# MS4 PROGRAM PLAN

## PERMIT NUMBER VAR040106

## April 2019

George Mason University
Land Development, Facilities
4400 University Drive MSN 2C1
Fairfax Virginia 22030

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**Appendices**

## ACCRONYMS AND ABBREVIATIONS

| Abbreviation/ Acronym | Term |
|---|---|
| **AS&S** | Annual Standards and Specifications |
| **BMP** | Best Management Practice |
| **CWA** | Clean Water Act |
| **CWP** | Northern Virginia Clean Waters Partners |
| **DEQ** | Virginia Department of Environmental Quality |
| **EHS** | Environmental, Health, & Safety |
| **EPA** | Environmental Protection Agency |
| **ESC** | Erosion and Sediment Control |
| **FM** | Facilities Maintenance |
| **GIS** | Geographic Information System |
| **GPS** | Global Position System |
| **HUC** | Hydrologic Unit Code |
| **IDDE** | Illicit Discharge Detection and Elimination |
| **Mason** | George Mason University |
| **Mason LD** | George Mason University Land Development |
| **MCM** | Minimum Control Measure |
| **MS4** | Municipal Separate Storm Sewer System |
| **NPDES** | National Pollutant Discharge Elimination System |
| **OoS** | Office of Sustainability |
| **OCR** | Office of Community Relations |
| **ORI** | Outfall Reconnaissance Inventory |
| **POC** | Pollutants of Concern |
| **PSA** | Public Service Announcement |
| **P&TS** | Parking and Transportation Services |
| **R&WM** | Recycling and Waste Management |
| **SWPPP** | Stormwater Pollution Prevention Plan |
| **SWM** | Stormwater Management |
| **TMDL** | Total Maximum Daily Load |
| **TSS** | Total Suspended Solids |
| **VDOT** | Virginia Department of Transportation |
| **VESCL&R** | Virginia Erosion and Sediment Control Law and Regulations |
| **VPDES** | Virginia Pollutant Discharge Elimination System |
| **VSMP** | Virginia Stormwater Management Program |

# I. BACKROUND

Controlling the quality and quantity of stormwater in urbanized areas has become of greater concern since the passage of the Clean Water Act (CWA). Despite earlier attempts to address water pollution, it was not until 1972 that the Environmental Protection Agency (EPA) was given the authority to develop and implement a stormwater management program, which regulates the amount of pollutants being discharged in U.S. water bodies. In response to amendments to the CWA, in 1990 the EPA created an enforcement management mechanism called the National Pollutant Discharge Elimination System (NPDES). With the implementation of the NPDES, it became obligatory for all operators of a Municipal Separate Storm Sewer System (MS4) who intend to discharge stormwater into surface waters to obtain a NPDES permit. Depending on the size of the municipality, the NPDES issued Phases I and Phase II Final Rule. Phase I requires a NPDES permit for medium and large cities or municipalities with populations greater than 100,000, industrial activities, and construction activities that disturb 5 or more acres. Phase II requires a NPDES permit holder to implement programs and practices to control and minimize polluted runoff for small MS4s and small construction sites. The EPA delegated the regulatory authority and oversight of the NPDES programs to the State governments. As authorized under the State Water Control Law and the federal Clean Water Act, the Virginia Pollutant Discharge Elimination System (VPDES) permitting program regulates point source pollution, which is administrated by Virginia Department of Environmental Quality (DEQ).

# II. EXECUTIVE SUMMARY

Stormwater discharges within George Mason University (Mason) are regulated under the terms of VPDES General Permit for Discharges from Small Municipal Separate Storm Sewer System (General Permit No. VAR040106). This MS4 permit is issued to Mason by Virginia DEQ, consistent with the provisions of Section 402 of the Clean Water Act and the Virginia Stormwater Management Act, which authorizes the Virginia Stormwater Management Program (VSMP) regulations.

The initial MS4 permit was issued to Mason on July 9, 2008 for permit year 2008-2013. The second permit was issued on July 2, 2013 for the permit year 2013-2018.

On October 31, 2018, the permit was re-issued with an effective date of November 1, 2018 and with an expiration date of October 31, 2023. Since the commencement of the permit coverage, Mason has begun implementing permit requirements and continues to work on improving existing control measures developed to reduce the discharges of pollutants into the MS4.

To achieve the required water quality goals, the MS4 permit requires Mason to control the discharges of pollutants by addressing the following six minimum control measures (MCM):

(1) Public Education and Outreach
(2) Public Involvement and Participation
(3) Illicit Discharge Detection and Elimination

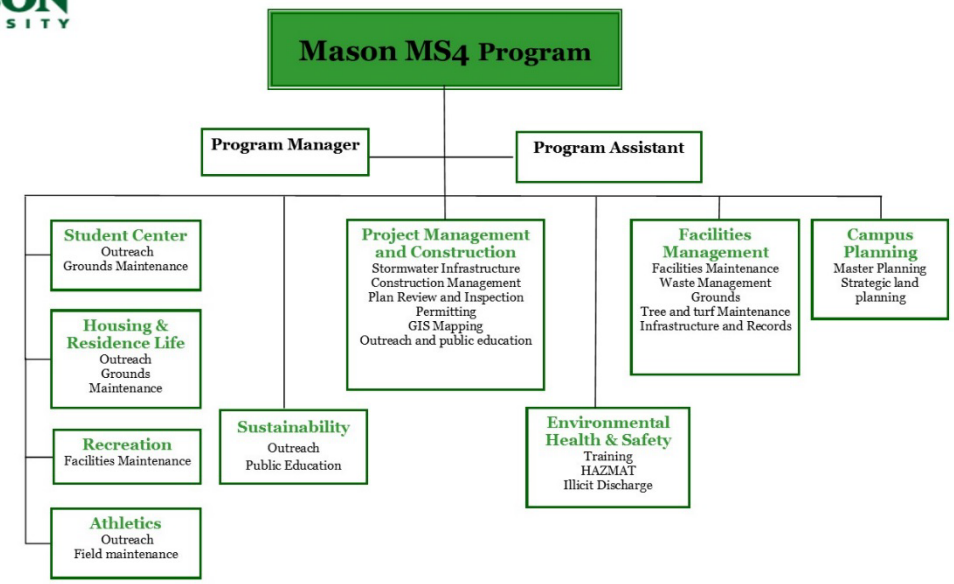
(4) Construction Site Stormwater Runoff Control
(5) Post-Construction Stormwater Management in New Development and Development on Prior Developed Lands
(6) Pollution Prevention and Good Housekeeping for Facilities Owned or Operated by Mason

In addition, the MS4 permit includes special conditions to address Chesapeake Bay Total Maximum Daily Load (TMDL). Mason is required to develop and implement a TMDL Action Plan for the second phase Chesapeake Bay TMDL to achieve the approved pollutant reduction goals through implementations of best management practices (BMP).

Therefore, it is the intent of this document to establish and define Mason's MS4 program and demonstrate Mason's plan to meet the permit requirements through October 31, 2023. Due to the extent and scale of the new permit requirement, the permit requires Mason to update the Program Plan no later than six months after the effective date of the permit. The Program Plan will be a "living" document, with the major updates corresponding with the annual report submittals.

## III. ORGANIZATION OF MASON STORMWATER MANAGEMENT PROGRAM

While stormwater activities and functions are divided among several different departments and divisions, the Land Development (Mason LD) has the primary responsibility for overall compliance with the permit. MS4 permit compliance activities are coordinated with Environmental Health and Safety Office (EHS), Facility Management (FM) and other Mason units. While Mason LD is the responsible for overall program compliance, including annual report submittal, several other departments and divisions play important roles in implementing the MS4 permit. These departments are shown in the following organization chart.



## IV. DESCIRPTION OF MS4 DRAINAGE AREA

Mason MS4 Permit covers two separate Northern Virginia campuses in Fairfax and Prince William County, which are located in the Potomac watershed within the larger Chesapeake Bay watershed.

Fairfax Campus consists of approximately 585 acres of developed and undeveloped land comprised of academic buildings, research facilities, residential buildings, auxiliary buildings, and athletic facilities. Approximately 220 acres drains to Popes Head Creek. The remaining 365 acres drains to Pohick Creek. As Figure 1 indicates, Fairfax Campus is physically interconnected to these MS4's: Fairfax County, City of Fairfax, and the Virginia Department of Transportation's (VDOT) MS4.

Science and Technology Campus is located in Prince William County and consists of approximately 135 acres of developed and undeveloped land that includes academic buildings, research facilities, auxiliary buildings, and athletic facilities. All 135 acres are within the Broad Run drainage area. Interconnections between the Science and Technology campus and other MS4s are depicted in Figure 2.

Currently, over 36,000 students attend Mason with approximately 5,500 living on the main campus in Fairfax. Mason anticipates continued growth in enrollment in the future.

## V. STORM WATER COLLECTION AND CONVEYANCE SYSTEM

All structural controls and conveyance features are depicted on the campus utility maps. The utility map is based on construction drawings and survey data collected by Mason personnel for record drawings verification. The campus utility maps are regularly updated as land use changes, or as necessary, based on the information reflected on new projects as-built (construction documents), as well as, surveying data.

Record drawings and field/survey data, including outfall reconnaissance, GPS measurements as well as other observations obtained by staff were reviewed to develop a complete MS4 map.

A complete MS4 system is currently mapped and maintained by Facilities Management. The MS4 map is periodically reviewed and updated with construction activities. These updates include the removal of the existing stormwater facilities and/or addition of newly constructed stormwater management facilities, piping and outfalls which are added to the existing GIS mapping system.

