

Action Plan for the Roanoke River Benthic TMDL (2018-2023 MS4 General Permit)

A Plan for Achieving Sediment Load Reductions VWCC's
Assigned Waste Load Allocation

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Updates include Appendix B, provided by H2R Engineering, Inc. to supplement this Action Plan, that provides the calculations required by Part II.B.5.c of the General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems, as requested in letter from DEQ dated 8/17/20.

This document addresses Part II B, of the General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer System. This document serves as a specific TMDL Action Plan to identify the best management practices and other interim milestone activities to be implemented to address the sediment waste load allocation assigned to VWCC's regulated MS4 area in the "Benthic TMDL Development for the Roanoke River" approved by the Environmental Protection Agency on May 1, 2006.

EXECUTIVE SUMMARY

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

The purpose of this Action Plan is to address the WLA assigned to VWCC for the “*Benthic TMDL Development for the Roanoke River Watersheds*” approved by the EPA on May 1, 2006. The TMDL assigns VWCC a WLA for Sediment of 2 tons/year from the existing conditions. However, the TMDL states: “Virginia intends for the required reductions to be implemented in an iterative process that first addresses those sources with the largest impact on water quality.” The Action Plan addresses sediment in accordance with the special conditions and expectations of the TMDL by demonstrating that VWCC uses an adaptive iterative implementation of programmatic BMPs to reduce or eliminate sediment to the maximum extent practicable. Compliance to the special conditions is demonstrated within the Action Plan through:

- Implementation of VWCC MS4 Program Best Management Practices (BMPs) and associated policies and procedures;
- BMPs integrated into the VWCC MS4 Program Plan beyond those required by the permit;
- Enhancement of the VWCC MS4 Public Education and Outreach Program;
- An assessment of campus facilities; and
- A methodology to measure Action Plan effectiveness through MS4 annual reporting.

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Acronyms

BMP	Best Management Practice
CUA	Census Urban Area
CWA	Clean Water Act
DEQ	Department of Environmental Quality
EPA	Environmental Protection Agency
GIS	Geographic Information System
IDDE	Illicit Discharge Detection and Elimination
IP	Implementation Plan
LA	Load Allocation
MCM	Minimum Control Measure
MEP	Maximum Extent Practicable
MOS	Margin of Safety
MS4	Municipal Separate Stormwater Sewer System
MS4 GP	General Permit for Discharge of Stormwater from Small MS4s
NPDES	National Pollutant Discharge Elimination System
POC	Pollutant of Concern
SWPPP	Stormwater Pollution Prevention Plan
SWM	Stormwater Management
TMDL	Total Maximum Daily Load
VAC	Virginia Administrative Code
VPDES	Virginia Pollutant Discharge Elimination System
VSMP	Virginia Stormwater Management Program
VWCC	Virginia Western Community College
WLA	Wasteload Allocation

1.0 INTRODUCTION AND PURPOSE

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

In 1996, the DEQ listed Roanoke River their biennial 303(d) TMDL Priority List and Report due to violations of the state’s water quality standard for sediment. As a consequence, a TMDL was developed and subsequently approved by the EPA on May 1, 2006. The TMDL assigned MS4 Permit holders a waste load allocation (WLA) for sediment discharges. The WLA represents the allowable sediment load from the MS4s to prevent instances of exceedance of sediment discharge water quality standards. The TMDL calculated the WLA for VWCC to be 2 tons per year (tons/year).

1.1. Total Maximum Daily Loads

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

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

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

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

The Roanoke River Sediment TMDL represents the sum of calculable sources plus a margin of safety that is required to not exceed the state water quality standard. Excess sediment, resulting in a benthic impairment, interferes with fish and insect life cycles, and specifically in the TMDL this refers to impaired benthic invertebrate communities.

