

University of Maryland, College Park  
National Pollutant Discharge Elimination  
System MS4 Phase II  
FY2019 Annual Report  
General Discharge Permit #13-SF-5501

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- Appendix A: Updated Notice of Intent to include IBBR
- Appendix B: Universities at Shady Grove Final Report and Recommendations
- Appendix C: UMD MS4 Baseline BMP Assessment Report
- Appendix D: Urban Stormwater Best Management Practice (BMP) Database
- Appendix E: Campus Creek Stream Restoration Summary (Full Report under separate cover)

## List of Acronyms

BLM	Facilities Management—Department of Building & Landscape Maintenance
BMP	Best Management Practice
CAD	Computer-Aided Design
CBT	Chesapeake Bay Trust
P&C	Facilities Management—Department of Planning & Construction
ESD	Environmental Site Design
FM	Facilities Management
FP	Facilities Management—Department of Facilities Planning
GIS	Geographic Information Systems software
IBBR	Institute for Bioscience and Biotechnology Research
MCM	Minimum Control Measure
MDE	Maryland Department of the Environment
MEP	Maximum Extent Practicable
MES	Maryland Environmental Services
MS4	Municipal Separate Storm Sewer System
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
UMD	University of Maryland, College Park
USG	Universities at Shady Grove

## **I. NPDES MS4 PERMIT UMD AUTHORIZATION**

The University of Maryland-College Park (UMD) owns and operates a municipal separate storm sewer system (MS4) and, therefore, must comply with the National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from State and Federal Small Municipal Separate Storm Sewer Systems. Maryland Department of the Environment (MDE) has regulatory authority to implement this program under their General Discharge Permit No. 13-SF-5501, which was effective on October 31, 2018 and expires on October 30, 2023.

The NPDES MS4 permit requires that permit holders implement Best Management Practices (BMPs) for the following Minimum Control Measures (MCMs):

- Personnel Education and Outreach
- Public Involvement and Participation
- Illicit Discharge Detection and Elimination
- Construction Site Stormwater Runoff Control
- Post Construction Management
- Pollution Prevention and Good Housekeeping

In addition, the permit requires restoration efforts for twenty percent of existing developed lands that have little or no stormwater management by 2025. These efforts include:

- Develop planning strategies
- Identifying water quality improvement opportunities
- Securing appropriate funding
- Development of an implementation schedule for achieving the 20% restoration requirement
- Implementing water quality improvement projects

As this is the initial report for General Discharge Permit 13-SF-5501, only activities related to the 20% restoration requirement are submitted. Progress on the MCMs will be updated in subsequent annual reports.

## II. NOTICE OF INTENT

UMD submitted a Notice of Intent (NOI) in October of 2018, which identifies all UMD properties that were eligible for MS4 coverage. At the time, discussions were on-going with the Universities at Shady Grove (USG) and if the Institute for Bioscience and Biotechnology Research (IBBR) facility located on the campus of USG at Shady Grove, Maryland would be included with the USG or the UMD NOI. After further review, it was decided that the IBBR facility would be included with the UMD NOI since UMD owns and operates this facility. See **Appendix A** for a copy of the revised NOI.

Please note that the Stormwater Treatment Final Report & Recommendation for the Universities at Shady Grove, dated June 2019, by Maryland Environmental Service indicates that the MS4 permit requirements for that campus has been fully satisfied by the existing onsite Gudelsky Stormwater Pond. See **Appendix B** for this report.

## III. UMD MS4 PERMIT ADMINISTRATION

### A. Reporting Period

This report covers the period from July 1, 2018 through June 30, 2019.

### B. Contact Information

Agency Name: University of Maryland – College Park Campus

Contact Person and Title: Christopher Ho, Civil Engineer

Mailing Address: 7757 Baltimore Avenue, 0600 Service Building, College Park, MD 20742

Phone Number: (301) 405-9969

Email: [hocyho@umd.edu](mailto:hocyho@umd.edu)

## IV. BASELINE IMPERVIOUS AREA ASSESSMENT

This section presents the Baseline Impervious Area Assessment. All of the UMD properties to be regulated as identified in the NOI were imported into a GIS mapping database. Mapping features delineated included all impervious and pervious areas within the properties, locations of existing Best Management Practices (BMPs), and drainage areas to the BMPs.

The following information is required with the assessment:

1. Total impervious acres in accordance with the guidance in Appendix B, Section III of this general permit;
2. Total impervious acres treated by stormwater water quality BMPs;
3. Total impervious acres treated by BMPs providing partial water quality treatment;
4. Total impervious acres treated by nonstructural practices (i.e., rooftop disconnections, non-rooftop disconnections, or vegetated swales);
5. Verification that any impervious area draining to BMPs with missing inspection records are not considered treated; and
6. Total impervious acres untreated and twenty percent of this total area (i.e., the restoration requirement).

To assist with this task, UMD contracted Whitney, Bailey, Cox & Magnani, LLP (WBCM) to inspect, verify and compile records for all of the known BMPs on campus. WBCM inspected a total of 116 BMPs. Some of these BMPs were not included in the database because they were later determined that they were not designed as BMPs or they were not located on university property. Also, although included in the database, WBCM did not inspect any of the green roofs or underground BMPs, since UMD has separate active contracts for this work.

See **Appendix C** for the full UMD MS4 Baseline BMP Assessment Report.

Table 1 below includes the Section I, Impervious area restoration reporting, as required by the MS4 permit. Overall, the initial baseline assessment finds that there is approximately 454 acres of existing impervious area within the NOI boundaries. Of the 120 BMPs within the UMD database, only 13 BMPs were identified to be in good functional condition. Although some these facilities are missing documentation, such as maintenance records or as-built plans, they were assumed to qualify for 11.1 ac of baseline credit since they are providing water quality treatment. Documentation of these facilities will be completed before the end of the permit term.

Note that some of these facilities may qualify for restoration credit as they were constructed for redevelopment projects. The baseline assessment will be updated annually to reflect the redevelopment restoration credit when the documentation verification for these facilities is complete.

**With 454 acres of existing impervious area and 11.1 ac of treatment, 20% of the remaining 443.0 ac of untreated impervious area requires 88.6 ac of restoration.**

**Table 1: Section I: Impervious Area Restoration Reporting**

1. a. Was the impervious area baseline assessment submitted in year 1?  
 Yes  No

b. If No, describe the status of completing the required information and provide a date at which all information required by MDE will be submitted:

c. Has the baseline been adjusted since the previous reporting year?  
 Yes  No

2. Complete the information below based on the most recent data:

Total impervious acres of area covered under this permit:   
 UMD 454 acres + IBBR 4.4 acres

Total impervious acres treated by stormwater water quality best management practices (BMPs):   
 UMD 11.1 acres + IBBR 4.4 acres

Total impervious acres treated by BMPs providing partial water quality treatment (multiply acres treated by percent of water quality provided):  
  
 0 (IBBR)

Total impervious acres treated by nonstructural practices (i.e., rooftop disconnections, non-rooftop disconnections, or vegetated swales):

Total impervious acres untreated:  0 (IBBR)

Twenty percent of this total area (this is the restoration requirement):

**Table 1: Section I: Impervious Area Restoration Reporting**

Verify that all impervious area draining to BMPs with missing inspection records is not considered treated. Describe how this information was incorporated into the overall analysis:

***All existing BMPs in inventory were inspected and the condition of each facility was assessed and rated. Available maintenance records were compiled with each facility. Only facilities in good working order were credited with treating impervious area. Facilities missing as-built or maintenance records are planned to be surveyed and serviced before the end of the permit term.***

3. Has an Impervious Area Restoration Work Plan been developed and submitted to MDE in accordance with Part V.B, Table 1 of the permit or other format?

Yes  No

Has MDE approved the work plan?

Yes  No

If the answer to either question is No, describe the status of submitting (or resubmitting) the work plan to MDE and provide a date at which all outstanding information will be available:

***The initial Impervious Restoration Work plan is submitted with this report. See Table 2.***

Describe progress made toward restoration planning, design, and construction efforts and describe adaptive management strategies necessary to meet restoration requirements by the end of the permit term:

***As this report is the initial assessment of the restoration requirements, all existing facilities with impervious area treatment records were identified. Facilities were inspected and rated. Cost estimates were established and a priority list of facilities for repairs were ranked for maximizing impervious area treatment at lowest cost. The goal is to restore as many existing facilities as possible by the end of the permit term.***

**Table 1: Section I: Impervious Area Restoration Reporting**

4. Has a Restoration Schedule been completed and submitted to MDE in accordance with Part V.B, Table 2 of the permit?

Yes  No

In year 5, has a complete restoration schedule been submitted including a complete list of projects and implementation dates for all BMPs needed to meet the twenty percent restoration requirement?

Yes  No

Are the projected implementation years for completion of all BMPs no later than 2025?

Yes  No

Describe actions planned to provide a complete list of projects in order to achieve compliance by the end of the permit term:

*As this report is the initial assessment of the restoration requirements, all existing facilities with impervious area treatment records were identified. Facilities were inspected and rated. Cost estimates were established and a priority list of facilities for repairs were ranked for maximizing impervious area treatment at the lowest cost. The goal is to bring all existing facilities into compliance by the end of the permit term.*

Describe the progress of restoration efforts (attach examples and photos of proposed or completed projects when available):

*In Spring of 2018, UMD initiated construction of the Campus Creek Stream Restoration Project. This project restores 3,039 linear feet of the stream and tributaries using a regenerative stream restoration approach to reduce erosion, pollutant loading and provides functional uplift. Based on the TMDL credits from pollutant loads determined from Protocol 1, Protocol 2 and the area of impervious surface within the total project watershed, the project has a potential credit of 172.3 acres, but is capped based on the actual impervious area of 105.8 acres draining to the stream. This credit amount is currently under review by MDE. See attached Appendix E report.*

*Since the total UMD restoration requirement is 88.6 acres, the Campus Creek Stream Restoration project provides more than enough credit at 105.9 acres (subject to MDE Approval).*



**Table 1: Section I: Impervious Area Restoration Reporting**

<p>5. Has the BMP database been submitted to MDE in Microsoft Excel format in accordance with Appendix B, Tables B.1.a, b, and c? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Is the database complete? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>If either answer is No, describe efforts underway to complete all data fields, and a date that MDE will receive the required information:</p> <p><i>Not all data fields for each BMP are complete or have been verified. Many facilities are missing original design records, so additional surveys and design verification is required to complete the database. Information including drainage area, impervious areas and Pe treated will need to be completed for the database.</i></p>
<p>6. Provide a summary of impervious area restoration activities planned for the next reporting cycle (attach additional information if necessary):</p> <p><i>Establish as-built records and determine impervious area treated for existing facilities that have no design records. Perform repairs on existing facilities that are not functional. Establish routine maintenance reporting and integrate with GIS database. See Table 3.</i></p>
<p>7. Describe coordination efforts with other agencies regarding the implementation of impervious area restoration activities:</p> <p><i>In discussions with City of College Park for treatment of off-site City drainage that flows onto UMD campus. In discussions with MTA for credit sharing of SWM facilities being proposed for Purple Line construction.</i></p>

**Table 1: Section I: Impervious Area Restoration Reporting**

<p>8. List the total cost of developing and implementing impervious area restoration program during the permit term:</p> <p><i>Consultant cost \$168,232</i></p>
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**V. RESTORATION WORK PLAN**

The restoration work plan required to be submitted with the MS4 progress report describes the plans and future activities proposed, as well as progress completed, over the course of the permit term towards meeting the restoration requirement.

**Table 2: Restoration Work Plan**

<p>Year 1 (FY2019)</p>	<ul style="list-style-type: none"> <li>• Import entire UMD campus properties into GIS mapping</li> <li>• Delineate all property lines, impervious areas, pervious area surfaces, BMP locations and drainage areas for baseline assessment.</li> <li>• Inspect the entire UMD inventory of SWM BMP facilities and assess for compliance with the MS4 permit requirements.</li> <li>• Research archives at UMD and MDE. Compile all available design plans, as-built plans, stormwater reports and maintenance records for each BMP.</li> <li>• Rate each facility based on the condition, availability of design plans, as-built plans, and maintenance records.</li> <li>• Establish a priority list of BMP repairs based on the lowest cost and greatest potential treatment areas.</li> <li>• Establish a BMP maintenance tracking program</li> <li>• Program budgets for Year 2 surveys, designs, and repairs</li> </ul>
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**Table 2: Restoration Work Plan**

<p>Year 2 (FY 2020)</p>	<ul style="list-style-type: none"> <li>• Execute projects for Year 2 repairs and surveys</li> <li>• Update baseline assessment and database.</li> <li>• Update restoration activity schedule on projects.</li> <li>• Integrate BMP documentation and maintenance records with database.</li> <li>• Continue surveys, designs and repairs to bring facilities into compliance.</li> <li>• Explore opportunities for grant funding to continue next phase of Campus Creek Stream restoration</li> <li>• Program budgets for Year 3 surveys, designs, and repairs</li> </ul>
<p>Year 3 (FY2021)</p>	<ul style="list-style-type: none"> <li>• Execute projects for Year 3 repairs and surveys</li> <li>• Update baseline assessment and database.</li> <li>• Continue improving database and incorporating new information from restoration activity work and maintenance information</li> <li>• Update restoration activity schedule on projects.</li> <li>• Program budgets for Year 4 surveys, designs, and repairs</li> </ul>
<p>Year 4 (FY2022)</p>	<ul style="list-style-type: none"> <li>• Execute projects for Year 4 repairs and surveys</li> <li>• Perform inspections of all BMPs.</li> <li>• Update baseline assessment and database.</li> <li>• Continue improving database and incorporating new information from restoration activity work and maintenance information</li> <li>• Update restoration activity schedule on projects.</li> <li>• Program budgets for Year 5 surveys, designs, and repairs</li> </ul>
<p>Year 5 (FY2023)</p>	<ul style="list-style-type: none"> <li>• Execute projects for Year 5 repairs and surveys</li> <li>• Update baseline assessment and database.</li> <li>• Continue improving database and incorporating new information from restoration activity work and maintenance information</li> <li>• Update restoration activity schedule on projects.</li> <li>• Program budgets for Year 6 surveys, designs, and repairs</li> <li>• Ensure MS4 permit restoration requirement will be achieved by 2025.</li> </ul>

## VI. RESTORATION ACTIVITY SCHEDULE

The Restoration Activity Schedule shows the status of projects that will be implemented to meet the MS4 permit restoration requirements. This table shows the proposed list of projects and identifies if they are in planning, construction or completed. The table is updated every year to show the balance towards achieving the restoration requirement.

In this initial reporting year of the UMD MS4 permit, 43 projects have been identified for restoration work to bring these existing BMPs into compliance. In addition, the Campus Creek restoration project, which is scheduled to be complete in October 2019, will provide 105 acres of MS4 credit. The Campus Creek project report summary is included in **Appendix E** and a full report is included under separate cover.

Note that costs shown are approximate ballpark estimates. Costs do not include markups, project management costs, escalation or contingencies.

Table 3: Restoration Activity Schedule

Total Acreage (1284); Impervious Acre Baseline (442.9); 20% Restoration Target (88.6 acres)									
Type of Restoration Project	BMP Code <sup>1</sup>	BMP ID (Optional)	Cost (\$K) <sup>2</sup>	Imperv Acres Treated	Imperv Acre Target and Balance	Project Status <sup>3</sup>	Year Complete or Projected Implementation Year (by 2025)	MD Grid Coordinates (Northing/Easting)	
					88.6				
Stream Restoration	STRE	UMCP19BMP0249	1,200	105.8	-17.2	C	2019		
Nonrooftop Disconnect	NDNR	UMCP19BMP0239	1.7	0.04	-17.24	P	2020	481271.37	1325918.40
Nonrooftop Disconnect	NDNR	UMCP19BMP0240	1.7	0.18	-17.42	P	2020	481633.78	1325589.40
Wet Pond	PWET	UMCP19BMP0012	7.2	8.63	-26.05	P	2020	484496.95	1329332.66
Micro-bioretentation	MMBR	UMCP19BMP0019	2.2	0.29	-26.34	P	2020	481208.87	1325538.88
Micro-bioretentation	MMBR	UMCP19BMP0033	7.7	0.12	-26.46	P	2020	481650.51	1325881.93
Micro-bioretentation	MMBR	UMCP19BMP0034	7.7	0.12	-26.58	P	2020	481688.13	1325846.31
Micro-bioretentation	MMBR	UMCP19BMP0035	7.7	0.12	-26.7	P	2020	481734.00	1325797.20
Micro-bioretentation	MMBR	UMCP19BMP0040	15.3	0.03	-26.73	P	2020	481229.80	1325762.54
Micro-bioretentation	MMBR	UMCP19BMP0041	1.7	0.09	-26.82	P	2020	481402.66	1325768.60
Micro-bioretentation	MMBR	UMCP19BMP0059	15.2	0.17	-26.99	P	2020	482851.89	1326599.66
Micro-bioretentation	MMBR	UMCP19BMP0070	8.8	0.09	-27.08	P	2020	482780.39	1326359.04
Micro-bioretentation	MMBR	UMCP19BMP0124	5.9	0.17	-27.25	P	2020	479335.15	1327710.91
Micro-bioretentation	MMBR	UMCP19BMP0152	3.9	0.37	-27.62	P	2020	482055.58	1330645.93
Micro-bioretentation	MMBR	UMCP19BMP0153	2.4	0.22	-27.84	P	2020	482307.02	1330582.92
Micro-bioretentation	MMBR	UMCP19BMP0154	3.9	0.4	-28.24	P	2020	482202.80	1330603.55
Sand Filter	FSD	UMCP19BMP0005	323.5	10.91	-39.15	P	2020	480711.38	1325893.79
Shallow Marsh	WSHW	UMCP19BMP0011	262.2	9.83	-48.98	P	2021	482743.43	1326174.16
Wet Pond	PWET	UMCP19BMP0021	135	7.29	-56.27	P	2021	483027.26	1329908.62
Wet Pond	PWET	UMCP19BMP0056	13.5	5.1	-61.37	P	2021	484831.46	1328962.20
Wet Pond	PWET	UMCP19BMP0013	8.2	4.88	-66.25	P	2021	486228.37	1329157.63
Wet Pond	PWET	UMCP19BMP0020	286.0	4.43	-70.68	P	2022	486993.69	1329342.50
Wet Pond	PWET	UMCP19BMP0024	6.5	4.25	-74.93	P	2022	483610.30	1328289.49
Bioretention	FBIO	UMCP19BMP0098	41.1	3.58	-78.51	P	2022	483968.75	1329861.10
Wet Pond	PWET	UMCP19BMP0002	150.0	3.4	-81.91	P	2022	483524.84	1327593.82
Dry Pond	PWED	UMCP19BMP0065	491.2	3.39	-85.3	P	2023	487927.05	1328801.87
Rain Garden	FBIO	UMCP19BMP0090	257.5	3.37	-88.67	P	2024	483259.07	1329107.28
Wet Pond	PWET	UMCP19BMP0010	50.2	2.7	-91.37	P	2024	487033.82	1328525.70
Rainwater Harvesting	MRWH	UMCP19BMP0076	12.0	2.04	-93.41	P	2024	483159.83	1328162.76
Bioretention	FBIO	UMCP19BMP0036	17.0	1.6	-95.01	P	2024	480058.25	1326332.76
Bioretention	FBIO	UMCP19BMP0022	17.0	0.68	-95.69	P	2024	483080.01	1330646.93
Bioretention	FBIO	UMCP19BMP0043	17.0	0.68	-96.37	P	2024	483073.34	1330677.21
Wet Pond	PWET	UMCP19BMP0109	87	1.32	-97.69	P	2024	485941.38	1328318.69
Rain Garden	FBIO	UMCP19BMP0144	6	1.14	-98.83	P	2025	482137.54	1325554.31
Dry Swale	MSWG	UMCP19BMP0026	26	1.05	-99.88	P	2025	483876.77	1330674.68
Wet Pond	PWET	UMCP19BMP0089	356.4	0.98	-100.86	P	2025	483417.65	1326180.86
Bioretention	FBIO	UMCP19BMP0055	13.7	0.87	-101.73	P	2025	484164.63	1328553.03
Bioretention	FBIO	UMCP19BMP0091	14.6	0.79	-102.52	P	2025	483250.11	1329803.28
Rain Garden	MRNG	UMCP19BMP0146	14.5	0.37	-102.89	P	2025	482184.32	1325174.55
Bioretention	MMBR	UMCP19BMP0231	6.2	0.27	-103.16	P	2025	482681.08	1329965.90
Rain Garden	MRNG	UMCP19BMP0147	12.5	0.2	-103.36	P	2025	481972.18	1325236.84
Rain Garden	MRNG	UMCP19BMP0112	16.5	0.07	-103.43	P	2025	482176.93	1325591.55
Rain Garden	MRNG	UMCP19BMP0129	5.2	0.04	-103.47	P	2025	480576.06	1329556.80
Bioretention	FBIO	UMCP19BMP0014	19.2	0.02	-103.49	P	2025	480152.71	1328758.86

## VII. URBAN STORMWATER BEST MANAGEMENT PRACTICE DATABASE

The data tables specified in the MS4 permit have been completed for all identified BMPs within the permit area. A GIS system was established with these data tables so that the corresponding information can be recorded, updated, and tracked to be associated with an electronically mapped BMP feature.

See **Appendix D** for the Urban Best Management Practice Database. An electronic version of this information will also be transmitted to MDE.

The university intends to further develop this database and incorporate additional fields such as cost data, credit data and maintenance tracking to establish a more adaptive management approach to maintaining the BMPs. It will provide better data for managing, planning, budgeting and tracking of the UMD BMP inventory.

## VIII. CONCLUSION

The completion of this initial report for FY2019 General Discharge Permit #13-SF-5501 established the baseline restoration requirements. Although 88.6 acres of impervious area treatment is required for the UMD campus, the Campus Creek Stream Restoration project appears will provide more than enough credit at 105.9 acres to satisfy the permit requirements. In addition, the IBBR MS4 requirements also appear to have been met by the existing Gudelsky Pond on the Shady Grove Campus. Therefore, no new facilities are required for this permit.

As such, the University of Maryland will focus efforts on restoring and maintaining existing BMPs, and database development for tracking existing BMPs during the remainder of the permit term. Progress on these efforts will be reported on subsequent annual reports.

The university will also continue the development of programs to comply with the six Minimum Control Measures (MCMs) as defined in the permit. Reporting on these measures will begin with next year's annual report.

# APPENDIX A

## Notice of Intent





**State and Federal Small MS4 Notice of Intent**

**Maryland Department of the Environment (MDE)**

**National Pollutant Discharge Elimination System (NPDES)  
Small Municipal Separate Storm Sewer Systems (MS4) General Permit**

This Notice of Intent (NOI) is intended for State and federal agencies applying for coverage under the General Discharge Permit (No. 13-SF-5501) for Small MS4s. Submitting this application constitutes notice that the agency below agrees to comply with all terms and conditions of the general permit. The information required in this NOI must be submitted to:

Maryland Department of the Environment, Water and Science Administration  
Sediment, Stormwater, and Dam Safety Program  
1800 Washington Boulevard, Baltimore, MD 21230-1708  
Phone: 410-537-3543 FAX: 410-537-3553  
Web Site: [www.mde.maryland.gov](http://www.mde.maryland.gov)


**Contact Information**

Permittee Name:	University of Maryland, College Park
Responsible Personnel:	Carlo Colella, Vice President for Admin. & Finance
Mailing Address:	2119 MAB, 7901 Regents Drive College Park, Maryland 20742
Phone Number(s):	(301) 405-2987
Email address:	ccolella@umd.edu
Additional Contact(s):	Christopher Ho
Mailing Address:	0600M Service Building, 7757 Baltimore Avenue College Park, Maryland 20742
Phone Number(s):	(301) 405-9969
Email address:	hocyho@umd.edu

**Signature of Responsible Personnel**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Carlo Colella  
Printed Name

  
Signature

10.29.2019  
Date

State and Federal Small MS4 Notice of Intent

Due Date: 10/31/2018

Date of Submission: 10/30/2018

Revised: 10/29/2019

Permittee Information:

Renewal Permittee:

New Permittee:

Check if sharing responsibilities with another entity:  Yes  No

Check if this NOI applies to multiple properties:  Yes  No

Required Information:

- 1. A brief description of property(ies) for which coverage is being sought (when multiple properties are covered under this general permit, provide a separate attachment identifying the specific information required below for each property):

The mission of the University of Maryland, College Park ("UMCP") is to provide excellent teaching, research, and service. All properties included in this NOI for UMCP support this mission. Most UMCP buildings support educational and research goals by providing classrooms, research facilities, offices, parking, and maintenance facilities. UMCP's campus and buildings are busiest during the daytime, noting however there are 38 resident halls. See the attached map for properties covered under this NOI.

UMCP owns over 100 properties throughout the State of Maryland and worked to evaluate all properties, after the 2018 NOI submission, to determine what other properties may come under UMCP's MS4 General Permit. UMCP, as a result of its research, hereby amends the 2018 NOI to include one UMCP facility outside of the main College Park campus. The Institute for Bioscience and Biotechnology Research (IBBR) facility located in Shady Grove, MD is operated and maintained by UMCP and meets MS4 coverage eligibility. A map of this facility is also attached.

After extensive research, UMCP has determined that, other than the IBBR Facility referenced above, no other UMCP buildings or facilities need to be included in this amendment to the 2018 NOI.

- 2. The approximate size of property(ies) in acres: 1,284(UMD) 12 (IBBR)

- 3. Population (or number of employees): 50,000\*

\*This is the daytime population that includes undergraduate and graduate students, faculty, and staff.

- 4. Provide a list of properties owned or operated by the permittee covered under the Maryland General Permit for Stormwater Discharges Associated with Industrial Activity or an individual industrial surface water discharge permit:

## State and Federal Small MS4 Notice of Intent

UMD has two industrial discharge permits as follows:

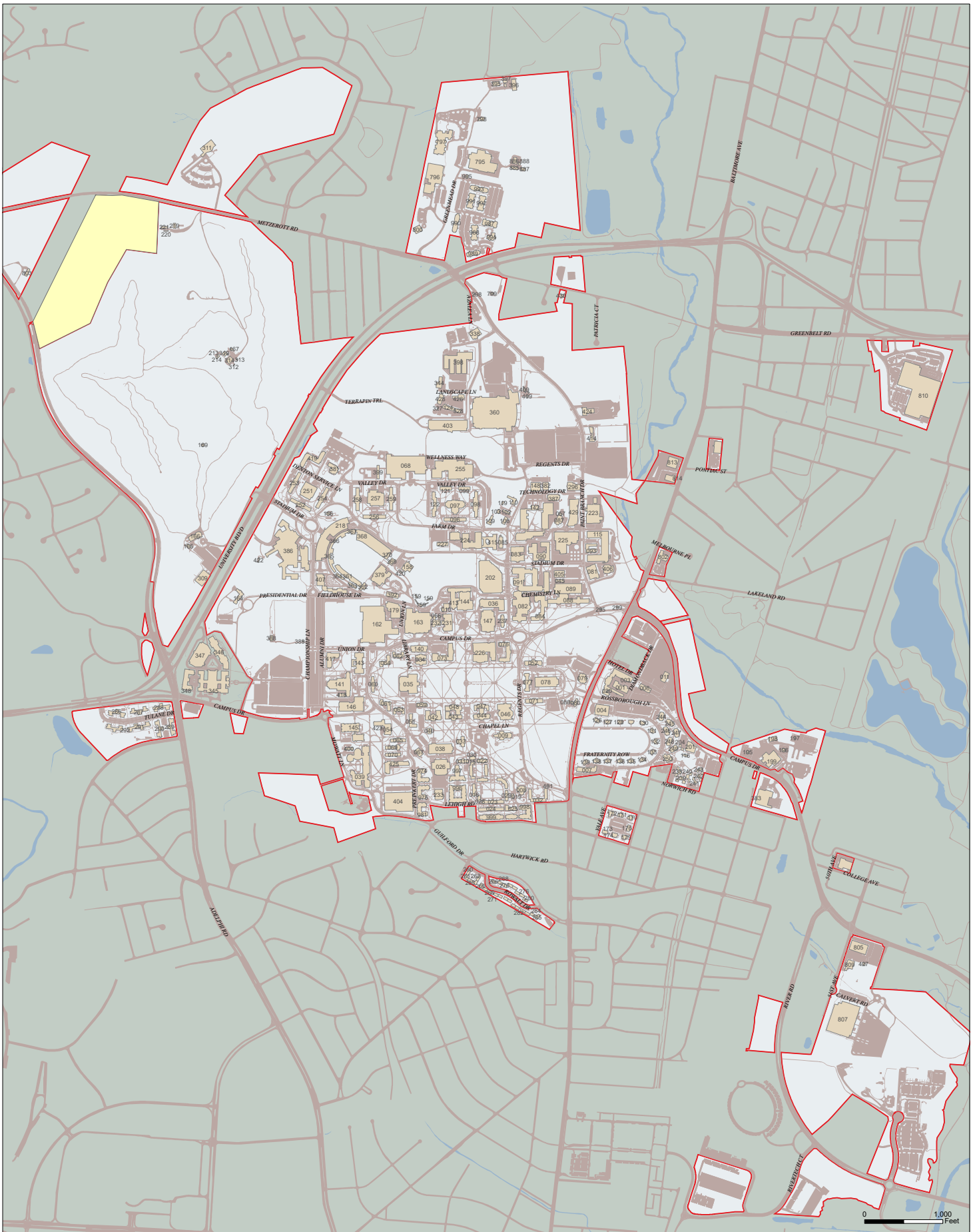
- 08-DP-2618 that regulates discharge of non-contact cooling water, boiler blowdown, condensate and stormwater water runoff through 13 regulated outfalls at the UMCP campus
- 12-SW permit for industrial activities for six locations on the UMCP campus (Shuttle Bus Depot, Environmental Service Building, Wye Oak maintenance facility, Art-Soc building yard (Smelter), Severn maintenance facility, and the Combined Heat and Power Plant)

5. Describe any programs that the applicant will share responsibilities for compliance with another entity. Describe the role of all parties and include a copy of a memorandum of agreement when applicable:

UMCP is continuing to evaluate possible shared responsibilities with adjacent property owners with respect to UMCP's properties and its MS4 General Permit. If warranted, UMCP may enter into one or more Memoranda of Agreement ("MOA") with adjacent property owners and present each MOA to MDE for review and comment.

6. Anticipated expenditures to implement the terms and conditions of the permit:

UMCP anticipates that expenditures to implement the terms and conditions of the MS4 Permit will exceed \$5,000,000.00 through FY25, not including any financial obligations that result from any MOA with adjacent property owners relating to any MS4 General Permit.



UNIVERSITY OF  
**MARYLAND**

University of Maryland  
College Park MS4  
Management Boundaries

Total Acreage  
1,284 Acres





# The Universities AT SHADY GROVE



— USG Management Boundary  
▨ IBBR Management Boundary - 12 Acres

■ USG Buildings  
■ IBBR

■ Parking Lot  
■ Roads

■ Waterbody  
■ Wooded Area





# UNIVERSITY OF MARYLAND

FACILITIES MANAGEMENT  
Department of Planning & Construction

7757 Baltimore Avenue  
College Park, Maryland 20742-6021  
(301) 405-3205

THIS TRANSMITTAL  
AND THE ATTACHED ARE  
FOR INFORMATION ONLY

## LETTER OF TRANSMITTAL

DATE: October 30, 2018

TO:  
Maryland Department of the Environment, Water and Science Administration  
Sediment, Stormwater, and Dam Safety Program  
1800 Washington Blvd.  
Baltimore, MD 21230-1708

FROM:  
Stephen Reid   
Environmental Planner  
University of Maryland, College Park  
7757 Baltimore Ave., Room 1400  
College Park, MD 20742

THIS TRANSMITTAL AND THE ATTACHED  
ARE FOR INFORMATION ONLY

RE: University of Maryland, College Park NPDES MS4 NOI

WE ARE SENDING YOU  ATTACHED  UNDER SEPARATE COVER

VIA  Mail  THE FOLLOWING ITEMS:

Shop Drawings  Prints  Plans  Samples  Specifications

Copy of Letter  Change Order Other:  Report

Copies	Date	Description
1	10/30/2018	University of Maryland, College Park National Pollutant Discharge Elimination System MS4 Phase II Permit Notice of Intent

THESE ARE TRANSMITTED as checked below:

for approval     approved as submitted     resubmit     copies for approval  
 for your use     approved as noted     submit     copies for distribution  
 as requested     returned for Corrections     return     corrected prints  
 for review and comment

REMARKS: Please find enclosed the University of Maryland, College Park NPDES MS4 General Permit Notice of Intent. Please contact Stephen Reid at (301) 405-6910 with any questions.

COPY TO:

If enclosures are not as noted, kindly notify us at once.



**State and Federal Small MS4 Notice of Intent**

**Maryland Department of the Environment (MDE)**

**National Pollutant Discharge Elimination System (NPDES)  
Small Municipal Separate Storm Sewer Systems (MS4) General Permit**

This Notice of Intent (NOI) is intended for State and federal agencies applying for coverage under the General Discharge Permit (No. 13-SF-5501) for Small MS4s. Submitting this application constitutes notice that the agency below agrees to comply with all terms and conditions of the general permit. The information required in this NOI must be submitted to:

Maryland Department of the Environment, Water and Science Administration  
Sediment, Stormwater, and Dam Safety Program  
1800 Washington Boulevard, Baltimore, MD 21230-1708  
Phone: 410-537-3543 FAX: 410-537-3553  
Web Site: [www.mde.maryland.gov](http://www.mde.maryland.gov)

**Contact Information**

Permittee Name:	University of Maryland, College Park
Responsible Personnel:	Carlo Colella, Vice President for Admin. & Finance
Mailing Address:	2119 MAB, 7901 Regents Drive
	College Park, Maryland 20742
Phone Number(s):	(301) 405-2987
Email address:	ccolella@umd.edu
Additional Contact(s):	Stephen Reid
Mailing Address:	7757 Baltimore Ave., Room 1400
Phone Number(s):	(301) 405-6910
Email address:	sreid@umd.edu

**Signature of Responsible Personnel**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Carlo Colella  
Printed Name

  
Signature

10-26-2010  
Date



State and Federal Small MS4 Notice of Intent

Due Date:  Date of Submission:

Permittee Information:

Renewal Permittee:

New Permittee:

Check if sharing responsibilities with another entity:  Yes  No

Check if this NOI applies to multiple properties:  Yes  No

Required Information:

1. A brief description of property(ies) for which coverage is being sought (when multiple properties are covered under this general permit, provide a separate attachment identifying the specific information required below for each property):

The mission of the University of Maryland, College Park ("UMCP") is to provide excellent teaching, research, and service. All properties included in this NOI for UMCP support its mission. Most UMCP buildings support educational and research goals by providing classrooms, research facilities, offices, parking, and maintenance facilities. UMCP's campus and buildings are busiest during the daytime, noting however there are 38 resident halls. See the attached map for properties located in College Park, which are covered under this NOI.

UMCP owns over 100 properties throughout the State of Maryland and is in the process of evaluating all properties to determine what other properties may come under UMCP's MS4 General Permit. UMCP will continue to inform MDE of progress in UMCP's property research and, as necessary, will amend this NOI if additional properties are identified that require coverage per the eligibility requirements.

2. The approximate size of property(ies) in acres:
3. Population (or number of employees):

\*This is the daytime population that includes undergraduate and graduate students, faculty, and staff.

4. Provide a list of properties owned or operated by the permittee covered under the Maryland General Permit for Stormwater Discharges Associated with Industrial Activity or an individual industrial surface water discharge permit:

UMCP has two industrial discharge permits as follows:

- 08-DP-2618 that regulates discharge of non-contact cooling water, boiler blowdown, condensate and stormwater water runoff through 13 regulated outfalls at the UMCP campus
- 12-SW permit for industrial activities for six locations on the UMCP campus (Shuttle Bus Depot, Environmental Service Building, Wye Oak

## State and Federal Small MS4 Notice of Intent

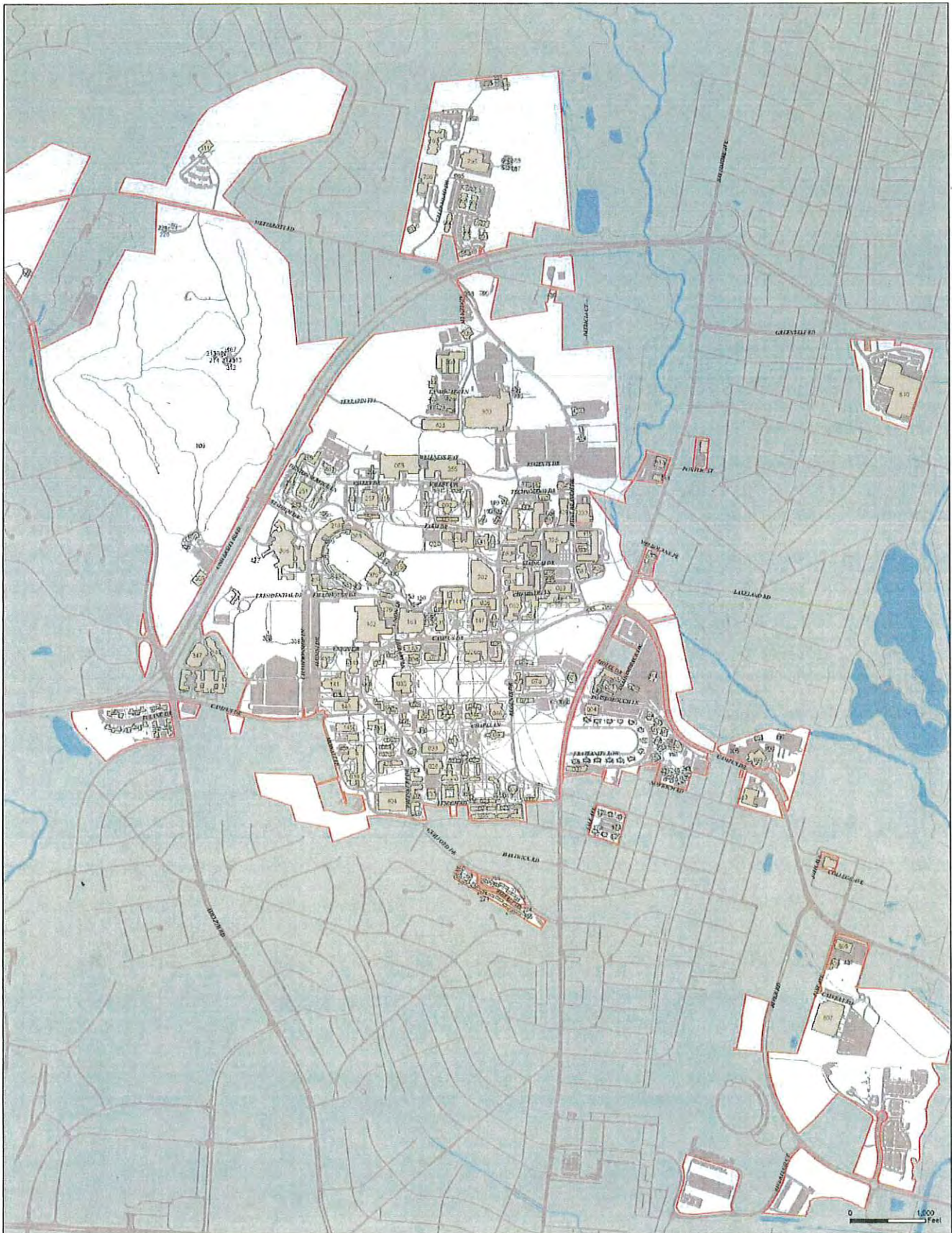
maintenance facility, Art-Soc building yard (Smelter), Severn maintenance facility, and the Combined Heat and Power Plant)

5. Describe any programs that the applicant will share responsibilities for compliance with another entity. Describe the role of all parties and include a copy of a memorandum of agreement when applicable:

UMCP is continuing to evaluate possible shared responsibilities with adjacent property owners with respect to UMCP's properties and its MS4 General Permit. If warranted, UMCP may enter into one or more Memoranda of Agreement ("MOA") with adjacent property owners and present each MOA to MDE for review and comment.

6. Anticipated expenditures to implement the terms and conditions of the permit:

UMCP anticipates that expenditures to implement the terms and conditions of the MS4 Permit will exceed \$5,000,000.00 through FY25, not including any financial obligations that result from any MOA with adjacent property owners relating to any MS4 General Permit.



University of Maryland  
College Park MS4  
Management Boundaries

Total Acreage  
1,292 Acres



## APPENDIX B

# Universities at Shady Grove Final Report and Recommendations





# **Universities at Shady Grove**

## **Stormwater Treatment Final Report & Recommendations**

**Prepared For**



**Prepared By**



**June 2019**





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Acronym	Definition
MES	Maryland Environmental Service
USG	Universities at Shady Grove
NPDES	National Pollutant Discharge Elimination System
MS4	Municipal Separate Storm Sewer System
MDE	Maryland Department of the Environment
IBBR	University of Maryland Institute for Bioscience and Biotechnology Research
NOI	Notice of Intent
UMCP	University of Maryland College Park
BMP	Best Management Practice
BSE	Biomedical Sciences & Engineering
County	Montgomery County
CAD	Computer-Aided Design
QAQC	Quality Assurance Quality Control
DA	Drainage Area
ESD	Environmental Site Design
Pe	Target rainfall amount

## 1.0 Introduction

This report, written by Maryland Environmental Service (MES), for the Universities at Shady Grove (USG), regarding the existing stormwater treatment on the Shady Grove Campus in Montgomery County, Maryland. The purpose of this report is to determine the requirements for Shady Grove's Campus for their National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Phase II permit from Maryland Department of the Environment (MDE).

For purposes of this report, it should be noted that the Shady Grove Campus consists of two distinct Universities – 1) USG and 2) the University of Maryland Institute for Bioscience and Biotechnology Research (IBBR). USG and IBBR share a property, owned by the State of Maryland and work jointly together to share their property management responsibilities.

It should also be noted that USG submitted a separate notice of intent (NOI) from IBBR to MDE for their MS4 permit. IBBR's permit responsibilities will be covered with a shared agreement between IBBR and the University of Maryland College Park (UMCP). UMCP included IBBR in their MS4 NOI. Therefore, some MS4 responsibilities will ultimately be shared amongst UMCP, IBBR, and USG.

This report will discuss the existing stormwater facilities and discuss any needed maintenance or repairs and will also discuss the campus's MS4 responsibilities and what should be reported to MDE as part of their first year's annual report submission, due on October 31, 2019. A geodatabase will also be provided to USG and IBBR, separate from this report, for submission to MDE.

## 2.0 Findings from Stormwater BMP Inspections

MES conducted a full assessment of the storm drain and stormwater infrastructure on the Shady Grove Campus, see the campus stormwater maps located in Appendix A. In total, nearly 150 storm drain features were inspected. While on site, MES used a hand-held GPS to map USG and IBBR's stormwater infrastructure.

MES performed functional inspections of 19 of USG and IBBR's stormwater BMPs. A rating system was used to classify the condition for each BMP. A BMP was rated as an A if the BMP was in good condition, functioning, and only needed routine maintenance. A BMP was rated as a B if the BMP was in fair-good condition, functioning, but needed minor repairs and maintenance. A BMP was rated as a C if the BMP was in poor/failing condition and needed major repairs. Inspections were performed after a 72-hour dry period to allow stormwater management facilities time to dewater as designed. Depending on the type of facility, only some facility types receive a ponding rating which indicates if the ponding is excessive or if there is no ponding in the facility.

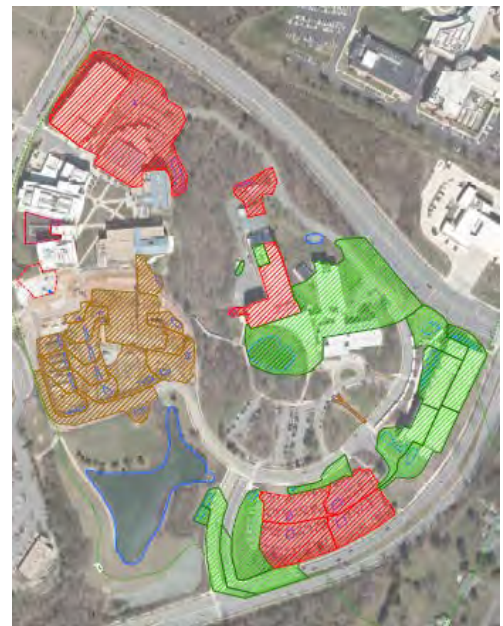


Figure 1 - BMP Treatment Map

The conditions and recommended improvements are listed on the individual inspection reports, included in Appendix B and summarized Table 1 on the following page. There were three facilities that were not inspected at this time but can be inspected at a future date. The two BaySavers were not inspected during the initial inspection because the facilities are holding water which restricts inspectors from performing a full stormwater inspection. Inspectors were also unable to access the rooftop to Building 3 and therefore could not conduct inspection of the green roof. Inspections of these BMPs can be done in the future and is not required for the initial annual report submission in 2019 but will be required by the end of the permit term in 2023.

Of the 19 BMPs inspected, eight were found to be in good condition, four need minor repairs, and seven need major repairs, as detailed below. Of the seven that need major repairs, four are located in Parking Lot 1, which were already identified by USG staff prior to this report as needing repairs. Recommendations for repairs to the four bioretention facilities located in Parking Lot 1 are included as part of this report. For the other three facilities which are listed as failing, two are small facilities located at IBBR and one is a sand filter which is providing treatment for the Travilla Garage and Building 2.

This following section will discuss the findings and define the criteria as to why these stormwater management facilities were defined as failing and not functioning as intended. All inspections were performed following a 72-hour dry period.

#### IBBR - Infiltration Trenches 1 & 3 (USG19BMP00004 & USG19BMP000006)

MES visited all 3 infiltration trenches at USG-IBBR. Two of the trenches were found to be failing and not functioning as designed. Infiltration trenches are designed to capture and filter a storm event. All infiltration trenches are designed to be fully dewatered within 48-hours after the storm event (2000 MDE Stormwater Design Manual, Chapter 3). Both trenches were observed following a 72-hour dry period and were found to be completely filled with water, indicating that the facilities are not infiltrating as intended. In addition to the infiltration observations, the BMPs were heavily vegetated with large woody vegetation and organic debris covering the infiltration media.

To restore these BMPs to working condition, the facilities would need to be reconstructed. Additionally, the location of these infiltration trenches next to a natural wetland may not be feasible and if USG-IBBR desires to reconstruct these facilities, MES would recommend consulting with a geotechnical engineer. If USG-IBBR does not wish to reconstruct these facilities, then MDE should be consulted about the possibility of a permit modification to allow this treatment to be handled elsewhere on campus.

#### Building 2 – Sand Filter (USG19BMP00002)

MES inspected a sand filter BMP located west of Building 2. The facility was originally a sediment trap when Building 2 was being constructed. The intent was to convert the sediment trap into a sand filter post construction. The sand filter was not designed with an underdrain or dewatering system and does not meeting current MDE Sand Filter design criteria. Additionally, the BMP was observed to be failing as it was filled with invasive species and was holding water. Like infiltration facilities, sand filters are also designed to temporarily store water and provide water quality treatment. Since the facility does

not have an underdrain system, the water cannot be filtered and released as intended. There is also a large amount of invasive species growing inside of the facility, impeding storage volume. The inflow is submerged and the embankment has been blown out.

To restore this BMP to working condition this facility would need to be reconstructed. Using data gathered for the stormwater network and existing documentation, there is not sufficient depth to provide a filter media and underdrain system to outfall into the wetland. Thus, MES does not believe this is a suitable location for a sand filter. MES recommends consulting with MDE about the possibility of a permit modification to allow this treatment to be handled elsewhere on campus.

Table 1 - BMP Treatment List

BMP ID	BMP NAME	BMP TYPE	Drainage Area (ac)	Impervious Area (ac)	Rating
USG19BMP00001	Travilla Gateway Garage Baysaver	Oil Grit Separator	1.05	0.73	Not Inspected
USG19BMP00002	Building 2 Sand Filter	Sand Filter	2.91	1.93	C
USG19BMP00003	Infiltration Trench 1 at IBBR	Infiltration Trench	0.28	0.14	C
USG19BMP00005	Infiltration Trench 2 at IBBR	Infiltration Trench	0.08	0.06	A
USG19BMP00006	Infiltration Trench 3 at IBBR	Infiltration Trench	0.59	0.48	C
USG19BMP00007	IBBR Pond	Retention Pond (Wet Pond)	2.84	1.11	B
USG19BMP00008	Green Roof at Building 3	Green Roof – Extensive	0.19	0.19	Not Inspected
USG19BMP00009	Building 3 Baysaver	Oil Grit Separator	0.22	0.15	Not Inspected
USG19BMP00010	BSE ESD-8	Micro-Bioretenention	0.51	0.4	Construction
USG19BMP00012	Micro-Bioretenention 4 at Shady Grove Garage	Micro-Bioretenention	0.44	0.15	A
USG19BMP00013	Micro-Bioretenention 5 at Shady Grove Garage	Micro-Bioretenention	0.43	0.33	A
USG19BMP00014	Micro-Bioretenention 3 at Shady Grove Garage	Micro-Bioretenention	0.43	0.29	A
USG19BMP00015	Micro-Bioretenention 2 at Shady Grove Garage	Micro-Bioretenention	0.45	0.29	A
USG19BMP00017	Micro-Bioretenention 1 at Shady Grove Garage	Micro-Bioretenention	0.44	0.36	B
USG19BMP00018	Bioretenention 9 at Parking Lot 1	Bioretenention	0.18	0.06	B
USG19BMP00019	Bioretenention 8 at Parking Lot 1	Bioretenention	0.37	0.31	C
USG19BMP00020	Bioretenention 7 at Parking Lot 1	Bioretenention	0.5	0.35	C
USG19BMP00021	Bioretenention 5 at Parking Lot 1	Bioretenention	0.47	0.43	C
USG19BMP00022	Bioretenention 6 at Parking Lot 1	Bioretenention	0.69	0.47	C
USG19BMP00023	Micro-Bioretenention 3 at New Campus Entry	Micro-Bioretenention	0.58	0.18	B
USG19BMP00024	Micro-Bioretenention 2 at New Campus Entry	Micro-Bioretenention	0.47	0.26	A
USG19BMP00025	Micro-Bioretenention 1 at New Campus Entry	Micro-Bioretenention	0.49	0.29	A
USG19BMP00026	Gudelsky Pond	Retention Pond (Wet Pond)	94.87	44.64	A
USG19BMP00027	BSE ESD-13	Micro-Bioretenention	0.17	0.06	Construction
USG19BMP00028	BSE ESD-9	Micro-Bioretenention	0.23	0.12	Construction
USG19BMP00029	BSE ESD-10	Micro-Bioretenention	0.15	0.09	Construction
USG19BMP00030	BSE ESD-5	Micro-Bioretenention	0.19	0.11	Construction
USG19BMP00031	BSE ESD-3	Micro-Bioretenention	0.21	0.14	Construction
USG19BMP00032	BSE Cistern #1	Rainwater Harvesting	0.75	0.75	Construction
USG19BMP00033	BSE Cistern #2	Rainwater Harvesting	0.11	0.11	Construction
USG19BMP00034	BSE ESD-6	Micro-Bioretenention	0.42	0.12	Construction
USG19BMP00035	BSE ESD-12	Micro-Bioretenention	0.11	0.07	Construction
USG19BMP00036	BSE ESD-11	Micro-Bioretenention	0.1	0.06	Construction
USG19BMP00037	BSE ESD-2	Micro-Bioretenention	0.2	0.12	Construction
USG19BMP00038	BSE ESD-1	Micro-Bioretenention	0.06	0.02	Construction
USG19BMP00039	BSE ESD-4	Micro-Bioretenention	0.18	0.12	Construction
USG19BMP00040	BSE ESD-7	Micro-Bioretenention	0.33	0.19	Construction
USG19BMP00041	BSE ESD-14	Infiltration Berms	0.12	0.04	Construction
USG19BMP00042	IBBR Non-Rooftop Disconnect	Disconnection of Non-Rooftop Runoff	0.03	0.03	Construction

An additional 16 facilities were included in the geodatabase for submission to MDE but were not inspected because they are currently under construction at the new Biomedical Sciences & Engineering (BSE) Building. USG has estimated construction to be completed September 2019. When construction is confirmed completed, the stormwater management facilities should be inspected for completion, functionality, and intended design. As-built records should also be provided at this time.

### 3.0 MS4 Permit Requirements and Existing Treatment

Though a few of these BMPs as described above are not in good condition, the entirety of the Shady Grove Campus is treated by a large pond on the southwestern side of the campus. Gudelsky Pond treats a drainage area of nearly 100 acres, including all of USG and IBBR and some offsite drainage from Montgomery County (County) as well.

While Gudelsky Pond is located on USG property, maintenance of the pond is shared between USG and the County. Approximately half of the drainage area is from the County's MS4 jurisdiction (see maps located in Appendix C). Originally built in 1987, the pond pre-dates the Shady Grove campus and was built to accommodate development on the (now) Shady Grove property as well as property to the north of the Shady Grove campus (part of the County's MS4 jurisdiction). The pond is a regional pond and is designed to handle future development, up to 72% impervious coverage within the pond's drainage area (see the agreement in Appendix D). Currently, the drainage area is 47% impervious, leaving capacity for future development or credit trading.

In 1996, when the County was transferring the property to USG-IBBR, USG entered into an agreement with Montgomery County regarding maintenance obligations of the pond. It was determined and agreed upon that USG would provide landscaping and trash removal maintenance for the pond while the County would provide maintenance to keep the pond in proper working condition, including structural repairs and improvements. The County also agreed to have accumulated sediment removed at the County's discretion when necessary for the proper functioning of the pond. Removal of sediment from the pond for recreational or aesthetic purposes would be the responsibility of USG. USG was also to remove solid waste and control weeds at the pond. The County has performed annual inspections on Gudelsky pond and the latest two reports from 2016 and 2017 have been provided to MES by USG.

### 3.1 Permit Requirements

By October 31, 2019, at the end of USG's NPDES MS4's first year's permit cycle, USG is responsible for determining how much of their campus is currently treated by existing stormwater facilities. Additionally, the untreated impervious areas will be summed, and the total will be multiplied by 20% in order to determine the restoration goal. This restoration goal is what will need to be treated in future years. As an example, if USG currently has 10 acres of untreated impervious area, then additional stormwater facilities will need to be implemented in future years to treat two acres of this untreated impervious area.

### 3.2 Determination of baseline treatment

MES evaluated all BMPs on the Shady Grove campus to determine if the BMP is functioning well and how much impervious area credit should be credited to the campus. The first step was to review plans

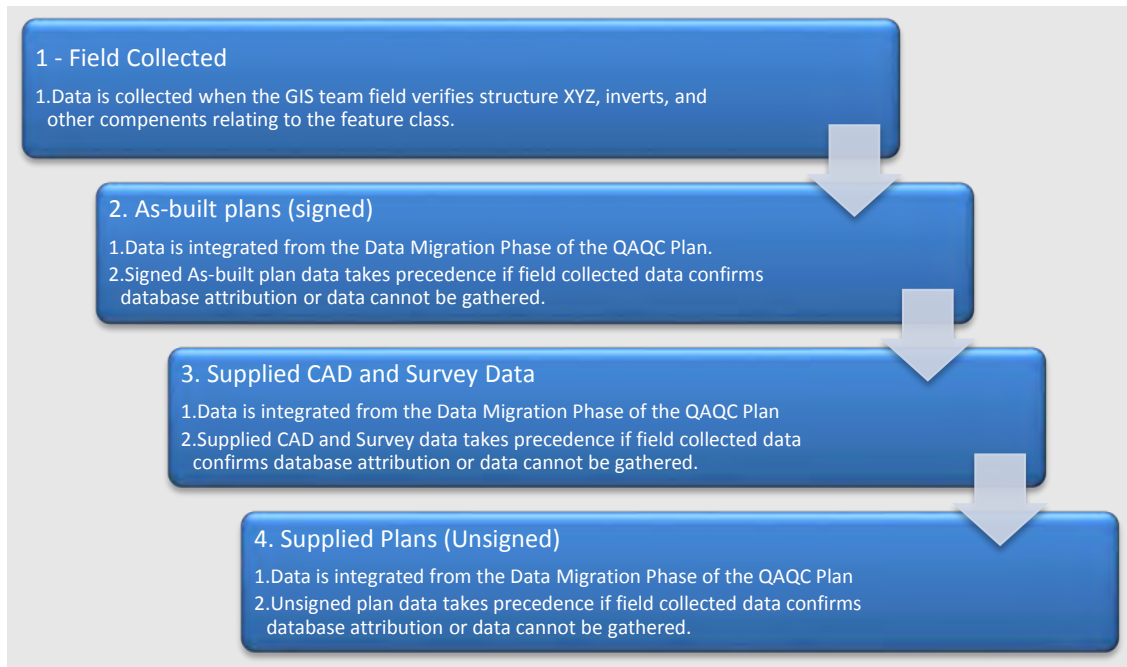
which were provided by USG to determine what data was known and what data would need to be gathered.

BMP drainage areas were digitized from provided stormwater management plans and CAD data when available. For BMPs without specified drainage areas in the provided plans or if the drainage appeared to have been significantly modified from the original conditions, MES used engineering judgement to delineate a new drainage area. MES determined this utilizing the surrounding stormwater networks, 2' contours, and field observations.

MES built the stormwater network in an ESRI Geodatabase and it accounts for USG-IBBR's MS4 permit analysis, future development, and maintenance. MES collected and populated the stormwater network relying on Survey Data, As Built Plans, Design Plans, GPS-Field Collection, and Verification. No survey grade data was collected by MES as part of this project and GPS data was collected using a Trimble Geo7x at 10-centimeter accuracy. In instances where as-built data did not match observed field conditions or measurements, field collected data trumped as-built survey-grade data. See MES's QAQC plan for collecting stormwater data in Appendix E.

#### The hierarchy of data sources for database attribution

MES uses a hierarchy for determining the accuracy of field collected data versus data shown on plans, as detailed in the graphic below. Field collected data would be considered the most accurate and would be used in cases where there is a discrepancy on the plans.



MES used computation spreadsheets to evaluate the treatment amounts for all BMPs on campus. A summarization of these results is provided below in Table 2, as well as the computations spreadsheets for each BMP are located in Appendix F (for ESD and Structural practices) and Appendix G (for



Alternative practices). All of the computations are for the existing BMPs, except for the four facilities in Parking Lot 1, where the proposed computations based on repairing the devices to accommodate a 12” ponding depth have been included, as detailed below in Section 4.0.

BMP ID	BMP NAME	BMP TYPE	Impervious Acres Credits (ac)	Pe	Status
USG19BMP00001	Travilla Gateway Garage Baysaver	Oil Grit Separator	0	0	Pretreatment
USG19BMP00002	Building 2 Sand Filter	Sand Filter	0.14	0.07	Fail
USG19BMP00003	Infiltration Trench 1 at IBBR	Infiltration Trench	0.07	0.5	Fail
USG19BMP00004	IBBR Outfall Stabilization	Outfall Stabilization	0.5	-	Alternate
USG19BMP00005	Infiltration Trench 2 at IBBR	Infiltration Trench	0.06	1.08	Pass
USG19BMP00006	Infiltration Trench 3 at IBBR	Infiltration Trench	0.37	0.78	Fail
USG19BMP00007	IBBR Pond	Retention Pond (Wet Pond)	1.55	2.6*	Pass
USG19BMP00009	Building 3 Baysaver	Oil Grit Separator	0	0	Pretreatment
USG19BMP00012	Micro-Bioretenention 4 at Shady Grove Garage	Micro-Bioretenention	0.19	2.25	Pass
USG19BMP00013	Micro-Bioretenention 5 at Shady Grove Garage	Micro-Bioretenention	0.22	0.65	Pass
USG19BMP00014	Micro-Bioretenention 3 at Shady Grove Garage	Micro-Bioretenention	0.33	1.54	Pass
USG19BMP00015	Micro-Bioretenention 2 at Shady Grove Garage	Micro-Bioretenention	0.31	1.29	Pass
USG19BMP00017	Micro-Bioretenention 1 at Shady Grove Garage	Micro-Bioretenention	0.26	0.71	Pass
USG19BMP00018	Bioretenention 9 at Parking Lot 1	Bioretenention	0.02	0.39	Pass
USG19BMP00019	Bioretenention 8 at Parking Lot 1	Bioretenention	0.28	0.92	Fail
USG19BMP00020	Bioretenention 7 at Parking Lot 1	Bioretenention	0.24	0.7	Fail
USG19BMP00021	Bioretenention 5 at Parking Lot 1	Bioretenention	0.13	0.29	Fail
USG19BMP00022	Bioretenention 6 at Parking Lot 1	Bioretenention	0.23	0.48	Fail
USG19BMP00023	Micro-Bioretenention 3 at New Campus Entry	Micro-Bioretenention	0.16	0.93	Pass
USG19BMP00024	Micro-Bioretenention 2 at New Campus Entry	Micro-Bioretenention	0.24	0.9	Pass
USG19BMP00025	Micro-Bioretenention 1 at New Campus Entry	Micro-Bioretenention	0.19	0.64	Pass
USG19BMP00026	Gudelsky Pond	Retention Pond (Wet Pond)	62.5	2.6*	Pass

Table 2 - Summary of BMP Treatment Amounts on USG-IBBR property (Pe values shown with a \* are actually treating greater than 2.6”, but MDE guidance allows a maximum treatment of 2.6”)

Table 3 shows that Gudelsky Pond currently treats 2.6” of the runoff within the drainage area, well in excess of MDE’s requirement to treat 1” of runoff. Thus, any of the existing impervious surface within Gudelsky Pond’s drainage area would be considered already treated. The water quality storage provided by Gudelsky Pond is shown in Table 4 below.

Table 3 - Gudelsky Pond treatment amounts

Drainage Area (Ac)	Impervious Drainage Area (Ac)	Required Treatment Volume @ 1" (cu ft)	Provided WQv Volume (cu ft)	Pe (in)	Impervious acreage credit (Ac)
94.87	44.64	162,043.2	435,090.4	2.6	62.5

There are a number of BMPs located within Gudelsky Pond’s drainage area, including on the Shady Grove Campus and within the County’s jurisdiction. Even without subtracting these BMPs from Gudelsky Pond’s treatment area, the pond is still treating 2.6”, and is actually treating even more, once the smaller BMPs are subtracted out. MES has evaluated all of the BMPs located on USG & IBBR’s property and has determined that there is an additional 3.53 acres which are treated from the smaller BMPs, which could be subtracted from Gudelsky Pond’s treatment (thus increasing the amount of credits which could be shared with a partner).



Table 4 - Gudelsky Pond Stage Storage Table

Stage Storage Table					
Project Name: USG - Gudelsky Pond					
Date: 10/25/2018					
Elevation (ft)	Area (sq ft)	Difference (ft)	Incremental Volume (cu ft)	Cumulative Volume (cu ft)	Cumulative Volume (ac ft)
422	955	-	0	0	0
424	31,356	2.00	32,311	32,311	0.74
426	39,595	2.00	70,951	103,262	2.37
428	47,662	2.00	87,257	190,519	4.37
430	55,907	2.00	103,569	294,088	6.75
432.2	72,277	2.20	141,002	435,090	9.99

The total drainage area to Gudelsky pond is 94.87 acres and the total impervious acreage is 44.64 acres. Of this, USG-IBBR’s property is 41.62 total acres, with 18.15 impervious acres, while the off-site area is 53.25 total acres, with 26.49 impervious acres (See Table 5). If the treatment from the smaller BMPs located on USG-IBBR’s property are subtracted from Gudelsky Pond’s treatment amount, but without subtracting out the acreages from the smaller BMPs located within the County’s jurisdiction, due to the excess storage in Gudelsky Pond, there are 21.39 acres of additional credit available. In summary, there are quite a few BMPs located within Gudelsky Pond’s drainage area, but even without subtracting out all of the credits, the pond is still treating 2.6”, the maximum amount allowed per MDE. The entire Shady Grove campus drains to Gudelsky Pond and thus is considered fully treated, as is. The excess credit at Gudelsky Pond could be shared with a partner or sold on Maryland’s nutrient trading website.