The MS4 map at Fairfax Campus encompasses roughly 680 drain inlets and 16 miles of storm sewer pipe. Fairfax Campus storm sewer discharges into Popes Head Creek and Pohick Creek via approximately 50 internal outfalls.

Drainage from the Science and Technology Campus is captured by roughly 50 inlets and transported through 2 miles of storm sewer pipe into a tributary to Cannon Branch via approximately 10 outfalls.

The stormwater map including stormwater BMPs is available on the Mason website

## VI. Special Condition for the Chesapeake Bay TMDL

The MS4 permit for Mason includes special condition to address Chesapeake Bay TMDL. It requires Mason to implement necessary reductions to meet the Level 2(L2) scoping run for the existing developed lands.

For compliance with the first permit cycle ending June 30, 2018, Mason utilized credit from existing oversized stormwater best management practices (BMPs) and implemented 320' of urban stream restoration on the Fairfax Campus for the Phase 1 TMDL Action Plan. This provided reductions above and beyond the 5% requirement in loading of the pollutants of concern (POCs), which are nitrogen, phosphorus and total suspended solids (TSS). These additional reductions will be credited toward the Phase 2 TMDL Action Plan reduction requirements.

This permit requires Mason to develop and implement the Phase 2 TMDL action plan to provide additional 35% reduction in loading of the POCs.

Mason drafted the Phase 2 Chesapeake Bay TMDL action plan and proposed to retrofit an existing pond to achieve the additional 35% reduction goal. The draft action plan was posted on Mason MS4 website to solicit public comments between December 17, 2018 and February 15, 2019. The Phase 2 Chesapeake Bay TMDL action plan is finalized and is available on https://stormwater.gmu.edu/

## VII. MINIMUN CONTROL MEASURES

The following sections describe the best management practices (BMP) that Mason plans to utilize and implement to meet each of the six minimum control measures.

### 1. Public Education and Outreach on Stormwater impacts

The MS4 program at Mason seeks to alert students, faculty and staff on the impacts of stormwater runoff on water quality through free training sessions, workshops, and the distribution of educational materials. The public outreach program at Mason also provides guidance on how the community can help in minimizing adverse impacts of urban runoff in waterways.

Mason utilizes existing programs, organizations, boards, and committees within the community to implement public education activities. The Public Education and Outreach program at Mason uses existing forums and outreach materials established by the EPA and Northern Virginia Clean Water Partners (CWP), in addition to educational brochures and materials developed by Mason staff. These materials are widely distributed by Mason staff members at various events and meetings. As a member of the Northern Virginia Clean Water Partners (CWP), Mason participates in the CWP education campaign through a multi-media approach.

<u>High-priority Water Quality Issues, Target Audience and Relevant Messages</u>

Mason and CWP have determined the high priority regional water quality issues that contribute the pollution of stormwater runoff at Mason: bacteria, nutrients, and motor oil/chemical

contaminants. These high priority water quality issues are listed below along with the rationale for their selection.

*Bacteria*: Bacteria pollution in stormwater runoff come from leaking sanitary sewer pipes, wildlife (i.e. Canada geese), and improper disposal of pet waste. Due to the significant number of geese population and pet owners in the community, Mason chooses students, faculty, staff members and campus visitors as the target audience and the education and outreach messages focused on proper disposal of pet waste.

*Nutrients*: Nitrogen and phosphorus are two of the three pollutants listed in the MS4 General Permit requiring an action plan for the Chesapeake Bay TMDL. Over fertilization of lawns provides a direct runoff source of nitrogen and phosphorous to streams. With approximately 134 acres of turf areas in the Mason and over 5,000 residential students/faculty on campus, the public awareness and of the effects of over-fertilization is important to reducing those pollutants in stormwater.

*Motor Oil/Chemical Contaminants*: Oils that leaks from cars onto roads and parking lots is washed into storm drains and then flows directly to a pond or stream. With 4 million square feet of parking lots and over 26,000 active parking permits, Mason chooses to target students, faculty and staff members with educational messages focused on prevention of fuel spills, illicit discharges, and improper handling of motor oils, anti-freeze and other hazardous waste.

Regional Coordination

Public education and outreach on stormwater issues is accomplished through both Mason local activities and participation in the CWP. CWP is a collaborative effort representing 19 Northern Virginia local governments, school systems, independent water and sanitary sewer authorities, and local businesses. It is dedicated to help its members to achieve the MS4 permit requirements related to education, outreach and public participation.

CWP meets regularly to plan, implement, and review regional stormwater education campaign, called “Only Rain Down the Drain Campaign”. The campaign was initiated in 2003 to enable Northern Virginia jurisdictions to pool outreach funds to achieve common goals regarding stormwater education and outreach and promote consistent messages across the Northern Virginia region. The campaign uses the storm drain markers symbol, the blue and green shad, as its logo. In addition, the campaign uses multi-media approach to educate the public on stormwater pollutions. Cable televisions, ads, promotional items, website, print materials, and internet banner ads are used to reach a large audience around the regions.

CWP has produced effective and far-reaching education and outreach programs that have benefited from variety of expertise and resources each partner offers.

Local Focus

In addition to the participation in the CWP, Mason LD leads local activities to focus on the education and outreach effort:

*Traditional written materials*: Mason has developed series of educational pamphlets, bookmarks, postcards, and posters to be distributed at various outreach events/activities.

*Alternative materials*: Mason has designed various promotional items such as keychains, mini hand sanitizer, pens, and pet waste dispensers with stormwater massages. These promotional items will be distributed at various outreach events/activities.

*Stormwater BMP signage*: Mason implements a design standard to develop permanent signage to identify surface structural stormwater BMPs. The signage serves as a highly effective platform for outreach and education of students/faculty/staff/visitors that might not otherwise be aware of such requirements and opportunities. Mason will install the signage when a new stormwater BMP is implemented.

*Storm sewer inlet marking*: Mason has installed markers on existing storm drain inlets. In addition, Mason requires new development and redevelopment projects to mark storm sewer inlets covers. The storm sewer inlet marking reduces dumping by providing a visual way of alerting students/faculty/visitors that storm drain empty into local streams and eventually Chesapeake Bay. Mason will install drain markers when new stormwater facilities are constructed.

Adjusting Target Audience and Messages

As necessary, Mason will adjust target audience and messages to address any observed weaknesses or shortcoming in the public education and outreach program.

Anticipated Time Periods of Message Communication

Mason distributes written materials and alternative materials throughout the academic year in highly visible locations on campus to engage students, faculty and staff. Media ad placement from partner agencies that reach the Mason population occur throughout the year. The timing and content of these media pieces are controlled by CWP. Stormwater BMPs and facilities are labeled at the time of their installation which occurs periodically as campus infrastructure is installed, rehabilitated and/or replaced.

## 2. Public Involvement and Participation

Mason encourages residents and students to participate in volunteer programs hosted on campus for conservation and improvement of water resources. Projects such as the Patriot Pack Out and the Campus Stream Cleanups are conducted every year with the purpose of getting the community involved in the Mason's efforts on reducing the amount of pollutant loads in stormwater. Educational workshops and materials, offered by Mason, also provide information to the public about stormwater management practices implemented on campus and different sustainable practices that can help restore and protect surface waters.

At Mason, public involvement is greatly encouraged as the community can provide valuable input and assistance to Mason on improving the MS4 program. In many cases public opinion helps identify problems promptly, and therefore, solutions can be accomplished in shorter

time. Volunteer work may also offer a broader base of expertise to supplement limited resources of Mason LD, while shortening time of program implementation as well, due to a greater number of members.

MS4 Website

Mason LD has developed a website dedicated to water quality and stormwater management https://stormwater.gmu.edu/. The site provides information on Mason's MS4 program, serves as a forum to distribute educational materials, and includes information on where to report potential illicit discharges. It provides a tool to provide water quality and pollution prevention information to the general public in an easily accessible format. It also provides public access to documents such as the program plan, annual reports, and TMDL action plan.

Mason Stream Clean-up Events

Mason LD hosts stream clean-up events every year. Many students/faculty/staff/visitors participate events to keep the streams free of trash and debris. The events provide a hands-on opportunity to learn about ways to protect the streams and environment. Mason LD keeps records on the number of participants and the weight of trash collected (recyclable and non-recyclable) at each events.

Mason Classroom Outreach

Mason LD visits multiple classrooms throughout the academic year to promote conservation and improvement of water resources while supporting the classroom curriculum. Mason LD presents MS4 program and relevant elements/activities to the students and faculty, provide them stormwater brochure, and discuss the stormwater related subjects. Mason LD keeps records on the number of participants at each classroom outreach.

Educational events

Mason LD presents stormwater materials and relevant projects in various community events, such as EcoFest, Connect Fair, and Health and Wellness Expo. During these events, Mason LD engages participants in discussion on stormwater and water quality, and distribute brochures and promotional items. Mason LD keeps records on the number of engagements.

## 3. Illicit Discharge Detection and Elimination

In order to detect and eliminate both direct and indirect illicit discharges, Mason has developed an Illicit Discharge Detection and Elimination Program (IDDE), which relies on Mason's *Illicit Discharge Detection and Elimination Policy* to prohibit any non-stormwater discharges into the sewer system or any receiving waterway. The policy is enforced by both Mason LD and EHS, who rely strongly on regular inspections and public notification. Mason encourages the community's contribution in discovering and reporting possible polluted runoff and maintains appropriate staffing to address such reported concerns.