1.2. TMDL Special Conditions

VWCC operates their regulated MS4 within a portion of the Roanoke River benthic TMDL watershed and is therefore subject to the TMDL WLAs assigned to MS4s in the TMDL. The special conditions for the TMDL listed in the MS4 General Permit require VWCC to develop a local TMDL Action Plan designed to reduce loadings for pollutants of concern where VWCC is given a WLA to an impaired water for which a TMDL has been approved by the EPA as described below:

- For TMDLs approved by the EPA prior to July 1, 2013, and in which an individual or aggregate wasteload has been allocated to VWCC, VWCC shall update the previously approved local TMDL action plans to meet the conditions of Part II B 3, B 4, B 5, B 6, and B 7 as applicable, no later than 18 months after the permit effective date and continue implementation of the action plan; and
- For TMDLs approved by EPA on or after July 1, 2013, and prior to June 30, 2018, and in which an individual or aggregate wasteload has been allocated to VWCC, VWCC shall develop and initiate implementation of action plans to meet the conditions of Part II B 3, B 4, B 5, B 6, and B 7 as applicable for each pollutant for which wasteloads have been allocated to VWCC's MS4 no later than 30 months after the permit effective date.

VWCC shall complete implementation of the TMDL action plans as soon as practicable. TMDL action plans may be implemented in multiple phases over more than one permit cycle using the adaptive iterative approach provided adequate progress is achieved in the implementation of BMPs designed to reduce pollutant discharges in a manner that is consistent with the assumptions and requirements of the applicable TMDL.

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

- The TMDL project name;
- The EPA approval date of the TMDL;
- The wasteload allocated to VWCC (individually or in aggregate), and the corresponding percent reduction, if applicable;
- Identification of the significant sources of the pollutants of concern discharging to VWCC's MS4 and that are not covered under a separate VPDES permit. For the purposes of this requirement, a significant source of pollutants means a discharge where the expected pollutant loading is greater than the average pollutant loading for the land use identified in the TMDL;
- The BMPs designed to reduce the pollutants of concern in accordance with Parts II B 4, B 5, and B 6;
- Any calculations required in accordance with Part II B 4, B 5, or B 6;

- For action plans developed in accordance with Part II B 4 and B 5, an outreach strategy to enhance the public's education (including employees) on methods to eliminate and reduce discharges of the pollutants; and
- A schedule of anticipated actions planned for implementation during this permit term.

1.3. VWCC Roanoke River Action Plan

The purpose of the VWCC Action Plan for the Roanoke River Benthic TMDL is to address each of the MS4 General Permit special conditions listed in Part II B. As an adaptive and iterative approach to meet surface water quality goals, the Action Plan may be revised from time to time to reduce sediment discharges from VWCC's MS4 to the maximum extent practicable (MEP). As stated in section 8.1 of the TMDL, "Virginia intends for those required reductions to be implemented in an iterative process that first addresses those sources with the largest impact on water quality." The Action Plan is incorporated, by reference, into VWCC's MS4 Program Plan, which outlines the best management practices that address the entirety of the conditions set forth in the MS4 General Permit.

2.0 THE ROANOKE RIVER WATERSHED BENTHIC TMDL

The "Benthic TMDL Development for the Roanoke River" assigns a WLA for the sediment. Excess sediment, resulting in benthic impairment, interferes with fish and insect life cycles, and specifically in the TMDL this refers to impaired benthic invertebrate communities. A WLA was calculated for existing point sources, including MS4 permit operators, along with LAs and the MOS to meet the water quality standard. The TMDL was established based on a scenario where a 69.5 percent reduction in urban, agricultural, and transitional land-based sources and instream erosion allocated to the MS4s is required to achieve the TMDL endpoint.

2.1 Wasteload Allocation

The TMDL considered potential sources of sediment from:

- Land Based Sources – Loadings from surface runoff characterized by land use (i.e. commercial, cropland, forest, residential, open space and wetlands).
- Instream Erosion – Loadings introduced directly to surface waters from high flow conditions associated with stormwater runoff.
- Point Sources – Loadings from facilities, typically non-settleable solids. Point source facilities contribute only 0.1% of the sediment load. As the overall contribution to the total annual watershed sediment load is small, no reductions are required for these sources.

