National Pollutant Discharge Elimination System
Municipal Separate Storm Sewer System
Permit No. 11-DP-3313 MD0068276
Permit Term October 9, 2015 to October 8, 2020

Sixth Annual Report
October 21, 2021

Submitted to:
Sediment, Stormwater, and Dam Safety Program
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Introduction

The following annual report was prepared by the Maryland Department of Transportation State Highway Administration (MDOT SHA) to demonstrate compliance from July 1, 2020 to June 30, 2021 (a.k.a., fiscal year 2021; referred to hereafter as "FY21") in accordance with conditions in Part V.A.1 of the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) discharge permit number 11-DP-3313 MD0068276, effective October 9, 2015 and scheduled for expiration on October 8, 2020 (referred to hereafter as the "MS4 Permit"). MDOT SHA submitted its reapplication for MS4 Permit coverage as Attachment B to its fourth, fiscal year 2019 (FY19) MS4 annual report received by the Maryland Department of the Environment (MDE) on October 8, 2019. In correspondence from MDE to MDOT SHA dated November 30, 2020, MDE conveyed that MDOT SHA coverage under the MS4 Permit has been administratively continued, in accordance with the Code of Federal Regulations, until a new MS4 Permit can be issued and that all permit requirements remain in force.

MDOT SHA has submitted, with this FY21 MS4 annual report, five electronic data sets including:

- Geographic Information System (GIS) data (hereafter referred to as the "MS4 Geodatabase – Part 1") in accordance with Part V.A.2 of the MS4 Permit and Version 1.2 of the MDE NPDES MS4 Geodatabase Design and User's Guide distributed to permitted MS4s in May 2017.
- A separate 'annual BMP' geodatabase ("MS4 Geodatabase – Part 2") that contains only an AltBMPPoly feature class with records for MDOT SHA implementation of annual/operational inlet cleaning and street sweeping Best Management Practices (BMPs). Records for other restoration BMP types remain in the MS4 geodatabase – Part 1.
- Two data sets not otherwise captured by the MDE MS4 geodatabase design and submitted to demonstrate compliance with conditions in Part IV.C of the MS4 Permit as described in the *Source Identification* section of this FY21 MS4 annual report, including:
    - A supplementary geodatabase containing inventory information for MDOT SHA stormwater infrastructure
    - A supplementary geodatabase containing non-permitted industrial sources
- A Microsoft Excel workbook containing a comprehensive list of restoration Best Management Practices (BMPs) completed from 2011 to October 8, 2021, separated by contract, with associated location, impervious treatment, and cost information provided in accordance with conditions in Part IV.E.5.c of the MS4 Permit.

MDE supplied MDOT SHA comments, dated July 30, 2021, related to the FY20 MS4 annual report and data submittal. MDOT SHA responses addressing the July 30, 2021 MDE comments are submitted in tandem to this FY21 MS4 annual report.

Permit Administration and Legal Authority

The MS4 Permit was administered during FY21 by the MDOT SHA Office of Environmental Design (OED) and Deputy Director, Mr. Kevin Wilsey, remains the designated liaison with MDE for implementation of the MS4 Permit. In accordance with conditions in Part IV.A of the MS4 Permit, MDOT SHA has provided contact information in the PermitInfo table of the MS4 Geodatabase – Part 1 and an updated organizational chart describing staff roles in relation to NPDES stormwater tasks in Appendix A.

In accordance with conditions in Part IV.B of the MS4 Permit relative to 40 CFR 122.26, MDOT SHA maintained adequate legal authority for compliance with all permit conditions during the FY21 reporting period.

Status of Implementing the Stormwater Management Program

In the following subsections, MDOT SHA has provided the status of implementing the components of its stormwater management (SWM) program that are established as conditions in the MS4 Permit. Stormwater program components reported in this FY21 MS4 annual report in accordance with conditions in Part V.A.1.a of the MS4 Permit include:

- Source Identification
- Stormwater Management
- Erosion and Sediment Control
- Illicit Discharge Detection and Elimination
- Trash and Litter
- Property Management and Maintenance
- Public Education
- Watershed Assessment
- Restoration Plans
- TMDL Compliance
- Assessment of Controls
- Program Funding

Source Identification

In accordance with conditions in Part IV.C.1 of the MS4 Permit and throughout FY21, MDOT SHA continued to maintain its inventory of storm drain infrastructure, major outfalls, SWM facilities, and associated drainage areas as described in Section C.1 of the FY19 MS4 annual report. Due to time and budgetary constraints, minimal data updates to the inventory for surrounding stormwater facilities/infrastructure were captured during respective BMP/facility preventative maintenance inspections. During FY21, the MDOT SHA Office of Highway Development (OHD), Highway Hydraulics Division's (HHD) Drainage Assets Team implemented new procedures for review of permitting issued for ditch trimming and minor pipe replacements by MDOT SHA maintenance forces. This provided a new avenue to glean information on pipe sizes as well as dates of construction for pipes in the inventory that are

planned for upgrade or replacement. These efforts will continue during FY22 and facilitated minor updates to the inventory across the MS4 permitted area during FY21.

During FY21, a program for inspecting culverts using drones was piloted in the MDOT SHA Office of Information and Technology. This program has the potential to provide pipe size information for the stormwater infrastructure inventory and to demonstrate efficiency and other added benefits that may result from utilizing drone technology for field investigations.

During FY20, a new Outfall Inspection tool completed development and was launched to add condition information, including drainage areas, to inventory updates. The new Outfall Inspection tool referenced in Section C.1 of the FY19 MS4 annual report and in the *Source Identification* section of the FY20 MS4 annual report, could not be deployed in FY21 due to budgetary constraints. As part of a MDOT SHA agencywide Asset Management effort that is under development, it is anticipated that additional funding and focus on this new technology for inspections may grow once budgetary issues have been resolved.

MDOT SHA has provided the outfall structure information in the Outfall and OutfallDrainageArea feature classes of the MS4 Geodatabase - Part 1. Information for conveyance and other structures not represented by the MDE MS4 geodatabase design are provided in a supplemental geodatabase submitted with this FY21 MS4 annual report in a format consistent with the FY20 submission.

In accordance with conditions in Part IV.C.2 of the MS4 Permit, MDOT SHA has identified industrial sites within MDOT SHA right-of-way that have the potential to contribute pollutants to MDOT SHA storm drain systems. These include MDOT SHA-owned NPDES 12-SW permitted industrial sites but also salt storage areas, parking lots, rest areas, and other highly trafficked or material storage areas as requested by MDE. There are no commercial sites on MDOT SHA properties. MDOT SHA has provided location and other information for NPDES 12-SW permitted industrial sites in the MunicipalFacilities feature class of the MS4 Geodatabase – Part 1. Non-permitted industrial sites are summarized in the supplemental geodatabase submitted with this FY21 MS4 annual report.

During FY21, updates to the inventory of urban BMPs/SWM facilities continued. MDOT SHA has provided urban BMP information in the BMPPOI feature class and the BMP table of the MS4 Geodatabase – Part 1.

As described in Section C.3 of the FY19 MS4 annual report, the MDOT SHA revised baseline analysis, submitted in June 2018, included GIS data for its impervious surfaces. MDE found it acceptable that this information was not resubmitted with the FY19 MS4 annual report and MDOT SHA has similarly excluded it from the FY20, and this FY21, MS4 annual report. MDOT SHA has provided updates to the ImperviousSurface table of the MS4 geodatabase – Part 1.

Monitoring site locations, established to meet conditions described in Part IV.F of the MS4 Permit, were revised as described in Section F.1 the FY19 MS4 annual report. As described in the Assessment of Controls section of the FY20 MS4 annual report, monitoring stations were removed in June 2020. These changes have been noted for applicable records in the MS4

Geodatabase – Part 1. MDOT SHA has provided information for its monitoring sites in the MonitoringSite and MonitoringDrainageArea feature classes of the MS4 Geodatabase – Part 1.

Information for MDOT SHA water quality improvement projects is provided in the RestBMP, AltBMPLine, and AltBMPPoly feature classes as well as the StrRestProtocols table of the MS4 Geodatabase – Part 1. Information for inlet cleaning and street sweeping annual/operational BMPs is provided in the AltBMPPoly feature class of the MS4 Geodatabase – Part 2. Submitted data includes projects completed through the current permit term as well as projects under construction that MDOT SHA expects to complete in State fiscal year 2023 (FY23) and claim for restoration credit. In accordance with Part V.A.2.d of the MS4 Permit and applicable guidance provided for the AltBMPLine feature class in Version 1.2 of the MDE NPDES MS4 Geodatabase Design and User's Guide and requirements described in Appendix E to the 2014 MDE document, "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated" (referred to hereafter as "MDE 2014"), MDOT SHA has included a Stream Restoration Analysis Report in Appendix G to show the work behind calculations for defining pollutant load reductions for stream restoration projects using protocols approved by the Chesapeake Bay Program.

Stormwater Management

MDOT SHA continues to comply with State and federal laws and regulations regarding SWM as well as MDE permit requirements. MDOT SHA also continues to implement the practices established in the 2000 Maryland Stormwater Design Manual and the MDOT SHA Sediment and Stormwater Guidelines and Procedures (October 6, 2017) for all projects and remains in compliance with the SWM Act of 2007, including the revised Chapter 5 of the 2000 Maryland Stormwater Design Manual, by implementing environmental site design (ESD) to the maximum extent practicable (MEP) for all new and redevelopment projects.

As described in Section D.1.a of the FY19 MS4 annual report, the OHD Plan Review Division (PRD) is the approving authority for both erosion and sediment control (ESC) and SWM for all MDOT SHA projects. During the FY21 reporting period, PRD continued to coordinate with MDE to update the PRD Sediment and Stormwater Guidelines and Procedures and Current Technical Practices documents in preparation of PRD being designated as an approval authority of NRCS-MD Code 378 Small Ponds on behalf of the MDE Dam Safety Permits Division. As part of this effort, PRD created Small Pond Review and Approval Guidelines and Procedures. These documents were submitted to MDE and are currently under review. MDE was developing a Memorandum of Understanding during FY21 to delegate Small Pond review and approval authority to PRD. PRD will continue to work closely with MDE during FY22 to complete the development and reviews of these documents so they can be accepted by MDE and published by PRD.

MDOT SHA maintained SWM and construction inspection information during FY21 utilizing the processes described in Sections D.1.b. and D.1.c of the FY19 MS4 annual report. In accordance with conditions in Part IV.B of the MS4 Permit, a summary of construction inspections, non-compliance findings, and the actions taken by MDOT SHA Districts is referenced in Section 1.11 of, and is provided as electronic data with, the *MDOT SHA Annual*

Report for Delegation of Sediment and Stormwater Approval Authority that was submitted to MDE on October 6, 2021. Information for the MDOT SHA SWM program; including required documentation in accordance with conditions in Parts IV.D.1.b, IV.D.1.c, and IV.D.1.d of the MS4 Permit; is provided in the SWM table of MS4 Geodatabase – Part 1.

In a communication to MDOT SHA on July 13, 2020, MDE stated that MDOT SHA may use the necessary mechanisms to ensure that maintenance work performed by contractors or District maintenance shops is acceptable and that MDOT SHA may also work with the MDE compliance program when needed to ensure proper facility maintenance. PRD and HHD have committed to schedule a meeting in FY22 with the MDE Compliance Program to collaborate for development of effective compliance strategies and to identify applicable documentation of standard operating procedures that require updates. Due to the pending coordination with MDE and uncertainties surrounding which specific MDOT SHA activities constitute maintenance enforcements or maintenance violations, MDOT SHA has reduced the "3" maintenance enforcements previously reported in the FY20 MS4 annual report to "0" in the "MAIN_ENF" data field of the SWM table in the MS4 Geodatabase – Part 1.

During the FY21 reporting period, MDOT SHA conducted 70 preventative maintenance inspections of SWM facilities applying processes described in Section D.1.d of the FY19 MS4 annual report and in accordance with COMAR 26.17.02 and conditions in Part IV.D.1.d of the MS4 Permit. MDOT SHA budget constraints during FY21, resultant from the COVID-19 pandemic, severely limited these activities. Triennial preventative maintenance inspections could not be performed for many facilities that were due in FY21. FY22 inspection activities will remedy this situation by the next reporting cycle. The program received funding for the FY22 period to inspect all facilities not inspected during FY21 as well as approximately 70% of the facilities required for inspection in FY22. In addition, State Planning and Research (SPR) funds were allocated to create a pilot program for inspection of the numerous 2A grass swales included in the inventory using drone technology. It is anticipated that this technology could increase inspection efficiency by as much as 50% in future years. MDOT SHA has provided the inspection program information in the BMPInspections, RestBMPInpsections, AltBMPLineInspections, and AltBMPPolyInspections tables of the MS4 Geodatabase – Part 1.

During FY21, MDOT SHA performed 121 initial inspections of SWM facilities. Most of these inspections are completed by default during construction as part of the SWM facility as-built certification process as described in detail within the *Stormwater Management* section of the FY20 MS4 annual report. During FY21, MDOT SHA continued to use the Quality Assurance (QA) Toolkit to submit SWM facility as-built certification packages electronically. A designated team of engineers reviews these packages for completeness and accuracy before they are forwarded to PRD for structural approval. Final acceptance for a given facility is not issued by HHD until structural acceptance is issued by PRD, landscaping has been approved, and the facility has been accepted by MDOT SHA maintenance. SWM facilities that have issues or concerns identified in the as-built process are "flagged" for follow-up. Depending on the findings, follow-up may include subsequent inspections with highlights on what to keep an eye on for premature dysfunction or may have a rating that places them in need of repair, remediation, major maintenance, or retrofit/reconstruction. During the reporting period, 67 of the initial inspections were flagged in this way.

MDOT SHA performed minimal routine maintenance for SWM facilities during FY21 due to funding constraints caused by the COVID-19 pandemic. Remediation maintenance for SWM facilities, applying processes described in Section IV.D.1.d of the FY19 MS4 annual report, were suspended in FY21 for the same reasons. Design and/or construction contracts opened to address major maintenance and remediation needs for SWM facilities had to be closed at the start of FY21. Four facilities repaired in FY20, as reported in the *Stormwater Management* section of the FY20 MS4 annual report, are still missing final acceptance records that have not been submitted by the contractor and the remediation contract was cancelled at the end of FY20. At this time, MDOT SHA is investigating strategies to complete activities needed to verify functionality for these facilities and to fully close the contract which remains open until December 2021.

The permits that have been obtained for remediation will remain active throughout FY22 and will be extended as practicable and as necessary. Many applications for Federal Aid have been made on behalf of remediation program activities and significant changes to the program status may be possible by FY23 depending on the outcome. MDOT SHA has not officially abandoned any SWM facilities in FY21; however, HHD and PRD anticipate they will finalize development of procedures for retiring SWM facilities during FY22.

SPR funding has been allocated in FY22 for updates to District operation manuals described in the *Stormwater Management* section of the FY20 MS4 annual report. More information and links to District-specific operation manuals can be found online at the following MDOT SHA webpage:

https://www.roads.maryland.gov/mdotsha/pages/Index.aspx?PageId=363

During the current MS4 Permit term, a total of 51 facilities have been remediated by MDOT SHA. A total of 256 SWM facilities still require major maintenance or retrofit. In accordance with conditions in Part IV.B of the MS4 Permit, a remediation maintenance resolution schedule is provided in **Table IV.D.1.d** located in Appendix B. Maintenance work has been prioritized and expected completion dates are between June 2023 and June 2027. Due to resource constraints during FY20 and FY21 as well as uncertainty surrounding resource availability for FY22, MDOT SHA has updated its remediation completion commitment dates to reflect greater resource availability anticipated in FY23.

Erosion and Sediment Control

During the FY21 reporting period, MDOT SHA maintained compliance with Maryland State and federal laws and regulations for ESC as well as MDE requirements for permitting, including compliance with the General Permit for Stormwater Associated with Construction Activity (NPDES-CA) for projects that disturb at least one acre of land. MDOT SHA continued to submit applications for coverage under the NPDES-CA (State discharge permit number 14GP, effective January 1, 2015; expired December 31, 2019), for all qualifying roadway projects as described in Section D.2.d of the FY19 MS4 annual report. During the FY21 reporting period, a total of 32 MDOT SHA construction projects receiving Notice to Proceed (NTP) required coverage under an NPDES-CA permit.

Under allowance granted by the MDE Consent Order issued May 18, 2020, MDOT SHA has elected to continue operating under the terms of the expired NPDES-CA permit until a new one can be issued. It is the intent of MDOT SHA to comply with the conditions of that allowance as described in the *Erosion and Sediment Control* section of the FY20 MS4 annual report.

In accordance with conditions in Part IV.D.b of the MS4 Permit and in cooperation with the Maryland Transportation Builders and Materials Association (MTBMA), MDOT SHA continued to offer updated ESC training, as described in Section D.2.b of the FY19 MS4 annual report, and issued 219 ESC (a.k.a., "Yellow Card") certifications and 285 re-certifications during the FY21 reporting period. The Governor issued a temporary suspension of certifications that was in affect during FY21 and all existing certifications where extended until 45 days after the conclusion of the emergency declaration which expired on July 1, 2021. Responsible Personnel Certification training was administered through MDE's online Responsible Personnel Course. More information regarding ESC certification is available at the following MDOT SHA webpage:

https://www.roads.maryland.gov/mdotsha/pages/Index.aspx?PageId=56

In accordance with conditions in Part IV.D.2.c of the MS4 Permit, MDOT SHA has provided the ESC program information in the ErosionSedimentControl table and the grading permit program information in the QuarterlyGradingPermits feature class and the QuarterlyGradingPmtInfo table in the MS4 Geodatabase – Part 1.

Illicit Discharge Detection and Elimination

The MDOT SHA Office of Environmental Design, Environmental Compliance Division (ECD) performed illicit discharge detection and elimination (IDDE) screenings during the FY21 reporting period. Whenever possible in FY21, ECD considered pollution potential and selected outfalls that were located in commercial and industrial areas determined to be "stormwater hotspots" with extra focus on permitted counties where IDDE screenings were less concentrated in previous years. Stormwater pipes 12 inches in diameter and greater were selected throughout Prince George's, Washington, Cecil, and Harford Counties.

In accordance with conditions in Part IV.D.3.a of the MS4 Permit, MDOT SHA exceeded the 150 minimum annual requirement for primary field screenings during FY21. Additional IDDE investigation and tracking was conducted during FY21 for illicit discharge (ID) sites whose status was reported as "open" in the FY20 MS4 annual report. Citizen reporting or other MDOT SHA contractors working within MDOT SHA right of way (ROW) also identified potential IDs requiring investigation. An IDDE screening related to this type of notification was completed during FY21 in Prince George's County.

In accordance with conditions in Parts IV.B, IV.D.3.d, and IV.D.3.e of the MS4 Permit, a summary of outfalls screened and potential IDs with associated jurisdictional contacts/resolution schedules for each is provided in **Tables IV.D.3.a and IV.D.3.d** located in Appendix C. In the MS4 Geodatabase – Part 1, MDOT SHA has provided the IDDE program information in the IDDE table.

In accordance with conditions in Part IV.D.3.b of the MS4 Permit, during FY21, ECD performed a total of 302 inspections across 164 MDOT SHA industrial facilities (inspecting 32 NPDES 12-SW permitted sites and 132 non-permitted sites) identified by MDOT SHA, per Part IV.C.2 of the MS4 Permit, as having the potential to contribute significant pollutants to MDOT SHA storm drain systems.

The types of inspections performed by ECD for identified industrial areas as well as the associated inspection tracking system remain unchanged relative to descriptions provided for each in the FY19 MS4 annual report. A total of 118 stormwater related findings were generated by facility inspections during FY21 and applicable records were uploaded to the MDOT SHA web-based tracking system. Of those findings, 85 were resolved during FY21 whereas 33 findings remain unresolved at the close of the final quarter. Some of the remaining corrections needed require further communication with maintenance managers and additional tracking. In accordance with Part IV.B of the MS4 Permit, a summary of the most recent quarterly inspection report for each of the NPDES 12-SW permitted sites located within the MS4 Permit areas is provided in Appendix C.

As part of its overarching program to respond to illegal discharges, dumping, and spills; ECD continued to coordinate with MDE, surrounding jurisdictions, and property owners during the FY21 reporting period to eliminate IDs and clean up spills and dumping. The full implementation of a new IDDE management tool was planned for completion during FY21; however, due to budgetary shortcomings resultant from the COVID-19 pandemic, further development has been delayed until FY23.

Trash and Litter

MDOT SHA provided comprehensive descriptions of its "multi-pronged" trash/litter reduction strategy in the FY18 and FY19 MS4 annual reports. The approach utilizes MDOT SHA employees, contractors, correctional services, the Sponsor-A-Highway (SAH) program and partnerships, as well as labor donated through Adopt-A-Highway (AAH) volunteers. Implementation in FY21 was heavily impacted by COVID-19 with reduced contractor and SAH staffing, MDOT SHA crews alternating work every other week for several months, no support from correctional services, and very limited access to support from AAH volunteers.

In accordance with conditions in Part IV.D.4.d of the MS4 Permit, trash/litter removed by MDOT SHA trash reduction strategies during the FY21 reporting period is documented in **Table IV.D.4.d** below. Implementation of the AAH and SAH programs in FY21 resulted in 86 highway miles adopted and 292 miles sponsored. Relative to implementation reported for the FY20 period, this is a decrease of 20 and 96 miles respectively for the two programs. MDOT SHA believes that COVID restrictions and community concern for health and safety during quarantine and lockdown periods reduced volunteer participation and widespread economic hardship contributed to reduced SAH sponsorship.

Table IV.D.4.d: Trash and Litter Removed During FY21 by MDOT SHA Trash Reduction Strategies

Jurisdiction	Truckloads	Conversion to Pounds
Anne Arundel	377	181,285
Baltimore	1,736	841,362
Carroll	74	35,929
Cecil	85	41,274
Charles	82	40,375
Frederick	158	77,226
Harford	131	63,609
Howard	486	234,598
Montgomery	338	162,966
Prince George's	765	372,898
Washington	56	27,132
Salisbury	43	20,855
Totals	**4,331**	**2,099,509**

During FY21, MDOT SHA continued to maintain its "Educational Outreach" webpage first described in Section D.4.b of the FY19 MS4 annual report. Content is accessible at the following address:

https://www.roads.maryland.gov/mdotsha/pages/index.aspx?PageId=48

In accordance with conditions in Parts IV.D.4.b and V.A.1.d of the MS4 Permit, additional public education and outreach activities implemented by MDOT SHA during FY21 to reduce littering are incorporated into the summary describing public education programs in Appendix D.

The MDOT Excellerator program, as described in Section D.4.c of the FY19 MS4 annual report, remains the primary performance management system for tracking the effectiveness of MDOT SHA trash reduction strategies. The most recent biannual report is publicly accessible at the following web address and includes; in charts 9.2D.1, 9.2D.2, and 9.2D.3; an evaluation of quarterly implementation and associated expenditures by MDOT for litter pickup from FY19 through the end of the first FY21 quarter:

https://www.mdot.maryland.gov/tso/pages/Index.aspx?PageId=170

Property Management and Maintenance

During FY21, MDOT SHA continued to monitor the need to update Storm Water Pollution Prevention Plans (SWPPP) and maps following site changes and renovations and continued providing annual SWPPP training to its maintenance personnel. As previously described in the *IDDE* section of this FY21 MS4 annual report, the MDOT SHA maintenance facility staff continued to perform monthly inspections and ECD continued to perform inspections at all MDOT SHA facilities through its District Environmental Coordinators throughout the FY21 reporting period. ECD managed resultant maintenance issues identified in accordance with the process previously described in Section D.3.b of the FY19 MS4 annual report.

For each municipal facility within the MS4 permitted jurisdictions covered under the General Discharge Permit (12-SW), MDOT SHA has provided, in **Table IV.D.5.a**, a summary of updates to facility SWPPPs and associated trainings for staff in accordance with conditions in Parts IV.D.5.a and IV.D.5.b.v of the MS4 Permit. Please note that the Thurmont facility is considered a "satellite" site of the Frederick facility meaning no MDOT SHA staff report to the Thurmont facility directly. MDOT SHA staff work at the Thurmont facility routinely but are technically staff from the Frederick facility. The Thurmont facility is a 12-SW permitted site and consequently requires an associated SWPPP; however, the staff training is accounted for within the Frederick facility's staff training totals in Table IV.D.5.a below. In the MS4 Geodatabase – Part 1, MDOT SHA has provided information regarding 12-SW permitted facilities in the MunicipalFacilities feature class.

Table IV.D.5.a: Summary of SWPPP Status and Training for MDOT SHA Municipal Facilities

District	Maintenance Facility	12-SW Permit Type	Date of Most Recent SWPPP Update (Month-YR)	Date of Most Recent SWPPP Training (Month-YR)	Number of Individuals Trained
1	Cambridge	General	January-17	December-20	15
	Salisbury	General	December-19	November-20	47
2	Elkton	General	April-19	October-20	22
3	Fairland	General	January-19	December-20	43
	Gaithersburg	General	February-19	June-21	28
	Laurel	General	February-19	December-20	24
	Marlboro	General	February-19	March-21	31
4	Churchville	General	March-19	June-21	36
	Golden Ring	General	March-19	June-21	32
	Hereford	General	March-19	June-21	29
	Owings Mills	General	March-19	June-21	22
5	Annapolis	General	March-19	September-20	20
	Glen Burnie	General	March-19	September-20	19
	La Plata	General	March-19	September-20	29
	Hanover Auto Shop	General	June-20	November-20	5
6	Hagerstown	General	February-20	September-20	41
7	Dayton	General	April-20	September-20	31
	Frederick	General	April-20	September-20	39
	Thurmont	General	May-20	-	-
	Westminster	General	May-20	September-20	43
				Total	**556**

MDOT SHA continued to clean inlets using vacuum technology as described in Section D.5.b of the FY19 MS4 annual report. MDOT SHA was not able to perform street sweeping activities along many roadways in FY21 due to significant budget reductions. FY22 budgets prioritize essential maintenance activities for roadway operation and safety and eliminated all supplemental street sweeping and inlet cleaning activities implemented exclusively to maintain current levels of MS4 impervious area treatment credit and Total Maximum Daily Load (TMDL) pollutant load reductions from annual/operational BMPs. Information for implementation of inlet cleaning and storm drain vacuuming operations during FY21 is provided in **Table IV.D.5.b** below.

Table IV.D.5.b: Tons Collected in FY21 from Inlets Cleaning and Storm Drain Vacuuming

County	MDOT SHA Maintenance Shop	Total Number of Inlets Cleaned	Tons Collected	Tons Collected from Storm Drain Vacuuming
Anne Arundel	Annapolis	4	0.4	7
	Glen Burnie	0	0	1
Baltimore	Golden Ring	191	20.1	9
	Hereford	135	14.2	7
	Owings Mills	445	46.7	4
Carrol	Westminster	0	0	0
Cecil	Elkton	19	2.0	6
Charles	La Plata	0	0	0
Frederick	Frederick	40	4.2	0
Harford	Churchville	71	7.5	24
Howard	Dayton	26	2.7	6
Montgomery	Fairland	990	103.9	44
	Gaithersburg	677	71.1	5
Prince George's	Laurel	644	67.6	42
	Upper Marlboro	118	12.4	17
Wicomico County	Salisbury	0	0	1
	Totals	**3,360**	**352.8**	**173**

Most vegetation management on MDOT SHA property is performed by mechanical methods. Herbicides are applied when it is not possible to meet management objectives by mechanical methods alone. MDOT SHA uses herbicides to control noxious weed species identified by the Maryland Department of Agriculture (MDA), invasive weeds, and plants that reduce highway safety and operability. MDOT SHA continues to decrease use of glyphosate, largely by minimizing use of non-selective herbicides on guardrails. To reduce mowing costs and fuel use, MDOT SHA also promotes use of plant growth regulators (e.g., trinexapac-ethyl).

To report statewide application of vegetation management chemicals, MDOT SHA uses purchasing records and estimates contractor application usage from contract documents. Less herbicide was applied during the FY21 reporting period due to programmatic improvements and impacts from the COVID-19 pandemic. In accordance with conditions in Part IV.D.5 of the MS4 Permit, MDOT SHA has provided its statewide usage during FY21 for herbicide, fertilizer, and deicing chemicals, including percent change for each chemical type based on amounts reported for the FY20 period, in the ChemicalApplication table of the MS4 Geodatabase – Part 1.

Work on the MDOT SHA Landscape Management Guide (LMG), described in Section D.5.b.iii of the FY19 MS4 annual report, was suspended in FY21. Efforts for agencywide implementation of the LMG have been deferred until funding can be made available. During FY21, MDOT SHA continued 3 of the 4 pesticide applicator training classes described in Section D.5.b.iii of the FY19 MS4 annual report, training 119 MDOT SHA pesticide applicators.

The excluded training, 'ENV 220', which qualifies participants to take MDA's *Category 5 – Aquatic* test, requires in-person attendance and could not be offered in FY21 due to COVID-19 safety restrictions.

As reported in the FY20 MS4 annual report, MDOT SHA concluded its multi-year cooperative research effort with MDA on biocontrol of invasive plants using the Mile-a-Minute Vine Weevil (*Rhinoncomimus latipes*). During FY21, MDOT SHA continued research described in the FY20 MS4 annual report that focused on Japanese Knotweed Psyllid (*Aphalara itadori*) and its potential to suppress the growth and spread of Japanese Knotweed (*Polygonum cuspidatum*).

MDOT SHA challenges introduced in FY21 due to the COVID-19 pandemic required significant adjustments to snow and ice management operations. New social distancing and decontamination practices implemented for facilities and equipment added complexity that negatively impacted overall implementation and progress. Despite these challenges, MDOT SHA continued to test and evaluate new equipment and strategies in an on-going effort to improve the level of service provided to motorists during winter storms while minimizing the impact of its operations on the environment. Minimization practices described in Section D.5.b.iv of the FY19 MS4 annual report continued during the FY21 reporting period. A description of MDOT SHA winter operations and a link to the current version of the MDOT SHA Salt Management Plan, most recently updated in October 2020, is publicly accessible at the following web address:

https://www.roads.maryland.gov/mdotsha/pages/index.aspx?PageId=352

Within the MS4-permitted areas, MDOT SHA applied a total of 180,544 tons of sodium chloride (rock or solar salt) during the 2020-2021 winter season. MDOT SHA uses a metric of pounds of road salt per total lane miles per inch of snow (lbs/lm/inch) in its year-to-year comparisons of road salt usage. For the FY21 reporting period, the value for this metric was 642 lbs/lm/inch which is an increase of 329 lbs/lm/inch when compared to amounts reported for the FY20 period. This increase can be attributed to an unusually high number of freezing rain/ice events, which require more salting and less plowing, coupled with decreased efficiency resultant from utilization of 63 newly hired operators who lacked experience managing MDOT SHA roadways.

As described in Section D.5.b.iv of the FY19 MS4 annual report, MDOT SHA continued its "Annual Snow College" training during FY21 in accordance with conditions in Part IV.D.5.b.v of the MS4 Permit. Snow College was implemented statewide in FY21 across all MDOT SHA Districts. FY21 Snow College events trained 86 operators in snow removal and salt management, including new hire and refresher training. MDOT SHA continued administration of supplementary annual maintenance shop winter meetings and hired equipment operator trainings during FY21, with annual outreach estimated at 1,000 State employees and 2,100 hired equipment operators respectively. The scale of outreach for these supplementary trainings is variable year-to-year depending on active contracts, State employee vacancies and new-hires, and equipment acquisitions but the annual variance is estimated to be less than 10% relative to the reported figures. Due to COVID related protocols, all trainings were conducted in a virtual environment during FY21.

Public Education

MDOT SHA continued to operate its Customer Care Management System, as described in Section D.6.a of the FY19 MS4 annual report, throughout FY21 for submission of complaints and concerns. In FY21, this system received approximately 20,071 service requests. There were approximately 2,921 service requests regarding littering related issues. These figures do not represent a significant difference relative to amounts reported for FY20.

During the FY21 reporting period, MDOT SHA maintained its public education webpage, providing links to several interactive maps and educational resources as previously described in the *Trash and Litter* section of this FY21 MS4 annual report. MDOT SHA also participated in numerous educational opportunities described in Appendix D.

