

Appendix G2 - Assessment of Controls (Watershed Assessment Monitoring)

MOU FOR THE WATERSHED ASSESSMENT MONITORING

POOLED MONITORING

Chesapeake Bay Trust – Harford County, Maryland Cooperative Agreement

COOPERATIVE AGREEMENT

THIS COOPERATIVE AGREEMENT (“The Agreement”), entered into this 7 day of
November, 2023, by and between the

HARFORD COUNTY, MARYLAND

212 SOUTH BOND STREET, 1ST FLOOR

ANNAPOLIS, MARYLAND 21401

(A Body Corporate and Politic, “Harford County”)

And

CHESAPEAKE BAY TRUST

108 SEVERN AVENUE

ANNAPOLIS, MARYLAND 21403

(“The Trust”)

WHEREAS, Harford County and the Trust share a common interest in conducting watershed assessments and evaluating long-term water quality trends within Harford County's boundaries.

WHEREAS, Harford County has opted into the Pooled Monitoring program as described in the *Assessment of Controls - Watershed Assessment Monitoring* section of Harford County's National Pollution Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit, for the specific Biological and Chloride monitoring requirements.

WHEREAS, the Trust administers the Pooled Monitoring Program to conduct watershed assessments and evaluate long-term water quality trends throughout Maryland.

WHEREAS, the Trust, a nonprofit entity established by the Maryland General Assembly in 1985 to promote public awareness and participation in the restoration and protection of the water quality, aquatic and land resources of the Chesapeake Bay, and other aquatic and land resources of the State, is authorized to contract with other units of government, including Harford County; and

WHEREAS, the Trust has a governance and oversight structure with formal representation from the local government, State natural resource agencies, and the Maryland General Assembly, and uses independent technical review committees to review proposals and recommend awards made through its competitive award programs; and

NOW, THEREFORE, for and in consideration of the mutual covenants contained herein, the parties agree as follows:

ARTICLE I. SCOPE OF WORK

The Trust administers the Pooled Monitoring Program as described in the *Assessment of Controls* section of Harford County's MS4 permit, which is incorporated herein by reference. The goal of the Pooled Monitoring program is to align monitoring and other resources from multiple sources to rigorously and effectively conduct watershed assessments and evaluate long-term water quality trends and address other key issues pertaining to watershed restoration and watershed assessment. The specific questions to be addressed in each program cycle are determined by the Pooled Monitoring Advisory Committee (PMAC), on which Harford County will have one (1) seat as per the PMAC charter (Attachment A to this agreement, which is expressly incorporated herein and made part of this Agreement).

Solicitation of proposals to conduct watershed assessment monitoring, monitoring to evaluate long-term water quality trends, and address other watershed restoration and assessment are posed via open, competitive, publicized Requests for Proposals for each program cycle by the Trust, in consultation with the Pooled Monitoring Advisory Committee (PMAC). The Trust uses an external peer review process to review proposals, and reviews are discussed, and proposals recommended for funding to the Trust board by the PMAC. The Trust, in consultation with the PMAC, manages subsequent awards, and works with the PMAC to interpret and present results for and to various stakeholder audiences.

ARTICLE II. CONSIDERATION AND METHOD OF PAYMENT

Harford County has opted to participate in the Pooled Monitoring Program option for MS4 permit required Watershed Assessment Monitoring as described in the *Assessment of Controls* section of Harford County's MS4 permit at a funding level of One hundred seventy-four thousand one hundred dollars (\$174,100) per year (\$166,000 for Biological Monitoring and \$8,100 for Chloride Monitoring) for the remainder of the MS4 permit term as determined by the Maryland Department of the Environment (the Department), the regulatory entity governing compliance with the monitoring section of the MS4 permits.

Harford County may provide additional funds to the Trust upon written agreement by both parties.

Harford County shall provide the annual amount identified above to the Trust by July 1 of each year for the duration of this Agreement. The Trust shall place the award funds in an account to be used solely for administering the Pooled Monitoring Program.

All financial obligations imposed on Harford County by this Agreement and any renewals thereof beyond the current County fiscal year (FY24) are subject to appropriation and availability of funds by the Harford County Council (Council). Should the Council not appropriate sufficient funds to meet Harford County's obligations under this Agreement, the Agreement shall automatically terminate at the end of the last fiscal year for which sufficient funds were appropriated.

To accomplish the Scope of Work and manage the Program, an amount not to exceed five percent (5%) may be allocated by the Trust to administrative expenses. Copies of financial and programmatic reports prepared by the Trust for the Pooled Monitoring Advisory Committee and

Maryland Department of the Environment will be submitted to Harford County quarterly for quarters ending September 30, December 30, March 31, and July 31 of each year.

The Trust agrees to follow a cost accounting practice, which is in accordance with the standards, principles, and procedures in the Code of Maryland Regulation (COMAR) 21.09 and uniform accounting practices of the profession, as acceptable to Harford County.

ARTICLE III. TERM AND RENEWAL

The Agreement Period shall be from September 1, 2023, through August 31, 2027. The agreement shall be renewable for additional terms of five (5) years upon written agreement by both parties. This agreement can be extended on an annual basis if the County's MS4 permit is administratively continued until a new permit becomes effective. Any portion of the initial term beyond the current Harford County fiscal year (FY24), and any renewal term, shall be subject to appropriation and availability of funds by the Harford County Council as set forth in Article II of this Agreement.

ARTICLE IV. AGREEMENT REPRESENTATIVES

The following individuals shall have authority to act under this Agreement for their respective parties:

Harford County: Harford County, Maryland
 Robert G. Cassilly
 County Executive
 410-638-3350
 countyexecutive@harfordcountymd.gov

Trust: Jana Davis, Ph.D.
 President
 Chesapeake Bay Trust
 410-974-2941 x100
 jdavis@cbtrust.org

ARTICLE V. KEY PERSONNEL

The parties agree that the following named individuals are considered to be essential to the work being performed hereunder and are designated as key personnel who shall be made available to the full extent required to carry out the work under this Agreement:

Harford County: Michele Dobson
Watershed Protection and Restoration
Harford County Department of Public Works
410-638-3217 ext. 1247
mgdobson@harfordcountymd.gov

Trust: Sadie Drescher
Vice President of Programs for Restoration
Chesapeake Bay Trust
410-974-2941 x105
sdrescher@cbtrust.org

Should these individuals become unavailable during the period of performance, personnel of equivalent capability shall be assigned to complete the work related to this Agreement. Any such substitutions shall require prior written approval by Harford County, of which approval may be denied by Harford County at its sole discretion. Should the Trust be unable to provide substitutes acceptable to Harford County, Harford County may terminate this Agreement, or at its option, negotiate with the Trust for an acceptable modification in the work and/or payment under the Agreement relative to the loss of such key personnel.

