Stormwater Management Program (SWMP)

Blackstone

53 Elm St MA 01504

EPA NPDES Permit Number MAR041015

Certification

Authorized Representative (Optional): All reports, including SWPPPs, inspection reports, annual reports, monitoring reports, reports on training and other information required by this permit must be signed by a person described in Appendix B, Subsection 11.A or by a duly authorized representative of that person in accordance with Appendix B, Subsection 11.B. If there is an authorized representative to sign MS4 reports, there must be a signed and dated written authorization.
The authorization letter is:

☐ Attached to this document (document name listed below)

☐ Publicly available at the website below

"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 gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Printed Name

Signature _____ Date

Click Here for Revisions

Background

Stormwater Regulation

The Stormwater Phase II Final Rule was promulgated in 1999 and was the next step after the 1987 Phase I Rule in EPA's effort to preserve, protect, and improve the Nation's water resources from polluted stormwater runoff. The Phase II program expands the Phase I program by requiring additional operators of MS4s in urbanized areas and operators of small construction sites, through the use of NPDES permits, to implement programs and practices to control polluted stormwater runoff. Phase II is intended to further reduce adverse impacts to water quality and aquatic habitat by instituting the use of controls on the unregulated sources of stormwater discharges that have the greatest likelihood of causing continued environmental degradation. Under the Phase II rule all MS4s with stormwater discharges from Census designated Urbanized Area are required to seek NPDES permit coverage for those stormwater discharges.

Permit Program Background

On May 1, 2003, EPA Region 1 issued its Final General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (2003 small MS4 permit) consistent with the Phase II rule. The 2003 small MS4 permit covered "traditional" (i.e., cities and towns) and "non-traditional" (i.e., Federal and state agencies) MS4 Operators located in the states of Massachusetts and New Hampshire. This permit expired on May 1, 2008 but remained in effect until operators were authorized under the 2016 MS4 general permit, which became effective on July 1, 2018.

Stormwater Management Program (SWMP)

The SWMP describes and details the activities and measures that will be implemented to meet the terms and conditions of the permit. The SWMP accurately describes the permittees plans and activities. The document should be updated and/or modified during the permit term as the permittee's activities are modified, changed or updated to meet permit conditions during the permit term. The main elements of the stormwater management program are (1) a public education program in order to affect public behavior causing stormwater pollution, (2) an opportunity for the public to participate and provide comments on the stormwater program (3) a program to effectively find and eliminate illicit discharges within the MS4 (4) a program to effectively control construction site stormwater discharges to the MS4 (5) a program to ensure that stormwater from development projects entering the MS4 is adequately controlled by the construction of stormwater controls, and (6) a good housekeeping program to ensure that stormwater pollution sources on municipal properties and from municipal operations are minimized.

Town Specific MS4 Background (optional)

Small MS4 Authorization

The NOI was submitted on Oct 1, 2018

The NOI can be found at the following (document name or web address):

https://www3.epa.gov/region1/npdes/stormwater/ma/tms4noi/blackstone.pdf

---

Authorization to Discharge was granted on June 26, 2019

The Authorization Letter can be found (document name or web address):

https://www3.epa.gov/region1/npdes/stormwater/ma/tms4noi/blackstone-auth.pdf

Stormwater Management Program Team

SWMP Team Coordinator

Name	James Sullivan	Title	Superintendent
Department	Department of Public Works		
Phone Number	508-883-9331	Email	jsullivan@townofblackstone.com
Responsibilities	MCM 1; MCM 2; MCM 3; MCM 4; MCM 5; MCM 6		

SWMP Team

Name	Patricia Dubois	Title	Secretary
Department	Highway Division, Water and Sewer Commission, Water Division, DPW, Sewer Division		
Phone Number	508-883-9331	Email	patricia.dubois@townofblackstone.org
Responsibilities			

Name	Robert Varieur	Title	Leadman
Department	Department of Public Works		
Phone Number	508-958-3004	Email	
Responsibilities			

Name	Chad Lovett	Title	Town Administrator
Department	Town Administrator		
Phone Number	508-883-1500	Email	clovett@townofblackstone.org
Responsibilities			

Name	Bruce Bernier	Title	Apprentice
Department	Department of Public Works		
Phone Number		Email	
Responsibilities			

Add SWMP Member

Receiving Waters

The following table lists all receiving waters, impairments and number of outfalls discharging to each waterbody segment.

OR

The information can be found in the following document or at the following web address:

Waterbody segment that receives flow from the MS4	Number of outfalls into receiving water segment	Chloride	Chlorophyll-a	Dissolved Oxygen/ DO Saturation	Nitrogen	Oil & Grease/ PAH	Phosphorus	Solids/ TSS/ Turbidity	E. coli	Enterococcus	Other pollutant(s) causing impairments
Blackstone River (MA51-06)	8	☐	☐	☐	☐	☐	☒	☒	☒	☐	Cadmium, Copper, DDT in Fish Tissue, E. Coli, Fish Bioassessments, Lead, PCB in Fish Tissue, Total Phosphorus, Total Suspended Solids (TSS)
Mill River (MA51-36)	15	☐	☐	☐	☐	☐	☐	☐	☒	☐	E. Coli
Fox Brook (MA51-39)	9	☐	☐	☐	☐	☐	☐	☐	☒	☐	E. Coli
Hop Brook	3	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Quick Stream	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Lake Hiawatha (MA51062)	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Aldrich Brook	3	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Tributary to Blackstone River	14	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Tributary to Mill River	39	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Tributary to Fox Brook	10	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Tributary to Hop Brook	2	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Tributary to Quick Stream	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Tributary to Aldrich Brook	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	

Waterbody segment that receives flow from the MS4	Number of outfalls into receiving water segment	Chloride	Chlorophyll-a	Dissolved Oxygen/ DO Saturation	Nitrogen	Oil & Grease/ PAH	Phosphorus	Solids/ TSS/ Turbidity	E. coli	Enterococcus	Other pollutant(s) causing impairments
Tributary to Peters River	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Woonsocket MS4	3	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Bellingham MS4	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	
MassDOT MS4	2	☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	

Click here to lengthen table

Eligibility: Endangered Species and Historic Properties

*Reminder: The proper consultations and updates to the SWMP must be conducted for construction projects related to your permit compliance where Construction General Permit (CGP) coverage, which requires its own endangered species and history preservation determination, is NOT being obtained.

Attachments:

- ☒ The results of Appendix C U.S. Fish and Wildlife Service endangered species screening determination
- ☐ The results of the Appendix D historic property screening investigations
- ☐ If applicable, any documents from the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Officer (THPO), or other Tribal representative to mitigate effects

These attachments are required within one year of the permit effective date and are:

- ☒ Attached to this document (document names listed below)

  Blackstone IPAC Report

- ☐ Publicly available at the website listed below

Under what criterion did permittee determine eligibility for ESA?

☐ Criterion A ☐ Criterion B ☒ Criterion C

Under what criterion did permittee determine eligibility for Historic Properties?

☒ Criterion A ☐ Criterion B ☐ Criterion C

Below add any additional measures for structural controls that you're required to do through consultation with U.S. Fish and Wildlife Service (if applicable):

Below add any additional measures taken to avoid or minimize adverse impacts on places listed, or eligible for listing, on the NRHP, including any conditions imposed by the SHPO or THPO (if applicable):

MCM 1
Public Education and Outreach
Permit Part 2.3.2

Objective: The permittee shall implement an education program that includes educational goals based on stormwater issues of significance within the MS4 area. The ultimate objective of a public education program is to increase knowledge and change behavior of the public so that the pollutants in stormwater are reduced.

Examples and Templates:
EPA's Stormwater Education Toolbox
MassDEP's Stormwater Outreach Materials

Other templates relevant to MCM 1 can be found here: https://www.epa.gov/npdes-permits/stormwater-tools-new-england#peo

BMP: Shared Social Media Post

BMP Number (Optional) **PE-1**

Document Name and/or Web Address: Think Blue Residents Pet Waste Social Media Post

Description:

A social media post will be shared on Blackstone's Facebook page annually in the summer. The social media post reminds residents to pick up dog waste to keep water clean and provides a link to the Think Blue Massachusetts website.

Targeted Audience: Residents

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Number of post views, shares, and likes.

Message Date(s): Permit Year 1

BMP: Flyer Distribution

BMP Number (Optional) **PE-2**

Document Name and/or Web Address: Parking Lot Maintenance Mailer

Description:

A flyer describing ways that businesses can reduce stormwater will be included in tax bills or by special mailing to businesses, institutions, and commercial facilities. Tips include frequently sweeping parking lots, keeping trash barrels covered, and maintaining stormwater structures frequently.

Targeted Audience: Businesses, institutions and commercial facilities

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Number of businesses receiving mailing. In Permit Year 6, this flyer was mailed to 14 applicable businesses in the Town in April 2024.

Message Date(s): Permit Year 6

BMP: Flyer Distribution

BMP Number (Optional) **PE-3**

Document Name and/or Web Address: Think Blue Developers Sediment Control Flyer

Description:

A flyer describing the importance of erosion controls for construction sites will be distributed with every approved construction permit and available at the Planning, Zoning, and Inspectional Services departments.

Targeted Audience: Developers (construction)

Responsible Department/Parties: Planning Board

Measurable Goal(s):

Number of flyers distributed, measured as number of construction permits issued per year.

Message Date(s): Rolling throughout Permit Year 2.

BMP: Flyer Distribution

BMP Number (Optional) **PE-4**

Document Name and/or Web Address: Think Blue Material Handling Flyer

Description:

A flyer describing ways that industrial site owners can reduce stormwater pollution will be distributed to every industrial facility with a NPDES permit. Tips include how to properly store and dispose of hazardous materials and how to minimize leaks and spills.

Targeted Audience: Industrial facilities

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Number of flyers distributed, measured as number of facilities with NPDES permits.

Message Date(s): Permit Year 1

BMP: Flyer Distribution at Town Meeting

BMP Number (Optional) **PE-5**

Document Name and/or Web Address: Do Your "Doody" for Clean Water

Description:

A flyer describing the negative effects of pet waste on water quality will be distributed at annual town

election.

Targeted Audience: Residents

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Number of brochures/pamphlets handed out at annual town election.

Message Date(s): Permit Year 1

BMP: Shared Social Media Post

BMP Number (Optional) **PE-6**

Document Name and/or Web Address: Think Blue Business Waste Disposal Social Media Post

Description:

A social media post will be shared on the Town of Blackstone's Facebook page annually in the fall. The social media post reminds business owners to keep dumpsters covered to keep water clean and provides a link to the Think Blue Massachusetts website.

Targeted Audience: Businesses, institutions, and commercial facilities

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Number of post views, shares, and likes.

Message Date(s): Permit Year 2

BMP: Press Release

BMP Number (Optional) **PE-7**

Document Name and/or Web Address: Think Blue Developers Sediment Control Press Release

Description:

A press release about the importance of erosion control on construction sites to prevent stormwater pollution will be posted to the Developers information section of the Town's Stormwater website

Targeted Audience: Developers (construction)

Responsible Department/Parties: Planning/Zoning Department

Measurable Goal(s):

Number of visitors to the Town's stormwater information page for developers.

Message Date(s): Permit Year 1

BMP: Brochure/Flyer Distribution

BMP Number (Optional) **PE-8**

Document Name and/or Web Address: "Gas, Oil and Grease...Oh My!"

Description:

A flyer detailing proper handling of gas, oil, and grease for spill prevention, particularly as related to vehicle maintenance, will be provided to all industrial facilities with a NPDES permit during annual inspections.

Targeted Audience: Industrial Facilities

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Number of flyers distributed, measured as number of NPDES permits.

Message Date(s): Permit Year 1

BMP:Post to Town Website/Shared Social Media Post

BMP Number (Optional) **PE-9**

Document Name and/or Web Address: Think Blue Landscaping Infographic

Description:

A flyer describing lawn and garden tips to reduce stormwater pollution will be posted on the Town of Blackstone website. The link to the flyer will be shared on social media twice a year (once in the spring and once in the fall). This flyer discusses proper disposal of yard waste (grass clippings and leaf litter) and fertilizer use.

Targeted Audience: Residents

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Number of post views, shares, and likes.

Message Date(s): Permit Years 1, 2, and 3.

BMP: Construction Flyer

BMP Number (Optional) **PE-10**

Document Name and/or Web Address: Construction BMP Flyer

Description:

Flyer describing proper planning to prevent pollution during construction activities and outlining BMPs and good housekeeping to reduce pollutant discharges from construction sites distributed in Building Inspectional Services office.

Targeted Audience: Developers (construction)

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Number distributed.

Message Date(s): Distributed throughout Permit Year 1.

BMP: Town Meeting Stormwater Flyer

BMP Number (Optional) **PE-11**

Document Name and/or Web Address: "What is Stormwater"

Description:

Flyer distributed describing stormwater to be distributed at a town meeting to better reach people who may not see messages on digital platforms.

Targeted Audience: Residents

Responsible Department/Parties: Department of Public Works

Measurable Goal(s):

Number of flyers distributed

Message Date(s): Distributed during Permit Year 1 in October 2018, and Permit Year 2 on October 19, 2019.

BMP: Pet Waste Flyer

BMP Number (Optional) **PE-12**

Document Name and/or Web Address: Pet Waste Belongs in the Trash!

Description:

Flyer describing how to dispose of pet waste properly distributed in Town Clerk's office, posted to bulletin boards around Town Hall, and posted on the Police Department Facebook page.

Targeted Audience: Residents

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Number distributed and views

Message Date(s): During Permit Years 1 and 2, the flyer was distributed to residents within the Town Clerk's office, posted on the Town's Facebook page and the public access cable channel. During Permit Year 3, the Town posted flyers at the Town Clerk's office.

BMP: Residents Flyer

BMP Number (Optional) **PE-13**

Document Name and/or Web Address: "What you can do as a citizen"

Description:

EPA flyer describing how to do your part in preventing stormwater pollution posted to the Town's website.

Targeted Audience: Residents

Responsible Department/Parties: Department of Public Works

Measurable Goal(s):

Number of views.

Message Date(s): The flyer was accessible on the Town's website throughout Permit Year 2, and distributed in mail with quarterly water bills and posted on the Town's website during Permit Year 3.

BMP: Website Information

BMP Number (Optional) **PE-14**

Document Name and/or Web Address: Think Blue Massachusetts Businesses Information

Description:

Messaging and information for businesses from the Think Blue Massachusetts website was made available to local businesses through the Town's website.

Targeted Audience: Businesses, institutions and commercial facilities

Responsible Department/Parties: Department of Public Works

Measurable Goal(s):

Number of views

Message Date(s): The information was accessible on the website throughout Permit Year 2. The flyer was distributed through mail, Town Hall, and quarterly water bills sent to 2,623 Town Residents in Permit Year 3.

BMP: Rain Garden Flyer

BMP Number (Optional) **PE-15**

Document Name and/or Web Address: Rain Garden Flyer

Description:

A Mass Audobon flyer describing the benefits of rain gardens and how to create a rain garden.

Targeted Audience: Residents

Responsible Department/Parties: Department of Public Works

Measurable Goal(s):

Number of flyers/views

Message Date(s): The flyer was made available to residents during Permit Year 2. The flyer was distributed in the mail with quarterly water bills to 2,623 Town Residents in Permit Year 3.

BMP: Website/Flyer

BMP Number (Optional) **PE-16**

Document Name and/or Web Address: "Tips to Prevent Stormwater Runoff Pollution"

Description:

Simple tips shared on the Town's webpage and distributed with water bills, reminding residents to pick up pet waste, never dump anything into the storm drain system, compost yard waste, use fertilizer sparingly, sweep up driveways and gutters, keep storm drains clean, and dispose of litter properly.

https://www.townofblackstone.org/sewer-division
https://www.townofblackstone.org/water-division

Targeted Audience: Residents/Businesses/Industrial

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Information maintained on website throughout the permit year, making it accessible to all parties.

Message Date(s): The information was posted during Permit Year 2 and has been maintained on the Town's website throughout Permit Years 2, 3, 4 and 5. The information was also distributed with water bills during Permit Year 3 and Permit Year 6.

BMP: Social Media Posts

BMP Number (Optional) **PE-17**

Document Name and/or Web Address: "Flushable" Wipes Message

Description:

Facebook post on the Blackstone Police Department Facebook page warning against the problems that so-called flushable wipes can cause with septic clogging and sewer pipe clogging that could cause sewer pump failures.

Targeted Audience: Residents

Responsible Department/Parties: Blackstone Police Department

Measurable Goal(s):

Number of shares and reactions

Message Date(s): The post was shared on the Blackstone Police Department during Permit Years 2, 3, and 4 and maintained on their account throughout the permit years.

BMP: Flyer

BMP Number (Optional) **PE-18**

Document Name and/or Web Address: After the Storm: Stormwater Pollution Solutions

Description:

Flyer posted to the Town website, posted in Town Hall and distributed via mail with water bills. Flyer describes basics of stormwater runoff, the problems it can cause, and how residents can help.

Targeted Audience: Residents/Businesses/Insitutional

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Number of flyers distributed.

Message Date(s): Permit Year 3

BMP: Water Flyer

BMP Number (Optional) **PE-19**

Document Name and/or Web Address: "25 Things You Can Do to Prevent Water Waste"

Description:

Flyer describing 25 ways to prevent water waste distributed via water bills

Targeted Audience: Residents

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Number of residents who received.

Message Date(s): Flyer was distributed to 2,623 residents through water bills sent in the mail during Permit Year 3.

BMP: Pollution Flyer

BMP Number (Optional) **PE-20**

Document Name and/or Web Address: "Tips for Preventing Pollution"

Description:

EPA flyer distributed with Town water bills describing tips to prevent pollution.

Targeted Audience: Residents/Businesses/Institutional

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Number of flyers distributed.

Message Date(s): Flyers were distributed in the mail with quarterly water bills to 2,623 Town Residents during Permit Year 3.

BMP:Brochure/Flyer Distribution

BMP Number (Optional) **PE-21**

Document Name and/or Web Address: Septic Maintenance

Description:

A flyer describing the proper orientation and maintenance of a septic system.

Targeted Audience: Residents

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Number of flyers distributed, measured as number of NPDES permits

Message Date(s): Mailed to 2,500 residents, posted to the Town's website, and distributed with quarterly water bills during Permit Year 3. The Town mailed out 3,266 flyers to residents during Permit Year 4. In Permit Year 6, the Town mailed flyers to 3,266 residents in November 2023.

BMP: Stormwater Pollution Prevention Guide for Homeowners

BMP Number (Optional) **PE-22**

Document Name and/or Web Address: "Stormwater Pollution Prevention Guide for Homeowners"

Description:

A flyer was created to distribute stormwater pollution prevention tips for homeowners. It included a variety of topics including: pet waste, lawn and garden, homes/businesses, automotive repair, and swimming pools and hot tubs.

https://www.townofblackstone.org/sites/g/files/vyhlif166/f/news/stormwater_pollution_prevention_for_homeowners_0.pdf

Targeted Audience: Residents/Businesses

Responsible Department/Parties: DPW

Measurable Goal(s):

Number of site visits.

Message Date(s): The flyer was posted to the Town's website during Permit Year 3 and maintained on the website throughout the duration of Permit Year 4. The flyer was also mailed to residents during Permit Year 4.

BMP:Website

BMP Number (Optional) **PE-23**

Document Name and/or Web Address: "MS4 Spring Stormwater Tips"

Description:

A spring messaging posted onto the Town's website providing information on a variety of topics, including: lawn care/chemicals/fertilizer, car washing, pet waste, and native plants.

https://www.townofblackstone.org/water-division/urgent-alerts/mas4-spring-stormwater-tips-2022
https://www.townofblackstone.org/water-division/urgent-alerts/ms4-spring-stormwater-tips-2023

Targeted Audience: Residents

Responsible Department/Parties: DPW

Measurable Goal(s):

Number of site visits

Message Date(s): Posted during Permit Years 4 and 5 and maintained on the Town website. Also mailed to 3,346 residents with the quarterly water bills in Permit Year 5 in March 2023.

BMP: Industrial Flyer

BMP Number (Optional) **PE-24**

Document Name and/or Web Address: Industrial Sites Pamphlet

Description:

Flyer detailing stormwater pollution prevention tips for industrial sites in topics such as illicit discharges,

erosion prevention, dust control, SWPPPs, salt storage, employee training and spill prevention response procedures.

Targeted Audience: Industrial facilities

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Number of flyers distributed

Message Date(s): The flyer was distributed to all industrial sites in Permit Year 4. In Permit Year 6, an informational pamphlet was made available at the Building Department.

BMP:Flyer Distribution

BMP Number (Optional) **PE-25**

Document Name and/or Web Address: "A Resident's Guide to Understanding Stormwater"

Description:

Flyer detailing stormwater runoff, the effects of polluted stormwater runoff, and stormwater pollution prevention tips for lawn care, auto care, septic systems, pet waste, and residential landscaping.

Targeted Audience: Residents/Businesses

Responsible Department/Parties: DPW

Measurable Goal(s):

Number of flyers distributed

Message Date(s): The flyer was mailed to 3,346 residents in Permit Year 5.

BMP:Website

BMP Number (Optional) **PE-26**

Document Name and/or Web Address: "MS4 Fall Stormwater Tips"

Description:

A fall messaging posted onto the Town's website providing information on a variety of topics, including: lawn care/chemicals/fertilizer, car washing, pet waste, and native plants.
https://www.townofblackstone.org/water-division

Targeted Audience: Residents

Responsible Department/Parties: DPW

Measurable Goal(s):

Number of site visits

Message Date(s): Posted in September 2022 during Permit Year 5 and maintained on website until the winter message.

BMP:Website

BMP Number (Optional) **PE-27**

Document Name and/or Web Address: "MS4 Winter Stormwater Tips"

Description:

A winter messaging posted onto the Town's website providing information on snow melt runoff and pollution with tips on snow placement and de-icing materials.
https://www.townofblackstone.org/home/news/winter-storm-water-tips

Targeted Audience: Residents

Responsible Department/Parties: DPW

Measurable Goal(s):

Number of site visits

Message Date(s): Posted in November 2022 during Permit Year 5 and maintained on website until spring message.

BMP:Flyer Distribution

BMP Number (Optional) **PE-28**

Document Name and/or Web Address: Dog Waste and Surface Water Quality Pamphlets

Description:

Flyer detailing how dog waste contains harmful bacteria which can be washed into surface waters and kill fish and encourage weed and algae growth. The flyer encourages proper management and disposal of pet waste.

Targeted Audience: Residents

Responsible Department/Parties: DPW

Measurable Goal(s):

Number distributed

Message Date(s): During Permit Year 5 and Permit Year 6, the Town posted flyers at the Town Clerk's office and the Blackstone Regional Animal Shelter.

BMP: Flyer

BMP Number (Optional) **PE-29**

Document Name and/or Web Address: Auto Repair and Maintenance Mailer

Description:

A flyer outlining pollutants of concern at auto repair facilities and best management practices for preventing stormwater contamination at such facilities.

Targeted Audience: Businesses, institutions and commercial facilities

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Number of flyers mailed.

Message Date(s): During Permit Year 6, the flyer was mailed to 14 applicable businesses in April 2024.

BMP: Newspaper Advertisement

BMP Number (Optional) **PE-30**

Document Name and/or Web Address: Monthly Dog Waste Ad in Blackstone Enlightener

Description:

A monthly advertisement included in the Blackstone Enlightener encouraging dog owners to properly dispose of pet waste.

Targeted Audience: Residents

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Information was maintained in the Blackstone Enlightener monthly throughout the permit year.

Message Date(s): Permit Year 6

BMP: Pamphlet

BMP Number (Optional) **PE-31**

Document Name and/or Web Address: Lake Effect Pamphlet at Town Hall

Description:

Pamphlets with information about water quality, reducing and eliminating nutrients and bacteria in waterbodies, how stormwater pollution affects lake quality, and infiltration and sedimentation control were distributed at Town Hall.

Targeted Audience: Residents

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

The information was made available to all relevant parties.

Message Date(s): Permit Year 6

Add BMP

MCM 2
Public Involvement and Participation
Permit Part 2.3.3

Objective: The permittee shall provide opportunities to engage the public to participate in the review and implementation of the permittee's SWMP.

BMP: Public Review of Stormwater Management Program

BMP Number (Optional) **PP-1**

Location of Plan and/or Web Address: https://www.townofblackstone.org/DocumentCenter/View/844/Storm-Water-Management-Program-PDF

Responsible Department/Parties: Board of Selectmen, DPW

Measurable Goal(s):

Allow annual review of stormwater management plan and posting of stormwater management plan on website

---

BMP: Public Participation in Stormwater Management Program Development

BMP Number (Optional) **PP-2**

Description:

Request public feedback on stormwater management plan

Responsible Department/Parties: Board of Selectmen

Measurable Goal(s):

Allow public and Town Officials to comment on stormwater management plan annually by publishing public notice and at public meetings.

During Permit Year 3, 3 public meetings were held discussing concern about drainage problems within the Town. During Permit Year 4, residents discussed drainage issues on Blackstone St during the Selectmen's meetings.

BMP: Public Participation in Cleanups

BMP Number (Optional) **PP-3**

Document Name and/or Web Address: Earth Day Flyer April 2024

Description:

Town will hold an Annual Clean-up Day

Responsible Department/Parties: Board of Health, DPW

Measurable Goal(s):

Hold Annual Clean-up Day; The Town held the Annual Clean-up Day during Permit Year 1 (4/14/19), Permit

Year 2 (5/3/20). During Permit Year 3, the Town hosted a month-long clean-up event named "Get Bagged in Blackstone", between 4/22/2021 and 5/22/2021 where over 75 bags of trash were collected. The Town held an Earth Day Festival and Morning Cleanup event on 4/22/23 during Permit Year 5. During Permit Year 6, the Town hosted and Earth Day celebration and clean-up event on 4/20/24.

BMP: Stormwater Survey

BMP Number (Optional) **PP-4**

Document Name and/or Web Address: https://www.surveymonkey.com/r/XJFJC5R

Description:

Questionnaire to gauge understanding of stormwater related issues in the community to better inform residents and businesses. Survey asks residents and businesses about yard waste disposal, knowledge of septic tank regulations, and gauges interest in cleanup events, stormwater informational messaging and the Stormwater Management Plan.

Responsible Department/Parties: DPW

Measurable Goal(s):

Allow public feedback on stormwater informational messaging provided to residents and businesses. Posted on Town website on 2/16/23 during Permit Year 5, and maintained on the website through the duration of Permit Year 6. Responses will be used to inform public education messaging.

BMP: Connect with your Community Night

BMP Number (Optional) **PP-5**

Document Name and/or Web Address: Connect with Your Community Night Stormwater Handout - April 2024

Description:

The Town hosted a "Connect with your Community Night" at the Town library which included a meet-and-greet with the various boards and committees of the Town. Members of the DPW attended and distributed "Be Stormwater Smart" pamphlets with information about stormwater, how pollution enters the storm sewer system green infrastructure, green infrastructure, and how green infrastructure can manage the impact of stormwater.

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Offer an opportunity for the public to meet and interact with the Town staff, ask questions, and learn about the Town;s stormwater efforts. During Permit Year 6, this event was held on April 18, 2024.

Add BMP

MCM 3
Illicit Discharge Detection and Elimination (IDDE) Program

Permit Part 2.3.4

Objective: The permittee shall implement an IDDE program to systematically find and eliminate illicit sources of non-stormwater discharges to its municipal separate storm sewer system and implement procedures to prevent such discharges.

Examples and Templates:
IDDE Program Template and SOPs

Other templates relevant to IDDE can be found here: https://www.epa.gov/npdes-permits/stormwater-tools-new-england#idde

BMP: IDDE Legal Authority

BMP Number (Optional) **ID-1** **Completed** (by May 1, 2008) ☒

Ordinances Link or Reference: https://www.ecode360.com/15990110

Department Responsible for Enforcement: Town Administrator and DPW

BMP: Sanitary Sewer Overflow (SSO) Inventory

BMP Number (Optional) **ID-2** **Completed** (by year 1) ☒

Document Name and/or Web Address: 2019 IDDE Plan

Description:

Develop SSO inventory in accordance of permit conditions and update annually

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Annually track and report the following SSO information: the location; a clear statement of whether the discharge entered a surface water directly or entered the MS4; date(s) and time(s) of each known SSO occurrence; estimated volume(s) of the occurrence; description of the occurrence indicating known or suspected cause(s); mitigation and corrective measures completed with dates implemented; and mitigation and corrective measures planned with implementation schedules. Update inventory as needed.

There were no SSOs reported in Permit Years 1, 2, 3, 4, 5, or 6.

SSO Reporting:

In the event of an overflow or bypass, a notification must be reported within 24 hours by phone to MassDEP, EPA, and other relevant parties. Follow up the verbal notification with a written report following MassDEP's Sanitary Sewer Overflow (SSO)/Bypass notification form within 5 calendar days of the time you become aware of the overflow, bypass, or backup.

The MassDEP contacts are:	The EPA contacts are:
Northeast Region (978) 694-3215 205B Lowell Street Wilmington, MA 01887 Central Region (508) 792-7650 8 New Bond Street Worcester, MA 01606 Southeast Region (508) 946-2750 20 Riverside Drive Lakeville, MA 02347 Western Region (413) 784-1100 436 Dwight Street Springfield, MA 01103 24-hour Emergency Line 1-888-304-1133	EPA New England (617) 918-1510 5 Post Office Square Boston, MA 02109

BMP: Map of Storm Sewer System

BMP Number (Optional) **ID-3**

Phase I Completed (by year 2) ☒

Phase II Completed (by year 10) ☐

Document Location and/or Web Address:

Description:

Create map of outfalls, receiving waters, open channel conveyances, interconnections, catch basins, municipally-owned BMPs, catchment delineations, and drainage manholes in the Town of Blackstone and update during IDDE program completion.

Responsible Department/Parties: DPW Operations, Planning Board

Measurable Goal(s):

Map 100% of outfalls and receving waters, open channel conveyances, interconnections with other MS4s and other storm sewer systems, municipally-owned stormwater treatment structures, waterbodies identified by name and indication of all use impairments, and initial catchment delineations within 2 years of the permit's effective date. Map 100% of outfall spatial locations, pipes, manholes, catch basins, refined catchment delineations, municipal sanitary sewer system (if available), and municipal combined sewer system (if applicable) within 10 years of the permit's effective date.

BMP: IDDE Program

BMP Number (Optional) **ID-4**

Written Document Completed (by year 1) ☒

Document Name and/or Web Address: 2019 IDDE Plan

Description:

Create written IDDE program, implement IDDE program and conduct outfall screening. Complete initial outfall ranking.

Responsible Department/Parties: DPW Operations/Consultant Support

Measurable Goal(s):

Conduct 100% of outfall screening on High and Low Priority Outfalls within 3 years of the permit's effective date. Complete catchment investigations for 100% of the Problem Outfalls within 7 years of the permit's effective date. Complete 100% of all catchment investigations within 10 years of the permit's effective date.

The outfall/interconnection inventory and initial ranking and the dry weather outfall and interconnection screening and sampling results can be found:

Outfall Ranking Memo

BMP: Employee Training

BMP Number (Optional) **ID-5**

Description:

Train employees on IDDE implementation.

Responsible Department/Parties: Board of Selectmen

Measurable Goal(s):

Training occurs annually. During Permit Year 6, training was conducted in December 2023. Municipal employees attended the following additional trainings during Permit Year 6: NPDES Stormwater Webcast: Building a Local Program to Maintain Your Stormwater Practices (June 2024); eCampus Webinar Series: Common Stormwater Violations and Tips to Avoid Them (February 2024).

BMP: Dry Weather Screening

BMP Number (Optional) **ID-6** **Completed** ☒

Document Name and/or Web Address: Outfall Sampling Memo

Description:

Conduct dry weather screening

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Complete 3 years after effective date of permit. Completed during Permit Year 3, and additional outfalls and interconnections screened during Permit Year 5.

BMP: Wet Weather Screening

BMP Number (Optional) **ID-7** **Completed** ☐

Document Name and/or Web Address:

Description:

Conduct wet weather screening

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Complete 10 years after effective date of permit.

BMP: Outfall Screening

BMP Number (Optional) **ID-8** **Completed** ☐

Document Name and/or Web Address:

Description:

Ongoing screening

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Complete ongoing outfall screening upon completion of IDDE program

---

BMP: System Improvement Plan

BMP Number (Optional) **ID-9** **Completed** ☐

Document Name and/or Web Address:

Description:

Implement system improvement plan

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Evaluate repair costs and prioritize upgrades based on needs and cost. Upgrades and improvements are completed as funding becomes available to the Town.

BMP: Capital Improvement Plan

BMP Number (Optional) **ID-10** **Completed** ☒

Document Name and/or Web Address: https://www.townofblackstone.org/527/Assessments-Budget-Capital

Description:

Capital Improvement Plan

Responsible Department/Parties: DPW, Board of Selectmen, Finance Committee

Measurable Goal(s):

Propose fund and complete drainage capital improvements based on needs and funds. The Capital Improvement Plan was completed during Permit Year 5.

BMP:

BMP Number (Optional) **Completed** ☐

Document Name and/or Web Address:

Description:

Responsible Department/Parties:

Measurable Goal(s):

Add BMP

MCM 4
Construction Site Stormwater Runoff Control
Permit Part 2.3.5

Objective: The objective of an effective construction stormwater runoff control program is to minimize or eliminate erosion and maintain sediment on site so that it is not transported in stormwater and allowed to discharge to a water of the U.S. through the permittee's MS4.

Examples and Templates:
Examples and templates relevant to MCM 4, including model ordinances and site inspection templates, can be found here: https://www.epa.gov/npdes-permits/stormwater-tools-new-england#csrc

BMP: Sediment and Erosion Control Ordinance

BMP Number (Optional) **CS-1** **Completed** (by May 1, 2008) ☒

Ordinances Link or Reference: https://ecode360.com/15990110#15990194

Department Responsible for Enforcement: Planning Board, Building Department

---

BMP: Site Plan Review Procedures

BMP Number (Optional) **CS-2** **Written procedures completed** (by year 1) ☒

Document Name and/or Web Address: https://ecode360.com/8904547#8904549

Description:

Complete written procedures of site plan review and begin implementation

Responsible Department/Parties: Planning Board, Building Department

Measurable Goal(s):

Conduct site plan review of 100% of projects according to the procedures outlined above.

BMP: Site Inspections and Enforcement of Sediment and Erosion Control Measures Procedures

BMP Number (Optional) **CS-3** **Completed** (by year 1) ☒

Document Name and/or Web Address: https://ecode360.com/15990194#15990234

Description:

Complete written procedures of site inspections and enforcement procedures

Responsible Department/Parties: Planning Board, Building Department

Measurable Goal(s):

Inspect 100% of construction sites as outlined in the above document and take enforcement actions as needed.

BMP: Waste Control

BMP Number (Optional) **CS-4** **Completed** ☒

Document Name and/or Web Address: http://www.ecode360.com/15990194

Description:

Adoption of requirements to control wastes, including but not limited to, discarded building materials, concrete truck washout, chemicals, litter, and sanitary washes.

Responsible Department/Parties: Board of Health, DPW

Measurable Goal(s):

Complete within 1 year of the effective date of permit

Add BMP

MCM 5
Post Construction Stormwater Management in New Development and Redevelopment

Permit Part 2.3.6

Objective: The objective of an effective post construction stormwater management program is to reduce the discharge of pollutants found in stormwater to the MS4 through the retention or treatment of stormwater after construction on new or redeveloped sites and to ensure proper maintenance of installed stormwater controls.

Examples and Templates:
Examples and templates relevant to MCM 5, including model ordinances and bylaw review templates and guidance can be found here: https://www.epa.gov/npdes-permits/stormwater-tools-new-england#pcsm

BMP: Post-Construction Ordinance

BMP Number (Optional) **PC-1** **Completed** (by year 2) ☒

Town Ordinances Link or Reference: http://www.ecode360.com/15990110

Department Responsible for Enforcement: Planning Board, Building Department, DPW

BMP: Street Design and Parking Lot Guidelines Report

BMP Number (Optional) **PC-2** **Completed** (by year 4) ☒

Document Name and/or Web Address: MS4 Land Use Regulatory Review Memo

Description:

Develop a report assessing requirements that affect the creation of impervious cover. The assessment will help determine if changes to design standards for streets and parking lots can be modified to support low impact design options.

Responsible Department/Parties: Planning Board, Building Department, DPW

Measurable Goal(s):

The report was completed during Permit Year 4. Recommendations included in this report are planned for adoption in Permit Year 7.

BMP: Green Infrastructure Report

BMP Number (Optional) **PC-3** **Completed** (by year 4) ☒

Document Name and/or Web Address: MS4 Land Use Regulatory Review Memo

Description:

Develop a report assessing existing local regulations to determine the feasibility of making green infrastructure practices allowable when appropriate site conditions exist.

Responsible Department/Parties: Planning Board, Building Department, DPW

Measurable Goal(s):

The report was completed during Permit Year 4. Recommendations included in this report are planned for adoption in Permit Year 7.

BMP: List of Municipal Retrofit Opportunities

BMP Number (Optional) **PC-4** **Completed** (by year 4) ☒

Document Name and/or Web Address: Stormwater Retrofit Plan

Description:

Identify at least 5 permittee-owned properties that could be modified or retrofitted with BMPs to reduce impervious areas and update annually.

Responsible Department/Parties: Planning Board, Building Department, DPW

Measurable Goal(s):

The list is completed by July 1, 2021 and updated as needed. The preliminary list was completed during Permit Year 4.

BMP: As-built plans for on-site stormwater control

BMP Number (Optional) **PC-5** **Completed** ☒

Document Name and/or Web Address: https://ecode360.com/15990110#15990248

Description:

The procedures to require submission of as-built drawings and ensure long term operation and maintenance will be added to the Storm Water Bylaw.

Responsible Department/Parties: Planning Board, Building Department, DPW

Measurable Goal(s):

Require and track submission of as-built plans for completed projects.

BMP: Retention and Treatment Requirements

BMP Number (Optional) **PC-6** **Completed** ☐

Document Name and/or Web Address: https://ecode360.com/8906364#8906364

Description:

Ensure any stormwater controls or management practices for new development and redevelopment meet the retention or treatment requirements of the permit and all applicable requirements of the Massachusetts Stormwater Handbook

Responsible Department/Parties: Planning Board, Building Department, DPW, Board of Selectmen

Measurable Goal(s):

Adoption, amendment, or modification of a regulatory mechanism to meet permit requirements. Complete by

Permit Year 5. The Town is in the process of adopting Stormwater Rules and Regulations to address gaps in the Town's compliance with the post-construction stormwater regulatory requirements of the MS4 Permit. The Stormwater Rules and Regulations are expected to be adopted by December 2024 in Permit Year 7.

Add BMP

MCM 6
Good Housekeeping and Pollution Prevention for Permittee Owned Operations

Permit Part 2.3.7

Objective: The permittee shall implement an operations and maintenance program for permittee-owned operations that has a goal of preventing or reducing pollutant runoff and protecting water quality from all permittee-owned operations.

Examples and Templates:
Examples and templates relevant to MCM 6, including SOP templates for catch basin cleaning, street sweeping, vehicle maintenance, parks and open space management, winter deicing, and Stormwater Pollutoin Prevention Plans can be found here: https://www.epa.gov/npdes-permits/stormwater-tools-new-england#gh

PERMITTEE OWNED FACILITIES

BMP: Parks and Open Spaces Operations and Maintenance Procedures

BMP Number (Optional) **GH-1** **Written Document Completed** (by year 2) ☒

Document Name and/or Web Address: Blackstone Municipal Inventory

Description:

Create written O&M procedures including all requirements contained in 2.3.7.a.ii for parks and open spaces, buildings and facilities, and vehicles and equipment. These plans will include procedures to properly manage grass cuttings and leaf litter, including blowing organic waste onto adjacent impervious surfaces

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Implement the SOP listed above on 100% of the parks and open spaces.

Properties List (Optional)**:**

BMP: Buildings and Facilities Operations and Maintenance Procedures

BMP Number (Optional) **GH-2** **Written Document Completed** (by year 2) ☒

Document Name and/or Web Address: Blackstone Municipal Inventory

Description:

Create written Operations and Maintenance procedures for buildings and facilities. These plans will include procedures to properly manage grass cuttings and leaf litter, including blowing organic waste onto adjacent impervious surfaces.

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Implement the SOP listed above on 100% of buildings and facilities.

Properties List (Optional)**:**

BMP: Vehicles and Equipment Operations and Maintenance Procedures

BMP Number (Optional) **GH-3** **Written Document Completed** (by year 2) ☒

Document Name and/or Web Address: Blackstone Municipal Inventory

Description:

Create written Operations and Maintenance procedures for vehicles and equipment.

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Implement the SOP listed above for 100% of vehicles and equipment according to the above document.

Properties List (Optional)**:**

INFRASTRUCTURE

BMP: Infrastructure Operations and Maintenance Procedures

BMP Number (Optional) **GH-4** **Written Procedure Completed** (by year 2) ☐

Document Name and/or Web Address:

Description:

Establish and implement program for repair and rehabilitation of MS4 infrastructure

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

100% of infrastructure is maintained to ensure proper function in accordance with the procedures above. The Town of Blackstone has O&M plans for the following: Parks/Open Spaces, Buildings and Facilities, and Municipal Vehicles and Equipment. The Town currently implements maintenance procedures for permittee owned facilities in accordance to the written O&M plans and will be developing O&M plans for Structural Stormwater BMPs, Winter Road Maintenance, and Street Sweeping Operations in Permit Year 7. The Town currently implements standard procedures for winter road maintenance and street sweeping. The Town currently implements MS4 infrastructure maintenance procedures as needed.

BMP: Catch Basin Cleaning Program

BMP Number (Optional) **GH-5** **Written Procedure Completed** (by year 1) ☒

Document Name and/or Web Address: Blackstone Recycling Center SWPPP, SOP 3: Catch Basin Inspection and Cleaning

Description:

Establish schedule for catch basin cleaning such that each catch basin is no more than 50% full and clean catch basins on that schedule.

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

All catch basins are cleaned in accordance to the document above such that no catch basin is more than 50% full at any given time.

BMP: Street Sweeping Program

BMP Number (Optional) **GH-6** **Written Procedure Completed** (by year 1) ☐

Document Name and/or Web Address:

Description:

Sweep all streets and permittee-owned parking lots in accordance with permit conditions

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Annually sweep 100% of all streets and 50% of all municipal parking lots in accordance with the schedule listed above. The Town currently maintains a schedule to ensure that all roads are swept at least annually. Standard operating procedures for street sweeping are in development and will be completed in Permit Year 7.

BMP: Winter Road Maintenance Program

BMP Number (Optional) **GH-7** **Written Procedure Completed** (by year 1) ☐

Document Name and/or Web Address:

Description:

Establish and implement a program to minimize the use of road salt.

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Evaluate at least one salt/chloride alternative for use in the municipality. Standard operating procedures for winter road maintenance are in development and will be completed in Permit Year 7.

BMP: Stormwater Treatment Structures Inspection and Maintenance Procedures

BMP Number (Optional) **GH-8** **Completed** (by year 1) ☐

Document Name and/or Web Address:

Description:

Establish and implement inspection and maintenance procedures and frequencies for structures such as water quality swales, retention/detention basins, infiltration structures, proprietary treatment devices, or other similar structures excluding catch basins.

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Inspect and maintain 100% of treatment structures to ensure proper function. Standard operating procedures for the inspection and maintenance of structural BMPs are in development and will be completed in Permit Year 7.

BMP: SWPPP

BMP Number (Optional) **GH-9** **Completed** (by year 2) ☒

Document Name and/or Web Address: "DPW SWPPP" and "Recycling Center SWPPP"

Description:

Create SWPPPs for maintenance garages, transfer stations, and other waste-handling facilities.

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Develop and implement SWPPPs for 100% of facilities.

BMP: Inventory all town-owned parks/open spaces, buildings and facilities, and vehicles and equipment

BMP Number (Optional) **GH-10** **Completed** ☒

Document Name and/or Web Address: Blackstone Municipal Inventory

Description:

Create inventory

Responsible Department/Parties: DPW Operations

Measurable Goal(s):

Complete within 2 years of effective date of permit and implement annually.

Add BMP

Annual Evaluation

Year 1 Annual Report

Document Name and/or Web Address:

https://www.epa.gov/npdes-permits/regulated-ms4-massachusetts-communities

Year 2 Annual Report

Document Name and/or Web Address:

https://www3.epa.gov/region1/npdes/stormwater/ma/reports/2020/blackstone-ma-ar20.pdf

Year 3 Annual Report

Document Name and/or Web Address:

https://www3.epa.gov/region1/npdes/stormwater/ma/reports/2021/BLACKSTONE_MA_AR21.pdf

Year 4 Annual Report

Document Name and/or Web Address:

Blackstone, MA - Year 4 MS4 Annual Report - Signed

Year 5 Annual Report

Document Name and/or Web Address:

Blackstone, MA - Year 5 MS4 Annual Report - Final - Signed

Year 6 Annual Report

Document Name and/or Web Address:

Blackstone, MA - Year 6 MS4 Annual Report - Final Signed

Add a Year

TMDLs and Water Quality Limited Waters

Select the applicable Impairment(s) and/or TMDL(s).

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 and Pathogen ☐ Metals ☐ Nitrogen ☒ Phosphorus

Clear Impairments and TMDLs

Bacteria/Pathogens

Combination of Impaired Waters Requirements and TMDL Requirements as Applicable

Applicable Receiving Waterbody(ies)	TMDL Name (if applicable)	Add/Delete Row
Blackstone River (MA51-06)	Draft Pathogen TMDL for the Blackstone River Watershed	+ -
Mill River (MA51-36)	Draft Pathogen TMDL for the Blackstone River Watershed	+ -
Fox Brook (MA51-39)	Draft Pathogen TMDL for the Blackstone River Watershed	+ -

Annual Requirements Beginning Year 1

Rank outfalls to these receiving waters as high priority for IDDE implementation in the initial outfall ranking

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

ID-4

Public Education and Outreach

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

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

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

PE-1, PE-5, PE-12 , PE-22, PE-23, PE-25, PE-26, PE-28, PE-30

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

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

PE-5, PE-12

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

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

PE-21, PE-25

Nitrogen

Combination of Impaired Waters Requirements and TMDL Requirements as Applicable

Applicable Receiving Waterbody(ies)	**TMDL Name** (if applicable)	**Add/Delete Row**
N/A		+ -

Annual Requirements Beginning Year 1

Public Education and Outreach

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

Distribute an annual message in the spring (April/May) that encourages the proper use and disposal of grass clippings and encourages the proper use of slow-release fertilizers

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

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

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

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

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Good Housekeeping and Pollution Prevention for Permittee Owned Operations

---

Establish requirements for the use of slow release fertilizers on permittee owned property currently using fertilizer, in addition to reducing and managing fertilizer use as provided in part 2.3.7.1

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Establish procedures to properly manage grass cuttings and leaf litter on permittee property, including prohibiting blowing organic waste materials onto adjacent impervious surfaces

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Increase 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)

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Nitrogen Reduction Tracking BMP

Any structural BMPs listed in Table 3 of Attachment 1 to Appendix H already existing or installed in the regulated area by the permittee or its agents shall be tracked and the permittee shall estimate the nitrogen removal by the BMP consistent with Attachment 1 to Appendix H. .

The BMP type, total area treated by the BMP, the design storage volume of the BMP and the estimated nitrogen removed in mass per year by the BMP is found in the following document or website and is updated yearly at a minimum:

N/A

Requirements Due by Year 2

Stormwater Management in New Development and Redevelopment

The requirement for adoption/amendment of the permittee's ordinance or other regulatory mechanism shall include a requirement that new development and redevelopment stormwater management BMPs be optimized for nitrogen removal

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Requirements Due by Year 4

Complete a Nitrogen Source Identification Report

The document name (if attached) and/or web address is/are:

N/A

Stormwater Management in New Development and Redevelopment

Retrofit inventory and priority ranking under 2.3.6.1.b. shall include consideration of BMPs to reduce nitrogen discharges

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Requirements Due by Year 5

Potential Structural BMPs

Evaluate all permittee-owned properties identified as presenting retrofit opportunities or areas for structural BMP installation under Permit part 2.3.6.d.ii or identified in the Nitrogen Source Identification Report that are within the drainage area of the impaired water or its tributaries

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Complete a listing of planned structural BMPs and a plan and schedule for implementation

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Chloride

Applicable Receiving Waterbody(ies)	TMDL Name (if applicable)	Add/Delete Row
N/A		+ -

Annual Requirements Beginning Year 1

Public Education and Outreach

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

Include an annual message in November/December to private road salt applicators and commercial industrial site owners on the proper storage and application rates of winter deicing material, along with the steps that can be taken to minimize salt use and protect local waterbodies

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

N/A

Requirements Due by Year 3

Develop a Salt Reduction Plan

The document name (if attached) and/or web address is/are:

N/A

Requirements Due by Year 4

Continue implementation of the Salt Reduction Plan

Requirements Due by Year 5

Fully implement the Salt Reduction Plan

Solids, Oil and Grease (Hydrocarbons), or Metals

Combination of Impaired Requirements and TMDL Requirements as Applicable

Applicable Receiving Waterbody(ies)	TMDL Name (if applicable)	Add/Delete Row
Blackstone River (MA51-06)	N/A	+ -

Annual Requirements Beginning Year 1

Rank outfalls to these receiving waters as high priority for IDDE implementation in the initial outfall ranking

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

ID-4

Good Housekeeping and Pollution Prevention for Permittee Owned Operations

---

Increase street sweeping frequency of all municipal owned streets and parking lots to a schedule to target areas with potential for high pollutant loads

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

The written Street Sweeping O&M Plan to be developed in Permit Year 7 will include a schedule for targeting areas with a potential for high pollutant loads. This will be incorporated into GH-6.

Prioritize inspection and maintenance for catch basins to ensure that no sump shall be more than 50 percent full; Clean catch basins more frequently if inspection and maintenance activities indicate excessive sediment or debris loadings

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

GH-5

Requirements Due by Year 2

Stormwater Management in New Development and Redevelopment

Stormwater management systems designed on commercial and industrial land use area draining to the water quality limited water body shall incorporate designs that allow for shutdown and containment where appropriate to isolate the system in the event of an emergency spill or other unexpected event

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

Not yet completed, expected to be completed by Year 7.

Phosphorus

Combination of Impaired Waters Requirements and TMDL Requirements as Applicable

Applicable Receiving Waterbody(ies)	TMDL Name (if applicable)	Add/Delete Row
Blackstone River (MA51-06)	N/A	+ -

Annual Requirements Beginning Year 1

Public Education and Outreach

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

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

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

PE-9, PE-23, PE-25

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

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

PE-1, PE-30

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

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

PE-9, PE-26

Good Housekeeping and Pollution Prevention for Permittee Owned Operations

---

Increase 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)

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

GH-6

Establish procedures to properly manage grass cuttings and leaf litter on permittee property, including prohibiting blowing organic waste materials onto adjacent impervious surfaces

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

GH-2

In the Town's Code, it establishes that litter, which definition includes "grass clipping or other lawn or garden waste", is prohibited from being deposited "in or upon any street, sidewalk or other public place within this municipality except in public receptacles or in authorized private receptacles for collection."

https://ecode360.com/8903736#8903737

Stormwater Management in New Development and Redevelopment

Retrofit inventory and priority ranking under 2.3.6.1.b. shall include consideration of BMPs to reduce phosphorus discharges

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

PC-4

Phosphorus Reduction Tracking BMP

Any structural BMPs listed in Table 3 of Attachment 1 to Appendix H already existing or installed in the regulated area by the permittee or its agents shall be tracked and the permittee shall estimate the phosphorus removal by the BMP consistent with Attachment 1 to Appendix H.

The BMP type, total area treated by the BMP, the design storage volume of the BMP and the estimated phosphorus removed in pass per year by the BMP is found in the following document or website and is updated yearly at a minimum:

The Town is actively working on identifying a suitable site for installation of a structural BMP in the Blackstone River watershed.

The Town of Blackstone does not currently have any impaired water bodies with an approved TMDL for phosphorus. However, the Town does have direct discharges to water bodies that are impaired for phosphorus without an approved TMDL. Appendix H does not require permittees to estimate the amount of phosphorus removed by existing structural BMPs - that is only a requirement for permittees discharging to a waterbody with an existing TMDL for phosphorus and therefore not applicable to Blackstone.

Requirements Due by Year 2

Stormwater Management in New Development and Redevelopment

The requirement for adoption/amendment of the permittee's ordinance or other regulatory mechanism shall include a requirement that new development and redevelopment stormwater management BMPs be optimized for phosphorus removal

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

Not yet completed, expected to be completed by Year 7 with adoption of the Stormwater Rules and Regulations.

Requirements Due by Year 4

Complete a Phosphorus Source Identification Report

The document name (if attached) and/or web address is/are:

Draft completed during Permit Year 4. The document is titled "Blackstone PSIR".

Stormwater Management in New Development and Redevelopment

Retrofit inventory and priority ranking under 2.3.6.1.b. shall include consideration of BMPs that infiltrate stormwater where feasible

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

Completed during Permit Year 4. The document is titled "Stormwater Retrofit Plan".

Requirements Due by Year 5

Potential Structural BMPs

Evaluate all permittee-owned properties identified as presenting retrofit opportunities or areas for structural BMP installation under Permit part 2.3.6.d.ii or identified in the Phosphorus Source Identification Report that are within the drainage area of the impaired water or its tributaries

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

Completed during Permit Year 5. The document is titled "Blackstone Phase II PSIR".

Complete a listing of planned structural BMPs and a plan and schedule for implementation

The relevant BMP number(s) listed above in the Stormwater Management Program OR the description of implementation actions and document location(s) are:

The Town's draft of its Phase II PSIR includes a list of potential sites for BMPs. BMPs will be implemented as funding allows.

Charles River Watershed Phosphorus TMDL

PCP Phase	Document Location
I (completed by year 5)	N/A
II (completed by year 10)	N/A
III (completed by year 15)	N/A

Lake and Pond Phosphorus TMDL

Begin Phase 1 of the Lake Phosphorus Control Plan during year 1 and complete by year 5.

Applicable Receiving Waterbody(ies)	PCP Complete	Document Location	Add/Delete Row
N/A	☐		+ -

Appendix A- Blackstone Authorization Letter

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
5 POST OFFICE SQUARE, SUITE 100
BOSTON, MA 02109-3912

VIA EMAIL

June 26, 2019

Daniel M. Keyes
Town Administrator

And;

James Sullivan
Superintendent of Public Works
53 Elm Street
Blackstone, MA. 01504
jsullivan@townofblackstone.org

Re: National Pollutant Discharge Elimination System Permit ID #: MAR041093, Town of Blackstone

Dear James Sullivan:

The 2016 NPDES General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts (MS4 General Permit) is a jointly issued EPA-MassDEP permit. Your Notice of Intent (NOI) for coverage under this MS4 General Permit has been reviewed by EPA and appears to be complete. You are hereby granted authorization by EPA and MassDEP to discharge stormwater from your MS4 in accordance with the applicable terms and conditions of the MS4 General Permit, including all relevant and applicable Appendices. This authorization to discharge expires at midnight on **June 30, 2022.**

For those permittees that certified Endangered Species Act eligibility under Criterion C in their NOI, this authorization letter also serves as EPA's concurrence with your determination that your discharges will have no effect on the listed species present in your action area, based on the information provided in your NOI.

As a reminder, your first annual report is due by **September 30, 2019** for the reporting period from May 1, 2018 through June 30, 2019.

Information about the permit and available resources can be found on our website: https://www.epa.gov/npdes-permits/massachusetts-small-ms4-general-permit. Should you have

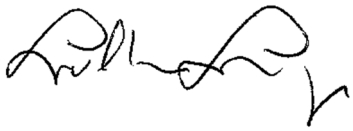
any questions regarding this permit please contact Newton Tedder at tedder.newton@epa.gov or (617) 918-1038.

Sincerely,



Thelma Murphy, Chief
Stormwater and Construction Permits Section
Office of Ecosystem Protection
United States Environmental Protection Agency, Region 1

and;



Lealdon Langley, Director
Wetlands and Wastewater Program
Bureau of Water Resources
Massachusetts Department of Environmental Protection

Appendix B - Blackstone IPAC Report

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

Location

Massachusetts and Rhode Island



Local office

New England Ecological Services Field Office

(603) 223-2541
(603) 223-0104

70 Commercial Street, Suite 300
Concord, NH 03301-5094

NOT FOR CONSULTATION

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

---

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

NOT FOR CONSULTATION

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Northern Long-eared Bat Myotis septentrionalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat Perimyotis subflavus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Bald & Golden Eagles

NOT FOR CONSULTATION

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

There are likely bald eagles present in your project area. For additional information on bald eagles, refer to Bald Eagle Nesting and Sensitivity to Human Activity

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NOT FOR CONSULTATION

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Aug 31
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds elsewhere

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (▪)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

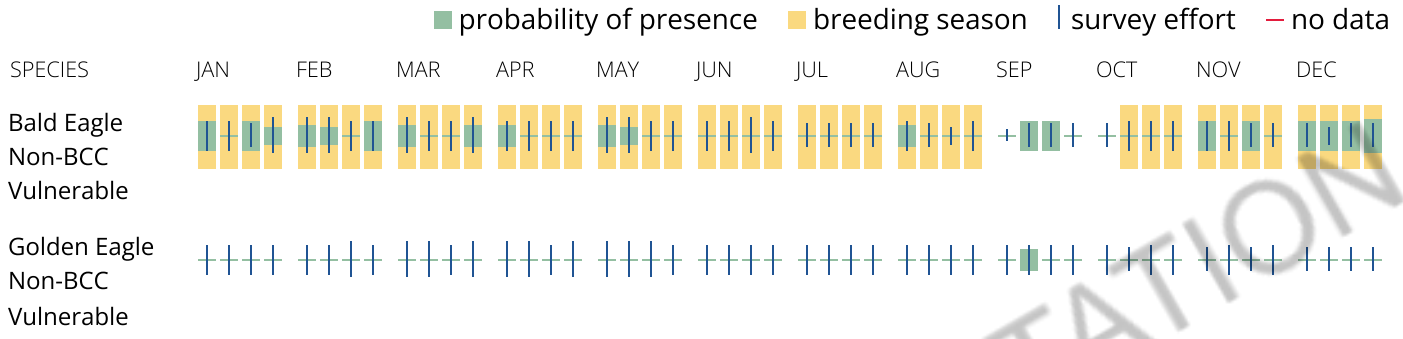
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

NOT FOR CONSULTATION

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



NOT FOR CONSULTATION

What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply). To see a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs of bald and golden eagles in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur. Please contact your local Fish and Wildlife Service Field Office if you have questions.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

NOT FOR CONSULTATION

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Aug 31
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Blue-winged Warbler *Vermivora cyanoptera* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 1 to Jun 30
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20

NOT FOR CONSULTATION

Golden Eagle Aquila chrysaetos — Breeds elsewhere

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Kentucky Warbler Geothlypis formosa — Breeds Apr 20 to Aug 20

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Lesser Yellowlegs Tringa flavipes — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9679

Pectoral Sandpiper Calidris melanotos — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Prairie Warbler Setophaga discolor — Breeds May 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Red-headed Woodpecker Melanerpes erythrocephalus — Breeds May 10 to Sep 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Rusty Blackbird Euphagus carolinus — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Scarlet Tanager Piranga olivacea — Breeds May 10 to Aug 10

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Semipalmated Sandpiper Calidris pusilla — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

NOT FOR CONSULTATION

Wood Thrush *Hylocichla mustelina* Breeds May 10 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

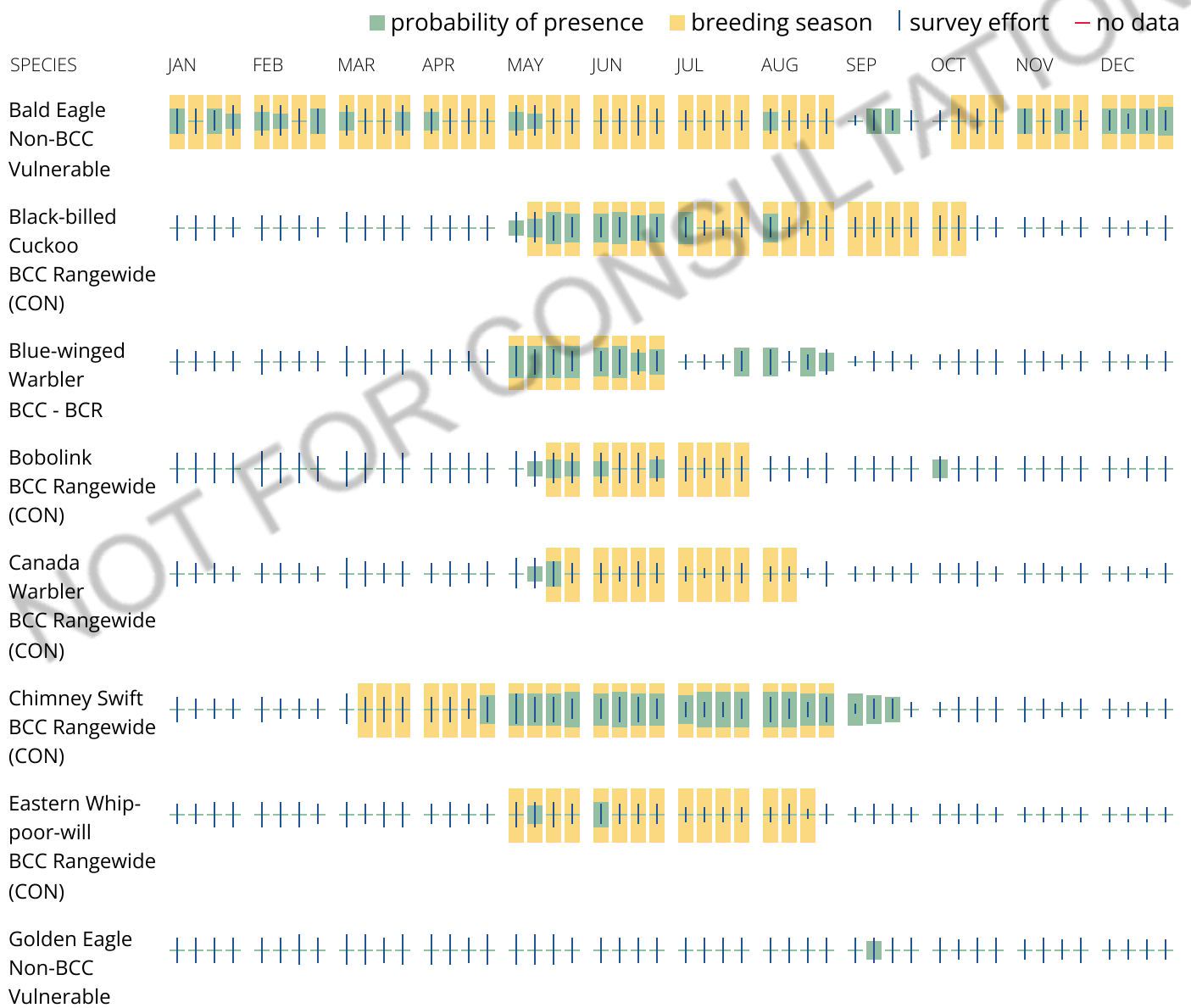
NOT FOR CONSULTATION

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

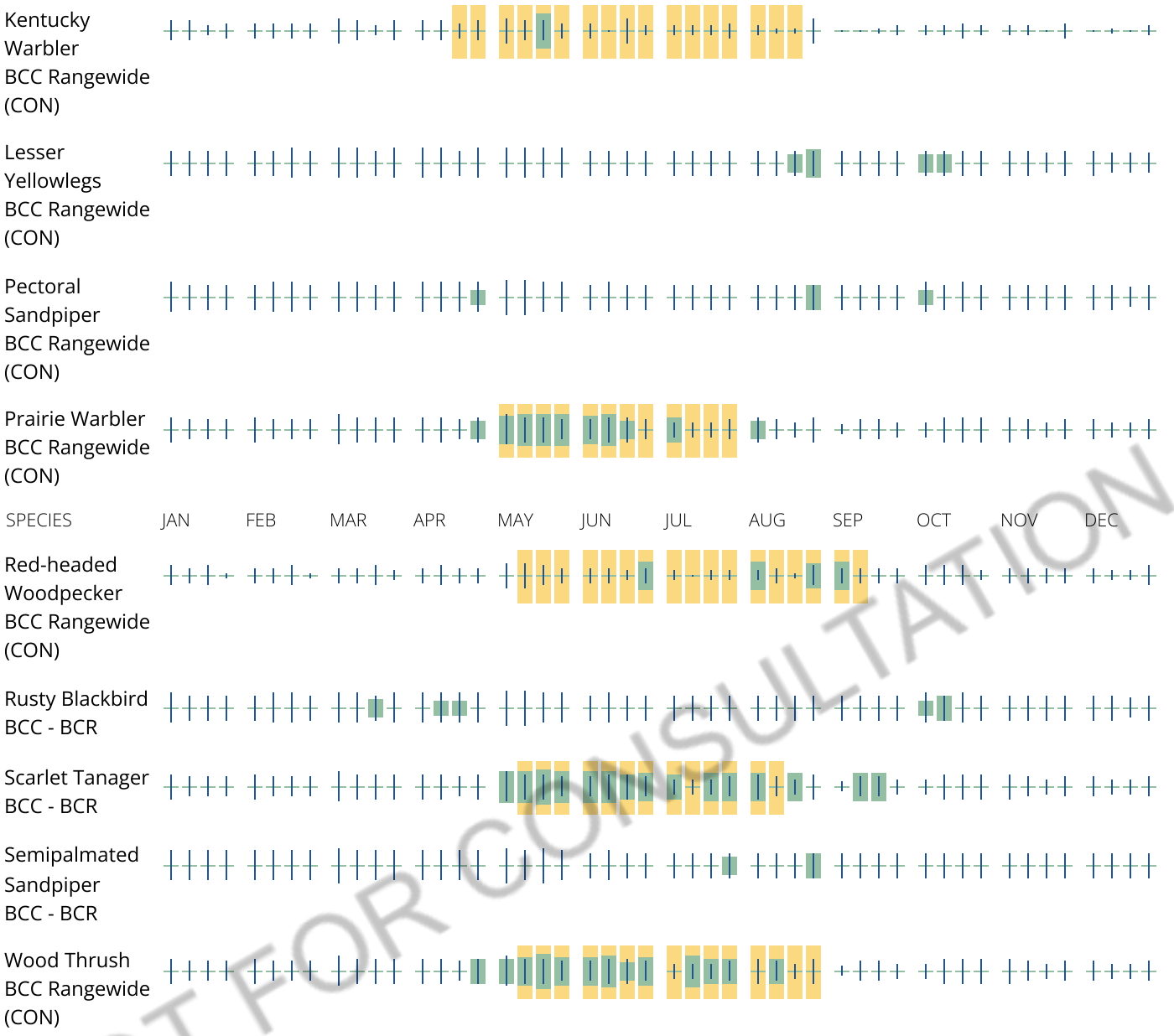
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



NOT FOR CONSULTATION



NOT FOR CONSULTATION

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

NOT FOR CONSULTATION

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

NOT FOR CONSULTATION

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

- PEM1C
- PEM1E
- PEM1F
- PEM1A

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1E
- PFO1/4E
- PSS1E
- PSS1/4C
- PFO1C
- PSS1C
- PFO1A
- PFO1/4C
- PSS1A

FRESHWATER POND

- PABH
- PABHh
- PUBH
- PUBHx

NOT FOR CONSULTATION

PUBHh

LAKE

L1UBH
L1UBHh
L2ABHh
L2ABH

RIVERINE

R2UBH
R4SBC
R5UBH
R2ABH

A full description for each wetland code can be found at the National Wetlands Inventory website

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

NOT FOR CONSULTATION

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOT FOR CONSULTATION

Appendix C - 2019 IDDE Plan

Illicit Discharge Detection and Elimination (IDDE) Plan

Town of Blackstone

Blackstone, Massachusetts

June, 2019

FUSS & O'NEILL

FUSS & O'NEILL

CMRSWC

Table of Contents

Illicit Discharge Detection and Elimination Plan
Town of Blackstone

Introduction 3
- MS4 Program 3
- Illicit Discharges 3
- Allowable Non-Stormwater Discharges 4
- Receiving Waters and Impairments 4
- IDDE Program Goals, Framework, and Timeline 5
- Work Completed to Date 7

Authority and Statement of IDDE Responsibilities 8
- Legal Authority 8
- Statement of Responsibilities 8

Stormwater System Mapping 9
- Phase I Mapping 9
- Phase II Mapping 9
- Additional Recommended Mapping Elements 11

Sanitary Sewer Overflows (SSOs) 12

Assessment and Priority Ranking of Outfalls 14
- Outfall Catchment Delineations 14
- Outfall and Interconnection Inventory and Initial Ranking 14

Dry Weather Outfall Screening and Sampling 18
- Weather Conditions 18
- Dry Weather Screening/Sampling Procedure 18
  - General Procedure 18
  - Field Equipment 19
  - Sample Collection and Analysis 20
- Interpreting Outfall Sampling Results 22
- Follow-up Ranking of Outfalls and Interconnections 23

Catchment Investigations 23
- System Vulnerability Factors 24
- Dry Weather Manhole Inspections 26
- Wet Weather Outfall Sampling 27
- Source Isolation and Confirmation 28
  - Sandbagging 28
  - Smoke Testing 29

Dye Testing 29
CCTV/Video Inspection 29
Optical Brightener Monitoring 30
IDDE Canines 30
Illicit Discharge Removal 30
Confirmatory Outfall Screening 30
Ongoing Screening 31

Training 31

Progress Reporting 31

Tables

Table 1-1. Impaired Waters 5
Table 1-2. IDDE Program Implementation Timeline 6
Table 4-1. SSO Inventory 13
Table 5-1. Outfall Inventory and Priority Ranking Matrix 17
Table 6-1. Field Equipment – Dry Weather Outfall Screening and Sampling 19
Table 6-2. Sampling Parameters and Analysis Methods 21
Table 6-3. Required Analytical Methods, Detection Limits, Hold Times, and Preservatives[1] 22
Table 6-4. Benchmark Field Measurements for Select Parameters 23
Table 7-1. Outfall Catchment System Vulnerability Factor (SVF) Inventory 25

Figures

Figure 1-1. IDDE Investigation Procedure Framework 6

Appendices

Appendix A – Legal Authority (IDDE Bylaw or Ordinance)
Appendix B – Storm System Mapping
Appendix C – Field Forms, Sample Bottle Labels, and Chain of Custody Forms
Appendix D – Water Quality Analysis Instructions, User's Manuals and Standard Operating Procedures
Appendix E – IDDE Employee Training Record
Appendix F – Source Isolation and Confirmation Methods: Instructions, Manuals, and SOPs

Introduction

MS4 Program

This Illicit Discharge Detection and Elimination (IDDE) Plan has been developed by Town of Blackstone to address the requirements of the United States Environmental Protection Agency's (USEPA's) 2016 National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) in Massachusetts, hereafter referred to as the "2016 Massachusetts MS4 Permit" or "MS4 Permit."

The 2016 Massachusetts MS4 Permit requires that each permittee, or regulated community, address six Minimum Control Measures. These measures include the following:

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination Program
4. Construction Site Stormwater Runoff Control
5. Stormwater Management in New Development and Redevelopment (Post Construction Stormwater Management); and
6. Good Housekeeping and Pollution Prevention for Permittee Owned Operations.

Under Minimum Control Measure 3, the permittee is required to implement an IDDE program to systematically find and eliminate sources of non-stormwater discharges to its municipal separate storm sewer system and implement procedures to prevent such discharges. The IDDE program must also be recorded in a written (hardcopy or electronic) document. This IDDE Plan has been prepared to address this requirement.

Illicit Discharges

An "illicit discharge" is any discharge to a drainage system that is not composed entirely of stormwater, with the exception of discharges pursuant to a NPDES permit (other than the NPDES permit for discharges from the MS4) and discharges resulting from fire-fighting activities.

Illicit discharges may take a variety of forms. Illicit discharges may enter the drainage system through direct or indirect connections. Direct connections may be relatively obvious, such as cross-connections of sewer services to the storm drain system. Indirect illicit discharges may be more difficult to detect or address, such as failing septic systems that discharge untreated sewage to a ditch within the MS4, or a sump pump that discharges contaminated water on an intermittent basis.

Some illicit discharges are intentional, such as dumping used oil (or other pollutant) into catch basins, a resident or contractor illegally tapping a new sewer lateral into a storm drain pipe to avoid the costs of a sewer connection fee and service, and illegal dumping of yard wastes into surface waters. Some illicit discharges are related to the unsuitability of original infrastructure to the modern regulatory environment. Examples of illicit discharges in this category include connected floor drains in old

buildings, as well as sanitary sewer overflows that enter the drainage system. Sump pumps legally connected to the storm drain system may be used inappropriately, such as for the disposal of floor washwater or old household products, in many cases due to a lack of understanding on the part of the homeowner.

Elimination of some discharges may require substantial costs and efforts, such as funding and designing a project to reconnect sanitary sewer laterals. Others, such as improving self-policing of dog waste management, can be accomplished by outreach in conjunction with the minimal additional cost of dog waste bins and the municipal commitment to disposal of collected materials on a regular basis.

Regardless of the intention, when not addressed, illicit discharges can contribute high levels of pollutants, such as heavy metals, toxics, oil, grease, solvents, nutrients, and pathogens to surface waters.

Allowable Non-Stormwater Discharges

The following categories of non-storm water discharges are allowed under the MS4 Permit unless the permittee, USEPA or Massachusetts Department of Environmental Protection (MassDEP) identifies any category or individual discharge of non-stormwater discharge as a significant contributor of pollutants to the MS4:

- Water line flushing
- Landscape irrigation
- Diverted stream flows
- Rising ground water
- Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20))
- Uncontaminated pumped groundwater
- Discharge from potable water sources
- Foundation drains
- Air conditioning condensation
- Irrigation water, springs
- Water from crawl space pumps
- Footing drains
- Lawn watering
- Individual resident car washing
- De-chlorinated swimming pool discharges
- Street wash waters
- Residential building wash waters without detergents

If these discharges are identified as significant contributors to the MS4, they must be considered an "illicit discharge" and addressed in the IDDE Plan (i.e., control these sources so they are no longer significant contributors of pollutants, and/or eliminate them entirely).

Receiving Waters and Impairments

Table 1-1 lists the "impaired waters" within the boundaries of Town of Blackstone's regulated area based on the Massachusetts Integrated List of Waters produced by MassDEP every two years. Impaired waters are water bodies that do not meet water quality standards for one or more designated use(s) such as recreation or aquatic habitat.

Table 1-1. Impaired Waters

Town of Blackstone, Massachusetts

Water Body Name	Segment ID	Category	Impairment(s)	Associated Approved TMDL
Blackstone River	MA51-06	5	(Other flow regime alterations), Cadmium, Copper, DDT, Lead, PCB in Fish Tissue, Phosphorous (Total), Total Suspended Solids (TSS)	N/A
Mill River	MA51-36	5	(Low flow alterations), (Non-Native Aquatic Plants), Aquatic Plants (Macrophytes), Copper, Lead	N/A

Category 4a Waters – impaired water bodies with a completed Total Maximum Daily Load (TMDL).
Category 4c Waters – impaired water bodies where the impairment is not caused by a pollutant. No TMDL required.
Category 5 Waters – impaired water bodies that require a TMDL.
"Approved TMDLs" are those that have been approved by EPA as of the date of issuance of the 2016 MS4 Permit.

IDDE Program Goals, Framework, and Timeline

The goals of the IDDE program are to find and eliminate illicit discharges to municipal separate storm sewer system and to prevent illicit discharges from happening in the future. The program consists of the following major components as outlined in the MS4 Permit:

- Legal authority and regulatory mechanism to prohibit illicit discharges and enforce this prohibition
- Storm system mapping
- Inventory and ranking of outfalls
- Dry weather outfall screening
- Catchment investigations
- Identification/confirmation of illicit sources
- Illicit discharge removal
- Followup screening
- Employee training.

The IDDE investigation procedure framework is shown in **Figure 1-1.** The required timeline for implementing the IDDE program is shown in **Table 1-2.**

Figure 1-1. IDDE Investigation Procedure Framework

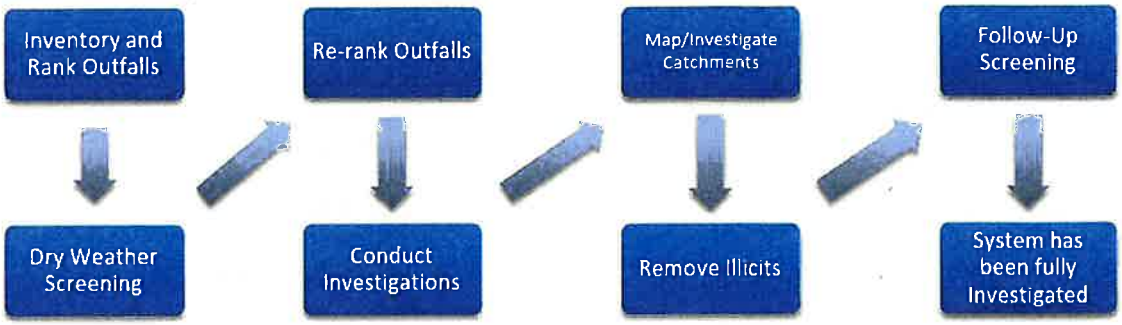


Table 1-2. IDDE Program Implementation Timeline

IDDE Program Requirement	Completion Date from Effective Date of Permit					
	1 Year	1.5 Years	2 Years	3 Years	7 Years	10 Years
Written IDDE Program Plan	X					
SSO Inventory	X					
Written Catchment Investigation Procedure		X				
Phase I Mapping			X			
Phase II Mapping						X
IDDE Regulatory Mechanism or By-law (if not already in place)				X		
Dry Weather Outfall Screening				X		
Follow-up Ranking of Outfalls and Interconnections				X		
Catchment Investigations – Problem Outfalls					X	
Catchment Investigations – all Problem, High and Low Priority Outfalls						X

Work Completed to Date

The 2003 MS4 Permit required each MS4 community to develop a plan to detect illicit discharges using a combination of storm system mapping, adopting a regulatory mechanism to prohibit illicit discharges and enforce this prohibition, and identifying tools and methods to investigate suspected illicit discharges. Each MS4 community was also required to define how confirmed discharges would be eliminated and how the removal would be documented.

The Town of Blackstone has completed the following IDDE program activities consistent with the 2003 MS4 Permit requirements:

- Developed a map of outfalls and receiving waters
- Adopted an IDDE bylaw or regulatory mechanism
- Developed procedures for locating illicit discharges (i.e., visual screening of outfalls for dry weather discharges, dye or smoke testing)
- Developed procedures for locating the source of the discharge
- Developed procedures for removal of the source of an illicit discharge
- Developed procedures for documenting actions and evaluating impacts on the storm sewer system subsequent to removal

In addition to the 2003 MS4 Permit requirements, other IDDE-related activities that may have been completed include:

- SSO inventory
- Outfall sampling
- Additional storm system mapping, including the locations of catch basins, manholes and pipe connectivity

Authority and Statement of IDDE Responsibilities

Legal Authority

The Town of Blackstone has adopted a Stormwater Management and Land Disturbance Bylaw. A copy of the Stormwater Management and Land Disturbance Bylaw is provided in **Appendix A**. The Stormwater Management and Land Disturbance Bylaw provides the Town of Blackstone with adequate legal authority to:

- Prohibit illicit discharges
- Investigate suspected illicit discharges
- Eliminate illicit discharges, including discharges from properties not owned by or controlled by the MS4 that discharge into the MS4 system
- Implement appropriate enforcement procedures and actions.

The Town of Blackstone will review its current Stormwater Management and Land Disturbance Bylaw and related land use regulations and policies for consistency with the 2016 MS4 Permit.

Statement of Responsibilities

The Director of Public Works is the lead municipal agency or department responsible for implementing the IDDE program pursuant to the provisions of the Stormwater Management and Land Disturbance Bylaw. Other agencies or departments with responsibility for aspects of the program include:

- Department of Public Works - administer, implement, and enforce Stormwater Management and Land Disturbance Bylaw
- Board of Health - ensure that their rules and regulations require compliance with the purposes of the Stormwater Management and Land Disturbance Bylaw for projects that are within their jurisdiction
- Conservation Commission - ensure that their rules and regulations require compliance with the purposes of the Stormwater Management and Land Disturbance Bylaw for projects that are within their jurisdiction
- Planning Board Chairperson - ensure that their rules and regulations require compliance with the purposes of the Stormwater Management and Land Disturbance Bylaw for projects that are within their jurisdiction
- Board of Selectmen - oversee the Director of Public Works in their roll to administer, implement, and enforce Stormwater Management and Land Disturbance Bylaw
- Town Administrator - oversee the Director of Public Works in their roll to administer, implement, and enforce Stormwater Management and Land Disturbance Bylaw

Stormwater System Mapping

The Town of Blackstone originally developed mapping of its stormwater system to meet the mapping requirements of the 2003 MS4 Permit. A copy of the existing storm system map is provided in **Appendix B**. The 2016 MS4 Permit requires a more detailed storm system map than was required by the 2003 MS4 Permit. The revised mapping is intended to facilitate the identification of key infrastructure, factors influencing proper system operation, and the potential for illicit discharges.

The 2016 MS4 Permit requires the storm system map to be updated in two phases as outlined below. The Department of Public Works is responsible for updating the stormwater system mapping pursuant to the 2016 MS4 Permit. The Town of Blackstone will report on the progress towards completion of the storm system map in each annual report. Updates to the stormwater mapping will be included in **Appendix B**.

Phase I Mapping

Phase I mapping must be completed within two (2) years of the effective date of the permit (July 1, 2019) and include the following information:

- Outfalls and receiving waters (previously required by the MS4-2003 permit)
- Open channel conveyances (swales, ditches, etc.)
- Interconnections with other MS4s and other storm sewer systems
- Municipally owned stormwater treatment structures
- Water bodies identified by name and indication of all use impairments as identified on the most recent EPA approved Massachusetts Integrated List of Waters report
- Initial catchment delineations. Topographic contours and drainage system information may be used to produce initial catchment delineations.

The Town of Blackstone has completed the following updates to its stormwater mapping to meet the Phase I requirements:

- Outfalls and receiving waters (previously required by the MS4-2003 permit)
- Open channel conveyances (swales, ditches, etc.)

The Town of Blackstone will update its stormwater mapping by July 1, 2019 to include the remaining Phase I information.

Phase II Mapping

Phase II mapping must be completed within ten (10) years of the effective date of the permit (July 1, 2027) and include the following information:

- Outfall spatial location (latitude and longitude with a minimum accuracy of +/-30 feet)
- Pipes

- Manholes
- Catch basins
- Refined catchment delineations. Catchment delineations must be updated to reflect information collected during catchment investigations.
- Municipal Sanitary Sewer system (if available)
- Municipal combined sewer system (if applicable).

The Town of Blackstone has completed the following updates to its stormwater mapping to meet the Phase II requirements:

- **Outfall spatial location (latitude and longitude with a minimum accuracy of +/-30 feet)**
- **Pipes**
- **Manholes**
- **Catch basins**

The Town of Blackstone will update its stormwater mapping by July 1, 2027 to include the remaining following Phase II information.

Additional Recommended Mapping Elements

Although not a requirement of the 2016 MS4 Permit, the Town of Blackstone may include the following recommended elements in its storm system mapping:

- Storm sewer material, size (pipe diameter), age
- Sanitary sewer system material, size (pipe diameter), age
- Privately owned stormwater treatment structures
- Where a municipal sanitary sewer system exists, properties known or suspected to be served by a septic system, especially in high density urban areas
- Area where the permittee's MS4 has received or could receive flow from septic system discharges
- Seasonal high water table elevations impacting sanitary alignments
- Topography
- Orthophotography
- Alignments, dates and representation of work completed of past illicit discharge investigations
- Locations of suspected confirmed and corrected illicit discharges with dates and flow estimates.

Sanitary Sewer Overflows (SSOs)

The 2016 MS4 Permit requires municipalities to prohibit illicit discharges, including sanitary sewer overflows (SSOs), to the separate storm sewer system. SSOs are discharges of untreated sanitary wastewater from a municipal sanitary sewer that can contaminate surface waters, cause serious water quality problems and property damage, and threaten public health. SSOs can be caused by blockages, line breaks, sewer defects that allow stormwater and groundwater to overload the system, power failures, improper sewer design, and vandalism.

Based on review of available documentation, no SSOs are known to have discharged to the MS4 within the five (5) years prior to the effective date of the 2016 MS4 Permit. Upon detection of an SSO, the Town of Blackstone will eliminate it as expeditiously as possible and take interim measures to minimize the discharge of pollutants to and from its MS4 until the SSO is eliminated. Upon becoming aware of an SSO to the MS4, the Town of Blackstone will provide oral notice to EPA within 24 hours and written notice to EPA and MassDEP within five (5) days of becoming aware of the SSO occurrence.

The inventory in **Table 4-1** will be updated by the Department of Public Works when new SSOs are detected. The SSO inventory will be included in the annual report, including the status of mitigation and corrective measures to address each identified SSO.

Table 4-1. SSO Inventory

Town of Blackstone, Massachusetts
Revision Date: May 10, 2019

SSO Location[1]	Discharge Statement[2]	Date[3]	Time Start[3]	Time End[3]	Estimated Volume[4]	Description[5]	Mitigation Completed[6]	Mitigation Planned[7]
No SSOs are known to have discharged to the MS4 within the five (5) years prior to the effective date of the 2016 MS4 Permit								

[1] Location (approximate street crossing/address and receiving water, if any)
[2] A clear statement of whether the discharge entered a surface water directly or entered the MS4
[3] Date(s) and time(s) of each known SSO occurrence (i.e., beginning and end of any known discharge)
[4] Estimated volume(s) of the occurrence
[5] Description of the occurrence indicating known or suspected cause(s)
[6] Mitigation and corrective measures completed with dates implemented
[7] Mitigation and corrective measures planned with implementation schedules

Assessment and Priority Ranking of Outfalls

The 2016 MS4 Permit requires an assessment and priority ranking of outfalls in terms of their potential to have illicit discharges and SSOs and the related public health significance. The ranking helps determine the priority order for performing IDDE investigations and meeting permit milestones.

Outfall Catchment Delineations

A catchment is the area that drains to an individual outfall[1] or interconnection.[2] The catchments for each of the MS4 outfalls will be delineated to define contributing areas for investigation of potential sources of illicit discharges. Catchments are typically delineated based on topographic contours and mapped drainage infrastructure, where available. As described in **Section 3**, initial catchment delineations will be completed as part of the Phase I mapping, and refined catchment delineations will be completed as part of the Phase II mapping to reflect information collected during catchment investigations

Outfall and Interconnection Inventory and Initial Ranking

The Department of Public Works will complete an initial outfall and interconnection inventory and priority ranking to assess illicit discharge potential based on existing information. The initial inventory and ranking will be completed within one (1) year from the effective date of the permit. An updated inventory and ranking will be provided in each annual report thereafter. The inventory will be updated annually to include data collected in connection with dry weather screening and other relevant inspections.

The outfall and interconnection inventory will identify each outfall and interconnection discharging from the MS4, record its location and condition, and provide a framework for tracking inspections, screenings and other IDDE program activities.

Outfalls and interconnections will be classified into one of the following categories:

1. **Problem Outfalls**: Outfalls/interconnections with known or suspected contributions of illicit discharges based on existing information shall be designated as Problem Outfalls. This shall

[1] **Outfall** means a point source as defined by 40 CFR § 122.2 as the point where the municipal separate storm sewer discharges to waters of the United States. An outfall does not include open conveyances connecting two municipal separate storm sewers or pipes, tunnels or other conveyances that connect segments of the same stream or other waters of the United States and that are used to convey waters of the United States. Culverts longer than a simple road crossing shall be included in the inventory unless the permittee can confirm that they are free of any connections and simply convey waters of the United States.

[2] **Interconnection** means the point (excluding sheet flow over impervious surfaces) where the permittee's MS4 discharges to another MS4 or other storm sewer system, through which the discharge is conveyed to waters of the United States or to another storm sewer system and eventually to a water of the United States.

include any outfalls/interconnections where previous screening indicates likely sewer input. Likely sewer input indicators are any of the following:

- Olfactory or visual evidence of sewage,
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine.

Dry weather screening and sampling, as described in **Section 6** of this IDDE Plan and Part 2.3.4.7.b of the MS4 Permit, is not required for Problem Outfalls.

2. **High Priority Outfalls**: Outfalls/interconnections that have not been classified as Problem Outfalls and that are:

   - Discharging to an area of concern to public health due to proximity of public beaches, recreational areas, drinking water supplies or shellfish beds
   - Determined by the permittee as high priority based on the characteristics listed below or other available information.

3. **Low Priority Outfalls**: Outfalls/interconnections determined by the permittee as low priority based on the characteristics listed below or other available information.

4. **Excluded outfalls**: Outfalls/interconnections with no potential for illicit discharges may be excluded from the IDDE program. This category is limited to roadway drainage in undeveloped areas with no dwellings and no sanitary sewers; drainage for athletic fields, parks or undeveloped green space and associated parking without services; cross-country drainage alignments (that neither cross nor are in proximity to sanitary sewer alignments) through undeveloped land.

Outfalls will be ranked into the above priority categories (except for excluded outfalls, which may be excluded from the IDDE program) based on the following characteristics of the defined initial catchment areas, where information is available. Additional relevant characteristics, including location-specific characteristics, may be considered but must be documented in this IDDE Plan.

- **Previous screening results** – previous screening/sampling results indicate likely sewer input (see criteria above for Problem Outfalls).

- **Past discharge complaints and reports.**

- **Poor receiving water quality** – the following guidelines are recommended to identify waters as having a high illicit discharge potential:
  - Exceeding water quality standards for bacteria
  - Ammonia levels above 0.5 mg/l
  - Surfactants levels greater than or equal to 0.25 mg/l

- **Density of generating sites** – Generating sites are those places, including institutional, municipal, commercial, or industrial sites, with a potential to generate pollutants that could

contribute to illicit discharges. Examples of these sites include, but are not limited to, car dealers; car washes; gas stations; garden centers; and industrial manufacturing areas.

- **Age of development and infrastructure** – Industrial areas greater than 40 years old and areas where the sanitary sewer system is more than 40 years old will probably have a high illicit discharge potential. Developments 20 years or younger will probably have a low illicit discharge potential.

- **Sewer conversion** – Contributing catchment areas that were once serviced by septic systems, but have been converted to sewer connections may have a high illicit discharge potential.

- **Historic combined sewer systems** – Contributing areas that were once serviced by a combined sewer system, but have been separated may have a high illicit discharge potential.

- **Surrounding density of aging septic systems** – Septic systems thirty years or older in residential land use areas are prone to have failures and may have a high illicit discharge potential.

- **Culverted streams** – Any river or stream that is culverted for distances greater than a simple roadway crossing may have a high illicit discharge potential.

- **Water quality limited waterbodies** that receive a discharge from the MS4 or waters with approved TMDLs applicable to the permittee, where illicit discharges have the potential to contain the pollutant identified as the cause of the water quality impairment.

Table 5-1 provides a sample format for an outfall inventory and priority ranking matrix.

Table 5-1. Outfall Inventory and Priority Ranking Matrix

Town of Blackstone, Massachusetts
Revision Date: ##DATE OF LAST UPDATE

Outfall ID	Receiving Water	Previous Screening Results Indicate Likely Sewer Input? [1]	Discharging to Area of Concern to Public Health? [2]	Frequency of Past Discharge Complaints	Receiving Water Quality [3]	Density of Generating Sites [4]	Age of Development/ Infrastructure [5]	Historic Combined Sewers or Septic? [6]	Aging Septic? [7]	Culverted Streams? [8]	Additional Characteristics	Score	Priority Ranking
Information Source		Outfall inspections and sample results	GIS Maps	Town Staff	Impaired Waters List	Land Use/GIS Maps, Aerial Photography	Land Use Information, Visual Observation	Town Staff, GIS Maps	Land Use, Town Staff	GIS and Storm System Maps	Other		
Scoring Criteria		Yes = 3 (Problem Outfall) No = 0	Yes = 3 No = 0	Frequent = 3 Occasional = 2 None = 0	Poor = 3 Fair = 2 Good = 0	High = 3 Medium = 2 Low = 1	High = 3 Medium = 2 Low = 1	Yes = 3 No = 0	Yes = 3 No = 0	Yes = 3 No = 0	TBD		
Sample 1	XYZ River	3	0	2	0	2	1	0	0	3	None	11	Problem
Sample 2	XYZ Lake	0	3	0	3	1	2	0	3	3	None	15	High Priority
Sample 3	XYZ Stream	0	0	2	0	1	1	0	0	0	None	4	Low Priority

Scoring Criteria:

[1] Previous screening results indicate likely sewer input if any of the following are true:

- Olfactory or visual evidence of sewage,
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine

[2] Outfalls/interconnections that discharge to or in the vicinity of any of the following areas: public beaches, recreational areas, drinking water supplies, or shellfish beds

[3] Receiving water quality based on latest version of MassDEP Integrated List of Waters.

- Poor = Waters with approved TMDLs (Category 4a Waters) where illicit discharges have the potential to contain the pollutant identified as the cause of the impairment
- Fair = Water quality limited waterbodies that receive a discharge from the MS4 (Category 5 Waters)
- Good = No water quality impairments

[4] Generating sites are institutional, municipal, commercial, or industrial sites with a potential to contribute to illicit discharges (e.g., car dealers, car washes, gas stations, garden centers, industrial manufacturing, etc.)

[5] Age of development and infrastructure:

- High = Industrial areas greater than 40 years old and areas where the sanitary sewer system is more than 40 years old
- Medium = Developments 20-40 years old
- Low = Developments less than 20 years old

[6] Areas once served by combined sewers and but have been separated, or areas once served by septic systems but have been converted to sanitary sewers.

[7] Aging septic systems are septic systems 30 years or older in residential areas.

[8] Any river or stream that is culverted for distance greater than a simple roadway crossing.

Dry Weather Outfall Screening and Sampling

Dry weather flow is a common indicator of potential illicit connections. The MS4 Permit requires all outfalls/interconnections (excluding Problem and excluded Outfalls) to be inspected for the presence of dry weather flow. The Department of Public Works is responsible for conducting dry weather outfall screening, starting with High Priority outfalls, followed by Low Priority outfalls, based on the initial priority rankings described in the previous section.

Weather Conditions

Dry weather outfall screening and sampling may occur when no more than 0.1 inches of rainfall has occurred in the previous 24-hour period and no significant snow melt is occurring. For purposes of determining dry weather conditions, program staff will use precipitation data from Pawtucket, North Central State Airport Weather Station. If Pawtucket, North Central State Airport Weather Station is not available or not reporting current weather data, then Norwood Memorial Airport Weather Station will be used as a back-up.

Dry Weather Screening/Sampling Procedure

General Procedure

The dry weather outfall inspection and sampling procedure consists of the following general steps:

1. Identify outfall(s) to be screened/sampled based on initial outfall inventory and priority ranking
2. Acquire the necessary staff, mapping, and field equipment (see **Table 6-1** for list of potential field equipment)
3. Conduct the outfall inspection during dry weather:
    a. Mark and photograph the outfall
    b. Record the inspection information and outfall characteristics (using paper forms or digital form using a tablet or similar device) (see form in **Appendix C**)
    c. Look for and record visual/olfactory evidence of pollutants in flowing outfalls including odor, color, turbidity, and floatable matter (suds, bubbles, excrement, toilet paper or sanitary products). Also observe outfalls for deposits and stains, vegetation, and damage to outfall structures.
4. If flow is observed, sample and test the flow following the procedures described in the following sections.
5. If no flow is observed, but evidence of illicit flow exists (illicit discharges are often intermittent or transitory), revisit the outfall during dry weather within one week of the initial observation, if practicable, to perform a second dry weather screening and sample any observed flow. Other techniques can be used to detect intermittent or transitory flows including conducting inspections during evenings or weekends and using optical brighteners.
6. Input results from screening and sampling into spreadsheet/database. Include pertinent information in the outfall/interconnection inventory and priority ranking.

7. Include all screening data in the annual report.

Previous outfall screening/sampling conducted under the 2013 MS4 Permit may be used to satisfy the dry weather outfall/screening requirements of the 2016 MS4 Permit only if the previous screening and sampling was substantially equivalent to that required by the 2016 MS4 Permit, including the list of analytes outlined in Section 2.3.4.7.b.iii.4 of the 2016 permit.

Field Equipment

Table 6-1 lists field equipment commonly used for dry weather outfall screening and sampling.

Table 6-1. Field Equipment – Dry Weather Outfall Screening and Sampling

Equipment	Use/Notes
Clipboard	For organization of field sheets and writing surface
Field Sheets	Field sheets for both dry weather inspection and Dry weather sampling should be available with extras
Chain of Custody Forms	To ensure proper handling of all samples
Pens/Pencils/Permanent Markers	For proper labeling
Nitrile Gloves	To protect the sampler as well as the sample from contamination
Flashlight/headlamp w/batteries	For looking in outfalls or manholes, helpful in early mornings as well
Cooler with Ice	For transporting samples to the laboratory
Digital Camera	For documenting field conditions at time of inspection
Personal Protective Equipment (PPE)	Reflective vest, Safety glasses and boots at a minimum
GPS Receiver	For taking spatial location data
Water Quality Sonde	If needed, for sampling conductivity, temperature, pH
Water Quality Meter	Hand held meter, if available, for testing for various water quality parameters such as ammonia, surfactants and chlorine
Test Kits	Have extra kits on hand to sample more outfalls than are anticipated to be screened in a single day
Label Tape	For labeling sample containers
Sample Containers	Make sure all sample containers are clean. Keep extra sample containers on hand at all times. Make sure there are proper sample containers for what is being sampled for (i.e., bacteria requires sterile containers).
Pry Bar or Pick	For opening catch basins and manholes when necessary
Sandbags	For damming low flows in order to take samples
Small Mallet or Hammer	Helping to free stuck manhole and catch basin covers
Utility Knife	Multiple uses
Measuring Tape	Measuring distances and depth of flow
Safety Cones	Safety
Hand Sanitizer	Disinfectant/decontaminant
Zip Ties/Duct Tape	For making field repairs
Rubber Boots/Waders	For accessing shallow streams/areas
Sampling Pole/Dipper/Sampling Cage	For accessing hard to reach outfalls and manholes

Sample Collection and Analysis

If flow is present during a dry weather outfall inspection, a sample will be collected and analyzed for the required permit parameters[3] listed in **Table 6-2**. The general procedure for collection of outfall samples is as follows:

1. Fill out all sample information on sample bottles and field sheets (see **Appendix C** for Sample Labels and Field Sheets)
2. Put on protective gloves (nitrile/latex/other) before sampling
3. Collect sample with dipper or directly in sample containers. If possible, collect water from the flow directly in the sample bottle. Be careful not to disturb sediments.
4. If using a dipper or other device, triple rinse the device with distilled water and then in water to be sampled (not for bacteria sampling)
5. Use test strips, test kits, and field meters (rinse similar to dipper) for most parameters (see **Table 6-2**)
6. Place laboratory samples on ice for analysis of bacteria and pollutants of concern
7. Fill out chain-of-custody form (**Appendix C**) for laboratory samples
8. Deliver samples to ##NAME OF LABORATORY(s)
9. Dispose of used test strips and test kit ampules properly
10. Decontaminate all testing personnel and equipment

In the event that an outfall is submerged, either partially or completely, or inaccessible, field staff will proceed to the first accessible upstream manhole or structure for the observation and sampling and report the location with the screening results. Field staff will continue to the next upstream structure until there is no longer an influence from the receiving water on the visual inspection or sampling.

Field test kits or field instrumentation are permitted for all parameters except indicator bacteria and any pollutants of concern. Field kits need to have appropriate detection limits and ranges. **Table 6-2** lists various field test kits and field instruments that can be used for outfall sampling associated with the 2016 MS4 Permit parameters, other than indicator bacteria and any pollutants of concern. Analytic procedures and user's manuals for field test kits and field instrumentation are provided in **Appendix D**.

[3] Other potentially useful parameters, although not required by the MS4 Permit, include **fluoride** (indicator of potable water sources in areas where water supplies are fluoridated), **potassium** (high levels may indicate the presence of sanitary wastewater), and **optical brighteners** (indicative of laundry detergents).