VWCC, as a regulated MS4, received a WLA of 2 tons/year, which is computed as part of a 69.5% reduction within the TMDL watershed. The expectation of the TMDL is for VWCC to address the WLA through the "iterative implementation of BMPs."

3.0 VIRGINIA WESTERN COMMUNITY COLLEGE CHARACTERIZATION IN THE TMDL WATERSHED

A review of the Roanoke River TMDL watershed determined that the VWCC campus is subject to the TMDL WLA. VWCC has three outfalls which discharge to Ore Branch: Outfall #1, Outfall #2, and Outfall #3, and two outfalls which discharge into Murry Run: Outfall #4 and Outfall #5. Mapping for VWCC outfalls and stormwater management facilities is provided in Appendix A. A review of the TMDL, VWCC MS4 Program Plan and a field investigation of the campus resulted in the campus characterization related to potential sediment sources described in the following sub-sections.

3.1. Potential Campus Sources of Sediment

Significant sediment sources on the VWCC campus may include active construction projects, sinkhole activity, and winter sand/salt application to paved surfaces.

Outfalls #1, #2, and #3 drain to Ore Branch and Outfalls #4 and #5 drain to Murray Run, which eventually discharges into the Roanoke River. In 2015, VWCC experienced issues with sinkholes forming in the South Campus Basin at Outfall #1 and in Parking Lot 2, located along Colonial Avenue.

Recent active construction sites include additions to Parking Lot 15 and the Student Life Center which were completed in the previous permit cycle, and construction of the STEM building, which was completed in 2019.

4.0 APPLICABLE OVERVIEW OF VWCC'S MS4 PROGRAM

VWCC's MS4 Permit regulates stormwater discharges from within the census urbanized area (CUA). VWCC's collective efforts, as described in the VWCC MS4 Program Plan, result in significant reduction of pollutants that could potentially be discharged from its regulated MS4.

4.1. Minimum Control Measures

The General Permit requires the Program Plan to include BMPs to address the requirements of six MCMs described in Part I E of the General Permit. BMPs already included in the VWCC Program Plan that address sediment are summarized below.

4.1.1. MCM 1 Public Education and Outreach

VWCC's MS4 Program includes, by reference, a Public Education and Outreach Program (PEOP) that incorporates educational information about TMDL pollutants of concern, including sediment. The PEOP efforts communicate that sediment is a major contributor of concern and includes, as part of the relevant message for identifying methods to reduce introduction of sediment into stormwater runoff.

4.1.2 MCM 2 Public Involvement and Participation

VWCC's MS4 program includes the public involvement and participation effort to post this Action Plan on their stormwater pollution prevention webpage at <https://www.virginiawestern.edu/fpd/swm.php>. Availability of the Action Plan will increase awareness of the TMDL with web page visitors.

4.1.3. MCM 3 Illicit Discharge Detection and Elimination

VWCC's MS4 Program includes an Illicit Discharge Detection and Elimination (IDDE) Program that includes written procedures to detect, identify, and address non-stormwater discharges, including illegal dumping, to the small MS4 with policies and procedures for when and how to use legal authorities. IDDE BMPs are described in the Minimum Control Measure 3 BMPs in the VWCC MS4 Program Plan. The IDDE Program is effective at addressing the Pollutant of Concern (POC) through staff training, prohibition of illicit discharges, and annual outfall screening.

4.1.4. MCM 4 Construction Site Runoff Control Program

VWCC's MS4 Program includes a Construction Site Runoff Control Program that includes mechanisms to ensure compliance and enforcement on regulated construction sites with implementation of the DEQ-approved "VCCS Annual Erosion and Sediment Control and Stormwater Management Standards and Specifications." The standards and specifications are consistent with the Virginia Erosion and Sediment Control and Stormwater Management Laws and Regulations and includes:

- Required plan approval prior to commencement of a regulated land disturbance activity;
- Construction site inspections and enforcement; and
- Certification of post-construction stormwater management facilities.