Watershed Assessment

In accordance with conditions in Part IV.E.1 of the MS4 Permit, MDOT SHA continued to reference County watershed assessments to identify specific watershed issues and restoration project opportunities, as described in Section E.1 of the FY19 MS4 annual report. Additionally, throughout the current permit term, MDOT SHA committed resources to advocating for, drafting, negotiating, executing, and amending long-term Memorandums of Understanding/Agreements with 15 different county, State, and federal government agencies in order to facilitate collaborative watershed restoration and monitoring activities. These interagency partnerships have facilitated data exchanges, ROW/easement acquisition, pooled stormwater and restoration monitoring and research, and construction of new restoration SWM, tree planting, outfall stabilization, impervious area removal, and stream restoration BMPs.

Restoration Plans

In accordance with conditions in Part IV.E.2.a of the MS4 Permit, MDOT SHA submitted impervious surface area assessments (as described in Section E.2.a of the FY19 MS4 annual report) and implemented restoration efforts for more than the required 4,621 equivalent acres of impervious surfaces before the end of FY20. Restoration implemented was consistent with the methodology described in the MDE 2014 document and all subsequently provided MDE guidance.

On April 9, 2021, MDOT SHA submitted response to the MDE letter dated November 30, 2020 that requested MDOT SHA provide a final impervious acre restoration analysis and total. In comments dated July 30, 2021, MDE confirmed MDOT SHA has completed 8,100 acres of restoration by October 8, 2020, representing 175% achievement of the 4,621 acres restoration required by the end of the permit term. In those same comments, MDE stated that MDOT SHA may not claim restoration implemented after the date of permit expiration and instead, must claim restoration completed after October 8, 2020 for the next permit.

In accordance with conditions in Part IV.E.3 of the MS4 Permit, MDOT SHA has provided the cumulative impervious acres restored achieved through FY21 and under the administratively

continued permit compliance period in **Table IV.E.3** below. In its July 30, 2021 comments, MDE stated that restoration credit must be removed for any 'failed' restoration BMP until proper performance can be verified. In accordance with MDE guidance and to account for other programmatic adjustments in FY21, MDOT SHA has temporarily removed credits from the summaries presented in Table IV.E.3 and in **Table V.A.1.e** contained in Appendix E and has aligned credit 'claimed' information in the GEN_COMMENTS attribute field of BMP records in the AltBMPPoly, AltBMPLine, and RestBMP features classes and the StrRestProtocols associated table of the MS4 Geodatabase – Part 1 for:

- 293 BMPs where the most recent credit verification inspection was assigned a 'failed' designation or performance could not otherwise be verified by inspection data
- 8 retrofit BMPs that are currently under consideration by PRD for Water Quality Bank Account submittals associated with the IS-495/IS-270 Public Private Partnership (a.k.a., "P3") Project (reference PRD No. 20-PR-0040-08)
- 2 outfall stabilization BMPs (see BMP identification numbers 030020UO and 150014UO) where credit generated must be proportionally divided in accordance with terms in interagency agreements with respective landowners, Baltimore County and the City of Rockville

Table IV.E.3: Impervious Acres Restored Achieved During the MS4 Permit Compliance Period

BMP Type	Oct. 21, 2010 to 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	Total
Impervious Surface Elimination to Pervious	0.00	0.00	1.83	0.02	0.11	0.49	0	**2.45**
New Stormwater Control Structures	84.69	52.11	33.09	50.94	30.72	0	0	**251.55**
Grass Swales	0	9.07	12.01	0.35	0	0	0.89	**22.32**
Outfall Stabilization	0	11.92	9.20	169.91	54.24	134.23	472.41	**851.91**
Retrofit Existing Stormwater Control Structures	0	90.54	6.33	45.37	48.85	3.02	56.13[1]	**250.24**
Stream Restoration	1,158.80	390.60	212.48	6.84	175.70	3,696.26	1,124.86	**6,765.54**
Tree Planting	370.76	39.94	7.09	30.25	66.45	23.83	9.23	**547.55**
Built BMP Subtotals =	**1,614.25**	**594.18**	**282.03**	**303.68**	**376.07**	**3,857.83**	**1,663.52**	**8,691.56**
Inlet Cleaning	164[2]						210.50	
Street Sweeping	29[2]						10.90	
Credit Acquisition	0						0	

[1] Total includes BMPs 020363, 130048, and 130073 that were still under construction at the end of FY21 and are estimated to restore 15.22 impervious acres

[2] Total acres achieved for inlet cleaning and street sweeping annual BMPs is presented here as the average annual implementation through FY20 as finalized in MDE comments dated July 30, 2021

TMDL Compliance

In FY20, 4 new TMDLs were approved by the United States Environmental Protection Agency (EPA). Per Part IV.E.2.b of the MS4 Permit, MDOT SHA completed and submitted TMDL Implementation Plans for 3 of the new TMDLs by their respective FY21 due dates. The names and submission dates of the 3 required plans are as follows:

- Marsh Run Sediment TMDL Implementation Plan; September 29, 2020
- Piscataway Creek Sediment TMDL Implementation Plan; October 3, 2020
- Port Tobacco River Sediment TMDL Implementation Plan; October 9, 2020

Each of the public comment periods for the 3 Implementation Plans that were submitted to MDE were announced in the Baltimore Sun, Washington Post, and on MDOT SHA's website during FY21 in accordance with conditions in Part IV.E.4 of the MS4 Permit. No comments were received during the respective comment periods.

An implementation plan was not submitted for one TMDL approved in FY20 for the following reason:

- Non-Tidal Upper Choptank River Sediment TMDL in Caroline, Talbot, and Queen Anne's Counties Maryland; approved on October 31, 2019 -

  No Implementation Plan was submitted due to this TMDL being located in Phase II Counties that are not currently listed on MDOT SHA's 2015 MS4 Permit (11-DP-3313). When the new permit is issued and MDOT SHA updates its baseline to include newly approved Phase II jurisdictions, this TMDL will be analyzed to determine if an implementation plan is needed.

To insure that MDOT SHA is on track to meet TMDL target dates set during the current MS4 Permit term, MDOT SHA has begun planning projects to meet all Total Nitrogen, Total Phosphorus, and Total Suspended Sediment TMDLs with a target date of 2025 to 2030 and has identified the amount of pollutants needed to reach the pollutant reduction requirements. MDOT SHA also identified a preliminary cost to implement projects to meet those pollutant reduction requirements. It is understood that TMDLs issued during the current MS4 Permit term apply the MDE 2014 guidance when modeling progress for TMDL wasteload allocation (WLA) obtainment. Prior to the date of this FY21 MS4 annual report, all TMDLs that were issued to MDOT SHA were developed using a version of the Maryland Assessment and Scenario Tool (MAST). Considering these details, MDOT SHA believes it is appropriate to continue modeling progress for obtainment of those TMDL WLAs using MDE 2014 in association with MAST. Moving forward, MDOT SHA will coordinate with MDE concerning the appropriate modeling guidance.

In accordance with conditions in Part IV.E.5 of the MS4 Permit, MDOT SHA has provided the required FY21 TMDL Assessment Report in Appendix E. MDOT SHA has also provided Bay and local TMDL compliance information, respectively, in the CountywideStormwaterWatershedAssessment and LocalStormwaterWatershedAssessment tables of the MS4 Geodatabase – Part 1. Bacteria and PCB progress modeling was removed

from Table V.A.1.e in Appendix E and from the aforementioned tables of the MS4 Geodatabase – Part 1 in anticipation of updated MDE guidance for reporting progress for PCB and Bacteria WLA obtainment qualitatively. Upon reception of said guidance, MDOT SHA will coordinate with MDE for steps needed to develop an active strategy to meet and model those TMDLs.

Assessment of Controls

The MDE-approved monitoring plans, developed by MDOT SHA to satisfy conditions in Part IV.F of the MS4 Permit, were appended to the FY16 and FY17 MS4 annual reports. Those approved monitoring plans contained a schedule for monitoring activities proposed by MDOT SHA based on project schedules at the time the plans were developed. No applicable monitoring activities were performed in FY21 so the summaries for monitoring schedules and progress provided in Table IV.F of the FY20 MS4 annual report remain valid and unchanged.

Due to impacts to available resources that initiated in FY20 and persisted in FY21 as a result of the COVID-19 pandemic, MDOT SHA removed monitoring installations and deferred CHEM 4 and BIO 4 monitoring activities at the Little Catoctin Creek stream restoration site. Funding was not available in FY21 or in initial FY22 budgets to coordinate and complete the remaining BIO 4 monitoring activities (habitat assessment) before the end of the summer 2021 sampling index period. The earliest date that MDOT SHA can resume and complete BIO 4 monitoring activities is during the summer 2022 sampling index period (i.e., June through September 2022). Funding has been allocated in budgets for the remaining three quarters of FY22 to resume CHEM 4 monitoring activities; by March 30, 2022 as directed by MDE in its July 30, 2021 comments; and BIO 4 monitoring activities as soon as practicable, at the start of the summer sampling index period in June 2022. Progress will be reported in the FY22 MS4 annual report and its associated MS4 geodatabase.

In response to MDE's July 30, 2021 comments, MDOT SHA completed analysis of benthic macroinvertebrate samples collected during the spring 2020 sampling index period as a component of BIO 4 and summarized associated data and Index of Biological Integrity calculations in Appendix F. In an MDE email communication to MDOT SHA on September 10, 2019, MDE expressed that placeholder values should not be used in the BiologicalMonitoring table of the MS4 geodatabase and that MDOT SHA should instead stagger (i.e., defer) its reporting of biological monitoring data in the MS4 geodatabase until the dataset for the given reporting year is complete. In accordance with that guidance and with conditions in Part IV.F.1.d of the MS4 Permit, MDOT SHA has provided Watershed Restoration Assessment information that matches what was submitted with the FY20 MS4 annual report in the BiologicalMonitoring table of the MS4 Geodatabase – Part 1. To complete reporting for BIO 4 monitoring activities, MDOT SHA will report benthic macroinvertebrate data from the spring 2020 sampling index period, summarized in Appendix F to this FY21 MS4 annual report, collectively with the fish sampling and habitat assessment data collected during the upcoming summer 2022 sampling index period as a single record in the BiologicalMonitoring table of the MS4 geodatabase submitted with the FY22 MS4 annual report.

On April 27, 2021, the United States Geological Survey (USGS) notified MDOT SHA that it had discovered an issue impacting ammonium, nitrite, and orthophosphate results for 16 samples collected at the Little Catoctin Creek stream restoration site and analyzed between March 2019

and June 2020 in association with the USGS gage numbers 0163688445 and 01636846. MDOT SHA notified MDE of this issue on June 10, 2021. On September 22, 2021 USGS notified MDOT SHA that the investigation has not yet been resolved and no values are expected to change regardless of the outcome. Although USGS has decided to flag these records as data of poor quality and remove them from the National Water Information System (NWIS) web portal, they acknowledged that the data may still have value for use in regulatory compliance if qualified with appropriate comments noting results may be biased high. MDOT SHA has decided to include theses data results within the ChemicalMonitoring table of the MS4 Geodatabase – Part 1 with specific qualifiers noted for each affected parameter in the GEN_COMMENTS data field in accordance with USGS recommendations. MDE should pay special attention to these data qualifiers before making its determination whether to use these data for further analysis. In response to MDE's aforementioned July 30, 2021 comments, MDOT SHA also coordinated with USGS during the first quarter of FY22 to obtain missing data for zinc and Biochemical Oxygen Demand and updated FY20 storm records in the ChemicalMonitoring table of the MS4 Geodatabase – Part 1.

As described in Section F.2 of the FY19 MS4 annual report, the construction schedule for the MDOT SHA-owned BMPs referenced in the MDE-approved monitoring plan for SWM Assessment is integrated with, and dependent on, the construction schedule for a Howard County bridge replacement project. The bridge replacement project design schedule was amended by the County in FY21 and the earliest potential construction start date is now August 2022. At the conclusion of FY20, MDOT SHA stopped work and deferred completion of its BMP design activities due to agencywide budget constraints resulting from the COVID-19 pandemic but funding has been allocated in FY22 budgets so that BMP design activities can resume and maintain alignment with the revised County bridge replacement project schedule.

MDOT SHA has fulfilled its SWM Assessment monitoring obligations by monitoring for at least two full years during the pre-construction period and consequently, did not perform any further pre-construction monitoring activities during FY21. MDOT SHA did not commit to any construction phase monitoring activities in the MDE-approved monitoring plan for SWM Assessment. Continuous flow measurements were performed throughout the pre-construction period and MDOT SHA evaluated the effects of continuous flow on channel geometry in its previously submitted MS4 annual reports. Hydrologic and/or hydraulic modeling was not performed in the fourth year of the MS4 Permit term, in accordance with conditions in Part IV.F.2.c, because the pre-requisite BMP construction did not initiate during the current MS4 Permit term.

Program Funding

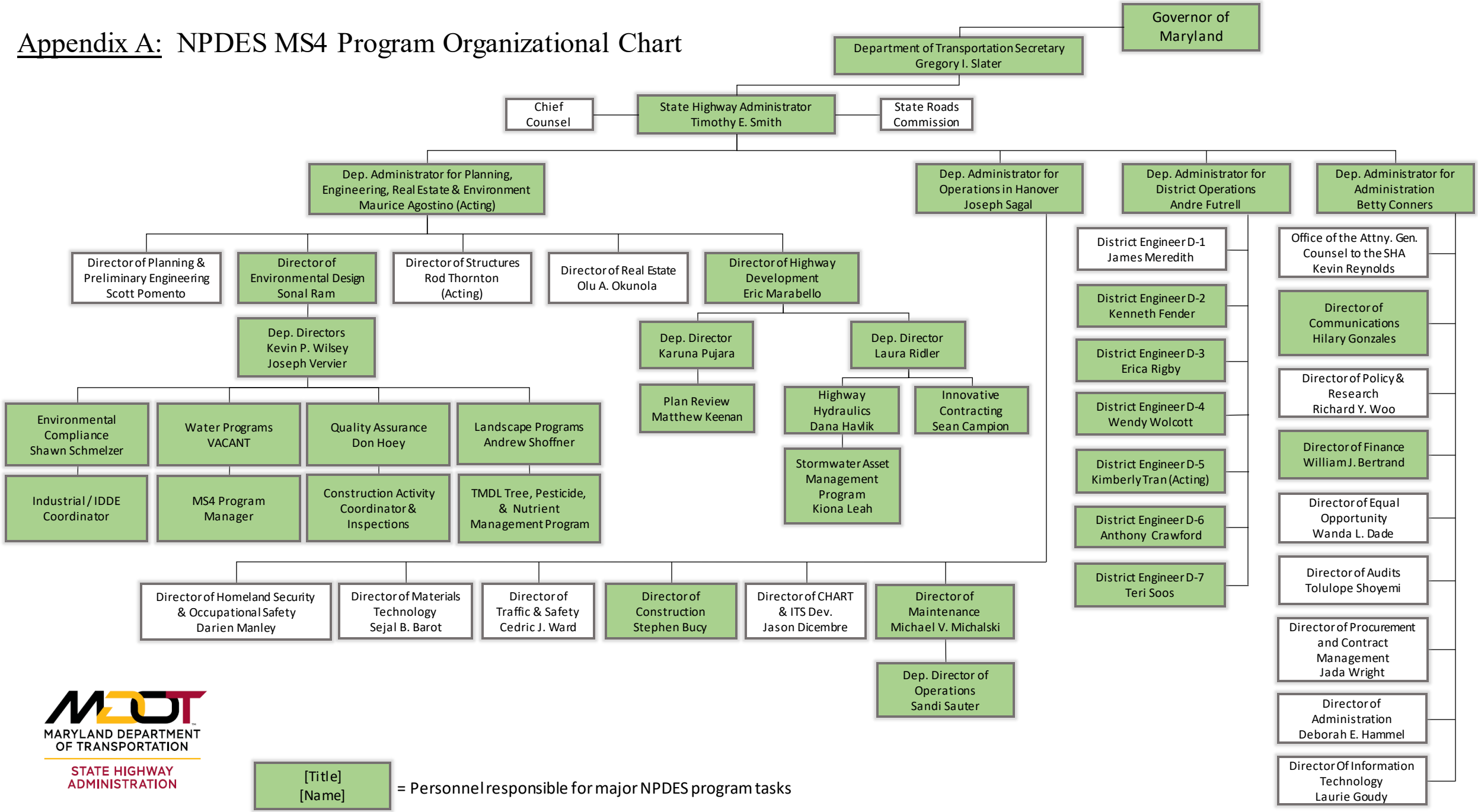
In accordance with conditions in Parts IV.G.1 and V.A.1.c of the MS4 Permit, MDOT SHA has provided program funding information in the FiscalAnalyses table of the MS4 Geodatabase – Part 1. **Table V.A.1.c** below contains a supplemental summary of this information.

Table V.A.1.c: MS4 Expenditures for FY21 and Proposed Budget for FY22

Fund	FY21 Expenditures (Millions*)	FY22 Budget (Millions*)
Fund 82 – TMDL/MS4	$31.0	$15.0
Fund 74 – Drainage	$6.1	$4.6
Fund 49 – Industrial	$0.09	$0.07
Operations/ Maintenance	$10.6	$11.5
Totals:	**$47.7**	**$31.2**
*Funding numbers are rounded to nearest $0.1 Million with the exception of Fund 49 which is rounded to the nearest $0.01 Million		

As described in Section G of the FY19 MS4 annual report, MDOT SHA does not impose fees or generate funding for watershed protection and restoration and all MS4 Program funding is sourced from the State Transportation Fund. The significant budget reductions for FY21 and FY22 periods is a consequence of impacts to the State Transportation Fund and the budget cuts described in the *Introduction* section to the FY20 MS4 annual report. Restrictions imposed on Maryland residents; by the State of Emergency Declaration issued by Governor Larry Hogan on March 5, 2020; remained in effect until July 1, 2021 and had significant impact on the State Transportation Fund and consequential funding availability for the MS4 Program during the FY21 reporting period.

Appendix A: NPDES MS4 Program Organizational Chart



MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

[Title]
[Name]
= Personnel responsible for major NPDES program tasks

Appendix B: Stormwater Preventative Maintenance Inspections and Remediation Summary

Table IV.D.1.d below represents the resolution schedule for failing stormwater BMPs that require maintenance. The table provides comments indicating status, identifies BMP remediation projects that may require additional approvals (such as a JPA permit or a small pond, dam safety, or NRCS Code 378 review), and provides commitment dates for maintenance completion.

Table IV.D.1.d: MDOT SHA SWM Facilities for Remediation Work Orders

SWM Facility Number	Facility Type	MDE Pass / Fail	Contract	Completion Commitment Date	Remediation Comments
020013	Wet pond	Fail	AX9295482[a]	6/30/2023[c]	Work Order Approved - Construction Pending Funding
020026	Wet pond	Fail	XX1725174[a]	9/30/2024[c]	Recommended for Retrofit
020048	Infiltration basin	Fail	XX1725174[a]	6/30/2026	BMP Added to List in FY20. Work Order Approved, Construction Pending Funding
020052	Infiltration basin	Fail		6/30/2025[c]	BMP Added to List in FY19
020061	Infiltration basin	Fail		9/30/2025[c]	
020090	Wet extended detention pond	Fail		6/30/2026	BMP Added to List in FY20
020092	Infiltration trench	Fail	AZ044A11[b]	9/30/2024[c]	In Design and Permitting Process
020094	Infiltration trench	Fail	XX1725174	6/30/2020	**FY20 Construction Complete**, Awaiting As-Builts
020103	Wet pond	Fail	XX1725174[a]	6/30/2025[c]	BMP Added to List in FY19, In Design and Permitting Process
020110	Wet pond	Fail	AX9295482[a]	6/30/2023[c]	Work Order Approved – Construction Pending Funding
020113	Wet pond	Fail			BMP Added to List in FY20
020114	Wet pond	Fail	XX1725174[a]	6/30/2025[c]	BMP Added to List in FY19, In Design and Permitting Process
020124	Wet pond	Fail	AX9295482[a]	6/30/2023[c]	Work Order Approved – Construction Pending Funding

Table IV.D.1.d: MDOT SHA SWM Facilities for Remediation Work Orders

SWM Facility Number	Facility Type	MDE Pass / Fail	Contract	Completion Commitment Date	Remediation Comments
020167	Dry pond	Fail		9/30/2023[c]	
020177	Dry swale	Fail		9/30/2024[c]	
020231	Infiltration trench	Fail		6/30/2025[c]	BMP Added to List in FY19
020244	Infiltration trench	Fail	AX3565274[b]	6/30/2024[c]	In Design and Permitting Process
020257	Wet pond	Fail	AX7665D82[b]	6/30/2025[c]	
020258	Infiltration basin	Fail	AA8225174	6/30/2021	**FY20 Construction Complete**, Awaiting As-Builts
020260	Infiltration basin	Fail	AA8225174	6/30/2021	**FY20 Construction Complete**, Awaiting As-Builts
020268	Infiltration basin	Fail	AA8225174	6/30/2021[c]	**FY21 Construction Complete,** Awaiting As-Builts
020271	Infiltration basin	Fail	AZ044A11[b]	6/30/2024[c]	BMP Added to List in FY19, In Design and Permitting Process
020272	Wet pond	Fail		6/30/2025[c]	BMP Added to List in FY19
020273	Dry pond	Fail		6/30/2026	BMP Added to List in FY20
020276	Wet pond	Fail	AX7665D82[b]	6/30/2025[c]	
020277	Wet pond	Fail		N/A	BMP Added to List in FY19, **BMP Abandoned**
020298	Wet pond	Fail		6/30/2026	BMP Added to List in FY20
020308	Infiltration trench	Fail	AZ044A11[b]	6/30/2024[c]	BMP Added to List in FY19, In Design and Permitting Process
020322	Infiltration trench	Fail	AZ044A11[b]	6/30/2024	BMP Added to List in FY20, In Design and Permitting Process
020338	Infiltration basin	Fail		9/30/2025[c]	
020339	Infiltration basin	Fail		6/30/2024[c]	
020357	Infiltration trench	Fail	AX9295482[a]	6/30/2023[c]	Work Order Approved – Construction Pending Funding
020363	Infiltration basin	Fail		9/30/2024[c]	
020388	Infiltration basin	Fail		9/30/2024[c]	
020393	Infiltration basin	Fail		6/30/2026	BMP Added to List in FY20
020394	Infiltration basin	Fail		9/30/2024[c]	

Table IV.D.1.d: MDOT SHA SWM Facilities for Remediation Work Orders

SWM Facility Number	Facility Type	MDE Pass / Fail	Contract	Completion Commitment Date	Remediation Comments
020396	Infiltration basin	Fail	XX1725174[a]	6/30/2023[c]	BMP Added to List in FY19, Work Order Approved – Construction Pending Funding
020399	Infiltration basin	Fail		6/30/2024[c]	
020403	Infiltration trench	Fail	XX1725174[a]	6/30/2023[c]	BMP Added to List in FY19, Work Order Approved – Construction Pending Funding
020406	Dry pond	Fail	XX1725174[a]	6/30/2024[c]	BMP Added to List in FY19, Recommended for Retrofit
020409	Infiltration trench	Fail	AZ044A11[b]	6/30/2024[c]	Recommended for Retrofit
020410	Infiltration trench	Fail	AZ044A11[b]	6/30/2024[c]	Recommended for Retrofit
020429	Infiltration trench	Fail	AX3565274[b]	6/30/2023[c]	In Design and Permitting Process
020480	Wet pond	Fail		6/30/2025[c]	BMP Added to List in FY19
020484	Infiltration trench	Fail	XX1725174[a]	6/30/2023[c]	BMP Added to List in FY19, Work Order Approved – Construction Pending Funding
020486	Wet pond	Fail	XX1725174[a]	6/30/2023[c]	BMP Added to List in FY19, Work Order Approved – Construction Pending Funding
020489	Infiltration basin	Fail	AZ044A11[b]	9/30/2025[c]	In Design and Permitting Process
020490	Infiltration trench	Fail	AX7665D82[b]	6/30/2019	**Remediation / Maintenance not completed on schedule; enforcement needed to rectify deficiencies**.
020494	Infiltration basin	Fail		6/30/2025[c]	
020514	Infiltration basin	Fail		6/30/2025[c]	
020516	Infiltration trench	Fail	XX1725174[a]	6/30/2023[c]	Work Order Approved – Construction Pending Funding
020517	Infiltration trench	Fail		6/30/2025[c]	
020520	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	Work Order Approved – Construction Pending Funding
020522	Wet pond	Fail		6/30/2025[c]	BMP Added to List in FY19
020532	Infiltration trench	Fail		6/30/2025[c]	BMP Added to List in FY19
020544	Wet pond	Fail		6/30/2025[c]	BMP Added to List in FY19
020561	Infiltration basin	Fail		6/30/2025[c]	

Table IV.D.1.d: MDOT SHA SWM Facilities for Remediation Work Orders

SWM Facility Number	Facility Type	MDE Pass / Fail	Contract	Completion Commitment Date	Remediation Comments
020565	Infiltration trench	Fail	AX3565274[b]	6/30/2023[c]	BMP Added to List in FY19, In Design and Permitting Process
020584	Wet extended detention pond	Fail		6/30/2025[c]	BMP Added to List in FY19
020603	Bioretention	Fail		6/30/2025[c]	BMP Added to List in FY19
020608	Bioretention	Fail		6/30/2025[c]	BMP Added to List in FY19
020747	Grass Swale	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
020757	Infiltration basin	Fail	XX1725174[a]	6/30/2023[c]	BMP Added to List in FY19, In Design and Permitting Process
020760	Infiltration basin	Fail	AZ044A11[b]	6/30/2023[c]	BMP Added to List in FY19, In Design and Permitting Process
020761	Infiltration basin	Fail		6/30/2025[c]	BMP Added to List in FY19
020764	Infiltration trench	Fail		6/30/2026	BMP Added to List in FY20
020774	Infiltration trench	Fail	XX1725174[a]	6/30/2024[c]	BMP Added to List in FY19, In Design and Permitting Process
020782	Infiltration trench	Fail	XX1725174[a]	6/30/2024[c]	BMP Added to List in FY19, In Design and Permitting Process
020787	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
020795	Infiltration trench	Fail	AX3565274[b]	6/30/2024[c]	BMP Added to List in FY19, In Design and Permitting Process
020801	Infiltration basin	Fail	AX7665D82[a]	N/A	**Abandonment pending**
020807	Infiltration trench	Fail		N/A	BMP Added to List in FY19, **BMP Abandoned**
020810	Infiltration trench	Fail		6/30/2025[c]	BMP Added to List in FY19
020811	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
020817	Surface sand filter	Fail		6/30/2025[c]	BMP Added to List in FY19
020818	Surface sand filter	Fail	AX7665D82[b]	6/30/2025[c]	
020820	Surface sand filter	Fail		6/30/2025[c]	BMP Added to List in FY19
020823	Infiltration basin	Fail	AX7665D82[b]	6/30/2024[c]	
020827	Wet pond	Fail	AZ044A11[b]	6/30/2024[c]	BMP Added to List in FY19, Recommended for Retrofit
020845	Infiltration basin	Fail	XX1725174[a]	6/30/2023[c]	BMP Added to List in FY19, In Design and Permitting Process

Table IV.D.1.d: MDOT SHA SWM Facilities for Remediation Work Orders

SWM Facility Number	Facility Type	MDE Pass / Fail	Contract	Completion Commitment Date	Remediation Comments
020850	Infiltration basin	Fail		9/30/2024[c]	
020875	Infiltration basin	Fail	XX1725174[a]	6/30/2024	BMP Added to List in FY20, In Design and Permitting Process
020880	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	BMP Added to List in FY19, In Design and Permitting Process
020892	Infiltration trench	Fail		N/A	BMP Added to List in FY19, **BMP Abandoned**
020893	Infiltration trench	Fail		N/A	BMP Added to List in FY19, **BMP Abandoned**
020896	Grass Swale	Fail		6/30/2024[c]	BMP Added to List in FY19
021012	Micropool extended detention pond	Fail		6/30/2026	BMP Added to List in FY20
021018	Infiltration basin	Fail		6/30/2026	BMP Added to List in FY20
021472	Bio-swale	Fail		6/30/2026	BMP Added to List in FY20
021473	Bio-swale	Fail		6/30/2026	BMP Added to List in FY20
021796	2A Grass swale	Fail		6/30/2026	BMP Added to List in FY20
022013	2A Grass swale	Fail		6/30/2026	BMP Added to List in FY20
022037	2A Grass swale	Fail		6/30/2026	BMP Added to List in FY20
022066	2A Grass swale	Fail		6/30/2026	BMP Added to List in FY20
030001	Grass Channel Credit	Fail	AX3565274[b]	6/30/2023[c]	In Design and Permitting Process
030005	Grass swale	Fail	AZ044A11[b]	6/30/2024	BMP Added to List in FY20, In Design and Permitting Process
030011	Wet pond	Fail	AZ044A11[b]	6/30/2024[c]	In Design and Permitting Process
030109	Infiltration Basin	Fail		6/30/2026	BMP Added to List in FY20
030113	Infiltration trench	Fail		6/30/2025[c]	BMP Added to List in FY19
030116	Infiltration basin	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
030124	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
030136	Infiltration basin	Fail		6/30/2024[c]	
030137	Infiltration basin	Fail		9/30/2025[c]	
030175	Dry pond	Fail		6/30/2024[c]	
030183	Infiltration basin	Fail		6/30/2025[c]	BMP Added to List in FY19
030189	Infiltration basin	Fail		9/30/2024[c]	

Table IV.D.1.d: MDOT SHA SWM Facilities for Remediation Work Orders

SWM Facility Number	Facility Type	MDE Pass / Fail	Contract	Completion Commitment Date	Remediation Comments
030198	Infiltration trench	Fail		6/30/2025[c]	BMP Added to List in FY19
030200	Infiltration basin	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
030214	Infiltration basin	Fail		9/30/2024[c]	
030215	Infiltration basin	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
030220	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
030227	Infiltration trench	Fail		6/30/2024[c]	BMP Added to List in FY19. BMP Failed Post Remediation, Recommended for Retrofit
030244	Infiltration trench	Fail		6/30/2026[c]	BMP Added to List in FY19. BMP Failed Post Remediation, Recommended for Retrofit
030245	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
030252	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	BMP Added to List in FY19, In Design and Permitting Process
030253	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	BMP Added to List in FY19, In Design and Permitting Process
030256	Infiltration trench	Fail	AX3565274[b]	6/30/2019	**Remediation / Maintenance not completed on schedule; enforcement needed to rectify deficiencies.** Remediation in Design and Permitting Process.
030269	Dry pond	Fail		6/30/2025[c]	BMP Added to List in FY19
030274	Infiltration trench	Fail		6/30/2024[c]	BMP Added to List in FY19
030284	Bioretention	Fail		6/30/2025[c]	BMP Added to List in FY19
030333	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
030385	Surface sand filter	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
030505	Micro-Bioretention	Fail		6/30/2025[c]	BMP Added to List in FY19
060104	Dry pond	Fail	AX7665D82[b]	N/A	**Site determined to be privately owned; removed from list in FY20.**
060106	Dry pond	Fail		6/30/2025	BMP Added to List in FY20
070003	Infiltration basin	Fail	AZ044A11[b]	6/30/2025	BMP Added to List in FY20, In Design and Permitting Process
070004	Infiltration basin	Fail	AZ044A11[b]	6/30/2025	BMP Added to List in FY20, In Design and Permitting Process