Table 6-2. Sampling Parameters and Analysis Methods

Analyte or Parameter	Instrumentation (Portable Meter)	Field Test Kit
Ammonia	CHEMetrics™ V-2000 Colorimeter Hach™ DR/890 Colorimeter Hach™ Pocket Colorimeter™ II	CHEMetrics™ K-1410 CHEMetrics™ K-1510 (series) Hach™ NI-SA Hach™ Ammonia Test Strips
Surfactants (Detergents)	CHEMetrics™ I-2017	CHEMetrics™ K-9400 and K-9404 Hach™ DE-2
Chlorine	CHEMetrics™ V-2000, K-2513 Hach™ Pocket Colorimeter™ II	NA
Conductivity	CHEMetrics™ I-1200 YSI Pro30 YSI EC300A Oakton 450	NA
Temperature	YSI Pro30 YSI EC300A Oakton 450	NA
Salinity	YSI Pro30 YSI EC300A Oakton 450	NA
Temperature	YSI Pro30 YSI EC300A Oakton 450	NA
Indicator Bacteria: *E. coli* (freshwater) or Enterococcus (saline water)	EPA certified laboratory procedure (40 CFR § 136)	NA
Pollutants of Concern[1]	EPA certified laboratory procedure (40 CFR § 136)	NA

[1] Where the discharge is directly into a water quality limited water or a water subject to an approved TMDL, the sample must be analyzed for the pollutant(s) of concern identified as the cause of the water quality impairment.

Testing for indicator bacteria and any pollutants of concern must be conducted using analytical methods and procedures found in 40 CFR § 136.[4] Samples for laboratory analysis must also be stored and preserved in accordance with procedures found in 40 CFR § 136. **Table 6-3** lists analytical methods, detection limits, hold times, and preservatives for laboratory analysis of dry weather sampling parameters.

[4] 40 CFR § 136: http://www.ecfr.gov/cgi-bin/text-idx?SID=b3b41fdea0b7b0b8cd6c4304d86271b7&mc=true&node=pt40.25.136&rgn=div5

Table 6-3. Required Analytical Methods, Detection Limits, Hold Times, and Preservatives[4]

Analyte or Parameter	Analytical Method	Detection Limit	Max. Hold Time	Preservative
Ammonia	**EPA**: 350.2, **SM**: 4500-NH3C	0.05 mg/L	28 days	Cool ≤6°C, H_2SO_4 to pH <2, No preservative required if analyzed immediately
Surfactants	**SM**: 5540-C	0.01 mg/L	48 hours	Cool ≤6°C
Chlorine	**SM**: 4500-Cl G	0.02 mg/L	Analyze within 15 minutes	None Required
Temperature	**SM**: 2550B	*NA*	Immediate	None Required
Specific Conductance	**EPA**: 120.1, **SM**: 2510B	0.2 µs/cm	28 days	Cool ≤6°C
Salinity	**SM**: 2520	-	28 days	Cool ≤6°C
Indicator Bacteria: *E.coli* Enterococcus	*E.coli* **EPA**: 1603 **SM**: 9221B, 9221F , 9223 B **Other**: Colilert®, Colilert-18® *Enterococcus* **EPA**: 1600 **SM**: 9230 C **Other**: Enterolert®	*E.coli* **EPA**: 1 cfu/100mL **SM**: 2 MPN/100mL **Other**: 1 MPN/100mL *Enterococcus* **EPA**: 1 cfu/100mL **SM**: 1 MPN/100mL **Other**: 1 MPN/100mL	8 hours	Cool ≤10°C, 0.0008% $Na_2S_2O_3$
Total Phosphorus	**EPA**: Manual-365.3, Automated Ascorbic acid digestion-365.1 Rev. 2, ICP/AES4-200.7 Rev. 4.4 **SM**: 4500-P E-F	**EPA**: 0.01 mg/L **SM** : 0.01 mg/L	28 days	Cool ≤6°C, H_2SO_4 to pH <2
Total Nitrogen (Ammonia + Nitrate/Nitrite, methods are for Nitrate-Nitrite and need to be combined with Ammonia listed above.)	**EPA**: Cadmium reduction (automated)-353.2 Rev. 2.0, **SM**: 4500-NO_3 E-F	**EPA**: 0.05 mg/L **SM** : 0.05 mg/L	28 days	Cool ≤6°C, H_2SO_4 to pH <2

SM = Standard Methods

Interpreting Outfall Sampling Results

Outfall analytical data from dry weather sampling can be used to help identify the major type or source of discharge. **Table 6-4** shows values identified by the U.S. EPA and the Center for Watershed Protection as typical screening values for select parameters. These represent the typical concentration (or value) of each parameter expected to be found in stormwater. Screening values that exceed these benchmarks may be indicative of pollution and/or illicit discharges.

Table 6-4. Benchmark Field Measurements for Select Parameters

Analyte or Parameter	Benchmark
Ammonia	>0.5 mg/L
Conductivity	>2,000 µS/cm
Surfactants	>0.25 mg/L
Chlorine	>0.02 mg/L (detectable levels per the 2016 MS4 Permit)
Indicator Bacteria[5]: *E.coli* *Enterococcus*	*E.coli*: the geometric mean of the five most recent samples taken during the same bathing season shall not exceed 126 colonies per 100 ml and no single sample taken during the bathing season shall exceed 235 colonies per 100 ml *Enterococcus:* the geometric mean of the five most recent samples taken during the same bathing season shall not exceed 33 colonies per 100 ml and no single sample taken during the bathing season shall exceed 61 colonies per 100 ml

Follow-up Ranking of Outfalls and Interconnections

The Town of Blackstone will update and re-prioritize the initial outfall and interconnection rankings based on information gathered during dry weather screening. The rankings will be updated periodically as dry weather screening information becomes available, but will be completed within three (3) years of the effective date of the permit (July 1, 2020).

Outfalls/interconnections where relevant information was found indicating sewer input to the MS4 or sampling results indicating sewer input are highly likely to contain illicit discharges from sanitary sources. Such outfalls/interconnections will be ranked at the top of the High Priority Outfalls category for investigation. Other outfalls and interconnections may be re-ranked based on any new information from the dry weather screening.

Catchment Investigations

Once stormwater outfalls with evidence of illicit discharges have been identified, various methods can be used to trace the source of the potential discharge within the outfall catchment area. Catchment investigation techniques include but are not limited to review of maps, historic plans, and records; manhole observation; dry and wet weather sampling; video inspection; smoke testing; and dye testing. This section outlines a systematic procedure to investigate outfall catchments to trace the source of potential illicit discharges. All data collected as part of the catchment investigations will be recorded and reported in each annual report.

[5] Massachusetts Water Quality Standards: http://www.mass.gov/eea/docs/dep/service/regulations/314cmr04.pdf

System Vulnerability Factors

The Department of Public Works will review relevant mapping and historic plans and records to identify areas within the catchment with higher potential for illicit connections. The following information will be reviewed:

- Plans related to the construction of the drainage network
- Plans related to the construction of the sewer drainage network
- Prior work on storm drains or sewer lines
- Board of Health or other municipal data on septic systems
- Complaint records related to SSOs
- Septic system breakouts.

Based on the review of this information, the presence of any of the following **System Vulnerability Factors (SVFs)** will be identified for each catchment:

- History of SSOs, including, but not limited to, those resulting from wet weather, high water table, or fat/oil/grease blockages
- Common or twin-invert manholes serving storm and sanitary sewer alignments
- Common trench construction serving both storm and sanitary sewer alignments
- Crossings of storm and sanitary sewer alignments where the sanitary system is shallower than the storm drain system
- Sanitary sewer alignments known or suspected to have been constructed with an underdrain system
- Inadequate sanitary sewer level of service (LOS) resulting in regular surcharging, customer back-ups, or frequent customer complaints
- Areas formerly served by combined sewer systems
- Sanitary sewer infrastructure defects such as leaking service laterals, cracked, broken, or offset sanitary infrastructure, directly piped connections between storm drain and sanitary sewer infrastructure, or other vulnerability factors identified through Inflow/Infiltration Analyses, Sanitary Sewer Evaluation Surveys, or other infrastructure investigations
- Sewer pump/lift stations, siphons, or known sanitary sewer restrictions where power/equipment failures or blockages could readily result in SSOs
- Any sanitary sewer and storm drain infrastructure greater than 40 years old
- Widespread code-required septic system upgrades required at property transfers (indicative of inadequate soils, water table separation, or other physical constraints of the area rather that poor owner maintenance)
- History of multiple Board of Health actions addressing widespread septic system failures (indicative of inadequate soils, water table separation, or other physical constraints of the area rather that poor owner maintenance).

A SVF inventory will be documented for each catchment (see **Table 7-1**), retained as part of this IDDE Plan, and included in the annual report.

Table 7-1. Outfall Catchment System Vulnerability Factor (SVF) Inventory

Town of Blackstone, Massachusetts
Revision Date: ##DATE OF LAST UPDATE

Outfall ID	Receiving Water	1 History of SSOs	2 Common or Twin Invert Manholes	3 Common Trench Construction	4 Storm/Sanitary Crossings (Sanitary Above)	5 Sanitary Lines with Underdrains	6 Inadequate Sanitary Level of Service	7 Areas Formerly Served by Combined Sewers	8 Sanitary Infrastructure Defects	9 SSO Potential In Event of System Failures	10 Sanitary and Storm Drain Infrastructure >40 years Old	11 Septic with Poor Soils or Water Table Separation	12 History of BOH Actions Addressing Septic Failure
Sample 1	XYZ River	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No

Presence/Absence Evaluation Criteria:

1. History of SSOs, including, but not limited to, those resulting from wet weather, high water table, or fat/oil/grease blockages
2. Common or twin-invert manholes serving storm and sanitary sewer alignments
3. Common trench construction serving both storm and sanitary sewer alignments
4. Crossings of storm and sanitary sewer alignments where the sanitary system is shallower than the storm drain system
5. Sanitary sewer alignments known or suspected to have been constructed with an underdrain system
6. Inadequate sanitary sewer level of service (LOS) resulting in regular surcharging, customer back-ups, or frequent customer complaints
7. Areas formerly served by combined sewer systems
8. Sanitary sewer infrastructure defects such as leaking service laterals, cracked, broken, or offset sanitary infrastructure, directly piped connections between storm drain and sanitary sewer infrastructure, or other vulnerability factors identified through Inflow/Infiltration Analyses, Sanitary Sewer Evaluation Surveys, or other infrastructure investigations
9. Sewer pump/lift stations, siphons, or known sanitary sewer restrictions where power/equipment failures or blockages could readily result in SSOs
10. Any sanitary sewer and storm drain infrastructure greater than 40 years old
11. Widespread code-required septic system upgrades required at property transfers (indicative of inadequate soils, water table separation, or other physical constraints of the area rather that poor owner maintenance)
12. History of multiple Board of Health actions addressing widespread septic system failures (indicative of inadequate soils, water table separation, or other physical constraints of the area rather that poor owner maintenance)

Dry Weather Manhole Inspections

The Town of Blackstone will implement a dry weather storm drain network investigation that involves systematically and progressively observing, sampling and evaluating key junction manholes in the MS4 to determine the approximate location of suspected illicit discharges or SSOs.

The Department of Public Works will be responsible for implementing the dry weather manhole inspection program and making updates as necessary. Infrastructure information will be incorporated into the storm system map, and catchment delineations will be refined based on the field investigation, where necessary. The SVF inventory will also be updated based on information obtained during the field investigations, where necessary.

Several important terms related to the dry weather manhole inspection program are defined by the MS4 Permit as follows:

- **Junction Manhole** is a manhole or structure with two or more inlets accepting flow from two or more MS4 alignments. Manholes with inlets solely from private storm drains, individual catch basins, or both are not considered junction manholes for these purposes.

- **Key Junction Manholes** are those junction manholes that can represent one or more junction manholes without compromising adequate implementation of the illicit discharge program. Adequate implementation of the illicit discharge program would not be compromised if the exclusion of a particular junction manhole as a key junction manhole would not affect the permittee's ability to determine the possible presence of an upstream illicit discharge. A permittee may exclude a junction manhole located upstream from another located in the immediate vicinity or that is serving a drainage alignment with no potential for illicit connections.

For all catchments identified for investigation, during dry weather, field crews will systematically inspect **key junction manholes** for evidence of illicit discharges. This program involves progressive inspection and sampling at manholes in the storm drain network to isolate and eliminate illicit discharges.

The manhole inspection methodology will be conducted in one of two ways (or a combination of both):

- By working progressively up from the outfall and inspecting key junction manholes along the way, or
- By working progressively down from the upper parts of the catchment toward the outfall.

For most catchments, manhole inspections will proceed from the outfall moving up into the system. However, the decision to move up or down the system depends on the nature of the drainage system and the surrounding land use and the availability of information on the catchment and drainage system. Moving up the system can begin immediately when an illicit discharge is detected at an outfall, and only a map of the storm drain system is required. Moving down the system requires more advance preparation and reliable drainage system information on the upstream segments of the storm drain system, but may be more efficient if the sources of illicit discharges are believed to be located in the

upstream portions of the catchment area. Once a manhole inspection methodology has been selected, investigations will continue systematically through the catchment.

Inspection of key junction manholes will proceed as follows:

1. Manholes will be opened and inspected for visual and olfactory evidence of illicit connections. A sample field inspection form is provided in **Appendix C**.

2. If flow is observed, a sample will be collected and analyzed at a minimum for ammonia, chlorine, and surfactants. Field kits can be used for these analyses. Sampling and analysis will be in accordance with procedures outlined in **Section 6**. Additional indicator sampling may assist in determining potential sources (e.g., bacteria for sanitary flows, conductivity to detect tidal backwater, etc.).

3. Where sampling results or visual or olfactory evidence indicate potential illicit discharges or SSOs, the area draining to the junction manhole will be flagged for further upstream manhole investigation and/or isolation and confirmation of sources.

4. Subsequent key junction manhole inspections will proceed until the location of suspected illicit discharges or SSOs can be isolated to a pipe segment between two manholes.

5. If no evidence of an illicit discharge is found, catchment investigations will be considered complete upon completion of key junction manhole sampling.

Wet Weather Outfall Sampling

Where a minimum of one (1) System Vulnerability Factor (SVF) is identified based on previous information or the catchment investigation, a wet weather investigation must also be conducted at the associated outfall. The Department of Public Works will be responsible for implementing the wet weather outfall sampling program and making updates as necessary.

Outfalls will be inspected and sampled under wet weather conditions, to the extent necessary, to determine whether wet weather-induced high flows in sanitary sewers or high groundwater in areas served by septic systems result in discharges of sanitary flow to the MS4.

Wet weather outfall sampling will proceed as follows:

1. At least one wet weather sample will be collected at the outfall for the same parameters required during dry weather screening.

2. Wet weather sampling will occur during or after a storm event of sufficient depth or intensity to produce a stormwater discharge at the outfall. There is no specific rainfall amount that will trigger sampling, although minimum storm event intensities that are likely to trigger sanitary sewer interconnections are preferred. To the extent feasible, sampling should occur during the spring (March through June) when groundwater levels are relatively high.

3. If wet weather outfall sampling indicates a potential illicit discharge, then additional wet weather source sampling will be performed, as warranted, or source isolation and confirmation procedures will be followed as described in **Section 7.4**.

4. If wet weather outfall sampling does not identify evidence of illicit discharges, and no evidence of an illicit discharge is found during dry weather manhole inspections, catchment investigations will be considered complete.

Source Isolation and Confirmation

Once the source of an illicit discharge is approximated between two manholes, more detailed investigation techniques will be used to isolate and confirm the source of the illicit discharge. The following methods may be used in isolating and confirming the source of illicit discharges

- Sandbagging
- Smoke Testing
- Dye Testing
- CCTV/Video Inspections
- Optical Brightener Monitoring
- IDDE Canines

These methods are described in the sections below. Instructions and Standard Operating Procedures (SOPs) for these and other IDDE methods are provided in **Appendix F**.

Public notification is an important aspect of a detailed source investigation program. Prior to smoke testing, dye testing, or TV inspections, the Department of Public Works will notify property owners in the affected area. Smoke testing notification will include robocalls, hanging notifications, and/or email for single family homes, businesses and building lobbies for multi-family dwellings.

Sandbagging

This technique can be particularly useful when attempting to isolate intermittent illicit discharges or those with very little perceptible flow. The technique involves placing sandbags or similar barriers (e.g., caulking, weirs/plates, or other temporary barriers) within outlets to manholes to form a temporary dam that collects any intermittent flows that may occur. Sandbags are typically left in place for 48 hours, and should only be installed when dry weather is forecast. If flow has collected behind the sandbags/barriers after 48 hours it can be assessed using visual observations or by sampling. If no flow collects behind the sandbag, the upstream pipe network can be ruled out as a source of the intermittent discharge. Finding appropriate durations of dry weather and the need for multiple trips to each manhole makes this method both time-consuming and somewhat limiting.

Smoke Testing

Smoke testing involves injecting non-toxic smoke into drain lines and noting the emergence of smoke from sanitary sewer vents in illegally connected buildings or from cracks and leaks in the system itself. Typically a smoke bomb or smoke generator is used to inject the smoke into the system at a catch basin or manhole and air is then forced through the system. Test personnel are place in areas where there are suspected illegal connections or cracks/leaks, noting any escape of smoke (indicating an illicit connection or damaged storm drain infrastructure). It is important when using this technique to make proper notifications to area residents and business owners as well as local police and fire departments.

If the initial test of the storm drain system is unsuccessful then a more thorough smoke-test of the sanitary sewer lines can also be performed. Unlike storm drain smoke tests, buildings that do not emit smoke during sanitary sewer smoke tests may have problem connections and may also have sewer gas venting inside, which is hazardous.

It should be noted that smoke may cause minor irritation of respiratory passages. Residents with respiratory conditions may need to be monitored or evacuated from the area of testing altogether to ensure safety during testing.

Dye Testing

Dye testing involves flushing non-toxic dye into plumbing fixtures such as toilets, showers, and sinks and observing nearby storm drains and sewer manholes as well as stormwater outfalls for the presence of the dye. Similar to smoke testing, it is important to inform local residents and business owners. Police, fire, and local public health staff should also be notified prior to testing in preparation of responding to citizen phone calls concerning the dye and their presence in local surface waters.

A team of two or more people is needed to perform dye testing (ideally, all with two-way radios). One person is inside the building, while the others are stationed at the appropriate storm sewer and sanitary sewer manholes (which should be opened) and/or outfalls. The person inside the building adds dye into a plumbing fixture (i.e., toilet or sink) and runs a sufficient amount of water to move the dye through the plumbing system. The person inside the building then radios to the outside crew that the dye has been dropped, and the outside crew watches for the dye in the storm sewer and sanitary sewer, recording the presence or absence of the dye.

The test can be relatively quick (about 30 minutes per test), effective (results are usually definitive), and inexpensive. Dye testing is best used when the likely source of an illicit discharge has been narrowed down to a few specific houses or businesses.

CCTV/Video Inspection

Another method of source isolation involves the use of mobile video cameras that are guided remotely through stormwater drain lines to observe possible illicit discharges. IDDE program staff can review the videos and note any visible illicit discharges. While this tool is both effective and usually definitive, it can be costly and time consuming when compared to other source isolation techniques.

Optical Brightener Monitoring

Optical brighteners are fluorescent dyes that are used in detergents and paper products to enhance their appearance. The presence of optical brighteners in surface waters or dry weather discharges suggests there is a possible illicit discharge or insufficient removal through adsorption in nearby septic systems or wastewater treatment. Optical brightener monitoring can be done in two ways. The most common, and least expensive, methodology involves placing a cotton pad in a wire cage and securing it in a pipe, manhole, catch basin, or inlet to capture intermittent dry weather flows. The pad is retrieved at a later date and placed under UV light to determine the presence/absence of brighteners during the monitoring period. A second methodology uses handheld fluorometers to detect optical brighteners in water sample collected from outfalls or ambient surface waters. Use of a fluorometer, while more quantitative, is typically more costly and is not as effective at isolating intermittent discharges as other source isolation techniques.

IDDE Canines

Dogs specifically trained to smell human related sewage are becoming a cost-effective way to isolate and identify sources of illicit discharges. While not widespread at the moment, the use of IDDE canines is growing as is their accuracy. The use of IDDE canines is not recommended as a standalone practice for source identification; rather it is recommended as a tool to supplement other conventional methods, such as dye testing, in order to fully verify sources of illicit discharges.

Illicit Discharge Removal

When the specific source of an illicit discharge is identified, the Town of Blackstone will exercise its authority as necessary to require its removal. The annual report will include the status of IDDE investigation and removal activities including the following information for each confirmed source:

- The location of the discharge and its source(s)
- A description of the discharge
- The method of discovery
- Date of discovery
- Date of elimination, mitigation or enforcement action OR planned corrective measures and a schedule for completing the illicit discharge removal
- Estimate of the volume of flow removed.

Confirmatory Outfall Screening

Within one (1) year of removal of all identified illicit discharges within a catchment area, confirmatory outfall or interconnection screening will be conducted. The confirmatory screening will be conducted in dry weather unless System Vulnerability Factors have been identified, in which case both dry weather and wet weather confirmatory screening will be conducted. If confirmatory screening indicates evidence of additional illicit discharges, the catchment will be scheduled for additional investigation.

Ongoing Screening

Upon completion of all catchment investigations and illicit discharge removal and confirmation (if necessary), each outfall or interconnection will be re-prioritized for screening and scheduled for ongoing screening once every five (5) years. Ongoing screening will consist of dry weather screening and sampling consistent with the procedures described in **Section 6** of this plan. Ongoing wet weather screening and sampling will also be conducted at outfalls where wet weather screening was required due to System Vulnerability Factors and will be conducted in accordance with the procedures described in **Section 7.3**. All sampling results will be reported in the annual report.

Training

Annual IDDE training will be made available to all employees involved in the IDDE program. This training will at a minimum include information on how to identify illicit discharges and SSOs and may also include additional training specific to the functions of particular personnel and their function within the framework of the IDDE program. Training records will be maintained in **Appendix E**. The frequency and type of training will be included in the annual report.

Progress Reporting

The progress and success of the IDDE program will be evaluated on an annual basis. The evaluation will be documented in the annual report and will include the following indicators of program progress:

- Number of SSOs and illicit discharges identified and removed
- Number and percent of total outfall catchments served by the MS4 evaluated using the catchment investigation procedure
- Number of dry weather outfall inspections/screenings
- Number of wet weather outfall inspections/sampling events
- Number of enforcement notices issued
- All dry weather and wet weather screening and sampling results
- Estimate of the volume of sewage removed, as applicable
- Number of employees trained annually.

The success of the IDDE program will be measured by the IDDE activities completed within the required permit timelines.

Appendix A

Legal Authority (IDDE Bylaw or Ordinance)

Town of Blackstone, MA
Friday, June 21, 2019

Chapter 110. Stormwater Management and Land Disturbance

[HISTORY: Adopted by the Annual Town Meeting of the Town of Blackstone 5-31-2011 by Art. 22. Amendments noted where applicable.]

GENERAL REFERENCES
Soil removal — See Ch. **109**.
Water supply protection — See Ch. **118**.
Wetlands — See Ch. **119**.
Subdivision of land — See Ch. **191**.

§ 110-1. Purpose.

The purposes of this chapter are to protect water resources, prevent pollutants from entering the Town's municipal separate storm sewer system (MS4), prohibit and remove illicit connections and unauthorized discharges to the MS4, promote the infiltration and recharge of groundwater, ensure that soil erosion and sedimentation control measures and runoff control practices are incorporated into the site planning and design process and are implemented and maintained, comply with state and federal statutes and regulations relating to discharges and establish the legal authority to ensure compliance with the provisions of this chapter through inspection, monitoring, and enforcement.

§ 110-2. Definitions.

AGRICULTURE
The normal maintenance or improvement of land in agricultural use, as defined by MGL c. 128, § 1A.

CERTIFIED PROFESSIONAL IN EROSION AND SEDIMENT CONTROL (CPESC)
A certified specialist in soil erosion and sediment control. This certification program, sponsored by the Soil and Water Conservation Society in cooperation with the American Society of Agronomy, provides the public with evidence of professional qualifications.

CLEARING
Any activity that removes the vegetative surface cover.

CONSTRUCTION AND WASTE MATERIALS
Excess or discarded building or site materials, including but not limited to concrete truck washout, chemicals, litter and sanitary waste at a construction site that may adversely impact water quality.

EROSION
The wearing away of the land surface by natural or artificial forces such as wind, water, ice, gravity, or vehicle traffic and the subsequent detachment and transportation of soil particles.

EROSION AND SEDIMENTATION CONTROL PLAN
A document containing narrative, drawings and details developed by a qualified professional engineer (PE) or a certified professional in erosion and sedimentation control (CPESC), which

includes best management practices, or equivalent measures designed to control surface runoff, erosion and sedimentation during pre-construction and construction-related land disturbance activities.

ESTIMATED HABITAT OF RARE WILDLIFE AND CERTIFIED VERNAL POOLS

Habitats delineated for state-protected rare wildlife and certified vernal pools for use with the Wetlands Protection Act Regulations (310 CMR 10.00) and the Forest Cutting Practices Act Regulations (304 CMR 11.00).

ILLICIT CONNECTION

A surface or subsurface drain or conveyance, which allows an illicit discharge into the municipal separate storm sewer drain system, including, without limitation, sewage, process wastewater, or wash water and any connections from indoor drains, sinks, or toilets, regardless of whether said connection was previously allowed, permitted, or approved before the effective date of this chapter.

ILLICIT DISCHARGE

Direct or indirect discharge to the municipal storm drain system that is not composed entirely of stormwater, except as exempted in § **110-4**. The term does not include a discharge in compliance with an NPDES stormwater discharge permit or a surface water discharge permit, or resulting from fire-fighting activities exempted pursuant to § **110-4A(4)**, of this chapter.

IMPERVIOUS SURFACE

My material or structure on or above the ground that prevents water from infiltrating the underlying soil. Impervious surface includes, without limitation, roads, paved parking lots, sidewalks, and rooftops.

MASSACHUSETTS ENDANGERED SPECIES ACT

MGL c. 131A and its implementing regulations at 321 CMR 10.00 which prohibit the "taking" of any rare plant or animal species listed as endangered, threatened, or of special concern.

MASSACHUSETTS STORMWATER MANAGEMENT POLICY

The policy issued by the Department of Environmental Protection, and as amended, that coordinates the requirements prescribed by state regulations promulgated under the authority of the Massachusetts Wetlands Protection Act MGL c. 131, § 40, and the Massachusetts Clean Waters Act MGL c. 21, § 23 through 56. The policy addresses impacts through implementation of performance standards to reduce or prevent pollutants from reaching water bodies and control the quantity of runoff from a site.

MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OR MUNICIPAL STORM DRAIN SYSTEM

The system of conveyances designed or used for collecting or conveying, including any road with a drainage system, street, gutter, curb, inlet, piped storm drain, pumping facility, retention or detention basin, natural or man-made or altered drainage channel, reservoir, and other drainage structure that together comprise the storm drainage system owned or operated by the Town of Blackstone.

PRIORITY HABITAT OF RARE SPECIES

Habitats delineated for rare plant and animal populations protected pursuant to the Massachusetts Endangered Species Act and its regulations.

RUNOFF

Rainfall, snowmelt, or irrigation water flowing over the ground surface.

STABILIZATION

The use, singly or in combination, of mechanical, structural, or vegetative methods to prevent or retard erosion.

STORMWATER

Snowmelt runoff, surface water runoff and drainage.

STRIP

Any activity which removes the vegetative ground surface cover, including tree removal, clearing, grubbing, and storage or removal of topsoil.

VERNAL POOLS

Temporary bodies of fresh water which provide critical habitat for a number of vertebrate and invertebrate wildlife species.

WATERCOURSE

A natural or man-made channel through which water flows or a stream of water, including a river, brook, or underground stream.

WETLAND RESOURCE AREA

Areas specified in the Massachusetts Wetlands Protection Act MGL c. 131, § 40 and in the Town's Wetland Bylaw.[1]

[1] *Editor's Note: See Ch.* ***119****, Wetlands.*

§ 110-3. Legislative authority.

This chapter is adopted under authority granted by the Home Rule Amendment of the Massachusetts Constitution, the Home Rule statutes, and pursuant to the regulations of the federal Clean Water Act found at 40 CFR 122.34.

§ 110-4. Applicability; exemptions.

This chapter shall apply to:

A. The Town's municipal separate stormwater sewer system as follows:

(1) Illicit discharges. No person shall dump, discharge, cause or allow to be discharged any pollutant or nondischarge into the municipal separate storm sewer system (MS4), into a watercourse, or into the waters of the commonwealth.

(2) Illicit connections. No person shall construct, use, allow, maintain or continue any illicit connection to the municipal storm drain system, regardless of whether the connection was permissible under applicable law, regulation or custom at the time of connection.

(3) Obstruction of municipal storm drain system. No person shall obstruct or interfere with the normal flow into or out of the municipal storm drain system without prior written approval from the Director of Public Works.

(4) The following nondischarges or flows are exempt from the prohibition of nondischarges, provided that the source is not a significant contributor of a pollutant to the municipal storm drain system:

(a) Waterline flushing;

(b) Flow from potable water sources;

(c) Springs;

(d) Natural flow from riparian habitats and wetlands;

(e) Diverted stream flow;

(f) Rising groundwater;

(g) Uncontaminated groundwater infiltration as defined in 40 CFR 35.2005(20), or uncontaminated pumped groundwater;

(h) Water from exterior foundation drains, footing drains (not including active groundwater dewatering systems), crawl space pumps, or air-conditioning condensation;

(i) Discharge from landscape irrigation or lawn watering;

(j) Water from individual residential car washing;

(k) Discharge from dechlorinated swimming pool water (less than one ppm chlorine), provided the water is allowed to stand for one week prior to draining and the pool is drained in such a way as not to cause a nuisance;

(l) Discharge from street sweeping;

(m) Dye testing, provided verbal notification is given to the Director of Public Works prior to the time of the test;

(n) Nondischarge permitted under an NPDES permit or a surface water discharge permit, waiver, or waste discharge order administered under the authority of the United States Environmental Protection Agency or the Massachusetts Department of Environmental Protection, provided that the discharge is in full compliance with the requirements of the permit, waiver, or order and applicable laws and regulations; and

(o) Discharge for which advanced written approval is received from the Director of Public Works as necessary to protect public health, safety, welfare or the environment.

B. Land disturbance activities as follows:

(1) All activities that result in the disturbance of land whose actual dimensions of disturbance total 20,000 or more square feet, or are part of a phased plan that will ultimately result in disturbance of 20,000 or more square feet and that are associated with a building permit or driveway permit.

(2) Except as authorized by the Planning Board in a land disturbance permit or as otherwise provided in this chapter, no person shall perform any activity that results in disturbance of 20,000 square feet or more of land. Disturbance shall be construed to mean the removal of vegetation, mineral substances or other natural or man-made materials that exposes loose soil, making it vulnerable to erosion.

C. The following activities are exempt from the requirement to obtain a separate land disturbance permit:

(1) Normal maintenance and improvement of land in agricultural use, as defined by MGL c. 128, § 1A.

(2) Stormwater discharges that demonstrate compliance with the Massachusetts Stormwater Management Policy resulting from the above activities that are subject to jurisdiction under:

(a) The Wetlands Protection Act and an order of conditions issued by the Conservation Commission;

(b) A permit from the Board of Health for a new or replacement septic system or well.

(3) For projects subject to site plan review, a Planning Board special permit or approval under the Subdivision Control Law,[1] a land disturbance permit shall be reviewed and issued by the

Planning Board simultaneously as part of those other review and approval processes.
[1] *See Ch. **191**, Subdivision of Land.*

§ 110-5. Administration.

A. The Director of Public Works, under the direction of the Town Administrator and Board of Selectmen, shall administer, implement and enforce this chapter as it pertains to illicit discharges and connections.

B. The Planning Board shall administer and implement this chapter as it pertains to land disturbance. Enforcement shall be the responsibility of the Building Inspector or other agent that may be designated, in writing, by the Planning Board.

C. Rules and regulations. The Director of Public Works and the Planning Board may each adopt and periodically amend rules and regulations to effectuate the purposes of this chapter. Failure to promulgate such rules and regulations shall not have the effect of suspending or invalidating this chapter. The Conservation Commission, Planning Board and Board of Health shall ensure that their rules and regulations require compliance with the purposes of this section for projects that are within their jurisdiction and exempt from the permitting provisions of this section.

D. Waiver. The Director of Public Works and the Planning Board may waive strict compliance with any requirement of this chapter under their jurisdiction or the rules and regulations promulgated hereunder based on the scale, nature and location of the proposed activity, where such action:

(1) Is allowed by federal, state and local statutes and/or regulations;

(2) Is in the public interest, and

(3) Is not inconsistent with the purpose and intent of this chapter.

§ 110-6. Land disturbance permit procedure.

A. Application. A completed application for a land disturbance permit shall be filed with the Planning Board. A permit must be obtained prior to the commencement of land-disturbing activity that may result in the disturbance of an area of 20,000 square feet or more. The land disturbance permit application package shall include:

(1) A completed application form with original signatures of all owners.

(2) Seven copies of the erosion and sediment control plan as specified in § **110-7** of this chapter.

(3) One copy of the application form to be filed with the Town Clerk by the Planning Board.

B. Entry. The filing of an application for a permit hereunder shall grant to and vest in the Planning Board or its agent, permission to enter the site described in such application to verify the information in the application and to inspect for compliance with permit conditions.

C. Other boards.

(1) Following a determination of completeness, the Planning Board shall submit a copy of the application form to the Town Clerk, and shall provide one copy of the application package to the:

(a) Conservation Commission.

(b) Department of Public Works.

(c) Board of Health.

(d) Board of Selectmen.

(2) These entities shall provide comments to the Planning Board and/or sign off on the application within 21 days of receipt of the application package, unless an extension is granted by the applicant. Failure to provide comments within the specified time shall be interpreted as no opposition to the application. Each Board and Commission may delegate sign-off authority to its chairman or other designated member.

D. Information requests. The applicant shall submit all additional information requested by the Planning Board as said Planning Board shall deem necessary in order for it to issue a decision on the application.

E. Action by the Planning Board. The Planning Board may:

(1) Approve the land disturbance permit application and issue a permit if it finds that the proposed plan will protect water resources and meets the objectives and requirements of this chapter.

(2) Approve the land disturbance permit application and issue a permit with conditions, modifications or restrictions that the Planning Board determines are required to ensure that the project will protect water resources and meets the objectives and requirements of this chapter.

(3) Disapprove the land disturbance permit application and deny the permit if it finds that the proposed plan will not protect water resources or fails to meet the objectives and requirements of this chapter.

F. Failure of the Planning Board to take one of the above-referenced three actions upon an application within 45 days of receipt of a completed application shall be deemed an approval of said application. Upon certification by the Town Clerk that the allowed time has passed without the Planning Board's action, the land disturbance permit shall be issued by the Planning Board.

G. Fee structure. Each application must be accompanied by the appropriate application fee as established by the Planning Board. Applicants shall pay review fees as determined by the Planning Board sufficient to cover any expenses connected with the review of the land disturbance permit application before the review process commences. The Planning Board is hereby authorized to retain a registered professional engineer or such other professional consultants as it may deem necessary to advise the Planning Board on any or all aspects of the application, and a reasonable fee for the employment of such consultants may be imposed in accordance with the provisions of MGL c. 44, § 53G, or any other enabling authority.

H. Project changes. The permittee, or its agent, must notify the Planning Board, in writing, of any change or alteration of a permitted land-disturbing activity authorized in a land disturbance permit before any change or alteration occurs. If the Planning Board determines that the change or alteration is significant, based on the design requirements listed in § **110-7B** and accepted construction practices, the Planning Board may, in its discretion, require that an amended land disturbance permit application be filed. If any change or alteration from activities permitted by the land disturbance permit occurs during any land-disturbing activities, the Planning Board may require the installation of interim erosion and sedimentation control measures before approving any such change or alteration.

§ 110-7. Erosion and sediment control plan.

A. The erosion and sediment control plan shall contain sufficient information to describe the nature and purpose of the proposed development, pertinent conditions of the site and the adjacent areas,

and proposed erosion and sedimentation controls. The applicant shall submit such material and information as the Planning Board shall deem necessary to show that the proposed development will comply with the design requirements listed in Subsection **B** below.

B. The design requirements of the erosion and sediment control plan shall:

(1) Minimize the total area of disturbance;

(2) Sequence activities to minimize simultaneous areas of disturbance;

(3) Minimize peak rate of runoff in accordance with the Massachusetts Stormwater Management Policy;

(4) Minimize soil erosion and control sedimentation during construction, provided that prevention of erosion is preferred over sedimentation control;

(5) Divert uncontaminated water around disturbed areas;

(6) Maximize groundwater recharge;

(7) Install and maintain all erosion and sediment control measures in accordance with the manufacturers' specifications and good engineering practices;

(8) Prevent off-site transport of sediment;

(9) Protect and manage on- and off-site material storage areas (overburden and stockpiles of dirt, borrow areas, or other areas used solely in conjunction with the permitted project are considered a part of the project);

(10) Comply with applicable federal, state and local laws and regulations, including waste disposal, sanitary sewer or septic system regulations, and air quality requirements, including dust control;

(11) Prevent significant alteration of habitats mapped by the Massachusetts Natural Heritage and Endangered Species Program as endangered, threatened or of special concern, estimated habitats of rare wildlife and certified vernal pools, and priority habitats of rare species from the proposed activities;

(12) Institute interim and permanent stabilization measures, which shall be instituted on a disturbed area as soon as practicable but no more than 14 days after construction activity has temporarily or permanently ceased on that portion of the site;

(13) Properly manage on-site construction and waste materials; and

(14) Prevent off-site vehicle tracking of sediments.

C. Erosion and sedimentation control plan content.

(1) The Plan shall contain the following information:

(a) Names, addresses, and telephone numbers of the owner, applicant, and person(s) or firm(s) preparing the plan;

(b) Title, date, North arrow, names of abutters, scale, legend, and locus map;

(c) Location and description of natural features, including:

[1] Watercourses and water bodies, wetland resource areas and all floodplain information, including the one-hundred-year flood elevation based upon the most

recent Flood Insurance Rate Map, or as calculated by a professional engineer for areas not assessed on these maps;

[2] Existing vegetation, including tree lines, canopy layer, shrub layer, and ground cover, and trees with a caliper 12 inches or larger, noting specimen trees and forest communities; and

[3] Habitats mapped by the Massachusetts Natural Heritage and Endangered Species Program as endangered, threatened or of special concern, estimated habitats of rare wildlife and certified vernal pools, and priority habitats of rare species within 500 feet of any construction activity.

(d) Lines of existing abutting streets showing drainage and driveway locations and curb cuts;

(e) Existing soils, volume and nature of imported soil materials;

(f) Topographical features, including existing and proposed contours at intervals no greater than two feet with spot elevations provided when needed;

(g) Surveyed property lines showing distances and monument locations, all existing and proposed easements, rights-of-way, and other encumbrances, the size of the entire parcel, and the delineation and number of square feet of the land area to be disturbed;

(h) Drainage patterns and approximate slopes anticipated after major grading activities (construction phase grading plans);

(i) Location and details of erosion and sediment control measures with a narrative of the construction sequence/phasing of the project, including both operation and maintenance for structural and nonstructural measures, interim grading, and material stockpiling areas;

(j) Path and mechanism to divert uncontaminated water around disturbed areas, to the maximum extent practicable;

(k) Location and description of industrial discharges, including discharges from dedicated asphalt plants and dedicated concrete plants, which are covered by this permit;

(l) Runoff calculations in accordance with the Department of Environmental Protection's Management Policy;

(m) Location and description of and implementation schedule for temporary and permanent seeding, vegetative controls, and other stabilization measures;

(n) A description of construction and waste materials expected to be stored onsite. The plan shall include a description of controls to reduce pollutants from these materials, including storage practices to minimize exposure of the materials to weather and persons, and spill prevention and response;

(o) A description of provisions for phasing the project where one acre of area or greater is to be altered or disturbed;

(p) Unless waived by the Planning Board, plans must be stamped and certified by a qualified professional engineer registered in Massachusetts or a certified professional in erosion and sediment control; and

(q) Such other information as is required by the Planning Board.

(2) The Planning Board shall have the authority to waive one or more of the above requirements when it deems it to be in the best interest of the Town to do so based on the scale, nature and

location of the proposed activity and upon a finding that the intent of this section is still achieved.

§ 110-8. Inspection and site supervision.

A. Pre-construction meeting. Prior to starting clearing, excavation, construction, or land-disturbing activity, the applicant, the applicant's technical representative, the general contractor or any other person with authority to make changes to the project shall meet with the Planning Board, or its designated agent, to review the permitted plans and their implementation, the requirements of this chapter and the schedule of required inspections.

B. Board inspection.

(1) The Planning Board, or its designated agent, shall make inspections as hereinafter required and shall either approve that portion of the work completed or shall notify the permittee wherein the work fails to comply with the land disturbance permit as approved. The permit and associated plans for grading, stripping, excavating, and filling work, bearing the signature of approval of the Planning Board, shall be maintained at the site at all times during the progress of the work. In order to obtain inspections, the permittee shall notify the Planning Board or its designated agent and request an inspection at least two working days before each of the following events:

(a) Erosion and sediment control measures are in place and stabilized;

(b) Site clearing has been substantially completed;

(c) Rough grading has been substantially completed;

(d) Final grading has been substantially completed;

(e) Close of the construction season; and

(f) Final landscaping (permanent stabilization) and project final completion.

(2) The Planning Board will make every effort to complete the required inspections as soon as possible following a request. Also, based on the scale, nature and location of the permitted activity, the Planning Board may combine or reduce the number of inspections required as it may deem appropriate.

C. Permittee inspections. The permittee or his/her agent shall conduct and document inspections of all control measures no less than weekly or as specified in the permit, and prior to and following anticipated storm events. The purpose of such inspections will be to determine the overall effectiveness of the control plan, and the need for maintenance or additional control measures. The permittee or his/her agent shall submit monthly reports of such inspections to the Planning Board or its designated agent in a format approved by the Planning Board.

D. Access permission. To the fullest extent permitted by state law, or if authorized by the owner or other party in control of the property, the Planning Board, its agents, officers, and employees may enter upon privately owned property for the purpose of performing their duties under this chapter and may make or cause to be made such examinations, surveys or sampling as the Planning Board deems reasonably necessary to determine compliance with the permit.

§ 110-9. Surety.

Prior to the start of land disturbance activity, the Planning Board may require the permittee to post a surety bond, irrevocable letter of credit, cash, or other acceptable form of performance security. The

form of the security shall be approved by Town Counsel, and shall be in an amount deemed sufficient by the Planning Board to ensure that the work will be completed in accordance with the permit. If the project is phased, the Planning Board may release part of the security as each phase is completed in compliance with the permit, but the security shall not be fully released until the Planning Board has received the final report as required by § **110-10** and issued a certificate of completion.

§ 110-10. Final reports.

Upon completion of the work, the permittee shall submit a report (including certified as-built construction plans) from a professional engineer (P.E.), surveyor, or certified professional in erosion and sediment control (CPESC), certifying that all erosion and sediment control devices, and approved changes and modifications, have been completed in accordance with the conditions of the approved permit. Any discrepancies should be noted in the cover letter. Based on the scale, nature and location of the permitted activity, the Planning Board may waive the requirement that a final report be submitted by a professional and may authorize submission of a substitute affidavit by the owner attesting that the work has been completed in accordance with the conditions of the permit.

§ 110-11. Enforcement; violations and penalties.

A. The Building Inspector or an authorized agent of the Planning Board shall enforce this chapter, any regulations, orders, violation notices, and enforcement orders issued pursuant hereto, and may pursue all civil and criminal remedies for such violations.

B. Orders.

(1) The Building Inspector or an authorized agent of the Board may issue a written order to enforce the provisions of this chapter or the regulations hereunder, which may include an order:

(a) To cease and desist from the land-disturbing activity until compliance with this chapter and provisions of the land-disturbance permit has been confirmed.

(b) For maintenance, installation or performance of additional erosion and sediment control measures.

(c) For monitoring, analyses, and reporting.

(d) For remediation of erosion and sedimentation resulting directly or indirectly from the land-disturbing activity.

(2) If the enforcing person determines that abatement or remediation of erosion and sedimentation is required, the order shall set forth a deadline by which such abatement or remediation must be completed. Said order shall further advise that, in the event the violator or property owner fails to promptly abate or perform remediation within the specified deadline, the Town may, at its option, undertake such work as may be necessary to abate or remediate such violation, and the property owner shall reimburse the Town's expenses.

(3) Within 30 days after the Town's completion of all measures necessary to abate the violation or to perform remediation, the violator and the property owner shall be notified of the costs incurred by the Town, including administrative costs in furtherance of such abatement and remediation. The violator or property owner may file a written protest objecting to the amount or basis of such costs with the Planning Board within 30 days of receipt of the notification of the costs incurred. If the amount due is not received by the expiration of the time in which to file a protest or within 30 days following a decision of the Planning Board affirming or reducing the costs, or from a final decision of a court of competent jurisdiction confirming such costs, the costs shall become a special assessment against the property owner and shall constitute

a lien on the owner's property for the amount of said costs pursuant to the provisions of MGL c. 40, § 57, Interest shall begin to accrue on any unpaid costs at the statutory rate, as provided in MGL c. 59, § 57, after the 31st day following the day on which the costs became due.

C. Criminal penalty. Any person who violates any provision of this chapter, regulation, order or permit issued thereunder shall be punished by a fine of not more than $200. Each day or part thereof that such violation occurs or continues unabated shall constitute a separate offense for the purposes of this section.

D. Noncriminal disposition. As an alternative to criminal prosecution or civil action, the Town may elect to utilize the noncriminal disposition procedure set forth in MGL c. 40, § 21D, and Article VII, § **5-49** of the Code of the Town of Blackstone, in which case the Director of Public Works (for violations pertaining to illicit discharges) or Building Inspector or the designated agent of the Planning Board (for violations pertaining to land disturbance activities) shall be the enforcing person. The penalty for the first violation shall be $50. The penalty for the second violation shall be $100. The penalty for the third and each subsequent violation shall be $200. Each day or part thereof that such violation occurs or continues shall constitute a separate offense.

E. Appeals. The decisions or orders of the Planning Board shall be appealable to the Board of Appeals. Such appeals shall be filed within 30 days of the decision or order. Further relief shall be to a court of competent jurisdiction.

F. Remedies not exclusive. The remedies listed in this chapter are not exclusive of any other remedies available under any applicable federal, state or local law.

§ 110-12. Certificate of completion.

The Planning Board or its designated agent shall issue a letter certifying completion upon receipt and approval of the final reports and/or upon otherwise determining that all work of the permit has been satisfactorily completed in conformance with this chapter.

§ 110-13. Severability.

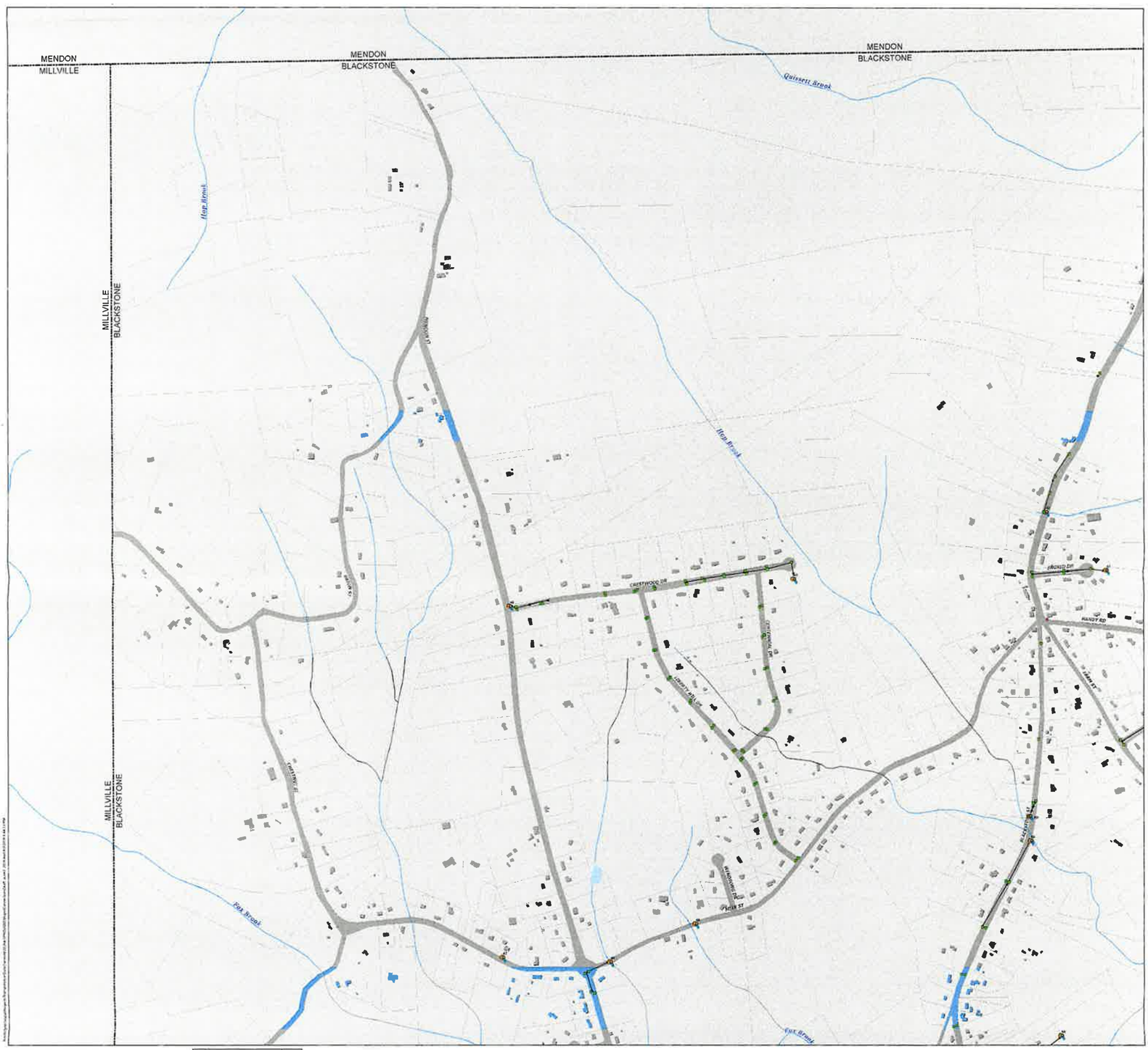
If any provision, paragraph, sentence, or clause of this chapter shall be held invalid or unenforceable for any reason, all other provisions shall continue in full force and effect.

FUSS & O'NEILL

CMRSWC

Appendix B

Storm System Mapping



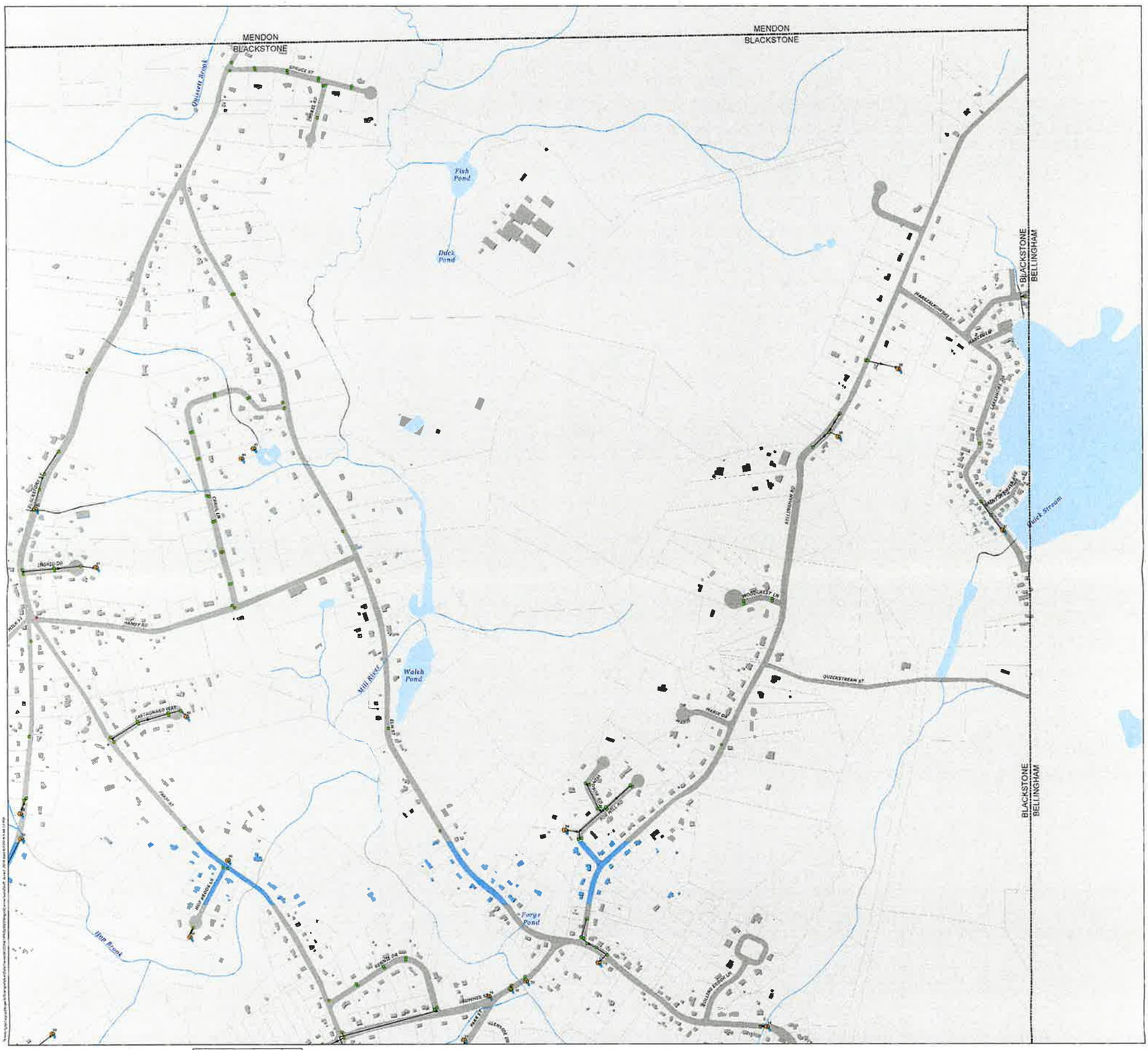
Town of Blackstone

GPS Data Collection May 2016

Sheet 1 of 4

May 20 2016

AECOM
Built to deliver a better world

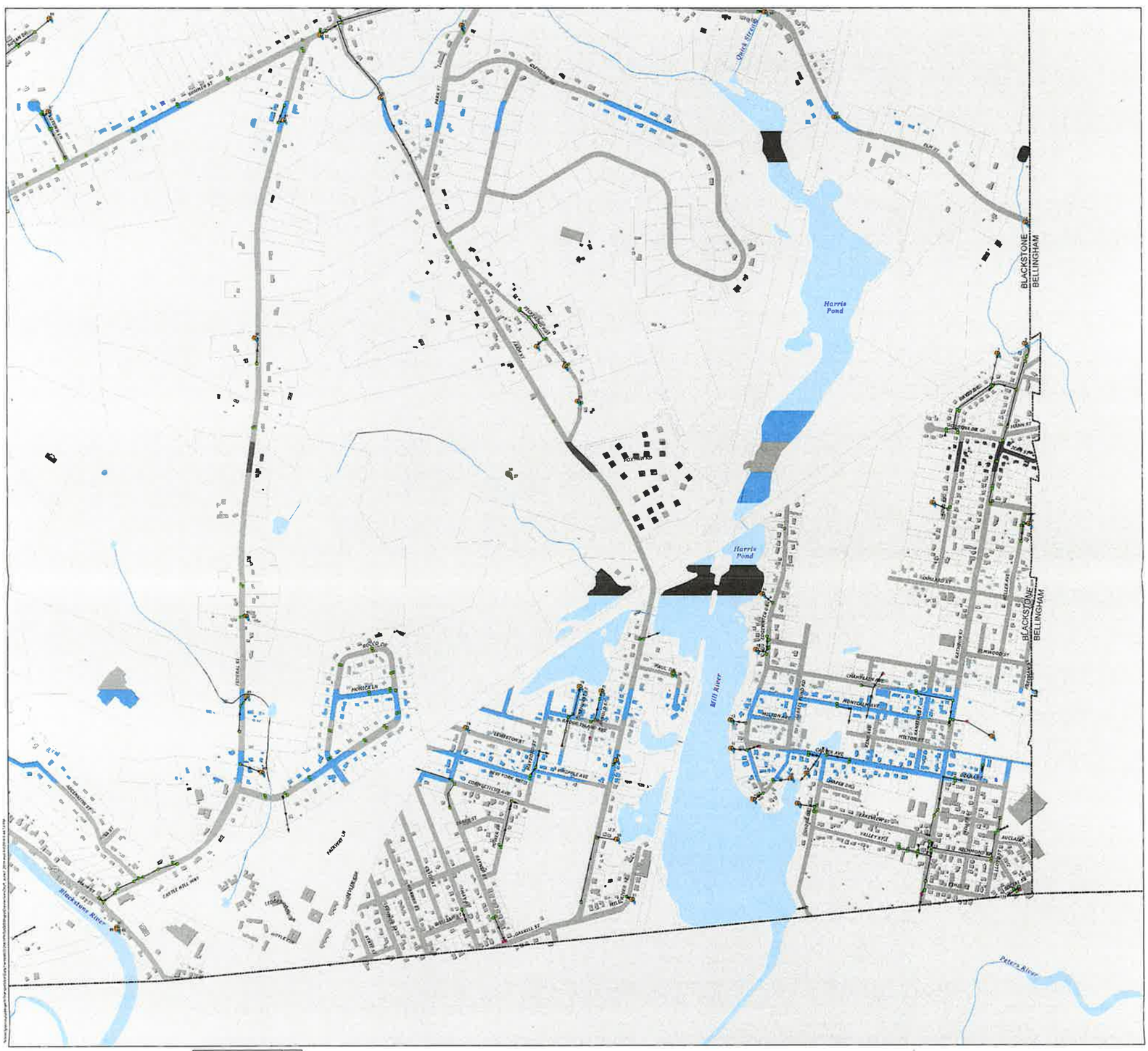


Town of Blackstone

GPS Data Collection May 2016

Sheet 2 of 4

AECOM
Built to deliver a better world



0 150 300 600 Feet



- Outfall
- Manhole
- Catch Basins
- Digitized Catch Basins
- Flow Path
- Grass Swales
- Detention Basin

Digitized Catch basins were located based on mapped catch basins from Blackstone DPW staff

Town of Blackstone

GPS Data Collection May 2016

Sheet 3 of 4

May 26, 2016

AECOM
Built to deliver a better world


MILLVILLE
BLACKSTONE
MILLVILLE
BLACKSTONE
Mdrch Brook
Kelly Pond
Blackstone River
Blackstone River
Fox Brook
0 150 300 600 Feet
1
2
3
4
Outfall
Manhole
Catch Basins
Digitized Catch Basins
Flow Path
Grass Swales
Detention Basin
Digitized Catch basins were located based on mapped catch basins from Blackstone DPW staff
Town of Blackstone
GPS Data Collection May 2016
Sheet 4 of 4
May 20 2016
AECOM
Built to deliver a better world

FUSS & O'NEILL

CMRSWC

Appendix C

Field Forms, Sample Bottle Labels, and Chain of Custody Forms

Address:

Date: Time:
Preservative: ICE/HCl/H_2O/MeOH/F/HNO^3/H_2SO^4/NaOH
Project: Location:
Project #:
Sampler:
Sample ID:

Address:

Date: Time:
Preservative: ICE/HCl/H_2O/MeOH/F/HNO^3/H_2SO^4/NaOH
Project: Location:
Project #:
Sampler:
Sample ID:

Address:

Date: Time:
Preservative: ICE/HCl/H_2O/MeOH/F/HNO^3/H_2SO^4/NaOH
Project: Location:
Project #:
Sampler:
Sample ID:

Address:

Date: Time:
Preservative: ICE/HCl/H_2O/MeOH/F/HNO^3/H_2SO^4/NaOH
Project: Location:
Project #:
Sampler:
Sample ID:

Address:

Date: Time:
Preservative: ICE/HCl/H_2O/MeOH/F/HNO^3/H_2SO^4/NaOH
Project: Location:
Project #:
Sampler:
Sample ID:

Address:

Date: Time:
Preservative: ICE/HCl/H_2O/MeOH/F/HNO^3/H_2SO^4/NaOH
Project: Location:
Project #:
Sampler:
Sample ID:

Address:

Date: Time:
Preservative: ICE/HCl/H_2O/MeOH/F/HNO^3/H_2SO^4/NaOH
Project: Location:
Project #:
Sampler:
Sample ID:

Address:

Date: Time:
Preservative: ICE/HCl/H_2O/MeOH/F/HNO^3/H_2SO^4/NaOH
Project: Location:
Project #:
Sampler:
Sample ID:

Address:

Date: Time:
Preservative: ICE/HCl/H_2O/MeOH/F/HNO^3/H_2SO^4/NaOH
Project: Location:
Project #:
Sampler:
Sample ID:

Address:

Date: Time:
Preservative: ICE/HCl/H_2O/MeOH/F/HNO^3/H_2SO^4/NaOH
Project: Location:
Project #:
Sampler:
Sample ID:

ADDRESS:

CHAIN-OF-CUSTODY RECORD NO. _____

☐ 24-Hour* ☐ 72-Hour* ☐ Other _____ (days)
☐ 48-Hour* ☐ Standard (____ days) *Surcharge Applies

PROJECT NAME | PROJECT LOCATION | PROJECT NUMBER | LABORATORY

REPORT TO:

INVOICE TO:

P.O. NO.:

Sampler's Signature: Date:

Source Codes:
MW=Monitoring Well PW=Potable Water T=Treatment Facility S=Soil B=Sediment
SW=Surface Water ST=Stormwater W=Waste A=Air C=Concrete

X=Other _____

Analysis Request

Containers

Item No.	Transfer Check 1	2	3	4	Sample Number	Source Code	Date Sampled	Time Sampled	Soil VOA Vial, ☐ methanol	Soil VOA Vial, ☐ water	Glass Soil Container ( ) oz	☐ $Na_2(SO_4)_2$	Other:	Other:	Water VOA Vial, ☐ As is ☐ HCl	Glass Amber ( ) ml, ☐ As is ☐ H_2SO_4	Plastic - As is, ☐ 250 ml ☐ 500 ml ☐ 1000 ml	Plastic - H_2SO_4, ☐ 250 ml ☐ 500 ml	Plastic - HNO_3, 250 ml ☐ Filtered ☐ 0.45µ ☐ 10µ	Plastic - NaOH, 250 ml	Comments

Transfer Number	Relinquished By	Accepted By	Date	Time
1				
2				
3				
4				

Charge Exceptions: ☐ CT Tax Exempt ☐ QA/QC ☐ Other _____
____ Duplicates ____ Blanks (Item Nos:)

Reporting and Detection Limit Requirements: ☐ RCP Deliverables ☐ MCP CAM Cert.

Additional Comments:

Outfall/Catchment Screening Form

Catchment ID: _____ **Town:** _____

Inspector: _____ **Date:** _____

Street Name: _____

Last rainfall event (date and amount): _____

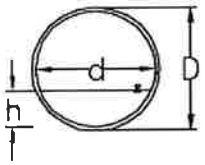
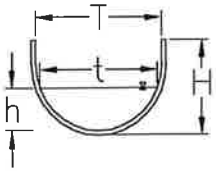
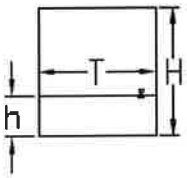
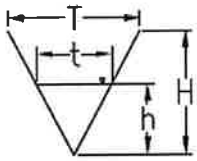
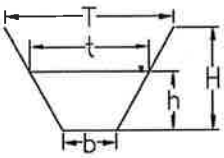
Type of Sampling Event ☐ Dry Weather Screening ☐ Wet Weather Sampling

Location: ☐ Outfall ☐ Manhole ☐ Catch Basin ☐ Interconnection

Is outfall submerged/inundated ? ☐ Yes ☐ No If YES screen/sample at 1st non-influenced structure: ☐ MH ☐ CB

Location ID: **Latitude:** **Longitude:**

Shape of Pipe/Swale (check one)

 ☐	 ☐	 ☐	 ☐	 ☐
Rounded Pipe	**Rounded Swale**	**Rectangular Pipe/Swale**	**Triangular Swale**	**Trapezoidal Swale**

Outfall Material:
- ☐ Concrete
- ☐ HDPE
- ☐ Corrugated Metal Pipe (CMP)
- ☐ Ductile Iron
- ☐ Clay
- ☐ PVC
- ☐ Other

Outfall/Manhole/Catchbasin Condition:
- ☐ Good ☐ Fair
- ☐ Poor ☐ Crumbling

Pipe Measurements:

Inner Dia. (in): d =

Outer Dia. (in.): D =

Pipe Width (in.): W =

Pipe Height (in.): H =

Flow Depth (in.): h =

Swale Measurements:

Swale Width (in): T =

Flow Width (in.): t =

Swale Height (in.): H =

Flow Depth (in.): h =

Bottom Width (in.): b =

Evidence of Flow: ☐ Yes ☐ No **If Yes, Description of Flow:** ☐ Damp ☐ Trickle ☐ Moderate ☐ High

Visual Evidence of Illicit Discharge

Visual Inspection: ☐ None ☐ Floatables ☐ Pet Waste ☐ Oily Sheen ☐ Sanitary Waste ☐ Algae ☐ Foam

Olfactory Evidence of Illicit Discharge

Olfactory Inspection: ☐ None ☐ Sewage Smell ☐ Musty ☐ Rotten Eggs ☐ Ammonia ☐ Petroleum

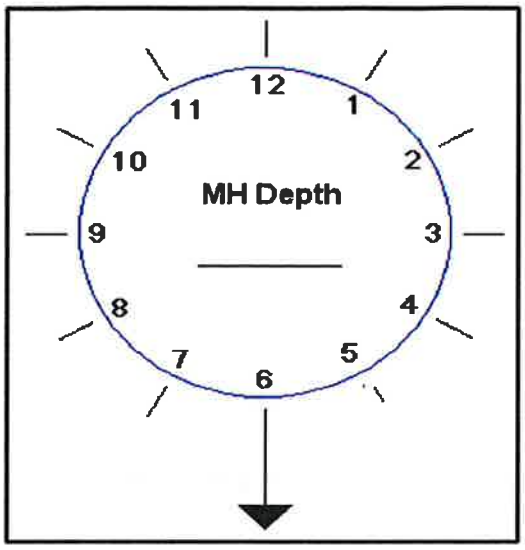
Samples Taken and Sampling Results

Temp.	Conductivity	Salinity	Chlorine
Ammonia	Surfactants	Bacteria	Pollutant of Concern

Manhole Inspection Form

Catchment ID	**Date**
Manhole ID	**Rain Last 48 Hours**
Street Location	
Inspector	

FUSS & O'NEILL



Sketch direction(s) of incoming flow

Clock Position (1-12) Pipe Material (Concrete, HDPE, PVC, Ductile Iron, CMP)	Pipe Diameter (in.)	Invert Elevation (ft)	Upgradient Structure/Source (MH ID, CB, Priv, Unk)	Flow (Damp, Trickle, Moderate, High)

Cover Conditions: Diameter of clear opening (in.) Buried: ☐ Cannot Inspect: ☐ Cannot Locate: ☐

Evidence of Flow: ☐ Yes ☐ No **If Yes, Description of Flow:** ☐ Damp ☐ Trickle ☐ Moderate ☐ High

Visual Evidence of Illicit Discharge

Visual Inspection: ☐ None ☐ Floatables ☐ Pet Waste ☐ Oily Sheen ☐ Sanitary Waste ☐ Algae ☐ Foam

Olfactory Evidence of Illicit Discharge

Olfactory Inspection: ☐ None ☐ Sewage Smell ☐ Musty ☐ Rotten Eggs ☐ Ammonia ☐ Petroleum

Samples Taken and Sampling Results

Temp.	Conductivity	Salinity	Chlorine
Ammonia	Surfactants	Bacteria	Pollutant of Concern

COMMENTS:

Further investigation needed? ☐ Yes ☐ No

FUSS & O'NEILL

CMRSWC

Appendix D

Water Quality Analysis Instructions, User's Manuals and Standard Operating Procedures

INTRODUCTION

This Standard Operating Procedure (SOP) applies to the collection of water quality samples at in-stream locations and stormwater outfalls, for the purposes of compliance with the MS4 General Permit, including chemical and bacteriological sampling.

FIELD PERSONNEL PROTECTION

Field personnel will protect themselves from potential exposure to pathogens and other contaminants. Precautions against exposure include the use of nitrile gloves and protective eyewear while collecting samples. Face shields will be worn if samples are collected from CSO regulator box and CSO outfall/intermediate manhole locations. Safety glasses with side shields will be worn by the sampler at all other sample locations.

Some work will be performed in flowing water. A personal flotation device will be worn while wearing chest or hip waders. Additionally, sampling will not be conducted alone. For work performed in roadways, samplers are required to wear a high visibility vest or clothing and use traffic cones for visibility. An escort vehicle/traffic detail will be provided when necessary to enhance visibility at road locations and provide additional eyes to look for potential safety issues.

COOLER PREPARATION

Before sampling begins, all coolers to be used for sample transport will be prepared with ice/water mixtures to ensure uniformity and that appropriate sample preservation temperatures (<4°C) are met.

1. Add ice to each cooler until the cooler is approximately half full. Once ice has been added to the cooler, add distilled water until the water level is at or near the ice surface. At this point the cooler is ready to accept samples and should be kept closed and shaded.

2. Periodically monitor water and ice levels in the coolers during the sampling event to ensure an appropriate amount of ice such that sample temperatures remain at or below 4°C. If additional ice needs to be added, first drain a portion of the water, not to exceed half of the water level, and add ice as necessary to ensure proper temperatures.

3. Samples should not rest on top of the ice/water mixture; rather they should be submerged or nearly submerged at all times. Be sure that all caps are tightened and undamaged. To avoid possible cross-contamination, sample bottles should be placed in unused colorless plastic zip-type bags by sample location.

4. Store the sample on wet ice in a clean cooler until it is delivered to the lab. Each cooler must contain a temperature blank, used to measure cooler temperature upon arrival at the lab. Unless samples were collected within 2 hours of delivery to the lab, chemical samples warmer than 6°C will be flagged, and bacteriological samples warmer than 10°C will be flagged.

SAMPLE BOTTLES AND ORDER OF FILLING

Table 1 lists the sampling parameters and bottles, in the order they should be collected, which is generally in order of decreasing volatility. Sample preservatives will be included in the appropriate bottles provided by the laboratory. Field sampling personnel should double-check via visual inspection prior to sampling to make sure the bottles have the appropriate preservative. Care should be taken not to displace preservative during filling of the sample bottle. Unfilled sample bottles should be kept cool, and potentially on ice, during extremely hot weather to prevent volatilization of any acid preservatives.

Table 1. Sample parameters, bottle size, preservative, headspace recommendation, and holding time.

Parameter	Sampling Technique	Sample Volume	Sample Preservation	Maximum Holding Time	Quality Control Procedure	Headspace
Volatile Organic Compounds	grab sample	40 ml	Hydrochloric acid; 4°C	14 days	Collect 1 duplicate field sample per team, per event	None
Semi-volatile Organic Compounds	grab sample	1000 ml	4°C; protect from light	40 days	Collect 1 duplicate field sample per team, per event	None
E. coli	grab sample	120 ml	Sterile container (sodium thiosulfate); 4°C	6 hours	Collect 1 duplicate field sample per team, per event	Fill to bottle shoulder (or fill indicator line)
Chemical Oxygen Demand	grab sample	500 ml	Sulfuric acid to pH <2	28 days	Collect 1 duplicate field sample per team, per event	Fill to bottle shoulder
Oil & Grease	grab sample	1000 ml	Sulfuric acid to pH <2; 4°C	28 days	Collect 1 duplicate field sample per team, per event	Fill to bottle shoulder
Phosphorus	grab sample	500 ml	Sulfuric acid to pH <2; 4°C	28 days	Collect 1 duplicate field sample per team, per event	Fill to bottle shoulder
Total Kjeldahl Nitrogen	grab sample	500 ml	Sulfuric acid to pH 1.5-2; 4°C	28 days	Collect 1 duplicate field sample per team, per event	Fill to bottle shoulder

Parameter	Sampling Technique	Sample Volume	Sample Preservation	Maximum Holding Time	Quality Control Procedure	Headspace
Total Metals	grab sample	250 ml	Nitric acid to pH <2; 4°C	6 months	Collect 1 duplicate field sample per team, per event	Fill to bottle shoulder
Hardness	grab sample	250 ml	Nitric acid to pH <2; 4°C	6 months	Collect 1 duplicate field sample per team, per event	Fill to bottle shoulder
Dissolved Metals	grab sample	250 ml	4°C	6 months	Collect 1 duplicate field sample per team, per event	Fill to bottle shoulder
Total Suspended Solids	grab sample	500 ml	4°C	7 days	Collect 1 duplicate field sample per team, per event	Fill to bottle shoulder
Turbidity	grab sample	500 ml	4°C	48 hours	Collect 1 duplicate field sample per team, per event	Fill to bottle shoulder
Pesticides	grab sample	1000 ml	4°C	40 days	Collect 1 duplicate field sample per team, per event	Fill to bottle shoulder

SAMPLING METHODS

Sample collection methods will differ depending on location type and based on site-specific factors such as water level, discharge velocity, water depth, and safety. The technique used for sample collection should be selected in the following order of priority, considering site access and safety (sampling should be conducted in the safest manner possible):

1. Direct Collection – preferred whenever possible
2. Pole Sampling – when direct collection is not feasible or cannot be done safely

In-Stream Locations (Dry and Wet Weather)

For in-stream sampling locations, water samples will be collected from flowing water, and mid-stream to ensure that the water is not stagnant. The sample will be collected upstream of the sampler, so as not to have

interference from disturbed sediments during collection and to minimize the potential for the sampler to contaminate the sample. If more than one sample is needed at a particular location or two sampling sites are in close proximity, the downstream samples will be collected before upstream samples. For direct sample collection, the sampler should use waders or hip boots to access the mid-stream sampling location. If water depths or water velocity prevent direct collection, a sample should be collected using a sampling pole.

Stormwater Outfalls (Dry Weather if flowing, and Wet Weather)

Stormwater outfall samples will be collected from the outlet of the outfall and by direct collection where possible. In situations where water depth or velocity prevents direct collection, samples will be taken using a sampling pole where appropriate. Samples should be collected from the direct flow emanating from the outfall and care should be taken not to touch the lip of the sample bottle to the outfall or otherwise contaminate the sample. In instances where outfalls are inundated due to elevated river levels, samples will be collected at the nearest accessible upstream manhole.

SAMPLING TECHNIQUES AND METHODS

In general, when the sample location is easily accessible by foot, grab samples will be collected by submerging the sample container directly into the surface water (direct collection). In areas where access is limited or difficult, sampling may be conducted with a long-handled pole. This is often the case at large streams where sampling away from the bank or from a bridge is necessary to obtain representative surface water samples. When such a sampling device is utilized, sample bottles will be attached to the device in an appropriate manner and equipment blanks will be used to ensure sample integrity.

Clean Sampling Techniques

In all cases, the following clean sampling techniques will be used, regardless of sample collection technique:

1. Never re-use sample bottles.
2. Wear powder-free nitrile gloves when collecting metal samples to avoid contamination of the sample. Either powder-free nitrile or latex gloves can be used for other sampling.
3. Change gloves if they are soiled or if there is potential for cross-contamination.
4. When collecting the sample, do not touch the inside of the bottle or cap. Do not put the cap on the ground.
5. When collecting the sample, do not breathe in the direction of the container.
6. No eating, drinking, or smoking or chewing tobacco during sample collection.
7. Do not park vehicles in the immediate sample collection area.
8. After each sample is collected, record the sample time and immediately place the bottles on ice in a cooler prepared as described above.

Surface water samples can be collected from flowing water by direct bottle submersion or by attaching sample bottles to an extendable swing-arm sampling pole or a weighted sampling vessel attached to a rope to sample from a distance, in a manhole or from a bridge.

Direct Collection (Bottle Immersion Technique)

The protocol for collecting surface water samples from flowing water using direct bottle submersion is as follows:

1. Label the sample bottles prior to sampling. Wet labels are difficult to write on. Use permanent marker or waterproof pen for labeling.

2. Collect samples in order of decreasing volatility. Sample preservatives should be included in the laboratory-supplied sample bottles. Double check via visual inspection that any required preservative is in the bottle prior to sampling.

3. Uncap the sample bottle. Do not touch the inside of the bottle or cap. Do not put the cap on the ground.

4. Collect samples upstream of the sampler at mid-stream. Care should be taken not to disturb bottom sediments during sample collection to prevent particles from becoming suspended in the water column.

5. Holding the bottle upside down, push the bottle below the water surface. Turn the bottle forward and scoop it forward and up and out of the water. Do this in one sweeping motion. Make sure you sample forward and away from you so that there is no chance that you will contaminate the sample with bacteria from your arm.

6. If the bottle contains a preservative, do not displace it while filling the container and leave adequate space in the sample bottle for mixing the preservative and the sample. If the sample bottle is completely filled, pour some of the sample out to provide adequate head space.

7. After filling the bottle, carefully replace the lid and shake the bottle to assure adequate mixing of the preservative and the sample.

8. When filling sample containers for volatile and semi-volatile organic compounds, do not agitate the sample during collection in the sample container. Tip the sample container so that a slow, laminar flow of water enters the sample container. The stream of water will be directed to the sides of the sample container to prevent aeration of the sample due to turbulence. Vials will be sealed with no headspace to prevent any further volatilization of the sample once it has been collected. Before it is sealed the VOA vial will be filled to overflowing such that a meniscus will form at the lip of the vial. The lid will be placed over the meniscus and tightened so that no air bubbles are present. After the lid is screwed on, the VOA vial will be turned over and tapped on a hard surface and checked for bubbles. If bubbles are observed in the VOA vial, empty the contents and follow step 8 until no head space is achieved.

9. Place sample(s) into unused colorless plastic zip-type bags (only with sample bottles from the same site) and in an iced cooler. Deliver samples to the laboratory within 6 hours of collection to meet bacteria sample hold times.

10. Perform sampling equipment decontamination procedures, as necessary, before leaving the site (see Decontamination Procedures, below).

Pole Sampling Technique

The protocol for collecting a water sample using an extendable pole sampler is outlined below.

1. Label the sample bottles prior to sampling. Wet labels are difficult to write on. Use permanent marker or waterproof pen for labeling.

2. Collect samples in order of decreasing volatility. Sample preservatives should be included in the laboratory-supplied sample bottles. Double check via visual inspection that any required preservative is in the bottle prior to sampling.

3. Affix the sample bottle to the swing arm of the pole sampler using cable ties. Make sure that the bottle is sufficiently secure so as not to be pulled away from the swing arm during sampling.

4. Uncap the sample bottle. Do not touch the inside of the bottle or cap. Do not put the cap on the ground.

5. Reach the pole, with sample bottle attached, out above the location to be sampled. Lower the lip of the sample bottle so that water begins to fill the vessel or just below the water surface. Take care to not touch the lip of the sample bottle to adjacent surfaces such as the bottom of the stream or outfall pipe to avoid disturbing/collecting sediment, algae, or other debris.

6. If the bottle contains a preservative, do not displace it while filling the container and leave adequate space in the sample bottle for mixing the preservative and the sample. If the sample bottle is completely filled, pour some of the sample out to provide adequate head space.

7. After filling the bottle, carefully replace the lid and shake the bottle to assure adequate mixing of the preservative and the sample.

8. When filling sample containers for volatile and semi-volatile organic compounds, do not agitate the sample during collection in the sample container. Tip the sample container so that a slow, laminar flow of water enters the sample container. The stream of water will be directed to the sides of the sample container to prevent aeration of the sample due to turbulence. Vials will be sealed with no headspace to prevent any further volatilization of the sample once it has been collected. Before it is sealed the VOA vial will be filled to overflowing such that a meniscus will form at the lip of the vial. The lid will be placed over the meniscus and tightened so that no air bubbles are present. After the lid is screwed on, the VOA vial will be turned over and tapped on a hard surface and checked for bubbles. If bubbles are observed in the VOA vial, empty the contents and follow step 8 until no head space is achieved.

9. Place sample(s) into unused colorless plastic zip-type bags (only with sample bottles from the same site) and in an iced cooler. Deliver samples to the laboratory within 6 hours of collection to meet bacteria sample hold times.

10. Perform sampling equipment decontamination procedures, as necessary, before leaving the site (see Decontamination Procedures, below).

QUALITY CONTROL SAMPLES – FIELD DUPLICATES

Duplicate samples should be collected at the frequency detailed in the sampling plan. Sampling techniques will be identical to those outlined for direct, pole and weighted vessel sampling. Duplicate samples will be collected immediately after the primary sample for the same parameter.

FIELD MEASUREMENTS

Instantaneous water quality measurements using field instruments will be collected prior to samples collected for laboratory analysis. Ammonia, surfactants, chlorine, water temperature, salinity, and conductivity will be measured in the field using a water quality meter and/or field test kit at the time of sample collection. Water quality field measurements will be taken with the approved meter(s)/probe(s) at half (1/2) the water depth where overall stream depth is greater than one (1) foot. Otherwise, the probe will be sufficiently submerged to collect water quality measurements. If water depth is not sufficient to fully submerge the probe, then water will be collected in a clean, spare, sample bottle or graduated cylinder such that the probe can be submerged. The water quality field parameters will be measured immediately after filling the container. Equipment decontamination procedures outlined in the Decontamination Procedure SOP will be followed, as necessary, between samples and sites.

DECONTAMINATION PROCEDURES: GENERAL REQUIREMENTS

- Before using any equipment, clean/decontaminate all sampling equipment that is exposed to the sample.
- At the start of a sampling event transport all equipment to the field pre-cleaned and ready to use, unless otherwise justified.
- Rinse all equipment with water after use, even if it is to be field-cleaned for other sites.
- Segregate equipment that is only used once (i.e., not cleaned in the field) from clean equipment and return to the in-house cleaning facility to be cleaned in a controlled environment.
- Protect decontaminated field equipment from environmental contamination by securely wrapping and sealing with one of the following:
    - Aluminum foil (commercial grade is acceptable);
    - Untreated butcher paper; or
    - Clean, untreated, disposable plastic bags. Plastic bags may be used:
        - For all analyte groups except volatile and extractable organics;
        - For volatile and extractable organics, if the equipment is first wrapped in foil or butcher paper or if the equipment is completely dry.
- Containerize all solvent rinsing wastes, detergent wastes and other chemical wastes requiring off-site or regulated disposal. Dispose of all wastes in conformance with applicable regulations.

CLEANING REAGENTS

Detergents:
Luminox (or a non-phosphate solvent based equivalent) and Liqui-Nox (or a non-phosphate equivalent). Note that Alconox cannot be used if Total Phosphorus is an analyte. EPA recommends Luminox (or equivalent) since solvent rinses can be eliminated from the cleaning process. Liquinox (or equivalent) may be substituted (solvent rinses, when applicable, must be performed).

Solvents:

Pesticide grade solvents must be used and must be purchased from a laboratory supply vendor.

- Properly dispose of all wastes according to applicable regulations. Containerize all solvents (including rinsates) for on-site remediation or off-site disposal, as required.
- Store all solvents away from potential sources of contamination (gas, copier supplies, etc.).

Analyte-free Water:

Analyte-free water is water in which all analytes of interest and all interferences are below method detection limits.

- Maintain documentation (such as results from equipment blanks) to demonstrate the reliability and purity of analyte-free water sources.
- The source of the water must meet the requirements of the analytical method and must be free from the analytes of interest. In general, the following water types are associated with specific analyte groups:
    - Milli-Q (or equivalent polished water): suitable for all analyses.
    - Organic-free: suitable for volatile and extractable organics.
    - Deionized water: not suitable for volatile and extractable organics if the analytes of interest are present in concentrations that affect the result.
    - Distilled water: not suitable for volatile and extractable organics, metals or ultra-trace metals.
- Use analyte-free water for blank preparation and the final decontamination water rinse.
- In order to minimize long-term storage and potential leaching problems, obtain or purchase analyte-free water just prior to the sampling event. If obtained from a source (such as a laboratory), fill the transport containers and use the contents for a single sampling event. Empty the transport container(s) at the end of the sampling event.
- Discard any analyte-free water that is transferred to a dispensing container (such as a wash bottle) at the end of each sampling day.

Acids:

- Reagent Grade Nitric Acid: 10 - 15% (one volume concentrated nitric acid and five volumes deionized water).
    - Use for the acid rinse unless nitrogen components (e.g., nitrate, nitrite, etc.) are to be sampled.
    - If sampling for ultra-trace levels of metals, use an ultra-pure grade acid.
- Reagent Grade Hydrochloric Acid: 10% hydrochloric acid (one volume concentrated hydrochloric and three volumes deionized water).
    - Use when nitrogen components are to be sampled.
- **If samples for both metals and the nitrogen-containing components are collected with the equipment, use the hydrochloric acid rinse, or thoroughly rinse with hydrochloric acid after a nitric acid rinse.**
- If sampling for ultra trace levels of metals, use an ultra-pure grade acid.
- Freshly prepared acid solutions may be recycled during the sampling event or cleaning process. Dispose appropriately at the end of the sampling event, cleaning process or if acid is discolored or appears otherwise contaminated (e.g., floating particulates).
    - Transport only the quantity necessary to complete the sampling event.
- Dispose of any unused acids properly.

REAGENT STORAGE CONTAINERS

The contents of all containers must be clearly marked.

- Detergents:
  - Store in the original container or in a high density polyethylene (HDPE) or polypropylene (PP) container.
- Solvents:
  - Store solvents to be used for cleaning or decontamination in the original container until use in the field. If transferred to another container for field use, the container must be either glass or Teflon.
  - Use dispensing containers constructed of glass, Teflon, or stainless steel. Note: if stainless steel sprayers are used, any components (including gaskets and transfer lines) that contact the solvents must be constructed of inert materials.
- Analyte-free Water: Transport in containers appropriate to the type of water to be stored. If the water is commercially purchased (e.g., grocery store), use the original containers when transporting the water to the field. Containers made of glass, Teflon, polypropylene, or Polyethylene (PE) are acceptable.
  - Use glass, Teflon, polypropylene or PE to transport organic-free sources of water on-site.
  - Dispense water from containers made of glass, Teflon, PE or polypropylene.
  - Do not store water in transport containers before beginning a sampling event, unless satisfactory long-term storage of analyte-free water for a specified maximum storage time has been documented for the analytes of interest. The water should be replaced and the maximum storage time shortened if it is determined that the analyte-free water has been contaminated, e.g., by the analysis of field-QC blanks or other QC blanks that have been composed using the water stored in the container.
  - Store and dispense acids using containers made of glass, Teflon, PE or polypropylene.

FIELD DECONTAMINATION OF PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment which comes into contact with the sampling matrix (i.e., stream water or outfall or CSO discharge) will be replaced or decontaminated in the field between sampling locations.

In most cases, only gloves will need to be replaced between sampling locations to prevent the inadvertent cross-contamination of samples. If waders or boots require decontamination between locations, decontamination will follow the procedure described below for sampling equipment.

FIELD DECONTAMINATION OF SAMPLING EQUIPMENT

Flow measuring equipment such as staff gages, velocity meters, and other stream gauging equipment may be cleaned with tap water between measuring locations, if necessary. No further field decontamination is necessary.

The following must be done prior to field decontamination:

1. Wear clean nitrile gloves & safety glasses.
2. No eating, smoking, drinking, chewing, or any hand to mouth contact shall be permitted during decontamination operations.
3. If stream sampling, rinse equipment in stream to remove any mud or debris.
4. Disassemble equipment (unscrew plastic bottle holder from pole sampler).

Preferred Method of Decontamination

The following procedure for field decontamination is taken from SESDPROC-205-R3, Field Equipment Cleaning and Decontamination (EPA SESD, 2015) and is the preferred method to be used for field decontamination of sampling equipment or components of equipment that come in contact with the sample:

1. An optional Liquinox® detergent wash step may be useful to remove gross dirt and soil, if present
2. Clean with tap water and Luminox® detergent using a brush, if necessary, to remove particulate matter and surface films.
3. Rinse thoroughly with tap water.
4. Rinse thoroughly with analyte-free water (deionized or better) and place on a clean foil-wrapped surface to air-dry.
5. Wrap the dry equipment with aluminum foil. If the equipment is to be stored overnight before it is wrapped in foil, it should be covered and secured with clean, unused plastic sheeting.
6. Upon arrival at next sampling location, rinse several times with sample water from the next sampling location.

Properly dispose of any analyte-free water that is transferred to a dispensing container (such as a wash bottle) at the end of each sampling day.

Alternative Method of Decontamination

The historical solvent rinse method of cleaning equipment for trace contaminant sampling remains an acceptable method, but should be used only if equipment blanks obtained using the field decontamination method above show evidence of cross-contamination due to sampling. Use of solvents and acids in the field in not preferred due to increased health and safety and disposal concerns. The procedure for field decontamination using

1. Clean with tap water and Liquinox® detergent using a brush, if necessary, to remove particulate matter and surface films.
2. Rinse thoroughly with tap water.
3. Rinse thoroughly with deionized water.
4. Rinse with 10% hydrochloric acid solution (Nitric acid cannot be used when sample analysis includes nutrients).
5. Rinse with analyte-free water (deionized or better).
6. Place on a clean foil-wrapped surface to air dry.
7. Wrap the dry equipment with aluminum foil. If the equipment is to be stored overnight before it is wrapped in foil, it should be covered and secured with clean, unused plastic sheeting.
8. Upon arrival at next sampling location, rinse several times with sample water from the next sampling location.

All rinsate from field decontamination will be collected in 5 gallon buckets, containerized with a lid, and neutralized to approximately pH 7 before off-site disposal. Equipment will be allowed to air dry before wrapping in aluminum foil.

The outside surface of containers is often covered with the matrix from which the sample was taken and/or corrosive preservatives. Consequently, sealed sample containers must be rinsed (with tap or deionized water) or wiped free of excess gross media/debris to the extent possible prior to its placement into the cooler. This measure will reduce the possibility that subsequent handlers will be exposed to analytes of interest and/or hazardous preservatives.

In addition, all equipment, instruments and containers must be cleaned of obvious mud, leaves, and debris prior to leaving the site.

FIELD DECONTAMINATION OF FIELD INSTRUMENTS (TAPES, METERS, ETC.)

Follow manufacturer's recommendations for cleaning instruments. At a minimum:

- Wipe down equipment body and cables with lab-grade detergent solution (Liqui-nox). Probes shall be well rinsed. Check manufacturer's instructions for recommendations and/or restrictions on cleaning.
- Rinse thoroughly with tap water.
- Rinse thoroughly with analyte-free water (deionized or better).
- Store equipment according to the manufacturer's recommendation or wrap equipment in aluminum foil, untreated butcher paper or untreated plastic bags to eliminate potential environmental contamination.

FIELD DECONTAMINATION SUPPLIES

Required solutions and equipment for field decontamination using the procedures described above:

- 5 gallon buckets with lid to containerize decontamination wastes
- Scrub brush
- Nitrile gloves
- Safety glasses
- Paper towels
- Cube of tap water (minimum 10 L) and squeeze bottle
- Cube of deionized water (minimum 10 L) and Teflon squeeze bottle
- Organic-free water and Teflon squeeze bottle,
- Non-phosphate detergent (Liquinox and Luminox) solutions in Teflon squeeze bottle
- +/- 10% hydrochloric acid solution in Teflon squeeze bottle

DECONTAMINATION OF OTHER SAMPLING-RELATED EQUIPMENT

Analyte-Free Water Containers

This section pertains to containers that are purchased to transport, store and dispense analyte-free water. It does not apply to water that has been purchased in containers.

New Containers:

- Wash containers and caps according to the instructions above for sampling equipment, omitting the solvent rinse if plastic (polyethylene or polypropylene) containers are being cleaned.
- Cap with Teflon film or the bottle cap. The bottle cap must be composed of the same material as the container and cannot be lined.

Reused Containers:

- Immediately after emptying, cap with aluminum foil, Teflon film or the container cap.
- Wash the exterior of the container with lab-grade detergent solution (Luminox) and rinse with analyte-free water.
- Rinse the interior thoroughly with analyte-free water.
- Invert and allow to drain and dry.

Ice Chests and Shipping Containers

- Wash the exterior and interior of all ice chests with laboratory detergent (Luminox) after each use.

- Rinse with tap water and air dry before storing.
- If the ice chest becomes severely contaminated, clean as thoroughly as possible, render unusable, and properly dispose.

REFERENCES

1. U.S. Environmental Protection Agency, Region IV, Science and Ecosystem Support Division, Field Equipment Cleaning and Decontamination, December 2015, (SESDPROC-205-R3).

2. Florida Department of Environmental Protection, FC 1000 Cleaning / Decontamination Procedures, March 1, 2014 (DEP-SOP-001/01).

FUSS & O'NEILL

CMRSWC

Appendix E

IDDE Employee Training Record

Illicit Discharge Detection and Elimination (IDDE)
Employee Training Record

Town of Blackstone, Massachusetts

Date of Training: _____

Duration of Training: _____

Name	Title	Signature

FUSS & O'NEILL

CMRSWC

Appendix F

Source Isolation and Confirmation Methods: Instructions, Manuals, and SOPs

SOP 10: LOCATING ILLICIT DISCHARGES

Introduction

An "illicit discharge" is any discharge to an engineered storm drain system that is not composed entirely of stormwater unless the discharge is defined as an allowable non-stormwater discharge under the 2003 Massachusetts MS4 Permit. Illicit discharges may enter the engineered storm drain system through direct or indirect connections, such as: cross-connections of sewer services to engineered storm drain systems; leaking septic systems; intentional discharge of pollutants to catch basins; combined sewer overflows; connected floor drains; and sump pumps connected to the system (under some circumstances). Illicit discharges can contribute high levels of pollutants, such as heavy metals, toxics, oil, grease, solvents, nutrients, and pathogens to receiving streams.

Illicit discharges can be located by several methods, including routine dry weather outfall inspections and catch basin inspections, which are described in detail in SOP 1, "Dry Weather Outfall Inspection" and SOP 3, "Catch Basin Inspection and Cleaning", respectively, as well as from citizen reports.

This SOP assumes that the municipality has legal authority (i.e., a bylaw or ordinance) in place, per the requirements of the 2003 Massachusetts MS4 Permit, to prohibit the connection of non-stormwater discharges into the storm drain system. The authority or department for addressing illicit discharge reports would be clearly identified in the municipality's legal authority. In Massachusetts, this is typically a combination of the Board of Health, the Department of Public Works (or Highway Department), and the local sanitary sewer department or commission. In some communities, the Conservation Commission may also play a role. This SOP refers to "appropriate authority" generically to reflect differences in how municipalities have identified these roles.

Identifying Illicit Discharges

The following are often indicators of an illicit discharge from stormwater outfall:

1. Foam: indicator of upstream vehicle washing activities, or an illicit discharge.
2. Oil sheen: result of a leak or spill.
3. Cloudiness: indicator of suspended solids such as dust, ash, powdered chemicals and ground up materials.
4. Color or odor: Indicator of raw materials, chemicals, or sewage.
5. Excessive sediment: indicator of disturbed earth of other unpaved areas lacking adequate erosion control measures.
6. Sanitary waste and optical enhancers (fluorescent dyes added to laundry detergent): indicator of the cross-connection of a sewer service.
7. Orange staining: indicator of high mineral concentrations.

Both bacteria and petroleum can create a sheen on the water surface. The source of the sheen can be differentiated by disturbing it, such as with a pole. A sheen caused by oil will remain intact and move in

a swirl pattern; a sheen caused by bacteria will separate and appear "blocky". Bacterial sheen is not a pollutant but should be noted.

Citizen Call in Reports

Reports by residents and other users of a water body can be effective tools in identifying the presence of illicit discharges. Many communities have set up phone hotlines for this purpose, or have provided guidance to local police departments and dispatch centers to manage data reported in this manner. Municipal employees and the general public should receive education to help identify the signs of illicit discharges and should be informed how to report such incidents.

When a call is received about a suspected illicit discharge, the attached IDDE Incident Tracking Sheet shall be used to document appropriate information. Subsequent steps for taking action to trace, document, and eliminate the illicit discharge are described in the following sections.

Potential illicit discharges reported by citizens should be reviewed on an annual basis to locate patterns of illicit discharges, identify high-priority catchments, and evaluate the call-in inspection program.

Tracing Illicit Discharges

Whenever an illicit discharge is suspected, regardless of how it was identified, the attached IDDE Incident Tracking Sheet should be utilized. The Incident Tracking Sheet shall be provided to the appropriate authority (i.e., Board of Health, Department of Public Works, etc.), which shall promptly investigate the reported incident.

If the presence of an illicit discharge is confirmed by the authority, but its source is unidentified, additional procedures to determine the source of the illicit discharge should be completed.

1. Review and consider information collected when illicit discharge was initially identified, for example, the time of day and the weather conditions for the previous 72 hours. Also consider and review past reports or investigations of similar illicit discharges in the area.
2. Obtain storm drain mapping for the area of the reported illicit discharge. If possible, use a tracking system that can be linked to your system map, such as GIS.
3. Document current conditions at the location of the observed illicit discharge point, including odors, water appearance, estimated flow, presence of floatables, and other pertinent information. Photograph relevant evidence.
4. If there continues to be evidence of the illicit discharge, collect water quality data using the methods described in SOP 13, "Water Quality Screening in the Field". This may include using field test kits or instrumentation, or collecting analytical samples for full laboratory analysis.
5. Move upstream from the point of observation to identify the source of the discharge, using the system mapping to determine infrastructure, tributary pipes, and drainage areas that contribute. At each point, survey the general area and surrounding properties to identify potential sources of the illicit discharge. Document observations at each point on the IDDE Incident Tracking Sheet as well as with photographs.
6. Continue this process until the illicit discharge is no longer observed, which will define the boundaries of the likely source. For example if the illicit discharge is present in catch basin 137

but not the next upstream catch basin, 138, the source of the illicit discharge is between these two structures.

If the source of the illicit discharge could not be determined by this survey, consider using dye testing, smoke testing, or closed-circuit television inspection (CCTV) to locate the illicit discharge.

Dye Testing

Dye testing is used to confirm a suspected illicit connection to a storm drain system. Prior to testing, permission to access the site should be obtained. Dye is discharged into the suspected fixture, and nearby storm drain structures and sanitary sewer manholes observed for presence of the dye. Each fixture, such as sinks, toilets, and sump pumps, should be tested separately. A third-party contractor may be required to perform this testing activity.

Smoke Testing

Smoke testing is a useful method of locating the source of illicit discharges when there is no obvious potential source. Smoke testing is an appropriate tracing technique for short sections of pipe and for pipes with small diameters. Smoke added to the storm drain system will emerge in connected locations. A third-party contractor may be required to perform this testing activity.

Closed Circuit Television Inspection (CCTV)

Televised video inspection can be used to locate illicit connections and infiltration from sanitary sewers. In CCTV, cameras are used to record the interior of the storm drain pipes. They can be manually pushed with a stiff cable or guided remotely on treads or wheels. A third-party contractor may be required to perform this testing activity.

If the source is located, follow steps for removing the illicit discharge. Document repairs, new sanitary sewer connections, and other corrective actions required to accomplish this objective. If the source still cannot be located, add the pipe segment to a future inspection program.

This process is demonstrated visually on the last page of this SOP.

Removing Illicit Discharges

Proper removal of an illicit discharge will ensure it does not recur. Refer to Table SOP 10-1, attached for, for examples of the notification process.

In any scenario, conduct a follow up inspection to confirm that the illicit discharge has been removed. Suspend access to the storm drain system if an "imminent and substantial danger" exists or if there is a threat of serious physical harm to humans or the environment.

