness of the plan in reducing the WLA pollutant.

The most recent General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Municipal Separate Storm Sewer Systems (MS4) No. VAR040057 was issued to the City from the Virginia Department of Environmental Quality (VDEQ) effective November 1, 2023 (2023 MS4 permit).

The 2023 MS4 permit contains special conditions for local total maximum daily loads (TMDL) under Part II, TMDL Special Conditions, Section B, Local TMDL Special Condition. This section of the permit requires the City to update any previously approved local TMDL action plans for TMDLs approved by the U.S. Environmental Protection Agency (EPA) prior to July 1, 2018, no later than 18-months after the permit effective date (May 1, 2025).

2. Background

This action plan updates the previously approved local TMDL action plan. The bacteria TMDLs addressed in this action plan are identified in Table 1.

Table 1. City of Alexandria's Approved Bacteria TMDLs

Approved Bacteria TMDLs
Fecal Coliform TMDL Development for Four Mile Run, Virginia (Non-Tidal) • Bacteria – fecal coliform • First listed – 1998 • EPA approval – 5/31/2002 • SWCB approval – 6/17/2004
Bacteria TMDL for the Tidal Four Mile Run Watershed • Bacteria – *E. coli* • First listed – 1996 • EPA approval – 6/14/2010 • SWCB approval – 9/30/2010
Bacteria TMDLs for the Hunting Creek, Cameron Run, and Holmes Run Watersheds • Bacteria – *E. coli* • First listed – 1998, 2006, 2004 (respectively) • EPA approval – 11/10/2010 • SWCB approval – 8/4/2011

VDEQ initially listed the Four Mile Run watershed as impaired on the Commonwealth's *Final 1998 305(b)/303(d) Water Quality Assessment Integrated Report*. Four Mile Run is a direct tributary of the Potomac River and is identified as Virginia River Segment VAN-A12R. The non-tidal portion of Four Mile Run associated with the City starts at the western border with Arlington County and extends to approximately the Mount Vernon Avenue Bridge across Four Mile Run. The *Fecal Coliform TMDL Development for Four Mile Run, Virginia* (NVRC, 2002), addresses a fecal coliform impairment and includes approximately 17.0 square miles of the watershed that was approved by the SWCB on June 17, 2004. According to Section 5.2 of the TMDL document, "there are no WLAs for fecal coliform bacteria in the non-tidal portion of the Four Mile Run watershed." In developing the *Bacteria TMDL Action Plan* to meet the requirements in the 2013 MS4 permit, the City took a proactive approach to protecting local water quality and included the non-tidal portion of Four Mile Run despite a WLA not being assigned to the City.

The impaired tidal portion of Four Mile Run associated with the City starts at approximately the Mount Vernon Avenue Bridge and continues east to the confluence with the Potomac River. The corresponding TMDL document for this section of stream is entitled *Bacteria TMDL for the Tidal Four Mile Run Watershed* (ICPRB, 2010) and was approved by the SWCB on September 30, 2010. The TMDL report provides an aggregate WLA for the City.

Hunting Creek, Cameron Run, and Holmes Run, are all located within the Potomac River basin within HUC PL26. The impaired segment of Homes Run extends from the confluence of Holmes Run and Backlick Run upstream to the mouth of Lake Barcroft in Fairfax County. The impaired segment of Cameron Run extends from approximately Telegraph Road upstream to the confluence of Holmes Run and Backlick Run. The impaired segment of Hunting Creek extends from the confluence with the Potomac River at the state boundary to Telegraph Road. The corresponding TMDL document for these impaired stream sections is entitled *Bacteria TMDLs for the Hunting Creek, Cameron Run, and Holmes Run Watersheds* (ICPRB, 2010) and was

approved by EPA in November 2010. The TMDL report provides an aggregated WLA for the City for each of the three streams.

This action plan identifies best management practices (BMP) and other interim milestone activities that were initially identified during the 2013 – 2018 MS4 permit cycle; and updated during the 2018 – 2023 MS4 permit cycle. The requirements outlined in the 2023 MS4 permit are provided in the text box.

2023 MS4 Permit Requirements

Each local TMDL action plan developed by the permittee shall include the following:

a. The TMDL project name;
b. The EPA approval date of the TMDL;
c. The wasteload allocated to the permittee (individually or in aggregate), and the corresponding percent reduction, if applicable;
d. Identification of the significant sources of the pollutants of concern discharging to the permittee's MS4 that are not covered under a separate VPDES permit. For the purposes of this requirement, a significant source of pollutants of concern means a discharge where the expected pollutant loading is greater than the average pollutant loading for the land use identified in the TMDL;
e. The BMPs designed to reduce the pollutants of concern in accordance with Part II B 5, B 6, B 7, and B 8;
f. Any calculations required in accordance with Part II B 5, B 6, B 7, or B 8;
g. For action plans developed in accordance with Part II B 5, B 6, and B 8, an outreach strategy to enhance the public's education (including employees) on methods to eliminate and reduce discharges of the pollutants; and
h. A schedule of anticipated actions planned for implementation during this permit term.

3. Legal Authorities to Reduce Pollutant of Concern

The City has a number of legal tools available to address the possible discharge of bacteria from municipal facilities, development and redevelopment projects, or private properties.

The MS4 general permit regulates discharges from properties that are owned or operated by the City. The City may use it expressed or implied authorities to regulate private lands with regard to stormwater management and MS4 permit requirements. This action plan addresses possible pollutant sources from private properties as well as municipal properties. The City may utilize its rights as the property owner or lessee to address possible sources of bacteria which may originate from the property.

Article XII of the Alexandria Zoning Ordinance (the Environmental Management Ordinance) contains the requirements for standard plan submission requirements. Standard conditions developed during the plan review and Special Use Permit (SUP) processes are enforceable through the Zoning Ordinance. Development plans and SUPs subject to standard conditions must go before the Planning Commission and City Council for consideration before approval.

Section 5-7-42.1 of the City Code prohibits leaving dog waste in public parks or playgrounds, and Section 5-7-46 allows for levying fines for pet owners that do not pick up after their pets. Pet owners not cleaning up after their pet or disposing of pet waste bags in a storm drain may be subject to other parts of the City code.