ARTICLE VI. MERGER

This Agreement, all exhibits, and approved modifications hereto (hereinafter referred to collectively as "Agreement Documents"), embody the entire agreement of the parties. There are no promises, terms, conditions, or obligations referring to the subject matter, other than those

contained herein or incorporated herein by reference. The Trust's performance of any work under the Agreement constitutes the Trust's acceptance of all of the Agreement Documents.

ARTICLE VII. AMENDMENT

Only a writing executed by both parties may amend this Agreement.

ARTICLE VIII. GOVERNING LAW

This Agreement shall be governed by and construed under the laws of the State of Maryland.

ARTICLE IX. NO THIRD-PARTY BENEFICIARIES

Nothing in this Agreement shall be construed to: (1) provide a benefit to any third party; (2) operate in any way as a promise, covenant, warranty, or other assurance to any third party; or (3) create any obligation to any third party.

ARTICLE X. INDEMNIFICATION

The Trust shall indemnify, defend, and hold harmless Harford County, its officers, directors, agents and employees (each, including Harford County, a "Covered Person") from and against any and all pending or threatened claims, losses, liabilities, litigation, damage, penalty, expense and demands of every kind and nature whatsoever (any of the foregoing a "Loss"), including, without limitation, the costs as and when incurred of defending any such Loss, and including, without limitation, reasonable attorneys' fees and disbursements therefore, incurred by a Covered Person resulting from or arising in connection with the performance of this Agreement, caused in part or in whole by any negligent or willful act or omission of the Trust, its officers, agents, employees or representatives. The Trust expressly understands and agrees that any performance bond or insurance protection required by this Agreement or otherwise provided shall in no way limit the responsibility to indemnify, keep and save harmless and defend Harford County as herein provided. Harford County does not waive any right or defense, or forebear any action, in connection herewith.

ARTICLE XI. ACCOUNTING

Retention of Records. The Trust shall retain and maintain all records and documents relating to this Agreement for three (3) years after final payment or any applicable statute of limitations, whichever is longer. Records and documents relating to this Agreement shall include, but not be limited to, the Request for Proposals, received proposals, proposal reviews, documents related to the selection of the proposals to fund, and all documentation prepared by or for the Awardees.

Audit. The Trust shall make available for inspection all records and documents relating to this Agreement upon request of Harford County. All records and documents relating to this Agreement are subject to audit by Harford County or an authorized representative of Harford County. The Trust shall promptly award access to its facilities to authorized Harford County representative(s) for review of documents, information and interviews of Trust personnel. The Trust will provide to Harford County upon request copies of any invoices, records, timesheets, work logs, contracts, or any other documents or information needed in order for Harford County to comply with State or federal reporting and audit requirements.

Payment. Payments to the Trust shall be made in accordance with the terms of the Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement by causing the same to be signed by their duly authorized representatives on the day and year first above written.

HARFORD COUNTY, MARYLAND

Kathy Stewart
WITNESS

Robert G. Cassilly
By: Robert G. Cassilly
Harford County Executive
Date: 11/7/23

APPROVED FOR LEGAL FORM AND
SUFFICIENCY

Margaret K. Hartka
Margaret K. Hartka
Deputy County Attorney
Date: 11/1/23

DEPARTMENT OF PUBLIC WORKS

Joseph J. Siemek
Joseph J. Siemek, P.E.
Director of Public Works
Date: 11-3-23

CHESAPEAKE BAY TRUST

Sadie Drescher
Sadie Drescher
10/31/23

WITNESS

Jana Davis
Jana Davis, PhD.
President
Chesapeake Bay Trust
Date: 10/31/23

ATTACHMENT A

**CHESAPEAKE BAY TRUST - HARFORD COUNTY, MARYLAND
COOPERATIVE AGREEMENT AND**

Chesapeake Bay Trust Pooled Monitoring Program (PMP)

INTRODUCTION

The Pooled Monitoring Program (PMP) will focus on answering key questions pertaining to the cumulative impacts of watershed restoration activities and the effectiveness of specific restoration practices posed by the regulatory, regulated, scientific, and practitioner communities using robust and rigorous methods.

Two tenets of the Pooled Monitoring Program are as follows:

All data are collected with a specific question or hypothesis in mind

Research products identify a clear path to integrate the new information into the regulatory process and make it accessible to regulators.

PROCESS

There is a Pooled Monitoring Advisory Committee (PMAC) whose membership generally includes:

Six members from the regulatory community (U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, National Oceanic Atmospheric Administration, Maryland Department of the Environment, Maryland Department of Natural Resources)

1 member from the practitioner community

At least 3 members from the MS4 Phase I permittee community. Any MS4 permittee who contributes funds would be a member.

1 member from the environmental community

2 non-voting members of the scientific community who are experts in experimental design and restoration evaluation.

MS4 Permittees who opt into the Pooled Monitoring Program agree with MDE on level of opt-in funding commitment and generate MOUs with the Chesapeake Bay Trust, which manages the Pooled Monitoring Program.

The Chesapeake Bay Trust and PMAC members maintain a list of key questions about certain kinds of restoration projects as well as a minimum research protocol. The PMAC active membership changes from time to time.

The PMAC meets in the fall of each year to review and prioritize key questions.

Questions are compiled into an RFP that lists the prioritized questions and minimum/preferred methodology. The RFP includes an outreach/dissemination requirement in the scope of work. The RFP is bid out to any type of entity that can address one or more questions and can include bids to conduct new research or to analyze existing data. Bidding entities could include, but are not limited to, academic institutions, consulting firms, scientifically capable watershed organizations. Existing research/monitoring programs would be eligible to bid. As part of the RFP, resources, such as lists of completed restoration projects or permitted projects not yet constructed, would be made available. Bidders would be allowed to use these projects in their research.

Bids/proposals must identify:

- The question being addressed/answered
- The methodology being used to address (including sample size, location, timing, etc.)
- The analysis proposed
- The final product

The interpretation of the results/dissemination plan, i.e. presentation of the results into a form usable by regulatory and practitioner communities.

The Trust, under guidance of PMAC, composes a Technical Review Committee (TRC) that evaluates proposals and recommends projects for funding. The TRC is composed of external technical peer reviewers who have expertise in the topics of the proposals submitted and are not involved in any proposals submitted. The TRC will evaluate proposals using criteria to include:

- Relevance of the project and question posed
- Quality of the methods and analysis proposed
- Qualifications of leads and of the organization
- Communication/dissemination plan

PMAC may recommend that Advisory Groups are established to oversee certain projects.

The research is undertaken and completed; reports are sent to PMAC for review. A subset of projects may be sent for external peer review prior to acceptance of final product or dissemination to the public/community.

Results are disseminated to the practitioner community through, at a minimum:

An annual forum to which regulatory audiences are invited/required by their agencies to attend

Other forums as appropriate.