Attachments

1. Illicit Discharge Incident Tracking Sheet

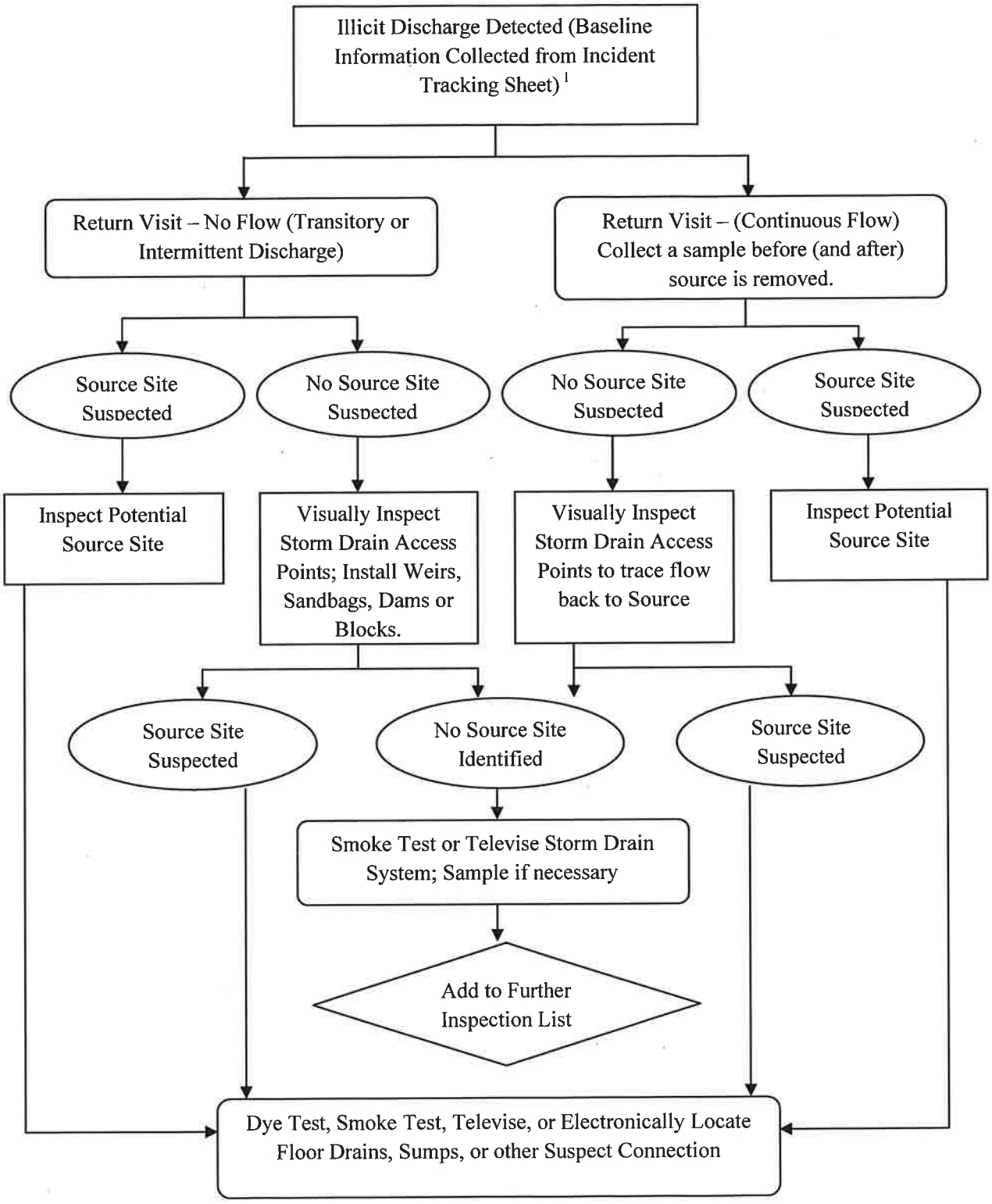
Related Standard Operating Procedures

1. SOP 1: Dry Weather Outfall Inspection
2. SOP 2: Wet Weather Outfall Inspection
3. SOP 3: Catch Basin Inspection
4. SOP 13: Using Field Test Kits For Outfall Screening
5. SOP 15: Private Drainage Connections

Table SOP 10-1

Notification and Removal Procedures for Illicit Discharges into the Municipal Separate Storm Sewer System

Financially Responsible	Source Identified	Enforcement Authority	Procedure to Follow
Private Property Owner	One-time illicit discharge (e.g. spill, dumping, etc.)	Ordinance enforcement authority (e.g. Code Enforcement Officer)	• Contact Owner • Issue Notice of Violation • Issue fine
Private Property Owner	Intermittent or continuous illicit discharge from legal connection	Ordinance enforcement authority (e.g. Code Enforcement Officer)	• Contact Owner • Issue Notice of Violation • Determine schedule for removal • Confirm removal
Private Property Owner	Intermittent or continuous illicit discharge from illegal connection or indirect (e.g. infiltration or failed septic)	Plumbing Inspector or ordinance enforcement authority	• Notify Plumbing Inspector or ordinance enforcement authority
Municipal	Intermittent or continuous illicit discharge from illegal connection or indirect (e.g. failed sewer line)	Ordinance enforcement authority (e.g. Code Enforcement Officer)	• Issue work order • Schedule removal • Remove connection • Confirm removal
Exempt 3rd Party	Any	USEPA	• Notify exempt third party and USEPA of illicit discharge


Illicit Discharge Detected (Baseline Information Collected from Incident Tracking Sheet) [1]
Return Visit – No Flow (Transitory or Intermittent Discharge)
Return Visit – (Continuous Flow) Collect a sample before (and after) source is removed.
Source Site Suspected
No Source Site Suspected
No Source Site Suspected
Source Site Suspected
Inspect Potential Source Site
Visually Inspect Storm Drain Access Points; Install Weirs, Sandbags, Dams or Blocks.
Visually Inspect Storm Drain Access Points to trace flow back to Source
Inspect Potential Source Site
Source Site Suspected
No Source Site Identified
Source Site Suspected
Smoke Test or Televise Storm Drain System; Sample if necessary
Add to Further Inspection List
Dye Test, Smoke Test, Televise, or Electronically Locate Floor Drains, Sumps, or other Suspect Connection

[1] – *Guidelines and Standard Operating Procedures: Illicit Discharge Detection and Elimination and Pollution Prevention/Good Housekeeping for Stormwater Phase II Communities in New Hampshire,* New Hampshire Estuary Project, 2006, p. 25, Figure 2-1.

Illicit Discharge Incident Tracking Sheet

Incident ID:				
Responder Information (for Citizen-Reported issues)				
Call Taken By:		Call Date:		
Call Time:		Precipitation (inches) in past 24-48 hours:		
Observer Information				
Date and Time of Observation:		Observed During Regular Maintenance or Inspections? ☐ Yes ☐ No		
Caller Contact Information (optional) or Municipal Employee Information:				
Observation Location: (complete one or more below)				
Latitude and Longitude:				
Stream Address or Outfall #:				
Closest Street Address:				
Nearby Landmark:				
Primary Location Description	**Secondary Location Description:**			
☐Stream Corridor (In or adjacent to stream)	☐Outfall	☐In-stream Flow	☐Along Banks	
☐Upland Area (Land not adjacent to stream)	☐Near Storm Drain	☐Near other water source (stormwater pond, wetland, ect.):		
Narrative description of location:				
Upland Problem Indicator Description				
☐Dumping	☐Oil/Solvents/Chemicals	☐Sewage		
☐Detergent, suds, etc.	☐Other:_____			
Stream Corridor Problem Indicator Description				
Odor	☐None	☐Sewage	☐Rancid/Sour	☐Petroleum (gas)
	☐Sulfide (rotten eggs); natural gas	☐Other: Describe in "Narrative" section		
Appearance	☐"Normal"	☐Oil Sheen	☐Cloudy	☐Foam
	☐Optical enhancers	☐Discolored		
	☐Other: Describe in "Narrative" section			
Floatables	☐None	☐Sewage (toilet paper, etc)	☐Algae	☐Trash or debris
	☐Other: Describe in "Narrative" section			
Narrative description of problem indicators:				
Suspected Source (name, personal or vehicle description, license plate #, address, etc.):				

CMRSWC

FUSS & O'NEILL

800.286.2469
www.fando.com

ENGINEERS • SCIENTISTS • PLANNERS

Appendix D- Outfall Sampling Memo

FUSS & O'NEILL

MEMORANDUM

TO: Dori Vecchio, Town Administrator

FROM: Matthew Kissane, MS

DATE: October 7, 2021

RE: MS4 Compliance - Dry Weather Outfall and Interconnection Screening and Sampling

---

This memo summarizes Fuss & O'Neill's dry weather outfall screening and sampling for the Town of Blackstone, in compliance with the Town's Municipal Separate Storm Sewer System (MS4) permit. The permit requires all outfalls and interconnections within the Town's regulated area be screened for flow during dry-weather conditions in accordance with the Town's written Illicit Discharge Detection and Elimination (IDDE) plan. All outfalls where flow is observed must be sampled and tested for a set of parameters designed to indicate the presence of sanitary sewage and pollutants of concern for the outfall's receiving waterbody.

The permit defines dry-weather conditions as no more than 0.1 inches of rainfall and no significant snow melt over the previous 24-hour period. Consistent with the Town's IDDE plan, Fuss & O'Neill recorded previous weather conditions on each day of screening and sampling based on the weather station in Bellingham, MA.

Prior to screening and sampling, Fuss & O'Neill set up a digital data collection system to efficiently collect and store screening and sampling data. All screening and sampling was conducted in accordance with the procedures detailed in the Dry Weather Screening/Sampling Procedure of the Town's IDDE plan, including the use of field kits, where allowed by the permit. Ammonia levels were measured with Hach ammonia test strips; chlorine was measured with the Hach 5870000 Pocket Colorimeter II; surfactants were measured with a Chemetrics CHEMets visual field kit. All analytical samples collected were transported to and analyzed by ESS Laboratory in Cranston, RI within hold times and according to the methods specified in 40 CFR § 136.

Per the Permit requirements, dry weather samples were analyzed for ammonia, surfactants, chlorine, *E. coli*, temperature, conductivity, salinity, and pollutants of concern. Outfalls OF-12104-7, OF-12104-10, OF-12104-11 and OF-12104-4 were also analyzed for *E. coli* and total phosphorus due to listed impairments for Fox Brook and its tributaries. Outfalls OF-12126-3, OF-12126-6, OF-12126-7, OF-12126-8, OF-12121-5, OF-12126-26, and OF-12120-2 were analyzed for Cadmium, *E. coli*, metals, Total Phosphorus & Total Suspended Solids (TSS) due to listed impairments for Mill River and its tributaries. Impairments were listed for Blackstone River, and sampling for these outfalls would have included analysis for Cadmium, Copper, E. Coli, Lead, Total Phosphorus & Total Suspended Solids (TSS). However, no outfalls with Blackstone River as the receiving water body were found to be discharging during dry weather events and therefore, none needed to be sampled. See **Table 1** and **Table 2** (Attached) for screening and sampling results.

Between February 2020 and July 2020 (**Table 1**), Fuss & O'Neill staff screened outfalls and sampled dry weather flow. Field staff had previously screened the Town's 101 outfalls during dry weather conditions. Of the 101 outfalls, only 29 were observed to have flow. Field staff conducted follow-up sampling with each of these 29 outfalls. However, when revisited, only 11 of the 29 outfalls were flowing, and therefore, sampled.

Table 1: Dry-weather screening and sampling dates and prior weather conditions

Date	Screening or Sampling	Previous Rainfall Date	Previous Rainfall Amount (in.)
02-20-2020	Screening	02-19-2020[1]	0.29
02-28-2020	Screening	02-27-2020[1]	0.65
03-02-2020	Screening	02-27-2020	0.65
06-18-2020	Sampling	06-12-2020	0.26
06-23-2020	Sampling	06-12-2020	0.26
06-29-2020	Sampling	06-25-2020	0.18
07-06-2020	Sampling	07-02-2020	0.52

[1] 24 hours of no rainfall had elapsed between the end of rainfall and the beginning of screening.

The follow-up sampling of these 11 outfalls revealed three outfalls (OF-12104-10, OF-12126-7, and OF-12120-2) where olfactory and visual indicators could potentially be linked to an illicit discharge (**Table 2, Attached**). It should be noted that the rotten egg smell detected at OF-12126-7 and OF-12120-2 is inconclusive; follow-up is therefore recommended at these outfalls within the next year. In addition, surfactant levels at outfalls OF-12104-10, and OF-12121-5 exceeded the benchmark value of 0.25mg/L; however, this is not considered indicative of an illicit discharge unless coupled with an exceedance for ammonia and either bacteria above water quality thresholds or detectable levels of chlorine.

At outfalls to impaired waters, bacteria levels at outfalls OF-12104-10, OF-12126-7, OF-12104-4, and OF-12126-26 exceeded the water quality criteria of 235 MPN/100 mL for Class B waters (314 CMR 4.05(3)(B)(4)(b)). The MS4 Permit does not specify threshold values for phosphorus, total suspended solids (TSS), or metals as pollutants of concern.

Based on these field measurements and analytical results, we recommend the following items as next steps to ensure continued compliance with section 2.3.4 of the MS4 permit.

- Based on visual and olfactory evidence, we recommend that the Town rank outfall)F-12104-10 as High Priority.
- Based on the inconclusive olfactory evidence at outfalls OF-12126-7 and OF-12120-2, we recommend that the Town consider also ranking these outfalls as High Priority for catchment investigations.
- Based on exceedances of *E. coli* thresholds at outfalls OF-12104-10, OF-12126-7, OF-12104-4, and OF-12126-26, these locations should be further monitored and listed as High Priority for

the Town's catchment rankings and catchment investigation process. The Town may also wish to consider these catchments for retrofit projects required under Minimum Control Measure 5 (Post-Construction Stormwater Management).

The Town should report these screening and sampling results in their MS4 Annual Report.

Table 2: Results of outfall sampling and screening. Exceedances of individual parameters are in bold. Multiple exceedances possibly indicating the presence of an illicit discharge are shaded.

Outfall ID	Object ID	Sample #	Inspector Name	Sampling Date	Last Rain Date	Last Rain Amount	Outfall Inundated?	Outside Diameter (Inches)	Inside Diameter (Inches)	Shape	Material	Physical Condition	Latitude	Longitude	Flow Present?	Flow Depth	Flow Description	Receiving Water	Visual Evidence of Illicit Discharge	Olfactory Evidence of Illicit Discharge	Conductivity (uS/cm)	Temperature	Salinity (ppm)	Chlorine Concentration (mg/L)	Surfactants MBAS (mg/L)	Ammonia as N (mg/L)	Comments	Lab Results
OF-12104-7	54	20200618-05	MG/LS	7/6/2020	7/2/2020	0.07	No	36	36	Rounded	Concrete	Good	-71.5405	42.03089	Yes	0.5	Moderate	Fox Brook	None	None	491	20.6	0.22	2.6	< 0.25	0	outfall underneath (built into) culvert	
OF-12104-10	64	20200618-07	MG/LS	7/6/2020	7/2/2020	0.07	No	35	30	Rounded	Other	Good	-71.5374	42.0297	Yes	0.01	Trickle	Fox Brook	Oily Sheen	Petroleum	673	21.1	0.3	0.2	**0.25 - 0.5**	0.25		
OF-12104-11	65	20200618-08	MG/LS	6/18/2020	6/11/2020	0.36	No	40	36	Rounded	Concrete	Good	-71.5379	42.02677	Yes	0.5	Trickle	Fox Brook	None	None	864	25	0.42	2.7	**0.25 - 0.5**	0.25		
OF-12121-6	58	20200618-13	MG/LS	6/23/2020	6/12/2020	0.82	No	15	15	Rounded	CMP	Good	-71.5326	42.04439	Yes	0.5	Moderate	Tributary to Mill River	None	None	320.6	22.1	0.14	2.6	< 0.25	0	near box culvert (see pic)	
OF-12126-7	8	20200618-14	MG/LS	6/23/2020	6/12/2020	0.82	No	18	18	Rounded	CMP	Good	-71.5059	42.02031	Yes	1.5	Trickle	Mill River	None	Rotten Eggs	290.2	27.2	0.12	2.6	< 0.25	0		
OF-12126-8	9	20200618-15	MG/LS	6/23/2020	6/12/2020	0.82	No	4	4	Rounded	Concrete	Fair	-71.5064	42.02018	Yes	0.2	Trickle	Mill River	None	None	725	20.9	0.33	2.7	< 0.25	0	Another HDPE pipe coming from y	
OF-12126-3	35	20200618-16	MG/LS	6/23/2020	6/12/2020	0.82	No	24	24	Rounded	PVC	Good	-71.5047	42.05457	Yes	0.5	Moderate	Tributary to Mill River	None	None	364.3	19.6	0.16	2.6	< 0.25	0	Two pipes coming in from opposite	
OF-12104-4	48	20200618-21	MG/LS	6/18/2020	6/11/2020	0.36	No	30	30	Rounded	CMP	Good	-71.5469	42.04131	Yes	0.5	Moderate	Tributary to Fox Brook	None	None	371.9	29.1	0.16	2.7	< 0.25	0.25	heavy flow	
OF-12121-5	57	20200618-22	MG/LS	6/23/2020	6/12/2020	0.82	No	28	28	Rounded	Concrete	Good	-71.5316	42.03944	Yes	0.5	Moderate	Tributary to Mill River	None	None	513.8	19.2	0.23	0	**0.25 - 0.5**	0.25		
OF-12126-26	27	20200618-23	MG/LS	6/23/2020	6/12/2020	0.82	No	20	16	Rounded	Concrete	Good	-71.516	42.02789	Yes	0.5	Trickle	Tributary to Mill River	None	None	286.2	20.4	0.12	2.7	< 0.25	0		
OF-12120-2	42	20200618-26	MG/LS	6/23/2020	6/12/2020	0.82	No	36	36	Rounded	Concrete	Good	-71.5246	42.05428	Yes	0.5	Trickle	Tributary to Mill River	None	Rotten Eggs	333.5	19.6	0.14	2.8	< 0.25	0	Upstream manhole Sampled	
OF-12104-14	68	N/A	MG/LS	2/20/2020	2/19/2020	0.29	No	10	10	Rounded	Concrete	Poor	-71.5378	42.02591	No	N/A	N/A	Fox Brook	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12104-15	69	N/A	MG/LS	2/20/2020	2/19/2020	0.29	No			Rounded	PVC	Good	-71.5355	42.02288	No	N/A	N/A	Fox Brook	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12104-17	91	N/A	MG/LS	2/20/2020	2/19/2020	0.29	No	30	30	Rounded	CMP	Fair	-71.543	42.02382	No	N/A	N/A	Fox Brook	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12104-3	47	N/A	MG/LS	2/20/2020	2/19/2020	0.29	No	36	36	Rounded	Concrete	Good	-71.544	42.04228	No	N/A	N/A	Tributary to Fox Brook	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12104-9	63	N/A	MG/LS	2/20/2020	2/19/2020	0.29	No	30	30	Rounded	Concrete	Fair	-71.5344	42.03257	No	N/A	N/A	Fox Brook	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12120-3	43	N/A	MG/LS	2/20/2020	2/19/2020	0.29	No	36	36	Rounded	Concrete	Good	-71.5251	42.05402	No	N/A	N/A	Tributary to Mill River	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12121-2	41	N/A	MG/LS	2/20/2020	2/19/2020	0.29	No	8	8	Rounded	CMP	Crumbling	-71.5321	42.05274	No	N/A	N/A	Tributary to Mill River	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12121-3	44	N/A	MG/LS	2/28/2020	2/27/2020	0.65	No	36	36	Rounded	Concrete	Good	-71.5407	42.05102	No	N/A	N/A	Hop Brook	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12126-31	32	N/A	MG/LS	2/28/2020	2/27/2020	0.65	No	15	15	Rounded	Concrete	Good	-71.5224	42.03902	No	N/A	N/A	Tributary to Mill River	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12126-32	60	N/A	MG/LS	2/28/2020	2/27/2020	0.65	No	30	30	Rounded	Concrete	Good	-71.5236	42.03687	No	N/A	N/A	Tributary to Mill River	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12126-36	95	N/A	MG/LS	2/28/2020	2/27/2020	0.65	No	18	18	Rounded	PVC	Good	-71.5246	42.03136	No	N/A	N/A	Tributary to Mill River	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12133-15	82	N/A	MG/LS	2/28/2020	2/27/2020	0.65	No	12	12	Rounded	Clay	Good	-71.5294	42.0164	No	N/A	N/A	Blackstone River	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12133-16	83	N/A	MG/LS	2/28/2020	2/27/2020	0.65	No	36	36	Rounded	Ductile Iron	Good	-71.538	42.01744	No	N/A	N/A	Blackstone River	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12133-20	87	N/A	MG/LS	2/28/2020	2/27/2020	0.65	No	18	18	Rounded	HDPE	Good	-71.5518	42.02383	No	N/A	N/A	Tributary to Blackstone River	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12133-21	89	N/A	MG/LS	2/28/2020	2/27/2020	0.65	No	15	15	Square	Concrete	Fair	-71.5473	42.02388	No	N/A	N/A	Tributary to Blackstone River	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12133-23	94	N/A	MG/LS	3/2/2020	2/27/2020	0.65	No	24	24	Rounded	HDPE	Good	-71.5393	42.01647	No	N/A	N/A	Blackstone River	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12133-5	62	N/A	MG/LS	3/2/2020	2/27/2020	0.65	No	12	12	Rounded	CMP	Good	-71.5249	42.02227	No	N/A	N/A	Tributary to Blackstone River	None	None	N/A	N/A	N/A	N/A	N/A	N/A		
OF-12133-7	71	N/A	MG/LS	3/2/2020	2/27/2020	0.65	No	24	24	Rounded	Clay	Fair	-71.5365	42.01565	No	N/A	N/A	Tributary to Blackstone River	None	None	N/A	N/A	N/A	N/A	N/A	N/A		

Arsenic (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Nickel (mg/L)	Silver (mg/L)	Total Hardness (CALC)	Zinc (mg/L)	Total Phosphate as P (mg/L)	Total Suspended Solids (mg/L)	E.Coli (MPN/100ml)
NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	ND	NT	52
NT	NT	NT	NT	[1]NT	NT	NT	NT	NT	[2]ND	NT	**760**	
NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.15	NT	180
ND	ND	ND	ND	0.02	ND	ND	ND	23.9	0.07	ND	ND	166
ND	ND	ND	ND	2.5	ND	ND	ND	34.5	0.014	ND	5	**816**
ND	ND	ND	ND	0.738	ND	ND	ND	49.2	0.019	ND	ND	1
ND	ND	ND	ND	0.026	ND	ND	ND	38.8	0.012	ND	ND	6.3
NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	0.13	NT	**890**
ND	ND	ND	ND	0.175	0.003	ND	ND	59.7	0.012	ND	ND	<1.0
ND	ND	ND	ND	1.91	ND	ND	ND	31.3	0.019	0.11	6	**488**
ND	ND	ND	0.002	0.016	ND	ND	ND	52.1	0.017	ND	ND	8.6

N/A - were not sampled

[1]NT = Parameter was not required to be tested for that specific outfall

[2]ND = Anylate not detected at or above the Maximum Residue Level (Limit of Quantification), Limit of Detection for DoD reports, Method Detection Limit for J-flagged anylates (anylate was positively identified, but not reliable)

Appendix E- MS4 Land Use Regulatory Review Memo

FUSS & O'NEILL

MEMORANDUM

TO: Jimmy Sullivan, Highway Superintendent, Town of Blackstone

FROM: Julianne Busa, PhD; Matthew Kissane, MSc; Sarah Hayden, MSc

DATE: November 9, 2021

RE: MS4 Land Use Regulatory Review
Town of Blackstone

1.0 INTRODUCTION

This memorandum summarizes an evaluation of the existing regulations of the Town of Blackstone relative to the United States Environmental Protection Agency (EPA) *General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts* (2016 MS4 Permit) requirements and the development of local regulatory mechanisms. The review focused on the Construction and Post-Construction stormwater regulatory mechanisms and associated requirements under the 2016 MS4 Permit.

The Town has several policies and regulations in place that address construction and post-construction stormwater management. Fuss & O'Neill reviewed the following Town bylaws and regulations:

Town of Blackstone bylaws and regulations:

- Town Code Chapter 105: Sewers (adopted 12/10/1979; amended 4/30/2001)
- Town Code Chapter 110: Stormwater Management and Land Disturbance (adopted 5/31/2011)
- Town Code Chapter 118: Water Supply Protection (adopted 6/17/1991)
- Town Code Chapter 123: Zoning (adopted 6/26/1968; amended 5/30/2017)
- Town Code Chapter 191: Subdivision of Land (adopted 10/7/2010)

This memorandum describes aspects of the Town's existing bylaws and regulations that address the 2016 MS4 Permit requirements and recommends changes to the Town's existing bylaws, regulations, and procedures to fully meet the 2016 MS4 Permit requirements.

2.0 SUMMARY OF RECOMMENDATIONS

Based on our review, the Town's existing regulations meet many of the construction and post-construction regulatory mechanisms (MCM 4 and MCM 5) and associated procedures required under the 2016 MS4 Permit. Detailed evaluations are included in *Table 1* and *Table 2* in *Section 3*. Additionally, during our regulatory review, Fuss & O'Neill noted that there are sections of the Town's bylaws that could be updated to remove barriers to and encourage the use of Green Infrastructure and Low Impact Development. The major recommendations that are detailed in the tables are summarized in *Section 2.1* and *Section 2.2* below.

2.1 General Recommendations

- The Town's regulations should be updated to remove outdated references and instead cite the most recent version of the MassDEP Massachusetts Stormwater Handbook and Stormwater Standards. For example, Chapter 110: Stormwater Management and Land Disturbance references the Massachusetts Stormwater Management Policy. The Town may consider using language that refers to "the most recent version of the Massachusetts Stormwater Handbook and Stormwater Standards" to avoid the need for frequent revisions in the future.
- The Town's existing Stormwater Regulations contain stormwater treatment standards and other requirements that are generally consistent with the Massachusetts Stormwater Standards and Stormwater Handbook. However, the stormwater retention and treatment standards contained in the MS4 Permit, as well as other provisions of the MS4 Permit, are inconsistent with the standards contained in the Massachusetts Stormwater Standards and Stormwater Handbook. MassDEP is currently working with EPA and other stakeholders to update the Massachusetts Stormwater Handbook and Stormwater Standards to better align both sets of requirements.
- Chapter 110: Stormwater Management and Land Disturbance and Chapter 191: Subdivision of Land are the two regulations that dictate stormwater regulations and controls. As some of the content overlaps in the two bylaws, consider updating the language of Chapter 110 to include references to the design standards and erosion control measures outlined in Chapter 191 and vice-versa.

2.2 Barriers to Low Impact Development/Green Infrastructure in Exiting Regulations

Chapter 191: Subdivision of Land (Section 10: Streets)

- Section §191-10.C.3 requires dead-end streets to have a paved turnaround area of at least 120 feet. Consider reducing the diameter to 100 feet to reduce impervious cover.
- In Section §191-10.H.1, consider relaxing the requirement for five-foot sidewalks on both sides of the street. Ensure that sidewalks comply with ADA standards, but look for alternative designs that reduce impervious cover. Consider relaxing requirements for sidewalks on both sides of the road, especially in lower-traffic areas such as subdivisions, where two sidewalks may not be necessary. Consider amending requirements to allow for non-conventional sidewalks, which are sited with land contours and designed to optimize pedestrian utility (e.g., connect sidewalks between common areas and shared open spaces) instead of automatically locating them immediately parallel to the road. Include language that encourages grading sidewalks towards vegetated areas or BMPs to keep stormwater off of roads.
- Section §191-10.J requires granite curbing on all sides of both roads. Consider amending to allow for curb cuts (with a minimum width of 18-36 inches) to direct stormwater to BMPs or landscaped areas in parking lots or allowing for sheet flow to infiltration practices rather than the piped stormwater system. Consider amending this language for exceptions on a case-by-case basis to accommodate incorporation of Green Infrastructure practices into the right-of-way that are intended to receive surface runoff.

- Consider amending the requirement for sidewalks to be constructed of Class I Bituminous Concrete to allow for permeable paving for sidewalks. Incorporate a requirement to consider the use of permeable pavement for sidewalks wherever possible. Note that this decision should include consideration of the Town's ability and willingness to maintain permeable pavement surfaces.
- In Section §191-10.K.2, consider implementing a maximum driveway width and/or encourage the use of shared driveways, if possible, to reduce the amount of impervious cover.

Chapter 191: Subdivision of Land (Section 11: Stormwater Management System)

- In Section §191-11, include/update references to stormwater management standards to reflect those in the most recent version of the Massachusetts Stormwater Management Handbook and Stormwater Management Standards.
- Section §191-11.A outlines minimum right-of-way and width by road classification. Consider adding a clause encouraging the use of "green streets" to manage stormwater runoff within the municipal right-of-way.
- Section §191-11.J.15 states that surface stormwater basins, including retention basins, detention basins, and basins providing both retention and detention, shall be designed with the following objectives to be considered: hydraulic function, safety, maintenance, aesthetics, and when required, water quality. Consider adding a reference to the most recent version of the Massachusetts Stormwater Handbook and Stormwater Standards for guidance on design best management practices.
- Section §191-11.J.15 requires at least 2% of the interior area of parking areas for 20 or more vehicles to be unpaved planting areas, each of which must be 40 feet or larger and have at least one tree per eight parking spaces. Consider increasing the percentage of required unpaved planting areas (e.g., to 5%). Additionally, consider amending this language to encourage the incorporation of Green Infrastructure BMPs (i.e., rain gardens, bioretention islands, drainage swales, etc.) to meet the unpaved planting area requirement.

Chapter 191: Subdivision of Land (Section 13: Other Improvements)

- Section §191-13.A.3, consider adding a clause under the requirement for tree planting at intervals of 40 feet along both sides of the street, providing an alternative that relaxes this requirement and allows for adequate space for Green Infrastructure BMPs. Encourage the use of Green Infrastructure concepts that enhance stormwater management benefits of trees, such as tree box filters and permeable pavement above root systems.
- Note that the recommended trees list currently includes at least one tree that is considered invasive by the Massachusetts Invasive Plant Advisory Group (Amur cork tree).

Chapter 191: Subdivision of Land (Section 14: Additional Requirements)

- Section §191-14.A states that the Planning Board may require the plan to show a potential park or parks suitably located for recreational purposes or for providing light and air. Requirements

state that the park or parks shall not be unreasonable in area in relation to the land being subdivided and to the prospective uses of the land, normally not exceeding 5% of the plan area. Consider adding language to allow for Green Infrastructure practices with aesthetic elements that contribute to the larger design of the landscape and planned uses of the open space.

- Additionally, consider requiring the submission of an open space development alternative for all new developments and redevelopment projects. Include a minimum percentage of unpaved green area (e.g., at least 5% of the total project area).

Town Code Chapter 123: Zoning

- Section §123-15.B dictates the minimum number of parking spaces by land-use type. Consider amending this section to allow for shared-use parking and for land banking designs (reserved areas where additional parking could be built, if necessary, but is vegetated until the need for additional parking arises).

3.0 LAND USE REGULATORY EVALUATIONS

Table 1. Construction Site Stormwater Runoff Control Evaluation

Permit Requirements	Comment
1. Section 2.3.5.a: Permittees shall implement and enforce a program to reduce pollutants in any stormwater runoff discharged to the MS4 from all construction activities that result in a land disturbance of greater than or equal to one acre within the regulated area and shall include disturbances less than one acre if that disturbance is part of a larger common plan of development or sale that would disturb one or more acres.	**Existing Regulations – Meets the Requirements** • Chapter 110: Stormwater Management and Land Disturbance Section §110-4.B.1 dictates that the stormwater regulations are applicable to all activities that result in the disturbance of land of 20,000 or more square feet (approximately 0.5 acres), or are part of a phased plan that ultimately results in a disturbance of 20,000 or more square feet and that are associated with a building or driveway permit. Land disturbance permits must be filed with the Planning Board and the Board must grant a permit before any land-disturbing activity begins. Exemptions are classified in Section §110-4.C. **Recommendations – None**
2. Section 2.3.5.c.i: The construction site runoff control program shall include an ordinance or regulatory mechanism that requires the use of sediment and erosion control practices at construction sites.	**Existing Regulations – Meets Most of the Requirements** • Section §110-6.A.1 requires the submission of erosion and sediment control plans with land disturbance permit applications. • Section §110-7.A states that the erosion and sediment control plan "shall contain information to describe the nature and purpose of the proposed development, pertinent conditions of the site and the adjacent areas, and proposed erosion and sedimentation controls." Section §110-7.B requires that erosion and sediment control plans must: ○ Minimize the total area of disturbance; ○ Sequence activities to minimize simultaneous areas of disturbance; ○ Minimize peak runoff in accordance with the Massachusetts Stormwater Management Policy; ○ Minimize erosion and control sedimentation during construction (given that erosion prevention is preferred over sedimentation control); ○ Divert uncontaminated water around disturbed areas; maximize groundwater recharge; ○ Install and maintain control measures according to manufacturers' specifications and good engineering practices; prevent sediment transport off-site, protect and manage on-site and off-site material storage areas (e.g., dirt stockpiles); ○ Comply with local, state, and federal laws and regulations on air quality, waste disposal, and sanitary sewer/septic system regulations; ○ Institute interim and permanent stabilization measures (as soon as practicable but no more than 14 days after the construction activity has temporarily or permanently ceased on that portion of the site); ○ And prevent off-site vehicle tracking of sediments.

Permit Requirements	Comment
	• Chapter 191: Subdivision of Land Section §191-11.D.8 requires that a "plan to control construction-related impacts including erosion, sedimentation, and other pollution sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be designed and implemented."
	Recommendations • Amend Section §110-7.A.B to remove the reference to the "Massachusetts Stormwater Management Policy" and replace it with "the most recent version of the Massachusetts Stormwater Handbook and Stormwater Standards." • Amend Section §191-11.A to include a reference to the Massachusetts Stormwater Standards.
3. Section 2.3.5.c.i: The ordinance must also address controls for other wastes on construction sites such as demolition debris, litter and sanitary wastes. **4. Section 2.3.5.c.iv**: The construction site runoff control program shall include requirements for construction site operators within the MS4 jurisdiction to control wastes, including but not limited to, discarded building materials, concrete truck washout, chemicals, litter and sanitary wastes. These must not be allowed to be discharged to the MS4.	**Existing Regulations – Meets Most of the Requirements** • Section §110-7.B.10 requires that all erosion and sediment control plans must comply with local, state, and federal laws and regulations, including those relating to waste disposal and sanitary sewer or septic systems. Section §110-7.B.13 requires that all erosion and sediment control plans properly manage on-site construction and waste materials.
	Recommendations • Include specific language in Section §110-7.B.10 and Section §110-7.B.13 to enumerate that discharging of waste materials to the MS4 is expressly forbidden.
5. Section 2.3.5.c.ii: Written (hardcopy or electronic) procedures for site inspections and enforcement of sediment and erosion control measures that clearly define who is responsible for site inspections as well as who has authority to implement enforcement procedures. The program shall provide that the permittee may, to the extent authorized by law, impose sanctions to ensure compliance with the local program.	**Existing Regulations – Meets the Requirements** • Section §110-8.B grants authority to the Planning Board or designated agent to conduct inspections and notify the permittee of failure to comply with the land disturbance permit as approved. The land disturbance permittee must notify the Planning Board and request an inspection at least two working days before: erosion and sediment control measures are in place and stabilized; site clearing has been substantially completed; rough grading has been substantially completed, final grading has been substantially completed, close of the construction season; and final landscaping and project final completion. • Section §110-8.C requires land disturbance permittees (or designated agent) conduct and document inspections of all erosion and sediment control measures at least weekly or as specified in the land disturbance permit, as well as prior to and following storm events. The land disturbance permittee is required to submit monthly reports of the effectiveness of the erosion and sediment control measures to the Planning Board. • Section §110-8.D grants access "to the fullest extent permitted by state law, or if authorized by the owner or other part in control of the property" by the Planning Board or designee for purposes related to enforcing the stormwater regulations.

Permit Requirements	Comment
	• Section §110-11.B.1 grants authority to the Building Inspector or authorized agent of the Planning Board to issue written orders to enforce the provisions of Chapter 110. This includes authority to order: a cease and desist of land-disturbing activities until land disturbance permittees are in compliance with their issued permits and the provisions of Chapter 110; the maintenance or installation of erosion and sediment control measures; monitoring, analysis, and reporting; remediation of erosion and sedimentation resulting directly or indirectly from the land-disturbing activity. Section §110-11.B.2 grants authority to set forth deadlines for remediation or abatement. If the land disturbance permittee fails to comply within the specified deadline, the Town may undertake necessary abatement or remediation work at the owner's expense. Section §110-11.B.3 states that within 30 days of the Town completing the abatement or remediation work, the owner will be notified of the cost. Within 30 days, the owner may file a written objection—if payment is not received within 30 days of the notification of cost or decision of the Planning Board on the written objection, the matter will be taken to court.
	Recommendations – None
6. Section 2.3.5.c.iii: Require construction site operators performing land disturbance activities within the MS4 jurisdiction that result in stormwater discharges to the MS4 to implement a sediment and erosion control program that includes BMPs appropriate for the conditions at the construction site. The program may include references to BMP design standards in state manuals, such as the Massachusetts Stormwater Handbook, or design standards developed by the MS4. Examples of appropriate sediment and erosion control measures for construction sites include local requirements to: 1. Minimize the amount of disturbed area and protect natural resources; 2. Stabilize sites when projects are complete or operations have temporarily ceased; 3. Protect slopes on the construction site; 4. Protect all storm drain inlets and armor all newly constructed outlets; 5. Use perimeter controls at the site; 6. Stabilize construction site entrances and exits to prevent off-site tracking;	**Existing Regulations – Meets Most of the Requirements** • Section §110-2 provides the definition of a sediment and erosion control plan. Section §110-7 details the requirements of the sediment control plan, such that it "shall contain sufficient information to describe the nature and purpose of the proposed development, pertinent conditions of the site and the adjacent areas, and proposed erosion and sedimentation controls." The plan requirements are included in Section §110-7.B, and include maximizing groundwater recharge, minimizing peak runoff in accordance with the Massachusetts Stormwater Management Policy, minimizing the total area of disturbance and preventing significant alteration of habitats mapped by the NHESP for species listed as threatened or of special concern, estimated habitats of rare wildlife, and certified vernal pools. It also requires instituting interim and permanent erosion stabilization measures. • Section §110-8.B states that the Planning Board, or its designated agent, shall make inspections as required and shall notify the permitee if work fails to comply with the land disturbance permit approved. • Section §191-8.D.A.1.G requires the erosion control plan detail erosion control measures, including slope stabilization measures, control measures regarding erosion entering streets and drainage systems, **Recommendations** • Consider including a reference in Section §110-7.A to the erosion control plan as outlined in Section §191-8.D.A.1.G. • In Section §191-8.D.A.1.G, update requirements for BMPs to be in conformity with the MassDEP Massachusetts Stormwater Handbook and Stormwater Standards in regards to site stabilization when projects are complete or have temporarily ceased, protect all storm drain inlets and armor all newly constructed outlets, perimeter control measures, and stabilization of construction site entrances and exits to prevent off-site tracking.

Permit Requirements	Comment
7. Inspect stormwater controls at consistent intervals.	
7. Section 2.3.5.c.v: Written procedures for site plan review and inspection and enforcement. The site plan review procedures shall: **1.** Include a pre-construction review of site design, planned site operations, and BMPs planned to be in place both during and after development. **2.** Incorporate procedures for the consideration of potential water quality impacts **3.** Incorporate procedures for the receipt and consideration of information submitted by the public **4.** Include evaluation of opportunities for use of LID and GI and encourage project proponents to use these practices.	**Existing Regulations – Meets Some of the Requirements** • Section §110-6.E.1 outlines the authority of the Planning Board to approve the land disturbance permit with conditions, modifications, and restrictions that the Planning Board will determine are required to ensure that the project will protect water resources and meet the objectives of Section §110. Article III of the Rules and Regulations of the Blackstone Planning Board Governing the Subdivision of Land outlines the submission and approval of plans. **Recommendations** • In Section §110.A, include specific wording in the pre-construction review of site design to consider potential water quality impacts and allow for receipt and consideration of information submitted by the public for those projects that do not otherwise require a public hearing. • In Chapter 110: Stormwater Management and Land Disturbance, include language to encourage evaluation for opportunities for the use of LID and Green Infrastructure. Consider amending Section §191-14.A.1 to include language encouraging the incorporation of LID/GI practices as well as open space.
8. Section 2.3.5.c.v: Written procedures for site plan review and inspection and enforcement. Site inspection procedures shall: 1. Require that inspections occur during construction of BMPs and after construction of BMPs to ensure they are working as described in the approved plans 2. Include clearly defined procedures for inspections including qualifications necessary to perform the inspections and the use of mandated inspection forms if appropriate 3. Include procedure for tracking the number of site reviews, inspections and enforcement actions.	**Existing Regulations – Meets Some of the Requirements** • Section §110.A grants authority to the Planning Board of its designee to make inspections during construction to approve whether the portion of work completed with the land disturbance permit. The permit and associated plans for grading, stripping, excavating, and filling work, bearing the signature of approval of the Planning Board, shall be maintained at the site at all times during the progress of the work. Form I in the appendix to Section §110 is a subdivision inspection list that contains required observations for: erosion and sediment controls; observation of erosion and sediment controls; observation of surface storm drain improvement and swales; and observation of retention/detention basins and appurtenances. The checklist requires the initials of the Planning Board's Agent and date of inspection(s) next to every line item. **Recommendations** • Create written pre- and post-construction site inspection and enforcement procedures and an inspection form and reference them in Chapter 110: Stormwater Management and Land Disturbance. Procedures should include frequency of inspection, including during and after construction. Include required qualifications of the individual doing the inspection (PE or other individual with sufficient experience or education to qualify them to inspect stormwater BMPs). Include a procedure for tracking the number of site reviews, inspections and enforcement actions. Include these materials in conjunction with Form I in the appendix to Section §110.

Table 2. Post-Construction Stormwater Management Evaluation

Permit Requirements	Comment
1. **Section 2.3.6.a:** Permittees shall develop, implement, and enforce a program to address post-construction stormwater runoff from all new development and redevelopment sites that disturb one or more acres and discharge into the permittees' MS4 at a minimum. The permittee's new development/ redevelopment program shall include sites less than one acre if the site is part of a larger common plan of development or redevelopment which disturbs one or more acre.	**Existing Regulations – Meets Some of the Requirements** • Section §110-4.B.1 dictates that the stormwater regulations are applicable to all activities that result in the disturbance of land of 20,000 or more square feet (approximately 0.5 acres), or are part of a phased plan that ultimately results in a disturbance of 20,000 or more square feet and that are associated with a building or driveway permit. Land disturbance permits must be filed with the Planning Board and the Board must grant a permit before any land-disturbing activity begins. Exemptions are classified in Section §110-4.C. **Recommendations—None**
1. **Section 2.3.6.a.ii:** The permittee shall develop or modify, as appropriate, an ordinance or other regulatory mechanism within two (2) years of the effective date of the permit to contain provisions that are at least as stringent as the following: 1. Low Impact Development (LID) site planning and design strategies must be used to the maximum extent feasible.	**Existing Regulations – Meets Most of the Requirements** • Section §191-11.A.10 requires that stormwater management systems shall "utilize low-impact design where practicable" **Recommendations—None**
2. **Section 2.3.6.a.ii:** The permittee shall develop or modify, as appropriate, an ordinance or other regulatory mechanism within two (2) years of the effective date of the permit to contain provisions that are at least as stringent as the following: 2. The design of treatment and infiltration practices should follow the guidance in Volume 2 of the Massachusetts Stormwater Handbook, as amended, or other federally or State approved BMP design guidance.	**Existing Regulations – Meets Most of the Requirements** • Section §191-11.D requires that stormwater management systems comply with ten standards (described in Sections 3 through 10 below), many of which are similar to the Massachusetts Stormwater Handbook Volume 2 requirements. **Recommendations** • Modify the language to reference the design requirements of treatment and infiltration practices to follow guidance outlined in the most recent version of the MassDEP Massachusetts Stormwater Handbook.

Permit Requirements	Comment
3. Section 2.3.6.a.ii.: The Town will develop or modify an ordinance or other regulatory mechanism within 2 years of the effective date of the permit to contain the following provisions: **3.** Stormwater Management Systems on new development and redevelopment sites shall be designed to: • Not allow new stormwater conveyances to discharge untreated stormwater in accordance with *Massachusetts Stormwater Handbook* Standard 1 (no new stormwater conveyances may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth)	**Existing Regulations – Meets the Requirements** • Section §191-11.D.1 states that no new stormwater conveyances may discharge untreated stormwater to or cause erosion in wetlands or waters of the Town of Blackstone. • **Recommendations – None**
4. Section 2.3.6.a.ii.: The Town will develop or modify an ordinance or other regulatory mechanism within 2 years of the effective date of the permit to contain the following provisions: • Stormwater Management Systems on new development and redevelopment sites shall be designed to: • Control peak runoff rates in accordance with *Massachusetts Stormwater Handbook* Standard 2 (post-development peak discharge rates should not exceed pre-development peak discharge rates)	**Existing Regulations – Meets Most of the Requirements** • Section §191-11.D.2 requires that stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. • Section §110-7.B.3 requires that the design requirements of the erosion and sediment control plan "minimize peak rate of runoff in accordance with the Massachusetts Stormwater Management Policy." **Recommendations** • Update Section §110-7.B.3 to match the standards included in the most recent version of the Massachusetts Stormwater Handbook and Stormwater Standards.
5. Section 2.3.6.a.ii.: The Town will develop or modify an ordinance or other regulatory mechanism within 2 years of the effective date of the permit to contain the following provisions: • Stormwater Management Systems on new development and redevelopment sites shall be designed to:	**Existing Regulations – Meets Most of the Requirements** • Section §191-11.D.2 requires that loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low-impact development techniques, stormwater best management practices and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from the pre-development conditions based on soil type. This standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

Permit Requirements	Comment
• Recharge groundwater in accordance with *Massachusetts Stormwater Handbook* Standard 3 (loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures)	• Section §110-7.B.6 requires that the design requirements of the erosion and sediment control plan "maximize groundwater recharge." **Recommendations** • Consider adding this standard to the Town Code Chapter 110: Stormwater Management and Land Disturbance. Include a reference to Section §191-11.D for related requirements. • Update Section §110-7.B.6 to match the standards included in the most recent version of the Massachusetts Stormwater Handbook and Stormwater Standards.
6. Section 2.3.6.a.ii.: The Town will develop or modify an ordinance or other regulatory mechanism within 2 years of the effective date of the permit to contain the following provisions: **6.** Stormwater Management Systems on new development and redevelopment sites shall be designed to: • Eliminate or reduce the discharge of pollutants from land uses with higher pollutant loads as defined in the *Massachusetts Stormwater Handbook* in accordance with *Massachusetts Stormwater Handbook* Standard 5 (eliminate or reduce the discharge of stormwater runoff from these sites to the maximum extent possible-industrial areas;	**Existing Regulations – Meets Most of the Requirements** • Section §191-11.D.5 For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention, all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt and stormwater runoff, the proponent shall use the specific structural stormwater BMPs as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, MGL c. 21, §§ 26 through 53, and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00. **Recommendations** • Consider adding this standard to the Town Code Chapter 110: Stormwater Management and Land Disturbance. Include a reference to Section §191-11.D for related requirements. • Consider adding a requirement to Section §110-7.B that systems should be designed to match the requirements of the Massachusetts Stormwater Handbook Standard 5.
7. Section 2.3.6.a.ii.: The Town will develop or modify an ordinance or other regulatory mechanism within 2 years of the effective date of the permit to contain the following provisions: **7.** Stormwater Management Systems on new development and redevelopment sites shall be designed to: • Protect Zone II or Interim Wellhead Protection Areas of public water supplies in accordance with Massachusetts	**Existing Regulations – Meets Most of the Requirements** • Section §191-11.D.6 states that stormwater discharges within the Zone II or interim wellhead protection area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such area as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to outstanding resource waters and special resource waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with

Permit Requirements	Comment
Stormwater Handbook Standard 6 (requires specific source control and pollution prevention measures and specific structural stormwater best management practices)	314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited, unless essential to the operation of the public water supply. **Recommendations** • Consider adding a requirement to Section §110-7.B that systems should be designed to match the requirements of the Massachusetts Stormwater Handbook Standard 6.
8. Section 2.3.6.a.ii.: The Town will develop or modify an ordinance or other regulatory mechanism within 2 years of the effective date of the permit to contain the following provisions: **8.** Stormwater Management Systems on new development sites shall be designed to: • Implement long term maintenance practices in accordance with *Massachusetts Stormwater Handbook* Standard 9	**Existing Regulations – Meets Most of the Requirements** • Section §191-11.D.9 requires that a long-term operation and maintenance plan be developed and implemented to ensure that the stormwater management system functions as designed. **Recommendations** • Consider adding a requirement to Section §110-7.B that systems should be designed to match the requirements of the Massachusetts Stormwater Handbook Standard 9.
9. Section 2.3.6.a.ii.: The Town will develop or modify an ordinance or other regulatory mechanism within 2 years of the effective date of the permit to contain the following provisions: **10.** Stormwater Management Systems on new development and redevelopment sites shall be designed to: • Require that all stormwater management systems be designed to: 1) retain the volume of runoff equivalent to, or greater than, one (1.0) inch (new development) or 0.8 inch (redevelopment) multiplied by the total post-construction impervious surface area on the site AND/OR, 2) Remove 90% (new development) or 80% (redevelopment) of the average annual load of Total Suspended Solids (TSS) generated from the total post-construction impervious area on the site AND 60% (new development) or 50%	**Existing Regulations – Meets Some of the Requirements** • Section §191-11.D.9 requires that stormwater management systems shall be designed to remove 80% of the average annual post-construction load of total suspended solids (TSS). This standard is met when: (a) Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan and thereafter are implemented and maintained; (b) Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with Massachusetts Stormwater Handbook; and (c) Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook. • Section §191-11.F.12 requires that the water quality volume to be treated is 1.0 inch of runoff multiplied by the total post-development impervious surface within the project area for discharges to critical areas and 0.5 inch of runoff multiplied by the total post-development impervious surface within the project area for discharges to all other areas. **Recommendations** • Update Section §191-11.D.9 to comply with Permit language in Section 2.3.6.a.ii.3.g for TSS removal. • Update Section §191-11.F.12 to comply with Permit language in Section 2.3.6.a.ii.3.g for retaining runoff volume. • Include a section in Section §191-11.D to set requirements for TP removal and include a reference to EPA Region 1's BMP Performance Extrapolation Tool or other BMP performance evaluation tool.

Permit Requirements	Comment
(redevelopment) of the average annual load of Total Phosphorus (TP) generated from the post-construction impervious area on the site, calculated using EPA Region 1's BMP Performance Extrapolation Tool or other BMP performance evaluation tool. • Redevelopment sites may utilize offsite mitigation within the same USGS HUC10 as the redevelopment site to meet the above retention or pollutant removal requirements.	• Include a clause in Section §191-11.D.9 allowing for redevelopment sites to utilize offsite mitigation within the same HUC10 watershed to meet the above requirements. • Consider adding these standards to the Section §191-11.B.
11. Section 2.3.6.a.iii: • Require the submission of as-built drawings no later than two years after completion of construction projects. As-built drawings must include all structural and non-structural on site stormwater controls. • Require procedures to ensure adequate long-term operation and maintenance of stormwater management practices after project completion.	**Existing Regulations – Meets Most of the Requirements** • Section §110-10 requires that upon completion of the work, the permittee shall submit a report (including certified as-built construction plans) from a professional engineer (P.E.), surveyor, or certified professional in erosion and sediment control (CPESC), certifying that all erosion and sediment control devices, and approved changes and modifications, have been completed in accordance with the conditions of the approved permit. Any discrepancies should be noted in the cover letter. Based on the scale, nature and location of the permitted activity, the Planning Board may waive the requirement that a final report be submitted by a professional and may authorize submission of a substitute affidavit by the owner attesting that the work has been completed in accordance with the conditions of the permit. • Section §191-11.A.13 requires the implementation an operation and maintenance (O&M) plan that complies with DEP guidelines and ensures proper function of the stormwater management system. **Recommendations** • Amend Section §110-10 to impose timeframe of two (2) years for as-built drawings submission.

Table 3. TMDL and Impairment Requirements related to MCM 4 and MCM 5

Permit Requirements	Comment
Appendix H Section B.II.1.a.i.2:	**Existing Regulations – Does Not Meet the Requirements** • The existing regulations do not address this requirement.

Permit Requirements	Comment
Requirement that the ordinance or other regulatory mechanism include a requirement that new development and redevelopment stormwater management BMPs be optimized for phosphorus removal, as appropriate. Retrofit inventory and priority rankings should include consideration of BMPs to reduce phosphorus discharges	**Recommendations** • Add language to the Chapter 110: Stormwater Management and Land Disturbance stating that an acceptable stormwater management plan will include source controls and design of BMPs that are optimized for phosphorus removal, as appropriate, in areas that discharge to water bodies that are subject to TMDL requirements.
Appendix H Section B.II.V.a.i.2: Requirement that the ordinance or other regulatory mechanism include a requirement that new development and redevelopment stormwater management BMPs designed on commercial and industrial land use area draining to the water quality limited waterbody shall incorporate designs that allow for shutdown and containment where appropriate to isolate the system in the event of an emergency spill or other unexpected event.	**Existing Regulations – Does Not Meet the Requirements** • The existing regulations do not address this requirement. **Recommendations** • Add language to the Chapter 110: Stormwater Management and Land Disturbance stating that an acceptable stormwater management plan will include source controls and design of BMPs designed on commercial and industrial land use area draining to the water quality limited waterbody will incorporate designs that allow for shutdown and containment where appropriate to isolate the system in the event of an emergency spill or other unexpected event.

Appendix F- Stormwater Retrofit Plan

FUSS & O'NEILL

M E M O R A N D U M

TO: Jimmy Sullivan, Highway Superintendent, Town of Blackstone, MA

FROM: Julianne Busa, PhD; David Rosengarten, MSc; Sarah Hayden, MSc

DATE: October 11, 2021

RE: Stormwater Retrofit Plan

---

1. Introduction

The Post-Construction Stormwater Management minimum control measure of the United States Environmental Protection Agency (EPA) *General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts* (2016 MS4 Permit, including 2020 modifications) requires that permittees identify a minimum of five permittee-owned properties that could potentially be modified or retrofitted with BMPs designed to reduce the frequency, volume, and pollutant loads of stormwater discharges to and from its MS4 through the reduction of impervious area connected to the MS4. Fuss & O'Neill performed a planning-level assessment of potential stormwater retrofit sites throughout the Town of Blackstone where low-impact development (LID), green infrastructure (GI), and/or runoff reduction could be implemented to address these requirements and identify potential stormwater retrofit projects.

The terms LID and green infrastructure all refer to systems and practices that reduce surface water runoff through the use of vegetation, soils, and natural processes to manage water and create healthier urban and suburban environments (EPA, 2014). Stormwater retrofits can include a variety of LID and green infrastructure practices such as bioretention, engineered wetland systems, permeable pavement, green roofs, green streets, infiltration systems, tree boxes, and rainwater harvesting. These practices capture, manage, and/or reuse rainfall close to where it falls, thereby reducing stormwater runoff and keeping it out of drainage systems and receiving waters.

In addition to reducing polluted runoff and improving water quality, LID and green infrastructure practices can improve flow conditions in streams and rivers by infiltrating water into the ground, thereby reducing peak flows during wet weather and sustaining or increasing stream base flow during dry periods, which can be important for aquatic habitat and fisheries. When applied throughout a watershed, LID and green infrastructure can recharge aquifers and groundwater supplies and help mitigate flood risk and increase flood resiliency. At a smaller scale, LID and green infrastructure can also reduce erosive velocities and streambank erosion.

Finally, LID and green infrastructure have been shown to provide other social and economic benefits relative to reduced energy consumption, improved air quality, carbon reduction and sequestration, improved property values, recreational opportunities, overall economic vitality, and adaptation to climate change.

2. Methods and Findings

Development of the stormwater retrofit plan consisted of three major tasks:

1. Screening-level assessment to efficiently identify areas within the community with the greatest feasibility for and potential benefits from stormwater retrofits to reduce impervious area connected to the MS4,
2. Field inventories of the most promising stormwater retrofit opportunities identified from the screening step,
3. Stormwater retrofit concept designs for selected retrofit sites, including anticipated reductions in impervious cover and pollutant loads and planning level costs.

This retrofit plan documents the methods and findings of the screening-level assessment, as well as field inventories and concept designs for selected retrofit sites.

2.1 Site Screening Evaluation

Sites were selected and analyzed using Geographic Information System (GIS) mapping and associated geospatial data and aerial imagery. GIS allows for rapid evaluation of specific land-based attributes that are important for assessing the feasibility of stormwater retrofit practices. The assessment used the following site evaluation criteria[1] and data sources.

- Land Ownership – Publicly-owned (e.g., municipal) sites are most favorable because they avoid the cost of land acquisition and provide direct control over stormwater retrofit construction, maintenance, and monitoring by the municipality. Both parcel-specific practices and linear BMPs in municipal right of ways or easements were considered. Other publicly-owned sites such as schools and state-owned property (road right of ways, parks, etc.) are also potential stormwater retrofit candidates. Publicly-owned properties in the Town were identified and mapped using the "Tax Parcels for Query" dataset from MassGIS from 2019.

- Regulated Area – Under the MS4 Permit, the Town's regulated area is defined based on those areas considered "urbanized" as defined based on 2010 Census data. (Note that 2020 Census definitions and mapping data are not yet available.) Locations within or immediately adjacent to the regulated area were given preference when identifying potential retrofit sites.

- Water Quality – The Town's impaired waters (2016) were also included for site screening to identify potential opportunities to provide water quality improvements, specifically focusing on phosphorus-impaired waterbodies. In the 2016 Integrated List of Waters the Blackstone River is listed as impaired for Total Phosphorus, E. Coli, and other parameters.

- Subsurface Conditions – Subsurface conditions are key considerations for infiltration-based green infrastructure retrofits. Soil infiltration capacity, depth to groundwater, depth to restrictive layers (bedrock, dense till), soil bulk density, and inundation of soils due to flooding are important soil-based characteristics that can affect the feasibility of infiltration-based green

[1] Other site-specific factors such as land area, impervious area, drainage area, subsurface utilities, subsurface contamination, and storm drainage system capacity are also important considerations for stormwater retrofits.

infrastructure retrofits. For the purposes of this screening evaluation, Natural Resources Conservation Service (NRCS) soil classifications and the Soil Survey Geographic Database (SSURGO) were used to assess the feasibility of infiltration practices at a given site.

Hydrologic Soil Groups (HSGs) mapped by the NRCS provide an initial estimate of infiltration rate and storage capacity of soils on a site. Group A soils have the lowest runoff potential (highest infiltration rates) and Group D soils have the highest runoff potential (lowest infiltration rates) when thoroughly wet. Soils with higher infiltration capacities are generally better suited for green infrastructure; therefore soil types A and B were selected from USDA Web Soil Survey data from 2019. HSG mapping provides an initial estimate of infiltration potential; field investigations are necessary to verify soil conditions for final feasibility determinations and design purposes.

- 100-Year Floodplain – Practices installed within the 100-year floodplain are more likely to be inundated during large riverine flood events, which may make them more susceptible to damage or pollutant export. For this screening-level analysis, sites outside the 100-year floodplain were given preference wherever possible. The FEMA Flood Insurance Rate Map retrieved from MassGIS in 2019 was used to identify the extent of the floodplain.

- Impervious Cover – Water quality impacts are known to occur in surface waters within drainage basins that have a high degree of impervious cover due to changes in watershed hydrology and pollutant sources that result from development of the landscape with hard surfaces. Sites with higher amounts of impervious cover generate more runoff and have greater potential for runoff reduction through the use of stormwater retrofits. Further, as the purpose of this MS4 Permit requirement is to develop a list of priority projects to improve water quality, areas with a high degree of development and impervious surfaces were considered high priority for stormwater retrofits.

The site screening process described above was performed by applying each of the screening criteria in succession to identify areas where favorable conditions overlapped. Additional input from the Town was obtained relative to:

- Planned capital improvements
- Existing drainage systems
- Available space relative to existing utilities/septic systems
- Known drainage issues

2.2 Site Screening Results

A total of 24 sites were identified from the GIS-based screening evaluation. This list included 13 Town-owned properties, three (5) right-of-way locations, three (3) State-owned properties, and properties owned by the Housing Authority and School District. (Figure 1; Table 1). The list of sites was provided to the Town for review and comment before proceeding with the field investigation. The comments provided information to further inform focus areas within the sites and preferred BMP types for various sites but did not change the overall site list.

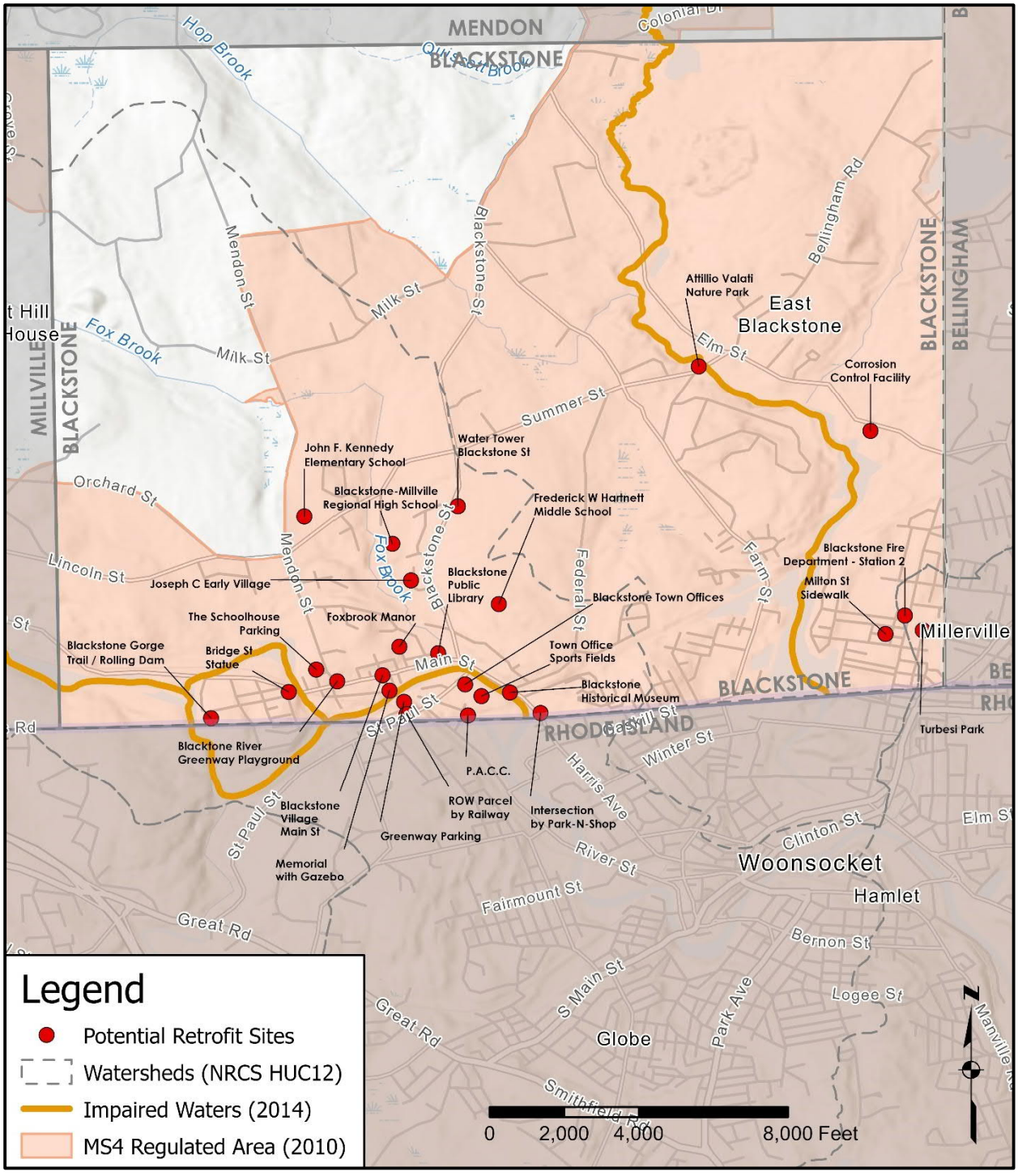


Figure 1: Map of potential retrofit sites selected for assessment in the Town of Blackstone

Table 1: Potential retrofit sites and initial recommendations

Blackstone Retrofit Sites							
Site Type	Site No.	Site Name	Address	Hydrologic Soil Group	Within Regulated Area	Within 100-Year Floodplain	Initial Retrofit Recommendations
Town-owned Parcels	1	P.A.C.C.	6 Mill St	A	Y	Y	Pavement/gravel removal with potential small bioretention area if parking lot is regraded to infiltrate runoff by directing flow to practice. Not much potential for retrofit benefits as there is no stormwater system and current runoff sheet flows to forest.
	2	Blackstone Historical Museum	23 Main St	A	Y		If parking lot is repaved in the future, reconfigure parking to optimize number of spaces and allow for small linear practice (with sufficient distance from retaining wall) to filter and treat runoff before it enters the Blackstone River.
	3	Town Office Sports Fields	St. Paul St Rear	B	Y	Y	Formalize low-gradient swale between parking blocks by right outfield fence, plant with native pollinator species and add educational signage related to native plantings, draining to rain garden by picnic tables. Add second shallow swale at northern end of basketball courts by moving those parking blocks to face the river. Recommend paving lot to stabilize loose material, ideally with permeable pavement.
	4	Blackstone Town Offices	15 St Paul St	B	Y		Convert center parking island to a bioretention area by replacing soil around trees with mix optimized for phosphorus reduction, add landscape plantings. Utilize existing catch basin as overflow. Add permeable pavers for sidewalk section through island and remove bituminous curb. Repeat with additional bioswale at back end of parking lot adjacent to fields.
	5	Schoolhouse Parking	Church St	B	Y		Site not selected for concept development due to lack of opportunity for infiltrating runoff.
	6	Blackstone Public Library	86 Main St	A, B/D	Y	Y	Parking island to left while entering could be lowered and curb removed to create a rain garden with overflow to the existing adjacent catch basin. Additional rain garden proposed in northeast corner of lot if fence and guardrail could be reset. Existing catch basin in the vicinity could function as overflow.
	7	Milton St Sidewalk	Milton & Rathbun Sts	A	Y		Site not selected for concept development due to lack of space and lack of stormwater infrastructure in the area.
	8	Turbesi Park	655 Rathbun St	A, B/D	Y		Site not selected for concept development--gravel parking lot currently sheet flowing/infiltrating into grass/forested area.
	9	Blackstone Fire Dept - Station 2	666 Rathbun St	A	Y		Potential underground infiltration/infiltrating catch basin along Rathbun Street. There is limited space for surface practices at the Station and along the street.
	10	John F. Kennedy Elementary School*	200 Lincoln St	B, C	Y		Construct shallow swale along entire edge of northern-most driveway area, draining to rain garden behind outbuilding or in northwest corner of driveway area. Additional swales could receive runoff along northwest section of driveway along west side of building. Improve narrow parking island in main southeast parking area as bioswale, potentially with overflow or underdrain to rain garden. Eastern side sloping down to building could be planted with vegetated filter strip, pollinator species with educational signage.
	11	Blackstone-Millville Regional High School	175 Lincoln St	A	Y		Install bioretention areas on either side of northwest parking spots inside circular drive with overflow to existing catch basins. Install bioretention with large northeastern parking lot at central southern catch basin between parking lot and building. Install bioretention at southwest corner of southwest parking lot between pavement and field. At the southwestern parking area potential repaving could sheet flow away from closed drainage into retention areas, could also install vegetated swale between tennis court and parking lot.
	12	Corrosion Control Facility	51 Elm St	A	Y	Y	Site not selected for concept development. No catch basins on site and runoff currently sheet flowing and infiltrating in undeveloped area.
	13	Water Tower Blackstone St	128 Blackstone St	C	Y		Lack of access prevented thorough site visit (posted private property); limited impervious area, with runoff sheet flowing to grass/undeveloped area/forest.
	14	Bridge St Statue	Bridge & Canal Sts	C	Y	Y	Possible pavement removal adjacent to statue but unlikely as this area is likely used for traffic turnarounds.
	15	Memorial with Gazebo	Butler & County Sts	A	Y		Potential rain garden adjacent to gazebo with overflow to existing catch basin.
	16	Attilio Valati Nature Park	Summer Street		?		Runoff directly entering waterbody (Mill River). Parking lot gravel/in poor condition. Potential future redesign if parking is ever paved or redesigned, incorporate GI elements such as filtration practices.
State-owned Parcels	17	Blacktone River Greenway Playground	Mendon St	C, B	Y		Site not selected for concept development due to limited space. Additionally, there is permeable play surface present on a large portion of the site.
	18	Blackstone Gorge Trail / Rolling Dam	Staples Ln	B	Y	Y	Extend permeable pavers from gate to edge of roadway to replace pavement. Install bioretention basin to right of gate while entering. During installation, grade area to drain into detention basin from gravel parking lot and roadside runoff.
	19	Greenway Parking	St Paul & Canal Sts	A	Y	Y	Site not selected for concept development. There is an existing stormwater practice (basin and swale to treat runoff from parking lot).
Other	20	Foxbrook Manor	Austin St	A	Y		Potential curbed bioswales in the sidewalk lawn. Potential bioretention in grass islands with open green space.
	21	Joseph C Early Village	8&1/2 Early Village Dr	B, B/D	Y		Replace existing paved swale with vegetated swale. Bioretention basin at outfall in proximity to stream.
	22	Frederick W Hartnett Middle School	35 Federal St	B, C	Y		Site not selected for concept development. The site has existing green infrastructure (large basin near entrance of school that appears to be sized to treat a majority of the site's runoff).
	23	Intersection by Park-N-Shop	Main St & Huntington Ave	A	Y		Site not selected for concept development. Limited space for surface practices and heavy traffic area, underground practice may not be optimal.
	24	Blackstone Village Main Street	Main & Howard Sts	C, A	Y		Potential underground infiltration in the intersection with Main Street (may require coordination with DOT). Very steep hill on Howard Street makes it prohibitive for practices on Howard Street itself.
	25	ROW Parcel Adjacent to Railway	St. Paul St & Elizabeth Ave	A	Y		Site not selected for concept development. Parcel thickly forested/hard to see. St Paul Street currently being repaved--future conditions unknown. Limited space for surface practices and a heavily trafficked area with a blind hill.

3. Field Inventories, Site Selection, and Conceptual Designs

3.1 Field Inventories

Field visits were conducted of the selected sites in July 2021. The sites and adjacent street areas were walked and visually inspected for potential stormwater retrofit opportunities (i.e., impervious surfaces connected to the on-site drainage system, available green space to accommodate new stormwater retrofits, and drainage features that could be enhanced or improved) and physical site characteristics such as site configuration, drainage patterns, current use, slope, landscaping, subsurface utilities, design complexity, and maintenance access considerations. Field notes on potential stormwater retrofit sites were recorded using the "Retrofit Reconnaissance Investigation" forms developed by the Center for Watershed *Protection*. Site photographs were taken to document site conditions/drainage features/etc.

The primary types of stormwater retrofits considered generally included:

- Bioretention areas and rain gardens.
- Sand and organic filters
- Water quality swales
- Infiltration trenches
- Impervious area removal and restoration

Permeable pavement (sidewalks, on-street and parking lot parking spaces, and low-traffic areas) was not considered due to concerns expressed by the Town regarding their use of sand as a winter road treatment and internal maintenance capabilities with available labor and equipment.

3.2 Sites Selected for Concept Designs

Based on the findings of the field inventories, potential stormwater retrofit opportunities were identified at 13 of the sites visited (see Table 1 for potential retrofit suggestions). The list was further narrowed down with input from the Highway Superintendent to select five top priority sites for further development of concept designs. These sites were selected because they: (1) have the greatest feasibility for stormwater retrofits, (2) provide the best opportunities to infiltrate (i.e., reduce) or filter runoff and impervious area (IA) coverage, and (3) were considered the most likely candidates for implementation by the Town. Many of the sites are also in highly visible, public locations and therefore provide good demonstration value. The five sites are listed in Table 2 with a summary of the proposed retrofit elements, estimated costs, and associated IA reduction.

Table 2. Sites selected for development of stormwater retrofit design concepts.

Site Name	Stormwater Retrofit BMP Type	Project Cost Estimate[1]	Impervious Area Treated	Cost Effectiveness ($1,000 per Acre Impervious Treated)
Blackstone Town Offices	• Linear Bioretention Basins • Pervious Walkway	$61,000	0.96 acres	$64
Memorial Park	• Bioretention Basin	$11,000	0.13 acres	$85
Historical Museum	• Linear Bioretention Basin	$22,000	0.25 acres	$88
Blackstone Public Library	• Bioretention Basins	$49,000	0.62 acres	$79
John F. Kennedy Elementary School	• Linear Bioretention Basins • Bioretention Basins • Pollinator Plantings	$153,000	2.3 acres	$67
TOTAL		$296,000	4.26 acres	

[1] Planning level opinion of cost. Includes estimated costs for engineering design, permitting, and construction. Excludes operation and maintenance costs.

3.3 Design Concepts

Stormwater retrofit design concepts were prepared for the selected sites. The design concepts reflect opportunities for infiltration and/or water quality treatment at each site. Opportunities were also evaluated to manage additional runoff from on-site and off-site drainage areas. BMPs were sited and preliminarily sized to accommodate the Water Quality Volume—defined as the first inch of runoff from the impervious area on a site. These concepts are sized to meet or exceed the water quality and impervious area (IA) requirements outlined in the MS4 Permit, which, for redevelopment sites (including retrofits) requires on-site retention of 0.8 inches of the total runoff from the post-construction impervious area on the site.

At many of the selected sites, there is sufficient physical space to build a practice that would retain/treat larger storms. Given the increasing frequency of heavy precipitation events associated with climate change impacts, the Town may wish to consider taking advantage of available space to implement retrofit designs with additional retention/treatment capacity to manage additional flow/accommodate larger storms and thereby address other goals such as increasing flooding resilience and climate resilience. Note that this approach would increase implementation costs, although these increases are often more favorable than a 1:1 ratio of increased size to cost due to economies of scale.

The retrofit design concepts, including planning-level costs and estimated pollutant load reductions (where TMDLs or water quality impairments apply), are presented on the following concept sheets. Each concept sheet includes a general site description, the proposed retrofit concept, field images, example images of similar completed retrofit opportunities (where available) or typical details of recommended BMPs. Sizing calculations for the recommended practices are provided in Attachment A.

Preliminary, planning-level costs were estimated for the site-specific concepts based upon unit costs derived from published sources, engineering experience, and the proposed design concepts. A 30% allowance has been incorporated to account for the costs of design and permitting. A more detailed breakdown of estimated costs, including operation and maintenance costs and total annualized costs based on the anticipated design life of each practice, is provided in Attachment B. Refined cost estimates would be developed during the design phase, and must take into consideration more detailed, site-specific data gathering, especially related to soils and the location of utilities.

The stormwater retrofit concepts presented in this retrofit plan provide potential on-the-ground projects for future implementation. They also serve as examples of the types of projects that could be implemented at similar sites throughout the Town. It is important to emphasize that these design concepts are not detailed designs and that further evaluation will be necessary to determine the ultimate feasibility of these designs, as well as conduct full design and permitting for these and similar site-specific concepts.

Blackstone Town Offices
Linear Bioretention Basins, Pervious Walkway, and Stormwater Signage
St Paul Street, Blackstone, MA

Site Description

The Blackstone town offices include administrative, police, and fire divisions all housed together in a facility on St. Paul Street. This site also includes public recreational fields and courts towards the rear of the lot. The building sits towards the street with parking in the rear. The parking area drains away from the building towards the sports fields. This area is adjacent to the Blackstone River but separated from it by a grass berm.

Proposed Concept

- Convert center parking island to bioretention area by replacing soil around trees (60 feet total length) with mix optimized for infiltration and phosphorus reduction; add landscape plantings. Basin will overflow to existing catch basin. Add permeable pavers for sidewalk section through island and add curb cuts in bituminous curb with redesign.
- Construct additional 6-foot wide linear bioretention area along back of parking lot adjacent to fields. Overflow to existing closed drainage system.
- Install educational signage about stormwater management at the BMPs including water cistern.



Image 2: Parking lot island; location of proposed bioretention basin and permeable walkway section with stormwater signage



Image 1: Example of bioretention area from the MA Stormwater Handbook

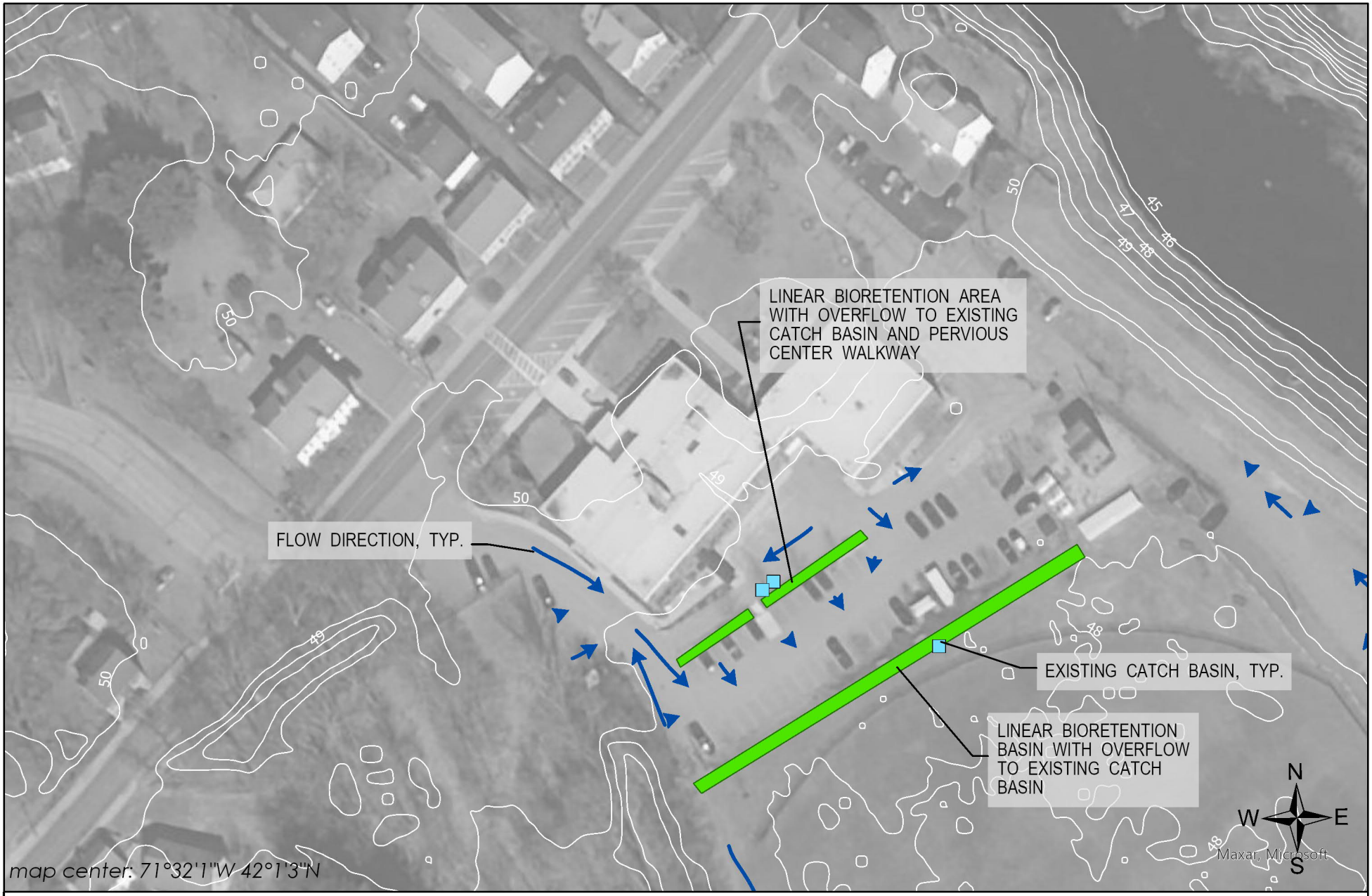
Retrofit Concept Summary

Impervious Area Treated: 0.96 acres
Design Storage Volume (DSV): 3,445 ft^3
Runoff Capture Depth: 1.1”
Required DSV to retain 0.8” runoff: 2,767 CF

Estimated Cost: $61,000



Image 3: Location of the proposed linear bioretention basin at the rear of the main parking lot



Stormwater Retrofit Concept for Town Offices

Blackstone, MA

0 45 90 180 Feet

contour interval = 1 foot

FUSS & O'NEILL ENGINEERS • SCIENTISTS • PLANNERS

Folder: K:\P2017\0202\A40\MXD\20170202A40_Blackstone_RetrofitConcepts\ Project: 20170202A40_Blackstone_RetrofitConcepts Layout: Blackstone Town Offices Concept Map: Map Frame
Date Exported: 6/16/2021 9:36 AM User: DRosengarten Date Saved: 10/11/2021 11:31 AM

Blackstone Memorial Gazebo Park
Bioretention Basins
Main Street (Rt 122), Blackstone, MA

Site Description

The site is a grass island between Main St, Butler St, and County St. If contains a memorial, bench, concrete curb and stone borders. The Blackstone River is directly to the east while roadway drainage flows along Main St to the northwest and includes a closed drainage system.

Proposed Concept

- Replace lawn area between gazebo and roadway with bioretention area/decorative rain garden.
- Construct vegetated swales and curb cut inlets on both sides of island to direct roadway runoff to the rain garden. These swales replace a landscaping strip on the north side and a section of stone border on the south side.
- Reconfigure the existing catch basin on the northeast corner to function as an overflow or be disconnected from the closed drainage system



Image 1: Approximate location of the proposed bioretention basin (blue) with existing catch basin (left) to function as overflow

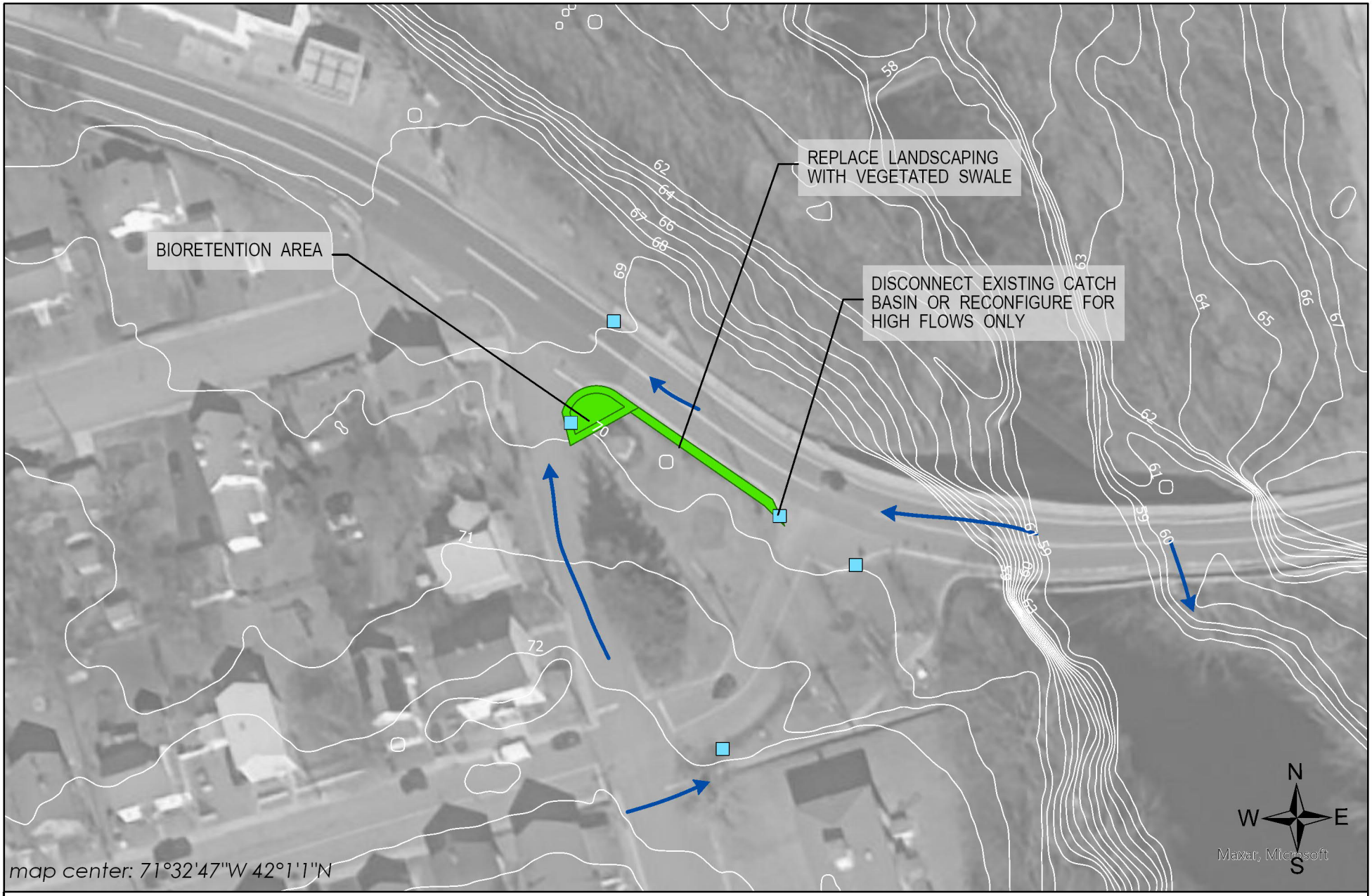


Image : Location of the proposed bioretention basin with existing catch basin to function as overflow

Retrofit Concept Summary

Impervious Area Treated: 0.13 acres
Design Storage Volume (DSV): 522 ft^3
Runoff Capture Depth: 1.1”
Required DSV to retain 0.8” runoff: 382 CF

Estimated Cost: $11,000



Stormwater Retrofit Concept for Memorial Gazebo

Blackstone, MA

0 37.5 75 150 Feet

contour interval = 1 foot

FUSS & O'NEILL ENGINEERS • SCIENTISTS • PLANNERS

Folder: K:\P2017\0202\A40\MXD\20170202A40_Blackstone_RetrofitConcepts\ Project: 20170202A40_Blackstone_RetrofitConcepts Layout: Memorial Gazebo Concept Map: Map Frame
Date Exported: 6/16/2021 9:36 AM User: DRosengarten Date Saved: 10/4/2021 10:57 AM

Blackstone Historical Commission Museum
Linear Bioretention Basin
Main Street (Rt 122), Blackstone, MA

Site Description

The Blackstone Historical Commission Museum is located on Main Street (Rt 122). The facility consists of a main building and a rear parking lot. The lot is elevated above the Blackstone River by a retaining wall, with a guardrail and chain link fence at the top of the wall. Currently drainage is separated with a high point in the driveway entrance directing water from the street into a closed drainage system while on-site drainage runs over the parking lot to the retaining wall adjacent to the Blackstone River.

Proposed Concept

- If parking lot is repaved in the future, reconfigure parking to optimize number of spaces and allow for removal of pavement for infiltration and stormwater treatment practices.
- Install a linear bioretention area with sufficient distance from retaining wall to infiltrate, filter, and treat runoff before it enters the Blackstone River.
    - Based on current conditions, a 4-foot wide linear practice is proposed along the full length of the parking lot.
    - Further investigation will be required to determine the necessary setback distance from the retaining wall to ensure structural stability and infiltration.

Retrofit Concept Summary

Impervious Area Treated: 0.13 acres
Design Storage Volume (DSV): 905 ft^3
Runoff Capture Depth: 1.1”
Required DSV to retain 0.8” runoff: 764 CF

Estimated Cost: $22,000



Image 1: Location of the proposed linear bioretention area (western side)



Image 2: Location of the proposed linear bioretention area (eastern side)



Stormwater Retrofit Concept for Historical Museum

Blackstone, MA

0 12.5 25 50 Feet

contour interval = 1 foot

FUSS & O'NEILL ENGINEERS • SCIENTISTS • PLANNERS

Folder: K:\P2017\0202\A40\MXD\20170202A40_Blackstone_RetrofitConcepts\ Project: 20170202A40_Blackstone_RetrofitConcepts Layout: Historical Museum Concept Map: Map Frame
Date Exported: 6/16/2021 9:36 AM User: DRosengarten Date Saved: 10/4/2021 10:57 AM

Blackstone Public Library
Bioretention Basins
Main Street (Rt 122), Blackstone, MA

Site Description

The Blackstone Public Library is located on Main Street (Rt 122). The facility consists of a building and parking lot set on a relatively small lot abutting Fox Brook which drains into the Blackstone River. Parking lot currently directs stormwater into a closed drainage system, likely discharging directly to Fox Brook.

Proposed Concept

- To left of the entrance while entering, install curb cuts and lower parking island to create a bioretention basin with overflow to an existing catch basin.
- Convert circular driveway island to bioretention area with curb cut inlets.
- Additional rain garden proposed in northeast corner of lot if fence and guardrail could be reset to provide sufficient space for a BMP. Repurpose existing catch basin in the vicinity to function as overflow.



Image 1: Northeast corner of the parking lot where bioretention is proposed

Retrofit Concept Summary

Impervious Area Treated: 0.62 acres
Design Storage Volume (DSV): 2,060 ft^3
Runoff Capture Depth: 0.9”
Required DSV to retain 0.8” runoff: 1,804 CF

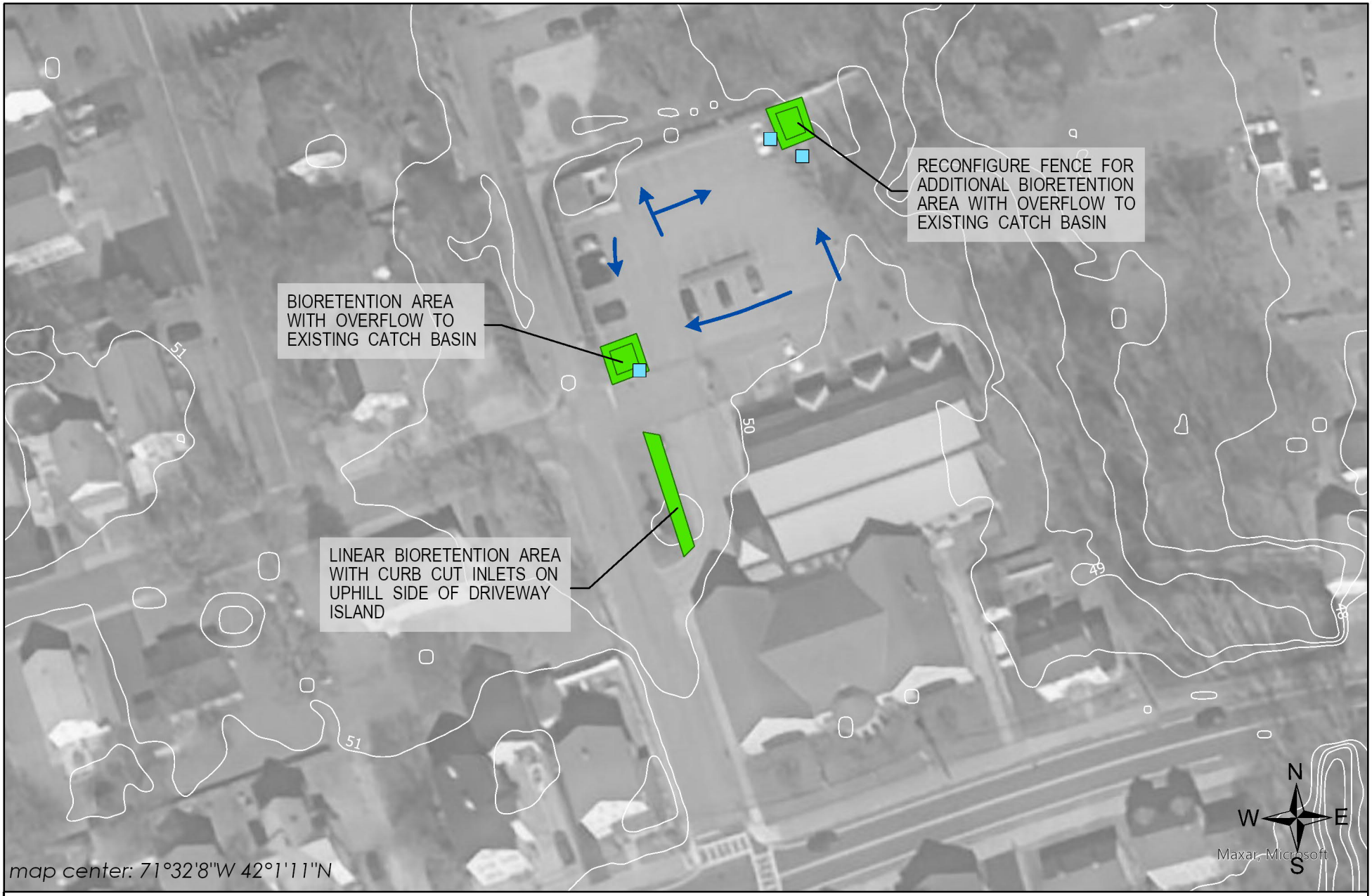
Estimated Cost: $49,000



Image 2: Existing front island where curb cuts and bioretention are proposed



Image 3: Location of the proposed bioretention area to the left as entering the parking lot



Stormwater Retrofit Concept for Public Library

Blackstone, MA

0 37.5 75 150 Feet

contour interval = 1 foot

FUSS & O'NEILL ENGINEERS • SCIENTISTS • PLANNERS

Folder: K:\P2017\0202\A40\MXD\20170202A40_Blackstone_RetrofitConcepts\ Project: 20170202A40_Blackstone_RetrofitConcepts Layout: Blackstone Public Library Concept Map: Map Frame
Date Exported: 6/16/2021 9:36 AM User: DRosengarten Date Saved: 10/4/2021 10:57 AM

John F. Kennedy Elementary School
Bioretention Areas, Pollinator Plantings
Lincoln Street, Blackstone, MA

Site Description

John F. Kennedy Elementary School is a school campus located between Lincoln and Mendon Streets. The site includes a large main school building, multiple driveway entrances and routes around the building, and parking areas. There are also sidewalks, sports fields, and a playground. Generally the drainage pattern runs north. Sediment accumulation occurs consistently in various places along the edge of existing paved areas.

Proposed Concept

- Construct bioretention areas to infiltrate and treat runoff from northern and northeastern paved surfaces.
- Evaluate parking use along northwest section of driveway, protect swale and install bioretention area.
- Convert narrow parking island in main southeast parking area to vegetated swale, potentially with overflow or underdrain to rain garden between parking area and south side of northern driveway entrance on Lincoln St.
- Install bioretention area inside driveway circle on Mendon St on downhill side with linear trench drains on both sides of driveway to capture stormwater runoff and direct it into the practice. Run overflow pipe under driveway to existing catch basin.
- Plant downhill side of driveway as a vegetated strip for pollinator species and install educational signage.



Image 2: Northwest corner of driveway area by outbuilding



Image 1: Area of proposed pollinator plantings with educational signage and linear bioretention area

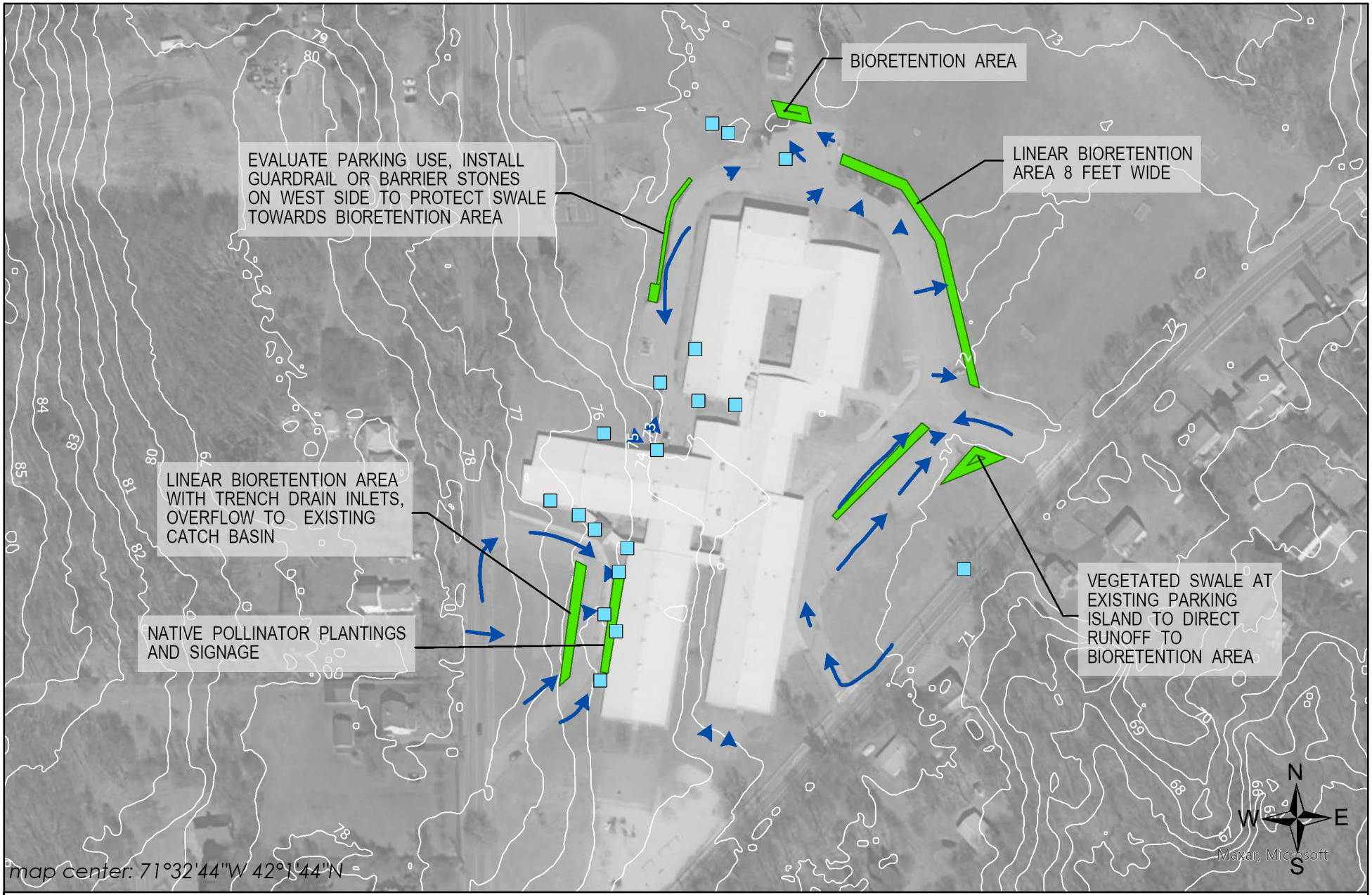
Retrofit Concept Summary

Impervious Area Treated: 0.36 acres
Design Storage Volume (DSV): 1,304 ft^3
Runoff Capture Depth: 1.2”
Required DSV to retain 0.8” runoff: 6,587 CF

Estimated Cost: $153,000*
*Excludes cost of pollinator plantings



Image 3: Location of the proposed bioretention basin (blue) by the northeast driveway entrance



Stormwater Retrofit Concept for JFK Elementary School

Blackstone, MA

0 95 190 380 Feet

contour interval = 1 foot

FUSS & O'NEILL ENGINEERS • SCIENTISTS • PLANNERS

Folder: K:\P2017\0202\A40\MXD\20170202A40_Blackstone_RetrofitConcepts\ Project: 20170202A40_Blackstone_RetrofitConcepts Layout: JFK School Concept Map: Map Frame
Date Exported: 6/16/2021 9:36 AM User: DRosengarten Date Saved: 10/4/2021 11:37 AM

FUSS & O'NEILL

Attachment A

Retrofit Sizing Calculations

FUSS & O'NEILL

Retrofit Sizing Calculations									
Retrofit Site	BMP Description	Contributing Drainage Area (Pervious and Impervious) (Sq Ft)	% Drainage Area That's Impervious	Area of Proposed BMP (Sq Ft)	Water Quality Volume* (CF)	Design Storage Volume (CF)	%WQV treated	Runoff Capture Depth (inches)	Required DSV to retain 0.8" runoff (CF)
Town Offices	Parking Island	9,047	100%	480	754	835	111%	1.1	603
	Ball Field	32,457	100%	1,600	2,705	2,784	103%	1.0	2,164
Memorial Park	Gazebo	11,462	50%	300	478	522	109%	1.1	382
Historical Museum	Parking Lot	11,462	100%	600	955	1,044	109%	1.1	764
Library	Circular Drive	8,117	100%	426	676	741	110%	1.1	541
	Left of Entrance	10,830	100%	376	903	654	72%	0.7	722
	Back Lot Corner	8,118	100%	382	677	665	98%	1.0	541
JFK Elementary	N Lot	12,606	100%	600	1,051	1,044	99%	1.0	840
	NE Drive	24,772	100%	1,440	2,064	2,506	121%	1.2	1,651
	SE Lot	37,425	100%	1,900	3,119	3,306	106%	1.1	2,495
	SW Drive	42,129	50%	1,429	1,755	2,486	142%	1.4	1,404
	NW Drive	2,950	100%	200	246	348	142%	1.4	197

* Water Quality Volume or WQV means the runoff generated by the first one inch of rainfall on the impervious area of a site

FUSS & O'NEILL

Attachment B

Planning Level Cost Estimates

FUSS & O'NEILL

Order of Magnitude Cost Estimates																
Location and BMP Type		Construction					Planning and Design		Cost Range			Life Cycle				
		Unit Cost	Unit	Adjustment Factor	Quantity	Base Cost	Allowance	Cost	Total Cost	-30%	50%	Lifespan (yrs.)	Annual Cost Over Lifespan	O&M (% Cost)	O&M ($/yr.)	Total Capitalized Cost/Year Over Lifespan
Town Offices	Parking Island (linear bioretention)	$12.75	CF design storage volume	1.5	716.00	$13,689	30%	$4,110	$18,000	$13,000	$27,000	20	$1,320	4%	$50	$1,370
	Ball Field (linear bioretention)	$12.75	CF design storage volume	1.0	2570.00	$32,757	30%	$9,830	$43,000	$30,000	$65,000	20	$3,160	4%	$130	$3,290
Memorial Park	Gazebo (bioretention basin)	$12.75	CF design storage volume	1.0	478.00	$6,093	30%	$1,830	$8,000	$6,000	$12,000	20	$590	4%	$20	$610
	Conveyance swale	$20.64	Linear feet	1.0	95.00	$1,961	30%	$590	$3,000	$2,000	$5,000	20	$220	4%	$10	$230
Historical Museum	Parking Lot (linear bioretention)	$12.75	CF design storage volume	1.5	854.00	$16,328	30%	$4,900	$22,000	$15,000	$33,000	20	$1,620	4%	$60	$1,680
Library	Circular Drive (linear bioretention)	$12.75	CF design storage volume	1.0	643.00	$8,196	30%	$2,460	$11,000	$8,000	$17,000	20	$810	4%	$30	$840
	Left of Entrance (bioretention basin)	$12.75	CF design storage volume	1.5	857.00	$16,385	30%	$4,920	$22,000	$15,000	$33,000	20	$1,620	4%	$60	$1,680
	Back Lot Corner (bioretention basin)	$12.75	CF design storage volume	1.5	643.00	$12,293	30%	$3,690	$16,000	$11,000	$24,000	20	$1,180	4%	$50	$1,230
JFK Elementary School	North Lot (bioretention basin)	$12.75	CF design storage volume	1.0	998.00	$12,720	30%	$3,820	$17,000	$12,000	$26,000	20	$1,250	4%	$50	$1,300
	Northeast Drive (linear bioretention)	$12.75	CF design storage volume	1.0	1961.00	$24,995	30%	$7,500	$33,000	$23,000	$50,000	20	$2,430	4%	$100	$2,530
	Southeast Lot (bioretention basin)	$12.75	CF design storage volume	1.0	2963.00	$37,766	30%	$11,330	$50,000	$35,000	$75,000	20	$3,680	4%	$150	$3,830
	Southeast Lot (vegetated swales)	$20.64	Linear feet	1.0	160.00	$3,302	30%	$990	$5,000	$4,000	$8,000	20	$370	4%	$10	$380
	Southwest Drive (linear bioretention)	$12.75	CF design storage volume	1.5	1755.00	$33,554	30%	$10,070	$44,000	$31,000	$66,000	20	$3,240	4%	$130	$3,370
	Northwest Drive (linear bioretention)	$12.75	CF design storage volume	1.0	200.00	$2,549	30%	$760	$4,000	$3,000	$6,000	20	$290	4%	$10	$300
								Total	***$296,000***	***$208,000***	***$447,000***					

Notes:
Rate of Inflation used = 2%
Interest (discount) rate used = 6%
Costs are based on screening-level evaluations of site characteristics and should be used for planning purposes only. Construction costs could vary significantly. Planning level opinion of costs include estimated costs for engineering design, permitting, and construction. Excludes operation and maintenance costs.
Quantities were determined through sizing calculations according to recommended formulas. BMP size may vary slightly on the concept sheets provided, as these images are provided for illustrative purposes only.
Cost formula and adjustment factors are based on EPA guidance: https://www3.epa.gov/region1/npdes/stormwater/ma/green-infrastructure-stormwater-bmp-cost-estimation.pdf
Unit Cost sources are as follows:
Bioretention/Rain Gardens/Swales: Mataleska, Karen, "MS4 Resource: BMP Cost Estimates" (2016). UNH Stormwater Center. 32.https://scholars.unh.edu/cgi/viewcontent.cgi?article=1031&context=stormwater

Appendix G- Blackstone Municipal Inventory

FUSS & O'NEILL

MEMORANDUM

TO: Daniel Keyes, Town Administrator

FROM: Matthew Kissane, MS, Fuss & O'Neill, Inc.
Julianne Busa, Ph.D., Fuss & O'Neill, Inc.
Sarah Hayden, MSc, Fuss & O'Neill, Inc.