Table IV.D.1.d: MDOT SHA SWM Facilities for Remediation Work Orders

SWM Facility Number	Facility Type	MDE Pass / Fail	Contract	Completion Commitment Date	Remediation Comments
080007	Wet pond	Fail		6/30/2025[c]	
080019	Infiltration basin	Fail		6/30/2025[c]	BMP Added to List in FY19
080027	Wet Swale	Fail		6/30/2024[c]	BMP Added to List in FY19
080028	Wet Swale	Fail		6/30/2024[c]	BMP Added to List in FY19
080069	Wet pond	Fail		6/30/2024[c]	BMP Added to List in FY19
080070	Wet pond	Fail		6/30/2024[c]	BMP Added to List in FY19
080071	Wet pond	Fail		6/30/2024[c]	BMP Added to List in FY19
080074	Wet pond	Fail		6/30/2025[c]	BMP Added to List in FY19
082187	Underground detention	Fail		6/30/2026	BMP Added to List in FY20
100001	Bioretention	Fail		6/30/2026	BMP Added to List in FY20
100004	Surface sand filter	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
100012	Infiltration trench	Fail		6/30/2024[c]	BMP Added to List in FY19
100060	Infiltration basin	Fail	AX7665D82[b]	6/30/2025[c]	
100061	Infiltration basin	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
100065	Dry pond	Fail	AX9295482[a]	6/30/2023[c]	Work Order Approved - Construction Pending Funding
100099	Wet pond	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
100126	Grass swale	Fail	AZ044A11[b]	6/30/2023	BMP Added to List in FY20, Work Order Approved – Construction Pending Funding
100129	Wet swale	Fail		6/30/2024[c]	BMP Added to List in FY19
100143	Dry swale	Fail		6/30/2024[c]	BMP Added to List in FY19
100310	Bio-swale	Fail		6/30/2026	BMP Added to List in FY20
100471	Other filtering	Pass			**Per Latest Inspection, BMP is Functioning as Designed and Only Needs Minor Maintenance**
120008	Dry pond	Fail	AX7665D82[b]	6/30/2025[c]	
120009	Dry pond	Fail		6/30/2025[c]	
120017	Infiltration trench	Fail	AX3565274[b]	6/30/2023[c]	In Design and Permitting Process
120019	Infiltration trench	Fail		6/30/2025[c]	BMP Added to List in FY19
120039	Infiltration trench	Fail	HA4285174[b]	9/30/2024[c]	
120042	Infiltration trench	Fail	HA4285174[b]	9/30/2024[c]	

Table IV.D.1.d: MDOT SHA SWM Facilities for Remediation Work Orders

SWM Facility Number	Facility Type	MDE Pass / Fail	Contract	Completion Commitment Date	Remediation Comments
120063	Infiltration trench	Fail	AX3565274[b]	6/30/2025[c]	In Design and Permitting Process
120066	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	BMP Added to List in FY19, In Design and Permitting Process
120095	Infiltration basin	Fail		6/30/2025[c]	
120105	Dry extended detention pond	Fail		9/30/2025[c]	
120106	Infiltration trench	Fail		6/30/2024[c]	BMP Added to List in FY19
120112	Infiltration trench	Fail	AX3565274[b]	6/30/2023[c]	In Design and Permitting Process
120133	Infiltration basin	Fail		9/30/2025[c]	
120203	Wet extended detention pond	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
120208	Surface sand filter	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
120291	Wet pond	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
122335	2A Grass swale	Fail		6/30/2026	BMP Added to List in FY20
130013	Dry extended detention pond	Fail		6/30/2025[c]	BMP Added to List in FY19
130027	Dry extended detention pond	Fail		9/30/2025[c]	
130050	Infiltration basin	Fail		6/30/2025[c]	BMP Added to List in FY19
130072	Dry extended detention pond	Fail	AX7665282	9/30/2021[c]	Retrofit under construction
130073	Wet pond	Fail	AX7665282	9/30/2021[c]	Retrofit under construction
130074	Micropool extended detention pond	Fail	AX9295482[a]	9/30/2024[c]	Recommended for Retrofit
130077	Wet pond	Fail		9/30/2025[c]	
130078	Dry pond	Fail		6/30/2025[c]	BMP Added to List in FY19
130134	Wet pond	Fail		6/30/2025[c]	BMP Added to List in FY19
130136	Infiltration trench	Fail		6/30/2026[c]	BMP Added to List in FY19, BMP Failed Post Remediation, Recommended for Retrofit
130167	Infiltration basin	Fail	AX9295482[a]	6/30/2023[c]	Work Order Approved - Construction Pending Funding
130180	Grass Swale	Fail		6/30/2024[c]	BMP Added to List in FY19
130204	Infiltration basin	Fail	AX9295482[a]	6/30/2023[c]	Work Order Approved - Construction Pending Funding
130206	Wet pond	Fail		9/30/2025[c]	

Table IV.D.1.d: MDOT SHA SWM Facilities for Remediation Work Orders

SWM Facility Number	Facility Type	MDE Pass / Fail	Contract	Completion Commitment Date	Remediation Comments
130208	Infiltration trench	Fail	AX9295482[a]	6/30/2024[c]	Recommended for Retrofit
130210	Wet pond	Fail		6/30/2025[c]	BMP Added to List in FY19
130220	Dry extended detention pond	Fail		9/30/2025[c]	
130237	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	BMP Added to List in FY19, In Design and Permitting Process
130251	Surface sand filter	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
130259	Surface sand filter	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
130263	Surface sand filter	Fail		6/30/2025[c]	BMP Added to List in FY19
130271	Dry pond	Fail	AX7665D82[b]	6/30/2025 [c]	
130292	Other infiltration	Fail	AX9295482[a]	6/30/2023[c]	Work Order Approved - Construction Pending Funding
130294	Other infiltration	Fail	AX9295482[a]	6/30/2023[c]	Work Order Approved - Construction Pending Funding
130317	Infiltration trench	Fail		6/30/2024[c]	BMP Added to List in FY19
130319	Infiltration trench	Fail		6/30/2024[c]	BMP Added to List in FY19
130332	Infiltration trench	Fail		6/30/2024[c]	BMP Added to List in FY19
130341	Infiltration trench	Fail		6/30/2024[c]	BMP Added to List in FY19
130357	Infiltration trench	Fail		N/A	BMP Added to List in FY19, **BMP Abandoned**
130366	Infiltration trench	Fail		6/30/2024[c]	BMP Added to List in FY19, BMP Failed Post Remediation, Recommended for Retrofit
130369	Shallow marsh	Fail	AX9295482[a]	6/30/2023[c]	Work Order Approved - Construction Pending Funding
130375	Infiltration basin	Fail		N/A	**BMP is Privately Owned and Maintained**
130417	Grass Swale	Fail	AX9295482[a]	6/30/2023[c]	Work Order Approved - Construction Pending Funding
130421	Wet pond	Fail		6/30/2025[c]	
130544	Bio-Swale	Fail		6/30/2024[c]	BMP Added to List in FY19
130629	Bio-Swale	Fail		6/30/2024[c]	BMP Added to List in FY19
130631	Bio-Swale	Fail		6/30/2024[c]	BMP Added to List in FY19
130632	Bio-Swale	Fail		6/30/2024[c]	BMP Added to List in FY19

Table IV.D.1.d: MDOT SHA SWM Facilities for Remediation Work Orders

SWM Facility Number	Facility Type	MDE Pass / Fail	Contract	Completion Commitment Date	Remediation Comments
132056	Micro-Bioretention	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
150036	Infiltration trench	Fail		6/30/2025[c]	
150059	Wet pond	Fail		6/30/2025[c]	**BMP Removed by SHA Contract MO3515172**
150066	Dry pond	Fail		6/30/2025[c]	
150079	Infiltration basin	Fail	AZ044A11[b]	6/30/2026	BMP Added to List in FY20. In Design and Permitting Process
150081	Infiltration basin	Fail		6/30/2025[c]	
150201	Infiltration trench	Fail		6/30/2024[c]	BMP Added to List in FY19
150217	Infiltration basin	Fail		6/30/2024[c]	BMP Added to List in FY19
150232	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
150285	Dry pond	Fail		6/30/2025[c]	
150295	Bioretention	Fail	AX3565274[b]	6/30/2023[c]	In Design and Permitting Process
150304	Surface sand filter	Fail		6/30/2025[c]	
150312	Dry extended detention pond	Fail		9/30/2025[c]	
150348	Wet pond	Fail		6/30/2025[c]	BMP Added to List in FY19
150352	Dry pond	Fail	AZ044A11[b]	6/30/2023[c]	BMP Added to List in FY19, In Design and Permitting Process
150355	Wet pond	Fail		6/30/2025[c]	
150400	Dry pond	Fail		6/30/2025[c]	BMP Added to List in FY19
150638	Infiltration basin	Fail		N/A	BMP Added to List in FY19, **BMP Abandoned**
150643	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	BMP Added to List in FY19, In Design and Permitting Process
150650	Dry pond	Fail	AZ044A11[b]	6/30/2023[c]	BMP Added to List in FY19, In Design and Permitting Process
150680	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	BMP Added to List in FY19, In Design and Permitting Process
150706	Infiltration trench	Fail	AX3565274[b]	6/30/2023[c]	In Design and Permitting Process
150749	Other	Fail		6/30/2024[c]	BMP Added to List in FY19
150750	Other	Fail		6/30/2024[c]	BMP Added to List in FY19
151370	2A Grass swale	Fail		6/30/2026	BMP Added to List in FY20

Table IV.D.1.d: MDOT SHA SWM Facilities for Remediation Work Orders

SWM Facility Number	Facility Type	MDE Pass / Fail	Contract	Completion Commitment Date	Remediation Comments
160012	Infiltration trench	Fail		6/30/2026	BMP Added to List in FY20
160061	Wet pond	Fail		6/30/2024[c]	BMP Added to List in FY19
160126	Infiltration trench	Fail		6/30/2026	BMP Added to List in FY20
160127	Wet extended detention pond	Fail		6/30/2026	BMP Added to List in FY20
160131	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
160136	Infiltration trench	Fail		6/30/2026	BMP Added to List in FY20
160151	Infiltration trench	Fail	AZ044A11[b]	6/30/2026	BMP Added to List in FY20. In Design and Permitting Process
160176	Dry extended detention pond	Fail		6/30/2025[c]	
160181	Infiltration trench	Fail		6/30/2026	BMP Added to List in FY20
160187	Wet swale	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
160197	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	BMP Added to List in FY19, In Design and Permitting Process
160203	Shallow marsh	Fail		6/30/2024[c]	
160211	Infiltration trench	Fail		6/30/2026	BMP Added to List in FY20
160218	Dry pond	Fail		6/30/2026	BMP Added to List in FY20
160224	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
160225	Infiltration trench	Fail	AZ044A11[b]	9/30/2023[c]	In Design and Permitting Process
160230	Infiltration trench	Fail	AX3565274[b]	6/30/2023[c]	In Design and Permitting Process
160232	Infiltration trench	Fail	AX3565274[b]	6/30/2023[c]	In Design and Permitting Process
160246	Infiltration trench	Fail		6/30/2026	BMP Added to List in FY20
160247	Infiltration trench	Fail		6/30/2026	BMP Added to List in FY20
160250	Infiltration trench	Fail		6/30/2026	BMP Added to List in FY20
160301	Dry pond	Fail		6/30/2026	BMP Added to List in FY20
160305	Wet pond	Fail		6/30/2026	BMP Added to List in FY20
160351	Wet pond	Fail		6/30/2026	BMP Added to List in FY20
160378	Dry pond	Fail		6/30/2025[c]	
160402	Infiltration trench	Fail		6/30/2026	BMP Added to List in FY20
160408	Infiltration trench	Fail	AX3565274[b]	6/30/2023[c]	In Design and Permitting Process
160427	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process

Table IV.D.1.d: MDOT SHA SWM Facilities for Remediation Work Orders

SWM Facility Number	Facility Type	MDE Pass / Fail	Contract	Completion Commitment Date	Remediation Comments
160429	Infiltration trench	Fail	AZ044A11[b]	6/30/2023[c]	In Design and Permitting Process
160505	Wet pond	Fail	AZ044A11[b]	6/30/2024[c]	In Design and Permitting Process
160624	Infiltration trench	Fail		6/30/2024[c]	**BMP is Being Removed by Purple Line**
160662	Wet pond	Fail		6/30/2025[c]	BMP Added to List in FY19
160732	Wet pond	Fail		6/30/2026	BMP Added to List in FY20
160747	Wet extended detention pond	Fail	AZ044A11[b]	6/30/2024[c]	BMP Added to List in FY19, In Design and Permitting Process
160749	Infiltration trench	Fail		6/30/2023[c]	**BMP is Being Removed by Purple Line**
160806	Wet pond	Fail		6/30/2025[c]	
161953	2A Grass swale	Fail		6/30/2026	BMP Added to List in FY20
162131	2A Grass swale	Fail		6/30/2026	BMP Added to List in FY20
162242	2A Grass swale	Fail		6/30/2026	BMP Added to List in FY20
210003	Dry swale	Fail	XY1695174[a]	6/30/2023[c]	In Design and Permitting Process
210009	Infiltration basin	Fail	XY1695174[a]	6/30/2019	**Remediation / Maintenance not completed on schedule; enforcement needed to rectify deficiencies.** Remediation in Design and Permitting Process
210233	Dry Pond	Fail	XX1695174[a]	6/30/2025	BMP Added to List in FY20. In Design and Permitting Process
210938	Bio-swale	Fail		6/30/2026	BMP Added to List in FY20

[a] Refers to a contract that went to construction during FY19 or FY20 that had to be cancelled due to budgetary impacts. These facilities will be prioritized first when resources are allocated for construction.

[b] Refers to a charge number created during FY20 for which work began for design and permitting only. These facilities will be prioritized second when resources are allocated for construction.

[c] Completion commitment date changed due to unanticipated FY20/21 budget cuts.

Appendix C: Illicit Discharge Detection and Elimination Program Summaries

Table IV.D.3.a below summarizes primary and additional field screening efforts for the FY21 reporting period. In the MS4 geodatabase submitted with this FY21 MS4 annual report, MDOT SHA has provided the applicable IDDE program information in the IDDE associated table.

Table IV.D.3.a: Primary Field Screening Summary

County	Number of Outfalls Field Screened FY21	Discharges Requiring Follow-up
Harford	27	3
Prince Georges	88	12
Washington	38	0
Cecil	24	1
Totals	177	16

Table IV.D.3.b below summarizes information from the most recent quarterly facility inspection performed at each of the NPDES 12-SW permitted sites within the MDOT SHA MS4 Permit area. Included in the summary is a description of each issue identified during those inspections and the associated resolutions made by MDOT SHA during the FY21 reporting period.

Table IV.D.3.b: Summary of the Most Recent Quarterly Inspection for NPDES 12-SW Permitted Facilities

Facility Name	Quarter Number and Fiscal Year for Last Inspection	Date of Last Quarterly Inspection	Number of Issues Identified	Uploaded to Web-based Tracking (Yes or No)	Issue Details	Resolved? (Yes or No)	Comments
Cambridge	2nd QTR 2021	04/08/21	1	Yes	Erosion – Eroded area previously identified near permitted QVM sampling location was resolved during this quarter. Area was regraded. Cloth, riprap stone, seed, and Curlex™ was used by facility field technicians to repair the area.	Yes	Issue resolved by facility personnel; issue closed 4/13/2021. Area stabilized and ECD will continue to monitor.
Salisbury	2nd QTR 2021	05/07/21	0	N/A	N/A	N/A	N/A

Table IV.D.3.b: Summary of the Most Recent Quarterly Inspection for NPDES 12-SW Permitted Facilities

Facility Name	Quarter Number and Fiscal Year for Last Inspection	Date of Last Quarterly Inspection	Number of Issues Identified	Uploaded to Web-based Tracking (Yes or No)	Issue Details	Resolved? (Yes or No)	Comments
Elkton	2nd QTR 2021	04/09/21	4	Yes	1. Storm Water/Material Storage - Materials Not Stored Under Cover/Contained – Cold patch bags improperly stored near team leader bays and aggregate stockpiles. 2. Storm Water/Material Storage - Storage Pile Management Problems - Large pile of topsoil needs to be tarped or removed from site. 3. Storm Water/Material Storage- Salt Storage Not Appropriate - Excess salt should be swept from the lot and barriers placed across the entrance of the salt barn to prevent run off. 4. 1f Shop Storm Water/Material Storage- Vehicle Parking Areas Not Properly Maintained - Inadequate Stormwater controls under dripping vehicle in parking area.	3 of 4 issues resolved	1. Cold patch bags moved to indoor storage; issue closed on 4/9/2021. 2. Soil storage issue remains open as of 6/17/2021. 3. Salt swept from lot and new berms at building opening; issue closed on 6/17/2021. 4. Spill controls in place; issue closed on 4/9/2021.
Fairland	2nd QTR 2021	04/09/21	2	Yes	1. Storm Water/Material Storage - Materials Not Stored Under Cover/Contained - Exterior bucket of cold patch sitting on a trailer & small jug of unlabeled product sitting beside the salt barn. 2. Storm Water/Material Storage- Floatable Debris Not Properly Contained - Excessive trash in swale behind material storage bins.	Yes	1. Bucket of cold patch moved into Shop. Jug labeled and moved to storage; issue closed on 6/28/2021. 2. All trash picked up prior to mowing; issue closed on 6/31/2021.
Gaithersburg	2nd QTR 2021	04/14/21	1	Yes	Storm Water/Material Storage - Brine Tank and/or Maker Issue – Dripping leak from the brine maker resulting in a discharge to stormwater. The tank must be emptied, and the plumbing will need to be repaired.	Yes	Brine tank plumbing repaired, and leak stopped; issue closed on 6/21/2021.
Laurel	2nd QTR 2021	04/20/21	0	N/A	N/A	N/A	N/A

Table IV.D.3.b: Summary of the Most Recent Quarterly Inspection for NPDES 12-SW Permitted Facilities

Facility Name	Quarter Number and Fiscal Year for Last Inspection	Date of Last Quarterly Inspection	Number of Issues Identified	Uploaded to Web-based Tracking (Yes or No)	Issue Details	Resolved? (Yes or No)	Comments
Marlboro	2nd QTR 2021	04/16/21	2	Yes	1. Storm Water/Material Storage - Storage Pile Management Problems – Material Storage Area – Erodible materials such as topsoil and sand must be stored under cover (tarp or roof). 2. Storm Water/Material Storage - Brine Tank and/or Maker Problems - Brine maker is dripping brine which flows across the lot and leads to a stormwater inlet.	Yes	1. Sand that was found beyond the storage building threshold and in contact with stormwater wash pushed back into building and swept; issue closed on 6/30/2021. 2. Brine maker leak addressed by plumber; issue closed on 6/30/2021.
Golden Ring	2nd QTR 2021	04/27/21	3	Yes	1. Storm Water/Material Storage - Materials Not Stored Under Cover/Contained – Five-gallon pails of cold patch outside improperly stored in front of team leader bays and cold patch bags improperly stored near outside of 90-day waste area. 2. Storm Water/Material Storage- Floatable Debris Not Properly Contained -Trash behind 90-day pole barn and in swale. 3. Storm Water/Material Storage- Erosion and Sediment Controls Not Adequate – Rip rap stone being washed downstream on sloped area during heavy precipitation events.	No	1. Issue with storage of pails and bags of cold patch remains open as of 6/30/2021. 2. Issue with trash behind the 90-day pole barn remains open as of 6/30/2021. 3. Issue remains open with washed out riprap stone as of 6/30/2021.
Hereford	2nd QTR 2021	04/06/21	3	Yes	1. Storm Water/Material Storage- Storage Pile Management Problems – Sand found to be extending beyond roofline and must be placed back under cover. 2. Storm Water/Material Storage - Brine Tank and/or Maker Problems – Hose on brine tank is showing signs of leakage 3. Storm Water/Material Storage- Floatable Debris Not Properly Contained – Excessive sediment in lower lot needs to be swept up.	Yes	1. Sand pushed back under roofed area by loader; issue closed 5/21/21. 2. Brine hose replaced; issue closed on 5/12/2021. 3. Lower lot swept, and sediment removed; issue closed on 5/12/2021.

Table IV.D.3.b: Summary of the Most Recent Quarterly Inspection for NPDES 12-SW Permitted Facilities

Facility Name	Quarter Number and Fiscal Year for Last Inspection	Date of Last Quarterly Inspection	Number of Issues Identified	Uploaded to Web-based Tracking (Yes or No)	Issue Details	Resolved? (Yes or No)	Comments
Owings Mills	2nd QTR 2021	04/22/21	2	Yes	1. Storm Water/Material Storage- Brine Tank and/or Maker - Small leak at brine tank fitting requires repair. 2. Storm Water/Material Storage- Floatable Debris Not Properly Contained – Garbage on ground behind the site dumpster.	Yes	1. Brine leak at fitting corrected by Shop staff; issue closed on 5/6/2021. 2. Trash cleaned up by site personnel; issue closed on 5/6/2021.
Churchville	2nd QTR 2021	04/08/21	0	N/A	N/A	N/A	N/A
Annapolis	2nd QTR 2021	04/13/21	0	N/A	N/A	N/A	N/A
Glen Burnie	2nd QTR 2021	04/14/21	4	Yes	1. Storm Water/Material Storage - Materials Not Stored Under Cover/Contained – Cold patch buckets in gated area and 5-gallon buckets of transmission fluid improperly stored in contact with stormwater. 2. Storm Water/Material Storage - Storage Pile Management Problems – Stockpiled dirt next to VTDS station needs to be tarped and straw bales placed at sand bin. 3. Storm Water/Material Storage - Brine Tank and/or Maker Problems - Brine maker is leaking. 4. Storm Water/Material Storage - Floatable Debris Not Properly Contained – Debris outside of dumpsters and along fence line and trash outside of shop.	Yes	1. Cold patch and buckets removed from contact with stormwater; issue closed on 5/10/2021. 2. Tarp procured. Sand swept back into storage bin area and bermed; issue closed on 5/13/2021. 3. Brine maker leak addressed; issue closed on 5/7/2021. 4. Debris and trash cleaned up by facility personnel; issue closed on 5/12/2021.
Hanover	2nd QTR 2021	04/16/21	0	N/A	N/A	N/A	N/A

Table IV.D.3.b: Summary of the Most Recent Quarterly Inspection for NPDES 12-SW Permitted Facilities

Facility Name	Quarter Number and Fiscal Year for Last Inspection	Date of Last Quarterly Inspection	Number of Issues Identified	Uploaded to Web-based Tracking (Yes or No)	Issue Details	Resolved? (Yes or No)	Comments
LaPlata	2nd QTR 2021	04/05/21	2	Yes	1. Storm Water/Material Storage - Salt Storage Not Appropriate – Tarp is ripped exposing hole in dome roof. Salt is leaching toward stormwater pond from dome and leaching under straw bales. 2. Storm Water/Material Storage - Brine Tank and/or Maker Problems - Salt accumulation around connections indicating potential leaks.	Yes	1. Tarp replaced, and berm materials replaced; issue closed on 5/17/2021. 2. Brine tank fitting tightened and replaced; issue closed on 5/4/2021.
Hagerstown	2nd QTR 2021	04/13/21	0	N/A	N/A	N/A	N/A
Frederick	2nd QTR 2021	04/08/21	2	Yes	1. Storm Water/Material Storage - Storage Pile Management Issue – Sediment found in lot in small pile in front of aggregate stockpiles bins. 2. Storm Water/Material Storage - Vehicle Parking Areas Not Properly Maintained - Equipment found dripping without a drip pan.	Yes	1. Sediment cleaned by facility staff; issue closed on 4/20/2021. 2. Leaking equipment removed from contact with stormwater; issue closed on 4/8/2021.
Thurmont	2nd QTR 2021	04/27/21	0	N/A	N/A	N/A	N/A
Dayton	2nd QTR 2021	04/05/21	2	Yes	1. Storm Water/Material Storage - Salt Storage Not Appropriate – Salt needs to be pushed back into barn and out of contact with stormwater. 2. Storm Water/Material Storage - Floatable Debris Not Properly Contained – Trash identified around aggregate stockpiles and storage trailer.	No	1. Issue with salt piles extending beyond the storage building threshold remain as of 6/30/2021. 2. Issue with trash around aggregate stockpiles and storage trailer remain as of 6/30/2021.
Westminster	2nd QTR 2021	04/06/21	1	Yes	Storm Water/Material Storage - Salt Storage Not Appropriate – Salt extending beyond storage barn threshold needs to be pushed back under cover.	No	Issue with salt piles extending beyond the storage building threshold remain as of 6/30/2021.

Table IV.D.3.d below summarizes the illicit discharges (IDs) that required follow-up during the FY21 period. Included in this summary are the discharges requiring follow-up that are referenced in Table IV.D.3.a above.

Table IV.D.3.d: Illicit Discharges Requiring Further Investigation During Reporting Period

Reference No.	County	MDOT SHA Structure or BMP#	Date of ID	Potential Pollutant	Status
1	Prince Georges	1600828.001	5/15/2020	pH & Copper	Closed following MDE feedback
2	Harford	1200366.001	6/3/2020	Chlorine	Closed following County notification
3	Harford	1203856.001	6/3/2020	Chlorine	Closed following County notification
4	Baltimore	300806.001	6/4/2020	Chlorine	Closed following Baltimore City DPW Inquiry
5	Charles	807019.001	6/24/2020	pH & Phenols	Closed following County notification
6	Harford	1201804.001	5/26/2021	Detergents & foam	Open referred to County
7	Prince Georges	1601694.001	4/20/2021	Copper	Open pending further evaluation
8	Prince Georges	1601944.001	4/29/2021	Detergents	Open pending further evaluation
9	Prince Georges	1601989.001	4/28/2021	Copper	Open pending further evaluation
10	Prince Georges	1602000.001	4/28/2021	Copper	Open pending further evaluation
11	Prince Georges	1602015.001	4/28/2021	Copper	Open pending further evaluation
12	Prince Georges	1602483.001	5/18/2021	Copper	Open pending further evaluation
13	Prince Georges	1602499.001	5/19/2021	Copper	Open pending further evaluation

Table IV.D.3.d: Illicit Discharges Requiring Further Investigation During Reporting Period

Reference No.	County	MDOT SHA Structure or BMP#	Date of ID	Potential Pollutant	Status
14	Prince Georges	1602690.001	4/23/2021	pH	Open pending further evaluation
15	Prince Georges	1602700.001	4/23/2021	pH	Open pending further evaluation
16	Prince Georges	1603274.001	4/20/2021	Copper	Open pending further evaluation

A potential ID was reported to the MDOT SHA Water Programs Division by a member of Clean Streams, LLC while performing stream assessment work in Temple Hills, Maryland. Clean Streams, LLC reported observing algal growth and persistent foaming in the stream in the MDOT SHA right-of-way. As a result, the Environmental Compliance Division (ECD) performed an IDDE inspection at MDOT SHA structure #1600416.001 on June 1, 2021. This structure was identified as being located just upstream of the reported water quality issue. Upon screening, no visual or testing parameters were exceeded. This site is not captured in Table IV.D.3.d above because the structure did not yield an ID; however, it is included in this narrative summary because it was screened as a direct result of a citizen report.

The following updates summarize the jurisdiction contacts/resolution schedule for IDs whose status was designated as "open" or "reopened" in previously submitted MS4 annual reports as well as any FY21 ID's that required investigation as a result of field screening. Updates below are numbered in alignment with the "Reference No." field of Table IV.D.3.d above.

1. Beginning in the FY18 annual report, MDOT SHA reported an ID located in Prince George's County at structure #1600828.001, which discharges into structural BMP# 160660. This ID was identified in a commercially developed area along the on-ramp to Interstate 495 from Ritchie Marlboro Road in Largo, MD. Since the initial identification, ECD has repetitively worked with Prince George's (PG) County code enforcement to eliminate the ID. PG County initially performed site visits, compiled stormwater mapping, and met with property owners. However, it appears as though no responsible party was identified, and no resolution has yet occurred. During the FY20 reporting period, ECD performed an additional follow up inspection and field testing. This follow up effort was conducted on May 15, 2020, and confirmed that issues with dry weather flow, low pH, and copper remain. MDE's Water and Science Administration, Compliance Program contacted MDOT SHA

during June 2020 and confirmed that they were working with County representatives to gather additional information and address the discharge. Consequently, this previously identified ID was considered closed and not reinspected during FY21.

2. As a result of FY20 primary outfall screening, structure #1200366.001, which is located near the intersection of US 40 and Mountain Road in Harford County, possessed high rates of dry weather flow. Following sampling and testing, this location was found by field staff to exceed the established chlorine action limit (<0.40 mg/l) and is indicative of an underground potable water line break. On June 12, 2020, ID investigation findings were sent to the County representatives requesting assistance with correction. Following further communication, the Harford County Superintendent of Water & Sewer Facilities submitted an email to MDOT SHA on November 10, 2020 indicating that the water line issue that caused the chlorinated discharge into structure #1200366.001 had been fully repaired. Based on this correspondence, this ID was considered closed and was not rescreened during FY21.

3. As a result of FY20 primary outfall screening, structure #1203856.001, which is located near the intersection of Porter Drive and Emmorton Road in Harford County, possessed dry weather flow. Initial primary screenings were performed on May 20th and 21st, 2020. Both inspections yielded elevated chlorine levels. Following this internally reported ID, MDOT SHA directed the Maryland Environmental Service (MES) to perform a follow up investigation and determine the source. On June 3, 2020, MES field inspectors visited the site and inspected the structure. Again, dry weather flow was found; however, MES found that chlorine was only detected below action levels. As a BMP, this location was also reported to Harford County on June 12, 2020. Following further communication, the Harford County Superintendent of Water & Sewer Facilities submitted an email to MDOT SHA on November 10, 2020 indicating that the water line issue that caused the chlorinated discharge into structure #1203856.001 had been fully repaired. Based on that correspondence, this ID was considered closed and was not rescreened during FY21.

4. In the FY19 MS4 annual report, MDOT SHA structure #0300806.001 was identified as ID. The structure, located near to 5212 Baltimore National Pike, was originally found to have clear, clean flow at a moderate rate of speed during dry weather conditions. To ensure that the chlorinated discharge was addressed, MDOT SHA added this location to the list of FY20 screenings. On June 4, 2020, rescreening of this open ID occurred. Both dry weather flow and chlorine levels above the action limit (<0.40 mg/l) were detected. The FY20 findings were immediately reported to Baltimore County. On June 16, 2020, the Baltimore County Bureau of Utilities responded to the notification. The Bureau of Utilities indicated that the water main break was verified and forwarded to Baltimore City for correction under work order #356584. MDOT SHA contacted the Baltimore City DPW customer service by phone and confirmed that the work order had been completed. Following that confirmation, the ID was considered closed and was not rescreened during FY21.

5. During FY20 primary screenings, structure #0807019.001, located along Route 301 in Charles County, was found by field staff to exceed the established phenol detection limit (<0.17 mg/l). Follow up inspections verified the ID yielded lower phenol levels, but an acidic pH. Inspectors were able to track dry weather flow back to the source, which appeared to be a nearby car dealership. MDOT SHA does not possess jurisdiction to pursue this matter further with private landowners so the issue was referred to Charles County on June 29, 2020 for assistance with correction. MDOT SHA received a response from the Charles County Codes Superintendent during July 2020 communicating that the county performed further field sampling and testing. The County found that exterior car washing was sporadically occurring. This activity was suspected as the cause of detected water quality issues. The Codes Superintendent met with the landowner to correct the matter. A letter of violation and educational outreach materials were also sent by the County for immediate correction. Based on this correspondence, this ID was considered closed and was not rescreened during FY21.

6. During FY21 primary screenings, structure #1201804.001, located along Philadelphia Road (Maryland 7) in Harford County, was determined to exceed the established detergent threshold of 1.5 mg/l. Sample field test results also yielded low levels of phenols and chlorine. Inspectors noted visual and olfactory issues indicating the presence of sewage at the site. The details of this detected ID were sent to the Harford County Health Department for correction on June 30, 2021. MDOT SHA is currently working with the County Assistant Environmental Health Director to address the ID. Until MDOT SHA can confirm with the County that this reported ID has been corrected, it will remain in "open" status. If the ID cannot be confirmed as "closed" before the next reporting period begins, the site will be added to the queue and rescreened during the FY22 primary screenings.

7. During FY21 primary screenings, structure #1601694.001; located along Central Avenue near the intersection with Shady Glen Drive in Capital Heights, Maryland; was determined to be an ID. Sample field tests determined that copper concentration in dry weather discharge was 0.66 mg/l. This concentration exceeds the established threshold for that pollutant. At the time of inspection, a strong ammonia and petroleum odor and discoloration was detected by inspectors which originated from the receiving water body. The MDOT SHA structure discharge was not the cause of the observed water quality issues. However, field inspectors contacted the MDE emergency response telephone number and reported the findings on April 20, 2021. Due to observed budget shortfalls as a result of the COVID-19 pandemic, limited resources were available to complete screenings. This ID location requires an additional site visit and investigation to determine the source of the ID. This location will remain in "open" status until MDOT SHA can perform needed follow up investigations and work with County and state officials to address the source.