Instructions on how to report concerns or potential illicit discharges are available online at the Facilities website.

MS4 mapping

Mason publishes interactive stormwater maps using online GIS. The maps can be found on Mason website. The complete MS4 map with outfall information table are available upon request.

Outfall Reconnaissance Inventory

Outfall Reconnaissance Inventory (ORI) is another important component of the IDDE program at Mason. The ORI is performed annually in order to identify possible illicit connections and discharges, as well as, to keep track of all existing stormwater management facilities and structures within the MS4. During the ORI, outfalls are also evaluated for structural damages or uncommon conditions that might indicate the present of pollutants. Outfalls are also inspected for possible maintenance necessity to avoid detrimental conditions on stream banks and bed. *Appendix A* provides the procedures on outfall reconnaissance.

Interconnection

Mason has interconnections with the stormwater system operated by Fairfax County, Fairfax City, Prince William County and Virginia Department of Transportation (VDOT). The sample of written notification is included in *Appendix C.*

## 4. Construction Site Storm Water Runoff Control

Under the VSMP permit, Mason is required to develop, implement and enforce a program to reduce the discharge of pollutants associated with construction activity into the MS4.

Mason's Annual Standards and Specifications for Erosion and Sediment Control and Stormwater Management (AS&S) is an integral component of all design, construction, maintenance, and management of the University's facilities and campuses. It is enforced during the planning, permitting and construction phases by Mason LD staff. Mason personnel receive training by DEQ on ESC and SWM, in order to enforce such programs. Certified staff is responsible for reviewing plans during the permitting process and conducting regular inspections of the site during construction. Inspections and Plan review procedure are implemented in accordance with state laws and regulations and Mason's AS&S. A copy of Mason's AS&S is available at the Facilities website and/or provided upon request.

Public concern associated with runoff from construction activity is received via email at MasonLD@gmu.edu. Instructions on how to report concerns or potential illicit discharges are available online at the Facilities website.

After public comment is received, Mason EHS is responsible for investigating the incident and contacting the appropriate spill response coordinator in accordance to Integrated Contingency Plan.

## 5. Post-Construction Storm Water Management in New Development and Redevelopment

As a non-traditional small MS4, Mason has direct control over planning, design, construction

and post-construction of stormwater management facilities, also called best management practices or BMPs. The MS4 program at Mason consists of minimizing the impacts of runoff associated with land disturbance such as flooding, erosion, and water pollution. Due its current developmental expansion, Mason's goal is to implement cost-effective measures that provide water quantity and quality control while complying with laws and regulations. Current practices implemented by Mason in managing and controlling stormwater focus on promoting natural hydrologic processes as well as minimizing contact of pollutants with rainwater. As land disturbing activities take place, Mason incorporates measures that protect and/or improve natural areas during and after construction. In addition to the ongoing efforts to preserve the natural landscape, Mason strives to reduce impervious areas as much as possible and create more vegetated regions.

Inspections on Mason owned stormwater management facilities are performed in accordance with state laws and regulations and Mason's AS&S, which is available at the Facilities website and/or provided upon request.

### 6. Pollution Prevention/ Good Housekeeping

Under the MS4 permit, Mason is required to develop and implement an operation and maintenance program designated to reduce and prevent the discharges of pollutants into the MS4. The operation and maintenance program for Mason includes activities, schedules, inspection procedures, as well as, corrective actions to ensure proper performance of each facility. Maintenance activities are managed by Facilities Maintenance on a schedule basis via Maintenance Direct. Maintenance Direct is a subsection of *School Dude Computer Software* where work orders are placed by staff member and received Facilities Maintenance. Facilities Maintenance uses a programmed "work order" to perform maintenance on each stormwater management facilities in accordance with frequency parameters established in the *Stormwater Management Maintenance Guide (Appendix B).*

Mason identified three high priority facilities that have a high potential of discharging pollutants. They are maintenance storage yard at Fairfax Campus, west campus yard, and facilities management site at Science and Technology campus. Mason has developed site specific stormwater pollution prevention plan (SWPPP) for each facilities and will implement them in accordance with the plans.

The operation and maintenance program also incorporates a training component focusing on groups and/or departments that are likely to have significant stormwater impacts. The EHS office is responsible for training Mason personnel involved in hazardous materials and petroleum product handling activities. Major Training elements of the Mason MS4 Program can be found in *Appendix D*

Mason developed the nutrient management plans for turf/landscape areas and athletic fields. The plans apply to 92.8 acres of turf areas and 19.5 acres of athletic fields on Fairfax Campus and 21.6 acres of turf areas on Science and Technology Campus. The current nutrient management plans are valid through August 18, 2021 and are available upon request.

## VI. ANNUAL REPORT AND PROGRAM EVALUATION

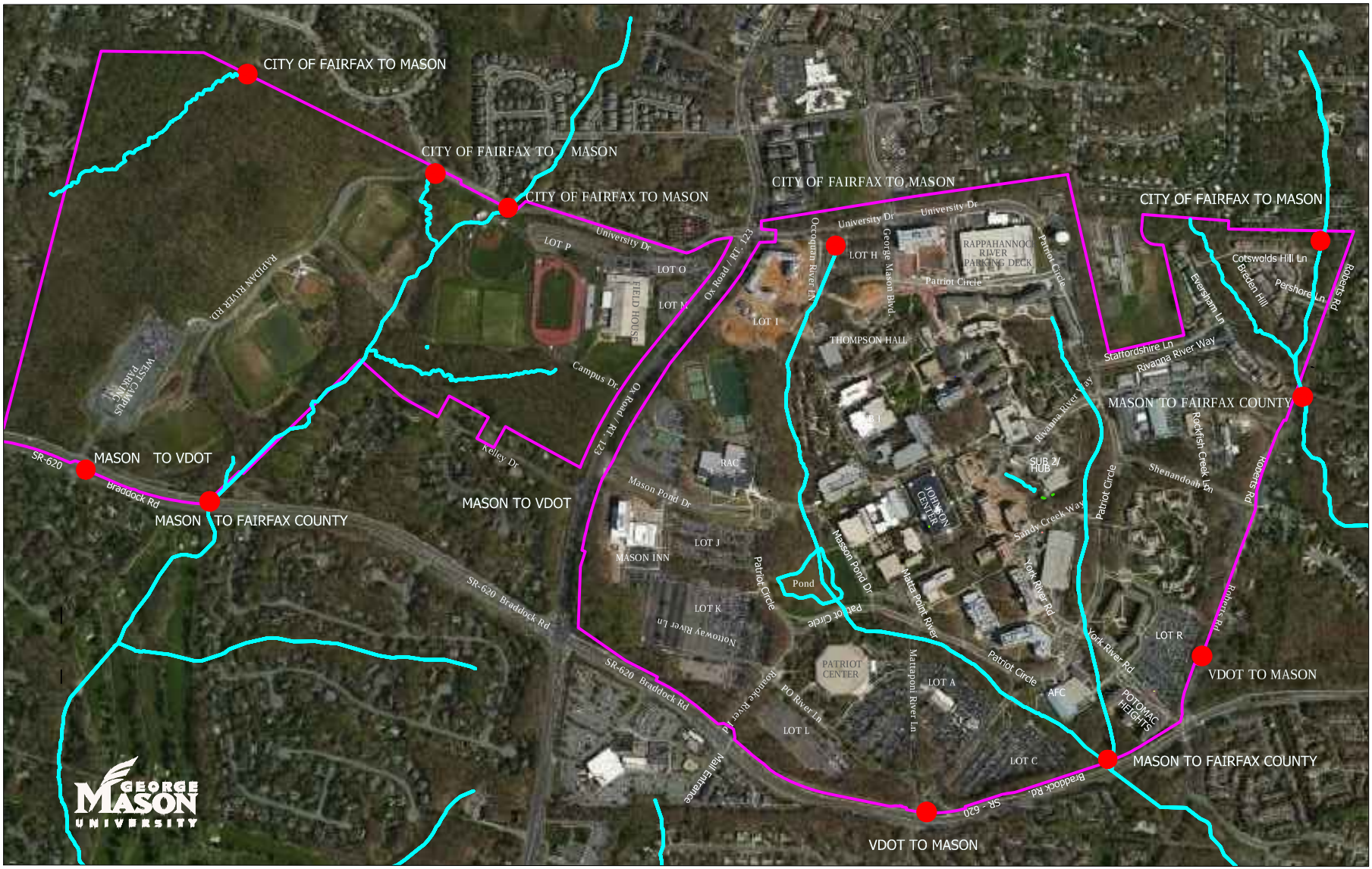
This program is to be evaluated annually by Mason LD personnel to ensure compliance with

all provision of the MS4 permit. Program plan modifications will take place as necessary or as required by DEQ.