Through inspections and enforcement, especially in regards to stormwater pollution prevention plan (SWPPP) inspections, potential for sediment discharges is minimized. Minimum Control Measure 4 BMPs in the VWCC MS4 Program Plan describe construction site runoff control BMPs.

4.1.5. MCM 5 Post-Construction Stormwater Management

VWCC's MS4 Program includes a Post-Construction SWM Program that ensures water quality criteria in the Virginia Stormwater Management Regulations have been achieved on new developments and developments on previously developed land. Included among these requirements are written policies and procedures in the VCCS Erosion and Sediment Control and Stormwater Management Standards and Specifications to ensure that stormwater management facilities are designed and installed in accordance with appropriate law and regulations. Although the facilities are designed to achieve target phosphorus reductions, many water quality BMPs also are effective at sediment removal. Post-construction, the Program includes schedules and written procedures to ensure long-term inspections and maintenance of stormwater management BMPs. Minimum Control Measure 5 BMPs in the VWCC MS4 Program Plan describe post-construction stormwater management BMPs.

4.1.6. MCM 6 Good Housekeeping

VWCC's MS4 Program includes a Pollution Prevention/Good Housekeeping Program that includes policies and procedures to ensure that day-to-day operations minimize the exposure of pollutants to rainfall on campus grounds to the maximum extent practicable. The program is supported with VWCC's Pollution Prevention & Good Housekeeping Standard Operating Procedures (SOPs) and annual training for applicable staff. Minimum Control Measure 6 BMPs in the VWCC MS4 Program Plan describe pollution prevention and good housekeeping BMPs.

5.0 ADDITIONAL PRACTICES AND CONTROLS

VWCC proposes a combined approach to meet the reduction defined in the TMDL, beyond what will occur through the implementation of the MS4 Program Plan. Though likely significant, reductions associated with the Program Plan are not quantified and do not have a numerical value that is applicable to the WLA.

5.1. Street Sweeping (See Appendix B for computations - an added revision by H2R)

VWCC will implement street sweeping in order to satisfy a portion of sediment reductions. In the 2017-2018 permit year, 16.2 cubic yards of debris removal was achieved through street sweeping. In the 2018-2019 permit year, 10 cubic yards of debris removal was achieved through street sweeping.

5.2 Stormwater Facilities

Multiple stormwater facility installations within the impacted watershed at VWCC have resulted in TSS reduction. Reduction rates are from the appropriate methods in Table V.A.1 and Table V.C.1 of the guidance document “Chesapeake Bay TMDL Special Condition Guidance” (Guidance Document) provided by the DEQ and dated May 18, 2015. Impervious and pervious acres treated by each BMP can be found below in Table 1.

Table 1: Stormwater Facility Acres Treated and Associated Reduction Rates.

BMP Name	Outfall Drainage Area	Practice Description	Total Acres Treated	Impervious Acres Treated	Pervious Acres Treated	TSS Load Reduction Rate
Dry Detention Pond	1	SWB 1	39.35	18.9	20.45	0.10
Dry Detention Pond	3	SWB 2	12.26	2.72	9.54	0.10
Filtration	1	Egg Crate 1	0.03	0	0.03	0.10
Filtration	1	Egg Crate 2	0.02	0	0.02	0.10
Filtration	1	UGDS	0.63	0.63	0	0.10
Bioretention	1	Biobed 1	3.34	2.72	0.62	0.55
Bioretention	3	Biobed 3	0.27	0.1	0.17	0.55
Bioretention	3	Biobed 4	0.5	0.1	0.4	0.55
Biofiltration	1	Rain Garden	0.1	0.1	0	0.8
Biofiltration	1	Rain Garden	0.16	0.16	0	0.8
Biofiltration	1	Filtterra	0.21	0.21	0	0.8
Biofiltration	1	Filtterra	0.21	0.21	0	0.8
Biofiltration	1	Filtterra	0.11	0.11	0	0.8
Biofiltration	1	Filtterra	0.11	0.11	0	0.8
Biofiltration	1	Filtterra	0.4	0.4	0	0.8
Biofiltration	1	Filtterra	0.4	0.4	0	0.8
Biofiltration	1	Filtterra	0.4	0.4	0	0.8
Biofiltration	1	Filtterra	0.4	0.4	0	0.8