For pet owners improperly disposing of pet waste, staff from the Fire Marshall's Office with the Environmental Investigations Unit (EIU) may enforce Chapter 13 of Title 11 of the City Code (Environmental Offenses), which prohibits non-stormwater discharges to the storm sewer system.

4. Planning Framework

a. Principles

The City has established the following overarching principles to guide the approach to meet the goals of this action plan:

- Utilize existing programs and efforts;
- Encourage voluntary, practical, and cost-effective practices;
- Follow an adaptive, iterative approach;
    - Replaces dependency on numerical models and traditional planning by applying a focused "learning-by-doing" approach to decision making;
- Focus on phased implementation over multiple permit cycles; and
- Identify additional funding needs.

b. Action Goals

The City has established the following goals consistent with the principles in developing the action plan:

- Consistent: The action plan is consistent with the assumptions and requirements of the TMDL and conforms to general permit requirements and current *MS4 Program Plan* efforts to reduce pollutants to the maximum extent practicable.
- Flexible: The controls, BMPs, design and methods discussed to reduce the pollutant of concern can be revised based on the observed effectiveness of these measures over multiple permit cycles, stakeholder involvement in the development of an implementation plan, change to a water quality standard, or introduction of new technologies and innovations to address the pollutant.
- Cost Effective: The City's *2023 MS4 Program Plan* incorporates both (1) pet waste and (2) illicit discharges as the top high-priority stormwater issues which both help with reducing bacteria loads to local waterways as well as our MS4 permit requirements.

5. TMDL Development and Load Determination

The following sections provide an overview about the development of the bacteria TMDLs and corresponding WLA for the City.

The Commonwealth's Surface Water Standards with General, Statewide Application, 9VAC25-260-10, designates the following uses for all water bodies: 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.

a. Four Mile Run Non-Tidal

The recreation designated use for the non-tidal section of Four Mile Run is currently listed as impaired. The impairment for the non-tidal portion of Four Mile Run was originally listed in Virginia's *Final 1998 305(b)/303(d) Water Quality Assessment Integrated Report* due to exceedances of the state's water quality criteria for fecal coliform. The fecal coliform TMDL was approved by the SWCB on June 17, 2004, and EPA decision rationale dated May 31, 2002. The impairment for the non-tidal segment begins at the headwaters of Four Mile Run just over nine miles upstream of its confluence with the Potomac River and extends to the tidal/non-tidal boundary approximately 1.5 miles upstream of the Potomac River. Although the entire Four Mile Run watershed includes approximately 19.7 square miles of Northern Virginia, only 17.0 square miles were considered for this TMDL Study. The City of Alexandria makes up about 10 percent, 1.7 square miles, of the portion of the watershed included in the study.

The TMDL was developed prior to the issuance of the City's first MS4 general permit. Per Section 5.2.1 of the *Fecal Coliform TMDL (Total Maximum Daily Load) Development for Four Mile Run, Virginia* (NVRC, 2002), since the City was expected to receive an MS4 permit soon after the TMDL was developed, WLAs for the TMDL were developed based on contributions from impervious surfaces in the study area. Per Section 5.2 of the TMDL report, there was no WLA assigned specifically to the City, however, the WLA association for MS4s in the non-tidal section of Four Mile Run MS4s is 2.04E+13 (counts/year). In general, "the Commonwealth intends for the required reductions to be implemented in an iterative process" as evidenced by the types of strategies discussed in the *Implementation Plan for Fecal Coliform TMDL (Total Maximum Daily Load) for Four Mile Run, Virginia* (NVRC, 2004).

b. Four Mile Run Tidal

The fish consumption and recreation designated uses for the tidal section of Four Mile Run are currently listed as impaired due to water quality exceedance associated with *Escherichia coli* (*E. coli*) bacteria. The tidal portion of Four Mile Run was originally listed as impaired for fecal coliform in 1996 and was listed as impaired for *E. coli* bacteria in 2008. The TMDL developed for the *E. coli* bacteria was approved by the SWCB on September 30, 2010, with the EPA decision rationale published June 14, 2010. The impairment for the tidal segment is from rivermile 1.46 (tidal/non-tidal boundary) downstream until the confluence with the Potomac River.

The *Bacteria TMDL for the Tidal Four Mile Run Watershed* (ICPRB, 2010) was built upon the TMDL for the non-tidal portion of the river, with WLAs developed only for the tidal drainage below the non-tidal portion of Four Mile Run. The model simulated fecal coliform bacteria which were converted to the equivalent *E. coli* bacteria using an instream translator. The TMDL documents an aggregate WLA of 1.53E+13 cfu/year for the City, Virginia Department of Transportation, and the George Washington Memorial Parkway. According to the TMDL, this equates to a 94 percent reduction for those regulated sources (see Table 2). A TMDL Implementation Plan has not been developed in response to this TMDL.

Table 2. *E. Coli* WLA for Four Mile Run (Tidal) for City of Alexandria

Water Name	Aggregated MS4s	WLA (cfu/yr)	Percent Reduction (%)
Four Mile Run (Tidal) VAN_A12E_FOU01A00	City of Alexandria, VDOT, G.W. Memorial Parkway	1.53E+13	94

c. Hunting Creek, Cameron Run, and Holmes Run

Hunting Creek, Cameron Run, and Holmes Run are all located within the Potomac River basin. The impaired segment of Hunting Creek extends from the confluence with the Potomac River at the state boundary to Telegraph Road. Cameron Run/Hunting Creek is currently listed as impaired for the designated uses of aquatic life, fish consumption, open-water aquatic life, and recreation beginning in 1998.

Cameron Run (VAN-A13-CAM01A04) was delisted in the *Final 2014 305(b)/303(d) Water Quality Assessment Integrated Report* and was found as supporting in the *Final 2016 305(b)/303(d) Water Quality Assessment Integrated Report*. However, Cameron Run/Hunting Creek is listed as impaired in the ***Draft 2024,*** *Final 2022 and 2018 305(b)/303(d) Water Quality Assessment Integrated Reports*.