Table 3 – Drainage Area to Gudelsky Pond

Total DA	Total Impervious	Total % Impervious	USG Total	USG Impervious	USG % Impervious	IBBR Total	IBBR Impervious	IBBR % Impervious	Off-Site Total	Off-Site Impervious	Off-Site % Impervious
94.87 Ac	44.64 Ac	46.9%	29.44 Ac	13.71 Ac	46.6%	12.18 Ac	4.44 Ac	36.5%	53.25 Ac	26.49 Ac	50.0%

#### 4.0 Maintenance Recommendations for Parking Lot 1 Bioretention Facilities

There are four stormwater management facilities located within Parking Lot 1 of the Shady Grove campus. These bioretention facilities were originally constructed in 2005. Two of the facilities were expanded to accommodate an expansion to the parking lot in 2007. In recent years, these facilities have not functioned well. The facilities are not well landscaped, have overly deep ponding areas, have erosion at all of the inflows, and have failing curb around the exterior sides. The facilities are located in a sump and lack a good overflow for large rain events and also have more ponding depth than is recommended, per MDE’s guidance.

When these facilities were originally designed, they were designed as bioretention facilities, which require pretreatment. The bioretentions are not up to current standards and in order to accommodate a properly designed pretreatment area, more space would be needed. Since each of these facilities are treating less than ½ acre of impervious surface, the facilities can be considered as micro-bioretention

facilities, instead of bioretention, thus eliminating the need for pretreatment areas. The recommended improvements listed herein document how these facilities can be brought into working order as microbioretention facilities.

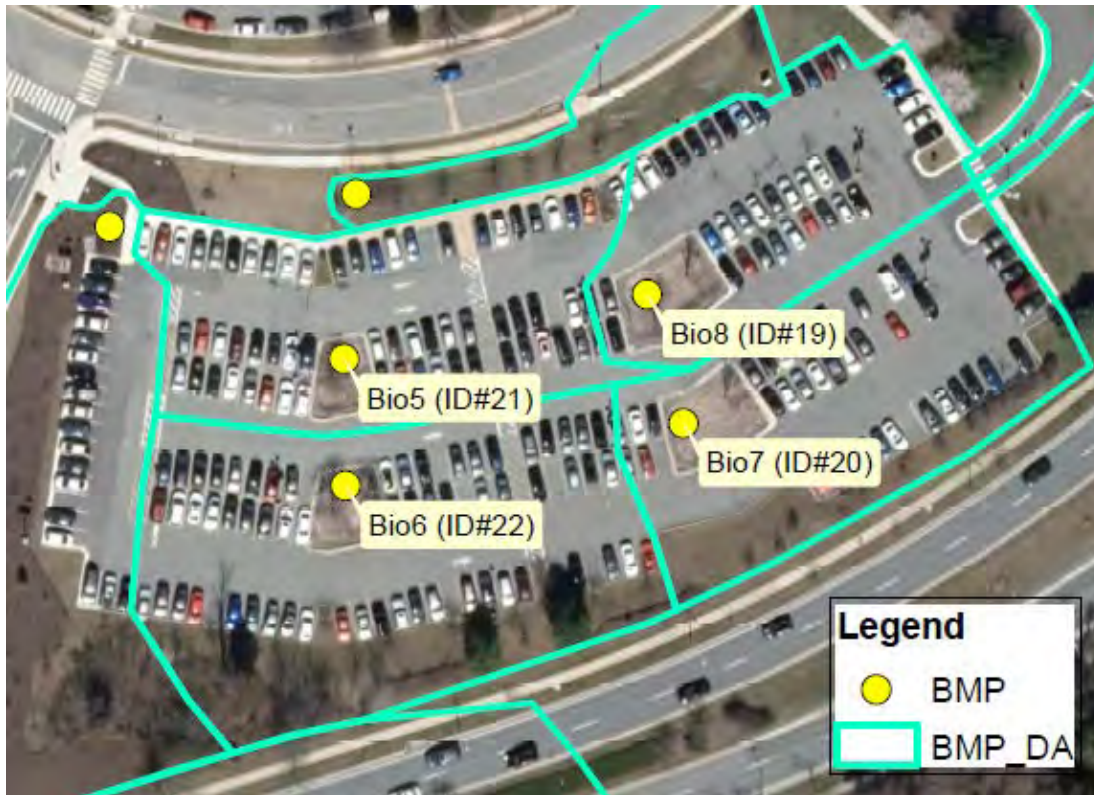


Figure 2 – Locations of bioretention facilities at Parking Lot 1

#### 4.1 Ponding depth improvements

All four facilities have overly deep ponding areas. MDE's guidance requires 12" or less of ponding at microbioretention and bioretention facilities. The facilities currently have 14"-20" of ponding depth. This depth is measured from the inlet's weir to the bottom of the basin. The original design plans called for 6" of ponding.

In order to lessen the ponding, 3" of mulch should be added



Figure 3 - Bioretention facility during rain event

to the facilities with ID#s ending in 19 and 21 (the two facilities located on the northern side of the parking lot) to bring the facilities to 12” of ponding depth. The ponding is even deeper in the two facilities with ID#s ending in 20 and 22 (the two facilities located on the southern side of the parking lot) and thus these facilities should first have 4-5” of bioretention media added (media shall adhere to SHA Std. 920.01.05) and then 3” of mulch should be placed on top of the bioretention media. This will provide 12” or less of ponding at all four facilities (see Table 6 below).

*Table 6 - Ponding Depths at Bioretention Facilities*

	Existing Ponding Depth (in.)	Proposed Bioretention Media (in.)	Proposed Mulch (in.)	Proposed Ponding Depth (in.)
<b>BMP00021</b>	14	0	3	11
<b>BMP00022</b>	20	5	3	12
<b>BMP00020</b>	19	4	3	12
<b>BMP00019</b>	15	0	3	12

It should be noted that the original design plans called for 6” of ponding. As part of our investigation, we considered raising the basin’s elevation to provide 6” of ponding, but this would require even more bioretention media to be brought in and would provide less treatment than 12” of ponding depth. Our calculations show that the four microbioretention facilities will combine for a total credit of 0.87 Ac with the proposed 12” ponding depth versus 0.60 Ac with a 6” ponding depth (see Table 7 below).

*Table 7 - Acreage Treated at Bioretention Facilities*

	Acreage Treated (Ac) (based on proposed ponding depths)		
	12” ponding depth	6” ponding depth	Difference
<b>BMP00021</b>	0.13	0.10	0.03
<b>BMP00022</b>	0.23	0.14	0.08
<b>BMP00020</b>	0.24	0.17	0.07
<b>BMP00019</b>	0.28	0.19	0.09
<b>Total</b>	0.87	0.60	0.28

#### 4.2 Side slope erosion improvements

There is erosion at many of the inflows due to large amounts of rainfall with inadequate slope protection. All side slopes should be re-graded at a 3:1 slope and should tie into the top of the back-side of the curb. Currently, the grading ties into the bottom of the curb, which is not providing enough structural stability for the curb, as shown in Figure 4.



Once the basin's new elevation has been established with the mulch (and bioretention media where needed), then the side slopes should be graded at a slope of 3:1 (3' horizontal for every 1' of vertical grade change), ultimately tying into the top of the back side of the curb, as shown in Figure 5.



Figure 4 - Existing erosion at side slopes

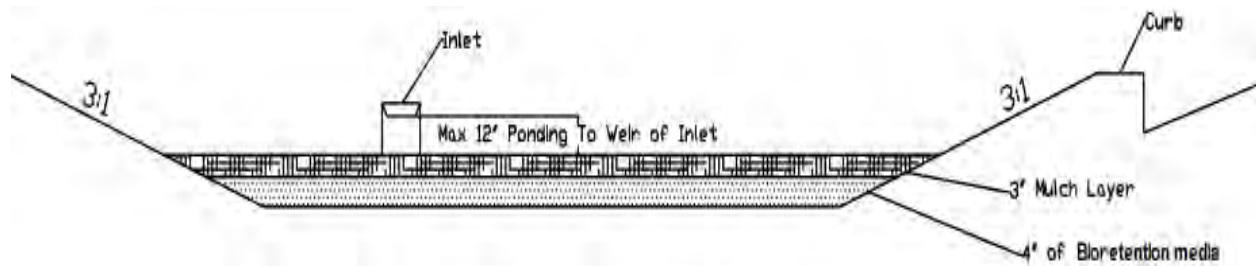


Figure 5 - Proposed typical section to show proposed depths and slopes

At the inflow points, Class 1 riprap should be placed at the curb cuts to dissipate the flows, as shown in Figure 6. The riprap should be placed from the edge of the curb to the bottom of the basin, also at a slope of 3:1. Class 1 riprap has an average diameter of 9.5 inches. The riprap should be placed at a minimum 19" thickness on nonwoven geotextile fabric. The existing rock around the edges of the facilities can be salvaged and reused if they meet the size requirements, or else discarded.

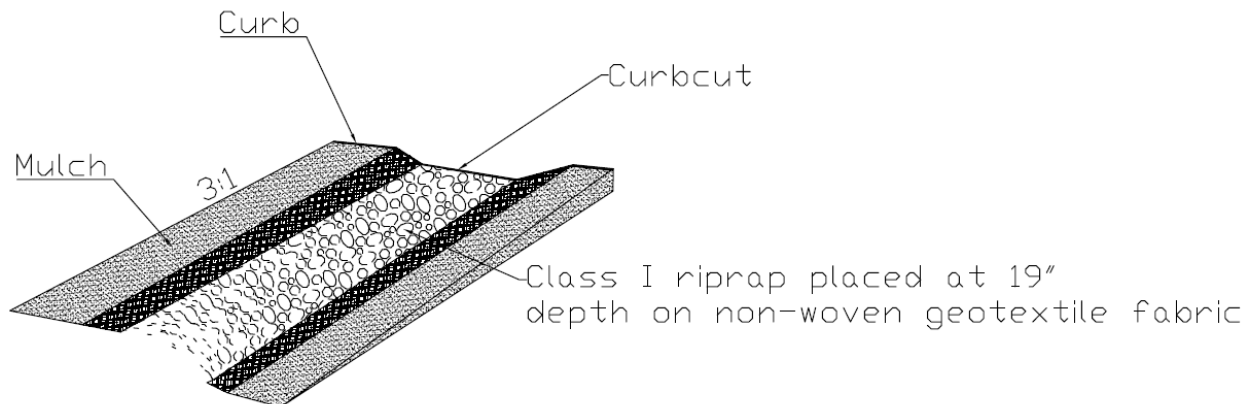


Figure 6 - Proposed grading at curb cuts

### 4.3 Curb & Asphalt Improvements

All curbing with cracks and other deterioration, as shown in Figure 7, should be replaced with new concrete curb and gutter. Any areas with cracks in the asphalt located near the deteriorated curb, as shown in Figure 8, should be sawcut and patched with new hot-mix asphalt.



Figure 7 - Existing deteriorated curb and gutter



Figure 8 - Existing cracked asphalt

### 4.4 Landscaping

The existing red maple trees in the bioretention facilities are in a poor to fair condition. Because of the fast-draining soils in bioretention facilities, red maple trees do not fare as well inside of bioretention facilities as they do outside of bioretention facilities. MES's recommendation is to remove the existing red maple trees and instead plant a mix of the species listed below. The plants listed below are native species, are aesthetically pleasing, and are well-suited for bioretention facilities.

- Soft Rush (*Juncus effusus*)
- Little Bluestem (*Schizachyrium scoparium*)
- Milkweed (*Asclepias tuberosa*)
- Joe Pye Weed (*Eupatorium dubium*)
- Narrowleaf Sunflower (*Helianthus angustifolius*)
- Cardinal Flower (*Lobelia cardinalis*)
- Switchgrass (*Panicum virgatum*) – switchgrass should be placed on the side slopes of the facility

### 5.0 Maintenance Recommendations for Gudelsky Pond

Gudelsky Pond could use some maintenance, particularly at the small forebay area on the east side of the pond where the two 30" pipes and one 15" pipe enters the pond. The forebay area is heavily silted with wetland plants growing and obstructing the inflow to the pond, as shown in Figures 9-12. The areas in front of the inflow pipes should be excavated to provide proper conveyance from the pipes.



Figures 9-12 – Photos of the silted in inflow at the point where the two 30" pipes and one 15" pipe enter Gudelsky Pond.



## 6.0 Potential Retrofit Opportunity at Gudelsky Pond

Since Gudelsky Pond was built in 1987, prior to current stormwater design guidelines, the pond does not have forebays to provide pre-treatment. So, even though the pond has more than enough capacity for new development (up to 72% imperviousness), any new projects would still need to provide water quality pre-treatment. Recent projects located off-site and on-site have largely accomplished this through an underground pre-treatment device called a Stormceptor. According to the County's publicly available data, there are several Stormceptors located off-site that are treating 16.4 total acres, 9.2 acres of impervious. The County and USG-IBBR also have several ESD & pre-treatment facilities located on-site.

The pond could be retrofitted by providing forebays at the inflows. As is, the pond meets current requirements because it was built to design standards which were appropriate during its construction era. However, some of the standards have changed and now newly built ponds are required to have



forebays at the inflows. If forebays were implemented at this pond, then additional water quality would be provided by providing a filtering component. Typically retrofitting an older pond to provide forebays would consist of constructing gabion walls around each inflow. Per MDE's guidance, the gabion walls would be designed to provide enough storage to handle 0.1" of the volume coming to each inflow.

There are three inflows into the pond and the proposed forebay wall could be implemented at the narrowest point of the pond, as shown in Figure 13, in order to save on construction costs. By implementing the forebay at the narrowest point of the pond, the wall would be approximately 90' long. Alternatively, if gabion walls were constructed around each of the three inflows, the walls would need to be approximately 275' long.



Figure 13 - Location map of proposed forebay at Gudelsky Pond

The gabion walls should be embedded 1' into the ground. The gabion would be 5' tall above ground. The top of the gabion wall would be under water. The forebay would provide storage well in excess of the needed 0.1" of the volume.

Implementing the forebays would also be beneficial to the maintenance of the pond. When the forebays are in place, the sediment, filtered in the pond, will settle out within the forebay and not throughout the whole pond. Over time, as sediment fills in the forebays, the forebays will need to be

cleaned out when they have reached 50% of their capacity, instead of needing to dredge the entire pond.

## 7.0 IBBR Pond Findings and Maintenance Recommendations

There is a small pond located on IBBR property, west of the IBBR building. Upon initial investigation of documents and plans at start of the project, it was determined that the IBBR pond was designed prior likely designed for aesthetic purposes and was not designed as a true stormwater management pond. The plans provided no documentation as to the depth or grading for the stormwater design. However even though this is not a true designed stormwater pond, MES was able to use existing documentation to provide an estimate as to how much treatment and storage the pond is providing. These computations and documentations are sufficient for submission to MDE for the year one baseline assessment.

MES inspected the pond and determined that it is functioning but needs minor and routine maintenance to keep the pond functioning as is and as was determined in the initial assessment mentioned above. Maintenance items include, vegetation management, clearing and cleaning of riprap inflow and control structure, and removal of debris and trash from the pond, inflows, control structure and outfall.

Considering USG's permit requirements are met by Gudelsky Pond, MES does not recommend any major maintenance to the pond, unless IBBR desires to dredge the pond to provide more depth for aesthetic reasons. IBBR indicated concerns with the algae in the pond, which may be caused by shallow stagnant water. MES recommends a fountain or a bubbler to combat algae growth in the pond.

For further permit years and baseline updates, it is recommended that USG-IBBR perform a more comprehensive study on the pond and provide BMP verification documentation to determine the actual grading, inverts, and depth of the original design for BMP documentations, maintenance, and reporting purposes.

## 8.0 Conclusion

The existing Gudelsky Pond, located on the Shady Grove Campus, is large and currently treats 2.6" of the runoff coming to the facility. This pond provides enough treatment that the entirety of USG and IBBR's campus are both fully meeting their MS4 permit requirements and will not need to provide any additional treatment. There is excess credit in Gudelsky Pond beyond USG and IBBR's needs and there are additional small BMPs located throughout the Shady Grove campus and the County's jurisdiction that could get additional treatment and these credits could be shared with a partner. A geodatabase and an excel spreadsheet are included with this report submittal for USG and IBBR's annual report submission to MDE.



# Appendix A - Campus Stormwater Maps





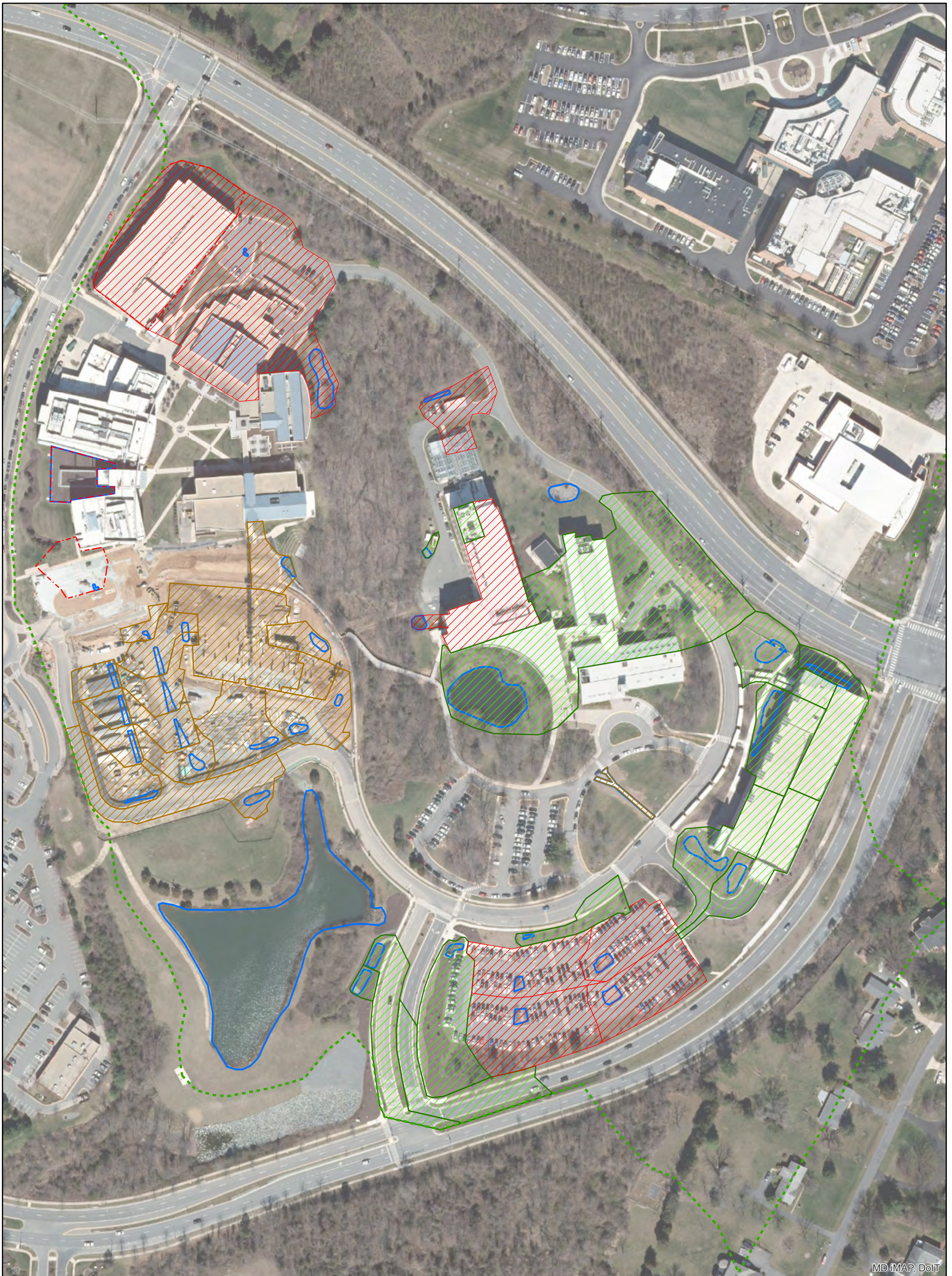
## USG / IBBR Stormwater Network



0 185 370 740 Feet

- |  |              |  |                      |
|--|--------------|--|----------------------|
|  | Outfall      |  | Control Structure    |
|  | Manhole      |  | Pipe                 |
|  | Inlet        |  | Hydraulic Connection |
|  | Head/Endwall |  | Drain                |
|  | Culvert      |  | Ditch                |










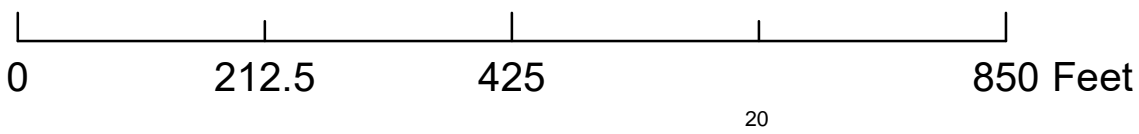
MD IMAP, DoIT



# USG / IBBR BMP Inspection Status

## BMP Drainage Area

-  Fail
-  Not Constructed
-  Not Inspected
-  Pass
-  SWMFAC





# Appendix B - BMP Inspection Reports

## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/15/2019 8:30 AM	<b>Inspector Initials</b>	SAL,JK,CAB
<b>BMP ID</b>	USG19BMP00002	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Sand Filter	<b>Underground BMP?</b>	No
<b>Rating:</b>	C - Failing, needs major maintenance	<b>Overall Inspection Comment</b>	Excessive unwanted vegetation, embankment blown out at wier, ponding, BMP designed with excess sand, tree growth on embankment. Remove vegetation, remediate to MDE criteria, restore embankment to design criteria

### Overall Photo



## Site Conditions

- **BMP Access** - Good
- **Debris & Sediment** - Fair
- **Vegetation** - Poor
  - Overgrown Vegetation, invasive species present, cattail growth reducing treatment capacity
- **BMP Contamination** - Good
- **Inflow Condition** - Fair
- **Forebay** - Not Rated
  - Not Part of Design
- **Conveyance Stability** - Fair
- **Downstream Condition** - Good

## Embankment

- **Embankment Cover** - Poor
- **Upstream Embankment** - Poor
  - Embankment blown out at control structure
- **Downstream Embankment** - Poor
  - Embankment blown out at control structure
- **Emergency Spillway** - Not Rated
  - Not Part of Design

## Ponding, Outlet/Control Structure, Outfall

- **Ponding** - Poor / **Water Depth** - 0.5 ft
- **Low Flow Orifice** - Not Rated
- **Outlet / Control Structure** - Not Rated
  - Not Part of Design
- **Principal Spillway** - Not Rated
- **Spillway Outfall** - Fair

**Overall Rating** - C - Failing, needs major maintenance

## Maintenance & Remediation Recommendations

The sand filter is considered failing and requires major maintenance to restore to functioning condition. Maintenance recommendations to restore the sand filter to functioning condition include: Removal of debris, unplanned and woody vegetation within a 10' buffer around the facility. Daylight 8" PVC inflow and repair and reset riprap at inflow. Removal of sediment and vegetation within the facility and dispose at an approved location. Excavation and reinstallation of the sand filter. Regrade the embankment to original design. If ENAKMAT 4010 device is compromised, reconstruct as designed. Removal of debris, unplanned and woody vegetation within a 15' from the downstream and upstream toe of the embankment and control structure. Recommend installing an underdrain and forebay to bring to approved MDE design standards. Facility may not be feasible in current location due to low grade and adjacent wetland. Site is located on type C soils.

**Additional Comment & Inspection Rating**



Overall, Facing North



Inflow, Pipe Submerged





Ponding within BMP



Cattails within BMP





Tree Growth on Embankment



Embankment Blown Out at Control Structure



Downstream Condition



## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/11/2019 10:28 AM	<b>Inspector Initials</b>	JFK, SAL, CAB
<b>BMP ID</b>	USG19BMP00003	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Infiltration Trench	<b>Underground BMP?</b>	No
<b>Rating:</b>	C - Failing, needs major maintenance	<b>Overall Inspection Comment</b>	Unable to access observation well (frozen); ponding observed on surface of BMP; organic debris present; and overgrown and unplanned vegetation disturbing functionality

### Overall Photo



## Site Conditions

- **BMP Access** - Good
- **Debris & Sediment** - Poor
- **Vegetation** - Poor
  - Trees growing in BMP
- **BMP Contamination** - Good
- **Inflow Condition** - Good
- **Forebay** - Not Rated
  - Not Part of Design
- **Conveyance Stability** - Poor
  - Infiltration trench is ponding past the dewatering period and not infiltrating as designed
- **Downstream Condition** - Poor
  - Overgrown vegetation at downstream end of BMP; erosion downstream from BMP overflow

## Embankment

- **Embankment Cover** - Not Rated
  - Not Part of Design
- **Upstream Embankment** - Not Rated
  - Not Part of Design
- **Downstream Embankment** - Not Rated
  - Not Part of Design
- **Emergency Spillway** – Not Rated
  - Not Part of Design

## Ponding, Outlet/Control Structure, Outfall

- **Ponding** - Poor / **Water Depth** – 0.5 ft
- **Low Flow Orifice** - Not Rated
  - Not Part of Design
- **Outlet / Control Structure** - Not Rated
  - Not part of design
- **Principal Spillway** - Not Rated
- **Spillway Outfall** - Not Rated

**Overall Rating** - C - Failing, needs major maintenance

## Maintenance & Remediation Recommendations

The infiltration trench is considered failing and requires major maintenance to restore to functioning condition. Maintenance recommendations to restore the infiltration trench to functioning condition include: Removal of debris, unplanned and woody vegetation within a 10' buffer around the facility. Excavation of the infiltration trench and dispose of material at an approved location. Reinstallation of the infiltration trench with monitoring well as originally designed. Restore 20' grass filter strip from edge of pavement to the facility.



**Additional Comment & Inspection Rating**



Tree growth within BMP



Ponding on BMP surface and observation well





Inflow to BMP – sheetflow



Overall, tree growth at outfall



## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/11/2019 11:10 AM	<b>Inspector Initials</b>	SAL,JK,CAB
<b>BMP ID</b>	USG19BMP00005	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Infiltration Trench	<b>Underground BMP?</b>	No
<b>Rating:</b>	A - Functioning, only needs routine maintenance	<b>Overall Inspection Comment</b>	Inflow pipe designed to drain sub-grade into infiltration trench. Debris, sediment, and overgrown vegetative growth at overflow. BMP does not receive sheetflow from surrounding impervious. BMP is performing as designed.

### Overall Photo





## **Site Conditions**

- **BMP Access** - Good
- **Debris & Sediment** - Fair
- **Vegetation** - Fair
- **BMP Contamination** - Good
- **Inflow Condition** - Not Rated
  - Inflow pipe buried under riprap, no sheetflow to the BMP
- **Forebay** - Not Rated
  - Not Part of Design
- **Conveyance Stability** - Good
- **Downstream Condition** - Fair

## **Embankment**

- **Embankment Cover** - Not Rated
  - Not Part of Design
- **Upstream Embankment** - Not Rated
  - Not Part of Design
- **Downstream Embankment** - Not Rated
  - Not Part of Design
- **Emergency Spillway** - Not Rated
  - Not Part of Design

## **Ponding, Outlet/Control Structure, Outfall**

- **Ponding** - Good / **Water Depth** – 0 ft
- **Low Flow Orifice** - Not Rated
  - Not Part of Design
- **Outlet / Control Structure** - Not Rated
  - Not Part of Design
- **Principal Spillway** - Not Rated
  - Not Part of Design
- **Spillway Outfall** - Fair

**Overall Rating** - A - Functioning, only needs routine maintenance

## **Maintenance & Remediation Recommendations**

No remedial action necessary as the infiltration trench is in good functioning condition. Routine maintenance recommendations include: Removal of debris, sediment, and unplanned vegetation at the overflow and within a 10' buffer around the facility.

**Additional Comment & Inspection Rating**



Vegetative growth at outfall



Overall B, Observation well





Overflow and overgrown vegetation



## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/11/2019 11:05 AM	<b>Inspector Initials</b>	SAL,JK,CAB
<b>BMP ID</b>	USG19BMP00006	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Infiltration Trench	<b>Underground BMP?</b>	No
<b>Rating:</b>	C - Failing, needs major maintenance	<b>Overall Inspection Comment</b>	Ponding within BMP, Observation well submerged, Tree growth within BMP. Remove unwanted vegetation, excavate and restore BMP to original design.

### Overall Photo



## Site Conditions

- **BMP Access** - Good
- **Debris & Sediment** - Poor
- **Vegetation** - Poor
  - Tree growth around infiltration trench
- **BMP Contamination** - Good
- **Inflow Condition** - Fair
- **Forebay** - Not Rated
  - Not Part of Design
- **Conveyance Stability** - Poor
  - BMP is ponding and not infiltrating
- **Downstream Condition** - Good

## Embankment

- **Embankment Cover** - Not Rated
  - Not Part of Design
- **Upstream Embankment** - Not Rated
  - Not Part of Design
- **Downstream Embankment** - Not Rated
  - Not Part of Design
- **Emergency Spillway** - Not Rated
  - Not Part of Design

## Ponding, Outlet/Control Structure, Outfall

- **Ponding** - Poor / **Water Depth** - 0.5 ft
- **Low Flow Orifice** - Not Rated
  - Not Part of Design
- **Outlet / Control Structure** - Not Rated
  - Not Part of Design
- **Principal Spillway** - Not Rated
- **Spillway Outfall** - Not Rated

**Overall Rating** - C - Failing, needs major maintenance

## Maintenance & Remediation Recommendations

The infiltration trench is considered failing and requires major maintenance to restore to functioning condition. Maintenance recommendations to restore the infiltration trench to functioning condition include: Removal of debris, unplanned and woody vegetation within a 10' buffer around the facility. Excavation of the infiltration trench and dispose of material at an approved location. Reinstallation of the infiltration trench with perforated pipe sub-drain and monitoring well as originally designed.



**Additional Comment & Inspection Rating**



Ponding within BMP, Observation Well submerged, minor reseeding at inflow - sheetflow.



Inflow Pipe





Inflow sheetflow, requires reseeding



## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/11/2019 12:16 PM	<b>Inspector Initials</b>	SAL,JK,CAB
<b>BMP ID</b>	USG19BMP00007	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Retention Pond (Wet Pond)	<b>Underground BMP?</b>	No
<b>Rating:</b>	B - Functioning, needs minor maintenance	<b>Overall Inspection Comment</b>	BMP may require sediment removal to return to full capacity, erosion at upstream embankment toe, riprap weir needs minor repair, inflow pipe requires minor sediment removal. BMP functioning as designed.

### Overall Photo



## Site Conditions

- **BMP Access** - Good
- **Debris & Sediment** - Fair
- **Vegetation** - Not Rated
  - Outside of growing season
- **BMP Contamination** - Good
- **Inflow Condition** - Fair
- **Forebay** - Not Rated
  - Not Part of Design
- **Conveyance Stability** - Fair
- **Downstream Condition** - Good

## Embankment

- **Embankment Cover** - Fair
- **Upstream Embankment** - Fair
- **Downstream Embankment** - Not Rated
  - Not Part of Design
- **Emergency Spillway** - Not Rated
  - Not part of design

## Ponding, Outlet/Control Structure, Outfall

- **Ponding** - Fair / **Water Depth** – 0 ft (Depth as Designed)
- **Low Flow Orifice** - Not Rated
- **Outlet / Control Structure** - Poor
  - Rock Weir has been compromised. Historical evidence shows water level to be 438.5 in 1989. Measured to be lower
- **Principal Spillway** - Fair
- **Spillway Outfall** - Good

**Overall Rating** - B - Functioning, needs minor maintenance

## Maintenance & Remediation Recommendations

The wet pond is considered functioning but could use minor and routine maintenance. Maintenance recommendations include: Removal of debris, sediment, and unplanned vegetation around the facility and at the inflow. Removal of sediment, debris, woody and unplanned vegetation at the rock weir and 15' downstream from the control structure. Removal of riprap at inflow and outfall and reset riprap to original design. If possible, wash and replace stone. Repair and stabilization of eroded sections of the pond perimeter. Refer to MDE for woody vegetation removal along the embankment.



**Additional Comment & Inspection Rating**



Inflow from roofdrain



Inflow from pipe, partially buried





Control structure, riprap weir



Downstream Condition





Upstream embankment, minor erosion



Erosion at embankment toe

## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	02/05/2019 12:18 PM	<b>Inspector Initials</b>	SAL,JW,TF,SL
<b>BMP ID</b>	USG19BMP00012	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Micro-Bioretenion	<b>Underground BMP?</b>	No
<b>Rating:</b>	B - Functioning, needs minor maintenance	<b>Overall Inspection Comment</b>	Erosive flow within BMP causing channel to form and plants being disturbed. Repair erosion and replant disturbed plants. Low point of BMP is at university sign placed within BMP. BMP is functioning as designed

### Overall Photo





## Site Conditions

- **BMP Access** - Good
- **Debris & Sediment** - Good
- **Vegetation** - Not Rated
  - Outside Growing Season
- **BMP Contamination** - Good
- **Inflow Condition** - Good
- **Forebay** - Not Rated
  - Not Part of Design
- **Conveyance Stability** - Poor
  - Erosive flow within BMP, low point
- **Downstream Condition** - Not Rated
  - Site outfalls to existing stormwater network

## Embankment

- **Embankment Cover** - Good
- **Upstream Embankment** - Good
- **Downstream Embankment** - Not Rated
  - Not Part of Design
- **Emergency Spillway** - Not Rated
  - Not Part of Design

## Ponding, Outlet/Control Structure, Outfall

- **Ponding** - Good / **Water Depth** – 0 ft
- **Low Flow Orifice** - Not Rated
- **Outlet / Control Structure** - Good
- **Principal Spillway** - Good
- **Spillway Outfall** - Good

## Overall Rating - B - Functioning, needs minor maintenance

The micro-bioretention is considered functioning but could use minor and routine maintenance. Maintenance recommendations include: Repair and stabilization of eroded areas within facility. Restore the facility to design grade. Replanting of any disturbed bioretention plants. Removal of any debris, sediment, and unplanned vegetation within BMP and at the inflows.

**Additional Comment & Inspection Rating**



Control Structure



Erosive flow within BMP conveyance





Observation Well



Arch located within BMP, BMP low point





Inflow - Curb Cut and unknown pipe



Inflow Pipe



Overall - Facing South



## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/11/2019 2:57 PM	<b>Inspector Initials</b>	SAL,JK,CAB
<b>BMP ID</b>	USG19BMP00013	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Micro-Bioretenention	<b>Underground BMP?</b>	No
<b>Rating:</b>	A - Functioning, only needs routine maintenance	<b>Overall Inspection Comment</b>	BMP in good condition and functioning as designed, Sign Placed within BMP

### Overall Photo





## **Site Conditions**

- **BMP Access** - Good
- **Debris & Sediment** - Good
- **Vegetation** - Not Rated
  - Outside Growing Season
- **BMP Contamination** - Good
- **Inflow Condition** - Good
- **Forebay** - Not Rated
  - Not Part of Design
- **Conveyance Stability** - Good
- **Downstream Condition** - Not Rated
  - Site outfalls to existing stormwater network

## **Embankment**

- **Embankment Cover** - Good
- **Upstream Embankment** - Good
- **Downstream Embankment** - Not Rated
  - Not Part of Design
- **Emergency Spillway** - Not Rated
  - Not Part of Design

## **Ponding, Outlet/Control Structure, Outfall**

- **Ponding** - Good / **Water Depth** – 0 ft
- **Low Flow Orifice** - Not Rated
- **Outlet / Control Structure** - Good
- **Principal Spillway** - Good
- **Spillway Outfall** - Good

**Overall Rating** - A - Functioning, only needs routine maintenance

## **Maintenance & Remediation Recommendations**

No remedial action needed as the micro-bioretenion is in good function condition. Routine maintenance recommendations include: Repair any eroded areas at the inflow within the BMP. Removal of any unplanned and invasive vegetation inside the facility.

**Additional Comment & Inspection Rating**



Principal Spillway



Overflow Device



Overall - Facing North, Minor Erosion at Riprap



Inflow, Pipe from Parking Garage





Observation Well

## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/11/2019 9:59 AM	<b>Inspector Initials</b>	SAL,JK,CAB
<b>BMP ID</b>	USG19BMP00014	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Micro-Bioretentation	<b>Underground BMP?</b>	No
<b>Rating:</b>	A - Functioning, only needs routine maintenance	<b>Overall Inspection Comment</b>	Minor Erosion at Eastern Inflow. Repair erosion at inflow. BMP is in good condition and functioning as designed.

### Overall Photo



## **Site Conditions**

- **BMP Access** - Good
- **Debris & Sediment** - Good
- **Vegetation** - Not Rated
  - Outside of Growing Season
- **BMP Contamination** - Good
- **Inflow Condition** - Fair
- **Forebay** - Not Rated
  - Not Part of Design
- **Conveyance Stability** - Good
- **Downstream Condition** - Not Rated
  - Site outfalls to existing stormwater network

## **Embankment**

- **Embankment Cover** - Good
- **Upstream Embankment** - Good
- **Downstream Embankment** - Good
- **Emergency Spillway** - Not Rated
  - Not Part of Design

## **Ponding, Outlet/Control Structure, Outfall**

- **Ponding** - Good / **Water Depth** – 0 ft
- **Low Flow Orifice** - Not Rated
  - Not Part of Design
- **Outlet / Control Structure** - Good
- **Principal Spillway** - Good
- **Spillway Outfall** - Good

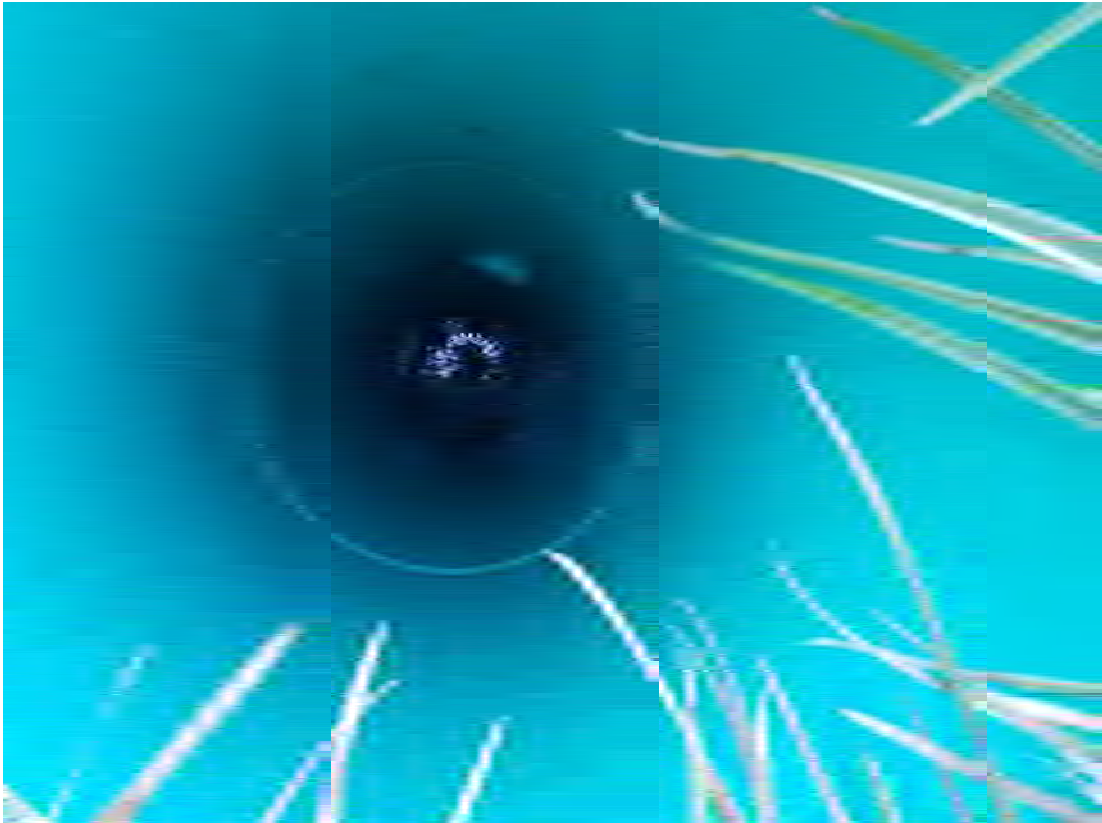
**Overall Rating** - A - Functioning, only needs routine maintenance

## **Maintenance & Remediation Recommendations**

No remedial action needed as the micro-bioretenion is in good function condition. Routine maintenance recommendations include: Repair any eroded areas at the inflow within the BMP. Removal of any unplanned and invasive vegetation inside the facility.



**Additional Comment & Inspection Rating**



Principal Spillway



Overall Facing West





Inflow A, West



Overflow Device and Cleanout





Inflow B, East - Erosion at inflow



Observation Well



## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/15/2019 11:03 AM	<b>Inspector Initials</b>	SAL,JK,CAB
<b>BMP ID</b>	USG19BMP00015	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Micro-Bioretenion	<b>Underground BMP?</b>	No
<b>Rating:</b>	A - Functioning, only needs routine maintenance	<b>Overall Inspection Comment</b>	BMP in good condition and functioning as designed.

### Overall Photo



## **Site Conditions**

- **BMP Access** - Good
- **Debris & Sediment** - Good
- **Vegetation** - Not Rated
  - Outside Growing Season
- **BMP Contamination** - Good
- **Inflow Condition** - Good
- **Forebay** - Not Rated
  - Not Part of Design
- **Conveyance Stability** - Good
- **Downstream Condition** - Not Rated
  - Site outfalls to existing stormwater network

## **Embankment**

- **Embankment Cover** - Good
- **Upstream Embankment** - Good
- **Downstream Embankment** - Good
- **Emergency Spillway** - Not Rated
  - Not Part of Design

## **Ponding, Outlet/Control Structure, Outfall**

- **Ponding** - Good / **Water Depth** – 0 ft
- **Low Flow Orifice** - Not Rated
- **Outlet / Control Structure** - Good
- **Principal Spillway** - Good
- **Spillway Outfall** - Good

**Overall Rating** - A - Functioning, only needs routine maintenance

## **Maintenance & Remediation Recommendations**

No remedial action needed as the micro-bioretenion is in good function condition. Routine maintenance recommendations include: Repair any eroded areas at the inflow within the BMP. Removal of any unplanned and invasive vegetation inside the facility.



**Additional Comment & Inspection Rating**



Inflow A - Pipe from Garage, Observation Well



Overflow Device 1

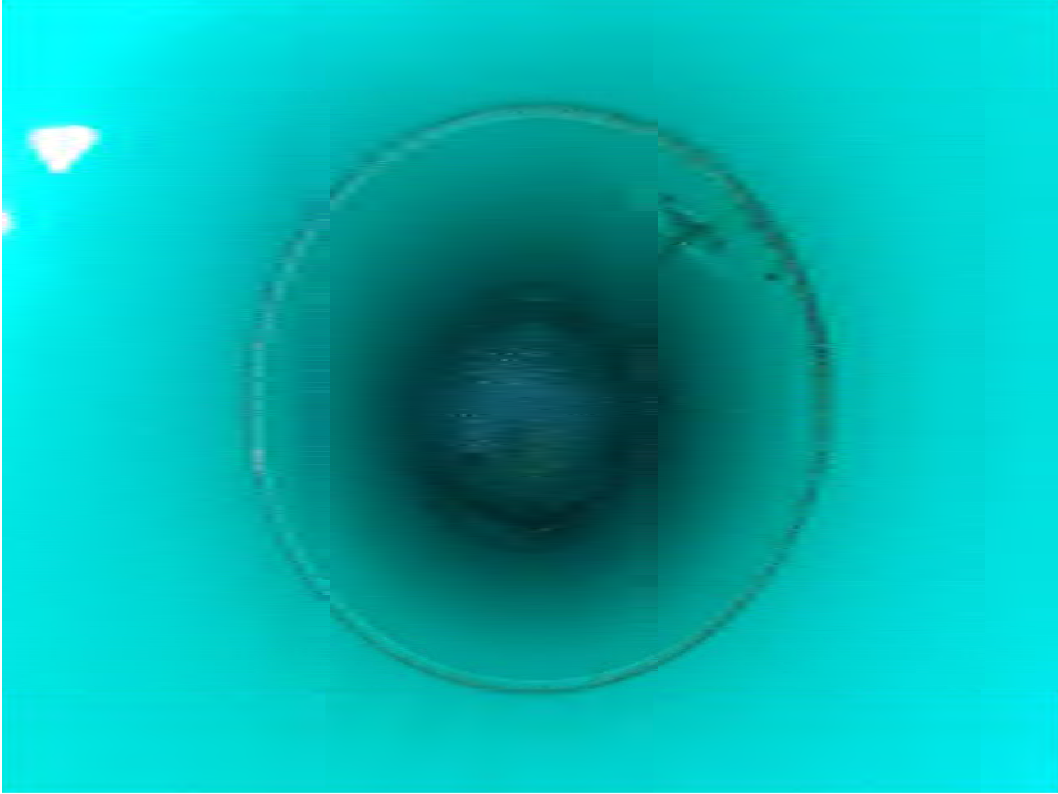




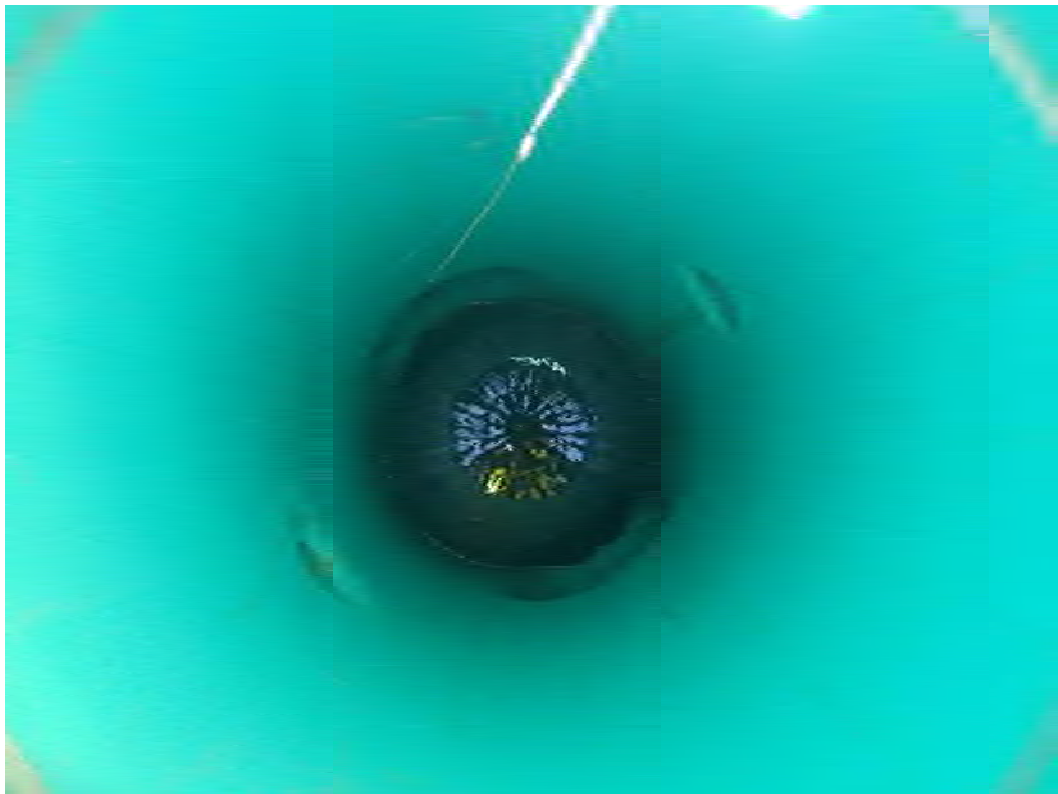
Inflow - Curb Cut



Overflow Device 2



Principal Spillway 1



Principal Spillway 2



## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/15/2019 10:31 AM	<b>Inspector Initials</b>	SAL,JK,CAB
<b>BMP ID</b>	USG19BMP00017	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Micro-Bioretenention	<b>Underground BMP?</b>	No
<b>Rating:</b>	B - Functioning, needs minor maintenance	<b>Overall Inspection Comment</b>	Erosion at inflow-curb cut - expand riprap apron and repair erosion, BMP in good condition and functioning as designed

### Overall Photo





## **Site Conditions**

- **BMP Access** - Good
- **Debris & Sediment** - Good
- **Vegetation** - Not Rated
  - Outside Growing Season
- **BMP Contamination** - Good
- **Inflow Condition** - Fair
- **Forebay** - Not Rated
  - Not Part of Design
- **Conveyance Stability** - Good
- **Downstream Condition** - Not Rated
  - Site outfalls to existing stormwater network

## **Embankment**

- **Embankment Cover** - Good
- **Upstream Embankment** - Good
- **Downstream Embankment** - Good
- **Emergency Spillway** - Not Rated
  - Not Part of Design

## **Ponding, Outlet/Control Structure, Outfall**

- **Ponding** - Good / **Water Depth** – 0 ft
- **Low Flow Orifice** - Not Rated
  - Not Part of Design
- **Outlet / Control Structure** - Good
- **Principal Spillway** - Good
- **Spillway Outfall** - Good

**Overall Rating** - B - Functioning, needs minor maintenance

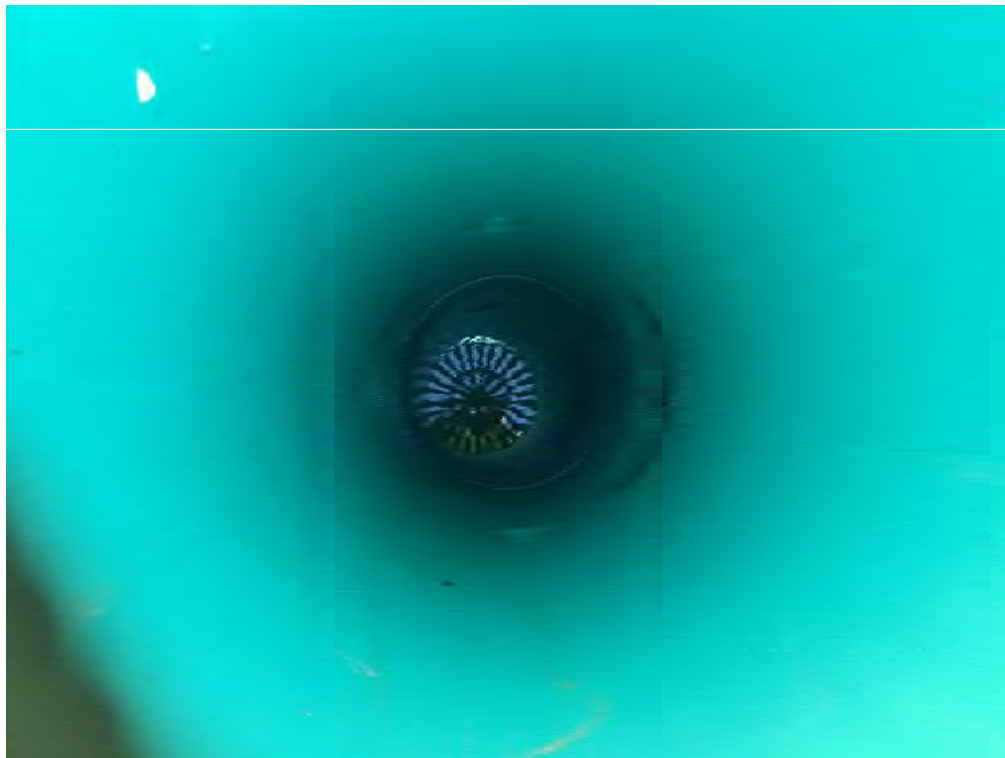
## **Maintenance & Remediation Recommendations**

The micro-bioretenion is considered functioning but could use minor and routine maintenance. Maintenance recommendations include: Removal of riprap aprons and any debris at the inflows. Repair eroded areas at the inflows and reset rip rap apron using the same stone. Removal of any unplanned and invasive vegetation within the BMP.

**Additional Comment & Inspection Rating**



Embankment



Principal Spillway





Erosion at Inflow A



Overall Facing North





Inflow - Pipe from Parking Garage



Inflow A, Curb Cut



Observation Well - Interior



## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/11/2019 3:08 PM	<b>Inspector Initials</b>	SAL,JK,CAB
<b>BMP ID</b>	USG19BMP00018	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Bioretention	<b>Underground BMP?</b>	No
<b>Rating:</b>	B - Functioning, needs minor maintenance	<b>Overall Inspection Comment</b>	Overgrown vegetation within BMP. Remove unwanted vegetation and replace with MDE approved bioretention plants. BMP is in good condition and functioning as designed

### Overall Photo





## **Site Conditions**

- **BMP Access** - Good
- **Debris & Sediment** - Good
- **Vegetation** - Poor
  - Overgrown vegetation within BMP
- **BMP Contamination** - Good
- **Inflow Condition** - Good
- **Forebay** - Not Rated
  - Not Part of Design
- **Conveyance Stability** - Good
- **Downstream Condition** - Not Rated
  - Site outfalls to existing stormwater network

## **Embankment**

- **Embankment Cover** - Good
- **Upstream Embankment** - Good
- **Downstream Embankment** - Not Rated
  - Not Part of Design
- **Emergency Spillway** - Not Rated
  - Not Part of Design

## **Ponding, Outlet/Control Structure, Outfall**

- **Ponding** - Good / **Water Depth** – 0 ft
- **Low Flow Orifice** - Not Rated
- **Outlet / Control Structure** - Good
- **Principal Spillway** - Good
- **Spillway Outfall** - Good

**Overall Rating** - B - Functioning, needs minor maintenance

## **Maintenance & Remediation Recommendations**

The bioretention is considered functioning but could use minor and routine maintenance. Maintenance recommendations include: Removal of debris, sediment, and unplanned vegetation within facility. Replanting of MDE approved bioretention plants where necessary.

**Additional Comment & Inspection Rating**



Inflow - COG Open Back, Grass Swale Conveyance



Cleanout





Overall - Facing West, Overflow Device



Principal Spillway



## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/15/2019 2:39 PM	<b>Inspector Initials</b>	SAL,JK,CAB
<b>BMP ID</b>	USG19BMP00019	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Bioretention	<b>Underground BMP?</b>	No
<b>Rating:</b>	C - Failing, needs major maintenance	<b>Overall Inspection Comment</b>	Major erosion at inflows - undermining of western curb, Vegetation Removed from BMP 2013. Repair erosion, replace bioretention plants, remove tree, and remediate BMP to current MDE standards. +/-12" ponding depth in BMP

### Overall Photo



## **Site Conditions**

- **BMP Access** - Good
- **Debris & Sediment** - Good
- **Vegetation** - Poor
  - Non-Woody Vegetation Removed 2013, Maple trees show evidence of distressed health
- **BMP Contamination** - Good
- **Inflow Condition** - Poor
  - Undermining of curbing at west curb opening. Erosion at Gravel Curtain Drain
- **Forebay** - Not Rated
  - Not Part of Design
- **Conveyance Stability** - Fair
- **Downstream Condition** - Not Rated
  - Site outfalls to existing stormwater network

## **Embankment**

- **Embankment Cover** - Poor
- **Upstream Embankment** - Poor
  - Erosion at embankment around inflows to BMP
- **Downstream Embankment** - Not Rated
  - Not Part of Design
- **Emergency Spillway** - Not Rated
  - Not Part of Design

## **Ponding, Outlet/Control Structure, Outfall**

- **Ponding** - Good / **Water Depth** – 0 ft
- **Low Flow Orifice** - Not Rated
- **Outlet / Control Structure** - Good
- **Principal Spillway** - Good
- **Spillway Outfall** - Good

**Overall Rating** - C - Failing, needs major maintenance

## **Maintenance & Remediation Recommendations**

The bioretention is considered failing and requires major maintenance to restore to functioning condition. Maintenance recommendations to restore the bioretention to a functioning condition include: Regrade and restore bioretention to design criteria. Replanting of MDE approved bio-wetland plants. MES recommends removing the maple tree and replace with other MDE approved bioretention plants. Restore parking lot curb along perimeter/inflows of the bioretention facility. Perform additional maintenance as directed by project engineer to restore structural integrity of the surrounding parking lot.

**Additional Comment & Inspection Rating**



Principal Spillway



Inflow - Curb Cut, Facing West, Curb Damaged and Undermined





Gravel Curtain Drain Clogged



Steep Slope on BMP Embankment, Cleanout



## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/11/2019 2:09 PM	<b>Inspector Initials</b>	SAL,JK,CAB
<b>BMP ID</b>	USG19BMP00020	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Bioretention	<b>Underground BMP?</b>	No
<b>Rating:</b>	C - Failing, needs major maintenance	<b>Overall Inspection Comment</b>	Erosion at curb cut inflow and gravel curtain drain, excessive ponding potential at overflow device, vegetation removed 2013. Repair erosion, replace bioretention plants, remove tree, and remediate BMP to current MDE standards. +/-12" ponding depth in BMP

### Overall Photo



## **Site Conditions**

- **BMP Access** - Good
- **Debris & Sediment** - Good
- **Vegetation** - Poor
  - Non-Woody Vegetation Removed 2013, Maple trees show evidence of distressed health
- **BMP Contamination** - Good
- **Inflow Condition** - Poor
  - Erosion at inflows of curb cuts surrounding the BMP. Evidence of parking lot integrity being undermined. Erosion at gravel curtain drain
- **Forebay** - Not Rated
  - Not Part of Design
- **Conveyance Stability** - Poor
  - Erosive channel along embankment
- **Downstream Condition** - Not Rated
  - Site outfalls to existing stormwater network

## **Embankment**

- **Embankment Cover** - Poor
- **Upstream Embankment** - Poor
  - Erosion of upstream embankment
- **Downstream Embankment** - Not Rated
  - Not Part of Design
- **Emergency Spillway** - Not Rated
  - Not Part of Design

## **Ponding, Outlet/Control Structure, Outfall**

- **Ponding** - Good / **Water Depth** – 0 ft
- **Low Flow Orifice** - Not Rated
- **Outlet / Control Structure** - Good
- **Principal Spillway** - Good
- **Spillway Outfall** - Good

**Overall Rating** - C - Failing, needs major maintenance

## **Maintenance & Remediation Recommendations**

The bioretention is considered failing and requires major maintenance to restore to functioning condition. Maintenance recommendations to restore the bioretention to a functioning condition include: Regrade and restore bioretention to design criteria. Replanting of MDE approved bio-wetland plants. MES recommends removing the maple tree and replace with other MDE approved bioretention plants. Restore parking lot curb along perimeter/inflows of the bioretention facility. Perform additional maintenance as directed by project engineer to restore structural integrity of the surrounding parking lot.



**Additional Comment & Inspection Rating**



Overall, Facing West



Vegetation Removed





Overflow Device



Principal Spillway





Cleanout



Erosion at Inflow A - Curb Cut - Facing South





Erosion at Inflow B - Curb Cut - Facing West



Erosion at Gravel Curtain - Facing North





Sinking of Biomediation



## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/11/2019 12:23 PM	<b>Inspector Initials</b>	SAL,JK,CAB
<b>BMP ID</b>	USG19BMP00021	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Bioretention	<b>Underground BMP?</b>	No
<b>Rating:</b>	C - Failing, needs major maintenance	<b>Overall Inspection Comment</b>	Erosion at curb cut inflow and gravel curtain drain, excessive ponding potential at overflow device, vegetation removed 2013. Repair erosion, replace bioretention plants, remove tree, and remediate BMP to current MDE standards. +/-12" ponding depth in BMP

### Overall Photo



## **Site Conditions**

- **BMP Access** - Good
- **Debris & Sediment** - Fair
- **Vegetation** - Poor
  - BMP Vegetation Removed 2013, Maple trees show evidence of distressed health
- **BMP Contamination** - Good
- **Inflow Condition** - Poor
  - Erosion at inflows of curb cuts surrounding the BMP. Evidence of parking lot integrity being undermined. Erosion at gravel curtain drain
- **Forebay** - Poor
  - Erosion of Curtain Drain Pretreatment
- **Conveyance Stability** - Fair
- **Downstream Condition** - Not Rated
  - Site outfalls to existing stormwater network

## **Embankment**

- **Embankment Cover** - Poor
- **Upstream Embankment** - Poor
  - Erosion at embankment around inflows to BMP
- **Downstream Embankment** - Not Rated
  - Not Part of Design
- **Emergency Spillway** - Not Rated
  - Not Part of Design

## **Ponding, Outlet/Control Structure, Outfall**

- **Ponding** - Good / **Water Depth** – 0 ft
- **Low Flow Orifice** - Not Rated
- **Outlet / Control Structure** - Good
- **Principal Spillway** - Good
- **Spillway Outfall** - Good

**Overall Rating** - C - Failing, needs major maintenance

## **Maintenance & Remediation Recommendations**

The bioretention is considered failing and requires major maintenance to restore to functioning conditions. Maintenance recommendations to restore the bioretention to functioning conditions include: Removal of debris, unplanned and woody vegetation within facility. Replanting of MDE approved bioorientation plants according to design. Repair of eroded areas at the inflows and gravel curtain drain. Investigation of underdrain for potential clogging and removal of sediment if necessary. Removal of any sediment build up on surface of facility or addition of mulch to meet MDE ponding depth requirement.



**Additional Comment & Inspection Rating**



Erosion at inflow, water flows under curbing



Overall, Overflow Device





Cleanout



Principal Spillway



## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/11/2019 1:48 PM	<b>Inspector Initials</b>	SAL,JK,CAB
<b>BMP ID</b>	USG19BMP00022	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Bioretention	<b>Underground BMP?</b>	No
<b>Rating:</b>	C - Failing, needs major maintenance	<b>Overall Inspection Comment</b>	Erosion at curb cut inflow and gravel curtain drain, excessive ponding potential at overflow device, vegetation removed 2013. Repair erosion, replace bioretention plants, remove tree, and remediate BMP to current MDE standards. +/-12" ponding depth in BMP

### Overall Photo



## **Site Conditions**

- **BMP Access** - Good
- **Debris & Sediment** - Good
- **Vegetation** - Poor
  - Non-Woody Vegetation Removed 2013, Maple trees show evidence of distressed health
- **BMP Contamination** - Good
- **Inflow Condition** - Poor
  - Erosion at inflows of curb cuts surrounding the BMP. Evidence of parking lot integrity being undermined. Erosion at gravel curtain drain
- **Forebay** - Not Rated
  - Gravel Curtain Drain Eroded and Riprap added
- **Conveyance Stability** - Fair
- **Downstream Condition** - Not Rated
  - Site outfalls to existing stormwater network

## **Embankment**

- **Embankment Cover** - Poor
- **Upstream Embankment** - Poor
  - Erosion at embankment around inflows to BMP
- **Downstream Embankment** - Not Rated
  - Not Part of Design
- **Emergency Spillway** - Not Rated
  - Not Part of Design

## **Ponding, Outlet/Control Structure, Outfall**

- **Ponding** - Good / **Water Depth** – 0 ft
- **Low Flow Orifice** - Not Rated
- **Outlet / Control Structure** - Good
- **Principal Spillway** - Good
- **Spillway Outfall** - Good

**Overall Rating** - C - Failing, needs major maintenance

## **Maintenance & Remediation Recommendations**

The bioretention is considered failing and requires major maintenance to restore to functioning condition. Maintenance recommendations to restore the bioretention to a functioning condition include: Regrade and restore bioretention to design criteria. Replanting of MDE approved bio-wetland plants. MES recommends removing the maple tree and replace with other MDE approved bioretention plants. Restore parking lot curb along perimeter/inflows of the bioretention facility. Perform additional maintenance as directed by project engineer to restore structural integrity of the surrounding parking lot.