Results are interpreted for the regulatory audiences, and recommendations are prepared for how regulators can integrate the new information into their processes and policies. Some program funds may be used to develop key tools that facilitate use of the results.

The Trust archives reports, synthesized data, and raw data for public use.



April 15, 2025

Danielle Hankins
Watershed Protection and Restoration Office
Harford County Department of Public Works
MS4 Program Administrator
212 South Bond Street, 1st Floor
Annapolis, MD 21401

RE: Chesapeake Bay Trust (the Trust) – Harford County, Maryland Cooperative Agreement for
“MOU for the Watershed Assessment Monitoring Pooled Monitoring” and the “MOU for
the BMP Effectiveness Pooled Monitoring”

Dear Danielle Hankins,

Please find enclosed a quarterly Status Report for the work provided under agreement between Harford County and the Chesapeake Bay Trust for the “MOU for the Watershed Assessment Monitoring Pooled Monitoring” and the “MOU for the BMP Effectiveness Pooled Monitoring.” The year one (FY 24) and year two (FY 25) program funding levels are \$174,100 (\$166,000 for biological monitoring and \$8,100 for chloride). The BMP effectiveness year one (FY25) program funding level is \$75,000.

This status report was prepared for the period 1/1/25 – 3/31/25. During this reporting period the awarded Pooled Monitoring Program projects continued to perform their work (details below), the FY 25 Request for Proposals closed on 1/23/25, and the applications underwent reviews.

Should you require any clarification or additional information, please feel free to contact me or Sadie Drescher of this office.

Thank you for your partnership.

Thank you,

Jana Davis
President

CC: Andrew Bodt Watershed Protection and Restoration Office, Harford County Department of Public Works





Pooled Monitoring Initiative's Restoration Research Award Program for Harford County, Maryland

April 15, 2025

Project Name: MOU for the Watershed Assessment Monitoring Pooled Monitoring

Project Term: September 1, 2023 – August 31, 2027

Project Name: MOU for the BMP Effectiveness Pooled Monitoring

Project Term: September 1, 2024 – August 31, 2027

Report Term: **January 1, 2025 – March 31, 2025**

Progress on Implementation for this Status Report:

- All open awards are ongoing and on track.
- The FY25 RFP closed 1/23/25, applications were reviewed by the “scientific” reviewers who posed questions to the applicants, applicants responded to the first round (“scientific” reviewers), and the applications were reviewed by the second round, “management” reviews. The Technical Review Committee meeting is scheduled for 4/14/25 to review and recommend applications for funding.
- As research projects are completed the final reports, tools, fact sheets, and other products are posted on the program’s website. A full list of past awards, research questions addressed, project progress, and final products is online at: <https://cbtrust.org/grants/restoration-research/>
- Award progress (cumulative) is provided in the below report.
- The Trust received the “BMP Effectiveness Monitoring” executed MOU and the associated payment of \$75,000 on 12/6/24 for FY 25 program funds. The Trust received the “Watershed Assessment Monitoring” MOU payment of \$174,100 on 12/13/24 for FY 25 program funds.

Award # 23847

Organization: University of Maryland Baltimore County

Title: Development of a simplified approach of PCB loading estimation using a combination of passive sampling and sediment trapping

Award Amount: \$172,359 with Harford County contribution of the award at \$165,395 (other funders are Baltimore City at \$6,517 and the Chesapeake Bay Trust at \$447)

Amount Paid this Quarter and Funding Source: **\$14,500 (paid with Harford County funds)**

Abstract: In this project, we will develop a simplified approach of PCB loading estimation during stormflow using a combination of passive sampling and sediment trapping. The objective is to help agencies to identify ongoing PCB sources in a watershed in a way that is cost effective compared to traditional stormwater sampling approach and increase accuracy of the PCB loading estimate using a time-integrated approach. The approach will be tested in two PCB contaminated watersheds within the Chesapeake Bay area, and compared to previous /ongoing measurements. Results from this study will serve as recommendations for future PCB monitoring implementations and PCB loading estimation to identify ongoing PCB sources and evaluate PCB (re)contamination of downstream waterbodies.

4/1/24 to 6/30/24 progress: The Trust worked with the project lead to develop the deliverables-based contract and compiled the contract that will be submitted next quarter. The full application is provided in Appendix A.

FY25 Q1 update: The executed contract was received (see Appendix A for a copy) and the kick-off meeting was held 8/29/24. The project is underway.

FY25 Q2 update: The project kick-off meeting was held, the first deliverable including the status report and draft list of sites was received and paid, and the project is progressing to the next phases with the QAPP provided and the second deliverable underway. The project lead reports that, “During this first reporting period 7/1/2024 – 8/31/2024, we initiated the project with our research partners, i.e. Elisabeth Green (Geologist, MDE), Barbara Krupiarz (Program manager, MDE), and Tim Wilson (Hydrologist/Geochemist, formerly USGS). Material for the sampling campaign at Lower Beaverdam Creek is being prepared, a test of suspended sediment traps is underway near UMBC at Patapsco River, a recon of LBC3 was performed, and preliminary results of ongoing monitoring by UMBC and MDE at LBC3 were discussed to refine the monitoring locations.” This quarter’s status report, list of sites, and invoice are provided at: https://drive.google.com/drive/folders/17-DcYscCr7WMT7iboDh1Ty9sLbdKTjt6?usp=drive_link.

FY25 Q3 update: The objective of the project is to help agencies to identify ongoing PCB sources in a watershed in a way that is cost effective compared to traditional stormwater sampling and increase accuracy of the PCB loading estimate using a time-integrated approach. Our team is testing the approach at a well characterized site, Lower Beaverdam Creek (LBC), where previous data were collected with traditional stormwater sampling approach and long-term (3 months) passive sampling.

During this second reporting period, the research team tested the sediment trap in the Patapsco River and collected suspended sediments that comprised sandy/gravel material during high flow

conditions, while finer particles, colloids and algae were collected during low flow conditions as expected. These preliminary results were encouraging and a few variations of the sediment trap are being tested in LBC. These tests were started after obtaining card access to WSSC property on Andalusia lane to safely access the stream. The tests are still ongoing and will run for about 2 weeks. A quality assurance project plan (QAPP) was also prepared.

(1) Update on sediment trap preliminary tests

The sediment trap was first tested in the Patapsco River, in the Patapsco State Park-Avalon Area (see Figure 1). The site was chosen due to its proximity to UMBC, the ability to wade and work at low flow, and a steep rise in discharge during storm events to a point similar to LBC discharge. The original design is presented in Figure 1. A baffle was added upstream of the sediment trap to reduce water velocity and help settling and retention of the suspended sediments, coarser to finer materials. The overall setting is shown in Figure 1.