An annual report is to be submitted for review to DEQ on MS4 Program Plan updates. The annual MS4 report is to be submitted by October 1st of each year. Copies of previously submitted Annual Reports can be reviewed on the Mason website: https://stormwater.gmu.edu/

# Figures

Map of MS4 Interconnectivity
George Mason University-Fairfax Campus




LEGEND

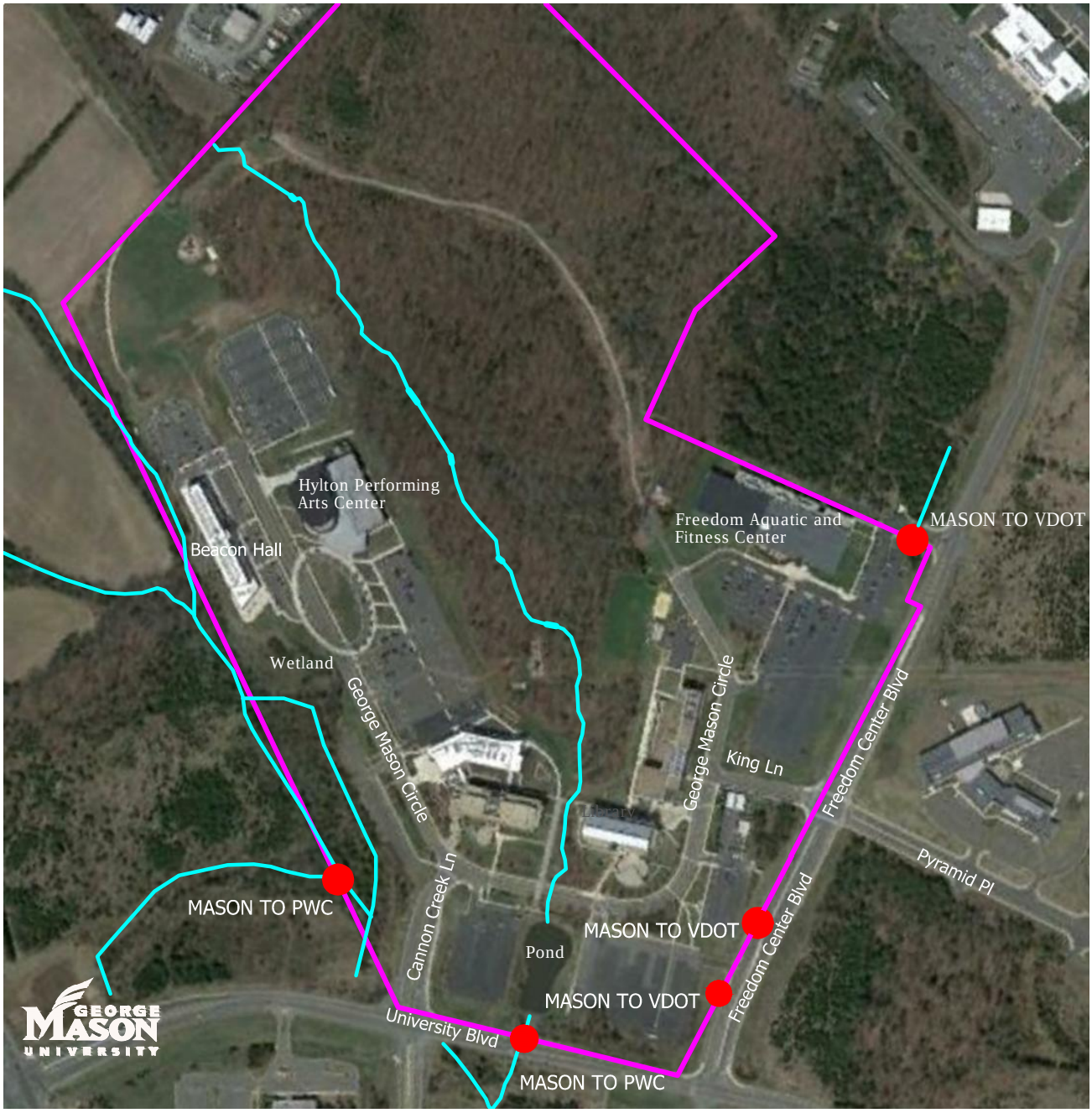
- STREAMS
- MASON BOUNDARY
- MASON GEORGE MASON UNIVERSITY
- VDOT VIRGINIA DEPARTMENT OF TRANSPORTATION

N

0 1000′ 2000′

SCALE: 1" = 1000'

Map of MS4 Interconnectivity
George Mason University - Science and Technology Campus




## LEGEND

| | |
|---|---|
| | STREAMS |
| | MASON BOUNDARY |
| MASON | GEORGE MASON UNIVERSITY |
| PWC | PRINCE WILLIAM COUNTY |
| VDOT | VIRGINIA DEPARTMENT OF TRANSPORTATION |

N

0 500' 1000'

SCALE: 1" = 500'

# Appendix A:

## Outfall Reconnaissance Procedures and Guidelines

# Outfall Reconnaissance Procedures and Guidelines

**PURPOSE**

As legislated by Virginia Stormwater Management Program (VSMP) Permit Regulations, Virginia Department of Water Quality (DEQ) issued George Mason University (Mason) a VSMP General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4) General Permit No. VAR040106. The effective date of the permit is from Nov 1, 2018 to Oct 31, 2023.

The permit requires Mason to develop and implement procedures to detect, identify and address the unauthorized non-stormwater discharges including illegal dumping.

Mason's Outfall Reconnaissance Inventory (ORI) procedures are developed to:

- Identify and record characteristics of existing drain outfall.
- Prioritize screening schedule
- Detect and assess the severity of illicit discharge problems, if any.
- Report illicit discharge problems, if any

**SCHEDULE**

ORI are to be performed twice a year, at spring and fall, during prolonged dry periods and non-growing season with low base flow levels. Moreover, ORI field work will be conducted at least 48 hours after the last rain event.

**STAFFING**

The ORI requires at least a two-person crew, for safety and efficiency. All crew members are to be trained on how to complete the ORI and have a basic understanding on illicit discharges and water quality impacts. Training on ORI would be conducted by Mason LD as necessary.

**RESOURCES NEEDED TO CONDUCT THE ORI**

**Maps:**

ORI maps of each campus are to provide labeled streets and hydrologic features (streams, stormwater pipes, wetlands and lakes). ORI maps should be used to check the accuracy and quality of pre-existing mapping information, such as location of outfalls and stream origins. Refer to Appendix A for Mason Stormwater maps.

**Field Sheets:**

ORI field sheets are used to record descriptive and qualitative information about each outfall inventoried in the field. Data from the field sheets represent Mason's outfall tracking system. ORI field sheets are to be completed in the field by the inspection crew and are to be entered and updated in the Mason LD's stormwater management GIS database.

Outfall Reconnaissance Inventory Form contains:

- Information such as the location map, outfall description, invert elevations, etc. Locations of outfalls and invert elevations are determined with the GPS equipment.
- Physical characteristics including outfall structure type, shape, dimensions, material, etc

Outfall Inspection Form contains:

- Information associated with quality of outfall with regards to:
  - Concentration of water- pipe flow and surface water elevation, which determines the presence of a pipe blockage or scouring velocities
  - Physical conditions/ indicators: including but not limited to outfall damages, deposits, abnormal vegetation, sediment, etc.
  - Characteristics of flow: including but not limited to odor, color, clarity, floatables, etc.
  - Signs of dumping and illicit discharges
- An overall rating to determine corrective actions required and level of priority for maintenance.

A copy of the Outfall Reconnaissance Inventory form and the Outfall inspection form is provided in Appendix B.

Field crews are expected to carry Mason identification and report any emergency leaks, spills, obvious illicit discharges, and/or other water quality problems to Mason Land Development and other emergency contacts below.

*Emergency Contacts:*

| | |
|---|---|
| Mason Police (Fairfax Campus) | 703 993-2800 |
| Mason Police (Science and Technology Campus) | 703 993-8370 |
| Mason Environmental Health & Safety Office (Fairfax Campus) | 703 993-8448 |
| Mason Environmental Health & Safety Office (Science and Technology Campus) | 703 993-1766 |
| Mason Land Development | 703 993-4051 |

**FIELD EQUIPMENT:**

Basic equipment needed during field work includes:

| Required | Optional |
|---|---|
| • GPS Survey Unit<br>• Camera<br>• Measuring Tape<br>• Watch<br>• Flashlight<br>• Clipboard, pencils and ORI sheets | • Thermometer<br>• Flow meter<br>• Test Strips<br>• Test Bottles<br>• Broom |

Basic safety items

- Surgical Gloves
- Cell phones or walkie-talkies
- First Aid Kit (Minimum needed: repellents packet, insect sting relief packet, sun block).

**PROCEDURE**

The ORI is to perform survey on streams and/or channels within Mason's MS4 using Field Maps and field equipment to locate existing and/or new outfalls as needed, and to verify existing outfalls depicted in the stormwater map. Field crews are to inspect at minimum the listed "high priority" outfalls. The "high priority" outfalls, are identified annually based upon physical conditions, age of the infrastructure, land use, interconnection with other MS4s jurisdictions; previously identified as potential illicit discharges and maintenance needs. The list will be updated as needed. At least one additional outfalls within each quadrant covering Mason campus is to be inspected at the permit year and shall not be as part of the previous year inspection. The goal is to inspect all outfalls every two years.

Newly installed outfalls will be located and described as part of the ORI. Inspection will be performed after substantial completion of the construction, unless illicit discharge is identified.

Field crews conduct an ORI by walking along streams and channels to verify existing and/or new outfalls, perform field screening of the minimum amount selected outfalls, and record the spatial location with a GPS unit as needed. Each outfall is to be photographed and marked by directly writing a unique identifying number that serves as its sub-"watershed address." (See section Outfall Identification for numbering system). A sample of the flow may be taken for water quality examination in case of potential illicit discharges by the Mason Environmental, Health and Security (EHS). Photographs and a ORI Inspection report for each outfall, are to be submitted to Mason LD. Inspection report should include data on outfall characteristic and observations.