The impaired segment of Homes run extends from the confluence of Holmes Run and Backlick Run upstream to the mouth of Lake Barcroft. The designated use of recreation has a current status of impaired. Similarly to Hunting Creek and Cameron Run, Holmes Run was listed as impaired for bacteria in 2004.

The *Bacteria TMDLs for the Hunting Creek, Cameron Run, and Holmes Run Watersheds* (ICPRB, 2010) were developed using Hydrologic Simulation Program-Fortran (HSPF) and Euler-Lagrangian Circulation (ELCIRC) models.

Table 3 presents the aggregated WLAs for the City for each stream. *E. coli* bacteria concentrations are measured in coliform forming units (cfu) expressed annually.

Table 3. *E. Coli* WLA for Holmes Run, Hunting Creek, and Cameron Run for City of Alexandria

Water Name	Aggregated MS4s	WLA (cfu/yr)	Percent Reduction (%)
Holmes Run VAN_A13R_HOR01A00	City of Alexandria and VDOT	2.40E+13	83
Hunting Creek VAN_A13E_HUT01A02	City of Alexandria, VDOT, G.W. Memorial Parkway	3.73E+13	92
Cameron Run VAN_A13R_CAM01A04	City of Alexandria and VDOT	3.20E+13	83

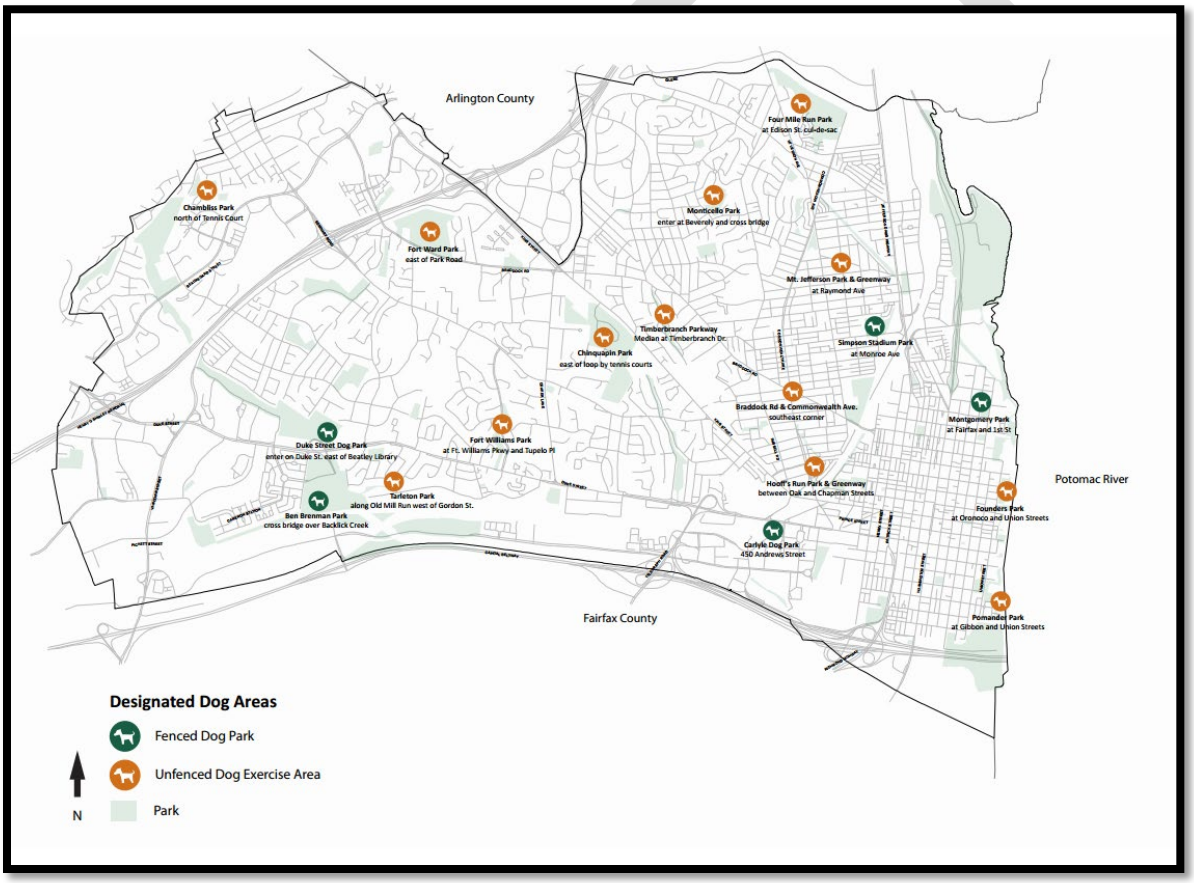
6. Possible Significant Sources of Bacteria

Potential contributors to the bacterial impairments, as documented in the TMDL reports, include wildlife (deer, raccoon, muskrat, beaver, and waterfowl), canine, human, and other. *There are no other significant sources of the pollutants of concern discharging to the permittee's MS4 that are not covered under a separate VPDES permit.*

As is the case for many streams, reductions from wildlife sources are not realistic and do not meet EPA's guidance for reasonable assurance. According to analyses of the water quality modeling, many streams with high wildlife inputs "will not attain standards under all flow regimes at all times." While there are a few options available, "the reduction of wildlife or changing a natural background condition is not the intended goal of a TMDL." According to the City's bacteria TMDLs, "Virginia and EPA are not proposing the elimination of wildlife to allow for the attainment of water quality standards."

The City does have several fenced dog parks and unfenced dog exercise areas as seen in Figure 1. These locations have been identified as having the potential to produce bacterial pollutant loadings which are greater than the average loading for the City's MS4 area. As a result, the City targets dog owners for outreach and education. In addition, the City distributes dog waste bags and supports pet waste stations. See Section 7 for additional information.

