Year 5 Annual Report
Massachusetts Small MS4 General Permit
Reporting Period: July 1, 2022-June 30, 2023

Please DO NOT attach any documents to this form. Instead, attach all requested documents to an email when submitting the form. Also ensure any websites included on this form are to publicly accessible sites

Unless otherwise noted, all fields are required to be filled out. If a field is left blank, it will be assumed the requirement or task has not been completed. Please ONLY report on activities between July 1, 2022 and June 30, 2023 unless otherwise requested.

Part I: Contact Information

Name of Municipality or Organization: Town of Medway

EPA NPDES Permit Number: MAR041132

Primary MS4 Program Manager Contact Information

Name: Stephanie Carlisle Title: Sustainability Coordinator

Street Address Line 1: 45 Holliston Street

Street Address Line 2: na

City: Medway State: MA Zip Code: 02053

Email: scarlisle@townofmedway.org Phone Number: (508) 321-4871

Stormwater Management Program (SWMP) Information

SWMP Location (publicly available web address): https://www.townofmedway.org/stormwater-management/webforms/reports

Date SWMP was Last Updated: June 29, 2023

If the SWMP is not available on the web please provide the physical address:

Part II: Self-Assessment

First, in the box below, select the impairment(s) and/or TMDL(s) that are applicable to your MS4. Make sure you are referring to the most recent EPA approved Section 303(d) Impaired Waters List which can be found here: https://www.epa.gov/tmdl/region-1-impaired-waters-and-303d-lists-state

Impairment(s)

☒ Bacteria/Pathogens ☐ Chloride ☐ Nitrogen ☒ Phosphorus
☐ Solids/ Oil/ Grease (Hydrocarbons)/ Metals

TMDL(s)

In State: ☐ Assabet River Phosphorus ☐ Bacteria and Pathogen ☐ Cape Cod Nitrogen
☒ Charles River Watershed Phosphorus ☐ Lake and Pond Phosphorus

Out of State: ☐ Bacteria/Pathogens ☐ Metals ☐ Nitrogen ☐ Phosphorus

Clear Impairments and TMDLs

Next, check off all requirements below that have been completed. ***By checking each box you are certifying that you have completed that permit requirement fully.*** *If you have not completed a requirement leave the box unchecked. Additional information will be requested in later sections.*

Annual Requirements

☒ Provided an opportunity for public participation in review and implementation of SWMP and complied with State Public Notice requirements

☒ Kept records relating to the permit available for 5 years and made available to the public

☒ The SSO inventory has been updated, including the status of mitigation and corrective measures implemented

- ○ This is not applicable because we do not have sanitary sewer
- ◉ This is not applicable because we did not find any new SSOs
- ○ The updated SSO inventory is attached to the email submission
- ○ The updated SSO inventory can be found at the following publicly available website:

☒ Updated system map due in year 2 as necessary

☒ Provided training to employees involved in IDDE program within the reporting period

☒ Properly stored and disposed of catch basin cleanings and street sweepings so they did not discharge to receiving waters

☒ All curbed roadways were swept at least once within the reporting period

☒ Enclosed all road salt storage piles or facilities and implemented winter road maintenance procedures to minimize the use of road salt

☒ Implemented SWPPPs for all permittee owned or operated maintenance garages, public works yards, transfer stations, and other waste handling facilities

☒ Updated inventory of all permittee owned facilities as necessary

☒ O&M programs for all permittee owned facilities have been completed and updated as necessary

☐ Implemented all maintenance procedures for permittee owned facilities in accordance with O&M programs

☐ Implemented program for MS4 infrastructure maintenance to reduce the discharge of pollutants

☒ Inspected all permittee owned treatment structures (excluding catch basins)

Optional: If you would like to describe progress made on any incomplete requirements listed above or provide any additional details, please use the box below:

1. The Department of Public Works maintains all town properties including the school properties; therefore, training has been focused on this department. O&M training for other town departments has not been developed at this time.
2. Maintenance on MS4 infrastructure occurs regularly, but the DPW is developing a more formalized five year maintenance plan and schedule.

Bacteria/ Pathogens (Combination of Impaired Waters Requirements and TMDL Requirements as Applicable)

Annual Requirements

*Public Education and Outreach**

☒ Annual message was distributed encouraging the proper management of pet waste, including noting any existing ordinances where appropriate

☒ Permittee or its agents disseminated educational material to dog owners at the time of issuance or renewal of dog license, or other appropriate time

☒ Provided information to owners of septic systems about proper maintenance in any catchment that discharges to a water body impaired for bacteria

☐ This is not applicable because there are no septic systems present

** Public education messages can be combined with other public education requirements as applicable (see Appendix H and F for more information)*

Optional: If you would like to describe progress made on any incomplete requirements listed above or provide any additional details, please use the box below:

Phosphorus (Combination of Impaired Waters Requirements and TMDL Requirements as Applicable)

Annual Requirements

*Public Education and Outreach**

☒ Distributed an annual message in the spring (April/May) encouraging the proper use and disposal of grass clippings and encouraging the proper use of slow-release and phosphorus-free fertilizers

☒ Distributed an annual message in the summer (June/July) encouraging the proper management of pet waste, including noting any existing ordinances where appropriate

☒ Distributed an annual message in the fall (August/September/October) encouraging the proper disposal of leaf litter

** Public education messages can be combined with other public education requirements as applicable (see Appendix H and F for more information)*

Good Housekeeping and Pollution Prevention for Permittee Owned Operations

☒ Increased street sweeping frequency of all municipal owned streets and parking lots subject to Permit part 2.3.7.a.iii.(c) to a minimum of two times per year (spring and fall)

Structural BMPs

☐ Completed the evaluation of all permittee owned properties identified as presenting retrofit opportunities or areas for structural BMP installation under permit part 2.3.6.d or identified in the Phosphorus Source Identification Report, including: *(select the items of the evaluation that have been completed below)*

- ☒ Next planned infrastructure, resurfacing, or redevelopment activity planned for the property (if applicable) OR planned retrofit date
- ☐ Estimated cost of redevelopment or retrofit BMPs
- ☐ Engineering and regulatory feasibility of redevelopment or retrofit BMPs

☐ Completed a listing of planned structural BMPs and a plan and schedule for implementation

- ◉ The BMP list and implementation schedule is attached to the email submission
- ○ The BMP list and implementation schedule can be found at the following publicly available website:

☒ Any structural BMPs already existing or installed in the regulated area by the permittee or its agents was tracked and the phosphorus removal by the BMP was estimated consistent with Attachment 3 to Appendix F. The BMP type, total area treated by the BMP, the design storage volume of the BMP, and the estimated phosphorus removed in mass per year by the BMP were documented.

- ○ No BMPs were installed
- ◉ The above referenced BMP information is attached to the email submission
- ○ The above referenced BMP information can be found at the following publicly available website:

Total estimated phosphorus removed in **lbs/year** from the installed BMPs: 15.93

Optional: If you would like to describe progress made on any incomplete requirements listed above or provide any additional details, please use the box below:

The DPW has previously identified and evaluated town owned properties for retrofit opportunities. Additional engineering plans (10% design plans) were developed for 10 town properties during Year 5. Cost estimates and 25% concept design plans were completed for retrofits and new stormwater structures at the High School and Middle School during this reporting period as well. The remaining identified structures on town owned and town managed properties were identified through GIS analysis on soil type, land use, land cover, and existing easements. The EPA BATT tool was used to calculate phosphorus removal. Cost estimates were developed based on current proposals, industry standards, and past actual costs. Engineering and regulatory feasibility of redevelopment or retrofit BMPs has not been completed for all BMPs. The items were not marked completed because they were not completed prior to June 30, 2023. The planned structural BMPs are

listed in the Phosphorus Control Plan (Attachment A.) Structural controls already existing and maintained are listed in Attachment B.

Charles River Watershed Phosphorus TMDL

☐ Completed the written Phase 1 Phosphorus Control Plan (PCP), including: *(select the items in the Phase 1 PCP that have been completed)*

- ☒ Planned nonstructural controls
- ☐ Planned structural controls
- ☐ O&M program for structural controls
- ☐ Implementation schedule
- ☐ Cost of implementation

The Phase 1 PCP: *(select one of the following options)*

- ◉ is attached to the email submission
- ○ can be found at the following publicly available website:

Below, calculate your current phosphorus export rate by first filling out the individual phosphorus loading components (labeled [A], [B], [C], and [D]) and then computing your current phosphorus export rate using the equation provided.

Baseline phosphorus export reduction required from PCP Area, as identified in Appendix F **(lbs/year) [A]**:	882

☒ Documented the nonstructural control measures implemented during **this reporting period** and their phosphorus reduction

total phosphorus reduction from all nonstructural controls this reporting period **(lbs/year) [B]**:	13.6

- ○ No nonstructural control measures were implemented
- ◉ The above referenced nonstructural control measures information is attached to the email submission
- ○ The above referenced nonstructural control measures information can be found at the following publicly available website:

☒ Documented the structural control measures implemented during **this reporting period and all previous years**, including location, phosphorus reduction in mass/year, and date of last completed maintenance and inspection for each control

total phosphorus reduction from all structural controls installed this reporting period and all previous years **(lbs/year) [C]**:	15.93

- ○ No structural control measures were implemented
- ◉ The structural control measures information is attached to the email submission
- ○ The structural control measures information can be found at the following publicly available website:

Phosphorus load increase due to development incurred since 2005 in **lbs/year [D]**: 0

Current phosphorus export rate from the PCP Area in **lbs/year [=A-(B+C)+D** from above]: 852.47

☒ I certify under penalty of law that all source control and treatment Best Management Practices being claimed for phosphorus reduction credit have been inspected, maintained and repaired in accordance with manufacturer or design specification. I certify that, to the best of my knowledge, all Best Management Practices being claimed for a phosphorus reduction credit are performing as originally designed.

☒ All municipally owned and maintained turf grass areas are being managed in accordance with Massachusetts Regulation 331 CMR 31 pertaining to proper use of fertilizers on turf grasses

Optional: If you would like to describe progress made on any incomplete requirements listed above or provide any additional details, please use the box below:

The Phase 1 Phosphorus Control Plan is complete and is submitted as Attachment A to this Annual Report. Non-structural control calculations are included within the PCP as Appendix B. The structural control calculations are attached to this Annual Report as Attachment B. The difference in land use from 2005 was not calculated in the PCP Phase 1; therefore, item D was left blank. The baseline phosphorus export reduction load of 882 pounds has been the basis of the PCP development. The town plans to collaborate with the Charles River Watershed Association and utilize their updated land use data to help recalculate the phosphorus load.

NON-TRADITIONAL AND TRANSPORTATION MS4s ONLY- *municipalities please skip this section:*

Describe the planned phosphorus reduction activities on site and coordination progress with the applicable municipality:

Optional: Use the box below to provide any additional information you would like to share as part of your self-assessment:

Part III: Receiving Waters/Impaired Waters/TMDL

Have you made any changes to your lists of receiving waters, outfalls, or impairments since the NOI was submitted?

- (•) Yes
- ( ) No

If yes, describe below, including any relevant impairments or TMDLs:

The DPW updated the outfall inventory to reflect new developments and additional information discovered through field work during the Year 5 reporting period.

The 2016 List of Impaired Waters changed Chicken Brook (segment 72-34) and Hopping Brook (segment 72-35) from Category 2 waters to Category 5 waters listing E.coli as the impairment.

Part IV: Minimum Control Measures

Please fill out all of the metrics below. If applicable, include in the description who completed the task if completed by a third party.

MCM1: Public Education

Number of educational messages completed **during this reporting period**: 11

*Below, report on the educational messages completed **during this reporting period**. For the measurable goal(s) please describe the method/measures used to assess the overall effectiveness of the educational program.*

BMP:Leaf Litter Management

Message Description and Distribution Method:

Message distributed through the DPW's Facebook page, "It's fall....and so are the leaves! Please keep leaves out of the roadway and away from storm drains to prevent localized flooding and excess nutrients from entering the waterways. NEVER dump leaves into a stream, river, wetland, or waterway. Learn why here: https://bit.ly/3DRFAnc Participants in the town's Trash and Recycling program may bring their leaves, brush, and grass clippings to the Recycling Center for no cost! Check out the Trash and Recycling page for more details. https://bit.ly/3vaTElu Town of Medway, MA."

Targeted Audience: Residents

Responsible Department/Parties: DPW, Communications Director

Measurable Goal(s):

283 people reached, 5 engagements, 5 likes, 2 comments, and 0 shares.

Message Date(s): November 1, November 2, and November 9, 2022.

Message Completed for: Appendix F Requirements ☒ Appendix H Requirements ☐

Was this message different than what was proposed in your NOI? Yes ◉ No ○

If yes, describe why the change was made:

We wanted to focus specifically on leaf litter management as it relates to phosphorus loading and flooding potential as opposed to general landscape management. By using the DPW's social media platforms, we are able to reach a large audience that can be shared among residents and groups.

BMP:Stormwater 101 and Phosphorus Pollution Awareness

Message Description and Distribution Method:

The DPW hosts a table at the annual Medway Pride Day event and shares information about stormwater with the public. Topics included best practices to prevent stormwater pollution, a visual of the water cycle, and statistics showing how 60% of water pollution comes from stormwater. An additional poster promoting awareness of nutrient pollution in the watershed was included. Lastly, we distributed Think Blue Massachusetts rubber ducks to children and adults to promote additional awareness.

Targeted Audience: Residents

Responsible Department/Parties: DPW

Measurable Goal(s):

Engaged with the public at Medway Pride Day event.

Message Date(s): May 20, 2023

Message Completed for: Appendix F Requirements ☒ Appendix H Requirements ☐

Was this message different than what was proposed in your NOI? Yes ○ No ◉

If yes, describe why the change was made:

BMP: Stormwater 101

Message Description and Distribution Method:

The posters and information developed for Medway Pride Day are propped on the easel in the main entrance of the Town Hall. Topics included best practices to prevent stormwater pollution, visual of the water cycle, and statistics showing how 60% of water pollution comes from stormwater.

Targeted Audience: Residents

Responsible Department/Parties: DPW

Measurable Goal(s):

Residents are able to see the poster when they enter the building.

Message Date(s): July 2022 through May 2023.

Message Completed for: Appendix F Requirements ☒ Appendix H Requirements ☐

Was this message different than what was proposed in your NOI? Yes ◉ No ○

If yes, describe why the change was made:

This is an additional method to reach the public.

BMP:Green Infrastructure and Nature Based Stormwater Solutions

Message Description and Distribution Method:

The DPW partnered with the Charles River Watershed Association on a green infrastructure study with 25% concept designs for the Medway High School and Middle School. A robust outreach campaign was completed as a part of this study including a 60 minute presentation to the Medway High School junior class.

Targeted Audience: Residents

Responsible Department/Parties: DPW

Measurable Goal(s):

Presented to the Medway High School Junior class (approximately 100 students). Presented to the Medway Select Board (270 views on Medway Cable Access streaming). Facebook promotion of the recorded presentation 390 people reached, 19 engagements, 18 likes, 1 comment, and 0 shares.

Message Date(s): May 1, 2023 (High School presentation) and June 5, 2023 (Select Board presentation).

Message Completed for: Appendix F Requirements ☒ Appendix H Requirements ☐

Was this message different than what was proposed in your NOI? Yes ◉ No ○

If yes, describe why the change was made:

This is an additional educational measure than proposed in the NOI.

BMP: Pet Waste Management - National Scoop the Poop Week

Message Description and Distribution Method:

Message posted on DPW Facebook page during National Scoop the Poop week. Messages included, "Poop Scoop Yoga. Pick up after your pet every time. Protect our health and the environment" and "Message from the DPW Dogs to Scoop the Poop!"

Targeted Audience: Residents

Responsible Department/Parties: DPW, Communications Director

Measurable Goal(s):

334 people reached, 14 engagements, 1 share, 0 comments, and 12 likes.

Message Date(s): May 26 and May 29, 2023.

Message Completed for: Appendix F Requirements ☐ Appendix H Requirements ☒

Was this message different than what was proposed in your NOI? Yes ◉ No ○

If yes, describe why the change was made:

The message did not change, but the distribution method is different than what was proposed in the NOI.

BMP: Pet Waste Management - Dog License

Message Description and Distribution Method:

Distributed messaging to residents during dog license renewal.

Targeted Audience: Residents

Responsible Department/Parties: DPW, Town Clerk

Measurable Goal(s):

1,607 dog licenses issued.

Message Date(s): January 1, 2023 through March 31, 2023.

Message Completed for: Appendix F Requirements ☐ Appendix H Requirements ☒

Was this message different than what was proposed in your NOI? Yes ○ No ◉

If yes, describe why the change was made:

BMP: Landscape Management

Message Description and Distribution Method:

Using the Think Blue Massachusetts graphics, we emailed 41 local landscape companies a brochure with information of best management practices. We requested read receipts to measure the number of people who opened the email.

Targeted Audience: Businesses, institutions and commercial facilities

Responsible Department/Parties: DPW

Measurable Goal(s):

Of the 41 companies emailed, 4 returned a read receipt a few emails addresses were undeliverable.

Message Date(s): May 22, 2023

Message Completed for: Appendix F Requirements ☒ Appendix H Requirements ☐

Was this message different than what was proposed in your NOI? Yes ◉ No ○

If yes, describe why the change was made:

Only the message distribution method changed.

BMP: Lawn and Landscape Management

Message Description and Distribution Method:

Messaging to the public through the DPW and Town's Facebook page on best practices for grass clippings, yard waste and fertilizing.

Targeted Audience: Residents

Responsible Department/Parties: DPW, Communications Director

Measurable Goal(s):

652 people reached, 25 engagements, 0 shares, 2 comments, and 42 likes.

Message Date(s): May 24 and May 30, 2023.

Message Completed for: Appendix F Requirements ☒ Appendix H Requirements ☐

Was this message different than what was proposed in your NOI? Yes ○ No ○

If yes, describe why the change was made:

The message is the same as proposed in the NOI, the distribution method is different.

BMP:Caring for Your Septic System

Message Description and Distribution Method:

Intern hand delivered the "Caring for Your Septic System" brochure to residents with septic systems in town.

Targeted Audience: Residents

Responsible Department/Parties: DPW

Measurable Goal(s):

Distributed brochures to residences on Whitney Road, Harding Road, Thayer Road, Longmeadow Ln, Iarussi Way, Alexandria Rd, Colonial Dr, Diane Dr, Kimberly Dr, Stephanie Road, Partridge St, Wards Lane, Ohlson Circle, Gray Squirrel Circle, Rainbow Dr, Jasmine Road, Short Street, Liberty Street, 1/3 of Clark Street, and West Street.

Message Date(s): June 20, June 21, June 22, June 26, June 27, and June 28, 2023.

Message Completed for: Appendix F Requirements ☐ Appendix H Requirements ☒

Was this message different than what was proposed in your NOI? Yes ○ No ◉

If yes, describe why the change was made:

This is an additional message than what was proposed in the NOI.

BMP:Industrial Properties Best Management Practices

Message Description and Distribution Method:

Mailed a Think Blue Massachusetts flyer targeted to industrial properties to all industrially zoned properties in

town. A letter referencing the Massachusetts Stormwater Handbook standards 3, 5 and 6 was also included.

Targeted Audience: Industrial facilities

Responsible Department/Parties: DPW

Measurable Goal(s):

Mailed to 100% of industrial zoned parcels.

Message Date(s): June 27, 2023.

Message Completed for: Appendix F Requirements ☐ Appendix H Requirements ☐

Was this message different than what was proposed in your NOI? Yes ○ No ◉

If yes, describe why the change was made:

BMP:Developers Best Management Practices

Message Description and Distribution Method:

Distributed a Think Blue Massachusetts flyer noting erosion control requirements, proper waste management, and low impact development to developers when they apply for a permits or approvals with the Building Department or Community and Economic Development Department.

Targeted Audience: Developers (construction)

Responsible Department/Parties: DPW, Community and Economic Development Department, Building Depart

Measurable Goal(s):

Distribute to developers at the time of permit application.

Message Date(s): ongoing

Message Completed for: Appendix F Requirements ☐ Appendix H Requirements ☐

Was this message different than what was proposed in your NOI? Yes ○ No ◉

If yes, describe why the change was made:

Add an Educational Message

MCM2: Public Participation

Describe the opportunity provided for public involvement in the development of the Stormwater Management Program (SWMP) **during this reporting period**:

On the Town's Stormwater Management web page, there is a link for the public to leave comments on the Stormwater Management Program. They may also report a violation if observed. This opportunity is available to residents 24 hours a day, 7 days a week.

Was this opportunity different than what was proposed in your NOI? Yes ○ No ◉

Describe any other public involvement or participation opportunities conducted **during this reporting period**:

During this reporting period, the DPW presented an update on the Stormwater Management Plan and Draft Phosphorus Control Plan to the Select Board on April 18 and May 1, 2023. This included opportunity for public comment. Additionally, the DPW worked with the Charles River Watershed Association on a Green Infrastructure Project at the Middle School and High School. This project was presented at the Select Board Meeting on June 5, 2023, which included opportunity for public comment. Lastly, the Medway Energy and Sustainability Committee have included discussion on the Stormwater Management Plan, Draft Phosphorus Control Plan, and potential locations for new stormwater infrastructure at their January, March, and April monthly meetings in 2023.

MCM3: Illicit Discharge Detection and Elimination (IDDE)

Sanitary Sewer Overflows (SSOs)

Check off the box below if the statement is true.

☐ This SSO section is NOT applicable because we DO NOT have sanitary sewer

*Below, report on the number of SSOs identified in the MS4 system and removed **during this reporting period**.*

Number of SSOs identified: 0

Number of SSOs removed: 0

MS4 System Mapping

Optional: Provide additional status information regarding your map:

The DPW continues to collect data and build its infrastructure database. During this reporting period, our new GIS Coordinator began GPS locating our catch basin inventory.

Screening of Outfalls/Interconnections

If conducted, please submit any outfall monitoring results from this reporting period. Outfall monitoring results should include the date, outfall/interconnection identifier, location, weather conditions at time of sampling, precipitation in previous 48 hours, field screening parameter results, and results from all analyses. Please also include the updated inventory and ranking of outfalls/interconnections based on monitoring results.

- ○ No outfalls were inspected
- ◉ The above referenced outfall screening data is attached to the email submission
- ○ The above referenced outfall screening data can be found at the following publicly available website:

*Below, report on the number of outfalls/interconnections screened **during this reporting period.***

Number of outfalls screened: 54

*Below, report on the percent of outfalls/interconnections screened **to date.***

Percent of outfalls screened: 100

Optional: Provide additional information regarding your outfall/interconnection screening:

Dry weather outfall screening was completed during Year 3. Followup on outfalls with sample results higher than the Massachusetts Surface Water Quality Standards were investigated during Year 3, Year 4, and Year 5. As mentioned, 54 outfalls were inspected, but some outfalls received additional inspections and sampling. The outfall inspection spreadsheet is attached (Attachment C).

Catchment Investigations

If conducted, please submit all data collected during this reporting period as part of the dry and wet weather investigations. Also include the presence or absence of System Vulnerability Factors for each catchment.

- ◉ No catchment investigations were conducted
- ○ The catchment investigation data is attached to the email submission
- ○ The catchment investigation data can be found at the following publicly available website:

*Below, report on the number of catchment investigations completed **during this reporting period.***

Number of catchment investigations completed this reporting period: 0

*Below, report on the percent of catchments investigated **to date.***

Percent of total catchments investigated: 2

Optional: Provide any additional information for clarity regarding the catchment investigations below:

Problem catchment area investigations will commence in Year 6.

IDDE Progress

If illicit discharges were found, please submit a document describing work conducted over this reporting period, and cumulative to date, including location source; description of the discharge; method of discovery; date of discovery; and date of elimination, mitigation, or enforcement OR planned corrective measures and schedule of removal.

- ○ No illicit discharges were found
- ◉ The illicit discharge removal report is attached to the email submission
- ○ The illicit discharge removal report can be found at the following publicly available website:

*Below, report on the number of illicit discharges identified and removed, along with the volume of sewage removed **during this reporting period.***

Number of illicit discharges identified: 0

Number of illicit discharges removed: 0

Estimated volume of sewage removed: 0 gallons/day

*Below, report on the total number of illicit discharges identified and removed to date. At a minimum, report on the number of illicit discharges identified and removed **since the effective date of the permit (July 1, 2018)**.*

Total number of illicit discharges identified: 56

Total number of illicit discharges removed: 18

Optional: Provide any additional information for clarity regarding illicit discharges identified, removed, or planned to be removed below:

Since the effective date of the permit, the town has inspected all 508 outfalls and completed dry weather sampling. 104 outfalls showed the presence of flow and were sampled for salinity, temperature, conductivity, pH, surfactants, chlorine, ammonia, E.coli, and phosphorus. During Year 3 and Year 4, samples from 57 outfalls showed the presence of at least one or more of the aforementioned pollutant indicators. During Year 5, 54 outfalls were re-sampled and 18 outfalls showed no sign of the pollutant indicator. The DPW conducted a second round of sampling on 5 of the 54 outfalls. No new illicit discharges were identified during Year 5. The IDDE Report is attached (Attachment D).