8. During FY21 primary screenings, structure #1601944.001; located along Central Avenue in Capital Heights, Maryland; was determined to be an ID. This site is located near to the intersection of Central Avenue and Davey Street just before reaching the District of Columbia. Sample field testing yielded 1.23 mg/l concentration for detergents at this site location. This

concentration exceeds the established threshold for this pollutant. Due to observed budget shortfalls as a result of the COVID-19 pandemic, limited resources were available to complete screenings. This ID location requires an additional site visit and investigation to determine the source of the ID. This location will remain in "open" status until MDOT SHA can perform needed follow up investigations and work with County and State officials to address the source.

9. During FY21 primary screenings, structure #1601989.001; located along Central Avenue in Bowie, Maryland; was determined to be an ID. This site is located near to the intersection of Central Avenue and Campus Way. Sample field testing found the concentration of copper to be 0.22mg/l which just exceeds the established limit of 0.21 mg/l. Due to observed budget shortfalls as a result of the COVID-19 pandemic, limited resources were available to complete screenings. This ID location requires an additional site visit and investigation to determine the source of the ID. This location will remain in "open" status until MDOT SHA can perform needed follow up investigations and work with County and State officials to address the source.

10. During FY21 primary screenings, structure #1602000.001; located along Central Avenue in Bowie, Maryland; was determined to be an ID. This site is located near the intersection of Central Avenue and Kettering Drive just west of site #1601989.001. Sample field testing found the concentration of copper to be 0.37 mg/l which exceeds the established limit of 0.21 mg/l. Due to observed budget shortfalls as a result of the COVID-19 pandemic, limited resources were available to complete screenings. This ID location requires an additional site visit and investigation to determine the source of the ID. This location will remain in "open" status until MDOT SHA can perform needed follow up investigations and work with County and State officials to address the source.

11. During FY21 primary screenings, structure #1602015.001; located along Central Avenue in Mitchellville, Maryland; was determined to be an ID. This site is located near to the intersection of Central Avenue and Michaels Drive. Sample field testing found the concentration of copper to be 1.48 mg/l which exceeds the established limit of 0.21 mg/l. Inspectors also noted that this site flow contained low levels of detergents and chlorine. However, both pollutants did not exceed established limits. Due to observed budget shortfalls as a result of the COVID-19 pandemic, limited resources were available to complete screenings. This ID location requires an additional site visit and investigation to determine the source of the ID. This location will remain in "open" status until MDOT SHA can perform needed follow up investigations and work with County and State officials to address the source.

12. During FY21 primary screenings, structure #1602483.001; located along Crain Highway in Bowie, Maryland; was determined to be an ID. This site is located near to the intersection of Crain Highway and Excaliber Road. Sample field testing found the concentration of copper to be 0.49 mg/l which exceeds the established limit of .0.21 mg/l. Due to observed budget shortfalls as a result of the COVID-19 pandemic, limited resources were available to complete screenings. This ID location requires an

additional site visit and investigation to determine the source of the ID. This location will remain in "open" status until MDOT SHA can perform needed follow up investigations and work with County and State officials to address the source.

13. During FY21 primary screenings, structure #1602499.001; located along Crain Highway in Bowie, Maryland; was determined to be an ID. This site is located near to the intersection of Crain Highway and Harbour Way. Sample field testing found the concentration of copper to be 0.93 mg/l which exceeds the established limit of 0.21 mg/l. Inspectors also noted that this site flow contained foam and low levels of detergents and chlorine. However, both pollutants did not exceed established limits. Due to observed budget shortfalls as a result of the COVID-19 pandemic, limited resources were available to complete screenings. This ID location requires an additional site visit and investigation to determine the source of the ID. This location will remain in "open" status until MDOT SHA can perform needed follow up investigations and work with County and State officials to address the source.

14. During FY21 primary screenings, structure #1602690.001; located along Croom Road in Upper Marlboro, Maryland; was determined to be an ID. This site is located near to the intersection of Croom Road and Nottingham Road. Sample field testing found a pH value of 6.2 which is outside of the established limit. Due to observed budget shortfalls as a result of the COVID 19 pandemic, limited resources were available to complete screenings. This ID location requires an additional site visit and investigation to determine the source of the ID. This location will remain in "open" status until MDOT SHA can perform needed follow up investigations and work with County and State officials to address the source.

15. During FY21 primary screenings, structure #1602700.001; located along Croom Road in Upper Marlboro, Maryland; was determined to be an ID. This site is located near to the intersection of Croom Road and Molly Berry Road. Sample field testing found a pH value of 6.2 which is outside of the established limit. Due to observed budget shortfalls as a result of the COVID 19 pandemic, limited resources were available to complete screenings. This ID location requires an additional site visit and investigation to determine the source of the ID. This location will remain in "open" status until MDOT SHA can perform needed follow up investigations and work with County and State officials to address the source.

16. During FY21 primary screenings, structure #1603274.001; located along the ramp to Crain Highway northbound in Bowie, Maryland; was determined to be an ID. This structure discharges into a stormwater pond that can be accessed from 4801 Tesla Drive. Sample field testing found the concentration of copper to be 0.22mg/l which just exceeds the established limit of 0.21 mg/l. Due to observed budget shortfalls as a result of the COVID-19 pandemic, limited resources were available to complete screenings. This ID location requires an additional site visit and investigation to determine the source of the ID. This location will remain in "open" status until MDOT SHA can perform needed follow up investigations and work with County and state officials to address the source.

Appendix D: Public Education Programs

In accordance with Part V.A.1.d of the MS4 Permit, MDOT SHA provides the following summary describing its public education programs implemented during the FY21 reporting period in accordance with conditions in Parts IV.D.4 and IV.D.6 of the MS4 Permit.

Earth Day

Organization of activities to celebrate Earth Day continued to be impacted by the COVID-19 pandemic during FY21 but alternative electronic education initiatives that began during FY20 persisted. Beginning on April 15, 2021, MDOT disseminated email newsletters to its workforce of more than 11,000 individuals to engage them in Earth Day activities. The first of these titled, "Earth Day 2021 Theme: Restore Our Earch", has been provided below.

MDOT MARYLAND DEPARTMENT OF TRANSPORTATION

Earth Day 2021 Theme:

Restore Our Earth

It's April, and that means we will be celebrating Earth Day!

This year's Earth Day Theme is ***Restore our Earth***.

MDOT's Commitment to Protect our Earth

MDOT is committed to minimizing adverse impacts, conserving natural resources, and integrating sustainability into all aspects of transportation systems. This month we will be highlighting ways MDOT's projects protect or restore the environment, reduce pollution, and uplift the community. To learn more about Earth Day visit the below link:

https://www.earthday.org/earth-day-2021/

Composting at MDOT Facilities

As we have highlighted in past newsletters, MDOT TBUs have made efforts to protect the earth via various methods including recycling, waste reduction, and reuse of materials. One method of reusing materials is composting. Certain facilities at MDOT SHA and MDOT MAA process hundreds of tons of grass, leaves, brush, branches, mixed yard, and wood trimmings. For example:

- **MDOT MAA:** Collected tree trimmings and yard waste as part of maintenance in and around the ~3,600-acre airport facility including along the 20-mile bike path. Some materials are mulched onsite, stored in the BWI mulch yard, and then delivered to the local Anne Arundel County landfill. The mulch is made available to residents free of charge. Deliveries of leaves, grass, and other yard wastes transferred to the landfill are ground into smaller pieces, managed and monitored over the course of a few months until decomposition is complete and compost is produced.

- **MDOT SHA Westminster Facility:** As part of regular maintenance, tree trimming crews collect from the road right of way. Most tree trimmings are ground and delivered directly to the Carroll County Northern Landfill or a commercial composting facility site in Woodbine, Maryland. The composted materials can then be used as garden products, mulch, and SHA specified topsoil.

Pictures of compost processing from tree trimmings and yard waste collected by MDOT and sent to the WeCare Woodbine, Maryland site.

MDOT Earth Day Activities

Throughout this month and beyond, MDOT TBUs will hold various activities to help focus on the protection and/or restoration of Maryland's natural habitats and bring attention to the importance of the environment. Some activities* are listed below:

- **MPA:** Masonville Cove will host several activities throughout the month.
  - Saturday, April 24: Project Clean Stream, shoreline clean up, open to the public (hosted by National Aquarium, click here to pre-register for this event)
  - Through April 30: Book Walk on trail to Captain Trash Wheel "Call Me Tree" for readers 6-10 years old, (English/Spanish)
  - March–mid-May: 2021 Cache Across America 17th Annual Challenge, one of 10 site across Maryland (https://www.mdgps.org)

- **MDTA:** Virtual events and talks all month long (via MS Teams). The link to the live events will be posted at MDOT Environment's intranet site on the morning of the event.
  - Thursday, April 15: Talk on Spotted Lantern Fly and Stream Restoration (10:00am - 11:00am).
  - Tuesday, April 20: Jug Bay & Citizen Science Project/Efforts (10:00am - 11:00am)
  - Annual Recycled Art Contest for MDTA employees - virtual submittals due by May 31, 2021.

- **TSO:** The 2021 Environmental Excellence Awards are annually hosted by MDOT TSO. These Awards recognize notable achievements in environmental compliance and sustainable practices across MDOT. Awards will be given for the following categories: *Sustainability, Environmental Quality,* and *Environmental Hero.* Nominations are due by Friday, April 16, 2021.

- **MDOT-wide:** April is also Flood Awareness month!

- MDOT is working alongside other state agencies and organizations to educate Marylanders about potential hazards associated with flooding.
- MDOT is also working to mitigate flooding by building more resilient transportation infrastructure and Restore the Earth via natural processes.
- Info about associated events can be found here.

*Sponsors of the events noted in this email are responsible for complying with the latest State and Local Public Health Guidance related to the COVID-19 Pandemic.

We Would Love to Hear From You

What are Your Plans for April?

Please tell us about your individual efforts to help ***Restore our Earth***. Please send us pictures and/or videos of what you like to do outside: gardening, planting a tree, hiking, going to the park, volunteer activities, etc. We would love to highlight MDOT employees and your connection to nature. And if you're looking for a clean-up activity to participate in this month, check out this site for searching events affiliated with Earth Day: Great Global Cleanup*

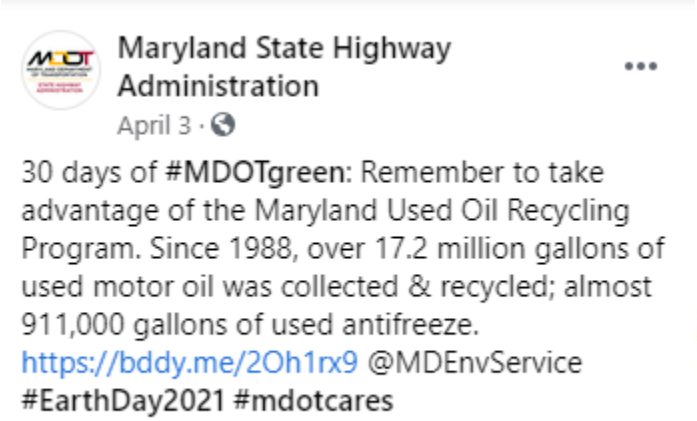
To tell us about your activities, click the comment button below:

Comment

Keep an eye out for more e-mails over the next few weeks about MDOT's environmental efforts!

Social Media

MDOT SHA leveraged the social media platform, Facebook, in FY21 during MDOT's "30 Days of #MDOTgreen" program to increase the reach of its environmental education initiatives. Posts included, but were not limited to, information about MDOT SHA's Bay Restoration efforts and the used oil and antifreeze recycling program administered by the Maryland Environmental Service. See below for copies of the two referenced examples.



Keep Maryland Beautiful Grant Program

Maryland Environmental Trust awarded 91 *Keep Maryland Beautiful* (KMB) grants in 2021 to support the removal of thousands of pounds of litter and the revitalization of public lands and waterways. Four different grants were offered to help volunteer and nonprofit groups, communities, and land trusts support environmental education projects, litter removal, citizen stewardship, and solve natural resource issues in urban and rural areas. Funding for the KMB grants program is provided by MDOT, Maryland Department of Housing and Community Development, the Forever Maryland Foundation, and Maryland Environmental Trust. MDOT

pledged $50,000 a year to the program for five years (starting in FY18) totaling $250,000. More information regarding KMB grants can be found online at:

https://forevermaryland.org/grants-page

Bike to Work Day

FY21 marked the return of Bike to Work Day for the Baltimore Region as MDOT SHA celebrated the 20th Anniversary of the event on March 21, 2021. This event celebrates bicycling as a healthy commuting option while promoting its environmental benefits. Riders who registered for Bike to Work Week 2021 and rode during the week of March 17-23 could pick up a free t-shirt at over a dozen area bike shops (open to the first 1,500 registrants) and had a chance to win prizes. Riders could sign up for the *Bike Month Global Challenge* to participate in a friendly month-long competition and become eligible to win even more prizes. The MDOT SHA Secretary Gregory Slater sent notice in early May 2021 to all MDOT SHA employees informing them of the event and how to participate. For more information, please visit the official website at:

biketoworkmd.com.

Community Outreach

During FY21, MDOT SHA launched numerous projects for goals as various as improving paths for pedestrians and bicyclists, preventing flooding, and improving stormwater management systems. To inform the public and engage stakeholders during project planning and construction, MDOT SHA reached out to individual communities to prepare them for upcoming work near them and to solicit their feedback. Attached to this Appendix D are two examples of community outreach fliers sent during FY21 for these intents and purposes.

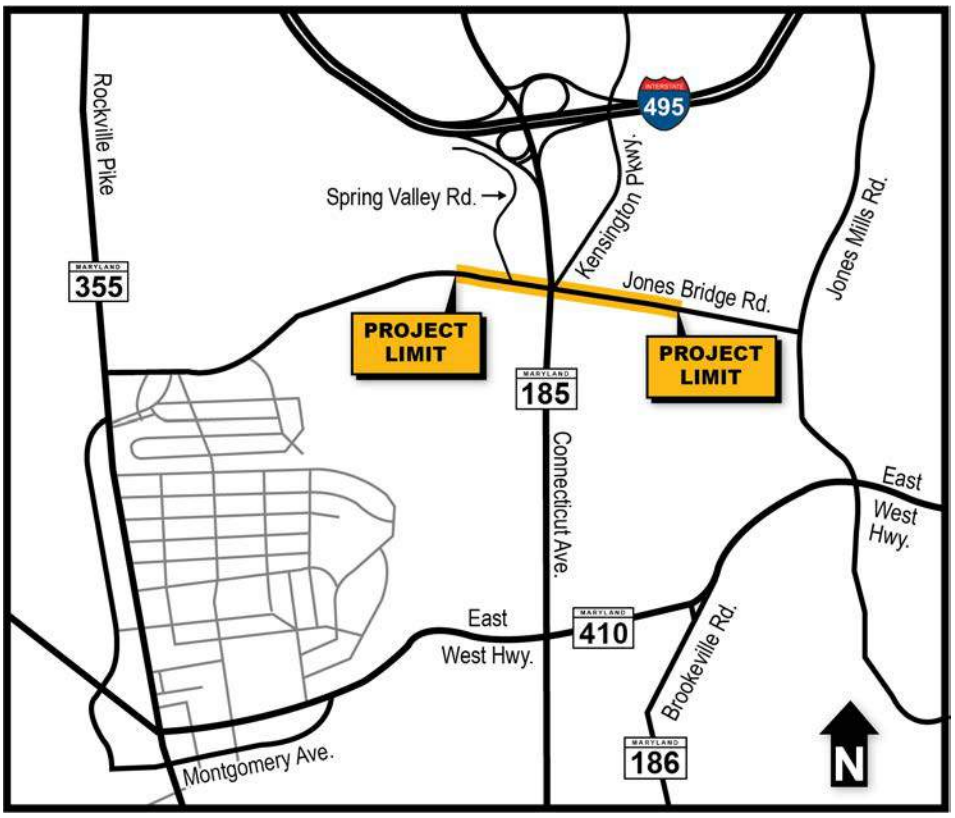
MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

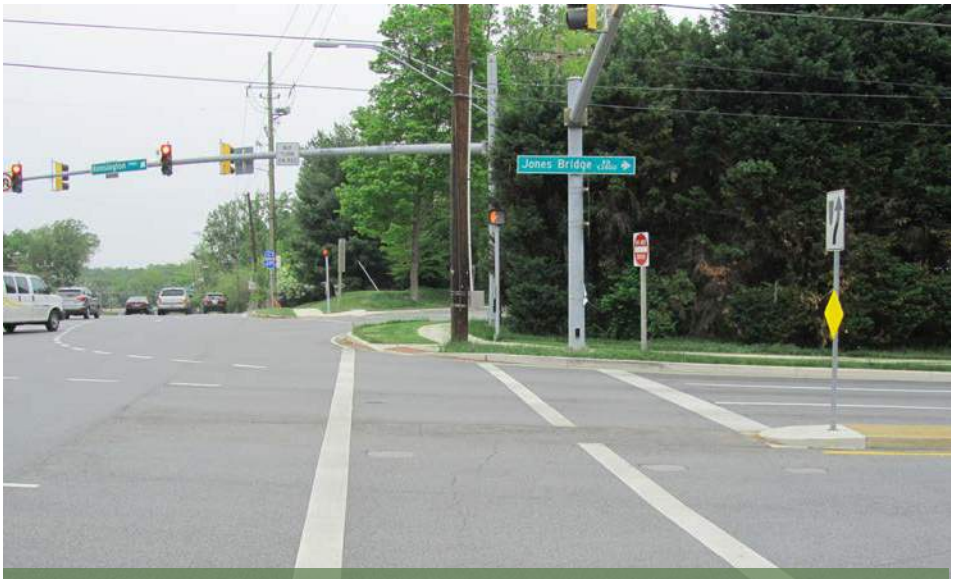
MD 185 at Jones Bridge Road / Kensington Parkway - Phase 3
BRAC Intersection Improvements

Construction to Begin February 2021; Virtual Public Meeting Scheduled

The Maryland Department of Transportation State Highway Administration (MDOT SHA) invites you to attend a virtual pre-construction informational meeting about the Base Realignment and Closure (BRAC) intersection improvement project on MD 185 (Connecticut Ave) at Jones Bridge Road / Kensington Parkway in Montgomery County. Work is scheduled to begin February 2021. Progress permitting, the project should be complete by late summer 2023.

A virtual pre-construction informational meeting will be held on Microsoft Teams, Wednesday, February 17th at 6:00 p.m. CLICK HERE TO ATTEND THE MEETING at that time. The meeting will familiarize you with the project. Representatives of MDOT SHA will be available to answer project-related questions. Attendees will also have an opportunity to leave comments and ask questions in an online comment form, located under Community Outreach and Newsletters on the Project Portal page **here** or via the QR code below. We encourage you to send questions and comments in advance so that we may address them during the virtual meeting.





MD 185 (Connecticut Ave.) and Kensington Pkwy. Intersection

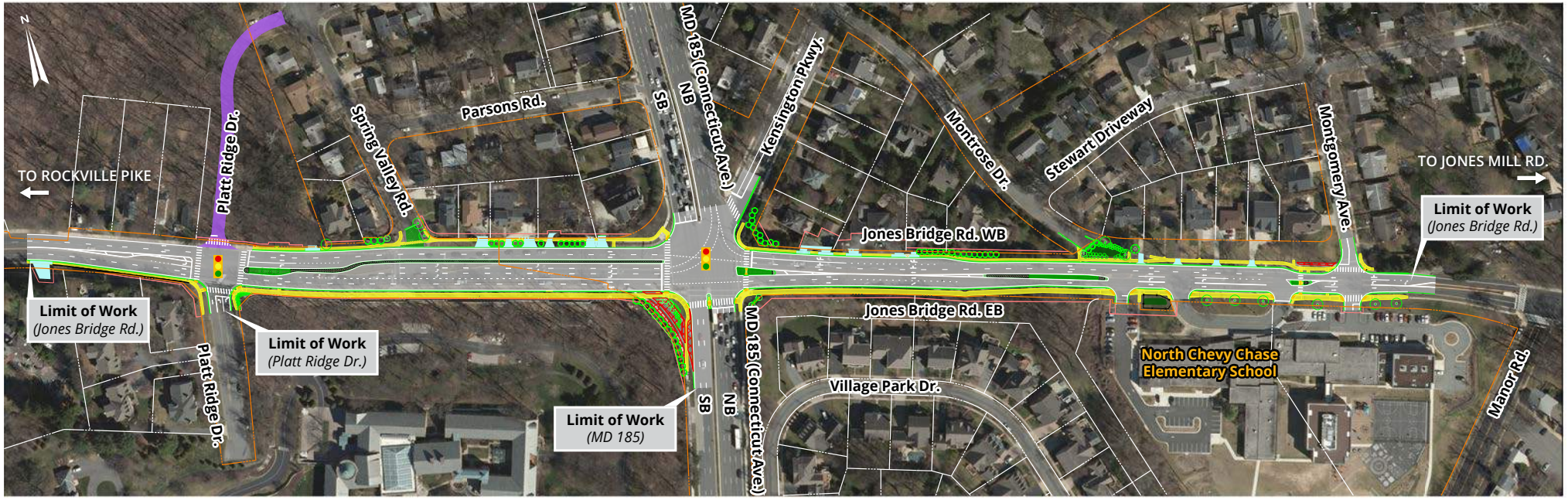
MD 185 at Jones Bridge Road / Kensington Parkway - Phase 3
BRAC Intersection Improvements

MARYLAND 185

Project Background and Overview

The purpose of this project is to improve safety and traffic operations at the MD 185 (Connecticut Ave.) at Jones Bridge Road/Kensington Parkway intersection, and enhance pedestrian and bicycle connectivity and accessibility. The scope of this project includes widening Jones Bridge road to accommodate an additional left turn lane for the movement from eastbound Jones Bridge Road to northbound MD 185. To improve bicycle and pedestrian accessibility and mobility, sidewalks and crosswalk ramps will be reconstructed to ADA compliance, and a shared-use-path will be provided throughout the project limits. Intersection geometry at MD 185 at Jones Bridge Road/Kensington Parkway will be revised to accommodate pedestrian and bicycle accessibility; including removing the channelization islands at the southwest quadrant of the intersection, and providing a pedestrian refuge island at the east leg of the intersection. High visibility markings will be provided at all crosswalks throughout the project corridor. Several other improvements will take place including the following:

- Replacement of the curb and gutter
- Reconstruction of existing traffic signals
- Underground utility relocations
- Landscaping, drainage, and stormwater management improvements



Montgomery County Aerial Photography 2011 - 2013; 30 Scale

LEGEND

- Proposed Curb & Gutter
- Concrete Median
- New Pavement
- Property Lines
- Proposed Concrete Sidewalk / Shared-Use-Path
- Pavement Removal
- Right-of-Way Lines
- Proposed Driveway Apron Reconstruction
- Proposed Emergency Vehicle Access
- Proposed Stormwater Management Facilities
- Traffic Signal
- Tree Planting Deciduous
- Tree Planting Evergreen
- Shrub Planting
- Grass
- Completed by MCDOT
- Easements

MD 185 at Jones Bridge Road / Kensington Parkway - Phase 3
BRAC Intersection Improvements

MARYLAND 185

What to Expect during Construction

There will be temporary lane closures in both directions of MD 185, Jones Bridge Road and Kensington Parkway during all phases of construction on weekdays from 9 a.m. to 3 p.m. and overnight, Sunday through Thursday, 8 p.m. to 5 a.m. Pedestrian access will be maintained at all times; however, pedestrians, bicyclists and other road users may be detoured as necessary during certain phases of construction work. Motorists should obey all posted speed limits and be aware of changing traffic patterns in the work zone. All road users should look for orange construction barrels, cones and fencing inside the work zone.

Meeting Information

The meeting is available to all and you can access it on your desktop computer, laptop, tablet, or by calling in by phone. If using a computer, you can ask questions during the meeting using the "Q&A" on the right side of the screen.

Join the Teams Live meeting on February 17th at 6:00 p.m. by clicking HERE.

If you are joining by phone, call +1 443-409-5228. The conference ID is 748 679 20#. Make sure to mute your phone after joining the meeting.

Find Us on the Web

Additional project details and status updates can be found on the Project Portal page by clicking **here** or using the QR code below.

@MDOTSHA
@MDSHA
MarylandStateHighwayAdmin
MDStateHighwayAdmin

For More Information

For project pre-construction questions about the MD 185 at Jones Bridge Road / Kensington Parkway BRAC Intersection Improvements Project, please contact:

Kurt Walcott II P.E., Project Manager
MDOT SHA Office of Highway Development
707 North Calvert Street
Baltimore, MD 21202
Phone: 410-545-0082
Toll-Free: 1-888-228-5003
Email: KWalcott@mdot.maryland.gov

For project construction questions about the MD 185 at Jones Bridge Road / Kensington Parkway BRAC Intersection Improvements Project, please contact:

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Request for Assistance

Maryland RELAY DIAL 7-1-1

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MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

MD 249 (PINEY POINT ROAD)

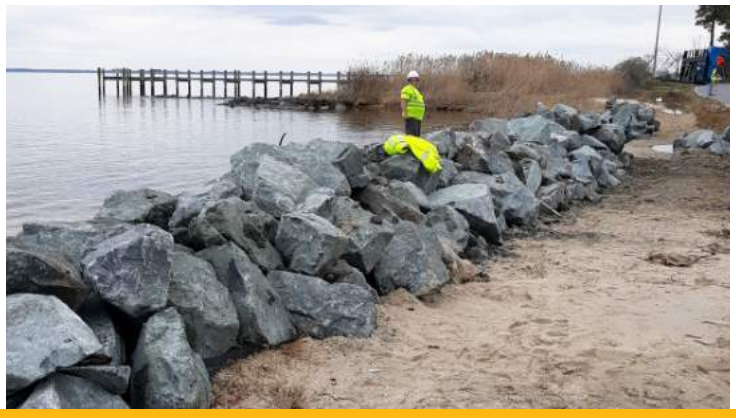
OVERVIEW AND RECENT MAINTENANCE WORK

The Maryland Department of Transportation State Highway Administration (MDOT SHA) appreciates the patience and feedback of residents living on St. George Island in St. Mary's County while we assessed and made plans to mitigate flooding along MD 249 (Piney Point Road). MD 249 serves as a main connector on St. George Island. MDOT SHA and area officials visited this location in summer 2019 to discuss flooding concerns, perform an on-site evaluation, and meet with residents.

On March 10, 2020, MDOT SHA issued a declaration to perform emergency work necessary to reduce the impact of water during high tides and coastal flooding. The MDOT SHA Leonardtown shop installed rip rap stone to create a barrier approximately 150 feet long. This barrier reduces the surge of waves, reduces erosion to protect the roadway, and allows crews to more easily maintain the ditch and culverts that would frequently fill with sand. Once high tides recede, crews can then clean out the ditch and culverts to allow water to flow back out into the Potomac River, reducing flooding on the residential side of MD 249.

CURRENT AND FUTURE PLANS

MDOT SHA has been conducting pre-planning-level studies. Currently, MDOT SHA in partnership with state and local stakeholders, is evaluating environmental factors that contribute to flooding in St. George Island to identify long-term improvements. To date, detailed design is not yet funded. MDOT SHA will continue to monitor the shoreline and perform necessary maintenance.



CONTACT INFORMATION

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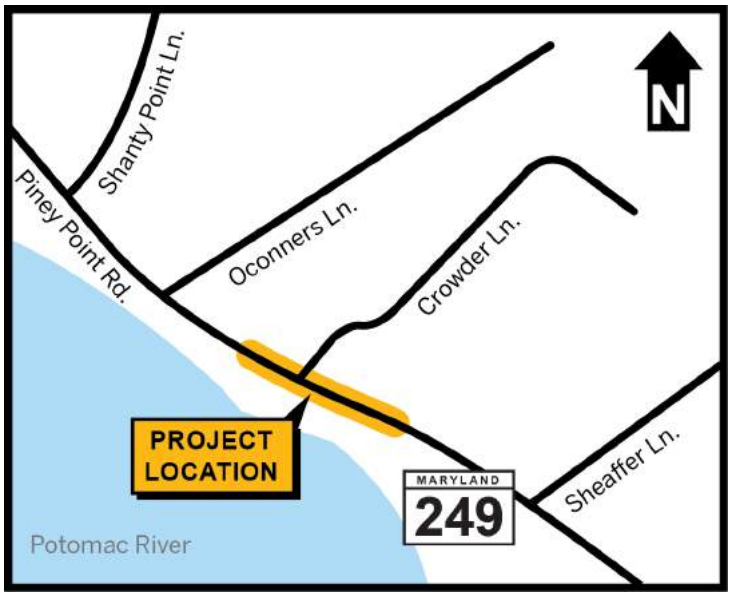

Appendix E: TMDL Compliance Progress

MDOT SHA has prepared and is submitting this FY21 TMDL assessment report with tables in accordance with conditions in Part IV.E.5 of the MS4 Permit.

A complete description of MDOT SHA restoration modeling protocol, used to evaluate whether MDOT SHA restoration plans are effectively working toward achieving compliance with EPA approved TMDLs, was provided as Appendix D to the FY19 MS4 annual report. That protocol was used to develop progress reporting presented in this FY21 TMDL assessment report.

Table V.A.1.e is provided below in accordance with conditions in Parts IV.E.5.a, estimated net change in pollutant load reductions from completed projects and programs, IV.E.5.b, comparison of net change in load reductions with established benchmarks, and V.A.1.e, annual reporting of above conditions, of the MS4 Permit. Progress toward attainment of benchmarks and applicable WLAs developed under EPA approved TMDLs is also documented in the CountywideStormwaterWatershedAssessment and LocalStormwaterWatershedAssessment tables of the MS4 Geodatabase – Part 1 submitted with the FY21 MS4 annual report.