Figure 1. Dog Parks within the City of Alexandria, VA



7. Best Management Practices to Reduce Bacteria

Adaptive management is an iterative implementation process that makes progress toward achieving water quality goals while using new data and information to reduce uncertainty and adjust implementation activities. The focus is oriented towards increasingly efficiently enforcing pet waste laws, educating the public on the impact of pet waste, implementation of the illicit

discharge and dumping program, and performing routine inspection and maintenance of the infrastructure. Strategies may change if warranted by new data and information.

National Pollutant Discharge Elimination System regulations allow the use of non-numeric, BMP-based water quality based effluent limits (WQBEL) where "[n]umeric effluent limitations are infeasible; or [t]he practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA" (40 CFR 122.44(k) 3-4). Adaptive implementation principles used to implement BMPs to address bacteria sources are appropriate due to the uncertainty associated with the TMDL loading capacity and specific allocation scheme.

The non-tidal Four Mile Run TMDL does not contain specific numeric waste load allocations for MS4 permits in the watershed, but rather discusses a number of best management practices that may be employed to address possible pollutant sources within the watershed. The tidal Four Mile Run and Hunting Creek/Cameron Run/Holmes Run TMDLs includes aggregated WLAs for the City's MS4.

Many of the BMPs discussed in the *Implementation Plan for the Fecal Coliform TMDL for Four Mile Run, Virginia* (NVRC, 2004) have been and continue to be implemented by the City to address the bacteria impairment in the watershed. The City's *2023 MS4 Program Plan* includes specific local education and outreach strategies to address "Bacteria from Pet Waste" as one of the identified top three high-priority water quality issues.

Specifically, the 2023 MS4 Permit requires the selection and implementation of a minimum of three (3) strategies from Table 5 (pg. 40 – 45) for bacteria TMDLs. A complete list of strategies is included as Table 4, adapted from the 2023 MS4 Permit.

Table 4. Strategies for Bacteria Reduction Stormwater Control/Management Strategy (adapted from the 2023 MS4 Permit)

Bacteria Source	Strategies
Domestic Pets (Dogs and Cats)	• Provide signage to pick up dog waste, providing pet waste bags and disposal containers. • Adopt and enforce pet waste ordinances or policies, or leash laws or policies. • Place dog parks away from environmentally sensitive areas. • Maintain dog parks by removing disposed of pet waste bags and cleaning up other sources of bacteria. • Protect riparian buffers and provide unmanicured vegetative buffers along streams to dissuade stream access.
Urban Wildlife	• Educate the public on how to reduce food sources accessible to urban wildlife (e.g., manage restaurant dumpsters and grease traps, residential garbage, feed pets indoors). • Install storm drain inlet or outlet controls. • Clean out storm drains to remove waste from wildlife. • Implement and enforce urban trash management practices. • Implement rooftop disconnection programs or site designs that minimize connections to reduce bacteria from rooftops. • Implement a program for removing animal carcasses from roadways and properly disposing of the same (either through proper storage or through transport to a licensed facility).

Illicit Connections or Illicit Discharges to the MS4 Dry Weather Urban Flows (Irrigations, Car Washing, Powerwashing, etc.)	• Implement an enhanced dry weather screening and illicit discharge, detection, and elimination program beyond the requirements of Part I E 3 to identify and remove illicit connections and identify leaking sanitary sewer lines infiltrating to the MS4 and implement repairs. • Implement a program to identify potentially failing septic systems. Educate the public on how to determine whether their septic system is failing. • Implement septic tank inspection and maintenance program. Implement an educational program beyond any requirements in Part I E 1 though E 6 to explain to citizens why they should not dump materials into the MS4. • Implement public education programs to reduce dry weather flows from storm sewers related to lawn and park irrigation practices, car washing, powerwashing and other nonstormwater flows. • Provide irrigation controller rebates. • Implement and enforce ordinances or policies related to outdoor water waste. • Inspect commercial trash areas, grease traps, washdown practices, and enforce corresponding ordinances or policies.
Birds (Canadian Geese, Gulls, Pigeons, etc.)	• Identify areas with high bird populations and evaluate deterrents, population controls, habitat modifications and other measures that may reduce bird associated bacteria loading. • Prohibit feeding of birds.
Other Sources	• Enhance maintenance of stormwater management facilities owned or operated by the permittee. • Enhance requirements for third parties to maintain stormwater management facilities. • Develop BMPs for locating, transporting, and maintaining portable toilets used on permittee owned sites. • Educate third parties that use portable toilets on BMPs for use. • Provide public education on appropriate recreational vehicle dumping practices.

• Pet Ordinance

Section 5-7-46 of the City Code allows for levying fines for pet owners that do not pick up after their pets at public parks. Pet owners not cleaning up after their pet or disposing of pet waste bags in a storm drain may be subject to the City Code of Ordinances Title 11, Chapter 13 Environmental Offenses for illicit discharges to the storm drain system.

Milestones, Measurable Goals and Assessment Methods

The City has found that these two codes sections are effective in reinforcing proper behavior for pet owners. The City will review the effectiveness of the pet ordinance and the Environmental Offenses annually. This effort will include a review of the annual follow-up survey data that is provided by the Northern Virginia Regional Commission (NVRC) Clean Water Partners – of which the City is a member partner – with the previous year's survey data. Additionally, the City tracks citizen complaints and results of proactive staff efforts related to improper disposal of pet waste in an asset management system database and/or the permit

tracking system. Annual results exported from these databases associated with pet waste will be compared to the previous year's results.

The goal of these code sections is to illuminate and reinforce proper behavior. This review will seek to identify trends in behavior using these two metrics. If this review shows a precipitous upward trend in improper behavior, the City will consider revising the code to better address increased improper behavior. The results of these activities are presented in the MS4 annual report.

- **Pet Stations, Dog Parks, and Street Cans**

The City continues to support the installation of pet waste stations on public and private property. The City has installed pet waste stations in public parks and continues to look for opportunities for installations. "Dog bone" shaped pet waste dispensers that can be attached to a dog leash are handed out during public outreach events as a more mobile way of dispensing pet waste bags. The City also hands out pet waste bag holders in an effort to promote dog owners to dispose of the bagged waste properly in a waste container.