**Additional Comment & Inspection Rating**



Sediment within Curtain Drain, Erosion at Curb Cut



Overall, Facing North





Cleanout



Erosion at inflow and embankment





Principal Spillway



Overflow Device



## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/11/2019 12:06 PM	<b>Inspector Initials</b>	SAL,JK,CAB
<b>BMP ID</b>	USG19BMP00023	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Micro-Bioretenention	<b>Underground BMP?</b>	No
<b>Rating:</b>	B - Functioning, needs minor maintenance	<b>Overall Inspection Comment</b>	Erosive flow within BMP at southern inflow, Overflow device buried under mulch. Repair erosion, replace bioretention plants as needed, and uncover overflow device. BMP functioning as designed

### Overall Photo





## **Site Conditions**

- **BMP Access** - Good
- **Debris & Sediment** - Fair
- **Vegetation** - Fair
- **BMP Contamination** - Good
- **Inflow Condition** - Fair
- **Forebay** - Not Rated
  - Not Part of Design
- **Conveyance Stability** - Fair
- **Downstream Condition** - Not Rated
  - Site outfalls to existing stormwater network

## **Embankment**

- **Embankment Cover** - Good
- **Upstream Embankment** - Good
- **Downstream Embankment** - Not Rated
  - Not Part of Design
- **Emergency Spillway** - Not Rated
  - Not Part of Design

## **Ponding, Outlet/Control Structure, Outfall**

- **Ponding** - Good / **Water Depth** – 0 ft
- **Low Flow Orifice** - Not Rated
- **Outlet / Control Structure** - Good
- **Principal Spillway** - Good
- **Spillway Outfall** - Good

**Overall Rating** - B - Functioning, needs minor maintenance

## **Maintenance & Remediation Recommendations**

The micro-bioretenion is considered functioning but could use minor and routine maintenance. Maintenance recommendations include: Removal of debris, sediment, and unplanned vegetation around the facility and at the inflow. Removal of sediment, and debris at the overflow device. Replace bioretention plants as needed.

**Additional Comment & Inspection Rating**



Principal Spillway



Overflow Device, Mulch on Inlet





Inflow A - Curb cut from parking lot



Inflow B - Flow from Sidewalk and planted area, Erosive flow into riprap



Overall B - Facing North, Cleanout



## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/11/2019 3:21 PM	<b>Inspector Initials</b>	SAL,JK,CAB
<b>BMP ID</b>	USG19BMP00024	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Micro-Bioretenion	<b>Underground BMP?</b>	No
<b>Rating:</b>	A - Functioning, only needs routine maintenance	<b>Overall Inspection Comment</b>	BMP in good condition, minor sediment within inflow protection. BMP functioning as designed.

### Overall Photo



## **Site Conditions**

- **BMP Access** - Good
- **Debris & Sediment** - Good
- **Vegetation** - Not Rated
  - Outside of Growing Season
- **BMP Contamination** - Good
- **Inflow Condition** - Good
- **Forebay** - Not Rated
  - Not Part of Design
- **Conveyance Stability** - Good
- **Downstream Condition** - Not Rated
  - Site outfalls to existing stormwater network

## **Embankment**

- **Embankment Cover** - Good
- **Upstream Embankment** - Good
- **Downstream Embankment** - Good
- **Emergency Spillway** - Not Rated
  - Not Part of Design

## **Ponding, Outlet/Control Structure, Outfall**

- **Ponding** - Good / **Water Depth** – 0 ft
- **Low Flow Orifice** - Not Rated
- **Outlet / Control Structure** - Good
- **Principal Spillway** - Good
- **Spillway Outfall** - Good

**Overall Rating** - A - Functioning, only needs routine maintenance

## **Maintenance & Remediation Recommendations**

No remedial action needed as the micro-bioretenion is in good functioning condition. Routine maintenance recommendations include: Removal of sediment within the facility. Repair any erosion at facility inflows. Removal of any unplanned and invasive vegetation inside the facility.



**Additional Comment & Inspection Rating**



Inflow - COG Open Back



Principal Spillway





Embankment, Overflow Device



Overall - Facing North, Cleanout



## Stormwater Management Facility BMP Inspection

### Inspection Data

<b>Date of Inspection:</b>	01/11/2019 4:11 PM	<b>Inspector Initials</b>	SAL,JK,CAB
<b>BMP ID</b>	USG19BMP00025	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Micro-Bioretention	<b>Underground BMP?</b>	No
<b>Rating:</b>	A - Functioning, only needs routine maintenance	<b>Overall Inspection Comment</b>	BMP in good condition, minor sediment within inflow protection. BMP functioning as designed.

### Overall Photo



## **Site Conditions**

- **BMP Access** - Good
- **Debris & Sediment** - Fair
- **Vegetation** - Not Rated
  - Outside Growing Season
- **BMP Contamination** - Good
- **Inflow Condition** - Good
- **Forebay** - Not Rated
  - Not Part of Design
- **Conveyance Stability** - Good
- **Downstream Condition** - Not Rated
  - BMP outflows into Stormdrain System

## **Embankment**

- **Embankment Cover** - Good
- **Upstream Embankment** - Good
- **Downstream Embankment** - Good
- **Emergency Spillway** - Not Rated
  - Not part of Design

## **Ponding, Outlet/Control Structure, Outfall**

- **Ponding** - Good / **Water Depth** – 0 ft
- **Low Flow Orifice** - Not Rated
  - Not part of Design
- **Outlet / Control Structure** - Good
- **Principal Spillway** - Good
- **Spillway Outfall** - Good

**Overall Rating** - A - Functioning, only needs routine maintenance

## **Maintenance & Remediation Recommendations**

No remedial action needed as the micro-bioretenion is in good functioning condition. Routine maintenance recommendations include: Removal of sediment within the facility. Repair any erosion at facility inflows. Removal of any unplanned and invasive vegetation inside the facility.



**Additional Comment & Inspection Rating**



Overflow Device



Principal Spillway





Inflow - from COG



Overall - Facing North





Gravel within Riprap

# Stormwater Management Facility BMP Inspection

## Inspection Data

<b>Date of Inspection:</b>	01/08/2019 3:50 PM	<b>Inspector Initials</b>	SAL,JW,TF,SL
<b>BMP ID</b>	USG19BMP00026	<b>Inspection Firm</b>	MES
<b>BMP Type:</b>	Retention Pond (Wet Pond)	<b>Underground BMP?</b>	No
<b>Rating:</b>	A - Functioning, only needs routine maintenance	<b>Overall Inspection Comment</b>	Pond in good condition, Forebay is undersized for pond inflow and filled with cattails, ponding at emergency spillway base, left valve appears closed, unable to test valves due to confined space. Functioning as designed.

## Overall Photo





## **Site Conditions**

- **BMP Access** - Good
- **Debris & Sediment** - Good
- **Vegetation** - Fair
  - Plant growth in forebay and in emergency spillway
- **BMP Contamination** - Good
- **Inflow Condition** - Good
- **Forebay** - Poor
  - Forebay is undersized and filled unwanted vegetation
- **Conveyance Stability** - Good
- **Downstream Condition** - Good

## **Embankment**

- **Embankment Cover** - Good
- **Upstream Embankment** - Good
- **Downstream Embankment** - Good
- **Emergency Spillway** - Good

## **Ponding, Outlet/Control Structure, Outfall**

- **Ponding** - Good / **Water Depth** - 0 ft (Depth as Designed)
- **Low Flow Orifice** - Not Rated
  - Unable to Rate - Low Flow Submerged
- **Outlet / Control Structure** - Good
- **Principal Spillway** - Good
- **Spillway Outfall** - Good

**Overall Rating** - A - Functioning, only needs routine maintenance

## **Maintenance & Remediation Recommendations**

No remedial action necessary as the pond is in good functioning condition. Routine maintenance recommendations include: Removal of debris, cattails and other unplanned vegetation at the forebay and remaining inflows. Removal of debris and unplanned vegetation at pond outfall, 15' downstream of the control structure and emergency spillway.

**Additional Comment & Inspection Rating**



Forebay, Cattail Growth



Emergency Spillway, standing water at end of spillway





Embankment



Control Structure Access





Outflow



Low flow Device, Submerged





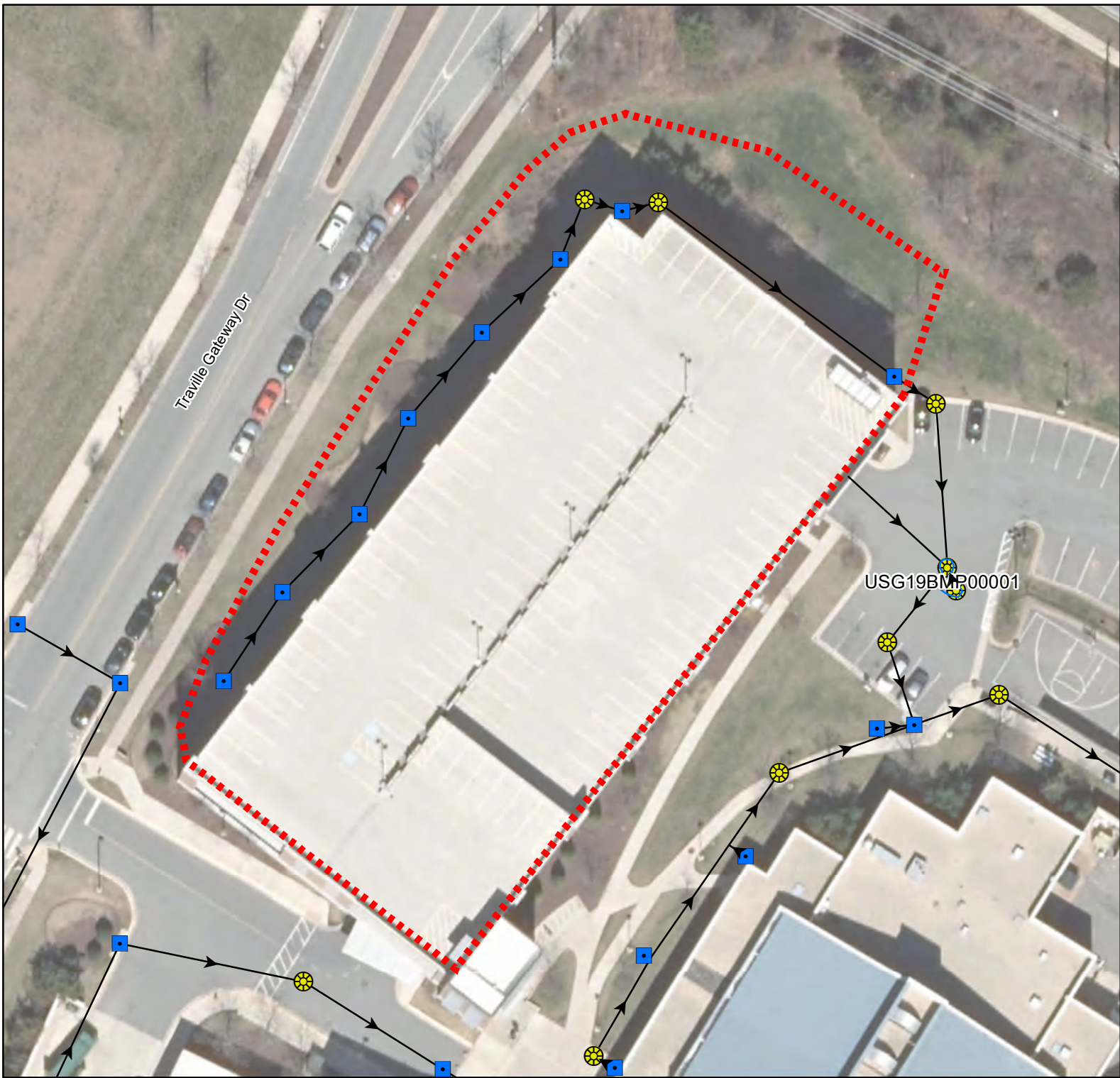
Northern Inflow and Overall



Tree Growth at Outflow of Emergency Spillway

# Appendix C - BMP Drainage Area Map





## USG / IBBR BMP Drainage Area

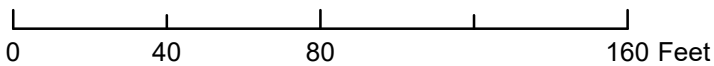
BMP ID: USG19BMP00001

BMP Type: Oil Grit Separator

Drainage Area (ac): 1.05

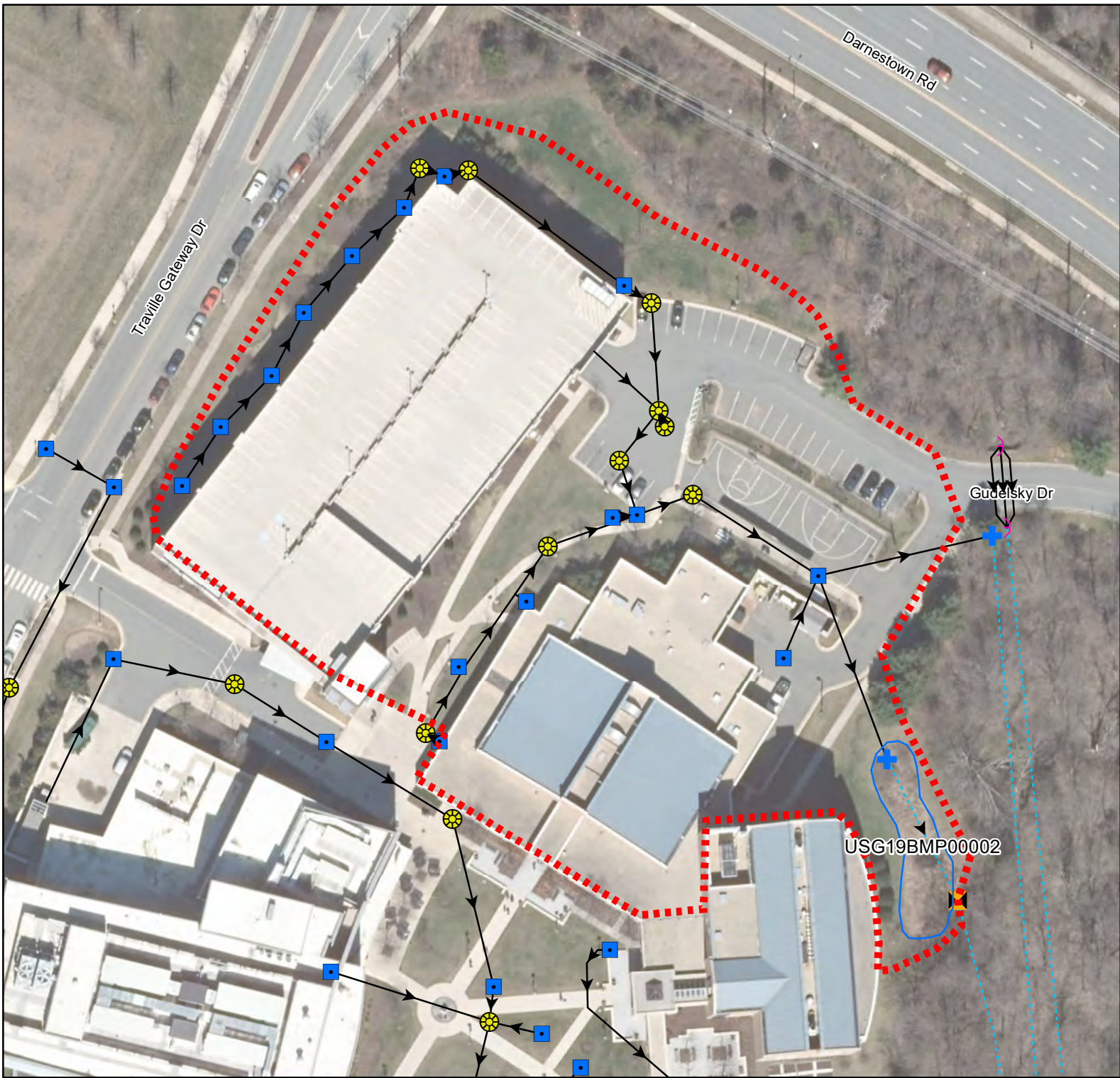
Impervious Area (ac): 0.73

Pe: 0 Inspection Status: Not Inspected



- |                   |        |         |              |                   |                      |       |
|-------------------|--------|---------|--------------|-------------------|----------------------|-------|
| BMP Drainage Area | SWMFAC | Manhole | Head/Endwall | Control Structure | Hydraulic Connection | Ditch |
| Outfall           | Inlet  | Culvert | Pipe         | Drain             |                      |       |





## USG / IBBR BMP Drainage Area

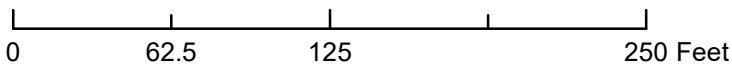
BMP ID: USG19BMP00002

BMP Type: Surface Sand Filter

Drainage Area (ac): 2.91

Impervious Area (ac): 1.93

Pe: 0.07 Inspection Status: Fail



- |                   |        |             |              |                   |                      |       |
|-------------------|--------|-------------|--------------|-------------------|----------------------|-------|
| BMP Drainage Area | SWMFAC | Manhole     | Head/Endwall | Control Structure | Hydraulic Connection | Ditch |
| Outfall           | Inlet  | Culvert 118 | Pipe         | Drain             |                      |       |





## USG / IBBR BMP Drainage Area

BMP ID: USG19BMP00003

BMP Type: Infiltration Trench

Drainage Area (ac): 0.28

Impervious Area (ac): 0.14



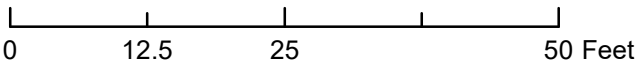




































Pe: 0.5 Inspection Status: Fail



0 20 40 80 Feet







































- BMP Drainage Area
- SWMFAC
- Manhole
- Head/Endwall
- Control Structure
- Hydraulic Connection
- Ditch
- Outfall
- Inlet
- Culvert 119
- Pipe
- Drain



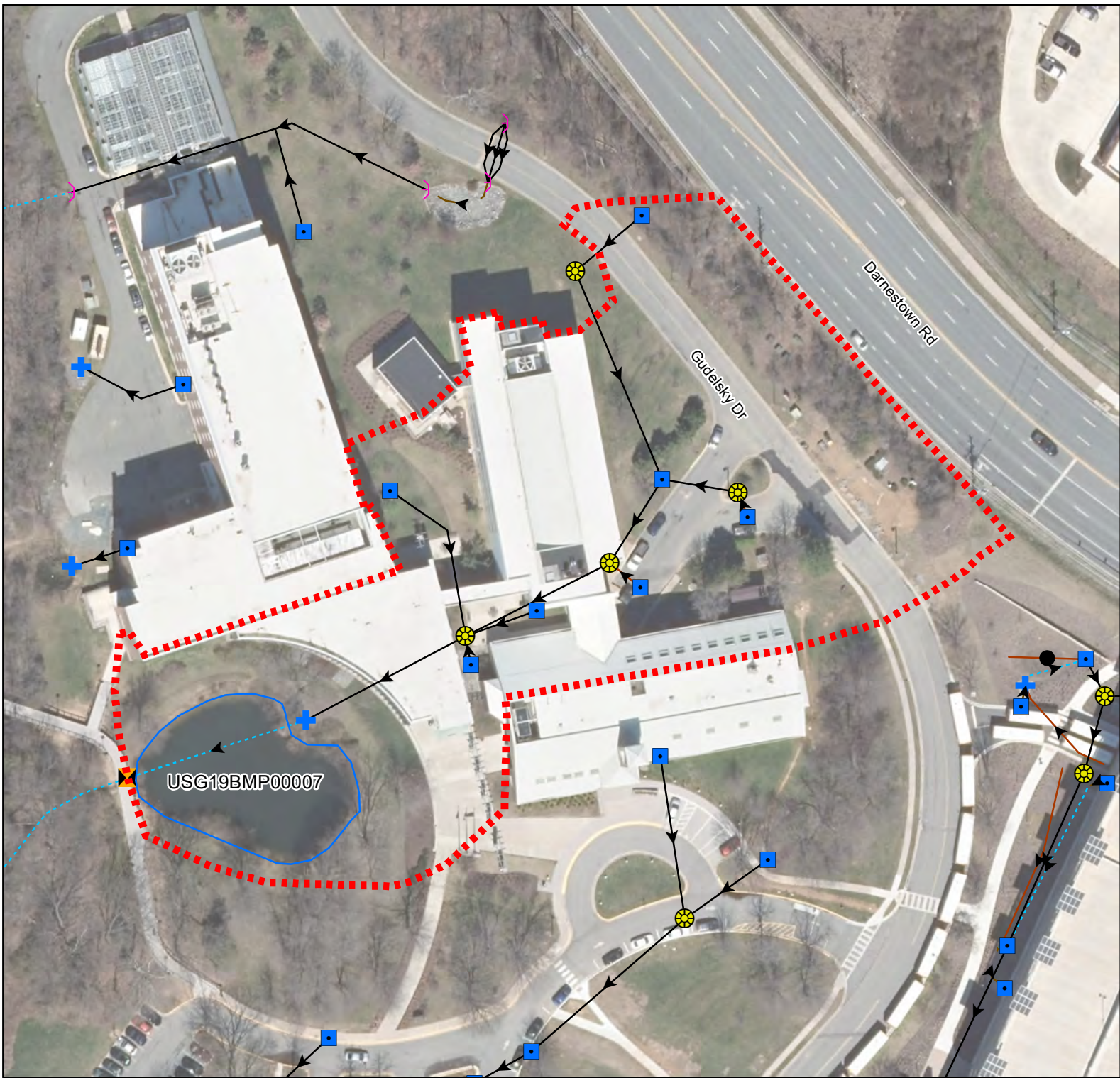
	<h2>USG / IBBR BMP Drainage Area</h2>	<p>BMP ID: USG19BMP00005</p> <p>BMP Type: Infiltration Trench</p> <p>Drainage Area (ac): 0.08</p> <p>Impervious Area (ac): 0.06</p> <p>Pe: 1.08 Inspection Status: Pass</p>														
<div style="display: flex; align-items: center;">   </div>																
<table border="0" style="width: 100%; font-size: small;"> <tr> <td> BMP Drainage Area</td> <td> SWMFAC</td> <td> Manhole</td> <td> Head/Endwall</td> <td> Control Structure</td> <td> Hydraulic Connection</td> <td> Ditch</td> </tr> <tr> <td> Outfall</td> <td> Inlet</td> <td> Culvert 120</td> <td> Pipe</td> <td> Drain</td> <td colspan="2"></td> </tr> </table>			 BMP Drainage Area	 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch	 Outfall	 Inlet	 Culvert 120	 Pipe	 Drain		
 BMP Drainage Area	 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch										
 Outfall	 Inlet	 Culvert 120	 Pipe	 Drain												





 <p><b>MARYLAND ENVIRONMENTAL SERVICE</b></p>	<h3>USG / IBBR BMP Drainage Area</h3>	<p>BMP ID: USG19BMP00006          BMP Type: Infiltration Trench          Drainage Area (ac): 0.59          Impervious Area (ac): 0.48          Pe: 0.78 Inspection Status: Fail</p>														
<div style="display: flex; align-items: center;">  <div style="border-bottom: 1px solid black; width: 400px; position: relative;"> <div style="position: absolute; left: 0; top: -10px;">0</div> <div style="position: absolute; left: 25%; top: -10px;">37.5</div> <div style="position: absolute; left: 50%; top: -10px;">75</div> <div style="position: absolute; left: 80%; top: -10px;">150 Feet</div> </div> </div>																
<table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black;"> BMP Drainage Area</td> <td style="border-right: 1px solid black;"> SWMFAC</td> <td> Manhole</td> <td style="border-right: 1px solid black;"> Head/Endwall</td> <td style="border-right: 1px solid black;"> Control Structure</td> <td> Hydraulic Connection</td> <td style="border-right: 1px solid black;"> Ditch</td> </tr> <tr> <td style="border-right: 1px solid black;"> Outfall</td> <td style="border-right: 1px solid black;"> Inlet</td> <td> Culvert 121</td> <td style="border-right: 1px solid black;"> Pipe</td> <td> Drain</td> <td></td> <td></td> </tr> </table>			 BMP Drainage Area	 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch	 Outfall	 Inlet	 Culvert 121	 Pipe	 Drain		
 BMP Drainage Area	 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch										
 Outfall	 Inlet	 Culvert 121	 Pipe	 Drain												





## USG / IBBR BMP Drainage Area

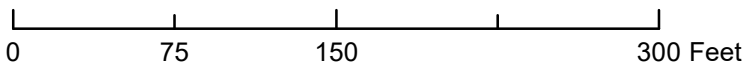
BMP ID: USG19BMP00007

BMP Type: Wet Pond

Drainage Area (ac): 2.84

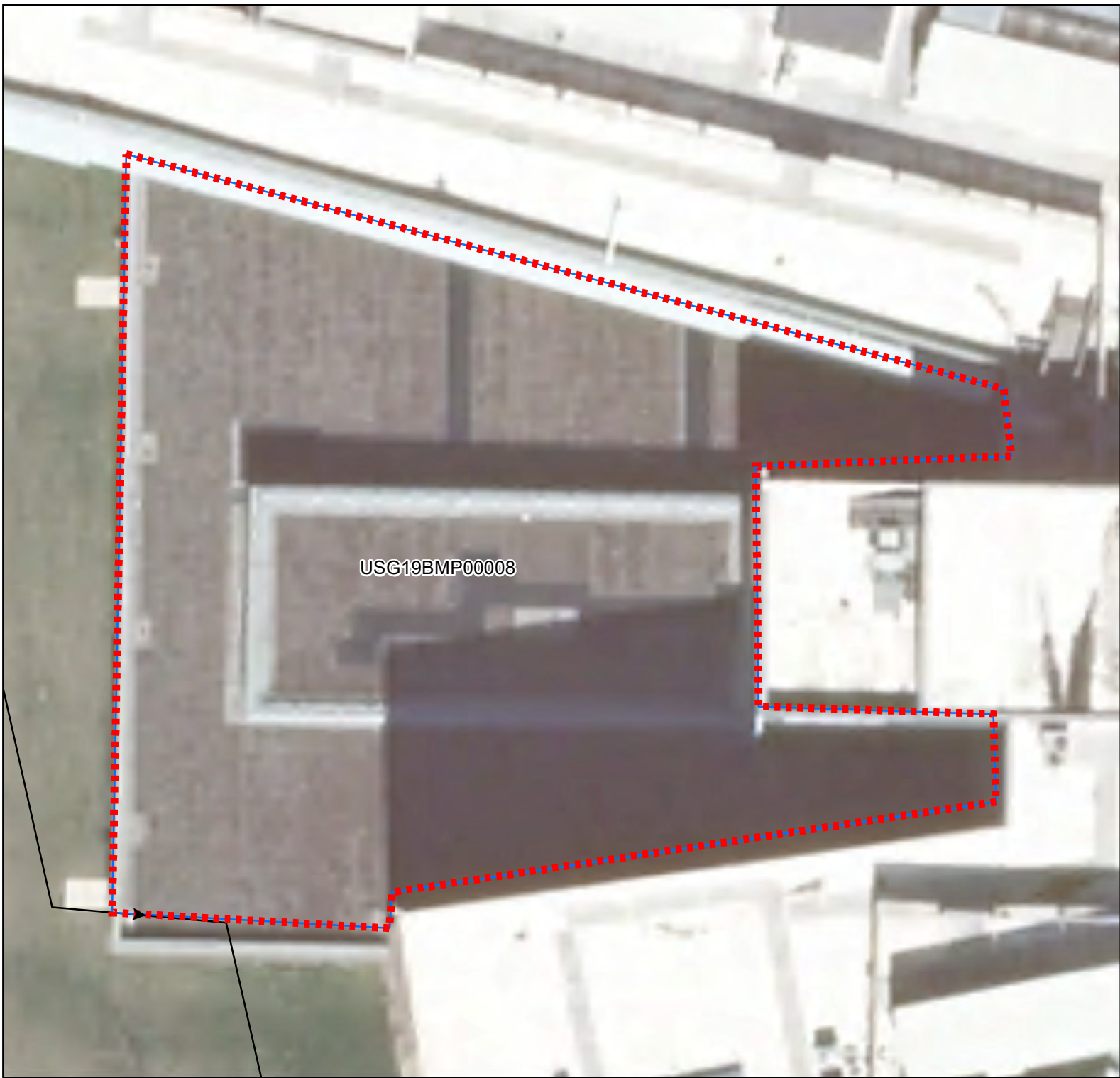
Impervious Area (ac): 1.11

Pe: 2.6 Inspection Status: Pass



- |                   |        |             |              |                   |                      |       |
|-------------------|--------|-------------|--------------|-------------------|----------------------|-------|
| BMP Drainage Area | SWMFAC | Manhole     | Head/Endwall | Control Structure | Hydraulic Connection | Ditch |
| Outfall           | Inlet  | Culvert 122 | Pipe         | Drain             |                      |       |





USG19BMP00008



## USG / IBBR BMP Drainage Area

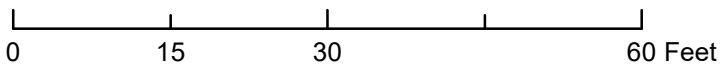
BMP ID: USG19BMP00008

BMP Type: Green Roof

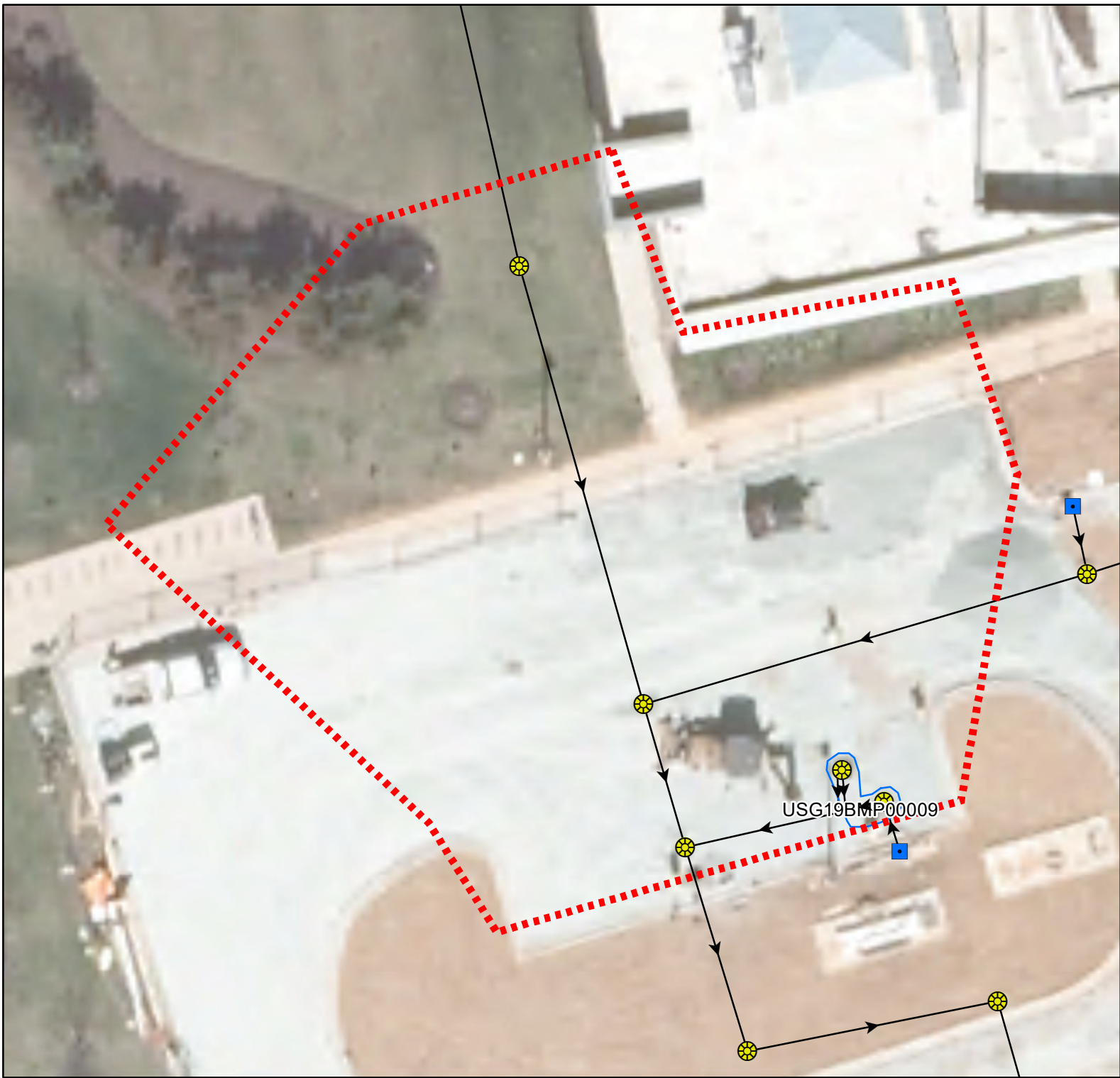
Drainage Area (ac): 0.19

Impervious Area (ac): 0.19

Pe: 0 Inspection Status: Not Inspected



- BMP Drainage Area
- SWMFAC
- Manhole
- Head/Endwall
- Control Structure
- Hydraulic Connection
- Ditch
- Outfall
- Inlet
- Culvert 123
- Pipe
- Drain



## USG / IBBR BMP Drainage Area

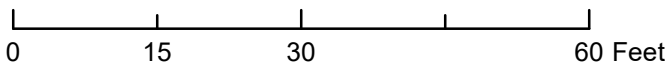
BMP ID: USG19BMP00009

BMP Type: Oil Grit Separator

Drainage Area (ac): 0.22

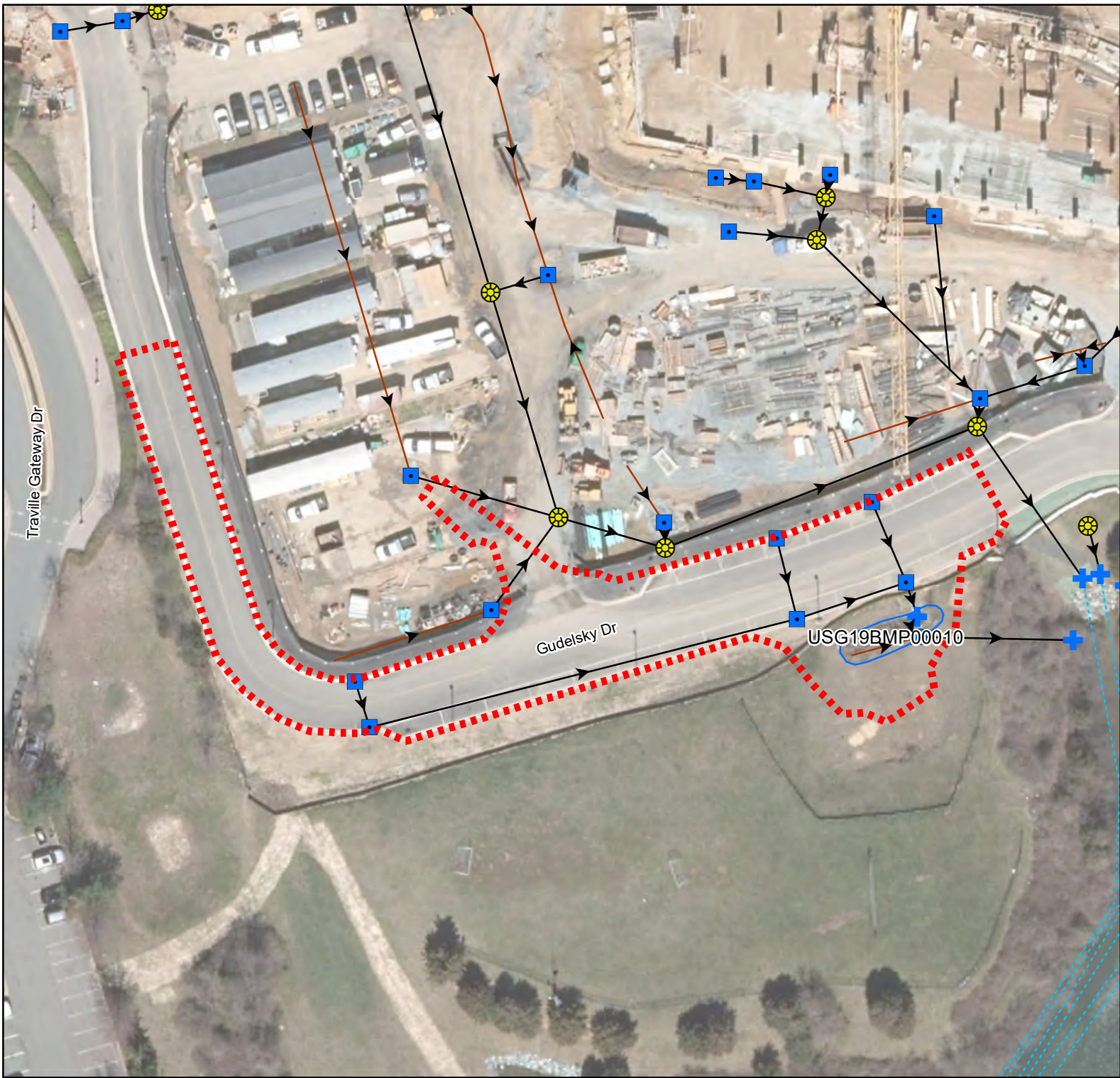
Impervious Area (ac): 0.15

Pe: 0 Inspection Status: Not Inspected



- |                   |        |                |              |                   |                      |       |
|-------------------|--------|----------------|--------------|-------------------|----------------------|-------|
| BMP Drainage Area | SWMFAC | Manhole        | Head/Endwall | Control Structure | Hydraulic Connection | Ditch |
| Outfall           | Inlet  | Culvert<br>124 | Pipe         | Drain             |                      |       |





## USG / IBBR BMP Drainage Area

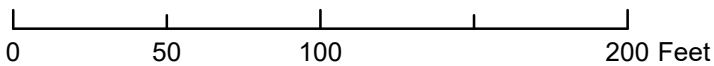
BMP ID: USG19BMP00010

BMP Type: Micro-Bioretention

Drainage Area (ac): 0.51

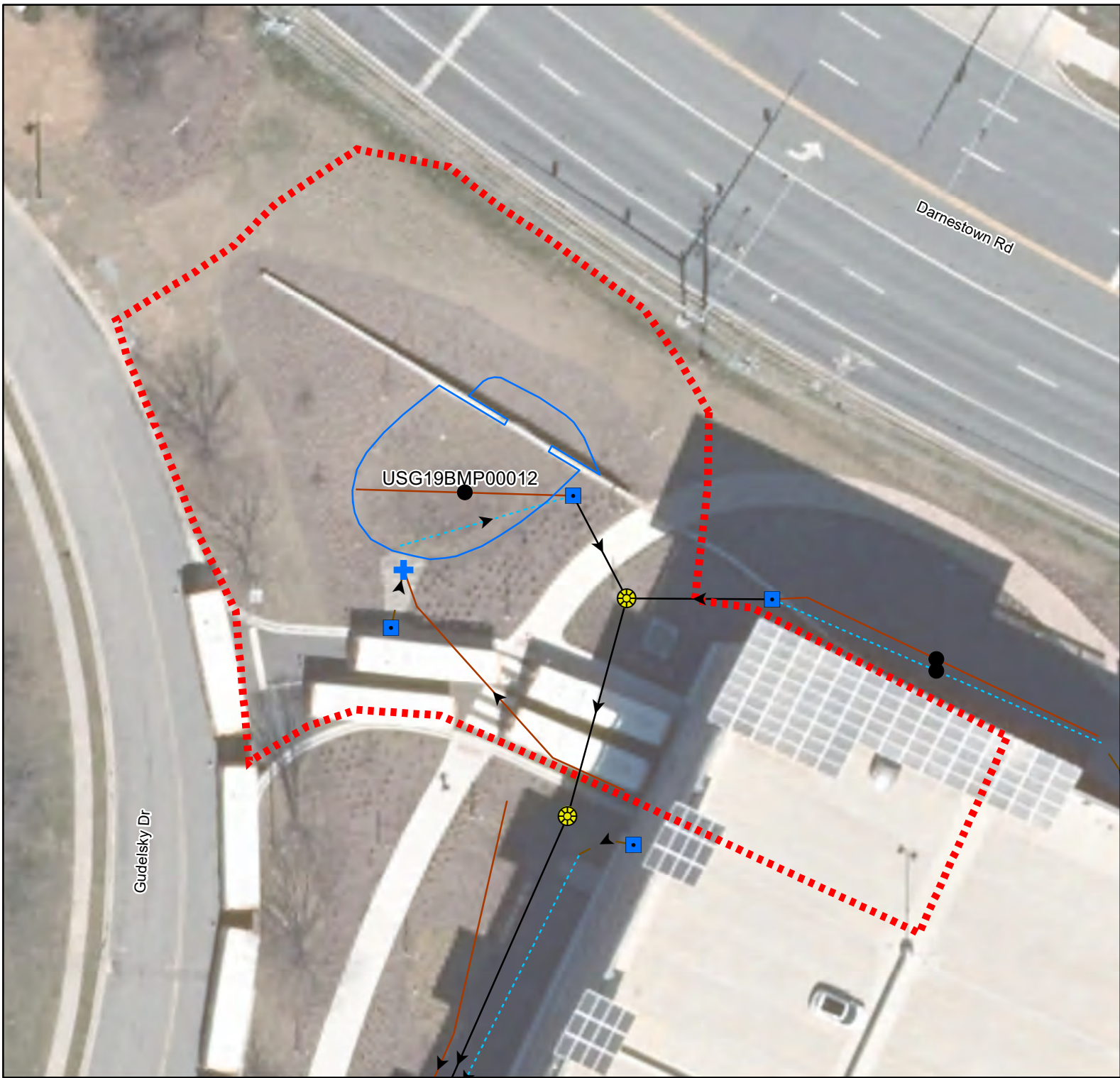
Impervious Area (ac): 0.4


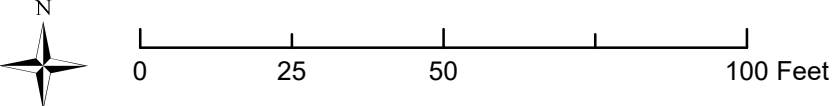




































Pe: 1 Inspection Status: Not Constructed



- |                   |             |         |       |              |                   |                      |       |
|-------------------|-------------|---------|-------|--------------|-------------------|----------------------|-------|
| BMP Drainage Area | SWMFAC      | Manhole | Inlet | Head/Endwall | Control Structure | Hydraulic Connection | Ditch |
| Outfall           | Culvert 125 | Pipe    | Drain |              |                   |                      |       |



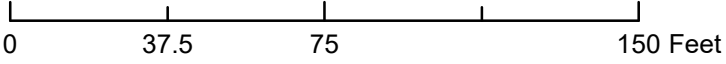






































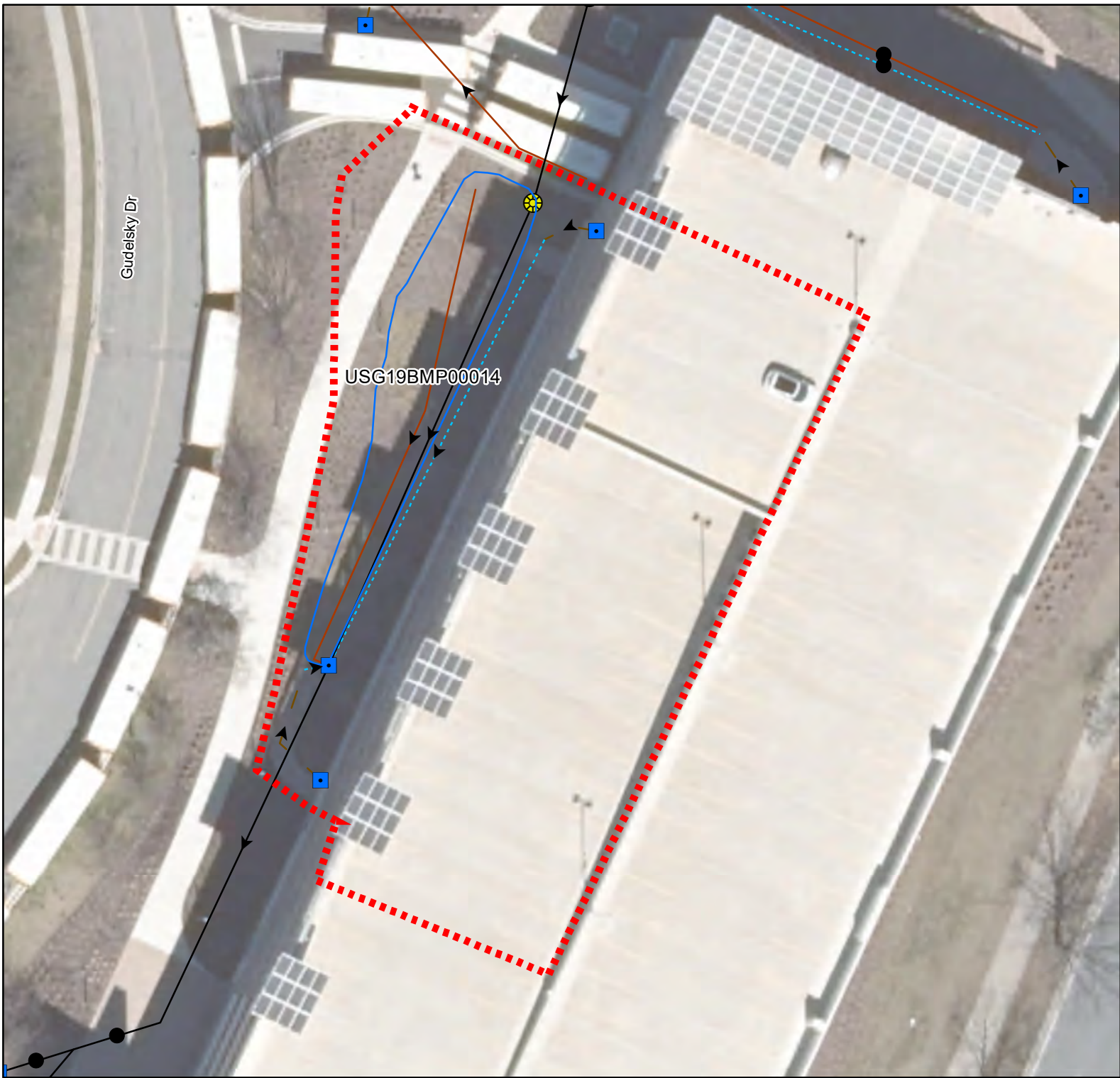




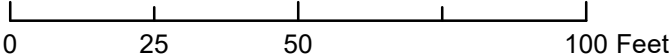




































	<h2>USG / IBBR BMP Drainage Area</h2>	<p>BMP ID: USG19BMP00012          BMP Type: Micro-Bioretention          Drainage Area (ac): 0.44          Impervious Area (ac): 0.15          Pe: 2.25 Inspection Status: Pass</p>														
																
<table border="0"> <tr> <td> BMP Drainage Area</td> <td> SWMFAC</td> <td> Manhole</td> <td> Head/Endwall</td> <td> Control Structure</td> <td> Hydraulic Connection</td> <td> Ditch</td> </tr> <tr> <td> Outfall</td> <td> Inlet</td> <td> Culvert 126</td> <td> Pipe</td> <td> Drain</td> <td colspan="2"></td> </tr> </table>			 BMP Drainage Area	 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch	 Outfall	 Inlet	 Culvert 126	 Pipe	 Drain		
 BMP Drainage Area	 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch										
 Outfall	 Inlet	 Culvert 126	 Pipe	 Drain												



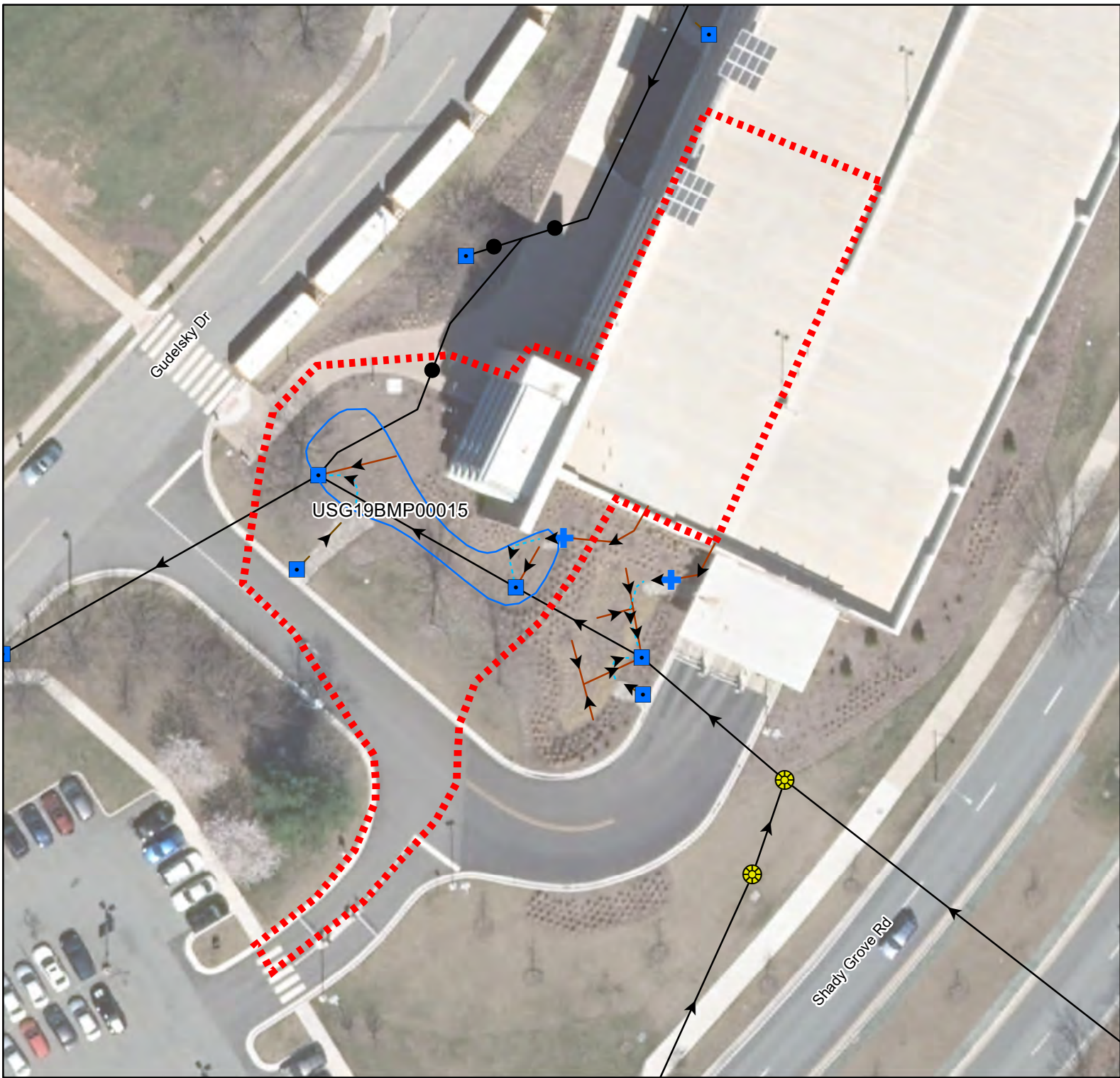




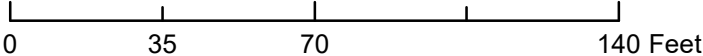








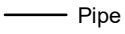



	<h2>USG / IBBR BMP Drainage Area</h2>	<p>BMP ID: USG19BMP00013          BMP Type: Micro-Bioretention          Drainage Area (ac): 0.43          Impervious Area (ac): 0.33          Pe: 0.65 Inspection Status: Pass</p>														
 	<table border="0"> <tr> <td> BMP Drainage Area</td> <td> SWMFAC</td> <td> Manhole</td> <td> Head/Endwall</td> <td> Control Structure</td> <td> Hydraulic Connection</td> <td> Ditch</td> </tr> <tr> <td> Outfall</td> <td> Inlet</td> <td> Culvert 127</td> <td> Pipe</td> <td> Drain</td> <td colspan="2"></td> </tr> </table>		 BMP Drainage Area	 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch	 Outfall	 Inlet	 Culvert 127	 Pipe	 Drain		
 BMP Drainage Area	 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch										
 Outfall	 Inlet	 Culvert 127	 Pipe	 Drain												



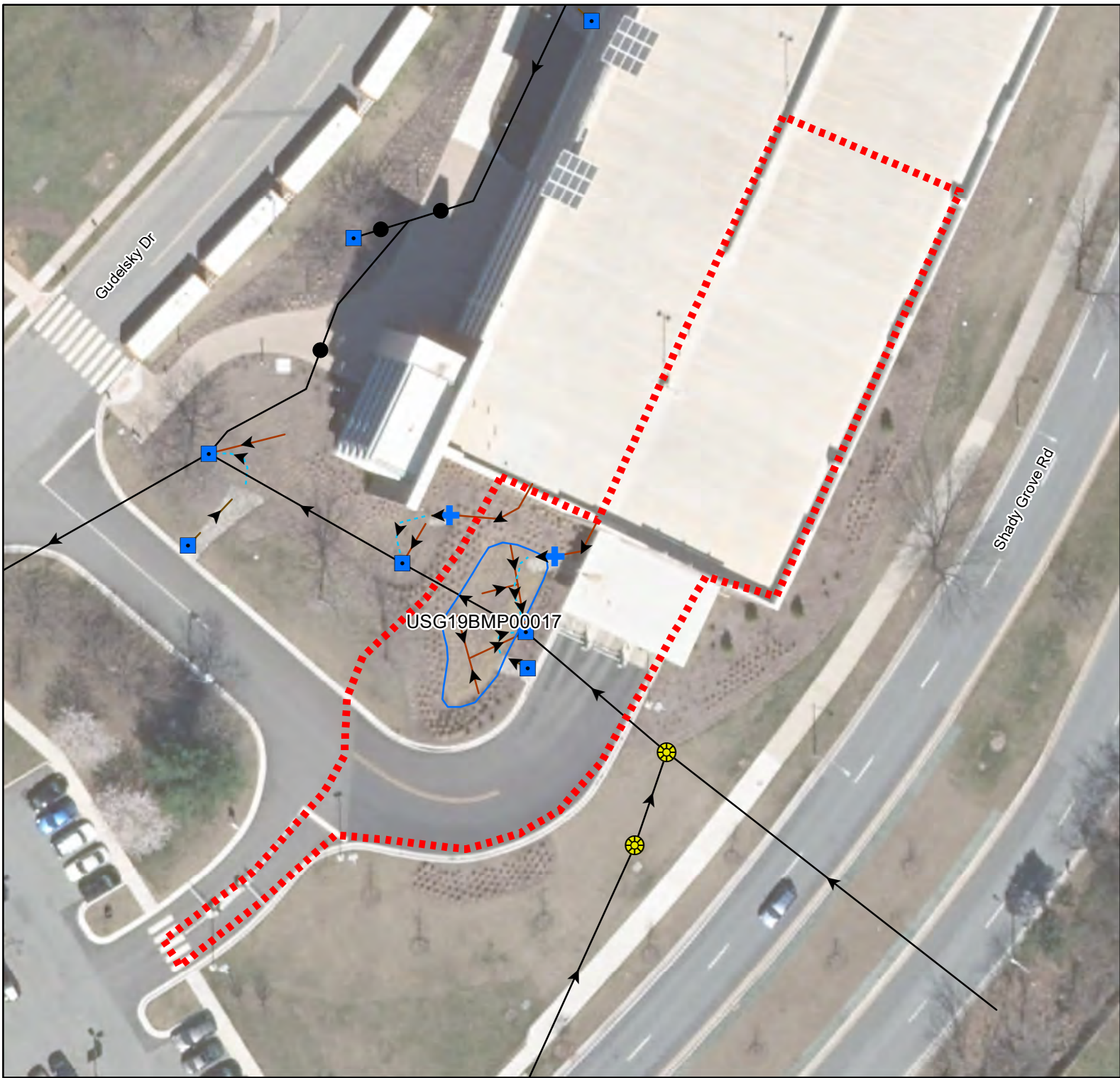
	<h2>USG / IBBR BMP Drainage Area</h2>	<p>BMP ID: USG19BMP00014</p> <p>BMP Type: Micro-Bioretention</p> <p>Drainage Area (ac): 0.43</p> <p>Impervious Area (ac): 0.29</p> <p>Pe: 1.54 Inspection Status: Pass</p>														
 																
<table border="0"> <tr> <td> BMP Drainage Area</td> <td> SWMFAC</td> <td> Manhole</td> <td> Head/Endwall</td> <td> Control Structure</td> <td> Hydraulic Connection</td> <td> Ditch</td> </tr> <tr> <td> Outfall</td> <td> Inlet</td> <td> Culvert 128</td> <td> Pipe</td> <td> Drain</td> <td colspan="2"></td> </tr> </table>			 BMP Drainage Area	 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch	 Outfall	 Inlet	 Culvert 128	 Pipe	 Drain		
 BMP Drainage Area	 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch										
 Outfall	 Inlet	 Culvert 128	 Pipe	 Drain												



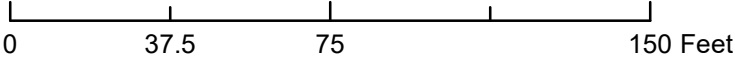








































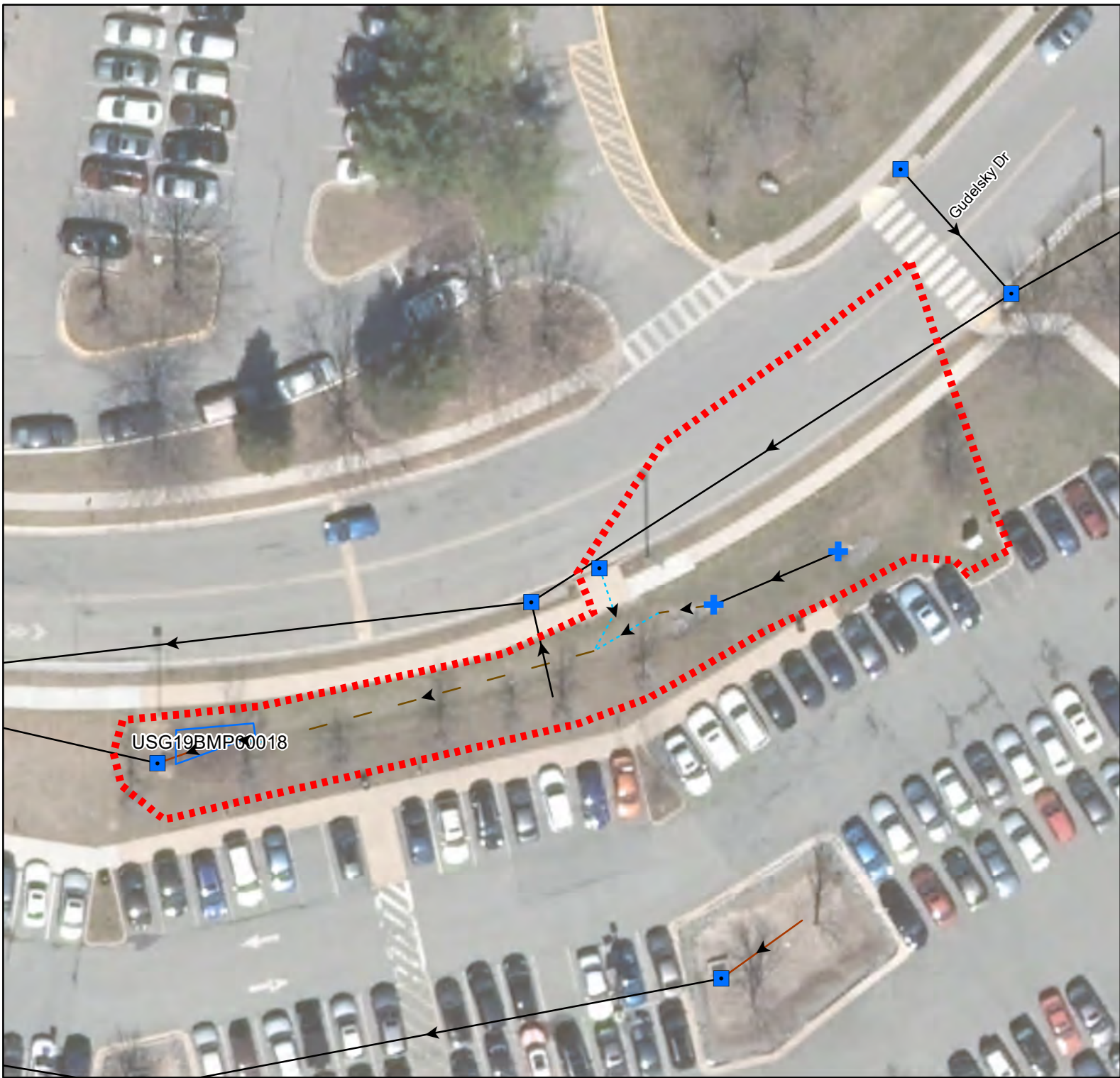
	<h2>USG / IBBR BMP Drainage Area</h2>	<p>BMP ID: USG19BMP00015</p> <p>BMP Type: Micro-Bioretention</p> <p>Drainage Area (ac): 0.45</p> <p>Impervious Area (ac): 0.29</p> <p>Pe: 1.29 Inspection Status: Pass</p>				
 						
 BMP Drainage Area	 SWMFAC  Outfall	 Manhole  Inlet	 Head/Endwall  Culvert 129	 Control Structure  Pipe	 Hydraulic Connection  Drain	 Ditch



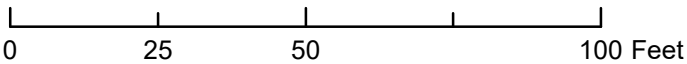










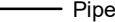











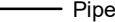











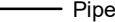






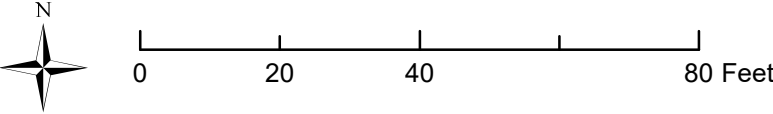
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 	<table border="0"> <tr> <td> BMP Drainage Area</td> <td> SWMFAC</td> <td> Manhole</td> <td> Head/Endwall</td> <td> Control Structure</td> <td> Hydraulic Connection</td> <td> Ditch</td> </tr> <tr> <td> Outfall</td> <td> Inlet</td> <td> Culvert 130</td> <td> Pipe</td> <td> Drain</td> <td colspan="2"></td> </tr> </table>		 BMP Drainage Area	 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch	 Outfall	 Inlet	 Culvert 130	 Pipe	 Drain		
 BMP Drainage Area	 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch										
 Outfall	 Inlet	 Culvert 130	 Pipe	 Drain												






