Stormwater Management Plan

Manchester-by-the-Sea, MA

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Contents

Appendices

Section 1: Overview of the Plan

The Town of Manchester-by-the-Sea is located along the Northeastern Shore of Massachusetts. The Town is roughly 30 miles from Boston in an area locally known as Cape Ann. The Town is approximately 8 square miles with about 12.8 miles of tidal shoreline. According to the 2020 United States (U.S.) Census, the Town is home to approximately 5,394 residents in 2,080 households.[1]

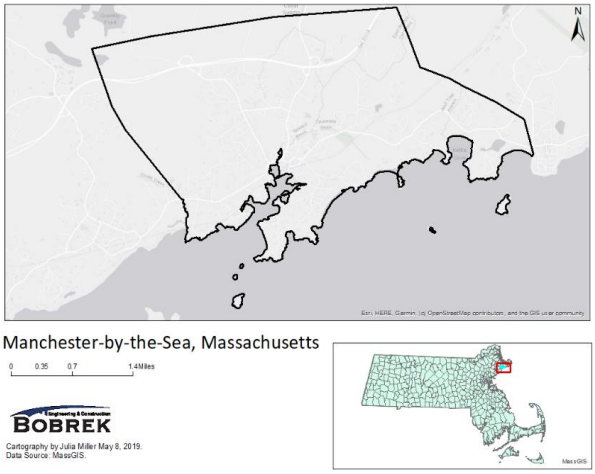

Figure 1. Map of Manchester-by-the-Sea, MA

1.1. Purpose of this Plan

According to the U.S. Environmental Protection Agency (EPA), stormwater is defined as water that is generated from rain and snowmelt events. Stormwater runoff flows over land or impervious surfaces, such as paved streets, parking lots, and building rooftops, and does not infiltrate into the ground. The concern with runoff is that it picks up pollutants like trash, chemicals, oils, and dirt/sediment. These pollutants are harmful to our rivers, streams, lakes, and coastal waters. To protect these resources, communities, construction companies, general industry, and others use stormwater controls, known as **Best Management Practices** (BMPs). These BMPs filter out pollutants and/or prevent pollution by controlling it at its source.[2]

This **Stormwater Management Plan** (SWMP) was developed to reduce the adverse impacts of stormwater within the Town. The SWMP is required by the EPA's National Pollutant Discharge Elimination System (NPDES) General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) in Massachusetts ("Small MS4 General Permit"). The SWMP defines BMPs that will be implemented by the Town to reduce stormwater pollution. The SWMP will be continuously updated during the permit term as the Town's activities are modified to meet the conditions of the permit.

1.2. Regulatory Requirements

1.2.1. Overview of EPA's NPDES MS4 Program

The EPA is authorized by the Clean Water Act and established the NDPES permit program. Through this program, the EPA regulates the stormwater that is discharged into the waters of the U.S. by means of the **Municipal Separate Storm Sewer System**, or MS4. An MS4 is defined as a conveyance or system of conveyances that is:

- Owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.,
- Designed or used to collect or convey stormwater (e.g., storm drains, pipes, ditches),
- Not a combined sewer, and
- Not part of a sewage treatment plant, or publicly owned treatment works (POTW).

The MS4 program was developed in two phases:

[1] U.S Census Bureau

[2] US EPA

1. Phase 1: Regulation was enacted in 1990 and requires medium and large cities or certain counties with populations of 100,000 or more to obtain NPDES permit coverage for their stormwater discharges.
2. Phase 2: Regulation was enacted 1999 and requires small MS4s in urbanized areas, as well as MS4s designated by the permitting authority, to obtain NPDES permit coverage for their stormwater discharges. Phase II also includes non-traditional MS4s such as public universities, departments of transportation, hospitals, and prisons.

In Massachusetts, the EPA Region 1 and the Massachusetts Department of Environmental Protection (MassDEP) jointly administer the municipal stormwater program. In 2003, the Town was authorized by EPA and MassDEP to discharge stormwater under a NPDES General Permit for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems, known as the "2003 General Permit." Under this permit, the Town has developed and implemented a Stormwater Management Program to reduce the contamination potential of stormwater runoff.

The 2003 General Permit expired in May 2008; however, it remained in effect until the 2016 General Permit. The NPDES 2016 General Permit for Stormwater Discharges from Small MS4s in Massachusetts was issued on April 4, 2016 and became effective on July 1, 2018. It substantially increases stormwater management requirements and mandates specific timelines for compliance. The new 2016 General Permit is intended to be more prescriptive than the 2003 General Permit and to build upon the regulations already in place. The EPA proposed modifications to the 2016 MS MS4 General Permit on April 23, 2020 which were finalized on December 7, 2020. These modifications include stronger standards for post-construction management and redevelopment sites.

1.3. Summary of MTBS Stormwater Management Program under the 2016 General Permit

The Town meets the EPA's regulatory threshold for Phase II of the MS4 program, and therefore is required to be managed under a NPDES permit for its stormwater discharges from the MS4 in its Urbanized Area. The Town is required by the EPA to operate and maintain its MS4 to manage stormwater runoff, as well as to protect public health and safety, preserve environmental resources, and safeguard town character.

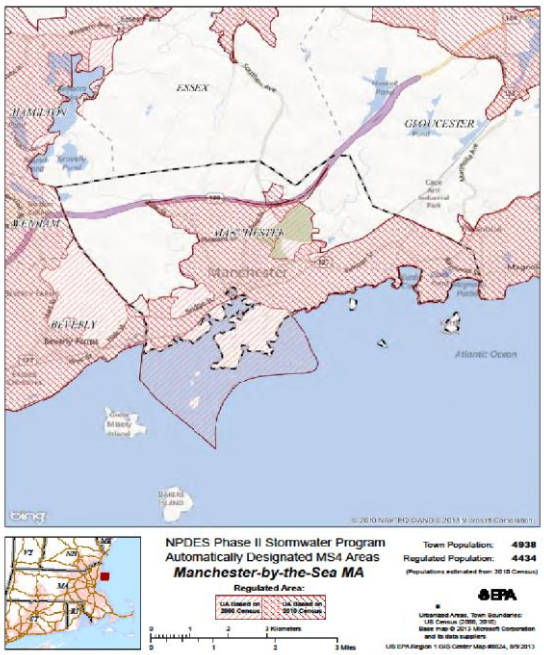

Figure 2. NPDES Phase II stormwater program automatically designated MS4 Areas within Manchester-by-the-Sea

Urbanized Areas (also known as "regulated areas") are defined by the latest U.S. decennial census. On March 26, 2012, the Census Bureau published the final listing of urbanized areas for the 2010 census. An urbanized area represents a densely settled territory that consists of core census block groups or blocks that have a population of at least 425 housing units per square mile and surrounding census blocks that have an overall density of at least 200 housing units per square mile or are included to link outlying densely settled territory with densely settled urban core.[3] According to EPA Region 1, the area covered by either the 2000 census or the 2010 census are regulated by EPA under the MS4 program. Approximately 75% of the Town is considered a regulated area, and 15%

[3] 2020 Urban Areas FAQ (census.gov)

is considered rural suburban by the EPA (see Figure 2). Please note that private stormwater from the rural suburban area most likely discharges to the Town's stormwater system and therefore is assumed to be regulated by the MS4 permit.

1.3.1. MCM 1 Public Education and Outreach

Manchester-by-the-Sea provides public education related to stormwater, water conservation and hazardous waste. The Town partners with Greenscapes North Shore Coalition (Greenscapes) to create opportunities for public education and outreach each year. Informational rack cards and stormwater brochures on topics such as stormwater management for homeowners and proper pet waste disposal are available on the Town's website as well as the Greenscapes website and social media pages. These materials are also available in-person at various locations in town such as Town Hall and the Highway Department buildings. Educational events are also regularly held by the Town and its partners to inform the public about stormwater.

The Town also keeps the public informed and educated about recycling through the Town's website and outreach events. The Health Department provides a question-and-answer webinar on hazardous waste disposal to promote and evaluate household waste recycling programs. Additionally, the Board of Health holds hazardous waste collection days annually. The residents can bring motor oil to the Highway Department for recycling with all materials collected and processed regularly by the Recycling Center. The Town participates in an All-Drug Take-Back programs sponsored nationally by the federal government and provides notice of these events locally.

The Animal Control Bylaw prohibits disposal of dog waste on beaches, sidewalks, streets, parks, in Town storm drains, and on public beaches. The Board of Health also promotes compliance with the bylaw and educates residents and visitors about impacts of dog waste as well as septic maintenance. The Town distributes a pamphlet, part of the "Scoop It!" campaign, that informs the public about the health and environmental concerns of improperly disposed animal waste. It also emphasizes the importance of keeping the storm drain system free of waste. The brochure is annually distributed with dog license confirmation letters to residents that registered their dog. The Police also enforce the bylaw by patrolling beaches, parks, recreational areas, and cemeteries. Signage on streets entering the Town alerting visitors of the animal control bylaw is maintained by the Town.