The City Council approved the master plan for dog exercise areas in September 2000, which defines areas for unleashed dog exercise and established guidelines for the creation of any new fenced dog parks and exercise areas, and to ensure that these facilities do not contribute to bacteria from pet waste. The *City's Plan for Dog Parks and Dog Exercise Areas* (2011) provides detailed information and rules governing the City's designated dog park and exercise areas. One of the reasons for having dog exercise areas is to concentrate activity and provide the City with a way to focus education and outreach efforts. The plan includes recommendations for providing plastic bags at dog runs and the strategic placement of waste receptacles. The plan also requires new dog exercise areas to be located more than 75 feet from bodies of water, and in most cases outside the Resource Protection Area (RPA) associated with waterbodies and wetlands.

The City places "street cans" in parks and along public streets where residents can deposit used pet waste bags and routinely empties the cans to further encourage their use and to mitigate the emanation of odors.

Milestones, Measurable Goals and Assessment Methods

The City will continue to support installation of pet waste stations and report on new stations installed in the annual report for the corresponding reporting period. Statistics on "dog bone" pet waste dispensers is included in annual reports. Street cans will be provided and maintained for parks and public streets.

- The number of pet stations, bags used, and the number of newly installed pet waste stations will be documented and included in each annual report.
- The City will continue ongoing implementation of the master plan and revise it as necessary. Plan updates will be reported with the associated annual report.
- Street cans, especially in parks, are widely used by dog owners for disposal of pet waste. These will continue to be routinely emptied and staff will note any precipitous drop-off in pet waste in the cans that is not related to seasonal variations.

- ## Illicit Discharge Detection and Elimination Program

The City has performed dry weather screening of regulated outfalls during the previous permit based on local the TMDLs. The 2023 MS4 permit requires the City to perform dry weather screening on at least 50 outfalls annually. However, as noted in the *Fecal Coliform Non-Tidal Four Mile Run TMDL*, Optical Brightener Monitoring (OBM) conducted on every outfall in the watershed "lends evidence that storm sewer outfalls are largely free from illicit connections." An analogous conclusion can be inferred from the interpretation of similar analytical data for the Tidal Four Mile Run TMDL, and Holmes Run, Cameron Run and Hunting Creek TMDL – that storm sewer outfalls in those local watersheds are largely free from illicit connections and that OBM is not the preferred assessment approach to be implemented during outfall screening. The City continues to implement screening methods found in the *Illicit Discharge Detection and Elimination Program Policies and Procedures* included in the *MS4 Program Plan* as Appendix E.

In addition to dry weather outfall screening, the City maintains a public reporting mechanism to receive complaints. Alex311 services include a webpage, mobile app, social media, and phone options to submit requests for service or information. Alex311can be used by residents and others to report suspected illicit discharges and other environmental concerns.

The reporting form can be found at the homepage at alexandriava.gov and is available on subordinate webpages. Incidents are routed to the proper staff and cases may be tracked for resolution. In general, reports of illicit discharging must be investigated within 48-hours, but are done typically as soon as possible. City staff utilize the *Illicit Discharge Detection and Elimination Program Policies and Procedures* developed and included as Appendix C of the *2023 MS4 Program Plan*.

Formal illicit discharge detection and elimination (IDDE) training is provided to staff per the schedule in the program plan, while and informal staff training is provided continually as the opportunity arises. The public also receives informal messaging on recognizing and reporting illicit discharges to the storm drain system.

Milestones, Measurable Goals and Assessment Methods

- Annually conduct dry weather screening on at least 50 outfalls and note results of the screening, to include if sanitary cross connections are found in each year's annual report.
- Report on the number of complaints received related to illicit bacteria discharges in the annual report.

- ## Routine Infrastructure Cleaning and Maintenance

As part of the IDDE program, the City performs routine cleaning of storm drain inlets and catch basins, and frequent street sweeping to remove debris, organics and other items from the system so that these materials are not transported to nearby surface waters during a subsequent storm. Street sweeping is performed routinely from March to October annually and suspended during the snow season. If blockages of the storm drain system are observed during routine maintenance, staff may perform CCTV of the lines to determine the extent of

the blockage and the best course of remedial action required to remove the blockage. Proactive CCTV of storm and sewer lines is also performed on a regular basis. Assessing the condition of sanitary sewer lines can serve to catch an issue with blockage, deflection or root intrusion and prevent sanitary overflows or backups from occurring. Reconstruction and remediation of sanitary sewers such as relining old sewers, joint sealing, rerouting connections and manhole repairs are performed as warranted as part of the inflow and infiltration program.

Milestones, Measurable Goals and Assessment Methods

- The City is divided in to 11 separate sweeping areas that receive three passes annually from March to October (outside of snow season). Crews sweep approximately 30,000 lane miles each year and this information is provided in the annual report.
- Crews perform proactive catch basin and inlet cleaning from March to October annually based on 12 separate zones that correlate to the snow zones, with the goal of reaching all 12 separate zones every two years.
- Crews perform proactive catch basin and inlet cleaning following the leaf collection activities to remove leaf and organic material that may have accumulated.
- Crews perform reactive catch basin and inlet clearing according to service requests, resident complaints, and weather-related activities.
- Reactive CCTV inspections occur in response to resident complaints on sewer mains associated with private backups.

The City will continue to perform ongoing routine maintenance, cleaning and investigations of the sewer system and report related information in the associated annual report.

8. Methods to Assess Action Plan Effectiveness

The City will continue to implement those BMPs discussed in Section 7 per the milestones, measurable goals, and assessment tools.

Pursuant to the 2008 – 2013 MS4 General Permit and submitted with the 2009 – 2010 MS4 annual report, municipal facilities of concern were previously assessed as to whether these facilities may be expected to constitute a significant source of bacteria. The City has been implementing BMPs to address bacteria for successive permit cycles. Chapter 8 of the *Implementation Plan for the Fecal Coliform TMDL for Four Mile Run, Virginia* (NVRC, 2004) cites "actions taken" and "water quality data" as two types of criteria to be monitored to ensure implementation and evaluate efficacy. Implementation actions are included in Chapter 6 of this plan (NVRC, 2004). These are pollution prevention, mitigation measures, and indirect measures. Pollution prevention efforts related to Alexandria's sewer system include the sewer rehabilitation program and routine inspection and maintenance.