Figure 1: Sediment trap test in the Patapsco River. Top picture: Overall setting of the sediment trap and baffle in the Patapsco River. Bottom left: map of the sediment trap location. Bottom right: sediment trap design.

The sediment trap was placed on Sept 23, 2023, at 1 pm, about 500 m downstream of USGS gage #01589025. The sediment trap was fully immersed to test suspended sediment capture during low flow and storm flow conditions. The hydrograph of the Patapsco River during the sediment trap

deployment is shown in Figure 2. Suspended sediments captured by the trap were collected on Sept 30, 2024 after one major storm event (max discharge of 724 ft³/s or 20.5 m³/s on 06/26/2024, 0.51 inches of precipitation that day). A majority of sands and gravel >2mm were collected and some finer material (see Table 1, Figure 3). The trap was left on site for 21 more days, during a dryer period (max discharge 160 ft³/s or 4.5 m³/s on 9/30/2024, 0.37 inches of rain recorded on 10/01/2024). A low amount of suspended sediments were collected, with only finer grain particles mixed with some algae. The ability to collect finer grain size particles was encouraging and suggested that the baffle helped reducing the water velocity enough to collect finer grain material, even during the higher discharges (68.6-724 ft³/s) encountered from 09/23/2024 to 09/30/2024.

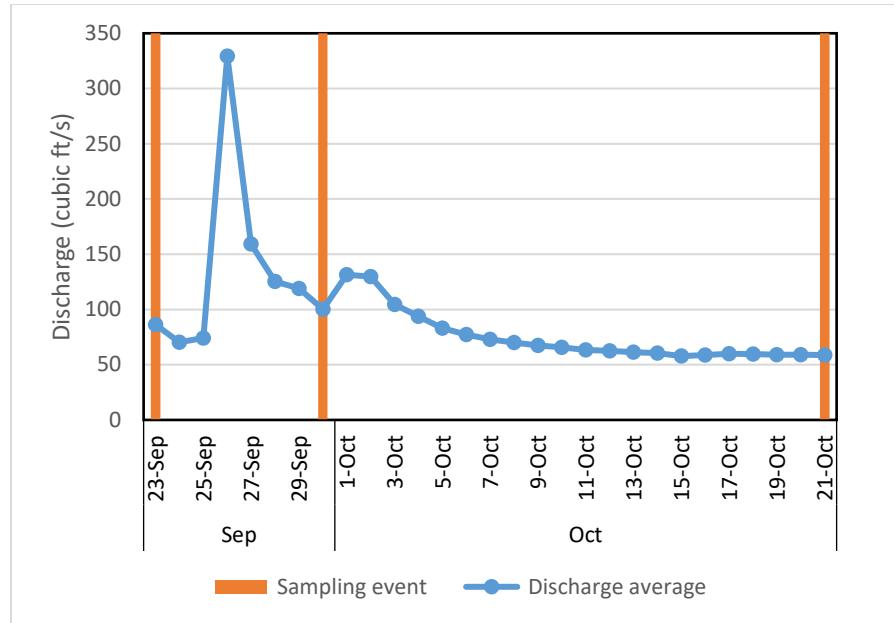


Figure 2: Discharge average of the Patapsco River during sediment trap deployment.



Figure 3: Fractionation of the suspended sediments <2mm collected during stormflow at Patapsco River site. Left 2-0.2 mm fraction, middle 0.2-0.06 mm fraction, right <0.06 mm.

Additional tests were initiated in the Lower Beaverdam Creek, where a higher proportion of finer materials are being transported compared to the Patapsco River site (T. Wilson, Personal communication). Some variations of the sediment trap were tested (see Figure 4). The objectives were (1) to compare the mass and granulometry of SS collected with versus without baffle (2) to verify the impact of the funnel and (3) the impact of the diameter: length ratio of the insert on the granulometry of the SS collected. The traps were placed in the middle of the stream (~230 inches or ~5.8 m from each bank) at LBC1, in series spaced by 122 to 130 inches (~3 m) (Figure 5). The traps were placed on 11/01/2024 at 3 pm, and suspended sediments that settled in the trap during 8 days of baseflow were collected on 11/09/2024. Fine grain particles were collected in all sediment traps. Lower mass was collected in the cylindric design, with no difference for inserts ratio 1:3 or 1:4. Higher mass of SS was collected when a funnel was present. The addition of the baffle led to the highest amount of SS collected (Figure 3). Collection during stormflow is ongoing and will be analyzed.

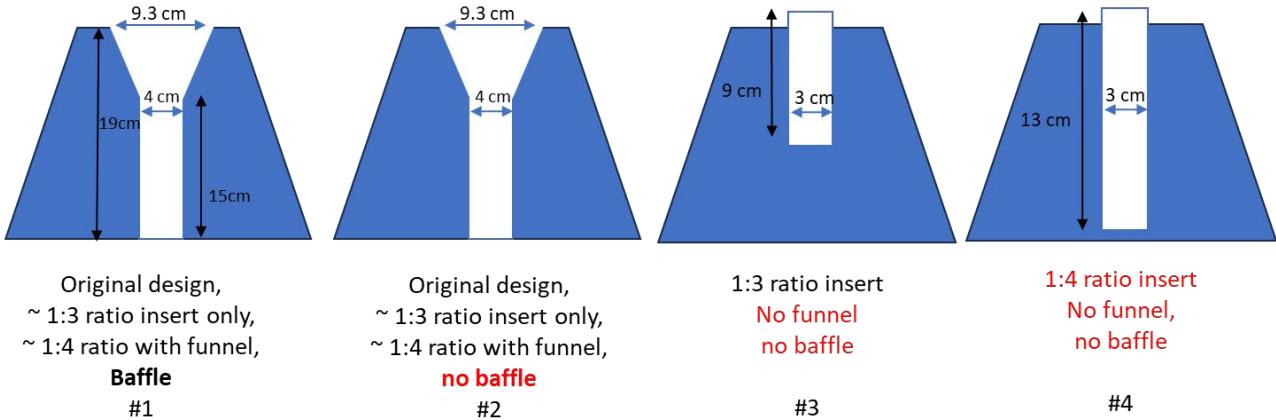


Figure 4: Sediment trap variation tested. On top, schematic of the sediment traps, bottom. Picture of the suspended sediment collected after 8 days of baseflow.