The ORI applies to all outfalls encountered during the stream walk, with the following exceptions:

- Drop Inlets from roads in culverts (Unless evidence of illegal dumping, dumpster leaks, etc.)
- Weep holes
- Discharges from roof downspouts that sheet flow over ground

Outfalls to be recorded:

- Both large and small diameter pipes that appear to be part of the storm drain infrastructure.
- Field connections to culverts
- Submerged or partially submerged outfalls
- Outfalls that are blocked with debris or sediment deposits
- Small diameter pipes

Common outfalls encountered in the field are illustrated Appendix D.

**Outfall Identification Number**

The outfall identification number is assigned based on the outfall location in relation to the stormwater map of each campus. The stormwater map of each campus is divided by quadrants which cover approximately 33 acres of land. Each quadrant is divided in 16 smaller sub-quadrants numbered left to right and top to bottom. Outfall identification numbers reflect the number of the quadrant and respective sub-quadrant in which they are located with respect to the stormwater map. A to Z suffix is assigned as available. For example: A-2-7-A outfall located on quadrant A-2, sub-quadrant 7 and labeled A suffix.

**Form Description**

<u>Outfall Reconnaissance Inventory</u>

Section 1: General Information

This section is used to record basic information about the survey and is used to create an accurate record of when and where data was collected. Information in this section is to include GPS coordinates for the outfall, stream, campus location, etc.

Section 2: Outfall Description

This section is used to provide basic characteristics for the outfall including type, shape, invert elevation, material, dimensions and depth of submergence or water elevation when water is present. This information is used to confirm and supplement existing storm drain maps.

Outfall Inspection

Section 1: General Data

This section is used to record basic information about the survey including date and time, temperatures, weather conditions, GPS coordinates, etc. This section provides information on when and where and under what conditions data was collected.

Section 2: Outfall Description

This section indicates if the pipe is submerged and the amount of flow in the pipe.

Section 3: Physical Conditions/ Indicators

This section is used to provide information any physical indicators or conditions that might require attention. This section can be associated with both flowing and non-flowing outfalls. Indicators can be detected by smell or sight, and require no measurement equipment. Such indicators do not always predict illicit discharges (See Definitions section for Illicit Discharges detection and Elimination Policy). Some of the indicators described in this section include, outfall damage, deposits, stains, abnormal vegetation, sediment, etc. See Appendix D for common examples of physical indicators and severity. Many of these physical indicators can represent an intermittent or transitory discharge that has occurred in the past, even if the pipe is not flowing at the time of the inspection.

Section 4: Quantitative Characterization

This section is to be determined on the field.

This section is used to provide information on any measurements taken in the field, such as, flow depth and width of discharge flow rate.

Flow rate can be measured using the following two techniques: (1) *For flat and shallow flow*: Recording the time it takes to fill a container of a known volume and; (2) *For Flow of larger discharges:* measure the velocity and multiply it by the estimated cross-sectional area of the flow.

The velocity of the flow is to be determined by defining a fixed flow length and observing the time it takes for a light object (ping pong ball, crumble leave, etc.) to travel across the length. The velocity of flow is computed as the length of the flow path (in feet) divided by the travel time (in seconds). The cross-sectional area (in square feet) is measured by multiplying readings of depth and width of flow. Once the cross-sectional area is determined, the flow rate (cubic feet/second) is computed by multiplying the cross-sectional area by the flow velocity (feet/second).

The quality of water in flowing outfalls is optional and can be measured by collecting a sample of the discharge. All measurements should be made from a sample bottle that

contains flow captured from the outfall. Measurements should be recorded in this section. When interpolation is required, results should not exceed mid-range between two color points.

Section 5: Physical Characteristics/ Indicators for Flowing Outfalls

Section 5 records data about four sensory indicators: odor, color, turbidity and floatables, which are based on the investigator's sense of smell or sight. No equipment is required to complete this part of the inspection form. While sensory indicators are not always reliable in predicting ALL illicit discharges, these are important indicators of severe or obvious discharges. Severity of the sensory indicator is to be recorded on a scale of 1 through three. Types and severity of indicators and discharges are defined in ORI sheets.

Section 6: Data Collection

This section records sample identification number for future reference.

Section 7: Overall Condition

This section describes the general condition of the outfall based on the number of indicators and the severity of such indicators. Any comments to this section should be noted in section 8.

Section 8: Recommendation

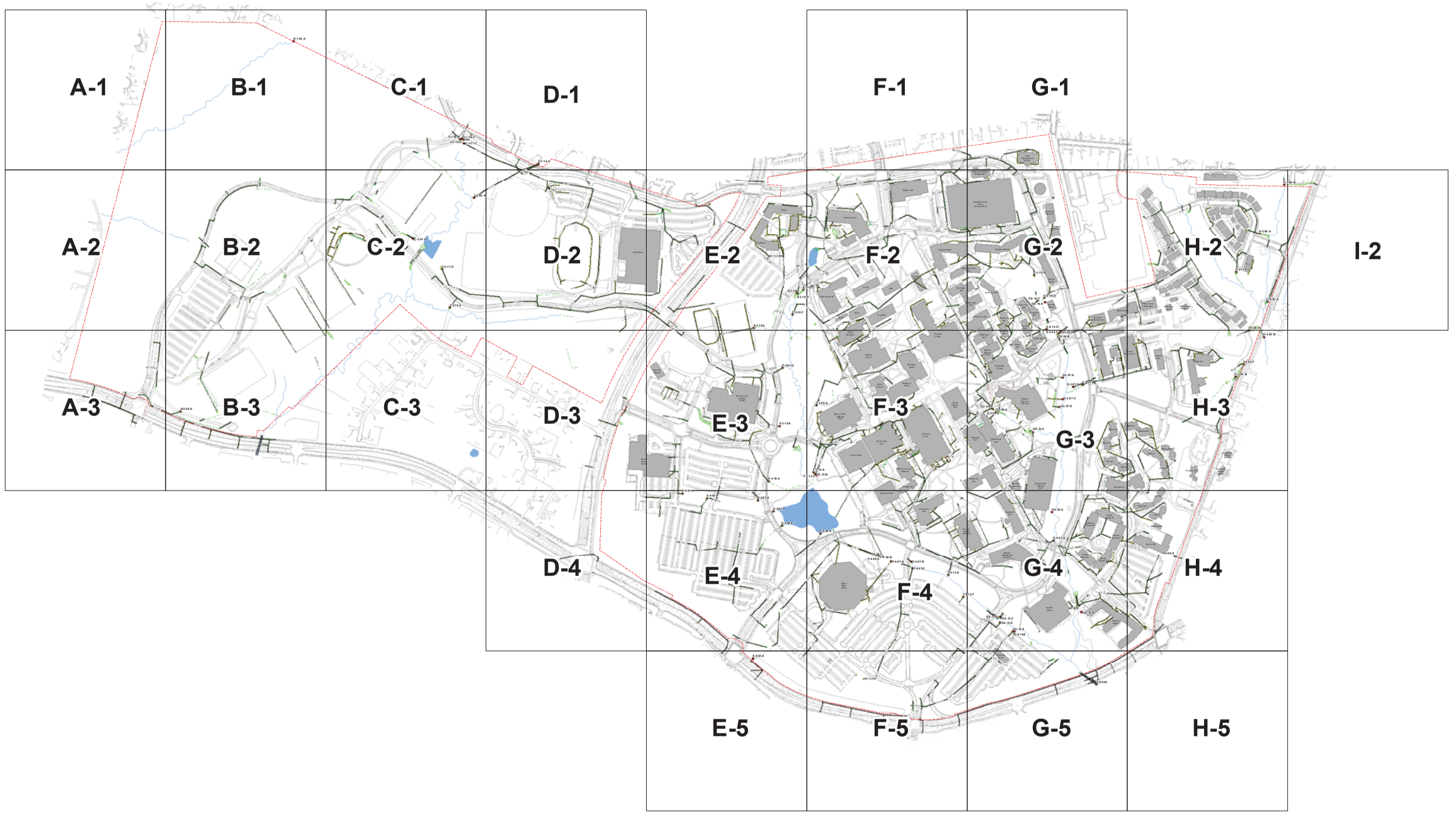
This section summarizes the discharge potential, infrastructure repairs and debris removal needs of each outfall. Based on the field visit and the data collected, the field crew is to give a final recommendation that summarizes the correctives actions necessary to restore the conditions of the outfall. This section is very important as it helps identify and prioritize outfalls that need more attention. Corrective maintenance schedules are to be based on the overall conditions of the outfall. If illicit discharge is identified, EHS will be notified to perform investigation and record the findings in the Incident Investigation and Response form.

Lastly, both the outfall reconnaissance and the inspection forms allow for additional comments from the field crew, which are to be recorded in the last section of the sheet. Additional information can be submitted as attachments when necessary.