Employee Training

Describe the frequency and type of employee training conducted **during this reporting period**:

IDDE training: 4/6/2023 hosted virtually by University of Massachusetts Amherst Transportation Center.
SWPPP training: 6/28/2023.

MCM4: Construction Site Stormwater Runoff Control

*Below, report on the construction site plan reviews, inspections, and enforcement actions completed **during this reporting period**.*

Number of site plan reviews completed: 9

Number of inspections completed: 105

Number of enforcement actions taken: 3

Optional: Enter any additional information relevant to construction site plan reviews, inspections, and enforcement actions:

MCM5: Post-Construction Stormwater Management in New Development and Redevelopment

Ordinance or Regulatory Mechanism

Date update was completed (due in year 3): June 8, 2020

Website of ordinance or regulatory mechanism: https://www.townofmedway.org/sites/g/files/vyhlif8006/f/uploads/sw_bylaw_clean_voted_at_june_8_2020_tm_final_bjs_1.pdf

As-built Drawings

Below, report on the number of as-built drawings received ***during this reporting period****.*

Number of as-built drawings received: 3

Optional: Enter any additional information relevant to the submission of as-built drawings:

Street Design and Parking Lots Report

Below, describe any changes made or planned to be made to local regulations and guidelines based on the report completed in Year 4:

On May 9, 2023 the Planning Board amended their Site Plan Rules and Regulations based on suggestions proposed in the report completed in Year 4.

Green Infrastructure Report

Below, describe progress towards making green infrastructure practices allowable based on the report completed in Year 4:

During Year 5, the Community and Economic Development Department and Department of Public Works collaborated on an update to the Stormwater Management and Land Disturbance Bylaw to include additional design requirements and guidance for low impact development and use of nature based solutions. The Land Disturbance Permit Rules and Regulations were also drafted. The Bylaw amendments are anticipated to be accepted during the Fall Town Meeting (2023). The Planning Board and Conservation Commission will adopt the Land Disturbance Rules and Regulations accordingly.

Retrofit Properties Inventory

Below, list remaining permittee-owned properties that could be modified or retrofitted with BMPs to mitigate impervious areas (must maintain a minimum of 5 sites in inventory until less than 5 sites remain):

Priority Parcels include:
45 HOLLISTON ST
9 LOVERING ST
76 OAKLAND ST
44 MILFORD ST
155 VILLAGE ST
16 CASSIDY LN
315 VILLAGE ST
26 HIGH ST
0 OAKLAND ST
0 VILLAGE ST
0 CROOKS ST
0 NORTH ST
88 SUMMER ST
46 MILFORD ST
123 HOLLISTON ST
13 CHESTNUT ST
6 FREEDOM TRAIL
18 TROTTER DR

Below, list all properties that have been modified or retrofitted with BMPs to mitigate impervious area that were inventoried as part of 2.3.6.d of the permit. Non-MS4 owned properties that have been modified or retrofitted with BMPs to mitigate impervious area may also be listed, but must be indicated as non-MS4.

MCM6: Good Housekeeping

Catch Basin Cleaning

*Below, report on the number of catch basins inspected and cleaned, along with the total volume of material removed from the catch basins **during this reporting period**.*

Number of catch basins inspected: 2,163

Number of catch basins cleaned: 2,163

Total volume or mass of material removed from all catch basins: 198.85 tons

Below, report on the total number of catch basins in the MS4 system.

Total number of catch basins: 2,618

If applicable:

Report on the actions taken if a catch basin sump is more than 50% full during two consecutive routine inspections/cleaning events:

During Year 5, the DPW invested in a tracking system for catch basin cleaning. This will help with data collection and gain a better representation of how full a basin was prior to its cleaning. Year 6 we will have data to compare sediment depths and will create work orders to inspect and clean more frequently. Land use and drainage area will be investigated as well to determine any contributing factors.

Street Sweeping

*Report on street sweeping completed **during this reporting period** using <u>one</u> of the three metrics below.*

- (●) Number of miles cleaned: 1,410.8
- ( ) Volume of material removed: [Select Units]
- ( ) Weight of material removed: [Select Units]

Stormwater Pollution Prevention Plan (SWPPP)

*Below, report on the number of site inspections for facilities that require a SWPPP completed **during this reporting period**.*

Number of site inspections completed: 2

Describe any corrective actions taken at a facility with a SWPPP:

There were no corrective actions taken at the DPW Facility. We continue to follow the operations and maintenance plan as described in the SWPPP.

Additional Information

Monitoring or Study Results

Results from any other stormwater or receiving water quality monitoring or studies conducted during the reporting period not otherwise mentioned above, where the data is being used to inform permit compliance or permit effectiveness must be attached.

- (•) Not applicable
- ( ) The results from additional reports or studies are attached to the email submission
- ( ) The results from additional reports or studies can be found at the following publicly available website(s):

If such monitoring or studies were conducted on your behalf or if monitoring or studies conducted by other entities were reported to you, a brief description of the type of information gathered or received shall be described below:

Additional Information

Optional: Enter any additional information relevant to your stormwater management program implementation during the reporting period. Include any BMP modifications made by the MS4 if not already discussed above. If any of the above year 5 requirements could not be completed due to the impacts of COVID-19, please identify the requirement that could not be completed, any actions taken to attempt to complete the requirement, and reason the requirement could not be completed below:

Activities Planned for Next Reporting Period

Please confirm that your SWMP has been, or will be, updated to comply with all applicable permit requirements including but not limited to the year 6 requirements summarized below. (Note: impaired waters and TMDL requirements are not listed below)

Yes, I agree ☒

Annual Requirements

- Annual report submitted and available to the public
- Annual opportunity for public participation in review and implementation of SWMP
- Keep records relating to the permit available for 5 years and make available to the public
- Properly store and dispose of catch basin cleanings and street sweepings so they do not discharge to

receiving waters
- Annual training to employees involved in IDDE program
- Update inventory of all known locations where SSOs have discharged to the MS4
- Continue public education and outreach program
- Update outfall and interconnection inventory and priority ranking and include data collected in connection with the dry weather screening and other relevant inspections conducted
- Implement IDDE program
- Review site plans of construction sites as part of the construction stormwater runoff control program
- Conduct site inspection of construction sites as necessary
- Inspect and maintain stormwater treatment structures
- Log catch basins cleaned or inspected
- Sweep all curbed streets at least annually
- Continue investigations of catchments associated with Problem Outfalls
- Implemented SWPPPs for all permittee owned or operated maintenance garages, public works yards, transfer stations, and other waste handling facilities
- Review inventory of all permittee owned facilities in the categories of parks and open space, buildings and facilities, and vehicles and equipment; update if necessary
- Review O&M programs for all permittee owned facilities; update if necessary
- Implement all maintenance procedures for permittee owned facilities in accordance with O&M programs
- Implement program for MS4 infrastructure maintenance to reduce the discharge of pollutants
- Enclose all road salt storage piles or facilities and implemented winter road maintenance procedures to minimize the use of road salt
- Review as-built drawings for new and redevelopment to ensure compliance with post construction bylaws, regulations, or regulatory mechanism consistent with permit requirements
- Inspect all permittee owned treatment structures (excluding catch basins)
- Identify additional permittee-owned properties that could potentially be modified or retrofitted with BMPs to reduce impervious areas so that the permittee maintains a minimum of 5 sites in their inventory, until such a time when the permittee has less than 5 sites remaining

Provide any additional details on activities planned for permit year 6 below:

1. Complete engineering designs for Middle School structural BMPs and begin construction.
2. Complete engineering designs for Holliston Street structural BMPs.

Part V: Certification of Small MS4 Annual Report 2023

40 CFR 144.32(d) Certification

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

Name:	Michael E. Boynton	Title:	Town Manager
Signature:		Date:	9/21/23

[Signatory may be a duly authorized representative]

TOWN OF MEDWAY, MA

PHASE 1 PHOSPHORUS CONTROL PLAN

Woodard & Curran

EPA NPDES Permit Number # MAR0411132

40 Shattuck Road | Suite 110
Andover, Massachusetts 01810
800.426.4262

woodardcurran.com

September 2023

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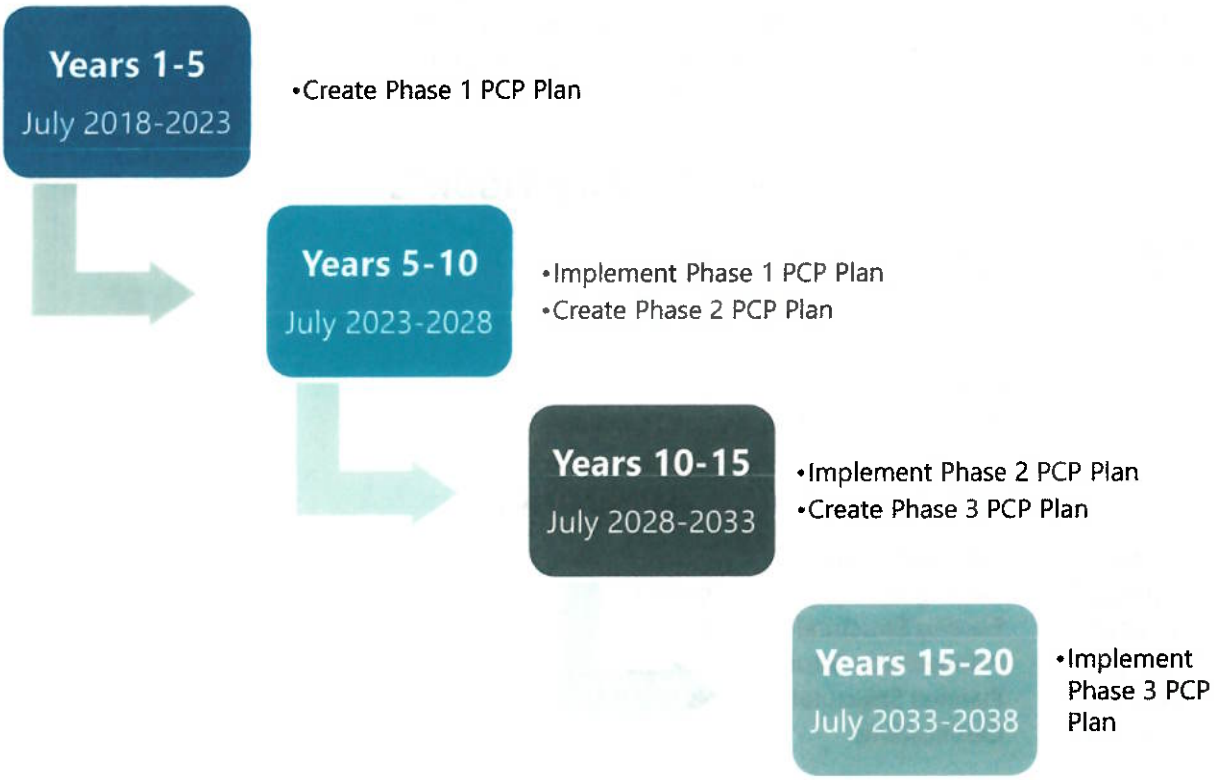
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1. INTRODUCTION

The Town of Medway, under the requirements of the United States Environmental Protection Agency (EPA), Municipal Separate Storm Sewer System (MS4) General Permit, is required to develop and execute a Phosphorus Control Plan (PCP) for its stormwater discharges into the Charles River watershed. The PCP will be implemented in three phases; this report is the Phase 1 PCP.

1.1 Required PCP Implementation Schedule

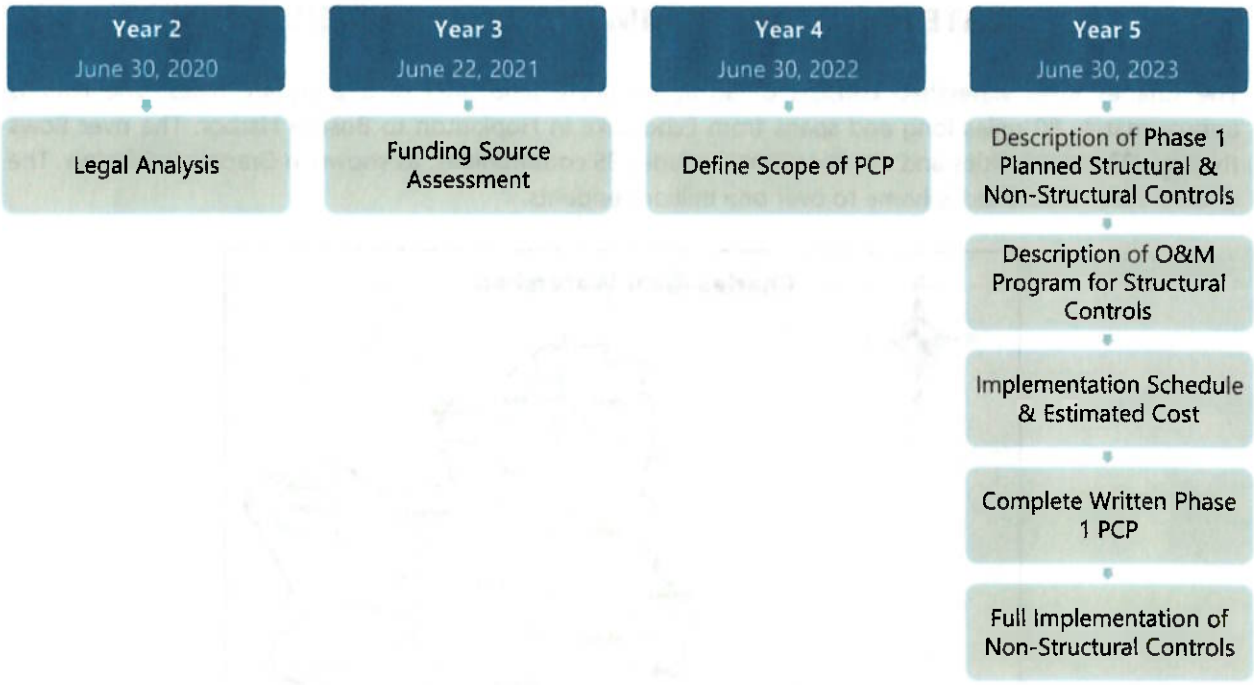
The MS4 General Permit (permit) PCP requirements are organized into three phases which are required to be implemented within a 20-year timeframe. The MS4 General Permit became effective July 1, 2018, and a modification to the MS4 General Permit became effective January 6, 2021. Graphic 1-1 below represents the schedule in 5-year MS4 General Permit-defined phases.



Graphic 1-1: MS4 General Permit-Defined Phases

1.2 Phase 1 of the PCP

Phase 1 plan elements are outlined below in Graphic 1-2. This Phase 1 PCP (Plan) includes the elements outlined below through Year 5. This Plan provides a summary of stormwater-based phosphorus load reduction requirements, documents existing stormwater control measures and associated phosphorus load reduction credits, describes planned control measures to meet the Phase 1 Year 10 25% reduction requirement, outlines an operation and maintenance program for structural controls, and presents a Phase 1 implementation schedule and cost estimate.



Graphic 1-2: Phase 1 Plan Elements

2. WATERSHED AND COMMUNITY CHARACTERIZATION

The Charles River watershed consists of an approximate land area of 308 square miles. The river is approximately 80-miles long and spans from Echo Lake in Hopkinton to Boston Harbor. The river flows through 23 communities and the watershed includes 35 communities, as shown in Graphic 2-1 below. The Charles River watershed is home to over one million residents.



Graphic 2-1: Charles River Watershed Map by CRWA

*Map not to scale

As an urban river, it is impaired for multiple pollutants. Three total maximum daily loads (TMDLs) have been developed for the watershed, including two for nutrients and one for bacteria. A nearly five-decade cleanup effort has resulted in water quality improvements, primarily from elimination of industrial and municipal wastewater discharges and a significant reduction in untreated sewage overflows discharging into the river.

The primary challenge facing the river today is considered stormwater runoff. The nutrient phosphorus is transported to the river through stormwater runoff. In excessive quantities, phosphorus can lead to harmful algal blooms (HABs) and an associated reduction in river dissolved oxygen levels, which can impact aquatic life and create toxic cyanobacteria outbreaks. Stormwater-based phosphorus sources in the urban environment typically consist of organic materials (leaves, grass clippings, etc.) washed off impervious areas during rain and snowmelt, sediments eroded from construction sites, wash off from winter sand application, and runoff containing phosphorus-based fertilizers.

The Town of Medway (the Town) is a suburban community located southwest of Boston between interstates 495 and 95 and bisected by route 109 (Main Street). The Town occupies a land area of approximately 11.5 square miles and is bordered by Holliston, Millis, Franklin, Bellingham, and Milford. As of 2020, the Town had a population of 13,115. The town's history as an agricultural community is still present today with several working farms occupying nearly 400 acres of land. The Charles River defines the southern border of town, and evidence of its industrial past is present through the Sanford Mill and Dam as well as the Village Street Dam. Per the Town's 2022 *Master Plan Update*, the Town is zoned approximately 55% residential, 9% commercial/industrial, 5% institutional, 23% open space, and 7% as other.

Medway is located entirely within the Charles River watershed. Excessive stormwater runoff is easily generated by the built environment within the Town which, without control measures in place, can contribute stormwater-based pollutants to the Charles River watershed. Reducing stormwater runoff and phosphorus in the Town's stormwater discharges are essential for the long-term sustainability and recovery of the Charles River.

2.1 Medway Characteristics

2.1.1 Hydrography

Medway contains multiple waterbodies, some impaired with one or more pollutants. Figure 1 identifies the waterbodies in town and Table 2-1 outlines the major receiving waterbodies with impairments as presented in the Draft Massachusetts Integrated List of Waters for the Clean Water Act 2022 Reporting Cycle.

Table 2-1: Medway's Impaired Waterbodies

Waterbody Segment	Impairments
Charles River (MA 72-04)	Flow Regime Modification, Ambient Bioassays - Chronic Aquatic Toxicity Chlordane in Fish Tissue DDT in Fish Tissue Escherichia (E. Coli) Fish Bioassessments Mercury in Fish Tissue Nutrient/Eutrophication Biological Indicators Phosphorus, Total Temperature
Charles River (MA 72-05)	Fanwort Water Chestnut Algae Benthic Macroinvertebrates Chlordane in Fish Tissue DDT in Fish Tissue Dissolved Oxygen Dissolved Oxygen Supersaturation Mercury in Fish Tissue Nutrient/Eutrophication Biological indicators Phosphorus, Total Turbidity
Chicken Brook (MA 72-34)	E.coli
Hopping Brook (MA 72-35)	E.coli

2.1.2 Land Cover

Impervious surfaces can contribute to increased stormwater runoff, route surface pollutants quickly to receiving waters, and restrict the recharge of groundwater. Pervious areas allow the infiltration of precipitation to recharge shallow and deep groundwater and preserve the hydrologic integrity of a watershed. Most impervious cover is made up of buildings, parking lots, driveways, and roads. The percentage of impervious cover in a watershed can indicate the probable health of the watershed and associated waterbody. Extensive literature sources indicate that watersheds with greater than 10% of their land area covered by impervious surfaces exhibit various signs of impairment due to stormwater runoff. Medway consists of approximately 974 acres of impervious area, which is approximately 13% of the total land area.

2.1.3 Land Use

Land use is also an important factor when evaluating a watershed for sources of stormwater-based runoff pollution. In most cases, commercial, industrial, high- and medium-density residential, and highway land uses generate higher concentrations of pollutants in stormwater runoff than undeveloped or rural areas. Land use distribution per the MassGIS 2005 Land Cover/Land Use dataset is illustrated in Figure 2 in Appendix A.

Table 2-2 summarizes the area distribution within each land use category, Table 2-3 summarizes the percent of total impervious cover by land use category. This data was presented in an EPA Region 1 memorandum dated April 22, 2014, with the subject *Overview of Methodology to Calculate Baseline Stormwater Phosphorus Loads and Phosphorus Load Reduction Requirements for Charles River Watershed* and is based on the MassGIS 2005 Land Use dataset. As demonstrated in Table 2-3, commercial, industrial, high-density residential, and highway areas in the Town have higher percent impervious cover than other land use types. This results in higher concentrations of pollutants in stormwater runoff from these land uses. Additionally, the Town's overall percent total impervious area cover of approximately 13% is 1.3 times higher than the 10% impervious surface indicator for impairments due to stormwater runoff. Finally, Table 2-2 demonstrates that the Watershed consists primarily of forest, medium-density residential, and commercial land use.

Table 2-2: Area of Aggregate Land Use (acres)

Community	Commercial	Industrial	High Density Residential	Medium Density Residential	Low Density Residential	Highway	Open Land	Agriculture	Forest	Total Area
Medway	191.33	132.25	266.04	399.17	1,816.75	11.6	423.67	370.14	3,812.36	7,466.14

Table 2-3: Percent Impervious Area of Aggregate Land Use Categories

Community	Commercial	Industrial	High Density Residential	Medium Density Residential	Low Density Residential	Highway	Open Land	Agriculture	Forest	Overall % IA
Medway	65%	58%	33%	26%	22%	37%	14%	8%	2%	13%

2.1.4 Soils

Based on data from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), Medway consists primarily of hydrologic soil group (HSG) B soils (37.4 %), followed by HSG A (27.7%), HSG C/D (18.8%), HSG C (11.4%) and HSG D (4.7%) soils. HSG A generally has the lowest runoff potential and HSG D the greatest. Understanding watershed soils aids stormwater runoff mitigation decision making, since stormwater control measures are more effective on HSG A and B soils due to their high infiltration capacity. Figure 3 illustrates the locations of each hydrologic soil group in the Watershed.

2.2 Water Infrastructure

Stormwater runoff in Medway is either captured and conveyed via an existing closed conduit drainage system or is conveyed via overland flow to waterbodies. The Town's drain and sewer are separated. Roughly 2,900 properties are connected to the sewer system, with the remainder utilizing septic systems.

2.3 Historic Stormwater Management Approach

Under the MS4 General Permit, the Town is required to implement a stormwater management program (SWMP) intended to reduce pollutants in stormwater. The Town's latest SWMP, dated June 2023, outlines

the activities and measures that the Town implements to meet the terms and conditions of the MS4 General Permit. The six minimum control measures, or main elements of the SWMP, include public education and outreach, public participation, illicit discharge detection and elimination (IDDE), management of construction site runoff, management of post-construction site runoff, and good housekeeping in municipal operations.

To ensure that stormwater from development projects is adequately controlled, the Town has developed requirements for stormwater design and drainage management that are applicable for the following:

1. Any activity that results in a land disturbance greater than 20,000 square feet of land; or
2. Any removal, disturbance, alteration, or addition of 10,000 square feet of more of impervious cover; or
3. Any development project that:
    a. Requires a special permit, site plan review, or subdivision review; or
    b. Requires a permit from the Conservation Commission.

In addition to the requirements outline above, the Town of Medway also regulates connections to the MS4 regardless of whether the connection was permitted in the past.

2.4 Economic Development Activity

Medway developed from a historically agricultural and industrial community. Factories utilized the Charles River and its tributaries for its hydropower which helped build Medway. The Town also has strong roots in its agricultural past and there are still several working farms. Industrial development has moved away from the rivers and are located in two zoned areas on the outskirts of town. Medway has no defined downtown area and is known as a "bedroom community" with the majority of its residents leaving town to work elsewhere. This this has led to the suburban sprawl we see in countless communities across the country.

Stormwater should continue to be an important aspect of the planning and economic development process. Redevelopment of commercial properties presents a cost-effective opportunity for the Town to reduce the phosphorus load to the Charles River.

3. PHOSPHORUS LOAD REDUCTION TARGETS

3.1 PCP Area

The Town of Medway has the option to implement its PCP across the entire town or just within the MS4-regulated urbanized area. The extent of the MS4-regulated urban area encompasses nearly the entire town (151 acres non-urban and 12 acres owned by MassDOT), as shown in Figure 4 in Appendix A. Therefore, Medway is opting to implement the PCP within our community boundaries because the planned practices/approaches will be implemented at the municipal scale and we want to "take credit" for all the non-structural and structural stormwater practices being implemented.

3.2 Baseline Load

The following table summarizes the annual baseline and allowable phosphorus load and required load reduction for the Town's stormwater discharges in the Charles River watershed as described in the MS4 General Permit and are based on 2005 land use information.

Table 3-1: Annual Stormwater Phosphorus Load Reduction (2005)

Annual Load (kg / lbs)			
Baseline Phosphorus Load (Permit - 2005)	Allowable Phosphorus Load	Phosphorus Load Reduction Requirement	Percent Reduction in Phosphorus Load
1,063 / 2,343	662 / 1,459	400 / 882	38%

3.3 Change in Baseline Load Since 2005

The baseline load displayed in Table 3-1 above was calculated by EPA using land use and land cover data from 2005. Land use and cover changes have occurred since 2005 that will likely increase the 2005 baseline load. As such, permittees are required to reflect and mitigate for increases in phosphorus load due to development since 2005. The current load reduction requirement is being used as the target management goal.