Table 1: Mass and granulometry of suspended sediments collected during preliminary tests

Waterbody	Patapsco River	Patapsco River	LBC1	LBC1
Trap	Original +baffle	Original +baffle	Original +baffle	Original +baffle
collection start	9/23/2024	9/30/2024	11/1/2024	11/9/2024
collection end	9/30/2024	10/21/2024	11/9/2024	11/17/2024
collection time (days)	7	21	8	8
av discharge (m ³ /s)	3.9	2.1	0.10	
min discharge (m ³ /s)	1.9	2.1	0.05	
max discharge(m³/s)	20.5	4.5	0.11	
av velocity (m/s)	0.3	0.1	0.3	
max velocity (m/s)	1.3	0.3	0.5	
Mass SS collected (g)	333.1	4.4	9.8	
mass SS collected >2 mm (g)	266.9	0.6	0.3	
mass SS collected <2 mm (g)	66.2	3.8	9.4	
Fraction 2-0.25 mm (%)	97.5%	72.6%	67.1%	
Fraction 0.25-0.063 mm (%)	2.0%	24.8%	30.8%	
Fraction <0.063mm (%)	0.5%	2.6%	2.1%	



Figure 5: Sediment traps deployed at LBC1

(2) Material preparation

Based on the preliminary results of the sediment traps at LBC, the funnel design is kept. PVC pipes are currently used for the insert.

This quarter's status report, QAPP, and invoice are provided at:

https://drive.google.com/drive/folders/1pKgYfUD2FQAO23BLbMOht_JZg52NVDPR?usp=drive_link



July 15, 2025

Danielle Hankins
MS4 Program Administrator
Department of Public Works
Watershed Protection and Restoration Office
Harford County Department of Public Works
212 South Bond Street, 1st Floor
Bel Air, MD 21014

RE: Chesapeake Bay Trust (the Trust) – Harford County, Maryland Cooperative Agreement for
“MOU for the Watershed Assessment Monitoring Pooled Monitoring” and the “MOU for
the BMP Effectiveness Pooled Monitoring”

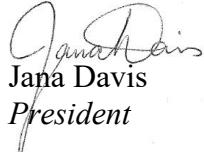
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This status report was prepared for the period 4/1/25 – 6/30/25. During this reporting period the awarded Pooled Monitoring Program projects continued to perform their work (details below), the FY 25 Request for Proposals were reviewed, funding recommendations were made, and contracts were drafted.

Should you require any clarification or additional information, please feel free to contact me or Sadie Drescher of this office. Thank you for your partnership.

Thank you,


Jana Davis
President

CC: Andrew Bodt Watershed Protection and Restoration Office, Harford County Department of Public Works



Pooled Monitoring Initiative's Restoration Research Award Program for Harford County, Maryland

July 15, 2025

Project Name: MOU for the Watershed Assessment Monitoring Pooled Monitoring

Project Term: September 1, 2023 – August 31, 2027

Project Name: MOU for the BMP Effectiveness Pooled Monitoring

Project Term: September 1, 2024 – August 31, 2027

Report Term: **April 1, 2025 – June 30, 2025**

Progress on Implementation for this Status Report:

- All open awards are ongoing and on track.
- FY 25 Request for Proposals were reviewed, funding recommendations were made, funds were encumbered to the FY 25 awards (Table 1), and contracts were drafted.
- The Pooled Monitoring Forum was held 6/18/2025; the agenda, registration list, and presentations (pdfs and recordings) are available at <https://cbtrust.org/grants/restoration-research/> under "Additional Information" --> "Restoration Research Forum" tab.
- As research projects are completed the final reports, tools, fact sheets, and other products are posted on the program's website. A full list of past awards, research questions addressed, project progress, and final products is online at: <https://cbtrust.org/grants/restoration-research/>.

Award # 23847**Organization: University of Maryland Baltimore County****Title: Development of a simplified approach of PCB loading estimation using a combination of passive sampling and sediment trapping****Award Amount:** \$172,359 with Harford County contribution of the award at \$165,395 (other funders are Baltimore City at \$6,517 and the Chesapeake Bay Trust at \$447)**Amount Paid this Quarter and Funding Source:** **\$31,500 (paid with Harford County funds on 5/29/25)**

Abstract: In this project, we will develop a simplified approach of PCB loading estimation during stormflow using a combination of passive sampling and sediment trapping. The objective is to help agencies to identify ongoing PCB sources in a watershed in a way that is cost effective compared to traditional stormwater sampling approach and increase accuracy of the PCB loading estimate using a time-integrated approach. The approach will be tested in two PCB contaminated watersheds within the Chesapeake Bay area, and compared to previous /ongoing measurements. Results from this study will serve as recommendations for future PCB monitoring implementations and PCB loading estimation to identify ongoing PCB sources and evaluate PCB (re)contamination of downstream waterbodies.

4/1/24 to 6/30/24 progress: The Trust worked with the project lead to develop the deliverables-based contract and compiled the contract that will be submitted next quarter. The full application is provided in Appendix A.

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FY25 Q2 update: The project kick-off meeting was held, the first deliverable including the status report and draft list of sites was received and paid, and the project is progressing to the next phases with the QAPP provided and the second deliverable underway. The project lead reports that, “During this first reporting period 7/1/2024 – 8/31/2024, we initiated the project with our research partners, i.e. Elisabeth Green (Geologist, MDE), Barbara Krupiarz (Program manager, MDE), and Tim Wilson (Hydrologist/Geochemist, formerly USGS). Material for the sampling campaign at Lower Beaverdam Creek is being prepared, a test of suspended sediment traps is underway near UMBC at Patapsco River, a recon of LBC3 was performed, and preliminary results of ongoing monitoring by UMBC and MDE at LBC3 were discussed to refine the monitoring locations.” This quarter’s status report, list of sites, and invoice are provided at: https://drive.google.com/drive/folders/17-DeYscCr7WMT7iboDh1Ty9sLbdKTjt6?usp=drive_link.

FY25 Q3 update: The objective of the project is to help agencies to identify ongoing PCB sources in a watershed in a way that is cost effective compared to traditional stormwater sampling and increase accuracy of the PCB loading estimate using a time-integrated approach. Our team is testing the approach at a well characterized site, Lower Beaverdam Creek (LBC), where previous data were collected with traditional stormwater sampling approach and long-term (3 months) passive sampling.

During this second reporting period, the research team tested the sediment trap in the Patapsco River and collected suspended sediments that comprised sandy/gravel material during high flow conditions,

while finer particles, colloids and algae were collected during low flow conditions as expected. These preliminary results were encouraging and a few variations of the sediment trap are being tested in LBC. These tests were started after obtaining card access to WSSC property on Andalusia lane to safely access the stream. The tests are still ongoing and will run for about 2 weeks. A quality assurance project plan (QAPP) was also prepared.

(1) Update on sediment trap preliminary tests

The sediment trap was first tested in the Patapsco River, in the Patapsco State Park-Avalon Area (see Figure 1). The site was chosen due to its proximity to UMBC, the ability to wade and work at low flow, and a steep rise in discharge during storm events to a point similar to LBC discharge. The original design is presented in Figure 1. A baffle was added upstream of the sediment trap to reduce water velocity and help settling and retention of the suspended sediments, coarser to finer materials. The overall setting is shown in Figure 1.