1.3.2. MCM 2 – Public Involvement and Participation

The Town continues to support stream cleaning and other cleanup projects over the permit term. The DPW supports volunteer cleanup events by removing trash and debris picked up at each event. In 2017, the town participated in COASTSWEEP, the statewide coastal cleanup sponsored by the Massachusetts Office of Coastal Zone Management (CZM). This cleanup was held at Black Cove (Stinky Beach) Beach and organized by the Brookwood School. The High School also has a volunteer organization called the Green Team who has held cleaning events on White and Black beaches. The Conservation Commission continues to meet twice a month on the second and fourth Tuesdays to discuss drainage and stormwater management issues related to the Wetlands Protection Act and related state and local laws. These meetings are open to the public. The Town also has the Manchester Coastal Stream Team, a Town Committee that meets monthly to discuss environmental issues concerning local waterways and to plan corrective measures. The group's work focuses on projects designed to maintain and improve water cleanliness and quality, and to preserve coastal habitats. All projects involve public participation and education. In 2020, Bobrek Engineering and Construction (BEC) presented the stormwater management program to the Stream Team and continues to

keep the Committee involved in the progress. BEC and the DPW also hold annually a public opportunity for comment and feedback on the Stormwater Management Plan at the Town Hall.

1.3.3. MCM 3 - Illicit Discharge Detection and Elimination (IDDE)

The Stormwater Management Special Permit (Article XXII of General Bylaws) prohibits all illicit discharges to the stormwater system on all new development and redevelopment projects. The Street and Sidewalks Bylaw regulates illegal dumping on the town streets and sidewalks, as well as public lands and coastal and inland waters. A map of storm sewer system (outfalls, catch basins, and other drainage structures) in the Urbanized Area exists in the form of a Geographic Information System (GIS) layer on the Town's Mapping website. Connectivity, where known, is included on the map. The Town has contracted Cartographic Associates, Inc. (CAI Technologies) for a mapping service, AxisGIS, which provides an online viewer for GIS public utility data, including the drainage system. Town Staff provide revisions and edits to AxisGIS throughout the year. In 2023, the Town transferred all GIS utility infrastructure data to ESRI's ArcGIS Online, a data management application for Town employees and external contractors to collect Town water, sewer, and stormwater assets on a table and see the information in real-time.

1.3.4. MCM 4 and MCM 5 - Construction Site Stormwater Runoff Control

The "Stormwater Management Special Permit" was added to the Town's Zoning Bylaw on April 4, 2007. Regulations have been adopted by the Planning Board. This bylaw requires erosion and sediment controls at construction sites that disturb one or more acres (or less than one acre if part of a common plan of development) and includes sanctions to ensure compliance and requirements for inspections. This bylaw references the Massachusetts Stormwater Management Standards and Handbook as performance standards. Planning Board continued to implement Bylaw and regulations.

The Town of Manchester-by-the-Sea, with the aid of Greenscapes North Shore Coalition, began the process of assessing and planning to implement changes to current regulations pertaining to the creation of impervious surfaces in new developments and redevelopments. The Town plans to integrate Low Impact Development (LID) and Green Infrastructure regulations to encourage stormwater BMPs and reduce the amount of impervious land cover required for streets and parking areas. These plans are detailed in Appendix L.

The Town also began prioritizing all permittee-owned parking areas for the potential for retrofit with green infrastructure. The prioritization process, retrofit plan, and permittee-owned property inventory is detailed more in Appendix M.

1.3.5. MCM 6 Pollution Prevention and Good Housekeeping in Municipal Operations

The Department of Public Works (DPW) inspects catch basins and other stormwater system components throughout Town, as needed. According to the Town, all catch basins are cleaned once a year or when they are full. The Board of Health (BOH) implements Title 5 Septic System controls where systems are inspected and failing systems are upgraded as required. The BOH continues to track the number of septic system pump outs. The DPW sweeps arterial roadways, which includes those near beaches and in the downtown areas, as needed throughout the summer season (May through September, or later, depending on weather). Training on stormwater elements is incorporated into training for the Conservation Commission,

Fire Department, and DPW. Town staff are trained on how to recognize illicit discharges during the annual IDDE staff training.

1.4. General Eligibility Determination

Section 1.2.1 of the Small MS4 General Permit authorizes the discharge of stormwater from small MS4s if the MS4 is determined to meet general eligibility criteria:

- *Small MS4 within the Commonwealth of Massachusetts*
    - The Town is located within Essex County, Massachusetts. Therefore, the Town meets the general eligibility criteria.
- *Not a large or medium MS4 as defined in 40 CFR 122.26(b)(4) or (7)*
    - The population of the Town is 5,395 according to the 2020 Census, the MS4 is not within a designated County, and the Town has not been designated by the Director as part of a large or medium MS4. Therefore, the Town meets the general eligibility criteria.
- *Located either fully or partially within an urbanized area as determined by the 2020 Census or located in a geographic area designated by EPA as requiring a permit*
    - The Town is partially within an urbanized area as determined by the 2020 Census and located in a geographic area designated by EPA as requiring a permit, see figure 2. Therefore, the Town meets the general eligibility criteria.

1.5. Special Eligibility Determinations

1.5.1. Endangered Species

Bobrek Engineering & Construction (BEC) has completed the National Endangered Species Eligibility Determination screening process in accordance with Part 1.9.1 and Appendix C of U.S. EPA's NPDES General Permits for MS4s, effective July 1, 2018, and determined that the Town meets Criterion C, where informal consultation with U.S. Fish and Wildlife Service (USFWS) resulted in a finding that the stormwater discharges and discharge related activities will have "no effect" on listed species or critical habitat. Please refer to Appendix B of the SWMP for supporting information, including the USFWS IPaC Official Species List for the project area and the Endangered Species Act Certification.

1.5.2. Historic Properties

BEC completed the National Historic Preservation Act Eligibility Determination screening process in accordance with Part 1.9.2 and Appendix D of U.S. EPA's NPDES General Permits for Stormwater Discharges from MS4s, effective July 1, 2018, and determined that the Town meets Criterion A, where the discharges do not have the potential to cause effects on historic properties. Refer to Appendix C of the SWMP for supporting information, including a list of the federal and state-listed historic areas, buildings, burial grounds, objects, and structures in downloaded from the Massachusetts Cultural Resource Information System (MACRIS).

1.5.3. Authorization for the Town to Discharge Stormwater

As required by the General Permit, a Notice of Intent (NOI) was submitted by the Town within 90 days of the effective date of the permit on September 28, 2018. A copy of the NOI is included in Appendix A. Along with documentation of the Town Authorization to Discharge by EPA. This written SWMP must be finalized within one year of the effective date of the permit.

Section 2: Watershed Resources

2.1. Watershed Inventory

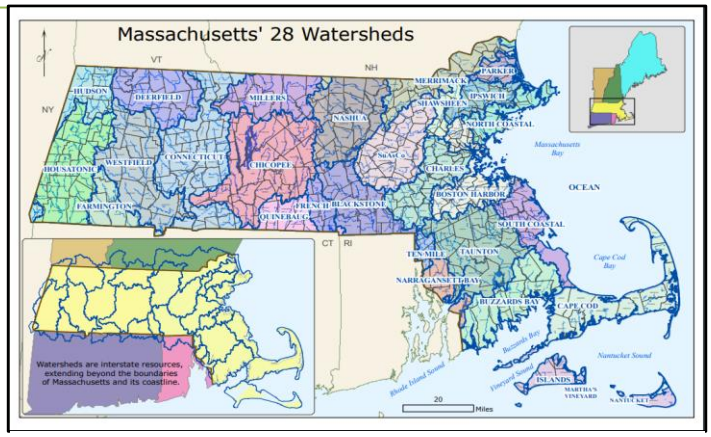

Figure 3. Watersheds in Massachusetts as defined by the Massachusetts Department of Environmental Protection.

The Town is located within the North Coastal Watershed, as defined by MassDEP. This is a watershed that drains approximately 168 square miles of the Massachusetts' North Shore. The watershed extends from Salisbury to Revere including the following communities Amesbury, Everett, Malden, Melrose, Saugus, Stoneham, Reading, Wakefield, Lynnfield, Lynn, Nahant, Swampscott, Marblehead, Salem, Peabody, Danvers, Beverly, Manchester, Wenham, Hamilton, Essex, Ipswich, Gloucester, and Rockport. The watershed area supports a population of approximately 500,000. The North Coastal watershed contains extensive areas of open space, rural towns, and highly urbanized communities. Surface waters in the watershed are commonly used for primary and secondary contact recreation (swimming and boating), viewing wildlife, habitat for aquatic life, lobster fishing, commercial shell fishing, and potable water. Offshore areas are protected against the disposal of treated or untreated sewage from vessels in this watershed. [4]

2.2. Water quality

The Clean Water Act (CWA) Section 303(d) requires Massachusetts to develop a list of impaired water bodies as well as identify surface water bodies that may not meet water quality standards after implementation of controls. These waters are prioritized for creating a Total Maximum Daily Loads (TMDLs) which includes a calculation of the maximum amount of a pollutant that can be present in a waterbody and still meet water quality standards. Massachusetts meets the CWA reporting requirements through the development of an Integrated List of Waters. The Integrated List is comprised of water bodies within the State that are categorized for attainment of designated uses. There are five categories that each waterbody can be assigned:

- Category 1: Waters that are unimpaired and not threatened for all designated uses
- Category 2: Waters that are unimpaired for some uses and not assessed for others
- Category 3: Waters with insufficient information to make assessments for any uses
- Category 4a: Waters with a completed TMDL
- Category 4c: Waters that are impaired or threatened for one or more uses, but not by a pollutant and therefore not requiring the calculation of a TMDL
- Category 5: waters that are impaired or threatened for one or more uses and requiring a TMDL

The categories that are of most concern is Categories 4a and 5. These categories do not meet CWA designated uses and stormwater pollutants of concern within these waters will need to be addressed per General Permit requirements.