As mentioned previously, implementation plans for Tidal Four Mile Run and the Hunting Creek, Cameron Run, and Holmes Run TMDLs have not yet been developed. Therefore, the following

actions were identified for non-tidal Four Mile Run but can also be considered as applicable for the City's other bacteria TMDLs. The submitted delisting for Cameron Run may be partially attributed to the City's commitment to protecting our waters and preventing bacterial contamination.

a. Evaluation of Results and Adaptive Management Strategies

2023 MS4 Permit Requirements

Each local TMDL action plan developed by the permittee shall include the following:

(1) An evaluation of the results achieved by the previous action plan; and
(2) Any adaptive management strategies incorporated into updated action plans based on action plan evaluation.

The 2023 MS4 Permit requires each updated TMDL action plan to include an evaluation of the results and any adaptative management strategies. For the purposes of this Bacteria TMDL Action Plan, the City relies on the NVRC Survey discussed in Section 9 and included annually with the City's MS4 Annual Report. Through the evaluation of survey results, discussions with community members, and discussions internally with staff across different City office (i.e., Parks and Resource Recovery), the City has generally remained consistent with the strategies incorporated into this action plan. The main target audience for this Bacteria TMDL is pet owners. The City not only provides pet waste bag dispensers during outreach events but has targeted large "Dog Walks" (i.e., Alex Dog Walk) to provide pet waste bag holders which have become very population with the community. Further, the City has created and distributed lawn signs with the "Poop Fairy" indicating that there is no such thing as a "Poop Fairy" to remind pet owners to clean up after their pets. Outreach is included in Section 10.

b. Actions Taken

In the absence of implementation plans for the Tidal Four Mile Run TMDL, and the Holmes Run, Cameron Run, and Hunting Creek TMDL, the City has taken a holistic approach to addressing bacteria impairments by applying the following items that are discussed in the *Implementation Plan for the Fecal Coliform TMDL for Four Mile Run, Virginia* (NVRC, 2004) to other watersheds draining to impaired waters in the City. Other actions discussed herein constitute additional efforts the City performs to address bacteria impairments using this holistic approach. These City-wide actions are discussed in detail below.

Sanitary Sewer Asset Renewal Program

The City is implementing a Sanitary Sewer Asset Renewal Program, which will provide for the inspection and rehabilitation of all City sanitary sewers, manholes, and City-owned portions of lateral sewers. A total of $36 million has been programmed over the next 10 years as part of the City's Sanitary Sewer Capital Improvement Program. The program commenced in Spring 2021 and inspection/rehabilitation has been occurring in three (3) phases

- *Phase I:* Del Ray East includes areas bounded by Commonwealth Avenue, Four Mile Run, Route 1, and the Metro rail lines. Inspections of sanitary manholes, sanitary sewers, and city-owned laterals took place from March 2021 to December 2021. Rehabilitation of structurally deficient manholes and sewers began October 2023. Rehabilitation of structurally deficient laterals is anticipated to commence in Spring 2025. Construction schedule and updates can be found on the capital project webpage, Sanitary Sewer Rehabilitation- Del Ray East.
- *Phase II:* Del Ray West includes areas between Russell Road, Commonwealth Avenue, West Glebe Road, and King Street. Inspections of sanitary manholes, sanitary sewers, and city-owned laterals took place from June 2022 to July 2023. Rehabilitation of structurally deficient manholes, sewers, and laterals is anticipated to commence in Winter 2025.
- *Phase III:* North Ridge includes areas between Russell Road, West Glebe Road, Cameron Mills Road, and West Braddock Road. Inspections started in June 2023 and will take approximately 9 months to complete.

Sanitary Sewer Infrastructure

- Sewer rehabilitation has taken place and continues to take place City-wide.
- Inspection and maintenance is performed as discussed in Section 7.e..

IDDE

- The *Implementation Plan for the Fecal Coliform TMDL for Four Mile Run, Virginia* (NVRC, 2004) required a pilot program that has since matured through successive permit cycles. Annual dry weather inspections are conducted on at least 50 outfalls City-wide, given that bacteria impairments within the City's watersheds.
- The local ordinance was updated in 2001 to include City Ordinance Title 11, Chapter 13 Environmental Offenses in the Environmental Management Ordinances per the

Implementation Plan for the Fecal Coliform TMDL for Four Mile Run, Virginia (NVRC, 2004), and continues to be enforced City-wide.

- The Environmental and Industrial Unit (EIU) was created in July 1, 2009 to coordinate environmental issues among departments, with staff from the EIU enforcing Chapter 13 with support from Transportation and Environmental Services.
- The City maintains a Complaint Reporting system through Alex311 for resident and staff complaint response and tracking.

Proper Pet Waste Disposal

- Consistent with the *Implementation Plan for the Fecal Coliform TMDL for Four Mile Run, Virginia* (NVRC, 2004), the entire City is targeted for the installation of pet waste stations and signage to promote responsible owner behavior. A memorandum of understanding was developed with the City's Department of Recreation, Parks, and Cultural Activities to install pet waste stations in public parks.
- The City anticipates initiating a new public awareness campaign targeted towards pet owners and picking up pet waste in public right of ways.
- The City performs additional efforts annually per Section 7.c. and will report of the activities annually.