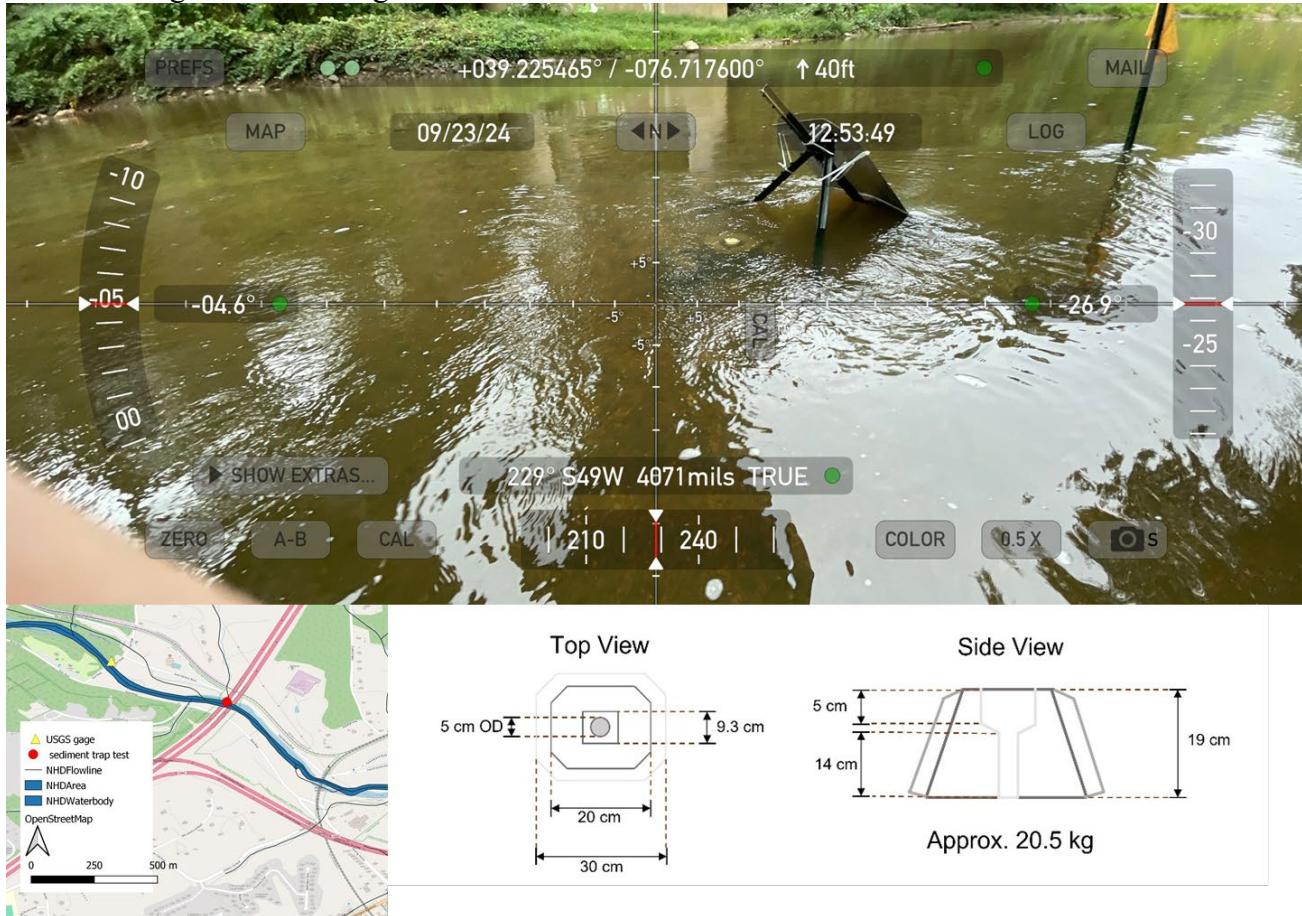


Figure 1: Sediment trap test in the Patapsco River. *Top picture: Overall setting of the sediment trap and baffle in the Patapsco River. Bottom left: map of the sediment trap location. Bottom right: sediment trap design.*

The sediment trap was placed on Sept 23, 2023, at 1 pm, about 500 m downstream of USGS gage #01589025. The sediment trap was fully immersed to test suspended sediment capture during low flow and storm flow conditions. The hydrograph of the Patapsco River during the sediment trap deployment

is shown in Figure 2. Suspended sediments captured by the trap were collected on Sept 30, 2024 after one major storm event (max discharge of 724 ft³/ s or 20.5 m³/s on 06/26/2024, 0.51 inches of precipitation that day). A majority of sands and gravel >2mm were collected and some finer material (see Table 1, Figure 3). The trap was left on site for 21 more days, during a dryer period (max discharge 160 ft³/s or 4.5 m³/s on 9/30/2024, 0.37 inches of rain recorded on 10/01/2024). A low amount of suspended sediments were collected, with only finer grain particles mixed with some algae. The ability to collect finer grain size particles was encouraging and suggested that the baffle helped reducing the water velocity enough to collect finer grain material, even during the higher discharges (68.6-724 ft³/s) encountered from 09/23/2024 to 09/30/2024.

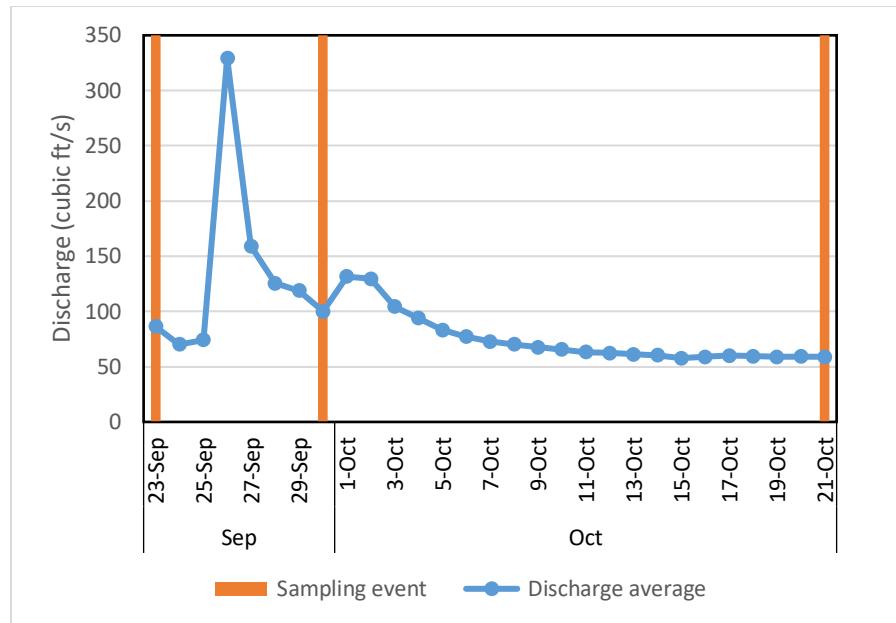


Figure 2: Discharge average of the Patapsco River during sediment trap deployment.