[4] Final Pathogen TMDL for the North Coastal Watershed, 2016. Massachusetts Department of Environmental Protection

2.2.1. 2018/2020 Integrated List of Waters

MassDEP's Integrated List of Waters was updated from the 2016 Integrated Report to the Final 2018/2020 Integrated List of Waters (§303(d) list) which was approved by the EPA on February 2, 2022[5]. Compared to the 2016 list, the Integrated List of Waters for the combined reporting periods of 2018 and 2020 includes the following changes:

- Removed Turbidity and added Temperature as an impairment for Category 5 water Cat Brook (MA93-29)
- Adds Enterococcus as an impairment for Category 4a Manchester Harbor (MA93-19)

Table 1

Category 5 Water: waters requiring a TMDL[6]			
Indicator contributing to impairment:	Cat Brook (MA93-29)		
Temperature	X		
pH, Low	X		
Category 4a Waters TMDL is completed			
Indicator contributing to impairment:	Manchester Harbor (MA93-19)	Salem Sound (MA93-55)	Causeway Brook (MA93-47)
Fecal Coliform	X	X	X
Enterococcus	X		
Escherichia Coli			X
Category 3 Waters: No uses Assessed			
Clark Pond			
Sawmill Brook			
Millets Swamp to Sawmill Brook			
Bennetts Brook to Manchester Harbor			
Unnamed Stream to Swamps and Sawmill Brook			
Wolftrap Brook			

2.2.2. Pollutants of Concern

Based on the 2018/2020 Integrated List of Waters, the pollutants of concern for the Town's impaired waters related to stormwater include bacteria, pH level, and turbidity. More information about these pollutants and their potential sources are included in Appendix E.

2.2.3. Applicable TMDLs

Currently, only one TMDL is established for the Town. The *Final Pathogen TMDL for the North Coastal Watershed* (2012) includes the following water bodies in the Town: Manchester Harbor (MA93-19), Salem Sound (MA93-55), Causeway Brook (MA93-47), and Cat Brook (MA93-29).

[5] Massachusetts Integrated List of Waters (mass.gov)

[6] MassDEP, Bureau of Water Resources "Final Massachusetts Year 2014 Integrated List of Waters". 2015. Accessed online May 2019 at: http://www.mass.gov/eea/docs/dep/water/resources/07v5/14list2.pdf.

Section 3: Best Management Practices to Address Minimum Control Measures (MCMs)

This section includes descriptions of each BMP included in the Town's NOI, who is responsible, and the measurable goal that will be implemented to best address the MCMs in the General Permit.

3.1. MCM 1: Public Education

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 to mitigate stormwater pollution. Please refer to Appendix H for the Town's public outreach plan that complies with the public education and outreach requirements in General Permit 2.3.2

3.1.1. MCM 1 Guidelines and Resources

The following links include free or low-cost resources the Town can use to supplement the Public Education program:

- EPA Public Education https://cfpub.epa.gov/npstbx/
- EPA Stormwater Education Toolkit (SET) http://www.stormwater.ucf.edu/toolkit/
- EPA National Menu of BMPs for Stormwater https://www.epa.gov/npdes/national-menu-best-management-practices-bmpsstormwater#edu
- MassDEP Public Education: https://www.mass.gov/guides/stormwater-outreach-materials-to-help-townscomply-with-the-ms4-permit
- Developing an Effective Stormwater Education and Outreach Program for Your Community http://www.urbanwaterslearningnetwork.org/wp-content/uploads/2016/04/Manual-Stormwater-Education-and-Outreach_2014.pdf
- Greenscapes: http://greenscapes.org/services-resources/
- Salem Sound Coastwatch http://www.salemsound.org/researchResources.html
- Northern Middlesex Stormwater Collaborative http://www.nmstormwater.org/resources-stormwater-collaborative
- Urban Waters http://www.nmstormwater.org/for-municipalities
- Merrimack Valley Stormwater Collaborative http://www.merrimackvalleystormwater.org/who-we-are/public-education/

3.2. MCM 2: Public Participation

Objective: The permittee shall provide opportunities to engage the public to participate in the review and implementation of the SWMP. Refer to Appendix VII for the Town's public involvement and participation plan that complies with the public education and outreach requirements in General Permit 2.3.3.

3.2.1. MCM 2 Guidelines and Resources

The following links include free or low-cost resources the Town can use to supplement the Public Involvement program:

- EPA National Menu of BMPs for Stormwater: https://www.epa.gov/npdes/national-menu-best-management-practices-bmpsstormwater#Inv

- EPA Evaluation of the Role of Public Outreach and Stakeholder Engagement in Stormwater Funding Decisions in New England: Lessons from Communities: https://www.epa.gov/sites/production/files/2015-09/documents/eval-sw-fundingnew-england.pdf
- Salem Sound Coastwatch Volunteer Webpage: https://www.salemsound.org/volunteer.html
- Massachusetts Open Meeting Law Guide: http://www.mass.gov/ago/docs/government/oml/oml-guide.pdf

3.3. MCM 3: Illicit Discharge Detection Elimination Program

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. Therefore, the Town shall implement the following best management practices (BMPs) to prevent such discharges.

3.3.1. MCM 3 BMPS from NOI

BMP ID	BMP Category	BMP Description	Responsible Department/ Parties	Measurable Goal	Beginning Year of BMP Implementation
3A	Sanitary Sewer Overflow (SSO) Inventory	Develop SSO inventory in accordance of permit conditions	Department of Public Works	Complete within 1 year of effective date of permit	PY 1 (FY 2019)
3B	Map of Storm Sewer System	Create map and update during IDDE program completion	Department of Public Works	Update map within two (2) years of effective date of permit and complete full system map 10 years after effective date of permit	PY 1 (FY 2019)
3C	Written IDDE Program	Create written IDDE Program Plan	Department of Public Works	Complete within 1 year after effective date of permit and update as required	PY 1 (FY 2019)
3D	Implement IDDE program	Implement catchment investigations according to program and permit conditions	Department of Public Works	Complete 10 years after effective date of permit	PY 2 (2020)
3E	Employee Training	Train employees on IDDE implementation	Department of Public Works	Train annually. Track employees trained, training topic, date/time, and materials presented.	PY 1 (FY 2019)
3F-1	Assessment and priority Ranking of Outfalls & Interconnection	Outfall/Interconnection Inventory and Initial priority ranking	Department of Public Works	Complete within 1 year after effective date of permit.	PY 1 (FY 2019)
3F-2	Assessment and priority Ranking of Outfalls & Interconnection	Conduct dry weather screening & Sampling in accordance with IDDE Plan and Permit Conditions	Department of Public Works	Complete 3 years after effective date of permit. Track number of illicit discharges & volume removed. Summarize screening/ sampling results.	PY 1 (FY 2019)
3F-3	Assessment and priority Ranking of Outfalls & Interconnection	Conduct wet weather screening in accordance with outfall screening procedure	Department of Public Works	Complete 10 years after effective date of permit. Track # and percentage of MS4 catchments evaluated. Track number of illicit discharges & volume removed. Summarize screening/sampling results.	PY 2 (FY 2020)
3F-4	Assessment and priority Ranking of Outfalls & Interconnection	Conduct ongoing dry and wet weather screenings as necessary	Department of Public Works	Complete ongoing outfall screening of catchments upon completion of IDDE Program according to program and permit conditions.	PY 1 (FY 2019)

3.3.2. MCM 3 Guidelines and Resources

The following links include free or low-cost resources that the Town can use to supplement the IDDE program. The Town-specific procedures in the IDDE Plan were developed using the IDDE Guidance Manual and New England Source Tracking Protocol linked below.

- Center for Watershed Protection Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments: https://www3.epa.gov/npdes/pubs/idde_manualwithappendices.pdf
- EPA New England Bacterial Source Tracking Protocol: https://www3.epa.gov/region1/npdes/stormwater/ma/2014AppendixI.pdf
- EPA National Menu of BMPs for Stormwater: https://www.epa.gov/npdes/national-menu-best-management-practices-bmpsstormwater#ill

3.4. MCM 4: Construction Site Stormwater Runoff Control

Objective: 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. Therefore, the Town shall implement the following best management practices (BMPs) to control such discharge.

3.4.1. MCM 4 BMPS from NOI

BMP ID	BMP Category	BMP Description	Responsible Department/ Parties	Measurable Goal	Beginning Year of BMP Implementation
4A	Site Inspections and Enforcement of Sediment and Erosion Control Measures	Complete written procedures of site inspections and enforcement procedures	DPW Operations/ Building Department	Complete within 1 year of the effective date of permit	PY 1 (FY 2019)
4B	Site Plan Review Procedures	Complete written procedures of site plan review and begin implementation	DPW Operations/ Building Department	Complete within 1 year of the effective date of permit	PY 1 (FY 2019)
4C	Sediment and Erosion Control	Adoption of requirements for construction operators to implement a sediment and erosion control program	DPW Operations/ Building Department	Complete within 1 year of the effective date of permit	PY 1 (FY 2019)
4D	Waste Control	Adoption of requirements to control wastes, including but not limited to, discarded building materials, concrete truck wash out, chemicals, litter, and sanitary wastes	DPW Operations/ Building Department	Complete within 1 year of the effective date of permit	PY 1 (FY 2019)

3.4.2. MCM 4 Guidelines and Resources

The following links include free or low-cost resources the Town an use to supplement the Construction program.