Table V.A.1.e: Progress Toward Attainment of Benchmarks and Applicable WLAs Developed Under EPA Approved TMDLs

						FY21 Progress		
Watershed Name	**County**	**Pollutant**	**Unit**	**Total Reduction Target[1]**	**2025 Interim Target[2]**	**Reduction Achieved as of 6/30/2021**	**% Total Reduction**	**% 2025 Interim Target**
Chesapeake Bay TMDLs								
MS4 Area Wide	NA	Nitrogen	DEL-lbs/yr	30,170	30,170	36,924	122%	122%
MS4 Area Wide	NA	Phosphorus	DEL-lbs/yr	10,620	10,620	14,025	132%	132%
MS4 Area Wide	NA	Sediment	DEL-lbs/yr	9,705,000	9,705,000	12,085,347	125%	125%
Note: The modeling was conducted for the entire permitted area. MDOT SHA assumed a baseline year of 2011.								
Nutrient and Sediment TMDLs								
Anacostia River - Nontidal	MO	Nitrogen	EOS-lbs/yr	22,738	3,342	3,920	17.2%	117.3%
		Phosphorus	EOS-lbs/yr	1,937	1,937	2,775	143.3%	143.3%
		Sediment	EOS-lbs/yr	508,632	508,632	1,418,817	278.9%	278.9%
Anacostia River - Tidal	MO, PG	Nitrogen	EOS-lbs/yr	4,917	42	156	3.2%	371.8%
		Phosphorus	EOS-lbs/yr	576	17	62	10.9%	367.4%
		Sediment	EOS-lbs/yr	157,808	5,011	18,739	11.9%	374.0%
Antietam Creek	WA	Phosphorus	EOS-lbs/yr	281	124	50	17.7%	40.2%

Table V.A.1.e: Progress Toward Attainment of Benchmarks and Applicable WLAs Developed Under EPA Approved TMDLs

						FY21 Progress		
Watershed Name	**County**	**Pollutant**	**Unit**	**Total Reduction Target[1]**	**2025 Interim Target[2]**	**Reduction Achieved as of 6/30/2021**	**% Total Reduction**	**% 2025 Interim Target**
		Sediment	EOS-lbs/yr	1,024,544	145,339	70,675	6.9%	48.6%
Bynum Run	HA	Sediment	EOS-lbs/yr	24,071	17,705	7,503	31.2%	42.4%
Cabin John Creek	MO	Sediment	EOS-lbs/yr	247,449	74,512	351,183	141.9%	471.3%
Catoctin Creek	FR	Phosphorus	EOS-lbs/yr	155	155	99	64.3%	64.3%
		Sediment	EOS-lbs/yr	602,607	308,204	185,155	30.7%	60.1%
Conococheague Creek	WA	Sediment	EOS-lbs/yr	538,820	63,621	39,554	7.3%	62.2%
Double Pipe Creek	CL, FR	Phosphorus	EOS-lbs/yr	1,051	686	29	2.8%	4.2%
		Sediment	EOS-lbs/yr	458,978	415,290	11,111	2.4%	2.7%
Gwynns Falls	BA	Sediment	EOS-lbs/yr	508,357	53,460	29,003	5.7%	54.3%
Jones Falls	BA	Sediment	EOS-lbs/yr	95,087	95,087	68,243	71.8%	71.8%
Liberty Reservoir	BA, CL	Phosphorus	EOS-lbs/yr	572	113	59	10.2%	51.7%
		Sediment	EOS-lbs/yr	516,349	98,312	50,688	9.8%	51.6%
Little Patuxent River	AA, HO	Sediment	EOS-lbs/yr	581,132	581,132	689,627	118.7%	118.7%
Loch Raven Reservoir	BA, CL, HA	Phosphorus	EOS-lbs/yr	190	190	993	523.5%	523.5%
Lower Gunpowder Falls	BA	Sediment	EOS-lbs/yr	175,203	170,420	230,593	131.6%	135.3%
Lower Monocacy River	CL, FR, MO	Phosphorus	EOS-lbs/yr	1,204	1,204	1,668	138.6%	138.6%
		Sediment	EOS-lbs/yr	1,063,804	413,410	326,332	30.7%	78.9%
Marsh Run	WA	Sediment	EOS-lbs/yr	162,998	29,260	11,931	7.3%	40.8%
Mattawoman Creek	CH, PG	Nitrogen	EOS-lbs/yr	3,073	545	403	13.1%	73.9%
		Phosphorus	EOS-lbs/yr	356	73	33	9.2%	44.7%
Non-Tidal Back River	BA	Nitrogen	EOS-lbs/yr	1,358	552	339	24.9%	61.4%
		Phosphorus	EOS-lbs/yr	134	134	87	65.5%	65.5%
		Sediment	EOS-lbs/yr	256,819	58,238	47,469	18.5%	81.5%
Other West Chesapeake	AA	Sediment	EOS-lbs/yr	19,673	19,673	242	1.2%	1.2%
Patapsco River LN Branch	AA, BA, HO	Sediment	EOS-lbs/yr	495,606	330,329	270,154	54.5%	81.8%

Table V.A.1.e: Progress Toward Attainment of Benchmarks and Applicable WLAs Developed Under EPA Approved TMDLs

						FY21 Progress		
Watershed Name	**County**	**Pollutant**	**Unit**	**Total Reduction Target[1]**	**2025 Interim Target[2]**	**Reduction Achieved as of 6/30/2021**	**% Total Reduction**	**% 2025 Interim Target**
Patuxent River Lower	AA, CH, PG	Sediment	EOS-lbs/yr	32,068	3,177	1,357	4.2%	42.7%
Patuxent River Middle	AA, PG	Sediment	EOS-lbs/yr	64,100	8,068	4,008	6.3%	49.7%
Patuxent River Upper	AA, HO, PG	Sediment	EOS-lbs/yr	43,619	43,619	19,472	44.6%	44.6%
Piscataway Creek	PG	Sediment	EOS-lbs/yr	81,426	60,270	22,226	27.3%	36.9%
Port Tobacco River	CH	Sediment	EOS-lbs/yr	28,121	2,843	2,355	8.4%	82.8%
Potomac River MO County	MO	Sediment	EOS-lbs/yr	339,203	60,591	33,690	9.9%	55.6%
Potomac River WA County	WA	Sediment	EOS-lbs/yr	205,888	55,562	52,012	25.3%	93.6%
Prettyboy Reservoir	BA, CL	Phosphorus	EOS-lbs/yr	19	19	395	2078.9%	2,078.9%
Rock Creek	MO	Phosphorus	EOS-lbs/yr	362	362	1,202	331.8%	331.8%
		Sediment	EOS-lbs/yr	686,139	654,889	749,883	109.3%	114.5%
Rocky Gorge Reservoir	HO, MO, PG	Phosphorus	EOS-lbs/yr	51	16	12	23.4%	75.1%
Seneca Creek	MO	Sediment	EOS-lbs/yr	667,331	377,461	275,317	41.3%	72.9%
South River	AA	Sediment	EOS-lbs/yr	71,094	71,094	195,046	274.8%	274.8%
Swan Creek	HA	Sediment	EOS-lbs/yr	7,936	7,936	2,237	28.2%	28.2%
Triadelphia Reservoir (Brighton Dam)	HO, MO	Phosphorus	EOS-lbs/yr	52	52	2	4.2%	4.2%
Upper Monocacy River	CL, FR	Phosphorus	EOS-lbs/yr	58	58	102	176.4%	175.3%
		Sediment	EOS-lbs/yr	440,307	65,776	62,121	14.1%	94.4%
West River	AA	Sediment	EOS-lbs/yr	13,561	256	178	1.3%	69.7%
Trash TMDLs								
Anacostia River MO County	MO	Trash	lbs/yr	6,044	4,764	5,022	83.1%	105.4%
Anacostia River PG County	PG	Trash	lbs/yr	14,134	10,344	5,240	37.1%	50.7%
Patapsco - Gwynns Falls	BA	Trash & Debris	lbs/yr	2,415	2,415	2,829	117.1%	117.1%

Table V.A.1.e: Progress Toward Attainment of Benchmarks and Applicable WLAs Developed Under EPA Approved TMDLs

						FY21 Progress		
Watershed Name	**County**	**Pollutant**	**Unit**	**Total Reduction Target[1]**	**2025 Interim Target[2]**	**Reduction Achieved as of 6/30/2021**	**% Total Reduction**	**% 2025 Interim Target**
Patapsco - Jones Falls	BA	Trash & Debris	lbs/yr	1,490	1,490	1,792	120.3%	120.3%

[1] "Total Reduction Target" has been updated to account for credit removed for BMPs failing their triannual inspections, being transferred to a Water Quality bank, or requiring updates to reflect agreed upon credit splits with MS4 jurisdictions

[2] "2025 Interim Target" has been updated to reflect current planning efforts to meet TMDL Target Dates

Note: For the Trash WLA MDOT SHA is required to continue practicing trash removal activities that are captured in the baseline and remove 100% of the WLA set in the TMDL documents. It is estimated that approximately 5 lbs. of trash is removed from an inlet during cleaning based on a literature review of inlet cleaning characterization studies and physically viewing MDOT SHA inlet cleaning operation.

In accordance with conditions in Part IV.E.5.c, a Microsoft Excel workbook containing a summary table and comprehensive list of restoration BMPs completed from 2011 to October 8, 2021; separated by contract and including associated location, impervious treatment, and cost information; is submitted electronically with the FY21 MS4 annual report.

Table IV.E.5.d below is provided in accordance with conditions in Part IV.E.5.d of the MS4 Permit and shows the amounts of MDOT SHA capital funding programmed through the MDOT SHA TMDL Restoration Fund ("Fund 82").

Table IV.E.5.d: TMDL Restoration Fund Allocations

Fiscal Year	Allocations (Millions)
2022	$15.0
2023	$14.3
2024	$14.3
2025	$21.7
2026	$35.6
Total 2022 - 2026	**$100.9**

Appendix F:
Watershed Restoration Assessment of Controls

Little Catoctin Creek Watershed Monitoring Implementation Document

MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

October 2021

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Attachments

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1 Introduction

The Maryland Department of Transportation State Highway Administration (MDOT SHA) Water Programs Division (WPD) has completed a stream restoration project on Little Catoctin Creek (LCC). The restoration extents originate at MDOT SHA bridge structure number 10081 along MD 180 (Jefferson Pike) and continues downstream approximately 3,100 LF of the existing channel. The floodplain restoration project consisted of stabilization and relocation of approximately 3,000 linear feet of Little Catoctin Creek, south of MD-180. The goals of the stream and floodplain restoration were to restore impaired vital ecosystems, and return hydrology, geomorphic, and hydraulic stream functions back to pre-development conditions within the 100-year floodplain. Construction of the Little Catoctin Creek stream restoration project was completed in April 2019.

MDOT SHA has performed monitoring the physical, chemical, and biological features of the project stream for four years: This report documents supplemental results from the fourth year of monitoring per the NPDES/MS4 Assessment of Controls for Stream Restoration of Little Catoctin Creek at U.S. 340. The following sections of this yearly report include data and results for chemical and biological monitoring activities performed in FY 2020 but previously unreported due to unavailability of the data at the time of report submittal. All physical monitoring activities were concluded in FY20, which was the final phase of physical monitoring (PHYS 4) as outlined in the NPDES/MS4 Assessment of Controls monitoring plan. Additionally, USGS monitoring stations 01636845 (Little Catoctin Creek Near Rosemont, MD; upstream location) and 01636846 (Little Catoctin Creek at Rosemont, MD; downstream location) have been decommissioned at the end of FY20 and are no longer collecting stage, discharge, velocity, or continuous water quality measurements. However, the aforementioned data, as well as discrete water quality sample analyses, collected previously will continue to be available through the U.S. Geological Survey's National Water Information Service (NWIS) online at: https://www.waterqualitydata.us/.

2 Study Area

The Little Catoctin Creek watershed occupies 17.72 square miles (11,340.3 acres) in the southwestern corner of Frederick County in the Blue Ridge physiographic province. It flows 8.5 stream-miles southeast from its headwaters on the eastern side of South Mountain to the mouth east of the town of Brunswick and drains directly into the Potomac River. Land use in the watershed is primarily agricultural. Approximately 20 percent of the watershed draining to the study reach is forested. Impervious surface comprises less than 3 percent of the watershed (SHA 2016).

The study area is located north of the town of Rosemont between US-340 at the upstream end and Petersville Road (MD-79) at the downstream end. Within the study area, Little Catoctin Creek flows through active and old pasture. Prior to restoration, much of the riparian area (especially in reaches adjacent to MD-180) contained few trees – leaving much of the stream open to direct sunlight. Stream banks within the open pasture were steep and heavily eroded. Riffle and run habitats within the creek were predominantly cobble and gravel. Heavy deposits of fine silt and sand were found in pools and depositional areas.

Physical, chemical, and biological monitoring locations were established above, within, and below the stream restoration project area as outlined in the monitoring plan. Detailed mapping showing each of the monitoring locations in included as **Attachment A – Monitoring Locations**.

3 Biological Monitoring

Biological data representing the final year of post-construction monitoring (BIO 4) were collected by the Maryland Department of Natural Resources (MDNR) Resource Assessment Service during the spring index period (March 1 - April 30) in 2020. However, due to budgetary impacts discussed in the FY20 Annual Report (SHA, 2020), benthic macroinvertebrate samples were unable to be processed and taxonomic identification was not completed by MDNR prior to submittal of the FY20 report; therefore, BIBI values were unable to be included in the 'BiologicalMonitoring' table of the geodatabase submittal to MDE. No new biological monitoring activities were performed in FY21.

In FY21, the spring 2020 benthic macroinvertebrate samples were subsampled and identified by Coastal Resources, Inc. in accordance with MBSS protocols (Boward and Friedman, 2019). All organisms were identified to genus or the lowest practical taxonomic level, and the subsequent taxa list and counts were analyzed following methods described in Southerland et al. (2008) to calculate final BIBI scores. Biological data representing the final year of restoration monitoring is included and discussed below.

Post-Restoration Biological Results

A total of 62 benthic macroinvertebrate taxa were collected in the 100-organism subsamples in Little Catoctin Creek in 2020. Complete benthic macroinvertebrate taxonomic data and metric scores for each sample are provided in **Attachment B - Biological Monitoring Results**. Taxa richness ranged from 16 to 28 and was lowest at PRFR-205-X-2020 and highest at PRFR-202-X-2020. Control sites had from two to six Ephemeroptera, Plecoptera and Trichoptera (EPT) taxa in 2020, restoration sites had from one to five EPT taxa present, and downstream sites both had four EPT taxa present (Tables 3-4 through 3-6). The upstream control sites contained from one to two intolerant taxa, the restoration sites contained from one to three intolerant taxa, and the downstream sites contained four intolerant taxa. Control sites had from six to 12 tolerant taxa, restoration reach sites had from 10 to 12 tolerant taxa, and downstream sites had from seven to 10 tolerant taxa.

Benthic index of biotic integrity (BIBI) scores varied little between sites in the study area, ranging from 2.00 to 2.50 in 2020 (Tables 3-1 through 3-3). Overall, BIBI scores were variable at all study sites between years, but this variation was well within what would be considered normal for benthic macroinvertebrate communities. Similar variation has been documented at other MBSS Sentinel sites and can likely be attributed to variability in biotic responses associated with precipitation and other naturally occurring factors, as well as sampling variability.

The benthic community in the three study reaches (downstream, restoration, and control) in Little Catoctin Creek was comparable before and after restoration. The number of EPT taxa present was similar for all downstream, restoration, and control sites, ranging from one to seven from 2016 to 2020. The presence of pollution-intolerant taxa also ranged from one to seven between 2016 and 2020, with the highest number of pollution-intolerant taxa occurring in the downstream study reach in 2016 at PRFR-201-X-2016. The presence of taxa tolerant to pollution was between six and 15 throughout all three study reaches before and after restoration. BIBI scores ranged from 1.50 to 2.75 across all sites between 2016 and 2020, with the highest score occurring in the downstream study reach in 2017 at PRFR-201-X-2017. Overall, trends through time were similar for the downstream, restoration, and control study reaches, based on data from 2016 through 2020.

Table 3-1. Benthic and fish index of biotic integrity scores from the downstream study reach in Little Catoctin Creek.

Reach	Downstream							
Site	201				202			
Year	2016	2017	2019	2020	2016	2017	2019	2020
BIBI	2.00	1.75	2.75	2.00	2.25	1.50	2.50	2.25
FIBI	4.33	4.00	4.00	NM	3.33	3.67	4.00	NM

NM = Not measured in FY20

Table 3-2. Benthic and fish index of biotic integrity scores from the restoration study reach in Little Catoctin Creek.

Reach	Restoration							
Site	203				204			
Year	2016	2017	2019	2020	2016	2017	2019	2020
BIBI	2.00	1.75	2.25	2.25	1.75	1.75	2.00	2.50
FIBI	3.33	3.67	4.33	NM	3.33	3.00	4.33	NM

NM = Not measured in FY20

Table 3-3. Benthic and fish index of biotic integrity scores from the control study reach in Little Catoctin Creek.

Reach	Control											
Site	205				206				107			
Year	2016	2017	2019	2020	2016	2017	2019	2020	2016	2017	2019	2020
BIBI	1.50	1.75	2.25	2.00	1.50	1.25	1.75	2.00	2.00	1.50	2.00	2.00
FIBI	3.00	3.33	3.00	NM	3.33	3.00	3.33	NM	N/A	N/A	N/A	N/A

NM = Not measured in FY20

N/A= Not applicable (only benthic macroinvertebrates sampled at this site)

Table 3-4. Numbers of Ephemeroptera, Plecoptera and Trichoptera (EPT) taxa and pollution-intolerant and tolerant benthic macroinvertebrate taxa from the downstream study reach in Little Catoctin Creek.

Reach	Downstream							
Site	201				202			
Year	2016	2017	2019	2020	2016	2017	2019	2020
Number of EPT taxa	7	3	3	4	6	1	3	4
Number of intolerant taxa	7	2	5	4	3	1	1	4
Number of tolerant taxa	13	8	10	7	15	9	11	10

Table 3-5. Numbers of Ephemeroptera, Plecoptera and Trichoptera (EPT) taxa and pollution-intolerant and tolerant benthic macroinvertebrate taxa from the restoration study reach in Little Catoctin Creek.

Reach	Restoration							
Site	203				204			
Year	2016	2017	2019	2020	2016	2017	2019	2020
Number of EPT taxa	5	3	3	1	1	0	2	5
Number of intolerant taxa	3	1	2	1	2	3	2	3
Number of tolerant taxa	12	12	13	10	10	10	10	12

Table 3-6. Numbers of Ephemeroptera, Plecoptera and Trichoptera (EPT) taxa and pollution-intolerant and tolerant benthic macroinvertebrate taxa from the control study reach in Little Catoctin Creek.

Reach	Control											
Site	205				206				107			
Year	2016	2017	2019	2020	2016	2017	2019	2020	2016	2017	2019	2020
Number of EPT taxa	1	0	4	3	1	0	1	2	3	1	2	6
Number of intolerant taxa	3	1	3	1	2	1	1	1	3	2	2	2
Number of tolerant taxa	7	14	9	6	7	11	6	12	11	9	11	10

4 Chemical Monitoring

Per the NPDES/MS4 Assessment of Controls monitoring plan, chemical monitoring of the Little Catoctin Creek was performed as specified in the chemical monitoring methodology. The monitoring efforts through January 31, 2018 fall under phase CHEM 1 activity to establish pre-restoration conditions. Monitoring efforts beginning February 1, 2018 through April 15, 2019 occurred during the construction phase (CHEM 2). Monitoring efforts beginning on April 16, 2019 and continuing through June 2020, were conducted under the post-construction phase (CHEM 3). No new chemical monitoring activities occurred in FY21 since phase CHEM 4 has been deferred as noted in the FY20 Annual Report to MDE (SHA, 2020). All stage, discharge, velocity, continuous water quality measurements, and discrete water quality sample analyses are reported on the U.S. Geological Survey's National Water Information Service (NWIS) and are available online at https://www.waterqualitydata.us/.

As noted in the FY20 report, data for some analytes were still in the process of being analyzed when the FY20 report was submitted to MDE, and therefore, not all data results were complete in the final geodatabase table of EMCs. Specifically, data for biochemical oxygen demand (5-day BOD), and zinc were not available for the storm event sampled on April 24,2020 and April 30, 2020. These were the final two storm sampling events conducted by the USGS in FY20. All missing EMC values in samples collected in FY20 were previously reported as '9999' in the data table to denote temporary placeholders until they could be replaces with final values.

During FY21, USGS reviewed the data for the two USGS gage stations on Little Catoctin Creek, 0163845 LITTLE CATOCTIN CREEK NEAR ROSEMONT, MD (upstream) and 01636846 LITTLE CATOCTIN CREEK AT ROSEMONT, MD (downstream) and calculated the Event Mean Concentrations (EMC) for data that were not available from the USGS NWQL laboratory in June 2020, when the FY20 Final report was prepared. Analytical results for individual storm samples are presented below in Table 4-1. The calculated EMC values for BOD5 and zinc for all storms sampled in FY20 (August 18, 2019 through April 30, 2020) are displayed in Tables 4-2 and 4-3 for the upstream and downstream sites, respectively

Field measurements, nutrients, metals, hydrocarbons, and bacteriologic data are now complete for FY20 samples. All available data were appended to the geodatabase 'ChemicalMonitoring' data table for submittal to MDE with the FY21 Annual Report.

Table 4-1. Analytical results of BOD5 and zinc in individual samples collected April-May 2020

Station	Date	Time	BOD5 MDL mg/L	BOD5 Result mg/L	Zn MDL µg/L	Zn Result µg/L
1636845	4/24/2020	3:45	1	5.4	2	7
1636845	4/24/2020	4:20	1	20.7	2	13
1636845	4/24/2020	9:45	1	13.3	2	7
1636845	5/1/2020	9:30	1	3.7	2	2
1636845	4/30/2020	8:10	1	16.1	2	19
1636845	4/30/2020	10:05	1	15.5	2	85
1636846	4/24/2020	9:15	1	10.2	2	11
1636846	4/24/2020	9:40	1	11.4	2	7
1636846	4/23/2020	21:20	1	16.8	2	6
1636846	5/1/2020	11:10	1	2.2	2	2
1636846	4/30/2020	8:20	1	13.8	2	9
1636846	4/30/2020	10:15	1	15.5	2	94

MDL = Method detection limit

Table 4-2. Event Mean Concentrations for BOD5 and Zinc August 2019 thru April 2020 at station 1636845 (upstream)

Station	Date	Time	BOD_dt	EMC_BOD_ computed	BOD_EMC_dt	Zinc_dt	EMC_Zinc_ computed	EMC_Zinc_ computed-dt
			mg/L	mg/L	mg/L	µg/L	µg/L	µg/L
1636845	4/30/2020	8:10	1	14.7	14.7	2	76	76
1636845	4/24/2020	3:45	1	13.3	13.3	2	9	9
1636845	4/13/2020	4:25	1	6.3	6.3	2	12	12
1636845	3/13/2020	3:05	1	3.8	3.8	2	5	5
1636845	2/6/2020	1:45	1	6.0	6.0	2	15	15
1636845	1/25/2020	2:30	1	7.2	7.2	2	124	124
1636845	11/24/2019	1:35	1	12.2	12.2	2	8	8
1636845	10/30/2019	21:40	1	12.6	12.6	2	8	8
1636845	10/22/2019	15:15	1	5.6	5.6	2	6	6
1636845	10/7/2019	21:15	1	8.5	8.5	2	9	9
1636845	9/30/2019	10:00	1	1.5	1.5	2	3	3
1636845	8/18/2019	20:55	1	19.0	19.0	2	57	57

BOD_dt and Zinc_dt : Detection levels for 5-day biologic oxygen demand and dissolved zinc, respectively

EMC_BOD_computed and EMC_Zinc_computed: Event mean concentration calculated using raw concentration and discharge

BOD_EMC_dt and EMC_Zinc_dt: Event mean concentration calculated with any raw concentration reported below the corresponding detection level replaced with the detection level

Table 4-3. Event Mean Concentrations for BOD5 and Zinc August 2019 thru April 2020 at station 1636846 (downstream)

Station	Date	TIme	BOD_dt	EMC_BOD_ Computed	BOD_EMC_dt	Zinc_dt	EMC_Zinc_ computed	EMC_Zinc_ computed-dt
			mg/L	mg/L	mg/L	µg/L	µg/L	µg/L
1636846	4/30/2020	8:20	1	14.5	14.5	2	60	60
1636846	4/23/2020	21:20	1	10.3	10.3	2	9	9
1636846	4/13/2020	3:50	1	5.3	5.3	2	9	9
1636846	3/13/2020	3:10	1	1.9	1.9	2	4	3
1636846	2/6/2020	1:45	1	3.9	3.9	2	6	6
1636846	1/25/2020	2:30	1	13.7	13.7	2	104	104
1636846	11/24/2019	0:50	1	7.6	7.6	2	7	7
1636846	10/30/2019	21:30	1	3.1	3.1	2	4	4
1636846	10/22/2019	15:15	1	2.6	2.6	2	11	10
1636846	10/7/2019	21:50	1	4.7	4.7	2	4	4
1636846	9/30/2019	10:15	1	2.8	2.8	2	3	2
1636846	8/18/2019	20:55	1	14.2	14.2	2	21	21

BOD_dt and Zinc_dt : Detection levels for 5-day biologic oxygen demand and dissolved zinc, respectively

EMC_BOD_computed and EMC_Zinc_computed: Event mean concentration calculated using raw concentration and discharge

BOD_EMC_dt and EMC_Zinc_dt: Event mean concentration calculated with any raw concentration reported below the corresponding detection level replaced with the detection level

Chemical data released by the USGS NWQL typically go through a laboratory review process followed by further review by the District Water Quality Specialist. In a letter dated April, 27 2021 (see **Attachment C – USGS Memoranda)**, USGS notified MDOT SHA of a quality assurance/quality control issue that occurred at the National Water Quality Laboratory (NWQL), which was used for processing samples collected at Little Catoctin Creek. The QA/QC issue impacted 16 LCC samples collected between March 2019 and April 2020; however, only nitrite and ammonium results were affected. A summary table listing samples and analytical results flagged by USGS is presented below in Table 4-4. An audit of QA/QC practices during this time indicated that violations of standard QC practices resulted in a high likelihood of bias. Therefore, values used to calculate EMCs for both Nitrate+Nitrate and TKN parameters were likely biased high, and values reported in the FY20 Annual Report for those parameters were likely higher than expected.

USGS provided a follow up letter on September 22, 2021 to MDOT SHA with an update on the status of the investigation. USGS indicated that the investigation has not yet been resolved, and no values are expected to change regardless of the outcome. Although USGS has decided to flag these records as data of poor quality and remove them from the National Water Information System (NWIS) web portal, they have acknowledged that the data may still have value for use in regulatory compliance purposed if qualified with appropriate comments noting results may be biased high. MDOT SHA has decided to include theses data results within the Chemical Monitoring table with specific qualifiers noted for each affected parameter in the General Comments field. MDE should pay special attention to these data qualifiers before making a determination whether to use these data for further analysis.

Table 4-4. Chemical Monitoring data records flagged by USGS due to QA/QC concerns

CHEM_MON_ID	LOCAL_STATION_ID	EVENT_DATE	Analytes
SH19CHE000119	1636845	3/21/2019	Nitrate/Nitrite
SH19CHE000120	1636846	3/21/2019	Nitrate/Nitrite
SH20CHE000149	1636845	1/25/2020	TKN
SH20CHE000150	1636846	1/25/2020	Nitrate/Nitrite
SH20CHE000151	1636845	2/6/2020	TKN, Nitrate/Nitrite
SH20CHE000152	1636846	2/6/2020	TKN, Nitrate/Nitrite
SH20CHE000157	01636846	4/23/2020	TKN
SH20CHE000158	01636845	4/24/2020	TKN

5 References

Boward, D.M., E.S. Friedman. 2019. Maryland Biological Stream Survey laboratory methods for benthic macroinvertebrate processing and taxonomy. Maryland Department of Natural Resources, Annapolis, Maryland.

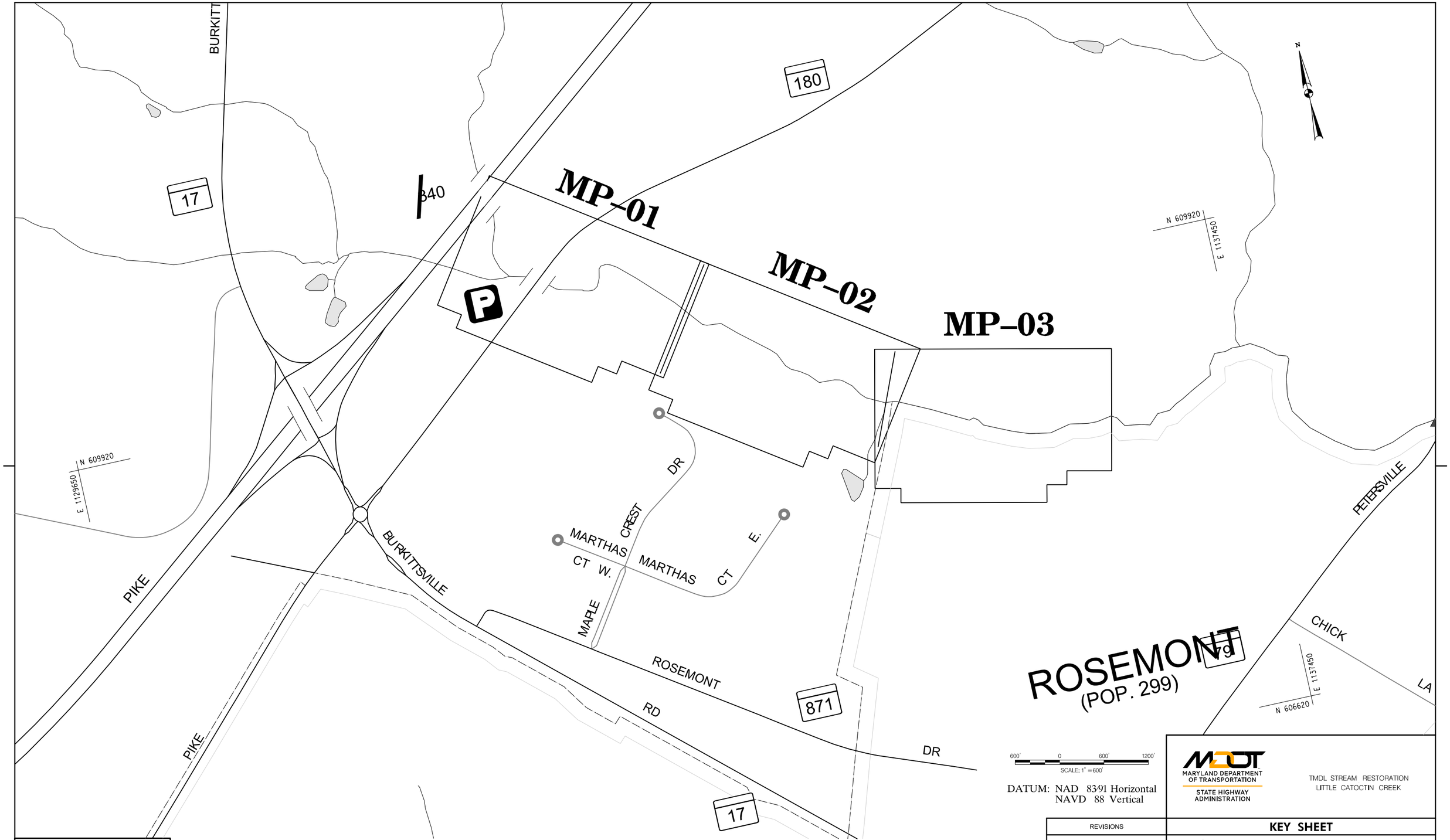
Southerland, M.T., G.M. Rogers, M.J. Kline, R.P. Morgan, D.M. Boward, P.F. Kazyak, R.J. Klauda, S.A. Stranko. 2005. New biological indicators to better assess the condition of Maryland streams.

State Highway Administration (SHA), Maryland Department of Transportation. 2016. NPDES/MS4 assessment of controls for stream restoration of Little Catoctin Creek at U.S. 340 in Frederick County, Maryland. Baltimore, Maryland.

State Highway Administration (SHA), Maryland Department of Transportation. 2017. National Pollutant Discharge Elimination System Annual Report. Baltimore, Maryland.

State Highway Administration (SHA), Maryland Department of Transportation. 2020. Fifth Annual Report: National Pollutant Discharge Elimination System. Baltimore, Maryland.