During Year 6 and Year 7, the change in load due to development since 2005 is required to be reported as a part of the Phase I Performance Evaluation. With funding from the MassDEP MS4 Technical Assistance Grant, the Charles River Watershed Association and the University of Vermont are partnering to help the watershed communities update their land use and impervious surface GIS data to 2021. This will assist the Town with recalculating the phosphorus load reductions.

4. LEGAL ANALYSIS

The MS4 General Permit describes the scope of the required legal analysis as a document that identifies existing regulatory mechanisms available to the Town, such as bylaws and ordinances, and describes changes to regulatory mechanisms that may be necessary to effectively implement all phases of the PCP.

The intent of the preliminary legal analysis is to provide guidance for the Town to consider how to best manage stormwater across the public and private sectors to meet the MS4 General Permit total phosphorus reduction requirements.

The town considers the approval of the Stormwater Management and Land Disturbance Bylaw at the May 2020 Town Meeting and the Massachusetts Attorney General as an example of the legal analysis completed to date. Considering that there was no Phosphorus Control Plan for Town Counsel to review until the end of Year 5, a more comprehensive legal analysis will occur in the follow phases of implementation.

5. FUNDING SOURCE ASSESSMENT

The town funds the stormwater management program through a dedicated stormwater expense account and stormwater consulting expense account. Larger projects may use capital funding which needs Town Meeting approval. Grant funding is another option the town is pursuing.

Possible funding entities include:

- Massachusetts Department of Environmental Protection State Revolving Fund Loan,
- Massachusetts Municipal Vulnerability Preparedness Action Grant,
- Section 604(b) Water Quality Management Program,
- Section 319 Water Quality Management Planning Grant Program,
- Metropolitan Area Planning Council's Accelerating Climate Resiliency Grant,
- Massachusetts Division of Ecological Restoration's Restoration and Revitalization Priority Projects Program, and
- Congressional Directed Spending.

It is anticipated that financing of the PCP will evolve as the MS4 General Permit term progresses and specific planned stormwater controls are designed and implemented.

6. EXISTING STORMWATER CONTROLS

6.1 Non-Structural

Non-structural pollution prevention practices prevent or reduce stormwater related runoff pollution by reducing the exposure and generation of pollutants that can be washed off during precipitation events. Non-structural management approaches can also include public education and outreach, or new or refined regulatory policies that minimizes creation or impact of land development, septic systems or other sources of stormwater and groundwater pollution. Non-structural management practices typically refer to stormwater runoff management that do not require extensive engineering design and construction efforts, hence the term non-structural. Non-structural controls can be the most cost-effective stormwater attenuation strategies for any given watershed but require careful planning and organization of labor resources, enforcement or incentives, education, and outreach, and may require specialized equipment.

The MS4 General Permit currently allows credit for three non-structural control measures: enhanced sweeping, catch basin cleaning, and organic waste and leaf litter collection. The following operational standards were used to estimate phosphorus reduction credits for current Town operations.

Table 6-1: Existing Non-Structural Control Standards

Non-Structural Control	Operational Standard	Reduction Factor
Sweeping	Semi-annual sweeping of municipally owned roadways, parking lots or other municipally operated impervious surfaces using a mechanical broom sweeper from March through November.	1% annual reduction, prorated by 0.75 for a period between March and November.
Catch Basin Cleaning	Annual cleaning of municipally owned catch basins within municipally owned and maintained roadways, parking areas and properties	1% annual reduction
Organic Waste and Leaf Litter Collection	Annual cleaning of municipal roadways, parks, and municipal facilities.	5% annual reduction

Implementing these non-structural controls on municipal properties represent a phosphorus reduction of 13.6 pounds per year, as noted in the table below.

Table 6-2: Existing Non-Structural Controls Load Reduction

	Land Cover (acres)			Load Reduction (lbs/year)		
	All Roadways & Parking lots	Impervious Catch Basin Drainage Area	Enhanced Sweeping	Catch Basin Cleaning	Organic Waste/ Leaf Litter Collection	Total
	285.09	491.59	4.01	9.59	0.0	**13.6**

Calculations supporting this estimate are included in Appendix B. The roadway jurisdiction is appended as Figure 5 in Appendix A, and a figure showing MAPC catchment areas for catch basins is appended as Figure 6.

6.2 Structural

Structural BMPs are permanent structures and/or facilities constructed and operated to reduce the discharge of pollutants in stormwater by treating runoff via filtration, infiltration, and/or biological processes. A structural BMP is creditable towards the Town's total phosphorus reduction requirement if it meets the design requirements outlined by EPA in the MS4 General Permit and is currently functioning as it was designed to. Medway organizes its structural BMPs into three categories: "town-owned," "town-managed," and "private."

Town-owned BMPs are structures located on town-owned properties. There are five town properties that treat all on-site impervious cover: Choate Park, Thayer Homestead, Oakland Park, Department of Public Works, and Medway High School. The Burke-Memorial Elementary School was retrofitted with a rain garden in 2019 to treat runoff from a portion of the parking lot, playground, and basketball court. The Medway Police Station also has a detention basin that treats roof and parking lot run off; however, there are no supporting stormwater calculations for this structure.

Most town-managed BMPs were built between the 1990s and 2010s as a part of residential subdivisions. Typically, the Town accepted these roads, and therefore; all infrastructure maintenance falls under the jurisdiction of the Department of Public Works (DPW). Some earlier subdivisions did not include drainage easements for maintenance access, but in later years, the Planning Board began requiring easements in the definitive plans. Other town-managed BMPs are located in the town's right-of-way, and therefore, fall under the DPW for maintenance.

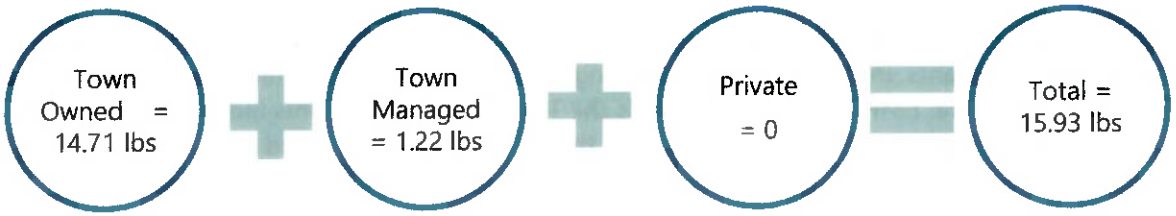
Private BMPs are structures outside of the jurisdiction of the Department of Public Works for maintenance. These are typically commercial, industrial, and institutional properties, or developments with homeowners' association to manage the property.

Using permitting and planning documentation provided Community and Economic Development Department, Board of Health, Building Department, and DPW, the Town identified existing structural stormwater control measures across town as seen in Table 6-3 below.

Table 6-3: Existing Structural Controls

Town-Owned	Town-Managed	Private	Total
31	72	89	192

As previously stated, structures are only creditable if they meet the EPA requirements and are functioning as they were designed. Over the years, many BMPs were not maintained in accordance with the operations and maintenance manuals. However, Medway is in the process of restoring these BMPs and will claim phosphorus reduction credits. Phosphorus reduction was calculated using EPA's Best Management Practice Accounting and Tracking Tool (BMP-BATT), which is a spreadsheet-based tool that provides accounting, tracking, and reporting for pollutant load reduction. The credit estimated for 15 Town-Owned, 1 Town-Managed, and zero privately managed BMPs is summarized in Graphic 6-1. Privately owned BMPs may be creditable; however, the town does not have reports documenting maintenance and functionality. The existing structural control credit calculations are included in Appendix C.1.



Graphic 6-1: Structural Controls Reduction (lbs/year)

Each BMP was inspected during 2022 by the DPW Highway Superintendent, Right of Way Supervisor, and Compliance Coordinator. The inspection form was based off criteria needed for the BATT tool as well as a BMP maintenance bid sheet shared by the Town of Tewksbury, MA. As DPW staff completed the initial inspections, additional information was collected to assist with prioritizing maintenance. For example, we included whether or not there was a drainage easement, and if so, was the easement obstructed making maintenance access a challenge. The inspection form is included in Appendix C.2. The locations of all structural BMPs are illustrated in a figure provided in Appendix C.3.

The total credit presented in this section is anticipated to be updated and refined as additional documentation is reviewed. It is also important to note that the date of last completed maintenance is required to take credit for each BMP. Certification that all BMPs are being inspected and maintained according to the O&M program specified in this PCP (Section 8) is also required. Certification requirements are listed in Appendix F.

6.3 Phosphorus Load Reduction Gap

Table 6-4 below summarizes Medway's anticipated stormwater phosphorus load reduction gap estimated by crediting existing non-structural and structural controls as outlined above.

Table 6-4: Estimated Existing Phosphorus Load Reduction Gap (lbs/year)

Required Phosphorus Load Reduction (lbs)	Estimated Reduction Achieved			Estimated Load Reduction Gap
	Non-Structural	Structural	Total Non-Structural and Structural Reduction	
882	13.6	15.93	29.53	852.47

The MS4 General Permit requires that municipalities achieve reduction targets in a phased approach. Under Phase 1 of the PCP implementation, the Town of Medway is obligated to meet 20% of the reduction target at the end of Permit Year 8 (June 2026) and 25% of this target at the end of Permit Year 10 (June 2028), as summarized in Table 6-5.

Table 6-5: Anticipated Phosphorus Load Reduction Gap for Phase 1

Target Milestones	Reduction Required	Reduction Provided by Existing Structural and Non-Structural Controls	Estimated Load Reduction Gap
Phase 1-Year 8 Reduction Requirement June 2026	20% (176 lbs./year)	3.3% (29.53 lbs./year)	83.3% (146.47 lbs./year)
Phase 1-Year 10 Reduction Requirement June 2028	25% (220 lbs./year)	3.3% (29.53 lbs./year)	86.6% (190.47 lbs./year)
Total 20-Year Permit Reduction Requirement June 2038	100% (882 lbs./year)	3.3% (29.53 lbs./year)	96.7% (852.47 lbs./year)

Section 7 of this plan summarizes planned controls to meet the Phase 1 reduction target of 25% by Year 10 (2028). It should be noted that the required phosphorus load reduction is anticipated to increase due to development since 2005, as discussed in Section 3.3.

7. PLANNED CONTROLS

7.1 Non-Structural

Per the MS4 General Permit, the permittee shall describe the non-structural stormwater control measures necessary to support achievement of the phosphorus export milestones in Table F-1 (MS4 General Permit Appendix F). The description of non-structural controls shall include the planned measures, the areas where the measures will be implemented, and the annual phosphorus reductions that are expected to result from their implementation in units of lbs/yr. Annual phosphorus reduction from non-structural BMPs shall be calculated consistent with Attachment 2 to Appendix F of the MS4 General Permit.

Table 7-1: Planned Non-Structural Controls Load Reduction

	Land Cover (acres)		Load Reduction (lbs/year)			
	All Roadways and Parking Areas	Impervious Catch Basin Drainage Area	Enhanced Sweeping	Catch Basin Cleaning	Organic Waste/ Leaf Litter Collection	Total
Town-Owned and Town-Managed Properties & Roadways	285.09	491.59	12.02	19.17	8.31	**39.5**

Calculations supporting the planned non-structural controls estimate are included in Appendix D.

7.2 Structural

Planned structural controls have been assessed to meet the Town's load reduction gap for Year 8 and 10. Phase 1 planned structural controls will be located on town owned and managed parcels, as well as roadways. Increased oversight and management of existing privately owned BMPs will also be part of Phase I implementation.

7.2.1 Municipal Structures

There are 128 municipally owned parcels in Medway, however, many properties that would be considered one site are actually comprised of multiple parcels. For example, the Town's high school is broken up into 6 different parcels but is considered one property.

In 2020, the Town partnered with the Charles River Watershed Association (CRWA) to conduct an infiltration feasibility assessment of town-owned parcels for their potential to treat stormwater onsite. Factors such as soil conditions, depth to ground water, wetland resource areas, and impervious cover were assessed through GIS analysis and soil assessments. Of the 128 municipal parcels, 77 have some portion of impervious cover with no single parcel having more than ~25% impervious cover. In total, 97 parcels were identified as having viable retrofit and infiltration potential. The results of the infiltration feasibility assessment have served as a basis for continued evaluation of town properties.

For example, Oakland Park was identified as a town parcel with opportunity for infiltration. As a member of the Charles River Climate Compact and participant in the Charles River Flood Model project, Medway's Oakland Park was selected as an opportunity for additional flood storage and green infrastructure. In 2023, the Town collaborated with the CRWA and Horsley Witten Group to further develop concept plans for 10 additional town sites and 25% engineered plans for the Medway Middle School and High School. The Medway Middle School project includes 4 new rain gardens and a subsurface infiltration basin. The High School project includes tree trenches and additional rain gardens.

Through the process of evaluating town sites, it was realized that incorporating offsite drainage onto larger town parcels with conducive soils a higher phosphorus reduction and infiltration capacity could be achieved. The Medway Middle School project will accommodate stormwater from Kelley Street and Holliston Street, which abut the school. An additional study was conducted on the lower section of Holliston Street, which will include enhanced biofiltration along the streetscape.

Lastly, there is an opportunity to retrofit existing structural controls to increase infiltration capacity and water quality treatment. For example, the existing detention basin at the Police Station can be retrofitted to incorporate stormwater from Village Street and Campbell Street, promoting additional infiltration and treatment. The High School also poses an opportunity to retrofit two existing basins with additional infiltration capacity. The Winter Street structural control has potential to collect stormwater from much of the Village Residential and Village Commercial Zoning Districts.

Table 7-2 below summarizes each retrofit's estimated phosphorus load reduction, estimated cost, and estimated cost per pound of phosphorus removed. These should be considered estimated implementation costs; they do not include inspection or maintenance for continued performance throughout the BMP's life.

Table 7-2: Town-Owned Parcel Retrofit Summary

Structure Location	BMP Type	Load Reduction (lbs/year)	Estimated Cost	Approximate Cost/Pound Removed ($/lb)
Middle School	Rain Garden 1 (Bioretention)	0.5	$66,600	$133,200
	Rain Garden 2 (Bioretention)	0.42	$41,200	$98,095
	Rain Gardens 3 & 4 (Bioretention)	3.39	$175,000	$51,622
	Infiltration Basin	17.44	$154,400	$8,853
Oakland Park	Bioswales	1.22	$61,000	$50,000
	Infiltration Basin	11.44	$101,278.32	$8,853
Fire Station #1	4 Infiltration rain gardens	2.1	$105,000	$50,000
Public Library	1 Infiltration rain garden	0.1	$5,000	$50,000
1 Mechanic St	1 infiltration rain garden	0.17	$8,500	$50,000
Burke-Memorial Elementary School	5 Infiltration rain gardens	9.6	$480,000	$50,000
0 North Street	1 Infiltration rain garden	0.4	$20,000	$50,000
Cassidy Field Parking Lot	1 infiltration rain garden	1.2	$60,000	$50,000
Jacob Ide House (158 Main Street)	2 infiltration rain gardens	0.3	$15,000	$50,000
Highway Barn	2 infiltration rain gardens	3.9	$195,000	$50,000

McGovern Elementary School	3 Rain Gardens	3.4	$170,000	$50,000
Police Station	3 Infiltration rain gardens	1	$50,000	$50,000
High School	2 infiltration basins	6.04	$60,400	$10,000
Holliston Street (Lower)	enhanced biofiltration	6.18	$309,000.00	$50,000.00
Winter Street	Infiltration basins, and bioretention basins	20.08	$200,800	$10,000
	Total	**88.88**	**$2,278,178**	**$25,632**

7.2.2 Roadways and Town-Managed Parcel Retrofit Summary

There are over 100 miles of municipally owned roadways in Medway, and stormwater runoff from impervious cover outside of the municipal right-of-way may also be captured by municipal catch basins and treated. Due to limitations in available space within municipal right-of-way, not all traditional BMPs are viable for roadway retrofits as they may be for a regional retrofit facility or a larger available municipal parcel. Therefore, existing BMPs within subdivisions, which were originally designed to treat roadway runoff, roof runoff, etc., are prioritized for retrofit or restoration during the first phase of the PCP. For the purposes of this plan, a retrofitted BMP involves reengineered designs for an existing BMP, whereas a restoration BMP involves reconstructing and existing BMP to its original design.

The roadways and sites listed in this phase of the PCP were selected after reviewing the Department of Public Works 5 Year Roadway Improvement Plan and determining which streets were scheduled for repaving. Retrofitting within these selected roadways provides an opportunity for the Town to address phosphorus removal credits as part of a broader roadway rehabilitation project. New BMP opportunities were identified on 6 roadway improvement areas.

Each BMPs' estimated phosphorus load reduction, estimated cost, and estimated cost per pound of phosphorus removed is summarized in Table 7-3 below. These should be considered estimated implementation costs; they do not include inspection or maintenance for continued performance throughout the BMP's life.

Table 7-3: Roadways and Town-Managed Parcel Retrofit Summary

Structure Location	Action	BMP Type	Load Reduction (lbs/year)	Estimated Cost	Approximate Cost/Pound Removed ($/lb)
Grapevine Way	Restoration	Infiltration basin	0.19	$5,000	$5,000
Hickory Lane	Restoration	wet basin	4.87	$ 24,395	$5,000
Broad Acres Farm Road	Restoration	wet basin	4.17	$ 20,865	$5,000
Broad Acres Farm Road	Restoration	wet basin	5.68	$28,445	$5,000
Lantern Lane & Pine Meadow	Restoration	Infiltration	0.42	$30,000.00	$5,000.00
Newton Lane	Restoration	detention basins	0.33	$5,000.00	$5,000.00
Blueberry Hill Road	Restoration	wet basin/created wetland	6.52	$15,000.00	$5,000.00
Fairway Lane	Restoration	enhanced biofiltration	3.18	$159,400	$50,000
Daffodil Drive	Restoration	infiltration basin	1.28	$6,415	$5,000
Daffodil Lane	Retrofit	enhanced biofiltration	1.38	$69,350.00	$50,000.00
Tulip Way	Retrofit	enhanced biofiltration	2.24	$112,250.00	$50,000.00
Tulip Way	Retrofit	enhanced biofiltration	0.48	$ 24,200.00	$50,000.00

Temple Street	Retrofit	enhanced biofiltration	4.85	$242,950.00	$50,000.00
Applegate	Retrofit	infiltration basin	8.82	$88,230.00	$10,000.00
Alder Street	Retrofit	infiltration basin	1.23	$12,300.00	$10,000.00
Ash Lane	Retrofit	enhanced biofiltration	5.42	$271,450.00	$50,000.00
Independence Lane & Freedom Trail	Retrofit/ Restoration	enhanced biofiltration	3.25	$162,550.00	$50,000.00
Diane Drive, Kimberly Drive, Stephanie Road (Country View Estates)	New	2 infiltration basins	5.64	$56,480	$10,000
Shaw St, Samoset St	New	enhanced biofiltration	8.04	$402,000	$ 50,000
Claybrook Farm Road	New	enhanced biofiltration	3.97	$198,700	$50,000
Cedar Farm Road	New	enhanced biofiltration	1.86	$93,300	$50,000
Castle Road/Granite Street	New	infiltration basin	1.72	$17,250	$10,000
Laurelwood Lane	New	enhanced biofiltration	1.75	$87,700.00	$50,000.00
		TOTAL	**77.4**	**$2,133,230**	**$27,560**

7.3 Phosphorus Load Reduction Gap

Table 7-4 and 7-5 below summarize Medway's anticipated stormwater phosphorus load reduction gap estimated by crediting existing and planned non-structural and structural controls.

Table 7-4: Estimated Planned Phosphorus Load Reduction Gap (lbs/year)

Required Phosphorus Load Reduction	Estimated Reduction Achieved				Estimated Load Reduction Gap
	Existing Structural & Non-Structural	Planned Non-Structural	Planned Structural	Total Existing and Planned	
882	29.53	39.5	166.28	221.71	-1.71

Table 7-5: Anticipated Phosphorus Load Reduction Gap for Phase 1

Target Milestones	Reduction Required	Reduction Provided by Existing and Planned Controls	Estimated Load Reduction Gap
Phase 1-Year 8 Reduction Requirement July 2026	20% (176 lbs/year)	20.2% (177.88 lbs/year)	0% (0 lbs/year)
Phase 1-Year 10 Reduction Requirement July 2028	25% (220 lbs/year)	25.1% (221.71 lbs/year)	0% (0 lbs/year)
Total 20-Year Permit Reduction Requirement July 2038	100% (882 lbs/year)	25.1% (221.71 lbs/year)	74.9% (660.29lbs/year)

It should be noted that the required phosphorus load reduction is anticipated to increase due to development since 2005, as discussed in Section 3.3.

Calculations for planned structural controls and concept plans are included in Appendix E.

8. OPERATION AND MAINTENANCE PROGRAM FOR STRUCTURAL CONTROLS

Per the MS4 General Permit, the permittee shall establish an Operation and Maintenance Program for all structural BMPs being claimed for phosphorus reduction credit as part of Phase 1 of the PCP. This includes BMPs implemented to date as well as BMPs to be implemented during Phase 1 of the PCP.

The Operation and Maintenance Plan (O&M) for existing and planned structural controls will follow the O&M Plans associated with the approved plans for individual sites and subdivisions. The Department of Public Works complied as-builts or the equivalent, stormwater reports, long term O&M plans, and Orders of Conditions for all town-owned, town-managed, and privately owned sites with BMPs in Medway. These documents are stored in a shared online drive for interdepartmental review as well as in hard copies in individual binders for DPW Highway Division Staff to implement in the field. Sites and subdivisions with specific O&M Plans and log sheets are used when they exist; otherwise, a standard BMP inspection sheet is provided in the binders.

Inspections of town-owned and town-managed sites are the responsibility of the DPW Highway Division, which oversees stormwater drainage infrastructure. When maintenance such as mowing or tree removal is required, the DPW Parks Division partners with the DPW Highway Division to complete the required maintenance. As inspection sheets are completed, they are recorded in the DPW work order system.

Privately owned structural BMPs fall within the DPW Sustainability Coordinator and Conservation Agent's jurisdiction. Reports will be submitted annually to both parties by the owner of the property or property manager.

The EPA self-certification program will be explored during Phase 1 of the PCP. In accordance with MS4 Permit Part 2.3.7.a. iii, "all permittee-owned stormwater treatment structures (excluding catch basins) shall be inspected annually at a minimum."

9. PHASE 1 IMPLEMENTATION

9.1 Schedule

The Town has created a schedule for implementation of all planned Phase 1 BMPs, including, as appropriate: obtaining funding, training, purchasing, construction, inspections, monitoring, operation and maintenance activities, and other assessment and evaluation components of implementation. Implementation of planned BMPs must begin upon completion of the Phase 1 Plan, and all non-structural BMPs shall be fully implemented within 6 years of the MS4 General Permit effective date. Structural BMPs shall be designed and constructed to ensure the permittee will comply with the Year 8 and Year 10 phosphorus load milestones established in Table F-1 (MS4 General Permit Appendix F). The Phase 1 plan shall be fully implemented as soon as possible, but no later than 10 years after the effective date of MS4 General Permit.

The implementation schedule is outlined in Table 9-1 below.

9.2 Estimated Cost

The estimated costs of implementing the phase 1 structural controls are based on a few factors including prior actual costs incurred for restoring BMPs and construction cost estimates from engineers for bioretention basins and subsurface infiltrators. Based on these factors the cost estimates were reasonably deduced.

Per prior experience, new structural controls typically have engineering and design costs of approximately $100,000 to receive bid ready construction plans. Retrofit BMPs not incorporating a wider drainage area may cost roughly $30,000. Costs incurred for the restoration BMPs will be funded through the stormwater operations budget. Non-structural controls will be funded through the stormwater operations budget as well.

The estimated design cost for the new and retrofitted BMPs is approximately $1,504,000. Construction cost for all new, retrofitted, and restored BMPs is approximately $4,393,000. Therefore, the total estimated implementation cost is $5,897,000 by Year 10. This yields a $26,600 cost per pound of phosphorus removal.

Table 9-1 outlines the Phase 1 structural and non-structural controls schedule and costs.