- EPA Construction General Permit SWPPP template, including inspection forms: https://www.epa.gov/npdes/epas-2017-construction-general-permit-cgp-andrelated-Documents
- Massachusetts Stormwater Handbook: https://www.mass.gov/guides/massachusetts-stormwater-handbook-andstormwater-standards
- EPA National Menu of BMPs for Stormwater https://www.epa.gov/npdes/national-menu-best-management-practices-bmpsstormwater#constr
- Central Massachusetts Regional Stormwater Coalition SOP 5: Construction Site Inspection: http://www.centralmastormwater.org/Pages/crsc_toolbox/Construction%20Inspection%20SOP_FINAL.pdf
- Central Massachusetts Regional Stormwater Coalition SOP 6: Erosion and Sedimentation Control http://www.centralmastormwater.org/Pages/crsc_toolbox/Erosion%20and%20Sedimentation%20Control%20SOP_FINAL.pdf

3.5. MCM 5: Post- Construction Stormwater Management

Objective: Reduce the discharge of pollutants found in stormwater through the retention or treatment of stormwater after construction on new or redeveloped sites. Therefore, the Town shall implement the following best management practices (BMPs) to reduce such discharges.

3.5.1. MCM 5 BMPS from NOI

BMP ID	BMP Category	BMP Description	Responsible Department/ Parties	Measurable Goal	Beginning Year of BMP Implementation
5A	As-built plans for on-site stormwater control	The procedures to require submission of as-built drawings and ensure long term operation and maintenance will be a part of the SWMP	Planning Board	Require submission of as-built plans for completed projects	PY 2 (2020)
5B	Target properties to reduce impervious areas	Identify at least 5 permittee-owned properties that could be modified or retrofitted with BMPs to reduce impervious areas and update annually	Planning Board	Complete 4 years after effective date of permit and report annually on retrofitted properties	PY 2 (2020)
5C	Allow green infrastructure	Develop a report assessing existing local regulations to determine the feasibility of making green infrastructure practices allowable when appropriate site conditions exist	Planning Board	Complete 4 years after effective date of permit and implement recommendations of report	PY 2 (2020)
5D	Street design and parking lot guidelines	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.	Planning Board	Complete 4 years after effective date of permit and implement recommendations of report	PY 2 (2020)
5E	Adoption, amendment, or modification of a regulatory mechanism to meet permit requirements	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	Planning Board	Complete 2 years after effective date of permit	PY 2 (2020)

3.5.2. MCM 5 Guidelines and Resources

- Massachusetts Stormwater Handbook https://www.mass.gov/guides/massachusetts-stormwater-handbook-andstormwater-standards
- EPA National Menu of BMPs for Stormwater: https://www.epa.gov/npdes/national-menu-best-management-practices-bmpsstormwater#post
- *Managing Stormwater in Your Community: A Guide for Building an Effective Post-Construction Program:* https://www3.epa.gov/npdes/pubs/stormwaterinthecommunity.pdf
- EPA Managing Stormwater with LID Practices: Addressing Barriers to LID: https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/AddressingBarrier2LID.pdf
- Metropolitan Area Planning Council LID Toolkit: https://www.mapc.org/resource-library/low-impact-development-toolkit/
- Central Massachusetts Regional Stormwater Coalition SOP 5: Construction Site Inspection: http://www.centralmastormwater.org/Pages/crsc_toolbox/Construction%20Inspection%20SOP_FINAL.pdf
- Central Massachusetts Regional Stormwater Coalition SOP 6: Erosion and Sedimentation Control:
- http://www.centralmastormwater.org/Pages/crsc_toolbox/Erosion%20and%20Sedimentation%20Control%20SOP_FINAL.pdf

3.6. MCM 6: Good Housekeeping and Pollution Prevention

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. Therefore, the Town shall implement the following best management practices (BMPs) to prevent and reduce such discharges.

3.6.1. MCM 6 BMPS from NOI

BMP ID	BMP Category	BMP Description	Responsible Department/ Parties	Measurable Goal	Beginning Year of BMP Implementation
6A	O&M procedures	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	DPW Operations	Complete and implement 2 years after effective date of permit	PY 2 (2020)
6B	Inventory all permittee-owned parks and open spaces, buildings and facilities, and vehicles and equipment	Create Inventory	DPW Operations	Complete 2 years after effective date of permit and implement annually	PY 2 (2020)
6C	Infrastructure O&M	Establish and implement program for repair and rehabilitation of MS4 infrastructure	DPW Operations	Complete 2 years after effective date of permit	PY 1 (2019)
6D	Stormwater Pollution Prevention Plan (SWPPP)	Create SWPPPs for maintenance garages, transfer stations, and other waste-handling facilities	DPW Operations	Complete and implement 2 years after effective date of permit	PY 2 (2020)
6E	Catch basin cleaning	Establish schedule for catch basin cleaning such that each catch basin is no more than 50% full and clean catch basins on that schedule	DPW Operations	Clean annually catch basins on established schedule and report number of catch basins cleaned and volume of material removed	PY 2 (2020)
6F	Street sweeping program	Sweep all streets and permittee-owned parking lots in accordance with permit conditions	DPW Operations	weep all streets and permittee-owned parking lots once per year in the spring	PY 1 (2019)
6G	Road salt use optimization program	Establish and implement a program to minimize the use of road salt	DPW Operations	Implement salt use optimization during deicing season	PY 1 (2019)
6H	Inspections and maintenance of stormwater treatment structures	Establish and implement inspection and maintenance procedures and frequencies	DPW Operations	Inspect and maintain treatment structures at least annually	PY 1 (2019)

3.6.2. MCM 6 Guidelines and Resources

The following links include free or low-cost resources the Town can use to supplement the Good Housekeeping and Pollution Prevention program. The Town should also refer to the Oil SPCC Plan and Town-Wide Operations and Maintenance Program (O&M) plan, located in the Engineering Department.

- EPA National Menu of BMPs for Stormwater: https://www.epa.gov/npdes/national-menu-best-management-practices-bmpsstormwater#poll
- Center for Watershed Protection Municipal Pollution Prevention/Good Housekeeping Practices: http://cdrpc.org/wpcontent/uploads/2015/05/CWP_Municipal_Pollution_Prevention.pdf
- MassDEP Management of Catch Basin Cleanings: https://www.mass.gov/files/documents/2018/03/09/catch-basins.pdf
- MassDEP Reuse & Disposal of Street Sweepings: https://www.mass.gov/files/documents/2018/05/14/street-sweepings.pdf
- MassDEP Snow Disposal Guidance: https://www.mass.gov/guides/snow-disposal-guidancE
- Central Massachusetts Regional Stormwater Coalition SOP: Inspecting Constructed BMPs: http://centralmastormwater.org/Pages/crsc_toolbox/Constructed%20BMP%20Inspection%20SOP_FINAL.pdf

Section 4: BMPS to Address Specific Waterbody Requirements

4.1. Impaired Waterbodies

As described in Section 2 of the SWMP, several surface waterbodies within the Town were identified in the 2018/2020 Integrated List of Waters as Category 5 waters requiring a TMDL.

4.2. North Coastal Watershed Pathogen TMDL

As described in Section 2.2.3 of the SWMP, a final TMDL for pathogens has been developed for the North Coastal Watershed. This TMDL requires that Towns discharging to the impaired waterways within the North Coastal Watershed comply with requirements in Appendix F of the 2016 General Permit.

4.3. Additional Requirements for Discharges to Surface Drinking Water Supplies and Their Tributaries

According to Section 3.0 of the 2016 Small MS4 General Permit, MS4s that discharge to public surface drinking water supply sources, or their tributaries should consider these waters a priority in the implementation of the SWMP. The Town's drinking water is supplied by two sources. The first source, Gravelly Pond (MassDEP Source ID# 3166000– 01S), is a surface water reservoir, which is located off Chebacco Road in Hamilton, MA. The second source is the Lincoln Street Well (MassDEP Source ID# 3166000-01G) located next to the Manchester/Essex Regional Junior/ Senior High School on Lincoln Street in the Town. Therefore, there are no surface drinking water supplies within the Town.

Section 5: Program Evaluation, Record Keeping, and Reporting

5.1. Program Evaluation

The Town will annually self-evaluate its compliance with the terms and conditions of the 2016 General Permit, including the appropriateness of selected BMPs and progress toward defined measurable goals. The self-evaluation will be submitted as part of the Annual Report and maintained as part of the SWMP.

5.2. Record Keeping

The Town will keep all records required by the 2016 General Permit for **at least five years**, including, but not limited to the following key information:

- Monitoring results;
- Copies of reports;
- Records of outfall/interconnection screening;
- Follow-up and elimination of illicit discharges;
- Maintenance records; and
- Inspection records.