Attachment A - Monitoring Locations



DATUM: NAD 83-91 Horizontal
NAVD 88 Vertical

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

TMDL STREAM RESTORATION
LITTLE CATOCTIN CREEK

RK&K
Rummel, Klepper & Kahl, LLP
700 EAST PRATT STREET | BALTIMORE, MD 21202
SUITE 500 PH: (410) 728-2900
Engineers | Construction Managers | Planners | Scientists
www.rkk.com

BY: dblack -

REVISIONS

KEY SHEET

SCALE 1" = 600' ADVERTISED DATE OCTOBER 2017 CONTRACT NO. AT62813

DESIGNED BY
DRAWN BY
CHECKED BY
MDE/PRD

COUNTY FREDERICK
LOGMILE

DRAWING NO. KY-01 OF 01

SHEET NO. 1 OF 4

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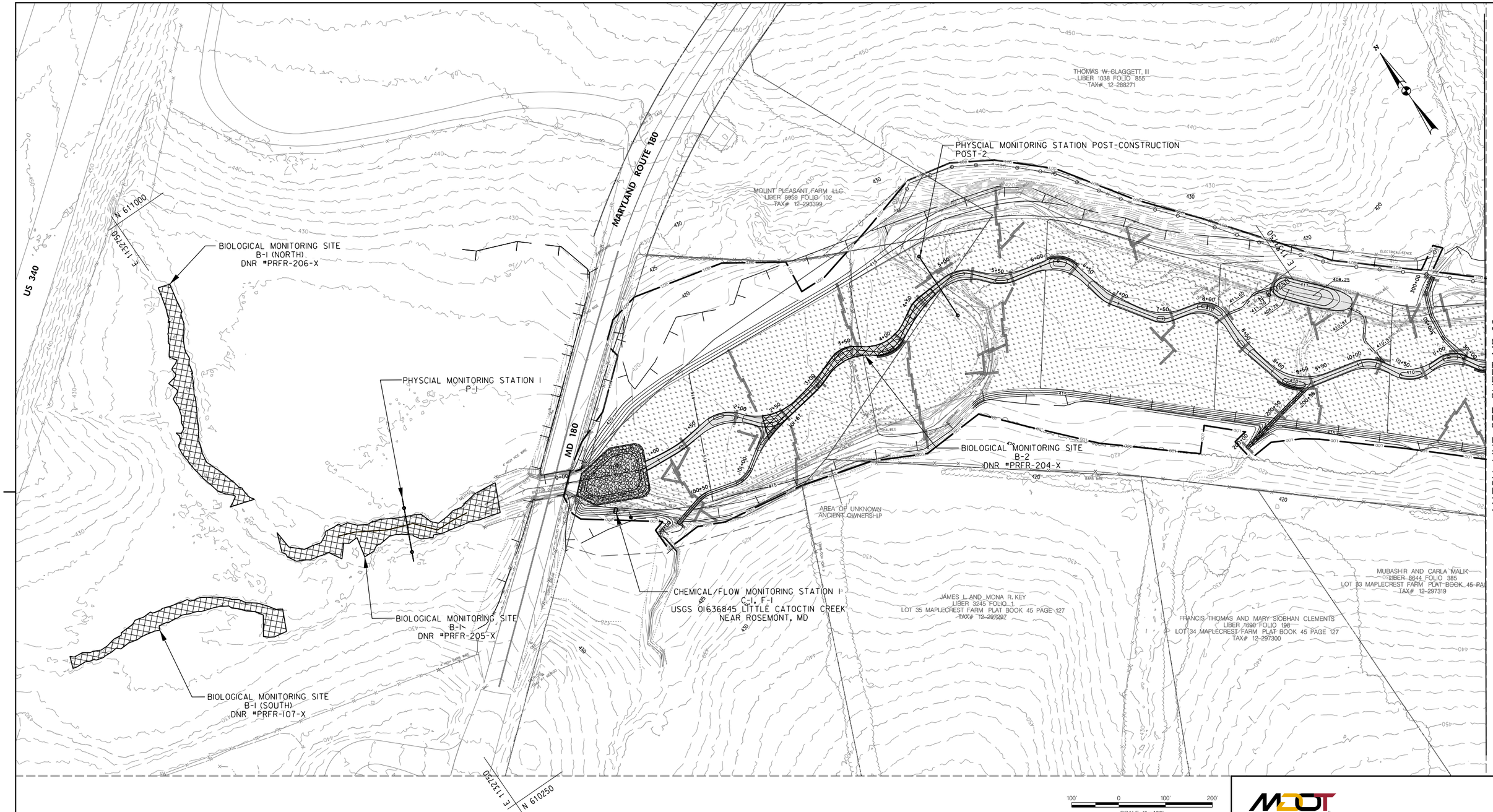

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SCALE: 1" = 100'

DATUM: NAD 83-91 Horizontal
NAVD 88 Vertical

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

TMDL STREAM RESTORATION
LITTLE CATOCTIN CREEK

REVISIONS

MONITORING LOCATION PLAN

SCALE 1" = 100' ADVERTISED DATE SEPT 2019 CONTRACT NO. AT62813

DESIGNED BY
DRAWN BY
CHECKED BY
MDE/PRD

COUNTY FREDERICK
LOGMILE

DRAWING NO. MP-01 OF 03

SHEET NO. 2 OF 4

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BY: MoxleyK -

MATCH LINE SEE SHEET MP-01

MATCH LINE SHEET MP-02

MATCH LINE SHEET MP-03

MATCH LINE SHEET 2

PHYSCIAL MONITORING STATION POST-CONSTRUCTION
POST-3

PHYSCIAL MONITORING STATION POST-CONSTRUCTION
POST-4

BIOLOGICAL MONITORING SITE
B-3
DNR #PRFR-203-X

N 610000
E 1134500

THOMAS W. CLAGGETT, III
LIBER 1038 FOLIO 855
TAX# 12-28827

ROBERT K. McMONAGLE, JR. AND TABETHA M. McMONAGLE
LIBER 9548 FOLIO 217
LOT 32 MAPLECREST FARM PLAT BOOK 45 PAGE 126
TAX# 12-297238

CHARLES E. AND SHAWN L. ANDREWS
LIBER 2009 FOLIO 641
LOT 31 MAPLECREST FARM PLAT BOOK 45 PAGE 126
TAX# 12-297211

E 1134500
N 609250

GARY A. AND BONNIE J. TEAGUE
LIBER 2644 FOLIO 700
LOT 30 MAPLECREST FARM PLAT BOOK 45 PAGE 126
TAX# 12-297203

MICHAEL THOMPSON
LIBER 2850 FOLIO 1265
LOT 19 MAPLECREST FARM PLAT BOOK 39 PAGE 22
TAX# 12-297835

MICHAEL D. AND LAURA L. PRITCHARD
LIBER 7003 FOLIO 136
LOT 18 MAPLECREST FARM PLAT BOOK 39 PAGE 22
TAX# 12-296827

AREA OF UNKNOWN LIBER/FOLIO OWNERSHIP

E 1134000
N 609250

100' 0 100' 200'
SCALE: 1" = 100'

DATUM: NAD 83\91 Horizontal
NAVD 88 Vertical

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

TMDL STREAM RESTORATION
LITTLE CATOCTIN CREEK

REVISIONS

BY: MoxleyK -

MONITORING PLAN LOCATION

SCALE 1" = 100' ADVERTISED DATE SEPT 2019 CONTRACT NO. AT62813

DESIGNED BY
DRAWN BY
CHECKED BY
MDE/PRD

COUNTY FREDERICK
LOGMILE

DRAWING NO. MP-02 OF 03

SHEET NO. 3 OF 4

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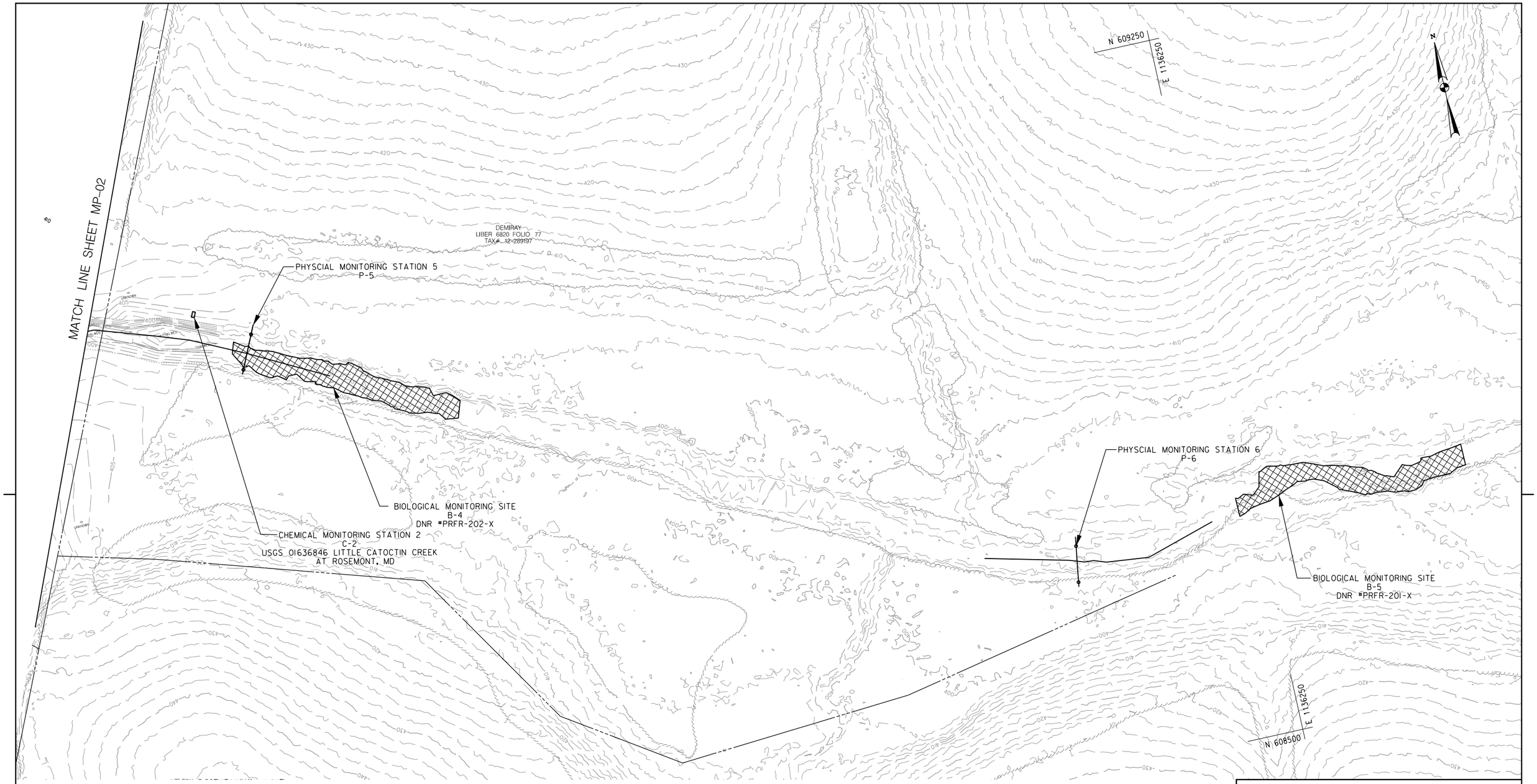

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NAVD 88 Vertical

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

TMDL STREAM RESTORATION
LITTLE CATOCTIN CREEK

REVISIONS

MONITORING PLAN LOCATIONS

SCALE 1" = 100' ADVERTISED DATE SEPT 2019 CONTRACT NO. AT62813

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CHECKED BY
MDE/PRD

COUNTY FREDERICK
LOGMILE

DRAWING NO. MP-03 OF 03

SHEET NO. 4 OF 4

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BY: MoxleyK -

Attachment B - Biological Monitoring Results

BIBI Results Summary

Coastal Resources, Inc.

PRFR-107-X-2020

Benthic Index of Biotic Integrity (BIBI) Results

The BIBI for **PRFR-107-X-2020**, sampled on **04/23/2020**, is **2.00** and is ranked as **Poor**. Site **PRFR-107-X-2020** is located in the **Highlands** physiographic province.

Table 1: Benthic Index of Biotic Integrity (BIBI) Summary for PRFR-107-X-2020

	Metric Values	Metric Scores
Number of Taxa	22	3
Number of EPT Taxa	6	1
Number of Ephemeroptera Taxa	3	3
% Intolerant to Urban	1.80	1
% Tanytarsini	0.60	3
% Scrapers	2.99	1
% Swimmers	2.99	1
% Diptera	49.10	3
BIBI	**-**	**2.00**
Narrative Rank	**-**	**Poor**

PRFR-107-X-2020

Table 2: Benthic Taxa Site Summary for PRFR-107-X-2020

Taxon	Count	Class	Order	Family	Genus	Subfamily	Tribe	FFG	Habit	Tolerance
Baetis	5	Insecta	Ephemeroptera	Baetidae	Baetis	-	-	Collector	sw, cb, cn	3.9
Caenis	1	Insecta	Ephemeroptera	Caenidae	Caenis	-	-	Collector	sp	2.1
Cheumatopsyche	1	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	-	-	Filterer	cn	6.5
Chironomidae	9	Insecta	Diptera	Chironomidae	-	-	-	-	-	6.6
Diamesa	1	Insecta	Diptera	Chironomidae	Diamesa	Diamesinae	Diamesini	Collector	sp	8.5
Eukiefferiella	5	Insecta	Diptera	Chironomidae	Eukiefferiella	Orthocladiinae	-	Collector	sp	6.1
Girardia	1	Turbellaria	Tricladida	Dugesiidae	Girardia	-	-	Predator	sp	9.3
Hydropsyche	2	Insecta	Trichoptera	Hydropsychidae	Hydropsyche	-	-	Filterer	cn	7.5
Larsia	1	Insecta	Diptera	Chironomidae	Larsia	Tanypodinae	Pentaneurini	Predator	sp	8.5
Lype	1	Insecta	Trichoptera	Psychomyiidae	Lype	-	-	Scraper	cn	4.7
Naididae	59	Oligochaeta	Haplotaxida	Naididae	-	-	-	Collector	bu	8.5
Orthocladius	20	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladiinae	-	Collector	sp, bu	9.2
Parametriocnemus	5	Insecta	Diptera	Chironomidae	Parametriocnemus	Orthocladiinae	-	Collector	sp	4.6
Plauditus	1	Insecta	Ephemeroptera	Baetidae	Plauditus	-	-	-	-	
Polypedilum	6	Insecta	Diptera	Chironomidae	Polypedilum	Chironominae	Chironomini	Shredder	cb, cn	6.3
Potthastia	2	Insecta	Diptera	Chironomidae	Potthastia	Diamesinae	Diamesini	Collector	sp	0.0
Rheotanytarsus	1	Insecta	Diptera	Chironomidae	Rheotanytarsus	Chironominae	Tanytarsini	Filterer	cn	7.2
Simulium	10	Insecta	Diptera	Simuliidae	Simulium	-	Simuliini	Filterer	cn	5.7
Stenelmis	4	Insecta	Coleoptera	Elmidae	Stenelmis	-	-	Scraper	cn	7.1
Thienemanniella	15	Insecta	Diptera	Chironomidae	Thienemanniella	Orthocladiinae	-	Collector	sp	5.1
Thienemannimyia Group	2	Insecta	Diptera	Chironomidae	Thienemannimyia Group	Orthocladiinae	-	Predator	sp	8.2
Tubificidae	10	Oligochaeta	Tubificida	Tubificidae	-	-	-	Collector	cn	8.4
Tvetenia	5	Insecta	Diptera	Chironomidae	Tvetenia	Orthocladiinae	-	Collector	sp	5.1

Habits: cb = climber, cn = clinger, sw = swimmer, bu = burrower, sp = sprawler, sk = skater

BIBI Results Summary

Coastal Resources, Inc.

PRFR-201-X-2020

Benthic Index of Biotic Integrity (BIBI) Results

The BIBI for **PRFR-201-X-2020**, sampled on **04/23/2020**, is **2.00** and is ranked as **Poor**. Site **PRFR-201-X-2020** is located in the **Highlands** physiographic province.

Table 1: Benthic Index of Biotic Integrity (BIBI) Summary for PRFR-201-X-2020

	Metric Values	Metric Scores
Number of Taxa	21	3
Number of EPT Taxa	4	1
Number of Ephemeroptera Taxa	2	1
% Intolerant to Urban	6.15	1
% Tanytarsini	6.15	5
% Scrapers	1.54	1
% Swimmers	9.23	3
% Diptera	75.38	1
BIBI	**-**	**2.00**
Narrative Rank	**-**	**Poor**

PRFR-201-X-2020

Table 2: Benthic Taxa Site Summary for PRFR-201-X-2020

Taxon	Count	Class	Order	Family	Genus	Subfamily	Tribe	FFG	Habit	Tolerance
Ablabesmyia	1	Insecta	Diptera	Chironomidae	Ablabesmyia	Tanypodinae	Pentaneurini	Predator	sp	8.1
Baetidae	2	Insecta	Ephemeroptera	Baetidae	-	-	-	Collector	sw, cn	2.3
Baetis	10	Insecta	Ephemeroptera	Baetidae	Baetis	-	-	Collector	sw, cb, cn	3.9
Caecidotea	4	Malacostraca	Isopoda	Asellidae	Caecidotea	-	-	Collector	sp	2.6
Caenis	1	Insecta	Ephemeroptera	Caenidae	Caenis	-	-	Collector	sp	2.1
Cheumatopsyche	2	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	-	-	Filterer	cn	6.5
Chimarra	1	Insecta	Trichoptera	Philopotamidae	Chimarra	-	-	Filterer	cn	4.4
Chironomidae	12	Insecta	Diptera	Chironomidae	-	-	-	-	-	6.6
Corydalus	1	Insecta	Megaloptera	Corydalidae	Corydalus	-	-	Predator	cn, cb	1.4
Eukiefferiella	5	Insecta	Diptera	Chironomidae	Eukiefferiella	Orthocladiinae	-	Collector	sp	6.1
Hemerodromia	3	Insecta	Diptera	Empididae	Hemerodromia	-	Hemerodromiini	Predator	sp, bu	7.9
Naididae	9	Oligochaeta	Haplotaxida	Naididae	-	-	-	Collector	bu	8.5
Optioservus	1	Insecta	Coleoptera	Elmidae	Optioservus	-	-	Scraper	cn	5.4
Orthocladius	34	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladiinae	-	Collector	sp, bu	9.2
Parametriocnemus	5	Insecta	Diptera	Chironomidae	Parametriocnemus	Orthocladiinae	-	Collector	sp	4.6
Polypedilum	5	Insecta	Diptera	Chironomidae	Polypedilum	Chironominae	Chironomini	Shredder	cb, cn	6.3
Psephenus	1	Insecta	Coleoptera	Psephenidae	Psephenus	-	-	Scraper	cn	4.4
Rheotanytarsus	5	Insecta	Diptera	Chironomidae	Rheotanytarsus	Chironominae	Tanytarsini	Filterer	cn	7.2
Stempellinella	1	Insecta	Diptera	Chironomidae	Stempellinella	Chironominae	Tanytarsini	Collector	cb, sp, cn	4.2
Synorthocladius	5	Insecta	Diptera	Chironomidae	Synorthocladius	Orthocladiinae	-	Collector	-	6.6
Tanypodinae	2	Insecta	Diptera	Chironomidae	Tanypodinae	Tanypodinae	-	Predator	-	7.5
Tanytarsini	1	Insecta	Diptera	Chironomidae	-	Chironominae	Tanytarsini	Collector	-	3.5
Tanytarsus	1	Insecta	Diptera	Chironomidae	Tanytarsus	Chironominae	Tanytarsini	Filterer	cb, cn	4.9
Thienemannimyia Group	3	Insecta	Diptera	Chironomidae	Thienemannimyia Group	Orthocladiinae	-	Predator	sp	8.2
Tvetenia	15	Insecta	Diptera	Chironomidae	Tvetenia	Orthocladiinae	-	Collector	sp	5.1

Habits: cb = climber, cn = clinger, sw = swimmer, bu = burrower, sp = sprawler, sk = skater

BIBI Results Summary

Coastal Resources, Inc.

PRFR-202-X-2020

Benthic Index of Biotic Integrity (BIBI) Results

The BIBI for **PRFR-202-X-2020**, sampled on **04/23/2020**, is **2.25** and is ranked as **Poor**. Site **PRFR-202-X-2020** is located in the **Highlands** physiographic province.

Table 1: Benthic Index of Biotic Integrity (BIBI) Summary for PRFR-202-X-2020

	Metric Values	Metric Scores
Number of Taxa	28	5
Number of EPT Taxa	4	1
Number of Ephemeroptera Taxa	2	1
% Intolerant to Urban	3.04	1
% Tanytarsini	2.70	3
% Scrapers	0.68	1
% Swimmers	7.09	3
% Diptera	47.30	3
BIBI	**-**	**2.25**
Narrative Rank	**-**	**Poor**

PRFR-202-X-2020

Table 2: Benthic Taxa Site Summary for PRFR-202-X-2020

Taxon	Count	Class	Order	Family	Genus	Subfamily	Tribe	FFG	Habit	Tolerance
Baetidae	3	Insecta	Ephemeroptera	Baetidae	-	-	-	Collector	sw, cn	2.3
Baetis	17	Insecta	Ephemeroptera	Baetidae	Baetis	-	-	Collector	sw, cb, cn	3.9
Caenis	1	Insecta	Ephemeroptera	Caenidae	Caenis	-	-	Collector	sp	2.1
Cardiocladius	4	Insecta	Diptera	Chironomidae	Cardiocladius	Orthocladiinae	-	Predator	bu, cn	10.0
Chironomidae	13	Insecta	Diptera	Chironomidae	-	-	-	-	-	6.6
Crangonyx	1	Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	-	-	Collector	sp	6.7
Cryptochironomus	1	Insecta	Diptera	Chironomidae	Cryptochironomus	Chironominae	Chironomini	Predator	sp, bu	7.6
Cryptotendipes	1	Insecta	Diptera	Chironomidae	Cryptotendipes	Chironominae	Chironomini	Collector	sp	6.6
Diamesa	1	Insecta	Diptera	Chironomidae	Diamesa	Diamesinae	Diamesini	Collector	sp	8.5
Eukiefferiella	22	Insecta	Diptera	Chironomidae	Eukiefferiella	Orthocladiinae	-	Collector	sp	6.1
Micropsectra/Tanytarsus	1	Insecta	Diptera	Chironomidae	Micropsectra/Tanytarsus	Chironominae	Tanytarsini	-	-	
Naididae	129	Oligochaeta	Haplotaxida	Naididae	-	-	-	Collector	bu	8.5
Orthocladiinae	4	Insecta	Diptera	Chironomidae	-	Orthocladiinae	-	Collector	-	7.6
Orthocladius	19	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladiinae	-	Collector	sp, bu	9.2
Parakiefferiella	4	Insecta	Diptera	Chironomidae	Parakiefferiella	Orthocladiinae	-	Collector	sp	2.1
Parametriocnemus	9	Insecta	Diptera	Chironomidae	Parametriocnemus	Orthocladiinae	-	Collector	sp	4.6
Paratanytarsus	1	Insecta	Diptera	Chironomidae	Paratanytarsus	Chironominae	Tanytarsini	Collector	sp	7.7
Pisidium	1	Bivalvia	Veneroida	Pisidiidae	Pisidium	-	-	Filterer	bu	5.7
Polypedilum	4	Insecta	Diptera	Chironomidae	Polypedilum	Chironominae	Chironomini	Shredder	cb, cn	6.3
Potthastia	1	Insecta	Diptera	Chironomidae	Potthastia	Diamesinae	Diamesini	Collector	sp	0.0
Psephenus	1	Insecta	Coleoptera	Psephenidae	Psephenus	-	-	Scraper	cn	4.4
Rheocricotopus	4	Insecta	Diptera	Chironomidae	Rheocricotopus	Orthocladiinae	-	Collector	sp	6.2
Rheotanytarsus	5	Insecta	Diptera	Chironomidae	Rheotanytarsus	Chironominae	Tanytarsini	Filterer	cn	7.2
Simulium	16	Insecta	Diptera	Simuliidae	Simulium	-	Simuliini	Filterer	cn	5.7
Stenelmis	1	Insecta	Coleoptera	Elmidae	Stenelmis	-	-	Scraper	cn	7.1
Taeniopteryx	1	Insecta	Plecoptera	Taeniopterygidae	Taeniopteryx	-	-	Shredder	sp, cn	4.8
Tanytarsus	1	Insecta	Diptera	Chironomidae	Tanytarsus	Chironominae	Tanytarsini	Filterer	cb, cn	4.9
Thienemanniella	14	Insecta	Diptera	Chironomidae	Thienemanniella	Orthocladiinae	-	Collector	sp	5.1
Thienemannimyia Group	6	Insecta	Diptera	Chironomidae	Thienemannimyia Group	Orthocladiinae	-	Predator	sp	8.2
Triaenodes	1	Insecta	Trichoptera	Leptoceridae	Triaenodes	-	Triaenodini	Shredder	sw, cb	5.0
Tvetenia	9	Insecta	Diptera	Chironomidae	Tvetenia	Orthocladiinae	-	Collector	sp	5.1

Habits: cb = climber, cn = clinger, sw = swimmer, bu = burrower, sp = sprawler, sk = skater

BIBI Results Summary

Coastal Resources, Inc.

PRFR-203-X-2020

Benthic Index of Biotic Integrity (BIBI) Results

The BIBI for **PRFR-203-X-2020**, sampled on **04/23/2020**, is **2.25** and is ranked as **Poor**. Site **PRFR-203-X-2020** is located in the **Highlands** physiographic province.

Table 1: Benthic Index of Biotic Integrity (BIBI) Summary for PRFR-203-X-2020

	Metric Values	Metric Scores
Number of Taxa	20	3
Number of EPT Taxa	1	1
Number of Ephemeroptera Taxa	0	1
% Intolerant to Urban	0.43	1
% Tanytarsini	7.23	5
% Scrapers	5.11	3
% Swimmers	0.43	1
% Diptera	47.23	3
BIBI	**-**	**2.25**
Narrative Rank	**-**	**Poor**

PRFR-203-X-2020

Table 2: Benthic Taxa Site Summary for PRFR-203-X-2020

Taxon	Count	Class	Order	Family	Genus	Subfamily	Tribe	FFG	Habit	Tolerance
Agabus	1	Insecta	Coleoptera	Dytiscidae	Agabus	-	-	Predator	sw, dv	5.4
Amphinemura	1	Insecta	Plecoptera	Nemouridae	Amphinemura	-	-	Shredder	sp, cn	3.0
Calopteryx	1	Insecta	Odonata	Calopterygidae	Calopteryx	-	-	Predator	cb	8.3
Chironomidae	5	Insecta	Diptera	Chironomidae	-	-	-	-	-	6.6
Dicrotendipes	2	Insecta	Diptera	Chironomidae	Dicrotendipes	Chironominae	Chironomini	Collector	bu	9.0
Dubiraphia	1	Insecta	Coleoptera	Elmidae	Dubiraphia	-	-	Scraper	cn, cb	5.7
Eukiefferiella	10	Insecta	Diptera	Chironomidae	Eukiefferiella	Orthocladiinae	-	Collector	sp	6.1
Girardia	10	Turbellaria	Tricladida	Dugesiidae	Girardia	-	-	Predator	sp	9.3
Hemerodromia	2	Insecta	Diptera	Empididae	Hemerodromia	-	Hemerodromiini	Predator	sp, bu	7.9
Macronychus	2	Insecta	Coleoptera	Elmidae	Macronychus	-	-	Scraper	cn	6.8
Micropsectra/Tanytarsus	9	Insecta	Diptera	Chironomidae	Micropsectra/Tanytarsus	Chironominae	Tanytarsini	-	-	
Microtendipes	1	Insecta	Diptera	Chironomidae	Microtendipes	Chironominae	Chironomini	Filterer	cn	4.9
Naididae	99	Oligochaeta	Haplotaxida	Naididae	-	-	-	Collector	bu	8.5
Orthocladiinae	5	Insecta	Diptera	Chironomidae	-	Orthocladiinae	-	Collector	-	7.6
Orthocladius	48	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladiinae	-	Collector	sp, bu	9.2
Parametriocnemus	10	Insecta	Diptera	Chironomidae	Parametriocnemus	Orthocladiinae	-	Collector	sp	4.6
Rheotanytarsus	4	Insecta	Diptera	Chironomidae	Rheotanytarsus	Chironominae	Tanytarsini	Filterer	cn	7.2
Simulium	3	Insecta	Diptera	Simuliidae	Simulium	-	Simuliini	Filterer	cn	5.7
Stenelmis	9	Insecta	Coleoptera	Elmidae	Stenelmis	-	-	Scraper	cn	7.1
Tanytarsus	4	Insecta	Diptera	Chironomidae	Tanytarsus	Chironominae	Tanytarsini	Filterer	cb, cn	4.9
Thienemannimyia Group	3	Insecta	Diptera	Chironomidae	Thienemannimyia Group	Orthocladiinae	-	Predator	sp	8.2
Tvetenia	5	Insecta	Diptera	Chironomidae	Tvetenia	Orthocladiinae	-	Collector	sp	5.1

Habits: cb = climber, cn = clinger, sw = swimmer, bu = burrower, sp = sprawler, sk = skater

BIBI Results Summary

Coastal Resources, Inc.

PRFR-204-X-2020

Benthic Index of Biotic Integrity (BIBI) Results

The BIBI for **PRFR-204-X-2020**, sampled on **04/23/2020**, is **2.50** and is ranked as **Poor**. Site **PRFR-204-X-2020** is located in the **Highlands** physiographic province.

Table 1: Benthic Index of Biotic Integrity (BIBI) Summary for PRFR-204-X-2020

	Metric Values	Metric Scores
Number of Taxa	26	5
Number of EPT Taxa	5	1
Number of Ephemeroptera Taxa	4	3
% Intolerant to Urban	2.54	1
% Tanytarsini	9.78	5
% Scrapers	6.52	3
% Swimmers	1.45	1
% Diptera	69.93	1
BIBI	**-**	**2.50**
Narrative Rank	**-**	**Poor**

PRFR-204-X-2020

Table 2: Benthic Taxa Site Summary for PRFR-204-X-2020

Taxon	Count	Class	Order	Family	Genus	Subfamily	Tribe	FFG	Habit	Tolerance
Agabus	1	Insecta	Coleoptera	Dytiscidae	Agabus	-	-	Predator	sw, dv	5.4
Baetis	2	Insecta	Ephemeroptera	Baetidae	Baetis	-	-	Collector	sw, cb, cn	3.9
Caenis	1	Insecta	Ephemeroptera	Caenidae	Caenis	-	-	Collector	sp	2.1
Ceratopogonidae	2	Insecta	Diptera	Ceratopogonidae	-	-	-	Predator	sp, bu	3.6
Chironomidae	13	Insecta	Diptera	Chironomidae	-	-	-	-	-	6.6
Elmidae	1	Insecta	Coleoptera	Elmidae	-	-	-	Collector	cn	4.8
Enchytraeidae	9	Oligochaeta	Haplotaxida	Enchytraeidae	-	-	-	Collector	bu	9.1
Ephemerella	1	Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	-	-	Collector	cn, sw	2.3
Girardia	5	Turbellaria	Tricladida	Dugesiidae	Girardia	-	-	Predator	sp	9.3
Hydropsyche	1	Insecta	Trichoptera	Hydropsychidae	Hydropsyche	-	-	Filterer	cn	7.5
Micropsectra	5	Insecta	Diptera	Chironomidae	Micropsectra	Chironominae	Tanytarsini	Collector	cb, sp	2.1
Naididae	40	Oligochaeta	Haplotaxida	Naididae	-	-	-	Collector	bu	8.5
Optioservus	1	Insecta	Coleoptera	Elmidae	Optioservus	-	-	Scraper	cn	5.4
Orthocladius	79	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladiinae	-	Collector	sp, bu	9.2
Pagastia	1	Insecta	Diptera	Chironomidae	Pagastia	Diamesinae	Diamesini	Collector	-	6.6
Paratanytarsus	5	Insecta	Diptera	Chironomidae	Paratanytarsus	Chironominae	Tanytarsini	Collector	sp	7.7
Physa	1	Gastropoda	Basommatophora	Physidae	Physa	-	-	Scraper	cb	7.0
Pisidiidae	1	Bivalvia	Veneroida	Pisidiidae	-	-	-	Filterer	-	6.5
Polypedilum	14	Insecta	Diptera	Chironomidae	Polypedilum	Chironominae	Chironomini	Shredder	cb, cn	6.3
Psephenus	1	Insecta	Coleoptera	Psephenidae	Psephenus	-	-	Scraper	cn	4.4
Rheotanytarsus	6	Insecta	Diptera	Chironomidae	Rheotanytarsus	Chironominae	Tanytarsini	Filterer	cn	7.2
Simulium	40	Insecta	Diptera	Simuliidae	Simulium	-	Simuliini	Filterer	cn	5.7
Stenelmis	15	Insecta	Coleoptera	Elmidae	Stenelmis	-	-	Scraper	cn	7.1
Sublettea	11	Insecta	Diptera	Chironomidae	Sublettea	Chironominae	Tanytarsini	Collector	-	10.0
Teloganopsis	1	Insecta	Ephemeroptera	Ephemerellidae	Teloganopsis	-	-	Collector	-	
Thienemannimyia Group	7	Insecta	Diptera	Chironomidae	Thienemannimyia Group	Orthocladiinae	-	Predator	sp	8.2
Tubificidae	2	Oligochaeta	Tubificida	Tubificidae	-	-	-	Collector	cn	8.4
Tvetenia	10	Insecta	Diptera	Chironomidae	Tvetenia	Orthocladiinae	-	Collector	sp	5.1

Habits: cb = climber, cn = clinger, sw = swimmer, bu = burrower, sp = sprawler, sk = skater

BIBI Results Summary

Coastal Resources, Inc.

PRFR-205-X-2020

Benthic Index of Biotic Integrity (BIBI) Results

The BIBI for **PRFR-205-X-2020**, sampled on **04/23/2020**, is **2.00** and is ranked as **Poor**. Site **PRFR-205-X-2020** is located in the **Highlands** physiographic province.