DATE: September 28, 2020

RE: MS4 Facility Evaluations
Town of Blackstone

On August 12, 2020 and September 14, 2020, Fuss & O'Neill staff conducted inspections of facilities owned or overseen by the Town of Blackstone, Massachusetts. As per Section 2.3.7.a.ii.1-3 of the *General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems* (MA MS4 General Permit) issued by the United States Environmental Protection Agency (EPA), properties, parks and other facilities, and vehicles and equipment that are owned or operated by the Town must be evaluated for the following:

1. Parks and Open Space
    - Proper use, storage, and disposal of pesticides, herbicides, and fertilizers.
    - Lawn maintenance and landscaping activities to ensure practices are protective of water quality.
    - Pet waste handling collection and disposal locations with signage are installed at all parks and open spaces where pets are permitted.
    - Waterfowl congregation areas are addressed to reduce waterfowl droppings from entering the MS4.
    - Trash containers at parks and open spaces are properly managed.
    - Erosion or poor vegetative cover are addressed, especially within 50 feet of a surface water.

2. Buildings and Facilities
    - Use, storage, and disposal of petroleum products and other potential stormwater pollutants.
    - Employee training as necessary is provided to those responsible for handling these products.
    - Spill Prevention Plans are in place, as applicable, and coordinated with the fire department, as necessary.
    - Management procedures for dumpsters and other waste management equipment are in place.
    - Parking lots and areas surrounding the facilities are swept and kept clean to reduce runoff of pollutants.

3. Vehicles and Equipment
    - Procedures for the storage of Town vehicles.
    - Vehicles with fluid leaks are stored indoors or containment is provided until repaired.

- Fueling areas owned or operated by the Town are under cover, if possible, to minimize exposure.
- Vehicle washing procedures ensure that wash waters are not discharged to the municipal storm sewer system or to surface waters.

Facilities Evaluated

Based on these requirements, the following Town facilities were evaluated:

1. General Facilities

- Blackstone Valley Regional Recycling Center – 14 Chestnut Street
- Robert J. Dubois Corrosion Control Facility – 53 Elm Street
- Municipal Center – 15 St. Paul Street
- Blackstone Public Library – 86 Main Street
- Fire Department Station #2 – 666 Rathbun Street
- Fire Department Station #3 – 132 Elm Street
- Salt and Sand Storage – Mill Street

2. Education Facilities

- Blackstone-Millville Regional High School – 175 Lincoln Street
- Frederick W. Hartnett Middle School – 35 Federal Street
- John F. Kennedy/Augustine F. Maloney Elementary School – 200 Lincoln Street

3. Parks and Recreation Facilities

- Roosevelt Park – St. Paul Street
- Turbesi Park – Rathbun Street
- Blackstone-Millville Regional High School Fields – 175 Lincoln Street, Blackstone
- Frederick W. Hartnett Middle School Field – 35 Federal Street
- John F. Kennedy/ Augustine F. Maloney Elementary School Fields – 200 Lincoln Street
- Attilio Valati Nature Park – Summer Street
- Veterans Memorial Park – Elm Street
- Elm Street Mini-Park – Elm Street

Recommendations

The attached inventories identify potential sources of stormwater pollution that were observed at each site. The tables detail existing management practices as they relate to these potential pollutant sources, as observed by Fuss & O'Neill staff during site visits, or as described by Town staff. Recommended best management practices are also presented. The best management practices include relevant elements

from the facilities and open space Standard Operating Procedures (SOPs) developed by Fuss & O'Neill on behalf of the Central Massachusetts Regional Stormwater Coalition. Recommended best management practices also call attention to specific practices that should be adopted at a particular facility or site to correct undesirable or non-compliant practices observed during the site visits.

SOP 19: Operations and Maintenance of Parks and Open Spaces

Introduction

Parks and open space operations and maintenance activities commonly involve the operation of equipment such as mowers and tractors; disposal of waste from mowing, planting, weeding, raking, pruning, and trash collection; application of pesticides, herbicides, and fertilizers; cleaning and maintenance of park amenities such as play equipment, restrooms, and structures; and snow removal. These activities have the potential to generate contaminants such as sediments and toxic chemicals that may be picked up by rainwater, thereby entering the storm drainage system and receiving waters. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to municipal employees to reduce the discharge of pollutants from the MS4 and to receiving waters as a result of parks and open space operations and maintenance. If services are contracted, this SOP should be provided to the contractor. The contract should specify that the contractor is responsible for compliance with all applicable laws.

The Town of Blackstone ("the Town") performs a variety of operations and maintenance activities at its municipal parks and open spaces. The Town's Parks and Recreation Commission is responsible for maintenance of municipally-owned parks and open spaces, including mowing and landscaping activities. Trash is picked up twice weekly at all applicable parks and open spaces. Trash pickup also occurs same-day if fields have been used for events. The Commission does not store any fertilizer, gasoline, or chemicals on site at any of the Town's parks or open spaces. The Commission uses its own staff and equipment for maintenance activities.

Within two years of the effective date of the MS4 Permit, the Town will create an inventory of all municipal parks and open spaces and update this inventory annually (refer to the attached inventory template).

Procedures

The Town will implement the following procedures at municipal parks and open spaces to reduce the discharge of pollutants from the MS4:

General

- Repair damage to landscaped or mulch or vegetated bare areas as soon as possible to prevent erosion. If there are areas of erosion or poor vegetation, repair them as soon as possible, especially if they are within 50 feet of a surface water (e.g., pond, lake, or river).
- Remove (sweep or shovel) materials such as soil, mulch, and grass clippings from parking lots, streets, curbs, gutters, sidewalks, and drainage-ways.
- Do not clean up any unidentified or possibly hazardous materials found during maintenance; notify a supervisor immediately.

Maintenance

- Wastewater from power washing signs, structures, or bleachers cannot be discharged into the stormwater system.
- When painting park equipment, use a drop cloth and clean up any spills immediately.
- Do not leave open containers on the ground where they may accidentally tip over.
- Sweep parking lots with a street sweeper and dispose of street sweepings in designated areas (see SOP 16: Streets and Parking Lots).
- Never wash debris from parking lots into the storm drain.

Mowing

- Remove debris and trash from landscaped areas prior to mowing.
- Collect grass clippings and leaves after mowing. Do not blow or wash them into the street, gutter, or storm drains.
- Properly recycle or dispose of organic waste after mowing, weeding, and trimming.
- Reduce mowing frequencies wherever possible by establishing low/no-mow areas in lesser-used spaces.
- Brush off mowers (reels and decks) and tractors over grassy areas or in contained washout areas.
- Leave clippings on grassy areas or dispose of them in the trash or by composting.
- Do not hose off mowers over paved areas that drain into the MS4 or directly to surface waters.
- Follow proper vehicle and equipment maintenance procedures to prevent leaks (see SOP 21: Operations and Maintenance of Municipal Vehicles and Equipment)
- Do not allow grease from mowers to fall onto areas where they can be washed into the stormwater system.

Irrigation

- Repair broken sprinkler heads as soon as possible.
- Only irrigate at a rate that can infiltrate into the soil to limit run-off.
- Avoid irrigating close to impervious surfaces such as parking lots and sidewalks.

Landscaping

- When establishing new plantings, use alternative landscaping materials, such as drought resistant or native plants to reduce the need for irrigation and extensive application of fertilizers and pesticides.
- Follow proper fueling procedures for all equipment to ensure that petroleum products do not enter the stormwater system (see SOP 7: Fuel and Oil Handling Procedures).
- Fertilizers, herbicides, and pesticides should be properly used, stored, and handled (see SOP 12: Storage and Use of Pesticides and Fertilizer).
- The Town discharges into the following phosphorus-impaired waterbody: the Blackstone River (MA51-06). Under MS4 Permit requirements, the Town acknowledges that blowing organic waste material (grass cuttings, leaf litter) onto adjacent impervious surfaces is strictly prohibited.

Snow Removal

- Store salt or sand for snow removal indoors under a roof or in a covered container and on impervious surfaces.
- See SOP 18: Winter Road Maintenance for more information on proper snow disposal and storage procedures.
- Any damage done to vegetated areas caused by plows or deicing materials should be repaired as early as possible in the spring.

Trash Management

- All waste and recycling containers must be leak-tight with tight-fitting lids or covers.
- Place waste and recycling containers indoors or under a roof or overhang whenever possible.
- Clean and sweep up around outdoor waste containers regularly.
- Arrange for waste and recyclables to be picked up regularly and disposed of at approved disposal facilities.
- Do not wash out waste or recycling containers outdoors or in a parking lot.
- Conduct periodic inspections of waste areas to check for leaks and spills.
- Ensure there are enough trash and recycling containers at appropriate areas.
- Monitor waste and recycling containers at heavily-used sites and on holidays to ensure that there is no overflow.

Other Activities

- Provide pet waste stations with bags and trash receptacles where pets are permitted. Post signs describing the proper disposal of pet waste.
- All portable toilets should be staked down in flat, secure locations where they are less likely to be knocked down or blown over. They should be placed in a location that would retain any spillage from washing into the MS4 or receiving waters. Ensure routine maintenance and cleaning of portable toilets.
- Identify undesirable waterfowl congregation areas and take steps to prevent waterfowl droppings from entering the stormwater system or surrounding waterbodies.
    - Take measures to discourage congregation near waterbodies and the storm system (e.g., use strobe lights or reflective tape, establish no-mow zones to reduce available feeding areas, or plant thick vegetation along waterlines). If waterfowl congregation cannot be managed, then isolate the drainage from congregation areas away from the storm system and waterbodies.
    - Install signage to educate the public on the negative effects of waterfowl feces entering the stormwater system or nearby waterbodies in order to discourage public feeding. Alternatively, enact feeding bans.

Employee Training

- Employees who perform maintenance or other applicable work at municipal parks and open spaces should be trained on these procedures and the proper operation of related equipment.
- Employees should also be trained on stormwater pollution prevention, illicit discharge detection and elimination (IDDE) procedures, and spill and response procedures.

- If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.

Attachments

1. Inventory of Municipal Parks and Open Spaces

Related Standard Operating Procedures

- SOP 7: Fuel and Oil Handling Procedures
- SOP 12: Storage and Use of Pesticides and Fertilizer
- SOP 16: Streets and Parking Lots
- SOP 18: Winter Road Maintenance
- SOP 21: Operations and Maintenance of Municipal Vehicles and Equipment

Inventory of Municipal Parks and Open Spaces
Blackstone, Massachusetts

Name of Park/Open Space	Location	Manager/Contact – Name, Position, Department, Phone Number	Potential Stormwater Pollutant Sources (e.g., trash containers, fertilizers, fuel)	Existing Management Practices Related to Potential Stormwater Pollutants	Recommended Best Management Practices to Reduce Exposure Risk of Potential Stormwater Pollutants
Roosevelt Park	St. Paul Street, Blackstone, MA	Adam Robidoux, Head Groundskeeper, Parks and Recreation Department (508) 883-1910	Trash containers, recycling containers	- A majority of trash containers have domed covers. - Some trash containers were uncovered at time of site visit. - Recycling containers have domed covers. - A storage shed is present but contains no identified potential stormwater pollutants.	- Keep trash containers covered with securely-fitting, leak-proof lids. Schedule regular trash pick-up to prevent containers from overflowing. Regularly inspect trash containers for signs of cracks or leaks. Regularly sweep/clean around trash containers to prevent waste accumulation. - Keep recycling containers covered with securely-fitting, leak-proof lids. Regularly sweep/clean around recycling containers to prevent waste accumulation. - Properly store any chemicals and potential stormwater pollutants in storage sheds, using secondary containment if necessary. Regularly inspect containers and storage areas for leaks or spills.
Turbesi Park	Rathbun Street, Blackstone, MA	Adam Robidoux, Head Groundskeeper, Parks and Recreation Department (508) 883-1910	Trash containers, recycling containers, portable toilets	- A majority of trash containers have domed covers. - Some trash containers were uncovered at time of site visit. - Recycling containers do not have securely fitting covers and are not leak-proof (are constructed of mesh wire with large openings on top). - "No Dogs Allowed" signage posted throughout park. - Portable toilets are located on flat, grassy area away from stormwater inlets. - Material storage piles observed at southeastern portion of site. Piles were uncovered at time of site visit. - No stormwater inlets observed on site.	- Keep trash containers covered with securely-fitting, leak-proof lids. Schedule regular trash pick-up to prevent containers from overflowing. Regularly inspect trash containers for signs of cracks or leaks. Regularly sweep/clean around trash containers to prevent waste accumulation. - Keep recycling containers covered with securely-fitting, leak-proof lids. Regularly sweep/clean around recycling containers to prevent waste accumulation. - Place portable toilet on flat surface away from stormwater inlets (e.g., at least 25 to 50 feet away). Avoid placing portable toilet on impervious surfaces, if possible—pervious surfaces, such as grass or sand, are preferable for spill containment purposes. Conduct regular clean-out and maintenance. Regularly inspect structure for leaks or spills. - Implement erosion and sediment control measures for material stockpiles (e.g., installation of silt fences), especially if stockpiles will remain exposed for an extended period of time.
Blackstone-Millville Regional High School Fields	175 Lincoln Street, Blackstone, MA	Blackstone-Millville Regional High School, (508) 876-0117	Trash containers, recycling container	- "No Dogs Allowed" signage posted near fields. - Uncovered trash containers located at tennis courts and track/field (containers are chained to fences). - Uncovered recycling container located at track/field (container is chained to fence).	- Keep trash containers covered with securely-fitting, leak-proof lids. Schedule regular trash pick-up to prevent containers from overflowing. Regularly inspect trash containers for signs of cracks or leaks. Regularly sweep/clean around trash containers to prevent waste accumulation. - Keep recycling containers covered with securely-fitting, leak-proof lids. Regularly sweep/clean around recycling containers to prevent waste accumulation.

Name of Park/Open Space	Location	Manager/Contact – Name, Position, Department, Phone Number	Potential Stormwater Pollutant Sources (e.g., trash containers, fertilizers, fuel)	Existing Management Practices Related to Potential Stormwater Pollutants	Recommended Best Management Practices to Reduce Exposure Risk of Potential Stormwater Pollutants
Frederick W. Hartnett Middle School Field	35 Federal Street, Blackstone, MA	Frederick W. Hartnett Middle School, (508) 876-0190	Trash container	- Trash container was uncovered at time of site visit. Container is located on a grassy area adjacent to field and is staked to the ground. - Trash was observed outside of the container on the field at time of site visit.	- Keep trash container covered with securely-fitting, leak-proof lids. Schedule regular trash pick-up to prevent container from overflowing. Regularly inspect trash container for signs of cracks or leaks. Regularly sweep/clean around trash container to prevent waste accumulation.
John F. Kennedy/ Augustine F. Maloney Elementary School Fields	200 Lincoln Street, Blackstone, MA	John F. Kennedy/ Augustine F. Maloney Elementary School, (508) 876-0188	Trash containers	- "No Dogs Allowed" signage posted near fields. - All trash containers on fields have domed covers. - Recycling containers do not have securely-fitting covers and are not leak-proof (are constructed of mesh wire with large openings on top). - A snack shack is present but contains no identified potential stormwater pollutants. - A metal storage container is present but contains no identified potential stormwater pollutants.	- Keep trash containers covered with securely-fitting, leak-proof lids. Schedule regular trash pick-up to prevent containers from overflowing. Regularly inspect trash containers for signs of cracks or leaks. Regularly sweep/clean around trash containers to prevent waste accumulation.
Attilio Valati Nature Park	Summer Street, Blackstone, MA	Adam Robidoux, Head Groundskeeper, Parks and Recreation Department (508) 883-1910	Trash containers, potential pet waste, litter	- Trash containers all have domed covers. - There is no posted signage prohibiting dogs or regarding cleaning up pet waste. - Litter was observed on the ground scattered across the property. - No stormwater inlets observed on site.	- Keep trash containers covered with securely-fitting, leak-proof lids. Regularly clean-out or schedule pick-up of trash to prevent containers from overflowing. Regularly inspect trash containers for signs of cracks or leaks. Regularly sweep/clean around trash containers to prevent waste accumulation. Post signage that expressly prohibits littering and indicates proper waste disposal areas. - Provide pet waste stations with bags and trash receptacles. Maintain signage describing the proper disposal of pet waste. Alternatively, post signage prohibiting dogs from the park.
Veterans Memorial Park	Elm Street, Blackstone, MA	Adam Robidoux, Head Groundskeeper, Parks and Recreation Department (508) 883-1910	No potential stormwater pollutant sources identified on site (park under construction)	- N/A	- N/A
Elm Street Mini-Park	Elm Street (Rear, Behind Fire Station), Blackstone, MA	Adam Robidoux, Head Groundskeeper, Parks and Recreation Department (508) 883-1910	Trash container	- Trash container was uncovered at time of site visit, chained to adjacent fence. - No stormwater inlets observed on site.	- Keep trash container covered with securely-fitting, leak-proof lids. Schedule regular trash pick-up to prevent container from overflowing. Regularly inspect trash container for signs of cracks or leaks. Regularly sweep/clean around trash container to prevent waste accumulation.

SOP 20: Operations and Maintenance of Municipal Buildings and Facilities

Introduction

Municipal buildings and facilities (schools, municipal offices, police and fire stations, etc.) often house various chemicals, such as petroleum products and hazardous materials. As a result, these buildings and facilities are potential sources of pollutant discharges to the storm drainage system. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to municipal employees on the use, storage, and disposal of chemicals and other stormwater pollutants to reduce the discharge of pollutants from the MS4. If services are contracted, this SOP should be provided to the contractor. The contract should specify that the contractor is responsible for compliance with all applicable laws.

The Town of Blackstone ("the Town") performs a variety of operations and maintenance activities at its municipally owned and operated buildings.

Petroleum products are primarily stored at the Town's Department of Public Works (DPW) and in the underground storage tank for the fueling station at the Municipal Center. Waste oil, including petroleum products, is stored at the DPW and the Blackstone Valley Regional Recycling Center. Spill kits are present at both sites and employees are trained on proper spill procedures. Waste from municipal facilities is picked up by Republic Services, a licensed waste hauler. Recyclable materials, including electronic waste, mattresses, metal, yard waste, batteries, and lightbulbs, are collected by the municipally-operated Blackstone Valley Regional Recycling Center. The Town conducts facilities maintenance using its own staff and equipment.

Within two years of the effective date of the MS4 Permit, the Town will create an inventory of all municipal buildings and facilities and update this inventory annually (refer to the attached buildings and facilities inventory).

Procedures

The Town will implement the following procedures for municipally owned or operated buildings and facilities to reduce the discharge of pollutants from the MS4:

Handling, Storage, Transfer, and Disposal of Trash and Recyclables

All liquid and solid waste must be disposed of properly. Some of the most common sources of pollution at municipal facilities are a result of littering, improper collection of debris, and improper disposal of solid or liquid waste.

- All waste and recycling receptacles must be leak-tight with tight-fitting lids or covers.
- Keep lids on dumpsters and containers closed at all times unless adding or removing material. If using an open-top roll-off dumpster, cover it and tie it down with a tarp unless adding materials.
- Place waste or recycling receptacles indoors or under a roof or overhang whenever possible.
- Locate dumpsters on a flat, paved surface and install berms or curbs around the storage area to prevent run-on and run-off.
- Do not locate dumpsters over or adjacent to catch basins.

- Prior to transporting waste, trash, or recycling, ensure that containers are not leaking (double bag if needed) and properly secure containers to the vehicle.
- Clean and sweep up around outdoor waste containers regularly.
- Clean up any liquid leaks or spills with dry cleanup methods.
- Arrange for waste or recycling to be picked up regularly and disposed of at approved disposal facilities.
- Never place hazardous materials, liquids, or liquid-containing wastes in a dumpster or recycling or trash container (see SOP 17: Hazardous Materials Storage and Handling).
- Do not wash trash or recycling containers outdoors or in parking lots.
- Conduct periodic inspections of solid and liquid waste storage areas to check for leaks and spills.
- Conduct periodic inspections of work areas to ensure that all wastes are being disposed of properly.
- In dumpster areas, regularly pick up surrounding trash and debris and regularly sweep the area.
- In compactor areas, regularly check the hydraulic fluid hoses and reservoir to ensure that there are no cracks or leaks. Regularly sweep the area.

Building Maintenance

- When power washing buildings and facilities, ensure that the washwater does not flow into the storm system. Containment or filtering systems should be provided.
- Paint and other chemicals should not be applied on the outside of buildings when it is raining or prior to expected rain.
- When sanding, painting, power washing, etc., ensure that sites are properly prepared (e.g., use tarps) and cleaned (e.g., use dry cleaning methods) especially if they are near storm drains. Protect catch basins when maintenance work is conducted upgradient of them.
- When painting, use a drop cloth and clean up any spills immediately.
- Do not leave open containers on the ground where they may accidentally tip over.
- Buildings should be routinely inspected for areas of potential leaks.
- Do not discharge chlorinated pool water into the stormwater system. Water must be properly dechlorinated and tested before it is discharged.
- Streets and parking lots surrounding municipal buildings and facilities should be swept and kept clean to reduce runoff of pollutants and debris to the stormwater system.
- Streets and parking lots around buildings and facilities will be swept in accordance with the procedures in SOP 16: Streets and Parking Lots.

Storage of Petroleum Products and Potential Pollutants

- Floor drains in storage areas should be disconnected from the stormwater system.
- Routinely inspect buildings and facilities for areas of potential leaks.
- For storage and handling procedures of petroleum products and potential pollutants, refer to SOP 17: Hazardous Materials Storage and Handling and SOP 7: Fuel and Oil Handling Procedures.
- For storage and handling procedures for fertilizers, pesticides, and herbicides, refer to SOP 12: Fertilizers, Pesticides, and Herbicides.

- All municipal buildings and facilities should be periodically inspected to address potential pollutant sources (e.g., leaks).

Spill Prevention Plan

- Spill prevention plans such as Spill Prevention Control and Countermeasure (SPCC) Plans should be in place where applicable, based on inventories of material storage and potential pollutants. Coordinate with the local fire department if necessary.
- Spill SOPs are outlined in SOP 4: Spill Response and Cleanup.

Employee Training

- Employees who perform maintenance or other applicable work at municipal buildings and facilities should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations. Employees should be trained on these procedures and the proper operation of related equipment. Employees should also be trained on stormwater pollution prevention, illicit discharge detection and elimination (IDDE) procedures, and spill response procedures.
- If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.

Attachments

1. Inventory of Municipal Buildings and Facilities

Related Standard Operating Procedures

1. SOP 4: Spill Response and Cleanup
2. SOP 7: Fuel and Oil Handling
3. SOP 12: Storage and Use of Pesticides and Fertilizer
4. SOP 16: Streets and Parking Lots
5. SOP 17: Hazardous Material Storage and Handling

Inventory of Municipal Buildings and Facilities
Blackstone, Massachusetts

Name of Building/Facility	Location	Manager/Contact – Name, Position, Department, Phone Number	Potential Stormwater Pollutant Sources (e.g., trash containers, fertilizers, fuel)	Existing Management Practices Related to Potential Stormwater Pollutants	Recommended Best Management Practices to Reduce Exposure Risk of Potential Stormwater Pollutants
Blackstone Valley Regional Recycling Center	14 Chestnut Street, Blackstone, MA	Blackstone Valley Regional Recycling Center, (508) 883-9169	Recyclable materials, material stockpiles, equipment maintenance fluids, waste oil	- A spill kit is maintained on site. - Recyclable debris was observed scattered across the site at the time of visit. - Battery and lightbulb disposal is contained in a covered shed. - Mercury waste products are not accepted at the site. - Material stockpiles were uncovered at time of site visit. - Waste oil tank is double walled. - 55-gallon drums at the waste oil station lack secondary containment and are located on pervious surface. - Insignificant quantities of used paint and used propane tanks are stored uncovered on pervious surface. - There are no stormwater inlets present on site.	- Regularly clean/sweep around recyclables stockpiles to prevent scattering of materials. - Implement erosion and sediment control measures for material stockpiles (e.g., installation of silt fences), especially if stockpiles will remain exposed for an extended period of time. - Conduct equipment maintenance indoors at the facility's repair shop or at the DPW garage. - Provide secondary containment, as needed, for waste oil containers. Regularly inspect the containers for signs of cracks or leaks.
Robert J. Dubois Corrosion Control Facility (Department of Public Works, Highway Division, Sewer Division, Water Division)	51 Elm Street, Blackstone, MA	Jimmy Sullivan, Superintendent, Department of Public Works, (508) 883-9331	Dumpster, vehicles and equipment maintenance fluid and wash water, diesel fuel, material storage pile (coal tar), waste oil	- Dumpster was covered at time of site visit. - Dumpsters located on gravel surface away from stormwater inlets. - No stormwater inlets present on site. - There are no floor drains in the facility's garage. - Vehicles and equipment are washed outside. - A majority of vehicle and equipment maintenance is conducted indoors. - Facility is located in a Zone II Wellhead Protection Area. - Chemicals for treating drinking water are stored in the Administrative Building. - A coal tar stockpile is present, contained within concrete fence.	- Keep dumpster lid and sliding doors closed unless adding or removing material. Do not dispose of liquid waste, leaking garbage bags, or hazardous materials in dumpster. Schedule regular pick-up to prevent overfilling of dumpster. Regularly sweep/clean around dumpster to prevent waste accumulation. Do not store trash outside of dumpster. Regularly inspect dumpster to ensure that it is free of leaks. Keep a spill clean-up kit near dumpster and ensure that employees are properly trained regarding spill clean-up. Place dumpster on flat, paved surface away from stormwater inlets to prevent stormwater pooling. - Conduct vehicle and equipment maintenance indoors at the facility's garage. - Whenever possible, wash vehicles and equipment indoors in the facility's garage (unless wash water from outdoor washing is captured by tight tank or similar structure). - Practice spill prevention measures when fueling the diesel generator. Store and maintain appropriate spill clean-up kit materials near the diesel generator. Educate employees on proper spill notification and clean-up procedures and use of spill kits. - Implement erosion and sediment control measures for material stockpiles (e.g., installation of silt fences), especially if stockpiles will remain exposed for an extended period of time. - Provide secondary containment, as needed, for waste oil containers. Regularly inspect the containers for signs of cracks or leaks.

Name of Building/Facility	Location	Manager/Contact – Name, Position, Department, Phone Number	Potential Stormwater Pollutant Sources (e.g., trash containers, fertilizers, fuel)	Existing Management Practices Related to Potential Stormwater Pollutants	Recommended Best Management Practices to Reduce Exposure Risk of Potential Stormwater Pollutants
Municipal Center (Town Hall, Police Department, Fire Department, Senior Center, etc.)	15 St. Paul Street, Blackstone, MA	Jimmy Sullivan, Superintendent, Department of Public Works, (508) 883-9331	Dumpster, gasoline, vehicle and equipment maintenance fluids and washwater, potential effluent from material storage for Fire Department	- Dumpster was covered at time of site visit. - Dumpster located on impervious surface away from stormwater inlets. - Fueling station is uncovered and located on a concrete slab on the curb.	- Keep dumpster lid and sliding doors closed unless adding or removing material. Do not dispose of liquid waste, leaking garbage bags, or hazardous materials in dumpster. Schedule regular pick-up to prevent overfilling of dumpster. Regularly sweep/clean around dumpster to prevent waste accumulation. Do not store trash outside of dumpster. Regularly inspect dumpster to ensure that it is free of leaks. Keep a spill clean-up kit near dumpster and ensure that employees are properly trained regarding spill clean-up. Place dumpster on flat, paved surface away from stormwater inlets. - Follow proper fueling procedures at fueling station (e.g., catch basins are adequately protected, no open flame sources are present, attending personnel is watching for leaks of spills, etc.). Store and maintain appropriate spill clean-up kit materials near the diesel tank. Educate employees on proper spill notification and clean-up procedures and use of spill kits. Cover fueling station. - Conduct vehicle and equipment maintenance indoors at the facility's garage or at the DPW. - Whenever possible, wash vehicles and equipment indoors in the (unless wash water from outdoor washing is captured by tight tank or similar structure). - Properly store all chemicals and potential stormwater pollutants in the Fire Department garage, using secondary containment if necessary. Regularly inspect containers and storage areas for leaks and spills.
Blackstone Public Library	86 Main Street, Blackstone, MA	Blackstone Public Library, (508) 883-1931	Dumpster, trash container, recycling container	- Dumpster, trash container, and recycling container were covered at time of site visit and secured in gated area. - Dumpster located on impervious surface away from stormwater inlets.	- Keep dumpster lid and sliding doors closed unless adding or removing material. Do not dispose of liquid waste, leaking garbage bags, or hazardous materials in dumpster. Schedule regular pick-up to prevent overfilling of dumpster. Regularly sweep/clean around dumpster to prevent waste accumulation. Do not store trash outside of dumpster. Regularly inspect dumpster to ensure that it is free of leaks. Keep a spill clean-up kit near dumpster and ensure that employees are properly trained regarding spill clean-up. Place dumpster on flat, paved surface away from stormwater inlets. - Keep trash container covered with securely-fitting, leak-proof lids. Schedule regular trash pick-up to prevent container from overflowing. Regularly inspect trash container for signs of cracks or leaks. Regularly sweep/clean around trash container to prevent waste accumulation. - Keep recycling container covered with securely-fitting, leak-proof lids. Regularly sweep/clean around recycling containers to prevent waste accumulation.
Fire Department Station #2	666 Rathbun Street, Blackstone, MA	Michael J. Sweeney, Chief, Blackstone Fire Department, (508) 883-1030	Potential effluent from vehicles and equipment, chemicals, and other materials stored inside garage	- All vehicles and equipment were located inside garage at time of site visit.	- Conduct vehicle and equipment maintenance indoors at the facility's garage or at the DPW. - Whenever possible, wash vehicles and equipment indoors in the (unless wash water from outdoor washing is captured by tight tank or similar structure). - Properly store all chemicals and potential stormwater pollutants, using secondary containment if necessary. Regularly inspect containers and storage areas for leaks and spills.

Name of Building/Facility	Location	Manager/Contact – Name, Position, Department, Phone Number	Potential Stormwater Pollutant Sources (e.g., trash containers, fertilizers, fuel)	Existing Management Practices Related to Potential Stormwater Pollutants	Recommended Best Management Practices to Reduce Exposure Risk of Potential Stormwater Pollutants
Fire Department Station #3	132 Elm Street, Blackstone, MA	Michael J. Sweeney, Chief, Blackstone Fire Department, (508) 883-1030	Potential effluent from vehicles and equipment, chemicals, and other materials stored inside garage	- All vehicles and equipment, with the exception of one vehicle, were parked inside the garage at time of site visit.	- Conduct vehicle and equipment maintenance indoors at the facility's garage or at the DPW. - Whenever possible, wash vehicles and equipment indoors in the (unless wash water from outdoor washing is captured by tight tank or similar structure). - Properly store all chemicals and potential stormwater pollutants, using secondary containment if necessary. Regularly inspect containers and storage areas for leaks and spills.
Blackstone-Millville Regional High School	175 Lincoln Street, Blackstone, MA	Blackstone-Millville Regional High School, (508) 876-0117	Dumpster, trash containers, recycling containers	- Trash containers do not have securely-fitting covers (are constructed of wire mesh, staked into ground). - Dumpster was covered at time of site visit. - Dumpster located on impervious surface within five feet of stormwater inlet. - Storage sheds and a metal storage container are present on site but contain no identified potential stormwater pollutants.	- Keep dumpster lid and sliding doors closed unless adding or removing material. Do not dispose of liquid waste, leaking garbage bags, or hazardous materials in dumpster. Schedule regular pick-up to prevent overfilling of dumpster. Regularly sweep/clean around dumpster to prevent waste accumulation. Do not store trash outside of dumpster. Regularly inspect dumpster to ensure that it is free of leaks. Keep a spill clean-up kit near dumpster and ensure that employees are properly trained regarding spill clean-up. Place dumpster on flat, paved surface away from stormwater inlets. - Keep trash containers covered with securely-fitting, leak-proof lids. Regularly clean-out or schedule pick-up of trash to prevent containers from overflowing. Regularly inspect trash containers for signs of cracks or leaks. Regularly sweep/clean around trash containers to prevent waste accumulation. - Keep recycling containers covered with securely-fitting, leak-proof lids. Regularly sweep/clean around recycling containers to prevent waste accumulation. - Properly store all chemicals and potential stormwater pollutants in storage shed, using secondary containment if necessary. Regularly inspect containers and storage areas for leaks and spills.
Frederick W. Hartnett Middle School	35 Federal Street, Blackstone, MA	Frederick W. Hartnett Middle School, (508) 876-0190	Dumpster, trash containers	- Dumpster was partially covered at time of site visit. - Dumpster located on impervious surface away from stormwater inlets. - Trash containers do not have securely-fitting lids. - Storage sheds are present on site but contain no identified potential stormwater pollutants.	- Keep dumpster lid and sliding doors closed unless adding or removing material. Do not dispose of liquid waste, leaking garbage bags, or hazardous materials in dumpster. Schedule regular pick-up to prevent overfilling of dumpster. Regularly sweep/clean around dumpster to prevent waste accumulation. Do not store trash outside of dumpster. Regularly inspect dumpster to ensure that it is free of leaks. Keep a spill clean-up kit near dumpster and ensure that employees are properly trained regarding spill clean-up. Place dumpster on flat, paved surface away from stormwater inlets. - Keep trash containers covered with securely-fitting, leak-proof lids. Schedule regular trash pick-up to prevent containers from overflowing. Regularly inspect trash containers for signs of cracks or leaks. Regularly sweep/clean around trash containers to prevent waste accumulation. - Properly store all chemicals and potential stormwater pollutants in storage shed, using secondary containment if necessary. Regularly inspect containers and storage areas for leaks and spills.

Name of Building/Facility	Location	Manager/Contact – Name, Position, Department, Phone Number	Potential Stormwater Pollutant Sources (e.g., trash containers, fertilizers, fuel)	Existing Management Practices Related to Potential Stormwater Pollutants	Recommended Best Management Practices to Reduce Exposure Risk of Potential Stormwater Pollutants
John F. Kennedy/Augustine F. Maloney Elementary School	200 Lincoln Street, Blackstone, MA	John F. Kennedy/ Augustine F. Maloney Elementary School, (508) 876-0188	Dumpster, trash container, recycling containers	- Dumpster lid was covered at time of site visit; sliding doors were partially open. - Dumpster is located within ten feet of stormwater inlet. Sedimentation and debris were observed surrounding the dumpster and obstructing the stormwater inlet at time of site visit. - Uncovered trash container observed near loading dock at time of site visit. - Most recycling containers were covered at time of site visit; some were uncovered.	- Keep dumpster lid and sliding doors closed unless adding or removing material. Do not dispose of liquid waste, leaking garbage bags, or hazardous materials in dumpster. Schedule regular pick-up to prevent overfilling of dumpster. Regularly sweep/clean around dumpster to prevent waste accumulation. Do not store trash outside of dumpster. Regularly inspect dumpster to ensure that it is free of leaks. Keep a spill clean-up kit near dumpster and ensure that employees are properly trained regarding spill clean-up. Place dumpster on flat, paved surface away from stormwater inlets. - Keep trash container covered with securely-fitting, leak-proof lid. Schedule regular trash pick-up to prevent containers from overflowing. Regularly inspect trash container for signs of cracks or leaks. Regularly sweep/clean around trash container to prevent waste accumulation. - Keep recycling containers covered with securely-fitting, leak-proof lids. Regularly sweep/clean around recycling containers to prevent waste accumulation.
Salt and Sand Storage	Mill Street, Blackstone, MA	Jimmy Sullivan, Superintendent, Department of Public Works, (508) 883-9331	Salt, sand	- Salt and sand are stored in covered shed away from storm drains on gravel surface.	- Keep deicing materials in a covered storage area on an impervious surface. Regularly sweep/clean around the storage area, including after loading/unloading vehicles.

SOP 21: Operations and Maintenance of Municipal Vehicles and Equipment

Introduction

Regular maintenance of both municipal and contracted vehicles and heavy equipment not only prolongs the life of municipal assets but also helps reduce the potential for leaking of fluids associated with normal wear and tear. Potential pollutants include fuels, oil, antifreeze, brake fluid, solvents, and battery acid. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to municipal employees to help reduce the discharge of pollutants from the MS4 as a result of leaks from vehicles and equipment. If services are contracted with respect to vehicles and equipment, this SOP should be provided to the contractor. The contract should also specify that the contractor is responsible for compliance with all applicable laws.

The Town of Blackstone ("the Town") undertakes various procedures in regards to its municipal vehicles and equipment. There are two fueling areas operated by the Town: one gasoline fueling station at the Town Municipal Center (15 St. Paul Street) and a diesel fuel tank located at the Department of Public Works at the Robert J. Dubois Corrosion Control Facility (51 Elm Street). Vehicle and equipment maintenance for Town vehicles is conducted indoors at the DPW Facility's garage. Vehicles and equipment at the DPW Facility are washed outdoors using biodegradable detergent.

Within two years of the effective date of the MS4 Permit, the Town will create an inventory of all municipal vehicles and equipment and update this inventory annually. The attached inventory contains vehicle make, model, year, description, and contact phone number for the department operating the vehicle or equipment. The inventory also contains a column for information on the most recent inspection/calibration date, which should be recorded for updates to the inventory.

Procedures

The Town will implement the following procedures for municipally owned and operated vehicles and equipment to reduce the discharge of pollutants from the MS4:

Vehicle and Equipment Maintenance

Vehicle Storage

- Monitor vehicles and equipment for leaks and use drip pans as needed until repairs can be performed.
- When drip pans are used, avoid overtopping.
- Drain fluids from leaking or wrecked vehicles and parts as soon as possible. Dispose of fluids properly.
- Store and park vehicles on impervious surfaces and/or under cover or indoors whenever possible.

Vehicle Maintenance

- Conduct routine inspections of heavy equipment and vehicles to proactively identify maintenance needs or potential leaks.
- Perform routine preventive maintenance to ensure heavy equipment and vehicles are operating optimally.

- Recycle or dispose of waste properly and promptly.
- Sweep and pick up trash and debris as needed.
- Do not dump any liquids or other materials outside, especially near or in storm drains or ditches.

Body Repair and Painting

- Conduct all body repair and painting work indoors.
- Minimize waste from paints and thinners. Calculate paint needs based on surface area.
- Use dry cleanup methods (vacuum, sweep) to clean up metal filings and dust and paint chips from grinding, shaving and sanding. Sweep debris from wet sanding after allowing it to dry overnight on the shop floor. Dispose of waste properly; never dump waste into storm or sanitary sewers.
- Use sanding tools equipped with vacuum capability to pick up debris and dust.

Fueling

- Fueling areas owned or operated by the municipality should be covered.
- Fueling areas should be evaluated to ensure that pollutants (e.g., gasoline or oil) do not enter the MS4. Follow the procedures in SOP 7: Fuel and Oil Handling.

Material Management

- Store materials and waste in labeled containers under cover and in secondary containment.
- Chemicals should not be combined in containers.
- Hazardous waste must be labeled and stored according to hazardous waste regulations. Follow the procedures in SOP 17: Hazardous Materials Storage and Handling.
- Carefully transfer collected fluids from containers into designated storage areas as soon as possible.
- Store new and used batteries securely to avoid breakage. Store indoors or in secondary containment to contain potential acid leaks. Recycle used batteries.
- Conduct periodic inspections of storage areas to detect possible leaks.
- Do not wash or hose down storage areas unless there is prior approval to collect and discharge the water into the sanitary sewer. Use dry cleanup methods whenever possible.
- Keep lids on containers. Store them indoors or under cover to reduce exposure to rain.
- Inspect and maintain all pretreatment equipment, including interceptors, according to the manufacturer's maintenance schedule and at least once per year.
- Proper spill protocol should be followed to prevent chemicals from entering the stormwater system. Follow the procedures in SOP 4: Spill Response and Cleanup.

Parts Cleaning

- Use designated areas for engine, parts, or radiator cleaning. Do not wash or rinse parts outdoors. If parts cleaning equipment is not available then capture parts cleaning fluids.
- Recycle cleaning solution. Never discharge waste to the sanitary sewer or storm sewer.
- Use steam cleaning or pressure washing of parts instead of solvent cleaning. Cleaning equipment must be connected to an oil/water interceptor prior entering the sanitary sewer.
- When using solvents for cleaning, drain parts over the solvent tank to avoid drips to the floor. Catch excess solutions and divert them back to tank. Allow parts to dry over the hot tank.

Vehicle and Equipment Washing

Vehicle washing can result in the discharge of nutrients, sediment, petroleum products, and other contaminants to a surface water body or to a stormwater system. The MS4 Permit does not authorize the discharge of municipal vehicle washing byproducts into the MS4.

Outdoor Vehicle Washing Procedures

Outdoor washing of municipal vehicles should be avoided unless wash water is contained in a tight tank or similar structure. Where no alternative wash system is available, and full containment of wash water cannot be achieved, adhere to the following procedures:

- Avoid discharge of any wash water directly to the storm drainage system or surface water (e.g., stream, pond, or drainage swale)
- Minimize the use of water to the extent practicable.
- Where the use of detergent cannot be avoided, use products that do not contain regulated contaminants. The use of a biodegradable, phosphate-free detergent is preferred.
- Do not use solvents except in dedicated solvent parts washer systems or in areas not connected to a sanitary sewer.
- Do not power wash, steam clean, or perform engine or undercarriage cleaning.
- Grassy and pervious (porous) surfaces may be used to promote direct infiltration of wash water, providing treatment before recharging groundwater and minimizing runoff to an adjacent stormwater system. Pervious surfaces or other infiltration-based systems should not be used within wellhead protection areas or within other protected resources.
- Impervious surfaces discharging to the storm drainage system should not discharge directly to a surface water unless treatment is provided. The treatment device should be positioned such that all drainage must flow through the device, preventing bypassing or short-circuiting.
- Periodic sweeping and/or cleaning should be completed to prevent accumulation from forming on the washing area.
- Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Follow the procedures in SOP 4: Spill Response and Cleanup.
- Heavily soiled vehicles or vehicles dirtied from salting or snow removal efforts should follow the SOPs in the "Heavy Equipment Washing Procedures" below.

Indoor Vehicle Washing Procedures

- Vehicles and equipment should be washed inside whenever possible to reduce runoff to the stormwater system.
- Where the use of detergent cannot be avoided, use products that do not contain regulated contaminants. The use of biodegradable, phosphate-free detergent is preferred.
- Detergents should not be used in areas where oil/water separators provide pre-treatment of drainage.
- Floor drains should be connected to a sanitary sewer or tight tank. Floor drains discharging to adjacent surface water bodies or engineered storm drain systems should be permanently plugged or otherwise abandoned before any vehicle wash activities are completed.
- Designate separate areas for routine maintenance and vehicle cleaning. This helps prevent

contamination of wash water by motor oils, hydraulic lubricants, greases, or other chemicals.

- Dry cleanup methods are recommended within garage facilities. Do not wash down floors and work areas with water.
- Bring smaller vehicles to commercial washing stations.
- Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Follow the procedures in SOP 4: Spill Response and Cleanup.

Heavy Equipment Washing Procedures

- Mud and heavy debris removal should occur on impervious surfaces or within a retention area.
- Maintain these areas with frequent mechanical removal and proper disposal of waste.
- Impervious surfaces with engineered storm drain systems should not discharge directly to a surface water.
- Floor drains should be connected to a sanitary sewer or tight tank. Floor drains discharging to adjacent surface waterbodies or engineered storm drain systems should be permanently plugged or otherwise abandoned before any vehicle wash activities are completed.
- Where the use of detergent cannot be avoided, use products that do not contain regulated contaminants. The use of biodegradable, phosphate-free detergent is preferred.
- Detergents should not be used in areas where oil/water separators provide pre-treatment of drainage.
- Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Follow the procedures in SOP 4: Spill Response and Cleanup.

Engine and Steam Washing Procedures

- Do not wash parts outdoors.
- Maintain drip pans and smaller containers to contain motor oils, hydraulic lubricants, greases, etc. and to capture and collect spills or noticeable leaks observed during washing activities, to the extent practicable. Follow the procedures in SOP 4: Spill Response and Cleanup.
- Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. The use of a biodegradable, phosphate-free detergent is preferred.
- Avoid cleaning with solvents except in dedicated solvent parts washer systems. Make use of pressure washing and steam cleaning.
- Recycle clean solutions and rinse water to the extent practicable.
- Wash water should discharge to a tight tank or a sanitary sewer via an oil/water separator. Detergents should not be used in areas where oil/water separators provide pre-treatment of drainage.

Employee Training

- Employees who perform work on/with municipal vehicles or equipment should be trained on these procedures and the proper operation of related equipment.
- Employees are also trained on stormwater pollution prevention, illicit discharge detection and elimination (IDDE) procedures, and spill and response procedures.
- If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.

Attachments

1. Inventory of Municipal Vehicles and Equipment

Related Standard Operating Procedures

1. SOP 4: Spill Response and Cleanup
2. SOP 7: Fuel and Oil Handling
3. SOP 17: Hazardous Material Storage and Handling

Inventory of Municipal Vehicles and Equipment
Blackstone, Massachusetts

Make	Model	Year	Vehicle Description	Plate No.	ID	Contact – Name, Position, Department, Phone Number	Date of Last Inspection/Calibration
Ford	Taurus	2015	Administrative	73TT91	1	Town Hall, (508) 883-1500	
Ford	E350 Van	2009	Council on Aging	M82955	2	Council on Aging, (508) 876-5134	
Ford	Escape	2011	Council on Aging	M87617	3	Council on Aging, (508) 876-5134	
Ford	Eldorado	2012	Council on Aging	M87586	4	Council on Aging, (508) 876-5134	
Ford	E450	2016	Council on Aging	M95876	5	Council on Aging, (508) 876-5134	
Dodge	Amerivan	2017	Council on Aging	M1038A	6	Council on Aging, (508) 876-5134	
Tiger	Boom Mower Tractor	1996	Department of Public Works	--	7	DPW, (508) 883-9331	
Ford	L8511 Cab Dump (#5)	1998	Department of Public Works	M99295	8	DPW, (508) 883-9331	
Ford	L8511 Cab W/Catch Basin (#6)	1998	Department of Public Works	M99296	9	DPW, (508) 883-9331	
Ford	F150	2001	Department of Public Works	M93612	10	DPW, (508) 883-9331	
Zipper	Utility Trailer (Asphalt)	2004	Department of Public Works	M80343	11	DPW, (508) 883-9331	
Ford	F250 Pickup	2004	Department of Public Works	M71248	12	DPW, (508) 883-9331	
Ford	F750 Dump	2004	Department of Public Works	M67929	13	DPW, (508) 883-9331	
Ford	Truck	2005	Department of Public Works	M69785	14	DPW, (508) 883-9331	
Mongoose	Sewer Jet Trailer	2005	Department of Public Works	M74375	15	DPW, (508) 883-9331	
Zierke	Utility Trailer	2005	Department of Public Works	M80342	16	DPW, (508) 883-9331	
John Deere	544J Front End Loader	2005	Department of Public Works	M74370	17	DPW, (508) 883-9331	
Elgin	Pelican Sweeper	2005	Department of Public Works	M74373	18	DPW, (508) 883-9331	
Ford	F350 Pickup Truck	2006	Department of Public Works	M74368	19	DPW, (508) 883-9331	
Sterling	Dump Truck	2006	Department of Public Works	M98709	20	DPW, (508) 883-9331	
John Deere	Compressor	2007	Department of Public Works	M76017	21	DPW, (508) 883-9331	

Make	Model	Year	Vehicle Description	Plate No.	ID	Contact – Name, Position, Department, Phone Number	Date of Last Inspection/Calibration
Ford	Ranger	2008	Department of Public Works	M76765	22	DPW, (508) 883-9331	
Ford	F350 Dump Truck	2008	Department of Public Works	M80366	23	DPW, (508) 883-9331	
Ford	Crown Victoria	2009	Department of Public Works	M94675	24	DPW, (508) 883-9331	
Ford	Dump Truck	2012	Department of Public Works	M90224	25	DPW, (508) 883-9331	
Carmate	Trailer	2013	Department of Public Works	M88884	26	DPW, (508) 883-9331	
Ford	F350	2015	Department of Public Works	M90860	27	DPW, (508) 883-9331	
Cat	Loader	2015	Department of Public Works	M93615	28	DPW, (508) 883-9331	
Ford	F-350	2017	Department of Public Works	M99279	29	DPW, (508) 883-9331	
JCB	4Cx15	2018	Department of Public Works	--	30	DPW, (508) 883-9331	
Elgin	Pelican	2018	Department of Public Works	M2843A	31	DPW, (508) 883-9331	
AMG	Tanker	1968	Fire Department	MF5930	32	Fire Department, (508) 883-1030	
Dilly	Boat Trailer	1979	Fire Department	--	33	Fire Department, (508) 883-1030	
American	General	1983	Fire Department	MF7876	34	Fire Department, (508) 883-1030	
Ford	F350 Pickup	1987	Fire Department	MF5917	35	Fire Department, (508) 883-1030	
International	1250 Gallon Pumper	1994	Fire Department	MF6143	36	Fire Department, (508) 883-1030	
Ford	LGT CON Van	1997	Fire Department	MF5241	37	Fire Department, (508) 883-1030	
International	400 SER Truck	1998	Fire Department	MF4713	38	Fire Department, (508) 883-1030	
HME Custom	Ladder Truck	2000	Fire Department	MF1100	39	Fire Department, (508) 883-1030	
E One	International	2006	Fire Department	MF4770	40	Fire Department, (508) 883-1030	
Chevrolet	C4500 Ambulance	2009	Fire Department	MF286A	41	Fire Department, (508) 883-1030	
Ford	Explorer	2009	Fire Department	MP776H	42	Fire Department, (508) 883-1030	
International	Fire Department Truck	2012	Fire Department	MFA310	43	Fire Department, (508) 883-1030	
Ford	F550 Ambulance	2014	Fire Department	MFB548	44	Fire Department, (508) 883-1030	
Ford	Explorer	2014	Fire Department	MFA183	45	Fire Department, (508) 883-1030	
Carry On	Trailer	2014	Fire Department	MFB545	46	Fire Department, (508) 883-1030	

Make	Model	Year	Vehicle Description	Plate No.	ID	Contact – Name, Position, Department, Phone Number	Date of Last Inspection/Calibration
Carry On	Trailer	2014	Fire Department	MFB547	47	Fire Department, (508) 883-1030	
Ford	F-450	2019	Fire Department	MF6174	48	Fire Department, (508) 883-1030	
Homemade	Flatbed Trailer	1979	Highway Division	M32231	49	Highway Division, (508) 883-9331	
Woodchuck	Portable Chipper	1985	Highway Division	M34782	50	Highway Division, (508) 883-9331	
Ford	F350 Pickup F38 (#4)	1997	Highway Division	M55413	51	Highway Division, (508) 883-9331	
Hudson	Utility Trailer	2005	Highway Division	M69791	52	Highway Division, (508) 883-9331	
Freightliner	Dump Truck	2014	Highway Division	M90771	53	Highway Division, (508) 883-9331	
Ford	Pickup	2004	Housing Authority	M71241	54	Housing Authority, (508) 883-1515	
Homemade	Flatbed Trailer	1979	Parks and Recreation Department	M32230	55	Parks and Recreation Department, (508) 883-1910	
Kubota	Tractor	2002	Parks and Recreation Department	M69634	56	Parks and Recreation Department, (508) 883-1910	
KauFM	Utility Trailer	2003	Parks and Recreation Department	M70489	57	Parks and Recreation Department, (508) 883-1910	
Quality	Trailer	2004	Parks and Recreation Department	M72337	58	Parks and Recreation Department, (508) 883-1910	
Ford	F350 Pickup	2012	Parks and Recreation Department	M88779	59	Parks and Recreation Department, (508) 883-1910	
Ford	F350	2003	Parks and Recreation Department	M69635	60	Parks and Recreation Department, (508) 883-1910	
Trail	Utility Radar Trailer	2003	Police Department	M70182	61	Police Department, (508) 883-1212	
Titan	ATV Trailer	2004	Police Department	MP767G	62	Police Department, (508) 883-1212	
Asti	Utility Trailer	2008	Police Department	MP533J	63	Police Department, (508) 883-1212	
Magnum	Utility Trailer	2008	Police Department	MP543J	64	Police Department, (508) 883-1212	
Ford	Crown Victoria	2009	Police Department	MP953J	65	Police Department, (508) 883-1212	
Ford	Crown Victoria	2009	Police Department	MP952J	66	Police Department, (508) 883-1212	
Ford	Taurus	2012	Police Department	762NF3	67	Police Department, (508) 883-1212	
Ford	Taurus	2013	Police Department	198MJ5	68	Police Department, (508) 883-1212	
Ford	Interceptor	2013	Police Department	MP449J	69	Police Department, (508) 883-1212	

Make	Model	Year	Vehicle Description	Plate No.	ID	Contact – Name, Position, Department, Phone Number	Date of Last Inspection/Calibration
Ford	Interceptor	2013	Police Department	MP428J	70	Police Department, (508) 883-1212	
Harley Davidson	Motorcycle	2015	Police Department	MMC795	71	Police Department, (508) 883-1212	
Ford	Explorer	2016	Police Department	MPB462	72	Police Department, (508) 883-1212	
Ford	Explorer	2016	Police Department	MPB461	73	Police Department, (508) 883-1212	
Ford	Explorer	2016	Police Department	MPB376	74	Police Department, (508) 883-1212	
Ford	Explorer	2017	Police Department	3NT374	75	Police Department, (508) 883-1212	
Chevrolet	Tahoe	2019	Police Department	--	76	Police Department, (508) 883-1212	
Chevrolet	Tahoe	2019	Police Department	--	77	Police Department, (508) 883-1212	
Ford	Explorer	2019	Police Department	--	78	Police Department, (508) 883-1212	
Homespace	Trailer	2005	Blackstone Valley Regional Recycling Center	M73409	79	Blackstone Valley Regional Recycling Center, (508) 883-1500 ext. 129	
Homespace	Trailer	2005	Blackstone Valley Regional Recycling Center	M73410	80	Blackstone Valley Regional Recycling Center, (508) 883-1500 ext. 129	
New Holland	Skid Steer Loader	2005	Blackstone Valley Regional Recycling Center	--	81	Blackstone Valley Regional Recycling Center, (508) 883-1500 ext. 129	
Homespace	Trailer	2006	Blackstone Valley Regional Recycling Center	M73913	82	Blackstone Valley Regional Recycling Center, (508) 883-1500 ext. 129	
Homespace	Trailer	2006	Blackstone Valley Regional Recycling Center	M73914	83	Blackstone Valley Regional Recycling Center, (508) 883-1500 ext. 129	
Ford	F150 Pickup	2014	Blackstone Valley Regional Recycling Center	M92109	84	Blackstone Valley Regional Recycling Center, (508) 883-1500 ext. 129	
Ford	Truck	2017	Blackstone Valley Regional Recycling Center	--	85	Blackstone Valley Regional Recycling Center, (508) 883-1500 ext. 129	
Ford	Sedan	2007	Town Administrator	4869WG	86	Town Administrator, (508) 883-1500	
Polaris	Ranger	2019	Police Department	MPD138	87	Police Department, (508) 883-1212	
Cam Superline	Utility Trailer	2019	Parks and Recreation Department	--	88	Parks and Recreation Department, (508) 883-1910	
Ford	F350	2019	Parks and Recreation Department	--	89	Parks and Recreation Department, (508) 883-1910	

Appendix H- DPW SWPPP

Stormwater Pollution Prevention Plan
Department of Public Works Facility

Town of Blackstone, MA

September 2021

1550 Main St, Suite 400
Springfield, MA 01130

20170202.A40

FUSS & O'NEILL

Table of Contents

Stormwater Pollution Prevention Plan
Department of Public Works Facility
Town of Blackstone, MA

1 Introduction 1
- 1.1 Pollution Prevention Team 2
- 1.2 Facility Description 2
- 1.3 Site Drainage 2

2 Potential Pollutant Sources 3
- 2.1 Allowable Non-Stormwater Discharges 3
- 2.2 Inventory of Exposed Material 3
- 2.3 Loading/Unloading Areas 3
- 2.4 Roof Areas 4
- 2.5 Outdoor Storage 4
- 2.6 On-site Waste Management Practices 4
- 2.7 Vehicle Washing/Rinsing 5
- 2.8 Maintenance and Storage Buildings 5
- 2.9 Administrative Building 5
- 2.10 Site Parking 5
- 2.11 Spill Prevention 5
- 2.12 List of Significant Leaks or Spills 6

3 Stormwater Controls 6
- 3.1 Prevent or Minimize Exposure 6
- 3.2 Good Housekeeping 7
- 3.3 Preventative Maintenance 7
- 3.4 Spill Prevention and Response 8
- 3.5 Erosion and Sediment Control 8
- 3.6 Management of Runoff 9
- 3.7 Salt Storage or Piles Containing Salt 9
- 3.8 Employee Training 9
- 3.9 Maintenance of Control Measures 9
- 3.10 Best Management Practices 10

4 Plan Implementation 15
- 4.1 Site Inspection Requirements 15
- 4.2 Recordkeeping and Reporting 16

5 SWPPP Certification 17

Table of Contents

Stormwater Pollution Prevention Plan
Department of Public Works Facility
Town of Blackstone, MA

Figures **End of Report**

1 Site Location Map
2 Site Drainage Map

Appendices **End of Report**

A Inventory of Exposed Materials
B Vehicle and Equipment Storage
C Standard Operating Procedures
D Employee Training Documentation
E Site Inspection Report Forms

1 Introduction

This Stormwater Pollution Prevention Plan (SWPPP) has been developed for the Blackstone Department of Public Works Facility (DPW Facility) to address the requirements of the United States Environmental Protection Agency's (USEPA's) 2016 National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) in Massachusetts, hereafter referred to as the 2016 Massachusetts MS4 Permit.

The 2016 Massachusetts MS4 Permit requires that each permittee, or regulated community, address six Minimum Control Measures. These measures include the following:

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination Program
4. Construction Site Stormwater Runoff Control
5. Stormwater Management in New Development and Redevelopment (Post Construction Stormwater Management); and
6. Good Housekeeping and Pollution Prevention for Permittee Owned Operations.

Under Measure 6, Good Housekeeping and Pollution Prevention for Permittee Owned Operations, the permittee is required, per Section 2.3.7.b of the 2016 Massachusetts MS4 Permit (page 50-54), to:

> *…develop and fully implement a SWPPP for each of the following permittee-owned or operated facilities: maintenance garages, public works yards, transfer stations, and other waste handling facilities where pollutants are exposed to stormwater as determined by the permittee.*
>
> *The SWPPP shall contain the following elements:*
> 1. *Pollution Prevention Team*
> 2. *Description of the facility and identification of potential pollutant sources.*
> 3. *Identification of stormwater controls*
> 4. *Management practices including:*
>   a. *Minimize or Prevent Exposure,*
>   b. *Good Housekeeping,*
>   c. *Preventative Maintenance,*
>   d. *Spill Prevention and Response,*
>   e. *Erosion and Sediment Control,*
>   f. *Management of Runoff,*
>   g. *Management of Salt Storage Piles or Piles Containing Salt,*
>   h. *Employee Training*
>   i. *Maintenance of Control Measures*
> 5. *Site inspections*

This SWPPP meets these requirements by:

- Identifying members of the SWPPP team and their responsibilities,
- Describing the facilities, with information on location and activities, a site map, and a description of the stormwater drainage system,
- Identifying potential stormwater contaminants,

- Describing stormwater management controls and various Best Management Practices (BMPs) to reduce pollutants in stormwater discharges,
- Describing the facility's monitoring programs, and
- Describing the implementation schedule and provisions for amendment of the plan.

1.1 Pollution Prevention Team

The Pollution Prevention Team for the DPW Facility is responsible for developing, implementing, maintaining, and revising, as necessary, the SWPPP for this facility. Listed below are Pollution Prevention Team members and their respective responsibilities.

Plan Supervisor/Manager: Jimmy Sullivan
Title: Superintendent, Department of Public Works
Phone Number: (508) 883-9331
Responsibilities: Overall responsibility for development, implementation, maintenance, and revision of the plan. Conducts required inspections, monitoring, and reporting.

Team Member: Robert Varieur
Title: Mechanic, Department of Public Works
Phone Number: (508) 883-9331
Responsibilities: Assists Plan Manager and Supervisor with implementing the plan.

1.2 Facility Description

The Blackstone DPW Facility is located on an approximately 2-acre parcel at 51 Elm Street, Blackstone Massachusetts at the Robert J. Dubois Corrosion Control Facility (*Figure 1*). The facility is owned and operated by the Town of Blackstone and is the staging point for the Town's maintenance and public works operations.

Undeveloped Town-owned parcels border the southern edge of the property. Elm Street borders the northern perimeter of the DPW Facility. The eastern edge of the parcel is bordered by a private residential property. The western edge of the property is bordered by a wooded Town-owned parcel. The DPW Facility consists of a vehicle maintenance garage, administrative building, and storage garage. The property is located in a Wellhead Zone II Protection Area.

1.3 Site Drainage

A map of the site, including drainage patterns, is included as *Figure 2*. The map shows the facility layout, stormwater flow directions, and locations where materials and activities are exposed to precipitation. The site is not connected to the Town's engineered stormwater drainage system.

Stormwater runoff from the developed portion of the site generally flows from the northern portion of the site to the southern portion. Runoff from the site discharges to the wooded area on the southern edge of the parcel.

2 Potential Pollutant Sources

Provided in this section is a discussion of site activities and the potential pollutant sources associated with each. Measures to prevent and/or minimize exposure of potential pollutant sources to stormwater runoff can be found in *Section 3.1*. The following activities occur at the facility:

1. Equipment storage;

An inventory of materials stored or handled with potential exposure to stormwater is contained in *Appendix A*.

2.1 Allowable Non-Stormwater Discharges

A non-stormwater discharge is defined as any discharge or flow to the engineered storm drain system that is not composed entirely of stormwater runoff.

Allowable non-stormwater discharges that occur at this facility include:

- Water line flushing
- Uncontaminated ground water infiltration (as defined at 40 CFR § 35.2005(20))
- Discharge from potable water sources
- Air conditioning condensation
- Lawn watering
- Flows from riparian habitats and wetlands
- Street wash waters

It has been determined that the above non-stormwater discharges at the DPW Facility do not represent a significant contribution of pollution to the MS4 or the waters of the United States. Therefore, these are considered to be authorized under the current MS4 permit.

2.2 Inventory of Exposed Material

An inventory of materials stored or handled with potential exposure to stormwater is contained in *Appendix A*. The type of container has also been identified. Oil, gasoline, and other petroleum-based materials are listed separately in the table. The locations of these material storage areas are provided on the Drainage Site Map (*Figure 2*).

2.3 Loading/Unloading Areas

Several loading and unloading areas are associated with this facility. Due to the facility's location in a Zone II Wellhead Protection Area, deicing materials are not stockpiled on site. Salt and sand are stored in a covered storage barn off of Mill Street, behind the Municipal Center. DPW vehicles are loaded at the barn in advance of inclement weather events, transported to the DPW Facility, and then stored indoors at the facility's garage until needed. Spills of deicing materials are possible during moving and

storing of vehicles and equipment. Sediments and chloride are potential stormwater pollutants associated with this operation.

A 2,000 gallon diesel fuel tank is located south of the DPW Facility's garage. The potential exists for spills or leaks during refueling or tank filling operations. Other loading and unloading operations associated with vehicle maintenance activities include loading of new and used oil, used antifreeze, chain lubricants, and other maintenance fluids inside the facility's garage. There are no floor drains in the garage. Hydrocarbons are the primary potential pollutant associated with these activities.

2.4 Roof Areas

Stormwater from facility roof areas, including the maintenance garage, storage garage, and administrative building, discharges to the adjacent ground surface. Atmospheric deposition is the only potential source of stormwater pollution associated with the facility roof areas.

2.5 Outdoor Storage

Outdoor material storage areas at the DPW facility include:

- Material stockpiles (coal tar)
- Miscellaneous materials (corrugated plastic piping, tires, concrete slabs)
- Equipment (cleaned plow blades, etc.)

Stockpiled materials such as gravel, loam, and crushed rock represent a source of pollution. When stored unprotected outdoors, material stockpiles are exposed to precipitation.

2.6 On-site Waste Management Practices

Waste handling and disposal activities present a potential to contaminate stormwater with pathogens (including bacteria and viruses), nutrients, including phosphorus and nitrogen, fertilizers, pesticides and sediments.

There are several classifications of waste which contribute to stormwater pollution, including:

1. Solid Waste
2. Hazardous Materials and Waste
3. Pesticides and Fertilizers
4. Petroleum Products
5. Detergents

Facility trash is stored in two (2) dumpsters located on the southwest portion of the DPW Facility and is disposed off-site by a licensed waste hauler. Waste oil, used antifreeze, used oil and gasoline filters, and other vehicle maintenance by-products are properly stored on-site before disposal.

2.7 Vehicle Washing/Rinsing

Vehicle and equipment washing activities are a potential source of pollution not only from petroleum products and pollutants deposited on the exterior of the equipment, but also from nutrients and sediment being washed into water bodies from the act of washing itself. Although some cleaning agents are becoming environmentally friendly, many still contain regulated contaminants. Due to the possibility for multiple types of pollutants, vehicle and equipment washing activities have a high potential for degrading stormwater quality.

There are no floor drains present in the facility's main garage. Vehicle and equipment washing is conducted outdoors over an impervious surface using biodegradable detergent. Runoff from vehicle and equipment washing flows to the gravel surface on the southern portion of the property before reaching surrounding undeveloped woodland.

Vehicles and major equipment stored and maintained at the DPW Facility are provided in *Appendix B*.

2.8 Maintenance and Storage Buildings

Carpentry, electrical, and minor maintenance activities are completed in the supplemental bay. This building contains no floor drains and is fully enclosed.

Small equipment, signage, and tools are stored in an enclosure within the main bay. Latex paint, spray paint, and similar products are stored in a fire proof, cement block enclosure within the main bay. This building contains two (2) floor drains and is fully enclosed. Gasoline and other flammable products are stored in a flame proof cabinet.

2.9 Administrative Building

The DPW administrative office is located attached to the main bay at the western portion of the property. This building includes administrative and office space.

2.10 Site Parking

The designated parking area for the DPW Facility is located on an impervious surface in the middle of the site. The parking lot is used primarily for visitors to DPW, Town-owned vehicles and cars for daily use by DPW employees, and employees' personal vehicles.

2.11 Spill Prevention

Under federal regulations 40 CFR Part 112 (and Amendments), a Spill Prevention, Control, and Countermeasure (SPCC) Plan is required when a facility has an aboveground oil storage capacity greater than 1,320 gallons when including all containers with a capacity of 55 gallons or more. The DPW Facility does have aboveground oil storage capacity that exceeds 1,320 gallons, and is therefore required to have

an SPCC plan in place.

2.12 List of Significant Leaks or Spills

Significant leaks or spills that occurred at the DPW Facility in the last three years are shown in Table 2-1. As of September 2020, there have been no MassDEP reportable releases within the past three years.

Table 2-1. Significant Leaks or Spills

Building or Area	Material	Volume
N/A	N/A	N/A

3 Stormwater Controls

3.1 Prevent or Minimize Exposure

Preventing or minimizing the exposure of materials to rain, snow, snowmelt and runoff can reduce stormwater pollution problems. This can be accomplished by locating materials and activities inside, or protecting them with storm-resistant covers, however, a significant enlargement to site impervious surfaces for the sake of additional coverage is not recommended. The following practices are carried out at the DPW Facility:

- Prevents Exposure
  - No fertilizers, herbicides, or pesticides are stored or used at the facility.
  - Outdoor storage of equipment, raw materials, finished goods, and waste materials are minimized to the extent practical.
  - Vehicle and equipment fluid changes and associated maintenance activities are performed indoors.
  - No deicing materials are stockpiled on site.
  - Outdoor material storage is limited to the coal tar stockpile.
  - The facility is not connected to the Town's engineered stormwater system.

- Minimizes Exposure
  - Trash is removed regularly from the facility. Trash dumpsters remain covered or closed when not in use.
  - Tools and materials are returned to designated storage areas after use.
  - Biodegradable detergent is used for outdoor vehicle and equipment washing.

3.2 Good Housekeeping

Good housekeeping practices are activities, often conducted daily, that help maintain a clean facility and prevent stormwater pollution problems. Good housekeeping practices are employed at the DPW Facility to provide a clean and orderly work environment. This contributes to a reduction in stormwater pollution from activities at the sites. General and site-specific practices that are employed at this facility are described below.

- Protection of Hazardous Material
    - Drums containing petroleum products, hazardous waste, and contaminated materials are stored with appropriate containment.

- Clean and Organized Site
    - All hazardous material storage areas and containers have proper labels.
    - Vehicular and pedestrian access routes are maintained such that containers do not interfere with access.
    - Work areas are regularly swept or vacuumed to collect metal, wood, and other particulates and materials.
    - Containment areas are cleaned regularly to remove any leaking materials.

- Knowledgeable Staff
    - Staff is familiar with manufacturer directions for proper use of materials and associated Safety Data Sheets (SDSs).
    - Staff is familiar with proper use of equipment.
    - Outdoor chemical or petroleum spills that are incidental and controllable by on-site personnel and resources are promptly cleaned up using appropriate absorbents.

- Spill Kits
    - Spill materials and cleanup kits are maintained at all locations where oil materials are used, stored, or may be present.
    - Used spill cleanup materials are disposed of properly.

3.3 Preventative Maintenance

Preventative Maintenance can minimize the occurrence of stormwater pollution by addressing issues before they become problems. Such maintenance at the facility involves routine equipment maintenance and visual inspection of stormwater management measures and areas that could generate spills, leaks, etc. Visual inspections will be performed quarterly at the facility in addition to, or as part of the annual comprehensive site compliance evaluation (see *Section 4*). Preventive maintenance at the facility involves the following elements:

- Inspections
    - Visual inspection of areas that could contribute pollutants to stormwater (truck loading/unloading areas, vehicle washing/rinsing areas, material storage areas).

- Tank filling area is inspected regularly for evidence of spills.
- Vehicle storage areas are inspected frequently for evidence of leaking oil.
- Material storage tanks and containers are regularly inspected for leaks.
- All waste oil is fully contained and the containers are inspected regularly.

- Routine Maintenance
  - Sweeping of paved surfaces as necessary, with particular emphasis on areas with high potential sediment contribution.
  - Vehicle preventive maintenance is performed on a regular basis per manufacturer's recommendations. Drivers visually inspect individual vehicles at the beginning of each shift.
  - Spill response equipment is maintained and replaced as needed.
  - Exposed earthen surfaces that are inactive are vegetated and maintained to reduce the potential for erosion and sedimentation during rainfall events.

- Knowledgeable Staff
  - All staff members are aware of spill prevention and response procedures.
  - All staff members have received formal spill prevention and response procedure training.
  - All equipment fueling procedures are completed by qualified personnel trained in spill response procedures.
  - Material and bulk deliveries are monitored by facility employees.

3.4 Spill Prevention and Response

In general, DPW personnel will respond only to incidental releases, which can be immediately absorbed or otherwise controlled at the time of the release. Spills will be contained as close to the source as possible with absorbent materials and other spill response resources at the facilities. Small spills may be determined to be incidental and therefore controllable and manageable by on-site resources. If the release is not manageable by facility personnel (i.e., non-incidental), then an emergency spill response contractor will be contacted. The following procedures apply to this facility:

- All personnel are instructed in location, use, and disposal of spill response equipment and supplies maintained at the site such as oil absorbent materials.
- The Pollution Prevention Team leader will be advised immediately of all spills of hazardous materials or regulated materials, regardless of quantity.
- Spills will be evaluated to determine the necessary response. If there is a health hazard, fire or explosion potential, 911 will be called. If a spill exceeds five gallons or threatens surface waters, including the storm drain system, state or federal emergency response agencies will be called.
- Spills will be contained as close to the source as possible with oil-absorbent materials.

3.5 Erosion and Sediment Control

The majority of the DPW Facility consists of buildings, pavement, or lawn. The southern portion of the site consists of gravel, which is a minor potential source of erosion during heavy rain events. Erosion

controls such as silt fence and strawbales may installed and maintained along the southern property line to limit erosion and sedimentation from the site, as necessary.

3.6 Management of Runoff

The impervious areas of the site have no curbs, which encourages sheet flow runoff to the surrounding vegetated areas, primarily the wooded area along the southern portion of the site.

3.7 Salt Storage or Piles Containing Salt

There are no salt or sand storage piles at the DPW Facility.

3.8 Employee Training

Regular employee training is required for employees who work in areas where materials or activities are exposed to stormwater, or who are responsible for implementing activities identified in the SWPPP, including all members of the Pollution Prevention Team.

All employees responsible for the fueling or lubrication of vehicles or equipment stored at the facility will be trained. The topics below will be covered at employee training sessions.

1. Spill prevention and response.
2. Good housekeeping.
3. Materials management practices.

The DPW is responsible for providing stormwater management training for their employees. EPA recommends the training occur annually. The DPW will document the following information for each training:

1. The training date, title and training duration;
2. List of municipal attendees;
3. Subjects covered during training.

Appendix D contains a copy of the attendance sheet which has fields for including these three items.

3.9 Maintenance of Control Measures

The DPW will maintain the control measures outlined in the SWPPP in effective operating condition. Documentation that describes procedures will be kept onsite. A regular schedule for preventative maintenance of all control measures and discussions of back-up practices are in place should a runoff event occur while a control measure is off-line. Nonstructural control measures will also be maintained (e.g., spill response supplies available, personnel trained).

3.10 Best Management Practices

Stockpiles

Potential Sources of Stormwater Pollution
Sand stored in piles for use during construction and during winter plowing and deicing activities represents a potential source to stormwater pollution. Stockpiled materials such as gravel, loam, and crushed rock represent a similar source of pollution. When stored unprotected outdoors, sand piles and material stockpiles are exposed to precipitation.

Pollution Prevention
To avoid contamination of stormwater by sand and other stockpiled materials, erosion and sediment control measures should be implemented at each storage site. When planning a location for a stockpile, a relatively level site away from slopes and water features should be selected.

Stockpiles can be stabilized by seeding or mulching if they are to remain exposed for more than two weeks, or can be covered with impermeable sheeting to protect the material from rainwater. If the stockpile location becomes a permanent storage site for sand, a roofed structure should be considered to reduce erosion.

Sediment barriers should be placed around the perimeter of the storage site to prevent any runoff carrying sand from entering storm drains and surface waters. Please refer to SOP 6, "Erosion and Sedimentation Control," for more information.

Ensuring that the storage area is regularly swept and kept clean is an important good housekeeping practice.

Solid Waste Management

Potential Sources of Stormwater Pollution
Solid waste production and storage locations present the threat to contaminate stormwater with pathogens, including bacteria and viruses, nutrients, including phosphorus and nitrogen, metals and sediments.

Solid waste may be classified as both hazardous and non-hazardous waste consisting of agricultural, construction and demolition, dead animals, industrial, municipal, and tire waste.

Pollution Prevention
To prevent or reduce the potential for stormwater pollution from solid waste management practices the following preventative maintenance procedures are recommended:

1. All staff shall be properly trained in correct solid waste management practices, including waste disposal and spill prevention and response. All employees shall also be knowledge of the potential hazards associated with solid waste handling and storage.

2. Each waste storage location shall be properly labeled and all significant sources of pollution shall be kept in a secure, covered and contained area.
3. The facility and storage containers shall remain locked at all times other than during normal hours of operation.
4. All waste storage containers and waste handling equipment shall be routinely inspected for signs of spills, leaks, corrosion or general deterioration.
5. The facility shall maintain spill response materials in accordance with SOP 4, "Spill Response and Cleanup".

Snow Storage

Potential Sources of Stormwater Pollution

Snow collected from plowing and road clearing activities can contaminate engineered storm drain systems and receiving waters if storage and/or disposal sites are not properly selected and maintained. As snow is removed from on-site roadways, parking lots, sidewalks, and other paved areas, contaminants such as sand, salt, litter, and automotive oil are collected along with the snow. These pollutants are ultimately transported to the storage site and eventually to receiving waters once the snow melts.

Infiltration of pollutants in snow, such as chlorides from road salt, can impact groundwater, including drinking water aquifers.

Pollution Prevention

To avoid contamination of stormwater and drinking water supplies by snow dumps, storage sites fotr on-site snow removal should be selected and prepared before the snow season begins. The snow storage should be located on a pervious surface in an upland area away from water resources and wells, so that meltwater can be filtered through the soil. Selected sites should have a combined capacity large enough to cope with the estimated snowfall totals for the season.

Debris and litter left after the snow has melted should be cleared and disposed of at the end of the snow season, no later than May 15 of each year.

Vehicle and Equipment Storage

Potential Sources of Stormwater Pollution

Vehicle and equipment storage activities are a potential source of pollution due to the diesel fuel, gasoline, oil, hydraulic fluid, antifreeze and similar hazardous materials or fuel the machinery may contain. In addition, vehicles or machinery may pick up pollutants during the course of offsite activities or at other facilities, and then deposit these pollutants at the storage facility.

Pollution Prevention

Regular visual inspection and maintenance of vehicles and equipment can greatly reduce the potential for pollution by finding and addressing leaks before pollution of the environment occurs. When in storage, vehicles and equipment should be kept on a covered slab or within a building with a common drain. Discharge to this drain shall be managed by an oil/ water separator (refer to SOP 11, "Oil/Water

Separator Maintenance") to remove oils and gasoline. Vehicle washing activities shall not be completed in areas served by an oil/water separator.

No equipment should be kept in an area where leaks could result in pollutants entering channels leading to outfalls.

Vehicle and Equipment Maintenance/Repair

Potential Sources of Stormwater Pollution

Vehicle and equipment maintenance and repair often requires the use of harmful liquids such as fuels, oils, and lubricants, and has the potential for producing dust, scrap and by-products that may contain pollutants. Both accidental and purposeful spillage, i.e., a leaky oil pan needing repair vs. draining the pan during an oil change, can lead to situations where pollutants can potentially enter stormwater runoff if the situations are not approached properly. Although there is little potential for effecting stormwater, it should be noted that hazardous gases can be produced during maintenance and repair as well.

Pollution Prevention

Proper maintenance and repair for vehicles and equipment shall include a preliminary assessment of potential pollutant sources. This assessment shall be used to determine the best means of containing any potential spills or by-products of the situation at hand. Approved containers shall be used to capture hazardous liquids to then be disposed of according to applicable MassDEP and USEPA guidelines. If the project may produce hazardous dust that could come in contact and mix with any liquids, the proper containment shall be utilized.

Due to heavy metal accumulation in antifreeze, brake fluid, transmission fluid, and hydraulic oils, it is not recommended that any of these liquids are disposed of in the sanitary sewer system. Contaminated parts removed or replaced on any vehicles or equipment shall be disposed of properly.

All work shall take place on a covered slab or within a building with a common drain. Discharge to this drain shall be managed by an oil/ water separator (refer to SOP 11, "Oil/Water Separator Maintenance") to remove oils and gasoline.

Maintenance and repairs shall not take place in areas prone to stormwater runoff or where pollutants could enter channels leading to outfalls.

Vehicle and Equipment Washing

Potential Sources of Stormwater Pollution

Vehicle and equipment washing activities are a potential source of pollution not only from petroleum products and pollutants deposited on the exterior of the equipment, but also from nutrients and sediment being washed into water bodies from the act of washing itself. Although some cleaning agents are becoming environmentally friendly, many still contain regulated contaminants. Due to the possibility for multiple types of pollutants, vehicle and equipment washing activities have a high potential for degrading stormwater quality.

Pollution Prevention

Outdoors, the use of a tight tank or other similar structure that can contain the wash water is ideal. If the wash water cannot be contained, it shall not be allowed to directly enter water bodies. Use phosphate free detergents that do not contain regulated contaminants, and avoid using solvents where the wash water may enter a sanitary sewer. Pervious surfaces may be used to promote infiltration and treatment before wash water enters the groundwater, but wash water coming from impervious pavement shall be treated to remove nutrients and petroleum products before entering an engineered storm drain system. Infiltration shall not be used within wellhead protection areas or other protected resource areas. Power washing, steam cleaning and engine and undercarriage washing shall not occur outdoors. Heavily soiled vehicles or vehicles dirtied from salting shall not be washed outdoors.

Washing vehicles and equipment indoors in the proper facilities is preferred over washing outdoors whenever possible. Indoor facilities shall have a common drain and it shall utilize a tight tank or other containment device to hold the wash water. The use of detergents shall be avoided and when the use of detergents cannot be avoided, use detergents free from phosphates and regulated contaminants. Detergents shall not be used when the discharge of this drain is controlled by an oil/ water separator (refer to SOP 11, "Oil/Water Separator Maintenance"). All drains that discharge directly to a water body or engineered storm drain system shall be plugged or abandoned. Dry clean-up methods such as vacuuming and sweeping shall be used whenever possible to avoid washing down floors with water.

For both outdoor and indoor washing, maintain absorbent pads and drip pans to collect spills and leaks observed during washing activities. Refer to SOP 4, "Spill Response and Cleanup Procedures" included for more information.

Waste Handling and Disposal

Potential Sources of Stormwater Pollution

Waste handling and disposal facilities and activities present a potential to contaminate stormwater with pathogens (including bacteria and viruses), nutrients, including phosphorus and nitrogen, fertilizers, pesticides and sediments.

There are several classifications of waste which contribute to stormwater pollution, including:

1. Solid Waste
2. Hazardous Materials and Waste
3. Pesticides and Fertilizers
4. Petroleum Products
5. Detergents

Pollution Prevention

A variety of measures are considered appropriate to prevent pollution from waste handling and disposal activities, based on the waste classifications noted previously. DPW does not take any solid waste on to the property. Waste Management collects solid wastes from individual properties all around town and disposes of accordingly.

Hazardous Materials and Wastes

1. To prevent leaks, empty and clean hazardous waste containers before disposing of them.
2. Never remove the original product label from the container. Follow the manufacturer's recommended method of disposal, printed on the label.
3. Never mix excess products when disposing of them, unless specifically recommended by the manufacturer.
4. Clean up spills immediately and in accordance with SOP 4 "Spill Response and Cleanup".

Pesticides, Fertilizers and Petroleum Products

1. Do not handle the materials more than necessary.
2. Store materials in a dry, covered, contained area.
3. Clean up spills immediately and in accordance with SOP 4, "Spill Response and Cleanup".

Detergents

1. Never dump wastes containing detergents to a storm drain system. All wastes containing detergents shall be directed to a sanitary sewer system for treatment at a wastewater treatment plant.

In addition to the pollution prevention requirements a waste management plan is recommended. The plan shall include employee training and signage informing individuals of the hazards associated with improper storage, handling and disposal of wastes. It is imperative that all employees are properly trained and follow the correct procedures to reduce or eliminate stormwater pollution. Routine visual inspection of storage and use areas is critical. The visual inspection process shall include identification of containers or equipment which could malfunction and cause leaks or spills. The equipment and containers shall be inspected for the following:

1. Leaks
2. Corrosion
3. Support or Foundation Failure
4. Other Deterioration

In the case a defect is found, immediately repair or replace.

Waste Oil Storage

Potential Sources of Stormwater Pollution

When not stored properly, waste oil can be a potential source of petroleum in stormwater. Waste oil containers can leak, and spills can occur while during transportation activities.

Pollution Prevention

All waste oil containers should be properly labeled and stored with secondary containment. Containers should be regularly inspected for rust, leaks, or other signs of deterioration. Defective containers should be promptly removed and replaced. A spill response kit should be located wherever waste oil is stored. Facility personnel should know where the spill kit is located and be familiar with the procedures outlined in SOP 4 "Spill Response and Cleanup Procedures". Used oil filters should also be properly disposed.

Care should be taken when transferring used oil to and from storage containers. For additional information see SOP 7 "Fuel and Oil Handling Procedures".

Waste oil should be stored indoors or under a covered structure to prevent exposure to precipitation. Floor drain in waste oil storage areas should drain to an oil/water separator rather than the storm drain system. See SOP 11 "Oil/Water Separator Maintenance" for further information.

When possible, steps should be taken to recycle waste oil or reduce the amount generated.

4 Plan Implementation

4.1 Site Inspection Requirements

It is required that the entire DPW Facility be inspected at least once each calendar quarter when the facility is in operation (at least one inspection must be conducted during a period when stormwater discharge is occurring).

The inspection must check for evidence of pollution, evaluate non-structural controls in place at the site, and inspect equipment. The site inspection report must include:

- The inspection date and time
- The name of the inspector
- Weather information and a description of any discharge occurring at the time of the inspection
- Identification of any previously unidentified discharges from the site
- Any control measures needing maintenance or repair
- Any failed control measures that need replacement
- Any SWPPP changes required as a result of the inspection
- Signed certification statement.

The inspection forms for these inspections are included in *Appendix E*.

Corrective actions may be required based on evidence of past stormwater pollution or the high potential for future stormwater pollution to occur. Information about any issues and the respective corrective actions must be included in a Stormwater Site Inspection Report. The DPW shall repair or replace control measures in need of repair or replacement before the next anticipated storm event if possible, or as soon as practicable. In the interim, back-up measures shall be in place. The DPW shall report the findings from the Site Inspections in the MS4 Annual Report. The Stormwater Site Inspection Report should be kept with the SWPPP and must state the problem, the solution, and when the solution was implemented.

4.2 Recordkeeping and Reporting

The permittee must keep a written record (hardcopy or electronic) of all activities required by the SWPPP including but not limited to maintenance, inspections, and training for a period of at least five years.

This SWPPP shall be kept at the DPW Facility. The SWPPP and records shall be made available to state or federal inspectors and the general public upon request.

The 2016 Massachusetts MS4 Permit requires that each permittee report on the findings from Site Inspections in the annual report to USEPA and MassDEP.

The Town of Blackstone shall review this SWPPP regularly to determine if any update or revision is required. Changes that may trigger revision include:

- An increase in the quantity of any potential pollutant stored at the facility;
- The addition of any new potential pollutant (not already addressed in this SWPPP) to the list of materials stored or used at the facility;
- Physical changes to the facility that expose any potential pollutant (not presently exposed) to stormwater;
- Presence of a new authorized non-stormwater discharge at the facility; or
- Addition of an activity that introduces a new potential pollutant.

Changes in activity may include an expansion of operations, or changes in any significant material handling or storage practices which could impact stormwater.

The amended SWPPP will describe the new activities that could contribute to increased pollution, as well as control measures that have been implemented to minimize the potential for pollution.

This SWPPP will be amended if a state or federal inspector determines that it is not effective in controlling stormwater pollutants discharged to waterways.

5 SWPPP Certification

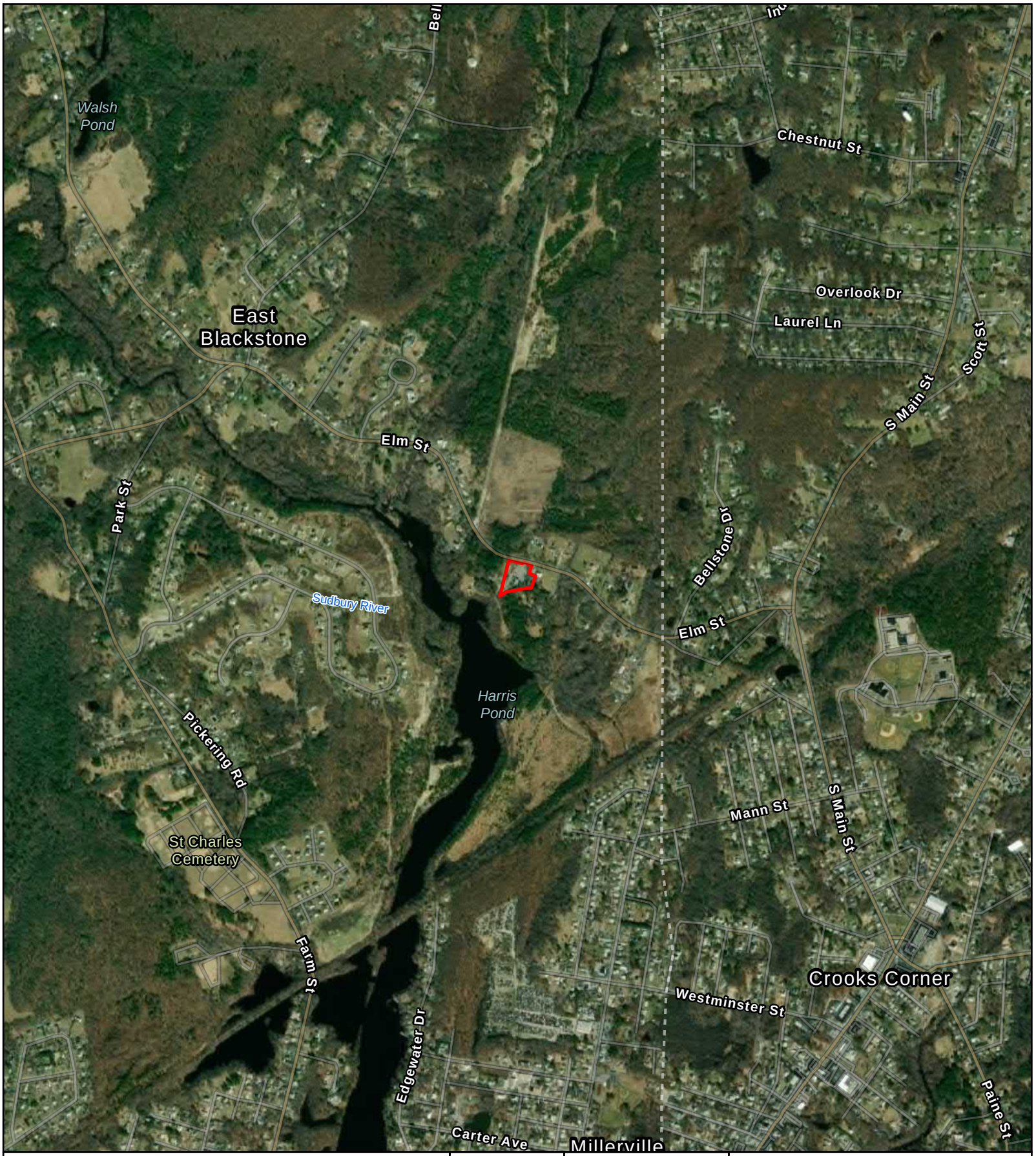
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage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

Authorized Official

Title

Date

Figures



Department of Public Works Facility
Stormwater Pollution Prevention Plan
Site Location Map

Blackstone, MA

FUSS & O'NEILL

FIG 1

Project No.: 20170202.A40
Date: September 2020

Data Source: ESRI

Site Location

0 1,000 2,000

US Feet





Department of Public Works Facility Stormwater Pollution Prevention Plan Site Map

Blackstone, MA

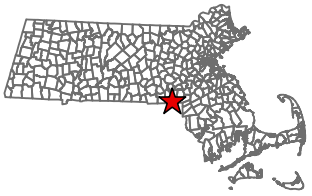
FUSS & O'NEILL

FIG 2

Project No.: 20170202.A40
Date: September 2020

0 35 70
US Feet

Data Source: ESRI, MassGIS



Appendix A

Inventory of Exposed Materials

FUSS & O'NEILL

Inventory of Material with Potential Stormwater Contact

Department of Public Works Facility

Blackstone, Massachusetts

Material	Total Quantity	Container Description	Location Stored	Potential Pollutant	Description of Potential Stormwater Contact
Oil	Up to 55 gallons	55-gallon drum	Garage	Petroleum hydrocarbons	Spill/leak during loading or unloading that reaches building exterior
Hydraulic Fluid/Oil	Up to 55 gallons	55-gallon drum	Garage	Petroleum hydrocarbons	Amount of oil is estimated
Propane	1 Tank	Propane tank	Garage	Petroleum hydrocarbons	Spill/leak during tank filling that reaches building exterior
Waste Oil	Up to 55 gallons	55-gallon drum	Garage	Petroleum hydrocarbons	Spill/leak during loading or unloading that reaches building exterior
Diesel Exhaust Fluid (DEF)	20 gallons	20-gallon storage container	Highway Garage Building	Urea	Spill/leak during loading or unloading that reaches building exterior
Antifreeze	5 gallons	5-gallon storage container	Equipment Maintenance Building	Ethylene glycol; potential source of BOD	Spill/leak during loading or unloading that reaches building exterior
Waste Oil / Hydraulic Fluid	20 gallons	4 x 5-gallon buckets on spill pallet	Equipment Maintenance Building	Petroleum hydrocarbons	Spill/leak during loading or unloading that reaches building exterior
Solid Waste, for Disposal	Varies	2 x Dumpsters	Southwestern portion of site	Particulate matter, solids, metals	Dumpsters are outside
Coal Tar Stockpile (Seasonally)	Various	Not Applicable	East of site entrance	Sediments	Not covered

Appendix B

Vehicle and Equipment Inventory

FUSS & O'NEILL

Vehicle and Equipment Inventory

Department of Public Works Facility

Blackstone, Massachusetts

Make	Model	Year	Vehicle Description	Plate No.	ID
Tiger	Boom Mower Tractor	1996	Department of Public Works	--	7
Ford	L8511 Cab Dump (#5)	1998	Department of Public Works	M99295	8
Ford	L8511 Cab W/Catch Basin (#6)	1998	Department of Public Works	M99296	9
Ford	F150	2001	Department of Public Works	M93612	10
Ford	F250 Pickup	2004	Department of Public Works	M71248	12
Ford	F750 Dump	2004	Department of Public Works	M67929	13
Ford	Truck	2005	Department of Public Works	M69785	14
Mongoose	Sewer Jet Trailer	2005	Department of Public Works	M74375	15
Zierke	Utility Trailer	2005	Department of Public Works	M80342	16
John Deere	544J Front End Loader	2005	Department of Public Works	M74370	17
Ford	F350 Pickup Truck	2006	Department of Public Works	M74368	19
Sterling	Dump Truck	2006	Department of Public Works	M98709	20
John Deere	Compressor	2007	Department of Public Works	M76017	21
Ford	Ranger	2008	Department of Public Works	M76765	22
Ford	F350 Dump Truck	2008	Department of Public Works	M80366	23
Ford	Crown Victoria	2009	Department of Public Works	M94675	24
Ford	Dump Truck	2012	Department of Public Works	M90224	25
Carmate	Trailer	2013	Department of Public Works	M88884	26
Ford	F350	2015	Department of Public Works	M90860	27
Cat	Loader	2015	Department of Public Works	M93615	28
Ford	F-350	2017	Department of Public Works	M99279	29
JCB	4Cx15	2018	Department of Public Works	--	30
Elgin	Pelican	2018	Department of Public Works	M2843A	31
Homemade	Flatbed Trailer	1979	Highway Department	M32231	49

Make	Model	Year	Vehicle Description	Plate No.	ID
Woodchuck	Portable Chipper	1985	Highway Department	M34782	50
Ford	F350 Pickup F38 (#4)	1997	Highway Department	M55413	51
Hudson	Utility Trailer	2005	Highway Department	M69791	52
Freightliner	Dump Truck	2014	Highway Department	M90771	53

Appendix C

Standard Operating Procedures

SOP 4: Spill Response and Cleanup

Introduction

Municipalities are responsible for any contaminant spill or release that occurs on property that they own or operate. Particular areas of concern include any facilities that use or store chemicals, fuel oil, or hazardous waste, including schools, garages, and landfills. Implementation of proper spill response and cleanup procedures can help to mitigate the effects of a contaminant release. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to municipal employees to help reduce the discharge of pollutants from the MS4 as a result of spills or releases.

Procedures

The Town of Blackstone will implement the following spill response and cleanup procedures to reduce the discharge of pollutants from the MS4:

Responding to a Spill

Employees should be trained in proper spill response specific to the materials used at their site and appropriate personal protective equipment (PPE). In the event of a spill, follow these spill response and cleanup procedures:

- If the facility has a Stormwater Pollution Prevention Plan (SWPPP), notify a member of the facility's Pollution Prevention Team, the facility supervisor, and/or the facility safety officer (fill out the attached spill response contact list). If not, continue to follow the procedures outlined below.
- Assess the contaminant release site for potential safety issues and for direction of flow.
- Complete the following:
    - Stop the contaminant release.
    - Contain the contaminant release through the use of spill containment berms or absorbents.
    - Protect all drains and/or catch basins with the use of absorbents, booms, berms or drain covers.
    - Clean up the spill.
    - Dispose of all contaminated products in accordance with applicable federal, state and local regulations.
        i. Soil contaminated with petroleum should be handled and disposed of as described in MassDEP policy WCS-94-400, Interim Remediation Waste Management Policy for Petroleum Contaminated Soils (https://www.mass.gov/files/documents/2016/08/mq/94-400.pdf).
        ii. Products saturated with petroleum products or other hazardous chemicals require special handling and disposal by licensed transporters. Licensed transporters will pick up spill contaminated materials for recycling or disposal. Save the shipping records for at least three years.
        iii. Waste oil contaminated industrial wipes and sorptive minerals:
            1. Perform the "one drop" test to ensure absorbents do not contain enough oil to be considered hazardous, as described in the MassDEP Waste Oil Management Guide (https://www.mass.gov/files/documents/2018/12/18/oilwiper.pdf).