Two dry detention ponds within the impacted watershed treat 21.62 impervious acres and 29.99 pervious acres for a total of 51.61 acres treated at a rate of 0.10 per Table V.C.1 of the Guidance Document. Two Egg crates treat 0 impervious acres and 0.05 pervious acres for a total of 0.05 acres treated at a rate of 0.10 per Table V.C.1 of the Guidance Document. One UGDS treats 0.63 impervious acres and 0 pervious acres for a total of 0.63 acres treated at a rate of 0.10 per Table V.C.1 of the Guidance Document. Three bioretention ponds treat 2.29 impervious acres and 1.19 pervious acres for a total of 4.11 acres treated at a rate of 0.55 per Table V.A.1 of the Guidance Document. Two rain gardens treat 0.26 impervious acres and 0 pervious acres for a total of 0.26 acres treated at a rate of 0.8 per Table V.A.1 of the Guidance Document. Eight filterrras treat 2.24 impervious acres and 0 pervious acres for a total of 2.24 acres treated at a rate of 0.8 per Table V.A.1 of the Guidance Document.

5.3 Enhanced Public Education and Employee Training

VWCC's MS4 program has enhanced public education and outreach and employee training programs to promote methods to eliminate or reduce the discharge of sediment from the MS4. This enhancement is described as follows:

VWCC exhibits educational slideshows year-round on 30 closed-circuit television system displays throughout campus. Slideshow content includes stormwater control and protection (methods used to treat stormwater and why it is important in the VWCC community) and protecting waterways (methods to reduce human impacts on local waters).

VWCC sets up a booth at the annual Spring Fling event on campus to promote stormwater management and water quality practices. VWCC provided pamphlets to students on stormwater pollution and what it means for the community. The pamphlet called "Understanding Stormwater Pollution" informs students of the effect of sediment in stormwater and describes practices that students may take to reduce sediment runoff in their community.

VWCC provides presentations and tours of the campus's stormwater features such as rains gardens, green roofs, underground systems, absorptive swales, and detention ponds and how they affect stormwater pollution and runoff. Presentations included information on the reduction of sediment pollution through stormwater structures and how each stormwater structure works and functions.