Checklists of record keeping items that the Town should maintain are also included under each BMP in Section 3 of the SWMP. Records relating to the 2016 General Permit, including the SWMP, will be made available to the public, as required by Section 4.2.c of the Permit.

5.3. Annual Reports

The Town will submit annual reports each year of the Small MS4 permit term, 90 days from the close of the reporting period, to the EPA. The reporting period will be a one-year period commencing on the permit effective date, and subsequent anniversaries thereof. As required by the 2016 General Permit, annual

reports will consist of a simple update provided to EPA. Secondly, a more robust documentation included in Appendix F of this SWMP should be completed which will continuously update this SWMP.

Per Section 4.4.b of the 2016 General Permit, the EPA's annual reports shall contain the following information:

i. *A self-assessment review of compliance with the permit terms and conditions.*
ii. *An assessment of the appropriateness of the selected BMPs.*
iii. *The status of any plans or activities required by part 2.1 and/ or part 2.2, including:*
    - *Identification of all discharges determined to be causing or contributing to an exceedance of water quality standards and description of response including all items required by part 2.1.1;*
    - *For discharges subject to TMDL related requirements, identification of specific BMPs used to address the pollutant identified as the cause of impairment and assessment of the BMPs effectiveness at controlling the pollutant (part 2.2.1. and Appendix F) and any deliverables required by Appendix F;*
    - *For discharges to water quality limited waters a description of each BMP required by Appendix H and any deliverables required by Appendix H.*
iv. *An assessment of the progress towards achieving the measurable goals and objectives of each control measure in part 2.3 including:*
    - *Evaluation of the public education program including a description of the targeted messages for each audience; method of distribution and dates of distribution; methods used to evaluate the program; and any changes to the program.*
    - *Description of the activities used to promote public participation including documentation of compliance with state public notice regulations.*
    - *Description of the activities related to implementation of the IDDE program including: status of the map; status and results of the illicit discharge potential ranking and assessment; identification of problem catchments; status of all protocols described in part 2.3.4.(program responsibilities and systematic procedure); number and identifier of catchments evaluated; number and identifier of outfalls screened; number of illicit discharges located; number of illicit discharges removed; gallons of flow removed; identification of tracking indicators and measures of progress based on those indicators; and employee training.*
    - *Evaluation of the construction runoff management including number of project plans reviewed; number of inspections; and number of enforcement actions.*
    - *Evaluation of stormwater management for new development and redevelopment including status of ordinance development (2.3.6.a.ii.), review and status of the street design assessment (2.3.6.b.), assessments to barriers to green infrastructure (2.3.6.c), and retrofit inventory status (2.3.6.d.)*
    - *Status of the O&M Programs required by part 2.3.7.a.*
    - *Status of SWPPP required by part 2.3.7.b. including inspection results.*
    - *Any additional reporting requirements in part 3.0.*
v. *All outfall screening and monitoring data collected by or on behalf of the permittee during the reporting period and cumulative for the permit term, including but not limited to all data collected pursuant to part 2.3.4. The permittee shall also provide a description of any additional monitoring data received by the permittee during the reporting period.*
vi. *Description of activities for the next reporting cycle.*
vii. *Description of any changes in identified BMPs or measurable goals.*

viii. Description of activities undertaken by any entity contracted for achieving any measurable goal or implementing any control measure.

5.4. SWMP Modifications

Per Section 4.1 of the 2016 General Permit, the Town shall complete the following tasks:

a. conditions of this permit and submit each self-evaluation in the Annual Report. The permittee shall also maintain the annual evaluation documentation as part of the SWMP.

b. The permittee shall evaluate the appropriateness of the selected BMPs in achieving the objectives of each control measure and the defined measurable goals. Where a BMP is found to be ineffective the permittee shall change BMPs in accordance with the provisions below. In addition, permittees may augment or change BMPs at any time following the provisions below:

- *Changes adding (but not subtracting or replacing) components or controls may be made at any time.*
- *Changes replacing an ineffective or infeasible BMP specifically identified in the SWMP with an alternative BMP may be made as long as the basis for the changes is documented in the SWMP by, at a minimum:*
  - *An analysis of why the BMP is ineffective or infeasible;*
  - *Expectations on the effectiveness of the replacement BMP; and*
  - *An analysis of why the replacement BMP is expected to achieve the defined goals of the BMP to be replaced.*

The permittee shall indicate BMP modifications along with a brief explanation of the modification in each Annual Report.

c. EPA or MassDEP may require the permittee to add, modify, repair, replace or change BMPs or other measures described in the annual reports as needed:

- *To address impacts to receiving water quality caused or contributed to by discharges from the MS4; or*
- *To satisfy conditions of this permit*

Any changes requested by EPA or MassDEP will be in writing and will set forth the schedule for the permittee to develop the changes and will offer the permittee the opportunity to propose alternative program changes to meet the objective of the requested modification.

The Town may update or revise the SWMP as needed as the Town's activities are modified, changed, or updated to meet permit conditions during the permit term. If it is necessary to modify or update the SWMP, the Town should follow this procedure to formalize the changes:

- Keep a log with a description of the modification, the date, and the name and signature of the person making it; and
- Re-sign and date the certification statement in Section 6 of this SWMP.

A SWMP amendment log and additional certification statements are in Appendix F.

Section 6: SWMP 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.

Name:_____ Title:_____

Signature:_____ Date:_____

Appendix A - Notice of Intent and Authorization to Discharge Letter

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part I: General Conditions

General Information

Name of Municipality or Organization: Manchester by-the Sea | State: MA

EPA NPDES Permit Number (if applicable): MAR041207

Primary MS4 Program Manager Contact Information

Name: Mr. Charles Dam, P.E. | Title: DPW Director

Street Address Line 1: 10 Central Street

Street Address Line 2:

City: Manchester | State: MA | Zip Code: 01944

Email: damc@manchester.ma.us | Phone Number: (978) 526-1242

Fax Number:

Other Information

Stormwater Management Program (SWMP) Location (web address or physical location, if already completed): In progress, draft expected early 2019

Eligibility Determination

Endangered Species Act (ESA) Determination Complete? Yes

Eligibility Criteria (check all that apply): ☐ A ☐ B ☒ C

National Historic Preservation Act (NHPA) Determination Complete? Yes

Eligibility Criteria (check all that apply): ☒ A ☐ B ☐ C

☑ Check the box if your municipality or organization was covered under the 2003 MS4 General Permit

MS4 Infrastructure (if covered under the 2003 permit)

Estimated Percent of Outfall Map Complete? *(Part II, III, IV or V, Subpart B.3.(a.) of 2003 permit)*: 20%

If 100% of 2003 requirements not met, enter an estimated date of completion (MM/DD/YY): 12/31/19

Web address where MS4 map is published: https://manchesterma.mapgeo.io/

If outfall map is unavailable on the internet an electronic or paper copy of the outfall map must be included with NOI submission (see section V for submission options)

Regulatory Authorities (if covered under the 2003 permit)

Illicit Discharge Detection and Elimination (IDDE) Authority Adopted? *(Part II, III, IV or V, Subpart B.3.(b.) of 2003 permit)*: No

Effective Date or Estimated Date of Adoption (MM/DD/YY): 09/11/18

Construction/Erosion and Sediment Control (ESC) Authority Adopted? *(Part II,III,IV or V, Subpart B.4.(a.) of 2003 permit)*: Yes

Effective Date or Estimated Date of Adoption (MM/DD/YY): 06/30/07

Post- Construction Stormwater Management Adopted? *(Part II, III, IV or V, Subpart B.5.(a.) of 2003 permit)*: Yes

Effective Date or Estimated Date of Adoption (MM/DD/YY): 06/30/07

Part V: Certification

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

Name: Chuck Dam, P.E.

Title: Director of Public Works

Signature:

Date: 09/28/18

[To be signed according to Appendix B, Subparagraph B.11, Standard Conditions]

Note: When prompted during signing, save the document under a new file name

NOI Submission

Please submit the form electronically via email using the "Submit by Email" button below or send in a CD with your completed NOI. You may also print and submit via mail using the address below if you choose not to submit electronically. The outfall map required in Part I of the NOI (if applicable) can be submitted electronically as an email attachment OR as a paper copy.
Permittees that choose to submit their NOI electronically by email or by mailing a CD with the completed NOI form to EPA, will be able to download a partially filled Year 1 Annual Report at a later date from EPA. (40 CFR 122.22)

Submit by Email — Submit by email using this button. Or, send an email with attachments to: stormwater.reports@epa.gov

Save — Save NOI for your records

EPA Submittal Address:

United States Environmental Protection Agency
5 Post Office Square - Suite 100
Mail Code - OEP06-1
Boston, Massachusetts 02109-3912
ATTN: Newton Tedder

State Submittal Address:

Massachusetts Department of Environmental Protection
One Winter Street - 5th Floor
Boston, MA 02108
ATTN: Fred Civian

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part II: Summary of Receiving Waters

Please list the waterbodies to which your MS4 discharges. For each waterbody, please report the number of outfalls discharging into it and, if applicable, the segment ID and any impairments.