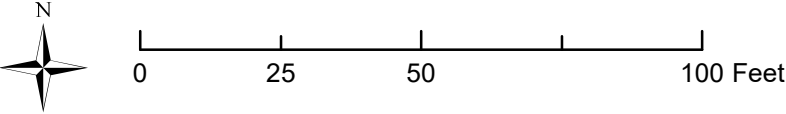
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<table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td> BMP Drainage Area</td> <td> SWMFAC</td> <td> Manhole</td> <td> Head/Endwall</td> <td> Control Structure</td> <td> Hydraulic Connection</td> <td> Ditch</td> </tr> <tr> <td> Outfall</td> <td> Inlet</td> <td> Culvert 131</td> <td> Pipe</td> <td> Drain</td> <td colspan="2"></td> </tr> </table>			 BMP Drainage Area	 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch	 Outfall	 Inlet	 Culvert 131	 Pipe	 Drain		
 BMP Drainage Area	 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch										
 Outfall	 Inlet	 Culvert 131	 Pipe	 Drain												



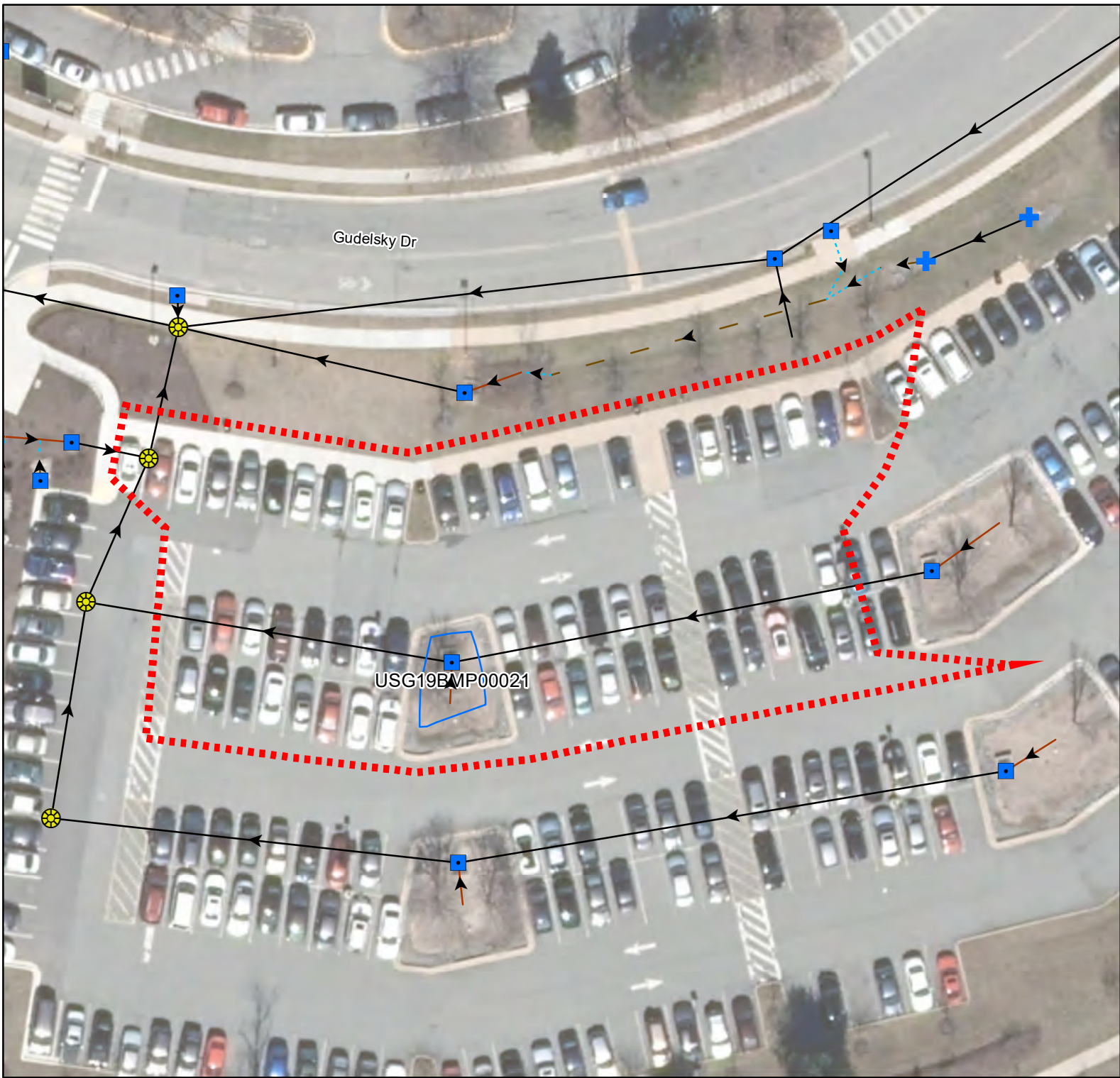
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<table border="0"> <tr> <td> BMP Drainage Area</td> <td> SWMFAC</td> <td> Manhole</td> <td> Head/Endwall</td> <td> Control Structure</td> <td> Hydraulic Connection</td> <td> Ditch</td> </tr> <tr> <td> Outfall</td> <td> Inlet</td> <td> Culvert</td> <td> Pipe</td> <td> Drain</td> <td colspan="2"></td> </tr> </table>			BMP Drainage Area	SWMFAC	Manhole	Head/Endwall	Control Structure	Hydraulic Connection	Ditch	Outfall	Inlet	Culvert	Pipe	Drain		
BMP Drainage Area	SWMFAC	Manhole	Head/Endwall	Control Structure	Hydraulic Connection	Ditch										
Outfall	Inlet	Culvert	Pipe	Drain												





	<h2>USG / IBBR BMP Drainage Area</h2>	<p>BMP ID: USG19BMP00020          BMP Type: Bioretention          Drainage Area (ac): 0.5          Impervious Area (ac): 0.35          Pe: 0.7 Inspection Status: Fail</p>														
																
<table border="0"> <tr> <td> BMP Drainage Area</td> <td> SWMFAC</td> <td> Manhole</td> <td> Head/Endwall</td> <td> Control Structure</td> <td> Hydraulic Connection</td> <td> Ditch</td> </tr> <tr> <td> Outfall</td> <td> Inlet</td> <td> Culvert 133</td> <td> Pipe</td> <td> Drain</td> <td colspan="2"></td> </tr> </table>			BMP Drainage Area	SWMFAC	Manhole	Head/Endwall	Control Structure	Hydraulic Connection	Ditch	Outfall	Inlet	Culvert 133	Pipe	Drain		
BMP Drainage Area	SWMFAC	Manhole	Head/Endwall	Control Structure	Hydraulic Connection	Ditch										
Outfall	Inlet	Culvert 133	Pipe	Drain												





## USG / IBBR BMP Drainage Area

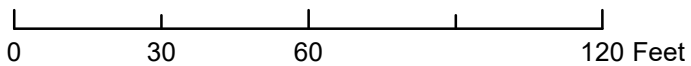
BMP ID: USG19BMP00021

BMP Type: Bioretention

Drainage Area (ac): 0.47

Impervious Area (ac): 0.43

Pe: 0.29 Inspection Status: Fail



- |                   |        |         |              |                   |                      |       |
|-------------------|--------|---------|--------------|-------------------|----------------------|-------|
| BMP Drainage Area | SWMFAC | Manhole | Head/Endwall | Control Structure | Hydraulic Connection | Ditch |
| Outfall           | Inlet  | Culvert | Pipe         | Drain             |                      |       |





## USG / IBBR BMP Drainage Area

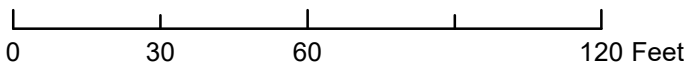
BMP ID: USG19BMP00022

BMP Type: Bioretention

Drainage Area (ac): 0.69

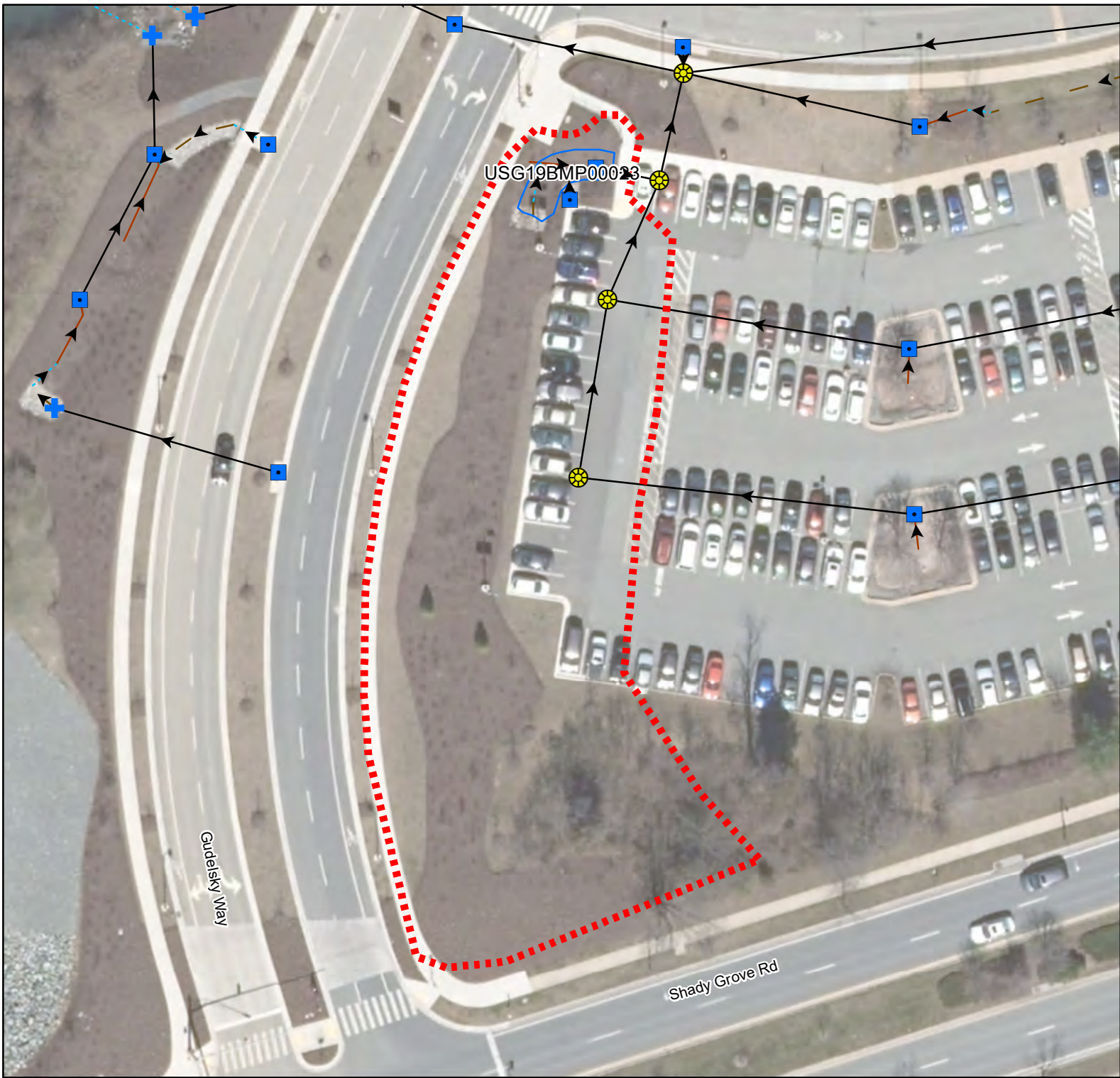
Impervious Area (ac): 0.47


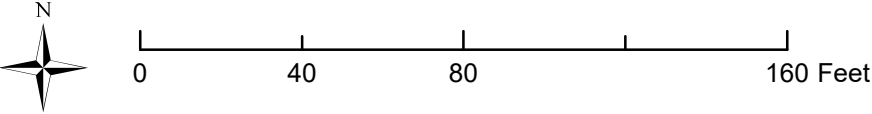




































Pe: 0.48 Inspection Status: Fail



- BMP Drainage Area
- SWMFAC
- Manhole
- Head/Endwall
- Control Structure
- Hydraulic Connection
- Ditch
- Outfall
- Inlet
- Culvert 135
- Pipe
- Drain





	<h2>USG / IBBR BMP Drainage Area</h2>	<p>BMP ID: USG19BMP00023</p> <p>BMP Type: Micro-Bioretention</p> <p>Drainage Area (ac): 0.58</p> <p>Impervious Area (ac): 0.18</p> <p>Pe: 0.93 Inspection Status: Pass</p>														
																
<table border="0" style="width: 100%;"> <tr> <td> BMP Drainage Area</td> <td> SWMFAC</td> <td> Manhole</td> <td> Head/Endwall</td> <td> Control Structure</td> <td> Hydraulic Connection</td> <td> Ditch</td> </tr> <tr> <td> Outfall</td> <td> Inlet</td> <td> Culvert 136</td> <td> Pipe</td> <td> Drain</td> <td colspan="2"></td> </tr> </table>			 BMP Drainage Area	 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch	 Outfall	 Inlet	 Culvert 136	 Pipe	 Drain		
 BMP Drainage Area	 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch										
 Outfall	 Inlet	 Culvert 136	 Pipe	 Drain												



Appendix D -  
Declaration of Covenants and  
Easements by and between  
Montgomery County, Maryland and the  
State of Maryland to the use of the  
University of Maryland System,  
November 1996

PARCEL ID Nos.  
4-1-52548  
4-502-52468.

NOT FILED  
MONTGOMERY COUNTY CLERKS OFFICE  
MONTGOMERY CO. MD  
FEB 12 1998

DECLARATION OF COVENANTS  
AND EASEMENTS  
BY AND BETWEEN  
MONTGOMERY COUNTY, MARYLAND  
AND  
THE STATE OF MARYLAND TO THE USE  
OF THE UNIVERSITY OF MARYLAND SYSTEM

98 FEB 12 P 2:55 P  
FILED  
KOLLY Q. RUMI  
CLERKS OFFICE  
MONTGOMERY COUNTY, MD

DATED

November 12, 1996

TOTAL  
RECEIVED NOVEMBER  
MAY 12 1998  
FEB 12 1998

NO FEE MONTGOMERY CO



DECLARATION OF COVENANTS AND EASEMENTS

THIS DECLARATION OF COVENANTS AND EASEMENTS ("Declaration") is made as of this 12th day of November, 1996 by and between MONTGOMERY COUNTY, MARYLAND, a body politic and corporate of the State of Maryland ("County") and the STATE OF MARYLAND TO THE USE OF THE UNIVERSITY OF MARYLAND SYSTEM ("University").

RECITALS

1. The County, as lessor, and the University, as lessee, entered into (i) a certain writing entitled "Gudelsky Tract Educational Facilities Lease" ("Ed. Facilities Lease") dated as of March 30, 1990 demising to the University a certain unimproved parcel of land of approximately 42± acres and (ii) a second certain writing entitled "Center for Advanced Research in Biotechnology Lease" ("CARB Lease") dated as of June 21, 1990 demising to the University a certain improved parcel of land of approximately 8± acres, both parcels located near the southwesterly corner of the intersection of Shady Grove Road and Route 28, Montgomery County, Maryland.

2. The County and the University desire that title to these two parcels, as improved, be conveyed to the University in fee simple, subject only to certain agreements between them and certain matters recorded among the Land Records of the County.

3. For the purpose of setting forth those matters of agreement, ~~the County and the University entered into a certain writing entitled "Transfer Agreement", dated July 27, 1994.~~

4. The County and the University enter into this Declaration as required and contemplated in the Transfer Agreement, for the purpose of subjecting the property demised under either the Ed. Fac. Lease or the CARB Lease, or parts thereof, to certain easements and covenants for the respective benefit of the County or the University, as the case may be.

NOW THEREFORE, the parties agree and declare as follows:

Article I

WESTERN ACCESS ROAD

Section 1.1 Subject to the terms and conditions of this Declaration, the County hereby grants to the University an, exclusive easement, in perpetuity (but subject to termination as set forth in this Declaration), in, to, over, on, under and through that real property situate in Montgomery County, Maryland more particularly described in Exhibit 1 ("Western Road Area"). The easement granted in this Article I ("Western Road Easement")

shall be appurtenant to that real property situate in Montgomery County, Maryland, conveyed by the County to the University by deed of even date herewith ("Deed") and more particularly described in Exhibit 2 ("UMS Area") and shall be for the benefit of the University, and for the use of UMS its invitees, employees, officers, officials, agents and representatives.

Section 1.2 For as long as the Western Road Easement is in effect ("Western Road Easement Term"), the uses permitted for the Western Road Area shall be limited to (i) surface parking (ii) the location of improvements, equipment or devices ancillary to surface parking and the improvement, reimprovement, and maintenance and operation thereof (iii) open space, or (iv) the location of improvements, equipment or devices to provide public and private utility services in connection with the UMS Area and the improvement, reimprovement, maintenance and operation thereof as are now existing or are generally depicted upon that drawing entitled "Master Plan - University of Maryland System - Shady Grove" and dated March, 1994 ("Master Plan").

Section 1.3 During the Western Road Easement Term the University shall be responsible for the improvement, operation, use, and maintenance of the Western Road Area as if it were the fee simple owner thereof.

Section 1.4 Notwithstanding anything in this Declaration to the contrary, the Western Road Easement shall terminate automatically provided the County gives the University at least three (3) months prior written notice that the County reasonably intends within one year after the termination of the Western Road Easement to initiate construction, or to cause the initiation of construction of a public roadway (generally as depicted on that plat entitled "Right of Way Sketch" attached as Exhibit 3,) partially over the Western Road Area and partially over property adjacent to the Western Road Area ("Western Road"). The Western Road Easement shall terminate automatically effective upon the date provided in the notice given by the County as contemplated above, provided however, the termination date shall be at least three (3) months later than the notice date and the Western Road Easement shall not terminate until the University and County have entered into the Western Road Agreement (as defined below). The County and the University shall cooperate with the other to determine and confirm the date on which the Western Road Easement shall be and has been terminated.

Section 1.5 The County covenants and warrants that the Western Road Area shall be used only (i) as permitted under Section 1.2 as long as the Western Road Easement is in effect,



(ii) for the location of the Western Road, (iii) as a wooded or landscaped open space area, or (iv) any other lawful use with the prior written consent of the University. The covenant of this Section 1.5 touches and concerns the land, and runs with the land for the benefit of the UMS Area and is a burden upon the Western Road Area.

Section 1.6 It is the intent and desire of the County that the University and the UMS Area shall be held harmless from and against any and all damage, and injury to the UMS Area, as improved, and from and against associated liability, costs (including cost of suit and attorneys' fees), claims and actions incurred by the University or to the UMS Area arising in connection with the construction or location of the Western Road but which are not solely caused by the University's actions. The County further acknowledges that the Western Road is intended, in part, for the benefit of the UMS Area to provide access to and from the UMS Area and Route 28. It is the intent and desire of the County that the Western Road connect with and to the vehicular and pedestrian roadway areas within the UMS Area in location, design and number as approved by the University.

Section 1.7 The County and University agree that it is not possible to determine with certainty at present, either the nature or scope of the affects to which the UMS Area may be subject as a result of the construction of the Western Road and the associated costs, or the need for connections into the Western Road, as they may arise upon construction of the Western Road. For that reason, the County and the University agree that they, in good faith and without undue delay or postponement, from and after the notice given to the University pursuant to Section 1.4, shall negotiate and enter into an agreement ("Western Road Agreement") as set forth in this Declaration, as a condition precedent to the termination of the Western Road Easement. The County and the University acknowledge that it shall be necessary to enter into the Western Road Agreement and cause the Western Road Easement to terminate without undue delay or postponement. To that end, the County and University agree to enter into discussions immediately upon proper notice being given by the County and to pursue those discussions conscientiously and in good faith until they have agreed upon the terms and conditions of the Western Road Agreement. In the event that the University and the County have not reached an agreement upon the thirtieth (30th) day after the County has given notice, the Chancellor of the University and the County Executive of the County personally shall meet, as soon as practicable, for the purpose of resolving the differences between the University and the County in respect to entering into the Western Road Agreement. In the event that

the Chancellor and the County Executive have not resolved those differences between the University and the County within fifteen (15) business days after their first meeting, they or one of them shall refer the disputed matters to the Attorney General of the State of Maryland for resolution in accordance with the provisions and intent of this Declaration and applicable law.

Section 1.8 The Western Road Agreement shall include the following among other provisions agreed to by the parties:

(i) the County shall hold the University harmless from and against any and all damage and injury to the UMS Area, as improved and from and against associated liability, costs (including cost of suit and attorneys' fees), damage, claims and actions incurred by the University or to the UMS Area all arising in connection with the construction or location of the Western Road, but which are not solely caused by the University's actions.

(ii) the County, without cost to the University, subject to item (iv) below, shall restore or reimprove or shall cause the restoration or reimprovement of any improvements in or on the UMS Area affected or damaged by the construction of the Western Road, which shall include without limitation grading, paving and striping of affected surface parking areas.

(iii) the County materially shall not interrupt and shall not permit or cause a material interruption of any and all utility services serving the UMS Area during or as a result of the construction of the Western Road.

(iv) in the event that any utility service is provided to the UMS Area through the Western Road Area ("Subject Utility Service"), the County shall remove or cause the removal from the Western Road Area of any and all property directly or indirectly used in the provision of each and every Subject Utility Service, and shall undertake any and all construction, reconstruction, improvement or reimprovement and any other appropriate action whatsoever required (i) to provide to the UMS Area Subject Utility Services (using then available technology and existing improvements) in quality and quantity at least equal to that previously provided, and (ii) to provide the University the rights, interests and estates in perpetuity to locate outside the UMS Area any and all property, equipment and devices associated with Subject Utility Services, as appropriate.



(v) the County shall landscape or cause the landscaping of the Western Road Area as agreed in the Western Road Agreement upon completion of construction of the Western Road.

(vi) the County shall plant on the UMS Area a tree barrier to separate the UMS Area from the public vehicular and pedestrian roadway use of the Western Road. The plan for such landscaping and planting and obligations for maintenance and replanting shall be included in the Western Road Agreement.

(vii) the County shall construct or cause the construction of vehicular and pedestrian access between the UMS Area and the Western Road, including, but not by way of limitation, signage and speed bumps, all in quantity, location and nature as agreed in the Western Road Agreement.

(viii) in the event any of the obligations on the part of the County in the Western Road Agreement require the expenditure of money by the County, the County shall be obligated to expend the same from then currently appropriated or otherwise available funds.

(ix) In the event that the County shall perform its obligations for the benefit of the University under the Western Road Agreement by causing a third party ("Contractor") to perform the same, as permitted in this Declaration, the County shall cause each Contractor to provide a surety acceptable to the University assuring the performance of the work and payment of all costs.

(x) the County shall warrant in the Western Road Agreement (among other provisions) that, to the extent that any and all work to be performed affects the UMS Area, each Contractor shall be obligated to the University under the Western Road Agreement or otherwise as follows:

(a) the contractor shall obtain and maintain errors and omissions insurance, if appropriate, for the benefit of the University, in amounts satisfactory to the University,

(b) the Contractor shall indemnify the University and hold it harmless from and against any and all matters arising from its engagement and performance or failure to perform,

(c) the contractor shall carry public liability insurance naming the University as a named or additional insured, in amounts satisfactory to the University.

(d) the contractor shall enter upon the UMS Area only in accordance with a right of entry granted by the

University.

(xi) the County agrees that any work performed on the UMS Area under the Western Road Agreement shall be in conformance with plans and specifications approved by the University exercising its discretion reasonably and with applicable general conditions governing work on University property, and that all designs, drawings and plans shall be for the benefit for, and if appropriate sealed to, the University and shall be the property of the University.

(xii) the County agrees that any and all work to be performed under the Western Road Agreement shall be without any cost whatsoever to the University.

Section 1.9 The County agrees that (i) in the event that it no longer intends to construct or have constructed the Western Road or (ii) desires to abandon the Western Road once constructed, it shall convey, subject to acceptance thereof by the University, the Western Road Area to the University in fee simple without further consideration therefor. The parties agree that upon such conveyance the Western Road Easement shall terminate automatically.

Section 1.10 During the Western Road Easement Term, the University, exercising its discretion reasonably, shall grant rights of entry to the County and its employees, agents, representatives and officers, to enter upon the UMS Area and the Western Road Area and to undertake thereon inspections, testing and surveys as permitted in and subject to the conditions established in the right of entry granted by the University.

Section 1.11 Notwithstanding anything herein to the contrary, upon request by the University and agreement by the County, the County may perform some or all of its obligations under the Western Road Agreement by the payment to the University of a sum or sums of money, as agreed by them.

## Article II

### WIDENING OF ROUTE 28

Section 2.1 The parties acknowledge that the County intends to widen and realign the existing Route 28 abutting the UMS Area at some unspecified date in the future. In furtherance of this project, upon request by the County, the University shall convey to the County, by deed or other appropriate writing, or confirm title in the State of Maryland for the use of the Maryland State Highway Administration to, all or a portion of that real property situate on the south side of Route 28 near the intersection with Shady Grove road as is more particularly described in Exhibit 4



("Route 28 Widening Area").

Section 2.2 As a condition of such conveyance, the County shall covenant and warrant to the University that the County (i) shall be responsible, without cost to the University or interruption of service, for the provision and reprovision, location and relocation of utility services and associated property provided through or located on the Route 28 Widening Area, or affected by the widening of the existing Route 28 and (ii) shall be responsible, without cost to the University, for the restoration of the University's property, real and personal, affected by the widening of the existing Route 28.

Section 2.3 In furtherance of the widening of the existing Route 28, the University shall grant to the County upon request temporary construction and slope easements as may be necessary on terms and conditions satisfactory to the University.

### ARTICLE III

#### REALIGNMENT OF ROUTE 28 AND GREAT SENECA HIGHWAY

The County contemplates that the realignment of the existing Route 28 in the future may result in the relocation of the roadway northward so that (i) the roadway and the UMS Area may no longer abut near the intersection of Shady Grove Road and Route 28, as realigned and (ii) a piece of land may lie between the UMS Area and the realigned roadway ("Abandoned Area"). The County may desire to abandon the Abandoned Area for roadway purposes; in which event the County intends that the Abandoned Area be conveyed to the University for no further consideration, but in accordance with the then existing ordinances and regulations governing the disposition and acquisition of such property. The parties now contemplate the conveyance of the Abandoned Property to the University and agree that they each shall cooperate with the other in furtherance thereof.

### Article IV

#### DEVELOPMENT OF THE UMS AREA

Section 4.1 The County and the University acknowledge (i) that, in part, the County previously leased the UMS Area to the University and shall convey the UMS Area to the University to further the goal of establishing and developing a Life Sciences Center at Shady Grove ("Life Sciences Center") and (ii) that a coordinated effort of development of the UMS Area and the Life Sciences Center will be of mutual benefit. To effectuate that coordinated effort of development, the University has adopted the Master Plan which has been submitted to the Maryland National Capital Park and Planning Commission and for mandatory review

("MNCPPC") and approved by the MNCPPC with the concurrence of the County. The University agrees it shall develop the UMS Area only in accordance with the Master Plan, as amended from time to time. The University reserves the right to amend the Master Plan from time to time, subject to the development and use restrictions set forth herein, and after consultation with the County shall submit each amendment to MNCPPC for mandatory review as contemplated in Section 7-112 of Article 28 of the Annotated Code of Maryland.

Section 4.2 The University and County agree and acknowledge that although (i) conveyance of the UMS Area is in part to further the establishment and development of the Life Sciences Center, and (ii) the UMS Area is a part of the Life Sciences Center, the UMS Area shall not be bound by development or use restrictions or assessments or encumbrances applicable to the remainder of or other portions of the Life Sciences Center except as specifically agreed to by the parties in writing.

Section 4.3 The University and County acknowledge and agree that the development of the UMS Area must be supported by public facilities adequate to support and serve the proposed development, and that the proposed development should not overburden existing programs of public services. In complete recognition of such mutual acknowledgement and agreement and to avert any such overburdening of existing programs, the University agrees to restrict construction of new buildings on the UMS Area in accordance with the following schedule:

Not Earlier Than:	Additional Net Square Footage
1994	30,000 sq. ft.
1996	63,000 sq. ft.
1998	120,000 sq. ft.

It being understood that the above restrictions are cumulative and the square foot restrictions established in connection with any one year shall be in addition to those restrictions set forth in each and every previous year.

Section 4.4 The University covenants that all water and waste water connections, electrical and telephone connections and installations of pipes, drains and wires to buildings shall be made underground.

#### Article V

#### STORM WATER MANAGEMENT

Section 5.1 The County and the University acknowledge that



the storm water management ponds, natural water courses and ancillary improvements and equipment which accommodate the run-off of storm water in, on, over and through the UMS Area ("Storm Water System") is a regional facility which serves generally the UMS Area, (which is the on-site drainage area), and that area located to the north of the UMS Area ("Off-Site Drainage Area") both generally depicted on Exhibit 5. The County represents that the Storm Water System, as configured as of the date of this Declaration, was designed to accommodate water run-off from the UMS Area and the Off-Site Drainage Area each improved with non-pervious covering not exceeding seventy-two percent (72%) of surface area of each respectively (each a "Development Limit"). Subject to the terms and conditions of this Declaration, the Off-Site Drainage Area shall enjoy and benefit from a nonexclusive easement in, under, through, and over (i) that portion of the UMS Area in which the Storm Water System as configured and reconfigured is located and relocated all from time to time ("Storm Water Area") and (ii) the Storm Water System as configured and reconfigured, and improved and reimproved from time to time for the lawful storm water runoff from the Off-Site Drainage Area.

Section 5.2 a. In recognition that the Storm Water System benefits both the UMS Area and the Off-Site Drainage Area, the County and the University agree to share between them the cost and obligations of operating and maintaining the Storm Water System as set forth below.

b. The University shall provide landscaping (grass cutting, etc.) and trash removal maintenance for the Storm Water System.

c. The County will provide maintenance for the Storm Water System to keep it in proper working condition in accordance with approved design standards. The County will make structural repairs and improvements and have accumulated sediment removed at the County's discretion when necessary for the proper functioning of the Storm Water System. Removal of sediment affecting the recreational or aesthetic qualities of the Storm Water System shall be the University's responsibility.

d. The University shall provide and maintain perpetual access from public rights-of-way to the Storm Water System for the County and its agents.

e. The University shall grant the County and its agents a right of entry to the Storm Water System for the purpose of inspecting, monitoring, operating, installing, constructing, reconstructing, modifying, maintaining or repairing the Storm Water system as required by the County hereunder.

f. The University shall remove solid waste from and control weeds in the Storm Water Area in accordance with the standards and requirements set forth in Chapters 48 and 58 of the Montgomery County Code.

g. The University shall not permit trees to be planted or grown naturally on any part of the dam structure, if any, which is a part of the Storm Water System.

h. In the event that the improvement, reimprovement, reconfiguration or other changes are required in order to bring the Storm Water System into compliance with applicable law, ordinances, rules or regulations promulgated or in effect after the date of this Declaration the University and County shall share the cost of the required work pro rata in accordance with the relative area of the UMS Area and the Off-Site Drainage Area.

i. In the event that the County performs or causes the performance of any work on the UMS Area in performance of its obligations under this Section 5.2 ("County Storm Water Obligations"), the County shall comply with the obligations set forth in Section 1.8 items viii - xi in connection with the Western Road Agreement but in connection the County Storm Water Obligations as if such obligations were fully set forth in this Section 5.2.i.

~~j. Each party shall promptly give the other notice when it legally transfers any of its responsibilities for the Storm Water System and shall deliver a copy of any document of transfer with such notice.~~

Section 5.3 The County and University each confirm that the present Storm Water System, which collects and channels storm water on the UMS Area by way of surface run-off, may not be appropriate or adequate for the further development and improvement of the UMS Area in conformance with the Master Plan. In the event the development of the UMS Area makes appropriate installation of certain improvements to be located underground for the collection and distribution of waste water through the Storm Water Area to replace or supplement in entirety or in part, the Storm Water System, as then configured from time to time, the County agrees that the University shall have the right to install the same and that the County and University shall share equally in the costs of planning, design, purchasing, constructing, and installing the Underground System ("Underground System Installation"). The University shall consult and cooperate with the County in a timely and appropriate manner in the scheduling of Underground System Installation for the purpose of assuring the County's easement granted herein and of allowing the County



to secure an appropriation or other funding for its share of the costs of the Underground System Installation ("County Share"). If County is unable to secure an appropriation or other funds for the purposes of paying its share of the costs of the Underground System Installation ("County Share"), then the University may proceed with the Underground System Installation, initially at its sole cost, and the full unpaid amount of the County Share shall be paid as a condition to the construction of any further building in the Off Site Drainage Area.

Section 5.4 Provided that the development and improvement of the UMS Area does not exceed the Development Limit, the County shall bear any and all costs and to cure detrimental effects of and prevent further overflow from or damage to the Storm Water System or effects to the natural slope, level of the water table, or ground stability in the UMS Area resulting from run-off from the Off-Site Drainage Area.

Section 5.5 The County, and no other person, shall have the right to enforce or enjoy a remedy in connection with the obligations of the University under this Article V.

#### Article VI

##### USE OF UMS AREA

Section 6.1 It is agreed that the UMS Area shall only be used for educational purposes, for the purposes of research and development or for public service purposes consistent with the University's mission. Notwithstanding anything in this Declaration to the contrary, the County shall have the right to enforce this covenant by exercising the possibility of reverter reserved to the County, as grantor, in that deed of even date herewith by which the County has conveyed the UMS Area to the University. No other person shall have the right to enforce, nor enjoy a remedy in law or in equity in connection with the use restrictions set forth in this Article VI.

Section 6.2 The University shall use and operate the UMS Area in accordance with applicable law, rules, regulation and order, including without limitation those which govern the storing, discharge of, and disposal of hazardous materials, petrochemicals, nuclear materials and biohazardous wastes.

Section 6.3 The University shall insure the improvements located on, in, under and through the UMS Area, or cause them to be insured against casualty or damage, for full replacement value, for so long as the County has a future right or interest in or to any of them under this Declaration or the Deed. It is agreed that insurance of any such improvements owned by the State of Maryland under the self insurance and/or commercial insurance

program operated and maintained by the Treasurer of the State of Maryland generally for property owned by the State of Maryland shall satisfy the obligation of the University under this Section 6.3.

## Article VII

### GENERAL PROVISIONS

Section 7.1 Notices. Any notice (which shall include, but not be limited to, a demand, a consent, an approval, a request or any other communication or document) to be provided hereunder or under the Deed (a) shall be in writing, and (b) shall be (i) sent as certified or registered mail in the United States mails, postage prepaid, return receipt requested, to the address of such person which is set forth herein or to such other address in the United States of America as such person may designate from time to time by notice to the other as hereinafter provided, or (ii) if such person's receipt thereof is acknowledged in writing, given by hand or other actual delivery to such person, or (iii) if such person's receipt thereof is acknowledged in writing, given by Federal Express or other national overnight courier service. The addresses of the parties for the receipt of notices shall be as follows:

If to County

Montgomery County, Maryland  
Department of Facilities and Services  
Division of Real Estate Management  
110 N. Washington Street  
3rd floor  
Rockville, MD 20850

With copies to:

Montgomery County, Maryland  
Office of Economic Development  
50 Monroe Street  
15th Floor  
Rockville, MD 20850  
Attention: Director

and

Montgomery County, Maryland  
County Attorney  
50 Monroe Street  
3rd Floor  
Rockville, MD 20850

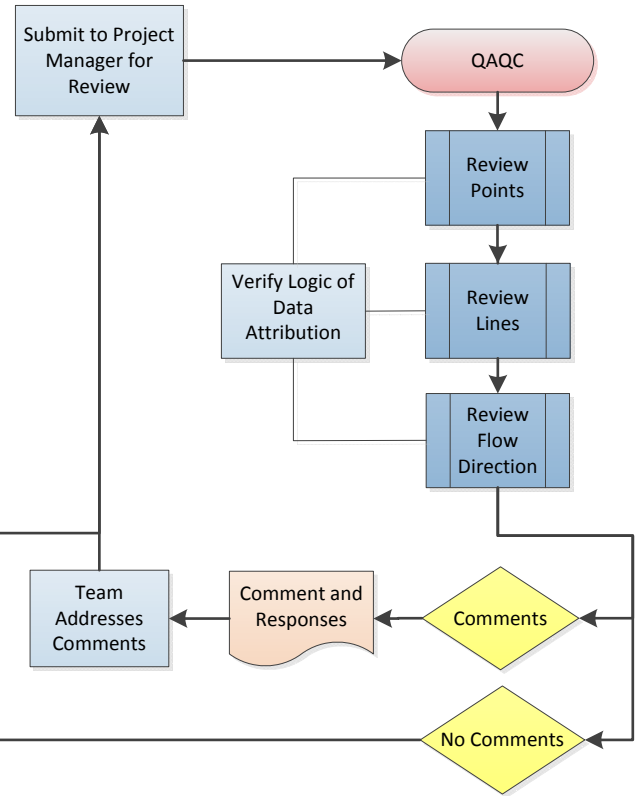
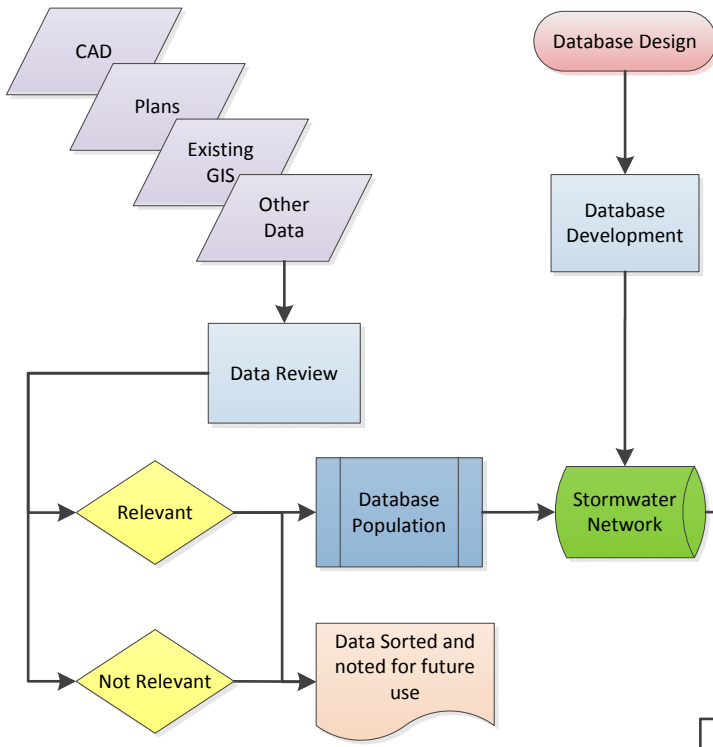


# Appendix E - Stormwater Data Collection QAQC Plan

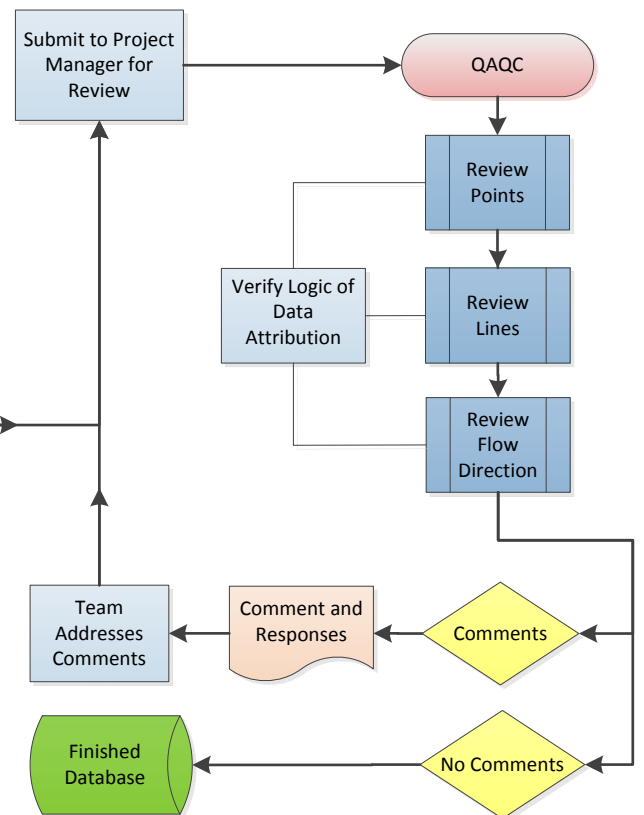
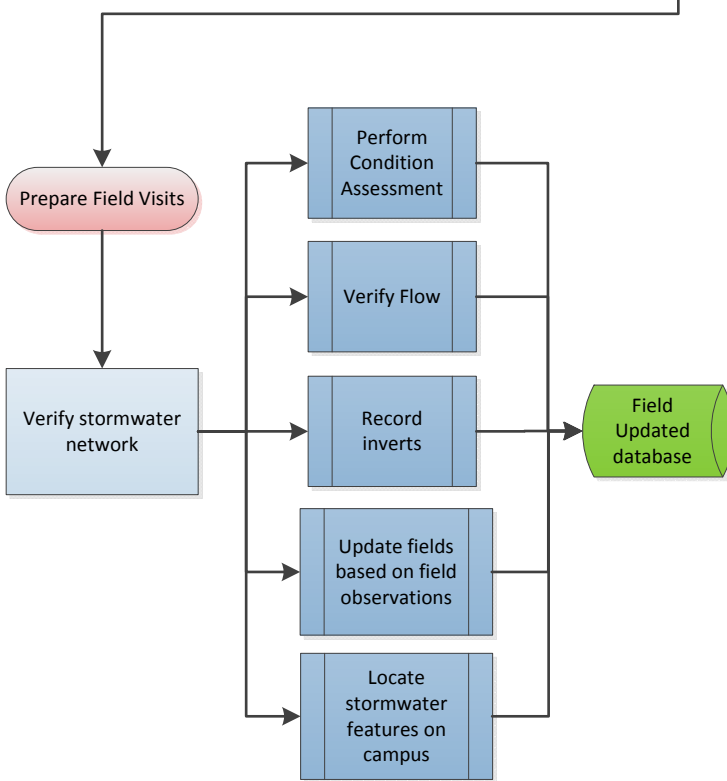
Data Migration Phase

Data Attribution and Updates

QAQC



Field Verification





# Appendix F - Stormwater Computations



**Project:** Universities at Shady Grove - Building 2  
**Date:** June 12, 2019

**Sand Filter # BMP00002**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	0 sq.ft.
DA from Hydrologic Soil Group C	126,598 sq.ft.
DA from Hydrologic Soil Group D	0 sq.ft.
<hr/>	
Total Drainage Area to Device	124,499 sq.ft.
Total Impervious Area to Device	83,964 sq.ft.
Percent Impervious	67.4%
Volumetric Runoff Coefficient (Rv)	0.656974901
<b>Target ESDv</b>	<b>6,816 cu. ft.</b>

Facility's Storage Computations	
Pretreatment Volume Required	1,704 cu. ft.
Pretreatment Volume Provided	115 cu. ft.
<b>25% of ESDv is NOT provided in pretreatment</b>	
Dry Storage Provided Above Filter	248 cu. ft.
Total Above Ground Storage Required	5,112 cu. ft.
Total Above Ground Storage Provided	362 cu. ft.
<b>Temporary Storage is NOT provided for 75% of ESDv</b>	

<b>Total ESDv Provided</b>	<b>483 cu. ft.</b>
<b>Pe Provided</b>	<b>0.07 inches</b>
<b>Impervious Area Credit</b>	<b>0.14 acres</b>

Facility's Dimensions	
Area of Forebay ( $A_{fb}$ )	382 sq.ft.
Area of Filter ( $A_f$ )	826 sq.ft.
Area of 10 yr WSEL (sq ft)	2,099 sq.ft.
Ponding Depth ( $D_{ponding}$ )	4 inches
Depth of Top Soil ( $D_{top\ soil}$ )	12 inches
Depth of Sand ( $D_{sand}$ )	69 inches

$$Volume_{pretreatment} = A_{fb} * \frac{D_{ponding}}{12}$$

$$Volume_{DRY} = A_f * \frac{D_{ponding}}{12}$$

$$Volume_{Above\ Ground\ Storage} = Volume_{pretreatment} + Volume_{DRY}$$

$$ESDv_{provided} = (Volume_{pretreatment} + Volume_{DRY})/0.75$$





**Project:** Universities at Shady Grove - IBBR Infiltration Trenches  
**Date:** June 7, 2019

**Infiltration Trench # BMP00003**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	0 sq.ft.
DA from Hydrologic Soil Group C	12,257 sq.ft.
DA from Hydrologic Soil Group D	0 sq.ft.
<hr/>	
Total Drainage Area to Device	12,257 sq.ft.
Total Impervious Area to Device	6,027 sq.ft.
Percent Impervious	49.2%
Volumetric Runoff Coefficient (Rv)	0.49253009
<b>Target ESDv</b>	<b>503 cu. ft.</b>

Facility's Dimensions	
Length of Trench ( L )	42 ft.
Width of Trench (W)	3 ft.
Depth of Trench(D)	5 ft
Void Fraction (vf)	0.4

<b>Total ESDv Provided</b>	<b>252 cu. ft.</b>
<b>Pe Provided</b>	<b>0.50 inches</b>
<b>Impervious Area Credit</b>	<b>0.07 Acres</b>

$$ESD_{PROVIDED} = L * W * D * vf$$



**Project:** Universities at Shady Grove - IBBR Infiltration Trenches  
**Date:** June 7, 2019

**Infiltration Trench # BMP00005**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	0 sq.ft.
DA from Hydrologic Soil Group C	3,360 sq.ft.
DA from Hydrologic Soil Group D	0 sq.ft.
<hr/>	
Total Drainage Area to Device	3,360 sq.ft.
Total Impervious Area to Device	2,633 sq.ft.
Percent Impervious	78.4%
Volumetric Runoff Coefficient (Rv)	0.75535337
<b>Target ESDv</b>	<b>211 cu. ft.</b>

Facility's Dimensions	
Length of Trench ( L )	12 ft.
Width of Trench (W)	10 ft.
Depth of Trench(D)	5 ft
Void Fraction (vf)	0.4

<b>Total ESDv Provided</b>	<b>228 cu. ft.</b>
<b>Pe Provided</b>	<b>1.08 inches</b>
<b>Impervious Area Credit</b>	<b>0.06 Acres</b>

$$ESD_{PROVIDED} = L * W * D * vf$$





**Project:** Universities at Shady Grove - IBBR Infiltration Trenches  
**Date:** June 7, 2019

**Infiltration Trench # BMP00006**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	0 sq.ft.
DA from Hydrologic Soil Group C	25,837 sq.ft.
DA from Hydrologic Soil Group D	0 sq.ft.
<hr/>	
Total Drainage Area to Device	25,837 sq.ft.
Total Impervious Area to Device	20,731 sq.ft.
Percent Impervious	80.2%
Volumetric Runoff Coefficient (Rv)	0.77214096
<b>Target ESDv</b>	<b>1,663 cu. ft.</b>

Facility's Dimensions	
Length of Trench ( L )	27 ft.
Width of Trench (W)	24 ft.
Depth of Trench(D)	5 ft
Void Fraction (vf)	0.4

<b>Total ESDv Provided</b>	<b>1,296 cu. ft.</b>
<b>Pe Provided</b>	<b>0.78 inches</b>
<b>Impervious Area Credit</b>	<b>0.37 Acres</b>

$$ESD_{PROVIDED} = L * W * D * vf$$



Project: Universities at Shady Grove - IBBR Pond  
 Date: 4/26/2019

IBBR Pond **BMP00007**

**Facility's Storage Volume**

Elevation (ft)	Area (sq ft)	Difference (ft)	Incremental Volume (cu ft)	Cumulative Volume (cu ft)	Cumulative Volume (ac ft)
436	5,000	-	0	0	0
438	8,000	2.00	13,000	13,000	0.30
438.5	10,255	0.50	4,564	17,564	0.40

\*pond elevation of 436 is an assumed elevation & has not been field verified

**Facility's Storage Computations**

Drainage Area	2.84 Ac.
Impervious Drainage Area	1.11 Ac.
Required Treatment Volume @ 1"	4,029 cu.ft.
Provided WQv Volume	17,564 cu.ft.
Pe	4.4 in.
Impervious acreage credit	1.55 Ac.

Required Forebay Volume @ 0.1"	403 cu.ft.
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**Project:** Universities at Shady Grove - Shady Grove Garage  
**Date:** June 12, 2019

**Microbioretention # BMP00012**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	0 sq.ft.
DA from Hydrologic Soil Group C	0 sq.ft.
DA from Hydrologic Soil Group D	17,932 sq.ft.
<hr/>	
Total Drainage Area to Device	15,832 sq.ft.
Total Impervious Area to Device	6,471 sq.ft.
Percent Impervious	40.9%
Volumetric Runoff Coefficient (Rv)	0.41782454
<b>Target ESDv</b>	<b>551 cu. ft.</b>

Facility's Storage Computations	
Pretreatment Volume Provided	0 cu. ft.
Dry Storage Provided Above Filter	929 cu. ft.
Total Above Ground Storage Required	413 cu. ft.
Total Above Ground Storage Provided	929 cu. ft.

**Temporary Storage is provided for 75% of ESDv**

<b>Total ESDv Provided</b>	<b>1,238 cu. ft.</b>
<b>Pe Provided</b>	<b>2.25</b>
<b>Impervious Area Credit</b>	<b>0.19 acres</b>

Facility's Dimensions	
Area of Forebay ( $A_{fb}$ )	0 sq.ft.
Area of Filter ( $A_f$ )	1,548 sq.ft.
Area of 10 yr WSEL	2,100 sq.ft.
Ponding Depth ( $D_{ponding}$ )	6 inches
Depth of Mulch Layer ( $D_{mulch}$ )	3 inches
Depth of Filter Media ( $D_{media}$ )	42 inches
Depth of Coarse Sand ( $D_{sand}$ )	4 inches
Depth of No. 7 Stone ( $D_7$ )	4 inches
Depth of No. 57 Stone ( $D_{57}$ )	6 inches

Note: Forebay not required  
 Area of the filter is at least 2% of the drainage area

$$Volume_{pretreatment} = A_{fb} * \frac{D_{mulch} + D_{ponding}}{12}$$

$$Volume_{DRY} = A_f * \frac{0.4 * D_{mulch} + D_{ponding}}{12}$$

$$Volume_{Above\ Ground\ Storage} = Volume_{pretreatment} + Volume_{DRY}$$

$$ESDv_{Provided} = (Volume_{pretreatment} + Volume_{DRY})/0.75$$



**Project:** Universities at Shady Grove - Shady Grove Garage  
**Date:** June 12, 2019

**Microbioretention # BMP00013**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	0 sq.ft.
DA from Hydrologic Soil Group C	0 sq.ft.
DA from Hydrologic Soil Group D	18,523 sq.ft.
<hr/>	
Total Drainage Area to Device	17,223 sq.ft.
Total Impervious Area to Device	14,332 sq.ft.
Percent Impervious	83.2%
Volumetric Runoff Coefficient (Rv)	0.79892504
<b>Target ESDv</b>	<b>1,147 cu. ft.</b>

Facility's Storage Computations	
Pretreatment Volume Provided	0 cu. ft.
Dry Storage Provided Above Filter	563 cu. ft.
Total Above Ground Storage Required	860 cu. ft.
Total Above Ground Storage Provided	563 cu. ft.

**Temporary Storage is NOT provided for 75% of**

<b>Total ESDv Provided</b>	<b>750 cu. ft.</b>
<b>Pe Provided</b>	<b>0.65</b>
<b>Impervious Area Credit</b>	<b>0.22 acres</b>

Facility's Dimensions	
Area of Forebay ( $A_{fb}$ )	0 sq.ft.
Area of Filter ( $A_f$ )	938 sq.ft.
Area of 10 yr WSEL	1,300 sq.ft.
Ponding Depth ( $D_{ponding}$ )	6 inches
Depth of Mulch Layer ( $D_{mulch}$ )	3 inches
Depth of Filter Media ( $D_{media}$ )	25 inches
Depth of Coarse Sand ( $D_{sand}$ )	4 inches
Depth of No. 7 Stone ( $D_7$ )	4 inches
Depth of No. 57 Stone ( $D_{57}$ )	6 inches

Note: Forebay not required  
 Area of the filter is at least 2% of the drainage area

$$Volume_{pretreatment} = A_{fb} * \frac{D_{mulch} + D_{ponding}}{12}$$

$$Volume_{DRY} = A_f * \frac{0.4 * D_{mulch} + D_{ponding}}{12}$$

$$Volume_{Above\ Ground\ Storage} = Volume_{pretreatment} + Volume_{DRY}$$

$$ESDv_{Provided} = (Volume_{pretreatment} + Volume_{DRY})/0.75$$





**Project:** Universities at Shady Grove - Shady Grove Garage  
**Date:** June 12, 2019

**Microbioretention # BMP00014**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	0 sq.ft.
DA from Hydrologic Soil Group C	0 sq.ft.
DA from Hydrologic Soil Group D	18,823 sq.ft.
<hr/>	
Total Drainage Area to Device	16,123 sq.ft.
Total Impervious Area to Device	12,825 sq.ft.
Percent Impervious	79.5%
Volumetric Runoff Coefficient (Rv)	0.7658727
<b>Target ESDv</b>	<b>1,029 cu. ft.</b>

Facility's Storage Computations	
Pretreatment Volume Provided	0 cu. ft.
Dry Storage Provided Above Filter	1,189 cu. ft.
Total Above Ground Storage Required	772 cu. ft.
Total Above Ground Storage Provided	1,189 cu. ft.

**Temporary Storage is provided for 75% of ESDv**

<b>Total ESDv Provided</b>	<b>1,586 cu. ft.</b>
<b>Pe Provided</b>	<b>1.54</b>
<b>Impervious Area Credit</b>	<b>0.33 acres</b>

Facility's Dimensions	
Area of Forebay ( $A_{fb}$ )	0 sq.ft.
Area of Filter ( $A_f$ )	1,982 sq.ft.
Area of 10 yr WSEL	2,700 sq.ft.
Ponding Depth ( $D_{ponding}$ )	6 inches
Depth of Mulch Layer ( $D_{mulch}$ )	3 inches
Depth of Filter Media ( $D_{media}$ )	25 inches
Depth of Coarse Sand ( $D_{sand}$ )	4 inches
Depth of No. 7 Stone ( $D_7$ )	4 inches
Depth of No. 57 Stone ( $D_{57}$ )	6 inches

Note: Forebay not required  
 Area of the filter is at least 2% of the drainage area

$$Volume_{pretreatment} = A_{fb} * \frac{D_{mulch} + D_{ponding}}{12}$$

$$Volume_{DRY} = A_f * \frac{0.4 * D_{mulch} + D_{ponding}}{12}$$

$$Volume_{Above\ Ground\ Storage} = Volume_{pretreatment} + Volume_{DRY}$$

$$ESDv_{Provided} = (Volume_{pretreatment} + Volume_{DRY})/0.75$$



**Project:** Universities at Shady Grove - Shady Grove Garage  
**Date:** June 12, 2019

**Microbioretention # BMP00015**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	0 sq.ft.
DA from Hydrologic Soil Group C	0 sq.ft.
DA from Hydrologic Soil Group D	19,759 sq.ft.
<hr/>	
Total Drainage Area to Device	17,259 sq.ft.
Total Impervious Area to Device	12,404 sq.ft.
Percent Impervious	71.9%
Volumetric Runoff Coefficient (Rv)	0.69678921
<b>Target ESDv</b>	<b>1,002 cu. ft.</b>

Facility's Storage Computations	
Pretreatment Volume Provided	0 cu. ft.
Dry Storage Provided Above Filter	966 cu. ft.
Total Above Ground Storage Required	752 cu. ft.
Total Above Ground Storage Provided	966 cu. ft.

**Temporary Storage is provided for 75% of ESDv**

<b>Total ESDv Provided</b>	<b>1,288 cu. ft.</b>
<b>Pe Provided</b>	<b>1.29</b>
<b>Impervious Area Credit</b>	<b>0.31 acres</b>

Facility's Dimensions	
Area of Forebay ( $A_{fb}$ )	0 sq.ft.
Area of Filter ( $A_f$ )	1,610 sq.ft.
Area of 10 yr WSEL	2,500 sq.ft.
Ponding Depth ( $D_{ponding}$ )	6 inches
Depth of Mulch Layer ( $D_{mulch}$ )	3 inches
Depth of Filter Media ( $D_{media}$ )	34 inches
Depth of Coarse Sand ( $D_{sand}$ )	4 inches
Depth of No. 7 Stone ( $D_7$ )	4 inches
Depth of No. 57 Stone ( $D_{57}$ )	6 inches

Note: Forebay not required  
 Area of the filter is at least 2% of the drainage area

$$Volume_{pretreatment} = A_{fb} * \frac{D_{mulch} + D_{ponding}}{12}$$

$$Volume_{DRY} = A_f * \frac{0.4 * D_{mulch} + D_{ponding}}{12}$$

$$Volume_{Above\ Ground\ Storage} = Volume_{pretreatment} + Volume_{DRY}$$

$$ESDv_{Provided} = (Volume_{pretreatment} + Volume_{DRY})/0.75$$





**Project:** Universities at Shady Grove - Shady Grove Garage  
**Date:** June 12, 2019

**Microbioretention # BMP00017**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	0 sq.ft.
DA from Hydrologic Soil Group C	0 sq.ft.
DA from Hydrologic Soil Group D	19,305 sq.ft.
<hr/>	
Total Drainage Area to Device	17,525 sq.ft.
Total Impervious Area to Device	15,770 sq.ft.
Percent Impervious	90.0%
Volumetric Runoff Coefficient (Rv)	0.85984623
<b>Target ESDv</b>	<b>1,256 cu. ft.</b>

Facility's Storage Computations	
Pretreatment Volume Provided	0 cu. ft.
Dry Storage Provided Above Filter	665 cu. ft.
Total Above Ground Storage Required	942 cu. ft.
Total Above Ground Storage Provided	665 cu. ft.

**Temporary Storage is NOT provided for 75% of**

<b>Total ESDv Provided</b>	<b>886 cu. ft.</b>
<b>Pe Provided</b>	<b>0.71</b>
<b>Impervious Area Credit</b>	<b>0.26 acres</b>

Facility's Dimensions	
Area of Forebay ( $A_{fb}$ )	0 sq.ft.
Area of Filter ( $A_f$ )	1,108 sq.ft.
Area of 10 yr WSEL	1,780 sq.ft.
Ponding Depth ( $D_{ponding}$ )	6 inches
Depth of Mulch Layer ( $D_{mulch}$ )	3 inches
Depth of Filter Media ( $D_{media}$ )	37 inches
Depth of Coarse Sand ( $D_{sand}$ )	4 inches
Depth of No. 7 Stone ( $D_7$ )	4 inches
Depth of No. 57 Stone ( $D_{57}$ )	6 inches

Note: Forebay not required  
 Area of the filter is at least 2% of the drainage area

$$Volume_{pretreatment} = A_{fb} * \frac{D_{mulch} + D_{ponding}}{12}$$

$$Volume_{DRY} = A_f * \frac{0.4 * D_{mulch} + D_{ponding}}{12}$$

$$Volume_{Above\ Ground\ Storage} = Volume_{pretreatment} + Volume_{DRY}$$

$$ESDv_{Provided} = (Volume_{pretreatment} + Volume_{DRY})/0.75$$



**Project:** Universities at Shady Grove - Parking Lot 1  
**Date:** June 7, 2019

**Microbioretention # BMP00018**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	7,971 sq.ft.
DA from Hydrologic Soil Group C	0 sq.ft.
DA from Hydrologic Soil Group D	0 sq.ft.
<hr/>	
Total Drainage Area to Device	7,209 sq.ft.
Total Impervious Area to Device	2,414 sq.ft.
Percent Impervious	33.5%
Volumetric Runoff Coefficient (Rv)	0.35139048
<b>Target ESDv</b>	<b>211 cu. ft.</b>

Facility's Storage Computations	
Pretreatment Volume Provided	0 cu. ft.
Dry Storage Provided Above Filter	62 cu. ft.
Total Storage Required	158 cu. ft.
Total Above Ground Storage Provided	62 cu. ft.

**Temporary Storage is NOT provided for 75% of**

<b>Total ESDv Provided</b>	<b>83 cu. ft.</b>
<b>Pe Provided</b>	<b>0.39</b>
<b>Impervious Area Credit</b>	<b>0.02 acres</b>

Facility's Dimensions	
Area of Forebay ( $A_{fb}$ )	0 sq.ft.
Area of Filter ( $A_f$ )	104 sq.ft.
Area of 10 yr WSEL	762 sq.ft.
Ponding Depth ( $D_{ponding}$ )	6 inches
Depth of Mulch Layer ( $D_{mulch}$ )	3 inches
Depth of Filter Media ( $D_{media}$ )	30 inches
Depth of Coarse Sand ( $D_{sand}$ )	4 inches
Depth of No. 7 Stone ( $D_7$ )	4 inches
Depth of No. 57 Stone ( $D_{57}$ )	6 inches

Note: Forebay not required  
 Area of the filter is NOT at least 2% of the drainage area

$$Volume_{pretreatment} = A_{fb} * \frac{D_{mulch} + D_{ponding}}{12}$$

$$Volume_{DRY} = A_f * \frac{0.4 * D_{mulch} + D_{ponding}}{12}$$

$$Volume_{Above\ Ground\ Storage} = Volume_{pretreatment} + Volume_{DRY}$$

$$ESDv_{Provided} = (Volume_{pretreatment} + Volume_{DRY})/0.75$$





**Project:** Universities at Shady Grove - Parking Lot 1  
**Date:** June 12, 2019

**Microbioretention # BMP00019**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	15,966 sq.ft.
DA from Hydrologic Soil Group C	0 sq.ft.
DA from Hydrologic Soil Group D	0 sq.ft.
<hr/>	
Total Drainage Area to Device	14,886 sq.ft.
Total Impervious Area to Device	13,286 sq.ft.
Percent Impervious	89.3%
Volumetric Runoff Coefficient (Rv)	0.85327718
<b>Target ESDv</b>	<b>1,058 cu. ft.</b>

Facility's Storage Computations	
Pretreatment Volume Provided	0 cu. ft.
Dry Storage Provided Above Filter	728 cu. ft.
Total Storage Required	794 cu. ft.
Total Above Ground Storage Provided	728 cu. ft.

**Temporary Storage is NOT provided for 75% of**

<b>Total ESDv Provided</b>	<b>971 cu. ft.</b>
<b>Pe Provided</b>	<b>0.92</b>
<b>Impervious Area Credit</b>	<b>0.28 acres</b>

**Proposed Retrofit with 12" Ponding Depth**

Facility's Dimensions	
Area of Forebay ( $A_{fb}$ )	0 sq.ft.
Area of Filter ( $A_f$ )	662 sq.ft.
Area of 10 yr WSEL	1,080 sq.ft.
Ponding Depth ( $D_{ponding}$ )	12 inches
Depth of Mulch Layer ( $D_{mulch}$ )	3 inches
Depth of Filter Media ( $D_{media}$ )	36 inches
Depth of Coarse Sand ( $D_{sand}$ )	4 inches
Depth of No. 7 Stone ( $D_7$ )	4 inches
Depth of No. 57 Stone ( $D_{57}$ )	6 inches

Note: Forebay not required  
 Area of the filter is at least 2% of the drainage area

$$Volume_{pretreatment} = A_{fb} * \frac{D_{mulch} + D_{ponding}}{12}$$

$$Volume_{DRY} = A_f * \frac{0.4 * D_{mulch} + D_{ponding}}{12}$$

$$Volume_{Above\ Ground\ Storage} = Volume_{pretreatment} + Volume_{DRY}$$

$$ESDv_{Provided} = (Volume_{pretreatment} + Volume_{DRY})/0.75$$



**Project:** Universities at Shady Grove - Parking Lot 1  
**Date:** June 12, 2019

**Microbioretention # BMP00020**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	21,662 sq.ft.
DA from Hydrologic Soil Group C	0 sq.ft.
DA from Hydrologic Soil Group D	0 sq.ft.
<hr/>	
Total Drainage Area to Device	20,776 sq.ft.
Total Impervious Area to Device	15,186 sq.ft.
Percent Impervious	73.1%
Volumetric Runoff Coefficient (Rv)	0.70784323
<b>Target ESDv</b>	<b>1,225 cu. ft.</b>

Facility's Storage Computations	
Pretreatment Volume Provided	0 cu. ft.
Dry Storage Provided Above Filter	639 cu. ft.
Total Storage Required	919 cu. ft.
Total Above Ground Storage Provided	639 cu. ft.