2. Wring absorbents through a paint filter. If doing so does not generate one drop of oil, the materials are not hazardous.
3. If absorbents pass the "one drop" test they may be discarded in the trash unless contaminated with another hazardous waste.
    a. It is acceptable to mix the following fluids and handle them as waste oil:
        i. Waste motor oil
        ii. Hydraulic fluid
        iii. Power steering fluid
        iv. Transmission fluid
        v. Brake fluid
        vi. Gear oil
    b. **Do not mix** the following materials with waste oil. Store each separately:
        i. Gasoline
        ii. Antifreeze
        iii. Brake and carburetor cleaners
        iv. Cleaning solvents
        v. Other hazardous wastes
4. If absorbents do not pass the "one drop" test they should be placed in separate metal containers with tight fitting lids, labeled "Oily Waste Absorbents Only."

- If you need assistance containing and/or cleaning up the spill, or preventing it from discharging to a surface water (or an engineered storm drain system), contact your local fire department using the number listed below. **In the case of an emergency call 911**.
    - Blackstone Fire Department: 508-881-2323
- Contact the MassDEP 24-hour spill reporting notification line, toll-free at **(888)-304-1133**;
    - The following scenarios **are exempt** from MassDEP reporting requirements (see the MassDEP factsheet on oil and hazardous materials handling for more information: https://www.mass.gov/files/documents/2016/08/xm/spillmgm.pdf).
        i. Spills that are less than 10 gallons of petroleum and do not impact a water body
        ii. Spills that are less than one pound of hazardous chemicals and do not present an imminent health or safety hazard
        iii. Fuel spills from passenger vehicle accidents
        iv. Spills within a vault or building with a watertight floor and walls that completely contain all released chemicals

Reporting a Spill

When contacting emergency response personnel or a regulatory agency, or when reporting the contaminant release, be prepared to provide the following information:

1. Your name and the phone number you are calling from.
2. The exact address and location of the contaminant release.
3. Specifics of release, including:
    a. What was released;
    b. How much was released, which may include:

   i. Pounds
   ii. Gallons
   iii. Number of containers
4. Where was the release sent/what was contaminated, addressing:
   a. Pavement
   b. Soil
   c. Drains
   d. Catch basins
   e. Water bodies
   f. Public streets
   g. Public sidewalks
5. The concentration of the released contaminant.
6. What/who caused the release.
7. Is the release being contained and/or cleaned up or is the response complete.
8. Type and amount of petroleum stored on site, if any.
9. Characteristics of contaminant container, including:
   a. Tanks
   b. Pipes
   c. Valves

Maintenance and Prevention Guidance

Prevention of spills is preferable to even the best response and cleanup. To mitigate the effects of a contaminant release, provide proper maintenance and inspection at each facility. To protect against contaminant release adhere to the following guidance:

- Ensure all employees are properly trained to respond in the case of a spill, understand the nature and properties of the contaminant, and understand the spill control materials and personnel safety equipment. Maintain training records of current personnel on site and retain training records of former personnel for at least three years from the date last worked at the facility.
- Provide yearly maintenance and inspection at all municipal facilities, paying particular attention to underground storage tanks. Maintain maintenance and inspection records on site.
- Implement good management practices where chemicals and hazardous wastes are stored:
   a. Ensure storage in closed containers inside a building and on an impervious surface wherever possible.
   b. If storage cannot be provided inside, ensure secondary containment for 110 percent of the maximum volume of the storage container.
   c. Locate storage areas near maintenance areas to decrease the distance required for transfer.
   d. Provide accurate labels, Material Safety Data Sheets (MSDS) information, and warnings for all stored materials.
   e. Regularly inspect storage areas for leaks.
   f. Ensure secure storage locations, preventing access by untrained or unauthorized persons.
   g. Maintain accurate records of stored materials.
- Replace traditional hazardous materials such as pesticides and cleansers with non-hazardous products such as bio-lubricants which can reduce response costs in the case of a spill.

Maintain appropriately stocked spill response kits at each facilities and locations where oil, chemicals, or other hazardous materials are handled and stored.

Employee Training

- Employees who perform work with potential stormwater pollutants ##NUMBER times per year on proper spill procedures.
- Employees are also trained on stormwater pollution prevention and illicit discharge detection and elimination (IDDE) procedures.
- If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.

Attachments

1. Spill Response and Cleanup Contact List

Spill Response and Cleanup Contact List

Contact	Phone Number	Date and Time Contacted
Safety Officer: _____		
Facility Supervisor: _____		
Fire Department: _____		
MassDEP 24-Hour Spill Reporting	**(888)-304-1133**	
MassDEP Regional Offices:		
Northeast Regional Office	**(978) 694-3200**	
Southeast Regional Office	**(508) 946-2700**	
Central Regional Office	**(508) 792-7650**	
Western Regional Office	**(413) 784-1100**	
Hazardous Waste Compliance Assistance Line	**(617) 292-5898**	
Household Hazardous Products Hotline	**(800) 343-3420**	
Massachusetts Department of Fire Services	**(978) 567-3100 or (413) 587-3181**	
Licensed Site Professionals Association (Wakefield, MA) Licensed Site Professionals Board	**(781) 876-8915** **(617) 556-1091**	

SOP 6: Erosion and Sediment Control

Erosion and sedimentation from land-disturbing human activities can be a significant source of stormwater pollution. This Standard Operating Procedure describes methods for reducing or eliminating pollutant loading from such activities.

Controlling Erosion and Sediment through Design and Planning

Prevention of erosion and sedimentation is preferable to installing treatment devices. Consistent application and implementation of the following guidelines during the design and review phases can prevent erosion and sedimentation:

1. Avoid sensitive areas, steep slopes, and highly erodible soils to the maximum extent possible when developing site plans.
2. Identify potential problem areas before the site plan is finalized and approved.
3. Plan to use sediment barriers along contour lines, with a focus on areas where short-circuiting (i.e., flow around the barrier) may occur.
4. Use berms at the top of a steep slopes to divert runoff away from the slope's edge.
5. Design trapezoidal or parabolic vegetated drainage channels, not triangular.
6. Use vegetated channels with rip rap check dams, instead of impervious pavement or concrete, to reduce the water velocity of the conveyance system.
7. Design a check dam or sediment forebay with level spreader at the exit of outfalls to reduce water velocity of the discharge and collect sediment.
8. Use turf reinforcement matting to stabilize vegetated channels, encourage vegetation establishment, and withstand flow velocities without scouring the base of the channel.
9. Plan open channels to follow land contours so natural drainage is not disrupted.
10. Use organic matting for temporary slope stabilization and synthetic matting for permanent stabilization.
11. Provide a stable channel, flume, or slope drain where it is necessary to carry water down slopes.

Controlling Erosion and Sediment on Construction Sites

During the construction phase, it is important to inspect active sites regularly to ensure that practices are consistent with approved site plans and the site's Stormwater Pollution Prevention Plan (SWPPP) or other document, as required by the municipality's legal authority. The following guidelines apply:

1. Erosion and sediment control features should be constructed before initiating activities that remove vegetated cover or otherwise disturb the site. These shall be installed consistent with the approved site plans and with manufacturer's instructions.
2. Erosion and sediment control devices shall be inspected by the contractor regularly, and maintained as needed to ensure function.

3. In the SWPPP or other document, the contractor shall clearly identify the party responsible for maintaining erosion and sediment control devices.
4. An inspection should be completed of active construction sites every month, at a minimum, to check the status of erosion and sedimentation controls. Refer to SOP 5, "Construction Site Inspection", for construction site stormwater inspection procedures.
5. Existing vegetation should be maintained on site as long as possible.
6. Construction should proceed progressively on the site in order to minimize exposed soil, and disturbed areas should be restored as soon as possible after work has been completed.
7. Stockpiles shall be stabilized by seeding or mulching if they are to remain for more than two weeks.
8. Disturbed areas shall be protected from stormwater runoff by using protective Best Management Practices (BMPs).
9. Clean water shall be diverted away from disturbed areas on construction sites to prevent erosion and sedimentation.
10. Sediment traps and sediment barriers should be cleaned out regularly to reduce clogging and maintain design function.
11. Vegetated and wooded buffers shall be protected.
12. Soils shall be stabilized by mulching and/or seeding when they would be exposed for more than one week during the dry season, or more than two days during the rainy season.
13. Vegetation shall be allowed to establish before introducing flows to channels.
14. Regular light watering shall be used for dust control, as this is more effective than infrequent heavy watering.
15. Excessive soil compaction with heavy machinery shall be avoided, to the extent possible.
16. Construction activities during months with higher runoff rates shall be limited, to the extent possible.

Controlling Erosion and Sediment by Proper Maintenance of Permanent BMPs

Many construction phase BMPs can be integrated into the final site design, but ongoing inspection and maintenance are required to ensure long-term function of any permanent BMP. Refer to SOP 9, "Inspection of Constructed Best Management Practices", for more information. The following guidelines summarize the requirements for long-term maintenance of permanent BMPs.

1. Responsibility for maintaining erosion and sediment control devices shall be clearly identified.
2. Erosion and sediment control devices shall be inspected following heavy rainfall events to ensure they are working properly.
3. Erosion control blankets shall be utilized when seeding slopes.
4. Vegetated and wooded buffers shall be protected, and left undisturbed to the extent possible.
5. Runoff shall not be diverted into a sensitive area unless this has been specifically approved.
6. Sedimentation basins shall be cleaned out once sediment reaches 50% of the basin's design capacity.
7. Snow shall not be plowed into, or stored within, retention basins, rain gardens, or other BMPs.

8. Easements and service routes shall be maintained, to enable maintenance equipment to access BMPs for regular cleaning.

Related Standard Operating Procedures

1. SOP 5, Construction Site Inspection
2. SOP 9, Inspection of Constructed Best Management Practices

EROSION AND SEDIMENTATION CONTROL INSPECTION REPORT

General Information

Project Name			
Project Location			
Inspector's Name			
Site Operator			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	

Subject to USEPA Construction General Permit? Yes ☐ No ☐

If yes, has NOI been approved? Yes ☐ No ☐

If yes, attach approved NOI to this report.

If no, contact contractor immediately to determine status of NOI.

Type of Inspection:

Regular ☐ Pre-Storm Event ☐ During Storm Event ☐ Post-Storm Event ☐

Describe the weather conditions at time of inspection	
Describe the current phase of construction	

Erosion and Sediment Control (ESC) on Construction Sites

Document any of the following issues found on the construction site, and the corrective action(s) required for each.

Issue	Status	Corrective Action Needed
Have all ESC features been constructed before initiating other construction activities?	Yes ☐ No ☐	
Is the contractor inspecting and maintaining ESC devices regularly?	Yes ☐ No ☐	
Is existing vegetation maintained on the site as long as possible?	Yes ☐ No ☐	
Is construction staged so as to minimize exposed soil and disturbed areas?	Yes ☐ No ☐	
Are disturbed areas restored as soon as possible after work is completed?	Yes ☐ No ☐	
Is clean water being diverted away from the construction site?	Yes ☐ No ☐	
Are sediment traps and sediment barriers cleaned regularly?	Yes ☐ No ☐	
Are vegetated and wooded buffers protected and left undisturbed?	Yes ☐ No ☐	
Are soils stabilized by mulching and/or seeding when they are exposed for a long time?	Yes ☐ No ☐	
Has vegetation been allowed to establish itself before flows are introduced to channels?	Yes ☐ No ☐	
Is regular, light watering used for dust control?	Yes ☐ No ☐	
Is excessive soil compaction with heavy machinery avoided, to the extent possible?	Yes ☐ No ☐	

(continued)

Issue	Status	Corrective Action Needed
Are erosion control blankets used when seeding slopes?	Yes ☐ No ☐	
Are trees and vegetation that are to be retained during construction adequately protected?	Yes ☐ No ☐	
Are areas designated as off-limits to construction equipment flagged or easily distinguishable?	Yes ☐ No ☐	
If excavated topsoil has been salvaged and stockpiled for later use on the project, are stockpiles adequately protected?	Yes ☐ No ☐	
Are temporary slope drains or chutes used to transport water down steep slopes?	Yes ☐ No ☐	
Do all entrances to the storm sewer system have adequate protection?	Yes ☐ No ☐	

Non-Compliance Actions

The municipality shall provide the site operator with a copy of this report, and notice of the corrective action(s) to be taken. The site operator shall have thirty days from the receipt of the notice to commence curative action of the violation.

SOP 7: Fuel and Oil Handling

Introduction

Spills, leaks, and overfilling can occur during handling of fuels and petroleum-based materials, representing a potential source of stormwater pollution, even in small volumes. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to municipal employees on a variety of ways by which fuels and petroleum-based materials can be delivered, as well as steps to be taken when petroleum products (such as waste oil) are loaded onto vehicles for offsite disposal or recycling. Delivery, unloading, and loading of waste oils are hereafter referred to as "handling." Attached is a fuel delivery form checklist.

Procedures

The Town of Blackstone will implement the following fuel and oil handling procedures to help reduce the discharge of pollutants from the MS4:

General Guidelines

For all manners of fuel and oil handling described below, a member of the facility's Pollution Prevention Team (if the facility has a SWPPP) or another knowledgeable person familiar with the facility should be present during handling procedures. This person should ensure that the following are observed:

- There is no smoking while fuel handling is in process or underway.
- Sources of flame are kept away while fuel handling is being completed. This includes smoking, lighting matches, carrying any flame, or carrying a lighted cigar, pipe, or cigarette.
- The delivery vehicle's hand brake is set and wheels are chocked while the activity is being completed.
- Catch basins and drain manholes are adequately protected.
- No tools are to be used that could damage fuel or oil containers or the delivery vehicle.
- No flammable liquid should be unloaded from any motor vehicle while the engine is operating, unless the engine of the motor vehicle is required to be used for the operation of a pump.
- Ensure that local traffic does not interfere with fuel transfer operations. If it does, make appropriate accommodations.
- The attending persons should watch for any leaks or spills:
    - Any small leaks or spills should be immediately stopped, and spilled materials absorbed and disposed of properly. Follow the procedures in SOP 4: Spill Response and Cleanup.
    - In the event of a large spill or one that discharges to surface waters or an engineered storm drain system, the facility representative should activate the facility's Stormwater Pollution Prevention Plan (SWPPP) and report the incident as specified in the document.

Delivery by Bulk (Tanker) Truck

Procedures for the delivery of bulk fuel should include the following:

- The truck driver should check in with the facility upon arrival.
- The facility representative should ensure that the appropriate spill cleanup and response equipment and personal protective equipment are readily available and easily accessible. Refer to SOP 4: Spill Response and Cleanup for examples of spill cleanup and response materials.
- The facility representative should check to ensure that the amount of delivery does not exceed the available capacity of the tank.

    - A level gauge can be used to verify the level in the tank.
    - If a level gauge is not functioning or is not present on the tank, the tank should be stick tested prior to filling.
- The truck driver and the facility representative should both remain with the vehicle during the delivery process.
- The truck driver and the facility representative should inspect all visible lines, connections, and valves for leaks.
- When delivery is complete and the hoses are removed, buckets should be placed underneath connection points to catch drippings.
- The delivery vehicle should be inspected prior to departure to ensure that the hose is disconnected from the tank.
- The facility representative should inspect the fuel tank to verify that no leaks have occurred, or that any leaked or spilled material has been cleaned and disposed of properly.
- The facility representative should gauge tank levels to ensure that the proper amount of fuel is delivered, and collect a receipt from the truck driver.

Delivery of Drummed Materials

Drummed materials may include motor oil, hydraulic fluid, transmission fluid, or waste oil from another facility (as approved). Procedures for the delivery of drummed materials should include the following:

- The truck driver should check in with the facility upon arrival.
- The facility representative should ensure that the appropriate spill cleanup and response equipment and personal protective equipment are readily available and easily accessible Refer to SOP 4: Spill Response and Cleanup for examples of spill cleanup and response materials. The facility representative should closely examine the shipment for damaged drums.
    - If damaged drums are found, they should be closely inspected for leaks or punctures.
    - Breached drums should be removed to a dry, well-ventilated area and the contents transferred to other suitable containers.
    - Drums should be disposed of in accordance with all applicable regulations.
- Drummed materials should not be unloaded outdoors during wet weather events.
- The truck driver and the facility representative should both remain with the vehicle during the delivery process.
- Drums should be handled and unloaded carefully to prevent damage.
- Upon completion of unloading, the facility representative should inspect the unloading point and the drums to verify that no leaks have occurred, that any leaked or spilled material has been cleaned up and disposed of properly, and that the unloaded drums are not leaking.
- The facility representative should check to ensure that the proper amount of fuel or other material is delivered, and collect a receipt from the truck driver.

Removal of Waste Oil from the Facility

When waste oil or similar oil products need to be removed from the premises, only haulers certified to transport waste oil should be utilized. Procedures should include the following:

- The disposal truck driver should check in with the facility upon arrival.

- The facility representative should ensure that the appropriate spill cleanup and response equipment and personal protective equipment are readily available and easily accessible. Refer to SOP 4: Spill Response and Cleanup for examples of spill cleanup and response materials. The truck driver and the facility representative should both remain with the vehicle during the tank draining process.
- When draining is complete and the hoses are removed, buckets should be placed underneath connection points to catch drippings.
- The facility representative should inspect the loading point and the tank to verify that no leaks have occurred, or that any leaked or spilled material has been cleaned up and disposed of properly.
- The facility representative should collect a receipt from the truck driver.
- When draining bulk oil tanks:
    - The facility representative should verify that the volume of waste oil in the tank does not exceed the available capacity of the disposal hauler's vehicle.
    - The disposal hauler vehicle should be inspected prior to departure to ensure that the hose is disconnected from the tank.

Employee Training

- Employees who handle or deliver fuel and/or oil are trained on proper procedures.
- Employees are also trained on stormwater pollution prevention, illicit discharge detection and elimination (IDDE) procedures, and spill and response procedures.
- If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.

Attachments

1. Fuel Delivery Checklist

Related Standard Operating Procedures

- SOP 4: Spill Response and Cleanup

FUEL DELIVERY FORM

TOWN OFBLACKSTONE

Date: _____

Time of Arrival: _____

Time of Departure: _____

Truck Number: _____

Name of Truck Driver: _____

Name of Town Employee: _____

BEFORE UNLOADING:

Is all spill response equipment and personal protective equipment in place?

Yes ☐ **No** ☐

In the case of bulk fuel delivery, does tank capacity exceed the amount of delivery?

Yes ☐ **No** ☐ **N/A** ☐

In the case of drum fuel delivery, are all drums free of leaks and punctures?

Yes ☐ **No** ☐ **N/A** ☐

COMMENCE UNLOADING. REMAIN WITH VEHICLE AT ALL TIMES.

AFTER UNLOADING IS COMPLETE:

Have all fuel containers, including the vehicle, been inspected for leaks?

Yes ☐ **No** ☐

Has the ground at the unloading point been inspected for evidence of leaks?

Yes ☐ **No** ☐

If there are any leaks or spills, has the material been properly cleaned?

Yes ☐ **No** ☐

Has the correct amount of fuel been delivered?

Yes ☐ **No** ☐

Has a receipt been collected?

Yes ☐ **No** ☐

DELIVERY IS COMPLETE.

SOP 11: Oil/Water Separator (OWS) Maintenance

Oil/water separators (OWS), also known as gas/oil separators, are structural devices intended to provide pretreatment of floor drain water from industrial and garage facilities. An OWS allows oils (and substances lighter than water) to be intercepted and be removed for disposal before entering the sanitary sewer system. Substances heavier than water settle into sludge at the bottom of the unit. The remaining water passes through the unit into the sanitary sewer system.

OWS units are generally required where petroleum-based products, wastes containing petroleum, or oily and/or flammable materials are used, produced, or stored. OWS units should not be used to manage stormwater or flow from vehicle washing facilities. High flow rates through an OWS will reduce the structure's ability to separate materials. Detergents and solvents can emulsify oil and grease, allowing the particles to enter the sewer, so these should not be disposed of in drains entering the OWS.

General OWS Maintenance Requirements

1. Each OWS at a facility may receive different materials in different quantities, so the cleanout schedule may not be the same for every OWS at a facility.
2. Employees performing inspections of an OWS must be properly trained and be familiar with the maintenance of that specific structure, since function can vary based on design. Third-party firms may be utilized to perform quarterly inspections.
3. Do not drain petroleum, oil, or lubricants directly to an OWS. The structures are designed to manage these materials at low and medium concentrations in sanitary sewage, not as slug loads.
4. Do not drain antifreeze, degreasers, detergents, fuels, alcohols, solvents, coolant, or paint to the OWS.
5. Separator compartment covers should be tightly sealed to ensure floor drainage only enters the first compartment of the OWS.
6. Drains should be kept free of debris and sediment to the maximum extent practicable.
7. Spill cleanup materials should be maintained in the area served by the OWS. For more information on spill cleanup and response materials, refer to SOP 4, "Spill Response and Cleanup Procedures".

OWS Inspection Procedures

Daily inspection of an OWS should include a visual examination of the area served by the OWS for evidence of spills or leaks.

Weekly inspections of an OWS should include the following:

1. Visually examine the area served by the OWS for evidence of spills or leaks.
2. Inspect the point of discharge (i.e., sewer manhole) for evidence of petroleum bypassing the OWS.
3. Inspect drains for any signs of unauthorized substances entering the OWS.
4. Examine the OWS for signs of leaks or any malfunction.

Quarterly inspections of an OWS should include the following:

1. Complete tasks noted as appropriate for daily and weekly inspection.
2. Complete the Quarterly OWS Inspection Checklist, attached, during the inspection.
3. Take the following measurements to benchmark function of the OWS:
    A. Distance from rim of access cover to bottom of structure
    B. Distance from rim of access cover to top of sludge layer
    C. Depth of sludge layer (C = A – B)
    D. Distance from rim of access cover to the oil/water interface
    E. Distance from rim of access cover to the top of the liquid surface
    F. Depth of oil layer (F = D – E)

OWS Cleaning Procedures

Cleaning of the OWS is required when there has been a spill to the OWS that exceeds ten gallons of oil, one gallon of detergent or solvent, or any material prohibited by the owner of the sanitary sewer. Cleaning is also required when the levels of accumulated sludge and/or oil meet the manufacturer's recommended levels for cleaning. This will vary based on the manufacturer of the OWS. If the manufacturer's recommendations are unknown, the following guidelines are appropriate for determining when to clean:

1. When sludge accumulates to 25% of the wetted height of the separator compartment; or
2. When oil accumulates to 5% of the wetted height of the separator compartment; or
3. When 75% of the retention capacity of the OWS is filled.

Cleaning should be performed a minimum of once per year. When cleaning is required, it shall be performed by licensed OWS maintenance companies. Materials removed from the OWS must be disposed of in accordance with Massachusetts Hazardous Waste Regulations, 310 CMR 30.00.

Documentation of Cleaning and Service

The operator of the premises where the OWS is located shall maintain a log describing the date and type of all inspections, service and maintenance performed in connection with the Separator. Documentation shall include the identity of the inspector (or the identity of the person or entity that performed the service and/or maintenance). Records shall also document the amount of residue removed from the OWS each time it was cleaned, and how removed materials were disposed. This documentation shall be maintained for a minimum of six years.

Attachments

1. Quarterly OWS Inspection Checklist

Related Standard Operating Procedures

1. SOP 4, Spill Response and Cleanup Procedures

OIL/WATER SEPARATOR (OWS)
QUARTERLY INSPECTION CHECKLIST

Facility: _____

OWS Location: _____

Inspected By: _____

Date: _____

Visual Inspection	Are there any signs of spills or leaks in the general area?	**Yes** ☐ **No** ☐
	Is there any evidence of petroleum bypassing the OWS?	**Yes** ☐ **No** ☐
	Are there any unauthorized substances entering the OWS?	**Yes** ☐ **No** ☐
	Does the OWS exhibit any signs of leaks or malfunctions?	**Yes** ☐ **No** ☐

If you answered "Yes" to any of the above questions, further inspection, repair, and/or cleaning may be necessary.

Measurements	A	Distance from rim of access cover to bottom of structure	
	B	Distance from rim of access cover to top of sludge layer	
	C = A - B	Depth of sludge layer	
	D	Distance from rim of access cover to the oil/water interface	
	E	Distance from rim of access cover to the top of the liquid surface	
	F = D - E	Depth of oil layer	

If the values for "C" and/or "F" are greater than those in the manufacturer's recommendations, the OWS must be cleaned by a licensed OWS maintenance company.

Appendix D

Stormwater Training Documentation

FUSS & O'NEILL

Stormwater Training Documentation

Department of Public Works

Blackstone, Massachusetts

Date: _____ Training Duration: _____

Training Session Title: _____

Topics Covered: _____

Name	**Title**	**Signature**

Appendix E

Site Inspection Report Forms

FUSS & O'NEILL

Stormwater Site Inspection Report

General Information			
Facility Name	Blackstone Department of Public Works		
Date of Inspection	Insert Date	**Start/End Time**	Insert Start/End Time
Inspector's Name(s)	Insert Name		
Inspector's Title(s)	Insert Title		
Inspector's Contact Information	Insert Contact Info		
Inspector's Qualifications	Insert qualifications or add reference to the SWPPP		

Weather Information

Weather at time of this inspection?
❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snow ❑ High Winds
❑ Other: Temperature:

Have any previously unidentified discharges of pollutants occurred since the last inspection? ❑Yes ❑No
If yes, describe: Describe

Are there any discharges occurring at the time of inspection? ❑Yes ❑No
If yes, describe: Describe

Control Measures

	Structural Control Measure	Control Measure is Operating Effectively?	If No, In Need of Maintenance, Repair, or Replacement?	Corrective Action Needed and Notes (identify needed maintenance and repairs, or any failed control measures that need replacement)
1	**Prevent or Minimize Exposure**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions
2	**Good Housekeeping**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions
3	**Preventative Maintenance**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions

	Structural Control Measure	Control Measure is Operating Effectively?	If No, In Need of Maintenance, Repair, or Replacement?	Corrective Action Needed and Notes (identify needed maintenance and repairs, or any failed control measures that need replacement)
4	**Spill Prevention and Response**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions
5	**Erosion and Sediment Control**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions
6	**Management of Runoff**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions
7	**Salt Storage or Piles Containing Salt**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions
8	**Employee Training**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions
9	**Maintenance of Control Measures**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions

FUSS & O'NEILL

Areas of Materials or Activities Exposed to Stormwater

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
1	**Loading/Unloading Areas**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions
2	**Roof Areas**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions
3	**Outdoor Storage**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions
4	**Dust or Particulate Generating Activities**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions
5	**On-Site Waste Management Practices**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions
6	**Vehicle Washing/Rinsing**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions

Non-Compliance

Describe any incidents of non-compliance observed and not described above:

Describe Non-compliance

Additional Control Measures

Describe any additional control measures or changes to the SWPPP needed to comply with the permit requirements:

Describe Additional Controls Needed

Notes

Use this space for any additional notes or observations from the inspection:

Additional Notes

Print inspector name and title:

_____

Signature: _____ **Date:** _____

FUSS & O'NEILL

Quarterly Visual Assessment Form– additional form when stormwater discharge is occurring

(Complete a separate form for each outfall you assess)

Name of Facility: Blackstone Department of Public Works

Outfall Name: Name "Substantially Identical Outfall"? ☐ No ☐ Yes (identify substantially identical outfalls):

Person(s)/Title(s) collecting sample: Name/Title

Person(s)/Title(s) examining sample: Name/Title

Date & Time Discharge Began (approx.): Enter date and time

Date & Time Visual Sample Collected: Enter date and time

Date & Time Visual Sample Examined: Enter date and time

Nature of Discharge: ☐ Rainfall ☐ Snowmelt

Parameter

Color ☐ None ☐ Other (describe):

Odor ☐ None ☐ Musty ☐ Sewage ☐ Sulfur ☐ Sour ☐ Petroleum/Gas _____
☐ Solvents ☐ Other (describe):

Clarity ☐ Clear ☐ Slightly Cloudy ☐ Cloudy ☐ Opaque ☐ Other

Floating Solids ☐ No ☐ Yes (describe):

Settled Solids* ☐ No ☐ Yes (describe):

Suspended Solids ☐ No ☐ Yes (describe):

Foam (gently shake sample) ☐ No ☐ Yes (describe):

Oil Sheen ☐ None ☐ Flecks ☐ Globs ☐ Sheen ☐ Slick
☐ Other (describe):

Other Obvious Indicators of Stormwater Pollution ☐ No ☐ Yes (describe):

* Observe for settled solids after allowing the sample to sit for approximately one-half hour.

Detail any concerns, additional comments, descriptions of pictures taken, and any corrective actions taken below (attach additional sheets as necessary). Insert details

A. Name:

B. Title:

C. Signature:

D. Date Signed:

Appendix I- Recycling Center SWPPP

Stormwater Pollution Prevention Plan
Blackstone Valley Regional Recycling Center

Town of Blackstone, MA

September 2021

1550 Main St, Suite 400
Springfield, MA 01130

20170202.A40

Table of Contents

Stormwater Pollution Prevention Plan
Blackstone Valley Regional Recycling Center
Town of Blackstone, MA

1 Introduction 1
- 1.1 Pollution Prevention Team 2
- 1.2 Facility Description 2
- 1.3 Site Drainage 3

2 Potential Pollutant Sources 3
- 2.1 Allowable Non-Stormwater Discharges 3
- 2.2 Inventory of Exposed Material 3
- 2.3 Equipment Storage and Maintenance/Repair 4
- 2.4 Waste Handling 4
- 2.5 Snow Storage 6

3 Stormwater Controls 6
- 3.1 Minimize or Prevent Exposure 6
  - 3.1.1 Equipment Storage and Maintenance/Repair 6
  - 3.1.2 Waste Handling 6
  - 3.1.3 Snow Storage 7
- 3.2 Good Housekeeping 7
- 3.3 Preventative Maintenance 7
- 3.4 Spill Prevention and Response 8
- 3.5 Erosion and Sediment Control 8
- 3.6 Management of Runoff 8
- 3.7 Salt Storage or Piles Containing Salt 8
- 3.8 Employee Training 9
- 3.9 Maintenance of Control Measures 9

4 Plan Implementation 14
- 4.1 Site Inspections 14
- 4.2 Recordkeeping and Reporting 15

5 SWPPP Certification 16

Table of Contents

Stormwater Pollution Prevention Plan
Blackstone Valley Regional Recycling Center
Town of Blackstone, MA

Figures — End of Report

1 Site Location Map
2 Site Drainage Map

Appendices — End of Report

A Inventory of Exposed Materials
B Inventory of Vehicles and Equipment
C Standard Operating Procedures
D Employee Training Documentation
E Site Inspection Report Forms

1 Introduction

This Stormwater Pollution Prevention Plan (SWPPP) has been developed for the Blackstone Valley Regional Recycling Center (Recycling Center) to address the requirements of the United States Environmental Protection Agency's (USEPA's) 2016 National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) in Massachusetts, hereafter referred to as the 2016 Massachusetts MS4 Permit.

The 2016 Massachusetts MS4 Permit requires that each permittee, or regulated community, address six Minimum Control Measures. These measures include the following:

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination Program
4. Construction Site Stormwater Runoff Control
5. Stormwater Management in New Development and Redevelopment (Post Construction Stormwater Management); and
6. Good Housekeeping and Pollution Prevention for Permittee Owned Operations.

Under Measure 6, Good Housekeeping and Pollution Prevention for Permittee Owned Operations, the permittee is required, per Section 2.3.7.b of the 2016 Massachusetts MS4 Permit (page 50-54), to:

> *…develop and fully implement a SWPPP for each of the following permittee-owned or operated facilities: maintenance garages, public works yards, Transfer Stations, and other waste handling facilities where pollutants are exposed to stormwater as determined by the permittee.*
>
> *The SWPPP shall contain the following elements:*
> 1. *Pollution Prevention Team*
> 2. *Description of the facility and identification of potential pollutant sources.*
> 3. *Identification of stormwater controls*
> 4. *Management practices including:*
>   a. *Minimize or Prevent Exposure,*
>   b. *Good Housekeeping,*
>   c. *Preventative Maintenance,*
>   d. *Spill Prevention and Response,*
>   e. *Erosion and Sediment Control,*
>   f. *Management of Runoff,*
>   g. *Management of Salt Storage Piles or Piles Containing Salt,*
>   h. *Employee Training*
>   i. *Maintenance of Control Measures*
> 5. *Site inspections*

This SWPPP meets these requirements by:

- Identifying members of the SWPPP team and their responsibilities,
- Describing the facilities, with information on location and activities, a site map, and a description of the stormwater drainage system,
- Identifying potential stormwater contaminants,

- Describing stormwater management controls and various Best Management Practices (BMPs) to reduce pollutants in stormwater discharges,
- Describing the facility's monitoring programs, and
- Describing the implementation schedule and provisions for amendment of the plan.

1.1 Pollution Prevention Team

The Pollution Prevention Team for the Recycling Center is responsible for developing, implementing, maintaining, and revising, as necessary, the SWPPP for this facility. Listed below are Pollution Prevention Team members and their respective responsibilities.

Plan Supervisor/Manager: Colleen Strapponi
Title: Health Agent, Board of Health
Phone Number: (508) 876-5130
Responsibilities: Overall responsibility for development, implementation, maintenance, and revision of the plan.

Team Member: Kevin J. Ryan
Title: Vice Chairman, Board of Health
Phone Number: (508) 876-5130
Responsibilities: Conducts required inspections, monitoring, and reporting. Assists Plan Manager and Supervisor with implementing the plan.

1.2 Facility Description

The Town of Blackstone operates a municipal recycling center located on an approximately 30-acre parcel at 14 Chestnut Street in Blackstone, Massachusetts (*Figure 1*). Recyclables, yard waste, and other waste streams (electronic waste, batteries, mattresses, etc.) are collected in onsite containers and transferred to off-site disposal or processing facilities on an as-needed basis. Fox Brook borders the southern and southwestern edge of the property, with residential parcels and Chestnut Street to the east. The western/northwestern edge of the parcel is bordered by undeveloped woodlands, with residential parcels to the north/northeast (*Figure 2*).

The Recycling Center consists of a repair shop, recycling processing building, defunct processing building, administrative office, an attendant's shack, and collection areas for the following types of waste:

- Bulky waste
- Metals
- Waste oil
- Recyclables
- Electronics, batteries, and lightbulbs
- Wood
- Brush and yard waste

1.3 Site Drainage

A drainage map of the site is included as *Figure 2*. The map shows the facility layout, stormwater drainage flow directions, and locations where materials and activities are exposed to precipitation. The site does not have an engineered stormwater drainage system.

Stormwater runoff from the developed portion of the site generally flows from east to west, from Chestnut Street towards the capped landfill west of the site. Runoff from a portion of the yard waste collection area towards the administrative office—flows south to north before reaching the administrative office building and flowing west. Runoff from the southern portion of the yard waste collection area runs south towards Fox Brook, with Fox Brook being the receiving water for the property. There are no discernible point stormwater discharges from the site.

2 Potential Pollutant Sources

Provided in this section is a discussion of site activities and the potential pollutant sources associated with each. Measures to prevent and/or minimize exposure of potential pollutant sources to stormwater runoff can be found in *Section 3.1*. The following activities occur at the facility:

1. Equipment storage;
2. Storage and transfer of recyclables and other waste streams.

An inventory of materials stored or handled with potential exposure to stormwater is contained in *Appendix A*. The type of container has also been identified. Petroleum-based materials are listed separately in the table. The locations of these material storage areas are provided on the Drainage Site Map as *Figure 2*.

2.1 Allowable Non-Stormwater Discharges

A non-stormwater discharge is defined as any discharge or flow to an engineered storm drain system or directly to surface waters that is not composed entirely of stormwater runoff. The Recycling Center does not have an engineered storm drainage system. Allowable non-stormwater discharges that occur at this facility include:

- Uncontaminated ground water infiltration (as defined at 40 CFR § 35.2005(20))

It has been determined that the above non-stormwater discharge at the Recycling Center does not represent a significant contribution of pollution to the MS4 or the waters of the United States. Therefore, it is are considered to be authorized under the current MS4 permit.

2.2 Inventory of Exposed Material

An inventory of materials stored or handled with potential exposure to stormwater is contained in *Appendix A*. All waste storage containers are covered or located in a covered area. The type of container

has also been identified. Oil, gasoline, and other petroleum-based materials are listed separately in the table. The locations of these material storage areas are provided on the Drainage Site Map as *Figure 2*.

2.3 Equipment Storage and Maintenance/Repair

The Recycling Center utilizes skid steer loaders for transferring recyclables to the processing area. Diesel fuel, brake fluid, and hydraulic fluid can be a potential source of pollutants in the event of a release (i.e., accidental release during routine maintenance or repairs).

An inventory of vehicles and equipment with potential exposure to stormwater is contained in *Appendix B*.

2.4 Waste Handling

Recycling centers and associated activities present a potential to contaminate stormwater with nutrients (including phosphorus and nitrogen), metals, organics, and sediments. The site is also a potential source of trash and recyclables (i.e., paper and cardboard) that could be transported off-site via stormwater runoff. There are several classifications of waste which could contribute to stormwater pollution, including various types of recyclables and petroleum products.

2.4.1.1 Bulky Waste and Metal Waste

A metal waste dumpster is located on the eastern portion of the Recycling Center. The metal waste dumpster is a potential pollutant source of metals. The dumpster is left uncovered, but appears to be in good condition, therefore the likelihood of pollutant exposure to stormwater is minimal.

The bulky waste dumpster for resident drop-off is a potential pollutant source of sediments, recyclables, and other pollutants. These potential pollutants sources could be introduced to the site stormwater runoff during loading/unloading, due to overfilling of the dumpsters, or during drainage of accumulated stormwater from the bulky waste dumpster.

A mattress recycling container is located on the northeastern portion of the property. The mattresses are kept in a covered metal storage container. There are no stormwater pollutants associated with this activity.

2.4.1.2 Waste Oil

A double-walled aboveground storage tank (AST) at the Recycling Center is used for storage of waste oil. The AST is located directly south of the battery storage shed. The waste oil is a potential pollutant source that could be introduced to stormwater through an accidental discharge, such as a leak or a spill.

2.4.1.3 Recyclables

There are thirteen recycling storage containers in total, five at the northern portion of the site, five at the eastern portion, and three at the western portion. These containers are enclosed with front-opening doors. The main potential pollutant source from the recyclable cardboard containers is organics, and potential pollutant sources from the recyclable plastics containers are bacteria and viruses, organics, and nutrients. These potential pollutant sources could be introduced to stormwater through an accidental discharge caused by overfilling of the containers or spillage during loading/unloading.

2.4.1.4 Electronic Waste

The Recycling Center maintains an electronic waste shed at the eastern portion of the site. The shed is covered and electronics overflow is stored outside of the shed. The electronic waste dumpster is a potential pollutant source of metals. This potential pollutant source could be introduced to stormwater through an accidental discharge caused by overfilling of the containers or spillage during loading/unloading. Additionally, a potential pollutant source could arise from electronic waste in the uncovered outdoor overflow, which is exposed to rainfall.

2.4.1.5 Florescent Lightbulbs

The Recycling Center maintains a shed at the northeastern portion of the site for florescent lightbulb disposal. The shed is covered and kept closed when not in use. The lightbulb storage area is a potential pollutant source of metals, which may be exposed to stormwater through spillage during loading/unloading.

2.4.1.6 Brush and Yard Waste

Brush and yard waste piles are located at the southern portion of the site. These piles are uncovered and do not have any sediment or erosion controls. The brush and yard waste piles are potential pollutant sources of sediment and organics, which can leach out of or run off of the pile during rain events.

2.4.1.7 Paint and Propane

The Recycling Center accepts paint cans and propane canisters, which are stored directly south of the electronic waste shed. The storage area is uncovered and on a pervious surface. The paint is a potential source of volatile organic compounds (VOCs) and the propane is a potential source of hydrocarbons. These potential pollutant sources may be exposed to stormwater through spills that occur during storage and loading/unloading. Knock or blow-overs of uncovered paint cans is another potential source of stormwater pollution.

2.4.1.8 Recyclable Wood

The Recycling Center maintains a stockpile of recyclable wood at the eastern portion of the site. The stockpile is uncovered. There are no potential stormwater pollutants associated with this activity.

2.5 Snow Storage

Snow plowed from the paved areas of the site is piled along the driveway leading to the yard waste storage area at the southern portion of the site. Snow is also stored adjacent to the recyclable wood stockpile on the eastern side of the site. Materials contained in the snow piles (sand, salt, litter, automotive fluids, etc.) are potential pollutants that can be carried off-site by meltwater and by stormwater runoff after the piles melt. Infiltration of meltwater and snow pile runoff that contains chlorides from road salt can also contaminate groundwater.

3 Stormwater Controls

3.1 Minimize or Prevent Exposure

Preventing or minimizing the exposure of materials to rain, snow, snowmelt and runoff can reduce stormwater pollution problems. This can be accomplished by locating materials and activities inside or protecting them with storm-resistant covers.

3.1.1 Equipment Storage and Maintenance/Repair

Equipment should be inspected regularly for leaks or other visual evidence of potential pollutant sources. Perform equipment maintenance in a paved, covered area away. Use appropriate containers to capture any fluids to be drained. Waste fluids or other regulated waste materials generated by equipment maintenance activities should be disposed of in accordance with state and federal requirements. Spill materials should be readily available in the event of a spill or release.

3.1.2 Waste Handling

The following measures should be followed to minimize pollution from waste handling activities.

Petroleum Products

1. Store waste oil in a dry, covered, contained area.
2. The waste oil tank should be regularly inspected for rust, leaks, or other signs of deterioration. If defective, the tank should be promptly removed and replaced.
3. Care should be taken when transferring used oil to and from waste oil tank. For additional information see SOP 7 "Fuel and Oil Handling Procedures" found in *Appendix C*.
4. A spill response kit should be located where the waste oil is stored. Facility personnel should know where the spill kit is located and be familiar with the procedures outlined in SOP 4, "Spill Response and Cleanup" (*Appendix C*).

Employees should receive regular pollution prevention training (see Section 3.8 of this Plan) and conduct routine visual inspections of the site equipment and containers (see Section 4.1). The visual inspections shall include identification of containers or equipment which could malfunction and cause leaks or spills. The equipment and containers shall be inspected for the following:

1. Leaks
2. Corrosion
3. Support or Foundation Failure
4. Other Deterioration

In the case a defect is found, immediately repair or replace the equipment or container.

3.1.3 Snow Storage

Proper preparation and maintenance of snow disposal sites will also prevent stormwater pollution. Prior to using the site for snow disposal, all debris should be cleared.

Debris and litter left after the snow has melted should be cleared and disposed of at the end of the snow season.

3.2 Good Housekeeping and Preventative Maintenance

Good housekeeping practices are activities, often conducted daily, that help maintain a clean facility and prevent stormwater pollution. The following is a list of good housekeeping measures that are practiced at the facility:

- A spill kit is present on site.
- Used spill cleanup materials are disposed of properly.
- Materials are stored in covered areas to minimize exposure to stormwater.
- All materials and waste oil storage containers are properly labeled.
- The waste oil container is double-walled.
- Different types of wastes are separated as appropriate.
- Staff is familiar with proper use of equipment.

Preventative maintenance can minimize the occurrence of stormwater pollution by addressing issues before they become problems. Such maintenance at the facility involves routine equipment maintenance and visual inspection of stormwater management measures and areas that could generate spills, leaks, etc. Visual inspections will be performed quarterly at the facility in addition to, or as part of the annual comprehensive site compliance evaluation (see *Section 4*). Preventive maintenance at the facility involves the following elements:

Inspections

- Visual inspection of areas that could contribute pollutants to the surface water bodies.
- Tank filling areas are inspected regularly for evidence of spills.
- Material storage tanks and containers are regularly inspected for leaks.
- The waste oil tank is fully contained and inspected regularly.

Routine Maintenance

- Sweeping of paved surfaces as necessary, with particular emphasis on areas with high potential sediment contribution.

- Spill response equipment is maintained and replaced as needed.
- Exposed earthen surfaces that are inactive are vegetated and maintained to reduce the potential for erosion and sedimentation during rainfall events.

Knowledgeable Staff

- All staff members are aware of spill prevention and response procedures.
- All staff members have received formal spill prevention and response procedure training.
- Material drop-offs are monitored by facility employees who ensure that materials go to the correct locations within the site

3.3 Spill Prevention and Response

Spill prevention, response, and reporting procedures at the facility are in accordance with SOP 4, "Spill Response and Cleanup" (*Appendix C*). In general, Recycling Center personnel will respond only to incidental releases, which can be immediately absorbed or otherwise controlled at the time of the release. Spills will be contained as close to the source as possible with absorbent materials and other spill response resources at the facilities. Small spills may be determined to be incidental and therefore controllable and manageable by on-site resources. If the release is not manageable by facility personnel (i.e., non-incidental), then an emergency spill response contractor will be contacted. The following procedures apply to this facility:

- All personnel are instructed in location, use, and disposal of spill response equipment and supplies maintained at the site such as oil absorbent materials.
- The Pollution Prevention Team leader will be advised immediately of all spills of hazardous materials or regulated materials, regardless of quantity.
- Spills will be evaluated to determine the necessary response. If there is a health hazard, fire or explosion potential, 911 will be called. If a spill exceeds ten gallons or threatens surface waters, including the onsite or offsite storm drain systems, state or federal emergency response agencies will be called.
- Spills will be contained as close to the source as possible with oil-absorbent materials.

3.4 Erosion and Sediment Control

The Recycling Center does not have a stormwater drainage system and the site topography prevents drainage of stormwater and any associated sedimentation of the site from discharging directly to a water body. The site mainly consists of buildings, pavement, and surrounding woodland.

3.5 Management of Runoff

There is no curbing onsite, which encourages sheet flow runoff to vegetated areas. Runoff from the southern portion of the yard waste storage site sheet flows to Fox Brook.

3.6 Employee Training

Regular employee training is required for employees who work in areas where materials or activities are exposed to stormwater, or who are responsible for implementing activities identified in the SWPPP, including all members of the Pollution Prevention Team. All employees responsible for the maintenance of the site equipment will also be trained. The topics below will be covered at employee training sessions.

1. Spill prevention and response.
2. Good housekeeping.
3. Materials management practices.

The Recycling Center is responsible for providing stormwater management training for their employees. EPA recommends the training occur annually. The Recycling Center will document the following information for each training:

1. The training date, title and training duration;
2. List of municipal attendees;
3. Subjects covered during training.

Appendix D contains a copy of the training attendance sheet.

3.7 Maintenance of Control Measures

The Recycling Center will maintain the control measures outlined in the SWPPP in effective operating condition. If a control measure is taken off-line, backup measures will be implemented until the primary control measure is put back in place. Nonstructural control measures will also be maintained (e.g., spill response supplies available, personnel trained).

3.8 Best Management Practices

Solid Waste Management

Potential Sources of Stormwater Pollution

Solid waste production and storage locations present the threat to contaminate stormwater with pathogens, including bacteria and viruses, nutrients, including phosphorus and nitrogen, metals and sediments.

Solid waste may be classified as both hazardous and non-hazardous waste consisting of agricultural, construction and demolition, dead animals, industrial, municipal, and tire waste.

Pollution Prevention

To prevent or reduce the potential for stormwater pollution from solid waste management practices the following preventative maintenance procedures are recommended:

1. All staff shall be properly trained in correct solid waste management practices, including waste disposal and spill prevention and response. All employees shall also be knowledge of the potential hazards associated with solid waste handling and storage.
2. Each waste storage location shall be properly labeled and all significant sources of pollution shall be kept in a secure, covered and contained area.
3. The facility and storage containers shall remain locked at all times other than during normal hours of operation.
4. All waste storage containers and waste handling equipment shall be routinely inspected for signs of spills, leaks, corrosion or general deterioration.
5. The facility shall maintain spill response materials in accordance with SOP 4, "Spill Response and Cleanup".

Snow Storage

Potential Sources of Stormwater Pollution

Snow collected from plowing and road clearing activities can contaminate engineered storm drain systems and receiving waters if storage and/or disposal sites are not properly selected and maintained. As snow is removed from roadways, parking lots, sidewalks, and other paved areas, contaminants such as sand, salt, litter, and automotive oil are collected along with the snow. These pollutants are ultimately transported to the storage site and eventually to receiving waters once the snow melts.

Infiltration of pollutants in snow, such as chlorides from road salt, can impact groundwater, including drinking water aquifers.

Pollution Prevention

To avoid contamination of stormwater and drinking water, snow storage should be located on a pervious surface in an upland area away from water resources and wells, so that meltwater can be filtered through the soil.

Debris and litter left after the snow has melted should be cleared and disposed of at the end of the snow season, no later than May 15 of each year.

Vehicle and Equipment Storage

Potential Sources of Stormwater Pollution

Vehicle and equipment storage activities are a potential source of pollution due to the diesel fuel, gasoline, oil, hydraulic fluid, antifreeze and similar hazardous materials or fuel the machinery may contain. In addition, vehicles or machinery may pick up pollutants during the course of offsite activities or at other facilities, and then deposit these pollutants at the storage facility.

Pollution Prevention

Regular visual inspection and maintenance of vehicles and equipment can greatly reduce the potential for pollution by finding and addressing leaks before pollution of the environment occurs. When in storage, vehicles and equipment should be kept on a covered slab or within a building with a common drain.

Discharge to this drain shall be managed by an oil/ water separator (refer to SOP 11, "Oil/Water Separator Maintenance") to remove oils and gasoline. Vehicle washing activities shall not be completed in areas served by an oil/water separator.

No equipment should be kept in an area where leaks could result in pollutants entering adjacent waterbodies.

Vehicle and Equipment Maintenance/Repair

Potential Sources of Stormwater Pollution

Vehicle and equipment maintenance and repair often requires the use of harmful liquids such as fuels, oils, and lubricants, and has the potential for producing dust, scrap and by-products that may contain pollutants. Both accidental and purposeful spillage, i.e., a leaky oil pan needing repair vs. draining the pan during an oil change, can lead to situations where pollutants can potentially enter stormwater runoff if the situations are not approached properly. Although there is little potential for effecting stormwater, it should be noted that hazardous gases can be produced during maintenance and repair as well.

Pollution Prevention

Proper maintenance and repair for vehicles and equipment shall include a preliminary assessment of potential pollutant sources. This assessment shall be used to determine the best means of containing any potential spills or by-products of the situation at hand. Approved containers shall be used to capture hazardous liquids to then be disposed of according to applicable MassDEP and USEPA guidelines. If the project may produce hazardous dust that could come in contact and mix with any liquids, the proper containment shall be utilized.

Due to heavy metal accumulation in antifreeze, brake fluid, transmission fluid, and hydraulic oils, it is not recommended that any of these liquids are disposed of in the sanitary sewer system. Contaminated parts removed or replaced on any vehicles or equipment shall be disposed of properly.

All work shall take place on a covered slab or within a building with a common drain. Discharge to this drain shall be managed by an oil/ water separator (refer to SOP 11, "Oil/Water Separator Maintenance") to remove oils and gasoline.

Maintenance and repairs shall not take place in areas prone to stormwater runoff or where pollutants could enter adjacent waterbodies or channels leading to outfalls.

Vehicle and Equipment Washing

Potential Sources of Stormwater Pollution

Vehicle and equipment washing activities are a potential source of pollution not only from petroleum products and pollutants deposited on the exterior of the equipment, but also from nutrients and sediment being washed into water bodies from the act of washing itself. Although some cleaning agents are becoming environmentally friendly, many still contain regulated contaminants. Due to the possibility for multiple types of pollutants, vehicle and equipment washing activities have a high potential for degrading stormwater quality.

Pollution Prevention

Outdoors, the use of a tight tank or other similar structure that can contain the wash water is ideal. If the wash water cannot be contained, it shall not be allowed to directly enter water bodies. Use phosphate free detergents that do not contain regulated contaminants, and avoid using solvents where the wash water may enter a sanitary sewer. Pervious surfaces may be used to promote infiltration and treatment before wash water enters the groundwater, but wash water coming from impervious pavement shall be treated to remove nutrients and petroleum products before entering an engineered storm drain system. Infiltration shall not be used within wellhead protection areas or other protected resource areas. Power washing, steam cleaning and engine and undercarriage washing shall not occur outdoors. Heavily soiled vehicles or vehicles dirtied from salting shall not be washed outdoors.

Washing vehicles and equipment indoors in the proper facilities is preferred over washing outdoors whenever possible. Indoor facilities shall have a common drain and it shall utilize a tight tank or other containment device to hold the wash water. The use of detergents shall be avoided and when the use of detergents cannot be avoided, use detergents free from phosphates and regulated contaminants. Detergents shall not be used when the discharge of this drain is controlled by an oil/ water separator (refer to SOP 11, "Oil/Water Separator Maintenance"). All drains that discharge directly to a water body or engineered storm drain system shall be plugged or abandoned. Dry clean-up methods such as vacuuming and sweeping shall be used whenever possible to avoid washing down floors with water.

For both outdoor and indoor washing, maintain absorbent pads and drip pans to collect spills and leaks observed during washing activities. Refer to SOP 4, "Spill Response and Cleanup Procedures" included for more information.

Waste Handling and Disposal

Potential Sources of Stormwater Pollution

Waste handling and disposal facilities and activities present a potential to contaminate stormwater with pathogens (including bacteria and viruses), nutrients, including phosphorus and nitrogen, fertilizers, pesticides and sediments.

There are several classifications of waste which contribute to stormwater pollution, including:

1. Solid Waste
2. Hazardous Materials and Waste
3. Pesticides and Fertilizers
4. Petroleum Products
5. Detergents

Pollution Prevention

A variety of measures are considered appropriate to prevent pollution from waste handling and disposal activities, based on the waste classifications noted previously. DPW does not take any solid waste on to the property. Waste Management collects solid wastes from individual properties all around town and disposes of accordingly.

Hazardous Materials and Wastes

1. To prevent leaks, empty and clean hazardous waste containers before disposing of them.
2. Never remove the original product label from the container. Follow the manufacturer's recommended method of disposal, printed on the label.
3. Never mix excess products when disposing of them, unless specifically recommended by the manufacturer.
4. Clean up spills immediately and in accordance with SOP 4 "Spill Response and Cleanup".

Pesticides, Fertilizers and Petroleum Products

5. Do not handle the materials more than necessary.
6. Store materials in a dry, covered, contained area.
7. Clean up spills immediately and in accordance with SOP 4, "Spill Response and Cleanup".

Detergents

1. Never dump wastes containing detergents to a storm drain system. All wastes containing detergents shall be directed to a sanitary sewer system for treatment at a wastewater treatment plant.

In addition to the pollution prevention requirements a waste management plan is recommended. The plan shall include employee training and signage informing individuals of the hazards associated with improper storage, handling and disposal of wastes. It is imperative that all employees are properly trained and follow the correct procedures to reduce or eliminate stormwater pollution. Routine visual inspection of storage and use areas is critical. The visual inspection process shall include identification of containers or equipment which could malfunction and cause leaks or spills. The equipment and containers shall be inspected for the following:

5. Leaks
6. Corrosion
7. Support or Foundation Failure
8. Other Deterioration

In the case a defect is found, immediately repair or replace.

Waste Oil Storage

Potential Sources of Stormwater Pollution

When not stored properly, waste oil can be a potential source of petroleum in stormwater. Waste oil containers can leak, and spills can occur while during transportation activities.

Pollution Prevention

All waste oil containers should be properly labeled and stored with secondary containment. Containers should be regularly inspected for rust, leaks, or other signs of deterioration. Defective containers should be promptly removed and replaced. A spill response kit should be located wherever waste oil is stored.

Facility personnel should know where the spill kit is located and be familiar with the procedures outlined in SOP 4 "Spill Response and Cleanup Procedures". Used oil filters should also be properly disposed.

Care should be taken when transferring used oil to and from storage containers. For additional information see SOP 7 "Fuel and Oil Handling Procedures".

Waste oil should be stored indoors or under a covered structure to prevent exposure to precipitation. Floor drain in waste oil storage areas should drain to an oil/water separator rather than the storm drain system. See SOP 11 "Oil/Water Separator Maintenance" for further information.

When possible, steps should be taken to recycle waste oil or reduce the amount generated.

4 Plan Implementation

4.1 Site Inspections

The Recycling Center should be inspected at least once each calendar quarter when the facility is in operation (at least one inspection must be conducted during a period when stormwater discharge is occurring). The Pollution Prevention Team Members are responsible for completing this inspection.

The inspection must check for evidence of pollution, evaluate non-structural controls in place at the site, and inspect equipment. Results of the inspections are documented using inspection forms, which include:

- The inspection date and time
- The name of the inspector
- Weather information and a description of any discharge occurring at the time of the inspection
- Identification of any previously unidentified discharges from the site
- Any control measures needing maintenance or repair
- Any failed control measures that need replacement
- Any SWPPP changes required as a result of the inspection
- Signed certification statement.

The inspection forms are included in *Appendix E*.

Corrective actions may be required based on the site inspections or evidence of past stormwater pollution or the high potential for future stormwater pollution to occur. Recommended corrective actions should be documented in the inspection forms. The Recycling Center shall repair or replace control measures in need of repair or replacement before the next anticipated storm event if possible, or as soon as practicable. In the interim, back-up measures shall be in place. The Recycling Center shall report the findings from the site inspections in the MS4 Annual Report. Documentation of corrective actions should be kept with the SWPPP and must state the problem, the solution, and when the solution was implemented.

4.2 Recordkeeping and Reporting

The permittee must keep a written record (hardcopy or electronic) of all activities required by the SWPPP including but not limited to maintenance, inspections, and training for a period of at least five years.

This SWPPP shall be kept at the Recycling Center and updated as necessary. The SWPPP and records shall be made available to state or federal inspectors and the general public upon request.

The 2016 Massachusetts MS4 Permit requires that each permittee report on the findings from site inspections in the MS4 Annual Report to USEPA and MassDEP.

The Town of Blackstone shall review this SWPPP regularly to determine if any update or revision is required. Changes that may trigger revision include:

- An increase in the quantity of any potential pollutant stored at the facility;
- The addition of any new potential pollutant (not already addressed in this SWPPP) to the list of materials stored or used at the facility;
- Physical changes to the facility that expose any potential pollutant (not presently exposed) to stormwater;
- Presence of a new authorized non-stormwater discharge at the facility; or
- Addition of an activity that introduces a new potential pollutant.

Changes in activity may include an expansion of operations, or changes in any significant material handling or storage practices which could impact stormwater.

The amended SWPPP will describe the new activities that could contribute to increased pollution, as well as control measures that have been implemented to minimize the potential for pollution.

This SWPPP will be amended if a state or federal inspector determines that it is not effective in controlling stormwater pollutants discharged to waterways.

5 SWPPP Certification

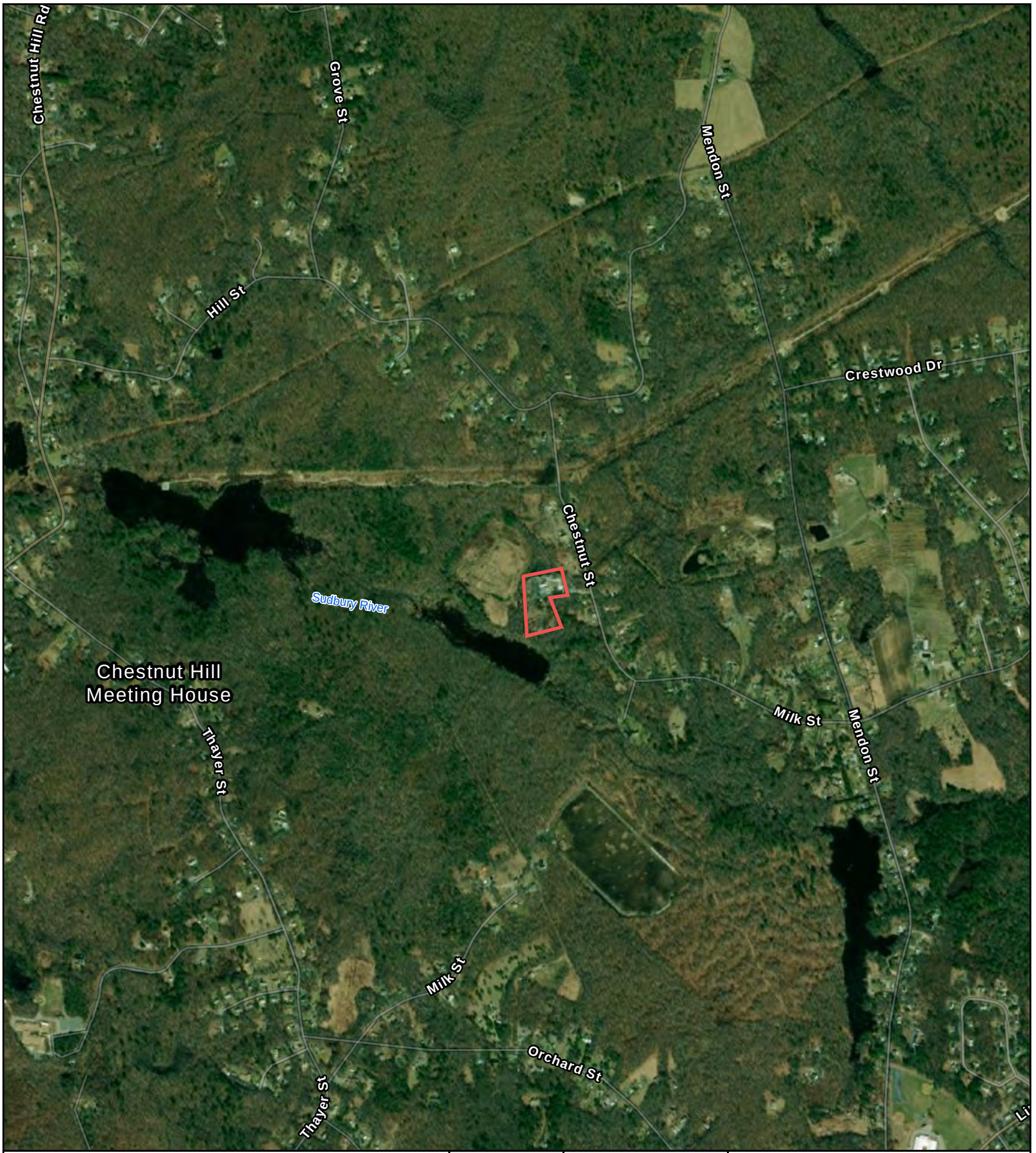
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage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

Authorized Official

Title

Date

Figures



Blackstone Valley Regional Recycling Center
Stormwater Pollution Prevention Plan
Site Location Map

Blackstone, MA

FUSS & O'NEILL

FIG 1

Project No.: 20170202.A40
Date: September 2020

Data Source: ESRI

Site Location

0 1,000 2,000

US Feet





Blackstone Valley Regional Recycling Center
Stormwater Pollution Prevention Plan
Site Map

Blackstone, MA

FUSS & O'NEILL

FIG. 2

Project No.: 20170202.A40
Date: September 2020

0 50 100
US Feet

Data Source: ESRI, MassGIS

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/ Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Appendix A

Inventory of Materials with Potential Stormwater Exposure

FUSS & O'NEILL

Inventory of Materials with Potential Stormwater Exposure

Blackstone Valley Regional Recycling Center

Blackstone, Massachusetts

Material	Total Quantity	Container Description	Location Stored	Potential Pollutant	Description of Potential Stormwater Contact
Waste Oil	350 gallons	Aboveground storage tank, double-walled	Eastern portion of site, near battery/lightbulb storage shed	Petroleum hydrocarbons	• Spill during tank filling • Leaking (unlikely to spread beyond containment)
Cardboard/Paper and Recyclable Plastics	Approx. 440 cubic yards	30 cubic yards (x8 storage containers), 40 cubic yards (x5 storage containers)	Five at the northern portion of the site, five at the eastern, and three at the western portion	Organics, bacteria and viruses, nutrients	• Spill during loading/unloading • Spill during baling of materials
Electronic Waste	Varies	Covered storage shed	Eastern portion of site	Metals	• Spill during loading/unloading
Metal Waste	Approx. 30 cubic yards	Dumpster	Eastern portion of site, north of electronic waste shed	Metals	• Spill during loading/unloading • Drainage of rain water collected in container
Bulky Waste	Approx. 30 cubic yards	Dumpster	Eastern portion of site, south of electronic waste shed	Sediment, Metals, Other	• Spill during loading/unloading • Drainage of rain water collected in container
Yard Waste/Brush	Varies	Not applicable	Southern portion of site	Organics, nutrients	• Leaching of organics and nutrients from exposed pile
Paint	Varies	Not applicable	South of electronic waste shed	VOCs	• Spill during loading/unloading • Spill during storage (exposed)

Material	Total Quantity	Container Description	Location Stored	Potential Pollutant	Description of Potential Stormwater Contact
Propane	Varies	Not applicable	South of electronic waste shed	Hydrocarbons	• Spill during loading/unloading • Spill during storage (exposed)

Appendix B

Inventory of Vehicles and Equipment

FUSS & O'NEILL

Inventory of Vehicles and Equipment

Blackstone Valley Regional Recycling Center

Blackstone, Massachusetts

Make	Model	Year	Vehicle Department	Plate No.	ID
Homespace	Trailer	2005	Blackstone Valley Regional Recycling Center	M73409	79
Homespace	Trailer	2005	Blackstone Valley Regional Recycling Center	M73410	80
New Holland	Skid Steer Loader	2005	Blackstone Valley Regional Recycling Center	--	81
Homespace	Trailer	2006	Blackstone Valley Regional Recycling Center	M73913	82
Homespace	Trailer	2006	Blackstone Valley Regional Recycling Center	M73914	83
Ford	F150 Pickup	2014	Blackstone Valley Regional Recycling Center	M92109	84
Ford	Truck	2017	Blackstone Valley Regional Recycling Center	--	85

Appendix C

Standard Operation Procedures

SOP 3: Catch Basin Inspection and Cleaning

Introduction

Catch basins help minimize flooding and protect water quality by removing trash, sediment, decaying debris, and other solids from stormwater runoff. These materials are retained in a sump below the invert of the outlet pipe (older catch basins may not have a sump). Catch basin cleaning reduces foul odors, prevents clogs in the storm drain system, and reduces the loading of trash, suspended solids, nutrients, bacteria, and other pollutants to receiving waters. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to municipal employees on catch basin inspection and cleaning to reduce the discharge of pollutants from the MS4. If services are contracted, this SOP should be provided to the contractor. The contract should specify that the contractor is responsible for compliance with all applicable laws.

This SOP can also be used for inspection of catch basins or manholes for the purpose of conducting catchment investigations as part of the municipality's Illicit Discharge Detection and Elimination program.

The Town of Blackstone performs routine inspections, cleaning, and maintenance of catch basins that are located within the MS4 regulated area. The Town will include an optimization plan for catch basin cleaning and inspection in its annual report.

The Town will implement the following catch basin inspection and cleaning procedures to reduce the discharge of pollutants from the MS4:

Procedures

Inspection and Cleaning Frequency

- Each catch basin should be cleaned and inspected at least annually.
- Catch basins near construction activities (roadway construction, residential, commercial, or industrial development or redevelopment) or high-use areas should be inspected and cleaned more frequently if inspection finds excessive sediments or debris loadings.
- Catch basins should be cleaned to ensure that they are no more than 50 percent full[1] at any time. Establish inspection and maintenance frequencies needed to meet this "50 percent" goal. If a catch basin sump is more than 50 percent full during two consecutive inspections, document the findings, investigate the contributing drainage area for sources of excessive sediment loading, and, if possible, address the contributing sources. If no contributing sources are found, increase the inspection and cleaning frequencies of the sump.
- Street sweeping performed on an appropriate schedule will reduce the amount of sediment, debris, and organic matter entering the catch basins, which will in turn reduce the frequency with which they need to be cleaned. Reference SOP 16: Streets and Parking Lots for information on appropriate street sweeping frequencies. Street sweeping schedules should also be adjusted based on catch basin inspection findings, with more frequent sweepings for areas with higher catch basin loads.

[1] A catch basin sump is more than 50 percent full if the contents within the sump exceed one half the distance between the bottom interior of the catch basin to the invert of the deepest outlet of the catch basin

- In accordance with TMDL/impaired water requirements, the Town will prioritize catch basin cleaning and inspection in catchments with TMDLs/impairments when creating their optimization schedule to ensure that these catch basins are no more than 50% full and reduce stormwater pollution to impaired waterbodies.

Inspection and Cleaning Procedures

Catch basin inspection and cleaning procedures should address both the grate opening and the catch basin structure, including the sump and any inlet and outlet pipes. Document any and all observations about the condition of the catch basin structure and water quality (an inspection form and log of catch basins cleaned or inspected are included in the attachments). Collect data on the condition of the physical basin structure, its frame, and the grate, as well as on the quality of stormwater conveyed by the structure. Observations like those below can indicate sources of pollution within the storm drain system:

- Oil sheen
- Discoloration
- Trash and debris

Both oil and bacteria can create a sheen on the water's surface. The source of a sheen can be differentiating by disturbing it (e.g., with a pole). A sheen caused by oil will remain intact and move in a swirl pattern, while a sheen caused by bacteria will separate and appear "blocky." The bacteria that cause this sheen are naturally occurring iron bacteria – they are not considered a pollutant but should be noted. Other types of bacteria, such as fecal bacteria, are considered pollutants and their discovery should be recorded.

Observations like those below can indicate a potential connection of a sanitary sewer to the storm drain system, which is an illicit discharge:

- Indications of sanitary sewage, including fecal matter or sewage odors
- Foaming, such as from detergent
- Optical enhancers, fluorescent dye added to laundry detergent

In general, adhere to the following procedures when inspecting and cleaning catch basins. Record the findings in the log in the attachments:

1. Implement appropriate traffic safety procedures (e.g., traffic cones) prior to and during the catch basin inspection and cleaning process.
2. Work upstream to downstream in a given drainage network.
3. Clean sediment and trash off of the grate.
4. Visually inspect the outside of the grate.
5. Remove the grate and visually inspect the inside of the catch basin to determine cleaning needs.
6. Inspect the catch basin for structural integrity.
7. Determine the most appropriate equipment and method for cleaning the basin:
    a. Manually use a shovel to remove accumulated sediments.
    b. Use a bucket loader to remove accumulated sediments.
    c. Use a high pressure washer to clean any remaining material out of the catch basin while capturing the slurry with a vacuum.

   d. If necessary, after the catch basin is cleaned, use the rodder of the vacuum truck to clean the downstream pipe and pull back sediment that might have entered it.

8. If contamination is suspected, chemical analysis will be required to determine if the materials comply with the Massachusetts Department of Environmental Protection (MassDEP) Hazardous Waste Regulations, 310 CMR 30.000 (https://www.mass.gov/files/documents/2016/08/xl/310cmr30_7883_54357.pdf). The chemical analysis required will depend on suspected contaminants. Note the identification number of the catch basin on the sample label and note sample collection on the Catch Basin Inspection Form.

Handling and Disposal of Catch Basin Cleanings

- Properly dispose of collected sediments and catch basin cleanings (solid material, such as leaves, sand, and twigs removed from stormwater collection systems during cleaning operations).
- Cleanings from stormwater-only drainage systems may be disposed at any landfill that is permitted by MassDEP to accept solid waste. MassDEP does not routinely require stormwater-only catch basin cleanings to be tested before disposal, unless there is evidence that they have been contaminated by a spill or some other means.
- Screenings may need to be placed in a drying bed to allow water to evaporate before proper disposal. In this case, ensure that the screenings are managed properly to prevent pollution.
- Catch basin cleanings must be handled and disposed in accordance with compliance with the applicable MassDEP regulations, policies, and guidance (https://www.mass.gov/files/documents/2018/03/09/catch-basins.pdf).

Documentation and Reporting

The following information should be documented and included in the municipality's annual report – use the catch basin inspection log provided in the attachments to document the information to include in the report (alternatively, obtain records of volume of debris removed to include in the report):

- Metrics and other information used to reach the determination that the established plan for cleaning and maintenance is optimal for the MS4 (include in the SWMP and first annual report)
- Any action taken in response to excessive sediment or debris loadings
- Total number of catch basins
- Number of catch basins inspected
- Number of catch basins cleaned
- Total volume or mass of material removed from catch basins.

Employee Training

- Employees who perform catch basin cleaning and inspection are trained ##NUMBER times per year on these procedures and the proper operation of related equipment.
- Employees are also trained on stormwater pollution prevention, illicit discharge detection and elimination (IDDE) procedures, and spill and response procedures.
- If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.

Attachments

1. Catch Basin Inspection Form and Log
2. Catch Basin Inventory

Related Standard Operating Procedures

1. SOP 16: Streets and Parking Lots

CATCH BASIN INSPECTION FORM

Job No.: _____ **Town:** _____ **Inspector:** _____ **Date:** _____

Catch Basin I.D.	_____	**Final Discharge from Structure?** Yes ☐ No ☐ **If Yes, Discharge to Outfall No:** _____	
Catch Basin Label:	**Stencil** ☐ **Ground Inset** ☐ **Sign** ☐ **None** ☐ **Other** _____		
Basin Material:	Concrete ☐ Corrugated metal ☐ Stone ☐ Brick ☐ Other: _____ ☐	**Catch Basin Condition:**	Good ☐ Poor ☐ Fair ☐ Crumbling ☐
Pipe Material:	Concrete ☐ HDPE ☐ PVC ☐ Clay Tile ☐ Other: _____	**Pipe Measurements:**	Inlet Dia. (in): d= ____ Outlet Dia. (in): D= ____

Required Maintenance/ Problems (check all that apply):

- ☐ Tree Work Required
- ☐ New Grate is Required
- ☐ Pipe is Blocked
- ☐ Frame Maintenance is Required
- ☐ Remove Accumulated Sediment
- ☐ Pipe Maintenance is Required
- ☐ Basin Undermined or Bypassed
- ☐ Cannot Remove Cover
- ☐ Ditch Work
- ☐ Corrosion at Structure
- ☐ Erosion Around Structure
- ☐ Remove Trash & Debris
- ☐ Need Cement Around Grate

Other: _____

Catch Basin Grate Type:	**Sediment Buildup Depth:**	**More than 50% full?**	**Description of Flow:**	**Street Name/ Structure Location:**
Bar: ☐ Cascade: ☐ Other: _____ Properly Aligned: Yes ☐ No ☐	0-6 (in): ____ 6-12(in): ____ 12-18 (in): ____ 18-24 (in): ____ 24 + (in): ____	Yes ☐ No ☐	Heavy ☐ Moderate ☐ Slight ☐ Trickling ☐	

***If the outlet is submerged check yes and indicate approximate height of water above the outlet invert.** h above invert (in):_ Yes ☐ No ☐

☐ **Flow**
☐ **Standing Water**
(check one or both)

Observations:

Color:	
Odor:	

Weather Conditions : Dry > 24 hours ☐ Wet ☐

Sample of Screenings Collected for Analysis? Yes ☐ No ☐

Amount of sediment removed:

Comments:

Circle those present:

Foam	Oil Sheen
Sanitary Waste	Bacterial Sheen
Orange Staining	Floatables
Excessive sediment	Pet Waste
Other: _____	Optical Enhancers

Catch Basin Inspection and Cleaning Log
Blackstone, Massachusetts

Date	Inspector	Weather Conditions	Number of Catch Basins Inspected/Cleaned	Amount of Material Removed	Catch Basins More Than 50% Full	Corrective Action Taken/Recommended if More Than 50% Full

SOP 4: Spill Response and Cleanup

Introduction

Municipalities are responsible for any contaminant spill or release that occurs on property that they own or operate. Particular areas of concern include any facilities that use or store chemicals, fuel oil, or hazardous waste, including schools, garages, and landfills. Implementation of proper spill response and cleanup procedures can help to mitigate the effects of a contaminant release. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to municipal employees to help reduce the discharge of pollutants from the MS4 as a result of spills or releases.

Procedures

The Town of Blackstone will implement the following spill response and cleanup procedures to reduce the discharge of pollutants from the MS4:

Responding to a Spill

Employees should be trained in proper spill response specific to the materials used at their site and appropriate personal protective equipment (PPE). In the event of a spill, follow these spill response and cleanup procedures:

- If the facility has a Stormwater Pollution Prevention Plan (SWPPP), notify a member of the facility's Pollution Prevention Team, the facility supervisor, and/or the facility safety officer (fill out the attached spill response contact list). If not, continue to follow the procedures outlined below.
- Assess the contaminant release site for potential safety issues and for direction of flow.
- Complete the following:
    - Stop the contaminant release.
    - Contain the contaminant release through the use of spill containment berms or absorbents.
    - Protect all drains and/or catch basins with the use of absorbents, booms, berms or drain covers.
    - Clean up the spill.
    - Dispose of all contaminated products in accordance with applicable federal, state and local regulations.
        i. Soil contaminated with petroleum should be handled and disposed of as described in MassDEP policy WCS-94-400, Interim Remediation Waste Management Policy for Petroleum Contaminated Soils (https://www.mass.gov/files/documents/2016/08/mq/94-400.pdf).
        ii. Products saturated with petroleum products or other hazardous chemicals require special handling and disposal by licensed transporters. Licensed transporters will pick up spill contaminated materials for recycling or disposal. Save the shipping records for at least three years.
        iii. Waste oil contaminated industrial wipes and sorptive minerals:
            1. Perform the "one drop" test to ensure absorbents do not contain enough oil to be considered hazardous, as described in the MassDEP Waste Oil Management Guide (https://www.mass.gov/files/documents/2018/12/18/oilwiper.pdf).

2. Wring absorbents through a paint filter. If doing so does not generate one drop of oil, the materials are not hazardous.
3. If absorbents pass the "one drop" test they may be discarded in the trash unless contaminated with another hazardous waste.
    a. It is acceptable to mix the following fluids and handle them as waste oil:
        i. Waste motor oil
        ii. Hydraulic fluid
        iii. Power steering fluid
        iv. Transmission fluid
        v. Brake fluid
        vi. Gear oil
    b. **Do not mix** the following materials with waste oil. Store each separately:
        i. Gasoline
        ii. Antifreeze
        iii. Brake and carburetor cleaners
        iv. Cleaning solvents
        v. Other hazardous wastes
4. If absorbents do not pass the "one drop" test they should be placed in separate metal containers with tight fitting lids, labeled "Oily Waste Absorbents Only."

- If you need assistance containing and/or cleaning up the spill, or preventing it from discharging to a surface water (or an engineered storm drain system), contact your local fire department using the number listed below. **In the case of an emergency call 911**.
    - Blackstone Fire Department: 508-881-2323
- Contact the MassDEP 24-hour spill reporting notification line, toll-free at **(888)-304-1133**;
    - The following scenarios **are exempt** from MassDEP reporting requirements (see the MassDEP factsheet on oil and hazardous materials handling for more information: https://www.mass.gov/files/documents/2016/08/xm/spillmgm.pdf).
        i. Spills that are less than 10 gallons of petroleum and do not impact a water body
        ii. Spills that are less than one pound of hazardous chemicals and do not present an imminent health or safety hazard
        iii. Fuel spills from passenger vehicle accidents
        iv. Spills within a vault or building with a watertight floor and walls that completely contain all released chemicals

Reporting a Spill

When contacting emergency response personnel or a regulatory agency, or when reporting the contaminant release, be prepared to provide the following information:

1. Your name and the phone number you are calling from.
2. The exact address and location of the contaminant release.
3. Specifics of release, including:
    a. What was released;
    b. How much was released, which may include:

   i. Pounds
   ii. Gallons
   iii. Number of containers
4. Where was the release sent/what was contaminated, addressing:
   a. Pavement
   b. Soil
   c. Drains
   d. Catch basins
   e. Water bodies
   f. Public streets
   g. Public sidewalks
5. The concentration of the released contaminant.
6. What/who caused the release.
7. Is the release being contained and/or cleaned up or is the response complete.
8. Type and amount of petroleum stored on site, if any.
9. Characteristics of contaminant container, including:
   a. Tanks
   b. Pipes
   c. Valves

Maintenance and Prevention Guidance

Prevention of spills is preferable to even the best response and cleanup. To mitigate the effects of a contaminant release, provide proper maintenance and inspection at each facility. To protect against contaminant release adhere to the following guidance:

- Ensure all employees are properly trained to respond in the case of a spill, understand the nature and properties of the contaminant, and understand the spill control materials and personnel safety equipment. Maintain training records of current personnel on site and retain training records of former personnel for at least three years from the date last worked at the facility.
- Provide yearly maintenance and inspection at all municipal facilities, paying particular attention to underground storage tanks. Maintain maintenance and inspection records on site.
- Implement good management practices where chemicals and hazardous wastes are stored:
   a. Ensure storage in closed containers inside a building and on an impervious surface wherever possible.
   b. If storage cannot be provided inside, ensure secondary containment for 110 percent of the maximum volume of the storage container.
   c. Locate storage areas near maintenance areas to decrease the distance required for transfer.
   d. Provide accurate labels, Material Safety Data Sheets (MSDS) information, and warnings for all stored materials.
   e. Regularly inspect storage areas for leaks.
   f. Ensure secure storage locations, preventing access by untrained or unauthorized persons.
   g. Maintain accurate records of stored materials.
- Replace traditional hazardous materials such as pesticides and cleansers with non-hazardous products such as bio-lubricants which can reduce response costs in the case of a spill.

Maintain appropriately stocked spill response kits at each facilities and locations where oil, chemicals, or other hazardous materials are handled and stored.

Employee Training

- Employees who perform work with potential stormwater pollutants ##NUMBER times per year on proper spill procedures.
- Employees are also trained on stormwater pollution prevention and illicit discharge detection and elimination (IDDE) procedures.
- If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.

Attachments

1. Spill Response and Cleanup Contact List

Spill Response and Cleanup Contact List

Contact	Phone Number	Date and Time Contacted
Safety Officer: _____		
Facility Supervisor: _____		
Fire Department: _____		
MassDEP 24-Hour Spill Reporting	**(888)-304-1133**	
MassDEP Regional Offices:		
Northeast Regional Office	**(978) 694-3200**	
Southeast Regional Office	**(508) 946-2700**	
Central Regional Office	**(508) 792-7650**	
Western Regional Office	**(413) 784-1100**	
Hazardous Waste Compliance Assistance Line	**(617) 292-5898**	
Household Hazardous Products Hotline	**(800) 343-3420**	
Massachusetts Department of Fire Services	**(978) 567-3100 or (413) 587-3181**	
Licensed Site Professionals Association (Wakefield, MA) Licensed Site Professionals Board	**(781) 876-8915** **(617) 556-1091**	

SOP 7: Fuel and Oil Handling

Introduction

Spills, leaks, and overfilling can occur during handling of fuels and petroleum-based materials, representing a potential source of stormwater pollution, even in small volumes. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to municipal employees on a variety of ways by which fuels and petroleum-based materials can be delivered, as well as steps to be taken when petroleum products (such as waste oil) are loaded onto vehicles for offsite disposal or recycling. Delivery, unloading, and loading of waste oils are hereafter referred to as "handling." Attached is a fuel delivery form checklist.

Procedures

The Town of Blackstone will implement the following fuel and oil handling procedures to help reduce the discharge of pollutants from the MS4:

General Guidelines

For all manners of fuel and oil handling described below, a member of the facility's Pollution Prevention Team (if the facility has a SWPPP) or another knowledgeable person familiar with the facility should be present during handling procedures. This person should ensure that the following are observed:

- There is no smoking while fuel handling is in process or underway.
- Sources of flame are kept away while fuel handling is being completed. This includes smoking, lighting matches, carrying any flame, or carrying a lighted cigar, pipe, or cigarette.
- The delivery vehicle's hand brake is set and wheels are chocked while the activity is being completed.
- Catch basins and drain manholes are adequately protected.
- No tools are to be used that could damage fuel or oil containers or the delivery vehicle.
- No flammable liquid should be unloaded from any motor vehicle while the engine is operating, unless the engine of the motor vehicle is required to be used for the operation of a pump.
- Ensure that local traffic does not interfere with fuel transfer operations. If it does, make appropriate accommodations.
- The attending persons should watch for any leaks or spills:
    - Any small leaks or spills should be immediately stopped, and spilled materials absorbed and disposed of properly. Follow the procedures in SOP 4: Spill Response and Cleanup.
    - In the event of a large spill or one that discharges to surface waters or an engineered storm drain system, the facility representative should activate the facility's Stormwater Pollution Prevention Plan (SWPPP) and report the incident as specified in the document.

Delivery by Bulk (Tanker) Truck

Procedures for the delivery of bulk fuel should include the following:

- The truck driver should check in with the facility upon arrival.
- The facility representative should ensure that the appropriate spill cleanup and response equipment and personal protective equipment are readily available and easily accessible. Refer to SOP 4: Spill Response and Cleanup for examples of spill cleanup and response materials.
- The facility representative should check to ensure that the amount of delivery does not exceed the available capacity of the tank.

  - A level gauge can be used to verify the level in the tank.
  - If a level gauge is not functioning or is not present on the tank, the tank should be stick tested prior to filling.
- The truck driver and the facility representative should both remain with the vehicle during the delivery process.
- The truck driver and the facility representative should inspect all visible lines, connections, and valves for leaks.
- When delivery is complete and the hoses are removed, buckets should be placed underneath connection points to catch drippings.
- The delivery vehicle should be inspected prior to departure to ensure that the hose is disconnected from the tank.
- The facility representative should inspect the fuel tank to verify that no leaks have occurred, or that any leaked or spilled material has been cleaned and disposed of properly.
- The facility representative should gauge tank levels to ensure that the proper amount of fuel is delivered, and collect a receipt from the truck driver.

Delivery of Drummed Materials

Drummed materials may include motor oil, hydraulic fluid, transmission fluid, or waste oil from another facility (as approved). Procedures for the delivery of drummed materials should include the following:

- The truck driver should check in with the facility upon arrival.
- The facility representative should ensure that the appropriate spill cleanup and response equipment and personal protective equipment are readily available and easily accessible Refer to SOP 4: Spill Response and Cleanup for examples of spill cleanup and response materials. The facility representative should closely examine the shipment for damaged drums.
  - If damaged drums are found, they should be closely inspected for leaks or punctures.
  - Breached drums should be removed to a dry, well-ventilated area and the contents transferred to other suitable containers.
  - Drums should be disposed of in accordance with all applicable regulations.
- Drummed materials should not be unloaded outdoors during wet weather events.
- The truck driver and the facility representative should both remain with the vehicle during the delivery process.
- Drums should be handled and unloaded carefully to prevent damage.
- Upon completion of unloading, the facility representative should inspect the unloading point and the drums to verify that no leaks have occurred, that any leaked or spilled material has been cleaned up and disposed of properly, and that the unloaded drums are not leaking.
- The facility representative should check to ensure that the proper amount of fuel or other material is delivered, and collect a receipt from the truck driver.

Removal of Waste Oil from the Facility

When waste oil or similar oil products need to be removed from the premises, only haulers certified to transport waste oil should be utilized. Procedures should include the following:

- The disposal truck driver should check in with the facility upon arrival.

- The facility representative should ensure that the appropriate spill cleanup and response equipment and personal protective equipment are readily available and easily accessible. Refer to SOP 4: Spill Response and Cleanup for examples of spill cleanup and response materials. The truck driver and the facility representative should both remain with the vehicle during the tank draining process.
- When draining is complete and the hoses are removed, buckets should be placed underneath connection points to catch drippings.
- The facility representative should inspect the loading point and the tank to verify that no leaks have occurred, or that any leaked or spilled material has been cleaned up and disposed of properly.
- The facility representative should collect a receipt from the truck driver.
- When draining bulk oil tanks:
    - The facility representative should verify that the volume of waste oil in the tank does not exceed the available capacity of the disposal hauler's vehicle.
    - The disposal hauler vehicle should be inspected prior to departure to ensure that the hose is disconnected from the tank.

Employee Training

- Employees who handle or deliver fuel and/or oil are trained on proper procedures.
- Employees are also trained on stormwater pollution prevention, illicit discharge detection and elimination (IDDE) procedures, and spill and response procedures.
- If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.

Attachments

1. Fuel Delivery Checklist

Related Standard Operating Procedures

- SOP 4: Spill Response and Cleanup

FUEL DELIVERY FORM

TOWN OFBLACKSTONE

Date: _____

Time of Arrival: _____

Time of Departure: _____

Truck Number: _____

Name of Truck Driver: _____

Name of Town Employee: _____

BEFORE UNLOADING:

Is all spill response equipment and personal protective equipment in place?

Yes ☐ **No** ☐

In the case of bulk fuel delivery, does tank capacity exceed the amount of delivery?

Yes ☐ **No** ☐ **N/A** ☐

In the case of drum fuel delivery, are all drums free of leaks and punctures?

Yes ☐ **No** ☐ **N/A** ☐

COMMENCE UNLOADING. REMAIN WITH VEHICLE AT ALL TIMES.

AFTER UNLOADING IS COMPLETE:

Have all fuel containers, including the vehicle, been inspected for leaks?

Yes ☐ **No** ☐

Has the ground at the unloading point been inspected for evidence of leaks?

Yes ☐ **No** ☐

If there are any leaks or spills, has the material been properly cleaned?

Yes ☐ **No** ☐

Has the correct amount of fuel been delivered?

Yes ☐ **No** ☐

Has a receipt been collected?

Yes ☐ **No** ☐

DELIVERY IS COMPLETE.

SOP 11: Oil/Water Separator (OWS) Maintenance

Oil/water separators (OWS), also known as gas/oil separators, are structural devices intended to provide pretreatment of floor drain water from industrial and garage facilities. An OWS allows oils (and substances lighter than water) to be intercepted and be removed for disposal before entering the sanitary sewer system. Substances heavier than water settle into sludge at the bottom of the unit. The remaining water passes through the unit into the sanitary sewer system.

OWS units are generally required where petroleum-based products, wastes containing petroleum, or oily and/or flammable materials are used, produced, or stored. OWS units should not be used to manage stormwater or flow from vehicle washing facilities. High flow rates through an OWS will reduce the structure's ability to separate materials. Detergents and solvents can emulsify oil and grease, allowing the particles to enter the sewer, so these should not be disposed of in drains entering the OWS.

General OWS Maintenance Requirements

1. Each OWS at a facility may receive different materials in different quantities, so the cleanout schedule may not be the same for every OWS at a facility.
2. Employees performing inspections of an OWS must be properly trained and be familiar with the maintenance of that specific structure, since function can vary based on design. Third-party firms may be utilized to perform quarterly inspections.
3. Do not drain petroleum, oil, or lubricants directly to an OWS. The structures are designed to manage these materials at low and medium concentrations in sanitary sewage, not as slug loads.
4. Do not drain antifreeze, degreasers, detergents, fuels, alcohols, solvents, coolant, or paint to the OWS.
5. Separator compartment covers should be tightly sealed to ensure floor drainage only enters the first compartment of the OWS.
6. Drains should be kept free of debris and sediment to the maximum extent practicable.
7. Spill cleanup materials should be maintained in the area served by the OWS. For more information on spill cleanup and response materials, refer to SOP 4, "Spill Response and Cleanup Procedures".

OWS Inspection Procedures

Daily inspection of an OWS should include a visual examination of the area served by the OWS for evidence of spills or leaks.

Weekly inspections of an OWS should include the following:

1. Visually examine the area served by the OWS for evidence of spills or leaks.
2. Inspect the point of discharge (i.e., sewer manhole) for evidence of petroleum bypassing the OWS.
3. Inspect drains for any signs of unauthorized substances entering the OWS.
4. Examine the OWS for signs of leaks or any malfunction.

Quarterly inspections of an OWS should include the following:

1. Complete tasks noted as appropriate for daily and weekly inspection.
2. Complete the Quarterly OWS Inspection Checklist, attached, during the inspection.
3. Take the following measurements to benchmark function of the OWS:
    A. Distance from rim of access cover to bottom of structure
    B. Distance from rim of access cover to top of sludge layer
    C. Depth of sludge layer (C = A – B)
    D. Distance from rim of access cover to the oil/water interface
    E. Distance from rim of access cover to the top of the liquid surface
    F. Depth of oil layer (F = D – E)

OWS Cleaning Procedures

Cleaning of the OWS is required when there has been a spill to the OWS that exceeds ten gallons of oil, one gallon of detergent or solvent, or any material prohibited by the owner of the sanitary sewer. Cleaning is also required when the levels of accumulated sludge and/or oil meet the manufacturer's recommended levels for cleaning. This will vary based on the manufacturer of the OWS. If the manufacturer's recommendations are unknown, the following guidelines are appropriate for determining when to clean:

1. When sludge accumulates to 25% of the wetted height of the separator compartment; or
2. When oil accumulates to 5% of the wetted height of the separator compartment; or
3. When 75% of the retention capacity of the OWS is filled.

Cleaning should be performed a minimum of once per year. When cleaning is required, it shall be performed by licensed OWS maintenance companies. Materials removed from the OWS must be disposed of in accordance with Massachusetts Hazardous Waste Regulations, 310 CMR 30.00.

Documentation of Cleaning and Service

The operator of the premises where the OWS is located shall maintain a log describing the date and type of all inspections, service and maintenance performed in connection with the Separator. Documentation shall include the identity of the inspector (or the identity of the person or entity that performed the service and/or maintenance). Records shall also document the amount of residue removed from the OWS each time it was cleaned, and how removed materials were disposed. This documentation shall be maintained for a minimum of six years.

Attachments

1. Quarterly OWS Inspection Checklist

Related Standard Operating Procedures

1. SOP 4, Spill Response and Cleanup Procedures

OIL/WATER SEPARATOR (OWS)
QUARTERLY INSPECTION CHECKLIST

Facility: _____

OWS Location: _____

Inspected By: _____

Date: _____

Visual Inspection	Are there any signs of spills or leaks in the general area?	**Yes** ☐ **No** ☐
	Is there any evidence of petroleum bypassing the OWS?	**Yes** ☐ **No** ☐
	Are there any unauthorized substances entering the OWS?	**Yes** ☐ **No** ☐
	Does the OWS exhibit any signs of leaks or malfunctions?	**Yes** ☐ **No** ☐

If you answered "Yes" to any of the above questions, further inspection, repair, and/or cleaning may be necessary.

Measurements	A	Distance from rim of access cover to bottom of structure	
	B	Distance from rim of access cover to top of sludge layer	
	C = A - B	Depth of sludge layer	
	D	Distance from rim of access cover to the oil/water interface	
	E	Distance from rim of access cover to the top of the liquid surface	
	F = D - E	Depth of oil layer	

If the values for "C" and/or "F" are greater than those in the manufacturer's recommendations, the OWS must be cleaned by a licensed OWS maintenance company.

Appendix D

Stormwater Training Documentation

FUSS & O'NEILL

Stormwater Training Documentation

Blackstone, Massachusetts

Date: _____ Training Duration: _____

Training Session Title: _____

Topics Covered: _____

Name	**Title**	**Signature**

Appendix E

Site Inspection Report Forms

FUSS & O'NEILL

Stormwater Site Inspection Report

General Information			
Facility Name	Blackstone Valley Regional Recycling Center		
Date of Inspection	Insert Date	**Start/End Time**	Insert Start/End Time
Inspector's Name(s)	Insert Name		
Inspector's Title(s)	Insert Title		
Inspector's Contact Information	Insert Contact Info		
Inspector's Qualifications	Insert qualifications or add reference to the SWPPP		

Weather Information

Weather at time of this inspection?

❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snow ❑ High Winds

❑ Other: Temperature:

Have any previously unidentified discharges of pollutants occurred since the last inspection? ❑Yes ❑No

If yes, describe: Describe

Are there any discharges occurring at the time of inspection? ❑Yes ❑No

If yes, describe: Describe

Areas of Materials or Activities Exposed to Stormwater

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
1	**Equipment Storage and Maintenance/Repair**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions
2	**Bulky Waste and Metal Waste Storage**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions
3	**Waste Oil Storage**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
4	**Waste Oil Storage**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions
5	**Recyclables Collection Area**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions
6	**Electronic Waste Containers**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions
7	**Mercury-Containing Waste Container/Light Bulb Waste Storage**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions
8	**Brush and Yard Waste Area**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions
9	**Paint and Propane Storage**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions
10	**Recyclable Wood Storage**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
11	**Snow Storage (Seasonal)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	Describe Corrective Actions

Control Measures

	Structural Control Measure	Control Measure is Operating Effectively?	If No, In Need of Maintenance, Repair, or Replacement?	Corrective Action Needed and Notes (identify needed maintenance and repairs, or any failed control measures that need replacement)
1	**Prevent or Minimize Exposure**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions
2	**Good Housekeeping**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions
3	**Preventative Maintenance**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions
4	**Spill Prevention and Response**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions

	Structural Control Measure	Control Measure is Operating Effectively?	If No, In Need of Maintenance, Repair, or Replacement?	Corrective Action Needed and Notes (identify needed maintenance and repairs, or any failed control measures that need replacement)
5	**Erosion and Sediment Control**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions
6	**Management of Runoff**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions
7	**Employee Training**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions
8	**Maintenance of Control Measures**	❑Yes ❑No	❑ Maintenance ❑ Repair ❑ Replacement	Describe Corrective Actions

Non-Compliance

Describe any incidents of non-compliance observed and not described above:

Describe Non-compliance

Additional Control Measures

Describe any additional control measures or changes to the SWPPP needed to comply with the permit requirements:

Describe Additional Controls Needed

Notes

Use this space for any additional notes or observations from the inspection:

Additional Notes

Print inspector name and title:

_____

Signature: _____ **Date:** _____

FUSS & O'NEILL

Quarterly Visual Assessment Form– additional form when stormwater discharge is occurring

(Complete a separate form for each outfall you assess)

Name of Facility: Blackstone Valley Regional Recycling Center

Outfall Name: Name "Substantially Identical Outfall"? ☐ No ☐ Yes (identify substantially identical outfalls):

Person(s)/Title(s) collecting sample: Name/Title

Person(s)/Title(s) examining sample: Name/Title

Date & Time Discharge Began (approx.): Enter date and time

Date & Time Visual Sample Collected: Enter date and time

Date & Time Visual Sample Examined: Enter date and time

Nature of Discharge: ☐ Rainfall ☐ Snowmelt

Parameter							
Color	☐ None	☐ Other (describe):					
Odor	☐ None	☐ Musty	☐ Sewage	☐ Sulfur	☐ Sour	☐ Petroleum/Gas _____	
	☐ Solvents	☐ Other (describe):					
Clarity	☐ Clear	☐ Slightly Cloudy	☐ Cloudy	☐ Opaque	☐ Other		
Floating Solids	☐ No	☐ Yes (describe):					
Settled Solids*	☐ No	☐ Yes (describe):					
Suspended Solids	☐ No	☐ Yes (describe):					
Foam (gently shake sample)	☐ No	☐ Yes (describe):					
Oil Sheen	☐ None	☐ Flecks	☐ Globs	☐ Sheen	☐ Slick		
	☐ Other (describe):						
Other Obvious Indicators of Stormwater Pollution	☐ No	☐ Yes (describe):					

* Observe for settled solids after allowing the sample to sit for approximately one-half hour.

Detail any concerns, additional comments, descriptions of pictures taken, and any corrective actions taken below (attach additional sheets as necessary). Insert details

A. Name: B. Title:

C. Signature: D. Date Signed:

Appendix J- Blackstone PSIR

Weston & Sampson℠

westonandsampson.com

WESTON & SAMPSON ENGINEERS, INC.
55 Walkers Brook Drive, Suite 100
Reading, MA 01867
tel: 978.532.1900

REPORT

September 2022

CITY OF
Blackstone
MASSACHUSETTS

MS4 Permit Compliance
Phosphorus Source Identification Report
UPDATED DRAFT JANUARY 2023

TABLE OF CONTENTS

Page

TABLE OF CONTENTS i

LIST OF TABLES ii

LIST OF APPENDICES iii

1.0 REGULATORY SUMMARY AND PURPOSE 1-1
Waterbody Descriptions 1-1
Blackstone River 1-1
Crane Pond 1-2
Fox Brook 1-2
Lake Hiawatha 1-2
Mill River 1-3

2.0 LITERATURE REVIEW 2-1
Literature Review 2-1
2017 Water Quality and Streamflow Analysis 2-1
Blackstone River Water Quality Monitoring 2-1
Historic Sampling Data 2-2

3.0 CATCHMENT AREA CHARACTERISTICS 3-1
Available GIS Mapping 3-1
Directly Connected Impervious Area 3-1

4.0 POLLUTANT LOADING ANALYSIS AND PRIORITIZATION OF CATCHMENTS WITH HIGHER POTENTIAL PHOSPHORUS LOADS 4-1
Phosphorus Load Export Rates 4-1
Results 4-2
4.2.1 Catchment Descriptions 4-2
Dry and Wet Weather Outfall Screening and Sampling 4-4
Catchment Ranking Matrix 4-5

5.0 BEST MANAGEMENT PRACTICE (BMP) RETROFIT OPPORTUNITIES 5-1
5.1 Potential Retrofit Sites 5-1
Rathbun Street 5-1
Washington Street 5-2
Liberty Hill Drive 5-2
Reilly Avenue 5-2
John F. Kennedy Elementary School 5-2
Mendon Street at Lincoln Street 5-2
Summer Street 5-2
Rocco Drive 5-3
5.2 Implementation 5-3

6.0 REFERENCES 5-1

LIST OF TABLES

Table 1..... Blackstone River Water Quality Monitoring Program Sampling Sites

Table 2.....Blackstone River Water Quality Monitoring Program River Sampling Data

Table 3..... Land Use in MS4 Catchment Areas in Blackstone

Table 4.....Conversion of MassGIS 2016 Land Use Codes to EPA Land Use Codes

Table 5..... EPA Land Use Classes and Corresponding Sutherland Equations

Table 6.....DCIA and Percent Connectivity in MS4 Catchment Areas

Table 7..... Phosphorus Load Export Rates by Land Use

Table 8.....Pollutant Loading Analysis Results – Top 10 Catchments

Table 9.....Dry Weather Phosphorus Sampling Results

Table 10..... High Priority Catchment Ranking

Table 11.....Potential BMP Retrofit Sites

LIST OF APPENDICES

Appendix A ..... Blackstone MS4 Map

Appendix B ..... Impervious Area and DCIA Results for All Catchments

Appendix C ..... Land Use/Land Cover Grid

Appendix D ..... Pollutant Loading Analysis Results

Appendix E ..... Catchment Prioritization and Ranking

Appendix F ..... BMP Retrofit Cut Sheets, Examples, and Working Designs

1.0 REGULATORY SUMMARY AND PURPOSE

The 2016 MS4 Permit includes specific requirements for MS4 operators that discharge to impaired waterbodies where pollutants typically found in stormwater—specifically nutrients, solids, bacteria/pathogens, chloride, metals, and oil and grease—are the cause of the impairment and there is not a Total Maximum Daily Load (TMDL) approved by USEPA. Additional requirements for phosphorus impairments include supplementary public education efforts, specific BMP design standards, increased street sweeping, and the development of a Phosphorus Source Identification Report (PSIR) for each waterbody with a phosphorus impairment. Waterbodies in Blackstone that are impaired for phosphorus include the Blackstone River; all stormwater discharges in Blackstone are tributary to the Blackstone River.