Massachusetts list of impaired waters: Massachusetts 2014 List of Impaired Waters- http://www.mass.gov/eea/docs/dep/water/resources/07v5/14list2.pdf

Waterbody that receives flow from the MS4 and segment ID if applicable	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
Manchester Harbor (MA93-19)		☐	☐	☐	☐	☐	☐	☐	☐	☐	Fecal Coliform
Salem Sound (MA93-55)		☐	☐	☐	☐	☐	☐	☐	☐	☐	Fecal Coliform
Cat Brook (MA93-29)		☐	☐	☐	☐	☐	☐	☐	☐	☐	Fecal Coliform, Low pH, Turbidity
Causeway Brook (MA93-47)		☐	☐	☐	☐	☐	☐	☐	☐	☐	
Wolftrap Brook		☐	☐	☐	☐	☐	☐	☐	☐	☐	
Clark Pond		☐	☐	☐	☐	☐	☐	☐	☐	☐	
Sawmill Brook		☐	☐	☐	☐	☐	☐	☐	☐	☐	
Millets Swamp to Sawmill Brook		☐	☐	☐	☐	☐	☐	☐	☐	☐	
Bennetts Brook to Manchester Harbor		☐	☐	☐	☐	☐	☐	☐	☐	☐	
Unnamed Stream to Swamps and Sawmill Brook		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
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Click to lengthen table

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part III: Stormwater Management Program Summary

Identify the Best Management Practices (BMPs) that will be employed to address each of the six Minimum Control Measures (MCMs). For municipalities/organizations whose MS4 discharges into a receiving water with an approved Total Maximum Daily Load (TMDL) and an applicable waste load allocation (WLA), identify any additional BMPs employed to specifically support the achievement of the WLA in the TMDL section at the end of part III.

For each MCM, list each existing or proposed BMP by category and provide a brief description, responsible parties/departments, measurable goals, and the year the BMP will be employed (public education and outreach BMPs also requires a target audience). **Use the drop-down menus in each table or enter your own text to override the drop down menu.**

MCM 1: Public Education and Outreach

BMP Media/Category (enter your own text to override the drop down menu)	**BMP Description**	**Targeted Audience**	**Responsible Department/Parties** (enter your own text to override the drop down menu)	**Measurable Goal**	**Beginning Year of BMP Implementation**
SEE ATTACHED GREENSCAPES		Residents			
		Businesses, Institutions and Commercial Facilities			
		Developers (construction)			
		Industrial Facilities			
		Residents			
		Businesses, Institutions and Commercial Facilities			
		Developers (construction)			
		Industrial Facilities			

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part III: Stormwater Management Program Summary (continued)

MCM 2: Public Involvement and Participation

BMP Categorization	Brief BMP Description (enter your own text to override the drop down menu)	Responsible Department/Parties (enter your own text to override the drop down menu)	Additional Description/ Measurable Goal	Beginning Year of BMP Imple-mentation
Public Review	SWMP Review	DPW Operations	Allow annual review of stormwater management plan and posting of stormwater management plan on website	2018
Public Participation	Partnership - Advocacy Groups	External Contractor	Allow public to comment on stormwater management plan annually	2019

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part III: Stormwater Management Program Summary (continued)

MCM 3: Illicit Discharge Detection and Elimination (IDDE)

BMP Categorization (enter your own text to override the drop down menu)	**BMP Description**	**Responsible Department/Parties** (enter your own text to override the drop down menu)	**Measurable Goal** (all text can be overwritten)	**Beginning Year of BMP Imple-mentation**
SSO inventory	Develop SSO inventory in accordance of permit conditions	DPW Operations	Complete within 1 year of effective date of permit	2019
Storm sewer system map	Create map and update during IDDE program completion	DPW Operations	Update map within 2 years of effective date of permit and complete full system map 10 years after effective date of permit	2019
Written IDDE program	Create written IDDE program	DPW Operations	Complete within 1 year of the effective date of permit and update as required	2019
Implement IDDE program	Implement catchment investigations according to program and permit conditions	DPW Operations	Complete 10 years after effective date of permit	2020
Employee training	Train employees on IDDE implementation	DPW Operations	Train annually	2019
Conduct dry weather screening	Conduct in accordance with outfall screening procedure and permit conditions	DPW Operations	Complete 3 years after effective date of permit	2019
Conduct wet weather screening	Conduct in accordance with outfall screening procedure	DPW Operations	Complete 10 years after effective date of permit	2019
Ongoing screening	Conduct dry weather and wet weather screening (as necessary)	DPW Operations	Complete ongoing outfall screening upon completion of IDDE program	2019

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part III: Stormwater Management Program Summary (continued)

MCM 4: Construction Site Stormwater Runoff Control

BMP Categorization (enter your own text to override the drop down menu or entered text)	**BMP Description**	**Responsible Department/Parties** (enter your own text to override the drop down menu)	**Measurable Goal** (all text can be overwritten)	**Beginning Year of BMP Implementation**
Site inspection and enforcement of Erosion and Sediment Control (ESC) measures	Complete written procedures of site inspections and enforcement procedures	DPW Operations/Assesor	Complete within 1 year of the effective date of permit	2019
Site plan review	Complete written procedures of site plan review and begin implementation	DPW Operations/Assesor	Complete within 1 year of the effective date of permit	2019
Erosion and Sediment Control	Adoption of requirements for construction operators to implement a sediment and erosion control program	DPW Operations/Assesor	Complete within 1 year of the effective date of permit	2019
Waste Control	Adoption of requirements to control wastes, including but not limited to, discarded building materials, concrete truck wash out, chemicals, litter, and sanitary wastes	DPW Operations/Assesor	Complete within 1 year of the effective date of permit	2019

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part III: Stormwater Management Program Summary (continued)

MCM 5: Post-Construction Stormwater Management in New Development and Redevelopment

BMP Categorization (enter your own text to override the drop down menu or entered text)	**BMP Description**	**Responsible Department/Parties** (enter your own text to override the drop down menu)	**Measurable Goal** (all text can be overwritten)	**Beginning Year of BMP Imple-mentation**
As-built plans for on-site stormwater control	The procedures to require submission of as-built drawings and ensure long term operation and maintenance will be a part of the SWMP	DPW Operations	Require submission of as-built plans for completed projects	2020
Target properties to reduce impervious areas	Identify at least 5 permittee-owned properties that could be modified or retrofitted with BMPs to reduce impervious areas and update annually	DPW Operations	Complete 4 years after effective date of permit and report annually on retrofitted properties	2020
Allow green infrastructure	Develop a report assessing existing local regulations to determine the feasibility of making green infrastructure practices allowable when appropriate site conditions exist	DPW Operations	Complete 4 years after effective date of permit and implement recommendations of report	2020
Street design and parking lot guidelines	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.	DPW Operations	Complete 4 years after effective date of permit and implement recommendations of report	2020

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	Adoption, amendment, or modification of a regulatory mechanism to meet permit requirements	DPW Operations	Complete 2 years after effective date of permit	2020

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part III: Stormwater Management Program Summary (continued)

MCM 6: Municipal Good Housekeeping and Pollution Prevention

BMP Categorization (enter your own text to override the drop down menu or entered text)	**BMP Description**	**Responsible Department/Parties** (enter your own text to override the drop down menu)	**Measurable Goal** (all text can be overwritten)	**Beginning Year of BMP Imple-mentation**
O&M procedures	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	DPW Operations	Complete and implement 2 years after effective date of permit	2020
Inventory all permittee-owned parks and open spaces, buildings and facilities, and vehicles and equipment	Create inventory	DPW Operations	Complete 2 years after effective date of permit and implement annually	2019
Infrastructure O&M	Establish and implement program for repair and rehabilitation of MS4 infrastructure	DPW Operations	Complete 2 years after effective date of permit	2019
Stormwater Pollution Prevention Plan (SWPPP)	Create SWPPPs for maintenance garages, transfer stations, and other waste-handling facilities	DPW Operations	Complete and implement 2 years after effective date of permit	2020
Catch basin cleaning	Establish schedule for catch basin cleaning such that each catch basin is no more than 50% full and clean catch basins on that schedule	DPW Operations	Clean catch basins on established schedule and report number of catch basins cleaned and volume of material moved annually	2019
Street sweeping program	Sweep all streets and permitee-owned parking lots in accordance with permit conditions	DPW Operations	Sweep all streets and permitee-owned parking lots once per year in the spring	2019
Road salt use optimization program	Establish and implement a program to minimize the use of road salt	DPW Operations	Implement salt use optimization during deicing season	2019

Inspections and maitenance of stormwater treatment structures	Establish and implement inspection and maitenance procedures and frequencies	DPW Operations	Inspect and maintain treatment structures at least annually	2019

Appendix B - Endangered Species Act Eligibility Criteria Documents

MEMORANDUM

Endangered Species Act Eligibility Certification

TO:	Town of Manchester-by-the-Sea Stormwater Management Program Files
FROM:	Bobrek Engineering & Construction
COPY:	Charles Dam, P.E., Department of Public Works Director
DATE:	May 15, 2019

Bobrek Engineering & Construction has completed the National Endangered Species Eligibility Determination screening process in accordance with Part 1.9.1 and Appendix C of U.S. EPA's National Pollutant Discharge Elimination System (NPDES) General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) in Massachusetts (see Attachment A of this memorandum), effective July 1, 2018, and determined that the **Town of Manchester-by-the-Sea** meets **Criterion C**, where informal consultation with U.S. Fish and Wildlife Service (USFWS) resulted in a finding that the stormwater discharges and discharge related activities will have "no affect" on listed species or critical habitat.