**Temporary Storage is NOT provided for 75% of**

<b>Total ESDv Provided</b>	<b>852 cu. ft.</b>
<b>Pe Provided</b>	<b>0.70</b>
<b>Impervious Area Credit</b>	<b>0.24 acres</b>

**Proposed Retrofit with 12" Ponding Depth**

Facility's Dimensions	
Area of Forebay ( $A_{fb}$ )	0 sq.ft.
Area of Filter ( $A_f$ )	581 sq.ft.
Area of 10 yr WSEL	887 sq.ft.
Ponding Depth ( $D_{ponding}$ )	12 inches
Depth of Mulch Layer ( $D_{mulch}$ )	3 inches
Depth of Filter Media ( $D_{media}$ )	40 inches
Depth of Coarse Sand ( $D_{sand}$ )	4 inches
Depth of No. 7 Stone ( $D_7$ )	4 inches
Depth of No. 57 Stone ( $D_{57}$ )	6 inches

Note: Forebay not required  
 Area of the filter is at least 2% of  
 the drainage area

$$Volume_{pretreatment} = A_{fb} * \frac{D_{mulch} + D_{ponding}}{12}$$

$$Volume_{DRY} = A_f * \frac{0.4 * D_{mulch} + D_{ponding}}{12}$$

$$Volume_{Above\ Ground\ Storage} = Volume_{pretreatment} + Volume_{DRY}$$

$$ESDv_{Provided} = (Volume_{pretreatment} + Volume_{DRY})/0.75$$





**Project:** Universities at Shady Grove - Parking Lot 1  
**Date:** June 12, 2019

**Microbioretention # BMP00021**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	20,463 sq.ft.
DA from Hydrologic Soil Group C	0 sq.ft.
DA from Hydrologic Soil Group D	0 sq.ft.
<hr/>	
Total Drainage Area to Device	19,817 sq.ft.
Total Impervious Area to Device	18,881 sq.ft.
Percent Impervious	95.3%
Volumetric Runoff Coefficient (Rv)	0.90750648
<b>Target ESDv</b>	<b>1,499 cu. ft.</b>

Facility's Storage Computations	
Pretreatment Volume Provided	0 cu. ft.
Dry Storage Provided Above Filter	326 cu. ft.
Total Storage Required	1,124 cu. ft.
Total Above Ground Storage Provided	326 cu. ft.

**Temporary Storage is NOT provided for 75% of**

<b>Total ESDv Provided</b>	<b>434 cu. ft.</b>
<b>Pe Provided</b>	<b>0.29</b>
<b>Impervious Area Credit</b>	<b>0.13 acres</b>

**Proposed Retrofit with 12" Ponding Depth**

Facility's Dimensions	
Area of Forebay ( $A_{fb}$ )	0 sq.ft.
Area of Filter ( $A_f$ )	296 sq.ft.
Area of 10 yr WSEL	646 sq.ft.
Ponding Depth ( $D_{ponding}$ )	12 inches
Depth of Mulch Layer ( $D_{mulch}$ )	3 inches
Depth of Filter Media ( $D_{media}$ )	36 inches
Depth of Coarse Sand ( $D_{sand}$ )	4 inches
Depth of No. 7 Stone ( $D_7$ )	4 inches
Depth of No. 57 Stone ( $D_{57}$ )	6 inches

Note: Forebay not required  
 Area of the filter is NOT at least 2% of the drainage area

$$Volume_{pretreatment} = A_{fb} * \frac{D_{mulch} + D_{ponding}}{12}$$

$$Volume_{DRY} = A_f * \frac{0.4 * D_{mulch} + D_{ponding}}{12}$$

$$Volume_{Above\ Ground\ Storage} = Volume_{pretreatment} + Volume_{DRY}$$

$$ESDv_{Provided} = (Volume_{pretreatment} + Volume_{DRY})/0.75$$



**Project:** Universities at Shady Grove - Parking Lot 1  
**Date:** June 12, 2019

**Microbioretention # BMP00022**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	30,144 sq.ft.
DA from Hydrologic Soil Group C	0 sq.ft.
DA from Hydrologic Soil Group D	0 sq.ft.
<hr/>	
Total Drainage Area to Device	29,364 sq.ft.
Total Impervious Area to Device	20,555 sq.ft.
Percent Impervious	70.0%
Volumetric Runoff Coefficient (Rv)	0.67999484
<b>Target ESDv</b>	<b>1,664 cu. ft.</b>

Facility's Storage Computations	
Pretreatment Volume Provided	0 cu. ft.
Dry Storage Provided Above Filter	596 cu. ft.
Total Storage Required	1,248 cu. ft.
Total Above Ground Storage Provided	596 cu. ft.

**Temporary Storage is NOT provided for 75% of**

<b>Total ESDv Provided</b>	<b>795 cu. ft.</b>
<b>Pe Provided</b>	<b>0.48</b>
<b>Impervious Area Credit</b>	<b>0.23 acres</b>

**Proposed Retrofit with 12" Ponding Depth**

Facility's Dimensions	
Area of Forebay ( $A_{fb}$ )	0 sq.ft.
Area of Filter ( $A_f$ )	542 sq.ft.
Area of 10 yr WSEL	780 sq.ft.
Ponding Depth ( $D_{ponding}$ )	12 inches
Depth of Mulch Layer ( $D_{mulch}$ )	3 inches
Depth of Filter Media ( $D_{media}$ )	41 inches
Depth of Coarse Sand ( $D_{sand}$ )	4 inches
Depth of No. 7 Stone ( $D_7$ )	4 inches
Depth of No. 57 Stone ( $D_{57}$ )	6 inches

Note: Forebay not required  
 Area of the filter is NOT at least  
 2% of the drainage area

$$Volume_{pretreatment} = A_{fb} * \frac{D_{mulch} + D_{ponding}}{12}$$

$$Volume_{DRY} = A_f * \frac{0.4 * D_{mulch} + D_{ponding}}{12}$$

$$Volume_{Above\ Ground\ Storage} = Volume_{pretreatment} + Volume_{DRY}$$

$$ESDv_{Provided} = (Volume_{pretreatment} + Volume_{DRY})/0.75$$





**Project:** Universities at Shady Grove - New Campus Entry  
**Date:** June 12, 2019

**Microbioretention # BMP00023**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	25,253 sq.ft.
DA from Hydrologic Soil Group C	0 sq.ft.
DA from Hydrologic Soil Group D	0 sq.ft.
<hr/>	
Total Drainage Area to Device	24,683 sq.ft.
Total Impervious Area to Device	7,648 sq.ft.
Percent Impervious	31.0%
Volumetric Runoff Coefficient (Rv)	0.32885459
<b>Target ESDv</b>	<b>676 cu. ft.</b>

Facility's Storage Computations	
Pretreatment Volume Provided	0 cu. ft.
Dry Storage Provided Above Filter	473 cu. ft.
Total Above Ground Storage Required	507 cu. ft.
Total Above Ground Storage Provided	473 cu. ft.

**Temporary Storage is NOT provided for 75% of**

<b>Total ESDv Provided</b>	<b>631 cu. ft.</b>
<b>Pe Provided</b>	<b>0.93</b>
<b>Impervious Area Credit</b>	<b>0.16 acres</b>

Facility's Dimensions	
Area of Forebay ( $A_{fb}$ )	0 sq.ft.
Area of Filter ( $A_f$ )	430 sq.ft.
Area of 10 yr WSEL	570 sq.ft.
Ponding Depth ( $D_{ponding}$ )	12 inches
Depth of Mulch Layer ( $D_{mulch}$ )	3 inches
Depth of Filter Media ( $D_{media}$ )	30 inches
Depth of Coarse Sand ( $D_{sand}$ )	4 inches
Depth of No. 7 Stone ( $D_7$ )	4 inches
Depth of No. 57 Stone ( $D_{57}$ )	6 inches

Note: Forebay not required  
 Area of the filter is NOT at least 2% of the drainage area

$$Volume_{pretreatment} = A_{fb} * \frac{D_{mulch} + D_{ponding}}{12}$$

$$Volume_{DRY} = A_f * \frac{0.4 * D_{mulch} + D_{ponding}}{12}$$

$$Volume_{Above\ Ground\ Storage} = Volume_{pretreatment} + Volume_{DRY}$$

$$ESDv_{Provided} = (Volume_{pretreatment} + Volume_{DRY})/0.75$$



**Project:** Universities at Shady Grove - New Campus Entry  
**Date:** June 12, 2019

**Microbioretention # BMP00024**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	20,309 sq.ft.
DA from Hydrologic Soil Group C	0 sq.ft.
DA from Hydrologic Soil Group D	0 sq.ft.
<hr/>	
Total Drainage Area to Device	19,309 sq.ft.
Total Impervious Area to Device	11,502 sq.ft.
Percent Impervious	59.6%
Volumetric Runoff Coefficient (Rv)	0.5861318
<b>Target ESDv</b>	<b>943 cu. ft.</b>

Facility's Storage Computations	
Pretreatment Volume Provided	0 cu. ft.
Dry Storage Provided Above Filter	640 cu. ft.
Total Above Ground Storage Required	707 cu. ft.
Total Above Ground Storage Provided	640 cu. ft.

**Temporary Storage is NOT provided for 75% of**

<b>Total ESDv Provided</b>	<b>853 cu. ft.</b>
<b>Pe Provided</b>	<b>0.90</b>
<b>Impervious Area Credit</b>	<b>0.24 acres</b>

Facility's Dimensions	
Area of Forebay ( $A_{fb}$ )	0 sq.ft.
Area of Filter ( $A_f$ )	600 sq.ft.
Area of 10 yr WSEL	1,000 sq.ft.
Ponding Depth ( $D_{ponding}$ )	12 inches
Depth of Mulch Layer ( $D_{mulch}$ )	2 inches
Depth of Filter Media ( $D_{media}$ )	30 inches
Depth of Coarse Sand ( $D_{sand}$ )	4 inches
Depth of No. 7 Stone ( $D_7$ )	4 inches
Depth of No. 57 Stone ( $D_{57}$ )	4 inches

Note: Forebay not required  
 Area of the filter is at least 2% of the drainage area

$$Volume_{pretreatment} = A_{fb} * \frac{D_{mulch} + D_{ponding}}{12}$$

$$Volume_{DRY} = A_f * \frac{0.4 * D_{mulch} + D_{ponding}}{12}$$

$$Volume_{Above\ Ground\ Storage} = Volume_{pretreatment} + Volume_{DRY}$$

$$ESDv_{provided} = (Volume_{pretreatment} + Volume_{DRY})/0.75$$





**Project:** Universities at Shady Grove - New Campus Entry  
**Date:** June 12, 2019

**Microbioretention # BMP00025**

Facility's Drainage Area	
DA from Hydrologic Soil Group A	0 sq.ft.
DA from Hydrologic Soil Group B	21,550 sq.ft.
DA from Hydrologic Soil Group C	0 sq.ft.
DA from Hydrologic Soil Group D	0 sq.ft.
<hr/>	
Total Drainage Area to Device	20,750 sq.ft.
Total Impervious Area to Device	12,826 sq.ft.
Percent Impervious	61.8%
Volumetric Runoff Coefficient (Rv)	0.60630843
<b>Target ESDv</b>	<b>1,048 cu. ft.</b>

Facility's Storage Computations	
Pretreatment Volume Provided	0 cu. ft.
Dry Storage Provided Above Filter	505 cu. ft.
Total Above Ground Storage Required	786 cu. ft.
Total Above Ground Storage Provided	505 cu. ft.

**Temporary Storage is NOT provided for 75% of**

<b>Total ESDv Provided</b>	<b>673 cu. ft.</b>
<b>Pe Provided</b>	<b>0.64</b>
<b>Impervious Area Credit</b>	<b>0.19 acres</b>

Facility's Dimensions	
Area of Forebay ( $A_{fb}$ )	0 sq.ft.
Area of Filter ( $A_f$ )	473 sq.ft.
Area of 10 yr WSEL	800 sq.ft.
Ponding Depth ( $D_{ponding}$ )	12 inches
Depth of Mulch Layer ( $D_{mulch}$ )	2 inches
Depth of Filter Media ( $D_{media}$ )	30 inches
Depth of Coarse Sand ( $D_{sand}$ )	4 inches
Depth of No. 7 Stone ( $D_7$ )	4 inches
Depth of No. 57 Stone ( $D_{57}$ )	5 inches

Note: Forebay not required  
 Area of the filter is at least 2% of  
 the drainage area

$$Volume_{pretreatment} = A_{fb} * \frac{D_{mulch} + D_{ponding}}{12}$$

$$Volume_{DRY} = A_f * \frac{0.4 * D_{mulch} + D_{ponding}}{12}$$

$$Volume_{Above\ Ground\ Storage} = Volume_{pretreatment} + Volume_{DRY}$$

$$ESDv_{Provided} = (Volume_{pretreatment} + Volume_{DRY})/0.75$$



Project: Universities at Shady Grove  
 Date: 10/25/2018

USG - Gudelsky Pond **BMP00026**

**Facility's Storage Volume**

Elevation (ft)	Area (sq ft)	Difference (ft)	Incremental Volume (cu ft)	Cumulative Volume (cu ft)	Cumulative Volume (ac ft)
422	955	-	0	0	0
424	31,356	2.00	32,311	32,311	0.74
426	39,595	2.00	70,951	103,262	2.37
428	47,662	2.00	87,257	190,519	4.37
430	55,907	2.00	103,569	294,088	6.75
432.2	72,277	2.20	141,002	435,090	9.99

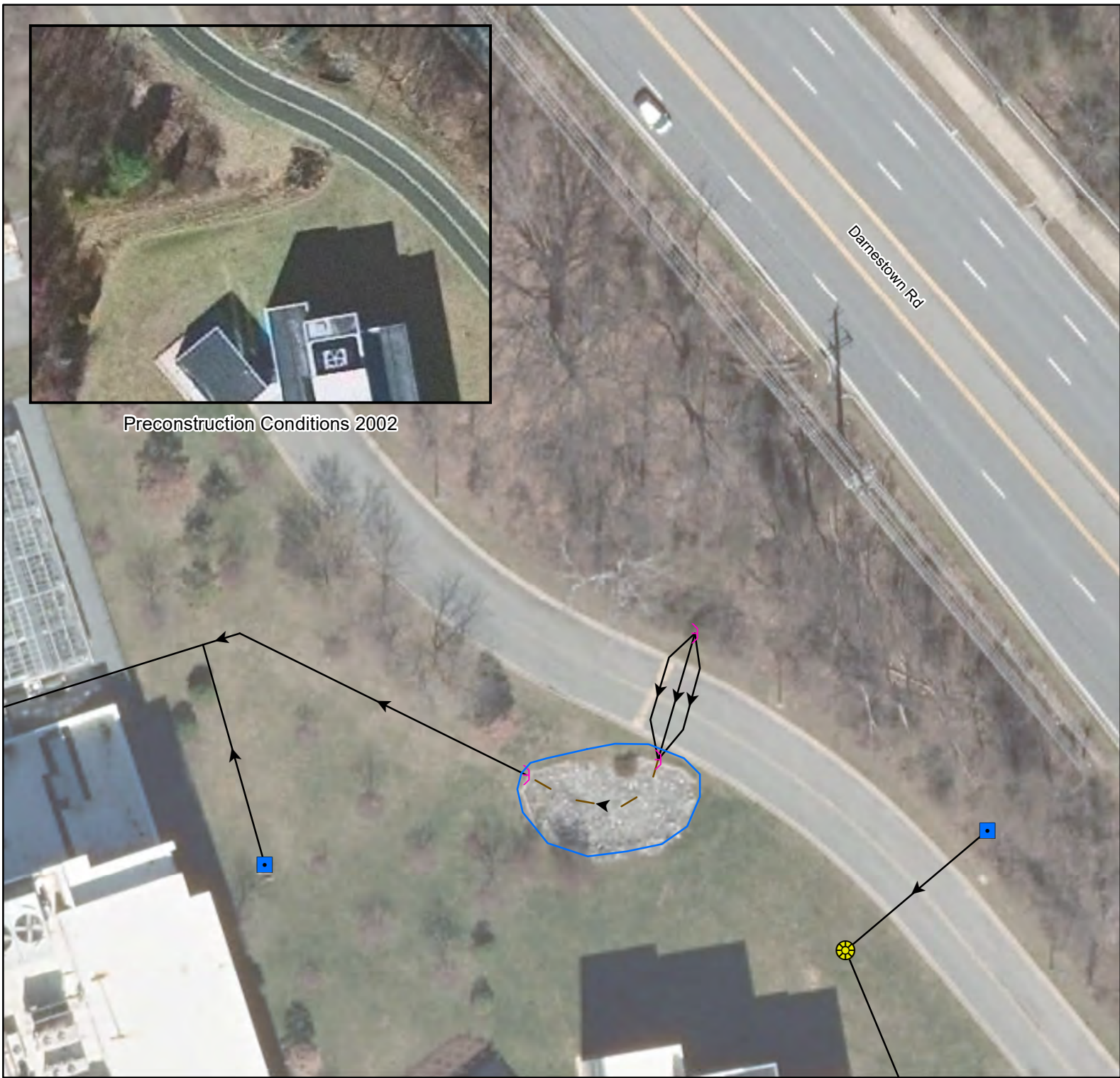
**Facility's Storage Computations**

Drainage Area	94.87 Ac.
Impervious Drainage Area	44.64 Ac.
Required Treatment Volume @ 1"	162,043 cu.ft.
Provided WQv Volume	435,090 cu.ft.
Pe	2.6 in.
Impervious acreage credit	62.50 Ac.



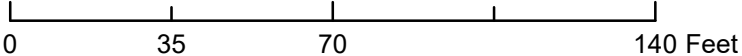

































Required Forebay Volume @ 0.1"	16,204 cu.ft.
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# Appendix G - Alternate Practices



Preconstruction Conditions 2002

	<h2>USG / IBBR Alternate BMP</h2>	<p>BMP ID: USG19BMP00004          BMP Type: Outfall Protection          Project Length (ft): 50          Impervious Credits (ac): 0.50</p>												
 														
<table border="0"> <tr> <td> SWMFAC</td> <td> Manhole</td> <td> Head/Endwall</td> <td> Control Structure</td> <td> Hydraulic Connection</td> <td> Ditch</td> </tr> <tr> <td> Outfall</td> <td> Inlet</td> <td> Culvert</td> <td> Pipe</td> <td> Drain</td> <td></td> </tr> </table> <p style="text-align: center;">174</p>			 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch	 Outfall	 Inlet	 Culvert	 Pipe	 Drain	
 SWMFAC	 Manhole	 Head/Endwall	 Control Structure	 Hydraulic Connection	 Ditch									
 Outfall	 Inlet	 Culvert	 Pipe	 Drain										





## APPENDIX C

# UMD MS4 Baseline BMP Assessment Report







***University of Maryland, College Park  
MS4 Baseline BMP Assessment***

***Task 6: Final Report***

***WBCM Job No.: 2015.0921.09***

***October 10, 2019***

**Prepared For:**

**University of Maryland, Facilities Management  
Department of Planning and Construction  
0600 Service Building  
7757 Baltimore Avenue  
College Park, MD 20742**



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**Appendices**

- Appendix A - Task 2 Assessment Reports
- Appendix B - Campus Map
- Appendix C - References



## **EXECUTIVE SUMMARY**

WBCM was tasked by the University of Maryland College Park (UMCP) with the baseline assessment of the stormwater management facilities that are covered under the University's Municipal Separate Storm Sewer System (MS4) permit. The MS4 permit is a component of Maryland's National Pollutant Discharge Elimination System (NPDES), and its purpose is to ensure that MS4 institutions within the state of Maryland comply with the Environmental Protection Agency's water quality standards.

The MS4 permit has two requirements. The first requirement is the restoration of twenty percent of a jurisdiction's previously unmanaged impervious. The second requirement is to develop a schedule for best management practice (BMP) implementation in order to meet this restoration requirement. The baseline assessment performed by WBCM consisted of six phases: the evaluation of impervious areas, the evaluation and inspection of existing BMPs, the recommendation of BMP repairs, the calculation of the restoration requirement, the development of an urban BMP database, and the preparation of this final report.

The evaluation of impervious areas was conducted by WBCM subcontractor, NMP Engineering. NMP created a GIS database that included shapefiles of all existing impervious areas on the UMCP campus. Using this database, WBCM was able to determine the total impervious land area on site and calculate the restoration requirement. The requirement was determined by WBCM to be 88.58 acres. WBCM conducted field inspections of each of BMPs on the UMCP campus, and used the information obtained on these site visits to create inspection reports of each BMP and repair recommendations for 40 BMPs. This report contains detailed information on the process undertaken by WBCM during the completion of the aforementioned six tasks.

## Introduction

The University of Maryland is required to commence impervious area restoration for twenty percent of existing developed lands that have little to no stormwater management as MS4 owners covered under the NPDES general permit. WBCM was tasked with the completion of a baseline assessment of UMCP's existing BMPs in order to meet the requirements of the NPDES MS4 permit.

WBCM completed this assessment in the form of six tasks which are outlined below:

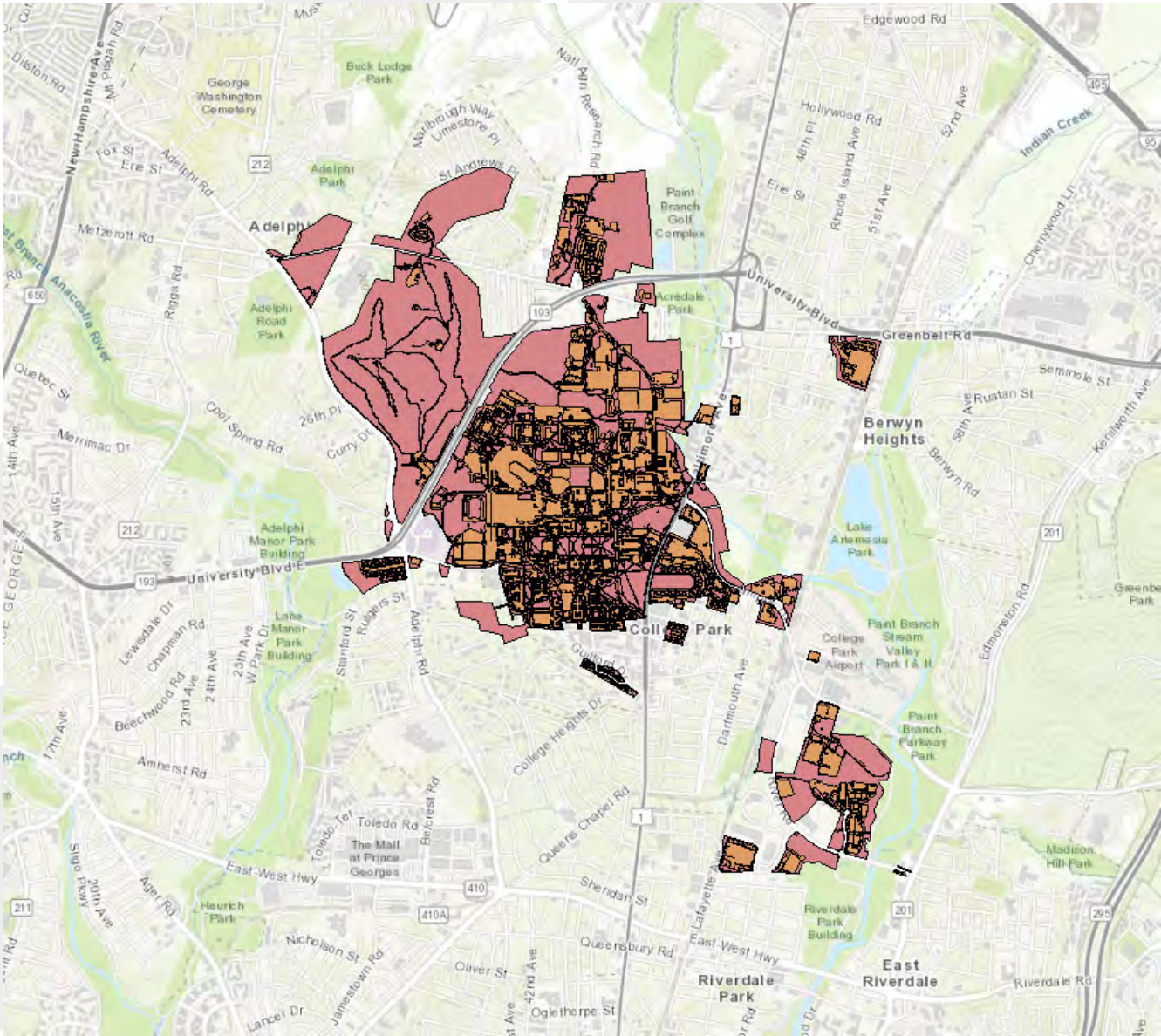
1. Task 1: Evaluation of Impervious Areas
2. Task 2: Evaluation & Inspection of Existing BMPs
3. Task 3: Recommendation for BMP Repairs
4. Task 4: Twenty Percent Restoration Requirement
5. Task 5: Develop Urban BMP Database
6. Task 6: Prepare Final Report

Over the course of six months, WBCM conducted research, analysis, and field work to prepare this document which outlines the MS4 requirements that UMCP must reach, as well as a plan of action for how to reach these requirements.

## Methodology

Task 1 was completed by WBCM subcontractor, NMP Engineering. The existing UMCP impervious area geodatabase was updated based on aerial photography for the College Park campus. WBCM and NMP assumed the evaluation of the existing impervious layer provided by UMD would be based upon current conditions as of January 2019, and not include any under design and/or construction projects which may be adding impervious areas. The shapefiles included within the geodatabase include: Impermeable and Permeable. The total impervious area within the College Park campus is 464 acres. The total permeable area on campus is 831 acres. These layers are based on data

received from the University of Maryland and digitized aerial photographs. MDE requires only impervious and pervious area to be reported for the MS4 permit. Comments on the initial submission of Task 1 by UMCP were received by WBCM on June 4, 2019. Responses were sent back to UMCP on June 28, 2019. Figure 1 below shows the agreed upon limits of study for Task 1.



**Figure 1.** The limits of study for Task 1. Areas shown in red are pervious. Areas show in orange are impervious.



Task 2 was completed by WBCM during field investigations over the months of April through June 2019. WBCM inspected 116 BMPs at UMCP. Notes were recorded and photos were taken at each BMP inspection. Inspections included visual examination and did not include subsurface test pits or survey elevation verification. The information needed to submit the first year Progress Report for MDE review and approval is the following:

1. Total impervious acres in accordance with the guidance in Appendix B, Section III of the general permit;
2. Total impervious acres treated by stormwater quality BMPs;
3. Total impervious acres treated by BMPs providing partial water quality treatment;
4. Total impervious acres treated by nonstructural practices (i.e., rooftop disconnections, non-rooftop disconnections, or vegetated swales);
5. Verification that any impervious area draining to BMPs with missing inspection records are not considered treated; and
6. Total impervious acres untreated and twenty percent of this total area (i.e., the restoration requirement).

BMPs were inspected, but without maintenance and inspection records, MDE approved design plans, and as built documents, they cannot pass the requirements needed to receive credit. According to the BMP Database Tracking section of the MS4 permit, "BMPs should be inspected every three years and routinely maintained. If the required inspection and maintenance data are missing or incomplete, then any credit previously applied must be removed." These records are needed to verify the level of water quality treatment provided for an existing BMP. MDE will allow UMCP to use BMPs that are in good condition when calculating the twenty percent restoration requirement as long as all required documentation be generated before permit approval is granted. This was confirmed by WBCM through an email exchange with Deborah Cappuccitti of MDE on July 3, 2019.

Task 3 was completed by WBCM after the inspection of all 116 BMPs were completed. Thirteen BMPs were used in the calculation of the Task 4 twenty percent baseline requirement under the assumption that all MDE required documentation will be generated. These facilities are designated in Task 3 as Priority 1, and any maintenance or documentation listed in the report for these facilities is mandatory. The remaining BMPs were ranked according to estimated impervious area treated and were then split into two prioritization categories. Priority 2 facilities includes any facility that treats an estimated impervious area of two acres or more. Priority 3 facilities include any facility that treats an estimated impervious area of less than two acre. The impervious area credits that each facility is eligible is proportional to its design PE. Design PE figures were taken from the original design reports. The general cost estimates shown in Task 3 for each facility include the following, depending on the needs of each facility: as-built survey, test pit, media replacement, landscaping, drainage area survey, generation of maintenance reports conversion to a different BMP type, and engineering design cost for a new facility. The cost estimates are based on previous BMP construction and repair projects

Task 4, the determination of the restoration requirement, was completed by WBCM using the data obtained by NMP during Task 1 and inspection data obtained from Task 2. The amount of impervious area that is treated by BMPs in good condition, with approved as-built documentation and/or proper inspection reports was subtracted from the total impervious area on the UMCP campus. The baseline restoration requirement is 20% of this new number. The thirteen facilities included in this calculation are missing essential documentation such as as-built drawings and/or maintenance records, which must be generated before approval of this baseline credit will be granted. It should be noted again that the design PE numbers used to calculate this requirement were taken from the original design reports.

For Task 5, WBCM integrated the BMP shapefile provided by UMCP with the MDE approved MS4 spreadsheet to create a geodatabase which will improve the organization and management of UMCP stormwater assets. The files included within the geodatabase include UMCP\_MS4\_BMP.shx, which is the shapefile containing spatial data for each BMP, and UMCPBMP.dbf, which is the attribute table which contains the inspection data for each BMP. The data contained in the attribute table matches the data required for submission to MDE for issuance of the MS4 permit. No additional fields were requested by UMD to be included in the database at the time of submission. In addition to creating a geodatabase, WBCM investigated three off-the-shelf database software platforms for future use by UMCP.

### Results

The complete Task 2 report and Task 3 report can be found in Appendix A and B of this report, respectively. A summary table of the findings of Tasks 3 and 4 can be found below. Baseline restoration credit to be obtained by UMCP was determined in Task 4 to be 88.59 acres. This calculation assumes that thirteen of the existing facilities that are in functional condition but lack the required documentation will meet MDE criteria before permit approval is granted. These thirteen facilities have been included in Table 2 of this report, which summarizes the required and recommended BMP repairs. The 40 BMPs explored by WBCM in Task 3 targets the restoration of an estimated 105 acres of impervious area, and 94.39 acres are able to be counted towards the twenty percent restoration credit.

It is important to note that the red numbers in the impervious area column of Table 2 are estimations. These estimates are based on the assumption that 50% of the reported drainage area of



the facility provided by UMCP is impervious area. Each repair recommendation in Task 3 includes a recommended drainage area survey to confirm this number. Additionally, if a facility was designed with a PE of less than 1", the impervious area treated may be less than the impervious area listed in the table.

**Table 1.** Twenty percent baseline restoration requirement calculations. This calculation assumes that the required documentation for the thirteen facilities listed will be generated before approval is granted.

UCMP MS4 Baseline Analysis						
Total Land Area (Ac)		1284				
Total Pervious Land (Ac)		830				
Total Impervious Land (Ac)		<b>454</b>				
Impervious Areas Draining to Ex. Facilities (Ac)			Year	Pe (in)	Construction Purpose	Treated Impervious (Ac)
	SWF NR 1 - University House	0.04	2012	1	New	0.04
	SWF NR 2 - University House	0.18	2012	1	New	0.18
	SWF 012 - Xfinity	10.03	2000	0.86	Unknown	8.63
	SWF 019 - University House Parking	0.29	2014	1	Redevelopment	0.29
	SWF 033 & 034 & 035 - University House	0.37	2012	1	New	0.37
	SWF 040 - University House	0.03	2012	1	New	0.03
	SWF 041 - University House	0.09	2012	1	New	0.09
	SWF 059 - Denton Dining Hall	0.17	2012	1	Redevelopment	0.17
	SWF 070 - Denton Dining Hall	0.09	2012	1	Redevelopment	0.09
	SWF 124 - Prince Frederick	0.17	2014	1	New	0.17
	SWF 152 - AV Williams (Lot GG)	0.37	2017	1	Redevelopment	0.37
	SWF 153 - AV Williams (Lot GG)	0.22	2017	1	Redevelopment	0.22
	SWF 154 - AV Williams (Lot GG)	0.40	2017	1	Redevelopment	0.40
	<b>Total</b>	<b>12.46</b>				<b>11.06</b>
Total Impervious Area - Treated Impervious =					442.94	
<b>20% Restoration Requirement (Ac) =</b>					<b>88.59</b>	

**Table 2.** Summary of BMP repair recommendations Impervious area in red is an estimation by WBCM which assumes 50% of the reported drainage area is impervious. Cost estimates provided are order of magnitude and for estimation purposes only and are not final. In the Construction Purpose column: R = Redevelopment, N = New Development, and U = Unknown.

Task 3: Facility Repair Recommendations Summary Table									
Priority Level	Facility ID	Description	Type	As-Built Plans	Maintenance Records	Condition	Construction Purpose	Impervious Area (AC)	Repair Cost*
1 Mandatory	SWF NR 1	University House	Non-Structural	Yes	No	Good	N	0.04	\$1,700
	SWF NR 2	University House	Non-Structural	Yes	No	Good	N	0.18	\$1,700
	SWF 012	Xfinity	Wet Pond	No	No	Good	U	8.63	\$7,200
	SWF 019	University House Parking	Bioretention	Yes	No	Good	R	0.29	\$2,200
	SWF 033 & 034 & 035	University House	Bioretention	Yes	No	Good	N	0.37	\$7,700
	SWF 040	University House	Bioretention	Yes	No	Good	N	0.03	\$15,300
	SWF 041	University House	Bioretention	Yes	No	Good	N	0.09	\$1,700
	SWF 059	Denton Dining Hall	Bioretention	No	No	Good	R	0.17	\$15,200
	SWF 070	Denton Dining Hall	Bioretention	No	Yes	Good	R	0.09	\$8,767
	SWF 124	Prince Frederick	Bioretention	Yes	No	Good	N	0.17	\$5,900
	SWF 152	AV Williams (Lot GG)	Bioretention	No	No	Good	R	0.37	\$3,867
	SWF 153	AV Williams (Lot GG)	Bioretention	No	No	Good	R	0.22	\$2,360
	SWF 154	AV Williams (Lot GG)	Bioretention	No	No	Good	R	0.40	\$3,867
	<b>Total</b>								<b>11.06</b>
2	SWF 005	Sand Filter	Sand Filter	No	Yes	Poor	U	10.91	\$323,500
	SWF 011	CSPAC Wet Pond	Wet Pond	No	No	Fair	U	9.83	\$262,200
	SWF 021	Neutral Buoyancy	Wet Pond	No	Yes	Poor	U	7.29	\$135,000
	SWF 056	Xfinity Upper Pond	Wet Pond	No	Yes	Poor	U	5.10	\$13,500
	SWF 013	Courtyard Apartments	Wet Pond	No	No	Good	U	4.88	\$8,200

	Facility ID	Description	Type	As-built Plans	Maintenance Records	Condition	Construction Purpose	Impervious Area (AC)	Repair Cost *
2	SWF 020	Crane Aquaculture	Wet Pond	No	No	Poor	U	4.43	\$286,000
	SWF 024	Terrapin Garage Pond	Wet Pond	No	Yes	Fair	U	4.25	\$6,500
	SWF 098	Artificial Turf Field	Bioretention	No	Yes	Fair	U	3.58	\$41,100
	SWF 002	Eppley	Wet Pond	Yes	Yes	Poor	U	3.40	\$150,000
	SWF 065	Greenmeade North	Dry Pond	Yes	No	Poor	U	3.39	\$491,200
	SWF 090	Lot PP2	Rain Garden	No	Yes	Poor	U	3.37	\$257,500
	SWF 010	Laboratory Physical Science	Wet Pond	No	No	Poor	U	2.70	\$50,200
	SWF 076 & 077	Public Health Garden	Rainwater Harvesting	No	Yes	Good	U	2.04	\$12,010
	<b>Total</b>								<b>65.17</b>
3	SWF 036	Lot 3	Bioretention	No	Yes	Fair	U	1.60	\$17,000
	SWF 022 & 043	Lot 11b/Campus Creek	Bioretention	No	Yes	Poor	U	1.36	\$34,000
	SWF 109	Metzerott Road	Wet Pond	No	Yes	Fair	U	1.32	\$87,000
	SWF 144	Golf Course Parking Lot	Rain Garden	No	Yes	Poor	U	1.14	\$6,000
	SWF 026	Shuttle Bus	Dry Swale	Yes	Yes	Fair	U	1.05	\$26,000
	SWF 089	Golf Course Lower	Wet Pond	No	No	Poor	U	0.98	\$356,400
	SWF 055	Landscape Lane	Bioretention	No	No	Poor	R	0.87	\$13,700
	SWF 091	Regents Drive Bio	Bioretention	No	Yes	Fair	U	0.79	\$14,600
	SWF 146	Golf Course Parking Lot	Rain Garden	No	Yes	Poor	U	0.37	\$14,500
	SWF CH1	Clark Hall	Bioretention	Yes	No	Fair	U	0.27	\$6,200
	SWF 147	Golf Course Parking Lot	Rain Garden	No	Yes	Fair	U	0.20	\$12,500
	SWF 112	Golf Course Parking Lot	Rain Garden	No	Yes	Poor	U	0.07	\$16,500
	SWF 129	Reckord Armory	Rain Garden	No	No	Fair	R	0.04	\$5,200
	SWF 014	Woods Halls	Bioretention	No	No	Good	R	0.02	\$19,200
	<b>Total</b>								<b>10.08</b>
<b>GRAND TOTAL</b>								<b>86.30</b>	<b>\$2,743,178 *</b>

\*Repair costs are approximate only and do not include markups, project management costs, escalation or contingencies



### Summary and Future Work

A total of 116 BMPs were inspected by WBCM. Of those 116, 40 were selected for recommendations of repairs. Thirteen of these 40 repair recommendations are required and creates a restoration requirement of 88.59 acres of impervious area. The remaining 27 of 40 facilities would restore an estimated total of 94.39 acres of impervious area.

Next steps for UMCP includes sending an MS4 application to MDE for approval as well as completing the required repairs and documentation for the Priority 1 facilities listed in the Task 3 report. WBCM recommends that UMCP complete the work outlined in the reports for the Priority 2 facilities in order to meet the twenty percent restoration requirement.

In addition to the creation of the aforementioned database in Task 5, WBCM investigated three off-the-shelf database platform tools: Viewworks, Hydro International, and 2nform. Each platform offers similar organizational and mobile capabilities, which could streamline the generation of maintenance and inspection reports. Hydro International provides free set up and implementation of a GIS software-based stormwater management program to clients, as long as the client agrees to have the facilities maintained by Hydro International. This would not be a good fit for UMD, as the University already has an in-house team dedicated to maintaining and inspecting its facilities. However, the utilization of one of the other database software applications would make generating the MDE required maintenance reports much easier and more organized.

***Appendix A:***  
***Task 2 BMP Assessment Report***

***University of Maryland, College Park  
MS4 Baseline BMP Assessment***

***Task 2: Evaluation and Inspection of Existing BMPs***

***WBCM Job No.: 2015.0921.09***

***October 10, 2019***

**Prepared For:  
University of Maryland, Facilities Management  
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## Task 2: Evaluation and Inspection of BMPs

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### Appendices

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Appendix B	-	Campus Map
Appendix C	-	Facility Summary Table
Appendix D	-	NPDES General Permit for Discharges from State and Federal Small Municipal Separate Storm Sewer Systems

**PART 1 - INTRODUCTION**



## Task 2: Evaluation and Inspection of BMPs

---

The University of Maryland is required to commence impervious area restoration for twenty percent of existing developed lands that have little to no stormwater management as MS4 owners covered under the NPDES general permit.

WBCM is tasked with the baseline assessment of stormwater management facilities covered in the UMD MS4 permit in College Park, Maryland. This report documents Task 2: Evaluation and Inspection of Existing BMPs. Task 2 includes field inspections of all BMPs in the University of Maryland, College Park database, and status reports on each of these BMPs. WBCM was exempt from inspecting green roof structures and underground facilities.

WBCM inspected 86 BMPs at the University of Maryland, College Park from April through June 2019. Notes were recorded and photos were taken at each BMP inspection. Inspections included visual examination and did not entail subsurface test pits or survey elevation verification. Furbish inspected seven green roofs which were also included in this report.

The information needed to submit the first year Progress Report for MDE review and approval is the following:

1. Total impervious acres in accordance with the guidance in Appendix B, Section III of the general permit;
2. Total impervious acres treated by stormwater quality BMPs;
3. Total impervious acres treated by BMPs providing partial water quality treatment;
4. Total impervious acres treated by nonstructural practices (i.e., rooftop disconnections, non-rooftop disconnections, or vegetated swales);
5. Verification that any impervious area draining to BMPs with missing inspection records are not considered treated; and
6. Total impervious acres untreated and twenty percent of this total area (i.e., the restoration requirement).

BMPs were inspected, but without maintenance and inspection records, MDE approved design plans, and as built documents, they cannot pass the requirements needed to receive credit. According to the BMP Database Tracking section of the MS4 permit, "BMPs should be inspected every three years and routinely maintained. If the required inspection and maintenance data are missing or incomplete, then any credit previously applied must be removed." These records are needed to verify the level of water quality treatment provided for an existing BMP.

Most BMPs inspected had no maintenance records, and therefore cannot be considered treated by MDE. The exception to this could be non-rooftop disconnect practices, since the only maintenance is mowing grass, provided design and as built documents are available, and the practices follow MDE guidelines.

**PART 2 – BMP ASSESSMENT REPORTS**

**BMP Iribe 1 – Brendan Iribe Center Bioretention**  
**MDE BMP ID: UMCP19BMP0241****Existing Site Conditions:**

**Date of Design / Construction:** Design Plans: June 7, 2016.  
MDE Permit Number: 16-SF-0064.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

Iribe 1 is a bioretention outside of the Brendan Iribe Center.

**General Observations:**

A site visit was conducted by WBCM on June 6, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility as sheet flow.

**Pretreatment:**

There is no pretreatment for this facility.

**Outflow:**

Runoff exits the facility through a 6-inch high riser outlet structure.

**Overall BMP:**

This facility is in good condition. The vegetation is well established. There are some signs of erosion visible on the side slopes of the facility. The facility appears to be functional.

**Meets MDE Criteria:** No.





**Photo #1:** View into the facility.



**Photo #2:** Erosion of the side slopes.

## **BMP Iribe 2 – Brendan Iribe Center Bioretention**

### **MDE BMP ID: UMCP19BMP0242**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Design Plans: June 7, 2016.  
MDE Permit Number: 16-SF-0064.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

#### **General Description:**

Iribe 2 is a bioretention that is outside of the Brendan Iribe Center.

#### **General Observations:**

A site visit was conducted by WBCM on June 6, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Water enters the facility via roof drains, which flow into a conveyance channel. The inflow swale is eroded, with standing water and irrigation lines visible. There is also an inflow pipe with riprap that is lower than the filter area.

#### **Pretreatment:**

There is no pretreatment for this facility.

#### **Outflow:**

Water exits the facility through an eight-inch, concrete riser outlet structure. The outlet is in good condition.

#### **Overall BMP:**

This facility is in good condition. The side slopes and inflow channels are eroded. Irrigation lines should be removed from facility as they may cause further erosion.

**Meets MDE Criteria:** No.





**Photo #1:** Erosion and standing water inside the inflow swale.



**Photo #2:** Exposed irrigation lines in the inflow swale.





**Photo #3:** Exposed irrigation lines inside the facility.



**Photo #4:** Inflow headwall that is lower than the filter bed area.

## **BMP Iribe 3 – Brendan Iribe Center Swale**

### **MDE BMP ID: UMCP19BMP0243**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Design Plans: June 7, 2016.  
MDE Permit Number: 16-SF-0064.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

#### **General Description:**

Iribe 3 is a swale outside of the Brendan Iribe Center.

#### **General Observations:**

A site visit was conducted by WBCM on June 6, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Water enters the facility through an inflow pipe and headwall with a riprap inflow channel. There is a low spot in the riprap that is causing standing water and algae blooms.

#### **Pretreatment:**

There is no pretreatment for this facility.

#### **Outflow:**

Water exits this facility through infiltration.

#### **Overall BMP:**

This facility is in poor condition. The waterproofing at weir walls is not secured, and the weirs do not extend fully to the edges of the swale which will allow water to bypass them. At the time of inspection, the irrigation system was backed up and causing standing water to pool in the facility. Irrigation lines are exposed throughout the facility.

**Meets MDE Criteria:** No.





Photo #1: View into the facility.



Photo #2: The effects of the backed-up irrigation system. Oil sheen is visible on water surface.





**Photo #3:** One of the weir walls. Notice the edges of the walls that do not tie not the sides of the swale.



**Photo #4:** Standing water at inflow.

## **BMP NR 1 – University House Non-Rooftop Disconnect**

### **MDE BMP ID: UMCP19BMP0239**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Design Plans: October 19, 2011.  
MDE Permit Number: 11-SF-0139

**As-Built Documents Available:** Yes, August 16, 2012

**Prior Maintenance Records Available:** No

#### **General Description:**

NR1 is a non-rooftop disconnect area across the street from the University House.

#### **General Observations:**

A site visit was conducted by WBCM on April 10, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Impervious runoff sheet flows into curb cuts before entering a grass area.

#### **Pretreatment:**

There is no pretreatment for this non-structural facility.

#### **Outflow:**

The runoff infiltrates into the grass conservation area.

#### **Overall BMP:**

This BMP is sheet flow to a conservation area and is a non-structural practice. The grass adjacent to the parking lot is in good condition. The design and as built plans do not show the drainage areas getting to each curb cut. Curb cuts are not a normal practice for non-rooftop disconnect.

**Meets MDE Criteria:** No.



**Photo #1:** A section of the non-rooftop disconnect area.



**Photo #2:** Curb cuts along the driveway.



## **BMP NR 2 – University House Non-Rooftop Disconnect**

### **MDE BMP ID: UMCP19BMP0240**

#### **Existing Site Conditions:**

**Date of Design / Construction:** October 19, 2011.  
MDE Permit Number: 11- SF-0139

**As-Built Documents Available:** Yes, August 16, 2012.

**Prior Maintenance Records Available:** No

#### **General Description:**

NR2 is a non-rooftop disconnect located next to the University House.

#### **General Observations:**

A site visit was conducted by WBCM on June 6, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Impervious runoff sheet flows into a grass area.

#### **Pretreatment:**

There is no pretreatment for this non-structural facility.

#### **Outflow:**

The runoff infiltrates into the grass conservation area.

#### **Overall BMP:**

This BMP is sheet flow to a conservation area and is a non-structural practice. The grass adjacent to the parking lot is in good condition. Some of the grass areas of the disconnect drainage area are greater than 5% slope. These areas do not pass MDE design criteria, unless MDE approved and made an exception within the original design plans. Areas with a slope less than 5% are in good condition and meet MDE criteria.

**Meets MDE Criteria:** No.



**Photo #1:** The driveway behind University House.



**Photo #2:** A section of the non-structural practice.



Photo #3: NR2



Photo #4: NR2



## **BMP SWF 002 – Eppley Recreation Center Wet Pond**

### **MDE BMP ID: UMCP19BMP0002**

#### **Existing Site Conditions:**

**Date of Design / Construction:** August 10, 1995.  
MDE Permit Number: 94-SF-0311

**As-Built Documents Available:** March 26, 1998.

**Prior Maintenance Records Available:** May 16, 2017.

#### **General Description:**

BMP SWF 002 is a wet pond located behind the Eppley Recreation Center to the west of the challenge course. It consists of a forebay and retention pond.

#### **General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Stormwater enters the facility through a culvert on the west side of the pond. Gabion inflow protection is present and slows the water in the forebay.

#### **Pretreatment:**

There is a pretreatment forebay present. The water in the pretreatment was a cloudy white color and filled with algae on the date of inspection. Snakes are present in the pretreatment.

#### **Outflow:**

Run off exits the facility through a culvert on the east side of the pond. There is a significant amount of leaf litter and sedimentation built up around the culvert, which hinders the flow of water.

#### **Overall BMP:**

Overall, the facility is in poor condition. A combination of sedimentation and erosion has left the water in the facility stagnant. Snakes have infested the facility. The questionable color of the water in the forebay suggests compromised water quality upstream.

**Meets MDE Criteria:** No.



Photo #1: The inflow structure and pretreatment area.



Photo #2: View into the facility.





**Photo #3:** Pretreatment area with discolored water. Multiple snakes were spotted here.



**Photo #4:** The outfall structure.



## **BMP SWF 005 – Peace Garden Sand Filter**

### **MDE BMP ID: UMCP19BMP0005**

#### **Existing Site Conditions:**

**Date of Design / Construction:** June 16, 2003.  
MDE Permit Number: 02-SF-0247.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** March 25, 2018.

#### **General Description:**

BMP SWF 5 is a sand filter that is located adjacent to the Peace and Friendship Garden on Union Drive. This BMP is used for the University's stormwater management credit bank. It consists of a flow splitter and weir, pretreatment area, sand filter area, and an overflow spillway channel.

#### **General Observations:**

A site visit was conducted by WBCM on April 10, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following pages for representative photos taken during the visit.

#### **Inflow:**

Stormwater enters the facility through a 24" RCP culvert and a swale receiving discharge from a curb cut in the adjacent parking lot. Gabion inflow protection and gabion outfall protection is present within the flowsplitter structure, as well as a rip rap mattress on the bottom of the flowsplitter. Standing water, algae, vines, debris, and trash are present within the flowsplitter and gabion baskets. Standing water present within the flowsplitter area shows that the inflow is not entering the pretreatment area as intended. The design plans for the flowsplitter show a notch weir to transfer water into the forebay, however this weir appears to have been filled in with concrete, leaving only a shallow linear orifice. The design and intention of this change to the flowsplitter is unknown. The channel northeast and upstream from the facility had flow during inspection and is bringing additional water to the sand filter. UMD has advised that this channel has baseflow entering the flowsplitter most of the time. This channel is bringing additional flow into the facility which may not have originally been accounted for. The drainage area to the facility is 26.17 acres, with 10.905 acres of impervious area.

**Pretreatment:**

The pretreatment forebay area has standing water, algae, debris, vines, and trash present. The pretreatment dewatering device is clogged and is not functioning as intended because the water is not flowing into the sand filter area. The forebay area is filled with vegetation, which is not allowing the water to flow as intended.

**Outflow:**

The outflow of the facility consists of an underdrain, outflow culvert, and overflow spillway channel. The underdrains appear to be completely clogged, standing water is present in all cleanouts up to the surface of the sand filter. The cleanout pipes are designed to be perforated up to the sand layer, however all pipes are perforated up to the filter surface. As a result, silt and soil could be entering the underdrain system through the perforations. This could be due to a clog in a pipe downstream from the underdrains or within the underdrain system. The overflow spillway stone shows signs of erosion. Matting fabric is not keyed into the ground.

**Overall BMP:**

The filter area is clogged with leaves, debris, and muck, and is not infiltrating water through the sand layer. A ½" layer of mud and silt is located throughout the sand filter area. Standing water is present on the surface of the sand filter due to an uneven filter surface elevation. Trash is present throughout filter area and pretreatment area. Algae is present in pretreatment area and within the flowsplitter. All observation wells are filled with standing water up to the filter surface and have broken caps. The channel adjacent to the flowsplitter is filled with leaves, branches, and debris. Leaves and branches are being dumped adjacent to the sand filter, causing the facility to become filled with debris and resulting in stagnant water. The sand filter is in overall poor condition and is failing to treat the stormwater runoff it receives.

**Meets MDE Criteria:** No



**Photo #1:** Flowsplitter, algae, vines, and debris present.



**Photo #2:** Flowsplitter, channel entering flowsplitter.





**Photo #3:** Outfall of flowsplitter, algae, debris present.



**Photo #4:** Pretreatment area, leaves, trash, and debris present.





Photo #5: Pretreatment area.



Photo #6: Pretreatment area.





**Photo #7:** Sand filter area, facing west.



**Photo #8:** Cleanout, full of water, algae present.





**Photo #9:** Pretreatment area, ponding and algae present.



**Photo #10:** Sand filter area, ponding shown.



**Photo #11:** Overflow spillway, erosion present.

## **BMP SWF 010 – Laboratory for Physical Sciences/Greenmead Drive Wet Pond MDE BMP ID: UMCP19BMP0010**

### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.  
MDE Permit Number: 91-SF-0059.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

### **General Description:**

SWF 010 is a mid-sized wet pond that sits in between the Laboratory for Physical Sciences and Greenmead Drive.

### **General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

### **Inflow:**

Runoff enters the facility through a curb inlet that flows to an overgrown riprap channel.

### **Pretreatment:**

There is no pretreatment forebay for this facility.

### **Outflow:**

Runoff exits this facility through a riser structure. The outlet has vegetation in the opening.

### **Overall BMP:**

This facility is in poor condition. It is overgrown and full of cattails. The pond appears to be dry at the bottom, suggesting that the facility is not functioning properly.

**Meets MDE Criteria:** No.





**Photo #1:** View into the facility. Filter area is completely covered with cattails.



**Photo #2:** The curb inlet structure that leads into the facility.

## **BMP SWF 011 – Clarice Smith Performing Arts Center Wet Pond**

### **MDE BMP ID: UMCP19BMP0011**

#### **Existing Site Conditions:**

**Date of Design / Construction:** 05/30/2003.  
**MDE Permit Number:** 03-SF-0282.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

#### **General Description:**

SWF 011 is a large wet pond outside of Clarice Smith Performing Arts Center.

#### **General Observations:**

A site visit was conducted by WBCM on June 5, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Water enters the facility through two inflow culverts. Both are overgrown.

#### **Pretreatment:**

There is a forebay area for this facility. The water level was low at time of inspection, and there was trash present.

#### **Outflow:**

Water exits this facility through a riser structure, which is surrounded by vegetation.

#### **Overall BMP:**

Overall this facility is in fair condition. The water is not stagnant, and the facility has become a thriving habitat for wildlife. Vegetation including cattails and trees are present within the facility and should be more frequently landscaped. Additional riprap is required at the second inflow point.

**Meets MDE Criteria:** No.





**Photo #1:** View into the facility.



**Photo #2:** The overgrown outfall structure.





**Photo #3:** Dead tree stump in front of the culvert inflow point.



**Photo #4:** Trees and low flow in the forebay.





**Photo #5:** The second inflow culvert.



**Photo #6:** Inflow channel that lacks riprap to protect from erosion.

## **BMP SWF 012 – Xfinity Center Parking Lot Wet Pond**

### **MDE BMP ID: UMCP19BMP0012**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Design Plans: December 14, 2000.  
MDE Permit Number: 00-SF-0275.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

#### **General Description:**

SWF 012 is a large J-shaped wet pond that is in between the Xfinity Center parking lot and the Maryland softball stadium.

#### **General Observations:**

A site visit was conducted by WBCM on May 8, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Runoff enters the facility through a culvert. It is directed around a peninsula in the middle of the facility.

#### **Pretreatment:**

There is no clear pretreatment area in this facility. The area on the inside of the peninsula is likely a forebay, but there is no identifiable weir structure. Given that the water level is below the orifice, the water should also be below the top of the weir if there is one present. The available design plans do not show a weir inside the facility.

#### **Outflow:**

Water exits this facility through a riser outlet. The outfall has both an orifice and an overflow. At the time of inspection the water surface was below the orifice.

#### **Overall BMP:**

This facility is in good condition. The vegetation should be maintained, and there is trash present in the facility.

**Meets MDE Criteria:** No.





**Photo #1:** View into the facility. Outfall structure visible. Water is below the orifice.



**Photo #2:** Possible forebay area. No weir is visible.

## **BMP SWF 013 – University Courtyard Apartments Wet Pond**

### **MDE BMP ID: UMCP19BMP0013**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

#### **General Description:**

SWF 013 is a wet pond behind the University Courtyard Apartments. There is a fountain in the center of the pond.

#### **General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Runoff enters the pretreatment stage through a concrete inflow culvert.

#### **Pretreatment:**

There is a forebay between the concrete inflow culvert and a gabion weir. The forebay is overgrown.

#### **Outflow:**

Water flows over a concrete weir and into a concrete culvert to exit the facility.

#### **Overall BMP:**

This facility is in good condition. The vegetation is well established and should continue to be landscaped. The fountain in the middle of the facility does not appear to affect its functionality.

**Meets MDE Criteria:** No.





**Photo #1:** The gabion weir that separates the forebay from the facility.



**Photo #2:** View into the facility.





**Photo #3:** The gabion weir that separates the forebay from the facility.



**Photo #4:** The outlet structure headwall.

**BMP SWF 014 – Woods Hall Bioretention**  
**MDE BMP ID: UMCP19BMP0014****Existing Site Conditions:**

**Date of Design / Construction:** November 17, 2011.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

BMP SWF 014 is a 1575-square foot bioretention located next to Woods Hall.

**General Observations:**

A site visit was conducted by WBCM on April 3, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility through sheet flow and stone inflow paths. The geotextile fabric on the inflow paths is exposed and coming loose.

**Pretreatment:**

This facility does not have a pretreatment stage.

**Outflow:**

Stormwater exits the facility through a 3-foot by 3-foot grate outlet. The outlet structure is in good condition. Leaf debris should be cleared from opening.

**Overall BMP:**

The facility is in overall good condition. Aside from the exposed geotextile, the only other issue is the accumulation of leaf litter on the filter area. Facility appears to be in functional condition.

**Meets MDE Criteria:** No.





**Photo #1:** View from base of the facility.



**Photo #2:** Sheet flow entry into the facility.





**Photo #3:** Exposed geotextile beneath stone inflow paths.



**Photo #4:** Stone inflow path into the facility.

**BMP SWF 016 – Shuttle Bus Facility Green Roof**  
**MDE BMP ID: UMCP19BMP0016****Existing Site Conditions:**

**Date of Design / Construction:** 09/29/2010.  
MDE Permit Number: 11-SF-0002.

**As-Built Documents Available:** 10/12/2012.

**Prior Maintenance Records Available:** 05/19/2019.

**General Description:**

BMP SWF 016 is a green roof located on top of the Shuttle Bus Facility.

**General Observations:**

A site visit was conducted by Furbish on May 29, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date.

**Inflow:**

Inflow enters the facility through sheet flow and precipitation.

**Pretreatment:**

There is no pretreatment facility for this BMP.

**Outflow:**

Excess runoff exits the facility through underdrains.

**Overall BMP:**

Overall this facility is in excellent condition.

**Meets MDE Criteria:** Yes.

**BMP SWF 017 – Shuttle Bus Facility Green Roof**  
**MDE BMP ID: UMCP19BMP0017****Existing Site Conditions:**

**Date of Design / Construction:** 09/29/2010.  
MDE Permit Number: 11-SF-0002.

**As-Built Documents Available:** 10/15/2012.

**Prior Maintenance Records Available:** 05/29/2019.

**General Description:**

BMP SWF 017 is a green roof located on top of the Shuttle Bus Facility.

**General Observations:**

A site visit was conducted by Furbish on May 29, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date.

**Inflow:**

Inflow enters the facility through sheet flow and precipitation.

**Pretreatment:**

There is no pretreatment facility for this BMP.

**Outflow:**

Excess runoff exits the facility through underdrains.

**Overall BMP:**

Overall this facility is in excellent condition.

**Meets MDE Criteria:** Yes.



## **BMP SWF 018 – Heavy Equipment Building Green Roof**

### **MDE BMP ID: UMCP19BMP0018**

#### **Existing Site Conditions:**

**Date of Design / Construction:** 02/18/2011.  
MDE Permit Number: 11-SF-0139.

**As-Built Documents Available:** No.

**Prior Maintenance Records Available:** 11/29/2019.

#### **General Description:**

BMP SWF 017 is a green roof located on top of the Heavy Equipment Building.

#### **General Observations:**

A site visit was conducted by Furbish on November 29, 2018. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date.

#### **Inflow:**

Inflow enters the facility through sheet flow and precipitation.

#### **Pretreatment:**

There is no pretreatment facility for this BMP.

#### **Outflow:**

Excess runoff exits the facility through underdrains.

#### **Overall BMP:**

Overall this facility is in excellent condition.

**Meets MDE Criteria:** No. As-built documentation required.

## **BMP SWF 019 – University House Parking Lot Bioretention**

### **MDE BMP ID: UMCP19BMP0019**

#### **Existing Site Conditions:**

**Date of Design / Construction:** 05/29/2013.  
MDE Permit Number: 13-SF-0237.

**As-Built Documents Available:** 08/28/2014.

**Prior Maintenance Records Available:** No

#### **General Description:**

BMP SWF 019 is a 1500-square foot bioretention located at the University House Parking Lot.

#### **General Observations:**

A site visit was conducted by WBCM on April 3, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Runoff from the parking lot enters the facility through a grate inlet and 15-inch culvert. Leaf debris should be cleared from the culvert.

#### **Pretreatment:**

This facility does not have a pretreatment area.

#### **Outflow:**

Stormwater exits the facility through infiltration. The presences of cleanouts suggest that an underdrain is present.

#### **Overall BMP:**

The facility is in good condition. The vegetation and mulch appear to be maintained, and the facility appears functional. One cleanout is broken.

**Meets MDE Criteria:** No.



Photo #1: View from above the facility.



Photo #2: Broken cleanout inside the facility.





**Photo #3:** Inflow culvert into the facility.

## **BMP SWF 020 – Crane Aquaculture Building Wet Pond**

### **MDE BMP ID: UMCP19BMP0020**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.  
MDE Permit Number: 98-SF-0319.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

#### **General Description:**

SWF 020 is a large wet pond behind the Crane Aquaculture Building.

#### **General Observations:**

A site visit was conducted by WBCM on June 5, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Runoff enters the facility through a culvert. The slope around the culvert is eroded and dense vegetation has obscured it from view.

#### **Pretreatment:**

There is no pretreatment area in this facility.

#### **Outflow:**

Water exits the facility through a concrete, v-notched weir. The weir is filled with debris but appears to be in functional condition.

#### **Overall BMP:**

Overall the BMP is in poor condition. The water quality is poor, and there is trash and algae all over the facility. The facility is completely fenced in, which likely makes routine maintenance difficult to accomplish.

**Meets MDE Criteria:** No.



**Photo #1:** View into the facility.



**Photo #2:** View of the water surface.





**Photo #3:** Algae and trash on the water surface.



**Photo #4:** The v-notched weir that leads to the facility outfall.

## **BMP SWF 021 – Biomolecular Sciences Building/Neutral Buoyancy Research Facility Wet Pond**

### **MDE BMP ID: UMCP19BMP0021**

#### **Existing Site Conditions:**

**Date of Design / Construction:** 04/01/1988.  
MDE Permit Number: 00-SF-0142.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 12/15/2016.