Table 9-1: Phase 1 Implementation Schedule and Estimated Costs

	Type	Phosphorus Removal	Construction Cost	Design Costs	Cost Estimate Source	FY24 (Year 6)	FY25 (Year 7)	FY26 (Year
Pine	Infiltration	0.428	$30,000	n/a	DPW	DPW perform maintenance, Engineer confirm calcs		
	detention basins	0.335	$5,000	n/a	DPW	DPW perform maintenance, Engineer confirm calcs		
ad	wet basin/created wetland	6.521	$15,000	n/a	DPW	DPW perform maintenance, Engineer confirm calcs		
	Infiltration	0.191	$5,000	n/a	DPW	DPW perform maintenance, Engineer confirm calcs		
	wet basin	4.879	$24,395	n/a	DPW	DPW perform maintenance, Engineer confirm calcs and determine retrofit opportunity	Retrofit or restore	
n	wet basin	4.173	$20,865	n/a	DPW	DPW perform maintenance, Engineer confirm calcs and determine retrofit opportunity	Retrofit or restore	
n	wet basin	5.689	$28,445	n/a	DPW	DPW perform maintenance, Engineer confirm calcs and determine retrofit opportunity	Retrofit or restore	
	enhanced biofiltration	3.188	$159,400	n/a	DPW	DPW perform maintenance, Engineer confirm calcs and determine retrofit opportunity	Retrofit or restore	
	2 infiltration basins	5.648	$56,480	$100,000	DPW	Concept design plans	100% Design plans with cost estimates	Construction
t St	enhanced biofiltration	8.04	$402,000	$100,000	DPW	Concept design plans	100% Design plans with cost estimates	Construction
	enhanced biofiltration	3.974	$198,700	$100,000	DPW	Concept design plans	100% Design plans with cost estimates	Construction
d	enhanced biofiltration	1.866	$93,300	$100,000	DPW	Concept design plans	100% Design plans with cost estimates	Construction

							estimates	
e	enhanced biofiltration	1.754	$87,700	$100,000	DPW	Concept design plans	100% Design plans with cost estimates	Construction
	infiltration basin	1.283	$6,415	$100,000	DPW	DPW perform maintenance, Engineer confirm calcs and determine retrofit opportunity	100% Design plans with cost estimates	Retrofit or restore
	enhanced biofiltration	1.387	$69,350					
	enhanced biofiltration	2.245	$112,250					
	enhanced biofiltration	0.484	$24,200					
	enhanced biofiltration	4.859	$242,950	$30,000	DPW	DPW perform maintenance, Engineer confirm calcs and determine retrofit opportunity	100% Design plans with cost estimates	Retrofit or restore
	Bioswales	1.22	$61,000	$60,000	CRWA	Concept design plans	100% Design plans with cost estimates	construction
	Infiltration Basin	11.44	$101,278					
	Rain Garden 1 (Bioretention)	0.5	$66,600	$60,000	Horsley Witten	100% Design plans with cost estimates		Construction
	Rain Garden 2 (Bioretention)	0.42	$41,200					
	Rain Gardens 3 & 4 *bioretention	3.39	$175,000					
	Infiltration Basin	17.44	$154,400					
rking	1 infiltration basin	1.2	$60,000	n/a	CRWA	100% Design plans with cost estimates		Construction
ool	3 Rain Gardens	3.4	$170,000	$30,000	CRWA	Concept design plans	100% Design plans with cost estimates	Construction
	2 infiltration basins	6.04	$60,400	$30,000	DPW	DPW perform maintenance, Engineer confirm calcs and determine retrofit opportunity	100% Design plans with cost estimates	retrofit
	infiltration basin	8.823	$88,230	$30,000	DPW	DPW perform maintenance, Engineer confirm calcs and determine retrofit opportunity	100% Design plans with cost estimates	retrofit
	infiltration basin	1.23	$12,300	$30,000	DPW	DPW perform maintenance, Engineer confirm calcs and determine retrofit opportunity	100% Design plans with cost estimates	retrofit
	enhanced					DPW perform maintenance,	100% Design	

						determine retrofit opportunity	estimates	
	enhanced biofiltration	6.18	$309,000	$84,000	DPW	Concept design plans		100% Design plans with co estimates
	3 Infiltration rain gardens	1	$50,000	n/a	CRWA	Concept design plans		engineered p
	1 Infiltration basin, 1 bioretention basin	20.08	$200,800	$100,000	DPW	DPW perform maintenance, Engineer confirm calcs and determine retrofit opportunity		100% Design plans with co estimates
	4 Infiltration rain gardens	2.1	$105,000	n/a	CRWA	Concept design plans		
	1 Infiltration rain garden	0.1	$5,000	$30,000	CRWA	Concept design plans		
	1 infiltration rain garden	0.17	$8,500	$30,000	CRWA	Concept design plans		
ol	5 Infiltration rain gardens	9.6	$480,000	$30,000	CRWA	Concept design plans		
	1 Infiltration rain garden	0.4	$20,000	$100,000	CRWA	Concept design plans		
	2 infiltration rain gardens	0.3	$15,000	$30,000	CRWA	Concept design plans		
	2 infiltration rain gardens	3.9	$195,000	$100,000	CRWA	Concept design plans		
	EXISTING STRUCTURAL	15.93						
	PLANNED NON-STRUCTURAL	39.5						
	TOTAL	**221.712**	**$4,393,778**	**$1,504,000**				
	Grand Total		**$5,897,778**					
$/lbs Phosphorus removal			**$26,601**					

APPENDIX A: WATERSHED FIGURES

Figure 1: Hydrology

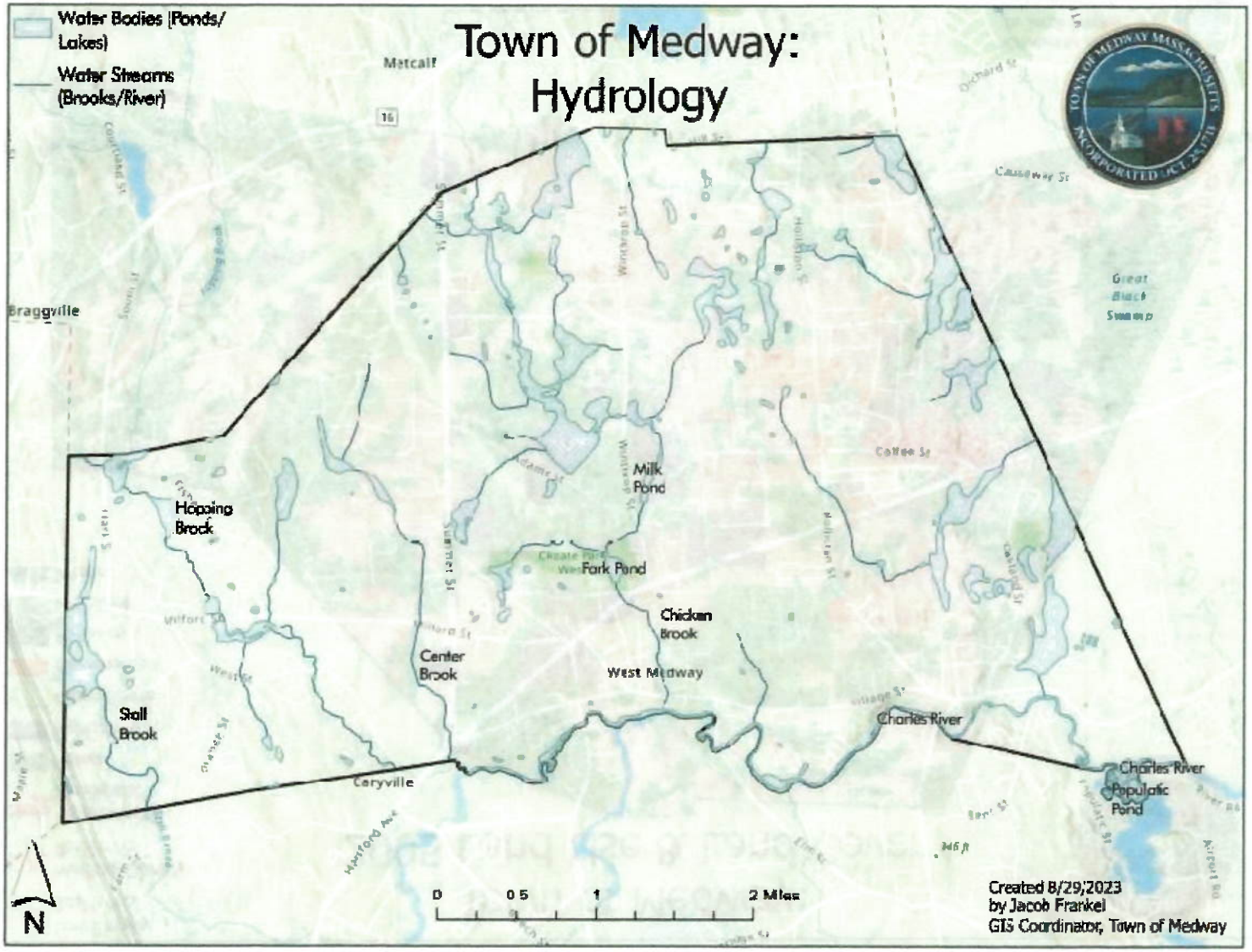


Figure 2: 2005 Land Use and Land Cover

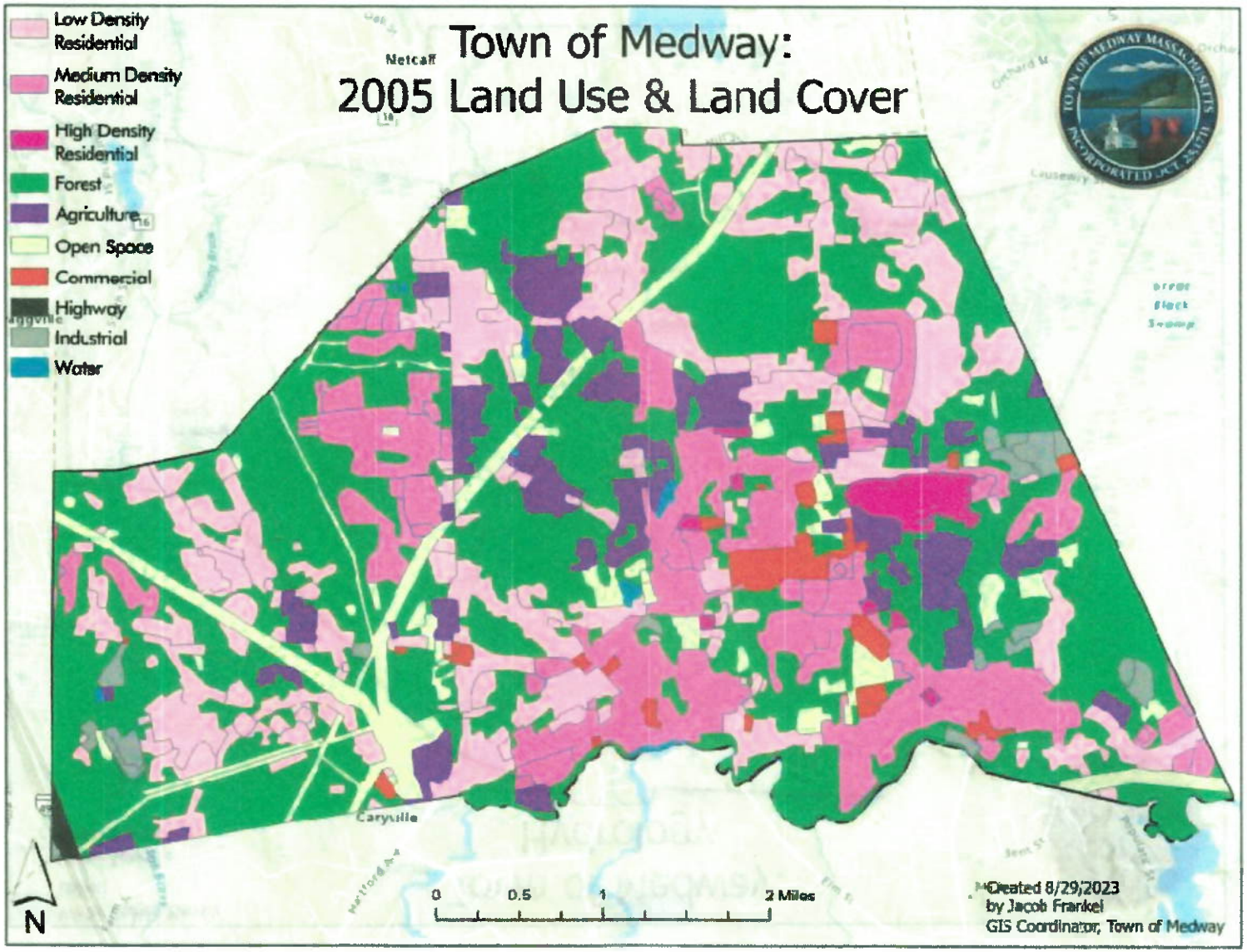


Figure 3: Hydrologic Soil Groups

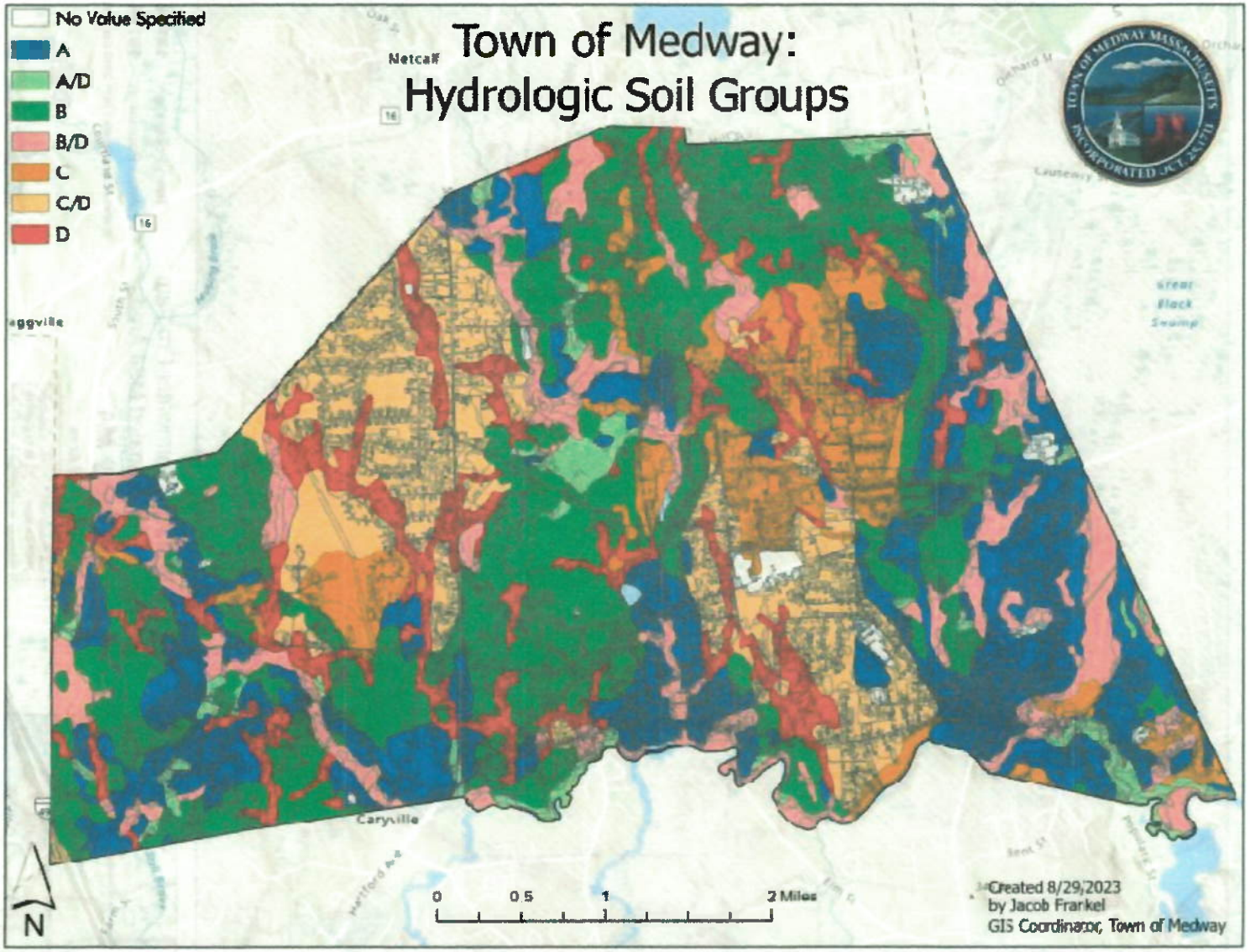


Figure 4: Urbanized Area

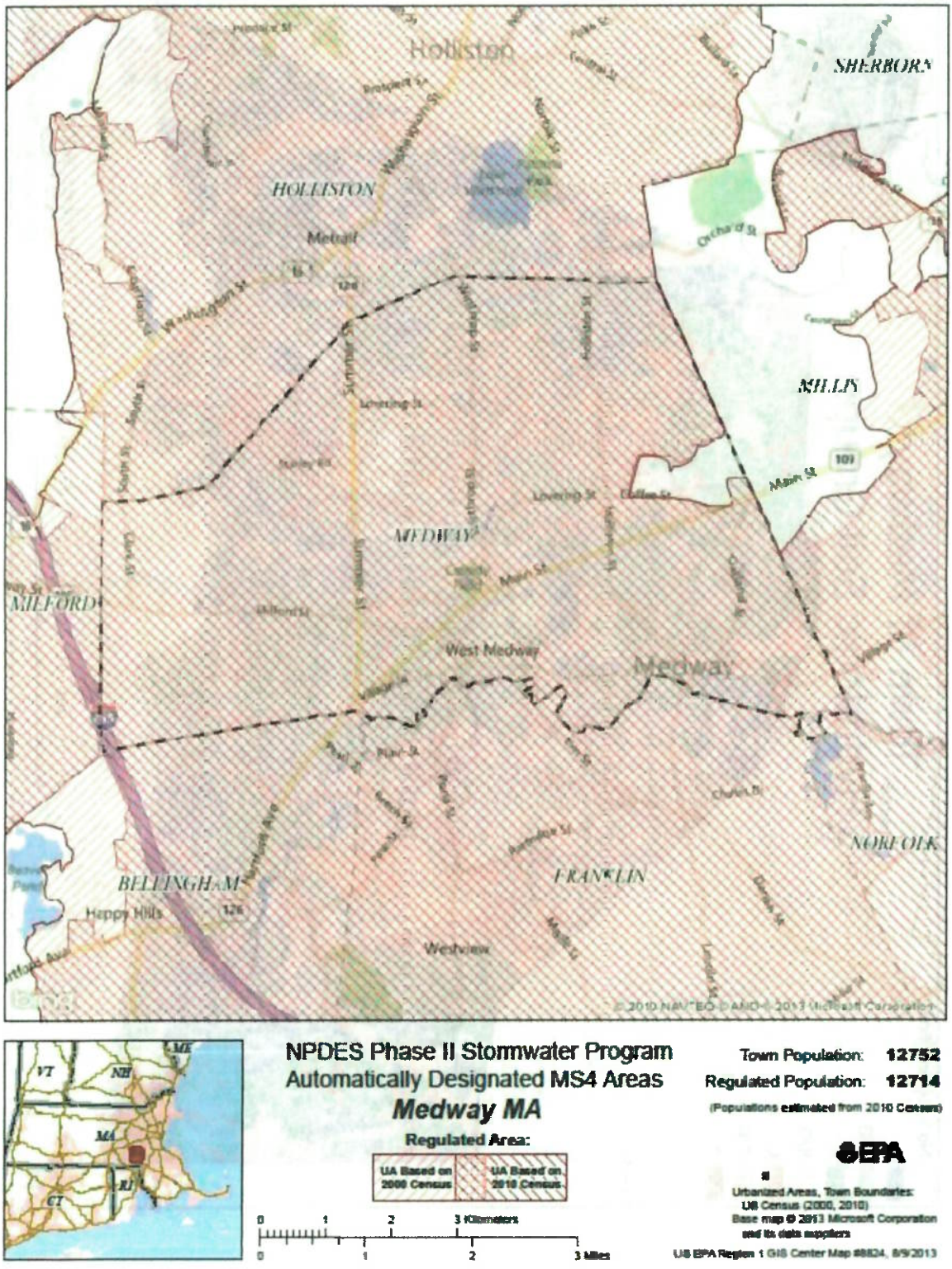


Figure 5: Roadway Jurisdiction

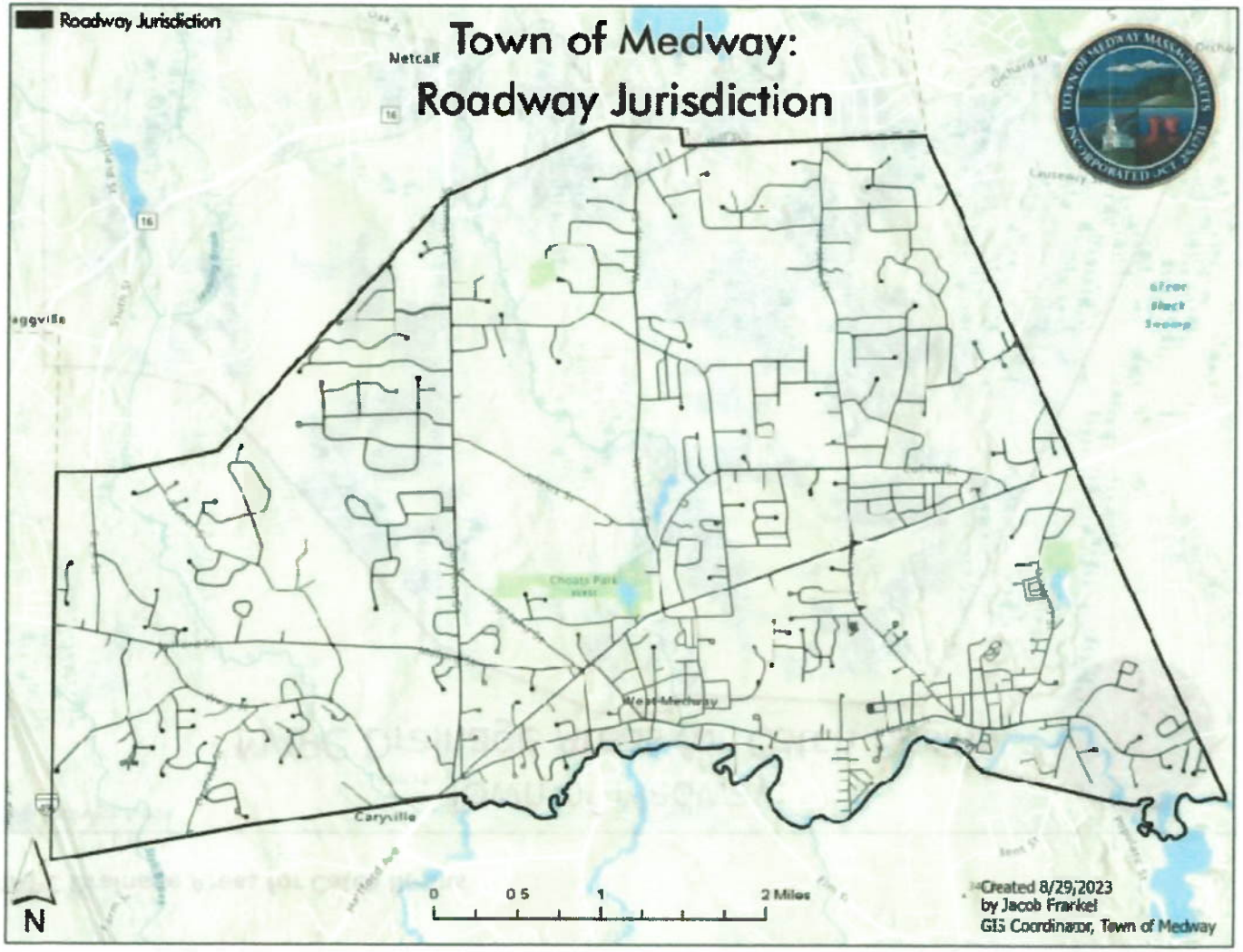
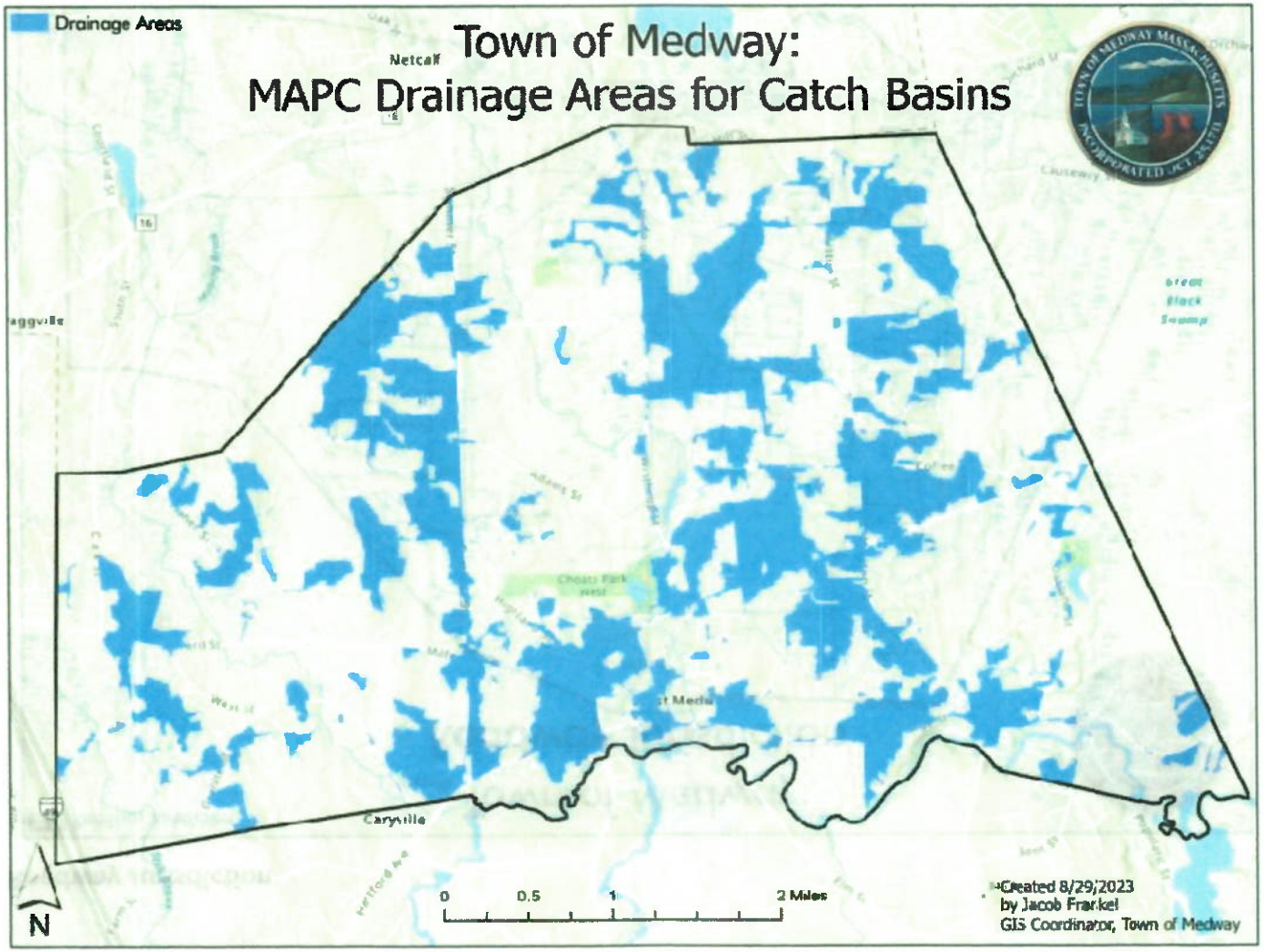


Figure 6: MAPC Drainage Areas for Catch Basins



APPENDIX B: EXISTING NON-STRUCTURAL CONTROLS

B.1: Enhanced Street Sweeping

The Town continues to gather and refine its data as well as expand its suite of analytic and tracking tools. However, during the time of these calculations it is important to note some data gaps. Currently, the town GIS roadway layer does not distinguish between private and public roadways or parking lots. Having a polygon layer that separates these features will help the town define its jurisdiction and more accurately identify phosphorus load removal.