This PSIR has been developed for the entire Town of Blackstone, as the town is entirely within the Blackstone River Watershed. In accordance with permit requirements, this report includes the following elements:

1. A calculation of the total MS4 areas draining to the water quality limited receiving water, incorporating updating mapping of the MS4 and catchment delineations;
2. All screening and monitoring results targeting the receiving water;
3. Impervious area and Directly Connected Impervious Area (DCIA) for the target catchment area(s);
4. Identification, delineation, and prioritization of potential catchments with high phosphorus loadings; and
5. Identification of potential retrofit opportunities or opportunities for the installation of structural BMPs during redevelopment, including the removal of impervious area.

Waterbody Descriptions

Blackstone is entirely located within the Blackstone River Watershed, meaning that every town-owned outfall is tributary to the Blackstone River. Since the Blackstone River is impaired for phosphorus, the Town must develop this PSIR for the entirety of its regulated area. A description of receiving waters in Blackstone, as well as the Blackstone River, is included below.

Blackstone River

The Blackstone River begins in Worcester, Massachusetts, flowing 46 miles south through several towns in Massachusetts and Rhode Island before discharging into the Narragansett Bay. The river comprises a drainage area of approximately 540 square miles. Sanitary waste disposal and heavy industrial usage in the 1800s by textile, leather, metal and woodworking companies left the Blackstone River exceptionally polluted by the early 1900s. A water quality survey of the river was first conducted by the Massachusetts Division of Water Pollution Control (DPWC), which started publishing data on the Blackstone River Basin in 1964. In 1975, the Blackstone River Basin Water Quality Management Plan was published, which set stream water-quality goals, effluent limitations for individual dischargers and a schedule for pollution abatement projects. In 1988, the Blackstone River Valley National Heritage Corridor was established by Congress in Massachusetts and Rhode Island to protect the valley's historic, cultural, and natural resources.

The Blackstone River has since consistently been listed on the Massachusetts Integrated List of Waters, or 303(d) list due to a variety of impairments. The Town of Blackstone is tributary to the southernmost

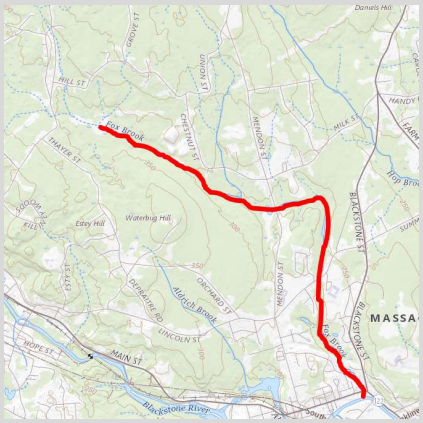
region of the Blackstone River within Massachusetts (MA51-06), from Millville to the Rhode Island Border, which is listed on the 2018/2020 Massachusetts Integrated List of Waters, or 303(d) list, for cadmium, copper, DDT in fish tissue, Escherichia Coli (E. Coli), fish bioassessments, lead, PCBs in fish tissue, total phosphorus, and total suspended solids. The Blackstone River crosses Blackstone from west to east. Water bodies in Blackstone that are tributary to the Blackstone River include Crane Pond, Fox Brook, Lake Hiawatha, and the Mill River.

Crane Pond

Crane Pond (MA51030), is a one-acre waterbody located in the western portion of town near Mendon Street; it is fed by Fox Brook and flows downstream to the Blackstone River. This water body does not have any impairments included on the 2018/2020 303(d) list.



Crane Pond Locus Map (USGS)



Fox Brook Locus Map (USGS)

Fox Brook

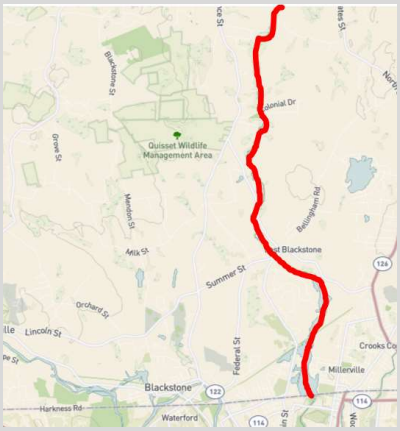
Fox Brook (MA51-39) flows 3.4 miles from its headwaters in Millville to the Blackstone River. The brook flows 0.1 mile through Crane Pond. The brook flows into Blackstone from the west and into the Blackstone River off Main Street near the Blackstone Public Library. The Town owns a large conservation area surrounding the brook downstream of Crane Pond. This waterbody is listed on the 2018/2020 303(d) list as impaired for E. Coli.

Lake Hiawatha

Lake Hiawatha (MA51062) is a 58-acre waterbody located in Blackstone and Bellingham, at the Town boundary. The waterbody outlets to the Mill River. This water body does not have any impairments included on the 2018/2020 303(d) list.



Lake Hiawatha Locus Map (USGS)



Mill River Locus Map (USGS)

Mill River

The Mill River (MA51-36) flows 15.9 miles from North Pond in Milford and Upton to the Rhode Island border. The river is a primary tributary to the Blackstone River, its confluence with the Blackstone is in Rhode Island. The river flows into Blackstone through Mendon from the north, and travels south to the Rhode Island border of Town, including Harris Pond. The Town owns conservation land surrounding the river and Harris Pond. The river is included on the 2018/2020 303(d) list as impaired for E. Coli.

2.0 LITERATURE REVIEW

Literature Review

Given that water quality in the Blackstone River has been an ongoing point of concern, many studies, reports, and remediation plans have been developed forthis water body. The following studies and reports were reviewed as part of the Phosphorus Source Identification Report:

- Analysis of Trends of Water Quality and Streamflow in the Blackstone, Branch, Pawtuxet, and Pawcatuck Rivers, Massachusetts and Rhode Island 1979 to 2015; Prepared by Jennifer G. Savoie, John R. Mullaney, and Gardner C. Bent, 2017. https://pubs.usgs.gov/sir/2016/5178/sir20165178.pdf
- Blackstone River Water Quality Monitoring Program 2020 Sampling Season Report, Prepared for Karla Sangrey by Marie-Francoise Hatte and Cameron Richards, August 2021. https://www.ubcleanwater.org/sites/g/files/vyhlif3951/f/uploads/2020_blackstone_report.pdf

2017 Water Quality and Streamflow Analysis

The 2017 Water Quality and Streamflow Analysis performed by USGS included long-term trends in flow-normalized nutrient concentrations and loads for total nitrogen, nitrite plus nitrate, total phosphorous and chloride at three water quality monitoring stations along the Blackstone River in Massachusetts and Rhode Island for water years 1979-2015. This study concluded that flow-normalized loads for total phosphorus decreased in the Blackstone River from 1979 to 2015 by up to 69 percent. This analysis showed that the total phosphorous concentration generally was less than 1 mg/L in the Blackstone River; and that from about 1992 to 2007 total phosphorous flow-normalized concentrations and loads increased and then returned to a decreasing pattern after February of 2007.

Blackstone River Water Quality Monitoring

The 2020 Water Quality Monitoring Report includes data collected along the mainstem of the Blackstone River between July and November 2020, and trends in total phosphorous, total nitrogen, and chlorophyll-a data observed since 2012 for the Upper Blackstone WWTF. The Upper Blackstone Water Pollutant Abatement District (UBWPAD) has been performing monthly water quality monitoring of the Blackstone River since 2010 in partnership with CDM Smith, Normandeau Associates, and the University of Massachusetts Amherst. Since 2012, Upper Blackstone has supported consistent annual water quality monitoring at sampling locations along the mainstem of the river. The data from this program is used for development of watershed and water quality assessments for the MassDEP's Integrated List of Waters. Phosphorus results from historical samples (2000-2006) suggested high concentrations of phosphorus in the Blackstone River. In 2009, the Upper Blackstone Wastewater Treatment Facility completed a $180 million capital improvement plan to meet effluent limits and minimize nutrient loads in response to an Administrative Order of Consent signed by the facility and the EPA. Upper Blackstone has continued to improve its treatment methods to minimize nutrient loads to the river.

The 2020 Blackstone River Water Quality Monitoring Program Report states that the total phosphorous effluent load from the Upper Blackstone facility has been reduced by 90% since the treatment facility upgrades were brought online, compared to the average pre-upgrade nutrient loads between 2006 and 2008. The 2017 Report states that total phosphorous concentrations in the Blackstone River were at or slightly higher than the MassDEP 2016 Consolidated Assessment and Listing Methodology (CALM) screening threshold of 100 µg/L. The 2020 report also indicated slightly higher total phosphorous

concentrations than in the past with only 55% of the samples collected below the 100 μg/L MassDEP guidance value.

Historic Sampling Data

Historic sampling data from the Blackstone River is available from the 2017 and 2020 studies. Figure 1 shows the total phosphorus trends from 1979 to 2015. The flow-normalized phosphorus concentrations and loads in the Blackstone River indicate decreasing loads between 1979 and 2015 up to 69 percent, besides a brief increasing pattern between 1992 and 2007; the report states that changes in concentrations and loads may reflect changes in source contributions and changes in land use and atmospheric deposition. The sampling sites along the mainstem of the river from the 2020 study and the location of the sites, with river mile increasing in the upstream direction, are included in Table 1. The mean summer (June-September) total phosphorous concentration at each sampling location is included in Table 2. The summer average total phosphorus concentration at the upstream-most site was comparable to previous years, and the yearly average at this site was the lowest since the study began. The other Massachusetts sites below the river's confluence point with the UBWPAD had higher mean summer concentrations than in recent years. However, the 2020 yearly mean concentrations for Massachusetts sampling locations are much lower than historical levels from 1996 to 2008 and are in the lower range of concentrations measured since 2012.

Figure 1: Total Phosphorus Concentrations in the Blackstone River (Savoie, Mullaney, Bent)

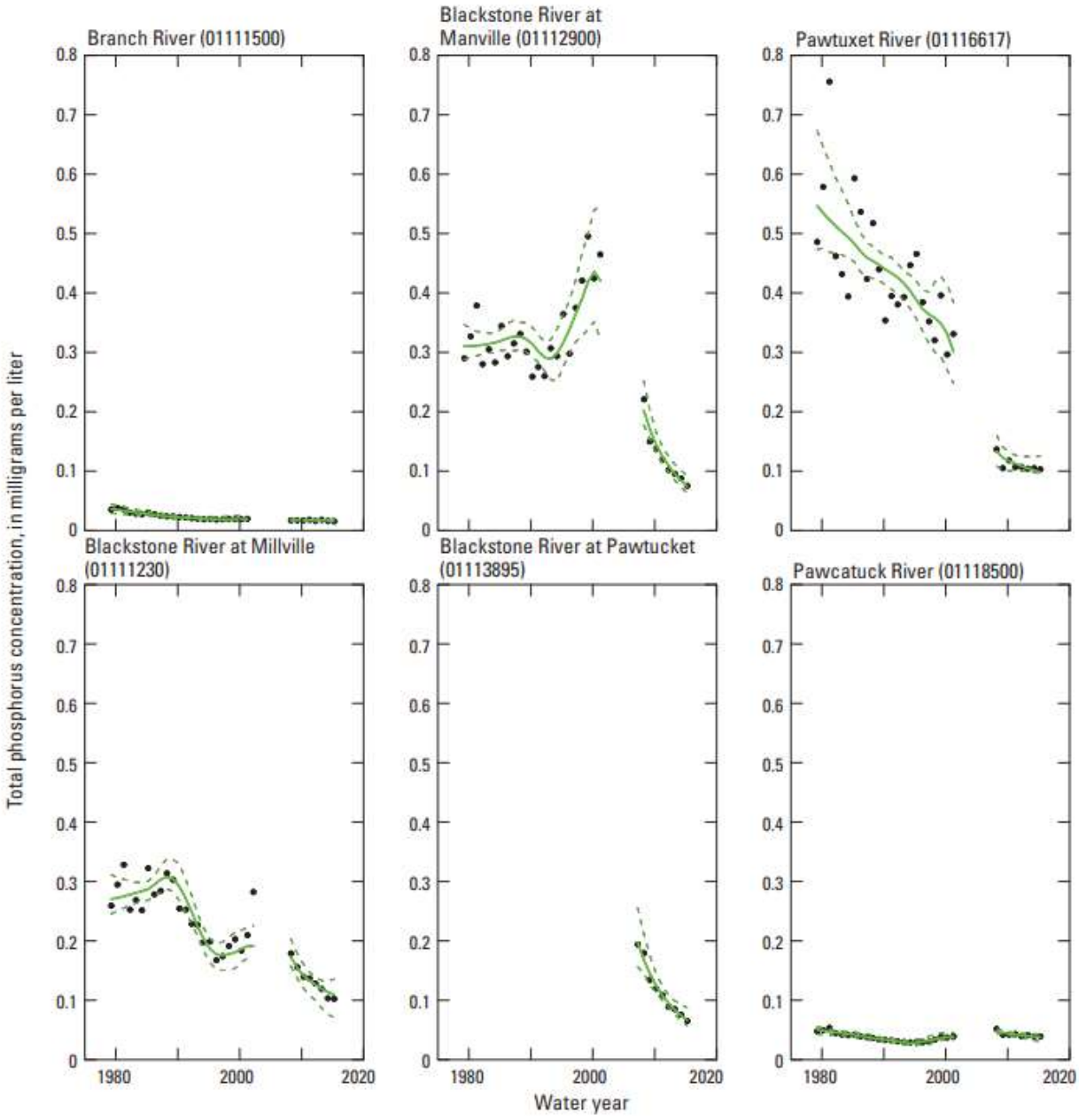


Figure 8. Ninety-percent confidence bands for total phosphorus concentrations in the Branch, Blackstone, Pawtuxet, and Pawcatuck Rivers in Massachusetts and Rhode Island, 1979 through 2015 (2007 through 2015 for Blackstone River at Pawtucket). Black dots are the estimated annual mean concentrations, solid green lines show the annual flow-normalized concentrations, and dashed green lines show the 5th and 95th percentiles of the annual flow-normalized concentrations. Gaps in lines indicate that data were not collected. Full station names are listed in table 1.

Table 1: 2020 Blackstone River Water Quality Monitoring Program Sampling Sites		
Site ID#	Site Name	River Mile
W0680	New Millbury Street Bridge, Worcester, MA	45.2
UBWAPD2	Confluence Site, Millbury, MA	44.6
W1258	Central Cemetery, Millbury, MA	42.7
W1242	Route 122A, Grafton, MA	36.3
W0767	Sutton Street Bridge, Northbridge, MA	33.4
W1779	Below Rice City Pond Sluice Gates, Hartford Street, Uxbridge, MA	27.8
RMSL	State Line, RI	15.5
R116	Route 1167 Bikepath Bridge, Pawtucket, RI	6.3
RMSD	Slater Mill Dam, Pawtucket, RI	0.0

Table 2 Blackstone River Water Quality Monitoring Program River Sampling Data Mean Summer Total Phosphorous Concentration 2012-2020, Collected by University of Massachusetts Water Resources Center									
TP (ppb)	W0680	UBWPAD2	W1258	W1242	W0767	W1779	RMSL	R116	RMSD
2012	77	143	157	157	157	220	185	140	87
2013	50	83	83	80	NA	137	77	70	60
2014	100	707	453	403	246	264	215	173	98
2015	71	130	115	81	106	137	86	76	82
2016	60	231	23	161	215	221	76	71	129
2017	55	152	131	112	157	166	83	74	91
2018	60	156	94	97	126	154	136	99	87
2019	50	134	108	90	70	123	57	52	61
2020	55.1	199.6*	137.3*	156.3	132.0	174.4*	62.0	85.0	50.7

*These means include June 1 data.

3.0 CATCHMENT AREA CHARACTERISTICS

Appendix H of the 2016 MA MS4 Permit requires permittees developing a Phosphorus Source Identification Report to calculate impervious and directly connected impervious area (DCIA) for all catchments tributary to the waterbodies of concern. As all of Blackstone is considered tributary to the Blackstone River, impervious area and DCIA were calculated for each delineated catchment area in town. This section discusses the procedure for and results of these calculations.

Available GIS Mapping

The Town of Blackstone began mapping its drainage infrastructure under the 2003 MS4 Permit and made updates under the 2016 MS4 Permit. The stormwater outfalls and infrastructure mapping used in this report were received from the Town; the stormwater catchments utilized in this report were manually delineated by Fuss & O'Neill in 2020 using existing infrastructure mapping overlaid on a digital elevation model and contours from MassGIS. Drainage infrastructure is not yet mapped for the Harris Pond Village development, but catchments were delineated for the neighborhood and, since it was recently accepted by the Town, these catchments have been included. Blackstone's mapping of the Town's drainage system will be updated during this permit term as the Town undertakes wet weather outfall sampling and catchment investigation efforts. There are currently 111 outfalls and interconnections that are owned by the Town of Blackstone and considered to be regulated under the permit. The total regulated drainage area—area discharging to a municipally-owned outfall or interconnection—in Blackstone is 798 acres (1.25 square miles), or approximately 11% of the Town's total area. Most drainage infrastructure in Blackstone is more than forty years old. A map of Blackstone's MS4 is included in Appendix A.

Land use data for the properties within the MS4 catchment areas, as well as impervious area delineations for roads and other rights-of-way, were collected from MassGIS' most recent (2016) land use data layer. Table 3 presents a summary of land use across all regulated catchment areas in Blackstone:

Table 3: Land Use in MS4 Catchment Areas in Blackstone

Land Use	Acres	Percent of Overall Area
Agriculture	4	1%
Commercial	9	1%
Forest	4	<1%
Mixed use, Other	8	1%
Open Land	82	10%
Residential – Multi-Family	64	8%
Residential – Single Family	444	55%
Right-of-Way	150	19%
Tax Exempt	34	4%
Unknown	2	<1%

Directly Connected Impervious Area

The land use data was used to calculate the percent of Directly Connected Impervious Area (DCIA) for each MS4 catchment area. Percent DCIA is calculated by applying the Sutherland Equation developed

in the 1995 publication *Methodology for Estimating the Effective Impervious Area of Urban Watersheds*[1] and updated in the 2014 memorandum titled *Overview of Methodology to Calculate Baseline Stormwater Phosphorus Loads and Phosphorus Load Reduction Requirements for the Charles River*[2]. In order to properly use the Sutherland Equations, the MassGIS land use codes were converted to EPA land use codes using the conversion methodology recommended by EPA and included in Table 4. Properties with an "Unknown" land use were considered as Commercial or Medium-density residential, which have the same Sutherland Equation. Weston & Sampson determined the amount and percent of impervious area in each MS4 catchment area for each land use, then used the appropriate Sutherland Equation to determine the percent DCIA for each land use in each catchment. These percentages were used to determine the total DCIA for each catchment. Table 5 lists the Sutherland Equation that was used for each land use type. Table 6 presents impervious area and DCIA statistics for the ten regulated catchments with the highest phosphorus loadings in Blackstone. DCIA statistics for all catchments in Blackstone are included in Appendix B.

Table 4: Conversion of MassGIS 2016 Land Use Codes to EPA Land Use Codes

MassGIS 2016 Code	MassGIS 2016 Use	EPA Code	EPA Use
7	Agriculture	7	Agriculture
3	Commercial	1	Commercial
6	Forest	8	Forest
4	Industrial	2	Industrial
20	Mixed Use, Other	1	Commercial
2	Open Land	9	Open Land
12	Residential- Multi-Family	5	High-Density Residential
11	Residential- Single Family	4	Medium-Density Residential*
55	Right-of-Way (Roads)	2	Industrial**
9	Tax-Exempt	6	Urban Public/Institutional

*EPA designates Medium-Density Residential as residential areas with parcel sizes between ¼ and ½ acre, which most closely matches this area[3]

**EPA considers all transportation uses, including roads, to be Industrial uses

Table 5: Land Use Classes and Corresponding Sutherland Equations (Source: EPA)

EPA Code	Land Use	Watershed Selection Criteria	Sutherland Equation (where IA(%) > 1)
1	Commercial	Average: Mostly storm sewered with curb and gutter, no dry wells or infiltration. Rooftops are directly connected.	DCIA%=0.4(IA%) ^ 1.2
2	Industrial	Average: Mostly storm sewered with curb and gutter, no dry wells or infiltration, rooftops are directly connected	DCIA%=0.4(IA%) ^ 1.2

[1] Sutherland, R.C., "Methodology for Estimating the Effective Impervious Area of Urban Watersheds", Watershed Protection Techniques, Vol. 2, No. 1, Fall 1995.
[2] Voorhees, Mark. Overview of Methodology to Calculate Baseline Stormwater Phosphorus Loads and Phosphorus Load Reduction Requirements for the Charles River. January 14, 2014.
[3] United States Environmental Protection Agency., "Methodology to Calculate Baseline Estimates of Impervious Area and Directly Connected Impervious Area for Massachusetts Communities". March 2010. https://www3.epa.gov/region1/npdes/stormwater/ma/IA-DCIA-Calculation-Methodology.pdf

Table 5: Land Use Classes and Corresponding Sutherland Equations (Source: EPA)			
EPA Code	Land Use	Watershed Selection Criteria	Sutherland Equation (where IA(%) > 1)
3	Low Density Residential	Somewhat connected: 50% not storm sewered, but open section roads, grassy swales, residential rooftops not connected, some infiltration	DCIA%=0.1(IA%) ^ 1.5
4	Medium Density Residential	Average: Mostly storm sewered with curb and gutter, no dry wells or infiltration, residential rooftops not directly connected	DCIA%=0.1(IA%) ^ 1.5
5	High Density Residential	Highly Connected: Same as above, but residential rooftops are connected	DCIA% = 0.4(IA%) ^ 1.2
6	Urban Public/ Institutional	Average: Mostly storm sewered with curb and gutter, no dry wells or infiltration, residential rooftops not directly connected	DCIA%=0.1(IA%) ^ 1.5
7	Agriculture	Mostly Disconnected: Small Percentage of urban area is storm sewered, or 70% or more infiltrated/disconnected	DCIA%=0.01(IA%) ^ 2
8	Forest	Mostly Disconnected: Small Percentage of urban area is storm sewered, or 70% or more infiltrated/disconnected	DCIA%=0.01(IA%) ^ 2
9	Open Land	Average: Mostly storm sewered with curb and gutter, no dry wells or infiltration, residential rooftops not directly connected	DCIA%=0.1(IA%) ^ 1.5
10	Water	n/a	n/a

Table 6: DCIA and Percent Connectivity in MS4 Catchment Areas					
Catchment Area	Catchment Size (Ac.)	IA (Acres)	DCIA (Acres)	DCIA (%)	Percent Connectivity (%)
Rathbun Interconnection	25.26	13.54	8.27	32.76	163.69
75	27.64	10.36	5.53	20.02	187.29
48	41.26	6.61	2.67	6.47	247.49
93	31.27	9.16	4.70	15.03	195.02
90	28.88	5.27	2.13	7.37	247.35
32	20.18	7.00	4.06	20.12	172.46
Rocco Drive	25.52	6.28	3.11	12.18	202.01
51	19.10	5.19	2.59	13.56	200.35
55	17.45	4.43	2.65	15.21	166.80
45	33.73	4.08	1.69	5.00	241.99
Note: Percent Connectivity is the percent of total impervious area which is connected.					

Many studies have been published in the past 15 years discussing the relationship between urban, impervious land cover and waterbody hydrology, habitat, biology, and ecosystem function. These studies have more recently included correlations between DCIA and biological indicators such as fish assemblages and algal blooms. Watersheds with as low as 4-6% IA and 1-5% DCIA typically begin to

show water quality impacts. While the DCIA in the Blackstone River Watershed exceeds this threshold, the calculated range of percent DCIA is expected for municipalities similar to Blackstone[4].

[4] Obropta, C.C. & Del Monaco, N. "Reducing Directly Connected Impervious Areas with Green Stormwater Infrastructure". *Journal of Sustainable Water in the Built Environment.* 2018. https://ascelibrary.org/doi/pdf/10.1061/JSWBAY.0000833

4.0 POLLUTANT LOADING ANALYSIS AND PRIORITIZATION OF CATCHMENTS WITH HIGHER POTENTIAL PHOSPHORUS LOADS

The 2016 MS4 Permit requires all Phosphorus Source Identification Reports to include the identification, delineation, and prioritization of potential catchments with high phosphorus loadings. The potential for a particular site or area to contribute phosphorus to stormwater varies based on land use, impervious coverage, directly connected impervious area, and soil type. Hydrologic soil group (HSG), or the soil's ability to infiltrate stormwater, is the most important soil characteristic for the purposes of this analysis. HSG is ranked from A to D, with type A soils more suited for infiltration, and type D soils more likely to contribute runoff.

To identify catchment areas with higher potential phosphorus loads, a model for each catchment area was developed using land use data (MassGIS, 2016) and soil HSG data from the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS). A land use/land cover grid was developed for the catchment areas in Blackstone. That grid, which calculated the areas of each combination of land use, land cover, and soil type in each catchment, is included as Appendix C.

Phosphorus Load Export Rates

Land use, impervious coverage, directly connected impervious area, and HSG have been utilized by EPA as part of the MS4 Permit to develop Phosphorus Load Export Rates (PLERs) for different combinations of those attributes in close geographical areas where there is no considerable difference in average annual rainfall. Table 7 presents the PLERs that are included in Attachment 1 of Appendix F of the 2016 Massachusetts MS4 Permit. Medium-density residential is the most prevalent land use in Blackstone, followed by right-of-way and open land. Tax-exempt land was assigned the same PLER as commercial and industrial land in accordance with permit guidance.

Table 7: Phosphorus Load Export Rates (PLERs) by Land Use		
Land Use Category	Land Surface Cover	PLER (lb/acre/year)
Commercial and Industrial	Directly Connected Impervious	1.78
	Pervious	*See Developed Pervious
Multi-Family and High Density Residential	Directly Connected Impervious	2.32
	Pervious	*See Developed Pervious
Medium Density Residential	Directly Connected Impervious	1.96
	Pervious	*See Developed Pervious
Low Density Residential	Directly Connected Impervious	1.52
	Pervious	*See Developed Pervious
Highway	Directly Connected Impervious	1.34
	Pervious	*See Developed Pervious
Forest	Directly Connected Impervious	1.52
	Pervious	0.13
Open Land	Directly Connected Impervious	1.52
	Pervious	*See Developed Pervious
Agriculture	Directly Connected Impervious	1.52
	Pervious	0.45
*Developed Pervious – HSG A	Pervious	0.03
*Developed Pervious – HSG B	Pervious	0.12
*Developed Pervious – HSG C	Pervious	0.21

Table 7: Phosphorus Load Export Rates (PLERs) by Land Use		
Land Use Category	Land Surface Cover	PLER (lb/acre/year)
*Developed Pervious – HSG C/D	Pervious	0.29
*Developed Pervious – HSG D	Pervious	0.37

Results

The land use/land cover grid shown in Appendix C, the directly connected impervious area (DCIA) determined for each catchment, and the PLERs included in Table 7 were used to calculate an estimated phosphorus load for each outfall. Disconnected impervious area, or the difference between impervious area and DCIA, was considered pervious coverage in HSG D to account for the fact that some runoff from disconnected impervious surfaces will be infiltrated before reaching the MS4. Each distinct area of the land use/land cover grid was multiplied by the appropriate PLER to determine its yearly phosphorus load, and the results were summed by catchment area. The ten catchments with the highest pollutant loading are presented in Table 8. The results of the pollutant loading analysis for all of the catchment areas are included in Appendix D. A map highlighting the top 10 catchment areas is included in Appendix E.

Table 8: Pollutant Loading Analysis Results – Top 10 Catchments					
Catchment Area	Receiving Water	Outfall Location	Catchment Size (Ac.)	DCIA (Ac.)	Phosphorus Loading (lb/yr)
Rathbun Interconnection	Woonsocket MS4	Rathbun Street	25.26	8.27	18.3
75	Blackstone River	Main Street	27.64	5.53	13.5
48	Tributary to Fox Brook	Milk Street	41.26	2.67	12.9
93	Fox Brook	Reilly Avenue	31.27	4.70	12.6
90	Tributary to Aldrich Brook	Mendon Street	28.88	2.13	10.1
32	Tributary to Mill River	Summer Street	20.18	4.06	10.0
Rocco Dr	Unknown	Rocco Drive	25.52	3.11	8.8
51	Tributary to Blackstone River	Chad Michael Court	19.10	2.59	8.7
55	Fox Brook	Lincoln Street	17.45	2.65	7.8
45	Hop Brook	Crestwood Drive	33.73	1.69	7.8

4.2.1 Catchment Descriptions

The characteristics of the ten catchments with the highest estimated phosphorus loading are summarized below:

1. Rathbun Interconnection – Discharges to Woonsocket, Rhode Island's MS4

   The catchment tributary to this interconnection covers 25 acres in the southeastern portion of town, including the portion of Rathbun Street south of Turbesi Park to the Rhode Island border, Richmond Street, Lloyd Street, and part of Valley Street. The interconnection discharges to

Woonsocket, Rhode Island's MS4 on Rathbun Street. The discharge location will be verified in the field. The most prominent land uses in this catchment are medium and high-density residential land and industrial land. The catchment is comprised of 54% impervious area and 32% directly connected impervious area; the soils are primarily hydrologic soil group (HSG) A. Potential sources of phosphorus in this catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that accumulate on roadways.

2. Outfall 75 – Discharges to the Blackstone River

The catchment tributary to Outfall 75 covers 28 acres in the southwestern portion of Town, including the area bounded by Main Street, Carrington Street, and Country Street. The outfall discharges to the Blackstone River. The most prominent land use in this catchment is medium-density residential land. The catchment is comprised of 38% impervious area and 20% directly connected impervious area; the soils are mostly HSG A or B. Potential sources of phosphorus in this catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that accumulate on roadways.

3. Outfall 48 – Tributary to Fox Brook

The catchment tributary to Outfall 48 covers 41 acres in the northwestern portion of town, consisting of Liberty Hill Drive and the surrounding area. The outfall discharges to a stream tributary to Fox Brook off Milk Street. The most prominent land use in this catchment is medium-density residential land. The catchment is 16% impervious area and 6% directly connected impervious area; the soils are mostly HSG B and C. Potential sources of phosphorus in this catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that accumulate on roadways.

4. Outfall 93 – Discharges to Fox Brook

The catchment tributary to Outfall 93 covers 31 acres in the southwestern portion of town, including most of Reilly Avenue, Mark Drive, Nancy Court, and Kimberly Lane. The outfall discharges to Fox Brook east of Reilly Avenue. The most prominent land use in this catchment is medium-density residential land. The catchment is 29% impervious area and 15% directly connected impervious area. The soils are mostly HSG A or B. Potential sources of phosphorus in this catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that accumulate on roadways.

5. Outfall 90 – Tributary to the Blackstone River

The catchment tributary to Outfall 90 covers 29 acres in the southwestern portion of Town, including part of Mendon Street and the intersection of Mendon Street and Lincoln Street. The outfall discharges to Aldrich Brook off Mendon Street which is tributary to the Blackstone River. The most prominent land use in this catchment is medium-density residential land. The catchment is 18% impervious area and 7% directly connected impervious area. The soils are mostly HSG C. Potential sources of phosphorus in this catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that accumulate on roadways.

6. Outfall 32– Tributary to the Mill River

The catchment tributary to Outfall 32 covers 20 acres in the central portion of Town. The catchment includes the portion of Summer Street between Blackstone Street and Rennie Drive.

The outfall discharges off Summer Street to a stream that is tributary to the Mill River. The most prominent land use in this catchment is medium-density residential land. The catchment is 35% impervious area and 20% directly connected impervious area; the soils are HSG A, B or C. Potential sources of phosphorus in the catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that may accumulate on roadways.

7. Rocco Drive Outfall – Tributary to the Blackstone River

The catchment tributary to the Rocco Drive outfall covers 26 acres, including Rocco Drive, Monica Lane and the surrounding area. The location of the outfall is unconfirmed; it likely discharges to a stream off Rocco Drive that is tributary to the Blackstone River. The most prominent land use in this catchment is medium-density residential. The catchment is 25% impervious area and 12% directly connected impervious area; the soils are mostly HSG A or B. Potential sources of phosphorus in this catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that accumulate on roadways.

8. Outfall 51– Tributary to the Blackstone River

The catchment tributary to Outfall 51 covers 19 acres in the southwestern portion of Town. It includes Chad Michael Court, the intersection of Orchard Street and Lincoln Street, and part of Mandy Drive. The outfall discharges off Chad Michael Court to a stream that is tributary to the Blackstone River. The most prominent land use in this catchment is medium-density residential land. The catchment is 27% impervious area and 15% directly connected impervious area; the soils are mostly HSG C. Potential sources of phosphorus in the catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that may accumulate on roadways.

9. Outfall 55 – Discharges to Fox Brook

The catchment tributary to Outfall 55 covers 17 acres in the central portion of Town, Residential Lane and the Residential Lane/ Lincoln Street intersection. The outfall discharges to Fox Brook off Lincoln Street. The most prominent land uses in this catchment are high-density residential and industrial land. The catchment is 25% impervious coverage and 15% directly connected impervious area; the soils are mostly HSG B. Potential sources of phosphorus in the catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that may accumulate on roadways.

10. Outfall 45 – Tributary to Hop Brook

The catchment tributary to Outfall 45 covers 34 acres in the northwestern portion of Town, including Centennial Drive and part of Crestwood Drive. The outfall discharges off Crestwood Drive to an area tributary to Hop Brook. The most prominent land use in this catchment is medium-density residential land. The catchment is 12% impervious area and 5% directly connected impervious area, and the soils are mostly HSG B. Potential sources of phosphorus in the catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that may accumulate on roadways.

Dry and Wet Weather Outfall Screening and Sampling

Dry weather screening and sampling was conducted at most regulated outfalls under the Town's jurisdiction in Blackstone by Fuss & O'Neill between February and July 2020, and by Weston & Sampson

in December 2022 in accordance with MS4 Permit requirements. The results of Fuss & O'Neill's sampling events were summarized in a 2021 report. Wet-weather outfall screening and sampling is planned and will be complete by the end of Permit Year 10, or June 30, 2028, as required by the 2016 MS4 Permit.

Dry weather flow was observed and sampled at 11 of the 101 outfalls that were screened by Fuss & O'Neill; the ten outfalls that were not screened were in the Harris Pond development. Dry weather flow was observed and sampled at 2 of the 20 outfalls that were screened by Weston & Sampson in 2022. Many of the samples resulted in non-detectable levels of phosphorus, 'ND'; sampling data is available for two of the outfalls downstream of the high priority catchments identified in Table 8. Fuss & O'Neill and Weston & Sampson used field kits to analyze samples for ammonia, chlorine, surfactants, temperature, salinity, and conductivity, and samples were sent to a laboratory to analyze samples for Escherichia coliform (E. coli), phosphorus, and other applicable pollutants of concern depending on the outfall's receiving water. The available dry-weather sampling results for phosphorus are presented in Table 9.

Table 9: Dry Weather Phosphorus Sampling Results

Outfall ID	Total Phosphorus (mg/L)
Rathbun_Intercon (INT-5)	0.12
HarrisPondVillage2	Parameter not sampled
8	ND
9	ND
27	0.11
35	ND
42	ND
48	0.13
54	ND
57	ND
58	ND
64	ND
65	0.15

While there is no benchmark criteria for phosphorus concentrations in the Massachusetts Surface Water Quality Standards, 0.1 mg/L has been used as a placeholder for outfall screening based on available literature. Outfalls 27, 48, and 65 exceeded the placeholder benchmark concentration of 0.1 mg/L during dry weather.

Catchment Ranking Matrix

The purpose of performing the pollutant loading analysis was to develop a priority ranking of the delineated catchments in Blackstone, with catchments with the highest potential phosphorus load considered highest priority. Since observed phosphorus concentrations in stormwater discharges can vary depending on the time of year the sampling is conducted, the size of the storm event, and other factors, the sample phosphorus concentrations were not considered when ranking the catchment areas.

The catchments with the highest potential pollutant loads, presented in Table 9 above, were all considered High Priority. The remaining catchments in Blackstone were determined to be lower priority. The ranking of high priority catchments is presented in Table 10; the ranking of all catchments in Blackstone is included in Appendix E. A figure highlighting the High Priority catchments is also included in Appendix E.

Table 10: High Priority Catchment Ranking

Rank	Receiving Outfall	Receiving Water	Phosphorus Loading (lb/year)	Relative Phosphorus Loading (lb/yr/ac)	Dry Weather Flow Observed	Dry-Weather Phosphorus Sampling Result (mg/L)
1	Rathbun Interconnection	Woonsocket MS4	18.3	0.7	Yes	0.12
2	75	Blackstone River	13.5	0.5	No	-
3	48	Tributary to Fox Brook	12.9	0.3	Yes	0.13
4	93	Fox Brook	12.6	0.4	No	-
5	90	Tributary to Aldrich Brook	10.1	0.3	No	-
6	32	Tributary to Mill River	10.0	0.5	No	-
7	Rocco Drive	Unknown	8.8	0.3	No	-
8	51	Tributary to Blackstone River	8.7	0.5	No	-
9	55	Fox Brook	7.8	0.4	No	-
10	45	Hop Brook	7.8	0.2	No	-

5.0 BEST MANAGEMENT PRACTICE (BMP) RETROFIT OPPORTUNITIES

In addition to a community-wide BMP retrofit inventory, the 2016 MS4 Permit requires permittees with discharges tributary to a phosphorus-impaired waterbody to identify potential retrofit opportunities in the sub-catchments tributary to those receiving waters as part of the PSIR. Retrofit opportunities may include the installation of structural BMPs during redevelopment or the removal of impervious area.

5.1 Potential Retrofit Sites

A number of factors were considered when identifying potential retrofit sites in the higher priority sub-catchments in Blackstone. In addition to municipal parcels, areas within the right-of-way were also considered for impervious area disconnection and/or reduction. Municipal ownership was considered the most important factor, as it is unlikely that the Town will be able to install a structural BMP on land that is privately owned unless the Town plans to acquire the property in question. Soils and available open space were also considered as site suitability characteristics. Projects within the right-of-way may be considered in conjunction with the Town's existing schedule for roadway and sidewalk improvements in the area. The identified locations for potential BMP retrofit, listed in order of catchment rank, are included in Table 11 and discussed in more detail below.

Table 11: Potential BMP Retrofit Sites

Site Address	Property Owner	Site Area (Ac.)	Soil Type	Existing Parcel Use	Catchment ID	Catchment Rank
Rathbun Street (Diana Street to Ethel Street)	Right-of-Way	N/A	A	-	Rathbun_ Intercon	1
Washington Street (Main Street to Brown Street)	Right-of-Way	N/A	A	-	75	2
Liberty Hill Drive	Right-of-Way	N/A	B/C	-	48	3
Reilly Avenue (Mendon Street to Kimberly Lane)	Right-of-Way	N/A	A/B	-	93	4
John F. Kennedy Elementary School (200 Lincoln Street)	Town of Blackstone	2.3	B/C	School, Playing Fields	90	5
Mendon Street at Lincoln Street	Right-of-Way	N/A	B/D	-	90	5
Summer Street (Rennie Drive to Blackstone Street)	Right-of-Way	N/A	A/B/C	-	32	6
Rocco Drive	Right-of-Way	N/A	A/B	-	Rocco Dr	7

Rathbun Street

Green infrastructure practices such as curb bump outs with bioretention areas, infiltration trenches, or tree filter pits could be installed along the section of Rathbun Street between Diana Street and Ethel Street. Runoff from a portion of Rathbun Street could be diverted through curb cuts to a small

bioretention area between the curb and property line, disconnecting impervious surface from the MS4 and reducing runoff volumes and pollutant loads. Cut sheets for bioretention areas and tree filter pits as well as examples of these BMPs in the right-of-way are included in Appendix F. The Town should look for specific locations to implement green infrastructure as well as infiltration trenches on Rathbun Street when planning future roadway and sidewalk improvements. Potential phosphorus removal attributable to this type of BMP will depend on how many BMPs are installed and how much impervious area is disconnected from the MS4.

Washington Street

Catchment 75 has a significant amount of impervious area (2.48 acres) that is directly connected to the MS4. Green infrastructure practices such as bioretention areas, vegetated bump-outs, or filter strips, could be installed along Washington Street between Main Street and Brown Street to treat surface runoff. Any green infrastructure practice in this area would disconnect portions of the roadway from the MS4, infiltrating runoff for up to the 2-inch storm, and the existing drainage system would be left in place to provide bypass during larger storm events. The Town could also consider the use of permeable pavement to make future improvements to the sidewalk or parking areas on this street.

Liberty Hill Drive

The entirety of the street and surrounding residential properties is part of catchment 48. There are catch basins on both sides of the street that could be converted to leaching catch basins. Green infrastructure practices such as infiltration trenches and small bioretention areas should also be considered. The Town could also consider the use of permeable pavementas they make future improvements on this street.

Reilly Avenue

Green infrastructure practices such as curb bump outs with bioretention areas, infiltration trenches, or tree filter pits could potentially be installed along Reilly Avenue, Mark Drive, Nancy Court, or Kimberly Lane. The portion of Reilly Avenue between Mendon Street and Kimberly Lane and the three cul-de-sacs are within catchment 93. Curb bump outs in this area could provide traffic calming at intersections and would help disconnect impervious surface from the MS4.

John F. Kennedy Elementary School

Fuss & O'Neill's 2021 Stormwater Retrofit Plan identifies this school as a top five priority site based on input from the Town and Blackstone's Highway Superintendent. The design concept developed as part of the retrofit plan proposes bioretention areas, vegetated swales, and vegetated filter strips to treat runoff from the impervious areas surrounding the school building.

Mendon Street at Lincoln Street

Green infrastructure practices such as curb bump outs with bioretention areas, infiltration trenches, or tree filter pits could potentially be installed at this intersection. Curb bump outs in this area could provide traffic calming and treatment of runoff from the paved portion of the intersection.

Summer Street

Green infrastructure practices such as bioretention areas, vegetated bump-outs, or filter strips, could be installed along Summer Street between Rennie Drive and Blackstone Street to treat surface runoff. Any green infrastructure practice in this area would disconnect portions of the roadway from the MS4.

Rocco Drive

The entirety of the street and surrounding residential properties is part of the Rocco Drive catchment. There are catch basins on both sides of the street that could be converted to leaching catch basins. Green infrastructure practices such as infiltration trenches and small bioretention areas should also be considered. The Town could also consider the use of permeable pavement as part of future improvements to this street.

5.2 Implementation

The Town of Blackstone will begin addressing the findings of this Phosphorus Source Identification Report in Permit Year 5 (FY2023). The Town must first evaluate each potential retrofit opportunity identified in the previous section through the following actions:

- Evaluate the feasibility of implementing the projects identified in Section 5.1. Determine a planned retrofit date for each potential retrofit site deemed feasible based on the next planned infrastructure, resurfacing, or redevelopment activity planned for the site.
- Determine an estimated cost for each potential retrofit project discussed in Section 5.1.A list of planned BMP retrofit projects and schedule for their implementation will be included in the Town's Year 5 MS4 Annual Report.

By the end of Permit Year 6 (FY2024), the Town will plan and install one of the retrofit projects identified in Section 5.1 as a demonstration project. The remainder of the retrofit projects, where implementation is feasible from an engineering and permitting perspective, will be installed according to the schedule included in the Year 5 Annual Report. Future availability of funding will also be considered in developing the schedule. Blackstone will track any structural BMPs installed in the watershed and calculate the estimated phosphorus removal attributable to those BMPs consistent with Attachment 3 to Appendix F of the MS4 Permit. The BMP type, area treated, design storage volume, and estimated phosphorus removed in pounds per year by each BMP will be included in the Town's future MS4 annual reports.

6.0 REFERENCES

- Analysis of Trends of Water Quality and Streamflow in the Blackstone, Branch, Pawtuxet, and Pawcatuck Rivers, Massachusetts and Rhode Island 1979 to 2015; Prepared by Jennifer G. Savoie, John R. Mullaney, and Gardner C. Bent, 2017. https://pubs.usgs.gov/sir/2016/5178/sir20165178.pdf

- Blackstone River Water Quality Monitoring Program 2020 Sampling Season Report, Prepared for Karla Sangrey by Marie-Francoise Hatte and Cameron Richards, August 2021. https://www.ubcleanwater.org/sites/g/files/vyhlif3951/f/uploads/2020_blackstone_report.pdf

- Obropta, C.C. & Del Monaco, N. "Reducing Directly Connected Impervious Areas with Green Stormwater Infrastructure". *Journal of Sustainable Water in the Built Environment.* 2018. https://ascelibrary.org/doi/pdf/10.1061/JSWBAY.0000833

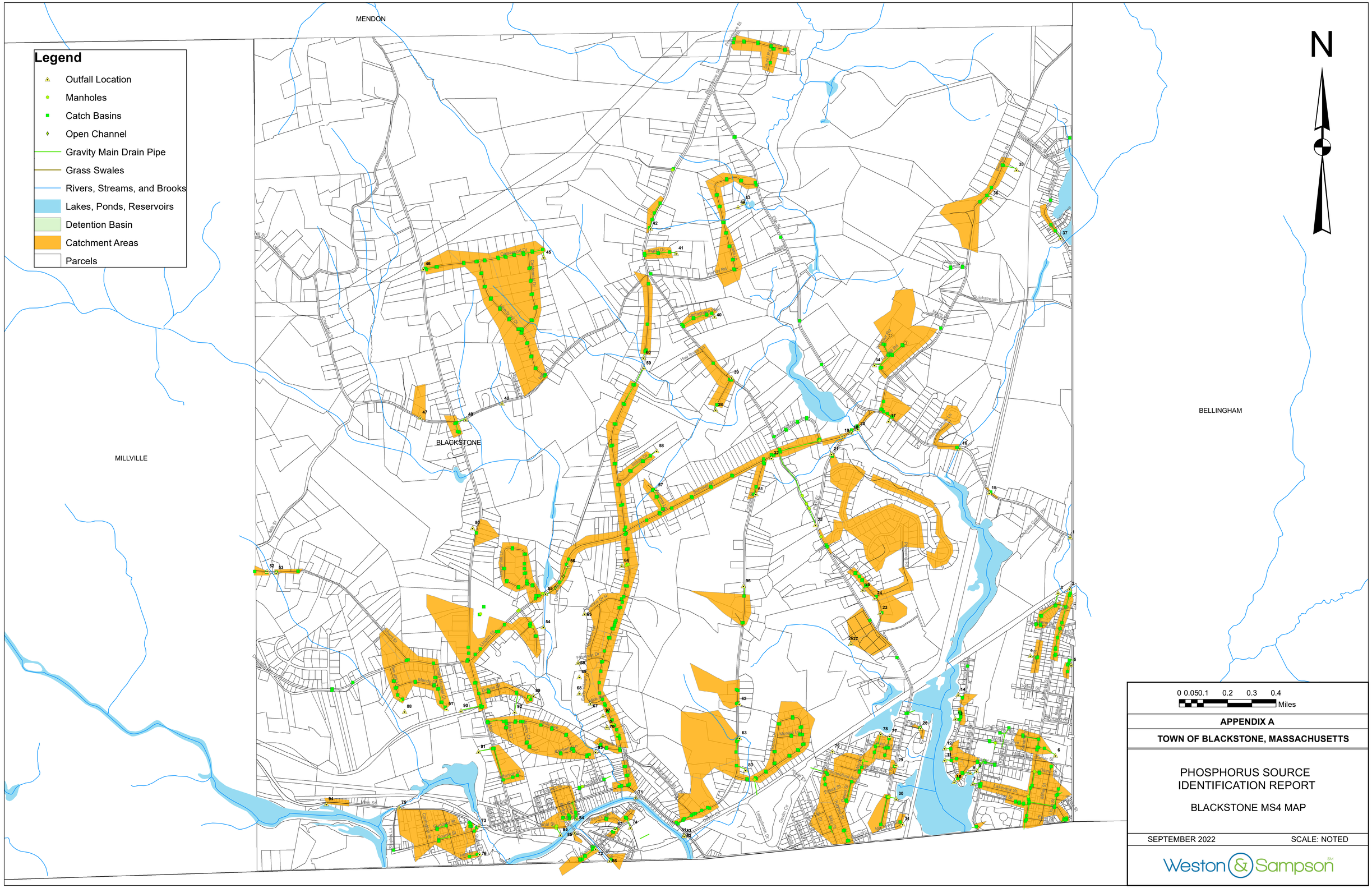
- Sutherland, R.C., "Methodology for Estimating the Effective Impervious Area of Urban Watersheds", Watershed Protection Techniques, Vol. 2, No. 1, Fall 1995.

- United States Environmental Protection Agency., "Methodology to Calculate Baseline Estimates of Impervious Area and Directly Connected Impervious Area for Massachusetts Communities". March 2010. https://www3.epa.gov/region1/npdes/stormwater/ma/IA-DCIA-Calculation-Methodology.pdf

- Voorhees, Mark. Overview of Methodology to Calculate Baseline Stormwater Phosphorus Loads and Phosphorus Load Reduction Requirements for the Charles River. January 14, 2014.

APPENDIX A

Blackstone MS4 Map



APPENDIX A

TOWN OF BLACKSTONE, MASSACHUSETTS

PHOSPHORUS SOURCE IDENTIFICATION REPORT

BLACKSTONE MS4 MAP

SEPTEMBER 2022 SCALE: NOTED

Weston & Sampson SM

APPENDIX B

Impervious Area and DCIA Results for All Catchments

Town of Blackstone Phosphorus Source Identification Report							
Appendix B - Impervious Area and DCIA Statistics for All Catchments							
Catchment	**Receiving Water**	**Catchment Size (Ac)**	**IA (Acres)**	**DCIA (Acres)**	**Percent Connectivity**	**Percent IA**	**Percent DCIA**
Rathbun_Intercon	Woonsocket MS4	25.26	13.54	8.27	163.69	53.62	32.76
75	Blackstone River	27.64	10.36	5.53	187.29	37.50	20.02
48	Tributary to Fox Brook	41.26	6.61	2.67	247.49	16.02	6.47
93	Fox Brook	31.27	9.16	4.70	195.02	29.30	15.03
90	Tributary to Aldrich Brook	28.88	5.27	2.13	247.35	18.24	7.37
32	Tributary to Mill River	20.18	7.00	4.06	172.46	34.69	20.12
Rocco Dr	Unknown	25.52	6.28	3.11	202.01	24.60	12.18
51	Tributary to Blackstone River	19.10	5.19	2.59	200.35	27.17	13.56
55	Fox Brook	17.45	4.43	2.65	166.80	25.37	15.21
45	Hop Brook	33.73	4.08	1.69	241.99	12.10	5.00
63	Fox Brook	32.41	3.97	1.14	346.83	12.25	3.53
Gaskill_Intercon	Unknown	13.87	5.41	2.98	181.30	39.01	21.52
59	Hop Brook	15.71	4.76	2.49	190.92	30.31	15.88
34	Tributary to Mill River	29.49	2.64	0.98	270.32	8.96	3.32
65	Fox Brook	16.25	4.51	2.24	201.55	27.73	13.76
84	Blackstone River	6.18	4.04	2.78	145.53	65.44	44.97
78	Mill River	15.99	4.80	2.44	196.45	30.04	15.29
54	Fox Brook	11.28	4.49	2.14	209.52	39.81	19.00
88	Aldrich Brook	11.43	2.91	1.43	203.45	25.50	12.53
71	Tributary to Blackstone River	4.66	3.36	2.07	162.35	72.07	44.39
44	Hop Brook	15.01	2.75	1.33	207.29	18.32	8.84
HarrisPondVillage2	Unknown	33.51	1.33	0.32	417.65	3.96	0.95
97	Tributary to Fox Brook	9.93	3.16	1.63	194.27	31.85	16.40
36	Tributary to Quick Stream	16.38	2.87	1.17	245.85	17.52	7.13
81	Blackstone River	12.48	2.57	1.31	196.75	20.58	10.46
56	Tributary to Fox Brook	10.96	2.82	1.53	184.91	25.77	13.94
6	Tributary to Peters River	6.96	2.90	1.70	170.69	41.75	24.46
2	Tributary to Mill River	5.91	2.64	1.64	161.04	44.75	27.79
60	Tributary to Mill River	8.05	2.18	1.18	184.56	27.07	14.67
91	Fox Brook	7.71	2.37	1.23	192.47	30.67	15.94
64	Fox Brook	7.19	2.22	1.20	185.08	30.89	16.69
95	Tributary to Mill River	2.64	1.87	1.50	124.59	70.72	56.76
SpruceSt	Unknown	9.81	2.17	1.12	193.78	22.13	11.42
92	Tributary to Fox Brook	4.73	1.89	1.13	166.97	40.00	23.96
66	Tributary to Fox Brook	5.74	1.85	0.93	198.61	32.17	16.20
58	Tributary to Mill River	5.14	1.54	0.84	183.67	30.02	16.34
OF_CB_Downtown2	Unknown	1.66	1.42	1.05	134.84	85.59	63.47
39	Tributary to Hop Brook	7.37	1.51	0.73	207.14	20.54	9.92
96	Tributary to Mill River	10.89	1.07	0.36	295.00	9.83	3.33
46	Tributary to Fox Brook	5.98	1.12	0.52	217.78	18.78	8.63
43	Tributary to Mill River	5.42	1.14	0.61	187.06	21.04	11.25

Town of Blackstone Phosphorus Source Identification Report							
Appendix B - Impervious Area and DCIA Statistics for All Catchments							
Catchment	**Receiving Water**	**Catchment Size (Ac)**	**IA (Acres)**	**DCIA (Acres)**	**Percent Connectivity**	**Percent IA**	**Percent DCIA**
7	Mill River	3.24	1.34	0.80	167.11	41.30	24.72
62	Tributary to Blackstone River	10.94	0.61	0.22	280.73	5.58	1.99
40	Tributary to Mill River	3.74	1.08	0.63	171.83	28.85	16.79
Pulaski_Intercon	Unknown	1.60	1.03	0.76	135.49	64.04	47.26
3	Tributary to Mill River	3.79	1.33	0.75	177.42	34.98	19.72
30	Mill River	5.47	1.23	0.73	167.45	22.43	13.39
94	Blackstone River	1.60	1.17	0.79	148.05	72.97	49.29
77	Mill River	3.29	1.27	0.69	184.42	38.56	20.91
57	Tributary to Mill River	3.56	0.89	0.47	187.82	24.94	13.28
17	Tributary to Mill River	6.15	1.28	0.62	205.10	20.80	10.14
HarrisPondVillage1	Unknown	8.08	1.26	0.55	228.64	15.58	6.82
41	Tributary to Mill River	3.30	0.91	0.50	181.80	27.50	15.12
61	Tributary to Mill River	3.31	0.97	0.54	180.00	29.44	16.36
50	Fox Brook	4.34	0.90	0.42	217.34	20.79	9.57
4	Tributary to Mill River	2.68	1.14	0.65	175.48	42.43	24.18
72	Tributary to Blackstone River	2.47	1.31	0.61	213.89	52.99	24.78
38	Tributary to Hop Brook	2.98	0.94	0.49	190.35	31.41	16.50
73	Blackstone River	1.83	0.91	0.63	144.68	49.80	34.42
42	Tributary to Mill River	2.52	0.74	0.39	191.90	29.48	15.36
HarrisPondVillage3	Unknown	3.58	0.87	0.45	194.62	24.22	12.44
8	Mill River	2.05	0.92	0.55	167.73	44.95	26.80
RiversEdgeRd	Unknown	2.51	0.68	0.46	147.64	27.24	18.45
HarrisPondVillage9	Unknown	5.52	1.05	0.47	223.95	19.03	8.50
74	Tributary to Blackstone River	1.29	0.84	0.54	154.39	65.16	42.21
35	Tributary to Mill River	3.76	0.75	0.34	217.37	19.91	9.16
MichelleLn	Unknown	2.21	0.81	0.51	158.22	36.69	23.19
0	Tributary to Fox Brook	2.03	0.74	0.42	176.97	36.36	20.54
49	Tributary to Fox Brook	2.58	0.81	0.47	172.90	31.24	18.07
27	Tributary to Mill River	6.03	1.13	0.48	236.31	18.71	7.92
80	Tributary to Blackstone River	3.02	0.73	0.39	188.31	24.29	12.90
HarrisPondVillage6	Unknown	2.36	0.71	0.38	186.25	30.01	16.11
79	Tributary to Mill River	5.00	0.90	0.45	197.82	17.91	9.05
26	Tributary to Mill River	6.29	1.11	0.45	248.45	17.67	7.11
76	Tributary to Blackstone River	1.01	0.74	0.52	143.69	73.87	51.41
37	Lake Hiawatha	1.87	0.76	0.46	164.35	40.87	24.87
25	Tributary to Mill River	2.45	0.62	0.30	206.57	25.37	12.28
23	Tributary to Mill River	6.41	0.27	0.09	281.93	4.14	1.47
19	Tributary to Mill River	1.74	0.57	0.43	133.70	32.92	24.62
47	Tributary to Fox Brook	4.24	0.39	0.15	255.90	9.21	3.60
16	Quick Stream	1.50	0.69	0.45	153.61	46.22	30.09
70	Tributary to Fox Brook	1.70	0.53	0.29	182.82	30.94	16.92

Town of Blackstone Phosphorus Source Identification Report							
Appendix B - Impervious Area and DCIA Statistics for All Catchments							
Catchment	**Receiving Water**	**Catchment Size (Ac)**	**IA (Acres)**	**DCIA (Acres)**	**Percent Connectivity**	**Percent IA**	**Percent DCIA**
87	Tributary to Blackstone River	0.84	0.59	0.39	151.67	69.62	45.91
89	Tributary to Blackstone River	1.10	0.58	0.37	155.27	52.69	33.93
24	Tributary to Mill River	2.95	0.51	0.17	293.38	17.36	5.92
20	Mill River	1.02	0.48	0.36	132.12	46.65	35.31
13	Mill River	1.21	0.53	0.31	171.93	43.94	25.56
31	Tributary to Mill River	1.10	0.44	0.28	157.87	40.21	25.47
HarrisPondVillage4	Unknown	2.72	0.00	0.00	0.00	0.00	0.00
9	Mill River	1.01	0.42	0.23	184.11	41.63	22.61
53	Aldrich Brook	1.18	0.29	0.18	162.77	24.49	15.05
11	Mill River	1.10	0.42	0.24	173.61	38.46	22.15
12	Mill River	1.27	0.42	0.23	183.10	32.89	17.96
HarrisPondVillage10	Unknown	2.44	0.35	0.09	372.40	14.42	3.87
HarrisPondVillage7	Unknown	1.75	0.41	0.22	187.40	23.52	12.55
ButlerSt_Intercon	Unknown	0.61	0.35	0.22	156.76	57.22	36.50
29	Mill River	0.90	0.36	0.21	169.29	39.93	23.59
5	Tributary to Mill River	1.08	0.37	0.21	176.29	34.40	19.51
10	Mill River	0.40	0.29	0.20	148.97	72.40	48.60
HarrisPondVillage5	Unknown	2.16	0.16	0.04	364.22	7.54	2.07
28	Mill River	0.75	0.27	0.18	148.89	35.93	24.13
14	Mill River	1.26	0.29	0.16	183.93	23.35	12.70
85	Blackstone River	0.45	0.27	0.19	138.06	59.04	42.76
52	Aldrich Brook	1.08	0.23	0.11	213.54	21.01	9.84
15	Tributary to Mill River	0.33	0.20	0.18	109.87	60.99	55.51
18	Tributary to Mill River	0.27	0.19	0.17	106.94	69.81	65.28
86	Tributary to Blackstone River	1.34	0.22	0.09	237.33	16.31	6.87
22	Tributary to Mill River	0.79	0.16	0.12	136.59	20.54	15.04
HarrisPondVillage8	Unknown	0.43	0.13	0.09	149.90	29.89	19.94
21	Tributary to Mill River	0.81	0.13	0.06	219.06	16.00	7.30
PreciousBloodCemetery	Unknown	0.45	0.06	0.03	184.03	13.64	7.41

APPENDIX C

Land Use/Land Cover Grid

MENDON

BLACKSTONE

BELLINGHAM

N

Legend

- Rivers, Streams, and Brooks
- Lakes, Ponds, Reservoirs

CATCHMENT AREAS

LAND USE, SOIL TYPE

- Agriculture, A
- Agriculture, B
- Agriculture, C
- Agriculture, D
- Commercial, Unknown
- Commercial, A
- Commercial, B
- Commercial, C
- Forest, B
- Forest, C
- Forest, D
- Industrial, Unknown
- Industrial, A
- Industrial, B
- Industrial, D
- Open land, Unknown
- Open land, A
- Open land, B
- Open land, B/D
- Open land, C
- Open land, D
- Residential - multi-family, A
- Residential - multi-family, B
- Residential - multi-family, B/D
- Residential - multi-family, C
- Residential - multi-family, D
- Residential - single family, Unknown
- Residential - single family, A
- Residential - single family, B
- Residential - single family, B/D
- Residential - single family, C
- Residential - single family, D
- Right-of-way, Unknown
- Right-of-way, A
- Right-of-way, B
- Right-of-way, B/D
- Right-of-way, C
- Right-of-way, D
- Tax exempt, A
- Tax exempt, B
- Tax exempt, B/D
- Tax exempt, C
- Unknown, Unknown
- Unknown, A
- Unknown, B
- Unknown, C
- Water, A
- Water, B

0 0.050.1 0.2 0.3 0.4 Miles

APPENDIX C

TOWN OF BLACKSTONE, MASSACHUSETTS

PHOSPHORUS SOURCE IDENTIFICATION REPORT

LAND USE/ LAND COVER GRID

SEPTEMBER 2022 SCALE: NOTED

Weston & Sampson SM

APPENDIX D

Pollutant Loading Analysis Results

Town of Blackstone Phosphorus Source Identification Report					
Appendix D - Pollutant Loading Analysis Results					
Catchment	**Receiving Water**	**Catchment Size (Ac)**	**DCIA (Acres)**	**Phosphorus Loading (lb/yr)**	**Relative Phosphorus Loading (lb/yr/ac)**
Rathbun_Intercon	Woonsocket MS4	25.26	8.27	18.3	0.7
75	Blackstone River	27.64	5.53	13.5	0.5
48	Tributary to Fox Brook	41.26	2.67	12.9	0.3
93	Fox Brook	31.27	4.70	12.6	0.4
90	Tributary to Aldrich Brook	28.88	2.13	10.1	0.3
32	Tributary to Mill River	20.18	4.06	10.0	0.5
Rocco Dr	Unknown	25.52	3.11	8.8	0.3
51	Tributary to Blackstone River	19.10	2.59	8.7	0.5
55	Fox Brook	17.45	2.65	7.8	0.4
45	Hop Brook	33.73	1.69	7.8	0.2
63	Fox Brook	32.41	1.14	7.5	0.2
Gaskill_Intercon	Unknown	13.87	2.98	7.4	0.5
59	Hop Brook	15.71	2.49	7.3	0.5
34	Tributary to Mill River	29.49	0.98	6.8	0.2
65	Fox Brook	16.25	2.24	6.4	0.4
84	Blackstone River	6.18	2.78	6.4	1.0
78	Mill River	15.99	2.44	5.8	0.4
54	Fox Brook	11.28	2.14	5.1	0.5
88	Aldrich Brook	11.43	1.43	5.0	0.4
71	Tributary to Blackstone River	4.66	2.07	4.8	1.0
44	Hop Brook	15.01	1.33	4.7	0.3
HarrisPondVillage2	Unknown	33.51	0.32	4.7	0.1
97	Tributary to Fox Brook	9.93	1.63	4.5	0.5
36	Tributary to Quick Stream	16.38	1.17	4.4	0.3
81	Blackstone River	12.48	1.31	4.2	0.3
56	Tributary to Fox Brook	10.96	1.53	4.1	0.4
6	Tributary to Peters River	6.96	1.70	4.0	0.6
2	Tributary to Mill River	5.91	1.64	3.5	0.6
60	Tributary to Mill River	8.05	1.18	3.4	0.4
91	Fox Brook	7.71	1.23	3.4	0.4
64	Fox Brook	7.19	1.20	3.3	0.5
95	Tributary to Mill River	2.64	1.50	3.0	1.1
SpruceSt	Unknown	9.81	1.12	2.8	0.3
92	Tributary to Fox Brook	4.73	1.13	2.8	0.6
66	Tributary to Fox Brook	5.74	0.93	2.6	0.5
58	Tributary to Mill River	5.14	0.84	2.5	0.5
OF_CB_Downtown2	Unknown	1.66	1.05	2.4	1.4
39	Tributary to Hop Brook	7.37	0.73	2.4	0.3
96	Tributary to Mill River	10.89	0.36	2.1	0.2
46	Tributary to Fox Brook	5.98	0.52	2.1	0.3
43	Tributary to Mill River	5.42	0.61	1.9	0.4

Town of Blackstone Phosphorus Source Identification Report					
Appendix D - Pollutant Loading Analysis Results					
Catchment	**Receiving Water**	**Catchment Size (Ac)**	**DCIA (Acres)**	**Phosphorus Loading (lb/yr)**	**Relative Phosphorus Loading (lb/yr/ac)**
7	Mill River	3.24	0.80	1.9	0.6
62	Tributary to Blackstone River	10.94	0.22	1.8	0.2
40	Tributary to Mill River	3.74	0.63	1.8	0.5
Pulaski_Intercon	Unknown	1.60	0.76	1.7	1.0
3	Tributary to Mill River	3.79	0.75	1.7	0.4
30	Mill River	5.47	0.73	1.7	0.3
94	Blackstone River	1.60	0.79	1.6	1.0
77	Mill River	3.29	0.69	1.6	0.5
57	Tributary to Mill River	3.56	0.47	1.6	0.4
17	Tributary to Mill River	6.15	0.62	1.5	0.3
HarrisPondVillage1	Unknown	8.08	0.55	1.5	0.2
41	Tributary to Mill River	3.30	0.50	1.5	0.5
61	Tributary to Mill River	3.31	0.54	1.5	0.4
50	Fox Brook	4.34	0.42	1.5	0.3
4	Tributary to Mill River	2.68	0.65	1.5	0.5
72	Tributary to Blackstone River	2.47	0.61	1.5	0.6
38	Tributary to Hop Brook	2.98	0.49	1.3	0.4
73	Blackstone River	1.83	0.63	1.3	0.7
42	Tributary to Mill River	2.52	0.39	1.3	0.5
HarrisPondVillage3	Unknown	3.58	0.45	1.3	0.4
8	Mill River	2.05	0.55	1.2	0.6
RiversEdgeRd	Unknown	2.51	0.46	1.2	0.5
HarrisPondVillage9	Unknown	5.52	0.47	1.2	0.2
74	Tributary to Blackstone River	1.29	0.54	1.2	0.9
35	Tributary to Mill River	3.76	0.34	1.2	0.3
MichelleLn	Unknown	2.21	0.51	1.2	0.5
0	Tributary to Fox Brook	2.03	0.42	1.2	0.6
49	Tributary to Fox Brook	2.58	0.47	1.2	0.5
27	Tributary to Mill River	6.03	0.48	1.2	0.2
80	Tributary to Blackstone River	3.02	0.39	1.2	0.4
HarrisPondVillage6	Unknown	2.36	0.38	1.2	0.5
79	Tributary to Mill River	5.00	0.45	1.1	0.2
26	Tributary to Mill River	6.29	0.45	1.1	0.2
76	Tributary to Blackstone River	1.01	0.52	1.1	1.1
37	Lake Hiawatha	1.87	0.46	1.0	0.5
25	Tributary to Mill River	2.45	0.30	1.0	0.4
23	Tributary to Mill River	6.41	0.09	1.0	0.2
19	Tributary to Mill River	1.74	0.43	1.0	0.6
47	Tributary to Fox Brook	4.24	0.15	0.9	0.2
16	Quick Stream	1.50	0.45	0.9	0.6
70	Tributary to Fox Brook	1.70	0.29	0.9	0.5

Town of Blackstone Phosphorus Source Identification Report					
Appendix D - Pollutant Loading Analysis Results					
Catchment	**Receiving Water**	**Catchment Size (Ac)**	**DCIA (Acres)**	**Phosphorus Loading (lb/yr)**	**Relative Phosphorus Loading (lb/yr/ac)**
87	Tributary to Blackstone River	0.84	0.39	0.9	1.0
89	Tributary to Blackstone River	1.10	0.37	0.8	0.8
24	Tributary to Mill River	2.95	0.17	0.7	0.2
20	Mill River	1.02	0.36	0.7	0.7
13	Mill River	1.21	0.31	0.7	0.6
31	Tributary to Mill River	1.10	0.28	0.6	0.6
HarrisPondVillage4	Unknown	2.72	0.00	0.6	0.2
9	Mill River	1.01	0.23	0.6	0.6
53	Aldrich Brook	1.18	0.18	0.6	0.5
11	Mill River	1.10	0.24	0.5	0.5
12	Mill River	1.27	0.23	0.5	0.4
HarrisPondVillage10	Unknown	2.44	0.09	0.5	0.2
HarrisPondVillage7	Unknown	1.75	0.22	0.5	0.3
ButlerSt_Intercon	Unknown	0.61	0.22	0.5	0.8
29	Mill River	0.90	0.21	0.5	0.5
5	Tributary to Mill River	1.08	0.21	0.5	0.4
10	Mill River	0.40	0.20	0.4	1.0
HarrisPondVillage5	Unknown	2.16	0.04	0.4	0.2
28	Mill River	0.75	0.18	0.4	0.5
14	Mill River	1.26	0.16	0.4	0.3
85	Blackstone River	0.45	0.19	0.4	0.8
52	Aldrich Brook	1.08	0.11	0.4	0.3
15	Tributary to Mill River	0.33	0.18	0.3	1.0
18	Tributary to Mill River	0.27	0.17	0.3	1.2
86	Tributary to Blackstone River	1.34	0.09	0.3	0.2
22	Tributary to Mill River	0.79	0.12	0.2	0.3
HarrisPondVillage8	Unknown	0.43	0.09	0.2	0.4
21	Tributary to Mill River	0.81	0.06	0.2	0.2
PreciousBloodCemetery	Unknown	0.45	0.03	0.1	0.2

APPENDIX E

Catchment Prioritization and Ranking

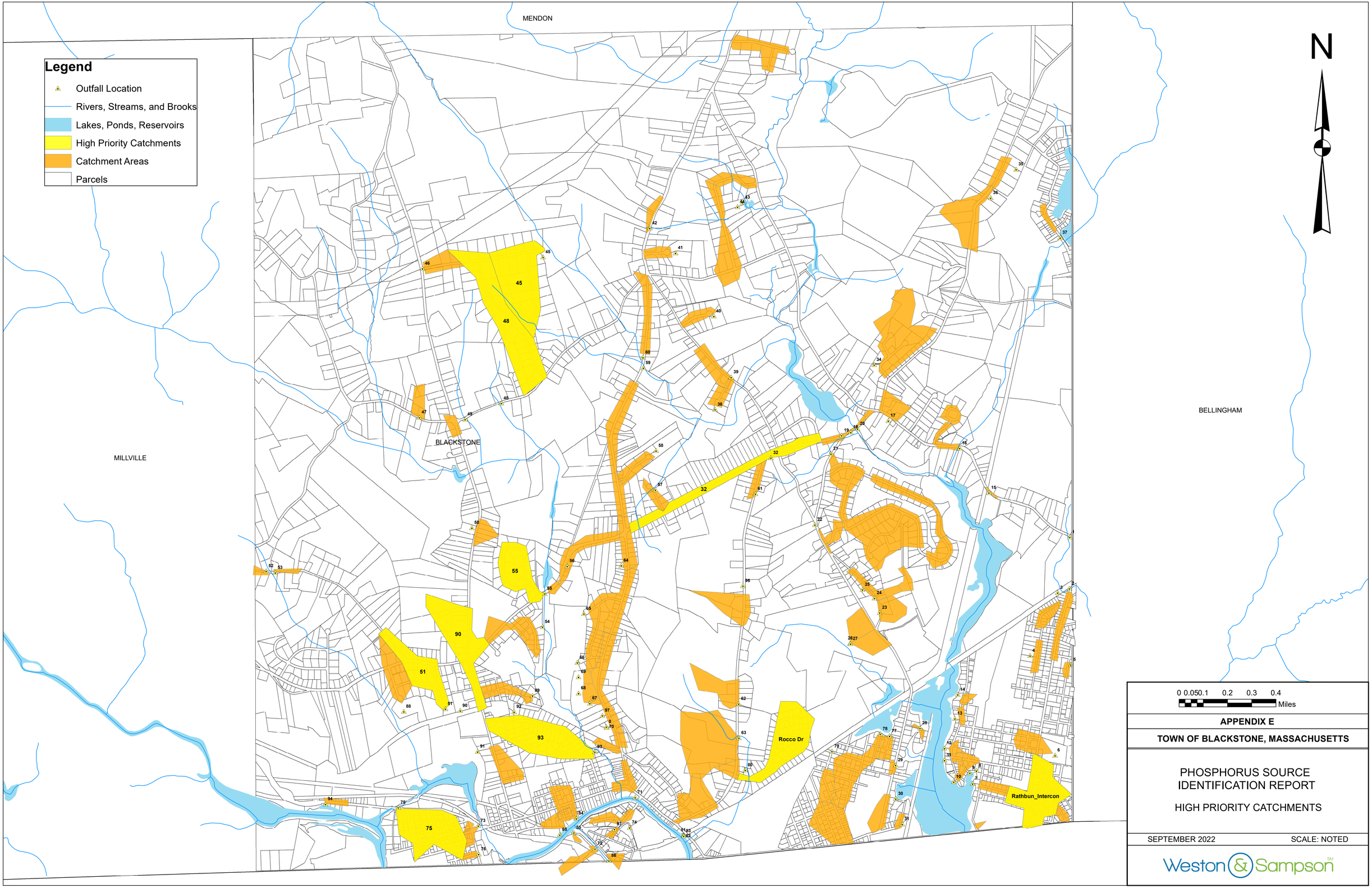
Town of Blackstone Phosphorus Source Identification Report

Appendix E - Catchment Ranking

Rank	Catchment	Receiving Water	Catchment Size (Ac)	DCIA (Acres)	Phosphorus Loading (lb/yr)	Relative Phosphorus Loading (lb/yr/ac)	Dry Weather Flow Observed	Dry Weather Phosphorus Value (mg/L)
1	Rathbun_Intercon	Woonsocket MS4	25.26	8.27	18.3	0.7	Yes	0.12
2	75	Blackstone River	27.64	5.53	13.5	0.5	No	-
3	48	Tributary to Fox Brook	41.26	2.67	12.9	0.3	Yes	0.13
4	93	Fox Brook	31.27	4.70	12.6	0.4	No	-
5	90	Tributary to Aldrich Brook	28.88	2.13	10.1	0.3	No	-
6	32	Tributary to Mill River	20.18	4.06	10.0	0.5	No	-
7	Rocco Dr	Unknown	25.52	3.11	8.8	0.3	No	-
8	51	Tributary to Blackstone River	19.10	2.59	8.7	0.5	No	-
9	55	Fox Brook	17.45	2.65	7.8	0.4	No	-
10	45	Hop Brook	33.73	1.69	7.8	0.2	No	-
11	63	Fox Brook	32.41	1.14	7.5	0.2	No	-
12	Gaskill_Intercon	Unknown	13.87	2.98	7.4	0.5	No	-
13	59	Hop Brook	15.71	2.49	7.3	0.5	No	-
14	34	Tributary to Mill River	29.49	0.98	6.8	0.2	No	-
15	65	Fox Brook	16.25	2.24	6.4	0.4	Yes	0.15
16	84	Blackstone River	6.18	2.78	6.4	1.0	No	-
17	78	Mill River	15.99	2.44	5.8	0.4	No	-
18	54	Fox Brook	11.28	2.14	5.1	0.5	Yes	ND
19	88	Aldrich Brook	11.43	1.43	5.0	0.4	No	-
20	71	Tributary to Blackstone River	4.66	2.07	4.8	1.0	No	-
21	44	Hop Brook	15.01	1.33	4.7	0.3	No	-
22	HarrisPondVillage2	Unknown	33.51	0.32	4.7	0.1	Yes	Parameter not sampled
23	97	Tributary to Fox Brook	9.93	1.63	4.5	0.5	No	-
24	36	Tributary to Quick Stream	16.38	1.17	4.4	0.3	No	-
25	81	Blackstone River	12.48	1.31	4.2	0.3	No	-
26	56	Tributary to Fox Brook	10.96	1.53	4.1	0.4	No	-
27	6	Tributary to Peters River	6.96	1.70	4.0	0.6	No	-
28	2	Tributary to Mill River	5.91	1.64	3.5	0.6	No	-
29	60	Tributary to Mill River	8.05	1.18	3.4	0.4	No	-
30	91	Fox Brook	7.71	1.23	3.4	0.4	No	-
31	64	Fox Brook	7.19	1.20	3.3	0.5	Yes	ND
32	95	Tributary to Mill River	2.64	1.50	3.0	1.1	No	-
33	SpruceSt	Unknown	9.81	1.12	2.8	0.3	No	-
34	92	Tributary to Fox Brook	4.73	1.13	2.8	0.6	No	-
35	66	Tributary to Fox Brook	5.74	0.93	2.6	0.5	No	-
36	58	Tributary to Mill River	5.14	0.84	2.5	0.5	Yes	ND
37	OF_CB_Downtown2	Unknown	1.66	1.05	2.4	1.4	No	-

Town of Blackstone Phosphorus Source Identification Report								
Appendix E - Catchment Ranking								
Rank	**Catchment**	**Receiving Water**	**Catchment Size (Ac)**	**DCIA (Acres)**	**Phosphorus Loading (lb/yr)**	**Relative Phosphorus Loading (lb/yr/ac)**	**Dry Weather Flow Observed**	**Dry Weather Phosphorus Value (mg/L)**
38	39	Tributary to Hop Brook	7.37	0.73	2.4	0.3	No	-
39	96	Tributary to Mill River	10.89	0.36	2.1	0.2	No	-
40	46	Tributary to Fox Brook	5.98	0.52	2.1	0.3	No	-
41	43	Tributary to Mill River	5.42	0.61	1.9	0.4	No	-
42	7	Mill River	3.24	0.80	1.9	0.6	No	-
43	62	Tributary to Blackstone River	10.94	0.22	1.8	0.2	No	-
44	40	Tributary to Mill River	3.74	0.63	1.8	0.5	No	-
45	Pulaski_Intercon	Unknown	1.60	0.76	1.7	1.0	No	-
46	3	Tributary to Mill River	3.79	0.75	1.7	0.4	No	-
47	30	Mill River	5.47	0.73	1.7	0.3	No	-
48	94	Blackstone River	1.60	0.79	1.6	1.0	No	-
49	77	Mill River	3.29	0.69	1.6	0.5	No	-
50	57	Tributary to Mill River	3.56	0.47	1.6	0.4	Yes	ND
51	17	Tributary to Mill River	6.15	0.62	1.5	0.3	No	-
52	HarrisPondVillage1	Unknown	8.08	0.55	1.5	0.2	No	-
53	41	Tributary to Mill River	3.30	0.50	1.5	0.5	No	-
54	61	Tributary to Mill River	3.31	0.54	1.5	0.4	No	-
55	50	Fox Brook	4.34	0.42	1.5	0.3	No	-
56	4	Tributary to Mill River	2.68	0.65	1.5	0.5	No	-
57	72	Tributary to Blackstone River	2.47	0.61	1.5	0.6	No	-
58	38	Tributary to Hop Brook	2.98	0.49	1.3	0.4	No	-
59	73	Blackstone River	1.83	0.63	1.3	0.7	No	-
60	42	Tributary to Mill River	2.52	0.39	1.3	0.5	Yes	ND
61	HarrisPondVillage3	Unknown	3.58	0.45	1.3	0.4	Not screened	-
62	8	Mill River	2.05	0.55	1.2	0.6	Yes	ND
63	RiversEdgeRd	Unknown	2.51	0.46	1.2	0.5	No	-
64	HarrisPondVillage9	Unknown	5.52	0.47	1.2	0.2	No	-
65	74	Tributary to Blackstone River	1.29	0.54	1.2	0.9	No	-
66	35	Tributary to Mill River	3.76	0.34	1.2	0.3	Yes	ND
67	MichelleLn	Unknown	2.21	0.51	1.2	0.5	No	-
68	0	Tributary to Fox Brook	2.03	0.42	1.2	0.6	No	-
69	49	Tributary to Fox Brook	2.58	0.47	1.2	0.5	No	-
70	27	Tributary to Mill River	6.03	0.48	1.2	0.2	Yes	0.11
71	80	Tributary to Blackstone River	3.02	0.39	1.2	0.4	No	-
72	HarrisPondVillage6	Unknown	2.36	0.38	1.2	0.5	No	-
73	79	Tributary to Mill River	5.00	0.45	1.1	0.2	No	-
74	26	Tributary to Mill River	6.29	0.45	1.1	0.2	No	-
75	76	Tributary to Blackstone River	1.01	0.52	1.1	1.1	No	-

Town of Blackstone Phosphorus Source Identification Report								
Appendix E - Catchment Ranking								
Rank	**Catchment**	**Receiving Water**	**Catchment Size (Ac)**	**DCIA (Acres)**	**Phosphorus Loading (lb/yr)**	**Relative Phosphorus Loading (lb/yr/ac)**	**Dry Weather Flow Observed**	**Dry Weather Phosphorus Value (mg/L)**
76	37	Lake Hiawatha	1.87	0.46	1.0	0.5	No	-
77	25	Tributary to Mill River	2.45	0.30	1.0	0.4	No	-
78	23	Tributary to Mill River	6.41	0.09	1.0	0.2	No	-
79	19	Tributary to Mill River	1.74	0.43	1.0	0.6	No	-
80	47	Tributary to Fox Brook	4.24	0.15	0.9	0.2	No	-
81	16	Quick Stream	1.50	0.45	0.9	0.6	No	-
82	70	Tributary to Fox Brook	1.70	0.29	0.9	0.5	No	-
83	87	Tributary to Blackstone River	0.84	0.39	0.9	1.0	No	-
84	89	Tributary to Blackstone River	1.10	0.37	0.8	0.8	No	-
85	24	Tributary to Mill River	2.95	0.17	0.7	0.2	No	-
86	20	Mill River	1.02	0.36	0.7	0.7	No	-
87	13	Mill River	1.21	0.31	0.7	0.6	No	-
88	31	Tributary to Mill River	1.10	0.28	0.6	0.6	No	-
89	HarrisPondVillage4	Unknown	2.72	0.00	0.6	0.2	No	-
90	9	Mill River	1.01	0.23	0.6	0.6	Yes	ND
91	53	Aldrich Brook	1.18	0.18	0.6	0.5	No	-
92	11	Mill River	1.10	0.24	0.5	0.5	No	-
93	12	Mill River	1.27	0.23	0.5	0.4	No	-
94	HarrisPondVillage10	Unknown	2.44	0.09	0.5	0.2	Not screened	-
95	HarrisPondVillage7	Unknown	1.75	0.22	0.5	0.3	No	-
96	ButlerSt_Intercon	Unknown	0.61	0.22	0.5	0.8	No	-
97	29	Mill River	0.90	0.21	0.5	0.5	No	-
98	5	Tributary to Mill River	1.08	0.21	0.5	0.4	No	-
99	10	Mill River	0.40	0.20	0.4	1.0	No	-
100	HarrisPondVillage5	Unknown	2.16	0.04	0.4	0.2	Not screened	-
101	28	Mill River	0.75	0.18	0.4	0.5	No	-
102	14	Mill River	1.26	0.16	0.4	0.3	No	-
103	85	Blackstone River	0.45	0.19	0.4	0.8	No	-
104	52	Aldrich Brook	1.08	0.11	0.4	0.3	No	-
105	15	Tributary to Mill River	0.33	0.18	0.3	1.0	No	-
106	18	Tributary to Mill River	0.27	0.17	0.3	1.2	No	-
107	86	Tributary to Blackstone River	1.34	0.09	0.3	0.2	No	-
108	22	Tributary to Mill River	0.79	0.12	0.2	0.3	No	-
109	HarrisPondVillage8	Unknown	0.43	0.09	0.2	0.4	No	-
110	21	Tributary to Mill River	0.81	0.06	0.2	0.2	No	-
111	PreciousBloodCemetery	Unknown	0.45	0.03	0.1	0.2	No	-



APPENDIX E

TOWN OF BLACKSTONE, MASSACHUSETTS

PHOSPHORUS SOURCE IDENTIFICATION REPORT

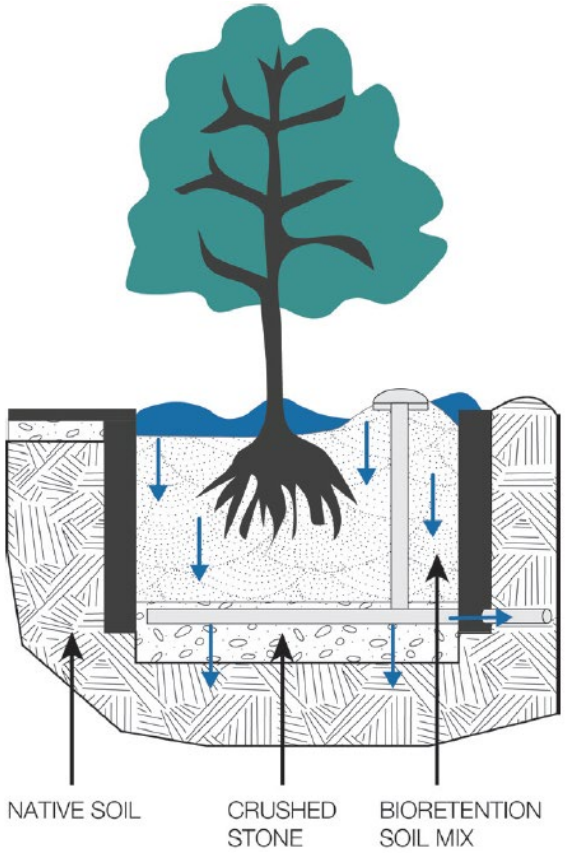
HIGH PRIORITY CATCHMENTS

SEPTEMBER 2022 SCALE: NOTED

Weston & Sampson

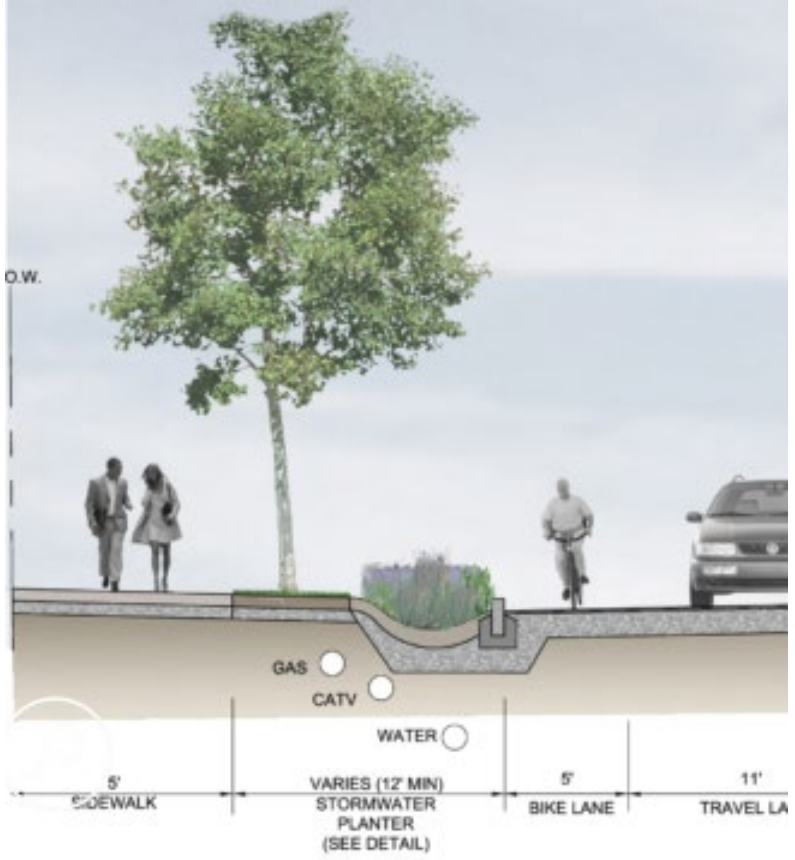
APPENDIX F

BMP Retrofit Cut Sheets, Examples, and Working Designs

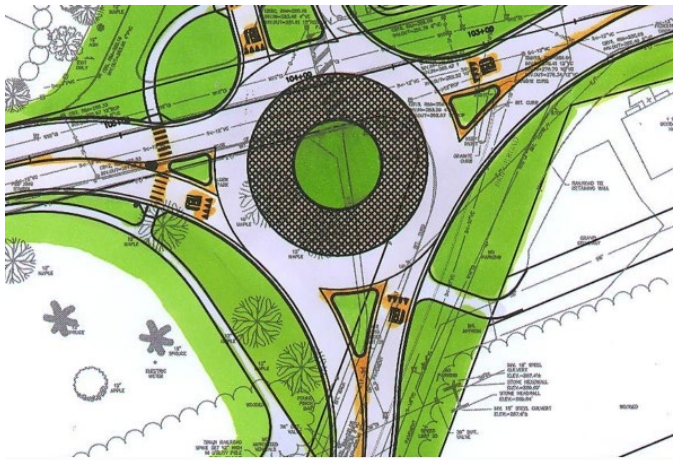




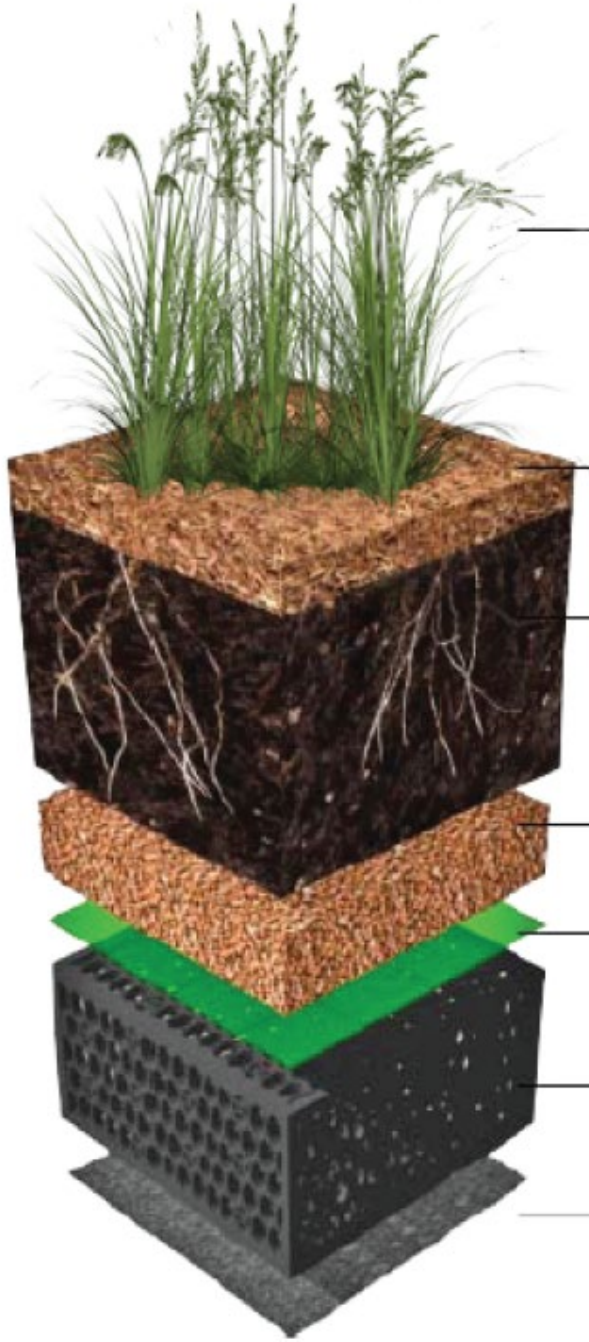








Weston & Sampson



PLANTING

CLEAN, SHREDDED HARDWOOD MULCH

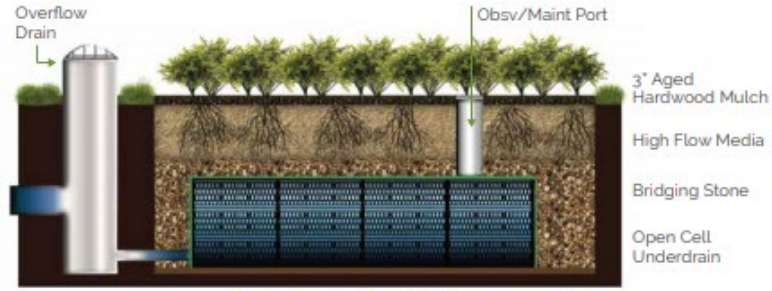
HIGH PERFORMANCE BIOFILTRATION MEDIA

CLEAN, BRIDGING STONE

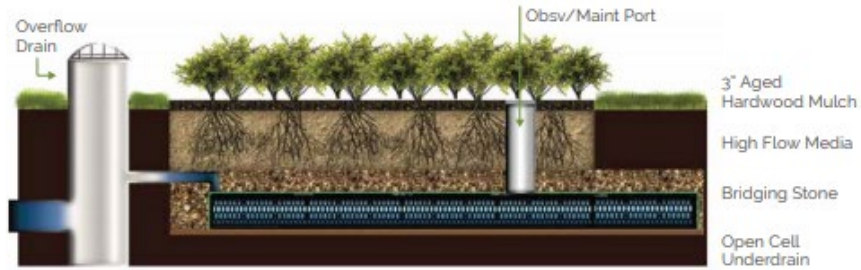
OPEN MESH SEPARATION FABRIC

MODULAR HIGH PERFORMANCE UNDERDRAIN

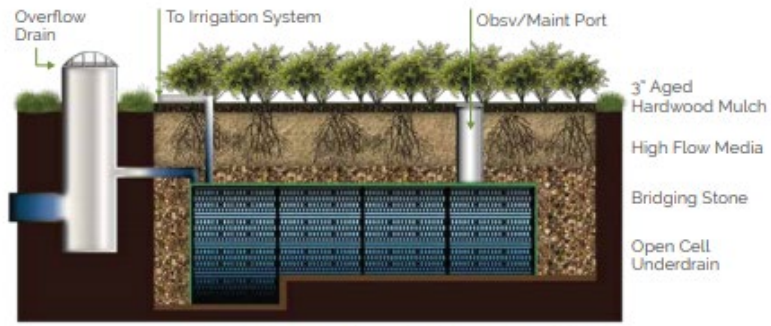
GEOTEXTILE OR LINER ENVELOPE



Expanded Detention



Expanded Infiltration



Rainwater Harvesting

ACF Environmental











ACF Environmental

Bioretention Areas & Rain Gardens



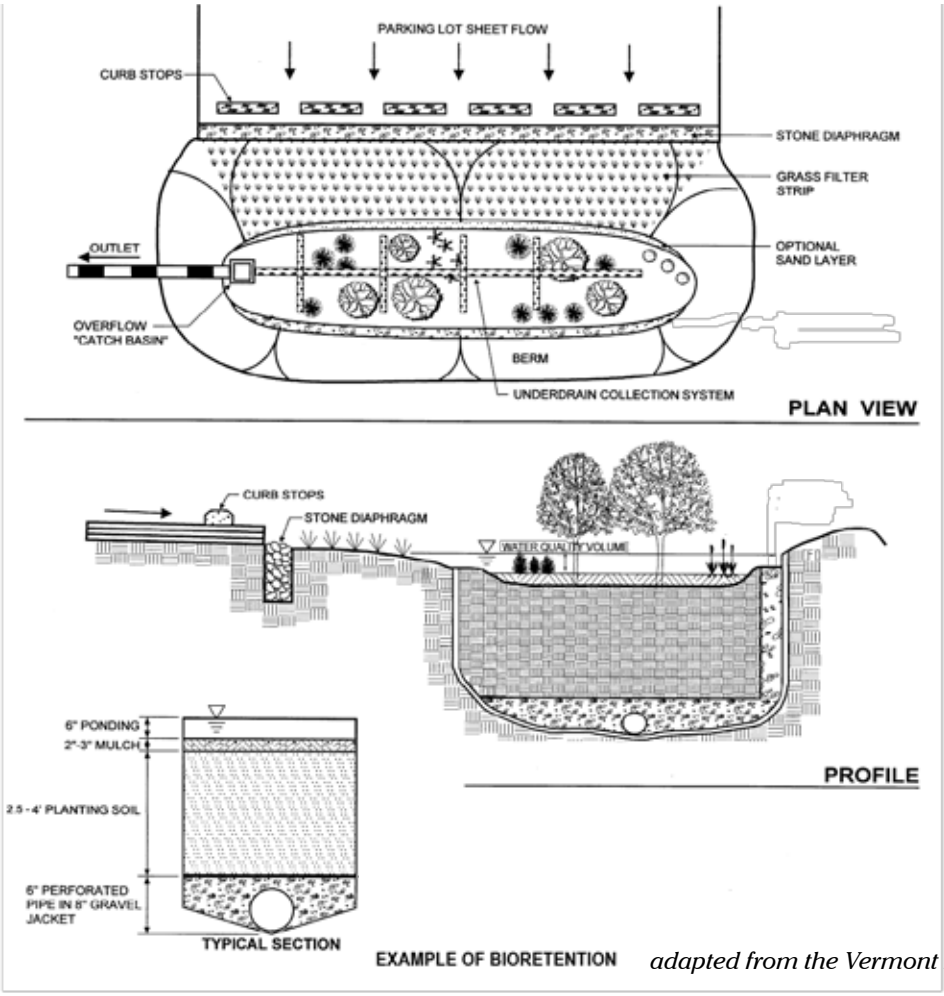
Description: Bioretention is a technique that uses soils, plants, and microbes to treat stormwater before it is infiltrated and/or discharged. Bioretention cells (also called rain gardens in residential applications) are shallow depressions filled with sandy soil topped with a thick layer of mulch and planted with dense native vegetation. Stormwater runoff is directed into the cell via piped or sheet flow. The runoff percolates through the soil media that acts as a filter.
There are two types of bioretention cells: those that are designed solely as an organic filter filtering bioretention areas and those configured to recharge groundwater in addition to acting as a filter exfiltrating bioretention areas. A filtering bioretention area includes an impermeable liner and underdrain that intercepts the runoff before it reaches the water table so that it may be conveyed to a discharge outlet, other best management practices, or the municipal storm drain system. An exfiltrating bioretention area has an underdrain that is designed to enhance exfiltration of runoff into the groundwater.