# APPENDIX A:

## GMU Stormwater

## Sewer System Maps




# GMU Fairfax Campus Stormwater Sewer System

Revised: 03/2019

## Legend

- Storm Outfalls
- StormStructure
- Storm Inlets
- Storm Manhole
- Storm Outlets
- Ditchline Swales
- Trench Drains
- Storm Culvert
- Storm Pipe
- Storm Riprap
- Storm Pipes Abandoned
- Storm Pipe < 12"
- Storm Inlets < 12"
- Storm Manholes < 12"
- Storm Outlets < 12"
- Water Features
- Fairfax Stream
- Fairfax Buildings
- MS4 Grid
- GMU Boundary

N

0 800 1,600 Feet


# GMU Prince William Campus Stormwater Sewer System

Revised: 03/2019

## Legend

- Outfalls
- Storm Inlets
- Storm Manhole
- Storm Outlets
- Trench Drain
- Ditchline/Swale
- Storm Culvert
- Storm Pipe
- Storm Pipe Abandoned
- Storm Riprap
- Storm Pipe < 12"
- Sci-Tech Stream
- Water Features
- Buildings
- Grid
- Campus Boundary

N

0 490 980 Feet

# APPENDIX B:

## Outfall Reconnaissance Inventory and Inspection Forms

# OUTFALL RECONNAISSANCE INVENTORY

**Entry Date:**_____

**Form Completed by:**_____ **Investigator:** _____

## Section 1: General Information

**Outfall ID:**_____ **GPS Location:** (N)_____(E)_____

**Stream:**_____ **Community:**_____

**Origin of Discharge:**_____ **Outfall on Map:** ☐ Yes ☐ No

| Outfall Photograph | Location Map |
|---|---|
| | |

## Section 2: Outfall Description

| Type | Material | Shape | Dimensions | Submerged |
|---|---|---|---|---|
| ☐ Closed Pipe | ☐ RCP ☐ CMP ☐ PVC ☐ HDPE ☐ Steel ☐ Other: _____ | ☐ Circular ☐ Single ☐ Eliptical ☐ Double ☐ Box ☐ Triple ☐ Other: _____ | Height (in): _____ Width (in): _____ Diameter (in): _____ | In water: ☐ No ☐ Partially ☐ Full |
| ☐ Open Drainage | ☐ Concrete ☐ Earthen ☐ Rip-rap ☐ Other: _____ | ☐ Trapezoid ☐ Parabolic ☐ V-shaped ☐ Other:_____ | Depth (ft): _____ Top width (ft): _____ Bottom width (ft): ____ | Water depth (ft):_____ Height from invert to stream flow (ft):_____ |
| ☐ Outfall Protection | Length = _____ | Width = _____ | Size of Rip Rap = _____ | |

**Invert Elevation:** _____

**Was there dry weather flow during the last inspection?** ☐ Yes ☐ No ☐ N/A

**Was there an investigation as to the source of the flow?** ☐ Yes ☐ No ☐ N/A

**If yes, describe the investigation:**_____

The informaition provided has been field verified by the investigator to the best of his/her knowledge and judgement.

**Investigator's Signature:**_____

Note: First Inspection:_____

# OUTFALL INSPECTION

**Section 1: General Data**

**Outfall ID:**_____ **GPS Location:** (N)_____(E)_____

**Date:**_____ **Time:** _____

**Temperature:**_____ **Rainfall (in)**: Last 24 hours_____Last 48 hours_____

**Inspector:**_____ **Time of last Rain:** ☐ < 24 hrs ☐ < 48 hrs ☐ < 72 hrs ☐ > 72 hrs

**Photos #s:**_____

| Outfall Photograph | Location Map |
|---|---|
| | |

**Section 2: Outfall Description**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Pipe Flow:** | ☐ None | ☐ < 1/4 Pipe | ☐ < 1/2 Pipe | ☐ < 3/4 Pipe | ☐ Full | ☐ Trickle |
| **Pipe Submergence:** | ☐ None | ☐ < 1/4 Pipe | ☐ < 1/2 Pipe | ☐ < 3/4 Pipe | ☐ Full | |

**Comments:**

**Section 3: Physical Conditions/ Indicators**

| Indicator | Check if present | Decription | comments |
|---|---|---|---|
| Outfall Damage | ☐ | ☐ Spalling,Cracking or Chipping ☐ Peeling Paint ☐ Corrosion | |
| Deposits/ Stains | ☐ | ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:_____ | |
| Abnormal Vegetation | ☐ | ☐ Excessive ☐ Inhibited | |
| Poor Pool Quality | ☐ | ☐ Odors ☐ Colors ☐ Floatables ☐ Suds ☐ Oil Sheen ☐ Excessive Algae ☐ Other | |
| Pipe Benthic Growth | ☐ | ☐ Brown ☐ Orange ☐ Green ☐ Other | |
| Sediment | ☐ | ☐ No ☐ Partially ☐ Full | |
| Rip-rap/ Energy Dissipation | ☐ | ☐ Good ☐ Fair ☐ Poor ☐ N/A | |
| **Other Observations:** | | | |

*Skip sections 4 and 6 if no flow is present.*

**Section 4: Quantitative Characterization for flowing outfalls ONLY**

| **FIELD DATA FOR FLOWING OUTFALLS** | | | | |
|---|---|---|---|---|
| *Flow #1 = Flat and Shallow Flow* *Flow #2 = Flow of larger discharges* | | | | |
| **Parameter** | | **Result** | **Unit** | **Equipment** |
| ☐ Flow #1 | Volume | | Liter | Bottle |
| | Time to Fill | | Sec | |
| | **Discharge Rate (Volume x Time)** | | Cubic Feet/ Sec | |
| ☐ Flow #2 | Flow Depth | | Ft | Tape Measure |
| | Flow Width | | Ft | Tape Measure |
| | Cross-sectional Area (Flow Depth x Flow Width) | | Square Ft | |
| | Measured Length | _____' _____" | Ft, in | Tape Measure |
| | Time of Travel | _____' _____" | Sec | Stop Watch |
| | Flow Velocity (Length x Time) | | Ft/Sec | |
| | **Discharge Rate (Cross-sectional Area x Flow Velocity)** | | Cubic Feet/ Sec | |
| Temperature (Optional) | | | $^{o}$F | Thermometer |
| pH (Optional) | | | pH Units | Test strip/ Probe |
| Ammonia (Optional) | | | mg/L | Test strip |

**Section 5: Physical Characteristics/ Indicators for flowing outfalls ONLY**

| Indicator | Check if present | Decription | Relative Severity Index (1-3) |
|---|---|---|---|
| Odor | ☐ | ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Petroleum/ gas ☐ Other | ☐ 1-Faint ☐ 2-Easily Detected ☐ 3-Noticeable from a distance |
| Color | ☐ | ☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other | ☐ Faint Colors in Sample Bottle ☐ Clearly Visible in Sample Bottle ☐ Clearly Visible in Outfall |
| Turbidity | ☐ | Severity | ☐ 1- Slight Cloudiness ☐ 2- Cloudy ☐ 3- Opaque |
| Floatables - Do not Include Trash | ☐ | ☐ Sewage (Toilet Paper, etc) ☐ Suds ☐ Petroleum (Oil Sheen) ☐ Other | ☐ 1- Few/ Slight ☐ 2- Some ☐ 3- Some; Origin Clear |

**Comment:**

**Section 6: Data Collection**

**Sample Collected:** ☐ Yes ☐ No **Sample ID:** _____

**Sample for Lab:** ☐ Yes ☐ No *If yes* , **Collected From:** ☐ Flow ☐ Pool

**Section 7: Overall Outfall Characterizations**

**Overall Conditions:** ☐ Good ☐ Fair^1 ☐ Poor^2 ☐ Critical

*[1] Fair: Presence of two or more indicators [2] Poor: One or more indicators with a severity of 3*

**Section 8: Recommendations**

☐ Investigate Illicit Discharge Corrective Action:_____ Priority: ☐ 1 ☐ 2 ☐ 3

☐ Infrastructure Repairs Needed Corrective Action:_____ Priority: ☐ 1 ☐ 2 ☐ 3

☐ Debris Removal Needed Corrective Action:_____ Priority: ☐ 1 ☐ 2 ☐ 3

*Priority 1: Inmediate action is required* *Priority 2: Needs attention* *Priority 3: Regular Maintenance*

**Comments:**

# APPENDIX C:

## Typical Outfalls

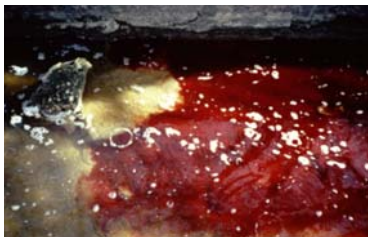
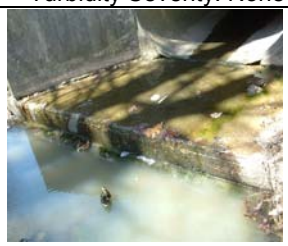
| | | |
|---|---|---|
|  Ductile iron round pipe |  4-6” HDPE; Check if roof leader connection (legal) |  Field connection to inside of culvert; Always mark and record. |
|  Small diameter (<2”) HDPE; Often a sump pump (legal), or may be used to discharge laundry water (illicit). |  Elliptical RCP; Measure both horizontal and vertical diameters. |  Double RCP round pipes; Mark as separate outfalls unless known to connect immediately up-pipe |
|  Culvert (can see to other side); Don’t mark as an outfall. |  Open channel “chute” from commercial parking lot; Very unlikely illicit discharge. Mark, but do not return to sample (unless there is an obvious problem). |  Small diameter PVC pipe; Mark, and look up-pipe to find the origin. |
|  CMP outfall; Crews should also note upstream sewer crossing. |  Box shaped outfall |  CMP round pipe with two weep holes at bridge crossing. (Don’t mark weep holes) |

**Typical Outfall Types Found in the Field**

Source: U.S. EPA Illicit Discharge Detection and Elimination: A Guidance Manual

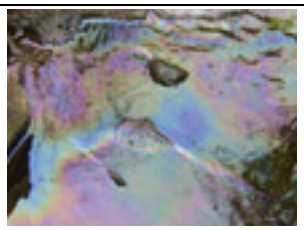
# APPENDIX D:

## Interpreting Indicators/
## Determining Severity of Indicators

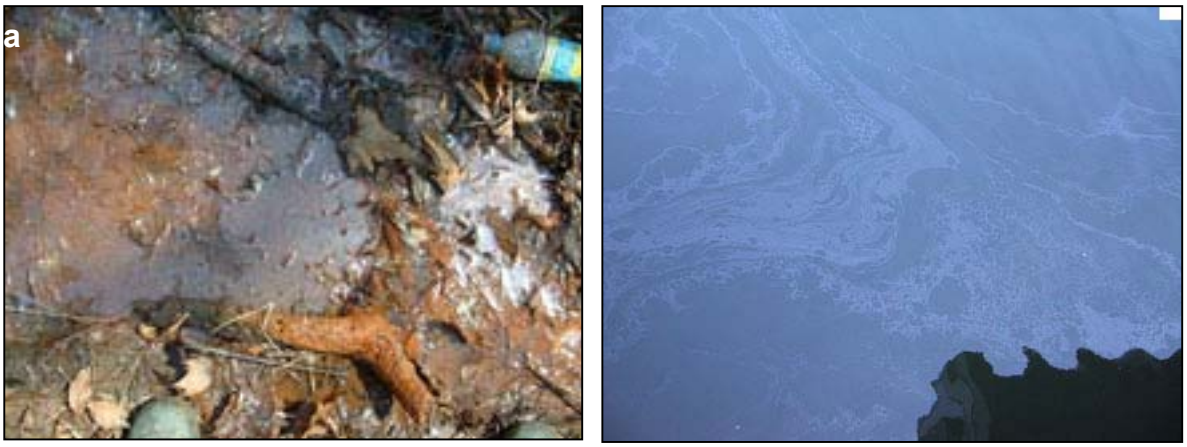
| | | |
|---|---|---|
|  <br>Color: Brown; Severity: 2<br>Turbidity Severity: 2 |  <br>Chromium Spill<br>Color: Green; Severity: 3<br>Turbidity Severity: None |  <br>Highly Turbid Discharge<br>Color: Brown; Severity: 3<br>Turbidity Severity: 3 |
|  <br>Sewage Discharge<br>Color: 3<br>Turbidity: 3 |  <br>Paint<br>Color: White; Severity: 3<br>Turbidity: 3 |  <br>Industrial Discharge<br>Color: Green; Severity: 3<br>Turbidity Severity: 3 |
|  <br>Blood<br>Color: Red; Severity: 3<br>Turbidity Severity: None |  <br>Failing Septic System:<br>Turbidity Severity: 3 |  <br>Turbidity in Downstream Plume<br>Turbidity Severity: 2<br>(also confirm with sample bottle) |
|  <br>High Turbidity in Pool<br>Turbidity Severity: 2<br>(Confirm with sample bottle) |  <br>Iron Floc<br>Color: Reddish Orange; Severity: 3<br>(Often associated with a natural source) |  <br>Slight Turbidity<br>Turbidity: 1<br>(Difficult to interpret this observation; May be natural or an illicit discharge) |
| Construction Site Discharge<br>Turbidity Severity: 3 |  |  <br>Discharge of Rinse from Floor Sanding (Found during wet weather)<br>Turbidity Severity: 3 | |

**Interpreting Color and Turbidity**

Source:U.S.EPA Illicit Discharge Detection and Elimination: A Guidance Manual 2008

| SUDS | | |
|---|---|---|
|  Natural Foam<br>Note: Suds only associated with high flows at the “drop off”<br>Do not record. |  Low Severity Suds<br>Rating: 1<br>Note: Suds do not appear to travel; very thin foam layer |  High severity suds<br>Rating: 3<br>Sewage |
| **OIL SHEENS** | | |
|  Low Severity Oil Sheen<br>Rating: 1 |  Moderate Severity Oil Sheen<br>Rating: 2 |  High Severity Oil Film<br>Rating: 3 |

**Determining the Severity of Floatables**




**Synthetic versus Natural Sheen (a) Sheen from bacteria such as iron floc forms a sheet-like film that cracks if disturbed (b) Synthetic oil forms a swirling pattern suds**

Source:U.S.EPA Illicit Discharge Detection and Elimination: A Guidance Manual 2008

Bacterial growth at this outfall indicates nutrient enrichment and a likely sewage source.

This bright red bacterial growth often indicates high manganese and iron concentrations. Surprisingly, it is not typically associated with illicit discharges.

*Sporalitis* filamentous bacteria, also known as “sewage fungus” can be used to track down sanitary sewer leaks.

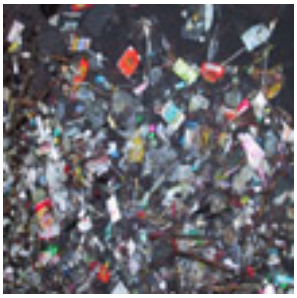
Algal mats on lakes indicate eutrophication. Several sources can cause this problem. Investigate potential illicit sources.

Illicit discharges or excessive nutrient application can lead to extreme algal growth on stream beds.

The drainage to this outfall most likely has a high nutrient concentration. The cause may be an illicit discharge, but may be excessive use of lawn chemicals.

This brownish algae indicates an elevated nutrient level.

**Interpreting Benthic and Other Biotic Indicators**

| | | |
|---|---|---|
|  Reddish staining on the rocks below this outfall indicate high iron concentrations. |  Toilet paper directly below the storm drain outlet. |  Watershed Protection?? |
|  Trash is not an indicator of illicit discharges, but should be noted. |  Staining at the base of the outfall may indicate a persistent, intermittent discharge. |  Excessive vegetation may indicate enriched flows associated with sewage. |
|  Brownish stain of unclear origin. May be from degradation of the brick infrastructure. |  Cracked rock below the outfall may indicate an intermittent discharge. |  Poor pool quality. Consider sampling from the pool to determine origin. |

**Typical Findings at both Flowing and Non-Flowing Outfalls**

Source:U.S.EPA Illicit Discharge Detection and Elimination: A Guidance Manual 2008

# Appendix B:

## Stormwater Management Maintenance Guide

# Stormwater Management Maintenance Guide

| Facility: | Detention (Dry) Pond | | | |
|---|---|---|---|---|
| **Feature** | **Potential Problem** | **Maintenance Needed** | **Desired Outcome** | **Notes/ Maintenance Suggested Frequency** |
| **General** | Sediment | Once every 5 years or if sediment accomulation exceeds 10% of the design pond depth. If less than treshold, sediment to be removed as part of next schedule maintenance. | Sediment clear from the site | Check sediment levels inside the forebay and main pool, record the depth at the same time each year. Conduct bathymetric survey annually. |
| | Trash and Debris | There should be no visual evidence of dumping. | Trash clear from the site. | Regular Inspection (once a month) is required to control presence of trash and floatables. |
| | Poisonous Vegetation and Noxious Weeds. | Presence of vegetation which may constitute to a hazard to maintenance personnel or the public | No danger of poisonous vegetation where maintenance personnel and public might be present. | Compliance with State or local policies for eradication and use of herbicides required. |
| | Contaminants and Pollution. | Any evidence of oil, gasoline, contaminants or other pollutants. | No contaminants or pollutants present | All outfalls are to be examined for the presence of non-stormwater discharges every 3 months. Coordinate removal/cleanups as necessary. |
| | Animal and Pest Control (Beaver and Rodents) | Presence of animal holes or evidence of water piping through dam or berm due to animal rodent holes. Any changes or funtion of the facility. | Rodents Exterminated and damages in structure repaired. | Regular inspection required |
| | Tree Growth and Hazard Trees | Tree growth that does not allow maintenance access or interferes with maintenance activity. If dead, diseased or dying trees are identified. | Accessible site for maintenance and inpection. | Do not remove vegetation that does not interfere with access or maintenance. |
| **Side Slopes** | Erosion | Any erosion observed on side slopes. | Stabilized slopes using appropiate control measures (see GMU-ESC manual)- Rock, planting of grass, etc. | Regular inspection required. Reseed as needed. |

| | | | | |
|---|---|---|---|---|
| **Storage Area** | Sediment | Once every 5 years or if sediment accomulation exceeds 1 foot of depth or 10% of the design pond depth. If less than treshold, sediment to be removed as part of next schedule maintenance. | Sediment clear from the site | Check sediment levels inside the forebay and main pool, record the depth at the same time each year. |
| **Pond Berms** | Settlements | Any part of the berm that has settled. | Berms are repaired and set to designed elevation. | Measure amount of settlement regularly. Settlement can be an indicator of more severe problems, source of settlement should be determined. |
| | Piping | Noticible water flow through the berm of the pond. Erosive conditions. | Piping eliminated. Potential erosion problem resolved. | Regular inspection required |
| **Emergency Overflow/ spillway and berms over 4 ft in height** | Tree Growth | Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncotrolled overtopping. Tree growth on berms over 4 ft in height may lead to piping through the berm which could lead to berm failure. | Trees removed. Roots should be removed when base is greater that 4 inches. | Regular inspection required. Restore berm as necessary. |
| | Piping | Noticible water flow through the berm of the pond. Erosive conditions. | Piping eliminated. Potential erosion problem resolved. | Regular inspection required |
| **Emergency overflow/ spillway** | Armoring Missing | Any exposure of soil at the top of outflow path of spillway. | Rock and pad depth are restored to design standards. | Regular inspection required |
| | Erosion | Any erosion observed on side slopes. | Stabilized slopes using appropiate control measures (see GMU-ESC manual)- Rock, planting of grass, etc. | Regular inspection required. |