#### **General Description:**

SWF 021 is a large wet pond that sits in between the Biomolecular Sciences Building and the Neutral Buoyancy Research Facility.

#### **General Observations:**

A site visit was conducted by WBCM on May 15, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Water enters the facility through an inflow pipe which was halfway full of standing water at the time of inspection. There is an eroded gully from the adjacent parking lot to the inlet that leads to the inflow culvert.

#### **Pretreatment:**

There is no pretreatment area in this facility.

#### **Outflow:**

Water exits the facility through large gabion weir on the end of the facility closest to the Biomolecular Sciences Building. This weir empties into a swale that outfalls into Campus Creek. The weir is filled with a deep layer of muck and sediment. Vegetation is growing in the heavy sedimentation that has clogged the weir. Additionally, an oil sheen was present on the water surface of the swale.

#### **Overall BMP:**

Overall the facility is in poor condition. The pond is almost completely full of cattails, and none of the vegetation on the side slopes have been maintained. There is heavy sedimentation and silt

in center of the filter area. The exterior wall of the Biomolecular building that is adjacent to the swale is deteriorating. Additionally, the facility is directly downstream from the Campus Farm, which leaves its manure pile uncovered. As a result, animal manure is flowing into a storm drain that empty into the facility. At the time of inspection, manure was observed in the storm drain inlet directly downstream from the campus farm.

**Meets MDE Criteria:** No.





**Photo #1:** View into the facility from the outfall.



**Photo #2:** Erosional gully that leads into the facility inlet.



**Photo #3:** View into the facility from the inlet point.



**Photo #4:** The gabion weir that flows into the swale.





**Photo #5:** Sedimentation in the weir.



**Photo #6:** The fenced-in and uncovered manure pile, and the storm drain that it is directly downstream.





**Photo #7:** The aforementioned storm drain with manure inside.



**Photo #8:** The inflow pipe with standing water.

**BMP SWF 022 & 043 – Lot 11b/Campus Creek Bioretentions**  
**MDE BMP ID: UMCP19BMP0022 & UMCP19BMP0043****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 05/16/2017.

**General Description:**

SWF 022 & SWF 043 are bioretention areas in between Campus Creek and Lot 11b. These facilities were the first experimental bioretention facilities on campus.

**General Observations:**

A site visit was conducted by WBCM on April 11, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Sheet flow from the adjacent parking lot reaches the facilities through a concrete channel that splits the flow between the two facilities. The channels are clogged with trash and leaf litter. There are signs of erosion at the inflow points on the facilities.

**Pretreatment:**

These facilities do not have pretreatment areas.

**Outflow:**

Stormwater exits the facility through riser outlets. Both risers have standing water inside and it appears that high flows are bypassing the riser structures and flowing over the sides of the facilities directly into Campus Creek.

**Overall BMP:**

These facilities are in very poor condition. Any vegetation present in the facility has been overtaken by weeds and grass. There is exposed black plastic sheeting surrounding the sides of both of facilities. There is left over silt fence between the facilities and the stream. It does not appear that these facilities have been maintained in years.

**Meets MDE Criteria:** No.





**Photo #1:** Trash and leaf debris clogging one of the concrete channels.



**Photo #2:** View into one of the bioretentions.





**Photo #3:** The riser outlet on SWF 22, and erroneous silt fence behind the facility.



**Photo #4:** The inflow point on SWF 43.



**Photo #5:** The inflow channels of both facilities.

## **BMP SWF 024 – Terrapin Trail Parking Garage Wet Pond**

### **MDE BMP ID: UMCP19BMP0024**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.  
MDE Permit Number: 01-SF-0005.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 10/30/2018.

#### **General Description:**

SWF 024 is a large wet pond outside of the Terrapin Trail Parking Garage.

#### **General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Runoff enters the site through a concrete culvert. There appears to be a submerged headwall that could be a second culvert, but it is unclear without design plans.

#### **Pretreatment:**

There is no pretreatment area in this facility.

#### **Outflow:**

Water exits through a large slotted weir with a grate. There is some accumulated sediment stuck on the grate from past high flows.

#### **Overall BMP:**

The facility is in fair condition. The water quality is cloudy, but the facility appears to be functional.

**Meets MDE Criteria:** No.





**Photo #1:** View into the facility.



**Photo #2:** The grated outfall structure.



**Photo #3:** The concrete inflow culvert.



**Photo #4:** The unidentifiable submerged headwall.



## **BMP SWF 026 – Shuttle Bus Facility Parking Lot Dry Swale**

### **MDE BMP ID: UMCP19BMP0026**

#### **Existing Site Conditions:**

**Date of Design / Construction:** 09/29/2010.  
MDE Permit Number: 11-SF-0002.

**As-Built Documents Available:** 10/12/2012.

**Prior Maintenance Records Available:** 5/16/2017.

#### **General Description:**

SWF 026 is a long narrow dry swale next to Shuttle Bus Facility parking lot.

#### **General Observations:**

A site visit was conducted by WBCM on April 16, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Runoff enters the pretreatment facility as sheet flow. From there it flows over a berm into the dry swale.

#### **Pretreatment:**

There is a pretreatment forebay in this facility. The forebay is holding standing water, and some areas of the berm between the forebay and the swale have eroded.

#### **Outflow:**

Stormwater exits the facility via infiltration. There is also a riprap overflow channel that drains directly into the adjacent stream.

#### **Overall BMP:**

The facility is in fair condition. The only vegetation present is grass and brush. There is a high buildup of brush in the filter area. The forebay has standing water, and the weir has been eroded.

**Meets MDE Criteria:** No.





**Photo #1:** Standing water in the forebay.



**Photo #2:** The dry swale to the left, and the forebay to the right.





**Photo #3:** Vegetation in the facility is dominated by brush.



**Photo #4:** The riprap overflow channel.

**BMP SWF 027 – Lot PP2 Bioretention**  
**MDE BMP ID: UMCP19BMP0027****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 3/28/2018.

**General Description:**

SWF 027 is a bioretention area in between lot PP2 and Wellness Way.

**General Observations:**

A site visit was conducted by WBCM on April 16, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff from the adjacent parking lot enters the facility through a curb cut, that is filled with debris and sedimentation.

**Pretreatment:**

This facility does not have a pretreatment forebay.

**Outflow:**

Stormwater exits the facility through infiltration only. The lack of cleanouts suggests that there is no underdrain present.

**Overall BMP:**

The facility is in poor condition. The only vegetation present is grass. The facility is full of mud, sticks, and leaf debris. It looks like a depressed grass area, rather than a stormwater facility. The filter area appears clogged and is ill defined.

**Meets MDE Criteria:** No.





**Photo #1:** The curb cut through which runoff enters the facility.



**Photo #2:** The filter area of the facility.





**Photo #3:** The filter area of the facility.



**Photo #4:** Close up of the filter area.

## **SWF 033, 034, 035 – University House Bioretentions**

### **MDE BMP ID: UMCP19BMP0033, UMCP19BMP0034, UMCP19BMP0035**

#### **Existing Site Conditions:**

**Date of Design / Construction:** 09/02/2011.  
MDE permit number: 11-SF-0184.

**As-Built Documents Available:** 08/16/2012.

**Prior Maintenance Records Available:** No

#### **General Description:**

BMP SWF 033 is a 360-square foot bioretention, BMP SWF 034 is a 700-square foot bioretention, and BMP SWF 035 is a 546-square foot bioretention. These three facilities function separately but were permitted under one MDE number. All located three are located adjacent to the University House.

#### **General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Runoff enters facility 033 through sheet flow and enters facilities 034 and 035 through inflow pipes. Runoff also enters facility 035 through a riprap channel.

#### **Pretreatment:**

None of these facilities have pretreatment forebays.

#### **Outflow:**

Runoff exits these facilities through infiltration. The underdrains daylight downhill. These pipes are not fully buried and show signs of erosion.

#### **Overall BMP:**

Overall, these facilities are in good condition. The filter fabric is exposed in some areas, but the landscaping has been maintained well and the facilities appear to be functional.

**Meets MDE Criteria:** No





Photo #1: View into facility 033.



Photo #2: View into facility 034.





**Photo #3:** View into facility 035.



**Photo #4:** The riprap channel that leads into facility 035. Exposed filter fabric visible.



**Photo #5:** One of the exposed underdrains.



**BMP SWF 036 – Lot Three Guilford Park Bioretention  
MDE BMP ID: UMCP19BMP0036****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 08/19/14.

**General Description:**

BMP SWF 036 is a long narrow bioretention located next to Lot Three.

**General Observations:**

A site visit was conducted by WBCM on April 3, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the site through two curb cuts that flow through one riprap channel. All three of these entry points contain sedimentation buildup.

**Pretreatment:**

The riprap channel acts as pretreatment. Water flows through the channel until it comes to a gabion basket weir where it ponds before entering the facility.

**Outflow:**

Stormwater exits the facility through a riprap channel which drains to a 24-inch culvert.

**Overall BMP:**

This facility is in fair condition. More riprap should be added to the inflow channel. Silt should be removed from the filter area and inflow channels. There are erosional gullies at the outfall culvert.

**Meets MDE Criteria:** No.



**Photo #1:** One of the curb cuts that leads to the facility.



**Photo #2:** The pretreatment riprap channel.





Photo #3: View onto the filter area.



Photo #13: Erosional gullies downstream from the outlet culvert.



**BMP SWF 039 – Chemical and Nuclear Engineering Building  
Bioretention  
MDE BMP ID: UMCP19BMP0039**

**Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

SWF 039 is a bioretention outside of the Chemical and Nuclear Engineering Building.

**General Observations:**

A site visit was conducted by WBCM on June 5, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters this facility through three curb cuts and a roof drain.

**Pretreatment:**

There is no pretreatment area in this facility.

**Outflow:**

Runoff exits this facility through an outlet riser structure that is covered by vegetation.

**Overall BMP:**

This facility is extremely overgrown. It does not appear to have been landscaped in several years. Overall this facility is in fair condition.

**Meets MDE Criteria:** No.



**Photo #1:** View into the facility.



**Photo #2:** Curb cuts that lead into the facility.

**BMP SWF 040 – Presidential Drive (University House) Bioretention  
MDE BMP ID: UMCP19BMP0040****Existing Site Conditions:**

**Date of Design / Construction:** 09/02/2011.  
MDE Permit Number 11-SF-0184.

**As-Built Documents Available:** 08/16/2012.

**Prior Maintenance Records Available:** No

**General Description:**

BMP SWF 040 is a 442-square foot bioretention next to Presidential Drive near the University House.

**General Observations:**

A site visit was conducted by WBCM on April 3, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility through a wide riprap-lined curb cut. The riprap is in good condition.

**Pretreatment:**

This facility does not have pretreatment forebay.

**Outflow:**

The stormwater leaves the facility through infiltration. The presence of cleanouts suggests that there is an underdrain present.

**Overall BMP:**

This facility is in good condition. There is a pile of sand in the middle of the filter bed, and two of the cleanouts are missing lids, but the facility appears functional.

**Meets MDE Criteria:** No.





**Photo #1:** View into the facility.



**Photo #2:** Pile of sand in the middle of the filter bed.



**Photo #3:** The riprap lined curb cut.

**BMP SWF 041 – Presidential House (University House) Bioretention  
MDE BMP ID: UMCP19BMP0041****Existing Site Conditions:**

**Date of Design / Construction:** 09/02/2011.  
MDE permit number: 11-SF-0184.

**As-Built Documents Available:** 08/16/2012.

**Prior Maintenance Records Available:** No

**General Description:**

BMP SWF 041 is a 17-foot by 54-foot bioretention facility located near the University House.

**General Observations:**

A site visit was conducted by WBCM on April 10, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility through a culvert.

**Pretreatment:**

This facility does not have a pretreatment facility.

**Outflow:**

Runoff exits the facility through an underdrain, which discharges into a downstream gravel strip. From there the runoff is piped under the adjacent road. This facility was adjusted after the as-built plans were finished.

**Overall BMP:**

Overall, this facility is in good condition. There is mulch buildup on the filter area which has made the filter area smaller than was designed. The culvert is clogged with leaf debris. The facility appears to be functional, and the landscaping seems maintained.

**Meets MDE Criteria:** No.





**Photo #1:** View into bioretention facility.



**Photo #2:** The gravel strip into which the underdrain drains.

**BMP SWF 042 – Wye Oak Building Bioretention**  
**MDE BMP ID: UMCP19BMP0042****Existing Site Conditions:**

**Date of Design / Construction:** 03/18/2013.  
MDE permit number: 13-SF-0233.

**As-Built Documents Available:** 02/24/2014.

**Prior Maintenance Records Available:** No

**General Description:**

SWF 042 is a bioretention next to the Wye Oak Building.

**General Observations:**

A site visit was conducted by WBCM on April 16, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility through two 6-inch inflow pipes, one of which is clogged with sediment and leaves.

**Pretreatment:**

This facility does not have a pretreatment forebay.

**Outflow:**

Stormwater exits the facility through a riser outlet, which is filled with at least 12 inches of standing water.

**Overall BMP:**

The facility is in fair condition. There is a trash can, as well as spilled garbage, in the filter area. The waterproofing on the wooden side walls is peeling, and there is significant leaf debris in the filter area.

**Meets MDE Criteria:** No.





Photo #1: Clogged inflow pipe.



Photo #2: View into the facility, with trashcan in the filter bed.



**BMP SWF 046 – Symons Hall Rain Garden**  
**MDE BMP ID: UMPC19BMP0046****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

BMP SWF 046 is a shallow, 9-foot by 33-foot rain garden. It is one of two identical rain gardens located in front of Symons Hall. It is surrounded by a pervious pavement patio.

**General Observations:**

A site visit was conducted by WBCM on April 2, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Inflow to this facility is sheet flow over the adjacent permeable pavement.

**Pretreatment:**

This facility does not have a pretreatment stage.

**Outflow:**

Flow exits this facility through infiltration.

**Overall BMP:**

This facility is a shallow, mulch covered rain garden facility with no vegetation except for two bushes and some weeds. At the time of inspection there was no standing water or algae present in the facility, and no noticeable signs of erosion. Aside from the lack of vegetation, this facility appears to be in good condition.

**Meets MDE Criteria:** No.



**Photo #1:** Overall view of the rain garden.



**Photo #2:** Close up view of the vegetation.

**BMP SWF 047 – Symons Hall Rain Garden**  
**MDE BMP ID: UMCP19BMP0047****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No.

**Prior Maintenance Records Available:** No.

**General Description:**

BMP SWF 047 is a shallow, 9-foot by 33-foot rain garden. It is one of two identical rain gardens located in front of Symons Hall. It is surrounded by a pervious pavement patio.

**General Observations:**

A site visit was conducted by WBCM on April 2, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Inflow to this facility is sheet flow over the adjacent permeable pavement.

**Pretreatment:**

This facility does not have a pretreatment stage.

**Outflow:**

Flow exits this facility through infiltration.

**Overall BMP:**

This facility is a shallow, mulch covered rain garden facility with no vegetation except for four bushes and some weeds. At the time of inspection there was no standing water or algae present in the facility, and no noticeable signs of erosion. Aside from the lack of vegetation, this facility appears to be in good condition.

**Meets MDE Criteria:** No.





**Photo #1:** View from the right side of the rain garden.



**Photo #2:** View from the left side of the rain garden.

## **BMP SWF 048 – Symons Hall Permeable Pavement**

### **MDE BMP ID: UMCP19BMP0048**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

#### **General Description:**

BMP SWF 047 is a section of permeable, brick pavement located in front of Symons Hall. Within the permeable pavement there are two identical rain garden facilities.

#### **General Observations:**

A site visit was conducted by WBCM on April 2, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Inflow to this facility is sheet flow.

#### **Pretreatment:**

This facility does not have a pretreatment stage.

#### **Outflow:**

Flow exits this facility through infiltration.

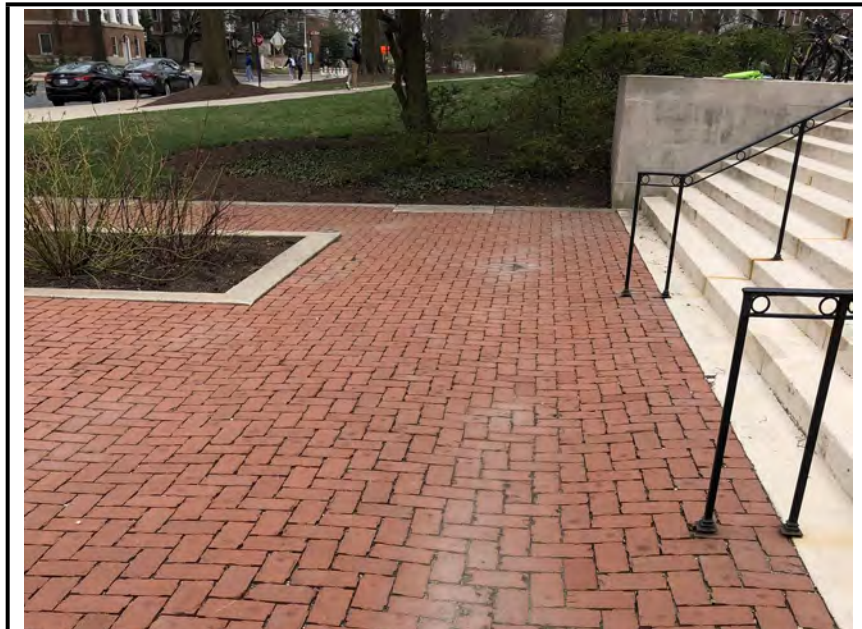
#### **Overall BMP:**

This facility is a permeable, brick patio that is in fair condition. The pavement pores are becoming clogged with debris in some areas, and there are several noticeably sunken areas in its surface. Uneven settling of the bricks may become a safety hazard. The uneven settling also indicates a possible subgrade failure due to poor drainage and infiltration.

**Meets MDE Criteria:** No.



**Photo #1:** Semi-clogged pores in pavement.



**Photo #2:** A section of unevenly settled bricks.



**BMP SWF 049 – Computer and Space Sciences Green Roof**  
**MDE BMP ID: UMCP19BMP0049****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 08/21/2018.

**General Description:**

BMP SWF 049 is a green roof located on top of the Computer and Space Sciences building.

**General Observations:**

A site visit was conducted by Furbish on August 21, 2018. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date.

**Inflow:**

Inflow enters the facility through sheet flow and precipitation.

**Pretreatment:**

There is no pretreatment facility for this BMP.

**Outflow:**

Excess runoff exits the facility through underdrains.

**Overall BMP:**

Overall this facility is in excellent condition.

**Meets MDE Criteria:** No. As-built documentation required.

**BMP SWF 050 – Cumberland Green Roof**  
**MDE BMP ID: UMCP19BMP0050****Existing Site Conditions:**

**Date of Design / Construction:** 07/11/2008.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 11/30/2018.

**General Description:**

BMP SWF 050 is a green roof located on top of the Cumberland Building.

**General Observations:**

A site visit was conducted by Furbish on November 30, 2018. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date.

**Inflow:**

Inflow enters the facility through sheet flow and precipitation.

**Pretreatment:**

There is no pretreatment facility for this BMP.

**Outflow:**

Excess runoff exits the facility through underdrains.

**Overall BMP:**

Overall this facility is in excellent condition.

**Meets MDE Criteria:** No. As-built documentation required.

**BMP SWF 055 – Landscape Lane Bioretention**  
**MDE BMP ID: UMCP19BMP0055****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.  
MDE Permit Number: 11-SF-0139.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

SWF 055 is a bioretention next to Landscape Lane and near the Wye Oak Building.

**General Observations:**

A site visit was conducted by WBCM on April 16, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility through a curb inlet, which has a filter log stuck inside of it.

**Pretreatment:**

This facility does not have a pretreatment area.

**Outflow:**

Stormwater exits the facility through a riser structure, which has standing water inside, and a grate inlet.

**Overall BMP:**

Overall, this facility is in poor condition. The only vegetation present are weeds and grass. The side slopes have eroded. It does appear to be a functional facility.

**Meets MDE Criteria:** No.





Photo #1: Filter log stuck inside of the inlet.



Photo #2: Vegetation inside the facility.





Photo #3: The grate outlet in the facility.



Photo #4: The riser outlet in the facility.

**BMP SWF 056 – Chesapeake Building/Research Greenhouse  
Way/Xfinity Center Wet Pond  
MDE BMP ID: UMCP19BMP0056**

**Existing Site Conditions:**

**Date of Design / Construction:** Design Plans: December 14, 2000.  
MDE Permit Number: 01-SF-0167.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 4/18/2018.

**General Description:**

SWF 056 is a large wet pond in between the Xfinity Center and Research Greenhouse Way.

**General Observations:**

A site visit was conducted by WBCM on May 8, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility through two submerged culverts. At the time of inspection, the tops of the headwalls were visible, but the culverts and riprap were submerged.

**Pretreatment:**

There is no pretreatment area in this facility.

**Outflow:**

Water exits the facility through a riser structure. At the time of inspection the orifice of this structure was completely submerged, and water was flowing over the overflow.

**Overall BMP:**

Overall the facility is in poor condition. The water level in the facility suggests that the facility is clogged. The BMP is not functional.

**Meets MDE Criteria:** No





**Photo #1:** View into the facility.



**Photo #2:** The outfall structure. Water is at the overflow level.



**Photo #3:** The top of one of the headwalls visible at water surface.

## **BMP SWF 0059 – Denton Dining Hall Bioretention MDE BMP ID: UMCP19BMP0059**

### **Existing Site Conditions:**

**Date of Design / Construction:** 03/20/2012.  
MDE Permit Number: 12-SF-0215

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

### **General Description:**

SWF 059 is a long, narrow bioretention next to the Denton Area Dining Hall.

### **General Observations:**

A site visit was conducted by WBCM on April 11, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

### **Inflow:**

Runoff enters the forebay through curb cuts. Stormwater flows from the forebay to the filter area by passing through cuts in the weir wall.

### **Pretreatment:**

The facility has two forebays on either side of the filter area.

### **Outflow:**

Stormwater exits the facility through a riser outlet, which is in good condition.

### **Overall BMP:**

This facility is in good condition. There is mulch buildup near the walls, trash present in the forebays and filter area, and waterproofing loose along the ledge, but the facility appears to be functional. There is a rug in the facility that must be removed.

**Meets MDE Criteria:** No.





**Photo #1:** Curb cuts that lead into one of the forebays.



**Photo #2:** The rug that is inside the facility.



Photo #3: Wall openings that lead from the forebay into the filter area.

**BMP SWF 065 – Laboratory for Telecommunication Sciences DryPond  
MDE BMP ID: UMCP19BMP0065****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.  
MDE Permit Number: 04-SF-0066.

**As-Built Documents Available:** 01/11/2006.

**Prior Maintenance Records Available:** No

**General Description:**

SWF 065 is a large dry pond next to the Laboratory of Telecommunication Sciences parking lot.

**General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility through a grass swale, which flows into a culvert. At the time of inspection, the culvert was full of standing water.

**Pretreatment:**

The grass swale serves as pretreatment for this facility.

**Outflow:**

It was impossible to see an outfall structure in this facility as the entire facility is obscured by the dense growth of cattails.

**Overall BMP:**

This facility is in poor condition. It does not appear to have been maintained for many years. The density of the overgrowth made this facility difficult to inspect, but it does not appear to be functional due to the stagnant water observed in the culvert.

**Meets MDE Criteria:** No.





**Photo #1:** The inflow culvert to the facility.



**Photo #2:** View into the facility obscured by dense vegetation.

**BMP SWF 066 – Laboratory for Telecommunication Sciences Swale**  
**MDE BMP ID: UMCP19BMP0066****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.  
MDE Permit Number: 04-SF-0066.

**As-Built Documents Available:** 01/11/2006.

**Prior Maintenance Records Available:** No

**General Description:**

SWF 066 is a grass swale on the edge of the Laboratory for Telecommunication Sciences parking lot.

**General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility as sheet flow from the adjacent parking lot.

**Pretreatment:**

This facility has no pretreatment area.

**Outflow:**

Water exits this facility through a grated rise outlet structure.

**Overall BMP:**

Overall this facility is in fair condition. The grading appears to be compromised as there are concentrated areas of standing water in various points of the swale. These puddles are dominated by young growths of cattails. Additionally, small fish and various types of algae are present.

**Meets MDE Criteria:** No.





**Photo #1:** Standing water in the swale.



**Photo #2:** View into the facility.





**Photo #3:** Pocket of standing water in the swale.



**Photo #4:** The outlet structure.

**BMP SWF 068 – Courtyards Northeast Parking Lot Bioretention**  
**MDE BMP ID: UMCP19BMP0068****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

SWF 068 is a bioretention in the Courtyards Northeast parking lot.

**General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility as sheet flow from the adjacent parking lot.

**Pretreatment:**

This facility has no pretreatment area.

**Outflow:**

It is not clear how runoff exits the facility other than infiltration.

**Overall BMP:**

This facility is in poor condition. There is no vegetation aside from some weeds and a few trees. The surface is very uneven, and parts of the adjacent pavement have eroded into the filter area.

**Meets MDE Criteria:** No.





Photo #1: View into the facility.



Photo #2: The uneven ground surface inside the facility.



**BMP SWF 0069 – Courtyards Northeast Parking Lot Bioretention  
MDE BMP ID: UMCP19BMP0069****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

SWF 068 is a bioretention in the Courtyards Northeast parking lot.

**General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility as sheet flow from the adjacent parking lot.

**Pretreatment:**

There is no pretreatment stage in this facility.

**Outflow:**

Water exits this facility through infiltration.

**Overall BMP:**

Overall this facility is in poor condition. There is no vegetation other than a few trees and one herbaceous plug. The filter area is unevenly eroded, and there is no storage depth.

**Meets MDE Criteria:** No.



**Photo #1:** View into the facility.



**Photo #2:** The unvegetated end of the facility.

**BMP SWF 070 – Denton Hall Bioretention**  
**MDE BMP ID: UMCP19BMP0070****Existing Site Conditions:**

**Date of Design / Construction:** 03/20/2012.  
MDE permit number: 12-SF-0215.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 12/02/2016.

**General Description:**

SWF 070 is a 450-square foot bioretention that is near Denton Hall.

**General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Water enters the facility through a riprap lined curb cut.

**Pretreatment:**

This facility does not have a pretreatment forebay.

**Outflow:**

Stormwater exits the facility through a riser inlet. Mulch is present at the bottom of the riser.

**Overall BMP:**

Overall, this facility is in good condition. The filter area has been overtaken by weeds and should be landscaped properly. The facility appears to be functional.

**Meets MDE Criteria:** No.





Photo #1: Weeds inside the filter area.



Photo #2: View of the facility.

**BMP SWF 073 – Stamp Center Green Roof West**  
**MDE BMP ID: UMCP19BMP0073****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 05/29/2019.

**General Description:**

BMP SWF 073 is a green roof located on top of the Stamp Center.

**General Observations:**

A site visit was conducted by Furbish on May 29, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date.

**Inflow:**

Inflow enters the facility through sheet flow and precipitation.

**Pretreatment:**

There is no pretreatment facility for this BMP.

**Outflow:**

Excess runoff exits the facility through underdrains.

**Overall BMP:**

Overall this facility is in good condition.

**Meets MDE Criteria:** No. As-built documentation required.

**BMP SWF 074 – Stamp Center Green Roof East  
MDE BMP ID: UMCP19BMP0074****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 05/29/19.

**General Description:**

BMP SWF 074 is a green roof located on top of the Stamp Center.

**General Observations:**

A site visit was conducted by Furbish on May 29, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date.

**Inflow:**

Inflow enters the facility through sheet flow and precipitation.

**Pretreatment:**

There is no pretreatment facility for this BMP.

**Outflow:**

Excess runoff exits the facility through underdrains.

**Overall BMP:**

Overall this facility is in good condition.

**Meets MDE Criteria:** No. As-built documentation required.



**BMP SWF 075 – Denton Hall Permeable Pavement**  
**MDE BMP ID: UMCP19BMP0075****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.  
MDE Permit Number: 12-SF-0215.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

SWF 075 is a permeable pavement area next to Denton Hall.

**General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility via sheet flow.

**Pretreatment:**

There is no pretreatment area for this facility.

**Outflow:**

Runoff exits this facility through infiltration.

**Overall BMP:**

This facility is in fair condition. The pavers have settled unevenly, and there are various stains on the bricks. The curb is not flush to the pavers and is chipping in some areas.

**Meets MDE Criteria:** No.



**Photo #1:** Stains on the pavers.



**Photo #2:** Curb is not flush to the pavers.



**Photo #3:** Stains on the pavers.



**Photo #4:** Curb is chipping and cracking in some places.



**BMP SWF 076 – Public Health Garden Bioretention**  
**MDE BMP ID: UMCP19BMP0076****Existing Site Conditions:**

**Date of Design / Construction:** 05/08/2013.  
MDE permit number: 12-SF-0301.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 04/27/2018.

**General Description:**

SWF 076 is a bioretention that is located next to the Eppley Recreation Center.

**General Observations:**

A site visit was conducted by WBCM on April 11, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff from the surrounding impervious areas enters the facility through a trench drain that flows onto a riprap channel into the bioretention.

**Pretreatment:**

There is no pretreatment for this facility.

**Outflow:**

Water exits the facility through a riser structure, which has standing water inside.

**Overall BMP:**

Overall the facility is in good condition. The filter area has been overtaken by weeds, which is choking out other vegetation. The facility appears to be functional. This bioretention is actually a pretreatment stage for the rainwater harvesting system (SWF 077) and would likely not be given credit as a stand-alone facility.

**Meets MDE Criteria:** No.



Photo #1: Riser outlet structure in facility.



Photo #2: Entry point to facility.





Photo #3: View into the facility.



Photo #4: Trench drain that leads to the facility.



## **BMP SWF 077 – Public Health Garden Rainwater Harvesting**

### **MDE BMP ID: UMCP19BMP0077**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 04/27/2018.

#### **General Description:**

SWF 077 is a rainwater harvesting system outside of the Eppley Recreation Center.

#### **General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Rainwater flows through a bioretention facility into a 2600-gallon cistern.

#### **Pretreatment:**

The pretreatment stage of this facility is a long, narrow bioretention facility (SWF 076).

#### **Outflow:**

Water is pumped from the cistern uphill into eight 50-gallon rainwater barrels via a solar pump. From there it is used as irrigation water for a garden.

#### **Overall BMP:**

Overall the facility is in good condition. The facility appears to be functioning properly.

**Meets MDE Criteria:** No.



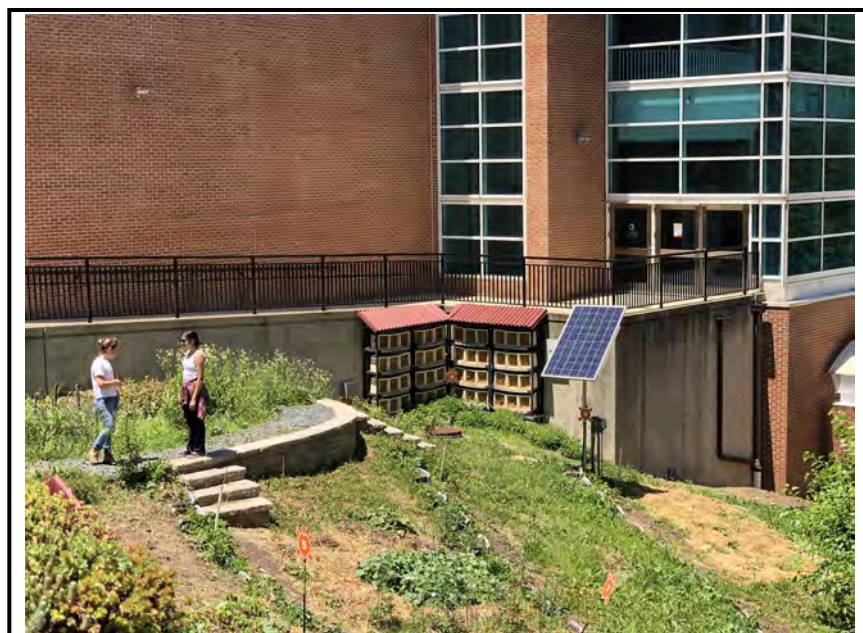
Photo #1: One of the 50-gallon rain barrels that store water for irrigation.



Photo #2: An informational sign explaining the process.



**Photo #3:** The manhole that leads to the cistern.



**Photo #4:** The edge of the pretreatment bioretention next to the water pump solar panel.



**BMP SWF 078 – Physical Science Green Roof**  
**MDE BMP ID: UMCP19BMP0078****Existing Site Conditions:**

**Date of Design / Construction:** 12/23/2009.  
MDE Permit Number: 10-SF-0085.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 05/29/2019.

**General Description:**

BMP SWF 078 is a green roof located on top of the Physical Science building.

**General Observations:**

A site visit was conducted by Furbish on May 29, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date.

**Inflow:**

Inflow enters the facility through sheet flow and precipitation.

**Pretreatment:**

There is no pretreatment facility for this BMP.

**Outflow:**

Excess runoff exits the facility through underdrains.

**Overall BMP:**

Overall this facility is in good condition.

**Meets MDE Criteria:** No. As-built documentation required.

**BMP SWF 079 – Glenn L. Martin Hall Permeable Pavement  
MDW BMP ID: UMCP19BMP0079****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

SWF 079 is an area of permeable pavement adjacent to William E. Kirwan Hall.

**General Observations:**

A site visit was conducted by WBCM on June 5, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility as sheet flow.

**Pretreatment:**

There is no pretreatment stage for this facility.

**Outflow:**

Runoff exits the facility through infiltration.

**Overall BMP:**

This facility is in good condition. Moss and other vegetation grows in some of the gaps between pavers and should be removed. The facility appears to be functional.

**Meets MDE Criteria:** No.



**Photo #1:** View of the facility.



**Photo #2:** Vegetation growing in cracks in the pavers.



**BMP SWF 080 – Neutral Buoyancy Research Facility Permeable  
Pavement (Lot FF2)  
MDE BMP ID: UMCP19BMP0080**

**Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

SWF 080 is an area of permeable pavement in the Neutral Buoyancy Research Facility parking lot.

**General Observations:**

A site visit was conducted by WBCM on May 15, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters this facility by direct precipitation onto the surface.

**Pretreatment:**

There is no pretreatment area in this facility.

**Outflow:**

Stormwater exits this facility through infiltration.

**Overall BMP:**

This facility is in fair condition. There is not much gravel between the pavers, and the pavers have settled along the border. The curb along the border prevents sheet flow from entering the facility.

**Meets MDE Criteria:** No.



Photo #1: View onto the facility.



Photo #2: Close up view of the pavers.

## **BMP SWF 081 – Denton Hall Rainwater Harvesting**

### **MDE BMP ID: UMCP19BMP0081**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.  
MDE Permit Number: 12-SF-0215.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

#### **General Description:**

SWF 081 is a rainwater harvesting area outside of Denton Area Dining Hall.

#### **General Observations:**

A site visit was conducted by WBCM on June 5, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Water enters the facility as runoff from the roof.

#### **Pretreatment:**

There is no pretreatment stage in this facility.

#### **Outflow:**

Water exits the facility through the irrigation system.

#### **Overall BMP:**

This facility is in fair condition. The seal on the pipe entering the barrel is loose and must be resealed.

**Meets MDE Criteria:** No.





**Photo #1:** The rainwater harvesting facility.



**Photo #2:** The irrigation system control panel.

**BMP SWF 083 – Denton Hall Rainwater Harvesting**  
**MDE BMP ID: UMCP19BMP0083****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.  
MDE Permit Number: 12-SF-0215.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

SWF 083 is a rainwater harvesting area outside of the Denton Dining Hall.

**General Observations:**

A site visit was conducted by WBCM on June 5, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Water enters the facility as runoff from the adjacent roof structure.

**Pretreatment:**

There is no pretreatment stage for this facility.

**Outflow:**

Water exits the facility through the irrigation system.

**Overall BMP:**

This facility is in fair condition. The seal on the pipe entering the facility is loose, and there is mildew forming on the outside.

**Meets MDE Criteria:** No.



Photo #1: The rainwater harvesting facility.



Photo #2: The irrigation control panel.



**BMP SWF 086 – Clarice Smith Performing Arts Center Permeable  
Pavement  
MDE BMP ID: UMCP19BMP0086**

**Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 08/24/2018.

**General Description:**

BMP SWF 086 is a section of permeable brick pavement behind the Clarice Smith Performing Arts Center and connected the parking area off Backstage Lane.

**General Observations:**

A site visit was conducted by WBCM on April 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters this facility through sheet flow.

**Pretreatment:**

There is no pretreatment area in this facility.

**Outflow:**

Water exits the facility through infiltration.

**Overall BMP:**

This facility is in poor condition. The pavers are clogged with dirt and have oil stains from golf carts. The golf carts are eroding the grass areas adjacent to the pavers. The pavers have settled unevenly which indicates a possible subgrade failure due to poor drainage and infiltration.

**Meets MDE Criteria:** No.



**Photo #1:** Oil spots on the pavers.



**Photo #2:** Pavers clogged with dirt.



**Photo #3:** Dirt covering pavers.



**Photo #4:** Eroded grass next to the pavers.



**BMP SWF 088 – Chemical and Nuclear Engineering Building  
Bioretention  
MDE BMP ID: UMCP19BMP0088**

**Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

SWF 088 is a bioretention outside of the Chemical & Nuclear Engineering Building.

**General Observations:**

A site visit was conducted by WBCM on June 5, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility through two curb cuts.

**Pretreatment:**

There is no pretreatment stage in this facility.

**Outflow:**

Runoff exits the facility through a concrete outlet that is flush to the ground and is full of standing water.

**Overall BMP:**

The facility is in fair condition. The outlet elevation is not high enough to ensure adequate ponding. The facility is also very overgrown and should be trimmed and landscaped.

**Meets MDE Criteria:** No.



**Photo #1:** The view into the facility.



**Photo #2:** The outlet structure.

**BMP SWF 089 – University of Maryland Golf Course Wet Pond  
MDE BMP ID: UMCP19BMP0089****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

SWF 089 is a large wet pond on the University of Maryland Golf Course.

**General Observations:**

A site visit was conducted by WBCM on May 1, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility through a culvert that discharges about 4 feet above the filter bottom. The area side slope around the culvert has eroded back so that about 10 feet of the pipe is exposed.

**Pretreatment:**

There is no pretreatment forebay in this facility.

**Outflow:**

Stormwater exits this facility through a dam, which is in very poor condition. The concrete is crumbling, and the low flow pipe is encased in a broken wooden box. There is considerable debris buildup on the front of dam, as well as errant sand bags lying around.

**Overall BMP:**

Overall, this facility is in poor condition. It is very overgrown and eroded, and there is oil visible on the water surface. There are some black PVC pipes in the filter area that are broken.

**Meets MDE Criteria:** No.





**Photo #1:** View into the facility.



**Photo #2:** Front of the dam.



**Photo #3:** Back of the dam.



**Photo #4:** Filter area of the facility.





Photo #5: Broken pipe on edge of the filter area.



Photo #6: Exposed inflow culvert.



**BMP SWF 090 – Lot PP2 Rain Garden**  
**MDE BMP ID: UMCP19BMP0090****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 10/29/2018.

**General Description:**

SWF 090 is a large rain garden in between Lot PP2 and Campus Creek and near the Xfinity Center.

**General Observations:**

A site visit was conducted by WBCM on April 16, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Water enters the facility through a culvert with a headwall.

**Pretreatment:**

It is unclear if the apparent pretreatment area was an intentional design element. At the time of inspection there was a pool of standing water in front of the inflow, however there was no discernable weir, and the water was not flowing into the rest of the facility.

**Outflow:**

The water exits the facility through a riser structure.

**Overall BMP:**

This facility is in poor condition. There is standing water surrounding each cleanout. The filter bed appears to be clogged. The only vegetation are weeds and grass, and low flows do not appear to be able to enter the facility.

**Meets MDE Criteria:** No.



Photo #1: View into facility.



Photo #2: Outlet structure.





**Photo #3:** Ponding water around one of the cleanouts.



**Photo #4:** Chicken wire inside of facility filter area.





Photo #5: Forebay pretreatment area.



Photo #6: Stagnant water in the forebay.

**BMP SWF 091 – Regents Drive Bioretention**  
**MDE BMP ID: UMCP19BMP0091****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 05/16/2017.

**General Description:**

SWF 091 is a bioretention along Regents Drive.

**General Observations:**

A site visit was conducted by WBCM on May 8, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility through a curb cut. Just downstream of the curb cut is an inlet. It is unclear where this inlet discharges.

**Pretreatment:**

There is no pretreatment forebay in this facility.

**Outflow:**

Stormwater exits the facility through an overflow weir, and into an inlet at grade.

**Overall BMP:**

Overall, this facility is in fair condition. The vegetation is overgrown, and the filter area is full of weeds and invasive species. Inside the facility there is trash, rocks, and leaf debris.

**Meets MDE Criteria:** No.





**Photo #1:** Overgrown vegetation in the filter area.



**Photo #2:** Inlet next to the inflow curb cut.



**BMP SWF 092 – Lot 9 Bioretention**  
**MDE BMP ID: UMCP19BMP0092****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

SWF 092 is a long narrow bioretention located in the Lot 9 parking lot.

**General Observations:**

A site visit was conducted by WBCM on May 8, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Run off enters the facility through curb cuts and curb inlets.

**Pretreatment:**

This facility does not have a pretreatment facility.

**Outflow:**

Runoff exits the facility through infiltration. The broken cleanout inside the facility suggests the presence of an underdrain.

**Overall BMP:**

This facility is in fair condition. The metal on one curb cut is broken, and the curb cut is clogged and touching pavement with no opening.

**Meets MDE Criteria:** No.



**Photo #1:** Eroded curb cut.



**Photo #2:** Broken cleanout.



Photo #3: Collapsing curb inlet.



**BMP SWF 093 – Regents Drive Bioretention**  
**MDE BMP ID: UMCP19BMP0093****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 05/16/2018.

**General Description:**

SWF 093 is a bioretention along Regents Drive.

**General Observations:**

A site visit was conducted by WBCM on May 8, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility through a curb cut that flows through a concrete channel.

**Pretreatment:**

There is no pretreatment in this facility.

**Outflow:**

Runoff exits the facility through an outflow inlet that is only 2 inches above the ground surface and is right next to the inflow.

**Overall BMP:**

Overall the facility is in poor condition. The location and height of the outfall suggests that water is not infiltrating through the media. The facility is not designed in a way that would make it function effectively. Additionally, the facility area is overgrown and filled with weeds.

**Meets MDE Criteria:** No.



Photo #1: View of the overgrown filter area.



Photo #2: Outlet structure next to the inflow channel.



Photo #3: Inflow channel to the facility.



## **BMP SWF 094 – Paint Branch Drive/Biomolecular Sciences Building Bioretention MDE BMP ID: UMCP19BMP0094**

### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 05/16/2017.

### **General Description:**

SWF 094 is a large bioretention area next to Paint Branch Drive and the Biomolecular Sciences Building.

### **General Observations:**

A site visit was conducted by WBCM on April 11, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

### **Inflow:**

Runoff enters the facility through a curb cut. The inlet appears to have the remnants of rock outlet protection but shows signs of erosion.

### **Pretreatment:**

There is no pretreatment forebay in this facility.

### **Outflow:**

Runoff exits the facility through infiltration.

### **Overall BMP:**

Overall this facility is in poor condition. The facility is indistinguishable from the forest and grass areas that surround it. It appears that no maintenance has been done for many years. Two cleanouts are missing tops, and the sides of the facility are heavily eroded.

**Meets MDE Criteria:** No.



**Photo #1:** View into the facility.



**Photo #2:** The filter area of the facility.





**Photo #3:** The inflow point of the facility.



**Photo #4:** Erosion on the side slopes.





Photo #5: View into the facility and surrounding area.



Photo #6: Vegetation inside the filter area.

**BMP SWF 098 – Artificial Turf Field Bioretention**  
**MDE BMP ID: UMCP19BMP0098****Existing Site Conditions:**

**Date of Design / Construction:** 07/20/1994.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 10/29/2018.

**General Description:**

SWF 098 is a long, narrow bioretention that runs along the Recreation Artificial Turf Field.

**General Observations:**

A site visit was conducted by WBCM on May 8, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility through a culvert.

**Pretreatment:**

There is no pretreatment stage for this facility.

**Outflow:**

Water exits the facility over a riprap spillway that drains directly into the adjacent swamp.

**Overall BMP:**

This facility is in fair condition. There is a thick grove of bamboo, an invasive species, in the middle of the facility. Additionally, there is a large amount of trash and standing water in the filter area. The side slopes have eroded, and the grass in the filter area is being overtaken by weeds.

**Meets MDE Criteria:** No.





**Photo #1:** The inflow culvert to the facility.



**Photo #2:** View into the facility.





**Photo #3:** The riprap spillway.



**Photo #4:** The thick grove of bamboo in the filter area.

## **BMP SWF 106 – Shuttle Bus Facility Parking Lot Wet Pond**

### **MDE BMP ID: UMCP19BMP0106**

#### **Existing Site Conditions:**

**Date of Design / Construction:** 10/29/2010.  
MDE Permit Number: 11-SF-0002.

**As-Built Documents Available:** 10/15/2012.

**Prior Maintenance Records Available:** 12/02/2016.

#### **General Description:**

SWF 106 is a wet pond behind the parking lot of the Shuttle Bus Facility.

#### **General Observations:**

A site visit was conducted by WBCM on April 16, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Inflow enters the facility through a riprap inflow channel, as well as an eroded inflow channel with no rip rap.

#### **Pretreatment:**

There is no pretreatment stage for this facility.

#### **Outflow:**

Water exits the facility beneath the fence through a brick lined channel. This channel flows into the forebay of the swale facility that is on the other side of the fence

#### **Overall BMP:**

This facility is in poor condition. There is standing water at the inflow and outflow. The design plans do not show a channel outflow. This suggests that water is supposed to leave the facility through infiltration alone but overtime an outlet channel has been eroded. This facility is not functional.

**Meets MDE Criteria:** No.





**Photo #1:** View into the facility.



**Photo #2:** Brick-lined outflow channel.





**Photo #3:** The riprap inflow channel.

## **BMP SWF 107 – Maryland Softball Stadium/Recreation Artificial Turf Field Bioretention**

### **MDE BMP ID: UMCP19BMP0107**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.  
MDE Permit Number: 01-SF-0255.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 05/16/2017.

#### **General Description:**

SWF 107 is a small bioretention located in between the Maryland Softball Stadium and the Recreation Artificial Turf Field.

#### **General Observations:**

A site visit was conducted by WBCM on May 8, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Water enters the facility through an inflow pipe.

#### **Pretreatment:**

There is no pretreatment stage in this facility.

#### **Outflow:**

Water exits the facility over a spillway that deposits into the adjacent swamp.

#### **Overall BMP:**

This facility is in poor condition. The entire filter area has been mowed, and the only vegetation present is grass and one planting area that is inexplicably surrounded by chicken wire. The side slopes have eroded so that this looks more like a depressed grass area than a stormwater facility. There is one line of river rock in the middle of the filter area. The cleanouts have been broken by a lawn mower.

**Meets MDE Criteria:** No.



**Photo #1:** A strip of riprap that has no clear purpose.



**Photo #2:** View into the facility.





**Photo #3:** Patch of vegetation surrounded by chicken wire.



**Photo #4:** Inflow pipe and channel.

**BMP SWF 109 – Metzert Road Wet Pond**  
**MDE BMP ID: UMCP19BMP0109****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 05/16/2017.

**General Description:**

SWF 109 is a wet pond off the side of Metzert Road.

**General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility through a culvert which discharges into a swale. The swale flows through a chain link fence into the facility, however muck and sediment have built up on the fence surface and has blocked the path of the water.

**Pretreatment:**

There is no pretreatment stage in this facility.

**Outflow:**

Water exits the facility through a v-notched weir with gabion sides. Once through the weir, the water flows from a swale into a culvert.

**Overall BMP:**

This facility is in fair condition. The inflow swale should be cleared out, and riprap should be installed in the channel. The fence is broken in many places should be removed.

**Meets MDE Criteria:** No.





**Photo #1:** View into the facility.



**Photo #2:** A section of broken fence.





**Photo #3:** The inflow culvert.



**Photo #4:** The section of collapsed and clogged fence in the inflow swale.

## **BMP SWF 112 – Golf Course Road/Gold Course Club House Rain Garden**

### **MDE BMP ID: UMCP19BMP0112**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 10/30/2018.

#### **General Description:**

SWF 112 is a rain garden along University Boulevard and Golf Course Road and near the Golf Course Club House.

#### **General Observations:**

A site visit was conducted by WBCM on May 1, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Runoff flows from the outflow rip rap swale of adjacent rain garden SWF 144. The designed inflow is unclear.

#### **Pretreatment:**

Rip rap collects sediment, trash, and reduces the flow velocity before entering the facility.

#### **Outflow:**

The rain garden outflows through infiltration, and excess runoff outfalls into an adjacent concrete channel.

#### **Overall BMP:**

The rain garden is in poor condition and has not been maintained. Invasive plants such as cattails, poison ivy, and English ivy are present within the filter area and on the side slopes. Leaf debris is present throughout the facility. Side slopes show signs of erosion.

**Meets MDE Criteria:** No.





Photo #1: View into the facility.



Photo #2: Inflow into the facility.



**BMP SWF 122 – Denton Hall Bioretention**  
**MDE BMP ID: UMCP19BMP0122****Existing Site Conditions:**

**Date of Design / Construction:** 03/20/2012.  
MDE Permit Number: 12-SF-0215.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

SWF 122 is an 1856-square foot bioretention located in between Denton Hall, Easton Hall, and Denton Area Dining Hall.

**General Observations:**

A site visit was conducted by WBCM on April 11, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility as sheet flow.

**Pretreatment:**

The pretreatment stage of this facility is a forebay.

**Outflow:**

Water exits the facility through a riser outlet structure.

**Overall BMP:**

This facility is in poor condition. The forebay shows signs of erosion that suggest that it is undersized. Three of the cleanouts are missing pieces. The weir is covered by mulch and is level with the bottom elevation of the forebay.

**Meets MDE Criteria:** No.



Photo #1: View into the facility.



Photo #2: The riser outlet structure.



**Photo #3:** View of the facility from the forebay.



**BMP SWF 124 – Prince Frederick Hall Bioretention  
MDE BMP ID: UMCP19BMP0124****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.  
MDE Permit Number: 12-SF-0232.

**As-Built Documents Available:** 07/28/2014.

**Prior Maintenance Records Available:** No

**General Description:**

SWF 124 is a small bioretention outside of Price Frederick Hall.

**General Observations:**

A site visit was conducted by WBCM on May 1, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Water enters the facility through two 6-inch inflow pipes.

**Pretreatment:**

There is no pretreatment stage for this facility.

**Outflow:**

Water exits this facility through an at-grade inlet with a trash rack. The inlet is in good condition, but its low elevation does not provide adequate ponding depth.

**Overall BMP:**

This facility is in good condition. The vegetation is well established and in good condition. The mulch on the steep side slope is eroding.

**Meets MDE Criteria:** No.



**Photo #1:** Outlet structure flush with the mulch elevation.



**Photo #2:** Mulch on the side slope is eroding.





**Photo #3:** The well-established herbaceous vegetation inside the filter area.



**Photo #4:** Curb lines the outside edge.



**BMP SWF 125 – Prince Frederick Hall Bioretention  
MDE BMP ID: UMCP19BMP0125****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.  
MDE Permit Number: 12-SF-0232.

**As-Built Documents Available:** 07/28/2014.

**Prior Maintenance Records Available:** No

**General Description:**

SWF 125 is a 613-square foot bioretention facility that is in front of Prince Frederick Hall.

**General Observations:**

A site visit was conducted by WBCM on May 1, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff enters the facility through two 8-inch inflow pipes with river rock inflow protection.

**Pretreatment:**

There is no pretreatment stage for this facility.

**Outflow:**

Runoff exits the facility through an at-grade inlet with a trash rack.

**Overall BMP:**

This facility is in poor condition. The side slopes have eroded around the inflow pipes. There is standing water in the center of the filter area, and the facility has high concentrations of algae in the filter area and on the inflow pipes.

**Meets MDE Criteria:** No.



**Photo #1:** An eroded and algae-covered inflow pipe.



**Photo #2:** Standing water in the center of the filter area.





**Photo #3:** Algae and standing water next to the outflow structure.



**Photo #4:** View of the facility.



## **BMP SWF 127 – Campus Drive and Rossborough Lane Bioretention MDE BMP ID: UMCP19BMP0127**

### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 04/01/2017.

### **General Description:**

SWF 127 is a bioretention facility next to SWF 128 and in between Rossborough Lane and Campus Drive.

### **General Observations:**

A site visit was conducted by WBCM on May 1, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

### **Inflow:**

The inflow is through a curb cut into a concrete channel. Stone buildup is present within the concrete channel, and erosion is apparent at the discharge location of the concrete channel.

### **Pretreatment:**

There is no pretreatment in this facility.

### **Outflow:**

The facility outflows through infiltration and an overflow riser. There is a plant growing within the overflow riser.

### **Overall BMP:**

This bioretention facility has a grass surface, with no other plantings. An eroded dirt area is present in the middle of the facility. This facility does not filter runoff as a bioretention because there are no plantings within the filter area. This facility is in poor condition.

**Meets MDE Criteria:** No.



Photo #1: Inflow to the facility.



Photo #2: Vegetation growing inside the outfall structure.

## **BMP SWF 128 – Campus Drive and Rossborough Lane Bioretention MDE BMP ID: UMCP19BMP0128**

### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 04/01/2017.

### **General Description:**

SWF 128 is a bioretention facility in between Campus Drive and Rossborough Lane.

### **General Observations:**

A site visit was conducted by WBCM on May 1, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

### **Inflow:**

The inflow to the bioretention facility is through an inlet that passes under the sidewalk. The inlet is clogged with leaves, grass, and other debris.

### **Pretreatment:**

A rip rap channel collects sediment and slows down the runoff before entering the facility.

### **Outflow:**

Outflow of the bioretention is through a concrete culvert that goes under the road. There are signs of erosion around the sides of the headwall.

### **Overall BMP:**

The bioretention filter area is covered by a layer of leaf debris. Trash is present within the facility. The side slopes of the bioretention area show signs of erosion. This facility is poor condition.

**Meets MDE Criteria:** No.





Photo #1: Inflow structure.



Photo #2: Inflow channel.

**BMP SWF 129 –Reckord Armory Rain Garden**  
**MDE BMP ID: UMCP19BMP0129****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

BMP SWF 129 is a rain garden located outside of the Reckord Armory.

**General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Inflow to the facility is through sheet flow.

**Pretreatment:**

There is no pretreatment for this facility.

**Outflow:**

Outflow of the rain garden is through infiltration.

**Overall BMP:**

Overall the BMP is in fair condition. Bare spots with no mulch are present in a few areas of the facility. Leaf debris and trash are both present throughout the facility and should be removed.

**Meets MDE Criteria:** No.



**Photo #1:** View from above the facility.



**Photo #2:** The filter area.



**BMP SWF 130 – William E. Kirwan Hall Permeable Pavement  
MDE BMP ID: UMCP19BMP0130****Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

SWF 130 is an area of permeable pavement that is in front of William E. Kirwan Hall.

**General Observations:**

A site visit was conducted by WBCM on June 5, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Inflow to the permeable pavers is through direct runoff.

**Pretreatment:**

There is no pretreatment for this facility.

**Outflow:**

Outflow of this facility is through infiltration.

**Overall BMP:**

Overall the permeable pavers are in good condition. Grass is growing between a portion of the pavers. A few pavers are missing or cracked. A low spot adjacent to the fountain has collected sand and sediment. The uneven settling of the pavers indicates potential subgrade failure from poor infiltration.

**Meets MDE Criteria:** No.



**Photo #1:** Missing brick pavers in pavement surface.



**Photo #2:** Uneven settling of pavers.

## **BMP SWF 133 – Kim Plaza Micro-Bioretenion MDE BMP ID: UMCP19BMP0133**

### **Existing Site Conditions:**

**Date of Design / Construction:** 03/03/2004.  
MDE Permit Number: 12-SF-0279.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

### **General Description:**

BMP SWF 133 is a 484-square foot micro-bioretenion pond located on the Kim Engineering Building Plaza. It is one of nine identical square micro-bioretenion facilities on the Plaza.

### **General Observations:**

A site visit was conducted by WBCM on April 2, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

### **Inflow:**

Runoff from the plaza enters the facility through curb cuts in the exterior wall. The surface of the facility is completely covered by gravel, which slows the flow as it enters the facility.

### **Pretreatment:**

This facility does not have a pretreatment stage.

### **Outflow:**

Flow exits this facility through an eight-inch high riser outlet. The surface area of the outlet is 11 inches by 11 inches.

### **Overall BMP:**

BMP SWF 133 is a shallow, gravel covered micro-bioretenion facility with no vegetation, except for one tree. The facility is 22 feet by 22 feet. At the time of inspection there was no standing water or algae present in the facility, and no noticeable signs of erosion. Aside from the lack of vegetation, this facility appears to be in fair condition. No MDE approved drawings were available, however it is assumed that the facility was designed according to Chapter 3 of the MDE Stormwater Manual. It does not meet the vegetation criteria of bioretention facilities. The



facility also does not meet the pretreatment requirements of installing a grass channel, grass filter strip, bottom sand layer, upper sand layer, or washed bank run as aggregate.

**Meets MDE Criteria:** No.

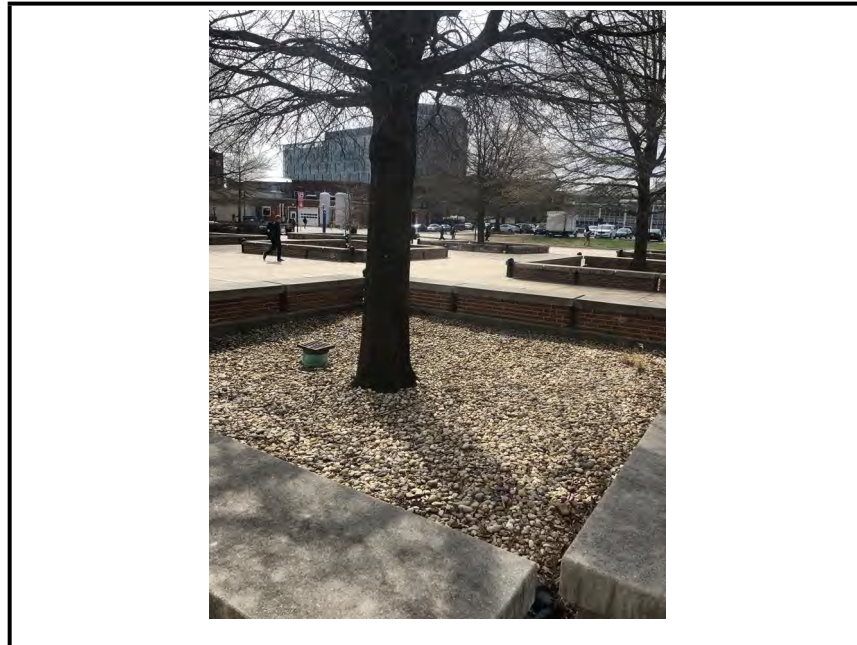


Photo #1: View into the facility.

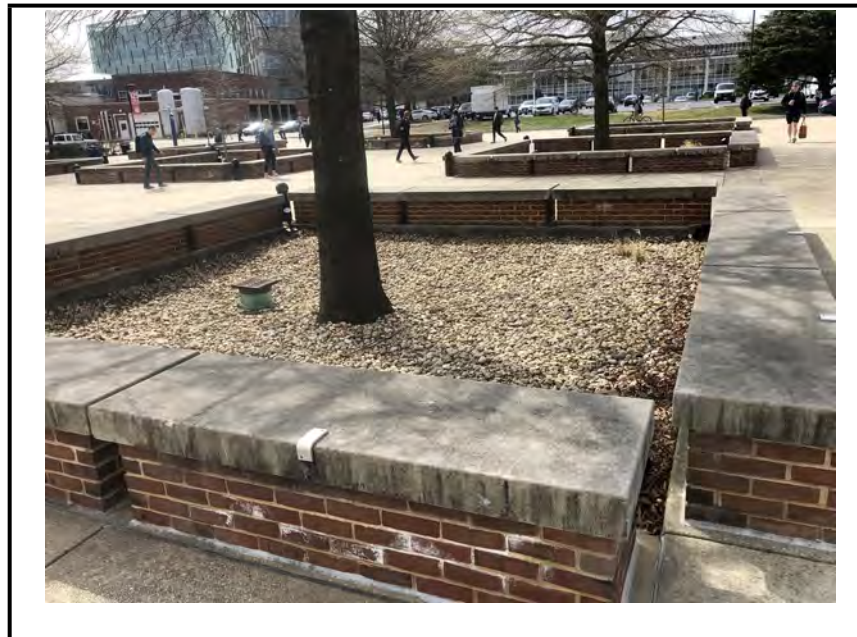


Photo #2: View into the facility.

## **BMP SWF 134 – Kim Plaza Micro-Bioretenion MDE BMP ID: UMCP19BMP0134**

### **Existing Site Conditions:**

**Date of Design / Construction:** 03/03/2004.  
MDE Permit Number: 12-SF-0279.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

### **General Description:**

BMP SWF 134 is a 484-square foot micro-bioretenion pond located on the Kim Engineering Building Plaza. It is one of nine identical square micro-bioretenion facilities on the Plaza.

### **General Observations:**

A site visit was conducted by WBCM on April 2, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

### **Inflow:**

Run off from the plaza enters the facility through curb cuts in the exterior wall. The surface of the facility is completely covered by gravel, which slows the flow as it enters the facility.

### **Pretreatment:**

This facility does not have a pretreatment stage.

### **Outflow:**

Flow exits this facility through a 17-inch high riser outlet. The surface area of the outlet is 11 inches by 11 inches.

### **Overall BMP:**

BMP SWF 134 is a shallow, gravel covered micro-bioretenion facility with no vegetation, except for one tree. The facility is 22 feet by 22 feet. At the time of inspection there was no standing water or algae present in the facility. Some erosion is apparent at the curb cut inflow areas. Aside from the lack of vegetation, this facility appears to be in fair condition. No MDE approved drawings were available, however it is assumed that the facility was designed according to Chapter 3 of the MDE Stormwater Manual. It does not meet the vegetation criteria of bioretention facilities. The facility also does not meet the pretreatment requirements of installing



a grass channel, grass filter strip, bottom sand layer, upper sand layer, or washed bank run as aggregate.

**Meets MDE Criteria:** No.

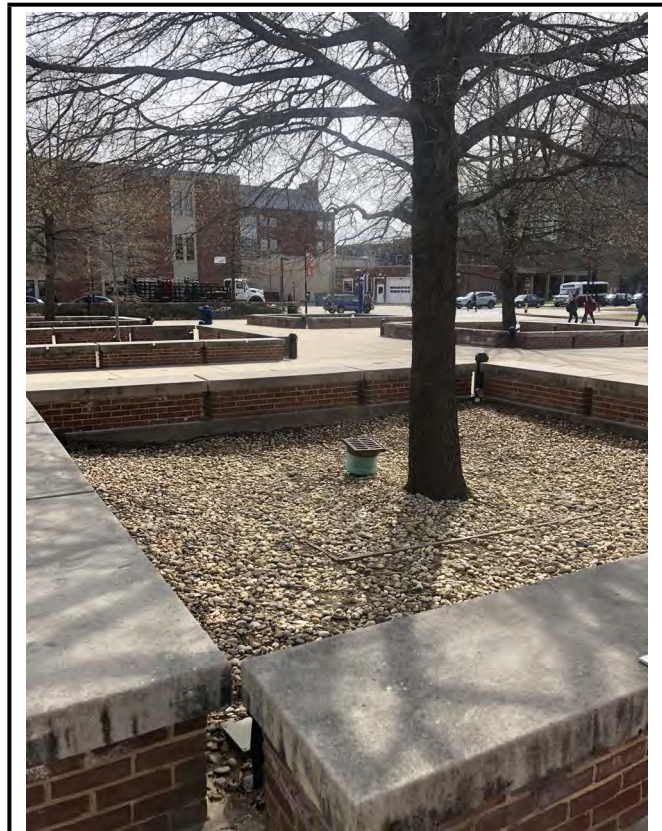


Photo #1: View into the facility.