Figure 3: Fractionation of the suspended sediments <2mm collected during stormflow at Patapsco River site. Left 2-0.2 mm fraction, middle 0.2-0.06 mm fraction, right <0.06 mm.

Additional tests were initiated in the Lower Beaverdam Creek, where a higher proportion of finer materials are being transported compared to the Patapsco River site (T. Wilson, Personal communication). Some variations of the sediment trap were tested (see Figure 4). The objectives were (1) to compare the mass and granulometry of SS collected with versus without baffle (2) to verify the impact of the funnel and (3) the impact of the diameter: length ratio of the insert on the granulometry of the SS collected. The traps were placed in the middle of the stream (~230 inches or ~5.8 m from each bank) at LBC1, in series spaced by 122 to 130 inches (~3 m) (Figure 5). The traps were placed on 11/01/2024 at 3 pm, and suspended sediments that settled in the trap during 8 days of baseflow were collected on 11/09/2024. Fine grain particles were collected in all sediment traps. Lower mass was collected in the cylindric design, with no difference for inserts ratio 1:3 or 1:4. Higher mass of SS was collected when a funnel was present. The addition of the baffle led to the highest amount of SS collected (Figure 3). Collection during stormflow is ongoing and will be analyzed.

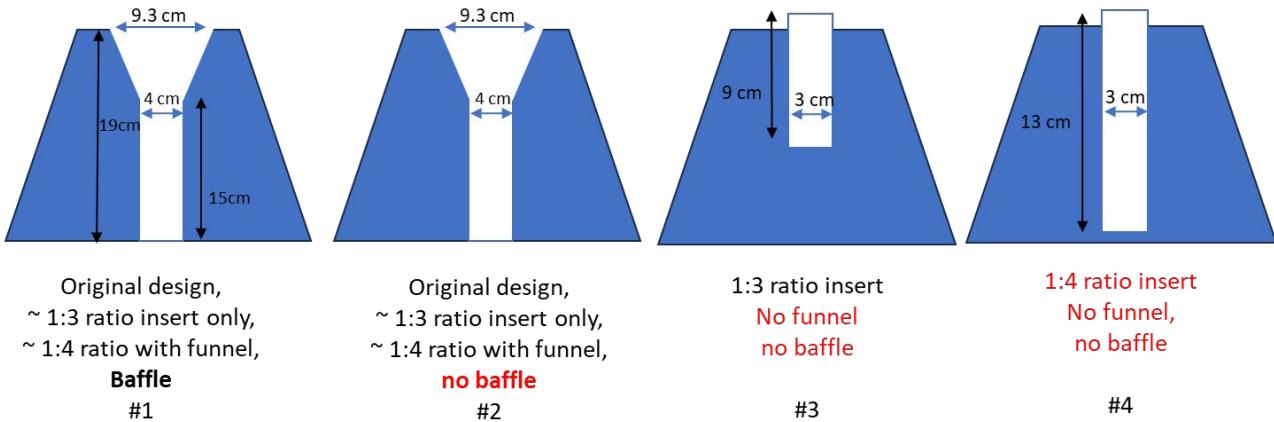


Figure 4: Sediment trap variation tested. On top, schematic of the sediment traps, bottom. Picture of the suspended sediment collected after 8 days of baseflow.

Table 1: Mass and granulometry of suspended sediments collected during preliminary tests

Waterbody	Patapsco River	Patapsco River	LBC1	LBC1
Trap	Original +baffle	Original +baffle	Original +baffle	Original +baffle
collection start	9/23/2024	9/30/2024	11/1/2024	11/9/2024
collection end	9/30/2024	10/21/2024	11/9/2024	11/17/2024
collection time (days)	7	21	8	8
av discharge (m ³ /s)	3.9	2.1	0.10	
min discharge (m ³ /s)	1.9	2.1	0.05	
max discharge(m³/s)	20.5	4.5	0.11	
av velocity (m/s)	0.3	0.1	0.3	
max velocity (m/s)	1.3	0.3	0.5	
Mass SS collected (g)	333.1	4.4	9.8	
mass SS collected >2 mm (g)	266.9	0.6	0.3	
mass SS collected <2 mm (g)	66.2	3.8	9.4	
Fraction 2-0.25 mm (%)	97.5%	72.6%	67.1%	
Fraction 0.25-0.063 mm (%)	2.0%	24.8%	30.8%	
Fraction <0.063mm (%)	0.5%	2.6%	2.1%	



Figure 5: Sediment traps deployed at LBC1

(2) Material preparation

Based on the preliminary results of the sediment traps at LBC, the funnel design is kept. PVC pipes are currently used for the insert.

This quarter's status report, QAPP, and invoice are provided at:

https://drive.google.com/drive/folders/1pKgYfUD2FQAO23BLbMOht_JZg52NVDPR?usp=drive_link.

FY25 Q4 update: The project leader attended the Pooled Monitoring June 2025 Forum. The final test of the sediment traps was conducted at LBC1 at the beginning of March, when temperatures were above freezing. Granulometry analysis of the suspended sediments (SS) collected during

stormflow showed that the proportion of finer particles settling into the sediment trap is negatively correlated ($R^2 >= 0.9$, $n=6$) with the height to opening diameter ratio until a threshold of 10 after which the fraction of finer particles remained constant. Granulometry analysis of SS in grab water sample showed a high proportion of fine particles (66% of particles $< 63 \text{ um}$) transported during the rising limb of the storm. These findings led us to the selection of the sediment trap variation #7 that had height to opening diameter of 10. Final design of the sediment trap was discussed, material for LBC monitoring was prepared, and all sampling devices are being deployed on April 15, 2025. The second watershed option to be monitored in summer 2025 was presented to CBT funding partners, and the Gwynn Falls waterbody was selected. The invoice, deliverables, and status report are online at:

https://drive.google.com/drive/folders/1s6EF5dtZ1PMSD3qLrXaEPi5lspI_4vvi?usp=drive_link.

FY 25 awards

Table 1: List of the FY 25 Pooled Monitoring Initiative's Restoration Research awards.