Ability to meet specific standards

Standard	Description
2 - Peak Flow	N/A
3 - Recharge	An exfiltrating bioretention area provides groundwater recharge.
4 - TSS Removal	90% TSS removal credit with adequate pretreatment
5 - Higher Pollutant Loading	Can be used for certain land uses with higher potential pollutant loads if lined and sealed until adequate pretreatment is provided. Adequate pretreatment must include 44% TSS removal prior to infiltration. For land uses that have the potential to generate runoff with high concentrations of oil and grease such as high intensity use parking lots and gas stations, adequate pretreatment may also include an oil grit separator, sand filter or equivalent. In lieu of an oil grit separator or sand filter, a filtering bioretention area also may be used as a pretreatment device for infiltration practices exfiltrating runoff from land uses with a potential to generate runoff with high concentrations of oil and grease.
6 - Discharges near or to Critical Areas	Good option for discharges near cold-water fisheries. Should not be used near bathing beaches and shellfish growing areas.
7 - Redevelopment	Suitable with appropriate pretreatment

Pollutant Removal Efficiencies

- Total Suspended Solids (TSS) — 90% with vegetated filter strip or equivalent
- Total Nitrogen — 30% to 50% if soil media at least 30 inches
- Total Phosphorus — 30% to 90%
- Metals (copper, lead, zinc, cadmium) — 40% to 90%
- Pathogens (coliform, e coli) — Insufficient data



EXAMPLE OF BIORETENTION *adapted from the Vermont Stormwater Manual*

Special Features:

- Can be lined and sealed to prevent recharge where appropriate
- Adequate pretreatment is essential
- Not recommended in areas with steep slope
- Depth of soil media depends on type of vegetation that is proposed
- Soil media must be 30 inches deep to achieve removal of nitrogen

Advantages/Benefits:

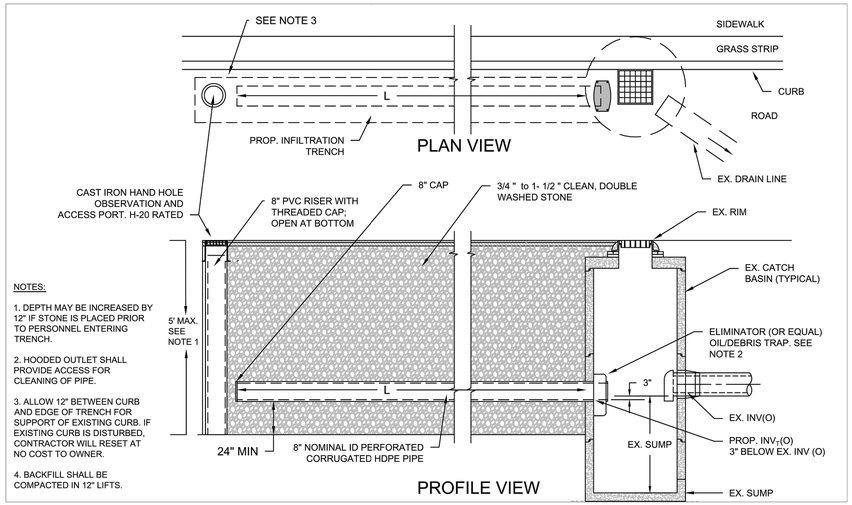
- Can be designed to provide groundwater recharge and preserves the natural water balance of the site
- Can be designed to prevent recharge where appropriate
- Supplies shade, absorbs noise, and provides windbreaks
- Can remove other pollutants besides TSS including phosphorus, nitrogen and metals
- Can be used as a stormwater retrofit by modifying existing landscape or if a parking lot is being resurfaced
- Can be used on small lots with space constraints
- Small rain gardens are mosquito death traps
- Little or no hazard for amphibians or other small animals

Disadvantages/Limitations:

- Requires careful landscaping and maintenance
- Not suitable for large drainage areas

Maintenance

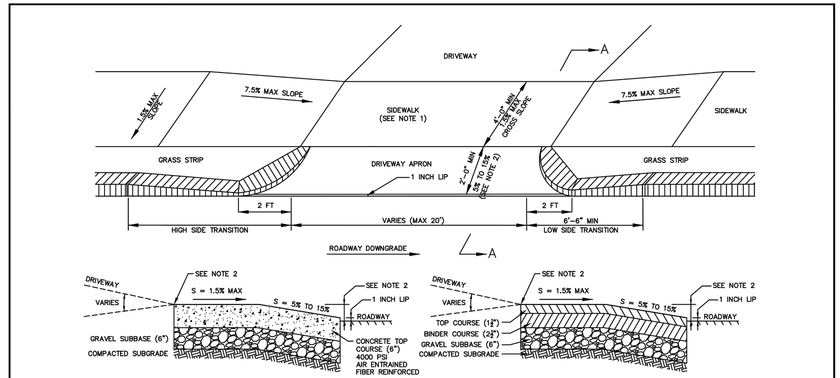
Activity	Frequency
Inspect and remove trash	Monthly
Mow	2 to 12 times per year
Mulch	Annually
Fertilize	Annually
Remove dead vegetation	Annually
Prune	Annually



NOTES:

1. DEPTH MAY BE INCREASED BY 12" IF STONE IS PLACED PRIOR TO PERSONNEL ENTERING TRENCH.
2. HOODED OUTLET SHALL PROVIDE ACCESS FOR CLEANING OF PIPE.
3. ALLOW 12" BETWEEN CURB AND EDGE OF TRENCH FOR SUPPORT OF EXISTING CURB. IF EXISTING CURB IS DISTURBED, CONTRACTOR WILL RESET AT NO COST TO OWNER.
4. BACKFILL SHALL BE COMPACTED IN 12" LIFTS.

Town of ARLINGTON ENGINEERING DIVISION	STANDARD PIPE TRENCH INFILTRATION SYSTEM	DEC. 2020 NOT TO SCALE REVISION ②	D-1



SECTION A–A
CONCRETE SIDEWALK & APRON
(SEE NOTE 1)

SECTION A–A
ASPHALT SIDEWALK & APRON
(SEE NOTE 1)

NOTES:

1. MATCH DRIVEWAY APRON MATERIALS WITH EXISTING SIDEWALK MATERIAL
2. DOWNWARD SLOPING DRIVEWAYS REQUIRE A SIDEWALK HEIGHT AT LEAST 3" ABOVE THE ROADWAY

Town of ARLINGTON ENGINEERING DIVISION	TYPICAL DRIVEWAY APRON WITH GRASS STRIP	SEPT. 2016 NOT TO SCALE REVISION ②	D-3

NOTES

1. PLANS WERE DEVELOPED USING AVAILABLE AERIAL IMAGERY, EXISTING PLANS, AND ON-SITE OBSERVATIONS. A FORMAL SURVEY OF THE PROJECT AREAS WAS NOT CONDUCTED. UTILITY LOCATIONS AND INVERT MEASUREMENTS ARE APPROXIMATE.
2. CONTRACTOR IS RESPONSIBLE FOR NOTIFYING DIG-SAFE AND ALL APPLICABLE UTILITIES OF THE PROPOSED WORK PRIOR TO ANY EXCAVATION. THE TOWN OF ARLINGTON IS NOT A MEMBER OF DIG-SAFE AND MUST BE NOTIFIED DIRECTLY AT LEAST 72 HOURS PRIOR TO EXCAVATION BY CALLING 781-316-3310.
3. TRENCHES HAVE BEEN PROPOSED IN LOCATIONS WHERE NO UTILITY CONFLICTS WERE APPARENT. THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING ALL APPLICABLE UTILITIES FOR APPROPRIATE MARK-OUTS AND CONFIRMING NO CONFLICTS ARE PRESENT. THE CONTRACTOR IS RESPONSIBLE FOR NOTIFYING THE ENGINEER SHOULD ANY EXISTING UTILITY CONFLICTS BE IDENTIFIED WITHIN PROPOSED TRENCH LIMITS.
4. CONTRACTOR IS RESPONSIBLE FOR NOTIFYING RESIDENTS AND ABUTTERS OF ANY WORK THAT MAY INTERFERE WITH DRIVEWAY AND WALKWAY ACCESS.
5. A RELATIVE LOCAL DATUM HAS BEEN SET FOR EACH TRENCH LOCATION. THE CATCHBASIN RIM ELEVATION HAS BEEN SET TO ZERO FEET (0.0') AT EACH LOCATION.
6. EXISTING ASPHALT SHOULD BE SAWCUT PRIOR TO EXCAVATION.
7. TRENCHES SHOULD BE BACKFILLED AND COMPACTED IN 12 INCH LIFTS.
8. CONTRACTOR IS RESPONSIBLE FOR APPROPRIATE CONSTRUCTION SIGNAGE AND BARRIERS AS NEEDED AND SHALL BE INCIDENTAL TO THE CONTRACT.
9. CONTRACTOR TO MAINTAIN CLEAN WORK ZONE AND SWEEP WORK SITE DAILY.
10. PAVING TO BE COMPLETED WEEKLY.
11. EROSION CONTROL SHALL BE USED WHEN NECESSARY AND CONSIDERED INCIDENTAL TO THE CONTRACT. ANY SEDIMENT THAT ENTERS THE TOWN'S STORMWATER SYSTEM AS A RESULT OF CONSTRUCTION SHALL BE REMOVED AT THE EXPENSE OF THE CONTRACTOR.
12. CONTRACTOR SHOULD TAKE CARE TO NOT IMPACT NEARBY TREES DURING CONSTRUCTION.
13. ANY AREA DISTURBED BY THE CONTRACTOR OUTSIDE OF THE LIMITS OF WORK SHALL BE RESTORED TO ORIGINAL CONDITION AT NO COST TO THE OWNER.

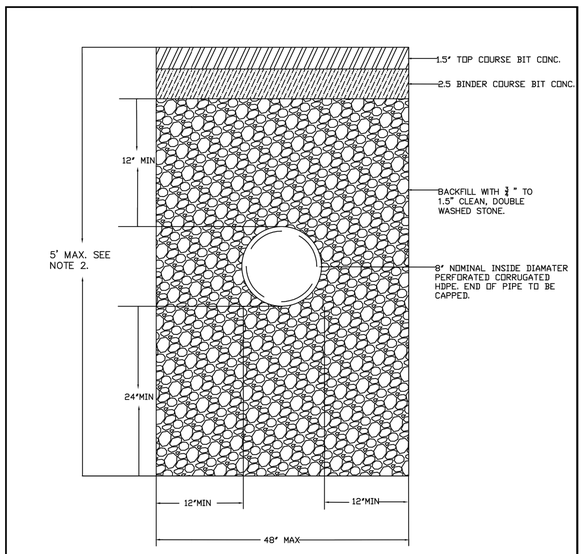
No.	Revision/Issue	Date

Town of
ARLINGTON
Engineering Division
51 Grove Street
Arlington, MA 02476

2021 GREEN INFRASTRUCTURE IMPROVEMENTS PROJECT

ARLINGTON CONSTRUCTION DETAILS

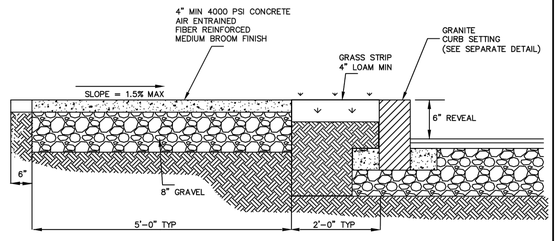
Dr□n B□: □C	Sheet: 13
Checked B□: WCC	
Scale: NTS	
Date: FEBR□□R□ 2021	



NOTES:

1. ALL BACKFILL SHALL BE COMPACTED IN 12 INCH LIFTS.
2. DEPTH MAY BE INCREASED BY 1 FOOT IF STONE IS PLACED PRIOR TO PERSONNEL ENTERING THE TRENCH.
3. MEASURES SHALL BE TAKEN TO PREVENT MIGRATION OF FINES INTO BACKFILL.
4. PIPE SPECS BASED OFF HD100EC PIPE MANUFACTURED BY LANE ENTERPRISES.

Town of ARLINGTON ENGINEERING DIVISION	STREET INFILTRATION TRENCH CROSS SECTION VIEW	DEC. 2020 NOT TO SCALE REVISION ⓪	D-2

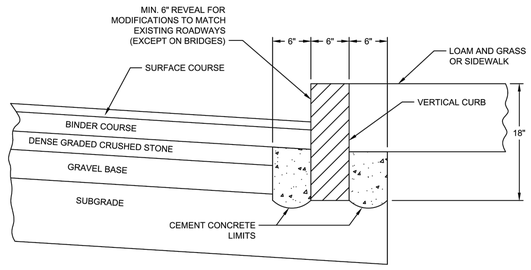


CONCRETE SIDEWALK

NOTES:

1. EXPANSION JOINTS SHALL BE INSTALLED EVERY 20 FEET MINIMUM. CONTROL JOINTS TO BE APPROXIMATELY 5 FEET.
2. ½" PREFORMED POLYMER FOAM JOINT FILLER INSTALLED TO FULL DEPTH OF CONCRETE.
3. GRASS STRIP CAN BE REDUCED TO 18 INCHES IF EXISTING WALKWAY CANNOT MAINTAIN A 5 FOOT SIDEWALK WITH 2 FOOT GRASS STRIP.
4. SIDEWALK SURFACE SHALL SLOPE TOWARD STREET TO AVOID STANDING WATER OR PUDDLING.
5. SIDEWALK TO BE BROOM FINISHED.

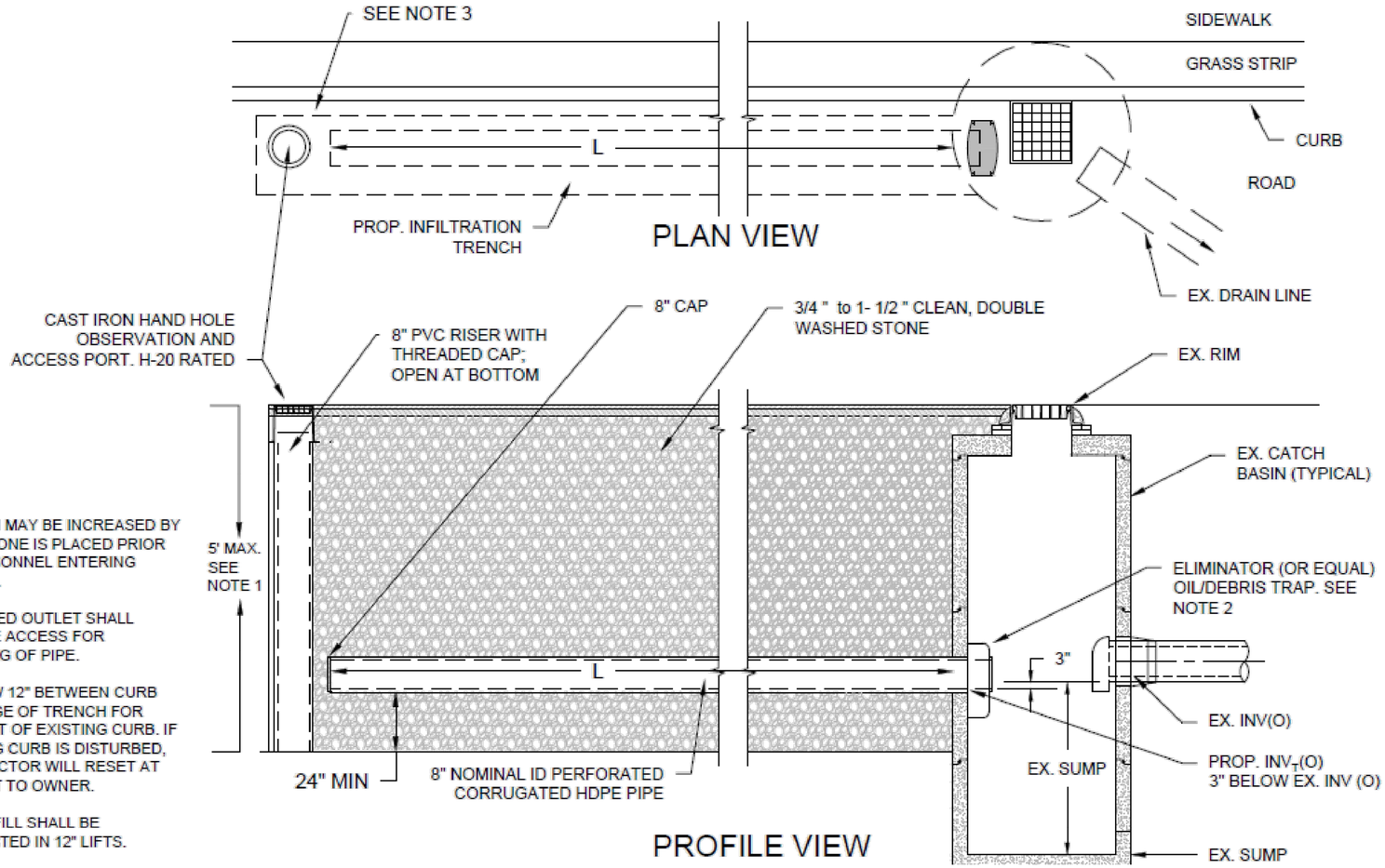
Town of ARLINGTON ENGINEERING DIVISION	TYPICAL SIDEWALK SECTIONS WITH GRASS STRIP	OCT. 2020 NOT TO SCALE REVISION ②	D-4



NOTES:

1. SAW-CUT NEAT LINE 6" FROM CURB LINE AND REMOVE BASE AND SUBGRADE, REPLACE WITH CEMENT CONCRETE. COVER WITH BINDER AND TOP COURSE TO CURB.
2. ANY DESIGNATED CEMENT CONCRETE THAT IS ACCEPTABLE UNDER SECTION M4 OF THE STANDARD MHD SPECIFICATIONS MAY BE USED; ALL TEST REQUIREMENTS ARE WAIVED. BITUMINOUS CONCRETE SHALL NOT BE USED AS A SUBSTITUTE.

Town of ARLINGTON ENGINEERING DIVISION	VERTICAL GRANITE CURB INSTALLATION	JAN. 2015 NOT TO SCALE REVISION ①	D-5



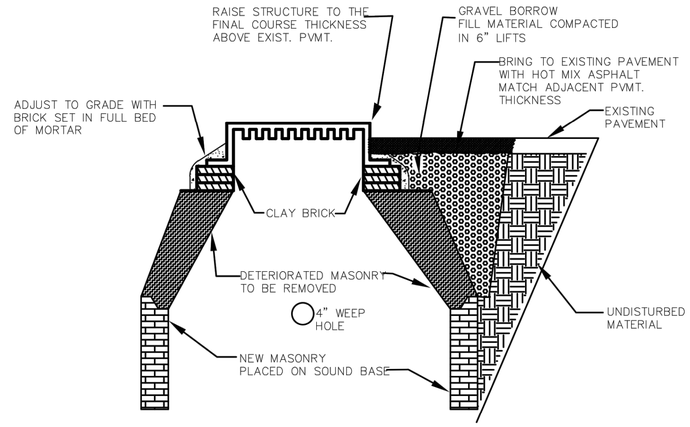
NOTES:

1. DEPTH MAY BE INCREASED BY 12" IF STONE IS PLACED PRIOR TO PERSONNEL ENTERING TRENCH.

2. HOODED OUTLET SHALL PROVIDE ACCESS FOR CLEANING OF PIPE.

3. ALLOW 12" BETWEEN CURB AND EDGE OF TRENCH FOR SUPPORT OF EXISTING CURB. IF EXISTING CURB IS DISTURBED, CONTRACTOR WILL RESET AT NO COST TO OWNER.

4. BACKFILL SHALL BE COMPACTED IN 12" LIFTS.



TYPICAL REBUILD OF DRAINAGE/SEWER STRUCTURE

NOTES:

1. ALL BACKFILL SHALL BE COMPACTED IN 12 INCH LIFTS.
2. DEPTH MAY BE INCREASED BY 1 FOOT IF STONE IS PLACED PRIOR TO PERSONNEL ENTERING THE TRENCH.
3. MEASURES SHALL BE TAKEN TO PREVENT MIGRATION OF FINES INTO BACKFILL.
4. PIPE SPECS BASED OFF HD100EC PIPE MANUFACTURED BY LANE ENTERPRISES.

NOTES:

1. PLANS WERE DEVELOPED USING AVAILABLE AERIAL IMAGERY, EXISTING PLANS, AND ON-SITE OBSERVATIONS. A FORMAL SURVEY OF THE PROJECT AREAS WAS NOT CONDUCTED. UTILITY LOCATIONS AND INVERT MEASUREMENTS ARE APPROXIMATE.
2. CONTRACTOR IS RESPONSIBLE FOR NOTIFYING DIG-SAFE AND ALL APPLICABLE UTILITIES OF THE PROPOSED WORK PRIOR TO ANY EXCAVATION. THE TOWN OF LEXINGTON IS NOT A MEMBER OF DIG-SAFE AND MUST BE NOTIFIED DIRECTLY AT LEAST 72 HOURS PRIOR TO EXCAVATION BY CALLING THE TOWN OF LEXINGTON OPERATIONS AT 781-274-8300.
3. TRENCHES HAVE BEEN PROPOSED IN LOCATIONS WHERE NO UTILITY CONFLICTS WERE APPARENT. THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING ALL APPLICABLE UTILITIES FOR APPROPRIATE MARK-OUTS AND CONFIRMING NO CONFLICTS ARE PRESENT. THE CONTRACTOR IS RESPONSIBLE FOR NOTIFYING THE ENGINEER SHOULD ANY EXISTING UTILITY CONFLICTS BE IDENTIFIED WITHIN PROPOSED TRENCH LIMITS.
4. CONTRACTOR IS RESPONSIBLE FOR NOTIFYING RESIDENTS AND ABUTTERS OF ANY WORK THAT MAY INTERFERE WITH DRIVEWAY AND WALKWAY ACCESS.
5. A RELATIVE LOCAL DATUM HAS BEEN SET FOR EACH TRENCH LOCATION. THE CATCHBASIN RIM ELEVATION HAS BEEN SET TO ZERO FEET (0.0') AT EACH LOCATION.
6. EXISTING ASPHALT SHOULD BE SAWCUT PRIOR TO EXCAVATION.
7. TRENCHES SHOULD BE BACKFILLED AND COMPACTED IN 12 INCH LIFTS.
8. CONTRACTOR IS RESPONSIBLE FOR APPROPRIATE CONSTRUCTION SIGNAGE AND BARRIERS AS NEEDED AND SHALL BE INCIDENTAL TO THE CONTRACT.
9. CONTRACTOR TO MAINTAIN CLEAN WORK ZONE AND SWEEP WORK SITE DAILY.
10. PAVING TO BE COMPLETED WEEKLY.
11. EROSION CONTROL SHALL BE USED WHEN NECESSARY AND CONSIDERED INCIDENTAL TO THE CONTRACT. ANY SEDIMENT THAT ENTERS THE TOWN'S STORMWATER SYSTEM AS A RESULT OF CONSTRUCTION SHALL BE REMOVED AT THE EXPENSE OF THE CONTRACTOR.
12. CONTRACTOR SHOULD TAKE CARE TO NOT IMPACT NEARBY TREES DURING CONSTRUCTION.
13. ANY AREA DISTURBED BY THE CONTRACTOR OUTSIDE OF THE LIMITS OF WORK SHALL BE RESTORED TO ORIGINAL CONDITION AT NO COST TO THE OWNER.
14. DO NOT PARK, IMPEDE ACCESS TO, OR STORE EQUIPMENT BEYOND RIGHT OF WAY, UNLESS PERMISSION HAS BEEN GRANTED IN WRITING BY THE TOWN AND/OR LAND OWNER.

DATE	REVISION	BY
1/22/21	VIEWPORTS	ML
1/25/21	DESIGN TABLES	ML
1/26/21	TRENCH LENGTHS	ML

STREET TRENCH DESIGNS AND LOCATIONS

Town of Lexington
ENGINEERING DIVISION

DRAWN BY: ML | DATE: 1/20/21 | SCALE: N.T.S
DESIGNED BY: ML | CHECKED BY: MS
APPROVED BY:

SHEET 14

STREET TRENCH SHEET.DWG Plotted on 4-Feb-2021 2:23 PM

sediment, trash and debris. Eventually a layer of sediment will accumulate on the top of the sand, which can be easily scraped off using rakes or other devices. Finer sediments will penetrate deeper into the sand over time, necessitating replacement of some (several inches) or all of the sand. Discolored sand indicates the presence of fine sediments. Dewater and properly dispose of sand removed from the filter.

References

Erickson, Andrew J., et al., Enhanced Sand Filtration for Storm Water Phosphorus Removal, Journal of Environmental Engineering. Volume 133, Issue 5, pp. 485-497, May 2007.

Tree Box Filter

Description: The Tree Box Filter consists of an open bottom concrete barrel filled with a porous soil media, an underdrain in crushed gravel, and a tree. Stormwater is directed from surrounding impervious surfaces through the top of the soil media. Stormwater percolates through the media to the underlying ground. Treated stormwater beyond the design capacity is directed to the underdrain where it may be directed to a storm drain, other device, or surface water discharge.



Advantages/Benefits:

- May be used as a pretreatment device
- Provides decentralized stormwater treatment
- Ideal for redevelopment or in the ultra-urban setting

Disadvantages/Limitations:

- Treats small volumes

Special Features

Reduces volume and rate of runoff.

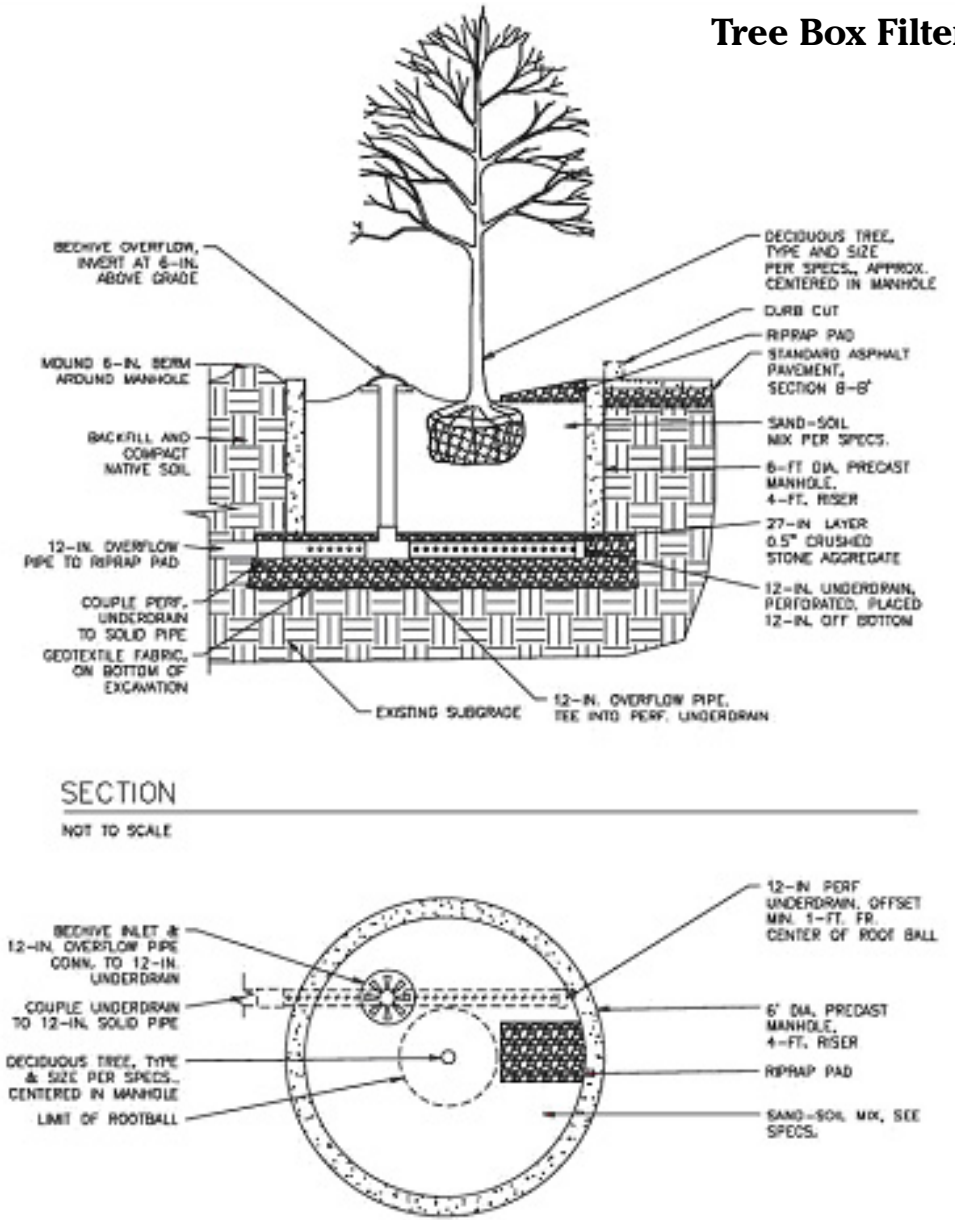
Ability to meet specific standards

Standard	Description
2 - Peak Flow	N/A
3 - Recharge	No infiltration credit
4 - TSS Removal	Presumed to remove 80% TSS
5 - Higher Pollutant Loading	May be used as pretreatment device if lined
6 - Discharges to near or to Critical Areas	Not suitable for vernal pools or swimming areas. At other critical areas, may be used as a pretreatment device.
7 - Redevelopment	May be used for retrofit.

Pollutant Removal Efficiencies

- Total Suspended Solids (TSS)- 80% presumed for regulatory purposes
- Total phosphorus (TP)- Not Reported
- Dissolved Inorganic Nitrogen- Not Reported
- Zinc- Not Reported
- Pathogens (coliform, e. coli)- Not Reported

Tree Box Filter



adapted from the Vermont Stormwater Manual

Maintenance

Activity	Frequency
Check tree	Annually. Expected tree life is 5-10 years.
Rake media surface to maintain permeability	Twice a year
Replace media	When tree is replaced

Appendix K- Blackstone Phase II PSIR



Weston & Sampson[SM]

westonandsampson.com

55 Walkers Brook Drive, Suite 100
Reading, MA 01867
tel: 978.532.1900

DRAFT PHASE II PHOSPHORUS SOURCE IDENTIFICATION REPORT

MS4 GENERAL PERMIT COMPLIANCE

JUNE 2023

TOWN OF
Blackstone
MASSACHUSETTS

psir

TABLE OF CONTENTS

1.0 INTRODUCTION 2
1.1 Regulatory Requirement 2
2.0 PROJECT BACKGROUND 3
2.1 Blackstone River 3
2.2 Phosphorus Source Identification Report 3
2.3 BMP Retrofit Inventory Report 5
3.0 EVALUATION OF STRUCTURAL BMP OPPORTUNITIES 6
3.1 Project Ranking Matrix Results 8
3.2 Demonstration BMP Project 10
3.3 Implementation and Maintenance Cost 10
3.4 Implementation Schedule 11

ATTACHMENTS

Attachment A – Blackstone Phosphorus Source Identification Report

Attachment B – BMP Assessment Matrix

Attachment C – Map of Retrofit Sites

Attachment D – Demonstration Project Concepts

1.0 INTRODUCTION

1.1 Regulatory Requirement

The 2016 Massachusetts General Permit for Small Municipal Separate Storm Sewer Systems (MS4 Permit) includes specific requirements for MS4 operators that discharge to impaired waterbodies where pollutants typically found in stormwater—specifically nutrients, solids, bacteria/pathogens, chloride, metals, and oil and grease—are the cause of the impairment and there is not a Total Maximum Daily Load (TMDL) approved by USEPA. Additional requirements for phosphorus impairments include supplementary public education efforts, specific Best Management Practice (BMP) design standards, increased street sweeping, the development of a Phosphorus Source Identification Report (PSIR) for each waterbody with a phosphorus impairment, and an evaluation of structural BMP retrofit or installation opportunities, and a demonstration project. A PSIR was developed in Permit Year 4 for the entire Town of Blackstone, as all stormwater discharges in Blackstone are tributary to the Blackstone River, which is impaired for phosphorus.

Phase II of Blackstone's PSIR has been developed to evaluate Town-owned properties or areas for structural BMP installation. In accordance with permit requirements, this report includes the following elements:

1. Next planned infrastructure, redevelopment activity planned for the property or planned retrofit date;
2. Estimated cost of redevelopment or retrofit BMPs; and
3. Engineering and regulatory feasibility of redevelopment or retrofit BMPs.

This report was completed on or before the end of Permit Year 5 or June 30, 2023 in accordance with Permit requirements. By the end of Permit Year 6 (FY2024), Blackstone is required to plan and install one of the retrofit projects identified in the PSIR as a demonstration project. The remainder of the retrofit projects, where implementation is feasible from an engineering and permitting perspective, should be installed according to a schedule that must be included in the Year 5 Annual Report. Blackstone will consider future availability of funding in developing the schedule. Blackstone is also required to track any structural BMPs installed in the watershed and calculate the estimated phosphorus removal attributable to those BMPs consistent with Attachment 3 to Appendix F of the MS4 Permit. The BMP type, area treated, design storage volume, and estimated phosphorus removed in pounds per year by each BMP must be included in the Town's future MS4 annual reports.

2.0 PROJECT BACKGROUND

2.1 Blackstone River

The Blackstone River begins in Worcester, Massachusetts, flowing 46 miles south through several towns in Massachusetts and Rhode Island before discharging into the Narragansett Bay. The river comprises a drainage area of approximately 540 square miles. The Blackstone River has consistently been listed on the Massachusetts Integrated List of Waters, or 303(d) list due to a variety of impairments. The Town of Blackstone is tributary to the southernmost portion of the Blackstone River within Massachusetts (MA51-06), from Millville to the Rhode Island Border, which is listed on the Final 2018/2020 Massachusetts Integrated List of Waters, or 303(d) list, for cadmium, copper, DDT in fish tissue, Escherichia Coli (E. Coli), fish bioassessments, lead, PCBs in fish tissue, total phosphorus, and total suspended solids. The Blackstone River crosses Blackstone from west to east. Water bodies in Blackstone that are tributary to the Blackstone River include Crane Pond, Fox Brook, Lake Hiawatha, and the Mill River.

2.2 Phosphorus Source Identification Report

A PSIR was developed for the entire Town of Blackstone in Permit Year 4. The report included a calculation of MS4 areas draining to the Blackstone River, screening and monitoring results targeting the Blackstone River, calculation of impervious area and Directly Connected Impervious Area (DCIA) for all applicable regulated catchment areas in Blackstone, identification and prioritization of potential catchments with high phosphorus loadings, and identification of potential retrofit opportunities for the installation of structural BMPs in high phosphorus loading catchment areas. Blackstone's PSIR is included as Attachment A.

Appendix H of the 2016 MA MS4 Permit requires permittees developing a PSIR to calculate impervious and directly connected impervious area (DCIA) for all catchments tributary to the waterbodies of concern. Phosphorus loadings for each catchment area were calculated using land use data, impervious coverage, hydrologic soil group (HSG) data, and Phosphorus Load Export Rates (PLERs). Land use data for the properties within the MS4 catchment areas, as well as impervious area delineations for roads and other rights-of-way, was collected from MassGIS' most recent (2016) land use data layer and was used to calculate impervious area and DCIA for each catchment area in Blackstone. HSG, or the soil's ability to infiltrate stormwater, is ranked from A to D, with type A soils more suited for infiltration, and type D soils more likely to contribute runoff. Land use, impervious coverage, directly connected impervious area, and HSG have been utilized by EPA as part of the MS4 Permit to develop PLERs. The DCIA calculated for each catchment and PLERs were used in accordance with MS4 permit guidance to calculate an estimated phosphorus load for each catchment area.

There are currently 111 outfalls and interconnections owned by the Town of Blackstone that discharge to the Blackstone River or its watershed. The catchments were ranked with highest potential phosphorus load considered highest priority. The 10 catchments with the highest pollutant loads that were considered High Priority in the PSIR are presented in Table 1.

Table 1: High Priority Catchment Ranking from PSIR					
Rank	Catchment ID	Catchment Size (Ac)	Phosphorus Loading (lb/year)	Dry Weather Flow Observed	Dry Weather Phosphorus Value (mg/L)
1	Rathbun Interconnection	25.26	18.3	Yes	0.12
2	75	27.64	13.5	No	-
3	48	41.26	12.9	Yes	0.13
4	93	31.27	12.6	No	-
5	90	28.88	10.1	No	-
6	32	20.18	10.0	No	-
7	Rocco Dr	25.52	8.8	No	-
8	51	19.10	8.7	No	-
9	55	11.62	7.8	No	-
10	45	21.39	7.8	No	-

The PSIR report included a desktop analysis of Town-owned parcels and right-of-way locations for BMP retrofit opportunities. The locations identified for BMP retrofit in the PSIR, listed in order of catchment ranking, are included in Table 2.

Table 2: Potential BMP Retrofit Sites from PSIR						
Rank	Site Address	Property Owner	Site Area (Ac.)	Soil Type	Existing Parcel Use	Catchment ID
1	Rathbun Street (Diana Street to Ethel Street)	Right-of-Way	N/A	A	-	Rathbun_ Intercon
2	Washington Street (Main Street to Brown Street)	Right-of-Way	N/A	A	-	75
3	Liberty Hill Drive	Right-of-Way	N/A	B/C	-	48
4	Reilly Avenue (Mendon Street to Kimberly Lane)	Right-of-Way	N/A	A/B	-	93
5	John F. Kennedy Elementary School (200 Lincoln Street)	Town of Blackstone	2.3	B/C	School, Playing Fields	90
5	Mendon Street at Lincoln Street	Right-of-Way	N/A	B/D	-	90
6	Summer Street (Rennie Drive to Blackstone Street)	Right-of-Way	N/A	A/B/C	-	32
7	Rocco Drive	Right-of-Way	N/A	A/B	-	Rocco Dr

The PSIR identified preliminary structural BMP opportunities at each of these locations without field verification or further analysis.

2.3 BMP Retrofit Inventory Report

As part of the minimum control measure for Post-Construction Stormwater Management, Section 2.3.6 of the 2016 MS4 Permit requires regulated communities to identify a minimum of 5 permittee-owned properties that could potentially be modified or retrofitted with BMPs designed to reduce the frequency, volume, and pollutant loads of stormwater discharges to and from its MS4. In 2021, Fuss & O'Neill developed a Stormwater Retrofit Plan which identified five Town-owned properties that could potentially be modified or retrofitted with BMPs designed to reduce the frequency, volume, and pollutant loads of stormwater discharges to and from its MS4. The five sites were narrowed down from the 24 sites identified from the GIS-based screening evaluation because they had the greatest feasibility for retrofits, provided the best opportunities to infiltrate, and were considered most likely candidates for implementation by the Town. Each of the priority sites are situated on Town-owned parcels. The proposed BMP type and other retrofit concepts in Fuss & O'Neill's report, as well as the catchment area the site is within or adjacent to and the associated phosphorus loading priority ranking are included in Table 3 below.

Table 3: BMP Retrofit Inventory Sites (Fuss & O'Neill, 2021)

Site Name/ Address	Soil Type	Stormwater Retrofit BMP Type	Project Cost Estimate	Impervious Area Treated (Acres)	Catchment ID	Catchment Rank
Blackstone Town Offices (15 St. Paul Street)	B	Linear Bioretention Basins, Pervious Walkway	$61,000	0.96	74	65
Memorial Park (Butler & County Streets)	A	Bioretention Basin	$11,000	0.13	73	59
Historical Museum (23 Main Street)	A	Linear Bioretention Basin	$22,000	0.25	81	25
Blackstone Public Library (86 Main Street)	A, B/D	Bioretention Basins	$49,000	0.62	71	20
John F. Kennedy Elementary School (200 Lincoln Street)	B, C	Linear Bioretention Basins, Bioretention Basins, Pollinator Plantings	$153,000	2.3	90	5

Of those sites included in the BMP retrofit inventory, only the John F. Kennedy Elementary School is located within a High-Priority catchment area identified in the PSIR.

3.0 EVALUATION OF STRUCTURAL BMP OPPORTUNITIES

Appendix H of the 2016 Massachusetts MS4 Permit Part II.1.c requires Blackstone to plan and install a minimum of one structural BMP as a demonstration project within the drainage area of a phosphorus-impaired water or its tributaries within six years of the permit effective date, or by June 30, 2024. The demonstration project must be installed in a catchment with high phosphorus load potential. Blackstone must evaluate all permittee-owned properties presenting retrofit opportunities or areas for structural BMP installation identified in the PSIR that are within the drainage area of the phosphorus-impaired water or its tributaries, which includes the entire Town since it is located completely within the Blackstone River watershed. To evaluate these opportunities, the matrix included as Attachment B was created with weighted site suitability criteria. Site and project suitability were determined based on a desktop analysis. No significant permitting hurdles are currently anticipated for the potential project areas, however both engineering and permitting feasibility will continue to be evaluated as projects move from the planning phase to the conceptual design phase. Factors that were analyzed and ranked for each parcel to determine overall site feasibility for BMP retrofit are outlined in Table 4.

Table 4: Project Ranking Site Suitability Criteria

Site Suitability Criteria	Description	Prioritization Scale
MS4 Catchment Phosphorus Loading Rank	Catchment rank from PSIR based on site location within MS4 catchment areas. Targeting BMP retrofits in higher-priority catchments	Reverse points of phosphorus loading rank. Top ranked catchment (10 Pts), Low priority catchment (0 Pts)
Location: Parcel or Right-of-Way (ROW)	Parcels provide more ample space for retrofits than right-of-way locations	Parcel (10 Pts), ROW (5 Pts)
Parcel: Total Lot Size	Larger parcel lot sizes generally provide more space for retrofits	>5 acres (4 Pts), <5 acres (2 Pts)
Parcel: Pervious Space Available	A large amount of pervious area on a parcel provides opportunities for installation of more expansive retrofits that can manage flow from adjacent drainage or impervious surfaces	>1.5 Acres (6 Pts), 1 to 1.5 Acres (4 Pts), <1 Acre - 2 (Pts)
ROW: Next scheduled improvement	ROW locations that are planned for roadway reconstruction or improvements provide greater opportunity for retrofit	Within 5 years (5 Pts), 5-10 years (3 Pts), Done within 5 years (0 Pts)
ROW: Existing green space	ROW locations with no existing green space should be prioritized to reduce impervious cover	Yes (5 Pts), No (10 Pts)
Within National FEMA Flood Hazard layer or Town-identified flooding location	Areas within the FEMA flood hazard areas and parcels or ROW locations that could provide relief for historical flood prone areas identified by the Town were prioritized	Yes (15pts), No (0 Pts)

Table 4: Project Ranking Site Suitability Criteria		
Site Suitability Criteria	Description	Prioritization Scale
Within 300' of sensitive ecological receptors, wetlands areas, or source water protection areas	Projects in proximity to water resource areas, including wetlands, providing an opportunity for water quality benefits, were prioritized	Yes (5 Pts), No (0 Pts)
Dominant Hydrologic Soil Group	Group HSG A and B soils have the best infiltration properties and are best suited for BMP retrofit	A or B (10 Pts), A/D, B/D, C, D (5 Pts)
Depth to Groundwater	High water tables limit infiltration of stormwater. Projects in areas with large unsaturated thickness, or depth to groundwater, were prioritized	>10ft (5 Pts), <10ft (0 Pts)
Existing BMPs in the catchment area?	Project locations in catchments that do not already have BMPs were prioritized	No (5 Pts), Yes (0 pts)
Anticipated BMP Design & Construction Cost[1]	Projects with lower cost proposed BMPs were prioritized Low Cost: <$10,000 Medium Cost: $10,000-$100,000 High Cost: >$100,000	Recently Completed Project or Low Cost (10 Pts), Medium (6 Pts), High -(2 Pts)
Anticipated Maintenance Cost/ Required Level of Effort[2]	Projects with proposed BMPs that require less, or lower costing, operation and maintenance were prioritized Low: <$3,000 /year Medium: $3,000-$5,000 /year High: >$5,000 /year	Low (10 Pts), Medium (6 Pts), High (2 Pts)
Roadwork or Infrastructure Improvements Planned or Recently Completed in Area	Project locations that are planned to coincide with roadway or infrastructure improvements provide greater opportunity and Town buy-in for retrofit	Project Concept Developed (20 Pts), Planned (15 Pts), No (0 Pts)

[1] Cost ranges for different BMP types were developed based on recent experience with similar projects, professional judgement, and available literature. Costs are planning level and will be updated as projects become more detailed.

[2] Estimated annual maintenance costs were developed based on recent project experience and the costs included in the National Cooperative Highway Research Program's *Long-Term Performance and Life-Cycle Costs of Stormwater Best Management Practices* (National Academy of Sciences, 2014). Costs have been adjusted to 2023 values based on the Consumer Price Index.

Each of these criteria were weighted based on importance for feasibility. Projects on Town-owned parcels were weighted higher than right-of-way locations because they present opportunities for larger BMPs. Projects within a FEMA flood hazard zone or in flooding locations identified by the Town and projects where roadwork or infrastructure improvements are planned were weighted highest because these locations all present opportunities for BMP retrofit with higher feasibility. The results of this evaluation are summarized below.

3.1 Project Ranking Matrix Results

Possible retrofit locations identified in the PSIR , as well as Centennial Drive, which is planned for road construction in 2023 and is in a high priority catchment area in the PSIR, were included in the ranking matrix. A map of all potential and proposed BMP retrofit sites is included in Attachment C. The map depicts soil data at each location and proximity to FEMA flood zones and water resources. The results of the matrix are included in Table 5.

Table 5: Project Ranking Sites

Site Name/ Address	Stormwater Retrofit BMP Type	Project Ranking Score	Anticipated BMP Design & Construction Cost	Anticipated Maintenance Cost/ Required Level of Effort	Project Status
Washington Street (Main Street to Brown Street)	Curb bump-outs or infiltration trenches	75	Low	Medium	Project Concept in Development
Reilly Avenue (Mendon Street to Kimberly Lane)	Curb bump-outs or infiltration trenches	73	Low	Medium	Project Concept in Development
Centennial Drive	Curb bump-outs or infiltration trenches	72	Low	Medium	Project Concept in Development
John F. Kennedy Elementary School (200 Lincoln Street)	Bioretention areas, vegetated swales and filter strips	51	Medium	Medium	Concept Developed
Rathbun Street (Diana Street to Ethel Street)	Curb bump-outs or infiltration trenches	56	Low	Medium	N/A
Summer Street (Rennie Drive to Blackstone Street)	Curb bump-outs or vegetated filter strips	56	Low	Medium	N/A
Mendon Street at Lincoln Street	Curb bump-outs or infiltration trenches	55	Low	Medium	N/A
Rocco Drive	Curb bump-outs or infiltration trenches	53	Low	Medium	N/A
Liberty Hill Drive	Curb bump-outs or infiltration trenches	47	Low	Medium	N/A

3.1.1 Washington Street

Catchment 75 has a significant amount of impervious area (2.48 acres) that is directly connected to the MS4. Green infrastructure practices such as bioretention areas, vegetated bump-outs, filter strips, or infiltration trenches could be installed along Washington Street between Main Street and Brown Street to treat surface runoff. Any green infrastructure practice in this area would disconnect portions of the roadway from the MS4, infiltrating runoff for up to the 2-inch storm, and the existing drainage system would be left in place to provide bypass during larger storm events. The Town

could also consider the use of permeable pavement to make future improvements to the sidewalk or parking areas on this street. Washington Street, Goddard Street, and Carrington Street, which are all part of catchment 75, are planned for roadwork in 2023 and green infrastructure improvements such as small curb bump-outs with bioretention or infiltration trenches should be considered as part of this work.

3.1.2 Reilly Avenue

Green infrastructure practices such as curb bump outs with bioretention areas, infiltration trenches, or tree filter pits could potentially be installed along Reilly Avenue, Mark Drive, Nancy Court, or Kimberly Lane. The portion of Reilly Avenue between Mendon Street and Kimberly Lane and the three cul-de-sacs are within catchment 93. Curb bump outs in this area could provide traffic calming at intersections and would help disconnect impervious surface from the MS4. Reilly Avenue, Kimberly Lane, Nancy Court and Mark Drive are planned for roadwork in 2023 and green infrastructure improvements such as small curb bump-outs with bioretention or infiltration trenches should be considered as part of this work.

3.1.3 Centennial Drive

The entirety of Centennial Drive, the eastern portion of Crestwood Drive and surrounding residential properties are part of catchment 45, which is ranked 10th for priority in the PSIR. There are catch basins on both sides of the street that could be converted to leaching catch basins with proper pretreatment. Green infrastructure practices such as infiltration trenches and small bioretention areas should also be considered. Centennial Drive is planned for roadwork in 2023 and green infrastructure improvements should be considered as part of this work.

3.1.4 John F. Kennedy Elementary School

Fuss & O'Neill's 2021 Stormwater Retrofit Plan identifies this school as a top five priority site based on input from the Town and Blackstone's Highway Superintendent. The design concept developed as part of the retrofit plan proposes bioretention areas, vegetated swales, and vegetated filter strips to treat runoff from the impervious areas surrounding the school building.

3.1.5 Rathbun Street

Green infrastructure practices such as curb bump outs with bioretention areas, infiltration trenches, or tree filter pits could be installed along the section of Rathbun Street between Diana Street and Ethel Street. Runoff from a portion of Rathbun Street could be diverted through curb cuts to a small bioretention area between the curb and property line, disconnecting impervious surface from the MS4 and reducing runoff volumes and pollutant loads. The Town should look for specific locations to implement green infrastructure as well as infiltration trenches on Rathbun Street when planning future roadway and sidewalk improvements. However, Blackstone's Highway Superintendent indicated that this street was recently paved, making it an undesirable location for BMP retrofit at this time.

3.1.6 Summer Street

Green infrastructure practices such as bioretention areas, vegetated bump-outs, or filter strips, could be installed along Summer Street between Rennie Drive and Blackstone Street to treat surface runoff. Any green infrastructure practice in this area would disconnect portions of the roadway from the MS4.Rennie Drive is planned for roadwork in 2023 and green infrastructure improvements could be included in his work. However, Blackstone's Highway Superintendent indicated that Rennie Drive was recently paved, making it an undesirable location for BMP retrofit as this time.

3.1.7 Mendon Street at Lincoln Street

Green infrastructure practices such as curb bump outs with bioretention areas, infiltration trenches, or tree filter pits could potentially be installed at this intersection. Curb bump outs in this area could provide traffic calming and treatment of runoff from the paved portion of the intersection. If BMPs are installed at John F. Kennedy Elementary School, retrofits at this intersection should be considered for simultaneous installation.

3.1.8 Rocco Drive

The entirety of the street and surrounding residential properties is part of the Rocco Drive catchment. There are catch basins on both sides of the street that could be converted to leaching catch basins with proper pretreatment. Green infrastructure practices such as infiltration trenches and small bioretention areas should also be considered. The Town could also consider the use of permeable pavement as part of future improvements to this street.

3.1.9 Liberty Hill Drive

The entirety of the street and surrounding residential properties is part of catchment 48. There are catch basins on both sides of the street that could be converted to leaching catch basins with proper pretreatment. Green infrastructure practices such as infiltration trenches and small bioretention areas should also be considered. The Town could also consider the use of permeable pavement if future roadway improvements are planned for this street.

3.2 Demonstration BMP Project

The project evaluation identified Washington Street as the most suitable site for structural BMP retrofit. Since roadway work is planned on Washington Street, Reilly Avenue, and Centennial Drive, each of these locations will be further investigated in the field and discussed with the Town to determine overall project feasibility. Demonstration project concepts for small curb bump-out areas and infiltration trenches as well as examples of these BMPs in the right-of-way are included in Attachment D. Blackstone's Highway Superintendent has indicated that a small infiltration trench or bioretention area could be installed by the Blackstone Department of Public Works. Construction of a BMP in a high-priority catchment area identified in the PSIR will be completed before June 30, 2024.

3.3 Implementation and Maintenance Cost

Estimated construction and maintenance costs associated with the selected demonstration BMP project are included in Table 6 below. One infiltration trench was assumed as the most likely BMP retrofit for the Blackstone DPW to install before June 30, 2024. Additional costs may be incorporated as a site is selected and the project is designed and constructed.

Table 6: Construction and Maintenance Costs for Demonstration Project	
Installation of Infiltration Trench	$6,600/unit
Total Cost of BMP Installation	$6,600
Estimated Annual Maintenance Cost	$2,275
Total Cost of Installation and Maintenance	$8,875

3.4 Implementation Schedule

Under Appendix H of the 2016 Massachusetts MS4 Permit, the Town of Blackstone shall provide a plan and schedule for implementation of planned structural BMPs identified in this report. Implementation timeframes for design and construction for each planned BMP are summarized in Table 5. Table 5 will be updated annually to reflect implementation progress and funding availability. The schedule for a number of potential projects is unknown at this point since the Town has not secured the necessary funding.

Table 5: Implementation Schedule for BMPs				
Site Address	Proposed BMP(s)	Funding Procurement Completion	Design Completion	Construction Completion
To Be Determined	Infiltration Trench	Pending	Pending	June 30, 2024

This plan and schedule will be included in Blackstone's Year 5 annual report and the Town will install the remainder of the BMPs in accordance with this schedule. This schedule will be updated as necessary based on Town input and funding considerations.

Attachment A

Blackstone Phosphorus Source Identification Report

Weston & Sampson℠

westonandsampson.com

WESTON & SAMPSON ENGINEERS, INC.
55 Walkers Brook Drive, Suite 100
Reading, MA 01867
tel: 978.532.1900

REPORT

September 2022

CITY OF
Blackstone
MASSACHUSETTS

MS4 Permit Compliance
Phosphorus Source Identification Report
UPDATED DRAFT JANUARY 2023

TABLE OF CONTENTS

Page

TABLE OF CONTENTS i

LIST OF TABLES ii

LIST OF APPENDICES iii

1.0 REGULATORY SUMMARY AND PURPOSE 1-1
Waterbody Descriptions 1-1
Blackstone River 1-1
Crane Pond 1-2
Fox Brook 1-2
Lake Hiawatha 1-2
Mill River 1-3

2.0 LITERATURE REVIEW 2-1
Literature Review 2-1
2017 Water Quality and Streamflow Analysis 2-1
Blackstone River Water Quality Monitoring 2-1
Historic Sampling Data 2-2

3.0 CATCHMENT AREA CHARACTERISTICS 3-1
Available GIS Mapping 3-1
Directly Connected Impervious Area 3-1

4.0 POLLUTANT LOADING ANALYSIS AND PRIORITIZATION OF CATCHMENTS WITH HIGHER POTENTIAL PHOSPHORUS LOADS 4-1
Phosphorus Load Export Rates 4-1
Results 4-2
4.2.1 Catchment Descriptions 4-2
Dry and Wet Weather Outfall Screening and Sampling 4-4
Catchment Ranking Matrix 4-5

5.0 BEST MANAGEMENT PRACTICE (BMP) RETROFIT OPPORTUNITIES 5-1
5.1 Potential Retrofit Sites 5-1
Rathbun Street 5-1
Washington Street 5-2
Liberty Hill Drive 5-2
Reilly Avenue 5-2
John F. Kennedy Elementary School 5-2
Mendon Street at Lincoln Street 5-2
Summer Street 5-2
Rocco Drive 5-3
5.2 Implementation 5-3

6.0 REFERENCES 5-1

LIST OF TABLES

Table 1..... Blackstone River Water Quality Monitoring Program Sampling Sites

Table 2.....Blackstone River Water Quality Monitoring Program River Sampling Data

Table 3..... Land Use in MS4 Catchment Areas in Blackstone

Table 4.....Conversion of MassGIS 2016 Land Use Codes to EPA Land Use Codes

Table 5..... EPA Land Use Classes and Corresponding Sutherland Equations

Table 6.....DCIA and Percent Connectivity in MS4 Catchment Areas

Table 7..... Phosphorus Load Export Rates by Land Use

Table 8.....Pollutant Loading Analysis Results – Top 10 Catchments

Table 9.....Dry Weather Phosphorus Sampling Results

Table 10..... High Priority Catchment Ranking

Table 11.....Potential BMP Retrofit Sites

LIST OF APPENDICES

Appendix A ..... Blackstone MS4 Map

Appendix B ..... Impervious Area and DCIA Results for All Catchments

Appendix C ..... Land Use/Land Cover Grid

Appendix D ..... Pollutant Loading Analysis Results

Appendix E ..... Catchment Prioritization and Ranking

Appendix F ..... BMP Retrofit Cut Sheets, Examples, and Working Designs

1.0 REGULATORY SUMMARY AND PURPOSE

The 2016 MS4 Permit includes specific requirements for MS4 operators that discharge to impaired waterbodies where pollutants typically found in stormwater—specifically nutrients, solids, bacteria/pathogens, chloride, metals, and oil and grease—are the cause of the impairment and there is not a Total Maximum Daily Load (TMDL) approved by USEPA. Additional requirements for phosphorus impairments include supplementary public education efforts, specific BMP design standards, increased street sweeping, and the development of a Phosphorus Source Identification Report (PSIR) for each waterbody with a phosphorus impairment. Waterbodies in Blackstone that are impaired for phosphorus include the Blackstone River; all stormwater discharges in Blackstone are tributary to the Blackstone River.

This PSIR has been developed for the entire Town of Blackstone, as the town is entirely within the Blackstone River Watershed. In accordance with permit requirements, this report includes the following elements:

1. A calculation of the total MS4 areas draining to the water quality limited receiving water, incorporating updating mapping of the MS4 and catchment delineations;
2. All screening and monitoring results targeting the receiving water;
3. Impervious area and Directly Connected Impervious Area (DCIA) for the target catchment area(s);
4. Identification, delineation, and prioritization of potential catchments with high phosphorus loadings; and
5. Identification of potential retrofit opportunities or opportunities for the installation of structural BMPs during redevelopment, including the removal of impervious area.

Waterbody Descriptions

Blackstone is entirely located within the Blackstone River Watershed, meaning that every town-owned outfall is tributary to the Blackstone River. Since the Blackstone River is impaired for phosphorus, the Town must develop this PSIR for the entirety of its regulated area. A description of receiving waters in Blackstone, as well as the Blackstone River, is included below.

Blackstone River

The Blackstone River begins in Worcester, Massachusetts, flowing 46 miles south through several towns in Massachusetts and Rhode Island before discharging into the Narragansett Bay. The river comprises a drainage area of approximately 540 square miles. Sanitary waste disposal and heavy industrial usage in the 1800s by textile, leather, metal and woodworking companies left the Blackstone River exceptionally polluted by the early 1900s. A water quality survey of the river was first conducted by the Massachusetts Division of Water Pollution Control (DPWC), which started publishing data on the Blackstone River Basin in 1964. In 1975, the Blackstone River Basin Water Quality Management Plan was published, which set stream water-quality goals, effluent limitations for individual dischargers and a schedule for pollution abatement projects. In 1988, the Blackstone River Valley National Heritage Corridor was established by Congress in Massachusetts and Rhode Island to protect the valley's historic, cultural, and natural resources.

The Blackstone River has since consistently been listed on the Massachusetts Integrated List of Waters, or 303(d) list due to a variety of impairments. The Town of Blackstone is tributary to the southernmost

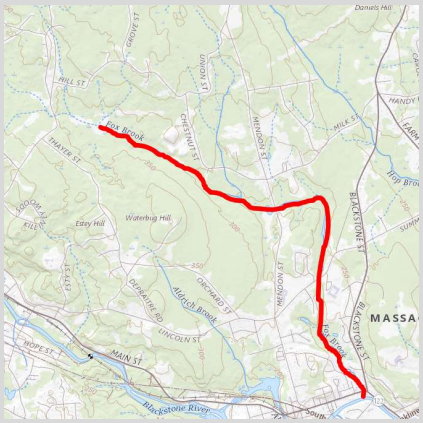
region of the Blackstone River within Massachusetts (MA51-06), from Millville to the Rhode Island Border, which is listed on the 2018/2020 Massachusetts Integrated List of Waters, or 303(d) list, for cadmium, copper, DDT in fish tissue, Escherichia Coli (E. Coli), fish bioassessments, lead, PCBs in fish tissue, total phosphorus, and total suspended solids. The Blackstone River crosses Blackstone from west to east. Water bodies in Blackstone that are tributary to the Blackstone River include Crane Pond, Fox Brook, Lake Hiawatha, and the Mill River.

Crane Pond

Crane Pond (MA51030), is a one-acre waterbody located in the western portion of town near Mendon Street; it is fed by Fox Brook and flows downstream to the Blackstone River. This water body does not have any impairments included on the 2018/2020 303(d) list.



Crane Pond Locus Map (USGS)



Fox Brook Locus Map (USGS)

Fox Brook

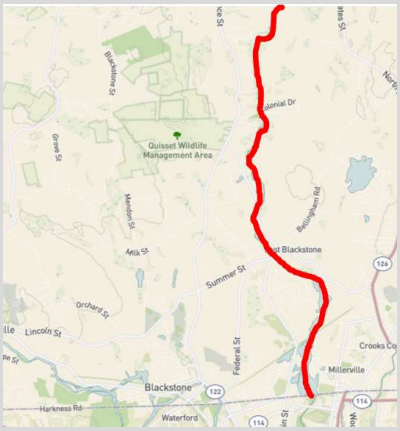
Fox Brook (MA51-39) flows 3.4 miles from its headwaters in Millville to the Blackstone River. The brook flows 0.1 mile through Crane Pond. The brook flows into Blackstone from the west and into the Blackstone River off Main Street near the Blackstone Public Library. The Town owns a large conservation area surrounding the brook downstream of Crane Pond. This waterbody is listed on the 2018/2020 303(d) list as impaired for E. Coli.

Lake Hiawatha

Lake Hiawatha (MA51062) is a 58-acre waterbody located in Blackstone and Bellingham, at the Town boundary. The waterbody outlets to the Mill River. This water body does not have any impairments included on the 2018/2020 303(d) list.



Lake Hiawatha Locus Map (USGS)



Mill River Locus Map (USGS)

Mill River

The Mill River (MA51-36) flows 15.9 miles from North Pond in Milford and Upton to the Rhode Island border. The river is a primary tributary to the Blackstone River, its confluence with the Blackstone is in Rhode Island. The river flows into Blackstone through Mendon from the north, and travels south to the Rhode Island border of Town, including Harris Pond. The Town owns conservation land surrounding the river and Harris Pond. The river is included on the 2018/2020 303(d) list as impaired for E. Coli.

2.0 LITERATURE REVIEW

Literature Review

Given that water quality in the Blackstone River has been an ongoing point of concern, many studies, reports, and remediation plans have been developed forthis water body. The following studies and reports were reviewed as part of the Phosphorus Source Identification Report:

- Analysis of Trends of Water Quality and Streamflow in the Blackstone, Branch, Pawtuxet, and Pawcatuck Rivers, Massachusetts and Rhode Island 1979 to 2015; Prepared by Jennifer G. Savoie, John R. Mullaney, and Gardner C. Bent, 2017. https://pubs.usgs.gov/sir/2016/5178/sir20165178.pdf
- Blackstone River Water Quality Monitoring Program 2020 Sampling Season Report, Prepared for Karla Sangrey by Marie-Francoise Hatte and Cameron Richards, August 2021. https://www.ubcleanwater.org/sites/g/files/vyhlif3951/f/uploads/2020_blackstone_report.pdf

2017 Water Quality and Streamflow Analysis

The 2017 Water Quality and Streamflow Analysis performed by USGS included long-term trends in flow-normalized nutrient concentrations and loads for total nitrogen, nitrite plus nitrate, total phosphorous and chloride at three water quality monitoring stations along the Blackstone River in Massachusetts and Rhode Island for water years 1979-2015. This study concluded that flow-normalized loads for total phosphorus decreased in the Blackstone River from 1979 to 2015 by up to 69 percent. This analysis showed that the total phosphorous concentration generally was less than 1 mg/L in the Blackstone River; and that from about 1992 to 2007 total phosphorous flow-normalized concentrations and loads increased and then returned to a decreasing pattern after February of 2007.

Blackstone River Water Quality Monitoring

The 2020 Water Quality Monitoring Report includes data collected along the mainstem of the Blackstone River between July and November 2020, and trends in total phosphorous, total nitrogen, and chlorophyll-a data observed since 2012 for the Upper Blackstone WWTF. The Upper Blackstone Water Pollutant Abatement District (UBWPAD) has been performing monthly water quality monitoring of the Blackstone River since 2010 in partnership with CDM Smith, Normandeau Associates, and the University of Massachusetts Amherst. Since 2012, Upper Blackstone has supported consistent annual water quality monitoring at sampling locations along the mainstem of the river. The data from this program is used for development of watershed and water quality assessments for the MassDEP's Integrated List of Waters. Phosphorus results from historical samples (2000-2006) suggested high concentrations of phosphorus in the Blackstone River. In 2009, the Upper Blackstone Wastewater Treatment Facility completed a $180 million capital improvement plan to meet effluent limits and minimize nutrient loads in response to an Administrative Order of Consent signed by the facility and the EPA. Upper Blackstone has continued to improve its treatment methods to minimize nutrient loads to the river.

The 2020 Blackstone River Water Quality Monitoring Program Report states that the total phosphorous effluent load from the Upper Blackstone facility has been reduced by 90% since the treatment facility upgrades were brought online, compared to the average pre-upgrade nutrient loads between 2006 and 2008. The 2017 Report states that total phosphorous concentrations in the Blackstone River were at or slightly higher than the MassDEP 2016 Consolidated Assessment and Listing Methodology (CALM) screening threshold of 100 µg/L. The 2020 report also indicated slightly higher total phosphorous

concentrations than in the past with only 55% of the samples collected below the 100 μg/L MassDEP guidance value.

Historic Sampling Data

Historic sampling data from the Blackstone River is available from the 2017 and 2020 studies. Figure 1 shows the total phosphorus trends from 1979 to 2015. The flow-normalized phosphorus concentrations and loads in the Blackstone River indicate decreasing loads between 1979 and 2015 up to 69 percent, besides a brief increasing pattern between 1992 and 2007; the report states that changes in concentrations and loads may reflect changes in source contributions and changes in land use and atmospheric deposition. The sampling sites along the mainstem of the river from the 2020 study and the location of the sites, with river mile increasing in the upstream direction, are included in Table 1. The mean summer (June-September) total phosphorous concentration at each sampling location is included in Table 2. The summer average total phosphorus concentration at the upstream-most site was comparable to previous years, and the yearly average at this site was the lowest since the study began. The other Massachusetts sites below the river's confluence point with the UBWPAD had higher mean summer concentrations than in recent years. However, the 2020 yearly mean concentrations for Massachusetts sampling locations are much lower than historical levels from 1996 to 2008 and are in the lower range of concentrations measured since 2012.

Figure 1: Total Phosphorus Concentrations in the Blackstone River (Savoie, Mullaney, Bent)

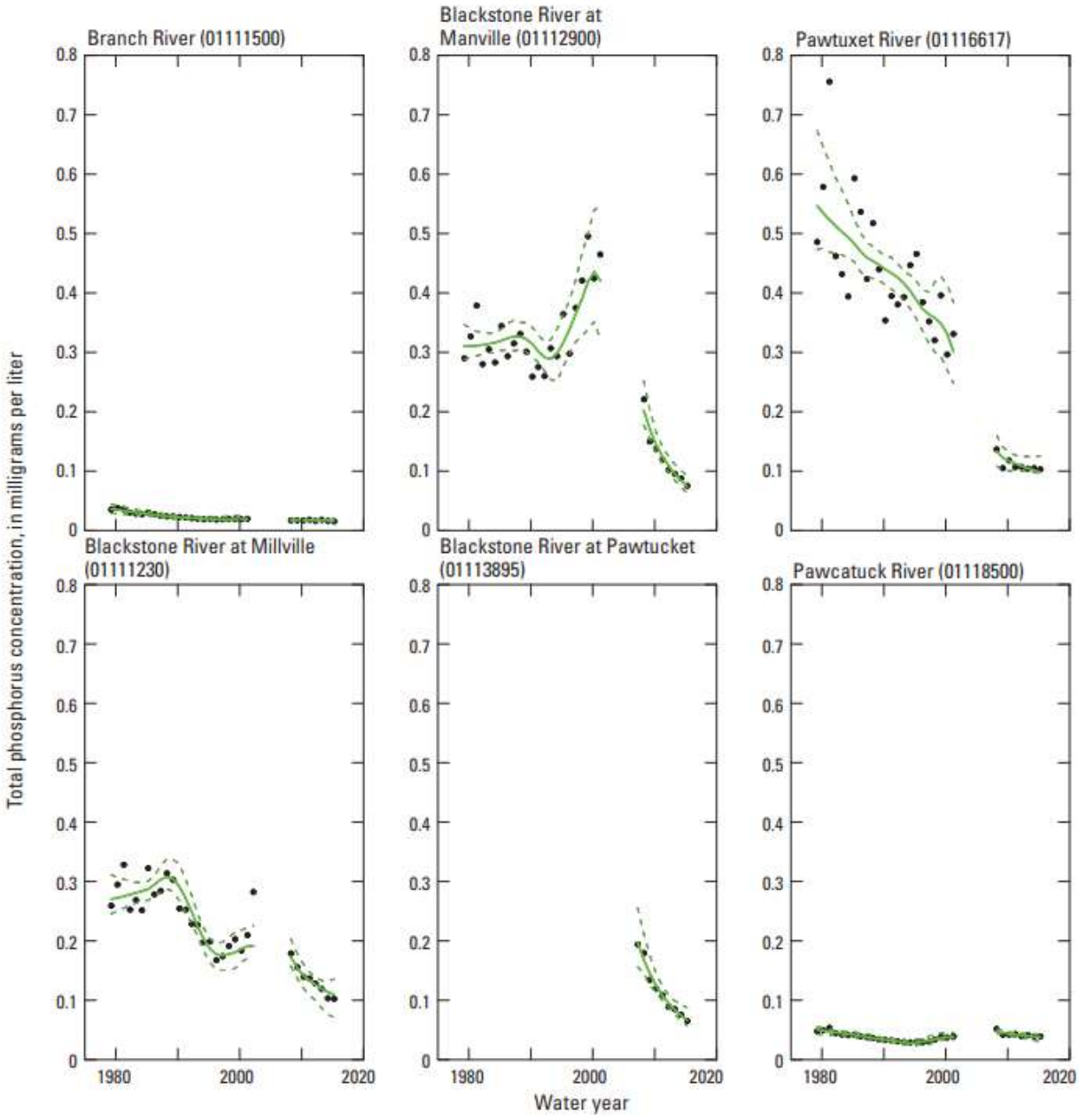


Figure 8. Ninety-percent confidence bands for total phosphorus concentrations in the Branch, Blackstone, Pawtuxet, and Pawcatuck Rivers in Massachusetts and Rhode Island, 1979 through 2015 (2007 through 2015 for Blackstone River at Pawtucket). Black dots are the estimated annual mean concentrations, solid green lines show the annual flow-normalized concentrations, and dashed green lines show the 5th and 95th percentiles of the annual flow-normalized concentrations. Gaps in lines indicate that data were not collected. Full station names are listed in table 1.

Table 1: 2020 Blackstone River Water Quality Monitoring Program Sampling Sites		
Site ID#	Site Name	River Mile
W0680	New Millbury Street Bridge, Worcester, MA	45.2
UBWAPD2	Confluence Site, Millbury, MA	44.6
W1258	Central Cemetery, Millbury, MA	42.7
W1242	Route 122A, Grafton, MA	36.3
W0767	Sutton Street Bridge, Northbridge, MA	33.4
W1779	Below Rice City Pond Sluice Gates, Hartford Street, Uxbridge, MA	27.8
RMSL	State Line, RI	15.5
R116	Route 1167 Bikepath Bridge, Pawtucket, RI	6.3
RMSD	Slater Mill Dam, Pawtucket, RI	0.0

Table 2 Blackstone River Water Quality Monitoring Program River Sampling Data Mean Summer Total Phosphorous Concentration 2012-2020, Collected by University of Massachusetts Water Resources Center									
TP (ppb)	W0680	UBWPAD2	W1258	W1242	W0767	W1779	RMSL	R116	RMSD
2012	77	143	157	157	157	220	185	140	87
2013	50	83	83	80	NA	137	77	70	60
2014	100	707	453	403	246	264	215	173	98
2015	71	130	115	81	106	137	86	76	82
2016	60	231	23	161	215	221	76	71	129
2017	55	152	131	112	157	166	83	74	91
2018	60	156	94	97	126	154	136	99	87
2019	50	134	108	90	70	123	57	52	61
2020	55.1	199.6*	137.3*	156.3	132.0	174.4*	62.0	85.0	50.7

*These means include June 1 data.

3.0 CATCHMENT AREA CHARACTERISTICS

Appendix H of the 2016 MA MS4 Permit requires permittees developing a Phosphorus Source Identification Report to calculate impervious and directly connected impervious area (DCIA) for all catchments tributary to the waterbodies of concern. As all of Blackstone is considered tributary to the Blackstone River, impervious area and DCIA were calculated for each delineated catchment area in town. This section discusses the procedure for and results of these calculations.

Available GIS Mapping

The Town of Blackstone began mapping its drainage infrastructure under the 2003 MS4 Permit and made updates under the 2016 MS4 Permit. The stormwater outfalls and infrastructure mapping used in this report were received from the Town; the stormwater catchments utilized in this report were manually delineated by Fuss & O'Neill in 2020 using existing infrastructure mapping overlaid on a digital elevation model and contours from MassGIS. Drainage infrastructure is not yet mapped for the Harris Pond Village development, but catchments were delineated for the neighborhood and, since it was recently accepted by the Town, these catchments have been included. Blackstone's mapping of the Town's drainage system will be updated during this permit term as the Town undertakes wet weather outfall sampling and catchment investigation efforts. There are currently 111 outfalls and interconnections that are owned by the Town of Blackstone and considered to be regulated under the permit. The total regulated drainage area—area discharging to a municipally-owned outfall or interconnection—in Blackstone is 798 acres (1.25 square miles), or approximately 11% of the Town's total area. Most drainage infrastructure in Blackstone is more than forty years old. A map of Blackstone's MS4 is included in Appendix A.

Land use data for the properties within the MS4 catchment areas, as well as impervious area delineations for roads and other rights-of-way, were collected from MassGIS' most recent (2016) land use data layer. Table 3 presents a summary of land use across all regulated catchment areas in Blackstone:

Table 3: Land Use in MS4 Catchment Areas in Blackstone

Land Use	Acres	Percent of Overall Area
Agriculture	4	1%
Commercial	9	1%
Forest	4	<1%
Mixed use, Other	8	1%
Open Land	82	10%
Residential – Multi-Family	64	8%
Residential – Single Family	444	55%
Right-of-Way	150	19%
Tax Exempt	34	4%
Unknown	2	<1%

Directly Connected Impervious Area

The land use data was used to calculate the percent of Directly Connected Impervious Area (DCIA) for each MS4 catchment area. Percent DCIA is calculated by applying the Sutherland Equation developed

in the 1995 publication *Methodology for Estimating the Effective Impervious Area of Urban Watersheds*[1] and updated in the 2014 memorandum titled *Overview of Methodology to Calculate Baseline Stormwater Phosphorus Loads and Phosphorus Load Reduction Requirements for the Charles River*[2]. In order to properly use the Sutherland Equations, the MassGIS land use codes were converted to EPA land use codes using the conversion methodology recommended by EPA and included in Table 4. Properties with an "Unknown" land use were considered as Commercial or Medium-density residential, which have the same Sutherland Equation. Weston & Sampson determined the amount and percent of impervious area in each MS4 catchment area for each land use, then used the appropriate Sutherland Equation to determine the percent DCIA for each land use in each catchment. These percentages were used to determine the total DCIA for each catchment. Table 5 lists the Sutherland Equation that was used for each land use type. Table 6 presents impervious area and DCIA statistics for the ten regulated catchments with the highest phosphorus loadings in Blackstone. DCIA statistics for all catchments in Blackstone are included in Appendix B.

Table 4: Conversion of MassGIS 2016 Land Use Codes to EPA Land Use Codes

MassGIS 2016 Code	MassGIS 2016 Use	EPA Code	EPA Use
7	Agriculture	7	Agriculture
3	Commercial	1	Commercial
6	Forest	8	Forest
4	Industrial	2	Industrial
20	Mixed Use, Other	1	Commercial
2	Open Land	9	Open Land
12	Residential- Multi-Family	5	High-Density Residential
11	Residential- Single Family	4	Medium-Density Residential*
55	Right-of-Way (Roads)	2	Industrial**
9	Tax-Exempt	6	Urban Public/Institutional

*EPA designates Medium-Density Residential as residential areas with parcel sizes between ¼ and ½ acre, which most closely matches this area[3]

**EPA considers all transportation uses, including roads, to be Industrial uses

Table 5: Land Use Classes and Corresponding Sutherland Equations (Source: EPA)

EPA Code	Land Use	Watershed Selection Criteria	Sutherland Equation (where IA(%) > 1)
1	Commercial	Average: Mostly storm sewered with curb and gutter, no dry wells or infiltration. Rooftops are directly connected.	DCIA%=0.4(IA%) ^ 1.2
2	Industrial	Average: Mostly storm sewered with curb and gutter, no dry wells or infiltration, rooftops are directly connected	DCIA%=0.4(IA%) ^ 1.2

[1] Sutherland, R.C., "Methodology for Estimating the Effective Impervious Area of Urban Watersheds", Watershed Protection Techniques, Vol. 2, No. 1, Fall 1995.
[2] Voorhees, Mark. Overview of Methodology to Calculate Baseline Stormwater Phosphorus Loads and Phosphorus Load Reduction Requirements for the Charles River. January 14, 2014.
[3] United States Environmental Protection Agency., "Methodology to Calculate Baseline Estimates of Impervious Area and Directly Connected Impervious Area for Massachusetts Communities". March 2010. https://www3.epa.gov/region1/npdes/stormwater/ma/IA-DCIA-Calculation-Methodology.pdf

Table 5: Land Use Classes and Corresponding Sutherland Equations (Source: EPA)			
EPA Code	Land Use	Watershed Selection Criteria	Sutherland Equation (where IA(%) > 1)
3	Low Density Residential	Somewhat connected: 50% not storm sewered, but open section roads, grassy swales, residential rooftops not connected, some infiltration	DCIA%=0.1(IA%) ^ 1.5
4	Medium Density Residential	Average: Mostly storm sewered with curb and gutter, no dry wells or infiltration, residential rooftops not directly connected	DCIA%=0.1(IA%) ^ 1.5
5	High Density Residential	Highly Connected: Same as above, but residential rooftops are connected	DCIA% = 0.4(IA%) ^ 1.2
6	Urban Public/ Institutional	Average: Mostly storm sewered with curb and gutter, no dry wells or infiltration, residential rooftops not directly connected	DCIA%=0.1(IA%) ^ 1.5
7	Agriculture	Mostly Disconnected: Small Percentage of urban area is storm sewered, or 70% or more infiltrated/disconnected	DCIA%=0.01(IA%) ^ 2
8	Forest	Mostly Disconnected: Small Percentage of urban area is storm sewered, or 70% or more infiltrated/disconnected	DCIA%=0.01(IA%) ^ 2
9	Open Land	Average: Mostly storm sewered with curb and gutter, no dry wells or infiltration, residential rooftops not directly connected	DCIA%=0.1(IA%) ^ 1.5
10	Water	n/a	n/a

Table 6: DCIA and Percent Connectivity in MS4 Catchment Areas					
Catchment Area	Catchment Size (Ac.)	IA (Acres)	DCIA (Acres)	DCIA (%)	Percent Connectivity (%)
Rathbun Interconnection	25.26	13.54	8.27	32.76	163.69
75	27.64	10.36	5.53	20.02	187.29
48	41.26	6.61	2.67	6.47	247.49
93	31.27	9.16	4.70	15.03	195.02
90	28.88	5.27	2.13	7.37	247.35
32	20.18	7.00	4.06	20.12	172.46
Rocco Drive	25.52	6.28	3.11	12.18	202.01
51	19.10	5.19	2.59	13.56	200.35
55	17.45	4.43	2.65	15.21	166.80
45	33.73	4.08	1.69	5.00	241.99
Note: Percent Connectivity is the percent of total impervious area which is connected.					

Many studies have been published in the past 15 years discussing the relationship between urban, impervious land cover and waterbody hydrology, habitat, biology, and ecosystem function. These studies have more recently included correlations between DCIA and biological indicators such as fish assemblages and algal blooms. Watersheds with as low as 4-6% IA and 1-5% DCIA typically begin to

show water quality impacts. While the DCIA in the Blackstone River Watershed exceeds this threshold, the calculated range of percent DCIA is expected for municipalities similar to Blackstone[4].

[4] Obropta, C.C. & Del Monaco, N. "Reducing Directly Connected Impervious Areas with Green Stormwater Infrastructure". *Journal of Sustainable Water in the Built Environment.* 2018. https://ascelibrary.org/doi/pdf/10.1061/JSWBAY.0000833

4.0 POLLUTANT LOADING ANALYSIS AND PRIORITIZATION OF CATCHMENTS WITH HIGHER POTENTIAL PHOSPHORUS LOADS

The 2016 MS4 Permit requires all Phosphorus Source Identification Reports to include the identification, delineation, and prioritization of potential catchments with high phosphorus loadings. The potential for a particular site or area to contribute phosphorus to stormwater varies based on land use, impervious coverage, directly connected impervious area, and soil type. Hydrologic soil group (HSG), or the soil's ability to infiltrate stormwater, is the most important soil characteristic for the purposes of this analysis. HSG is ranked from A to D, with type A soils more suited for infiltration, and type D soils more likely to contribute runoff.

To identify catchment areas with higher potential phosphorus loads, a model for each catchment area was developed using land use data (MassGIS, 2016) and soil HSG data from the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS). A land use/land cover grid was developed for the catchment areas in Blackstone. That grid, which calculated the areas of each combination of land use, land cover, and soil type in each catchment, is included as Appendix C.

Phosphorus Load Export Rates

Land use, impervious coverage, directly connected impervious area, and HSG have been utilized by EPA as part of the MS4 Permit to develop Phosphorus Load Export Rates (PLERs) for different combinations of those attributes in close geographical areas where there is no considerable difference in average annual rainfall. Table 7 presents the PLERs that are included in Attachment 1 of Appendix F of the 2016 Massachusetts MS4 Permit. Medium-density residential is the most prevalent land use in Blackstone, followed by right-of-way and open land. Tax-exempt land was assigned the same PLER as commercial and industrial land in accordance with permit guidance.

Table 7: Phosphorus Load Export Rates (PLERs) by Land Use		
Land Use Category	Land Surface Cover	PLER (lb/acre/year)
Commercial and Industrial	Directly Connected Impervious	1.78
	Pervious	*See Developed Pervious
Multi-Family and High Density Residential	Directly Connected Impervious	2.32
	Pervious	*See Developed Pervious
Medium Density Residential	Directly Connected Impervious	1.96
	Pervious	*See Developed Pervious
Low Density Residential	Directly Connected Impervious	1.52
	Pervious	*See Developed Pervious
Highway	Directly Connected Impervious	1.34
	Pervious	*See Developed Pervious
Forest	Directly Connected Impervious	1.52
	Pervious	0.13
Open Land	Directly Connected Impervious	1.52
	Pervious	*See Developed Pervious
Agriculture	Directly Connected Impervious	1.52
	Pervious	0.45
*Developed Pervious – HSG A	Pervious	0.03
*Developed Pervious – HSG B	Pervious	0.12
*Developed Pervious – HSG C	Pervious	0.21

Table 7: Phosphorus Load Export Rates (PLERs) by Land Use		
Land Use Category	Land Surface Cover	PLER (lb/acre/year)
*Developed Pervious – HSG C/D	Pervious	0.29
*Developed Pervious – HSG D	Pervious	0.37

Results

The land use/land cover grid shown in Appendix C, the directly connected impervious area (DCIA) determined for each catchment, and the PLERs included in Table 7 were used to calculate an estimated phosphorus load for each outfall. Disconnected impervious area, or the difference between impervious area and DCIA, was considered pervious coverage in HSG D to account for the fact that some runoff from disconnected impervious surfaces will be infiltrated before reaching the MS4. Each distinct area of the land use/land cover grid was multiplied by the appropriate PLER to determine its yearly phosphorus load, and the results were summed by catchment area. The ten catchments with the highest pollutant loading are presented in Table 8. The results of the pollutant loading analysis for all of the catchment areas are included in Appendix D. A map highlighting the top 10 catchment areas is included in Appendix E.

Table 8: Pollutant Loading Analysis Results – Top 10 Catchments					
Catchment Area	Receiving Water	Outfall Location	Catchment Size (Ac.)	DCIA (Ac.)	Phosphorus Loading (lb/yr)
Rathbun Interconnection	Woonsocket MS4	Rathbun Street	25.26	8.27	18.3
75	Blackstone River	Main Street	27.64	5.53	13.5
48	Tributary to Fox Brook	Milk Street	41.26	2.67	12.9
93	Fox Brook	Reilly Avenue	31.27	4.70	12.6
90	Tributary to Aldrich Brook	Mendon Street	28.88	2.13	10.1
32	Tributary to Mill River	Summer Street	20.18	4.06	10.0
Rocco Dr	Unknown	Rocco Drive	25.52	3.11	8.8
51	Tributary to Blackstone River	Chad Michael Court	19.10	2.59	8.7
55	Fox Brook	Lincoln Street	17.45	2.65	7.8
45	Hop Brook	Crestwood Drive	33.73	1.69	7.8

4.2.1 Catchment Descriptions

The characteristics of the ten catchments with the highest estimated phosphorus loading are summarized below:

1. Rathbun Interconnection – Discharges to Woonsocket, Rhode Island's MS4

   The catchment tributary to this interconnection covers 25 acres in the southeastern portion of town, including the portion of Rathbun Street south of Turbesi Park to the Rhode Island border, Richmond Street, Lloyd Street, and part of Valley Street. The interconnection discharges to

Woonsocket, Rhode Island's MS4 on Rathbun Street. The discharge location will be verified in the field. The most prominent land uses in this catchment are medium and high-density residential land and industrial land. The catchment is comprised of 54% impervious area and 32% directly connected impervious area; the soils are primarily hydrologic soil group (HSG) A. Potential sources of phosphorus in this catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that accumulate on roadways.

2. Outfall 75 – Discharges to the Blackstone River

The catchment tributary to Outfall 75 covers 28 acres in the southwestern portion of Town, including the area bounded by Main Street, Carrington Street, and Country Street. The outfall discharges to the Blackstone River. The most prominent land use in this catchment is medium-density residential land. The catchment is comprised of 38% impervious area and 20% directly connected impervious area; the soils are mostly HSG A or B. Potential sources of phosphorus in this catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that accumulate on roadways.

3. Outfall 48 – Tributary to Fox Brook

The catchment tributary to Outfall 48 covers 41 acres in the northwestern portion of town, consisting of Liberty Hill Drive and the surrounding area. The outfall discharges to a stream tributary to Fox Brook off Milk Street. The most prominent land use in this catchment is medium-density residential land. The catchment is 16% impervious area and 6% directly connected impervious area; the soils are mostly HSG B and C. Potential sources of phosphorus in this catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that accumulate on roadways.

4. Outfall 93 – Discharges to Fox Brook

The catchment tributary to Outfall 93 covers 31 acres in the southwestern portion of town, including most of Reilly Avenue, Mark Drive, Nancy Court, and Kimberly Lane. The outfall discharges to Fox Brook east of Reilly Avenue. The most prominent land use in this catchment is medium-density residential land. The catchment is 29% impervious area and 15% directly connected impervious area. The soils are mostly HSG A or B. Potential sources of phosphorus in this catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that accumulate on roadways.

5. Outfall 90 – Tributary to the Blackstone River

The catchment tributary to Outfall 90 covers 29 acres in the southwestern portion of Town, including part of Mendon Street and the intersection of Mendon Street and Lincoln Street. The outfall discharges to Aldrich Brook off Mendon Street which is tributary to the Blackstone River. The most prominent land use in this catchment is medium-density residential land. The catchment is 18% impervious area and 7% directly connected impervious area. The soils are mostly HSG C. Potential sources of phosphorus in this catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that accumulate on roadways.

6. Outfall 32– Tributary to the Mill River

The catchment tributary to Outfall 32 covers 20 acres in the central portion of Town. The catchment includes the portion of Summer Street between Blackstone Street and Rennie Drive.

The outfall discharges off Summer Street to a stream that is tributary to the Mill River. The most prominent land use in this catchment is medium-density residential land. The catchment is 35% impervious area and 20% directly connected impervious area; the soils are HSG A, B or C. Potential sources of phosphorus in the catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that may accumulate on roadways.

7. Rocco Drive Outfall – Tributary to the Blackstone River

The catchment tributary to the Rocco Drive outfall covers 26 acres, including Rocco Drive, Monica Lane and the surrounding area. The location of the outfall is unconfirmed; it likely discharges to a stream off Rocco Drive that is tributary to the Blackstone River. The most prominent land use in this catchment is medium-density residential. The catchment is 25% impervious area and 12% directly connected impervious area; the soils are mostly HSG A or B. Potential sources of phosphorus in this catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that accumulate on roadways.

8. Outfall 51– Tributary to the Blackstone River

The catchment tributary to Outfall 51 covers 19 acres in the southwestern portion of Town. It includes Chad Michael Court, the intersection of Orchard Street and Lincoln Street, and part of Mandy Drive. The outfall discharges off Chad Michael Court to a stream that is tributary to the Blackstone River. The most prominent land use in this catchment is medium-density residential land. The catchment is 27% impervious area and 15% directly connected impervious area; the soils are mostly HSG C. Potential sources of phosphorus in the catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that may accumulate on roadways.

9. Outfall 55 – Discharges to Fox Brook

The catchment tributary to Outfall 55 covers 17 acres in the central portion of Town, Residential Lane and the Residential Lane/ Lincoln Street intersection. The outfall discharges to Fox Brook off Lincoln Street. The most prominent land uses in this catchment are high-density residential and industrial land. The catchment is 25% impervious coverage and 15% directly connected impervious area; the soils are mostly HSG B. Potential sources of phosphorus in the catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that may accumulate on roadways.

10. Outfall 45 – Tributary to Hop Brook

The catchment tributary to Outfall 45 covers 34 acres in the northwestern portion of Town, including Centennial Drive and part of Crestwood Drive. The outfall discharges off Crestwood Drive to an area tributary to Hop Brook. The most prominent land use in this catchment is medium-density residential land. The catchment is 12% impervious area and 5% directly connected impervious area, and the soils are mostly HSG B. Potential sources of phosphorus in the catchment include leaf litter, grass clippings, fertilizer, pet waste, and other sediment and debris that may accumulate on roadways.

Dry and Wet Weather Outfall Screening and Sampling

Dry weather screening and sampling was conducted at most regulated outfalls under the Town's jurisdiction in Blackstone by Fuss & O'Neill between February and July 2020, and by Weston & Sampson

in December 2022 in accordance with MS4 Permit requirements. The results of Fuss & O'Neill's sampling events were summarized in a 2021 report. Wet-weather outfall screening and sampling is planned and will be complete by the end of Permit Year 10, or June 30, 2028, as required by the 2016 MS4 Permit.

Dry weather flow was observed and sampled at 11 of the 101 outfalls that were screened by Fuss & O'Neill; the ten outfalls that were not screened were in the Harris Pond development. Dry weather flow was observed and sampled at 2 of the 20 outfalls that were screened by Weston & Sampson in 2022. Many of the samples resulted in non-detectable levels of phosphorus, 'ND'; sampling data is available for two of the outfalls downstream of the high priority catchments identified in Table 8. Fuss & O'Neill and Weston & Sampson used field kits to analyze samples for ammonia, chlorine, surfactants, temperature, salinity, and conductivity, and samples were sent to a laboratory to analyze samples for Escherichia coliform (E. coli), phosphorus, and other applicable pollutants of concern depending on the outfall's receiving water. The available dry-weather sampling results for phosphorus are presented in Table 9.

Table 9: Dry Weather Phosphorus Sampling Results

Outfall ID	Total Phosphorus (mg/L)
Rathbun_Intercon (INT-5)	0.12
HarrisPondVillage2	Parameter not sampled
8	ND
9	ND
27	0.11
35	ND
42	ND
48	0.13
54	ND
57	ND
58	ND
64	ND
65	0.15

While there is no benchmark criteria for phosphorus concentrations in the Massachusetts Surface Water Quality Standards, 0.1 mg/L has been used as a placeholder for outfall screening based on available literature. Outfalls 27, 48, and 65 exceeded the placeholder benchmark concentration of 0.1 mg/L during dry weather.

Catchment Ranking Matrix

The purpose of performing the pollutant loading analysis was to develop a priority ranking of the delineated catchments in Blackstone, with catchments with the highest potential phosphorus load considered highest priority. Since observed phosphorus concentrations in stormwater discharges can vary depending on the time of year the sampling is conducted, the size of the storm event, and other factors, the sample phosphorus concentrations were not considered when ranking the catchment areas.

The catchments with the highest potential pollutant loads, presented in Table 9 above, were all considered High Priority. The remaining catchments in Blackstone were determined to be lower priority. The ranking of high priority catchments is presented in Table 10; the ranking of all catchments in Blackstone is included in Appendix E. A figure highlighting the High Priority catchments is also included in Appendix E.

Table 10: High Priority Catchment Ranking

Rank	Receiving Outfall	Receiving Water	Phosphorus Loading (lb/year)	Relative Phosphorus Loading (lb/yr/ac)	Dry Weather Flow Observed	Dry-Weather Phosphorus Sampling Result (mg/L)
1	Rathbun Interconnection	Woonsocket MS4	18.3	0.7	Yes	0.12
2	75	Blackstone River	13.5	0.5	No	-
3	48	Tributary to Fox Brook	12.9	0.3	Yes	0.13
4	93	Fox Brook	12.6	0.4	No	-
5	90	Tributary to Aldrich Brook	10.1	0.3	No	-
6	32	Tributary to Mill River	10.0	0.5	No	-
7	Rocco Drive	Unknown	8.8	0.3	No	-
8	51	Tributary to Blackstone River	8.7	0.5	No	-
9	55	Fox Brook	7.8	0.4	No	-
10	45	Hop Brook	7.8	0.2	No	-

5.0 BEST MANAGEMENT PRACTICE (BMP) RETROFIT OPPORTUNITIES

In addition to a community-wide BMP retrofit inventory, the 2016 MS4 Permit requires permittees with discharges tributary to a phosphorus-impaired waterbody to identify potential retrofit opportunities in the sub-catchments tributary to those receiving waters as part of the PSIR. Retrofit opportunities may include the installation of structural BMPs during redevelopment or the removal of impervious area.

5.1 Potential Retrofit Sites

A number of factors were considered when identifying potential retrofit sites in the higher priority sub-catchments in Blackstone. In addition to municipal parcels, areas within the right-of-way were also considered for impervious area disconnection and/or reduction. Municipal ownership was considered the most important factor, as it is unlikely that the Town will be able to install a structural BMP on land that is privately owned unless the Town plans to acquire the property in question. Soils and available open space were also considered as site suitability characteristics. Projects within the right-of-way may be considered in conjunction with the Town's existing schedule for roadway and sidewalk improvements in the area. The identified locations for potential BMP retrofit, listed in order of catchment rank, are included in Table 11 and discussed in more detail below.

Table 11: Potential BMP Retrofit Sites

Site Address	Property Owner	Site Area (Ac.)	Soil Type	Existing Parcel Use	Catchment ID	Catchment Rank
Rathbun Street (Diana Street to Ethel Street)	Right-of-Way	N/A	A	-	Rathbun_ Intercon	1
Washington Street (Main Street to Brown Street)	Right-of-Way	N/A	A	-	75	2
Liberty Hill Drive	Right-of-Way	N/A	B/C	-	48	3
Reilly Avenue (Mendon Street to Kimberly Lane)	Right-of-Way	N/A	A/B	-	93	4
John F. Kennedy Elementary School (200 Lincoln Street)	Town of Blackstone	2.3	B/C	School, Playing Fields	90	5
Mendon Street at Lincoln Street	Right-of-Way	N/A	B/D	-	90	5
Summer Street (Rennie Drive to Blackstone Street)	Right-of-Way	N/A	A/B/C	-	32	6
Rocco Drive	Right-of-Way	N/A	A/B	-	Rocco Dr	7

Rathbun Street

Green infrastructure practices such as curb bump outs with bioretention areas, infiltration trenches, or tree filter pits could be installed along the section of Rathbun Street between Diana Street and Ethel Street. Runoff from a portion of Rathbun Street could be diverted through curb cuts to a small

bioretention area between the curb and property line, disconnecting impervious surface from the MS4 and reducing runoff volumes and pollutant loads. Cut sheets for bioretention areas and tree filter pits as well as examples of these BMPs in the right-of-way are included in Appendix F. The Town should look for specific locations to implement green infrastructure as well as infiltration trenches on Rathbun Street when planning future roadway and sidewalk improvements. Potential phosphorus removal attributable to this type of BMP will depend on how many BMPs are installed and how much impervious area is disconnected from the MS4.

Washington Street

Catchment 75 has a significant amount of impervious area (2.48 acres) that is directly connected to the MS4. Green infrastructure practices such as bioretention areas, vegetated bump-outs, or filter strips, could be installed along Washington Street between Main Street and Brown Street to treat surface runoff. Any green infrastructure practice in this area would disconnect portions of the roadway from the MS4, infiltrating runoff for up to the 2-inch storm, and the existing drainage system would be left in place to provide bypass during larger storm events. The Town could also consider the use of permeable pavement to make future improvements to the sidewalk or parking areas on this street.

Liberty Hill Drive

The entirety of the street and surrounding residential properties is part of catchment 48. There are catch basins on both sides of the street that could be converted to leaching catch basins. Green infrastructure practices such as infiltration trenches and small bioretention areas should also be considered. The Town could also consider the use of permeable pavementas they make future improvements on this street.

Reilly Avenue

Green infrastructure practices such as curb bump outs with bioretention areas, infiltration trenches, or tree filter pits could potentially be installed along Reilly Avenue, Mark Drive, Nancy Court, or Kimberly Lane. The portion of Reilly Avenue between Mendon Street and Kimberly Lane and the three cul-de-sacs are within catchment 93. Curb bump outs in this area could provide traffic calming at intersections and would help disconnect impervious surface from the MS4.

John F. Kennedy Elementary School

Fuss & O'Neill's 2021 Stormwater Retrofit Plan identifies this school as a top five priority site based on input from the Town and Blackstone's Highway Superintendent. The design concept developed as part of the retrofit plan proposes bioretention areas, vegetated swales, and vegetated filter strips to treat runoff from the impervious areas surrounding the school building.

Mendon Street at Lincoln Street

Green infrastructure practices such as curb bump outs with bioretention areas, infiltration trenches, or tree filter pits could potentially be installed at this intersection. Curb bump outs in this area could provide traffic calming and treatment of runoff from the paved portion of the intersection.

Summer Street

Green infrastructure practices such as bioretention areas, vegetated bump-outs, or filter strips, could be installed along Summer Street between Rennie Drive and Blackstone Street to treat surface runoff. Any green infrastructure practice in this area would disconnect portions of the roadway from the MS4.

Rocco Drive

The entirety of the street and surrounding residential properties is part of the Rocco Drive catchment. There are catch basins on both sides of the street that could be converted to leaching catch basins. Green infrastructure practices such as infiltration trenches and small bioretention areas should also be considered. The Town could also consider the use of permeable pavement as part of future improvements to this street.

5.2 Implementation

The Town of Blackstone will begin addressing the findings of this Phosphorus Source Identification Report in Permit Year 5 (FY2023). The Town must first evaluate each potential retrofit opportunity identified in the previous section through the following actions:

- Evaluate the feasibility of implementing the projects identified in Section 5.1. Determine a planned retrofit date for each potential retrofit site deemed feasible based on the next planned infrastructure, resurfacing, or redevelopment activity planned for the site.
- Determine an estimated cost for each potential retrofit project discussed in Section 5.1.A list of planned BMP retrofit projects and schedule for their implementation will be included in the Town's Year 5 MS4 Annual Report.

By the end of Permit Year 6 (FY2024), the Town will plan and install one of the retrofit projects identified in Section 5.1 as a demonstration project. The remainder of the retrofit projects, where implementation is feasible from an engineering and permitting perspective, will be installed according to the schedule included in the Year 5 Annual Report. Future availability of funding will also be considered in developing the schedule. Blackstone will track any structural BMPs installed in the watershed and calculate the estimated phosphorus removal attributable to those BMPs consistent with Attachment 3 to Appendix F of the MS4 Permit. The BMP type, area treated, design storage volume, and estimated phosphorus removed in pounds per year by each BMP will be included in the Town's future MS4 annual reports.