# Stormwater Management Maintenance Guide

| Facility: | Retention (Wet) Pond | | | |
|---|---|---|---|---|
| **Feature** | **Potential Problem** | **Maintenance Needed** | **Desired Outcome** | **Notes/ Maintenance Suggested Frequency** |
| **General** | Sediment | Once every 5 years or if sediment accomulation exceeds 1 foot of depth or 10% of the design pond depth. If less than treshold, sediment to be removed as part of next schedule maintenance. | Sediment clear from the site | Check sediment levels inside the forebay and main pool, record the depth at the same time each year. Conduct bathymetric survey annually. |
| | Floating Trash | There should be no visual evidence of dumping. | Trash clear from the site. | Regular Inspection (once a month) is required to control presence of trash and floatables. |
| | Oil Sheen on Water | Prevalent or visible oil sheen. | Oil removed from water and source of oil located | Oil removal using Oil absorbent pads or vactor truck. If chronic low levels of oil persist, plant wetland plants such as Juncus effusus (soft rush) which can uptake small concentrations of oil. |
| | Poisonous Vegetation and Noxious Weeds. | Presence of vegetation which may constitute to a hazard to maintenance personnel or the public. | No danger of poisonous vegetation where maintenance personnel and public might be present. | Compliance with State or local policies for eradication and use of herbicides required. |

# Stormwater Management Maintenance Guide (2012)

| Facility: | Extended Detention Pond | | | |
|---|---|---|---|---|
| **Feature** | **Potential Problem** | **Maintenance Needed** | **Desired Outcome** | **Notes/ Maintenance Suggested Frequency** |
| **General** | Sediment | Once every 5 years or if sediment accomulation exceeds 1 foot of depth or 10% of the design pond depth. If less than treshold, sediment to be removed as part of next schedule maintenance. | Sediment clear from the site | Check sediment levels inside the forebay and main pool, record the depth at the same time each year. Conduct bathymetric survey annually. |
| | Trash and Debris | There should be no visual evidence of dumping. | Trash clear from the site. | Regular Inspection (once a month) is required to control presence of trash and floatables. |
| | Poisonous Vegetation and Noxious Weeds. | Presence of vegetation which may constitute to a hazard to maintenance personnel or the public | No danger of poisonous vegetation where maintenance personnel and public might be present. | Compliance with State or local policies for eradication and use of herbicides required. |
| | Contaminants and Pollution. | Any evidence of oil, gasoline, contaminants or other pollutants | No contaminants or pollutants present | All outfalls are to be examined for the presence of non-stormwater discharges every 3 months. Coordinate removal/cleanups yearly. |

# Stormwater Management Maintenance Guide

| Facility: | Biofiltration Swale | | | |
|---|---|---|---|---|
| **Feature** | **Potential Problem** | **Maintenance Needed** | **Desired Outcome** | **Notes/ Maintenance Suggested Frequency** |
| **General** | Sediment Accumulation on Grass | Sediment depth that exceeds 2 inches in depth. Areas of standing water when no inflow is present. | Sediment clear from grass treatment area of the bio-swale, Swale should be leveled from side to side and drain freely towards the outlet. | Check sediment regularly. Reseed as necessary. |
| | Standing Water | Areas of standing water in the swale between storms and does not drain freely and is still present 72 hours after hydrologic event. | Biofiltration swale should be clear from sediment and debris or any other blockage that does not allow water to drain freely. | Any of the following may apply: remove sediment or trash blockages, improve grade from head to foot of swale, remove clogged check dams, add underdrains orconvert to a wet biofiltration swale. Regular inspection is required. |
| | Trash | There should be no visual evidence of dumping. | Trash clear from the site. | Regular Inspection (once a month) is required to control presence of trash. |
| | Flow Spreader (if applicable) | Flow spreader uneven or clogged. Flow that is not uniformly distributed through entire swale width. | Clean and level spreader. Flows are spread evenly over entire swale width. | Regular inspection required. |

# Stormwater Management Maintenance Guide

| Facility: | Rain Gardens | | | |
|---|---|---|---|---|
| **Feature** | **Potential Problem** | **Maintenance Needed** | **Desired Outcome** | **Notes/ Maintenance Suggested Frequency** |
| **General** | Dead Plant Material | Presence of dead plant material | Rain garden should be clear from dead plant material | Cut off dead plant material every spring. Plant new vegetation as necessary. |
| | Trash | There should be no visual evidence of dumping. | Trash clear from the site. | Regular Inspection (once a month) is required to control presence of trash. |
| | Vegetation Coverage | When grass is sparse or bare or eroded patches occur at various places. When poisonous or nuisance vegetation exists. | Continuous vegetation growth. No danger of poisonous vegetation. | Re-seed and/or mow as necessary. Regular inspecition required. |
| | Invasive Species | Presence of noxious weeds as defined by State and local regulations. | Eradication of noxious weeds. | Compliance with State or local eradication policies required. |

# Stormwater Management Maintenance Guide

| Facility: | Infiltration Trenches and Trench Drains | | | |
|---|---|---|---|---|
| **Feature** | **Potential Problem** | **Maintenance Needed** | **Desired Outcome** | **Notes/ Maintenance Suggested Frequency** |
| **General** | Contaminants and Pollution. | Any evidence of oil, gasoline, contaminants or other pollutants. | No contaminants or pollutants present. | Identify and remove source, Report to Mason LD's Illicit Discharge Detection and Elimination Program. |
| | Slow Drainage | Decrease capacity that indicates slow drainage. | Facility's drainage rate as designed. | Verify facilities design rate. Clean perforated drain pipe. |
| | Trash and Debris | There should be no visual evidence of dumping. | Trash clear from the site. | Regular Inspection (once a month) is required. Remoe trash, debris, and other large vegetation from trench perimenter and dispose properly. |
| | Excessive Vegetation | Woody vegetation present. | Trench clear from woody vegetation. | Mow and trim vegetation as needed (annually) to prevent establishment of woody vegetation. |

# Appendix C:

## MS4 Interconnection Notifications

Facilities Project Management & Construction
4400 University Drive - MSN 1E4
Fairfax, VA 22030-4444

(703) 993-2542
Fax: (703) 993-2539
e-mail: fstrike@gmu.edu

Subject: MS4 Permit; Notice of Potential Interconnected Stormwater System

George Mason University (Mason) is a Phase II small MS4 and is covered under the Virginia Stormwater Management Program (VSMP) General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (Permit Number VAR040106).

The purpose of this letter is to notify you of the potential for interconnections between the stormwater system operated by Mason and the stormwater systems that you operate. The MS4 permit requires Mason notify in writing, any downstream regulated MS4 to which Mason is physically interconnected. We have identified several points where Mason discharges stormwater into your regulated MS4 stormwater system. Please see attached Figure 1: Map of MS4 Interconnectivity. There is no action required on your part at this time, as this letter is for notification purposes only. Please keep this for your records.

If you have any questions or desire additional information related to this subject, please contact me or

Zhongyan Xu
Manager, Civil and Environmental Engineering
(703) 993-4051
Email: zxu8@gmu.edu

Sincerely,

Frank Strike
Interim Vice President of Facilities
Phone: (703) 993-2542
Email: fstrike@GMU.EDU

Attachment(s):
(1) Figure 1: Map of MS4 Interconnectivity

# Appendix D:

## Mason MS4 Training Plan

| George Mason University MS4 Training Matrix | | | | | | | |
|---|---|---|---|---|---|---|---|
| Permit Requirement | Facilities Administration | Facility Management | Environmental Health & Safety | Dept. of Police & Public Safety | Housing | Office of Athletics | Resources |
| Illicit Discharge Detention (IDDE) MCM6.m.1 | X | X | X | X | X | X | Biennial<br>EHS Training Courses (General Safety training, Hazard Communication Training, Hazardous & Universal Waste Handling and Storage Training, Lab Safety Training , etc.)<br>https://ehs.gmu.edu/training/<br><br>EPA Illicit Discharge Detection and Elimination webinars<br>https://www.epa.gov/npdes/npdes-stormwater-webcasts |
| Good Housekeeping and Pollution Prevention (GHPP) MCM6.m.2-3 | | X | | | X | X | Biennial<br>EPA Pollution Prevention/Good Housekeeping webinars<br>https://www.epa.gov/npdes/npdes-stormwater-webcasts<br>Stormwater Pollution Prevention Training Series (DVD available in Land Development office) |
| Certified Pesticide Applicator (PA) MCM6.m.4 | | X | | | | | VDACS Training Courses<br>http://www.vdacs.virginia.gov/pesticide-applicator-training.shtml |
| Certified ESC Inspector/Plan Reviewer (ESC) MCM6.m.5 | X | | | | | | DEQ Training Courses<br>https://www.deq.virginia.gov/ConnectWithDEQ/TrainingCertification.aspx |
| Certified SWM Inspector/Plan Reviewer (SWM) MCM6.m.6 | X | | | | | | DEQ Training Courses<br>https://www.deq.virginia.gov/ConnectWithDEQ/TrainingCertification.aspx |
| Spill Response (SR) MCM6.m.7 | | X | X | X | | | EHS Training Courses (40-hour Hazardous Waste Operations (HAZWOPER); HAZWOPER First Responder, 8-hour annual HAZWOPER refresher, etc.)<br>https://ehs.gmu.edu/training/ |