Stormwater Treatment

- As a local Virginia Stormwater Management Program (VSMP) authority, the City administers the VSMP Regulations and the Chesapeake Bay Act. The VSMP Regulations have superseded the Bay Act for stormwater quality requirements, while existing portions of the Bay Act related to RPA protection and enhancement is retained.
- City has been awarded grants through the Stormwater Local Assistance Fund (SLAF) for retrofits under the Chesapeake Bay TMDL for Lake Cook and Ben Brenman (Cameron Station) Pond. These practices include features to enhance the exclusion of geese and improve water quality in the Cameron Run Watershed, the Potomac River, and the Chesapeake Bay.
- The City inspects and maintains public stormwater facilities, inspects private facilities, and requires private facility owners to maintain private facilities.
- The City has retrofitted publicly-owned facilities with stormwater management BMPs. The Burke Library with a StormFilter™ and bioretention facility, and pervious pavers and bioretention at Four Mile Run Park are a few examples.
- The City adopted the updated *Environmental Action Plan 2040* in 2019 which includes an updated Green Building policy effective March 2, 2020. This policy requires public development to meet 100% of the required stormwater treatment through green infrastructure.
- On January 24, 2018, the City's Transportation and Environmental Services issued Memorandum to Industry No. 01-18, "Use of Manufactured/Proprietary Stormwater BMPs". This memo outlines new requirements for new development and redevelopment to utilize non-proprietary surface BMPs approved by the Virginia BMP

Clearinghouse to remove a minimum of 65% of the total phosphorus removal required by VSMP.

Street and Infrastructure Management

- City streets are swept per Section 7.e.
- Catch basins and inlets are cleaned per Section 7.e.
- The City maintains an ArcGIS database and provides updates and maintenance, as needed.

Stream Corridor & Wetlands Restoration

- The City completed the restoration of Lucky Run.
- The Four Mile Run wetlands restoration project was completed in FY16.
- Windmill Hill Living Shoreline project on the banks of the Potomac River was completed in FY19.

Stormwater Runoff Reduction and Reuse

- The City completed a number of retrofit projects recently, to include installation of green infrastructure at Charles Barrett Elementary School and Four Mile Run Park, and the installation of a cistern at Fire Station 206.
- The City ensures that municipal redevelopment projects explore the feasibility of implementing stormwater controls beyond VSMP requirements to address Chesapeake Bay TMDL target reductions and provide other ancillary benefits.

c. Water Quality and Estimation of Discharge

Per the *Implementation Plan for the Fecal Coliform TMDL for Four Mile Run, Virginia* (NVRC, 2004), water quality data will be reported by VDEQ through its own bacteria monitoring efforts. The ultimate goal is for that the water quality in Four Mile Run will respond to actions in the watershed. This TMDL implementation plan (NVRC, 2004) was created jointly by jurisdictions in the watershed and it requires actions of all parties to improve water quality in the run. VDEQ also performs bacteria monitoring on other impaired streams in the City. The City will rely on this water quality data for other TMDLs consistent with the approach identified in the implementation plan (NVRC, 2004). The City will continue to implement structural and non-structural BMPs to address bacteria impairments in its receiving waters.

9. Outreach Strategy

The 2023 MS4 permit, Part II. B. 3. g., identifies the requirement to develop an outreach strategy that enhances the public's education (including employees) on methods to eliminate and reduce discharges of the pollutants.

The City has identified "Bacteria from Pet Waste" as one of the top three high-priority water quality issues in the *2023 MS4 Program Plan*. BMPs to address bacteria were introduced in the City's inaugural permit for the 2003 – 2008 permit cycle, the 2008 – 2013 permit cycle, the 2013 – 2018 permit cycle, the 2018 – 2023 permit, and the current 2023 – 2028 permit. This is in addition to the City's continued participation as an active partner in the NVRC Clean

Water Partners regional education and outreach program. The goal of these efforts is to reduce bacteria pollution from pet sources by educating owners of the importance of picking up after their pets, while making it convenient for them to dispose of the waste after picking it up. Therefore, dog owners continue to be targeted with education and outreach efforts.

The City's education and outreach strategy utilizes messaging via multi-media and message delivery. Given that addressing bacteria from pet waste is one of the City's high-priority water quality issues, the goal of the outreach effort is to reach at least 20% of pet owners annually to comply with permit requirements. The City's proposed efforts are captured in the *MS4 Program Plan* and actions are included in the annual report

- Create and distribute annually at least one education message for distribution via the City's electronic email alert system (*eNews*) and estimate the number of dog owners reached.
- Create and distribute annually at least one message on social media about picking up after pets and properly disposal of the waste and estimate the number of dog owners reached.
- Distribute the Pet Waste brochure annually at appropriate events, at the Animal Shelter, and local businesses, and estimate the number of residents reached.
- Provide education on proper pet waste disposal during speaking engagements.
- Participate in the NVRC Clean Water Partners regional efforts and estimate the number of Alexandria residents reached through messaging.
- Promote the distribution of the "No Such Thing as the Poop Fairy" pet waste yard signs.

The effectiveness of the City's education and outreach strategy will be assessed annually using the NVRC Survey that is conducted following the annual campaign. The survey has been conducted for a number of years and is useful in showing trends over time. Results will be provided in each annual report for the corresponding permit term.

10. Schedule

The 2023 MS4 permit, Part II. B. 3. h., identifies the requirement to incorporate a schedule of anticipated actions planned for implementation during the permit term (2023 – 2028). The best management practices described in this action plan have been and are currently being implemented.

The *2023 MS4 Program Plan* includes a schedule of strategies associated with pet waste and illicit discharge. Within these two "sources" are several strategies designed to reduce the load of bacteria to the MS4. Figure 1 provides the schedule associated with pet waste and Figure 2 provides the schedule associated with illicit discharge. These Figures are both presented in the City's 2023 MS4 Program Plan and reported on annually in the MS4 report.