Through GIS analysis, the town calculated the acreage of roadway in each land use type and its impervious and pervious coverage. Per the US EPA's land use land cover guidance titled, "2016 Massachusetts Small MS4 Permit Pollutant Loading Export Rates applied to the 2016 Massachusetts Land Use/Land Cover GIS Dataset," the town used the weighted average phosphorus loading rates of 1.95lbs P/ac/yr for all land use types except forest and agricultural lands.

Medway's sweeping operations occurs annually in the spring and fall using our mechanical broom sweeper. These operations begin in March and end by December.

We calculated the following phosphorus removal using Equation 2-1 provided in Appendix F of the MS4 General permit:

Equation 2-1: Phosphorus Credit $_{p\ sweeping}$ = **IA** $_{swept}$ X **PLER** $_{IC\text{-}land\ use}$ X **PRF** $_{sweeping}$ X **AF**

IA_{swept}	= Area of impervious cover swept
$PLER_{IC\text{-}land\ use}$	= Phosphorus load export rate for impervious cover and specified land use (lb/acre/yr)
$PRF_{sweeping}$	= Phosphorus reduction factor for sweeping based on sweeper type and frequency
AF	= Annual frequency of sweeping

Agricultural

IA swept	= 6.52 acres
PLER	= 1.52 lbs/acre/year
PRF	= 0.01
AF	= 0.75

Agricultural Credit $_{p\ sweeping}$ = 6.52acres x 1.52 lbs/acre/year x 0.01 x 0.75
= 0.07 lbs/year

Commercial

IA swept = 12.25 acres
PLER = 1.95 lbs/acre/year
PRF = 0.01
AF = 0.75

Commercial Credit $_{p\ sweeping}$ = 12.25acres x 1.95 lbs/acre/year x 0.01 x 0.75
= 0.18 lbs/year

Forest

IA swept = 44.00 acres
PLER = 1.52 lbs/acre/year
PRF = 0.01
AF = 0.75

Credit $_{p\ sweeping}$ = 44.00acres x 1.52 lbs/acre/year x 0.01 x 0.75
= 0.50 lbs/year

High Density Residential

IA swept = 27.01 acres
PLER = 1.95 lbs/acre/year
PRF = 0.01
AF = 0.75

HDR Credit $_{p\ sweeping}$ = 27.01acres x 1.95 lbs/acre/year x 0.01 x 0.75
= 0.40 lbs/year

Industrial

IA swept = 7.68acres
PLER = 1.95 lbs/acre/year
PRF = 0.01
AF = 0.75

Industrial Credit $_{p\ sweeping}$ = 7.68acres x 1.95 lbs/acre/year x 0.01 x 0.75
= 0.11 lbs/year

Low Density Residential

IA swept = 139.15acres
PLER = 1.95 lbs/acre/year
PRF = 0.01
AF = 0.75

LDR Credit $_{p\ sweeping}$ = 139.15acres x 1.95 lbs/acre/year x 0.01 x 0.75
= 2.04 lbs/year

Medium Density Residential

IA swept = 38.71acres
PLER = 1.95 lbs/acre/year
PRF = 0.01
AF = 0.75

MDR Credit $_{p\ sweeping}$ = 38.71acres x 1.95 lbs/acre/year x 0.01 x 0.75
= 0.57 lbs/year

Open Land

IA swept = 9.76acres
PLER = 1.95 lbs/acre/year
PRF = 0.01
AF = 0.75

Open Land Credit $_{p\ sweeping}$ = 9.76acres x 1.95 lbs./acre/year x 0.01 x 0.75
= 0.14 lbs/year

Total phosphorus removal for all impervious cover land uses = 4.01 lbs./year

B.2: Catch Basin Cleaning

The Town utilized the Metropolitan Area Planning Council (MAPC) "Catchment Delineation Toolbox" to determine the drainage area contributing to each catch basin. Using GIS analysis, we were able to overlay land use, land cover, and soil types for each catch basin drainage area. Additionally, per the US EPA's land use land cover guidance titled, "2016 Massachusetts Small MS4 Permit Pollutant Loading Export Rates applied to the 2016 Massachusetts Land Use/Land Cover GIS Dataset," the town used the weighted average phosphorus loading rates of 1.95lbs P/ac/yr for all land use types.

Medway cleans all town owned catch basins annually. Catch basins that need attention before the annual spring cleaning are addressed as needed. At this time, the town's data does not distinguish between public and privately owned catch basins. Further delineation in the data is needed to better define the phosphorus load removal and town jurisdiction.

Each of the 2430 catch basin drainage areas were analyzed for their impervious cover and their total phosphorus load per land use type. We used the Equation 2-3 per the MS4 General Permit Appendix F to determine the pounds of phosphorus removed through our catch basin cleaning program. We used a phosphorus reduction factor of 0.01 because we clean our basins annually and not semi-annually. The excel spreadsheet includes the analysis for each basin. Below are three examples demonstrating how each catch basin phosphorus removal was calculated.

Equation 2-3: Credit $_{P\ CB}$ = IA_{CB} x $PLER_{IC\text{-}land\ use}$ x PRF_{CB}

IA_{CB} = Area of impervious cover swept

$PLER_{IC\text{-}land\ use}$ = Phosphorus load export rate for impervious cover and specified land use (lb/acre/yr)

PRF_{CB} = Phosphorus reduction factor for catch basin cleaning

Example 1: **CB-1** = 0.24acres X 0.421lbs/acre/year x 0.01
=0.001lbs/year

Example 2: **CB-969** = 4.27acres X 7.69lbs/acre/year X 0.01
= **0.34lbs/year**

Example 3: **CB-1000** = 0.774acres x 1.176lbs/acres/yeas x 0.01
= 0.009lbs/year

The total phosphorus removal from catch basin cleaning is 9.59lbs/year.

B.3: Enhanced Organic Waste and Leaf Litter Collection Program

The Town of Medway collects leaf litter and organics from parks across town, and the street sweeper is used daily in the fall. However, we do not have the capacity to sweep every street or every parking lot weekly. Therefore, the Town is not claiming phosphorus removal credit for this non-structural control.

The total phosphorus removal from leaf litter collection is 0.0lbs/year.

APPENDIX C: EXISTING STRUCTURAL CONTROLS

C.1: Credit Calculations

State	MASSACHUSETTS
Municipality	MEDWAY
Permit Type	MS4
Permit Number	
Major Watershed	CHARLES
TP Load Reduction Target	N/A
TN Load Reduction Target	N/A
TSS Load Reduction Target	N/A

Table 1. Project Summary Credit for MEDWAY, MASSACHUSETTS

Project Type	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)
Structural	15.93	125.93	5499.38
Non-Structural	0	0	0
Land Use Conversion	0	0	0
Total	15.93	125.93	5499.38

Table 2. Structural Project Summary for MEDWAY, MASSACHUSETTS

Project ID	BMP Type	BMP Storage Capacity (ft^3)/ Filter Depth (in.)	Phosphorus BMP Efficiency (%)	Nitrogen BMP Efficiency (%)	Sediment BMP Efficiency (%)	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)	Impervious Area Treated (ac)	Runoff Depth (in.)

BMP-51-1	WET POND/CREATED WETLAND	750	8.96	5.76	19.19	0.53	2.92	243.92	3.23	0.06
BMP-51-2	INFILTRATION BASIN	19640	100	100	100	4.14	35.13	880.75	2.26	1.9
BMP-48-8	INFILTRATION BASIN	1724	99.25	100	100	1.11	8.37	476.71	0.73	0.65
BMP-48-7	INFILTRATION BASIN	2407	100	100	100	0.57	4.28	239.04	0.36	1.42
BMP-48-2	INFILTRATION BASIN	20956	100	100	100	3.74	31.73	795.66	2.03	2.14
BMP-47-12	INFILTRATION TRENCH	308	96.36	99.12	100	0.12	0.9	51.96	0.08	1.06
BMP-48-1	EXTENDED DRY DETENTION POND	1008	12.55	16.04	46.55	0.04	0.4	66.55	0.218	1.27
BMP-48-3	INFILTRATION TRENCH	210	52.6	81.02	74.95	0.2	2.29	118.38	0.238	0.24
BMP-48-5	EXTENDED DRY DETENTION POND	3393	14	23.13	49	0.08	0.98	113.3	0.343	2.27
BMP-42-2	INFILTRATION BASIN	44930	98.8	100	100	1.87	14.13	800.61	1.22	10.15
BMP-42-5	GRASS SWALE (CONVEYANCE)	1708	15.26	10.08	73.39	0.15	0.76	315.75	0.66	0.71
BMP-59-5	BIOFILTRATION	3544	56.8	35.8	99.76	0.66	3.59	250.15	0.615	1.2
BMP-37-1	EXTENDED DRY DETENTION POND	4072	14	23.13	49	0.08	1.07	56.73	0.287	3.17
BMP-29-2	EXTENDED DRY DETENTION POND	65017	14	23.13	49	1.16	16.72	885.71	4.282	2.91
BMP-29-3	EXTENDED DRY DETENTION POND	5065	12.39	15.11	46.39	0.26	2.66	204.15	1.166	1.2
BMP-62-8	EXTENDED DRY	53750	14	23.13	49	1.219	19.981	1226.997	4.05	

	DETENTION POND									

Table 3. Non-Structural Project Summary for MEDWAY, MASSACHUSETTS

There are no non-structural BMPs.

Table 4. Land Use Conversion Project Summary for MEDWAY, MASSACHUSETTS

There are no land use conversion projects.

C.2: BMP Inspection Form

STORMWATER BMP INSPECTION SHEET

Section 1: Background Data

Street:	Structure ID:
Owner: ☐ Town ☐ Private ☐ Town Managed Private	
Today's date:	Time:
Investigators:	Form completed by:
Temperature (°F):	Rainfall (in.): Last 24 hours: Last 48 hours:

Land Use in Drainage Area (Check all that apply):

☐ Commercial Institutional	☐ Open Space
☐ Residential – High Density (smaller than 1/4 acres lots)	☐ Agricultural
☐ Residential – Medium Density (1/4 to 1/2 acre lots)	☐ Forest
☐ Residential – Low Density (1/2 acre lot or larger)	☐ Highway
☐ Industrial	

Section 2: Structure Type

☐ Detention Basin	☐ Infiltration Basin	☐ Dry Well	☐ Tree Box Filter	☐ Cistern	☐ Vegetative Filter Strip
☐ Retention	☐ Infiltration Trench	☐ Oil Grit Separator	☐ Porous Pavement	☐ Gravel Wetland	☐ Rain Barrel
☐ Rain Garden	☐ Grass Swale	☐ Proprietary Separator	☐ Green Roof	☐ Deep Sump Catch Basin	☐ Other

Section 3: Sketch/Description

Section 4: Maintenance

Are the definitive plans dated **AFTER** Nov. 18, 1996?	☐ No ☐ Yes
Is Maintenance Needed?	☐ No ☐ Yes (If no, the inspection is complete.)
Any structural conditions of Concern?	☐ No ☐ Yes (If yes, please describe:
Is the BMP accessible with DPW equipment?	☐ No ☐ Yes
Is there a drainage easement?	☐ No ☐ Yes
Is access to the easement obstructed?	☐ No ☐ Yes
Any illicit connections?	☐ No ☐ Yes

Page 1 of 2

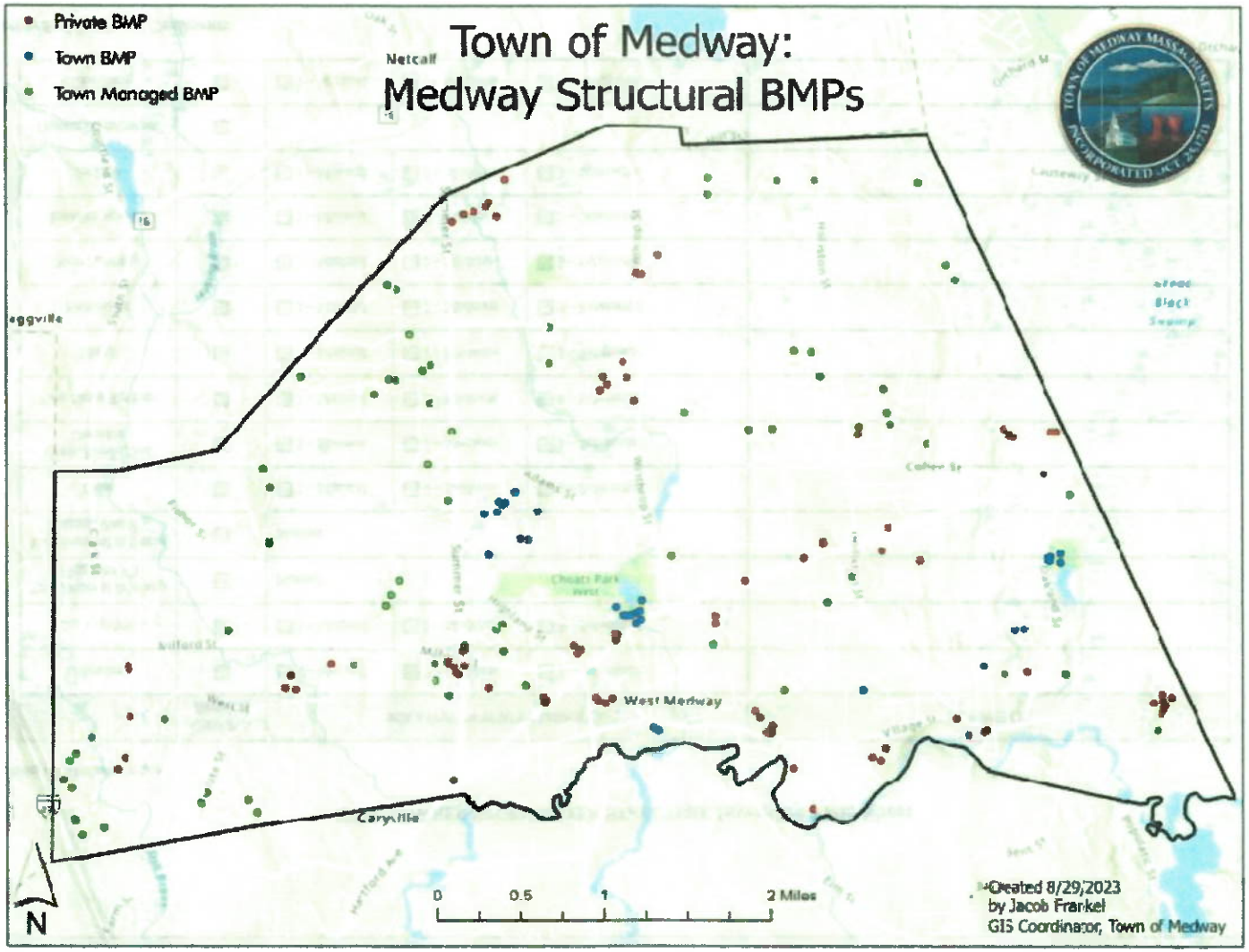
TOWN OWNED STORMWATER STRUCTURE Inventory Field Sheet

Section 4: Maintenance

	CHECK if Needed	RELATIVE SEVERITY INDEX (1-3)			COMMENTS
Mowing	☐	☐ 1 – Minimal	☐ 2 – Moderate	☐ 3 – Substantial	
Trim Vegetation	☐	☐ 1 – Minimal	☐ 2 – Moderate	☐ 3 – Substantial	
Tree Removal & Stump (less than 9")	☐	Number:			
Tree Removal & Stump (greater than 9")	☐	Number:			
Litter	☐	☐ 1 – Minimal	☐ 2 – Moderate	☐ 3 – Substantial	
Grass, Brush, Leaf Dumping	☐	☐ 1 – Minimal	☐ 2 – Moderate	☐ 3 – Substantial	
New Stone Rip Rap	☐	☐ 1 – Minimal	☐ 2 – Moderate	☐ 3 – Substantial	
Mulch	☐	☐ 1 – Minimal	☐ 2 – Moderate	☐ 3 – Substantial	
Excavating	☐	☐ 1 – Minimal	☐ 2 – Moderate	☐ 3 – Substantial	
New Plantings	☐	☐ 1 – Minimal	☐ 2 – Moderate	☐ 3 – Substantial	
Invasive Species	☐	☐ 1 – Minimal	☐ 2 – Moderate	☐ 3 – Substantial	
Jet Line	☐	☐ 1 – Minimal	☐ 2 – Moderate	☐ 3 – Substantial	
Camera Investigation	☐				
Clean Sump	☐	☐ 1 – Minimal	☐ 2 – Moderate	☐ 3 – Substantial	

Section 5: Additional Comments

C.3: Structural BMP Locations



APPENDIX D: PLANNED NON-STRUCTURAL CONTROLS

D.1: Enhanced Street Sweeping

The town used the same method described in Appendix A to calculate the phosphorus removal credits.

Due to incompatible weather conditions in the winter (i.e., mechanical broom sweeper can cause ice on the roads), Medway will continue the sweeping frequency from March through December. Additionally, the town will continue using the mechanical broom sweeper for town wide sweeping. The update to our sweeping program will be to increase sweeping activities to monthly as opposed to twice per year.

We calculated the following phosphorus removal using Equation 2-1 provided in Appendix F of the MS4 General permit:

Equation 2-1: Phosphorus Credit $_{p\ sweeping}$ = **IA** $_{swept}$ X **PLER** $_{IC\text{-}land\ use}$ X **PRF** $_{sweeping}$ X **AF**

IA_{swept}	= Area of impervious cover swept
$PLER_{IC\text{-}land\ use}$	= Phosphorus load export rate for impervious cover and specified land use (lb/acre/yr)
$PRF_{sweeping}$	= Phosphorus reduction factor for sweeping based on sweeper type and frequency
AF	= Annual frequency of sweeping

Agricultural

IA swept	= 6.52 acres
PLER	= 1.52 lbs/acre/year
PRF	= 0.03
AF	= 0.75

Agricultural Credit $_{p\ sweeping}$ = 6.52acres x 1.52 lbs/acre/year x 0.03 x 0.75
= **0.22 lbs/year**

Commercial

IA swept	= 12.25 acres
PLER	= 1.95 lbs/acre/year
PRF	= 0.03
AF	= 0.75

Commercial Credit $_{p\ sweeping}$ = 12.25acres x 1.95 lbs/acre/year x 0.03 x 0.75
= **0.54 lbs/year**

Forest

IA swept = 44.00 acres
PLER = 1.52 lbs/acre/year
PRF = 0.03
AF = 0.75

Credit $_{p\ sweeping}$ = 44.00acres x 1.52 lbs/acre/year x 0.03 x 0.75
= 1.50 lbs/year

High Density Residential

IA swept = 27.01 acres
PLER = 1.95 lbs/acre/year
PRF = 0.03
AF = 0.75

HDR Credit $_{p\ sweeping}$ = 27.01acres x 1.95 lbs/acre/year x 0.03 x 0.75
= 1.19 lbs/year

Industrial

IA swept = 7.68acres
PLER = 1.95 lbs/acre/year
PRF = 0.03
AF = 0.75

Industrial Credit $_{p\ sweeping}$ = 7.68acres x 1.95 lbs/acre/year x 0.03 x 0.75
= 0.34 lbs/year

Low Density Residential

IA swept = 139.15acres
PLER = 1.95 lbs/acre/year
PRF = 0.03
AF = 0.75

LDR Credit $_{p\ sweeping}$ = 139.15acres x 1.95 lbs/acre/year x 0.03 x 0.75
= 6.11 lbs/year

Medium Density Residential

IA swept = 38.71acres
PLER = 1.95 lbs/acre/year
PRF = 0.03
AF = 0.75

MDR Credit $_{p\ sweeping}$ = 38.71acres x 1.95 lbs/acre/year x 0.03 x 0.75
= 1.7 lbs/year

Open Land

IA swept	= 9.76acres
PLER	= 1.95 lbs/acre/year
PRF	= 0.03
AF	= 0.75

Open Land Credit $_{p\ sweeping}$ = 9.76acres x 1.95 lbs./acre/year x 0.03 x 0.75
= 0.43 lbs/year

Total phosphorus removal for all impervious cover land uses = 12.2 lbs./year

D.2: Catch Basin Cleaning

The town used the same methods to calculate the phosphorus removal credits described in Appendix B.

After incorporating a new data collection and management system for catch basin cleaning, we can more accurately track which catch basins require more frequent cleaning. Therefore, the town will continue with its town wide annual catch basin cleaning operations; however, we will increase the frequency of cleaning for basins that accumulate more sediment. We will use a phosphorus reduction factor of 0.02 to accommodate the increased frequency of cleaning. Below are three examples demonstrating how each catch basin phosphorus removal was calculated.

Equation 2-3: Credit $_{P\ CB}$ = IA_{CB} x $PLER_{IC\text{-}land\ use}$ x PRF_{CB}

IA_{CB}	= Area of impervious cover swept
PLER $_{IC\text{-}land\ use}$	= Phosphorus load export rate for impervious cover and specified land use (lb/acre/yr)
PRF_{CB}	= Phosphorus reduction factor for catch basin cleaning

Example 1: **CB-1** = 0.24acres X 0.421lbs/acre/year x 0.02
=0.002lbs/year

Example 2: **CB-969** = 4.27acres X 7.69lbs/acre/year X 0.02
= **0.65lbs/year**

Example 3: **CB-1000** = 0.774acres x 1.176lbs/acres/yeas x 0.02
= **0.0118lbs/year**

The total phosphorus removal from catch basin cleaning is 19.17lbs/year.

D.2: Enhance Organic Waste and Lead Litter Collection Program

The Town of Medway plans to increase sweeping and leaf litter collection in high density residential areas, commercial areas, open space and forested areas between September 1 and December 1.

Equation 2-5: Credit $_{P\ Leaf\ Litter}$ = $IA_{leaf\ litter}$ x $PLER_{IC\text{-}land\ use}$ x (0.05)

IA $_{Leaf\ Litter}$ = Impervious area in applicable watersheds are subject to enhanced organic waste and leaf litter collection program

PLER $_{IC\text{-}land\ use}$ = Phosphorus load export rate for impervious cover and specified land use (lb/acre/yr)

(0.05) = 5% nutrient reduction factor for organic waste and leaf litter collection program

High Density Residential

IA swept = 27.01 acres
PLER = 2.32 lbs/acre/year
(0.05)

HDR Credit $_{p\ leaf\ litter}$ = 27.01acres x 2.32 lbs/acre/year x 0.05
= 3.13 lbs/year

Commercial

IA swept = 12.25 acres
PLER = 1.78 lbs/acre/year
(0.05)

Commercial Credit $_{p\ leaf\ litter}$ = 12.25acres x 1.78 lbs/acre/year x 0.05
= **1.09 lbs/year**

Forest

IA swept = 44.00 acres
PLER = 1.52 lbs/acre/year
(0.05)

Credit $_{p\ leaf\ litter}$ = 44.00acres x 1.52 lbs/acre/year x 0.05
= 3.34 lbs/year

Open Land

IA swept = 9.76acres
PLER = 1.52 lbs/acre/year
(0.05)

Open Land Credit $_{p\ leaf\ litter}$ = 9.76acres x 1.52 lbs./acre/year x 0.05
= 0.74 lbs/year

The total phosphorus removal from enhanced leaf litter cleaning is 8.31lbs/year.