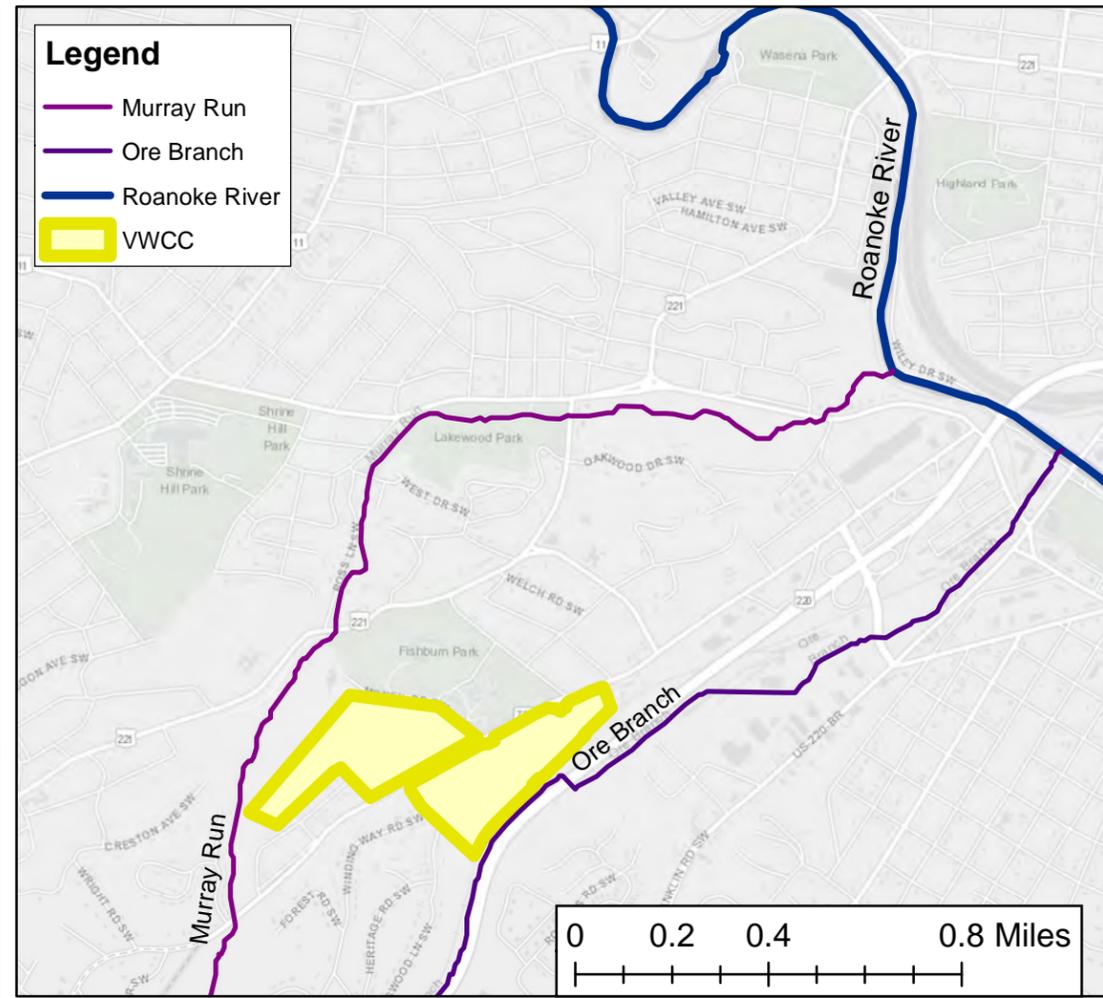
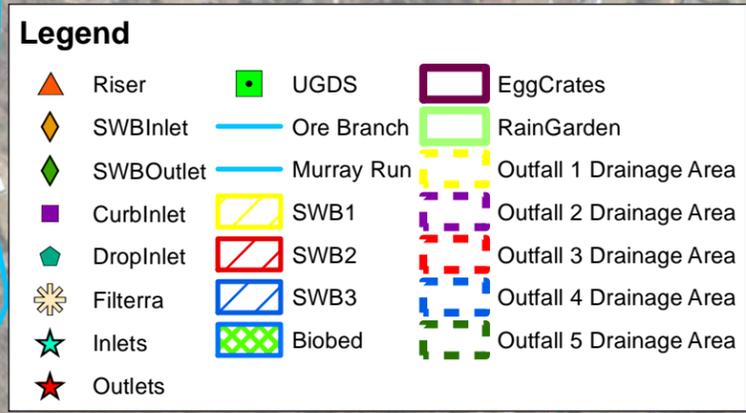
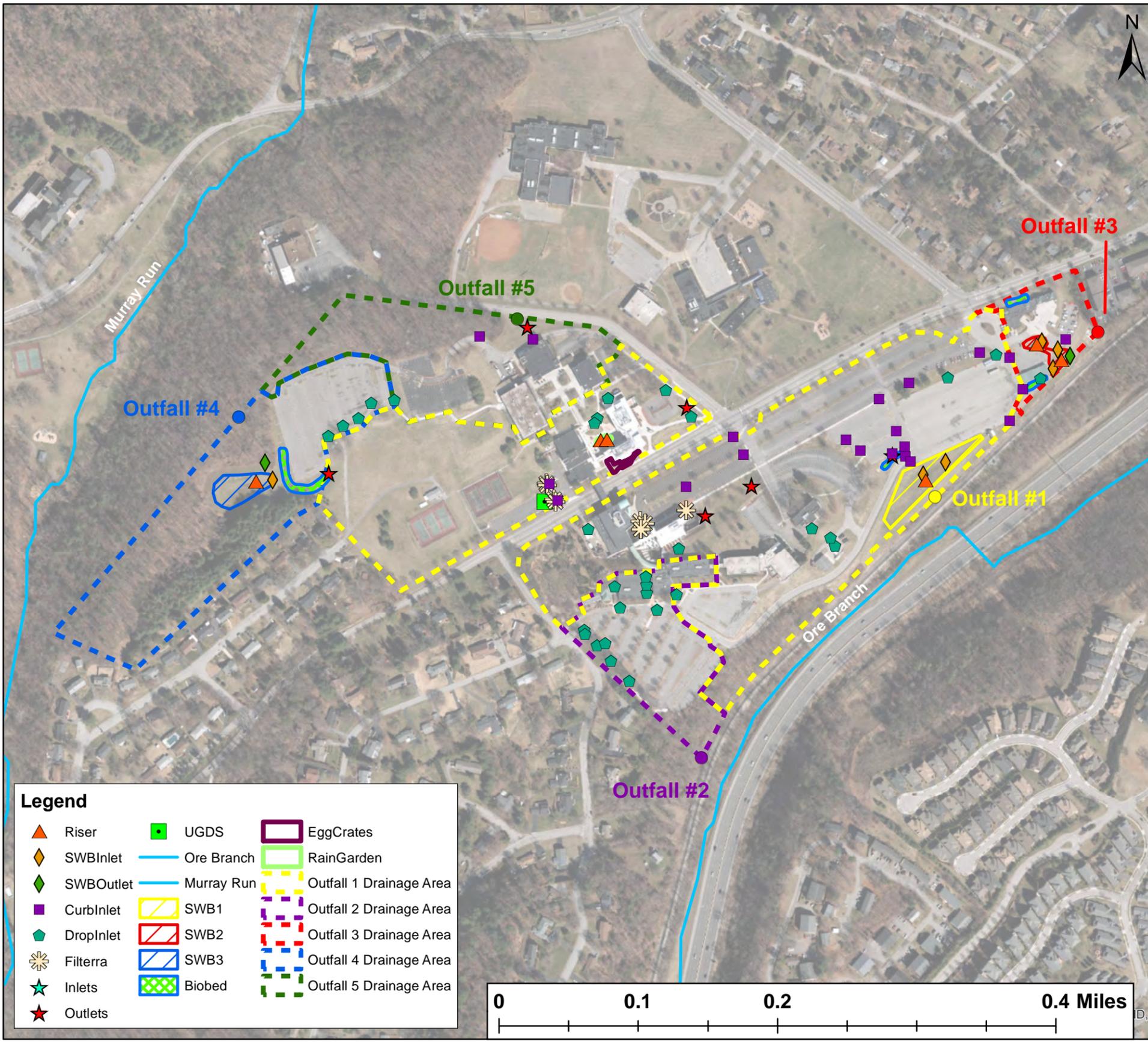
Operations, maintenance, and housekeeping staff attend annual stormwater management training sessions. This annual training incorporates TMDL awareness content and techniques for VWCC employees, including illicit discharge detection, proper application and storage of deicing materials, and the role of employee awareness in identifying and eliminating sources of sediment contamination of stormwater