6.0 REFERENCES

- Analysis of Trends of Water Quality and Streamflow in the Blackstone, Branch, Pawtuxet, and Pawcatuck Rivers, Massachusetts and Rhode Island 1979 to 2015; Prepared by Jennifer G. Savoie, John R. Mullaney, and Gardner C. Bent, 2017. https://pubs.usgs.gov/sir/2016/5178/sir20165178.pdf

- Blackstone River Water Quality Monitoring Program 2020 Sampling Season Report, Prepared for Karla Sangrey by Marie-Francoise Hatte and Cameron Richards, August 2021. https://www.ubcleanwater.org/sites/g/files/vyhlif3951/f/uploads/2020_blackstone_report.pdf

- Obropta, C.C. & Del Monaco, N. "Reducing Directly Connected Impervious Areas with Green Stormwater Infrastructure". *Journal of Sustainable Water in the Built Environment.* 2018. https://ascelibrary.org/doi/pdf/10.1061/JSWBAY.0000833

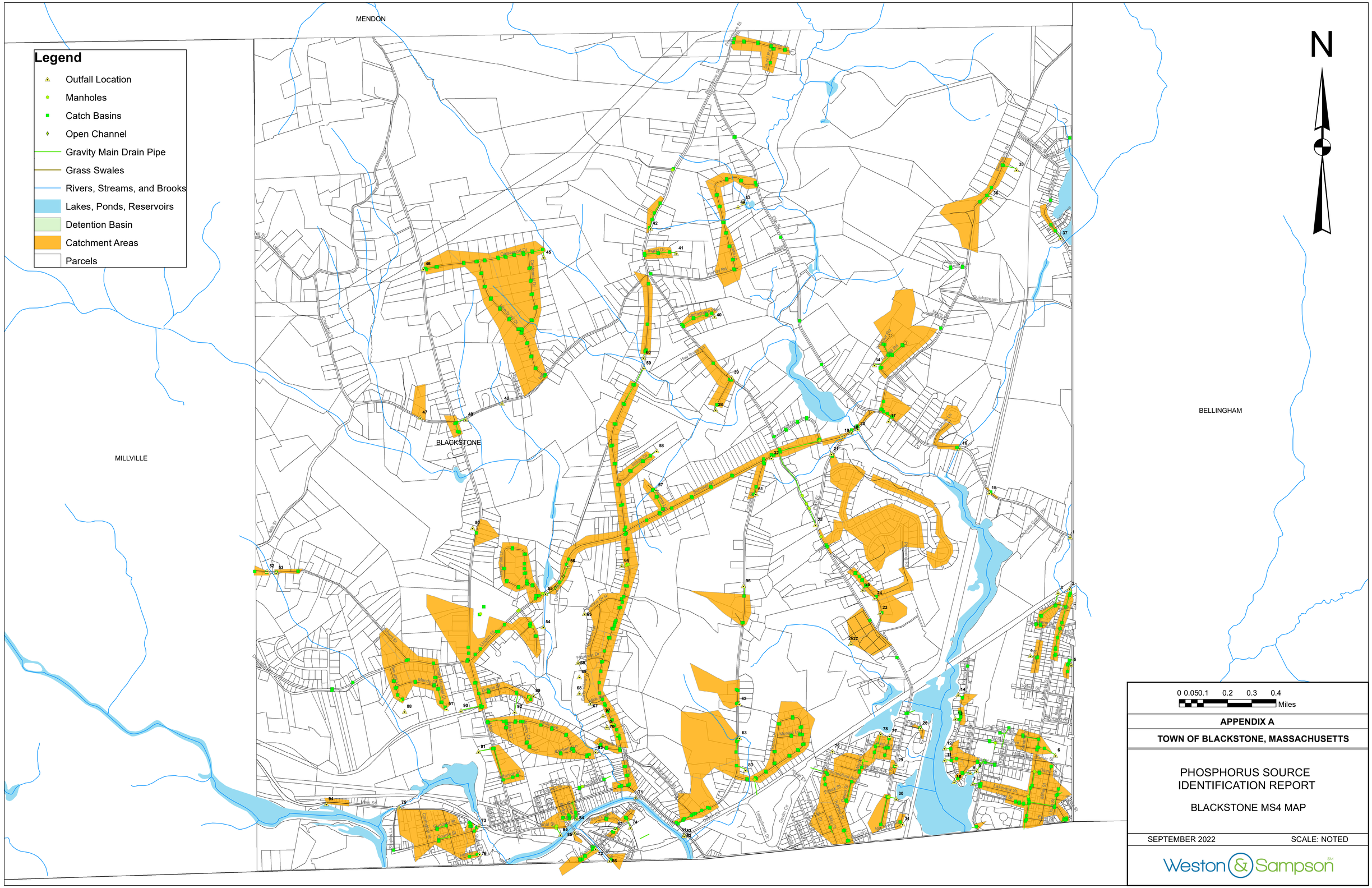
- Sutherland, R.C., "Methodology for Estimating the Effective Impervious Area of Urban Watersheds", Watershed Protection Techniques, Vol. 2, No. 1, Fall 1995.

- United States Environmental Protection Agency., "Methodology to Calculate Baseline Estimates of Impervious Area and Directly Connected Impervious Area for Massachusetts Communities". March 2010. https://www3.epa.gov/region1/npdes/stormwater/ma/IA-DCIA-Calculation-Methodology.pdf

- Voorhees, Mark. Overview of Methodology to Calculate Baseline Stormwater Phosphorus Loads and Phosphorus Load Reduction Requirements for the Charles River. January 14, 2014.

APPENDIX A

Blackstone MS4 Map



APPENDIX A

TOWN OF BLACKSTONE, MASSACHUSETTS

PHOSPHORUS SOURCE IDENTIFICATION REPORT

BLACKSTONE MS4 MAP

SEPTEMBER 2022 SCALE: NOTED

Weston & Sampson SM

APPENDIX B

Impervious Area and DCIA Results for All Catchments

Town of Blackstone Phosphorus Source Identification Report							
Appendix B - Impervious Area and DCIA Statistics for All Catchments							
Catchment	**Receiving Water**	**Catchment Size (Ac)**	**IA (Acres)**	**DCIA (Acres)**	**Percent Connectivity**	**Percent IA**	**Percent DCIA**
Rathbun_Intercon	Woonsocket MS4	25.26	13.54	8.27	163.69	53.62	32.76
75	Blackstone River	27.64	10.36	5.53	187.29	37.50	20.02
48	Tributary to Fox Brook	41.26	6.61	2.67	247.49	16.02	6.47
93	Fox Brook	31.27	9.16	4.70	195.02	29.30	15.03
90	Tributary to Aldrich Brook	28.88	5.27	2.13	247.35	18.24	7.37
32	Tributary to Mill River	20.18	7.00	4.06	172.46	34.69	20.12
Rocco Dr	Unknown	25.52	6.28	3.11	202.01	24.60	12.18
51	Tributary to Blackstone River	19.10	5.19	2.59	200.35	27.17	13.56
55	Fox Brook	17.45	4.43	2.65	166.80	25.37	15.21
45	Hop Brook	33.73	4.08	1.69	241.99	12.10	5.00
63	Fox Brook	32.41	3.97	1.14	346.83	12.25	3.53
Gaskill_Intercon	Unknown	13.87	5.41	2.98	181.30	39.01	21.52
59	Hop Brook	15.71	4.76	2.49	190.92	30.31	15.88
34	Tributary to Mill River	29.49	2.64	0.98	270.32	8.96	3.32
65	Fox Brook	16.25	4.51	2.24	201.55	27.73	13.76
84	Blackstone River	6.18	4.04	2.78	145.53	65.44	44.97
78	Mill River	15.99	4.80	2.44	196.45	30.04	15.29
54	Fox Brook	11.28	4.49	2.14	209.52	39.81	19.00
88	Aldrich Brook	11.43	2.91	1.43	203.45	25.50	12.53
71	Tributary to Blackstone River	4.66	3.36	2.07	162.35	72.07	44.39
44	Hop Brook	15.01	2.75	1.33	207.29	18.32	8.84
HarrisPondVillage2	Unknown	33.51	1.33	0.32	417.65	3.96	0.95
97	Tributary to Fox Brook	9.93	3.16	1.63	194.27	31.85	16.40
36	Tributary to Quick Stream	16.38	2.87	1.17	245.85	17.52	7.13
81	Blackstone River	12.48	2.57	1.31	196.75	20.58	10.46
56	Tributary to Fox Brook	10.96	2.82	1.53	184.91	25.77	13.94
6	Tributary to Peters River	6.96	2.90	1.70	170.69	41.75	24.46
2	Tributary to Mill River	5.91	2.64	1.64	161.04	44.75	27.79
60	Tributary to Mill River	8.05	2.18	1.18	184.56	27.07	14.67
91	Fox Brook	7.71	2.37	1.23	192.47	30.67	15.94
64	Fox Brook	7.19	2.22	1.20	185.08	30.89	16.69
95	Tributary to Mill River	2.64	1.87	1.50	124.59	70.72	56.76
SpruceSt	Unknown	9.81	2.17	1.12	193.78	22.13	11.42
92	Tributary to Fox Brook	4.73	1.89	1.13	166.97	40.00	23.96
66	Tributary to Fox Brook	5.74	1.85	0.93	198.61	32.17	16.20
58	Tributary to Mill River	5.14	1.54	0.84	183.67	30.02	16.34
OF_CB_Downtown2	Unknown	1.66	1.42	1.05	134.84	85.59	63.47
39	Tributary to Hop Brook	7.37	1.51	0.73	207.14	20.54	9.92
96	Tributary to Mill River	10.89	1.07	0.36	295.00	9.83	3.33
46	Tributary to Fox Brook	5.98	1.12	0.52	217.78	18.78	8.63
43	Tributary to Mill River	5.42	1.14	0.61	187.06	21.04	11.25

Town of Blackstone Phosphorus Source Identification Report							
Appendix B - Impervious Area and DCIA Statistics for All Catchments							
Catchment	**Receiving Water**	**Catchment Size (Ac)**	**IA (Acres)**	**DCIA (Acres)**	**Percent Connectivity**	**Percent IA**	**Percent DCIA**
7	Mill River	3.24	1.34	0.80	167.11	41.30	24.72
62	Tributary to Blackstone River	10.94	0.61	0.22	280.73	5.58	1.99
40	Tributary to Mill River	3.74	1.08	0.63	171.83	28.85	16.79
Pulaski_Intercon	Unknown	1.60	1.03	0.76	135.49	64.04	47.26
3	Tributary to Mill River	3.79	1.33	0.75	177.42	34.98	19.72
30	Mill River	5.47	1.23	0.73	167.45	22.43	13.39
94	Blackstone River	1.60	1.17	0.79	148.05	72.97	49.29
77	Mill River	3.29	1.27	0.69	184.42	38.56	20.91
57	Tributary to Mill River	3.56	0.89	0.47	187.82	24.94	13.28
17	Tributary to Mill River	6.15	1.28	0.62	205.10	20.80	10.14
HarrisPondVillage1	Unknown	8.08	1.26	0.55	228.64	15.58	6.82
41	Tributary to Mill River	3.30	0.91	0.50	181.80	27.50	15.12
61	Tributary to Mill River	3.31	0.97	0.54	180.00	29.44	16.36
50	Fox Brook	4.34	0.90	0.42	217.34	20.79	9.57
4	Tributary to Mill River	2.68	1.14	0.65	175.48	42.43	24.18
72	Tributary to Blackstone River	2.47	1.31	0.61	213.89	52.99	24.78
38	Tributary to Hop Brook	2.98	0.94	0.49	190.35	31.41	16.50
73	Blackstone River	1.83	0.91	0.63	144.68	49.80	34.42
42	Tributary to Mill River	2.52	0.74	0.39	191.90	29.48	15.36
HarrisPondVillage3	Unknown	3.58	0.87	0.45	194.62	24.22	12.44
8	Mill River	2.05	0.92	0.55	167.73	44.95	26.80
RiversEdgeRd	Unknown	2.51	0.68	0.46	147.64	27.24	18.45
HarrisPondVillage9	Unknown	5.52	1.05	0.47	223.95	19.03	8.50
74	Tributary to Blackstone River	1.29	0.84	0.54	154.39	65.16	42.21
35	Tributary to Mill River	3.76	0.75	0.34	217.37	19.91	9.16
MichelleLn	Unknown	2.21	0.81	0.51	158.22	36.69	23.19
0	Tributary to Fox Brook	2.03	0.74	0.42	176.97	36.36	20.54
49	Tributary to Fox Brook	2.58	0.81	0.47	172.90	31.24	18.07
27	Tributary to Mill River	6.03	1.13	0.48	236.31	18.71	7.92
80	Tributary to Blackstone River	3.02	0.73	0.39	188.31	24.29	12.90
HarrisPondVillage6	Unknown	2.36	0.71	0.38	186.25	30.01	16.11
79	Tributary to Mill River	5.00	0.90	0.45	197.82	17.91	9.05
26	Tributary to Mill River	6.29	1.11	0.45	248.45	17.67	7.11
76	Tributary to Blackstone River	1.01	0.74	0.52	143.69	73.87	51.41
37	Lake Hiawatha	1.87	0.76	0.46	164.35	40.87	24.87
25	Tributary to Mill River	2.45	0.62	0.30	206.57	25.37	12.28
23	Tributary to Mill River	6.41	0.27	0.09	281.93	4.14	1.47
19	Tributary to Mill River	1.74	0.57	0.43	133.70	32.92	24.62
47	Tributary to Fox Brook	4.24	0.39	0.15	255.90	9.21	3.60
16	Quick Stream	1.50	0.69	0.45	153.61	46.22	30.09
70	Tributary to Fox Brook	1.70	0.53	0.29	182.82	30.94	16.92

Town of Blackstone Phosphorus Source Identification Report							
Appendix B - Impervious Area and DCIA Statistics for All Catchments							
Catchment	**Receiving Water**	**Catchment Size (Ac)**	**IA (Acres)**	**DCIA (Acres)**	**Percent Connectivity**	**Percent IA**	**Percent DCIA**
87	Tributary to Blackstone River	0.84	0.59	0.39	151.67	69.62	45.91
89	Tributary to Blackstone River	1.10	0.58	0.37	155.27	52.69	33.93
24	Tributary to Mill River	2.95	0.51	0.17	293.38	17.36	5.92
20	Mill River	1.02	0.48	0.36	132.12	46.65	35.31
13	Mill River	1.21	0.53	0.31	171.93	43.94	25.56
31	Tributary to Mill River	1.10	0.44	0.28	157.87	40.21	25.47
HarrisPondVillage4	Unknown	2.72	0.00	0.00	0.00	0.00	0.00
9	Mill River	1.01	0.42	0.23	184.11	41.63	22.61
53	Aldrich Brook	1.18	0.29	0.18	162.77	24.49	15.05
11	Mill River	1.10	0.42	0.24	173.61	38.46	22.15
12	Mill River	1.27	0.42	0.23	183.10	32.89	17.96
HarrisPondVillage10	Unknown	2.44	0.35	0.09	372.40	14.42	3.87
HarrisPondVillage7	Unknown	1.75	0.41	0.22	187.40	23.52	12.55
ButlerSt_Intercon	Unknown	0.61	0.35	0.22	156.76	57.22	36.50
29	Mill River	0.90	0.36	0.21	169.29	39.93	23.59
5	Tributary to Mill River	1.08	0.37	0.21	176.29	34.40	19.51
10	Mill River	0.40	0.29	0.20	148.97	72.40	48.60
HarrisPondVillage5	Unknown	2.16	0.16	0.04	364.22	7.54	2.07
28	Mill River	0.75	0.27	0.18	148.89	35.93	24.13
14	Mill River	1.26	0.29	0.16	183.93	23.35	12.70
85	Blackstone River	0.45	0.27	0.19	138.06	59.04	42.76
52	Aldrich Brook	1.08	0.23	0.11	213.54	21.01	9.84
15	Tributary to Mill River	0.33	0.20	0.18	109.87	60.99	55.51
18	Tributary to Mill River	0.27	0.19	0.17	106.94	69.81	65.28
86	Tributary to Blackstone River	1.34	0.22	0.09	237.33	16.31	6.87
22	Tributary to Mill River	0.79	0.16	0.12	136.59	20.54	15.04
HarrisPondVillage8	Unknown	0.43	0.13	0.09	149.90	29.89	19.94
21	Tributary to Mill River	0.81	0.13	0.06	219.06	16.00	7.30
PreciousBloodCemetery	Unknown	0.45	0.06	0.03	184.03	13.64	7.41

APPENDIX C

Land Use/Land Cover Grid

MENDON

BLACKSTONE

BELLINGHAM

N

Legend

- Rivers, Streams, and Brooks
- Lakes, Ponds, Reservoirs

CATCHMENT AREAS

LAND USE, SOIL TYPE

- Agriculture, A
- Agriculture, B
- Agriculture, C
- Agriculture, D
- Commercial, Unknown
- Commercial, A
- Commercial, B
- Commercial, C
- Forest, B
- Forest, C
- Forest, D
- Industrial, Unknown
- Industrial, A
- Industrial, B
- Industrial, D
- Open land, Unknown
- Open land, A
- Open land, B
- Open land, B/D
- Open land, C
- Open land, D
- Residential - multi-family, A
- Residential - multi-family, B
- Residential - multi-family, B/D
- Residential - multi-family, C
- Residential - multi-family, D
- Residential - single family, Unknown
- Residential - single family, A
- Residential - single family, B
- Residential - single family, B/D
- Residential - single family, C
- Residential - single family, D
- Right-of-way, Unknown
- Right-of-way, A
- Right-of-way, B
- Right-of-way, B/D
- Right-of-way, C
- Right-of-way, D
- Tax exempt, A
- Tax exempt, B
- Tax exempt, B/D
- Tax exempt, C
- Unknown, Unknown
- Unknown, A
- Unknown, B
- Unknown, C
- Water, A
- Water, B

0 0.050.1 0.2 0.3 0.4 Miles

APPENDIX C

TOWN OF BLACKSTONE, MASSACHUSETTS

PHOSPHORUS SOURCE IDENTIFICATION REPORT

LAND USE/ LAND COVER GRID

SEPTEMBER 2022 SCALE: NOTED

Weston & Sampson SM

APPENDIX D

Pollutant Loading Analysis Results

Town of Blackstone Phosphorus Source Identification Report					
Appendix D - Pollutant Loading Analysis Results					
Catchment	**Receiving Water**	**Catchment Size (Ac)**	**DCIA (Acres)**	**Phosphorus Loading (lb/yr)**	**Relative Phosphorus Loading (lb/yr/ac)**
Rathbun_Intercon	Woonsocket MS4	25.26	8.27	18.3	0.7
75	Blackstone River	27.64	5.53	13.5	0.5
48	Tributary to Fox Brook	41.26	2.67	12.9	0.3
93	Fox Brook	31.27	4.70	12.6	0.4
90	Tributary to Aldrich Brook	28.88	2.13	10.1	0.3
32	Tributary to Mill River	20.18	4.06	10.0	0.5
Rocco Dr	Unknown	25.52	3.11	8.8	0.3
51	Tributary to Blackstone River	19.10	2.59	8.7	0.5
55	Fox Brook	17.45	2.65	7.8	0.4
45	Hop Brook	33.73	1.69	7.8	0.2
63	Fox Brook	32.41	1.14	7.5	0.2
Gaskill_Intercon	Unknown	13.87	2.98	7.4	0.5
59	Hop Brook	15.71	2.49	7.3	0.5
34	Tributary to Mill River	29.49	0.98	6.8	0.2
65	Fox Brook	16.25	2.24	6.4	0.4
84	Blackstone River	6.18	2.78	6.4	1.0
78	Mill River	15.99	2.44	5.8	0.4
54	Fox Brook	11.28	2.14	5.1	0.5
88	Aldrich Brook	11.43	1.43	5.0	0.4
71	Tributary to Blackstone River	4.66	2.07	4.8	1.0
44	Hop Brook	15.01	1.33	4.7	0.3
HarrisPondVillage2	Unknown	33.51	0.32	4.7	0.1
97	Tributary to Fox Brook	9.93	1.63	4.5	0.5
36	Tributary to Quick Stream	16.38	1.17	4.4	0.3
81	Blackstone River	12.48	1.31	4.2	0.3
56	Tributary to Fox Brook	10.96	1.53	4.1	0.4
6	Tributary to Peters River	6.96	1.70	4.0	0.6
2	Tributary to Mill River	5.91	1.64	3.5	0.6
60	Tributary to Mill River	8.05	1.18	3.4	0.4
91	Fox Brook	7.71	1.23	3.4	0.4
64	Fox Brook	7.19	1.20	3.3	0.5
95	Tributary to Mill River	2.64	1.50	3.0	1.1
SpruceSt	Unknown	9.81	1.12	2.8	0.3
92	Tributary to Fox Brook	4.73	1.13	2.8	0.6
66	Tributary to Fox Brook	5.74	0.93	2.6	0.5
58	Tributary to Mill River	5.14	0.84	2.5	0.5
OF_CB_Downtown2	Unknown	1.66	1.05	2.4	1.4
39	Tributary to Hop Brook	7.37	0.73	2.4	0.3
96	Tributary to Mill River	10.89	0.36	2.1	0.2
46	Tributary to Fox Brook	5.98	0.52	2.1	0.3
43	Tributary to Mill River	5.42	0.61	1.9	0.4

Town of Blackstone Phosphorus Source Identification Report					
Appendix D - Pollutant Loading Analysis Results					
Catchment	**Receiving Water**	**Catchment Size (Ac)**	**DCIA (Acres)**	**Phosphorus Loading (lb/yr)**	**Relative Phosphorus Loading (lb/yr/ac)**
7	Mill River	3.24	0.80	1.9	0.6
62	Tributary to Blackstone River	10.94	0.22	1.8	0.2
40	Tributary to Mill River	3.74	0.63	1.8	0.5
Pulaski_Intercon	Unknown	1.60	0.76	1.7	1.0
3	Tributary to Mill River	3.79	0.75	1.7	0.4
30	Mill River	5.47	0.73	1.7	0.3
94	Blackstone River	1.60	0.79	1.6	1.0
77	Mill River	3.29	0.69	1.6	0.5
57	Tributary to Mill River	3.56	0.47	1.6	0.4
17	Tributary to Mill River	6.15	0.62	1.5	0.3
HarrisPondVillage1	Unknown	8.08	0.55	1.5	0.2
41	Tributary to Mill River	3.30	0.50	1.5	0.5
61	Tributary to Mill River	3.31	0.54	1.5	0.4
50	Fox Brook	4.34	0.42	1.5	0.3
4	Tributary to Mill River	2.68	0.65	1.5	0.5
72	Tributary to Blackstone River	2.47	0.61	1.5	0.6
38	Tributary to Hop Brook	2.98	0.49	1.3	0.4
73	Blackstone River	1.83	0.63	1.3	0.7
42	Tributary to Mill River	2.52	0.39	1.3	0.5
HarrisPondVillage3	Unknown	3.58	0.45	1.3	0.4
8	Mill River	2.05	0.55	1.2	0.6
RiversEdgeRd	Unknown	2.51	0.46	1.2	0.5
HarrisPondVillage9	Unknown	5.52	0.47	1.2	0.2
74	Tributary to Blackstone River	1.29	0.54	1.2	0.9
35	Tributary to Mill River	3.76	0.34	1.2	0.3
MichelleLn	Unknown	2.21	0.51	1.2	0.5
0	Tributary to Fox Brook	2.03	0.42	1.2	0.6
49	Tributary to Fox Brook	2.58	0.47	1.2	0.5
27	Tributary to Mill River	6.03	0.48	1.2	0.2
80	Tributary to Blackstone River	3.02	0.39	1.2	0.4
HarrisPondVillage6	Unknown	2.36	0.38	1.2	0.5
79	Tributary to Mill River	5.00	0.45	1.1	0.2
26	Tributary to Mill River	6.29	0.45	1.1	0.2
76	Tributary to Blackstone River	1.01	0.52	1.1	1.1
37	Lake Hiawatha	1.87	0.46	1.0	0.5
25	Tributary to Mill River	2.45	0.30	1.0	0.4
23	Tributary to Mill River	6.41	0.09	1.0	0.2
19	Tributary to Mill River	1.74	0.43	1.0	0.6
47	Tributary to Fox Brook	4.24	0.15	0.9	0.2
16	Quick Stream	1.50	0.45	0.9	0.6
70	Tributary to Fox Brook	1.70	0.29	0.9	0.5

Town of Blackstone Phosphorus Source Identification Report					
Appendix D - Pollutant Loading Analysis Results					
Catchment	**Receiving Water**	**Catchment Size (Ac)**	**DCIA (Acres)**	**Phosphorus Loading (lb/yr)**	**Relative Phosphorus Loading (lb/yr/ac)**
87	Tributary to Blackstone River	0.84	0.39	0.9	1.0
89	Tributary to Blackstone River	1.10	0.37	0.8	0.8
24	Tributary to Mill River	2.95	0.17	0.7	0.2
20	Mill River	1.02	0.36	0.7	0.7
13	Mill River	1.21	0.31	0.7	0.6
31	Tributary to Mill River	1.10	0.28	0.6	0.6
HarrisPondVillage4	Unknown	2.72	0.00	0.6	0.2
9	Mill River	1.01	0.23	0.6	0.6
53	Aldrich Brook	1.18	0.18	0.6	0.5
11	Mill River	1.10	0.24	0.5	0.5
12	Mill River	1.27	0.23	0.5	0.4
HarrisPondVillage10	Unknown	2.44	0.09	0.5	0.2
HarrisPondVillage7	Unknown	1.75	0.22	0.5	0.3
ButlerSt_Intercon	Unknown	0.61	0.22	0.5	0.8
29	Mill River	0.90	0.21	0.5	0.5
5	Tributary to Mill River	1.08	0.21	0.5	0.4
10	Mill River	0.40	0.20	0.4	1.0
HarrisPondVillage5	Unknown	2.16	0.04	0.4	0.2
28	Mill River	0.75	0.18	0.4	0.5
14	Mill River	1.26	0.16	0.4	0.3
85	Blackstone River	0.45	0.19	0.4	0.8
52	Aldrich Brook	1.08	0.11	0.4	0.3
15	Tributary to Mill River	0.33	0.18	0.3	1.0
18	Tributary to Mill River	0.27	0.17	0.3	1.2
86	Tributary to Blackstone River	1.34	0.09	0.3	0.2
22	Tributary to Mill River	0.79	0.12	0.2	0.3
HarrisPondVillage8	Unknown	0.43	0.09	0.2	0.4
21	Tributary to Mill River	0.81	0.06	0.2	0.2
PreciousBloodCemetery	Unknown	0.45	0.03	0.1	0.2

APPENDIX E

Catchment Prioritization and Ranking

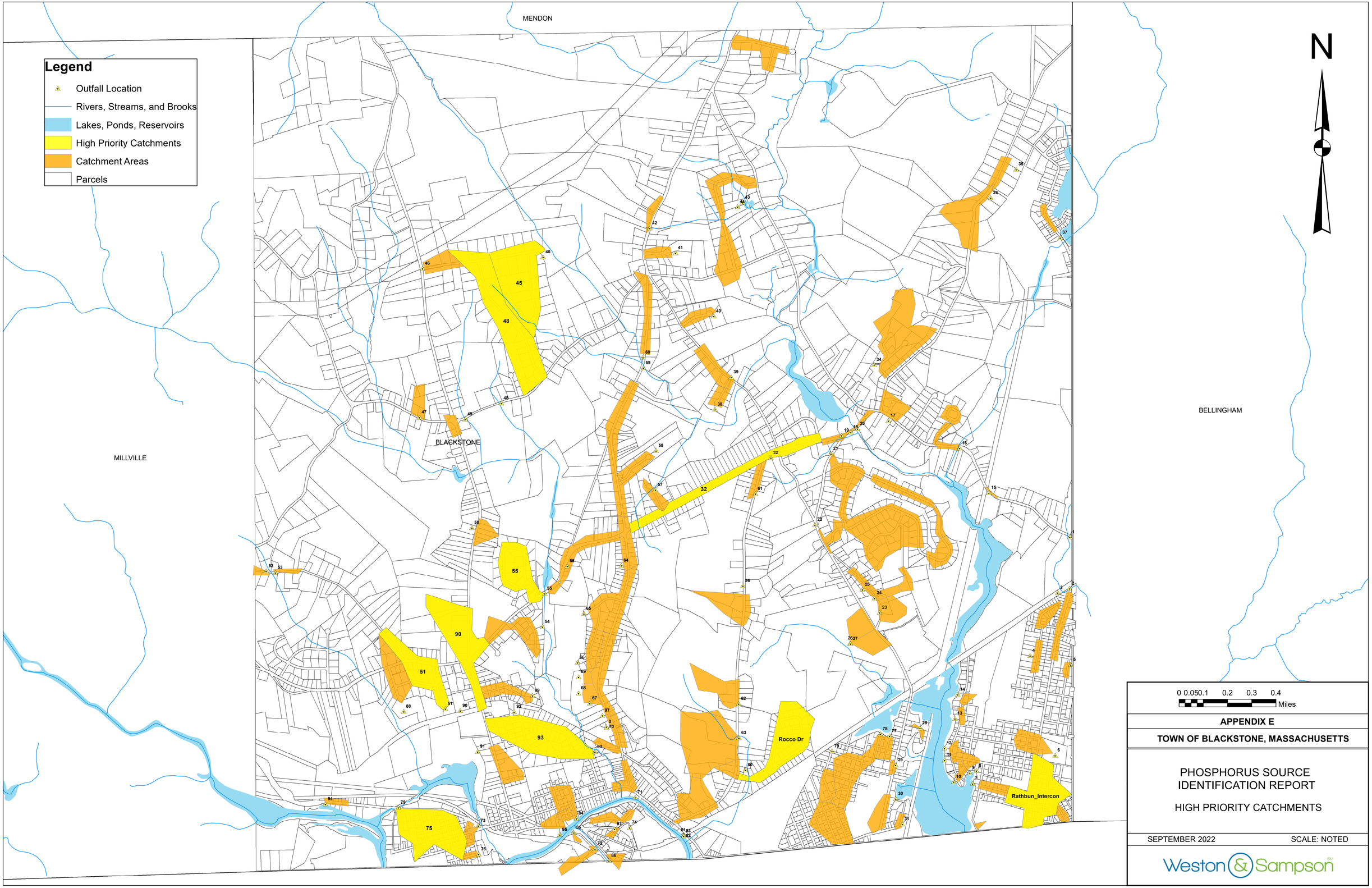
Town of Blackstone Phosphorus Source Identification Report

Appendix E - Catchment Ranking

Rank	Catchment	Receiving Water	Catchment Size (Ac)	DCIA (Acres)	Phosphorus Loading (lb/yr)	Relative Phosphorus Loading (lb/yr/ac)	Dry Weather Flow Observed	Dry Weather Phosphorus Value (mg/L)
1	Rathbun_Intercon	Woonsocket MS4	25.26	8.27	18.3	0.7	Yes	0.12
2	75	Blackstone River	27.64	5.53	13.5	0.5	No	-
3	48	Tributary to Fox Brook	41.26	2.67	12.9	0.3	Yes	0.13
4	93	Fox Brook	31.27	4.70	12.6	0.4	No	-
5	90	Tributary to Aldrich Brook	28.88	2.13	10.1	0.3	No	-
6	32	Tributary to Mill River	20.18	4.06	10.0	0.5	No	-
7	Rocco Dr	Unknown	25.52	3.11	8.8	0.3	No	-
8	51	Tributary to Blackstone River	19.10	2.59	8.7	0.5	No	-
9	55	Fox Brook	17.45	2.65	7.8	0.4	No	-
10	45	Hop Brook	33.73	1.69	7.8	0.2	No	-
11	63	Fox Brook	32.41	1.14	7.5	0.2	No	-
12	Gaskill_Intercon	Unknown	13.87	2.98	7.4	0.5	No	-
13	59	Hop Brook	15.71	2.49	7.3	0.5	No	-
14	34	Tributary to Mill River	29.49	0.98	6.8	0.2	No	-
15	65	Fox Brook	16.25	2.24	6.4	0.4	Yes	0.15
16	84	Blackstone River	6.18	2.78	6.4	1.0	No	-
17	78	Mill River	15.99	2.44	5.8	0.4	No	-
18	54	Fox Brook	11.28	2.14	5.1	0.5	Yes	ND
19	88	Aldrich Brook	11.43	1.43	5.0	0.4	No	-
20	71	Tributary to Blackstone River	4.66	2.07	4.8	1.0	No	-
21	44	Hop Brook	15.01	1.33	4.7	0.3	No	-
22	HarrisPondVillage2	Unknown	33.51	0.32	4.7	0.1	Yes	Parameter not sampled
23	97	Tributary to Fox Brook	9.93	1.63	4.5	0.5	No	-
24	36	Tributary to Quick Stream	16.38	1.17	4.4	0.3	No	-
25	81	Blackstone River	12.48	1.31	4.2	0.3	No	-
26	56	Tributary to Fox Brook	10.96	1.53	4.1	0.4	No	-
27	6	Tributary to Peters River	6.96	1.70	4.0	0.6	No	-
28	2	Tributary to Mill River	5.91	1.64	3.5	0.6	No	-
29	60	Tributary to Mill River	8.05	1.18	3.4	0.4	No	-
30	91	Fox Brook	7.71	1.23	3.4	0.4	No	-
31	64	Fox Brook	7.19	1.20	3.3	0.5	Yes	ND
32	95	Tributary to Mill River	2.64	1.50	3.0	1.1	No	-
33	SpruceSt	Unknown	9.81	1.12	2.8	0.3	No	-
34	92	Tributary to Fox Brook	4.73	1.13	2.8	0.6	No	-
35	66	Tributary to Fox Brook	5.74	0.93	2.6	0.5	No	-
36	58	Tributary to Mill River	5.14	0.84	2.5	0.5	Yes	ND
37	OF_CB_Downtown2	Unknown	1.66	1.05	2.4	1.4	No	-

Town of Blackstone Phosphorus Source Identification Report								
Appendix E - Catchment Ranking								
Rank	**Catchment**	**Receiving Water**	**Catchment Size (Ac)**	**DCIA (Acres)**	**Phosphorus Loading (lb/yr)**	**Relative Phosphorus Loading (lb/yr/ac)**	**Dry Weather Flow Observed**	**Dry Weather Phosphorus Value (mg/L)**
38	39	Tributary to Hop Brook	7.37	0.73	2.4	0.3	No	-
39	96	Tributary to Mill River	10.89	0.36	2.1	0.2	No	-
40	46	Tributary to Fox Brook	5.98	0.52	2.1	0.3	No	-
41	43	Tributary to Mill River	5.42	0.61	1.9	0.4	No	-
42	7	Mill River	3.24	0.80	1.9	0.6	No	-
43	62	Tributary to Blackstone River	10.94	0.22	1.8	0.2	No	-
44	40	Tributary to Mill River	3.74	0.63	1.8	0.5	No	-
45	Pulaski_Intercon	Unknown	1.60	0.76	1.7	1.0	No	-
46	3	Tributary to Mill River	3.79	0.75	1.7	0.4	No	-
47	30	Mill River	5.47	0.73	1.7	0.3	No	-
48	94	Blackstone River	1.60	0.79	1.6	1.0	No	-
49	77	Mill River	3.29	0.69	1.6	0.5	No	-
50	57	Tributary to Mill River	3.56	0.47	1.6	0.4	Yes	ND
51	17	Tributary to Mill River	6.15	0.62	1.5	0.3	No	-
52	HarrisPondVillage1	Unknown	8.08	0.55	1.5	0.2	No	-
53	41	Tributary to Mill River	3.30	0.50	1.5	0.5	No	-
54	61	Tributary to Mill River	3.31	0.54	1.5	0.4	No	-
55	50	Fox Brook	4.34	0.42	1.5	0.3	No	-
56	4	Tributary to Mill River	2.68	0.65	1.5	0.5	No	-
57	72	Tributary to Blackstone River	2.47	0.61	1.5	0.6	No	-
58	38	Tributary to Hop Brook	2.98	0.49	1.3	0.4	No	-
59	73	Blackstone River	1.83	0.63	1.3	0.7	No	-
60	42	Tributary to Mill River	2.52	0.39	1.3	0.5	Yes	ND
61	HarrisPondVillage3	Unknown	3.58	0.45	1.3	0.4	Not screened	-
62	8	Mill River	2.05	0.55	1.2	0.6	Yes	ND
63	RiversEdgeRd	Unknown	2.51	0.46	1.2	0.5	No	-
64	HarrisPondVillage9	Unknown	5.52	0.47	1.2	0.2	No	-
65	74	Tributary to Blackstone River	1.29	0.54	1.2	0.9	No	-
66	35	Tributary to Mill River	3.76	0.34	1.2	0.3	Yes	ND
67	MichelleLn	Unknown	2.21	0.51	1.2	0.5	No	-
68	0	Tributary to Fox Brook	2.03	0.42	1.2	0.6	No	-
69	49	Tributary to Fox Brook	2.58	0.47	1.2	0.5	No	-
70	27	Tributary to Mill River	6.03	0.48	1.2	0.2	Yes	0.11
71	80	Tributary to Blackstone River	3.02	0.39	1.2	0.4	No	-
72	HarrisPondVillage6	Unknown	2.36	0.38	1.2	0.5	No	-
73	79	Tributary to Mill River	5.00	0.45	1.1	0.2	No	-
74	26	Tributary to Mill River	6.29	0.45	1.1	0.2	No	-
75	76	Tributary to Blackstone River	1.01	0.52	1.1	1.1	No	-

Town of Blackstone Phosphorus Source Identification Report								
Appendix E - Catchment Ranking								
Rank	**Catchment**	**Receiving Water**	**Catchment Size (Ac)**	**DCIA (Acres)**	**Phosphorus Loading (lb/yr)**	**Relative Phosphorus Loading (lb/yr/ac)**	**Dry Weather Flow Observed**	**Dry Weather Phosphorus Value (mg/L)**
76	37	Lake Hiawatha	1.87	0.46	1.0	0.5	No	-
77	25	Tributary to Mill River	2.45	0.30	1.0	0.4	No	-
78	23	Tributary to Mill River	6.41	0.09	1.0	0.2	No	-
79	19	Tributary to Mill River	1.74	0.43	1.0	0.6	No	-
80	47	Tributary to Fox Brook	4.24	0.15	0.9	0.2	No	-
81	16	Quick Stream	1.50	0.45	0.9	0.6	No	-
82	70	Tributary to Fox Brook	1.70	0.29	0.9	0.5	No	-
83	87	Tributary to Blackstone River	0.84	0.39	0.9	1.0	No	-
84	89	Tributary to Blackstone River	1.10	0.37	0.8	0.8	No	-
85	24	Tributary to Mill River	2.95	0.17	0.7	0.2	No	-
86	20	Mill River	1.02	0.36	0.7	0.7	No	-
87	13	Mill River	1.21	0.31	0.7	0.6	No	-
88	31	Tributary to Mill River	1.10	0.28	0.6	0.6	No	-
89	HarrisPondVillage4	Unknown	2.72	0.00	0.6	0.2	No	-
90	9	Mill River	1.01	0.23	0.6	0.6	Yes	ND
91	53	Aldrich Brook	1.18	0.18	0.6	0.5	No	-
92	11	Mill River	1.10	0.24	0.5	0.5	No	-
93	12	Mill River	1.27	0.23	0.5	0.4	No	-
94	HarrisPondVillage10	Unknown	2.44	0.09	0.5	0.2	Not screened	-
95	HarrisPondVillage7	Unknown	1.75	0.22	0.5	0.3	No	-
96	ButlerSt_Intercon	Unknown	0.61	0.22	0.5	0.8	No	-
97	29	Mill River	0.90	0.21	0.5	0.5	No	-
98	5	Tributary to Mill River	1.08	0.21	0.5	0.4	No	-
99	10	Mill River	0.40	0.20	0.4	1.0	No	-
100	HarrisPondVillage5	Unknown	2.16	0.04	0.4	0.2	Not screened	-
101	28	Mill River	0.75	0.18	0.4	0.5	No	-
102	14	Mill River	1.26	0.16	0.4	0.3	No	-
103	85	Blackstone River	0.45	0.19	0.4	0.8	No	-
104	52	Aldrich Brook	1.08	0.11	0.4	0.3	No	-
105	15	Tributary to Mill River	0.33	0.18	0.3	1.0	No	-
106	18	Tributary to Mill River	0.27	0.17	0.3	1.2	No	-
107	86	Tributary to Blackstone River	1.34	0.09	0.3	0.2	No	-
108	22	Tributary to Mill River	0.79	0.12	0.2	0.3	No	-
109	HarrisPondVillage8	Unknown	0.43	0.09	0.2	0.4	No	-
110	21	Tributary to Mill River	0.81	0.06	0.2	0.2	No	-
111	PreciousBloodCemetery	Unknown	0.45	0.03	0.1	0.2	No	-



APPENDIX E

TOWN OF BLACKSTONE, MASSACHUSETTS

PHOSPHORUS SOURCE IDENTIFICATION REPORT

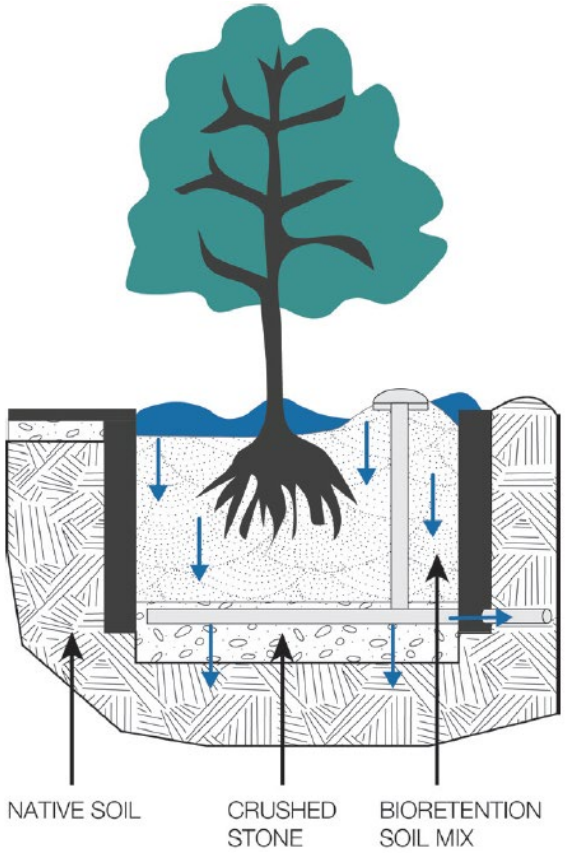
HIGH PRIORITY CATCHMENTS

SEPTEMBER 2022 SCALE: NOTED

Weston & Sampson

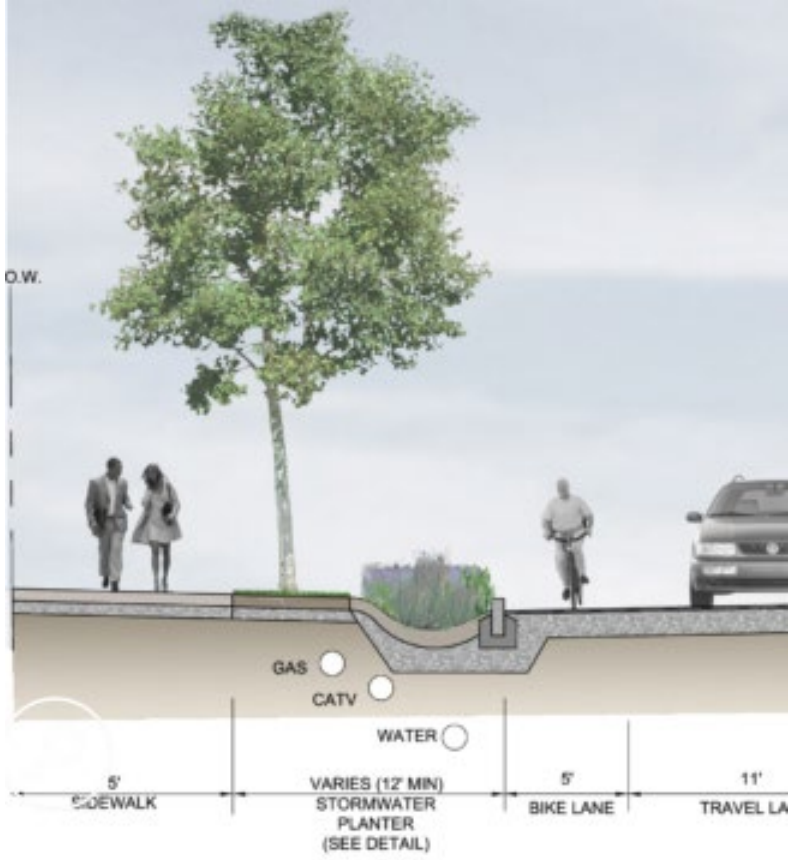
APPENDIX F

BMP Retrofit Cut Sheets, Examples, and Working Designs

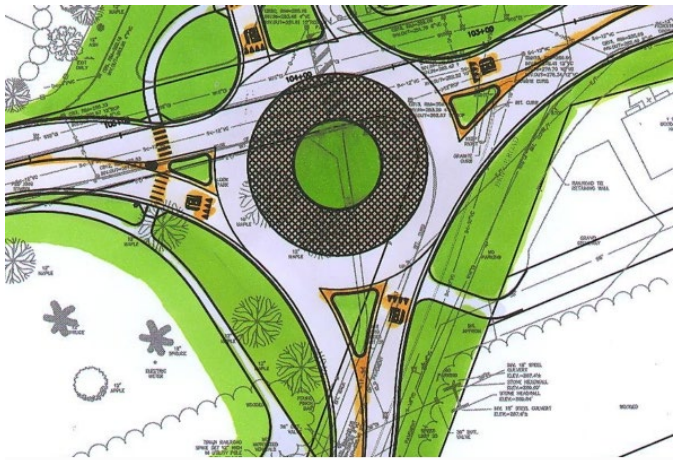




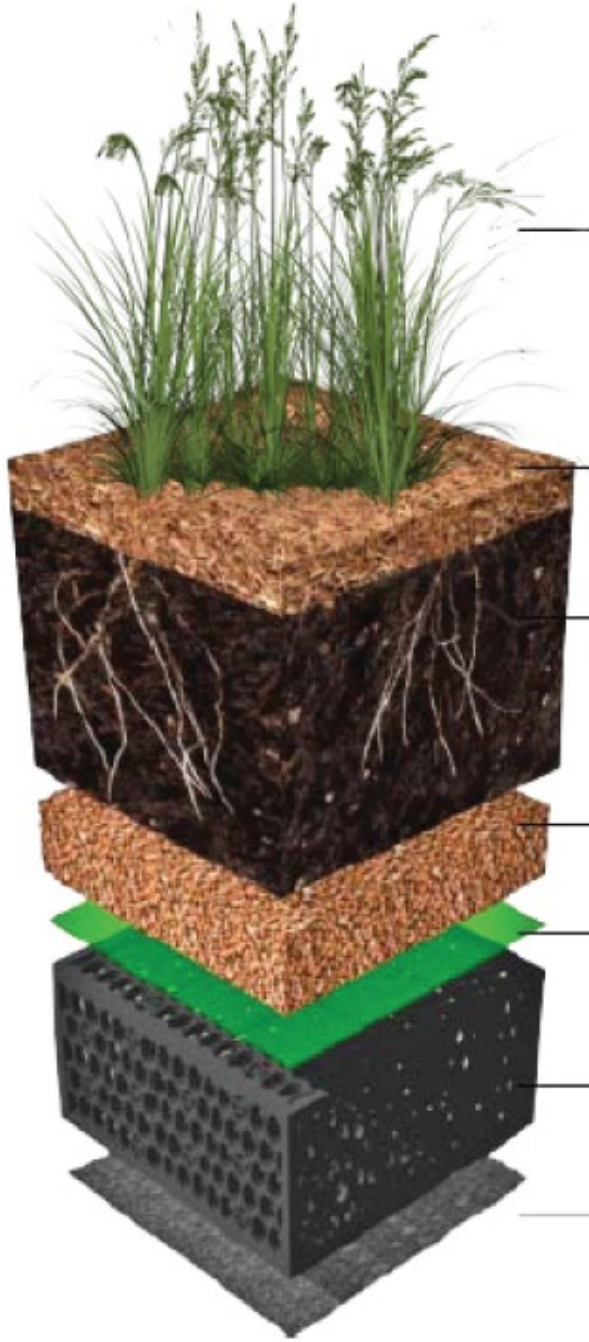








Weston & Sampson



PLANTING

CLEAN, SHREDDED HARDWOOD MULCH

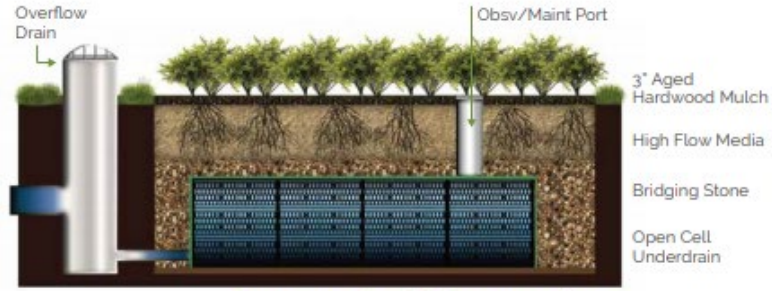
HIGH PERFORMANCE BIOFILTRATION MEDIA

CLEAN, BRIDGING STONE

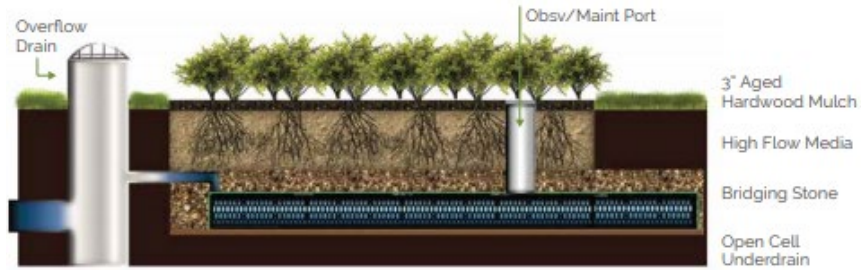
OPEN MESH SEPARATION FABRIC

MODULAR HIGH PERFORMANCE UNDERDRAIN

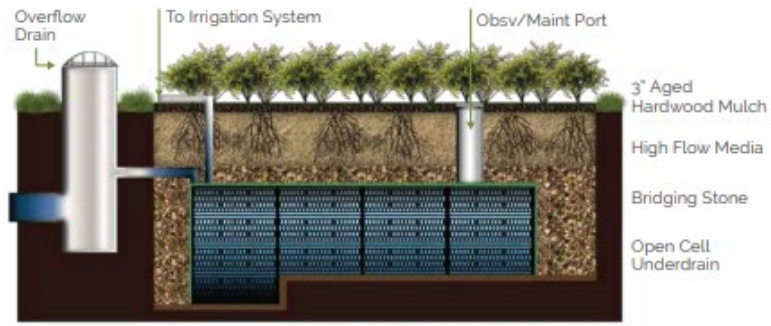
GEOTEXTILE OR LINER ENVELOPE



Expanded Detention



Expanded Infiltration



Rainwater Harvesting

ACF Environmental











ACF Environmental

Bioretention Areas & Rain Gardens



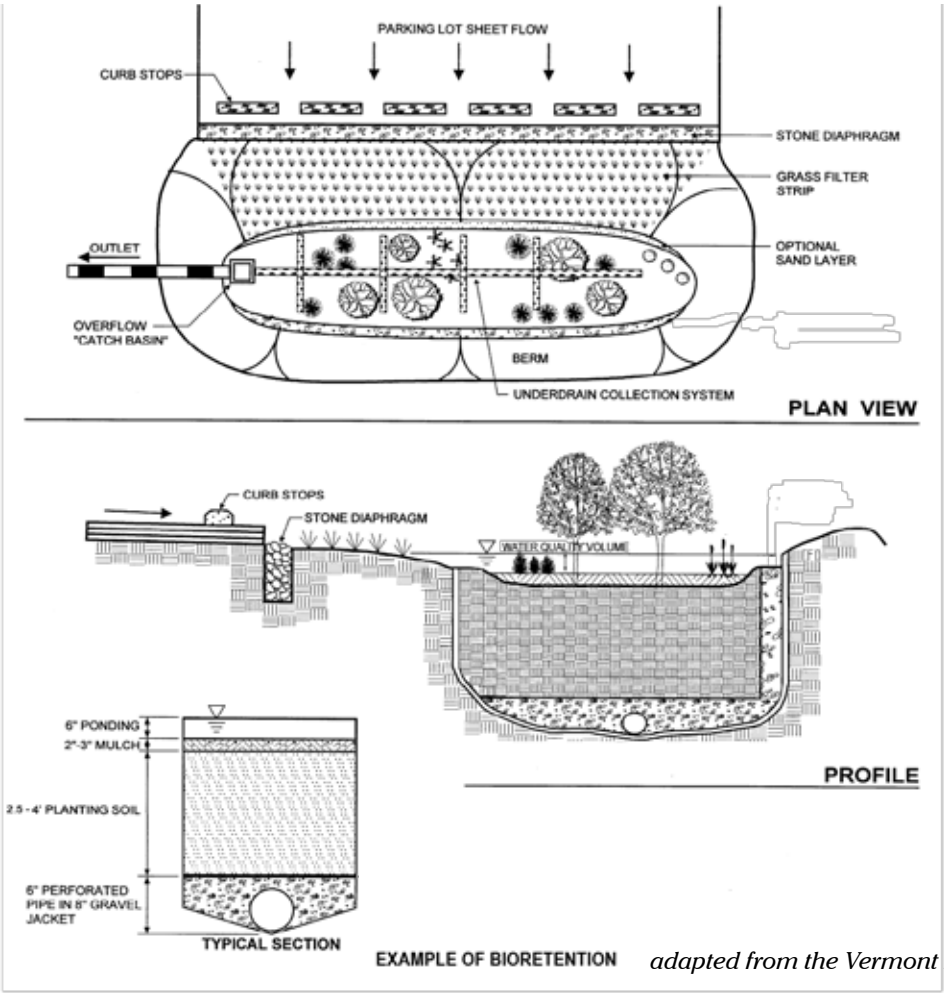
Description: Bioretention is a technique that uses soils, plants, and microbes to treat stormwater before it is infiltrated and/or discharged. Bioretention cells (also called rain gardens in residential applications) are shallow depressions filled with sandy soil topped with a thick layer of mulch and planted with dense native vegetation. Stormwater runoff is directed into the cell via piped or sheet flow. The runoff percolates through the soil media that acts as a filter.
There are two types of bioretention cells: those that are designed solely as an organic filter filtering bioretention areas and those configured to recharge groundwater in addition to acting as a filter exfiltrating bioretention areas. A filtering bioretention area includes an impermeable liner and underdrain that intercepts the runoff before it reaches the water table so that it may be conveyed to a discharge outlet, other best management practices, or the municipal storm drain system. An exfiltrating bioretention area has an underdrain that is designed to enhance exfiltration of runoff into the groundwater.

Ability to meet specific standards

Standard	Description
2 - Peak Flow	N/A
3 - Recharge	An exfiltrating bioretention area provides groundwater recharge.
4 - TSS Removal	90% TSS removal credit with adequate pretreatment
5 - Higher Pollutant Loading	Can be used for certain land uses with higher potential pollutant loads if lined and sealed until adequate pretreatment is provided. Adequate pretreatment must include 44% TSS removal prior to infiltration. For land uses that have the potential to generate runoff with high concentrations of oil and grease such as high intensity use parking lots and gas stations, adequate pretreatment may also include an oil grit separator, sand filter or equivalent. In lieu of an oil grit separator or sand filter, a filtering bioretention area also may be used as a pretreatment device for infiltration practices exfiltrating runoff from land uses with a potential to generate runoff with high concentrations of oil and grease.
6 - Discharges near or to Critical Areas	Good option for discharges near cold-water fisheries. Should not be used near bathing beaches and shellfish growing areas.
7 - Redevelopment	Suitable with appropriate pretreatment

Pollutant Removal Efficiencies

- Total Suspended Solids (TSS) — 90% with vegetated filter strip or equivalent
- Total Nitrogen — 30% to 50% if soil media at least 30 inches
- Total Phosphorus — 30% to 90%
- Metals (copper, lead, zinc, cadmium) — 40% to 90%
- Pathogens (coliform, e coli) — Insufficient data



EXAMPLE OF BIORETENTION *adapted from the Vermont Stormwater Manual*

Special Features:

- Can be lined and sealed to prevent recharge where appropriate
- Adequate pretreatment is essential
- Not recommended in areas with steep slope
- Depth of soil media depends on type of vegetation that is proposed
- Soil media must be 30 inches deep to achieve removal of nitrogen

Advantages/Benefits:

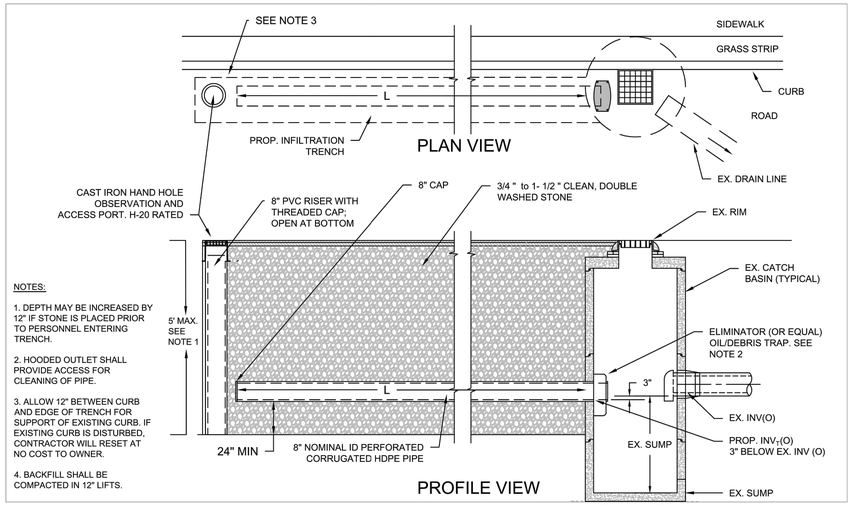
- Can be designed to provide groundwater recharge and preserves the natural water balance of the site
- Can be designed to prevent recharge where appropriate
- Supplies shade, absorbs noise, and provides windbreaks
- Can remove other pollutants besides TSS including phosphorus, nitrogen and metals
- Can be used as a stormwater retrofit by modifying existing landscape or if a parking lot is being resurfaced
- Can be used on small lots with space constraints
- Small rain gardens are mosquito death traps
- Little or no hazard for amphibians or other small animals

Disadvantages/Limitations:

- Requires careful landscaping and maintenance
- Not suitable for large drainage areas

Maintenance

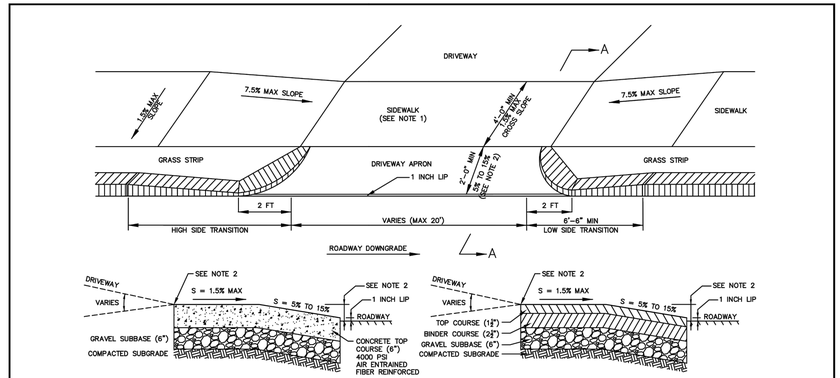
Activity	Frequency
Inspect and remove trash	Monthly
Mow	2 to 12 times per year
Mulch	Annually
Fertilize	Annually
Remove dead vegetation	Annually
Prune	Annually



NOTES:

1. DEPTH MAY BE INCREASED BY 12" IF STONE IS PLACED PRIOR TO PERSONNEL ENTERING TRENCH.
2. HOODED OUTLET SHALL PROVIDE ACCESS FOR CLEANING OF PIPE.
3. ALLOW 12" BETWEEN CURB AND EDGE OF TRENCH FOR SUPPORT OF EXISTING CURB. IF EXISTING CURB IS DISTURBED, CONTRACTOR WILL RESET AT NO COST TO OWNER.
4. BACKFILL SHALL BE COMPACTED IN 12" LIFTS.

Town of ARLINGTON ENGINEERING DIVISION	STANDARD PIPE TRENCH INFILTRATION SYSTEM	DEC. 2020 NOT TO SCALE REVISION ②	D-1



SECTION A–A
CONCRETE SIDEWALK & APRON
(SEE NOTE 1)

SECTION A–A
ASPHALT SIDEWALK & APRON
(SEE NOTE 1)

NOTES:

1. MATCH DRIVEWAY APRON MATERIALS WITH EXISTING SIDEWALK MATERIAL
2. DOWNWARD SLOPING DRIVEWAYS REQUIRE A SIDEWALK HEIGHT AT LEAST 3" ABOVE THE ROADWAY

Town of ARLINGTON ENGINEERING DIVISION	TYPICAL DRIVEWAY APRON WITH GRASS STRIP	SEPT. 2016 NOT TO SCALE REVISION ②	D-3

NOTES

1. PLANS WERE DEVELOPED USING AVAILABLE AERIAL IMAGERY, EXISTING PLANS, AND ON-SITE OBSERVATIONS. A FORMAL SURVEY OF THE PROJECT AREAS WAS NOT CONDUCTED. UTILITY LOCATIONS AND INVERT MEASUREMENTS ARE APPROXIMATE.
2. CONTRACTOR IS RESPONSIBLE FOR NOTIFYING DIG-SAFE AND ALL APPLICABLE UTILITIES OF THE PROPOSED WORK PRIOR TO ANY EXCAVATION. THE TOWN OF ARLINGTON IS NOT A MEMBER OF DIG-SAFE AND MUST BE NOTIFIED DIRECTLY AT LEAST 72 HOURS PRIOR TO EXCAVATION BY CALLING 781-316-3310.
3. TRENCHES HAVE BEEN PROPOSED IN LOCATIONS WHERE NO UTILITY CONFLICTS WERE APPARENT. THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING ALL APPLICABLE UTILITIES FOR APPROPRIATE MARK-OUTS AND CONFIRMING NO CONFLICTS ARE PRESENT. THE CONTRACTOR IS RESPONSIBLE FOR NOTIFYING THE ENGINEER SHOULD ANY EXISTING UTILITY CONFLICTS BE IDENTIFIED WITHIN PROPOSED TRENCH LIMITS.
4. CONTRACTOR IS RESPONSIBLE FOR NOTIFYING RESIDENTS AND ABUTTERS OF ANY WORK THAT MAY INTERFERE WITH DRIVEWAY AND WALKWAY ACCESS.
5. A RELATIVE LOCAL DATUM HAS BEEN SET FOR EACH TRENCH LOCATION. THE CATCHBASIN RIM ELEVATION HAS BEEN SET TO ZERO FEET (0.0') AT EACH LOCATION.
6. EXISTING ASPHALT SHOULD BE SAWCUT PRIOR TO EXCAVATION.
7. TRENCHES SHOULD BE BACKFILLED AND COMPACTED IN 12 INCH LIFTS.
8. CONTRACTOR IS RESPONSIBLE FOR APPROPRIATE CONSTRUCTION SIGNAGE AND BARRIERS AS NEEDED AND SHALL BE INCIDENTAL TO THE CONTRACT.
9. CONTRACTOR TO MAINTAIN CLEAN WORK ZONE AND SWEEP WORK SITE DAILY.
10. PAVING TO BE COMPLETED WEEKLY.
11. EROSION CONTROL SHALL BE USED WHEN NECESSARY AND CONSIDERED INCIDENTAL TO THE CONTRACT. ANY SEDIMENT THAT ENTERS THE TOWN'S STORMWATER SYSTEM AS A RESULT OF CONSTRUCTION SHALL BE REMOVED AT THE EXPENSE OF THE CONTRACTOR.
12. CONTRACTOR SHOULD TAKE CARE TO NOT IMPACT NEARBY TREES DURING CONSTRUCTION.
13. ANY AREA DISTURBED BY THE CONTRACTOR OUTSIDE OF THE LIMITS OF WORK SHALL BE RESTORED TO ORIGINAL CONDITION AT NO COST TO THE OWNER.

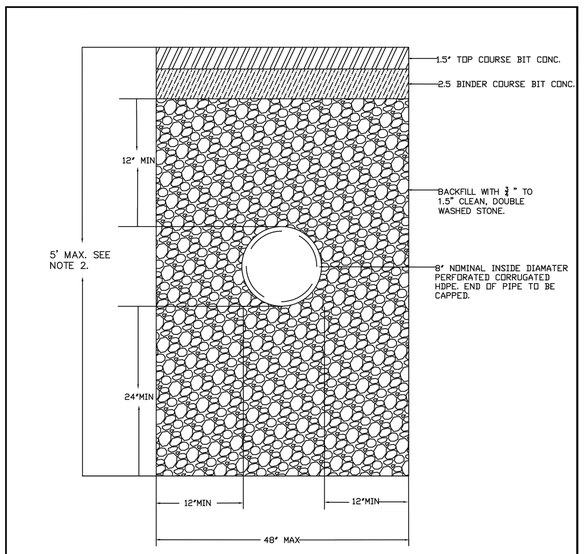
No.	Revision/Issue	Date

Town of
ARLINGTON
Engineering Division
51 Grove Street
Arlington, MA 02476

2021 GREEN INFRASTRUCTURE IMPROVEMENTS PROJECT

ARLINGTON CONSTRUCTION DETAILS

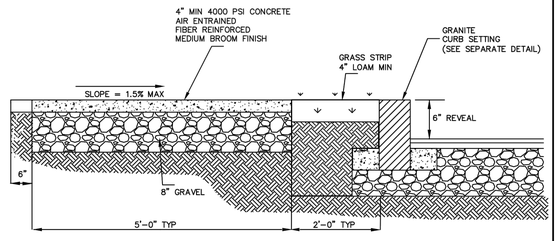
Dr□n B□: □C	Sheet: 13
Checked B□: WCC	
Scale: NTS	
Date: FEBR□□R□ 2021	



NOTES:

1. ALL BACKFILL SHALL BE COMPACTED IN 12 INCH LIFTS.
2. DEPTH MAY BE INCREASED BY 1 FOOT IF STONE IS PLACED PRIOR TO PERSONNEL ENTERING THE TRENCH.
3. MEASURES SHALL BE TAKEN TO PREVENT MIGRATION OF FINES INTO BACKFILL.
4. PIPE SPECS BASED OFF HD100EC PIPE MANUFACTURED BY LANE ENTERPRISES.

Town of ARLINGTON ENGINEERING DIVISION	STREET INFILTRATION TRENCH CROSS SECTION VIEW	DEC. 2020 NOT TO SCALE REVISION ⓪	D-2

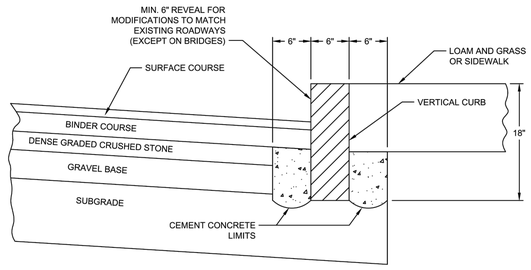


CONCRETE SIDEWALK

NOTES:

1. EXPANSION JOINTS SHALL BE INSTALLED EVERY 20 FEET MINIMUM. CONTROL JOINTS TO BE APPROXIMATELY 5 FEET.
2. ½" PREFORMED POLYMER FOAM JOINT FILLER INSTALLED TO FULL DEPTH OF CONCRETE.
3. GRASS STRIP CAN BE REDUCED TO 18 INCHES IF EXISTING WALKWAY CANNOT MAINTAIN A 5 FOOT SIDEWALK WITH 2 FOOT GRASS STRIP.
4. SIDEWALK SURFACE SHALL SLOPE TOWARD STREET TO AVOID STANDING WATER OR PUDDLING.
5. SIDEWALK TO BE BROOM FINISHED.

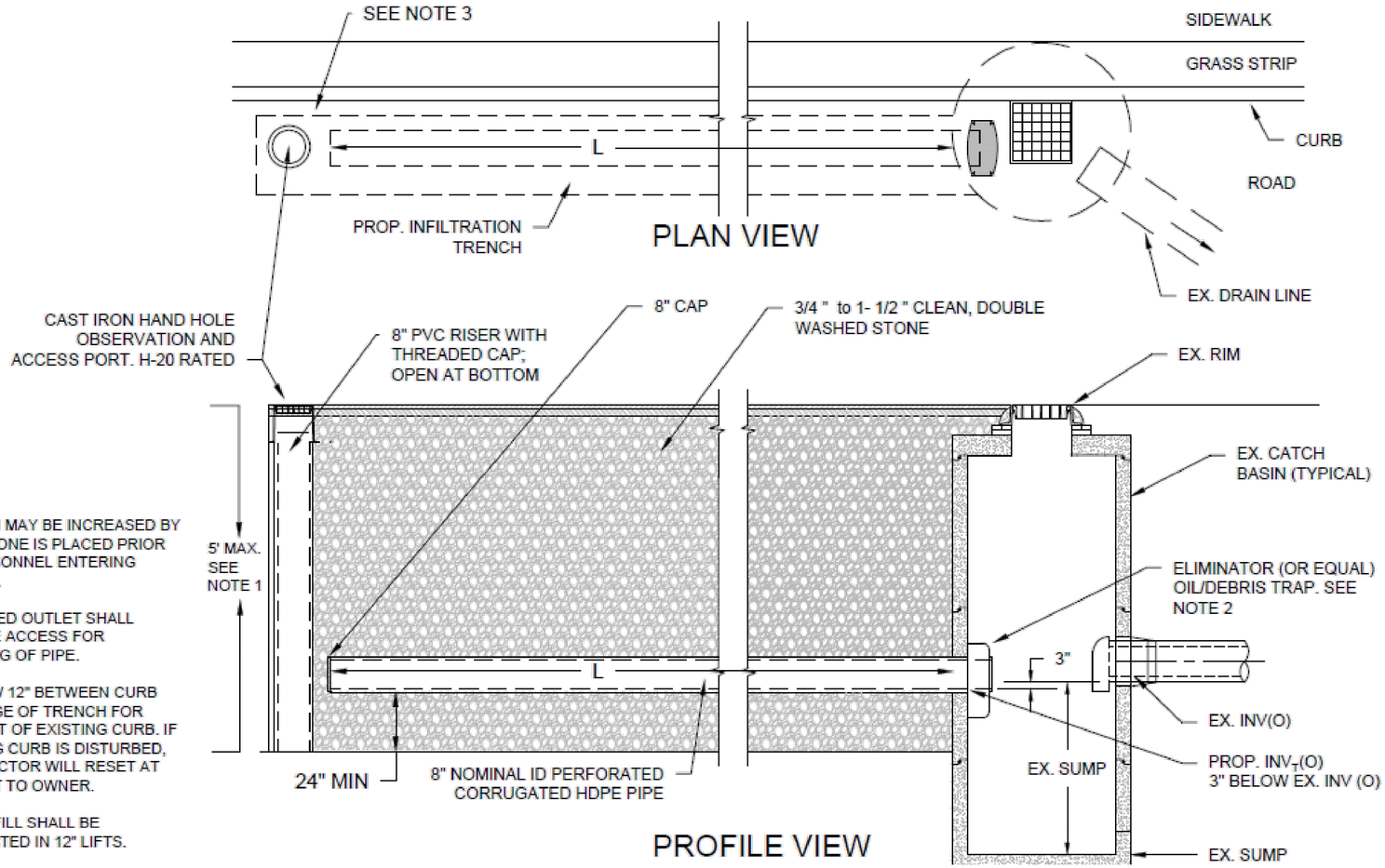
Town of ARLINGTON ENGINEERING DIVISION	TYPICAL SIDEWALK SECTIONS WITH GRASS STRIP	OCT. 2020 NOT TO SCALE REVISION ②	D-4



NOTES:

1. SAW-CUT NEAT LINE 6" FROM CURB LINE AND REMOVE BASE AND SUBGRADE, REPLACE WITH CEMENT CONCRETE. COVER WITH BINDER AND TOP COURSE TO CURB.
2. ANY DESIGNATED CEMENT CONCRETE THAT IS ACCEPTABLE UNDER SECTION M4 OF THE STANDARD MHD SPECIFICATIONS MAY BE USED; ALL TEST REQUIREMENTS ARE WAIVED. BITUMINOUS CONCRETE SHALL NOT BE USED AS A SUBSTITUTE.

Town of ARLINGTON ENGINEERING DIVISION	VERTICAL GRANITE CURB INSTALLATION	JAN. 2015 NOT TO SCALE REVISION ①	D-5



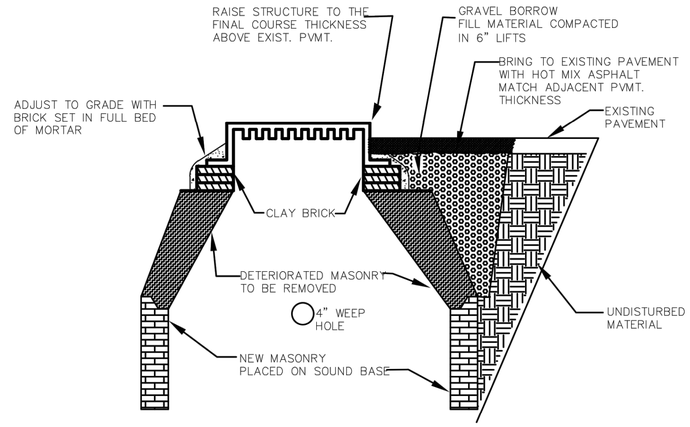
NOTES:

1. DEPTH MAY BE INCREASED BY 12" IF STONE IS PLACED PRIOR TO PERSONNEL ENTERING TRENCH.

2. HOODED OUTLET SHALL PROVIDE ACCESS FOR CLEANING OF PIPE.

3. ALLOW 12" BETWEEN CURB AND EDGE OF TRENCH FOR SUPPORT OF EXISTING CURB. IF EXISTING CURB IS DISTURBED, CONTRACTOR WILL RESET AT NO COST TO OWNER.

4. BACKFILL SHALL BE COMPACTED IN 12" LIFTS.



TYPICAL REBUILD OF DRAINAGE/SEWER STRUCTURE

NOTES:

1. ALL BACKFILL SHALL BE COMPACTED IN 12 INCH LIFTS.
2. DEPTH MAY BE INCREASED BY 1 FOOT IF STONE IS PLACED PRIOR TO PERSONNEL ENTERING THE TRENCH.
3. MEASURES SHALL BE TAKEN TO PREVENT MIGRATION OF FINES INTO BACKFILL.
4. PIPE SPECS BASED OFF HD100EC PIPE MANUFACTURED BY LANE ENTERPRISES.

NOTES:

1. PLANS WERE DEVELOPED USING AVAILABLE AERIAL IMAGERY, EXISTING PLANS, AND ON-SITE OBSERVATIONS. A FORMAL SURVEY OF THE PROJECT AREAS WAS NOT CONDUCTED. UTILITY LOCATIONS AND INVERT MEASUREMENTS ARE APPROXIMATE.
2. CONTRACTOR IS RESPONSIBLE FOR NOTIFYING DIG-SAFE AND ALL APPLICABLE UTILITIES OF THE PROPOSED WORK PRIOR TO ANY EXCAVATION. THE TOWN OF LEXINGTON IS NOT A MEMBER OF DIG-SAFE AND MUST BE NOTIFIED DIRECTLY AT LEAST 72 HOURS PRIOR TO EXCAVATION BY CALLING THE TOWN OF LEXINGTON OPERATIONS AT 781-274-8300.
3. TRENCHES HAVE BEEN PROPOSED IN LOCATIONS WHERE NO UTILITY CONFLICTS WERE APPARENT. THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING ALL APPLICABLE UTILITIES FOR APPROPRIATE MARK-OUTS AND CONFIRMING NO CONFLICTS ARE PRESENT. THE CONTRACTOR IS RESPONSIBLE FOR NOTIFYING THE ENGINEER SHOULD ANY EXISTING UTILITY CONFLICTS BE IDENTIFIED WITHIN PROPOSED TRENCH LIMITS.
4. CONTRACTOR IS RESPONSIBLE FOR NOTIFYING RESIDENTS AND ABUTTERS OF ANY WORK THAT MAY INTERFERE WITH DRIVEWAY AND WALKWAY ACCESS.
5. A RELATIVE LOCAL DATUM HAS BEEN SET FOR EACH TRENCH LOCATION. THE CATCHBASIN RIM ELEVATION HAS BEEN SET TO ZERO FEET (0.0') AT EACH LOCATION.
6. EXISTING ASPHALT SHOULD BE SAWCUT PRIOR TO EXCAVATION.
7. TRENCHES SHOULD BE BACKFILLED AND COMPACTED IN 12 INCH LIFTS.
8. CONTRACTOR IS RESPONSIBLE FOR APPROPRIATE CONSTRUCTION SIGNAGE AND BARRIERS AS NEEDED AND SHALL BE INCIDENTAL TO THE CONTRACT.
9. CONTRACTOR TO MAINTAIN CLEAN WORK ZONE AND SWEEP WORK SITE DAILY.
10. PAVING TO BE COMPLETED WEEKLY.
11. EROSION CONTROL SHALL BE USED WHEN NECESSARY AND CONSIDERED INCIDENTAL TO THE CONTRACT. ANY SEDIMENT THAT ENTERS THE TOWN'S STORMWATER SYSTEM AS A RESULT OF CONSTRUCTION SHALL BE REMOVED AT THE EXPENSE OF THE CONTRACTOR.
12. CONTRACTOR SHOULD TAKE CARE TO NOT IMPACT NEARBY TREES DURING CONSTRUCTION.
13. ANY AREA DISTURBED BY THE CONTRACTOR OUTSIDE OF THE LIMITS OF WORK SHALL BE RESTORED TO ORIGINAL CONDITION AT NO COST TO THE OWNER.
14. DO NOT PARK, IMPEDE ACCESS TO, OR STORE EQUIPMENT BEYOND RIGHT OF WAY, UNLESS PERMISSION HAS BEEN GRANTED IN WRITING BY THE TOWN AND/OR LAND OWNER.

DATE	REVISION	BY
1/22/21	VIEWPORTS	ML
1/25/21	DESIGN TABLES	ML
1/26/21	TRENCH LENGTHS	ML

STREET TRENCH DESIGNS AND LOCATIONS

Town of Lexington
ENGINEERING DIVISION

DRAWN BY: ML | DATE: 1/20/21 | SCALE: N.T.S
DESIGNED BY: ML | CHECKED BY: MS
APPROVED BY:

SHEET 14

STREET TRENCH SHEET.DWG Plotted on 4-Feb-2021 2:23 PM

sediment, trash and debris. Eventually a layer of sediment will accumulate on the top of the sand, which can be easily scraped off using rakes or other devices. Finer sediments will penetrate deeper into the sand over time, necessitating replacement of some (several inches) or all of the sand. Discolored sand indicates the presence of fine sediments. Dewater and properly dispose of sand removed from the filter.

References

Erickson, Andrew J., et al., Enhanced Sand Filtration for Storm Water Phosphorus Removal, Journal of Environmental Engineering. Volume 133, Issue 5, pp. 485-497, May 2007.

Tree Box Filter

Description: The Tree Box Filter consists of an open bottom concrete barrel filled with a porous soil media, an underdrain in crushed gravel, and a tree. Stormwater is directed from surrounding impervious surfaces through the top of the soil media. Stormwater percolates through the media to the underlying ground. Treated stormwater beyond the design capacity is directed to the underdrain where it may be directed to a storm drain, other device, or surface water discharge.



Advantages/Benefits:

- May be used as a pretreatment device
- Provides decentralized stormwater treatment
- Ideal for redevelopment or in the ultra-urban setting

Disadvantages/Limitations:

- Treats small volumes

Special Features

Reduces volume and rate of runoff.

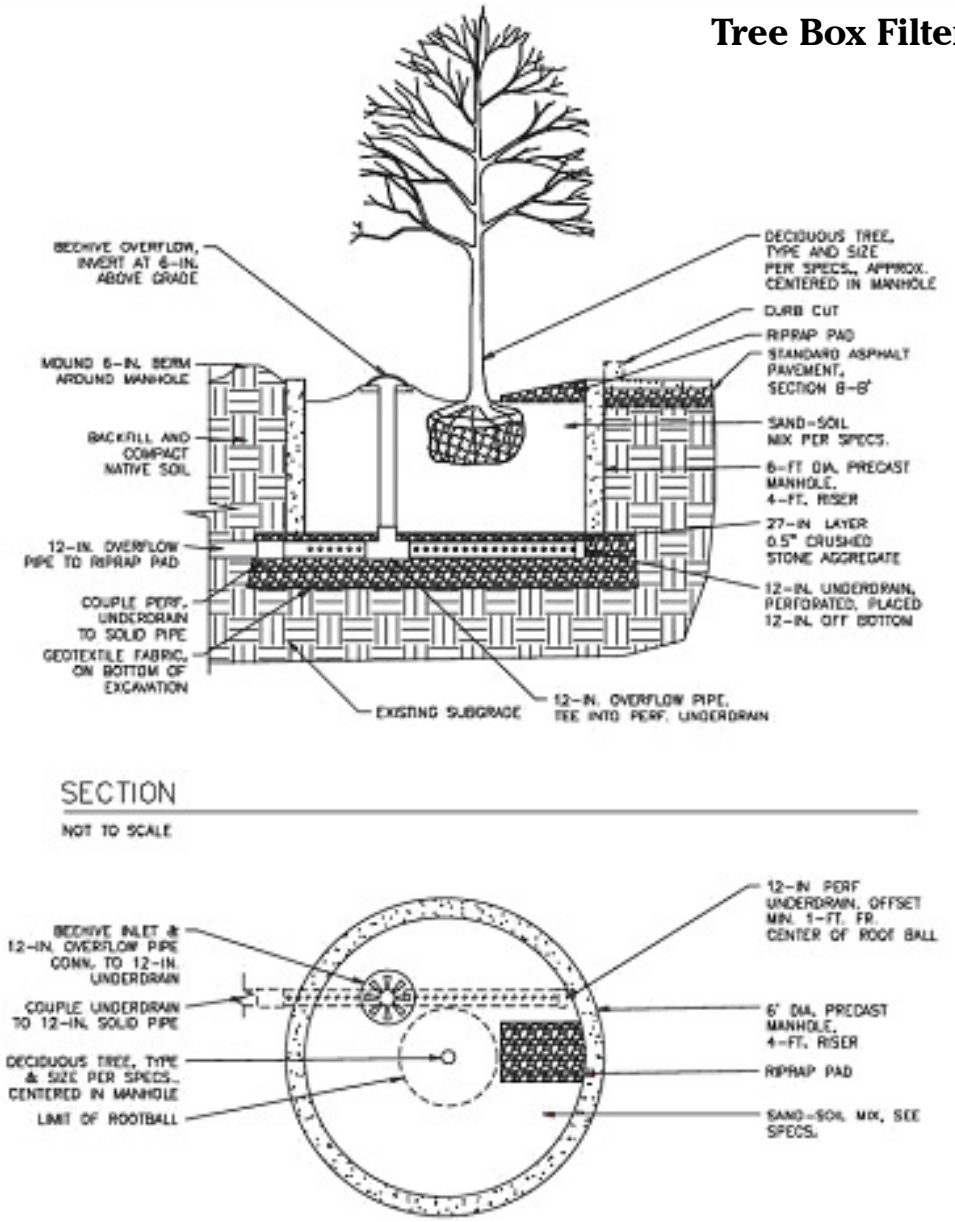
Ability to meet specific standards

Standard	Description
2 - Peak Flow	N/A
3 - Recharge	No infiltration credit
4 - TSS Removal	Presumed to remove 80% TSS
5 - Higher Pollutant Loading	May be used as pretreatment device if lined
6 - Discharges to near or to Critical Areas	Not suitable for vernal pools or swimming areas. At other critical areas, may be used as a pretreatment device.
7 - Redevelopment	May be used for retrofit.

Pollutant Removal Efficiencies

- Total Suspended Solids (TSS)- 80% presumed for regulatory purposes
- Total phosphorus (TP)- Not Reported
- Dissolved Inorganic Nitrogen- Not Reported
- Zinc- Not Reported
- Pathogens (coliform, e. coli)- Not Reported

Tree Box Filter



adapted from the Vermont Stormwater Manual

Maintenance

Activity	Frequency
Check tree	Annually. Expected tree life is 5-10 years.
Rake media surface to maintain permeability	Twice a year
Replace media	When tree is replaced

Attachment B

BMP Assessment Matrix

Town of Blackstone, MA
Phosphorus Source Identification Report - Retrofit Project Ranking

Project Name and Location	Criteria	MS4 Catchment Ranking in PSIR	Location: Parcel or ROW	If Parcel: Total lot size	If parcel: pervious space available	If ROW: Next Scheduled Improvement	If ROW: Existing green space in buffer strip	Within National FEMA flood hazard layer or Town-identified flooding location	Within 300' of sensitive ecological receptors, wetlands areas, or source water protection areas	Dominant Hydrologic Soil Group	Depth to Groundwater	Existing BMPs in the catchment area?	Anticipated BMP Design & Construction Cost	Anticipated Maintenance Cost/ Required Level of Effort	Roadwork or Infrastructure Improvements Planned or Recently Completed in Area	Project Score	Proposed BMPs
	Weight	Reverse points of phosphorus loading rank Top ranked catchment (10 Pts), Low priority catchment (0 Pts)	Parcel (10 Pts), ROW (5 Pts)	>5 acres (4 Pts), <5 acres (2 Pts)	>1.5 Acres (6 Pts), 1 to 1.5 Acres (4 Pts), <1 Acre - 2 (Pts)	Within 5 years (5 Pts), 5-10 years (3 Pts), Done within 5 years (0 Pts)	Yes (5 Pts), No (10 Pts)	Yes (15pts), No (0 Pts)	Yes (5 Pts), No (0 Pts)	A or B (10 Pts), A/D, B/D, C, D (5 Pts)	>10ft (5 Pts), <10ft (0 Pts)	No (5 Pts), Yes (0 pts)	Recently Completed Project or Low Cost (10 Pts), Medium (6 Pts), High (2 Pts)	Low Cost (10 Pts), Medium (6 Pts), High (2 Pts)	Project Concept Developed (20 Pts), Planned (15 Pts), No (0 Pts)		
Washington Street (Main Street to Brown Street)		9	5	-	-	5	10	0	0	10	0	5	10	6	15	**75**	Curb bump-outs or infiltration trenches
Reilly Avenue (Mendon Street to Kimberly Lane)		7	5	-	-	5	10	0	0	10	0	5	10	6	15	**73**	Curb bump-outs or infiltration trenches
Centennial Drive		1	5	-	-	5	5	0	5	10	5	5	10	6	15	**72**	Curb bump-outs or infiltration trenches
John F. Kennedy Elementary School (200 Lincoln Street)		6	10	2	6	-	-	0	0	5	5	5	6	6	20	**71**	Bioretention areas, vegetated swales and filter strips
Rathbun Street (Diana Street to Ethel Street)		10	5	-	-	0	10	0	0	10	0	5	10	6	0	**56**	Curb bump-outs or infiltration trenches
Summer Street (Rennie Drive to Blackstone Street)		5	5	-	-	0	10	0	5	5	5	5	10	6	0	**56**	Curb bump-outs or vegetated filter strips
Mendon Street at Lincoln Street		6	5	-	-	3	10	0	0	5	5	5	10	6	0	**55**	Curb bump-outs or infiltration trenches
Rocco Drive		4	5	-	-	3	5	0	5	10	0	5	10	6	0	**53**	Curb bump-outs or infiltration trenches
Liberty Hill Drive		8	5	-	-	3	5	0	0	5	5	0	10	6	0	**47**	Curb bump-outs or infiltration trenches

Attachment C

Map of Retrofit Sites

Legend

- Parcels for Retrofit
- Outfall Location
- Manholes
- Catch Basins
- Open Channel
- Gravity Main Drain Pipe
- Grass Swales
- Catchment Areas

FEMA National Flood Hazard Layer

Flood Zone Designations

- A: 1% Annual Chance of Flooding, no BFE
- AE: 1% Annual Chance of Flooding, with BFE
- AE: Regulatory Floodway
- AH: 1% Annual Chance of 1-3ft Ponding, with BFE
- AO: 1% Annual Chance of 1-3ft Sheet Flow Flooding, with Depth
- VE: High Risk Coastal Area
- D: Possible But Undetermined Hazard
- X: 0.2% Annual Chance of Flooding

Hydrologic Soil Group

- A
- A/D
- B
- B/D
- C
- D
- Rivers, Streams, and Brooks
- Lakes, Ponds, Reservoirs
- Detention Basin
- Parcels

MENDON

MILLVILLE

BLACKSTONE

BELLINGHAM

Centennial Drive

Liberty Hill Drive

Summer Street (Rennie Drive to Blackstone Street)

John F. Kennedy Elementary School

Mendon Street at Lincoln Street

Rocco Drive

Reilly Avenue (Mendon Street to Kimberly Lane)

Rathbun Street (Diana Street to Ethel Street)

Washington Street (Main Street to Brown Street)

N

0 0.050.1 0.2 0.3 0.4 Miles

ATTACHMENT C

TOWN OF BLACKSTONE, MASSACHUSETTS

PHOSPHORUS SOURCE IDENTIFICATION REPORT PHASE II

POTENTIAL BMP RETROFIT SITES MAP

MAY 2023 SCALE: NOTED

Weston & Sampson SM

Attachment D

Demonstration Project Conceptual Designs

Conceptual Designs for Blackstone Demonstration Project

Washington Street, Reilly Avenue, and Centennial Drive

Blackstone, MA

WHAT IS A GREEN STREET?

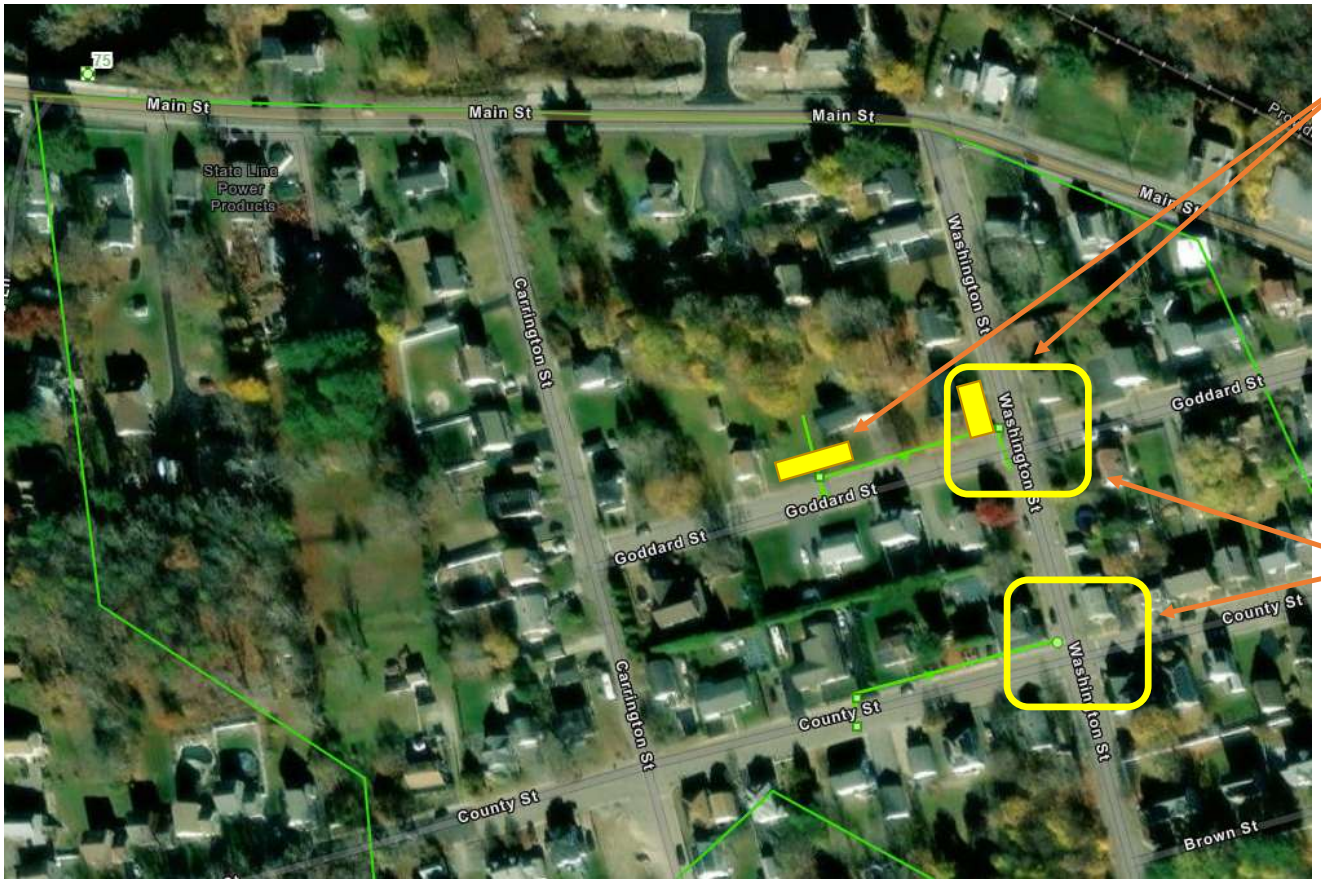
- Green streets use green infrastructure practices, or vegetation, trees, and soils, to manage stormwater close to the source and limit the transport of stormwater pollution in traditional drainage systems.



TYPICAL STREET | OPPORTUNITY | IMPLEMENTATION

Source: EPA Green Streets Design Guidelines

Washington Street



Install tree trenches, small green streets practices or infiltration trenches connecting to CBs along edge of pavement.

Decrease ROW and add curb cuts to create small green streets practices or infiltration trenches between the sidewalk and curb

SITE CONDITIONS – WASHINGTON STREET/GODDARD STREET





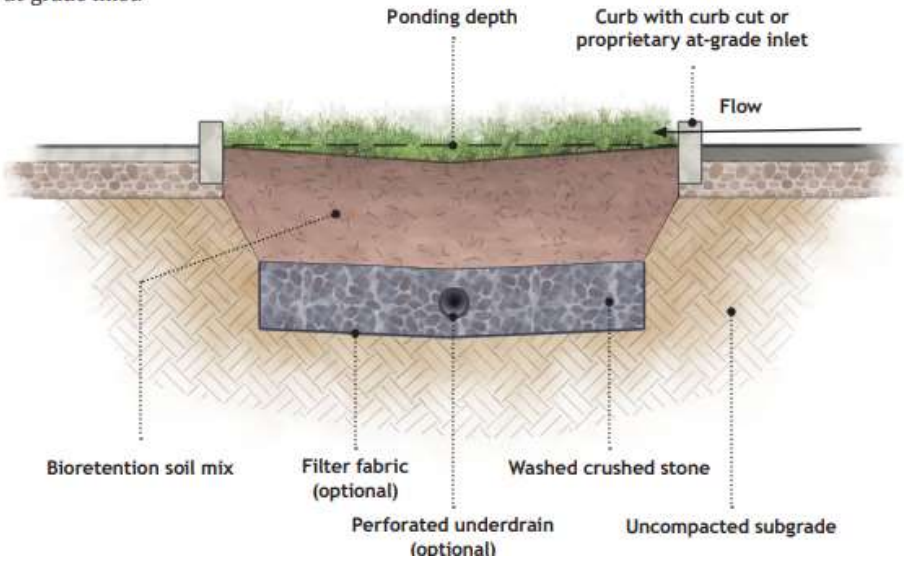
Source: Google Street View

CURB INLET BIORETENTION/ PLANTER CELLS

New England Stormwater Retrofit Manual

Bio-Filtration Curb Inlet Planter

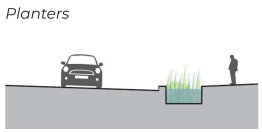
A Bio-Filtration Curb Inlet Planter is a Bio-Filtration measure located within a roadway right-of-way, immediately adjacent to the curb, containing engineered soil media and plantings. Runoff often enters the measure at the surface via a curb cut or proprietary at-grade inlet.



Source: New England Stormwater Retrofit Manual



Planters

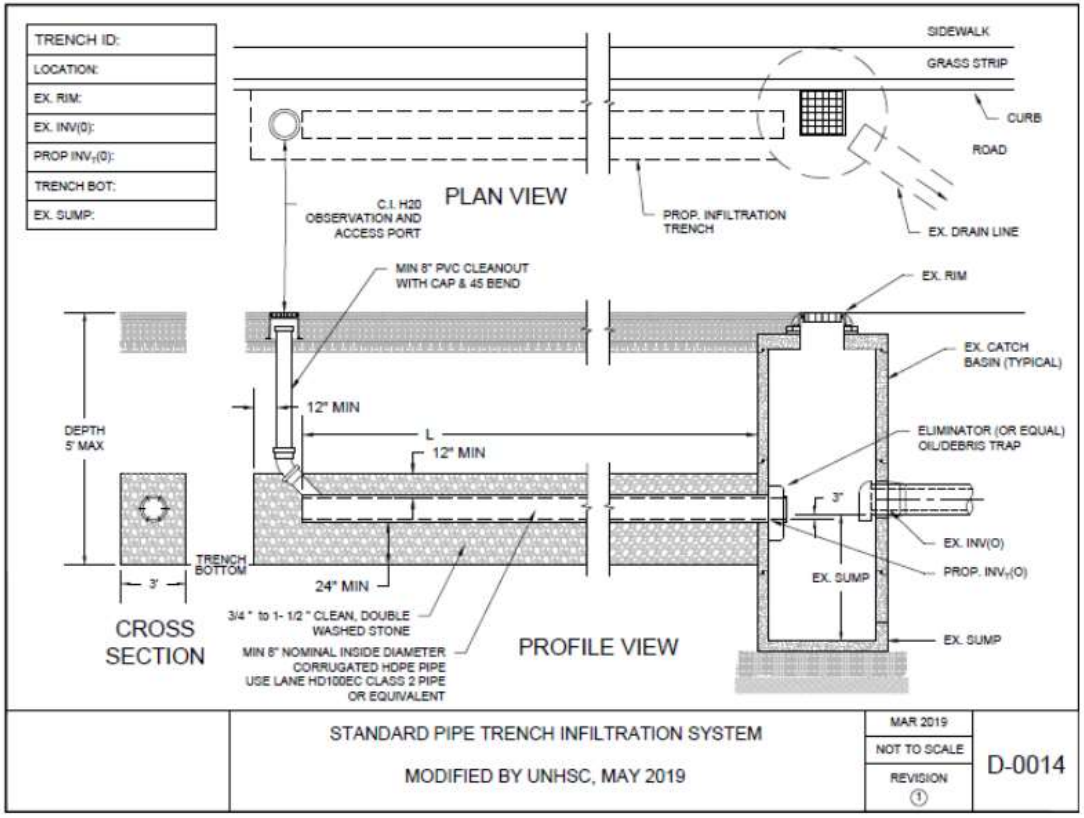


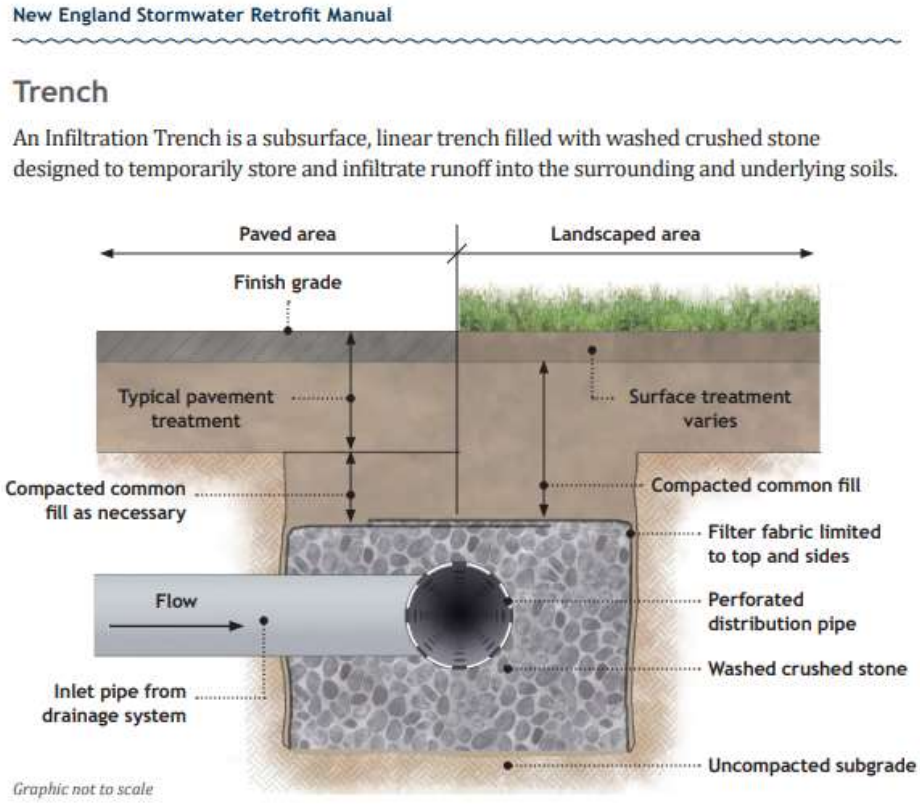






INFILTRATION TRENCH





Source: New England Stormwater Retrofit Manual

Reilly Avenue



Install infiltration trenches connecting to CBs along edge of pavement

Install small bioretention area to collect runoff from cul-de-sacs

Decrease ROW and add curb cuts to create small green streets practices or infiltration trenches between the sidewalk and curb

SITE CONDITIONS – REILLY AVENUE/ NANCY COURT



Source: Google Street View



Centennial Drive/ Crestwood Drive





Install small bioretention area to collect runoff from cul-de-sac



Install tree trenches, small green streets practices or infiltration trenches connecting to CBs along edge of pavement.



BIORETENTION AREA





Source: Google Street View

SITE CONDITIONS – CENTENNIAL DRIVE/ CRESTWOOD DRIVE