Figure 1. Pet Waste Outreach Strategy Implementation Schedule

Strategy Name	Description	Impact on Stormwater Discharges	Target Audience	Responsible Parties	Implementation Schedule	Documentation	Measurable Goal
Traditional Written Materials	Distribute pet waste pamphlets and other written materials at outreach events	Provide education and outreach written materials on the proper disposal of pet waste to reduce the amount of bacteria that is carried to waterways	Individuals attending outreach events / pet owners	T&ES-SWM	Distribute materials at outreach events	Sample written materials distributed	Dates and location of outreach events with the approximate number of attendees
Signage	Installation, maintenance, and re-stocking of pet waste stations with appropriate signage "Poop Fairy" yard signs	Provide waste stations and/or bags for waste stations to make it convenient for pet owners to properly dispose of pet waste to reduce the amount of bacteria that is carried to waterways Inform public that they are responsible for picking up pet waste	Individuals using the area with their pet	T&ES-SWM in coordination with RPCA and general public	Provide bags to refill pet waste stations as needed Distribute "Poop Fairy" yard signs during outreach events and as requested	Photo of new pet waste station, documentation of existing pet waste stations Photo of "Poop Fairy" yard signs in neighborhoods	Number of existing and new pet waste stations Number of pet waste bags used and distributed to refill stations Number of "Poop Fairy" yard signs distributed
Media Materials	Use eNews (City electronic news distribution system), social media (Facebook, Instagram, or X), television, and/or websites to convey message	Provide education and outreach on the proper disposal of pet waste to reduce the amount of bacteria that is carried to waterways	General public / pet owners	T&ES-SWM in coordination with OCCE and NVRC Clean Water Partners for regional efforts	Annually distribute one (1) eNews and one (1) social media post. Implement television advertising and post information on the City's Stormwater Quality webpage	eNews, social media posts, screen captures of webpage	The number of individuals signed up to receive the City's eNews. The number of T&ES Facebook, Instagram, and X followers. The number of visits to the Stormwater Management webpage. Clean Water Partners Only Rain Summary Report of Findings
Speaking Engagements	Present at no less than two (2) events per year and include a message about proper disposal of pet waste	Provide education on the proper disposal of pet waste to reduce the amount of bacteria that is carried to waterways	Individuals attending the activity, event, or class / pet owners	T&ES-SWM	Annually present at no less than two (2) events per year	Presentation materials	Dates and locations of presentations with the approximate number of attendees

Figure 2. Illicit Discharge Outreach Strategy Implementation Schedule

Strategy Name	Description	Impact on Stormwater Discharges	Target Audience	Responsible Parties	Implementation Schedule	Documentation	Measurable Goal
Traditional Written Materials	Distribute household hazardous waste pamphlets and other written materials at outreach events.	Provide education and outreach written materials on the proper disposal of household hazardous waste to reduce illicit discharges	Individuals attending outreach events	T&ES-SWM in coordination with T&ES-RR	Distribute materials at outreach events	Sample written materials distributed	Dates and location of outreach events with the approximate number of attendees
Signage	Install storm drain markers	Reduce dumping and increase awareness by visually alerting residents that anything that goes down the storm drain goes to the local waterway and is not treated	Individuals traveling past storm drains with the markers	T&ES-SWM in coordination with P&Z, private developers, and general public	Provide markers to public and private developers as needed	Graphic of the storm drain marker and sample plan sheet with the requirement for private developers to place the markers on all storm drains within 50-ft of the project	Number of markers placed
Media Materials	Use eNews (City electronic news distribution system), social media (Facebook, Instagram or X), television, and/or websites to convey message	Provide education and outreach on the proper disposal of non-stormwater materials to reduce illicit discharges along with recognizing and reporting illicit discharges	General public	T&ES-SWM in coordination with OCCE and NVRC Clean Water Partners for regional efforts	Annually distribute one (1) eNews and one (1) social media post. Implement television advertising and post information on the City's Stormwater Quality webpage	eNews, social media posts, screen captures of webpage	The number of individuals signed up to receive the City's eNews. The number of T&ES Facebook, Instagram, and X followers. The number of visits to the Stormwater Management webpage. Clean Water Partners Only Rain Summary Report of Findings
	Have a reporting mechanism on the City's website so that residents can report potential illicit discharges (Alex311)	Ensure the reporting of potential illicit discharges is convenient so that City staff can investigate and determine the source	General public	T&ES-SWM and EIU	Have the reporting mechanism continuously available	Screen capture of the webpage with the reporting mechanism	The number of stormwater pollution related complaints received
Speaking Engagements	Present at no less than two (2) events per year and include a message about illicit discharges	Provide education on the proper disposal of non-stormwater materials to reduce illicit discharges	Individuals attending the activity, event, or class	T&ES-SWM	Annually present at no less than two (2) events per year	Presentation materials	Dates and locations of presentations with the approximate number of attendees

11. References

Bacteria TMDL for the Tidal Four Mile Run Watershed. Interstate Commission on the Potomac River Basin (ICPRB). April 21, 2010. Available at https://www.deq.virginia.gov/portals/0/DEQ/Water/TMDL/apptmdls/potrvr/tidalfourmile.pdf. Accessed April 6, 2020.

Bacteria TMDLs for the Hunting Creek, Cameron Run, and Holmes Run Watersheds. ICPRB. November 2, 2010. Available at https://www.deq.virginia.gov/portals/0/DEQ/Water/TMDL/apptmdls/potrvr/huntingec.pdf. Accessed April 6, 2020.

Environmental Action Plan 2040. City of Alexandria. July 9, 2019. Available at https://www.alexandriava.gov/uploadedFiles/tes/EAP2040v25.pdf. Accessed April 15, 2020.

Fecal Coliform TMDL (Total Maximum Daily Load) Development for Four Mile Run, Virginia. Northern Virginia Regional Commission (NVRC). May 31, 2002. Available at https://www.novaregion.org/DocumentCenter/View/289/Final-Report-for-the-4MR-Fecal-Coliform-TMDL-502?bidId=. Accessed April 6, 2020.

Guidance Memo No. GM-16-2006, TMDL Action Planning for Local Total Maximum Daily Loads as Required in the Small MS4 General Permit (VAR04) Effective July 1, 2013 and MS4 Individual Permits. Virginia Department of Environmental Quality, Water Division. November 21, 2016.

Implementation Plan for Fecal Coliform TMDL (Total Maximum Daily Load) for Four Mile Run, Virginia. NVRC. March 31, 2004. Available at https://www.deq.virginia.gov/Portals/0/DEQ/Water/TMDL/ImplementationPlans/4mileip.pdf. Accessed April 6, 2020.

Memo to Industry No. 01-18, Use of Manufactured/Proprietary Stormwater BMPs. City of Alexandria. January 24, 2018.

Plan for Dog Parks and Dog Exercise Areas. City of Alexandria. Revised Winter 2011.