APPENDIX E: PLANNED STRUCTURAL CONTROLS

E.1: Structural Control Retrofit Fact Sheets and BATT Calculations

Calculations based on Existing Plans and MAPC Catchment Area Analysis.

State	MASSACHUSETTS
Municipality	MEDWAY
Permit Type	MS4
Permit Number	
Major Watershed	CHARLES
TP Load Reduction Target	N/A
TN Load Reduction Target	N/A
TSS Load Reduction Target	N/A

Table 1. Project Summary Credit for MEDWAY, MASSACHUSETTS

Project Type	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)
Structural	103.52		
Non-Structural	0	0	0
Land Use Conversion	0	0	0
Total	103.52		

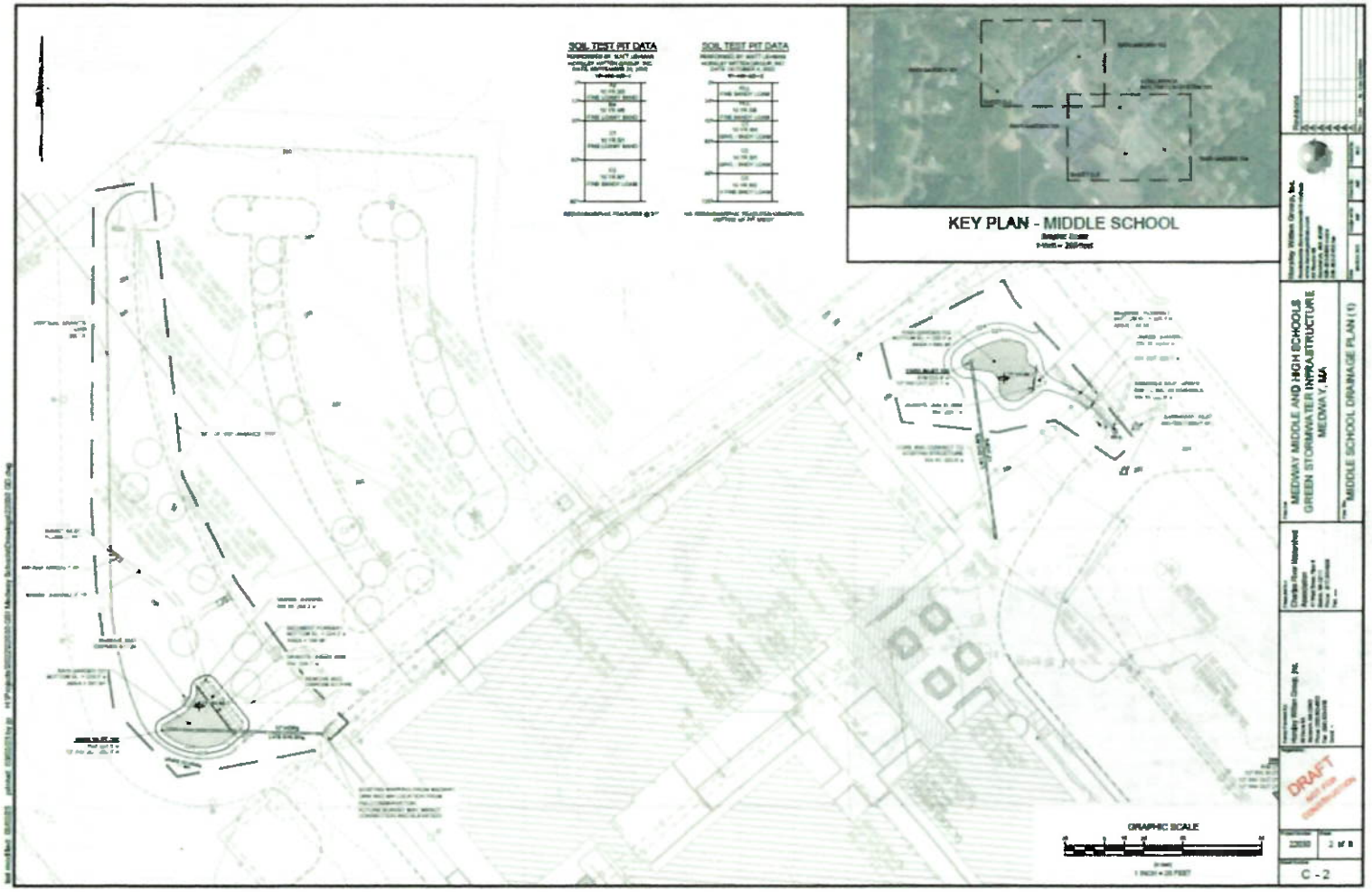
Table 2. Structural Project Summary for MEDWAY, MASSACHUSETTS

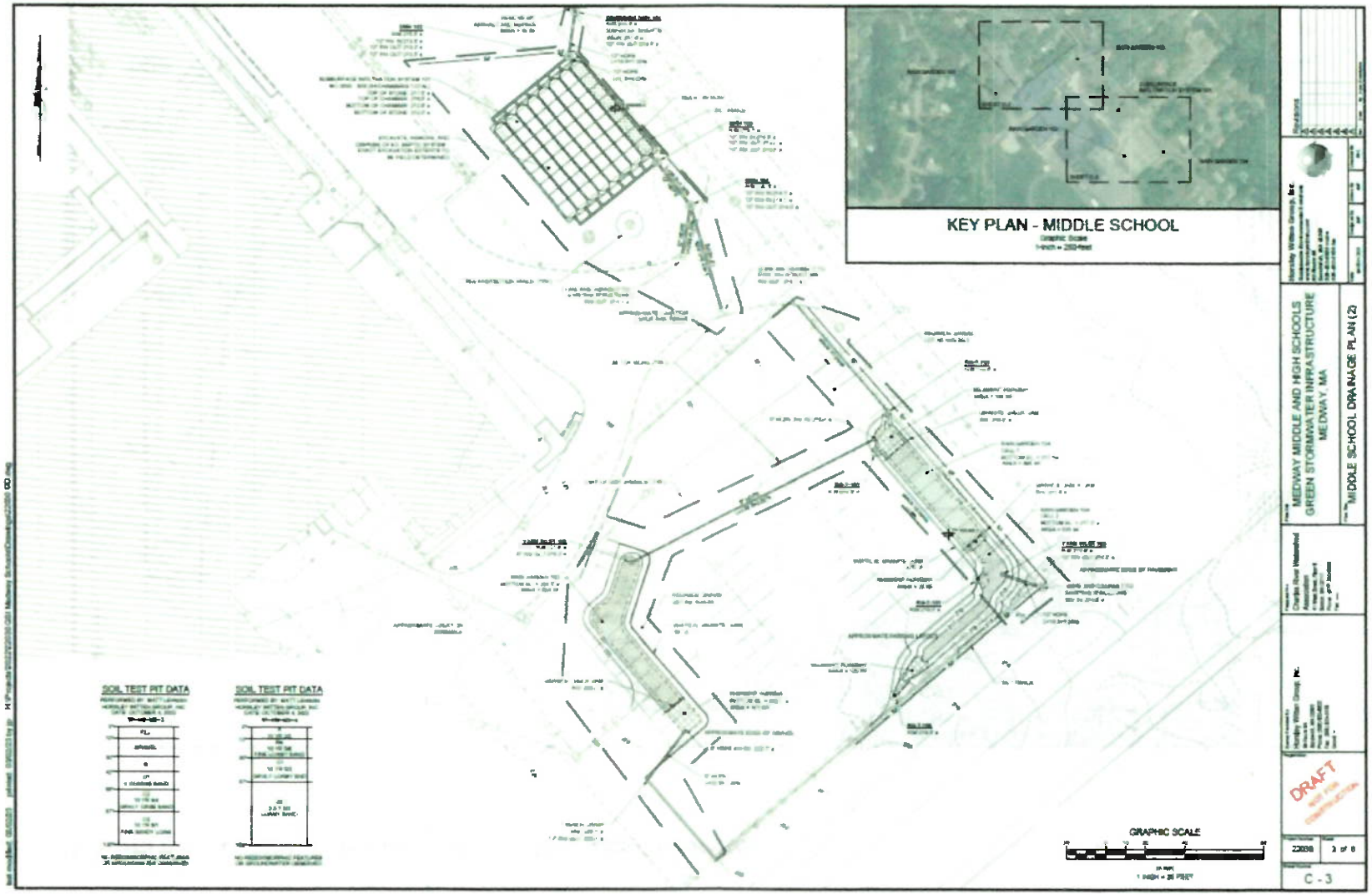
Project ID	BMP Type	Land Use	Impervious Area Treated (ac)	Pervious Area	Soil type	Infiltration Rate	BMP Storage Capacity (ft^3)/ Filter Depth (in.)	Removed Phosphorus Load (lb/yr)

High School (BMP-37-2)	Infiltration Basin	Commercial	1.874	4.945	B	1.02	22,901	3.78
High School (BMP-38-1)	Infiltration Basin	Commercial			B	1.02	57,600	2.26
Winter Street (BMP-30-3)	Infiltration basin	HDR	11.73	18.01	B	1.02	510,958	20.08
Diane Drive (OF-7-1)	Infiltration basin	LDR	1.947	2.959	B	1.02	4,500	2.987
Kimberly Drive (OF-7-2)	Infiltration basin	LDR	1.66	3.58	B	1.02	1125	2.661
Shaw Street (OF-68-1) (OF-58-4) Samoset (OF-69-2) (OF-69-1)	Enhance biofiltration	LDR	5.73	18.214	B		25,000	8.04
Fairway Lane (OF-9-5) (OF-9-4) (OF-9-3) (OF-9-1)	Enhanced Biofiltration	LDR	2.003	4.483	B		25,000	3.188
Hickory Drive (BMP-10-1)	Wet Basin	LDR	3.941	14.621	B		149,019	4.879
Broad Acres Farm Road (BMP-19-1))	Wet Basin	LDR	2.631	9.051	C/D		132,018	4.173
Broad Acres Farm Road (BMP-18-1)	Wet Basin	LDR	4.01	10.12	C/D		132,018	5.689
Claybrook Farm Road (OF-12-16)	Enhanced Biofiltration	LDR	1.92	5.83	C/D		12,000	3.974
Temple Street (BMP-39-2)	Enhanced Biofiltration	MDR	2.647	9.03	A		140,721	4.859
Cedar Farm Road (OF-26-2)	Enhanced Biofiltration	LDR	1.145	2.964	B		12,000	1.866
Granite Street/ Castle Road (OF-55-1)	Infiltration Basin	LDR	1.01	7.02	A	2.41	20,000	1.725
Daffodil Lane (BMP-64-2)	Infiltration Basin	LDR	0.813	2.089	A	2.41	53,685	1.283
Daffodil Lane (BMP-64-1)	Infiltration Basin	LDR	0.888	1.8	A	2.41	120,000	1.387
Tulip Way (BMP-65-1)	Enhanced Biofiltration	LDR	1.567	4.68	B		241,245	2.245

Tulip Way (BMP-65-2)	Enhanced Biofiltration	LDR	0.348	0.504	B		120,336	0.484
Laurelwood Lane (OF-34-4)	Enhanced Biofiltration	MDR	0.985	1.321	A		19,500	1.754
Applegate Road (BMP-32-1)	Infiltration Basin	LDR	5.484	19.804	A	2.41	145,566	8.823
Alder Street (BMP-53-1)	Infiltration Basin	Industrial	0.689	0.609	A	2.41	26,460	1.23
Ash Lane (BMP-21-4)	Enhanced Biofiltration	LDR	2.898	14.125	B	1.02	137,574	5.429
Lantern Lane (BMP-45-1)	Infiltration Basin	LDR	0.128	2.085	B	1.02	142,352	0.428
Independence Lane (BMP-47-1) (BMP-47-2)	Enhanced Biofiltration	LDR	0.856	1.049	B		122,558	1.27
Freedom Trail (BMP-46-3)	Enhanced Biofiltration	LDR	1.352	1.427	B		43,208	1.981
Newton Lane (BMP-19-3) (BMP-19-4) (BMP-19-5)	Enhanced Biofiltration	LDR	1.02	4.833	C/D		61,912	0.335
Blueberry Hill Road (BMP-19-7)	Wet Basin	LDR	3.517	17.261	C/D		240,000	6.521
Grapevine Way (BMP-61-1)	Infiltration Basin	LDR	0.118	0.459	A	2.41	7,545	0.191

E.2 CRWA and Horsley Witten Group Concept Plans and Calculations




KEY PLAN - MIDDLE SCHOOL
SOIL TEST PIT DATA
SOIL TEST PIT DATA
GRAPHIC SCALE
MEDWAY MIDDLE AND HIGH SCHOOLS
GREEN STORMWATER INFRASTRUCTURE
MEDWAY, MA
MIDDLE SCHOOL DRAINAGE PLAN (2)
DRAFT
C - 3

Total Phosphorus Load Reduction

Horsley Witten Group
Sustainable Environmental Solutions

Project Name: Medway Schools GSI
Project Location: Medway, MA
Date: 3/7/2023
Calculated By: JMP
Checked By: SS

Existing Total Phosphorus Load

Drainage Area ID	Land Use	Land Cover within Use	TP Load Export Rate (lb/ac/year)	Area (acres)	TP Load (lb/yr)
Middle School Surface (Total)	Commercial	Impervious	1.78	2.961	5.27
		Pervious (HSG D)	0.37	0.900	0.33
Holliston (Street and Neighborhood)	*Medium Family Residential*	*Impervious*	*1.96*	*7.190*	*14.09*
		Pervious (HSG C/D)	*0.29*	*2.397*	*0.69*
Courtyard (Building)	*Commercial*	*Impervious*	*1.96*	*2.162*	*4.24*
		Pervious (HSG D)	*0.37*	*0.143*	*0.05*
High School (Total)	Commercial	Impervious	1.78	1.138	2.03
		Pervious (HSG B)	0.12	0.335	0.04
				Total Existing Load	**26.75**

Proposed Total Phosphorus Load (without reductions from SCMs)

Drainage Area ID	Land Use	Land Cover within Use	TP Load Export Rate (lb/ac/year)	Area (acres)	TP Load (lb/yr)
MS1	Commercial	Impervious	1.78	0.207	0.37
		Pervious (HSG D)	0.37	0.388	0.14
MS2	Commercial	Impervious	1.78	0.195	0.35
		Pervious (HSG D)	0.37	0.222	0.08
MS3 (A&B)	Commercial	Impervious	1.78	0.641	1.14
		Pervious (HSG D)	0.37	0.164	0.06
MS4 (A&B)	Commercial	Impervious	1.78	1.918	3.41
		Pervious (HSG D)	0.37	0.126	0.05
Holliston	Medium Family Residential	Impervious	1.96	7.190	14.09
		Pervious (HSG C/D)	0.29	2.397	0.69
Courtyard	Commercial	Impervious	1.96	2.162	4.24
		Pervious (HSG D)	0.37	0.143	0.05
HS1	Commercial	Impervious	1.78	0.416	0.74
		Pervious (HSG B)	0.12	0.106	0.01
HS2	Commercial	Impervious	1.78	0.577	1.03
		Pervious (HSG B)	0.12	0.140	0.02
HS3	Commercial	Impervious	1.78	0.145	0.26
		Pervious (HSG B)	0.12	0.089	0.01
				Total Proposed Load (without SCMs)	**26.75**

Proposed SCM Phosphorus Reduction

Drainage Area ID	SCM	Applicable Performance Curve	Treated Runoff Depth from Impervious Area (in)	TP Percent Reduction	TP Load to SCM (lb/yr)	TP Load after SCM (lb/yr)
MS1	Rain Garden 101	Infiltration Basin	1.0	98%	0.51	0.01
MS2	Rain Garden 102	Infiltration Basin	1.0	98%	0.43	0.01
MS3 (A&B)	Infiltration Chambers 101	Infiltration Trench	0.5	86%	1.20	0.17
MS4 (A&B)	Rain Gardens 103 and 104	Infiltration Basin	1.0	98%	3.46	0.07
Holliston + Courtyard	Infiltration Chambers 101	Infiltration Trench	0.5	86%	19.08	2.67
HS1	Rain Garden 201	Infiltration Basin	1.0	98%	0.75	0.02
HS2	Tree Trench 201	Infiltration Trench	1.0	98%	1.04	0.02
HS3	Rain Garden 202	Infiltration Basin	1.0	98%	0.27	0.01
					Total Proposal Load (with SCMs)	**2.97**
					Load Reduction from Existing to Proposed Conditions	**23.78**

Note: Methodology based on Massachusetts MS4 General Permit (as modified January 6, 2021), Appendix F, Attachment 3

Abbreviations:

SCM = Stormwater Control Measure

TP = Total Phosphorus

The following town owned and right of way parcels have been identified as opportunities for stormwater structural best management practice (BMP) in the Town of Medway by the Charles River Watershed Association and the Town staff. The sites are listed in order of priority. This document contains proposed BMP design characteristics, and maps for each site.

A. Fire Station
B. Medway Public Library
C. Medway Police Department
D. 1 Mechanic St
E. Burke Memorial Elementary School
F. 0 North St
G. 11 Winthrop St
H. Highway Barn
I. 158 Main St
J. McGovern Elementary School

ID# 46-53: FIRE STATION 1 (44 MILFORD ST)



BMP sizing and design

- Drainage Area : 2.04 acres
- Existing load: 2.4 lbs
- Proposed reduction: 2.1 lbs (90%)
- Sub-drainages: 4
- BMP type: Infiltration rain garden
- Depth: 1 ft

ID	Drainage area (acre)	Percent Impervious	BMP water quality volume (cf)	P-Load Reduction (lb/yr)
#1 (A)	0.85	56%	1,289	0.8
#2 (B)	0.74	70%	1,372	0.9
#3 (C)	0.28	68%	505	0.3
#4 (D)	0.17	61%	278	0.2

ID#57-44: MEDWAY PUBLIC LIBRARY (26 HIGH ST)



BMP sizing and design

- Drainage Area : 0.29 acres
- Existing load: 0.38 lbs
- Proposed reduction: 0.3 lbs (90%)
- Sub-drainages: 1
- BMP type: Infiltration rain garden
- Depth: 1 ft

ID	Drainage area (acre)	Percent Impervious	BMP water quality volume (cf)	P- Load Reduction (lb/yr)
#5	0.29	72%	556	0.3

ID# 58-27: MEDWAY POLICE DEPARTMENT (315 VILLAGE ST)



BMP sizing and design

- Drainage Area : 1.2 acres
- Existing load: 1.16 lbs
- Proposed reduction: 1 lbs (90%)
- Sub-drainages: 3
- BMP type: Infiltration rain garden
- Depth: 1 ft

ID	Drainage area (acre)	Percent Impervious	BMP water quality volume (cf)	P-Load Reduction (lb/yr)
#6 (A)	0.67	70%	1,038	0.8
#7 (B)	0.29	21%	147	0.1
#8 (C)	0.25	32%	225	0.1

ID# 47-58: 1 MECHANIC ST



BMP sizing and design

- Drainage Area : 0.22 acres
- Existing load: 0.2 lbs
- Proposed reduction: 0.17 lbs (90%)
- Sub-drainages: 1
- BMP type: Infiltration rain garden
- Depth: 1 ft

ID	Drainage area (acre)	Percent Impervious	BMP water quality volume (cf)	P- Load Reduction (lb/yr)
#9	0.22	45%	273	0.17

ID# 59-39: BURKE ELEMENTARY SCHOOL (16 CASSIDY LN)



BMP sizing and design

- Drainage Area : 3.7 acres
- Existing load: 5.1 lbs
- Proposed reduction: 4.6 lbs (90%)
- Sub-drainages: 4
- BMP type: Infiltration rain garden
- Depth: 1 ft

ID	Drainage area (acre)	Percent Impervious	BMP water quality volume (cf)	P- Load Reduction (lb/yr)
#10 (A)	1.7	83%	4,737	2.3
#11 (B)	0.37	100%	1,209	0.6
#12 (C)	0.9	66%	2,094	1
#13 (D)	0.7	62%	1,435	0.7

ID# 60-37: 0 NORTH ST



BMP sizing and design

- Drainage Area : 1.4 acres
- Existing load: 0.5lbs
- Proposed reduction: 0.4lbs (90%)
- Sub-drainages: 1
- BMP type: Infiltration rain garden
- Depth: 1 ft

ID	Drainage area (acre)	Percent Impervious	BMP water quality volume (cf)	P- Load Reduction (lb/yr)
#14	1.4	21%	512	0.4

ID# 39-79: 11 WINTHROP ST



BMP sizing and design

- Drainage Area : 1.6 acres
- Existing load: 1.3 lbs
- Proposed reduction: 1.2 lbs (90%)
- Sub-drainages: 1
- BMP type: Infiltration rain garden
- Depth: 1 ft

ID	Drainage area (acre)	Percent Impervious	BMP water quality volume (cf)	P- Load Reduction (lb/yr)
#15	1.6	44%	1,263	1.2

ID# 48-67: 158 MAIN ST



BMP sizing and design

- Drainage Area : 1.1 acres
- Existing load: 0.4 lbs
- Proposed reduction: 0.3 lbs (90%)
- Sub-drainages: 2
- BMP type: Infiltration rain garden
- Depth: 1 ft

ID	Drainage area (acre)	Percent Impervious	BMP water quality volume (cf)	P- Load Reduction (lb/yr)
#16 (A)	0.96	3%	53	0.1
#17 (B)	0.18	89%	285	0.3

ID# 50-74: HIGHWAY BARN (46 BROAD ST)



BMP sizing and design

- Drainage Area : 2.5 acres
- Existing load: 4.3 lbs
- Proposed reduction: 3.9 lb(90%)
- Sub-drainages: 2
- BMP type: Infiltration rain garden
- Depth: 1 ft

ID	Drainage area (acre)	Percent Impervious	BMP Water Quality Volume (cf)	P- Load Reduction (lb/yr)
#18 (A)	1.9	94%	4,690	3
#19 (B)	0.6	100%	1,594	1

ID# 31-96: McGovern (9 Lovering St)



BMP sizing and design

- Drainage Area : 6.4 acres
- Existing load: 3.8 lbs
- Proposed reduction: 3.4 lbs (90%)
- Sub-drainages: 3
- BMP type: Infiltration rain garden
- Depth: 1 ft

ID	Drainage area (acre)	Percent Impervious	BMP Water Quality Volume (cf)	P- Load Reduction (lb/yr)
#20 (A)	0.55	100%	1,797	0.9
#21 (B)	0.57	67%	1,314	0.6
#22 (C)	1.7	67%	3,311	1.9