Photo #2: Close view of the filter area.

## **MP SWF 135 – Kim Plaza Micro-Bioretenion MDE BMP ID: UMCP19BMP0135**

### **Existing Site Conditions:**

**Date of Design / Construction:** 03/03/2004.  
MDE Permit Number: 12-SF-0279.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

### **General Description:**

BMP SWF 135 is a 484-square foot micro-bioretenion pond located on the Kim Engineering Building Plaza. It is one of nine identical square micro-bioretenion facilities on the Plaza.

### **General Observations:**

A site visit was conducted by WBCM on April 2, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

### **Inflow:**

Run off from the plaza enters the facility through curb cuts in the exterior wall. The surface of the facility is completely covered by gravel, which slows the flow as it enters the facility.

### **Pretreatment:**

This facility does not have a pretreatment stage.

### **Outflow:**

Flow exits this facility through a 13-inch high riser outlet. The surface area of the outlet is 11 inches by 11 inches

### **Overall BMP:**

BMP SWF 135 is a shallow, gravel covered micro-bioretenion facility with no vegetation, except for one tree. The facility is 22 feet by 22 feet. At the time of inspection there was no standing water or algae present in the facility. There was trash present, and several weeds. The center surface of the facility is sunken down due to settling over time. Aside from the lack of vegetation, this facility appears to be in fair condition. No MDE approved drawings were available, however it is assumed that the facility was designed according to Chapter 3 of the MDE Stormwater Manual. It does not meet the vegetation criteria of bioretention facilities. The facility also does



not meet the pretreatment requirements of installing a grass channel, grass filter strip, bottom sand layer, upper sand layer, or washed bank run as aggregate.

**Meets MDE Criteria:** No.

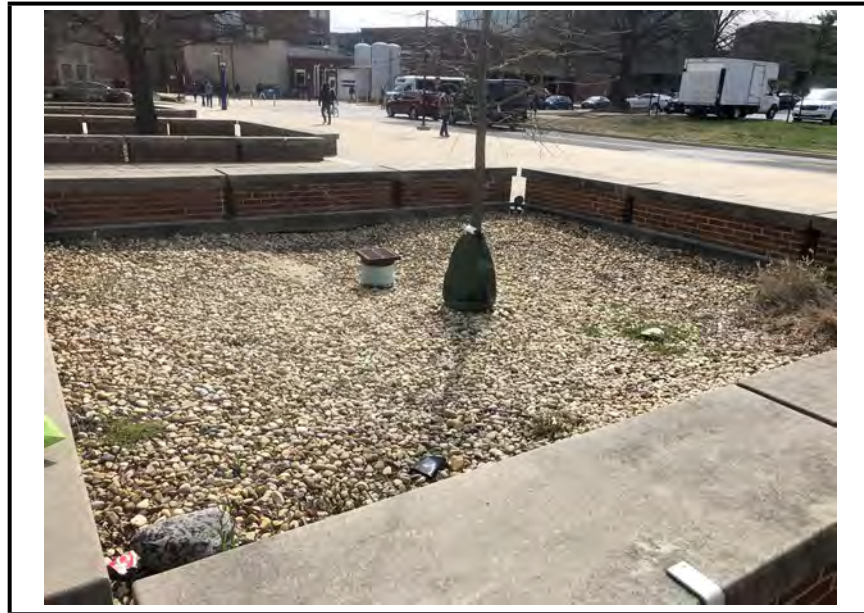


Photo #1: Close view of the filter bed.



Photo #2: View into the facility.

## **BMP SWF 136 – Kim Plaza Micro-Bioretenion MDE BMP ID: UMCP19BMP0136**

### **Existing Site Conditions:**

**Date of Design / Construction:** 03/03/2004.  
MDE Permit Number: 12-SF-0279.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

### **General Description:**

BMP SWF 136 is a 484-square foot micro-bioretenion pond located on the Kim Engineering Building Plaza. It is one of nine identical square micro-bioretenion facilities on the Plaza.

### **General Observations:**

A site visit was conducted by WBCM on April 2, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

### **Inflow:**

Run off from the plaza enters the facility through curb cuts in the exterior wall. The surface of the facility is completely covered by gravel, which slows the flow as it enters the facility.

### **Pretreatment:**

This facility does not have a pretreatment stage.

### **Outflow:**

Flow exits this facility through a 12-inch high riser outlet. The surface area of the outlet is 11 inches by 11 inches.

### **Overall BMP:**

BMP SWF 136 is a shallow, gravel covered micro-bioretenion facility with no vegetation, except for one tree. The facility is 22 feet by 22 feet. At the time of inspection there was no standing water or algae present in the facility. Some erosion is apparent at the curb cut inflow areas. Aside from the lack of vegetation, this facility appears to be in fair condition. No MDE approved drawings were available, however it is assumed that the facility was designed according to Chapter 3 of the MDE Stormwater Manual. It does not meet the vegetation criteria of bioretention facilities. The facility also does not meet the pretreatment requirements of installing



a grass channel, grass filter strip, bottom sand layer, upper sand layer, or washed bank run as aggregate.

**Meets MDE Criteria:** No.



Photo #1: View into the facility.



Photo #2: View of the vegetation within the facility.

## **BMP SWF 137 – Kim Plaza Micro-Bioretenion MDE BMP ID: UMCP19BMP0137**

### **Existing Site Conditions:**

**Date of Design / Construction:** 03/03/2004.  
MDE Permit Number: 12-SF-0279.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

### **General Description:**

BMP SWF 137 is a 484-square foot micro-bioretenion pond located on the Kim Engineering Building Plaza. It is one of nine identical square micro-bioretenion facilities on the Plaza.

### **General Observations:**

A site visit was conducted by WBCM on April 2, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

### **Inflow:**

Run off from the plaza enters the facility through curb cuts in the exterior wall. The surface of the facility is completely covered by gravel, which slows the flow as it enters the facility.

### **Pretreatment:**

This facility does not have a pretreatment stage.

### **Outflow:**

Flow exits this facility through a 13-inch high riser outlet. The surface area of the outlet is 11 inches by 11 inches.

### **Overall BMP:**

BMP SWF 137 is a shallow, gravel covered micro-bioretenion facility with no vegetation, except for one tree. The facility is 22 feet by 22 feet. At the time of inspection there was no standing water or algae present in the facility. Some erosion is apparent at the curb cut inflow areas. The center surface of the facility is sunken in due to settling over time. Aside from the lack of vegetation, this facility appears to be in fair condition. No MDE approved drawings were available, however it is assumed that the facility was designed according to Chapter 3 of the MDE Stormwater Manual. It does not meet the vegetation criteria of bioretention facilities. The



facility also does not meet the pretreatment requirements of installing a grass channel, grass filter strip, bottom sand layer, upper sand layer, or washed bank run as aggregate.

**Meets MDE Criteria:** No.



Photo #1: View into the facility.



Photo #2: View into the facility.

## **BMP SWF 138 – Kim Plaza Micro-Bioretention MDE BMP ID: UMCP19BMP0138**

### **Existing Site Conditions:**

**Date of Design / Construction:** 03/03/2004.  
MDE Permit Number: 12-SF-0279.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

### **General Description:**

BMP SWF 138 is a 484-square foot micro-bioretention pond located on the Kim Engineering Building Plaza. It is one of nine identical square micro-bioretention facilities on the Plaza.

### **General Observations:**

A site visit was conducted by WBCM on April 2, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

### **Inflow:**

Run off from the plaza enters the facility through curb cuts in the exterior wall. The surface of the facility is completely covered by gravel, which slows the flow as it enters the facility.

### **Pretreatment:**

This facility does not have a pretreatment stage.

### **Outflow:**

Flow exits this facility through a 6.5-inch high riser outlet. The surface area of the outlet is 11 inches by 11 inches.

### **Overall BMP:**

BMP SWF 138 is a shallow, gravel covered micro-bioretention facility with no vegetation, except for one tree. The facility is 22 feet by 22 feet. At the time of inspection there was no standing water or algae present in the facility. Some erosion is apparent at the curb cut inflow areas. Aside from the lack of vegetation, this facility appears to be in fair condition. No MDE approved drawings were available, however it is assumed that the facility was designed according to Chapter 3 of the MDE Stormwater Manual. It does not meet the vegetation criteria of bioretention facilities. The facility also does not meet the pretreatment requirements of installing



a grass channel, grass filter strip, bottom sand layer, upper sand layer, or washed bank run as aggregate.

**Meets MDE Criteria:** No.



**Photo #1:** View of the vegetation within the facility.



**Photo #2:** View into the facility.

## **BMP SWF 139 – Kim Plaza Micro-Bioretention MDE BMP ID: UMCP19BMP0139**

### **Existing Site Conditions:**

**Date of Design / Construction:** 03/03/2004.  
MDE Permit Number: 12-SF-0279.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

### **General Description:**

BMP SWF 139 is a 484-square foot micro-bioretention pond located on the Kim Engineering Building Plaza. It is one of nine identical square micro-bioretention facilities on the Plaza.

### **General Observations:**

A site visit was conducted by WBCM on April 2, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

### **Inflow:**

Run off from the plaza enters the facility through curb cuts in the exterior wall. The surface of the facility is completely covered by gravel, which slows the flow as it enters the facility.

### **Pretreatment:**

This facility does not have a pretreatment stage.

### **Outflow:**

Flow exits this facility through a 5-inch high riser outlet. The surface area of the outlet is 11 inches by 11 inches.

### **Overall BMP:**

BMP SWF 139 is a shallow, gravel covered micro-bioretention facility with no vegetation, except for one tree. The facility is 22 feet by 22 feet. At the time of inspection there was no standing water or algae present in the facility. Some erosion is apparent at the curb cut inflow areas. The center surface of the facility is sunken in due to settling over time. Aside from the lack of vegetation, this facility appears to be in fair condition. No MDE approved drawings were available, however it is assumed that the facility was designed according to Chapter 3 of the MDE Stormwater Manual. It does not meet the vegetation criteria of bioretention facilities. The



facility also does not meet the pretreatment requirements of installing a grass channel, grass filter strip, bottom sand layer, upper sand layer, or washed bank run as aggregate.

**Meets MDE Criteria:** No.



**Photo #1:** View into the facility.



**Photo #2:** View into the facility.

## **BMP SWF 140 – Kim Plaza Micro-Bioretenion MDE BMP ID: UMCP19BMP0140**

### **Existing Site Conditions:**

**Date of Design / Construction:** 03/03/2004.  
MDE Permit Number: 12-SF-0279.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

### **General Description:**

BMP SWF 140 is a 484-square foot micro-bioretenion pond located on the Kim Engineering Building Plaza. It is one of nine identical square micro-bioretenion facilities on the Plaza.

### **General Observations:**

A site visit was conducted by WBCM on April 2, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

### **Inflow:**

Run off from the plaza enters the facility through curb cuts in the exterior wall. The surface of the facility is completely covered by gravel, which slows the flow as it enters the facility.

### **Pretreatment:**

This facility does not have a pretreatment stage.

### **Outflow:**

Flow exits this facility through a 7-inch high riser outlet. The surface area of the outlet is 11 inches by 11 inches.

### **Overall BMP:**

BMP SWF 140 is a shallow, gravel covered micro-bioretenion facility with no vegetation, except for one tree. The facility is 22 feet by 22 feet. At the time of inspection there was no standing water or algae present in the facility. Some erosion is apparent at the curb cut inflow areas. The center surface of the facility is sunken in due to settling over time. Aside from the lack of vegetation, this facility appears to be in fair condition. No MDE approved drawings were available, however it is assumed that the facility was designed according to Chapter 3 of the MDE Stormwater Manual. It does not meet the vegetation criteria of bioretention facilities. The



facility also does not meet the pretreatment requirements of installing a grass channel, grass filter strip, bottom sand layer, upper sand layer, or washed bank run as aggregate.

**Meets MDE Criteria:** No.



**Photo #1:** View into the facility.



**Photo #2:** View into the facility.

## **BMP SWF 141 – Kim Plaza Micro-Bioretenion MDE BMP ID: UMCP19BMP0141**

### **Existing Site Conditions:**

**Date of Design / Construction:** 03/03/2004.  
MDE Permit Number: 12-SF-0279.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

### **General Description:**

BMP SWF 141 is a 484-square foot micro-bioretenion pond located on the Kim Engineering Building Plaza. It is one of nine identical square micro-bioretenion facilities on the Plaza.

### **General Observations:**

A site visit was conducted by WBCM on April 2, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

### **Inflow:**

Run off from the plaza enters the facility through curb cuts in the exterior wall. The surface of the facility is completely covered by gravel, which slows the flow as it enters the facility.

### **Pretreatment:**

This facility does not have a pretreatment stage.

### **Outflow:**

Flow exits this facility through a 15-inch high riser outlet. The surface area of the outlet is 11 inches by 11 inches.

### **Overall BMP:**

BMP SWF 141 is a shallow, gravel covered micro-bioretenion facility with no vegetation, except for one tree. The facility is 22 feet by 22 feet. At the time of inspection there was no standing water or algae present in the facility. Some erosion is apparent at the curb cut inflow areas. The center surface of the facility is sunken in due to settling over time. Aside from the lack of vegetation, this facility appears to be in fair condition. No MDE approved drawings were available, however it is assumed that the facility was designed according to Chapter 3 of the MDE Stormwater Manual. It does not meet the vegetation criteria of bioretention facilities. The



facility also does not meet the pretreatment requirements of installing a grass channel, grass filter strip, bottom sand layer, upper sand layer, or washed bank run as aggregate.

**Meets MDE Criteria:** No.



Photo #1: View into the facility.

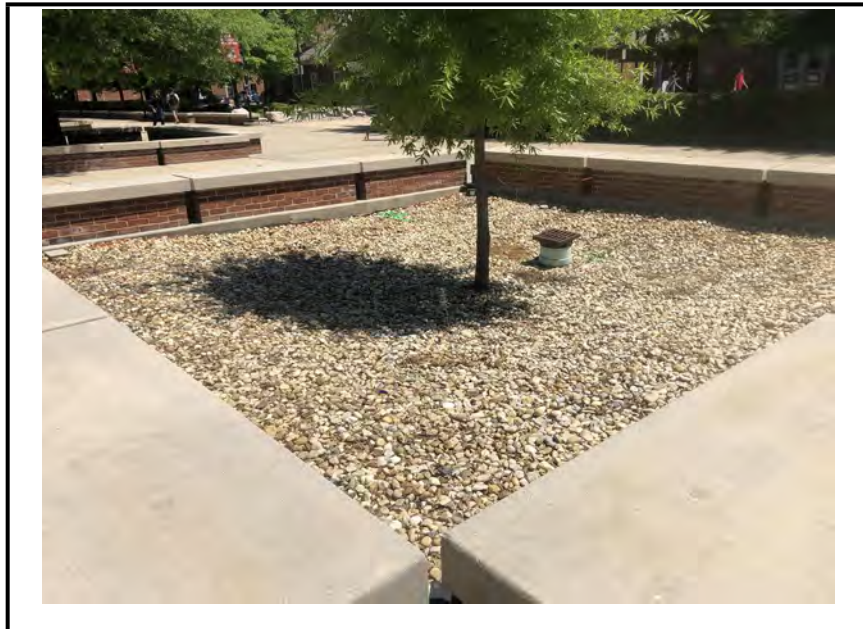


Photo #2: View into the facility.

**BMP SWF 142 – Kim Plaza Bioretention**  
**MDE BMP ID: UMCP19BMP0142****Existing Site Conditions:**

**Date of Design / Construction:** 03/03/2004.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

BMP SWF 142 is a 53-foot by 60-foot bioretention

**General Observations:**

A site visit was conducted by WBCM on April 2, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff from the plaza enters the facility by sheet flow. Runoff goes over a concrete step before reaching the facility surface.

**Pretreatment:**

A gravel strip is located between the plaza and the facility surface.

**Outflow:**

Flow exits this facility through a 15-inch high riser outlet. The surface area of the outlet is 15 inches by 15 inches.

**Overall BMP:**

BMP SWF 142 is a circular bioretention facility with grasses and trees. The facility is 53 feet by 60 feet. At the time of inspection there was no standing water present in the facility. Some erosion is present where sheet flow enters the facility. Some trash and excess leaf debris are present throughout the facility. This facility appears to be in fair condition. No MDE approved drawings were available, however it is assumed that the facility was designed according to Chapter 3 of the MDE Stormwater Manual.

**Meets MDE Criteria:** No





Photo #1: View in to the facility; facing east



Photo #2: View into the facility; facing north

## **BMP SWF 143 – Central Animal Resources Facility Permeable Pavement**

### **MDE BMP ID: UMCP19BMP0143**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

#### **General Description:**

SWF 143 is an area of permeable pavement that is behind the Central Animal Resources Facility.

#### **General Observations:**

A site visit was conducted by WBCM on May 15, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Inflow to the permeable pavers is by direct flow, and sheet flow from the Central Animal Resources Facility roof.

#### **Pretreatment:**

There is no pretreatment in this facility.

#### **Outflow:**

Outflow is through infiltration.

#### **Overall BMP:**

The permeable pavers are in fair condition. Some weeds are present between pavers. A tree is beginning to grow between the building foundation and the paver area. Equipment storage on the permeable pavers are blocking part of the facility area from receiving runoff. Buildup of weeds and sediment is occurring in the corner of the pavers near the parked trailer.

**Meets MDE Criteria:** No.



Photo #1: The facility surface.



Photo #2: Vegetation growing from the facility surface.





**Photo #3:** Steam from a vent that condenses on the roof and runs off onto the facility.

## **BMP SWF 144 – Golf Course Road/Golf Course Club House Rain Garden**

### **MDE BMP ID: UMCP19BMP0144**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 10/30/2018.

#### **General Description:**

SWF 144 is a 1018 square foot rain garden next to Golf Course Road and University Boulevard and near the Golf Course Club House.

#### **General Observations:**

A site visit was conducted by WBCM on May 1, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Runoff from the parking lot sheet flows into the facility.

#### **Pretreatment:**

A river rock strip filters and slows down the parking lot runoff before entering the facility.

#### **Outflow:**

The rain garden outflows into a rip rap channel, then entering the adjacent BMP, SWF 112.

#### **Overall BMP:**

The rain garden filter area is designed to be 1018 square feet. The drainage area to the facility is 50,700 square feet, including 15,881 square feet of impervious area. 48,000 square feet is treated within the facility. No mulch is present within the facility. Grasses and herbaceous plants are present throughout the filter area. No defined filter bed and ponding area is visible. The facility is in poor condition.

**Meets MDE Criteria:** No.



Photo #1: Vegetation within the facility.



Photo #2: Pretreatment stage of the facility.



## **BMP SWF 146 – Golf Course Club House Parking Lot Rain Garden**

### **MDE BMP ID: UMCP19BMP0146**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 10/30/2018.

#### **General Description:**

SWF 146 is a 630-square foot rain garden in the northwest corner of the golf course parking lot and near the Golf Course Club House.

#### **General Observations:**

A site visit was conducted by WBCM on May 1, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Runoff from the parking lot sheet flows into a swale, then discharges into the rain garden facility.

#### **Pretreatment:**

The swale adjacent to the parking lot collects sediment and trash, as well as slows down the runoff before entering the facility.

#### **Outflow:**

The outflow of the rain garden is through infiltration. A 6-inch high overflow riser conveys excess flow to the existing storm drain.

#### **Overall BMP:**

The rain garden filter area is designed to be 630 square feet. The drainage area to the facility is 5,400 square feet, including 3,325 square feet of impervious area. 9,828 square feet is treated within the facility. The vegetation within the rain garden is healthy. There are stones creating a walking path from the parking lot to the putting green through the facility area. Since the stones are raised higher than the filter area, this could be fractioning the total filter area, and creating less ponding volume.

**Meets MDE Criteria:** No.



**Photo #1:** Vegetation within the facility.



**Photo #2:** Pathway that bisects the filter area.



**Photo #3:** Grass area of the facility.



## **BMP SWF 147 – Golf Course Club House Parking Lot Rain Garden**

### **MDE BMP ID: UMCP19BMP0147**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** 10/30/2018.

#### **General Description:**

SWF 147 is a 653 square foot rain garden in the southwest corner of the parking lot near the Golf Course Club House. The drainage area to the facility is 13,500 square feet, including 8,500 square feet of impervious area.

#### **General Observations:**

A site visit was conducted by WBCM on May 1, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Runoff from the parking lot sheet flows into a swale, and from there it flows into an inlet at the end of the swale, then it enters a pipe which discharges into the rain garden. The inlet has standing water at the bottom.

#### **Pretreatment:**

The swale adjacent to the parking lot acts as the pretreatment stage by collecting sediment and trash and slowing down the runoff before it enters the facility.

#### **Outflow:**

The rain garden outflows through infiltration.

#### **Overall BMP:**

It is unclear if the intended drainage area enters the swale and therefore the facility. The pipe carrying water from the swale to the rain garden does not daylight at the discharge point. The outflow of the pipe could be clogged with grass or leaves, therefore backing up flow into the inlet. This facility is in fair condition.

**Meets MDE Criteria:** No.



**Photo #1:** The pretreatment swale.



**Photo #2:** View into the facility.



**Photo #3:** The vegetation within the facility.



**BMP SWF 152 – A.V. Williams Building Bioretention**  
**MDE BMP ID: UMCP19BMP0152****Existing Site Conditions:**

**Date of Design / Construction:** 05/22/2017.  
MDE Permit Number: 16-SF-0064.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

BMP SWF 152 is a 1,629-square foot bioretention located outside of the A.V. Williams Building.

**General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff from the adjacent parking lot sheet flows into a curb cut, followed by a rip rap channel, and then into the facility.

**Pretreatment:**

There is no pretreatment in this facility. Stone is placed at the curb cut inflow to reduce flow velocity.

**Outflow:**

Outflow of the facility is through an underdrain, and an overflow riser. A rock is on top of the outlet structure.

**Overall BMP:**

The bioretention facility is in overall good condition. The total drainage area of the facility is 25,448 square feet, including 16,263 square feet of impervious area. The ponding depth is designed to be 6 inches, with 2 feet of media depth. The total designed ESDv provided is 1,723 cubic feet, and a  $P_E$  of 1.3 inches is designed. There are grasses and vegetation covering much of the filter area. Some trash is present within the facility.

**Meets MDE Criteria:** No.



Photo #1: View into the facility.



Photo #2: View into the facility.





**Photo #3:** The riprap inflow channel.



**Photo #4:** The riprap channel that serves as pretreatment.



## **BMP SWF 153 – A.V. Williams Building Bioretention**

### **MDE BMP ID: UMCP19BMP0153**

#### **Existing Site Conditions:**

**Date of Design / Construction:** 05/22/2017.  
MDE permit number: 16-SF-0064.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

#### **General Description:**

BMP SWF 153 is a 943-square foot bioretention located outside of the A.V. Williams Building.

#### **General Observations:**

A site visit was conducted by WBCM on June 6, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Runoff from the adjacent parking lot sheet flows into a curb cut, followed by a rip rap channel, and then into the facility.

#### **Pretreatment:**

There is no pretreatment in this facility. Stone is placed at the curb cut inflow to reduce flow velocity.

#### **Outflow:**

Outflow of the facility is through an underdrain, and an overflow riser.

#### **Overall BMP:**

The bioretention facility is in overall good condition. The total drainage area of the facility is 14,925 square feet, including 9,477 square feet of impervious area. The ponding depth is designed to be 6 inches, with 2 feet of media depth. The total designed ESDv provided is 1,005 cubic feet, and a  $P_E$  of 1.3 inches is designed. There are grasses and vegetation covering much of the filter area.

**Meets MDE Criteria:** No.



Photo #1: View into the facility.



Photo #2: View into the facility.



**Photo #3:** The riprap inflow that leads to the facility.



**BMP SWF 154 – A.V. Williams Building Bioretention**  
**MDE BMP ID: UMCP19BMP0154****Existing Site Conditions:**

**Date of Design / Construction:** 05/22/2017.  
MDE permit number: 12-SF-0064.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

**General Description:**

BMP SWF 154 is a 1,252-square foot bioretention located outside of the A.V. Williams Building.

**General Observations:**

A site visit was conducted by WBCM on April 3, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

Runoff from the adjacent parking lot sheet flows into a curb cut, followed by a rip rap channel, and then into the facility.

**Pretreatment:**

There is no pretreatment in this facility. Stone is placed at the curb cut inflow to reduce flow velocity.

**Outflow:**

Outflow of the facility is through an underdrain, and an overflow riser.

**Overall BMP:**

The bioretention facility is in overall good condition. The total drainage area of the facility is 23,781 square feet, including 17,396 square feet of impervious area. The ponding depth is designed to be 6 inches, with 2 feet of media depth. The total designed ESDv provided is 1,263 cubic feet, and a  $P_E$  of 0.9 inches is designed. There are grasses and vegetation covering much of the filter area. Some trash is present within the facility.

**Meets MDE Criteria:** No.



**Photo #1:** Inflow channel that leads to the facility.



**Photo #2:** Vegetation within the facility.



**Photo #3:** The riser outfall structure.



## **BMP SWF CY1 – University Courtyard Apartments Bioretention MDE BMP ID: UMCP19BMP0172**

### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

### **General Description:**

SWF CY1 is a bioretention facility in the University Courtyard Apartments, in the south parking lot.

### **General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

### **Inflow:**

The inflow to the bioretention facility is through a curb cut and sheet flow from the parking lot area. A swale has eroded at the curb cut entry area at the corner of the parking lot.

### **Pretreatment:**

There is no pretreatment for this facility.

### **Outflow:**

Outflow of the facility is through infiltration and an overflow riser.

### **Overall BMP:**

The facility has grasses and herbaceous plants throughout the treatment area, and several bushes and trees along the edges. A muck layer is present throughout the entire bottom of the facility as a result of deposited leaves and sediment. Birdhouses on poles are installed throughout the facility. The facility is in fair condition.

**Meets MDE Criteria:** No.



**Photo #1:** View into the facility.



**Photo #2:** Erosion at curb cut.





Photo #3: The outfall structure.



Photo #4: Vegetation in the facility.



## **BMP SWF SCA 1 – University Courtyard Apartments Non-Rooftop Disconnect**

### **MDE BMP ID: UMCP19BMP0236**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

#### **General Description:**

SWF SCA 1 is a non-structural practice in the Courtyards Northeast parking lot.

#### **General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

Impervious runoff sheet flows into a grass area.

#### **Pretreatment:**

There is no pretreatment for this non-structural facility.

#### **Outflow:**

The runoff infiltrates into the grass conservation area.

#### **Overall BMP:**

This BMP is sheet flow to a grass area and is a non-structural practice. The grass adjacent to the parking lot is in good condition. There is a gravel pile located in the corner of the parking lot that could carry gravel and sediment into the grass area. A trailer was also parked on the edge of the parking lot on the day of inspection. This impedes runoff from getting to the grass area. The facility is in fair condition.

**Meets MDE Criteria:** No.



**Photo #1:** Gravel that is blocking the non-structural practice.



**Photo #2:** Trailer that is blocking the non-structural practice.



Photo #3: View of the non-structural practice.



Photo #4: Grass area behind the parking lot.



## **BMP SWF SCA 2 – University Courtyard Apartments Non-Rooftop Disconnect**

### **MDE BMP ID: UMCP19BMP0237**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

#### **General Description:**

SWF SCA 2 is a non-rooftop disconnect that is behind the University Courtyards Apartments.

#### **General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

The intent of this BMP is to sheet flow impervious area to a grass conservation area. However, the impervious area looks to be removed.

#### **Pretreatment:**

There is no pretreatment for this non-structural facility.

#### **Outflow:**

The runoff infiltrates into the grass conservation area.

#### **Overall BMP:**

This BMP is sheet flow to a conservation area and is a non-structural practice. The impervious area that was intended to be treated looks to be removed because a rectangular sand area remains. More information and plans are needed to understand the status of this facility. If impervious area was removed, credit could be attributed to this area.

**Meets MDE Criteria:** No.



**Photo #1:** View of the removed non-structural practice.



**Photo #2:** View of the removed non-structural practice.

## **BMP SWF UP – University of Maryland Golf Course Wet Pond**

### **MDE BMP ID: UMCP19BMP0235**

#### **Existing Site Conditions:**

**Date of Design / Construction:** 10/22/1956; Dam reconstruction: 10/10/1972.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

#### **General Description:**

SWF UP is a wet pond on the University of Maryland Golf Course.

#### **General Observations:**

A site visit was conducted by WBCM on May 1, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

The pond has several inflow pipes into the pond. The inflow areas are eroded, with the pipes exposed and elevated above the surface.

#### **Pretreatment:**

This facility has no pretreatment.

#### **Outflow:**

The wet pond outflow is through a dam that was reconstructed in 1972. The concrete dam is broken and has crumbling concrete. Water is seeping underneath the dam into the outflow stream.

#### **Overall BMP:**

The wet pond is in overall poor condition. There are various smaller ponds throughout, with most of the facility area being dry. The pond area has been overrun by cattails, and other invasive species such as honeysuckle and poison ivy are growing along the edges of the pond. There are flow swale areas that have eroded throughout the pond area, carrying water away from the inflow points into smaller ponded areas. The side slopes of the facility show signs of erosion, with extremely steep side slopes in some areas. A walking path to a golf hole on the west side of the pond is creating erosion directly above one of the inflow culvert pipes. On the



northern edge of the pond, there are several large piles of leaves that have been dumped extremely close to the edge of the facility. This leaf debris could be entering the facility area

**Meets MDE Criteria:** No.



Photo #1: View into the facility.



Photo #2: Erosion around inflow pipe.





**Photo #3:** Small ponded area at inflow pipe.



**Photo #4:** Erosion above inflow pipe.





Photo #5: Erosion around inflow pipe.



Photo #6: Leaf piles adjacent to pond edge.





Photo #7: Crumbling dam outflow.



Photo #8: View into the facility.

## **BMP SWF WW1 – Wellness Way Bioretention**

### **MDE BMP ID: UMCP19BMP0238**

#### **Existing Site Conditions:**

**Date of Design / Construction:** Unknown, no records available.

**As-Built Documents Available:** No

**Prior Maintenance Records Available:** No

#### **General Description:**

SWF WW1 is a bioretention facility on Wellness Way near the School of Public Health Building.

#### **General Observations:**

A site visit was conducted by WBCM on April 16, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

The facility receives runoff through a culvert discharging to a concrete channel, then a rip rap channel. The rip rap channel is filled with sediment and leaves that have discharged from the culvert. An area of standing water is present after the rip rap channel, due to a low spot caused by erosion.

#### **Pretreatment:**

The rip rap channel between the culvert and the facility filters sediment and debris from the runoff before entering the bioretention facility.

#### **Outflow:**

The facility discharges through infiltration, and a concrete channel to an at grade inlet. Before the concrete channel, there is an area of rip rap and sediment buildup.

#### **Overall BMP:**

The facility area does not have any vegetation except for a few grass patches. The filter area appears to be clogged with sediment buildup and muck. The gabion basket weir in the middle of the facility is also clogged with leaves, and has plants growing within it. Due to the clogged weir, water is instead going around the weir, causing erosions around the weir.

**Meets MDE Criteria:** No.





Photo #1: Inflow and facility area.



Photo #2: Gabion weir.





**Photo #3:** Gabion weir.



**Photo #4:** Gabion weir and undercut sidewalk.





**Photo #5:** Rip rap to outflow.



**Photo #6:** Outflow inlet clogged with leaves and trash.



## **BMP SWF CH1 – Clark Hall Bioretention**

### **MDE BMP ID: UMCP19BMP0231**

#### **Existing Site Conditions:**

**Date of Design / Construction:** 09/18/2015.  
MDE Permit Number: 14-SF-0265.

**As-Built Documents Available:** 10/3/2019.

**Prior Maintenance Records Available:** 08/22/2018.

#### **General Description:**

BMP SWF CH1 is a long narrow bioretention on the West side of A. James Clark Hall.

#### **General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

#### **Inflow:**

The facility has four inflow points. The inflow comes from four roof leaders, discharging onto splash blocks, then into the facility. The roof leaders have mesh filter covers, however three of them have fallen off the leaders and into the facility. One roof leader has a constant drip leak coming from the pipe.

#### **Pretreatment:**

There is no pretreatment in this facility.

#### **Outflow:**

The facility outflows through infiltration, an underdrain, and an overflow riser. The underdrain was clogged with 3 inches of water at the time of inspection.

#### **Overall BMP:**

This facility is in fair condition. The facility has trash and weeds present throughout the BMP area. An irrigation hose system is installed throughout the facility. Additional water filtering through the facility from the irrigation system could contribute to more flow than the runoff that the facility was designed to treat and cause erosion.

**Meets MDE Criteria:** No.



**Photo #1:** View into the facility.



**Photo #2:** Vegetation within the facility with the irrigation lines exposed.

**BMP SWF CH2 – Clark Hall Bioretention**  
**MDE BMP ID: UMCP19BMP0232****Existing Site Conditions:**

**Date of Design / Construction:** 09/18/2015.  
MDE Permit Number: 14-SF-0265.

**As-Built Documents Available:** 10/3/2019.

**Prior Maintenance Records Available:** No

**General Description:**

BMP SWF CH2 is a small bioretention area on the south side of Clark Hall.

**General Observations:**

A site visit was conducted by WBCM on June 4, 2019. Descriptions and opinions regarding BMP and surroundings are based upon visual observation made on that date. See following page(s) for representative photos taken during the visit.

**Inflow:**

The facility has inflows from both a trench drain, and roof leaders from Clark Hall. There is erosion present at both inflow points. The roof drain should be discharging into river stone according to the design plans.

**Pretreatment:**

There is no pretreatment in this facility.

**Outflow:**

The facility outflow is through infiltration, an underdrain, and an overflow riser. The riser had 6 inches of standing water at the time of inspection.

**Overall BMP:**

The facility is in fair condition. The facility has trash and weeds present throughout the BMP area. An irrigation hose system is installed throughout the facility. Additional water filtering through the facility from the irrigation system could contribute to more flow than the runoff that the facility was designed to treat. This could lead to increased erosion within the facility.

**Meets MDE Criteria:** No.





**Photo #1:** The riser outlet structure shared with CH-1



**Photo #2:** Two inflow pipes and the trench drain that lead into the facility.

***Appendix B***  
***Campus Map***





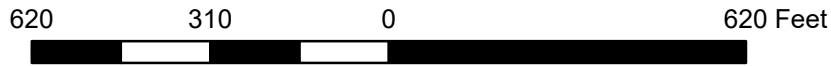
# UMCP BMP LOCATION MAP



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeBCO, IGN, Swisstopo, NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

## Legend

- BMP LOCATION
- ▣ BMP OUTLINE



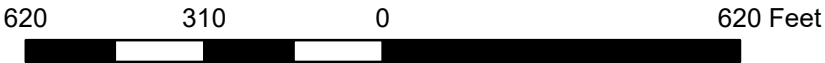
# UMCP BMP LOCATION MAP



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

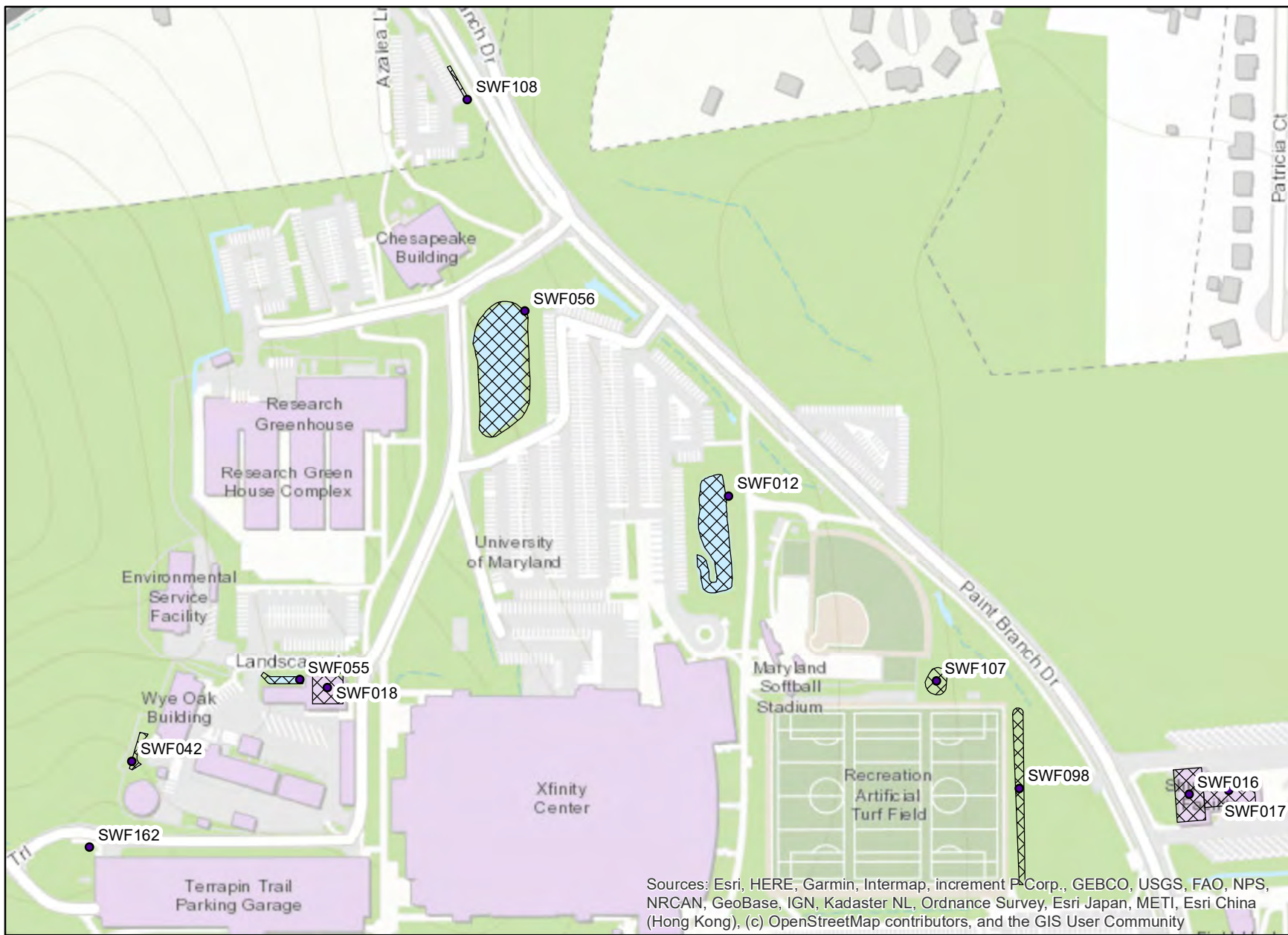
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- BMP OUTLINE





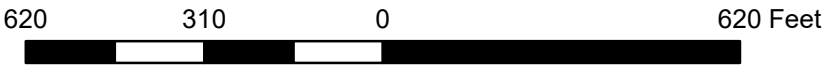
# UMCP BMP LOCATION MAP



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

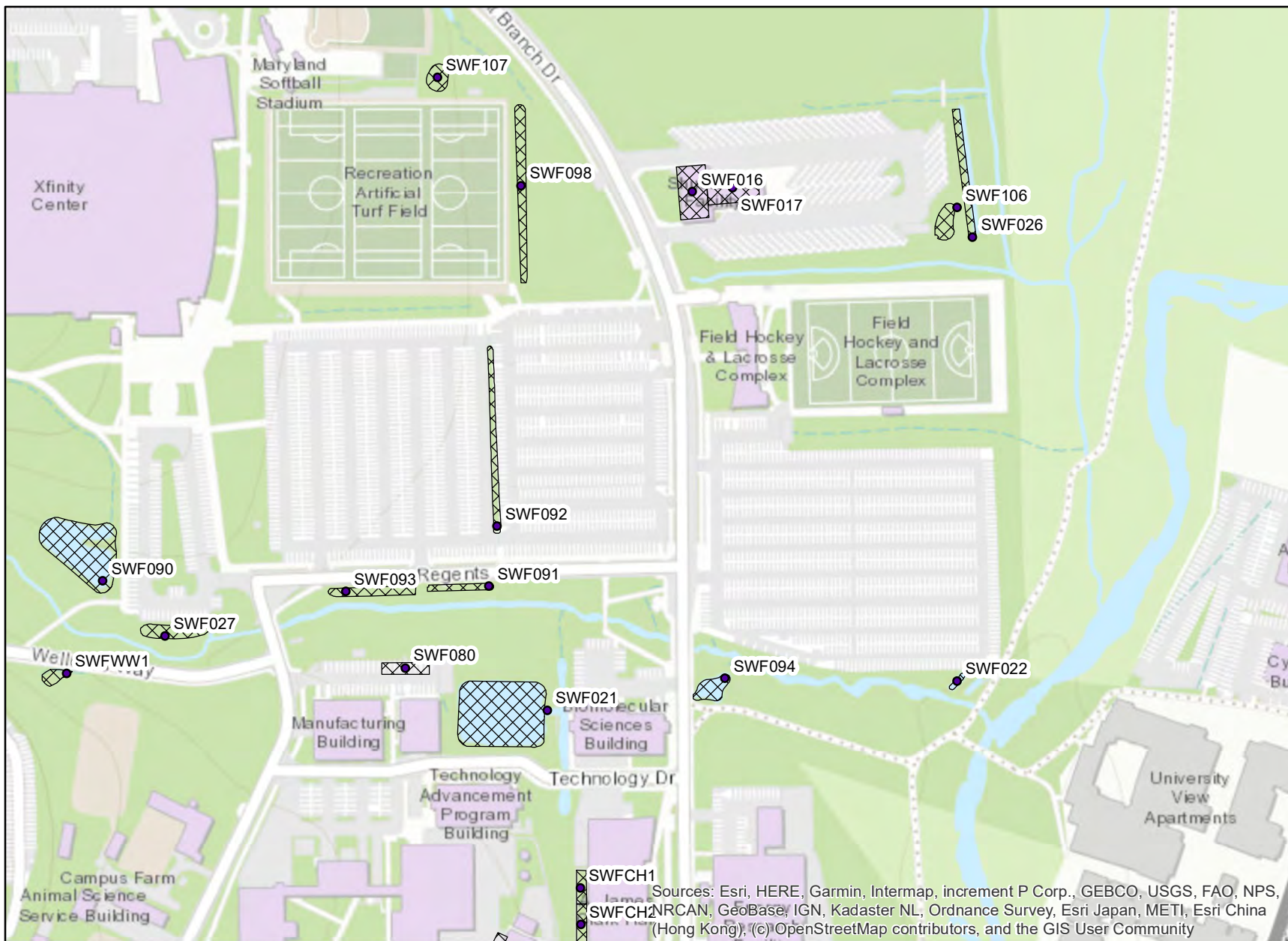
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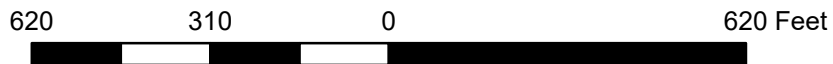


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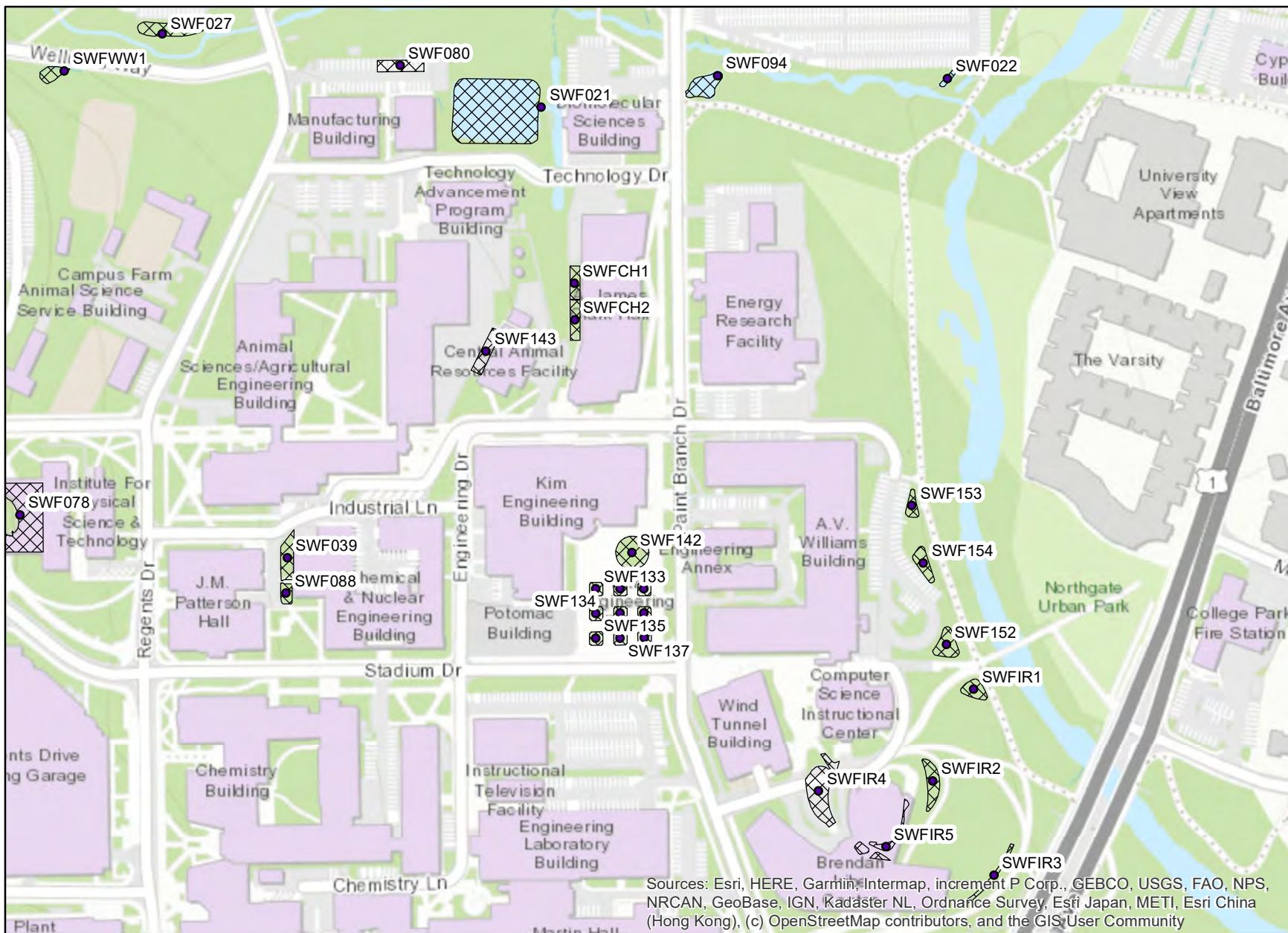
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- BMP LOCATION
- ▨ BMP OUTLINE



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

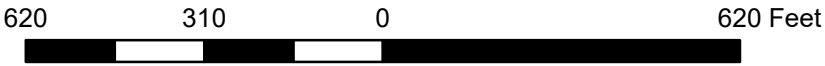
# UMCP BMP LOCATION MAP



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

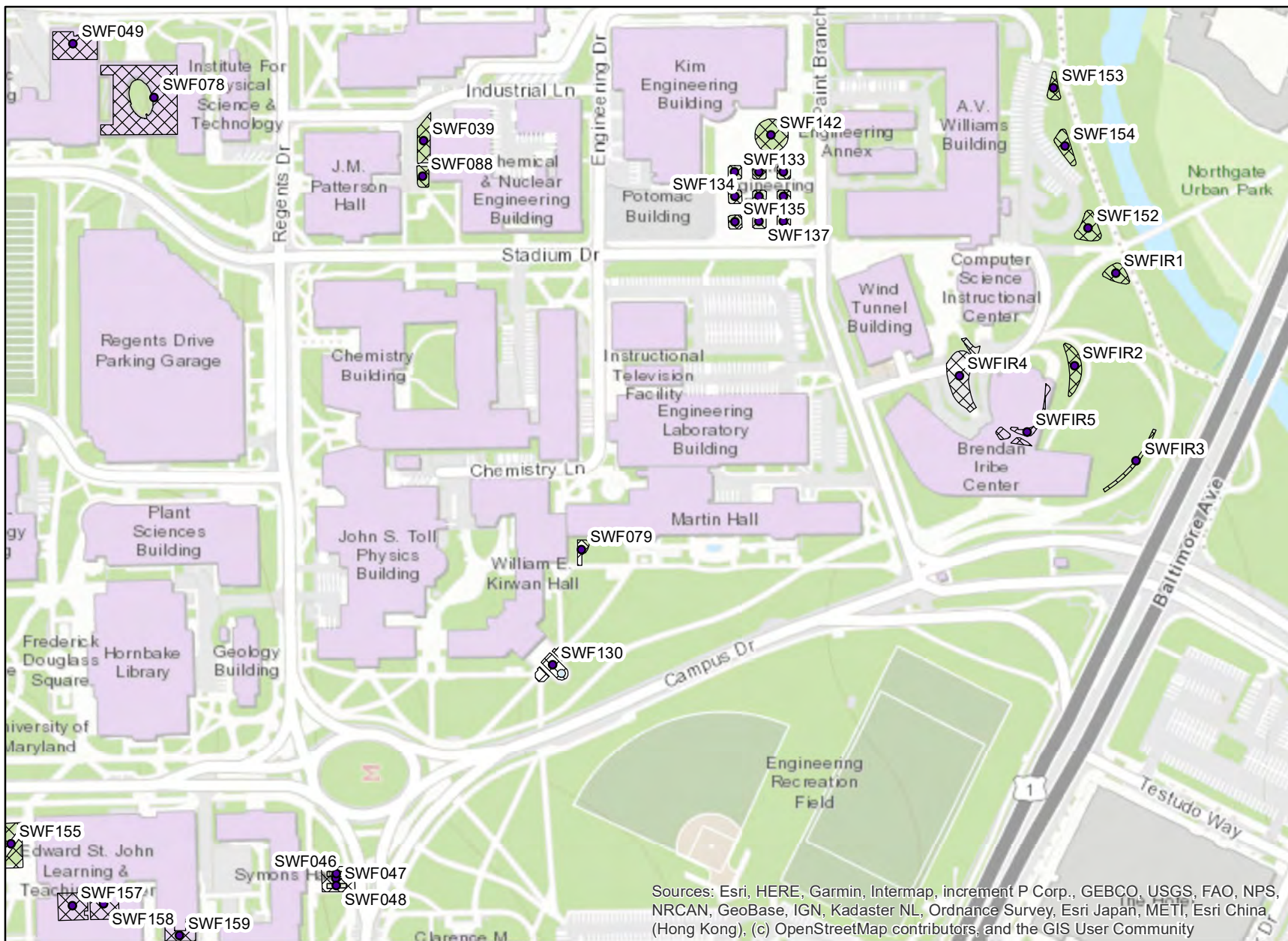
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- BMP LOCATION
- ▣ BMP OUTLINE





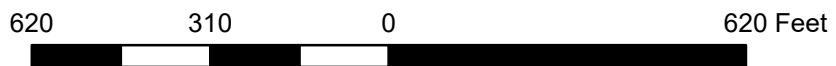
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

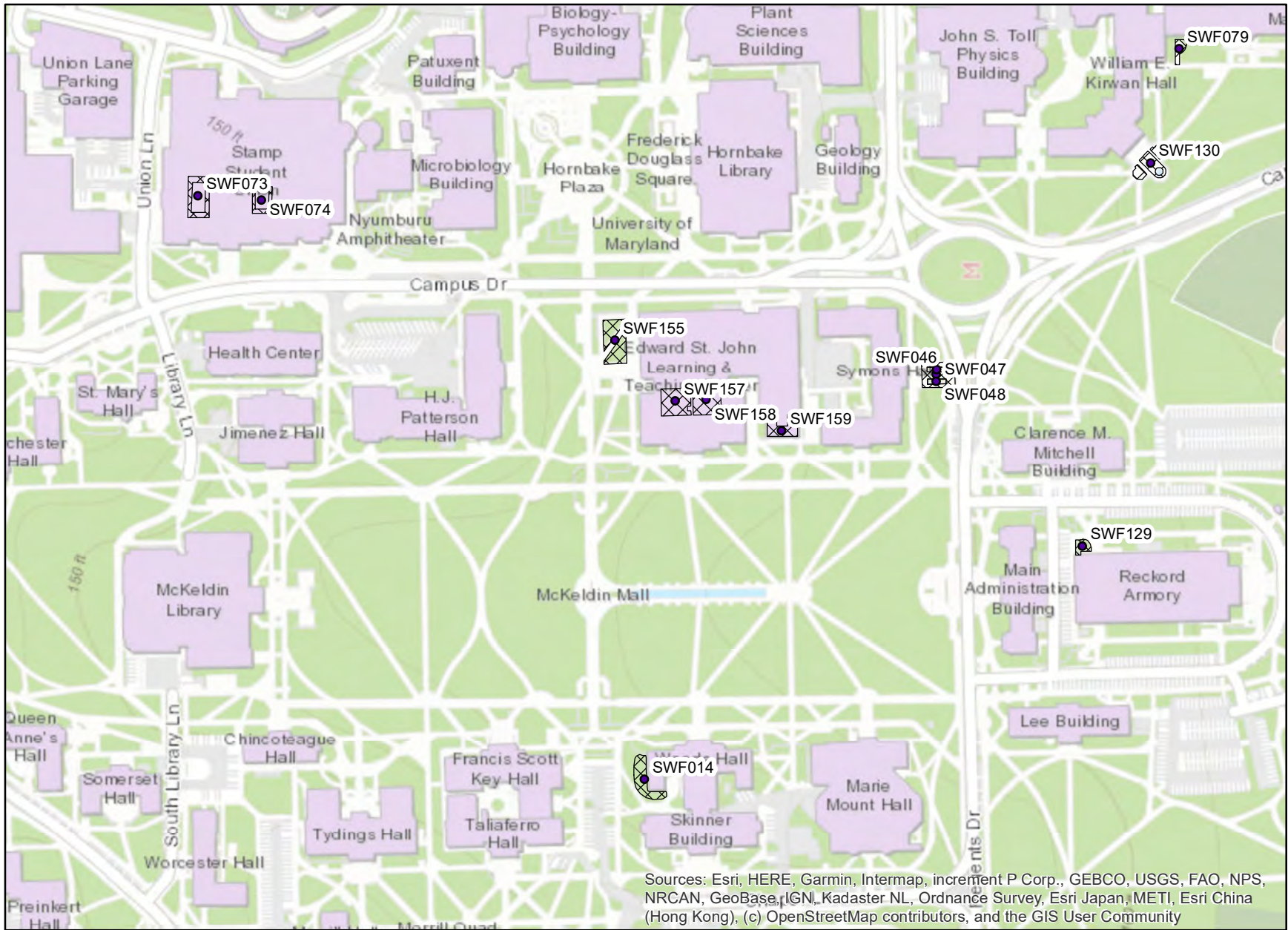
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- BMP LOCATION
- BMP OUTLINE





# UMCP BMP LOCATION MAP



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

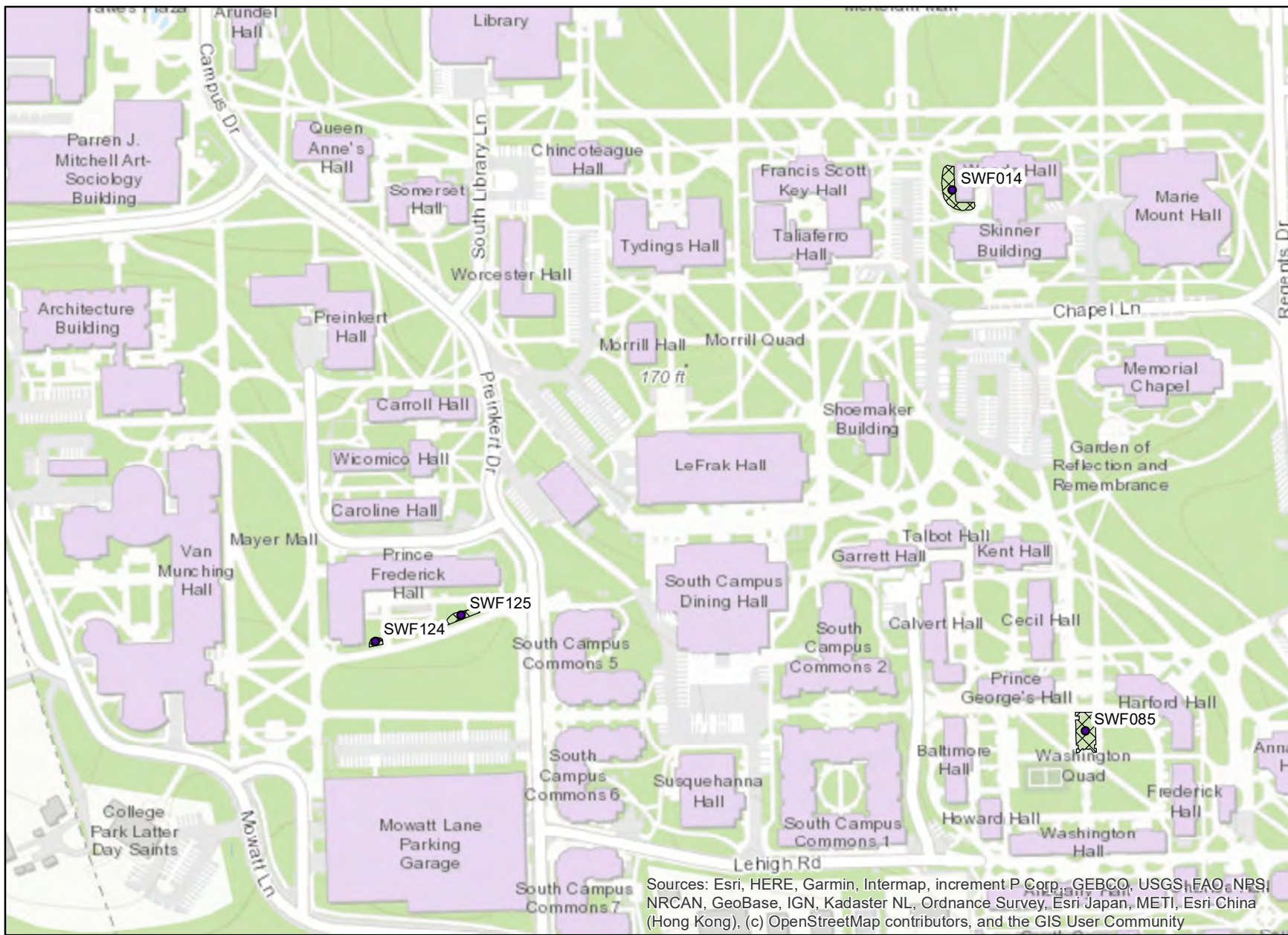
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- BMP LOCATION
- ⊠ BMP OUTLINE





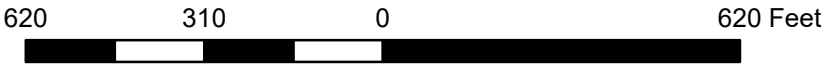
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NRS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

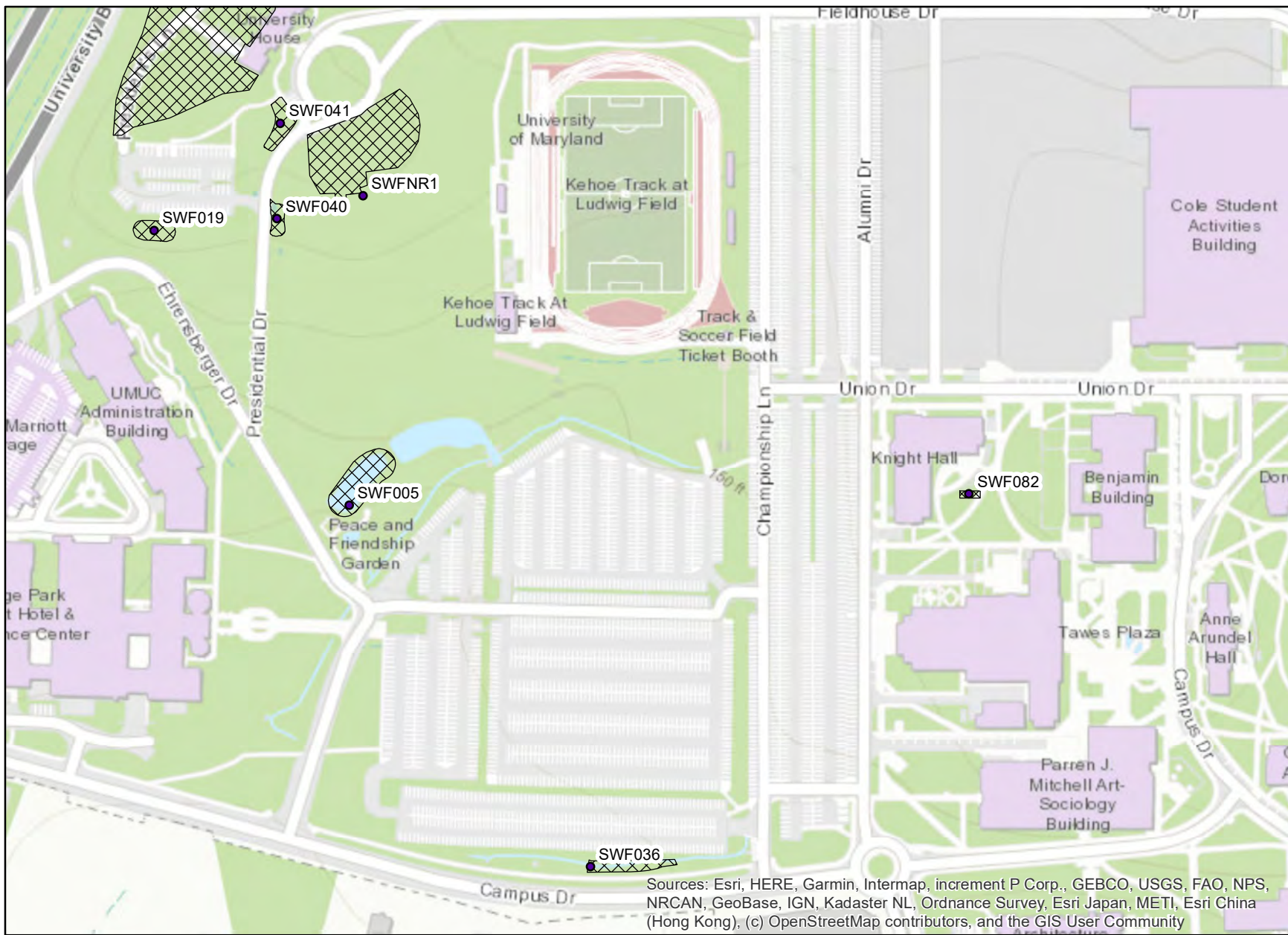
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- ⊠ BMP OUTLINE