Bobrek Engineering & Construction followed EPA's screening process required by the 2016 Small MS4 General Permit as follows:

Bobrek Engineering & Construction went to the USFWS Information for Planning and Consultation (IPaC) website [1] and created an IPaC Trust Resources Report, included in Attachment B to this memorandum. This Report lists the following species that may occur or could potentially be affected by activities in the Town:

- Northern Long-eared Bat.

This report documents that there are **no critical habitats in Manchester-by-the-Sea.**

Bobrek Engineering & Construction then utilized the USFWS New England Field Office website for Endangered Species Reviews/Consultations[2] and selected the Massachusetts state list to review which Towns have federally-listed species. A copy of the list of Federally Listed Endangered and Threatened Species in Massachusetts is included in Attachment C to this memorandum. Based on review of this list, the Northern Long-eared Bat is listed statewide.

Bobrek Engineering & Construction then reviewed Step 1 Part B of the USFWS endangered species consultation and visited the Massachusetts Natural Heritage and Endangered Species Program (NHESP) species information and conservation website about the Northern Long-eared Bat[5]. The NHESP website included a map showing the known locations of the Northern Long-eared Bat within Massachusetts. Attachment D includes a map showing there are no roost trees or hibernating locations within Manchester-by-the-Sea for the Northern Long-Eared Bat. Based on the results of the NHESP website review, Bobrek Engineering & Construction determined there is no potential habitat for any USFWS listed endangered species within the action area and therefore no further coordination is required with the USFWS.

[1] http://ecos.fws.gov/ipac/
[2] https://www.fws.gov/newengland/EndangeredSpec-Consultation_Project_Review.htm

Attachment E provides the results of Bobrek Engineering & Construction's informal consultation on behalf of the Town of Manchester-by-the-Sea with USFWS "no species present" letter that states "no species are known to occur in the project area".

Step 1 – Determine if you can meet USFWS Criterion A

"USFWS Criterion A: You can certify eligibility, according to USFWS Criterion A, for coverage by this permit if, upon completing the Information, Planning, and Conservation (IPaC) online system process, you printed and saved the preliminary determination which indicated that federally listed species or designated critical habitats are not present in the action area. See Attachment 1 to Appendix C for instructions on how to use IPaC."

No, the Town of Manchester-by-the-Sea's IPaC action area contains the Northern Long-eared Bat.

Step 2 – Determine if You Can Meet Eligibility USFWS Criteria B

"USFWS Criterion B: You can certify eligibility according to USFWS Criteria B for coverage by this permit if you answer "Yes" to **all** of the following questions:

Does your action area contain one or more of the following species: Sandplain gerardia, Small whorled Pogonia, American burying beetle, Dwarf wedgemussel, Northeastern bulrush, Piping Plover, Northern Red-bellied cooter, Bog Turtle, Roseate Tern, Puritan tiger beetle, and Northeastern beach tiger beetle?"

No, the Town of Manchester-by-the-Sea's action area does not contain any of the above species.

Step 3 – Determine if You Can Meet Eligibility USFWS Criteria C

"You can certify eligibility according to USFWS Criterion C for coverage by this permit if you answer "Yes" to both of the following questions:

1) Does your action area contain one or more of the following species: Northern Long-eared Bat, Sandplain gerardia, Small whorled Pogonia and/or American burying beetle and does not contain any following species: Dwarf wedgemussel, Northeastern bulrush, Piping Plover, Northern Red-bellied cooter, Bog Turtle, Roseate Tern, Puritan tiger beetle, and Northeastern beach tiger beetle?

   Yes, the Town of Manchester-by-the-Sea's action area contains the Northern Long-eared Bat, but none of the other subsequent species.

2) Did the assessment of your discharge and discharge related activities indicate that there would be "no affect" on listed species or critical habitat and EOA provided concurrence with your determination?

   Yes, Bobrek Engineering & Construction performed an informal consultation with USFWS and determined that the Town's discharges and discharge related activities will have "no affect" on listed species or critical habitat (see discussion above).

3) Do you agree that if, during the course of the permit term, you plan to install a structural BMP not identified in the NOI that you will conduct an endangered species screening for the proposed site and contact the USFWS if you determine that the new activity "may affect" or is "not likely to adversely affect" listed species or critical habitat under the jurisdiction of the USFWS."

Yes, during the course of the permit term the Town of Manchester-by-the-Sea agrees to conduct an endangered species screening for the proposed site and contact USFWS if they plan to install a structural BMP not identified in the NOI.

Bobrek Engineering & Construction's review of all five questions under Step 3 resulted in "Yes" and thereby we determined the Town of Danvers's action area meets the endangered species' eligibility requirements included in Criterion C.

If you have any questions or would like to discuss further, please do not hesitate to call us at 978-406-9619.

Sincerely,

Bobrek Engineering & Construction, LLC

John Bobrek, P.E.
President

Enclosures: Attachment A: Appendix C of U.S. EPA's National Pollutant Discharge Elimination System (NPDES) General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) in Massachusetts

Attachment B: Manchester-by-the-Sea IPaC Report

Attachment C: Federally Listed Endangered and Threatened Species in Massachusetts

Attachment D: Northern Long-eared Bat Location Map

Attachment E: U.S. Fish and Wildlife Review Letter

ATTACHMENT A: Appendix C Of U.S. EPA's National Pollutant Discharge Elimination System (NPDES) General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) in Massachusetts

APPENDIX C
ENDANGERED SPECIES GUIDANCE

A. Background

In order to meet its obligations under the Clean Water Act and the Endangered Species Act (ESA), and to promote the goals of those Acts, the Environmental Protection Agency (EPA) is seeking to ensure the activities regulated by this general permit do not adversely affect endangered and threatened species or critical habitat. Applicants applying for permit coverage must assess the impacts of their stormwater discharges and discharge-related activities on federally listed endangered and threatened species ("listed species") and designated critical habitat ("critical habitat") to ensure that those goals are met. Prior to obtaining general permit coverage, applicants must meet the ESA eligibility provisions of this permit by following the steps in this Appendix[1].

Applicants also have an independent ESA obligation to ensure that their activities do not result in any prohibited "take" of listed species[12]. The term "Take" is used in the ESA to include harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. "Harm" is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering. "Harass" is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Many of the measures required in this general permit and in these instructions to protect species may also assist in ensuring that the applicant's activities do not result in a prohibited take of species in violation of section 9 of the ESA. If the applicant has plans or activities in an area where endangered and threatened species are located, they may wish to ensure that they are protected from potential take liability under ESA section 9 by obtaining an ESA section 10 permit or by requesting formal consultation under ESA section 7. Applicants that are unsure whether to pursue a section 10 permit or a section 7 consultation for takings protection should confer with the appropriate United States Fish and Wildlife Service (USFWS) office or the National Marine Fisheries Service (NMFS), (jointly the Services).

Currently, there are 20 species of concern for applicants applying for permit coverage, namely the Dwarf wedgemussel *(Alasmidonta heterodon)*, Northeastern bulrush (*Scirpus ancistrochaetus*), Sandplain gerardia *(Agalinis acuta)*, Piping Plover (*Charadrius melodus*), Roseate Tern (*Sterna dougallii*), Northern Red-bellied cooter (*Pseudemys rubriventis),* Bog Turtle (*Glyptemys muhlenbergii*), Small whorled Pogonia (*Isotria medeoloides*), Puritan tiger beetle (*Cicindela puritana*), American burying beetle (*Nicrophorus americanus*), Northeastern beach tiger beetle (*Cicindela dorsalis*), Northern Long-eared Bat *(Myotis septentriolis)*Atlantic Sturgeon *(Acipenser oxyrinchus*), Shortnose Sturgeon *(Acipenser brevirostrum)*, North Atlantic Right Whale (*Eubalaena glacialis*) Humpback Whale *(Megaptera novaengliae)*, Fin Whale (*Balaenoptera physalus),* Kemp's Ridley Sea Turtle *(Lepidochelys kempii)*, Loggerhead Sea Turtle *(Caretta caretta),* Leatherback Sea Turtle *(Dermochelys coriacea),* and the Green Turtle *(Chelonia*

[1] EPA strongly encourages applicants to begin this process at the earliest possible stage to ensure the notification requirements for general permit coverage are complete upon Notice of Intent (NOI) submission.

[2] Section 9 of the ESA prohibits any person from "taking" a listed species (e.g. harassing or harming it) unless: (1) the taking is authorized through an "incidental take statement" as part of completion of formal consultation according to ESA section 7; (2) where an incidental take permit is obtained under ESA section 10 (which requires the development of a habitat conversion plan; or (3) where otherwise authorized or exempted under the ESA. This prohibition applies to all entities including private individuals, businesses, and governments.

mydas). The Atlantic Sturgeon, Shortnose Sturgeon, North Atlantic Right Whale, Humpback Whale, Fin Whale, Loggerhead Sea Turtle, Kemp's Ridley Sea Turtle, Leatherback Sea Turtle and Green Turtle are listed under the jurisdiction of NMFS. The Dwarf wedgemussel, Northeastern bulrush, Sandplain gerardia, Piping Plover, Northern Red-bellied cooter, Bog Turtle, Small whorled Pogonia, Roseate Tern, Puritan tiger beetle, Northeastern beach tiger beetle, Northern Long-eared Bat and American burying beetle are listed under the jurisdiction of the U.S. Fish and Wildlife Service.