E.3: CRWA and Weston & Sampson Concept Plans and Calculations

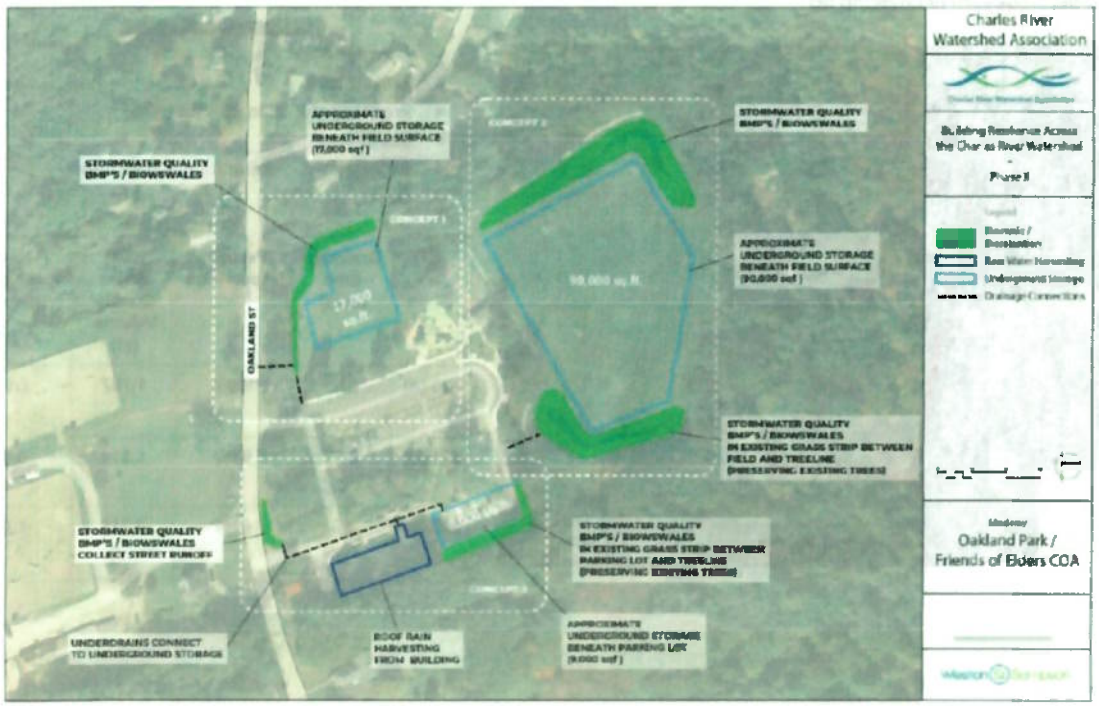


Figure 3.6 Medway Oakland Park/Friends of the Elders COA concepts

Appendix 5

Phosphorus Loading and Reduction Calculations

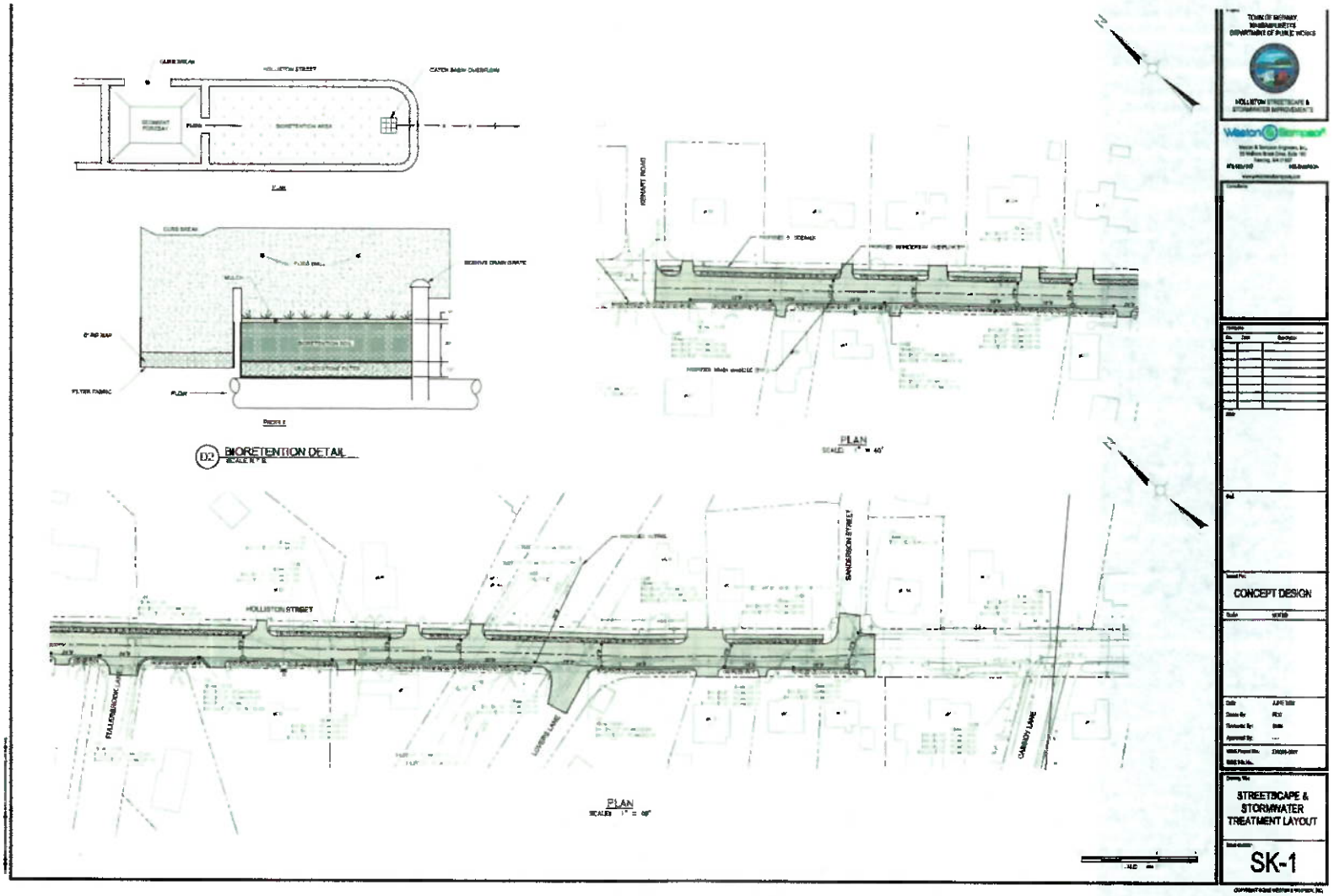
City/Town	BMP Location	BMP Type	BMP Type MS4 Permit (Ref 1)	BMP Size (sf)	Total Drainage Area (sf) (Ref 2)	Total Drainage (Acres)	Land Use (Ref 3)	Land Use (Ref 4)	Impervious % (Ref 5)	Pervious %	Impervious Area (acres)	Pervious area (acres)	Loading Rate - (lbs/acre/year) Impervious (Ref 6)	Soils Type (Majority) (Ref 7)	Load Rate - (lb/acre/year) Pervious (Ref 6)	Total Load (lbs/year)	BMP Percent Reduction (Ref 8)	Load Reduction (lbs/year)
Waltham	Three along Lakeview Ave, 2 along Shore Rd	Bioretention (no underdrain)	Biofiltration	10,750	77,400[1]	1.78	High Density Residential	High Density Residential	39%	61%	0.69	1.08	2.32	A	0.03	1.64	53%	0.87
Waltham	One in Lazazzero Playground	Bioretention (no underdrain)	Biofiltration	1,950	14,040[1]	0.32	Participation Recreation	Open Space	100%	0%	0.32	0.00	1.52	A	0	0.49	53%	0.26
Newton	Bioswales along Cheesecake Brook	Bioretention (no underdrain)	Biofiltration	18,125	166,750[2]	3.83	Participation Recreation	Open Space	100%	0%	3.83	0.00	1.52	A	0	5.82	53%	3.08
Newton	Bioswales in Park	Bioretention (no underdrain)	Biofiltration	33,395	307,234[2]	7.05	Participation Recreation	Open Space	45%	55%	3.17	3.88	1.52	A	0.03	4.94	53%	2.62
Newton	Subsurface Infiltration	Subsurface infiltration	Infiltration Trench	138,000	993,600[1]	22.81	Medium Density Residential	Medium Density Residential	45%	55%	10.26	12.55	1.96	A	0.03	20.49	98%[3]	20.08
Newton	Roof Rain Harvesting	N/A not available														0.00		
Medway	Bioswales in Park	Bioretention (no underdrain)	Biofiltration	35,750	328,900[1]	7.55	Participation Recreation	Open Space	30%	70%	2.27	5.29	1.52	A	0.03	3.60	53%	1.91
Medway	Subsurface Infiltration	Subsurface infiltration	Infiltration Trench	116,000	835,200[1]	19.17	Medium Density Residential	Medium Density Residential	30%	70%	5.75	13.42	1.96	A	0.03	11.68	98%[3]	11.44
Medway	Roof Rain Harvesting	N/A not available																

[1]Drainage area calculated assuming 0.5 ft ponding and 1.5 in WQV. Assumes 1 ft^2 bioretention area or subsurface infiltration area can capture stormwater from 7.2 ft^2 of drainage area. See Reference 2 for detailed calculations.

[2]Drainage area calculated assuming 0.75 ft ponding and 1.5 in WQV. Assumes 1 ft^2 bioretention area can capture stormwater from 9.2 ft^2 of drainage area. See Reference 2 for detailed calculations.

[3]Assumes 2.41 in/hr, 98% removal. See Reference 8 for additional details.

E.4: Holliston Street Structural Controls



State	MASSACHUSETTS
Municipality	MEDWAY
Permit Type	Other
Permit Number	
Major Watershed	CHARLES
TP Load Reduction Target	N/A
TN Load Reduction Target	N/A
TSS Load Reduction Target	N/A

Table 1. Project Summary Credit for MEDWAY, MASSACHUSETTS

Project Type	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)
Structural	6.18	31.65	2294.55
Non-Structural	0	0	0
Land Use Conversion	0	0	0
Total	6.18	31.65	2294.55

Table 2. Structural Project Summary for MEDWAY, MASSACHUSETTS

Project ID	BMP Type	BMP Storage Capacity (ft^3)/ Filter Depth (in.)	Phosphorus BMP Efficiency (%)	Nitrogen BMP Efficiency (%)	Sediment BMP Efficiency (%)	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)	Impervious Area Treated (ac)	Runoff Depth (in.)
curbside bio	BIOFILTRATION	14610	63	40	100	6.18	31.65	2294.55	3.652	0.65

APPENDIX F: CERTIFICATIONS

F.1: Inspection/Maintenance for Structural BMPs

F.2: Municipal Turf Fertilizer Management

F.1: Inspection/Maintenance for Structural BMPs

Per the MS4 General Permit: Certification that all structural BMPs are being inspected and maintained according to the O&M program specified as part of the PCP. The certification statement shall be:

I certify under penalty of law that all source control and treatment Best Management Practices being claimed for phosphorus reduction credit have been inspected, maintained, and repaired in accordance with manufacturer or design specification. I certify that, to the best of my knowledge, all Best Management Practices being claimed for a phosphorus reduction credit are performing as originally designed.

H.2: Municipal Turf Fertilizer Management

Per the MS4 General Permit: Certification that all municipally owned and maintained turf grass areas are being managed in accordance with Massachusetts Regulation 331 CMR 31 pertaining to proper use of fertilizers on turf grasses.

Woodard & Curran



State	MASSACHUSETTS
Municipality	MEDWAY
Permit Type	MS4
Permit Number	
Major Watershed	CHARLES
TP Load Reduction Target	N/A
TN Load Reduction Target	N/A
TSS Load Reduction Target	N/A

Table 1. Project Summary Credit for MEDWAY, MASSACHUSETTS

Project Type	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)
Structural	15.93	125.93	5499.38
Non-Structural	0	0	0
Land Use Conversion	0	0	0
Total	15.93	125.93	5499.38

Table 2. Structural Project Summary for MEDWAY, MASSACHUSETTS

Project ID	BMP Type	BMP Storage Capacity (ft^3)/ Filter Depth (in.)	Phosphorus BMP Efficiency (%)	Nitrogen BMP Efficiency (%)	Sediment BMP Efficiency (%)	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)	Impervious Area Treated (ac)	Runoff Depth (in.)
BMP-51-1	WET POND/CREATED WETLAND	750	8.96	5.76	19.19	0.53	2.92	243.92	3.23	0.06
BMP-51-2	INFILTRATION BASIN	19640	100	100	100	4.14	35.13	880.75	2.26	1.9
BMP-48-8	INFILTRATION BASIN	1724	99.25	100	100	1.11	8.37	476.71	0.73	0.65
BMP-48-7	INFILTRATION BASIN	2407	100	100	100	0.57	4.28	239.04	0.36	1.42
BMP-48-2	INFILTRATION BASIN	20956	100	100	100	3.74	31.73	795.66	2.03	2.14
BMP-47-12	INFILTRATION TRENCH	308	96.36	99.12	100	0.12	0.9	51.96	0.08	1.06
BMP-48-1	EXTENDED DRY DETENTION POND	1008	12.55	16.04	46.55	0.04	0.4	66.55	0.218	1.27

BMP-48-3	INFILTRATION TRENCH	210	52.6	81.02	74.95	0.2	2.29	118.38	0.238	0.24
BMP-48-5	EXTENDED DRY DETENTION POND	3393	14	23.13	49	0.08	0.98	113.3	0.343	2.27
BMP-42-2	INFILTRATION BASIN	44930	98.8	100	100	1.87	14.13	800.61	1.22	10.15
BMP-42-5	GRASS SWALE (CONVEYANCE)	1708	15.26	10.08	73.39	0.15	0.76	315.75	0.66	0.71
BMP-59-5	BIOFILTRATION	3544	56.8	35.8	99.76	0.66	3.59	250.15	0.615	1.2
BMP-37-1	EXTENDED DRY DETENTION POND	4072	14	23.13	49	0.08	1.07	56.73	0.287	3.17
BMP-29-2	EXTENDED DRY DETENTION POND	65017	14	23.13	49	1.16	16.72	885.71	4.282	2.91
BMP-29-3	EXTENDED DRY DETENTION POND	5065	12.39	15.11	46.39	0.26	2.66	204.15	1.166	1.2
BMP-62-8	EXTENDED DRY DETENTION POND	53750	14	23.13	49	1.219	19.981	1226.997	4.05	

Table 3. Non-Structural Project Summary for MEDWAY, MASSACHUSETTS

There are no non-structural BMPs.

Table 4. Land Use Conversion Project Summary for MEDWAY, MASSACHUSETTS

There are no land use conversion projects.

Report	Report Date	User	Asset Tag	Asset Description	Investigator	Temperature (F)	Rainfall (in): Last 24 Hours	Rainfall (in): Last 48 hours	Land Use in Drainage Area (check all that apply)	Outfall Description	Type	Material	Outfall shape	Count
874157003	2022-11-21 8:33:38 AM	STEPHANIE CARLISLE	OF-21-7	Outfall - OF-21-7		27	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874157517	2022-11-22 2:03:47 PM	MELISSA MORRELL	OF-28-4	Outfall - OF-28-4		47	0	0	Suburban Residential		Closed Pipe	Steel	Circular	2 Single
874157589	2022-11-22 1:41:32 PM	MELISSA MORRELL	OF-34-3	Outfall - OF-34-3	CHAPAN, CHAD	48	0	0	Suburban Residential		Closed Pipe	Steel	Circular	2 Single
874157650	2022-11-22 1:22:46 PM	MELISSA MORRELL	OF-26-5	Outfall - OF-26-5	CHAPAN, CHAD	49	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874157673	2022-11-22 12:40:06 PM	MELISSA MORRELL	OF-26-4	Outfall - OF-26-4	CHAPAN, CHAD	49	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874157683	2022-11-22 11:44:58 AM	MELISSA MORRELL	OF-21-8	Outfall - OF-21-8	CHAPAN, CHAD	48	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874157710	2022-11-22 11:09:26 AM	MELISSA MORRELL	OF-16-8	Outfall - OF-16-8	CHAPAN, CHAD	46	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874157743	2022-11-21 1:41:18 PM	MELISSA MORRELL	OF-65-3	Outfall - OF-65-3	CHAPAN, CHAD	39	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874157812	2022-11-21 10:31:37 AM	MELISSA MORRELL	OF-49-9	Outfall - OF-49-9	CHAPAN, CHAD	34	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874166895	2022-11-21 9:31:22 AM	MELISSA MORRELL	OF-22-15	Outfall - OF-22-15	CHAPAN, CHAD	27	0	0	Suburban Residential		Closed Pipe	CMP	Circular	2 Single
874167023	2022-11-22 8:24:05 AM	MELISSA MORRELL	OF-66-7	Outfall - OF-66-7	CHAPAN, CHAD	35	0	0			Closed Pipe	Steel	Circular	1 Double
874167191	2022-11-22 9:26:03 AM	MELISSA MORRELL	OF-67-9	Outfall - OF-67-9	CHAPAN, CHAD	39	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874167250	2022-11-29 7:46:47 AM	MELISSA MORRELL	OF-6-2	Outfall - OF-6-2	CHAPAN, CHAD	28	0	0.41	Suburban Residential		Closed Pipe	RCP	Elliptical	2 Single
874167273	2022-11-29 8:01:08 AM	MELISSA MORRELL	OF-6-4	Outfall - OF-6-4	CHAPAN, CHAD	29	0	0.41	Suburban Residential		Closed Pipe	RCP	Elliptical	2 Single
874167308	2022-11-29 8:52:03 AM	MELISSA MORRELL	OF-12-10	Outfall - OF-12-10	CHAPAN, CHAD	29	0	0.41	Suburban Residential		Closed Pipe	RCP	Circular	
874167357	2022-11-29 9:14:15 AM	MELISSA MORRELL	OF-12-12	Outfall - OF-12-12	CHAPAN, CHAD	29	0	0.41	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874167390	2022-11-29 9:21:45 AM	MELISSA MORRELL	OF-12-9	Outfall - OF-12-9	CHAPAN, CHAD		0	0.41	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874167467	2022-11-29 9:51:19 AM	MELISSA MORRELL	OF-12-16	Outfall - OF-12-16	CHAPAN, CHAD	29	0	0.41	Suburban Residential		Closed Pipe	RCP	Elliptical	2 Single
874167534	2022-11-29 10:41:03 AM	MELISSA MORRELL	OF-19-2	Outfall - OF-19-2	CHAPAN, CHAD	37	0	0.41	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874167700	2022-11-29 11:04:56 AM	MELISSA MORRELL	OF-28-1	Outfall - OF-28-1	CHAPAN, CHAD	39	0	0.41	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874168044	2022-11-29 11:26:34 AM	MELISSA MORRELL	OF-37-3	Outfall - OF-37-3	CHAPAN, CHAD		0	0.41	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874168081	2022-11-29 11:56:51 AM	MELISSA MORRELL	OF-37-14	Outfall - OF-37-14	CHAPAN, CHAD	39	0	0.41	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874168111	2022-11-30 10:54:36 AM	MELISSA MORRELL	OF-21-11	Outfall - OF-21-11	CHAPAN, CHAD	46	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874168133	2022-11-30 11:01:24 AM	MELISSA MORRELL	OF-21-8	Outfall - OF-21-8	CHAPAN, CHAD	46	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874168192	2022-11-30 11:44:32 AM	MELISSA MORRELL	OF-26-5	Outfall - OF-26-5	CHAPAN, CHAD	47	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874168217	2022-12-05 12:14:48 PM	MELISSA MORRELL	OF-50-3	Outfall - OF-50-3	CHAPAN, CHAD	49	0	0.29	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874168305	2022-12-05 11:06:31 AM	MELISSA MORRELL	OF-35-4	Outfall - OF-35-4	CHAPAN, CHAD	45	0	0.29	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874168341	2022-12-05 10:17:12 AM	MELISSA MORRELL	OF-30-2	Outfall - OF-30-2	CHAPAN, CHAD	40	0	0.29	Suburban Residential		Closed Pipe	CMP	Circular	2 Single
874168360	2022-12-05 10:07:37 AM	MELISSA MORRELL	OF-30-1	Outfall - OF-30-1	CHAPAN, CHAD	34	0	0.29	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874168376	2022-12-05 9:55:47 AM	MELISSA MORRELL	OF-31-13	Outfall - OF-31-13	CHAPAN, CHAD	33	0	0.29	Suburban Residential		Closed Pipe	PVC	Circular	2 Single
874168392	2022-12-05 9:41:09 AM	MELISSA MORRELL	OF-32-3	Outfall - OF-32-3	CHAPAN, CHAD	33	0	0.29	Suburban Residential		Closed Pipe	HDPE	Circular	2 Single
874168431	2022-12-05 9:33:10 AM	MELISSA MORRELL	OF-32-1	Outfall - OF-32-1	CHAPAN, CHAD	33	0	0.29	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874168456	2022-12-05 9:23:27 AM	MELISSA MORRELL	OF-23-1	Outfall - OF-23-1	CHAPAN, CHAD	33	0	0.29	Suburban Residential		Closed Pipe	PVC	Circular	2 Single
874168478	2022-12-05 9:11:33 AM	MELISSA MORRELL	OF-16-5	Outfall - OF-16-5	CHAPAN, CHAD	33	0	0.29	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874168650	2022-12-05 9:01:52 AM	MELISSA MORRELL	OF-16-2	Outfall - OF-16-2	CHAPAN, CHAD		0	0.29	Suburban Residential		Closed Pipe	Steel	Circular	2 Single
874168734	2022-12-05 8:36:33 AM	MELISSA MORRELL	OF-13-1	Outfall - OF-13-1	CHAPAN, CHAD	29	0	0.29	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874190622	2022-11-30 10:33:03 AM	MELISSA MORRELL	OF-16-8	Outfall - OF-16-8	CHAPAN, CHAD	46	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874190699	2022-11-21 8:33:32 AM	MELISSA MORRELL	OF-21-7	Outfall - OF-21-7	CHAPAN, CHAD	27	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874190746	2022-11-22 11:28:47 AM	MELISSA MORRELL	OF-21-10	Outfall - OF-21-10	CHAPAN, CHAD	47	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874381457	2022-12-21 1:32:03 PM	MELISSA MORRELL	OF-21-11	Outfall - OF-21-11	CHAPAN, CHAD	39	0	0			Closed Pipe	RCP	Circular	2 Single
874381613	2022-12-21 1:25:44 PM	MELISSA MORRELL	OF-21-10	Outfall - OF-21-10	CHAPAN, CHAD	39	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874381703	2022-12-21 1:18:12 PM	MELISSA MORRELL	OF-21-8	Outfall - OF-21-8	CHAPAN, CHAD	39					Closed Pipe	RCP	Circular	2 Single
874381732	2022-12-21 2:22:59 PM	MELISSA MORRELL	OF-65-2	Outfall - OF-65-2	CHAPAN, CHAD	40	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874381854	2022-12-21 2:27:38 PM	MELISSA MORRELL	OF-65-3	Outfall - OF-65-3	CHAPAN, CHAD	40	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874382083	2022-12-21 1:54:44 PM	MELISSA MORRELL	OF-28-4	Outfall - OF-28-4	CHAPAN, CHAD	40	0	0	Suburban Residential		Closed Pipe	Steel	Circular	2 Single
874382113	2022-12-21 12:48:04 PM	MELISSA MORRELL	OF-16-8	Outfall - OF-16-8	CHAPAN, CHAD	39	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874382163	2022-12-21 11:33:04 AM	MELISSA MORRELL	OF-34-3	Outfall - OF-34-3	CHAPAN, CHAD	36	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874382211	2022-12-28 3:46:40 PM	MELISSA MORRELL	OF-26-4	Outfall - OF-26-4	CHAPAN, CHAD				Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874382229	2022-12-21 11:12:31 AM	MELISSA MORRELL	OF-26-5	Outfall - OF-26-5	CHAPAN, CHAD	36	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874382272	2022-12-28 3:57:40 PM	MELISSA MORRELL	OF-48-15	Outfall - OF-48-15	CHAPAN, CHAD	34	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874382306	2022-12-21 10:31:19 AM	MELISSA MORRELL	OF-57-11	Outfall - OF-57-11	CHAPAN, CHAD	32	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874382320	2022-12-21 10:17:06 AM	MELISSA MORRELL	OF-56-7	Outfall - OF-56-7	CHAPAN, CHAD	30	0	0	Suburban Residential		Closed Pipe	RCP	Elliptical	2 Single
874382328	2022-12-21 9:21:45 AM	MELISSA MORRELL	OF-55-1	Outfall - OF-55-1	CHAPAN, CHAD	28	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874770422	2023-01-30 12:19:22 PM	MELISSA MORRELL	OF-16-2	Outfall - OF-16-2	CHAPAN, CHAD	41	0.02	0.12	Suburban Residential		Closed Pipe	Steel	Circular	2 Single
874770754	2023-01-30 12:53:02 PM	MELISSA MORRELL	OF-16-5	Outfall - OF-16-5	CHAPAN, CHAD	42	0.02	0.12	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874771308	2023-01-30 12:57:17 PM	MELISSA MORRELL	OF-23-1	Outfall - OF-23-1	CHAPAN, CHAD	42	0.02	0.12	Suburban Residential		Closed Pipe	PVC	Circular	2 Single
874771346	2023-01-30 1:58:35 PM	MELISSA MORRELL	OF-30-1	Outfall - OF-30-1	CHAPAN, CHAD	45	0.02	0.12	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874771380	2023-01-30 2:03:15 PM	MELISSA MORRELL	OF-32-1	Outfall - OF-32-1	CHAPAN, CHAD	46	0.02	0.12	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874771419	2023-01-30 2:07:25 PM	MELISSA MORRELL	OF-39-18	Outfall - OF-39-18	CHAPAN, CHAD	47	0.02	0.12	Suburban Residential		Closed Pipe	RCP	Elliptical	2 Single
874771442	2023-01-30 2:11:10 PM	MELISSA MORRELL	OF-48-10	Outfall - OF-48-10	CHAPAN, CHAD	47	0.02	0.12	Suburban Residential		Closed Pipe	RCP	Elliptical	2 Single
874771787	2023-01-30 2:41:36 PM	MELISSA MORRELL	OF-48-16	Outfall - OF-48-16	CHAPAN, CHAD	48	0.02	0.12	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874771820	2023-01-30 2:45:13 PM	MELISSA MORRELL	OF-59-1	Outfall - OF-59-1	CHAPAN, CHAD	50	0.02	0.12	Suburban Residential		Closed Pipe	RCP	Elliptical	2 Single
874771844	2023-01-30 2:48:10 PM	MELISSA MORRELL	OF-50-3	Outfall - OF-50-3	CHAPAN, CHAD	50	0.02	0.12	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874771927	2023-01-30 2:51:32 PM	MELISSA MORRELL	OF-59-11	Outfall - OF-59-11	CHAPAN, CHAD	50	0.02	0.12	Suburban Residential		Closed Pipe	RCP	Elliptical	2 Single
874771995	2023-01-30 3:05:28 PM	MELISSA MORRELL	OF-50-1	Outfall - OF-50-1	CHAPAN, CHAD	51	0.02	0.12	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874772067	2023-01-30 3:10:22 PM	MELISSA MORRELL	OF-35-4	Outfall - OF-35-4	CHAPAN, CHAD	53	0.02	0.12	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874772163	2023-01-30 3:13:38 PM	MELISSA MORRELL	OF-35-6	Outfall - OF-35-6	CHAPAN, CHAD	53	0.05	0.15	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874827505	2023-02-03 9:25:57 AM	MELISSA MORRELL	OF-48-15	Outfall - OF-48-15	CHAPAN, CHAD	38	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874827528	2023-02-03 9:32:48 AM	MELISSA MORRELL	OF-31-13	Outfall - OF-31-13	CHAPAN, CHAD	37	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874827668	2023-02-03 9:37:59 AM	MELISSA MORRELL	OF-16-8	Outfall - OF-16-8	CHAPAN, CHAD						Closed Pipe	RCP	Circular	2 Single
874827683	2023-02-03 9:48:28 AM	MELISSA MORRELL	OF-9-8	Outfall - OF-9-8	CHAPAN, CHAD	36	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874827704	2023-02-03 9:50:30 AM	MELISSA MORRELL	OF-9-7	Outfall - OF-9-7	CHAPAN, CHAD	36	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874827725	2023-02-03 9:53:49 AM	MELISSA MORRELL	OF-64-8	Outfall - OF-64-8	CHAPAN, CHAD	31	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874827752	2023-02-03 9:57:09 AM	MELISSA MORRELL	OF-59-4	Outfall - OF-59-4	CHAPAN, CHAD		0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874827781	2023-02-03 9:59:11 AM	MELISSA MORRELL	OF-45-7	Outfall - OF-45-7	CHAPAN, CHAD	26	0		Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874827830	2023-02-03 10:01:24 AM	MELISSA MORRELL	OF-36-5	Outfall - OF-36-5	CHAPAN, CHAD	25	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single
874827864	2023-02-03 10:08:14 AM	MELISSA MORRELL	OF-45-2	Outfall - OF-45-2	CHAPAN, CHAD	26	0	0	Suburban Residential		Closed Pipe	RCP	Circular	2 Single