6.0 SCHEDULE

VWCC will implement the practices and controls described in Sections 4 and 5 to reduce the potential of sediment discharged to surface waters to the maximum extent practicable. In accordance with Part II B 2 and Part II B 3 (h), respectively, VWC will complete implementation of the TMDL action plan as soon as practicable, with the schedule of anticipated actions planned for implementation during this permit term shown below in Table 2. The method of assessment is implemented through the annual reporting process with the review of the effectiveness of each MS4 Program Plan BMP.

Table 2: Schedule of Anticipated Actions Planned for Implementation of Sediment Reduction Stormwater Control/Management Strategies			
Year	Strategies	Method	Completion Date
Future Permit Years 2020-2023	Street Sweeping	Record amount of debris collected by street sweeping efforts.	Annually (by June 30)
Future Permit Years 2020-2023	Stormwater Facilities	Calculate treatment area of stormwater facilities, including any newly online facilities. In the event that impervious and pervious area treated by the stormwater facilities, these changes will be documented in the annual report.	Annually (by June 30)

Appendix A: Outfalls and Stormwater Management Facilities Map



Total Acres: 68.74
 Watershed: Roanoke River
 VaNWBDv5 (HU6): RU14
 Hydrologic Unit Code (HUC): 30101010404
 Impairment: 4A - Impaired
 TMDLs: Bacteria (2006), and Benthic (2006)
 Land Use: Commercial/Industrial - Educational

Outfall ID	Location	Est. Acreage	Discharge Water Body
#1	37.246012, -79.969082	39.35	Ore Branch
#2	37.243266, -79.972070	5.50	Ore Branch
#3	37.247752, -79.966996	2.53	Ore Branch
#4	37.246728, -79.978172	12.26	Murray Run
#5	37.247794, -79.974563	9.10	Murray Run

Appendix B: Computations for Anticipated Load Reductions from Street Sweeping

(Appendix added by H2R Engineering, Inc. to original Action Plan, developed by others, to provide calculations required by Part II.B.5.c of the General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems, as requested in a letter from DEQ dated 8/17/20.)

Computations

1. Per the EPA-approved TMDL, sediment wasteload allocation (WLA) = 1.9 tons/year based on a 69.5% reduction of the existing load. Therefore, the existing (baseline) campus load (x) from the TMDL is:

$$x - (0.695x) = 1.9 \frac{\text{tons}}{\text{year}} \rightarrow x = 6.23 \frac{\text{tons}}{\text{year}}$$

2. The required annual reduction is then computed as the difference between the baseline load and the WLA as:

$$6.23 \frac{\text{tons}}{\text{year}} - 1.90 \frac{\text{tons}}{\text{year}} = 4.33 \frac{\text{tons}}{\text{year}}$$

3. Reduction from BMP implementation (Street Sweeping), based on swept material over the previous two years as presented in Section 5.1 of this Action Plan, is provided in the Table below.

Table. Reported volume of swept material from Section 5.1, translated to mass and TSS for estimating loading reductions towards achieving the WLA.

Reporting Year	Material Swept (CY)	Mass (tons) ^a	TSS (tons) ^b
2017-2018	16.2	27.31	7.80
2018-2019	10.0	16.86	4.81

^a Mass converted from volume based on average density of 2.0 g/cm³ from Pitt et al. (2005) for swept material.

^b Equivalent total suspended solids (TSS) removed from surface waters based on results of sampling of swept material by MS4s throughout the Commonwealth, including VCCS colleges, as described by Hixon and Dymond (2019). Incorporates moisture content and is conservatively equivalent to 571 lbs. per ton of material swept.

4. The Table from Step 3 finds an average of 6.3 tons/year of TSS removed during the two recent referenced reporting periods from the college's street sweeping efforts. Referring to Step 2, street sweeping has achieving the reductions to meet the WLA by exceeding the required reduction of 4.33 tons/year. Therefore, VWCC should continue similar annual street sweeping efforts. VWCC will sample and provide analysis of swept material as part of an ongoing effort to measure the effectiveness of street sweeping, along with other MS4s within the VCCS. In the case street sweeping is not consistently achieving the WLA, SWM facilities installed after the time of the TMDL development (baseline) will be evaluated for supplemental reductions of TSS.

Citations

- Hixon, L. F., and R. L. Dymond. 2018. "State of the practice: Assessing water quality benefits from street sweeping." *J. Sustainable Water Built. Environ.* 4 (3). 04018007. <https://doi.org/10.1061/JSWBAY.0000860>.
- Pitt, R., Williamson, D., Voorhees, J., and Clark, S. (2005). "Review of historical street dust and dirt accumulation and washoff data." *J. Water Manage. Modeling*, 10.14796/JWMM.R223-12.