Table 1: Benthic Index of Biotic Integrity (BIBI) Summary for PRFR-205-X-2020

	Metric Values	Metric Scores
Number of Taxa	16	3
Number of EPT Taxa	3	1
Number of Ephemeroptera Taxa	2	1
% Intolerant to Urban	0.26	1
% Tanytarsini	0.78	3
% Scrapers	0.78	1
% Swimmers	1.55	1
% Diptera	20.21	5
BIBI	**-**	**2.00**
Narrative Rank	**-**	**Poor**

PRFR-205-X-2020

Table 2: Benthic Taxa Site Summary for PRFR-205-X-2020

Taxon	Count	Class	Order	Family	Genus	Subfamily	Tribe	FFG	Habit	Tolerance
Baetidae	1	Insecta	Ephemeroptera	Baetidae	-	-	-	Collector	sw, cn	2.3
Baetis	5	Insecta	Ephemeroptera	Baetidae	Baetis	-	-	Collector	sw, cb, cn	3.9
Chironomidae	7	Insecta	Diptera	Chironomidae	-	-	-	-	-	6.6
Cricotopus	4	Insecta	Diptera	Chironomidae	Cricotopus	Orthocladiinae	-	Shredder	cn, bu	9.6
Empididae	1	Insecta	Diptera	Empididae	-	-	-	Predator	sp, bu	7.5
Eukiefferiella	14	Insecta	Diptera	Chironomidae	Eukiefferiella	Orthocladiinae	-	Collector	sp	6.1
Hydropsyche	1	Insecta	Trichoptera	Hydropsychidae	Hydropsyche	-	-	Filterer	cn	7.5
Naididae	295	Oligochaeta	Haplotaxida	Naididae	-	-	-	Collector	bu	8.5
Nematoda	2	-	-	-	-	-	-	-	-	
Orthocladius	33	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladiinae	-	Collector	sp, bu	9.2
Parametriocnemus	5	Insecta	Diptera	Chironomidae	Parametriocnemus	Orthocladiinae	-	Collector	sp	4.6
Plauditus	1	Insecta	Ephemeroptera	Baetidae	Plauditus	-	-	-	-	
Polypedilum	1	Insecta	Diptera	Chironomidae	Polypedilum	Chironominae	Chironomini	Shredder	cb, cn	6.3
Psephenus	1	Insecta	Coleoptera	Psephenidae	Psephenus	-	-	Scraper	cn	4.4
Simulium	5	Insecta	Diptera	Simuliidae	Simulium	-	Simuliini	Filterer	cn	5.7
Stenelmis	2	Insecta	Coleoptera	Elmidae	Stenelmis	-	-	Scraper	cn	7.1
Tanytarsini	3	Insecta	Diptera	Chironomidae	-	Chironominae	Tanytarsini	Collector	-	3.5
Thienemanniella	5	Insecta	Diptera	Chironomidae	Thienemanniella	Orthocladiinae	-	Collector	sp	5.1

Habits: cb = climber, cn = clinger, sw = swimmer, bu = burrower, sp = sprawler, sk = skater

BIBI Results Summary

Coastal Resources, Inc.

PRFR-206-X-2020

Benthic Index of Biotic Integrity (BIBI) Results

The BIBI for **PRFR-206-X-2020**, sampled on **04/23/2020**, is **2.00** and is ranked as **Poor**. Site **PRFR-206-X-2020** is located in the **Highlands** physiographic province.

Table 1: Benthic Index of Biotic Integrity (BIBI) Summary for PRFR-206-X-2020

	Metric Values	Metric Scores
Number of Taxa	23	3
Number of EPT Taxa	2	1
Number of Ephemeroptera Taxa	1	1
% Intolerant to Urban	0.27	1
% Tanytarsini	1.35	3
% Scrapers	1.62	1
% Swimmers	1.62	1
% Diptera	25.68	5
BIBI	**-**	**2.00**
Narrative Rank	**-**	**Poor**

PRFR-206-X-2020

Table 2: Benthic Taxa Site Summary for PRFR-206-X-2020

Taxon	Count	Class	Order	Family	Genus	Subfamily	Tribe	FFG	Habit	Tolerance
Baetis	6	Insecta	Ephemeroptera	Baetidae	Baetis	-	-	Collector	sw, cb, cn	3.9
Chironomidae	4	Insecta	Diptera	Chironomidae	-	-	-	-	-	6.6
Corydalus	1	Insecta	Megaloptera	Corydalidae	Corydalus	-	-	Predator	cn, cb	1.4
Corynoneura	10	Insecta	Diptera	Chironomidae	Corynoneura	Orthocladiinae	-	Collector	sp	4.1
Diamesa	2	Insecta	Diptera	Chironomidae	Diamesa	Diamesinae	Diamesini	Collector	sp	8.5
Dicrotendipes	1	Insecta	Diptera	Chironomidae	Dicrotendipes	Chironominae	Chironomini	Collector	bu	9.0
Elmidae	1	Insecta	Coleoptera	Elmidae	-	-	-	Collector	cn	4.8
Enchytraeidae	1	Oligochaeta	Haplotaxida	Enchytraeidae	-	-	-	Collector	bu	9.1
Girardia	6	Turbellaria	Tricladida	Dugesiidae	Girardia	-	-	Predator	sp	9.3
Hydropsyche	2	Insecta	Trichoptera	Hydropsychidae	Hydropsyche	-	-	Filterer	cn	7.5
Macronychus	1	Insecta	Coleoptera	Elmidae	Macronychus	-	-	Scraper	cn	6.8
Micropsectra/Tanytarsus	1	Insecta	Diptera	Chironomidae	Micropsectra/Tanytarsus	Chironominae	Tanytarsini	-	-	
Naididae	251	Oligochaeta	Haplotaxida	Naididae	-	-	-	Collector	bu	8.5
Orthocladius	40	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladiinae	-	Collector	sp, bu	9.2
Pagastia	1	Insecta	Diptera	Chironomidae	Pagastia	Diamesinae	Diamesini	Collector	-	6.6
Parametriocnemus	5	Insecta	Diptera	Chironomidae	Parametriocnemus	Orthocladiinae	-	Collector	sp	4.6
Polypedilum	4	Insecta	Diptera	Chironomidae	Polypedilum	Chironominae	Chironomini	Shredder	cb, cn	6.3
Rheotanytarsus	1	Insecta	Diptera	Chironomidae	Rheotanytarsus	Chironominae	Tanytarsini	Filterer	cn	7.2
Simulium	15	Insecta	Diptera	Simuliidae	Simulium	-	Simuliini	Filterer	cn	5.7
Stenelmis	5	Insecta	Coleoptera	Elmidae	Stenelmis	-	-	Scraper	cn	7.1
Sublettea	2	Insecta	Diptera	Chironomidae	Sublettea	Chironominae	Tanytarsini	Collector	-	10.0
Tanytarsus	1	Insecta	Diptera	Chironomidae	Tanytarsus	Chironominae	Tanytarsini	Filterer	cb, cn	4.9
Thienemannimyia Group	3	Insecta	Diptera	Chironomidae	Thienemannimyia Group	Orthocladiinae	-	Predator	sp	8.2
Tubificidae	1	Oligochaeta	Tubificida	Tubificidae	-	-	-	Collector	cn	8.4
Tvetenia	5	Insecta	Diptera	Chironomidae	Tvetenia	Orthocladiinae	-	Collector	sp	5.1

Habits: cb = climber, cn = clinger, sw = swimmer, bu = burrower, sp = sprawler, sk = skater

Attachment C - USGS Memoranda

United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Maryland-Delaware-DC Water Science Center
5522 Research Park Drive
Baltimore, MD
21228

To: Water Programs Division
Office of Environmental Design
State Highway Administration
Maryland Department of Transportation

From: Mary Kay Foley
Director
Maryland-Delaware-DC Water Science Center
United States Geological Survey

Date: April 27, 2021

RE: Issue impacting some water quality samples analyzed by the USGS National Water Quality Laboratory

The USGS National Water Quality Laboratory (NWQL) has discovered an issue impacting a subset of environmental sample results for ammonium, nitrite, and orthophosphate. Due to an analyst's failure to follow the analytical standard operating procedures, results from 2,238 samples analyzed between March 2019 and June 2020 were released to the USGS National Water Information System (NWIS) even though the bracketing quality control (QC) samples did not meet the required specifications. Upon discovery of the issue, the NWQL Quality Assurance Section and Analytical Services Section performed an exhaustive audit to determine the full extent of samples affected. You're receiving this notification because 16 of the affected samples are associated with collaborative work between USGS and your organization at Little Catoctin Creek, USGS gage numbers 01636845 and 01636846.

The impact of this error on the sample results is typically small but is variable and depends on the concentration of an analyte in the sample in comparison to the concentration detected in the QC samples. NWQL is reprocessing the analytical data from these samples and will revise the reported QC flag appropriately. Current information known about these samples are appended in a supplementary table attached to this letter. The results will be communicated in a follow-up notification.

Meanwhile, we are working to understand the scope of potential impacts this may have on your organization and particularly on any applications that rely on these samples. We are eager to assist in any way we can.

We sincerely apologize for any inconvenience this incident may cause you and assure you that we are doing everything we can to remedy the situation. The USGS remains dedicated to the highest scientific standards and we are working to ensure to the best of our abilities that a similar situation does not occur again.

Best regards,

Mary Kay Foley
Director

STATION_ID	SAMPLEDATE	TIME	TEST_SHORT_NAME	RESULT	RESULT_UNIT	RESULT_COMMENT
1636845	03/22/2019	1025	Nitrite	0.01037	mg-N/L	Continuing calibration verification (CCV) result of 0.05507 mg/L, result may be biased high. CCV expected value is 0.050 and acceptance range is 0.0450 to 0.0550 mg/L.
1636845	01/25/2020	940	Ammonium	0.07775	mg-N/L	Laboratory reagent blank (LRB) result of 0.0102 mg/L, result may be biased high. LRB acceptance criteria is ≤0.010 mg/L.
1636845	02-06-20	145	Nitrite	0.01523	mg-N/L	Third party check (TPC) result of 0.17677, result may be biased high. TPC expected value is 0.160 mg/L and acceptance range is 0.1498 to 0.1702 mg/L.
1636845	02-06-20	1120	Nitrite	0.01024	mg-N/L	Third party check (TPC) result of 0.17677, result may be biased high. TPC expected value is 0.160 mg/L and acceptance range is 0.1498 to 0.1702 mg/L.
1636845	02-06-20	1110	Nitrite	0.00988	mg-N/L	Third party check (TPC) result of 0.17677, result may be biased high. TPC expected value is 0.160 mg/L and acceptance range is 0.1498 to 0.1702 mg/L.
1636845	02-07-20	5	Ammonium	0.06743	mg-N/L	Laboratory reagent blank (LRB) results of 0.01432 and 0.01337 mg/L, result may be biased high. LRB acceptance criteria is ≤0.010 mg/L.
1636845	02-07-20	5	Nitrite	0.0112	mg-N/L	Third party check (TPC) result of 0.17855, result may be biased high. TPC expected value is 0.160 mg/L and acceptance range is 0.1498 to 0.1702 mg/L.
1636845	04/24/2020	420	Ammonium	0.51116	mg-N/L	Continuing calibration verification (CCV) results of 0.22719 and 0.22136 mg/L, result may be biased high. CCV expected value is 0.20 mg/L and acceptance range is 0.1800 to 0.2200 mg/L.
1636846	03/22/2019	1135	Nitrite	0.01269	mg-N/L	Continuing calibration verification (CCV) result of 0.05507 mg/L, result may be biased high. CCV expected value is 0.050 and acceptance range is 0.0450 to 0.0550 mg/L.
1636846	01/25/2020	920	Ammonium	0.07811	mg-N/L	Laboratory reagent blank (LRB) result of 0.01194 mg/L, result may be biased high. LRB acceptance criteria is ≤0.010 mg/L.
1636846	02-06-20	1100	Ammonium	0.05456	mg-N/L	Laboratory reagent blank (LRB) results of0.0112 and 0.01194 mg/L, result may be biased high. LRB acceptance criteria is ≤0.010 mg/L.
1636846	02-06-20	1105	Ammonium	0.05036	mg-N/L	Laboratory reagent blank (LRB) results of 0.01194 and 0.01432 mg/L, result may be biased high. LRB acceptance criteria is ≤0.010 mg/L.
1636846	02-06-20	115	Nitrite	0.01355	mg-N/L	Third party check (TPC) result of 0.17677, result may be biased high. TPC expected value is 0.160 mg/L and acceptance range is 0.1498 to 0.1702 mg/L.
1636846	02-07-20	0	Ammonium	0.06134	mg-N/L	Laboratory reagent blank (LRB) results of 0.01432 and 0.01337 mg/L, result may be biased high. LRB acceptance criteria is ≤0.010 mg/L.
1636846	02-07-20	0	Nitrite	0.01198	mg-N/L	Third party check (TPC) result of 0.17855, result may be biased high. TPC expected value is 0.160 mg/L and acceptance range is 0.1498 to 0.1702 mg/L.
1636846	04/24/2020	915	Ammonium	0.19637	mg-N/L	Continuing calibration verification (CCV) results of 0.22719 and 0.22136 mg/L, result may be biased high. CCV expected value is 0.20 mg/L and acceptance range is 0.1800 to 0.2200 mg/L.

United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Maryland-Delaware-DC Water Science Center
5522 Research Park Drive
Baltimore, MD
21228

To: Water Programs Division
Office of Environmental Design
State Highway Administration
Maryland Department of Transportation

From: Matthew J Cashman, Ph.D.
Supervisory Hydrologist
Maryland-Delaware-DC Water Science Center
United States Geological Survey

Date: September 22, 2021

RE: Status update to “Issue impacting some water quality samples analyzed by the USGS National Water Quality Laboratory”

This letter is to provide a further update as to the status of data affected by the USGS National Water Quality Laboratory (NWQL) issue first addressed in a letter dated April 27, 2021. That letter identified 16 samples of concern affected by a violation of standard QC processes at the NWQL which have a high likelihood of bias.

Since our last correspondence, the USGS headquarters-led investigation into the issue is still ongoing and there is currently no official timeline for the conclusion of the investigation. Any forthcoming update at its conclusion is not expected to change any values for the affected data but may provide additional qualifiers or comments. In addition, a technical memo is being produced that will document the process used to qualify these data.

The USGS Maryland-Delaware-DC Water Science Center has decided that data affected by this NWQL issue will be marked within our internal databases with the Data Quality Indicator Code of ‘Q’ (*i.e.* Reviewed and Rejected, or Poor Quality), since these data do not meet the standards of our standard laboratory QC processes and may lead to incorrect interpretations about the occurrence and distribution of these compounds in the sampled streams. This decision in the face of unknown bias is based on preexisting recommendations from Office of Water Quality Technical Memorandum (OWQTM) 2002.15 (available at: https://water.usgs.gov/water-resources/memos/memo.php?id=2224) and corresponds to similar recent decisions by USGS National and Regional water quality trend networks in how to respond to this NWQL data quality issue.

This decision will restrict public access to these data through standard publicly accessible USGS portals (e.g., the National Water Information System, waterdata.usgs.gov). Since USGS public-facing data are frequently accessed for studies beyond their initial collection purpose, the screening of public access is intended to prevent these samples from being included inappropriately in future studies. Given the uncertainty associated with these values, these data may result in biased spatial and temporal analyses and flawed interpretations.

We acknowledge that, given careful consideration of the impact of these potential biases, these data may have value in some limited use cases. As a result, even though these data are screened from public access through USGS web-portals, the MDOT-SHA Office of Environmental Design, in consultation with Maryland Department of the Environment, may determine that these data are sufficient, or informative, for use in regulatory compliance purposes with appropriate qualifiers and comments. Our previous correspondence on April 27, 2021 indicated that nutrient concentrations in the 16 samples from Little Catoctin Creek USGS Stations 01636845 and 01636846 may be biased high, compared to true values. Full consideration should be given as to the potential impact of bias associated with these samples on their intended final use.

Sincerely,
Matthew J Cashman, Ph.D.
Supervisory Hydrologist
Maryland-Delaware-DC Water Science Center
US Geological Survey

Appendix G: Stream Restoration Analysis Report

In accordance with Part V.A.2.d of the MS4 Permit and applicable guidance provided for the AltBMPLine feature class in Version 1.2 of the MDE *NPDES MS4 Geodatabase Design and User's Guide* and in Appendix E to the 2014 MDE document, "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated", MDOT SHA has included this Stream Restoration Analysis Report to show the work behind calculations for defining pollutant load reductions for stream restoration projects using protocols approved by the Chesapeake Bay Program (CBP). Pollutant removal credits for stream restoration are described in the CBP approved document "Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects" (Schueler and Stack, 2014).

Included as attachments to this report are three memos that serve as representative examples of the three distinct protocol computations MDOT SHA applied to stream restoration and outfall stabilization projects implemented during the current MS4 Permit term. MDOT SHA applied Protocol 1 from Schueler and Stack (2014) but also 'Protocol 5' described in the CBP approved document developed by MDOT SHA, titled "Recommendations for Crediting Outfall and Gully Stabilization Projects in the Chesapeake Bay Watershed". In some cases, both Protocol 1 and Protocol 5 could be applied additively to a single project.

MDOT SHA implemented stream restoration at 54 sites and outfall stabilization at 31 sites during the current MS4 Permit term. Provided below is a summary of crediting methodology applied by MDOT SHA for sites, separated by BMP type.

Table V.A.2.d: Summary of Crediting Methodologies Applied to MDOT SHA Stream Restoration and Outfall Stabilization Projects

BMP Type	Interim Rate	Protocol 1	Protocol 5	Protocol 1 & 5
Stream Restoration	26	23	1	4
Outfall Stabilization	6	4	21	0

TMDL Protocol 1 Crediting Memorandum
Gramies Run Stream Restoration Project

MDOT SHA Contract No. CE 286A21

Revised April 2021

Prepared for:

Maryland Department of Transportation
State Highway Administration
Office of Environmental Design
Water Programs Division
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INTRODUCTION

Gramies Run, a tributary to Big Elk Creek located in Cecil County, MD, was identified for restoration by the Maryland Department of Transportation State Highway Administration (MDOT SHA) to help meet Total Maximum Daily Load (TMDL) mandates for nitrogen, phosphorus, and sediment. Approximately 5,473 linear feet of stream will be restored using a combination of channel stabilization and floodplain reconnection techniques that will maximize TMDL credit. As part of these design efforts, McCormick Taylor (MT) and Versar, Inc. conducted a modified Bank Assessment for Non-Point Source Consequences of Sediment (BANCS) model (Rosgen, 2001, 2006) to estimate streambank erosion at the project site. All field assessments performed at the project site follow the methodology outlined in the Standard Operating Procedure (MDOT SHA 2019): Estimating Bank Erosion using the BANCS Model for TMDL Sediment Monitoring (MDOT SHA, 2017). The Standard Operating Procedure (SOP) serves as the basis for field assessments and calculations as defined in the Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects (Schueler and Stack, 2014) Protocol 1: Credit for Prevented Sediment during Storm Flow. The BANCS method component of Protocol 1 is being utilized for TMDL crediting based on its wide applicability to the project site, to maximize the TMDL credit potential.

In March 2021, TMDL calculations were revised to reflect any changes in the linear feet restored as part of project construction and to revise the restoration efficiency from 100% to 56% in accordance with guidance from staff at MDOT SHA OED. The originally projected length of restoration for Gramies Run was approximately 5,160 linear feet. The 30-day post-construction monitoring report for Gramies Run (August 2020) show that approximately 5,473 linear feet was restored. The as-built restoration length is 313 linear feet greater than the original length assessed for Protocol 1 in 2019. The additional 313 linear feet was added to the total restoration length after detailed topographic surveys provided greater stream length accuracy, showing greater sinuosity than what was assumed in the technical proposal.

Crediting Summary (Updated April 2021):

Site Name	Annual Calculated TN (lbs/yr)	Annual Calculated TP (lbs/yr)	Annual Calculated TSS[1] (tons/yr)	Annual Calculated TSS[2] (tons/yr)	Interim TN [0.075] (lbs/ year)	Interim TP [0.068] (lbs/year)	Interim TSS [15.1/44.9] (tons/year)	Calculated Total Impervious Acre Treatment (Acres)	Capped Impervious Acre Treatment (Acres)
Gramies	765	150	98	968	410	372	123	132.9	123.0

[1]Edge of Stream delivery ratio applied to Annual TSS based on location of the project: coastal plain (0.061) or non-coastal plain (0.181) (CBWM 5.3.2.)
[2]Edge of Field rate with no delivery ratio applied to Annual TSS Total
Note: This summary includes calculations for Protocol 1

BACKGROUND INFORMATION

The project area at Gramies Run lies in a rural watershed, with 6 percent impervious area, and a maximum drainage area of 3.11 square miles. The watershed is located in the Piedmont physiographic region, and topography is primarily gently rolling, to moderately hilly terrain. The project consists of a main branch of Gramies Run (Mainstem) and three unnamed tributaries (UNT-1, UNT-2, and UNT-3). The mainstem and tributaries are located within Fair Hill State Natural Resources Management Area (FH-NRMA) and adjacent private farm properties. At the upstream and downstream extent of the project area, the Mainstem of Gramies Run is a second order, perennial stream, and remains perennial to the confluence with Big Elk

Creek. The unnamed tributaries are also perennial streams draining to Gramies Run. The primary erosion mechanism is through fluvial processes causing channel degradation and lateral erosion of streambanks.

BANCS Assessment, Cross Section Survey, and Soil Sampling

Field assessments at each stream restoration site consist of BANCS monitoring and soil sampling. BANCS monitoring uses Bank Erosion Hazard Index (BEHI) and Near-Bank Stress (NBS) to calculate erosion potential. Soil samples for bulk density analysis and nutrient analysis of total phosphorus and total nitrogen were collected for every 1,000 linear foot of streambank. Soil samples are then analyzed for bulk density at Spectrum Analytic, Inc., and sent to the Pennsylvania State Agricultural Analytical Services Laboratory (AASL) to test for total nitrogen and total phosphorus composition.

METHODOLOGY

Estimating Erosion Rate and Nutrient Load

Results of the BANCS field assessments utilize erosion rates included in **Table 1**, developed by the U.S. Fish and Wildlife Service Chesapeake Bay Field Office (USFWS, 2018). The rates are included in a spreadsheet referenced as an alternative source for erosion rates by the Chesapeake Stormwater Network (CSN) and the Center for Watershed Protection (CWP) in Frequently Asked Questions: Urban Stream Restoration BMP (CSN and CWP, 2018). The erosion rates are based on data collected by the USFWS at Hickey Run (USFWS, 2005) and data collected by the U.S. Forest Service in Colorado (Rosgen, 2001) with interpolated values for some erosion rates (USFWS, 2018). The erosion rate is applied to an appropriate area of stream bank to determine the volume of bank material eroded in tons per year.

Table 1. Erosion Rate in Feet per Year for Predicting Bank Erosion

		BEHI					
	RATING	Very Low	Low	Moderate	High	Very High	Extreme
NBS	Very Low	0.005[c]	0.015[c]	0.090[c]	0.250[a]	0.250[a]	0.150[c]
	Low	0.010[a]	0.030[a]	0.125[a]	0.400[a]	0.400[a]	1.300[a]
	Moderate	0.020[c]	0.070[a]	0.300[a]	0.640[a]	0.640[a]	1.750[a]
	High	0.035[c]	0.150[c]	0.800[a]	1.000[a]	1.000[a]	2.500[a]
	Very High	0.065[c]	0.350[c]	1.000[c]	1.750[a]	1.750[a]	3.500[a]
	Extreme	0.150[c]	0.800[c]	1.200[b]	2.500[a]	2.500[a]	4.500[a]

Note: Values are from Appendix A. TMDL Credit Reduction Workbook Using BANCS and Protocol 1 of the Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects (USFWS, 2018): a) Hickey Run Bank Erosion Curve (USFWS, 2005); b) Colorado Bank Erosion Curve (Rosgen, 2001); c) Interpolated Colorado Bank Erosion Curve (USFWS, 2018).

The measured bulk density and nutrient concentrations were averaged by North and South reaches of Gramies Run. The average erosion rate (feet/year) is converted to a predicted loading rate for sediment (tons/year), nitrogen (lbs./year), and phosphorus (lbs./year) by multiplying the erosion rate by the average bulk density and nutrient concentrations. Monumented cross sections were resurveyed prior to construction of the Gramies Run project and will be evaluated in the future with other SHA stream restoration projects to evaluate actual erosion rates.

Sediment Delivery Factor

Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects (Schueler and Stack, 2014) states that mass load reductions should be discounted for projects not being 100% effective in preventing stream bank erosion. In accordance with guidance from staff at MDOT SHA OED (March 2021) a 56% restoration efficiency was applied to the calculated credit.

Based on revised interim rates provided by MDE (MDOT, March 2020) for TN, TP and TSS, McCormick Taylor applied the rates per linear foot of restoration (see **Figure 1**).

Figure 1. Stream Restoration Revised Interim Rates provided by MDE (MDOT, March 2020)

Table E.4 Stream Restoration Revised Interim Removal Rates per Linear Foot (lb/ft/yr)

Source	TN	TP	TSS[1]	
			Coastal Plain	Non-Coastal Plain
Revised Interim Rate	0.075	0.068	15.1	44.9

[1] The TSS removal rates are based on whether a project is located in the coastal plain or non-coastal plain. Schueler and Stack (2014) provides a discussion of the TSS removal rate and application of a sediment delivery ratio based on the location of the project. The TSS removal rates shown above were derived by multiplying 248 lb/ft/yr by the average CBWM (version 5.3.2) sediment delivery ratio for projects located in the coastal plain (0.061) and non-coastal plain (0.181).

Impervious Area Treatment

Impervious area treatment for the BANCS method is calculated following methods described in MDE (2014). Once total annual pollutant load reduction is calculated, it is converted to an average pollutant load reduction by dividing by the watershed area (acres). The average acres of treatment for nutrients and sediment per linear foot is then calculated using the impervious acre conversion factor, site length, and drainage area. Total acres of treatment for nutrients and sediment is based on the site length and average acres of treatment per linear foot.

PROTOCOL 1 CREDITING RESULTS

The Gramies Run project site was assessed for BANCS between May 2, 2017 and May 3, 2017. Cross section survey and soil sampling was performed between July 17, 2017 and July 19, 2017. The site was assessed as two reaches (North and South) based on distinct differences in channel geomorphology. The North Reach includes UNT-3 and Gramies Run Reach 5, for a combined total of 4,438 linear feet of streambank. The South Reach includes UNT-1 and UNT-2, as well as Gramies Run Reach 2 and Reach 3, for a combined total of 6,547 linear feet of streambank. Lengths for each BEHI category were totaled, including left and right banks. A summary of the proportion of BEHI classifications found within the project site is below: the sum of left and right bank lengths for each BEHI category were divided by total length of all BEHI sections to calculate the percentages in **Table 2**. Six (6) cross sections were surveyed, three (3) on the North Reach and three (3) on the South Reach, to encompass the six classifications of BEHI in each reach. A total of 38 soil samples were collected at representative soil strata within the surveyed cross sections. The average sediment and nutrient concentrations are included in **Table 3**.

Table 2: Summary of BEHI Class Proportions for Gramies Run

BEHI	*North Reach*	*South Reach*	*Entire Gramies Run Project Site*
Very Low	12.7%	13.0%	12.8%
Low	14.7%	16.5%	15.8%
Moderate	15.3%	17.8%	16.8%
High	23.0%	14.7%	18.0%
Very High	23.3%	19.0%	20.8%
Extreme	11.0%	19.0%	15.8%

Note: The project length was split 40% North Reach and 60% South Reach

Table 3: Average Bulk Density, Total Nitrogen, and Total Phosphorus at Gramies Run

	Bulk Density (lbs/cf)	*Nitrogen (%)*	*Phosphorus (%)*
North Reach	74.8	0.077	0.016
South Reach	78.5	0.067	0.013
Gramies Run Average	76.6	0.072	0.014

Approximately 55% of the project site is associated with higher erosion classes (high, very high, and extreme) and 45% of the project site is associated with lower erosion classes (very low, low, and moderate). The Very High class was the most commonly identified across the project site. North Reach exhibits a larger percentage of High and Very High, while the South Reach shows a larger percentage of Extreme classification. North Reach contains higher concentrations of nitrogen and phosphorus than South Reach, but lower bulk density.

The predicted erosion rates were evaluated for each project reach and the overall site average. Final loading estimates for sediment and nutrients are based on a reach-average of bulk density values and nutrient concentrations values. Preliminary loading estimates are shown in **Table 4**.

Table 4: Preliminary Loading Estimates for Sediment and Nutrients

Site, Reach	*Sediment Load (tons/yr.)*[1]	*Nutrient Removed as Percent of Sediment Load*	
		Nitrogen Removed (lbs./yr.)	*Phosphorus Removed (lbs./yr.)*
Gramies Run, North	344	527	108
Gramies Run, South	624	835	161
TOTAL	**968**	**1363**	**268**

[1]Edge of Field rate with no delivery ratio applied to Annual TSS Total

The BANCS assessment and TMDL Protocol 1 for Gramies Run determined the annual pollutant load for the three pollutants total suspended sediment, total nitrogen, and total phosphorus **(Table 4)**. In the final analysis of the crediting protocol, the results in this table are used to determine overall water quality credit. Final crediting is computed using these sediment and nutrient values applied over the project site, based on

site-specific values for watershed area, percent impervious area, linear feet of stream, and physiographic region.

Table 5 provides the results with the SDF applied to TSS (0.181 for Non-Coastal Plain), and without SDF applied for TN and TP. Only TSS has been given a delivery ratio applied in accordance with updated guidance (MDOT SHA, March 2020). These values also have the 56% efficiency factor applied as directed by staff at MDOT SHA OED (March 2021). From the preliminary assessment, 6 % of the watershed at the Gramies Run project site is impervious surface (123 acres). A total of 5,473 linear feet of stream channel is assessed for this crediting summary, which includes left and right streambanks.

The values for Delta Impervious Surface and Forest are assumed for all sites where this protocol is applied. These values are based on the pollutant loads associated with runoff from an acre of impervious land cover and an acre of forest (MDOT SHA, March 2020). The Average Pollutant Load Reduction column shows pollutant load reduction on a per-acre basis and is the result of the total pollutant load divided by the total watershed area in acres. The ratio of Average Pollutant Load Reduction to Delta Impervious Surface and Forest yields the Impervious Acre Conversion Factor. This conversion factor is averaged for the three pollutants (TSS, TN, and TP), resulting in 0.07 AC/AC.

The Grammies Run stream restoration project utilizing Protocol 1 gives a total annual pollutant load reduction of 763 lbs./yr. TN, 150 lbs./yr. TP and 98 tons/yr. TSS, **Table 5**. Converting these values to an average pollutant load reduction results in 0.38 lbs./acre/yr. TN, 0.08 lbs./acre/yr. TP, and 0.05 lbs./acre/yr. TSS, **Table 5**. Results indicate that the amount of pollutant load reduction associated with stabilizing the existing channels in impervious area treatment is 0.02 acres per LF. The total impervious acres equivalent is 132.9 acres and the capped total impervious acres is 123.0 acres.

Table 5: Impervious Area Treatment Summary (Updated April 2021)

Parameter	Delta Impervious Surface and Forest (weight/acre/yr.)	Total Pollutant Load Reduction (weight/yr.)	Average Pollutant Load Reduction (weight/acre/yr.)	Impervious Acre Conversion Factor (AC/AC)*
TN (lbs.)	12.14	763	0.38	0.03
TP (lbs.)	1.56	150	0.08	0.05
TSS (tons)	0.41	98	0.05	0.12
Average Value for Nutrients and Sediment (AC/AC)				**0.07**
Average Acres of Treatment for Nutrients and Sediment per LF				**0.02**
Length of Site (LF)				**5,478**
Average Acres of Treatment for Nutrients and Sediment per 100 LF				**2.4**
Calculated Total Impervious Acre Equivalent (Acres)				**132.9**
Capped Total Impervious Acre Treatment (Acres)				**123.0**

* Average Pollutant Load Reduction divided by Delta Impervious Surface and Forest (MDOT, March 2020)

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TMDL Protocol 5 Crediting Memorandum
Tower Oaks

MDOT SHA Contract No. PG 832A21

Revised April 2021

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TMDL Crediting for Cabin John Tributary at Tower Oaks Outfall Stabilization

The Cabin John Tributary at Tower Oaks Outfall Stabilization (Site) in Montgomery County site located in Montgomery County was assessed to determine deficiencies and improvement opportunities to help meet MDOT SHA's Municipal Separate Storm Sewer Systems (MS4) requirements for Total Maximum Daily Load (TMDL) mandates for nitrogen (TN), phosphorus (TP), and sediment (TSS). To do this, McCormick Taylor and Versar, Inc. conducted the Alternative Headwater Channel and Outfall Crediting Protocol (MDOT SHA, 2018).