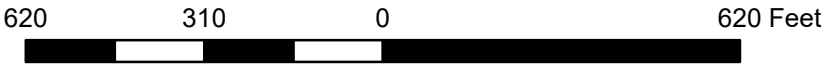
# UMCP BMP LOCATION MAP



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

## Legend

- BMP LOCATION
- BMP OUTLINE



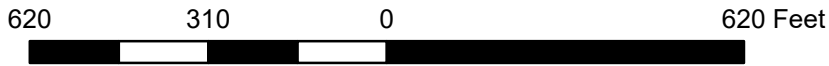


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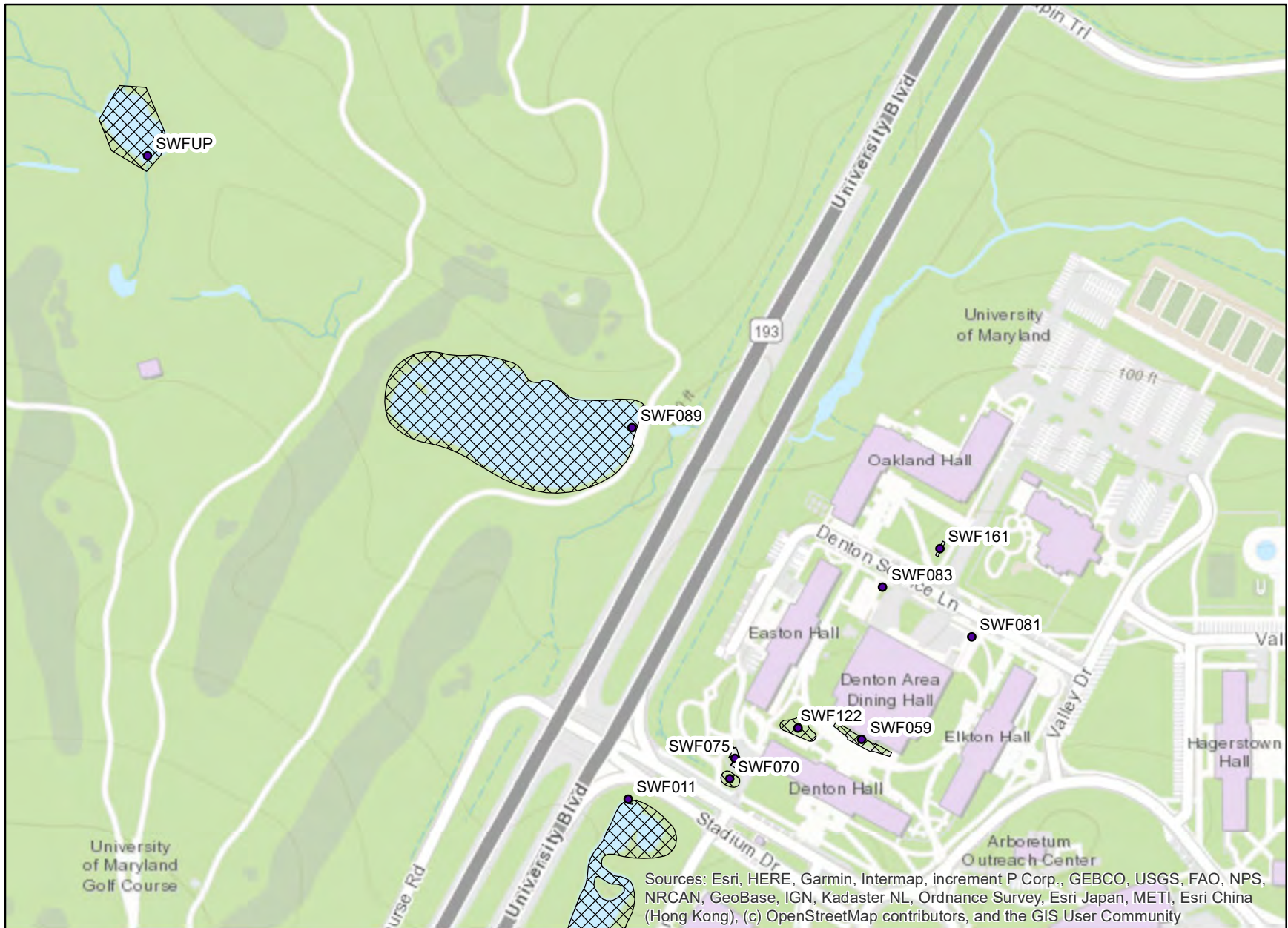


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- BMP LOCATION
- ▨ BMP OUTLINE



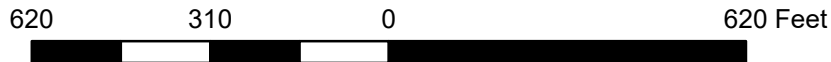
# UMCP BMP LOCATION MAP



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

## Legend

- BMP LOCATION
- BMP OUTLINE





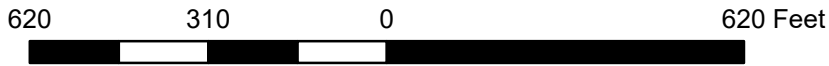
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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

## Legend

- BMP LOCATION
- BMP OUTLINE





# UMCP BMP LOCATION MAP



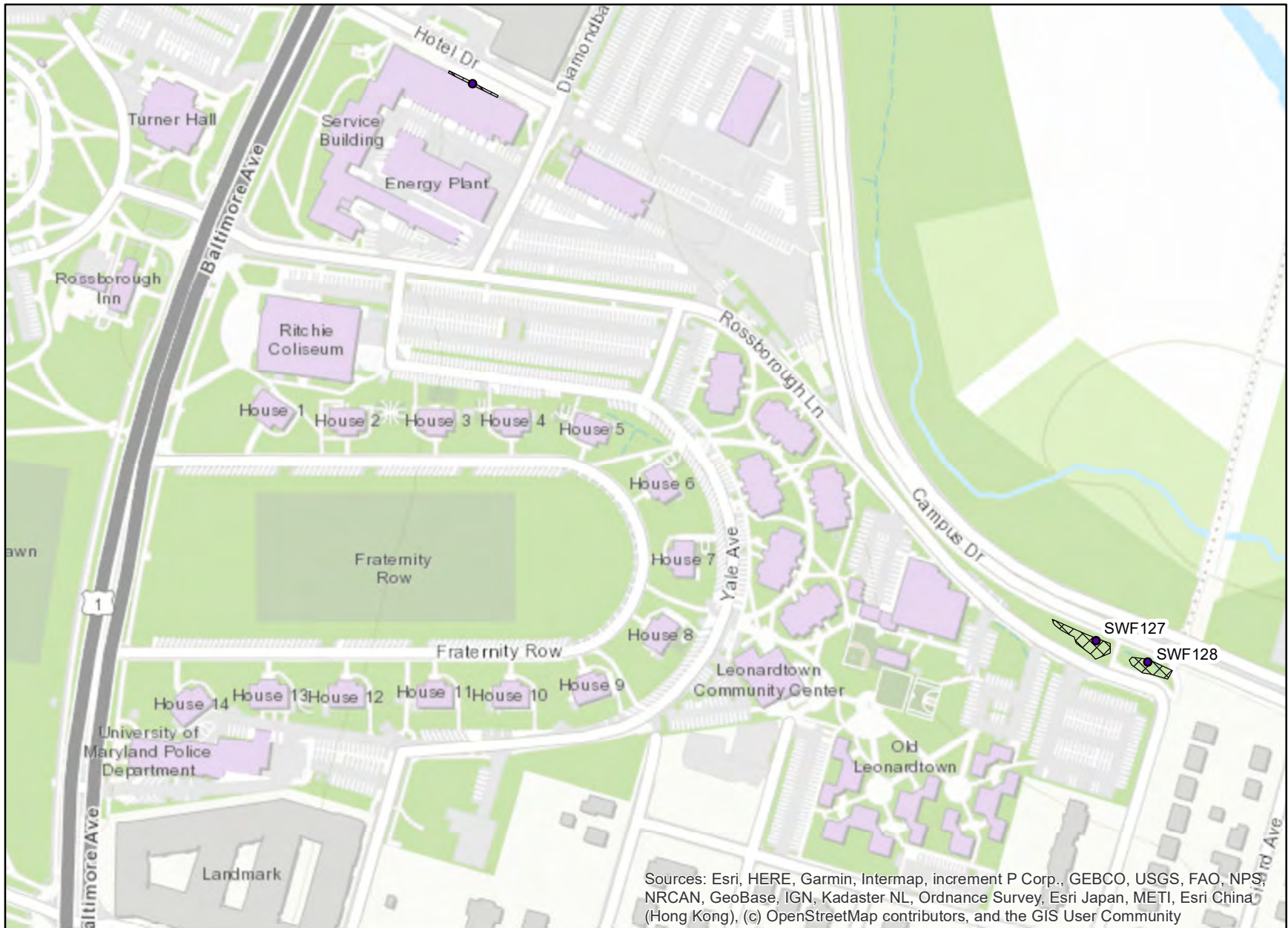
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## Legend

- BMP LOCATION
- ⊠ BMP OUTLINE



# UMCP BMP LOCATION MAP



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

## Legend



# ***Appendix C***

## ***References***



**UMCP MS4 BMP ASSESSMENT**  
**Task 2 Report**

The references used in compiling this report are as follows:

*2000 Stormwater Design Manual (and 2008 Amendments)*, Maryland Department of the Environment, Water Management Administration

*MS4 permit for UMCP*

## APPENDIX D

# Urban Stormwater Best Management Practice (BMP) Database





**Table B.1.a. BMP Reporting Requirements**

This table represents the basic data elements that are required of all structural, ESD and alternative Best Management Practices (BMPs)

BMP_ID <sup>1</sup>	REPORTING_YEAR	MD_NORTH <sup>2</sup>	MD_EAST	PERMIT_NUM	LOCAL_BMP_ID	BMP_NAME	BMP_CLASS	BMP_TYPE	CON_PURPOSE	LAST_INSP_DATE	BMP_STATUS	MAIN_DATE	REINSP_DATE	REINSP_STATUS	GEN_COMMENTS
UMCP19BMP002	2019	483524.837	1327593.825	94-SF-0311	SWF002	Lot 2 retention pond	S	PWET		6/4/2019	F	5/16/2017			Epply parking lot pond. With riprap overflow into vegetated swale. Check design docs.
UMCP19BMP005	2019	480711.3846	1325893.791	02-SF-0247	SWF005	Peace Garden Sand Filter	S	FSND		4/10/2019	F	3/25/2018			Failed sand filter basis of UMD SWM Bank.
UMCP19BMP0010	2019	487033.8201	1328525.704	91-SF-0059	SWF010	Laboratory for Physical Science we	S	PWET		6/4/2019	F				heavy sedimentation. heavy cattail growth. nice wooded edge condition favorable wildlife habitat
UMCP19BMP0011	2019	482743.4291	1326174.16	03-SF-0282	SWF011	CSPAC retention pond	S	WSHW		6/5/2019	F				recomend annual perennial cut back. High habitat value. Many species of Birds observed.
UMCP19BMP0012	2019	484496.9525	1329332.659	00-SF-0275	SWF012	Softball complex retention pond	S	PWET		5/8/2019	P				Heavy vegetation around edge of facility. Annual reduction of cattails recommended.
UMCP19BMP0013	2019	486228.3664	1329157.625		SWF013	Courtyards retention pond	S	PWET		6/4/2019	P				sediments and trash at swale/inlet into pond
UMCP19BMP0014	2019	480152.7125	1328758.859		SWF014	Woods Hall Bioretention	S	FBIO	REDE	4/3/2019	P				Garden Area funde by AWS and DNR
UMCP19BMP0016	2019	483957.8509	1330169.595	13-SF-5501	SWF016	Shuttle Facility	E	AGRE	NEWD	5/29/2019	P	11/29/2018			sedum green roof. in bloom many observed pollinator bees. interviewed facility staff, no problems experienced so far. 75% plant cover, room to fill in
UMCP19BMP0017	2019	483965.1193	1330241.696	13-SF-5501	SWF017	Shuttle Facility	E	AGRE	NEWD	5/29/2019	P	11/29/2018			same as lower roof
UMCP19BMP0018	2019	484150.5293	1328603.614	13-SF-5501	SWF018	BLS Heavy Equipment	E	AGRE		11/29/2018	P	11/29/2018			Green roof appears to be functional. Sedums in bloom. Some volunteer "weeds" should be removed.
UMCP19BMP0019	2019	481208.8699	1325538.884	13-SF-0237	SWF019	University House Parking Lot	S	MMBR	REDE	6/5/2019	P				Facility outfall presents an issue with eroding the hillside.
UMCP19BMP0020	2019	486993.6897	1329342.501	98-SF-0319	SWF020	VetMed research pond	S	PWET		5/15/2019	F				swale wraps lot. Heavy vegtation in swale, heavy sedimentation at inlets.
UMCP19BMP0021	2019	483027.2625	1329908.618	00-SF-0275	SWF021	Animal science retention pond	S	PWET		4/11/2019	F	12/15/2016			FF2 Pond O&M has proposal to maintain and enhance.
UMCP19BMP0022	2019	483080.0131	1330646.935		SWF022	Lot 11b bioretention	S	FBIO		4/11/2019	F	5/16/2017			Dr. Davis bioretention
UMCP19BMP0023	2019	482883.8389	1329941.985	13-SF-5501	SWF023	SWF23	S	WSHW		6/4/2019	F	10/30/2018			
UMCP19BMP0024	2019	483610.2988	1328289.489	01-SF-0005	SWF024	Terrapin Trail Garage retention po	S	PWET		4/16/2019	F	5/16/2017			no observed safety bench at pond edge. algae bloom mid june. retrofit candidat?
UMCP19BMP0026	2019	483876.7671	1330674.677	11-SF-0002	SWF026	Shuttle Facility dry swale	E	MSWG		4/16/2019	F	3/28/2018			
UMCP19BMP0027	2019	483159.8535	1329219.956		SWF027	Lot PP2 bioretention	S	FBIO		6/4/2019	P				Dr. Davis bioretention. Built w/ EPA/PG \$ (\$250K for 4 facilities)
UMCP19BMP0033	2019	481650.512	1325881.931	11-SF-0184	SWF033	University House	S	FBIO	NEWD	6/4/2019	P				Bioretention North
UMCP19BMP0034	2019	481688.1317	1325846.308	11-SF-0184	SWF034	University House	S	FBIO	NEWD	6/4/2019	P				Bioretention North
UMCP19BMP0035	2019	481734.0023	1325797.203	11-SF-0184	SWF035	University House	S	FBIO	NEWD	4/3/2019	F				Bioretention North
UMCP19BMP0036	2019	480058.2495	1326332.759		SWF036	Lot Three - Guilford Park Bioretent	S	FBIO		6/5/2019	F				Middle Guilford Bioretention.
UMCP19BMP0039	2019	482211.5263	1329448.112		SWF039	Chem-Nuc Bldg bioretention	S	FBIO		4/3/2019	P				North Cell
UMCP19BMP0040	2019	481229.8029	1325762.538	11-SF-0184	SWF040	University House	S	FBIO		4/10/2019	P				Bioretention South
UMCP19BMP0041	2019	481402.6565	1325768.604	11-SF-0184	SWF041	University House	S	FBIO		4/16/2019	F				Bioretention South
UMCP19BMP0042	2019	484016.7898	1328248.59	13-SF-0233	SWF042	Wye Oak Building bioretention	S	FBIO	NEWD	4/2/2019	P				
UMCP19BMP0043	2019	483073.3353	1330677.212		SWF043	Lot 11b bioretention	S	FBIO		4/2/2019	P				Dr. Davis bioretention
UMCP19BMP0046	2019	480900.3482	1329290.634		SWF046	Symons Hall	E	MRNG		4/2/2019	F				
UMCP19BMP0047	2019	480879.194	1329291.176		SWF047	Symons Hall	E	MRNG		8/21/2018	P	8/21/2018			
UMCP19BMP0048	2019	480889.881	1329294.458		SWF048	Symons Hall	E	APRP		11/30/2018	P	11/30/2018			
UMCP19BMP0049	2019	482388.0299	1328849.928		SWF049	Computer and Space Sciences	E	AGRE		4/16/2019	F				Atlantic Building loading dock
UMCP19BMP0050	2019	482774.2886	1328287.399	13-SF-5501	SWF050	Cumberland	E	AGRE		5/8/2019	F	4/18/2018			south cell. same condition as others.
UMCP19BMP0055	2019	484164.6287	1328553.028	11-SF-0139	SWF055	Heavy Equipment Building biorete	S	FBIO	REDE	4/11/2019	P				BLS Bioretention. no observed plants. room for enhanced planting.
UMCP19BMP0056	2019	484831.4617	1328962.2	01-SF-0167	SWF056	Comcast north retention pond	S	PWET		6/4/2019	F				Comcast/Chesapeake Pond. Reported problems with overflow during large rains events. Geese infestation.
UMCP19BMP0059	2019	482851.8935	1326599.66	12-SF-0215	SWF059	Denton dining bioretention	S	FBIO	REDE	6/4/2019	F				
UMCP19BMP0065	2019	487927.0543	1328801.867		SWF065	Greenmeade North dry pond	S	PWED		6/4/2019	F				Dry detention pond? appears functional.
UMCP19BMP0066	2019	487762.4309	1328743.324		SWF066	conveyance to SWF65				6/4/2019	F				Area still needs to be investigated. Low point is at inflow. This could be a conveyance to the pond. Looks like it may flood
UMCP19BMP0068	2019	486629.3347	1328987.466		SWF068	Courtyards Northeast parking	S	FBIO		6/4/2019	P				sheet flow to bioretention curb at north edge collapsed
UMCP19BMP0069	2019	486601.3669	1329047.406		SWF069	Courtyards Northeast parking	S	FBIO		5/29/2019	P	11/29/2018			sheet flow to bioretention
UMCP19BMP0070	2019	482780.3864	1326359.042	12-SF-0215	SWF070	Denton bioretention	S	FBIO	REDE	5/29/2019	P	11/29/2018			new bioretention, check to see if required and if yes triggered by what project. Rip rap at inlet should be lowered to allow greater volume to enter
UMCP19BMP0073	2019	481210.7157	1327955.06		SWF073	Stamp Green Roof West	E	AGRE		6/4/2019	F				Good condition. Some volunteer weeds should be removed. verify LEED status
UMCP19BMP0074	2019	481196.1091	1328073.222		SWF074	Stamp Green Roof East	E	AGRE		4/11/2019	P	4/27/2018			same as other stamp green roof verify LEED status
UMCP19BMP0075	2019	482817.908	1326368.49	12-SF-0215	SWF075	Denton permeable pavements	E	APRP		6/4/2019	P	4/27/2018			Service parking permeable paving.
UMCP19BMP0076	2019	483159.8253	1328162.762	12-SF-0301	SWF076	Public Health Garden bioretention	S	FBIO		5/29/2019	P	11/30/2018			Water enters facility too rapidly, causing scouring and channeling of swale bays.
UMCP19BMP0077	2019	483176.3646	1328164.089		SWF077	Public Health Garden rainwater ha	E	MRWH		6/5/2019	P				
UMCP19BMP0078	2019	482289.1987	1328961.903	10-SF-0085	SWF078	Physical Sciences	E	AGRE		5/15/2019	F				
UMCP19BMP0079	2019	481478.2469	1329732.834		SWF079	Glenn L Martin Hall permeable pa	E	APRP		6/5/2019	F				Engineering permeable paving
UMCP19BMP0080	2019	483102.9199	1329652.484		SWF080	Lot FF2 permeable pavements	E	APRP			F				Dr. Davis permeable paving research with treatment vault for nitrogen reduction.
UMCP19BMP0081	2019	483038.1969	1326799.892	12-SF-0215	SWF081	Denton Hall rainwater harvesting	E	MRWH		6/5/2019	F				
UMCP19BMP0082	2019	480739.8321	1327000.378		SWF082	Knight Hall	E	MRWH			F				
UMCP19BMP0083	2019	483128.4179	1326637.434	12-SF-0215	SWF083	Denton Hall rainwater harvesting	E	MRWH		4/4/2019	F	8/24/2018			
UMCP19BMP0085	2019	479174.1512	1329001.58		SWF085	Washington Quad	E	MRWH		6/5/2019	F				
UMCP19BMP0086	2019	482130.68	1326042.922		SWF086	CSPAC permeable pavements	E	APRP		5/1/2019	F				CSPAC landscape service building permeable paving. Some weeds/sediment buildup in joints.
UMCP19BMP0088	2019	482147.9461	1329445.959		SWF088	Chem-Nuc Bldg bioretention	S	FBIO		4/16/2019	F	10/29/2018			South Cell

**Table B.1.a. BMP Reporting Requirements**

This table represents the basic data elements that are required of all structural, ESD and alternative Best Management Practices (BMPs)

BMP_ID¹	REPORTING_YEAR	MD_NORTH²	MD_EAST	PERMIT_NUM	LOCAL_BMP_ID	BMP_NAME	BMP_CLASS	BMP_TYPE	CON_PURPOSE	LAST_INSP_DATE	BMP_STATUS	MAIN_DATE	REINSP_DATE	REINSP_STATUS	GEN_COMMENTS
UMCP19BMP0089	2019	483417.6512	1326180.861		SWF089	Golf course lower wet pond	S	PWET		5/8/2019	F	5/16/2018			Dam failed years ago. No funding identified for fix. Undermined condition presents safety hazard. Confirm status w/ course manager
UMCP19BMP0090	2019	483259.0731	1329107.28		SWF090	Lot PP2 rain garden		FBIO		5/8/2019	F				Not a Dr. Davis facility. Need to find out more info on this. ID'd as a retrofit opportunity in AWRP.
UMCP19BMP0091	2019	483250.1059	1329803.278		SWF091	Regents Drive bioretention	S	FBIO		5/8/2019	F	5/16/2018			Dr. Davis bioretention. Built w/ EPA/PG \$ (\$250K for 4 facilities)
UMCP19BMP0092	2019	483357.5093	1329817.677		SWF092	Lot 9 bioretention	S	FBIO		4/11/2019	F	5/16/2017			Dr. Davis bioretention. Built w/ EPA/PG \$ (\$250K for 4 facilities)
UMCP19BMP0093	2019	483240.312	1329545.407		SWF093	Regents Drive bioretention	S	FBIO		5/8/2019	F	5/16/2017			Dr. Davis bioretention. Built w/ EPA/PG \$ (\$250K for 4 facilities)
UMCP19BMP0094	2019	483085.0265	1330229.006		SWF094	Paint Branch Drive bioretention	S	FBIO		4/16/2019	F				Dr. Davis bioretention. Built w/ EPA/PG \$ (\$250K for 4 facilities)
UMCP19BMP0098	2019	483968.7534	1329861.103		SWF098	Artificial Turf Field bioretention	S	FBIO		5/8/2019	F	5/16/2017			
UMCP19BMP0106	2019	483930.2289	1330646.339	11-SF-0002	SWF106	Shuttle Bus wet pond	S	PWET	NEWD						
UMCP19BMP0107	2019	484162.6504	1329710.058	01-SF-0255	SWF107	Taylor stadium bioretention	S	FBIO	NEWD	6/4/2019	F	5/16/2017			
UMCP19BMP0108	2019	485214.0259	1328857.304	13-SF-5501	SWF108	Chesapeake Parking Lot East	S	FUND		5/1/2019	F	10/30/2018			storm vault unknown type. imited sedimentation and tras present
UMCP19BMP0109	2019	485941.3824	1328318.694		SWF109	Metzerott Rd and Greenmead Dr	S	PWET		4/11/2019	F				
UMCP19BMP0112	2019	482176.9342	1325591.546		SWF112	Golf Course Parking Lot rain garde	E	MRNG		5/1/2019	P				Bioretention discovered during inspection of Golf Course Rd. drainage swale-December 2014
UMCP19BMP0122	2019	482872.5699	1326483.871	12-SF-0215	SWF122	Denton Courtyard bioretention	S	FBIO	REDE	5/1/2019	F				
UMCP19BMP0124	2019	479335.1453	1327710.908	12-SF-0232	SWF124	Prince Frederick Hall Bioretention	S	FBIO	NEWD	5/1/2019	F	4/1/2017			
UMCP19BMP0125	2019	479382.6087	1327866.88	12-SF-0232	SWF125	Prince Frederick Hall Bioretention	S	FBIO	NEWD	5/1/2019	F	4/1/2017			
UMCP19BMP0127	2019	479594.1861	1331835.011		SWF127	Paint Branch Dr & Rossborough Ln	S	FBIO		6/4/2019	F				This was identified by Seth C and no info is avail. But it is on UMD and appears to drain UMD property.
UMCP19BMP0128	2019	479555.7613	1331929.59		SWF128	Paint Branch Dr & Rossborough Ln	S	FBIO		6/5/2019	P				This was identified by Seth C and no info is avail. But it is on UMD and appears to drain UMD property.
UMCP19BMP0129	2019	480576.0627	1329556.8		SWF129	Reckord Armory	E	MRNG		4/2/2019	F				Built as part of sustainability fund student project
UMCP19BMP0130	2019	481271.3363	1329680.859		SWF130	Kirwan Hall fountain permeable pa	E	APRP		4/2/2019	F				Observed to be pervious in field. No drawings found to date.
UMCP19BMP0133	2019	482155.8529	1330008.429	12-SF-0279	SWF133	Kim Plaza	E	MMBR		4/2/2019	F				Final design drawings available. Searching for Record Drawings.
UMCP19BMP0134	2019	482111.8349	1330008.664	12-SF-0279	SWF134	Kim Plaza	E	MMBR		4/2/2019	F				Final design drawings available. Searching for Record Drawings.
UMCP19BMP0135	2019	482066.8284	1330008.686	12-SF-0279	SWF135	Kim Plaza	E	MMBR		4/2/2019	F				Final design drawings available. Searching for Record Drawings.
UMCP19BMP0136	2019	482112.0757	1330052.603	12-SF-0279	SWF136	Kim Plaza	E	MMBR		4/2/2019	F				Final design drawings available. Searching for Record Drawings.
UMCP19BMP0137	2019	482067.043	1330052.625	12-SF-0279	SWF137	Kim Plaza	E	MMBR		4/2/2019	F				Final design drawings available. Searching for Record Drawings.
UMCP19BMP0138	2019	482156.0077	1330052.479	12-SF-0279	SWF138	Kim Plaza	E	MMBR		4/2/2019	F				Final design drawings available. Searching for Record Drawings.
UMCP19BMP0139	2019	482156.2075	1330096.27	12-SF-0279	SWF139	Kim Plaza	E	MMBR		4/2/2019	F				Final design drawings available. Searching for Record Drawings.
UMCP19BMP0140	2019	482112.2142	1330096.395	12-SF-0279	SWF140	Kim Plaza	E	MMBR		4/2/2019	F				Final design drawings available. Searching for Record Drawings.
UMCP19BMP0141	2019	482067.4397	1330096.562	12-SF-0279	SWF141	Kim Plaza	E	MMBR		5/15/2019	F				Final design drawings available. Searching for Record Drawings.
UMCP19BMP0142	2019	482222.0089	1330074.163		SWF142	Kim Plaza	E	MMBR		5/1/2019	F	10/30/2018			Final design drawings available. Searching for Record Drawings.
UMCP19BMP0143	2019	482586.084	1329808.817		SWF143	Central Animal Resources Facility	E	APRP		5/1/2019	F	10/30/2018			
UMCP19BMP0144	2019	482137.5386	1325554.312		SWF144	North East corner of golf course p	E	MRNG		5/1/2019	F	10/30/2018			Built as part of CBT grant; built in-house by BLM; drawings consist of profile and plan view- no detail drawings were created; construction cost include all 3 facilities combined.
UMCP19BMP0146	2019	482184.322	1325174.548		SWF146	North west corner of golf course p	E	MRNG		6/4/2019	P				Built as part of CBT grant; built in-house by BLM; drawings consist of profile and plan view- no detail drawings were created; construction cost include all 3 facilities combined.
UMCP19BMP0147	2019	481972.1767	1325236.835		SWF147	South west corner of golf course p	E	MRNG		6/4/2019	P				RG2. Built as part of CBT grant; built in-house by BLM; drawings consist of profile and plan view- no detail drawings were created; construction cost include all 3 facilities combined. 6" inflow pipe from swale is below grade.
UMCP19BMP0152	2019	482055.5834	1330645.933	16-SF-0064	SWF152	A.V. Williams	E	FBIO	REDE	4/3/2019	P				
UMCP19BMP0153	2019	482307.0189	1330582.918	16-SF-0064	SWF153	A.V. Williams	E	FBIO	REDE						
UMCP19BMP0154	2019	482202.7954	1330603.546	16-SF-0064	SWF154	A.V. Williams	E	FBIO	REDE						
UMCP19BMP0155	2019	480949.1483	1328704.808	13-SF-5501	SWF155	West of Edward St. John	E	AGRE							
UMCP19BMP0157	2019	480849.825	1328824.899	13-SF-5501	SWF157	West Side of Edward St. John	E	AGRE							
UMCP19BMP0158	2019	480851.3414	1328882.262	13-SF-5501	SWF158	West Side of Edward St. John	E	AGRE							
UMCP19BMP0159	2019	480798.9881	1329021.021	13-SF-5501	SWF159	East Side of Edwards St. John	E	AGRE							
UMCP19BMP0161	2019	483203.0230	1326740.4635		SWF161	Oakland Hall Sandfilter	S	FUND							
UMCP19BMP0162	2019	483861.0576	1328166.0676		SWF162	Terrapin Trail Garage BaySaver	S	FUND							
UMCP19BMP0163	2019	484696.2474	1333989.0591		SWF163	Severn Stormceptor	S	FUND							
UMCP19BMP0164	2019	484618.5369	1334203.8746		SWF164	Severn Stormceptor	S	FUND							
UMCP19BMP0165	2019	484702.2385	1334419.5136		SWF165	Severn Stormceptor	S	FUND							
UMCP19BMP0166	2019	484757.4241	1334574.7988		SWF166	Severn Stormceptor	S	FUND							
UMCP19BMP0167	2019	484599.1039	1334729.6757		SWF167	Severn Stormceptor	S	FUND							
UMCP19BMP0168	2019	484399.8851	1334678.4645		SWF168	Severn Stormceptor	S	FUND							
UMCP19BMP0169	2019	484226.0567	1334042.4136		SWF169	Severn Stormceptor	S	FUND							
UMCP19BMP0170	2019	483992.1159	1334108.3853		SWF170	Severn Stormceptor	S	FUND		6/4/2019	F				
UMCP19BMP0171	2019	483797.5412	1334512.1328		SWF171	Severn Stormceptor	S	FUND		6/4/2019	F				
UMCP19BMP0172	2019	486101.8916	1328781.476		SWFCY1	Courtyards South Parking	E	FBIO		6/4/2019	P				Structure identified from imagery. Field confirmation required. Check with the Courtyards for existing plan set.
UMCP19BMP0231	2019	482681.0841	1329965.904	14-SF-0265	SWFCH1	A. James Clark Hall	E	MMBR		5/1/2019	F				Clarks Hall Rain Garden
UMCP19BMP0232	2019	482643.1564	1329969.8381	14-SF-0265	SWFCH2	A. James Clark Hall	E	MMBR		6/4/2019	F				Structure identified from imagery. Field confirmation required. Check with the Courtyards for existing plan set.
UMCP19BMP0235	2019	483911.162	1325297.737	11-SF-0139	SWFUP	Upper golf course wet pond	S	PWET		6/4/2019	F				
UMCP19BMP0236	2019	486633.8416	1329140.262		SWFSCA1	Courtyards sheetflow to conservat	E	NDNR		4/16/2019	P				
UMCP19BMP0237	2019	486372.557	1329174.551		SWFSCA2	Courtyards sheetflow to conservat	E	NDNR		4/10/2019	F				
UMCP19BMP0238	2019	483092.6715	1329042.472	11-SF-0139	SWFWW1	Wellness Way bio-swale	E	MSWB		6/6/2019	F				
UMCP19BMP0239	2019	481271.3668	1325918.397		SWFNRR1	Presidents House Disconnect 1	E	NDNR		6/6/2019	P				





**Table B.1.b. Reporting Requirements for ESD and Structural Practices**

More specific data related to ESD and structural BMPs is populated in this table.

BMP_ID <sup>1</sup>	NUM_BMPS <sup>2</sup>	ON_OFF_SITE	CONVERTED_FROM	BMP_STATUS	BMP_DRAIN_AREA	IMP_ACRES <sup>3</sup>	PE_ADR	APPR_DATE	BUILT_DATE	GEN_COMMENTS
UMCP19BMP0002	1	ON		ACT	6.95			8/10/1995	3/26/1998	Lot 2 retention pond
UMCP19BMP0005	1	ON		ACT	23.88			6/16/2003		Peace Garden Sand Filter
UMCP19BMP0010	1	ON		ACT	8.7					Laboratory for Physical Science wet pond
UMCP19BMP0011	1	ON		ACT	28.16					CSPAC retention pond
UMCP19BMP0012	1	ON		ACT	9.2	10.03	0.86	12/14/2000		Softball complex retention pond
UMCP19BMP0013	1	ON		ACT	8.6					Courtyards retention pond
UMCP19BMP0014	1	ON		ACT	0.11			11/17/2011		Woods Hall Bioretention
UMCP19BMP0016	1	ON		ACT						Shuttle Facility
UMCP19BMP0017	1	ON		ACT						Shuttle Facility
UMCP19BMP0018	1	ON		ACT						BLS Heavy Equipment
UMCP19BMP0019	1	ON		ACT	0.63	0.29	1	5/29/2013	8/28/2014	University House Parking Lot
UMCP19BMP0020	1	ON		ACT	9.92					VetMed research pond
UMCP19BMP0021	1	ON		ACT	11.8			4/1/1988		Animal science retention pond
UMCP19BMP0022	1	ON		ACT	0.86					Lot 11b bioretention
UMCP19BMP0023	1	ON		ACT						SWF 23
UMCP19BMP0024	1	ON		ACT	9.7	4.25	0.4			Terrapin Trail Garage retention pond
UMCP19BMP0026	1	ON		ACT	1.51			9/29/2010	10/12/2012	Shuttle Facility dry swale
UMCP19BMP0027	1	ON		ACT	0.32					Lot PP2 bioretention
UMCP19BMP0033	1	ON		ACT	0.47	0.3721	1	9/2/2011	8/16/2012	University House
UMCP19BMP0034	1	ON		ACT	0.21		1			University House
UMCP19BMP0035	1	ON		ACT	0.41		1			University House
UMCP19BMP0036	1	ON		ACT	2.11					Lot Three - Guilford Park Bioretention
UMCP19BMP0039	1	ON		ACT	0.24					Chem-Nuc Bldg bioretention
UMCP19BMP0040	1	ON		ACT	0.28	0.034	1	9/2/2011	8/16/2012	University House
UMCP19BMP0041	1	ON		ACT	0.38	0.0936	1	9/2/2011	8/16/2012	University House
UMCP19BMP0042	1	ON		ACT	0.38	0.21		3/18/2013	2/24/2014	Wye Oak Building bioretention
UMCP19BMP0043	1	ON		ACT	0.57					Lot 11b bioretention
UMCP19BMP0046	1	ON		ACT	0.01					Symons Hall
UMCP19BMP0047	1	ON		ACT	0.01					Symons Hall
UMCP19BMP0048	1	ON		ACT	0.04					Symons Hall
UMCP19BMP0049	1	ON		ACT						Computer and Space Sciences
UMCP19BMP0050	1	ON		ACT						Cumberland
UMCP19BMP0055	1	ON		ACT	0.16					Heavy Equipment Building bioretention
UMCP19BMP0056	1	ON		ACT	14.05	5.1		12/14/2000		Comcast north retention pond
UMCP19BMP0059	1	ON		ACT	0.28		1	3/20/2012		Denton dining bioretention
UMCP19BMP0065	1	ON		ACT	7.23					Greenmeade North dry pond
UMCP19BMP0066	1	ON		ACT	5.87					conveyance to SWF65
UMCP19BMP0068	1	ON		ACT	0.5					Courtyards Northeast parking
UMCP19BMP0069	1	ON		ACT	0.54					Courtyards Northeast parking
UMCP19BMP0070	1	ON		ACT	0.13	0.17	1	3/20/2012		Denton bioretention
UMCP19BMP0073	1	ON		ACT						Stamp Green Roof West
UMCP19BMP0074	1	ON		ACT						Stamp Green Roof East
UMCP19BMP0075	1	ON		ACT	0.02					Denton permeable pavements
UMCP19BMP0076	1	ON		ACT	4.82	0.09		5/8/2013		Public Health Garden bioretention
UMCP19BMP0077	1	ON		ACT	4.82					Public Health Garden rainwater harvesting

**Table B.1.b. Reporting Requirements for ESD and Structural Practices**

More specific data related to ESD and structural BMPs is populated in this table.

BMP_ID <sup>1</sup>	NUM_BMPS <sup>2</sup>	ON_OFF_SITE	CONVERTED_FROM	BMP_STATUS	BMP_DRAIN_AREA	IMP_ACRES <sup>3</sup>	PE_ADR	APPR_DATE	BUILT_DATE	GEN_COMMENTS
UMCP19BMP0078	1	ON		ACT	0.3					Physical Science
UMCP19BMP0079	1	ON		ACT	0.01					Glenn L Martin Hall permeable pavements
UMCP19BMP0080	1	ON		ACT	0.04					Lot FF2 permeable pavements
UMCP19BMP0081	1	ON		ACT	0.02					Denton Hall rainwater harvesting
UMCP19BMP0082	1	ON		ACT	0.45					Knight Hall
UMCP19BMP0085	1	ON		ACT	0.37					Washington Quad
UMCP19BMP0083	1	ON		ACT	0.05					Denton Hall rainwater harvesting
UMCP19BMP0086	1	ON		ACT	0.1					CSPAC permeable pavements
UMCP19BMP0088	1	ON		ACT	0.09					Chem-Nuc Bldg bioretention
UMCP19BMP0089	1	ON		ACT	32.84					Golf course lower wet pond
UMCP19BMP0090	1	ON		ACT	7.58	3.37				Lot PP2 rain garden
UMCP19BMP0091	1	ON		ACT	0.86					Regents Drive bioretention
UMCP19BMP0092	1	ON		ACT	2.99					Lot 9 bioretention
UMCP19BMP0093	1	ON		ACT	0.45					Regents Drive bioretention
UMCP19BMP0094	1	ON		ACT	0.27					Paint Branch Drive bioretention
UMCP19BMP0098	1	ON		ACT	3.91			7/20/1994		Artificial Turf Field bioretention
UMCP19BMP0106	1	ON		ACT	1.32			10/29/2010	10/15/2012	Shuttle Bus wet pond
UMCP19BMP0107	1	ON		ACT	0.69					Taylor stadium bioretention
UMCP19BMP0108	1	ON		ACT	3.9					Chesapeake Parking Lot East
UMCP19BMP0109	1	ON		ACT	7.49					Metzerott Rd and Greenmead Dr wet pond
UMCP19BMP0112	1	ON		ACT	0.2					Golf Course Parking Lot rain garden
UMCP19BMP0122	1	ON		ACT	0.25			3/20/2012		Denton Courtyard bioretention
UMCP19BMP0124	1	ON		ACT	0.23				7/28/2014	Prince Frederick Hall Bioretention Cell 1
UMCP19BMP0125	1	ON		ACT	0.46				7/28/2014	Prince Frederick Hall Bioretention Cell 2
UMCP19BMP0127	1	ON		ACT	0.41					Paint Branch Dr & Rossborough Ln
UMCP19BMP0128	1	ON		ACT	3.14					Paint Branch Dr & Rossborough Ln bioretention
UMCP19BMP0129	1	ON		ACT	0.06					Reckord Armory
UMCP19BMP0130	1	ON		ACT	0.04					Kirwan Hall fountain permeable pavements
UMCP19BMP0133	1	ON		ACT	0.06			3/3/2004		Kim Plaza
UMCP19BMP0134	1	ON		ACT	0.07			3/3/2004		Kim Plaza
UMCP19BMP0135	1	ON		ACT	0.06			3/3/2004		Kim Plaza
UMCP19BMP0136	1	ON		ACT	0.05			3/3/2004		Kim Plaza
UMCP19BMP0137	1	ON		ACT	0.04			3/3/2004		Kim Plaza
UMCP19BMP0138	1	ON		ACT	0.04			3/3/2004		Kim Plaza
UMCP19BMP0139	1	ON		ACT	0.14			3/3/2004		Kim Plaza
UMCP19BMP0140	1	ON		ACT	0.05			3/3/2004		Kim Plaza
UMCP19BMP0141	1	ON		ACT	0.04			3/3/2004		Kim Plaza
UMCP19BMP0142	1	ON		ACT	0.17			3/3/2004		Kim Plaza
UMCP19BMP0143	1	ON		ACT	0.04					Central Animal Resources Facility & ENST
UMCP19BMP0144	1	ON		ACT	1.25					North East corner of golf course parking lot rain gardens
UMCP19BMP0146	1	ON		ACT	0.47					North west corner of golf course parking lot rain garden
UMCP19BMP0147	1	ON		ACT	0.37					South west corner of golf course parking lot rain garden
UMCP19BMP0152	1	ON		ACT	0.68	0.3733	1	5/22/2017		A.V. Williams
UMCP19BMP0153	1	ON		ACT	0.62	0.2176	1	5/22/2017		A.V. Williams
UMCP19BMP0154	1	ON		ACT	0.35	0.3944	1	5/22/2017		A.V. Williams

## Table B.1.b. Reporting Requirements for ESD and Structural Practices

More specific data related to ESD and structural BMPs is populated in this table.

BMP_ID <sup>1</sup>	NUM_BMPS <sup>2</sup>	ON_OFF_SITE	CONVERTED_FROM	BMP_STATUS	BMP_DRAIN_AREA	IMP_ACRES <sup>3</sup>	PE_ADR	APPR_DATE	BUILT_DATE	GEN_COMMENTS
UMCP19BMP0155	1	ON		ACT	0.06					West of Edward St. John
UMCP19BMP0157	1	ON		ACT	0.06					West Side of Edwards St. John
UMCP19BMP0158	1	ON		ACT	0.06					West Side of Edwards St. John
UMCP19BMP0159	1	ON		ACT	0.02					East Side of Edwards St. John
UMCP19BMP0161	2	ON		ACT						Oakland Hall Sandfilter
UMCP19BMP0162	3	ON		ACT						Terrapin Trail Garage BaySaver
UMCP19BMP0163	4	ON		ACT						Severn Stormceptor
UMCP19BMP0164	1	ON		ACT						Severn Stormceptor
UMCP19BMP0165	1	ON		ACT						Severn Stormceptor
UMCP19BMP0166	1	ON		ACT						Severn Stormceptor
UMCP19BMP0167	1	ON		ACT						Severn Stormceptor
UMCP19BMP0168	1	ON		ACT						Severn Stormceptor
UMCP19BMP0169	1	ON		ACT						Severn Stormceptor
UMCP19BMP0170	1	ON		ACT						Severn Stormceptor
UMCP19BMP0171	1	ON		ACT						Severn Stormceptor
UMCP19BMP0172	1	ON		ACT	0.98					Courtyards South Parking
UMCP19BMP0231	1	ON		ACT	0.63			9/18/2015		A. James Clark Hall
UMCP19BMP0232	1	ON		ACT	0.31			9/18/2015		A. James Clark Hall
UMCP19BMP0235	1	ON		ACT	208.28			10/10/1972		Upper golf course wet pond
UMCP19BMP0238	1	ON		ACT						Wellness Way bio-swale
UMCP19BMP0241	1	ON		ACT				6/7/2019		Brendan Iribe 1
UMCP19BMP0242	1	ON		ACT				6/7/2019		Brendan Iribe 2
UMCP19BMP0243	1	ON		ACT						Brendan Iribe 3
UMCP19BMP0244	1	ON		ACT						Brendan Iribe 4
UMCP19BMP0245	1	ON		ACT						Brendan Iribe 5
UMCP19BMP0248	1	ON		ACT						Service Building Bioretention
UMCP19BMP0249	1	ON		ACT					10/10/2019	Campus Creek Stream Restoration



**Table 8.1.c Reporting Requirements for Alternative BMPs (Sample Input Table)**

More specific data related to alternative BMPs is populated in this table.										
BMP_ID <sup>1</sup>	PROJECT_DESC	PROJECT_LENGTH	ACRES_SWEPT	TIMES_SWEPT	ACRES_PLANTED	IMP_ACR_ELIM	EQU_IMP_ACR	INSTALL_DATE	IMPL_COMP_YR	GEN_COMMENTS
UMCP19BMP0048	Symons Hall									SWF048
UMCP19BMP0049	Computer and Space Sciences									SWF049
UMCP19BMP0050	Cumberland									SWF050
UMCP19BMP0073	Stamp Green Roof West									SWF073
UMCP19BMP0074	Stamp Green Roof East									SWF074
UMCP19BMP0075	Denton permeable pavements									SWF075
UMCP19BMP0079	Glenn L. Martin Hall permeable pavements									SWF079
UMCP19BMP0080	Lot FF2 permeable pavements									SWF080
UMCP19BMP0086	CSPAC permeable pavements									SWF086
UMCP19BMP0130	Kirwan Hall fountain permeable pavements									SWF130
UMCP19BMP0143	Central Animal Resources Facility & ENST									SWF143
UMCP19BMP0155	West of Edward St. John									SWF155
UMCP19BMP0157	West Side of Edward St. John									SWF157
UMCP19BMP0158	West Side of Edward St. John									SWF158
UMCP19BMP0159	East Side of Edwards St. John									SWF159
UMCP19BMP0236	Courtyards sheetflow to conservation 1									SWFSCA1
UMCP19BMP0237	Courtyards sheetflow to conservation 2									SWFSCA2
UMCP19BMP0239	Presidents House Disconnect 1						0.0381	10/19/2011		SWFNr1
UMCP19BMP0240	Presidents House Disconnect 2						0.1846	10/19/2011		SWFNr2
UMCP19BMP0244	Brendan Iribe 4									SWFIR4
UMCP19BMP0245	Brendan Iribe 5									SWFIR5
UMCP19BMP0249	Campus Creek Restoration	3039						10/10/2019		

<sup>1</sup> Every BMP Identified in this table should correspond to "BMP" sheet.



## APPENDIX E

### Campus Creek Stream Restoration Project Summary (Full report under separate cover)







## Campus Creek Crediting Memorandum

The Campus Creek Stream Restoration Design Build Project Site is a stream restoration project located at the University of Maryland, College Park in Prince George's County, Maryland. The project purpose is to restore the stream and tributaries using a regenerative stream restoration approach to meet Municipal Separate Storm Sewer Systems (MS4) permit requirements, reduce pollutant (i.e. sediment, nitrogen, phosphorus) loading to meet Total Maximum Daily Load (TMDL) goals, and provide stream functional uplift. There is potential to restore approximately 3,039 linear feet of the stream at this site. TMDL credit for the project site is estimated using pollutant loads determined from Protocol 1, Protocol 2, and the area of impervious surface within the total project watershed. Protocol 1 and Protocol 2 are being utilized to estimate the TMDL credit of the project based on its applicability and ability to maximize the TMDL credit potential.

Field assessments at the Campus Creek stream restoration site consisted of BANCS monitoring using Bank Erosion Hazard Index (BEHI) and Near-Bank Stress (NBS) to calculate erosion potential. Total phosphorous, total nitrogen, and total suspended sediment removal rates are calculated based on the Bank Assessment for Non-point source Consequences of Sediment model. Based on this model, the total nitrogen treated by stream restoration is 6,090 lbs. per year of nitrogen, 2,805 lbs. year of phosphorous, and 5,342,542 lbs. year of sediment. Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects states that mass load reduction should be discounted for projects not being 100% effective in preventing stream bank erosion. A 50% reduction was applied to the BANCS totals for this reason. A conservative sediment delivery ratio of 6.1% for the coastal plain was also used to account for the amount of sediment that would be carried from the streambank erosion downstream. The sediment delivery ratio could be increased to account for edge of stream – edge of tide calculations but a more conservative 6.1% value was used as the site maxes out on treatment even at a low sediment delivery ratio.

Once the annual pollutant load reduction was calculated it was converted to an average pollutant load reduction by dividing it by the watershed area in acres. The average acres of treatment for nutrients and sediment per linear foot was then calculated using the impervious acre conversion factor, site length, and drainage area. The impervious acre conversion factor is a factor of the calculated average pollutant loads using the BANCS data and the delta pollutant loads for impervious and forest cover listed in the Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated. The delta values for impervious and forest cover utilized for this project were 7.69 lbs. per acre per year for nitrogen, 1.91 lbs. per acre per year for phosphorous and 0.43 tons per acre per year. Total acres of treatment for nutrients and sediment is based on the site length and average acres of treatment per linear foot. Campus Creek stream restoration project utilizing Protocol 1 and Protocol 2 gives a total pollutant load reduction of 384 lbs. per year TN, 171 lbs. per year TP, and 163 tons per year TSS when utilizing the 50% effectiveness reduction and the 6.1% sediment delivery ratio. Results indicate that the amount of pollutant load reduction associated with stabilizing the existing channel in impervious area treatment is 0.06 acres per linear foot. This gives a total potential credit of 172.3 acres for 3039 linear feet of restoration. The total impervious acreage credit received by this method is capped based on the actual impervious acres draining to the most downstream point of stream restoration per MDEs Stream Restoration Crediting Clarification from April 2019 provided as an attachment. Therefore, at this site the total impervious acres treated is 105.8 acres which accounts for all the impervious area within the watershed. See the attached BANCs calculations and water quality sheet for full calculations.

**SUMMARY**

Project *Campus Creek Stream Restoration Design Build*  
Date *15-Jun-17*

**Estimated Restoration Reductions (lb/yr)**

Pollutant	Protocol 1 (BANCS)	Protocol 2 (Hyporheic Box)	Protocol 3 (Floodplain Reconnection)	Total
TN	6,090	213	0	<b>6,303</b>
TP	2,805	--	0	<b>2,805</b>
TSS	5,342,416	--	0	<b>5,342,416</b>

**Revised Default Stream Restoration Reductions**

Pollutant	Reduction Rate	Reduction (lb/yr)
TN	0.075	27
TP	0.068	24
TSS	44.9	16,112
TSS (Coastal Plain)	15.1	5,432

Removal rates provided in "Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects" Revised September 8, 2014



**PROTOCOL 1**

Campus Creek Stream Restoration Design Build

**STEP 1: ESTIMATION OF EROSION RATES**

Description	Bank Side (Facing DS)	Station Start	Station End	Bank Height (ft)	Radius of Curvature (ft)	Bankfull Width (ft)	BEHI Score	NBS Score*	Bulk Density of Soil (lb/cf)	Erosion Rate (ft/yr)			Length (ft)	Area (sf)	Sediment
										Colorado, 1989	USFWS Draft DC <sup>+</sup>	NRCS, NC <sup>+</sup>			Colorado, 1989
Main Stem	LEFT	0+00	1+20	4.8			Very Low	1	125	---	---	---	1+20	576	0.0
Main Stem	RIGHT	0+00	1+20	4.8			Very Low	1	125	---	---	---	1+20	576	0.0
Main Stem	LEFT	1+20	1+60	2.5			Extreme	5	125	7.027	3.367	6.117	0+40	100	43.9
Main Stem	RIGHT	1+80	2+20	8			Extreme	2	125	0.420	1.215	1.528	0+40	320	8.4
Main Stem	LEFT	2+20	2+80	7			Very High	5	125	0.872	1.641	1.139	0+60	420	22.9
Main Stem	LEFT	2+80	3+45	8			Extreme	5	125	7.027	3.367	6.117	0+65	520	228.4
Main Stem	LEFT	3+45	6+10	7			Extreme	4	125	2.747	2.397	3.853	2+65	1855	318.5
Main Stem	RIGHT	3+45	6+10	7			Extreme	4	125	2.747	2.397	3.853	2+65	1855	318.5
Main Stem	LEFT	6+10	6+90	7			Very High	1	125	0.165	0.248	0.470	0+80	560	5.8
Main Stem	RIGHT	6+10	6+90	7			Very High	1	125	0.165	0.248	0.470	0+80	560	5.8
Main Stem	RIGHT	6+90	8+20	6.1			Extreme	5	125	7.027	3.367	6.117	1+30	793	348.3
Main Stem	LEFT	6+90	8+90	6.1			Very High	5	125	0.872	1.641	1.139	2+00	1220	66.5
Main Stem	RIGHT	8+20	8+90	4.5			Very High	5	125	0.872	1.641	1.139	0+70	315	17.2
Main Stem	RIGHT	8+90	9+80	7.5			Extreme	5	125	7.027	3.367	6.117	0+90	675	296.4
Main Stem	LEFT	8+90	10+00	6			Extreme	4	125	2.747	2.397	3.853	1+10	660	113.3
Main Stem	RIGHT	9+80	10+10	7.5			High	4	125	0.575	1.023	0.205	0+30	225	8.1
Main Stem	LEFT	10+00	10+90	6			Extreme	5	125	7.027	3.367	6.117	0+90	540	237.2
Main Stem	RIGHT	10+10	12+00	6			Extreme	5	125	7.027	3.367	6.117	1+90	1140	500.7
Main Stem	LEFT	10+90	13+00	6.2			High	5	125	0.872	1.641	0.282	2+10	1302	71.0
Main Stem	RIGHT	12+00	12+50	6			High	1	125	0.165	0.248	0.078	0+50	300	3.1
Main Stem	RIGHT	12+50	13+00	5.5			High	1	125	0.165	0.248	0.078	0+50	275	2.8
Main Stem	RIGHT	13+20	14+20	8			Extreme	1	125	0.164	0.865	0.962	1+00	800	8.2
Main Stem	LEFT	14+20	18+00	6			Extreme	5	125	7.027	3.367	6.117	3+80	2280	1001.3
Main Stem	RIGHT	14+20	18+00	6			Extreme	5	125	7.027	3.367	6.117	3+80	2280	1001.3
Main Stem	LEFT	14+40	18+00	6			Very High	5	125	0.872	1.641	1.139	3+60	2160	117.7
Main Stem	RIGHT	14+40	18+00	6			Very High	5	125	0.872	1.641	1.139	3+60	2160	117.7
Main Stem	LEFT	18+00	19+30	10			Very High	2	125	0.250	0.398	0.587	1+30	1300	20.3
Main Stem	LEFT	19+30	21+05	12			High	3	125	0.380	0.638	0.148	1+75	2100	49.8
Main Stem	LEFT	21+05	22+55	14			Extreme	4	125	2.747	2.397	3.853	1+50	2100	360.6
Main Stem	RIGHT	22+55	23+15	4.5			Very High	3	125	0.380	0.638	0.732	0+60	270	6.4
Main Stem	LEFT	23+15	26+15	10			Extreme	3	125	1.074	1.707	2.426	3+00	3000	201.4
Upper Tributary	LEFT	0+00	2+10	6.5			High	5	125	0.872	1.641	0.282	2+10	1365	74.4
Upper Tributary	RIGHT	0+00	2+10	6.5			High	5	125	0.872	1.641	0.282	2+10	1365	74.4
Lower Tributary	LEFT	0+00	1+25	3			High	5	125	0.872	1.641	0.282	1+25	375	20.4
Lower Tributary	RIGHT	0+00	1+25	3			High	5	125	0.872	1.641	0.282	1+25	375	20.4
													<b>Total</b>	<b>5691</b>	

\*Conservative estimate based on radius of curvature and bankfull estimate. Enter NBS directly when available.

<sup>+</sup>Low and Moderate set equal to High above NBS 4.

**STEP 2: NUTRIENT LOADING**

Nutrient	Site Specific (lb/ton)	CBP 2014 (lb/ton)
Phosphorus		1.05
Nitrogen		2.28

<b>Estimated Reduction</b>
50%

**STEP 3: NUTRIENT REMOVAL**

Bank Erosion Estimate	Nitrogen (lb/yr)	Phosphorus (lb/yr)	Sediment Load (lb/yr)
Colorado	6488	2988	5691304
DC	5029	2316	4411222
NC	6754	3110	5924722

**HYPOREHIC BOX (edit blue cells only)**

*Campus Creek Stream Restoration Design Build*

**HYPOREHIC BOX DIMENSIONS**

**ONLY APPLICABLE AREAS WHERE BANK HEIGHT RATIO IS 1.0 OR LESS**

Reconnection Reach River Station Start	Reconnection Reach River Station End	Bank	Average Width from Thalweg to Bank at Baseflow (ft)	Hyporehic Box Width (ft)	Cross Sectional Area (sf)	Length of Reconnection (ft)	Hyporehic Box Volume (cf)
Existing							
				5.0	25.0	0.0	0
				5.0	25.0	0.0	0
				5.0	25.0	0.0	0
<b>Total_Ex</b>						<b>0.0</b>	<b>0</b>
Proposed							
3+80	7+51	Left	5.0	5.0	25.0	371.0	9275
9+72	10+41	Left	5.0	5.0	25.0	69.0	1725
10+50	12+57	Left	5.0	5.0	25.0	207.0	5175
14+00	28+37	Left	5.0	5.0	25.0	1437.0	35925
14+00	28+37	Right	5.0	5.0	25.0	1437.0	35925
						0.0	0
						0.0	0
<b>Total_Prop</b>						<b>3521.0</b>	<b>88025.0</b>

**DENITRIFICATION**

Additional Hyporehic Box Volume (cf)	Bulk Density of Soil (lb/cf)	Hyporehic Box Mass (ton)	Denitrification Rate (lb/ton/day)	Denitrification (lb/day)	Denitrification (lb/yr)
88025	125	5502	0.000106	0.58	<b>213</b>

**ANNUAL TN LOAD**

TN_LOAD	40% of TN_LOAD	TN_RED_P2
84199	33680	<b>213</b>

PRELENGTH_LT	0
PRELENGTH_RT	0
PREWIDTH_LT	0
PREWIDTH_RT	0
POSTLENGTH_LT	2084
POSTLENGTH_RT	1437
POSTWIDTH_LT	5
POSTWIDTH_RT	0

TMDL Water Quality Results

Campus Creek Stream Restoration

POI	Protocol 1 TMDL Credit			Protocol 2 TMDL Credit	Protocol 3 TMDL Credit			Combined TMDL Credit			Site Length (Linear Feet)	Total Watershed Area (Acres)	Impervious Watershed Area	Delta Impervious Surface and Forest			Average Pollutant Load Reduction			Impervious Acre Conversion Factor (AC/AC)				Average Acres of Treatment for Nutrients and Sediment per Linear Foot	Average Acres of Treatment for Nutrients and Sediment per 100 Linear Feet	Calculated Total Impervious Acre Treatment (Acres)	Capped Impervious Acre Treatment (Acres)
	TN (lbs/yr)	TP (lbs/yr)	TSS (tons/yr)	TN (lbs/yr)	TN (lbs/yr)	TP (lbs/yr)	TSS (tons/yr)	TN (lbs/yr)	TP (lbs/yr)	TSS (tons/yr)				TN (lbs/acre/yr)	TP (lbs/acre/yr)	TSS (tons/acre/yr)	TN (lbs/acre/yr)	TP (lbs/acre/yr)	TSS (tons/acre/yr)	TN	TP	TSS	Average				
Campus Creek	6090	2805	2671	213				6303	2805	2671	3039	406.9	105.79	7.69	1.91	0.43	15.4903	6.8936	6.5648	2.0143	3.6092	15.2669	6.9635	0.93	93	2833.4	105.8

Calculations including sediment delivery ratio

POI	Protocol 1 TMDL Credit			Protocol 2 TMDL Credit	Protocol 3 TMDL Credit			Combined TMDL Credit			Site Length (Linear Feet)	Total Watershed Area (Acres)	Impervious Watershed Area	Delta Impervious Surface and Forest			Average Pollutant Load Reduction			Impervious Acre Conversion Factor (AC/AC)				Average Acres of Treatment for Nutrients and Sediment per Linear Foot	Average Acres of Treatment for Nutrients and Sediment per 100 Linear Feet	Calculated Total Impervious Acre Treatment (Acres)	Capped Impervious Acre Treatment (Acres)
	TN (lbs/yr)	TP (lbs/yr)	TSS (tons/yr)	TN (lbs/yr)	TN (lbs/yr)	TP (lbs/yr)	TSS (tons/yr)	TN (lbs/yr)	TP (lbs/yr)	TSS (tons/yr)				TN (lbs/acre/yr)	TP (lbs/acre/yr)	TSS (tons/acre/yr)	TN (lbs/acre/yr)	TP (lbs/acre/yr)	TSS (tons/acre/yr)	TN	TP	TSS	Average				
Campus Creek	371	171	163	13				384	171	163	3039	406.9	105.79	7.69	1.91	0.43	0.913	0.421	0.400	0.1187	0.2202	0.9313	0.4234	0.06	6	172.3	105.8





**Memorandum**

**Date:** April 30, 2019

**To:** Maryland's Municipal Separate Storm Sewer System (MS4) Community

**From:** Maryland Department of the Environment (Department), Sediment, Stormwater, and Dam Safety Program

**Re:** Stream Restoration Crediting Clarification for MS4 Permitting Purposes

.....

**Introduction**

The Department recognizes and accepts the Chesapeake Bay Program's (CBP) Urban Stormwater Work Group's revised stream restoration pollutant load reduction rates, *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects, Schueler and Stack, 2014*, for use in crediting projects to support MS4 permit restoration requirements. The Department's *Municipal Separate Storm Sewer System Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated, (Guidance), August 2014*, provided instructions for transitioning to these pollutant load reduction rates for total maximum daily load (TMDL) analysis. More recently in December 2017 and October 2018, the Department provided guidance on how to use these revised pollutant load reduction rates for calculating equivalent impervious acres toward completing MS4 permit restoration requirements. This memorandum provides further clarification on the use of pollutant load reduction planning rates and individual site monitoring for calculating MS4 equivalent impervious acre permit restoration credit. These clarifications are for use in coordination with the CBP Phase 5 model calibration and applicable to Maryland's MS4 jurisdictions.

**Stream Restoration Pollutant Load Reduction Planning Rates**

In *Schueler and Stack, 2014*, the CBP established pollutant load reduction planning rates for stream restoration projects for use in the CBP's Phase 5 watershed model. These planning rates may be used by Maryland's MS4 community for calculating MS4 equivalent impervious acre permit restoration credit. The MS4 equivalent impervious acre permit restoration credit may be applied uncapped in relation to the actual impervious acres in the stream restoration project's watershed. Table 1 below provides the CBP pollutant load reduction planning rates for stream restoration projects and the equivalent impervious acre credit in accordance with the Department's *Guidance, August 2014*.

**Table 1. Planning Rates for Stream Restoration and Impervious Acre Equivalents**

Geography	TN <sup>1</sup> (lbs./ft.)	TP <sup>1</sup> (lbs./ft.)	TSS <sup>1</sup> (lbs./ft.)	Equivalent Impervious Acres <sup>2</sup> EIA (acres/ft.)
Coastal Plain	0.075	0.068	15	0.02
Non-Coastal Plain	0.075	0.068	45	0.03

<sup>1</sup> *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects, Schueler and Stack, 2014*

<sup>2</sup> *Municipal Separate Storm Sewer System Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated, (Guidance), August 2014*

**Site Specific Monitoring of Stream Restoration Projects**

The Department also supports the use of site specific stream restoration monitoring data combined with the protocols approved by the CBP for calculating pollutant load reductions for TMDLs. The stream restoration protocols, and specifically the pollutant load reductions associated with the monitoring of individual stream restoration projects, are currently being re-evaluated by the CBP's Urban Stormwater Work Group. For this reason, the equivalent impervious acre MS4 permit restoration credit for site specific stream restoration monitoring is capped at the actual impervious acres draining to the most downstream point of the stream restoration project. Once the CBP completes its reevaluation of the stream restoration protocols and provides updates, the Department will determine how to incorporate them into future MS4 permits in coordination with the Phase 6 CBP model calibration and will reconsider the impervious acre cap applied to the use of site specific monitoring data.