Diameter (in)	Submerged in Water?	Submerged with Sediment?	FLOW	Flow Present?	Flow Description	Flow Direction	Physical Indicators Present in the Flow?	Odor?	Odor Severity	Odor Descriptors	Odor Description Comments	Color?	Color Severity
21	No	No		Yes	Trickle		No						
12	Partially	No		No									
	Fully			No									
26	No	No		No									
30	No	Partially		No									
12	No	No		No									
15	No	No		No									
15	No	No		Yes	Trickle	NA	No						
PIPE BURIED, UNABLE TO MEASURE		Fully		Yes	Trickle		No						
16	No	Partially		Yes	Trickle	NA	Yes	No				Yes	1 - Faint Colors in Outfall Flow
	Fully	Partially		Yes	Moderate		No						
30	No	No		Yes	Moderate		No						
	No	Partially		No									
24	No	No		Yes	Trickle		No						
	No	No		Yes	Trickle		No						
24	No	No		No									
15	No	No		No									
15	Partially	No		Yes	Trickle		No						
24	Partially	No		No									
36	No	Partially		No									
18	No	No		Yes	Trickle		No						
15	Partially	Partially		No									
12	No	No		No									
12	No	No		No									
26	No	No		Yes	Trickle		No						
18	No	No		Yes	Trickle		No						
21	No	No		No									
	No	No		Yes	Trickle		No						
18	No	No		Yes	Moderate		No						
6	No	Partially		No									
24	No	No		Yes	Moderate		No						
24	No	No		No									
10	No	No		No									
21	No	No		No									
18	No	Partially		No									
18	No	No		Yes	Trickle		No						
15	No	No		No									
21" ID	No	No		Yes	Trickle		No						
36	No	No		Yes			No						
12"	No	No		Yes	Moderate		No						
36"	Partially	No		Yes	Moderate		No						
12"	No	No		Yes	Trickle		No						
15"	No	Partially		Yes	Trickle		No						
15"	No	No		Yes	Trickle		No						
12"	Partially	No		Yes	Trickle		No						
18"	No	No		Yes	Trickle		Yes	Yes	1 - Faint	Sulfide			
12"	Fully			No									
30"	No	Partially		No									
27"	No	No		Yes	Trickle		No						
12"	No	No		Yes	Trickle		No						
12"	Partially	No		Yes	Moderate		No						
24"	No	No		Yes	Trickle		No						
18	No	No		Yes	Moderate		No						
18"	Partially			Yes	Moderate		No						
21"	No			Yes	Moderate		No						
10"	Partially			Yes	Trickle		No						
18	No	No		Yes	Moderate		No						
24"	No	No		Yes	Moderate		No						
24"	No	No		Yes	Moderate		No						
12"	No	No		Yes	Trickle		No						
48"	No	No		Yes	Moderate		No						
18"	No	No		Yes	Trickle		No						
18"	No	No		Yes	Moderate		No						
18"	No	No		Yes	Trickle		No						
12"	No	No		Yes	Trickle		No						
21"	No	No		Yes	Moderate		No						
24"	Partially	No		Yes	Trickle		No						
12"	No	No		Yes	Trickle		No						
24"	No	No		Yes	Moderate		No						
15"	No	No		Yes	Moderate		No						
18"	No	Partially		Yes	Moderate		No						
12"	Partially	No		Yes	Moderate		No						
24"	No	No		Yes	Trickle		No						
24"	No	No		Yes	Moderate		No						
15"	Partially	Partially		Yes	Moderate		No						
12"	No	No		Yes	Moderate		No						
18"	No	No		Yes	Moderate		No						

Color Description	Color Description Comments	Turbidity?	Turbidity Severity	Floatables?	Floatables Severity	Floatables Description	Floatables Description Comments	Physical Indicators Present that are NOT Related to Flow?	Outfall Damage?	Outfall Damage Description
								No		
								No		
								No		
								No		
								No		
								No		
								No		
								Yes	No	
Brown								No		
								Yes		
								No		
								No		
								No		
								No		
								No		
								No		
								No		
								No		
								Yes	Yes	Spalling, Cracking, or Chipping
								No		
								No		
								No		
								No		
								No		
								No		
								Yes	Yes	Corrosion
								No		
								No		
								No		
								No		
								No		
								No		
								No		
								No		
								No		
								No		
								No		
								No		
								No		
								Yes		
								No		
								No		
								No		
								No		
								No		
								No		
								No		
								No		
								No		
								No		
								No		
								No		
								Yes	Yes	Spalling, Cracking, or Chipping
								No		
								Yes		
								No		
								No		
								No		
								No		
								No		
								Yes		
								No		
								No		
								No		
								No		
								No		
								Yes		
								No		
								No		
								No		

Outfall Damage Comments	Deposit Stains?	Deposit/Stains Description	Deposit/Stains Comments	Abnormal Vegetation?	Abnormal Vegetation Description	Abnormal Vegetation Comments	Poor Pool Quality?	Poor Pool Quality Description
	No			Yes	Inhibited	ROOTS & ORGANIC COVERING PIPE OPENING	No	

END OF PIPE CRACKED

BOTTOM OF PIPE RUSTED OUT 3'-4' BACK

END OF PIPE CRACKING APART. 3' OF EXPOSED STILL SOLID

Poor Pool Quality Comments	Pipe Benthic Growth?	Pipe Benthic Growth Description	Pipe Benthic Growth Comments	Potential for Illicit Discharges	Potential for Illicit Discharge?	Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?	Outfall Photo
					Unlikely		
						STANDING WATERNO FLOWNO TEST	
					Unlikely	STANDING WATERNO FLOWNO TEST	
					Unlikely	NO FLOWNO TEST	
					Unlikely	NO FLOW NO TEST	
					Unlikely	NO FLOWNO TESTDRY PIPE	
					Unlikely	NO FLOW NO TEST	
					Unlikely	NA	
	No					PIPE BEING OBSTRUCTED BY ROOTS, SOIL & ORGANICS. DIG-OUT	
					Unlikely		
	Yes	Brown			Unlikely		
						Stone of head wall have begun to fall out concrete cap has multiple cracks and heaves	
					Unlikely	Dry pipeNo flowNo test	
					Unlikely		
					Unlikely		
					Unlikely	NO FLOWDRY PIPENO TEST	
					Unlikely	DRY PIPENO FLOWNO TEST	
					Unlikely	LOCATION ON MAP TO BE CHANGED	
					Unlikely	STANDING WATER NO FLOWNO TEST	
					Unlikely	DRY PIPENO FLOW NO TEST	
					Obvious		
					Unlikely	STANDING WATER NO FLOWNO TEST	
					Unlikely	DRY PIPE NO FLOWNO TEST	
					Unlikely	DRY PIPENO FLOW NO TEST	
					Unlikely		
					Unlikely		
					Unlikely	DRY PIPENO FLOWNO TEST	
					Unlikely		
					Unlikely	DRY PIPENO FLOWNO TEST	
					Unlikely		
					Unlikely	DRY PIPENO FLOWNO TEST	
					Unlikely	DRY PIPENO FLOWNO TEST	
					Unlikely	DRY PIPENO FLOWNO TEST	
					Unlikely	DRY PIPENO FLOWNO TEST	
					Unlikely		
					Unlikely	DRY PIPENO FLOW NO TEST	
					Unlikely	Veneer stone is chipping /breaking away from concrete head wall.	
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
	Yes	Orange			Unlikely		
					Unlikely		
					Unlikely	Standing Water/Frozen OverNo FlowNo Test	
					Unlikely	Dry PipeNo FlowNo Test	
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
	Yes	Orange					
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
	Yes	Brown			Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
					Unlikely		
	Yes	Brown			Unlikely		
					Unlikely		
					Unlikely		

Comments	Stormwater Sampling	Water Temperature (F)	pH	Conductivity (µs/cm)	Salinity (ppt)	Detergent (mg/L)	Chlorine (mg/L)	Ammonia (mg/L)	E. Coli (MPN/100mL)	Phosphorus (mg/L)
Veneer stone is chipping/breaking away from concrete headwall.		46.	7.02	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		44.1	7.61	NA	1.40	NA	NA	NA		
		51.6	7.07	NA	NA	NA	NA	NA		
		45.2	6.94	NA	NA	NA	NA	NA	NA	NA
		46.9	7.04	NA	NA	NA	NA	NA	NA	NA
		49.7	7.03	NA	NA	NA	NA	NA	NA	NA
		NA	NA	NA	NA	NA	NA	NA	NA	TO LAB
		NA	7.25	NA	NA	NA	NA	NA	NA	TO LAB
		NA	NA	NA	NA	NA	NA	NA	NA	TO LAB
ORIGIN OF OUTFALL: 6CB ALONG BLUEBERRY HILL										
ORIGIN OF OUTFALL 19 CB'S										
7 CB'S		NA	NA	NA	NA	.25	NA	NA	NA	TO LAB
ORIGIN OF OUTFALL -2 CB'S										
ORIGIN OF OUTFALL: 2CB										
		NA	NA	NA	NA	.25	NA	NA	NA	NA
ORIGIN OF OUTFALL: TBD		NA	0.30	NA	NA	NA	NA	NA	30	0.06
		NA	NA	NA	NA	NA	NA	NA	NA	0.02
ORIGIN OF OUTFALL: 14 CB		NA	NA	NA	NA	NA	NA	NA		0.03
ORIGIN OF OUTFALL: 1 CB										
ORIGIN OF OUTFALL: 9 CB		NA	NA	NA	NA	NA	NA	NA	NA	0.02
ORIGIN OF OUTFALL: 4 CB										
22 CB										
8 CB										
4 CB		42.5	7.96	NA	NA	0.25	NA	NA	NA	0.01
		46.3	7.02	NA	NA	NA	NA	NA	NA	NA
		NA	NA	NA	NA	.25	NA	NA	NA	NA
		0	7.98	0	0.60	0.25	0	0		
		NA	NA	NA	NA	0.25	NA	NA	NA	NA
		NA	7.41	NA	NA	NA	NA	NA	NA	NA
		NA	NA	NA	0.20	6.82	NA	NA	NA	NA
		NA	NA	NA	1.70	NA	NA	NA	NA	NA
		NA	NA	NA	NA	0.0	NA	NA	NA	NA
		NA	NA	NA	NA	0.25	NA	NA		
		NA	NA	NA	NA	0.25	NA	NA		
		NA	7.03	NA	1.00	NA	NA	NA		
		NA	6.97	NA	NA	NA	NA	NA		
		NA	NA	NA	0.70	NA	NA	NA		
4 CB		40.9	7.42	NA	NA	NA	NA	NA		
8 CB		NA	NA	NA	NA	NA	NA	NA	345	0.02
22 CB		NA	NA	NA	NA	NA	NA	NA	2,420	
4 CB		NA	NA	NA	NA	NA	NA	NA	NA	0.03
14 CB		NA	NA	NA	NA	NA	NA	NA	NA	.02
16 CB		NA	NA	NA	NA	NA	NA	NA	NA	0.05
17 CB (NEW 1 ON MAPLE)		NA	NA	NA	NA	NA	NA	NA	NA	0.01
		NA	NA	NA	NA	NA	NA	NA	NA	0.02
ALOT		NA	NA	NA	NA	NA	NA	NA	NA	0.02
		NA	NA	NA	NA	NA	NA	NA	NA	0.02
		NA	NA	NA	NA	NA	NA	NA	NA	0.13
		na	6.53	NA	NA	NA	NA	NA	NA	0.01
		NA	NA	NA	0.40	NA	NA	NA	NA	0.11
		NA	NA	NA	NA	NA	NA	NA	NA	0.10
		NA	NA	NA	NA	NA	NA	NA	NA	0.04
		NA	NA	NA	0.40	NA	NA	NA	NA	NA
		NA	NA	NA	0.20	NA	NA	NA	NA	NA
		NA	NA	NA	NA	0.00	NA	NA	NA	NA
		NA	6.72	NA	NA	NA	NA	NA	NA	NA
		NA	6.51	NA	NA	NA	NA	NA	NA	NA
		NA	6.79	NA	0.40	NA	NA	NA	NA	NA
		NA	NA	NA	0.30	0.25	NA	NA	NA	NA
		NA	NA	NA	NA	0.25	NA	NA	NA	NA
		0	0	0	0	0.00	0	0	0	0
		NA	NA	NA	NA	0.00	NA	NA	NA	NA

	Date	Asset Tag	Status	pH	Conductivity (ps/cm)	Salinity (ppt)	Detergent (mg/L)	Chlorine (mg/L)	Ammonia (mg/L)	E. Coli (MPN/100mL)
8	4/12/2021	OF-16-8	closed	6.15	438	0.2	1	0	0	20
12	4/12/2021	OF-21-7	closed	5.69	842	0.4	0.25	0	0	<10
13	5/13/2020	OF-21-8	closed	5.9	87.1	0	0	0	0	3.1
14	4/12/2021	OF-22-15	closed	5.88	576	0.3	0.25	0	0	<10
19	1/20/2021	OF-28-4	closed	6.3	349	0.2	0.75	0	0.25	<10
20	5/13/2020	OF-30-1	closed	7.18	428	0.2	0.25	0	0	9.7
21	4/12/2021	OF-30-2	closed	6.48	783	0.4	0.25	0	0	<10
24	4/13/2021	OF-32-3	closed	6.03	688	0.3	0.25	0	0	<10
31	4/12/2021	OF-39-18	closed	6.25	1090	0.5	0.25	0	0	<10
34	4/12/2021	OF-48-10	closed	6.19	440	0.2	0.25	0	0	<10
36	4/1/2020	OF-48-16	closed	7.36	783	0.3	0.25	0	0	28.2
37	4/8/2021	OF-49-9	closed	5.78	367	0.3	0.25	0	0	<10
40	4/8/2021	OF-55-1	closed	5.92	466	0.2	0.25	0	0	<10
42	4/8/2021	OF-57-11	closed	5.7	474	0.2	0.25	0	0	50
43	4/8/2021	OF-59-1	closed	6.44	824	0.4	0.25	0	0	20
44	4/8/2021	OF-59-11	closed	5.96	850	0.4	0.25	0	0	<10
49	4/8/2021	OF-65-2	closed	5.64	1136	0.85	0.25	0	0	<10
51	4/8/2021	OF-66-7	closed	5.25	560	0.3	0.25	0	0	5
53	4/8/2021	OF-67-9	closed	5.64	725	0.2	0.25	0	0	<10
1	4/6/2021	OF-12-10	open	5.88	869	0.4	0.25	0	0	<10
2	4/6/2021	OF-12-12	open	5.9	698	0.4	0.25	0	0	170
3	4/13/2021	OF-12-16	open	6.41	425	0.2	0.25	0	0	<10
4	4/6/2021	OF-12-9	open	5.97	787	0.4	0.25	0	0	1630
5	4/12/2021	OF-13-1	open	5.83	641	0.3	0.5	0	0	10
6	3/22/2021	OF-16-2	open	7.09	300	0.1	0.25	0	0	310
7	4/6/2021	OF-16-5	open	6.76	802	0.3	0.25	0	0	280
9	4/6/2021	OF-19-2	open	6.23	386	0.2	0	0	0	<10
10	4/16/2020	OF-21-10	open	6.6	219	0.1	0.75	0	0	2
11	4/16/2020	OF-21-11	open	8.81	227	1.1	0.5	0	0.25	3.1
15	5/13/2020	OF-23-1	Open	6.81	1105	0.5	0.25	0	0	5.2
16	1/20/2021	OF-26-4	Open	6.78	522	0.2	1	0	0.25	52
17	1/20/2021	OF-26-5	Open	6.93	763	0.3	0.5	0	0	<10
18	4/6/2021	OF-28-1	Open	6.31	561	0.2	2	0	0	<10
22	4/12/2021	OF-31-13	open	6.93	1738	0.8	0.25	0	0.25	<10
23	3/25/2021	OF-32-1	open	7.84	652	0.3	0.25	0	0	<10
25	1/20/2021	OF-34-3	open	8.03	364	0.1	0.75	0	0	<10
26	1/20/2021	OF-35-4	open	6.51	537	0.2	0.25	0	0	10
27	1/20/2021	OF-35-6	open	6.45	376	0.2	0.25	0	0	<10
28	1/20/2021	OF-36-5	open	6.22	60.3	0	0.5	0	0	<10
29	1/20/2021	OF-37-14	open	6.86	310	0.1	0.25	0	0	20
30	4/6/2021	OF-37-3	open	6.9	598	0.3	0.75	0	0.25	<10
32	1/20/2021	OF-45-2	open	6.72	137.5	0	0.75	0	0	<10
33	1/20/2021	OF-45-7	open	6.32	789	0.4	1.5	0	0	<10
35	4/12/2021	OF-48-15	open	5.52	1947	0.9	0.25	0	0	<10
38	4/6/2021	OF-50-1	open	6.6	1300	0.6	0.25	0	0	<10
39	4/8/2021	OF-50-3	open	6.28	1997	0.9	0	0	0	>3000
41	4/8/2021	OF-56-7	open	6.27	244	1.2	0.25	0	0	<10
45	4/13/2021	OF-59-4	open	6.58	1251	0.6	0.5	0	0	<5
46	4/13/2021	OF-6-2	open	6.8	810	0.4	0.25	0	0	<10
47	4/6/2021	OF-6-4	open	6.12	544	0.3	0.25	0	0	35
48	4/8/2021	OF-64-8	open	5.57	1862	0.9	0.25	0	0	<10
50	4/8/2021	OF-65-3	open	5.79	1750	0.9	0.25	0	0	<10
52	4/6/2021	OF-6-7	open	6.09	1170	0.5	0.25	0	0	1130
54	4/13/2021	OF-6-9	open	6.89	602	0.3	0.25	0	0	<10
55	3/22/2021	OF-9-7	open	5.86	134.7	0	0.25	0	0	<10
56	4/6/2021	OF-9-8	open	5.50	186	0	0.25	0	0	<10

Phosphorus (mg/L)	Notes	ReTest - DATE		Results	ReTest - DATE
0.02	Detergent	11/22/2022 & 11/30/2022	no flow		12/21/2022
0	pH	11/22/2022		pH resolved	
<0.02	pH	11/22/2022 & 11/30/2022	no flow		12/21/2022
0	pH	11/22/2022		pH resolved	
<.02	Detergent	11/22/2022	no flow		12/21/2022
0.03	Phosphorus	12/5/2022	phoshorus		1/18/2023
0.03	Phosphorus	12/5/2022		phosphorus resolved	
0.12	Phosphorus	12/5/2022		phosphorus resolved	
0.1	Phosphorus	1/18/2023		phosphorus resolved 0.01	
0.6	Phosphorus	1/18/2023		phosphorus resolved 0.02	
0.03	Phosphorus	1/18/2023		phosphorus resolved 0.02	
0.01	pH	11/21/2022		pH resolved	
0	pH	1/18/2023	phosphorus 0.13		
0	pH	12/21/2022	salinity (0.7)		
0.05	Phosphorus	12/21/2022		pH resolved (6.97)	
0.04	pH, Phosphorus	1/18/2023		pH resolvred (6.53), phosphorus resolved (0.01)	
0	pH, Salinity,	12/21/2022		salinity resolved (0.2), pH resolved (6.82)	
0	pH	11/22/2022		pH resolved	
0	pH	11/22/2022		pH resolved	
0.08	pH, Phosphorus	11/29/2022	Phophorus	pH resolved,	
0	pH, E.coli	11/29/2022	no flow		
0.13	Phosphorus	11/29/2022	phosphorus		
0	pH, E.coli	11/29/2022	no flow		
0.29	pH, Detergent,Phosphorus	12/5/2022	Detergent	pH resolved, Phophorus resolved	
0.04	E.coli, Phosphorus	12/5/2022	no flow		1/18/2023
0.02	E.coli	12/5/2022	no flow		1/18/2023
0.03	Phosphorus	11/29/2022	no flow		
0.02	Detergent	11/22/2022	Detergent		12/21/2022
<0.02	pH, Salinity,Detergent	11/30/2022	no flow		12/21/2022
0.21	Phosphorus	12/5/2022	no flow		1/18/2023
0.02	Detergent	11/22/2022	no flow		12/21/2022
<.02	Detergent	11/22/2022 & 11/30/2022	Detergent		12/21/2022
0.32	Detergent, Phosphorus	11/29/2022	no flow		
0.06	Salinity, Phosphorus	12/5/2022	no flow		2/2/2023
0.04	Phosphorus	12/5/2022	no flow		1/18/2023
<.02	Detergent	11/22/2022	no flow		12/21/2022
0.06	Phosphorus	12/5/2022	no flow		1/18/2023
0.03	Phosphorus	1/18/2023	phosphorus 0.04		
0.03	Detergent, Phosphorus	2/2/2023	phosphorus didn't test	detergent resolved 0.0	
0.12	Phosphorus	11/29/2022	no flow		
0.03	Detergent, Phosphorus	11/29/2022	Detergent, Phosphorus		
0.18	Detergent, Phosphorus	2/2/2023	phosphorus didn't test	detergent resolved 0.0	
0.04	Detergent, Phosphorus	2/2/2023	phosphorus didn't test, detergent 0.25		
0	pH, Salinity,	12/21/2022	pH resolved (7.03)	salinity 1.0	2/2/2023
0.04	Salinity,Phosphorus	1/18/2023	phosphorus 0.11,	salinity resolved 0.4	
0.21	Salinity, E.coli, Phosphorus	12/5/2022	phosphorus	salinity resolved, E.coli resolved	
0	Salinity	12/21/2022		pH resolved (7.42)	
0.03	Salinity, Detergent, Phosphorus	2/2/2023	phosphorus didn't test, detergent	salinity resolved 0.3,	
0.45	Phosphorus	11/29/2022	no flow		
1.36	Phosphorus	11/29/2022	phosphorus		
0.11	pH, Salinity, Phosphorus	2/2/2023	phosphorus didn't test	pH resolved 6.79, salinity resolved 0.4	
0	pH, Salinity,	11/21/2022	salinity	pH resolved	
0.11	E.coli, Phosphorus				
0.09	Phosphorus				
0.03	pH, Phosphorus	2/2/2023	phosphorus didn't test	pH resolved	
0.03	pH, Phosphorus	2/2/2023	phosphorus didn't test	pH resolved 6.72	

	Results	ReTest - DATE	Results
Detergent 0.25		2/2/2023	detergent resolved (0.0)
	pH resolved (7.41)		
	detergent resolved (0.0) phosphorus resolved		
E.Coli 345 E.coli 2420	phosphorus resolved		
Detergent 0.25 salinity 0.6; detergent 0.05 phosphorus 0.03 no flow Detergent 0.25	pH resolved (7.48)		
phosphorus didn't test phosphorus 0.05 no flow phosphorus 0.10	salinity resolved (0.2),		
	salinity resolved 0.4		