In March 2021, TMDL calculations were revised to a restoration efficiency of 56% in accordance with guidance from staff at MDOT SHA OED.

Crediting Summary (Updated April 2021):

Site Name	Annual Calculated TN (lbs/yr)	Annual Calculated TP (lbs/yr)	Annual Calculated TSS[1] (tons/yr)	Annual Calculated TSS[2] (tons/yr)	Interim TN [0.075] (lbs/ year)	Interim TP [0.068] (lbs/year)	Interim TSS [15.1/44.9] (tons/year)	Calculated Total Impervious Acre Treatment (Acres)	Capped Impervious Acre Treatment (Acres)
Cabin John at Tower Oaks	448	59	55	542	75	68	22	69.6	13.4

[1]Edge of Stream delivery ratio applied to Annual TSS based on location of the project: coastal plain (0.061) or non-coastal plain (0.181) (CBWM 5.3.2.)
[2]Edge of Field rate with no delivery ratio applied to Annual TSS Total
Note: This summary includes calculations for Protocol 1

Methodology

Crediting for Alternative Headwater Channel and Outfalls

The projects assessed for this TMDL crediting effort predate the Chesapeake Bay watershed applied Outfall and Gully Stabilization Crediting Protocol approved in October 2019 (Stream Restoration Group 2, 2019). The outfall sites were evaluated using the Alternative Headwater Channel and Outfalls Protocol (MDE, 2018), follows the Maryland Department of the Environment (MDE) Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated Guidance for National Pollutant Discharge Elimination System Stormwater Permits (August 2014) stream restoration revised interim rates and further guidance SHA received from MDE (MDOT March, 2020).

The key steps of the Alternative Headwater Channel and Outfalls Crediting Protocol is provided below: (1) calculating equilibrium channel slope, (2) calculating equilibrium bank slope, (3) determining channel bottom width, (4) generating a future equilibrium ground surface (DTM), (5) converting the total erosion to an annual timescale, (6) converting erosion rates to annual loading of TN, TP, and TSS, and (7) estimating pollutant load reduction. Calculating equilibrium channel slope, bank slope, and channel bottom width result in a future equilibrium ground surface (DTM) that is compared to the existing ground surface to estimate total mass of eroded sediment. The total eroded sediment is combined with concentrations of TN and TP and converted to an annual timescale to determine total pollutant loading and potential for pollutant load reduction.

Soil Sampling

Nitrogen and phosphorus concentrations were measured following the methodology outlined in Merritts et al (2010). A sample is taken for each observed strata from the top of banks to below the water line. Samples are dried prior to testing. Bulk density is performed following the methods provided in the NRCS "Soil Quality Test Kit Guide" Chapter 4. Using this method, a known volume of unconsolidated soil is collected from selected banks. Soil samples are then analyzed for bulk density at Versar Inc., and for TN and TP at the Pennsylvania State Agricultural Analytical Services Laboratory (AASL).

Pollution Reduction Efficiency and Removal Rates

Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects (Schueler and Stack, 2014) states that mass load reductions should be discounted for projects not being 100% effective in preventing stream bank erosion. In accordance with guidance from staff at MDOT SHA OED (March 2021) a 56% restoration efficiency was applied to the calculated credit.

Based on revised interim rates provided by MDE (MDOT, March 2020) for TN, TP and TSS, McCormick Taylor applied the rates per linear foot of restoration (see **Figure 1**).

Figure 1. Stream Restoration Revised Interim Rates provided by MDE (MDOT, March 2020)

Table E.4 Stream Restoration Revised Interim Removal Rates per Linear Foot (lb/ft/yr)

Source	TN	TP	TSS[1]	
			Coastal Plain	Non-Coastal Plain
Revised Interim Rate	0.075	0.068	15.1	44.9

[1] The TSS removal rates are based on whether a project is located in the coastal plain or non-coastal plain. Schueler and Stack (2014) provides a discussion of the TSS removal rate and application of a sediment delivery ratio based on the location of the project. The TSS removal rates shown above were derived by multiplying 248 lb/ft/yr by the average CBWM (version 5.3.2) sediment delivery ratio for projects located in the coastal plain (0.061) and non-coastal plain (0.181).

Impervious Area Treatment

Impervious area treatment for the alternative method is calculated following methods described in MDE (2014). Once total annual pollutant load reduction is calculated, it is converted to an average pollutant load reduction by dividing by the watershed area (acres). The average acres of treatment for nutrients and sediment per linear foot is then calculated using the impervious acre conversion factor, site length, and drainage area. Total acres of treatment for nutrients and sediment is based on the site length and average acres of treatment per linear foot. If the calculated amount of impervious area treatment is greater than total watershed impervious area for outfall projects, impervious area is capped at the total watershed impervious area. Impervious area treatment is not capped for stream sites.

Outfall Design Report Information

Information not collected in the field, including, drainage area, impervious surface (total/MDOT SHA), slope, and 10-year discharge was taken from the outfalls individual final review design reports prepared by Whitney Bailey Cox & Magnani, LLC.

Results

The Cabin John Tributary at Tower Oaks is located within the Cabin John Creek Watershed Basin (02-14-02-07). The watershed has a total area of 16,500 acres (25.8 square miles). The drainage area to the downstream extent of the channel is 34.7 acres. The central part of the watershed passes through the interstate I-270 and I-495 corridors where the project is located. The watershed is within the Piedmont physiographic region. The Stream is designated as a Use I-P. Land use in the drainage area is mostly developed area dominated by impervious areas (roadways, parking lots) and commercial/industrial areas.

Reach 1 extends from a 48-inch outfall and ends at the confluence with Cabin John Creek. A large gabion basket is located at the outfall that is approximately 40-feet in length. A 4-foot headcut exists just downstream of the structure. Downstream from the gabion structure, the stream is highly incised with steep, unstable banks.

Reach 2 originates at two outfalls: a 24-inch CMP stormwater facility outfall and an 8-inch connection to rood drainpipe from the Geico building.

Table 1 –Tower Oaks Outfall Annual Pollutant Load -Outfall Remediation and Enhancement Contract PG 832A21 (Updated April 2021)

Parameter	Delta Impervious Surface and Forest (weight/acre/yr)	Total Pollutant Load Reduction (weight/yr)	Average Pollutant Load Reduction (weight/acre/yr)	Impervious Acre Conversion Factor* (AC/AC)
TN (lbs)	12.14	448	12.92	1.06
TP (lbs)	1.56	59	1.69	1.09
TSS (tons)	0.41	55[a]	3.86	3.86
			Volume of Erosion (yd^3)	**12,907**
			Bulk Density (default)(lbs/ft^3)	**93.4**
			Weight of Erosion (tons)	**16,273**
			Average Impervious Acre Conversion Factor for Nutrients and Sediment	**2.006**
			Average Acres of Treatment for Nutrients and Sediment per LF	**0.069**
			Average Acres of Treatment for Nutrients and Sediment per 100 LF	**6.97**

* Average Pollutant Load Reduction divided by Delta Impervious Surface and Forest (MDOT, March 2020)

[a] Edge of Stream delivery ratio applied to TSS depending on the project location (0.061/0.181) coastal/non-coastal.

Table 2: Tower Oaks Outfall Impervious Area Treatment Crediting-
Outfall Remediation and Enhancement Contract PG 832A21 (Updated April 2021)

Site	Watershed Drainage Area (Acres)	Impervious Watershed Area (Acres)	Calculated Total Impervious Acre Equivalent (Acres)	Capped Total Impervious Acre Treatment (Acres)
Tower Oaks Road	34.7	13.4	69.6	13.4

Note: The crediting calculations are included in an electronic excel file Revised 2020_Protocol5_TowerOaks.xlsx.

The Annual Pollutant Load Reduction (**Table 1**) and Impervious Area Treatment (**Table 2**) were calculated for the outfall at Tower Oaks Road. Results indicate that the amount of pollutant load reduction associated with stabilizing the existing channel in impervious area treatment is 0.069 acres per LF.

Based on the results of the impervious area treatment calculations for Tower Oaks Road, it appears that the total acres of credit calculated (69.6 acres, **Table 2**) is more than the current impervious surface watershed area of 13.4 acres; therefore, the site will be capped at the current impervious surface watershed area of 13.4 acres.

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TMDL Protocols 1 & 5 Crediting Memorandum
Little Gunpowder Falls Tributary at MD 145 and 165 Stream Restoration Project

MDOT SHA Contract No. BA2015682

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INTRODUCTION

An Unnamed Tributary to Little Gunpowder Falls at MD 145 as well as a tributary at MD 165, both located in Baltimore County, MD, were identified for restoration by the Maryland Department of Transportation State Highway Administration (MDOT SHA) to help meet Total Maximum Daily Load (TMDL) mandates for nitrogen, phosphorus, and sediment. Approximately 1,836 linear feet of the MD 145 tributary and 2,427 linear feet of the MD 165 tributary will be restored using a combination of channel stabilization and floodplain reconnection techniques that will maximize TMDL credit. As part of these design efforts, McCormick Taylor (MT) and Versar, Inc. conducted a modified Bank Assessment for Non-Point Source Consequences of Sediment (BANCS) model (Rosgen, 2001, 2006) to determine erosion rates at the project site. All field assessments performed at the project site follow the methodology outlined in the Standard Operating Procedure (SOP): Estimating Bank Erosion using the BANCS Model for TMDL Sediment Monitoring (MDOT SHA, 2019). The SOP serves as the basis for field assessments and calculations as defined in the Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects (Schueler and Stack, 2014) Protocol 1: Credit for Prevented Sediment during Storm Flow. The BANCS method component of Protocol 1 is being utilized for TMDL crediting based on its wide applicability to the project site, to maximize the TMDL credit potential. The alternative protocol of headwater and outfall crediting was determined to be suitable for one reach where drainage order and discharge volume was within the threshold for that protocol. The total restoration length was assessed as follows: 1,241 linear feet of the MD 145 tributary and 2,427 linear feet of the MD 165 tributary was assessed with Protocol 1 and 595 linear feet of the MD 145 tributary was assessed with Protocol 5. The combined crediting calculations are depicted in the tables below.

In March 2021, TMDL calculations were revised to a restoration efficiency of 56% in accordance with guidance from staff at MDOT SHA OED.

Crediting Summary (Updated April 2021):

Site Name	Annual Calculated TN (lbs/yr)	Annual Calculated TP (lbs/yr)	Annual Calculated TSS[1] (tons/yr)	Annual Calculated TSS[2] (tons/yr)	Interim TN [0.075] (lbs/ year)	Interim TP [0.068] (lbs/year)	Interim TSS [15.1/44.9] (tons/year)	Calculated Total Impervious Acre Treatment (Acres)	Capped Impervious Acre Treatment (Acres)
Little Gunpoweder 145 and 165	644	243	60	590	320	290	96	118.1	92.2

[1]Edge of Stream delivery ratio applied to Annual TSS based on location of the project: coastal plain (0.061) or non-coastal plain (0.181) (CBWM 5.3.2.)
[2]Edge of Field rate with no delivery ratio applied to Annual TSS Total
Note: This summary includes calculations for Protocol 1 and 5

BACKGROUND INFORMATION

The Little Gunpowder Falls Tributaries at MD 145 and 165 project sites lie in a rural watershed. Primary land use is low-density residential. The impervious area makes up approximately 7 percent of the MD 145's watershed with a total drainage area of 1.69 square miles. The total drainage area of the MD 165 project site is 1,843 acres, with 5 percent (92 acres) of impervious area. The watershed for both projects is located in the Piedmont physiographic region, and topography is primarily gently rolling, to moderately hilly terrain.

The MD 145 project consists of a main branch of the Unnamed Tributary (Mainstem) and one minor unnamed tributary. The mainstem and tributary are adjacent to farm properties. At the upstream and downstream extent of the project area, the main stem of the Unnamed Tributary is perennial and remains perennial to the confluence with Little Gunpowder Falls. The minor tributary is not included in DNR's Maryland Environmental Resource and Land Information Network (MERLIN) Interactive Map (Version 2.0) base map, indicating that this tributary is likely ephemeral. The primary erosion mechanism appears to be lateral instability and adjustment at meander bends as well as headcutting in the minor tributary. The MD 165 project area lies mostly in cow pasture and wooded areas on private property as well as a portion of the Maryland Department of Natural Resources (DNR) property. The project reaches include a main branch of the Unnamed Tributary and two small tributaries that join the main branch. The primary erosion mechanism is through fluvial processes causing channel degradation and lateral erosion of streambanks.

METHODOLOGY

BANCS Assessment, Cross Section Survey, and Soil Sampling

Field assessments at each stream restoration site consist of BANCS monitoring, cross section survey, and soil sampling. BANCS monitoring uses Bank Erosion Hazard Index (BEHI) and Near-Bank Stress (NBS) to calculate erosion potential. After the BANCS assessment is completed, monumented cross sections are placed at representative BEHI locations across the project site. During cross section survey, soil samples for bulk density analysis and nutrient analysis of total phosphorus and total nitrogen are collected within every soil strata represented on both the right and left banks. To avoid disturbing the banks at the representative cross sections, soil samples are specifically taken at least 15 feet away from the section, within the same BEHI classification. Soil samples are analyzed for bulk density at Versar Inc. and analyzed for total nitrogen and total phosphorus at the Pennsylvania State Agricultural Analytical Services Laboratory (AASL). The average of the bulk density and nutrient concentrations measured across the project site was used in estimating nutrient loads.

Estimating Erosion Rate and Nutrient Load

Results of the BANCS field assessments utilize erosion rates included in **Table 1**, developed by the U.S. Fish and Wildlife Service Chesapeake Bay Field Office (USFWS, 2018). The rates are included in a spreadsheet referenced as an alternative source for erosion rates by the Chesapeake Stormwater Network (CSN) and the Center for Watershed Protection (CWP) in Frequently Asked Questions: Urban Stream Restoration BMP (CSN and CWP, 2018). The erosion rates are based on data collected by the USFWS at Hickey Run (USFWS, 2005) and data collected by the U.S. Fish and Wildlife Service in Colorado (Rosgen, 2001) with interpolated values for some erosion rates (USFWS, 2018). The erosion rate is applied to an appropriate area of stream bank to determine the volume of bank material eroded in tons per year.

Table 1. Erosion Rate in Feet per Year for Predicting Bank Erosion

		BEHI					
	RATING	Very Low	Low	Moderate	High	Very High	Extreme
NBS	Very Low	0.005	0.015	0.090	0.250	0.250	0.150
	Low	0.010	0.030	0.125	0.400	0.400	1.300
	Moderate	0.020	0.070	0.300	0.640	0.640	1.750
	High	0.035	0.150	0.800	1.000	1.000	2.500
	Very High	0.065	0.350	1.000	1.750	1.750	3.500
	Extreme	0.150	0.800	1.200	2.500	2.500	4.500

Note: Values are from Appendix A. TMDL Credit Reduction Workbook Using BANCS and Protocol 1 of the Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects (USFWS, 2018): a) Hickey Run Bank Erosion Curve (USFWS, 2005); b) Colorado Bank Erosion Curve (Rosgen, 2001); c) Interpolated Colorado Bank Erosion Curve (USFWS, 2018).

The measured bulk density and nutrient concentrations were averaged for the entire site. The average erosion rate (feet/year) is converted to a predicted loading rate for sediment (tons/year), nitrogen (lb/year), and phosphorus (lb/year) by multiplying the erosion rate by the average bulk density and nutrient concentrations. Monumented cross sections were resurveyed prior to construction of the Piney Run project and will be evaluated in the future with other SHA stream restoration projects to evaluate actual erosion rates.

Sediment Delivery Ratio

Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects (Schueler and Stack, 2014) states that mass load reductions should be discounted for projects not being 100% effective in preventing stream bank erosion. In accordance with guidance from staff at MDOT SHA OED (March 2021) a 56% restoration efficiency was applied to the calculated credit.

Based on revised interim rates provided by MDE (MDOT, March 2020) for TN, TP and TSS, McCormick Taylor applied the rates per linear foot of restoration (see **Figure 1**).

Figure 1. Stream Restoration Revised Interim Rates provided by MDE (MDOT, March 2020)

Table E.4 Stream Restoration Revised Interim Removal Rates per Linear Foot (lb/ft/yr)

Source	TN	TP	TSS[1]	
			Coastal Plain	Non-Coastal Plain
Revised Interim Rate	0.075	0.068	15.1	44.9

[1] The TSS removal rates are based on whether a project is located in the coastal plain or non-coastal plain. Schueler and Stack (2014) provides a discussion of the TSS removal rate and application of a sediment delivery ratio based on the location of the project. The TSS removal rates shown above were derived by multiplying 248 lb/ft/yr by the average CBWM (version 5.3.2) sediment delivery ratio for projects located in the coastal plain (0.061) and non-coastal plain (0.181).

Impervious Area Treatment

Impervious area treatment for the BANCS method is calculated following methods described in MDE (2014). Once total annual pollutant load reduction is calculated, it is converted to an average pollutant load reduction by dividing by the watershed area (acres). The average acres of treatment for nutrients and

sediment per linear foot is then calculated using the impervious acre conversion factor, site length, and drainage area. Total acres of treatment for nutrients and sediment is based on the site length and average acres of treatment per linear foot.

PROTOCOL 1 CREDITING RESULTS

The Little Gunpowder Falls Tributary at MD 145 project site was assessed for BANCS between June 6, 2017 and June 8, 2017. Cross section survey and soil sampling was performed on July 17, 2017. The site was assessed as one reach on the main stem (Reach 3). Following updates to the project area work limits Reach 3 was the only main stem reach determined suitable for Protocol 1. Reach 3 on the mainstem starts farther downstream, and continues to the end of proposed work, approximately 150 feet upstream of the road crossing at MD 145. A summary of the proportion of BEHI classifications found within the project site is provided in Table 1. Four (4) cross sections were surveyed to encompass the six classifications of BEHI in each reach. A total of 22 soil samples were collected at representative soil strata within the surveyed cross sections. The average sediment and nutrient concentrations are included in **Table 2**. The average sediment and nutrient concentrations are included in **Table 3**.

The Unnamed Tributary to Little Gunpowder Falls at MD-165 project site was assessed for BANCS on May 23, 2017. Cross section survey and soil sampling was performed on July 17, 2017. The site was assessed as one reach due to consistent geomorphology along the main branch and two tributaries. Bulk density analysis was performed in the main branch, and bulk density values were averaged to obtain a single value for the analysis on a site-wide basis. Lengths for each BEHI category were totaled, including left and right banks. A summary of the proportion of BEHI classifications found within the project site is below: the sum of left and right bank lengths for each BEHI category were divided by total length of all BEHI sections to calculate the percentages in **Table 4**. Four (4) cross sections were surveyed, all of which were in the main branch of the tributary, to encompass the six classifications of BEHI in each reach. A total of 23 soil samples were collected at representative soil strata within the surveyed cross sections. The average sediment and nutrient concentrations are included in **Table 5**.

Table 2: Summary of BEHI Class Proportions for MD 145

BEHI	*Percent by Length*
Very Low	3.9%
Low	23.0%
Moderate	23.4%
High	26.8%
Very High	19.5%
Extreme	3.4%

Table 3: Average Bulk Density, Total Nitrogen, and Total Phosphorus at MD 145

Site	*Bulk Density (lb/cf)*	*Nitrogen (%)*	*Phosphorus (%)*
Little Gunpowder Falls Tributary at MD 145	72.70	0.104	0.034

Approximately 50% of the project site is associated with higher erosion classes (high, very high, and extreme) and 50% of the project site is associated with lower erosion classes (very low, low, moderate). The High class was the most commonly identified across the project site, with the Extreme class being the least identified.

Table 4: Summary of BEHI Class Proportions for Unnamed Tributary at MD 165

BEHI	*Percent Site by Length*
Very Low	2.3%
Low	10.6%
Moderate	18.7%
High	20.2%
Very High	32.5%
Extreme	15.7%

Table 5: Average Bulk Density, Total Nitrogen, and Total Phosphorus at MD 165

Site	*Bulk Density (lb/cf)*	*Nitrogen (%)*	*Phosphorus (%)*
MD-165	69.61	0.091	0.039

Approximately 68% of the project site is associated with higher erosion classes (high, very high, and extreme) and the remaining 32% of the project site is associated with lower erosion classes (very low, low, and moderate). The Very High class was the most commonly identified across the project site, and Very Low BEHI rating occurred the least frequently.

The predicted erosion rates were evaluated for each project reach and the overall site average. Final loading estimates for sediment and nutrients are based on a reach-average of bulk density values and nutrient concentrations values. Preliminary loading estimates are shown in **Table 6**.

Table 6: Preliminary Loading Estimates for Sediment and Nutrients

Site	*Sediment Load (tons/yr)*[1]	*Nutrient Removed as Percent of Sediment Load*	
		Nitrogen Removed (lbs/yr)	*Phosphorus Removed (lbs/yr)*
Little Gunpowder Falls Tributary at MD 145	135	262	100
Little Gunpowder Falls Tributary at MD 165	413	801	306

[1]Edge of Field rate with no delivery ratio applied to Annual TSS Total

The BANCS assessment and TMDL Protocol 1 for Little Gunpowder Falls Tributary at MD 145 and MD 165 determined the annual pollutant load for the three pollutants total suspended sediment, total nitrogen, and total phosphorus **(Table 6)**. In the final analysis of the crediting protocol, the results in this table are used to determine overall water quality credit. Final crediting is computed using these sediment and nutrient

values applied over the project site, based on site-specific values for watershed area, percent impervious area, linear feet of stream, and physiographic region.

Table 7 provides the results with the sediment delivery ratio applied to TSS (0.181 for Non-Coastal Plain), and without SDF applied for TN and TP. Only TSS has been given a delivery ratio applied in accordance with updated guidance (MDOT SHA, March 2020). These values also have the 56% efficiency factor applied as directed by staff at MDOT SHA OED (March 2021). From the preliminary assessment, 5% of the watershed at the Little Gunpowder Falls Tributaries at MD 145 and MD 165 combined is impervious surface (92.2 acres). A total of 3,668 linear feet of stream channel is assessed for this crediting summary, which includes left and right streambanks of both MD 145 and MD 165 project lengths. The values for Delta Impervious Surface and Forest are assumed for all sites where this protocol is applied. These values are based on the pollutant loads associated with runoff from an acre of impervious land cover and an acre of forest (MDE SHA, March 2020). The Average Pollutant Load Reduction column shows pollutant load reduction on a per-acre basis and is the result of the total pollutant load divided by the total watershed area in acres. The ratio of Average Pollutant Load Reduction to Delta Impervious Surface and Forest yields the Impervious Acre Conversion Factor. This conversion factor is averaged for the three pollutants (TSS, TN, and TP), resulting in 0.06 AC/AC.

The Little Gunpowder Falls Tributaries at MD 145 and MD 165 stream restoration project utilizing Protocol gives a total combined annual pollutant load reduction of 595 lbs/yr TN, 227 lbs/yr TP and 56 tons/yr TSS, **Table 7**. Converting these values to an average pollutant load reduction results in 0.32 lbs/acre/yr TN, 0.12 lbs/acre/yr TP, and 0.03 lbs/acre/yr TSS, **Table 7**. Results indicate that the amount of pollutant load reduction associated with stabilizing the existing channels in impervious area treatment is 0.03 acres per LF (**Table 7**). The total impervious acres equivalent is 110.1 acres (**Table 7)**.

Table 7: Impervious Area Treatment Summary for MD 145 and 165 Tributaries Combined (Updated April 2021)

Parameter	Delta Impervious Surface and Forest (weight/acre/yr)	Protocol 1 Total Pollutant Load Reduction (weight/yr)	Average Pollutant Load Reduction (weight/acre/yr)	Impervious Acre Conversion Factor (AC/AC)*
TN (lbs)	12.14	595	0.32	0.03
TP (lbs)	1.56	227	0.12	0.08
TSS (tons)	0.41	56	0.03	0.07
Average Value for Nutrients and Sediment (AC/AC)				**0.06**
Average Acres of Treatment for Nutrients and Sediment per LF				**0.03**
Length of Site (LF)				**3,668**
Average Acres of Treatment for Nutrients and Sediment per 100 LF				**3.0**
Calculated Total Impervious Acre Equivalent (Acres)				**110.1**
Capped Total Impervious Acre Treatment (Acres)				**92.2**

* Average Pollutant Load Reduction divided by Delta Impervious Surface and Forest (MDOT, March 2020)

PROTOCOL 5 CREDITING RESULTS

UNNAMED TRIBUTARY 5

UNT 5 is located in Baltimore County on Lower Gunpowder at two tree roots holding channel grade at the upstream limits of the headwater channel. The channel was evaluated using three reaches to determine erosion potential. Reach 1 starts at the tree roots at the upstream limits of the headwater channel and extends to the top of the existing bedrock feature. Reach 2 starts at the bottom of the existing bedrock feature to the private driveway culvert. Reach 3 starts at the private driveway culvert and extends to the channel's confluence with the mainstem. All three reaches share a mean grain size is 29 mm, the D50 is 29 mm, and the D90 is 104 mm. The overall slope of the headwater channel is approximately 4.1%. Overall average bottom width of the headwater channel is 3.5 ft, while top width is 8.5 ft. Average bank heights range from 1 to 3 ft high. The bank material is medium dense sand. The overall base level control is the confluence with the mainstem channel (See **Figure 2**).

There is evidence of headcutting and bank erosion along the UNT 5 headwater channel within the reaches upstream and downstream of the existing bedrock feature and within the reach downstream of the private driveway culvert. Therefore, this outfall qualifies for the Alternative Headwater Channel and Outfall Crediting Protocol.

There is 100 ft bedrock reach within the upper limits of the channel approximately 140 ft downstream of where the channel starts to form. The channel crosses beneath a private driveway culvert approximately 220 ft upstream of its confluence with the mainstem. UNT 5 enters the mainstem channel on the right bank approximately 300 ft upstream of the end of proposed work. Total drainage area to the outfall is 68.48 acres with 3.37 acres of total impervious draining to the outfall. Based on a TR-55 analysis, the 10-year discharge for UNT 5 is 134.10 cfs.

Figure 2 – UNT 5 Profile

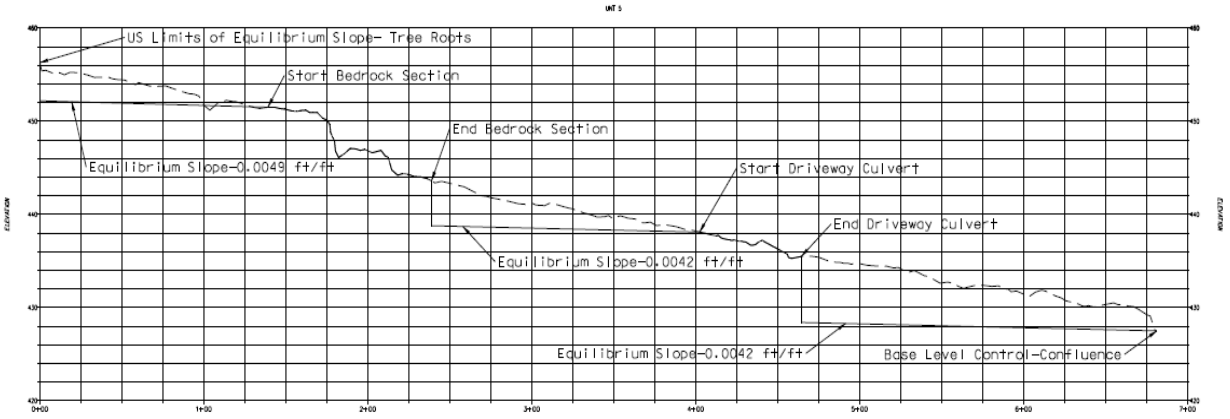

Table 8: UNT 5 Impervious Area Treatment Summary
Outfall Remediation and Enhancement Contract BA2015682 (Updated April 2021)

Parameter	Delta Impervious Surface and Forest (weight/acre/yr)	Protocol 5 Total Pollutant Load Reduction (weight/yr)	Average Pollutant Load Reduction (weight/acre/yr)	Impervious Acre Conversion Factor (AC/AC)*
TN (lbs)	12.14	48	0.70	0.06
TP (lbs)	1.56	16	0.23	0.15
TSS (tons)	0.41	4	0.06	0.15
Average Value for Nutrients and Sediment (AC/AC)				**0.12**
Average Acres of Treatment for Nutrients and Sediment per LF				**0.01**
Length of Site (LF)				**595**
Average Acres of Treatment for Nutrients and Sediment per 100 LF				**1.4**
Calculated Total Impervious Acre Equivalent (Acres)				**8.1**
Capped Total Impervious Acre Treatment (Acres)				**3.4**

* Average Pollutant Load Reduction divided by Delta Impervious Surface and Forest (MDOT, March 2020)

Table 9: UNT 5 Impervious Area Treatment Crediting-
Outfall Remediation and Enhancement Contract BA2015682 (Updated April 2021)

Site	Watershed Drainage Area (Acres)	Impervious Watershed Area (Acres)	Calculated Total Impervious Acre Equivalent (Acres)	Capped Total Impervious Acre Treatment (Acres)
UNT 5	68	3.4	8.1	3.4

The Annual Pollutant Load Reduction (**Table 8**) and Impervious Area Treatment (**Table 9**) were calculated for UNT 5. Results indicate that the amount of pollutant load reduction associated with stabilizing the existing channel in impervious area treatment is 0.014 acres per LF.

Based on the results of the impervious area treatment calculations for UNT 5, it appears that the total acres of credit calculated (8.1 acres, **Table 9**) is more than the current impervious surface watershed area of 3.4 acres; therefore, the site will be capped at the current impervious surface watershed area of 3.4 acres.

PROTOCOLS 1 & 5 CREDITING SUMMARY

Table 10 provides the results with the sediment delivery ratio applied to TSS (0.181 for Non-Coastal Plain), and without SDF applied for TN and TP. From the preliminary assessment, 4.8% of the watershed at the Little Gunpowder Falls Tributaries at MD 145 and 165 project site is impervious surface (92.2 acres). A total of 4,263 linear feet of stream channel is assessed for this crediting summary for both Protocol 1 and Protocol 5, which includes left and right streambanks. The values for Delta Impervious Surface and Forest are assumed for all sites where this protocol is applied. These values are based on the pollutant loads associated with runoff from an acre of impervious land cover and an acre of forest (MDE SHA, March 2020). The Average Pollutant Load Reduction column shows pollutant load reduction on a per-acre basis and is the result of the total pollutant load divided by the total watershed area in acres. The ratio of Average Pollutant Load Reduction to Delta Impervious Surface and Forest yields the Impervious Acre Conversion Factor. This conversion factor is averaged for the three pollutants (TSS, TN, and TP), resulting in 0.06 AC/AC.

The Little Gunpowder Falls Tributaries at MD 145 and MD 165 stream restoration project utilizing Protocol 1 and Protocol 5 gives a total combined pollutant load reduction of 644 lbs/yr TN, 243 lbs/yr TP and 60 tons/yr TSS, **Table 10**. Converting these values to an average pollutant load reduction results in 0.34 lbs/acre/yr TN, 0.13 lbs/acre/yr TP, and 0.03 lbs/acre/yr TSS, **Table 10**. Results indicate that the amount of pollutant load reduction associated with stabilizing the existing channels in impervious area treatment is 0.03 acres per LF (**Table 10**). The total impervious acres equivalent is 118.1 acres (**Table 10)**.

Table 10: Combined Protocol 1 and 5 Impervious Area Treatment Summary (Updated April 2021)

Parameter	Delta Impervious Surface and Forest (weight/acre/yr)	Combined Protocol Total Pollutant Load Reduction (weight/yr)	Average Pollutant Load Reduction (weight/acre/yr)	Impervious Acre Conversion Factor (AC/AC)*
TN (lbs)	12.14	644	0.34	0.03
TP (lbs)	1.56	243	0.13	0.08
TSS (tons)	0.41	60	0.03	0.08
Average Value for Nutrients and Sediment (AC/AC)				**0.06**
Average Acres of Treatment for Nutrients and Sediment per LF				**0.03**
Length of Site (LF)				**4,263**
Average Acres of Treatment for Nutrients and Sediment per 100 LF				**2.8**
Calculated Total Impervious Acre Equivalent (Acres)				**118.1**
Capped Total Impervious Acre Treatment (Acres)				**92.2**

* Average Pollutant Load Reduction divided by Delta Impervious Surface and Forest (MDOT, March 2020)

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