Award #	Organization	Title	Total Award Amount	Harford County - Pool 1 BMP Effectiveness (#35225)	Harford County Pool 2 Watershed Assessment (#37625)	Other funding source (Chesapeake Bay Trust, MD DNR, Anne Arundel Co, Baltimore City, Montgomery Co, Charles Co, Frederick Co, Prince George's Co, MDOT SHA, EPA CBPO)
25722	University of Maryland Baltimore County	Evaluation of SmartSWM Continuous Monitoring and Adaptive Control Technology for Improving BMP Effectiveness	\$350,995	\$ -	\$ 33,126	\$317,869
25735	Virginia Polytechnic Institute and State University	Stream Floodplain Restoration to Counter Increased Peak Flows from Climate Change at Watershed Scales	\$298,519	\$ 71,250	\$ 84,769	\$142,500
25738	Virginia Institute of Marine Science	Trade-offs in ecosystem services between living shorelines and unrestored shallow water	\$311,526	\$ -	\$ 47,500	\$264,026
25729	The Pennsylvania State University	Optimizing eDNA protocols for stream restoration biodiversity assessments in Maryland: a comprehensive literature review and gap analysis	\$50,000	\$ -		\$50,000
25725	Virginia Polytechnic Institute and State University	Environmental DNA as a tool for monitoring restoration success in Chesapeake streams	\$49,832	\$ -		\$49,832
25736	EA Engineering, Science, and Technology, Inc., PBC	Developing a Novel eDNA-Based Ecosystem Health Metric for Monitoring Ecological Uplift in the Chesapeake Watershed: A Combined Literature Review and Field Study	\$287,485	\$ -		\$287,485
25728	The Pennsylvania State University	Urban Forests for All: Advancing Urban Tree Adoption and Maintenance in Pennsylvania Communities	\$233,254	\$ -		\$233,254
25730	Virginia Polytechnic Institute and State University	Development and Application of a Framework for Assessing Resource Trade-offs for Stream	\$50,000	\$ -		\$50,000
25739	University of Maryland Center for Environmental Science	Co-creating solutions for environmental stewardship in communities	\$167,540	\$ -		\$167,540
Total			\$1,799,151	\$ 71,250	\$ 165,395	\$1,562,506

Award # 23822**Organization: University of Maryland Baltimore County****Title: Evaluation of SmartSWM Continuous Monitoring and Adaptive Control Technology for Improving BMP Effectiveness****Award Amount:** \$350,995 with Harford County contribution of the award at \$33,126 for Pool 2 Watershed Assessment, fund #37625 (other funders are MD DNR at \$51,242 and MDOT SHA at \$266,627)**Amount Paid this Quarter and Funding Source:** **\$0 (paid with Harford County funds)**

Abstract: This project seeks to address Question 1 on BMP Effectiveness Monitoring: How effective is the BMP (or suite of BMPs) for reducing total suspended solids (TSS), total phosphorus (TP), or total nitrogen (TN)? To address this question, we propose to retrofit three BMP facilities in Baltimore County, MD with SmartSWM Continuous Monitoring and Adaptive Control (CMAC) technology and to collect discharge and water quality data at the BMP inlet and outlet. The data will be used to calculate removal efficiencies for TSS, TP, and TN loads at the facility scale, before and after retrofit. Water quality data will be collected using a combination of in-situ high-frequency sensors and automated samplers. We will test the hypothesis that SmartSWM can increase BMP effectiveness. In addition, we will assess how retrofits affect thermal loads, since we will be collecting data to make this assessment..

Project Progress FY25 Q4: Contracts compiled and will be sent/executed next quarter when we will invite the County to the kick-off meeting then send executed contracts with the next status report.

Award # 23835**Organization: Virginia Polytechnic Institute and State University****Title: Stream Floodplain Restoration to Counter Increased Peak Flows from Climate Change at Watershed Scales****Award Amount:** \$298,519 with Harford County contribution of the award at \$71,250 for Pool 1 BMP Effectiveness, fund #35225 and \$84,769 for Pool 2 Watershed Assessment, fund #37625 (other funders are MD DNR at \$30,000, Baltimore City at \$47,500, and Montgomery County at \$65,000)**Amount Paid this Quarter and Funding Source:** **\$0 (paid with Harford County funds)**

Abstract: Climate change is increasing storm intensities and peak flows in the Chesapeake Bay Watershed, threatening prior stream restoration investments and the broader built environment. Here we ask whether floodplain restoration can reduce peak flows enough to protect stream channels, particularly at the watershed/channel network scale. We will use watershed-scale models to test hypotheses including that 1) floodplain restoration can mitigate climate change-induced increases in peak flows, 2) such mitigation is due in part to increased groundwater storage, 3) such effects attenuate with distance downstream of restoration, and 4) vary with degree of climate change and amount of restoration. Outcomes will include “design curves” to maximize climate mitigation benefits for individual floodplain restoration projects, and “planning curves” to prioritize or rank project locations by expected benefit.

Project Progress FY25 Q4: Contracts compiled and will be sent/executed next quarter when we will invite the County to the kick-off meeting then send executed contracts with the next status

report.

Award # 23838

Organization: Virginia Institute of Marine Science

Title: Trade-offs in ecosystem services between living shorelines and unrestored shallow water habitats

Award Amount: \$311,526 with Harford County contribution of the award at \$47,500 for Pool 2 Watershed Assessment, fund #37625 (also funded by MD DNR at \$100,000, Baltimore City at \$47,500, and the Trust at \$116,526)

Amount Paid this Quarter and Funding Source: **\$0 (paid with Harford County funds)**

Abstract: This project asks the questions (1) “What are the trade-offs in carbon fixation, nutrient removal, and algal food resources associated with living shoreline installation relative to intertidal and both vegetated and unvegetated subtidal habitats?”, and (2) “As sea level rises, how will changes in living shoreline resilience affect the long-term provision of these services in Bay watersheds?”

We hypothesize that (1) Primary producer biomass, carbon fixation, denitrification, and net nutrient (N, P) storage and removal are at least equivalent and likely greater in living shorelines compared to intertidal and both vegetated and unvegetated shallow subtidal sediments, and (2) As long as total habitat area (living shoreline + unvegetated and vegetated subtidal sediments) remains constant, sea level rise and the migration of habitats will have minimal impact on ecosystem service provision; however, restriction of marsh migration, if not balanced by a wide shallow subtidal area, will lead to a decline in ecosystem service provision.

We propose a combination field, lab, and modeling study to (1) quantify the services listed above, (2) evaluate tradeoffs associated with living shoreline installation relative to pre-existing habitats, (3) refine an online living shoreline model for computing restoration benefits, and (4) use the model to explore tradeoffs associated with living shoreline installation and resilience of ecosystem benefits with sea level rise at selected sites around the Bay.

The expanded online model will provide a readily-accessible tool for managers and restoration practitioners to compute the ecosystem services associated with living shoreline installation as a function of location and design, and to assess the tradeoffs in services associated with replacement of pre-existing habitats.

Project Progress FY25 Q4: Contracts compiled and will be sent/executed next quarter when we will invite the County to the kick-off meeting then send executed contracts with the next status report.