Any applicant seeking coverage under this general permit, must consult with the Services where appropriate. When listed species are present, permit coverage is only available if EPA determines, or the applicant determines and EPA concurs, that the discharge or discharge related activities will have "no affect" on the listed species or critical habitat, or the applicant or EPA determines that the discharge or discharge related activities are "not likely to adversely affect" listed species or critical habitat and formal or informal consultation with the Services has been concluded and results in written concurrence by the Services that the discharge is "not likely to adversely affect" an endangered or threatened species or critical habitat.

EPA may designate the applicants as non-Federal representatives for the general permit for the purpose of carrying out formal or informal consultation with the Services (See 50 CFR §402.08 and §402.13). By terms of this permit, EPA has automatically designated operators as non-Federal representatives for the purpose of conducting formal or informal consultation with the U.S. Fish and Wildlife Service. EPA has not designated operators as non-Federal representatives for the purpose of conducting formal or informal consultation with the National Marine Fisheries Service. EPA has determined that discharges from MS4s are not likely to adversely affect listed species or critical habitat under the jurisdiction of the National Marine Fisheries Service. EPA has initiated informal consultation with the National Marine Fisheries Service on behalf of all permittees and no further action is required by permittees in order to fulfill ESA requirements of this permit related to species under the jurisdiction of NMFS

B. The U.S. Fish and Wildlife Service ESA Eligibility Process

Before submitting a notice of intent (NOI) for coverage by this permit, applicants must determine whether they meet the ESA eligibility criteria by following the steps in Section B of this Appendix. Applicants that cannot meet the eligibility criteria in Section B must apply for an individual permit.

The USFWS ESA eligibility requirements of this permit relating to the Dwarf wedgemussel, Northeastern bulrush, Sandplain gerardia, Piping Plover, Northern Red-bellied cooter, Bog Turtle, Small whorled Pogonia, Roseate Tern, Puritan tiger beetle, Northeastern beach tiger beetle, Northern Long-eared Bat and American burying beetle may be satisfied by documenting that one of the following criteria has been met:

USFWS Criterion A: No endangered or threatened species or critical habitat are in proximity to the stormwater discharges or discharge related activities.

USFWS Criterion B: In the course of formal or informal consultation with the Fish and Wildlife Service, under section 7 of the ESA, the consultation resulted in either a no jeopardy opinion (formal consultation) or a written concurrence by USFWS on a finding that the stormwater discharges and

discharge related activities are "not likely to adversely affect" listed species or critical habitat (informal consultation).

USFWS Criterion C: Using the best scientific and commercial data available, the effect of the stormwater discharge and discharge related activities on listed species and critical habitat have been evaluated. Based on those evaluations, a determination is made by EPA, or by the applicant and affirmed by EPA, that the stormwater discharges and discharge related activities will have "no affect" on any federally threatened or endangered listed species or designated critical habitat under the jurisdiction of the USFWS.

1. The Steps to Determine if the USFWS ESA Eligibility Criteria Can Be Met

To determine eligibility, you must assess the potential effects of your known stormwater discharges and discharge related activities on listed species or critical habitat, PRIOR to completing and submitting a Notice of Intent (NOI). You must follow the steps outlined below and document the results of your eligibility determination.

Step 1 – Determine if you can meet USFWS Criterion A

USFWS Criterion A: You can certify eligibility, according to USFWS Criterion A, for coverage by this permit if, upon completing the Information, Planning, and Conservation (IPaC) online system process, you printed and saved the preliminary determination which indicated that federally listed species or designated critical habitats are not present in the action area. See Attachment 1 to Appendix C for instructions on how to use IPaC.

If you have met USFWS Criterion A skip to Step # 4.

If you have not met USFWS Criterion A, go to Step # 2.

Step 2 – Determine if You Can Meet Eligibility USFWS Criteria B

USFWS Criterion B: You can certify eligibility according to USFWS Criteria B for coverage by this permit if you answer "Yes" to **all** of the following questions:

1) Does your action area contain one or more of the following species: Sandplain gerardia, Small whorled Pogonia, American burying beetle, Dwarf wedgemussel, Northeastern bulrush, Piping Plover, Northern Red-bellied cooter, Bog Turtle, Roseate Tern, Puritan tiger beetle, and Northeastern beach tiger beetle?
   AND
2) Did your assessment of the discharge and discharge related activities indicate that the discharge or discharge related activities "may affect" or are "not likely to adversely affect" listed species or critical habitat?
   AND
3) Did you contact the USFWS and did the formal or informal consultation result in either a "no jeopardy" opinion by the USFWS (for formal consultation) or concurrence by the

USFWS that your activities would be "not likely to adversely affect" listed species or critical habitat (for informal consultation)?
AND

4) Do you agree to implement all measures upon which the consultation was conditioned?
5) Do you agree that if, during the course of the permit term, you plan to install a structural BMP not identified in the NOI that you will re-initiate informal or formal consultation with USFWS as necessary?

Use the guidance below Step 3 to understand effects determination and to answer these questions.

If you answered "Yes" to all four questions above, you have met eligibility USFWS Criteria B. Skip to Step 4.

If you answered "No" to any of the four questions above, go to Step 3.

Step 3 – Determine if You Can Meet Eligibility USFWS Criterion C

USFWS Criterion C: You can certify eligibility according to USFWS Criterion C for coverage by this permit if you answer "Yes" to both of the following question:

1) Does your action area contain one or more of the following species: Northern Long-eared Bat, Sandplain gerardia, Small whorled Pogonia and/or American burying beetle and **does not** contain one any following species: Dwarf wedgemussel, Northeastern bulrush, Piping Plover, Northern Red-bellied cooter, Bog Turtle, Roseate Tern, Puritan tiger beetle, and Northeastern beach tiger beetle?[3]
OR
2) Did the assessment of your discharge and discharge related activities and indicate that there would be "no affect" on listed species or critical habitat and EPA provided concurrence with your determination?
3) Do you agree that if, during the course of the permit term, you plan to install a structural BMP not identified in the NOI that you will to conduct an endangered species screening for the proposed site and contact the USFWS if you determine that the new activity "may affect" or is "not likely to adversely affect" listed species or critical habitat under the jurisdiction of the USFWS.

Use the guidance below to understand effects determination and to answer these questions.

If you answered "Yes" to both the question above, you have met eligibility USFWS Criterion C. Go to Step 4.

If you answered "No" to either of the questions above, you are not eligible for coverage by this permit. You must submit an application for an individual permit for your stormwater discharges. (See 40 CFR 122.21).

USFWS Effects Determination Guidance:

If you are unable to certify eligibility under USFWS Criterion A, you must assess whether your stormwater discharges and discharge-related activities "may affect", will have "no affect" or are "not likely to adversely affect" listed species or critical habitat. "Discharge-related activities" include: activities which cause, contribute to, or result in point source stormwater pollutant discharges; and measures to provide treatment for stormwater discharges including the siting, construction and operational procedures to control, reduce or prevent water pollution. Please be aware that no protection from incidental take liability is provided under this criterion.

The scope of effects to consider will vary with each system. If you are having difficulty in determining whether your system is likely to cause adverse effects to a listed species or critical habitat, you should contact the USFWS for assistance. In order to complete the determination of effects it may be necessary to follow the formal or informal consultation procedures in section 7 of the ESA.

Upon completion of your assessment, document the results of your effects determination. If your results indicate that stormwater discharges or discharge related activities will have "no affect" on threatened or endangered species or critical habitat and EPA concurs with your determination, you are eligible under USFWS Criterion C of this Appendix. Your determination may be based on measures that you implement to avoid, eliminate, or minimized adverse effects.

If the determination is "May affect" or "not likely to adversely affect" you must contact the USFWS to discuss your findings and measures you could implement to avoid, eliminate, or minimize adverse effects. If you and the USFWS reach agreement on measures to avoid adverse effects, you are eligible under USFWS Criterion B. Any terms and/or conditions to protect listed species and critical habitat that you relied on in order to complete an adverse effects determination, must be incorporated into your Storm Water Management Program (required by this permit) and implemented in order to maintain permit eligibility.

If endangered species issues cannot be resolved: If you cannot reach agreement with the USFWS on measures to avoid or eliminate adverse effects then you are not eligible for coverage under this permit. You must seek coverage under an individual permit.

Effects from stormwater discharges and discharge-related activities which could pose an adverse effect include:

- *Hydrological:* Stormwater discharges may cause siltation, sedimentation, or induce other changes in receiving waters such as temperature, salinity or pH. These effects will vary with the amount of stormwater discharged and the volume and condition of the receiving water. Where a discharge constitutes a minute portion of the total volume of the receiving water, adverse hydrological effects are less likely.
- *Habitat:* Excavation, site development, grading and other surface disturbance activities, including the installation or placement of treatment equipment may adversely affect listed species or their habitat. Stormwater from the small MS4 may inundate a listed species habitat.

- *Toxicity:* In some cases, pollutants in the stormwater may have toxic effects on listed species.

Step 4 - Document Results of the Eligibility Determination

Once the USFWS ESA eligibility requirements have been met, you shall include documentation of USFWS ESA eligibility in the Storm Water Management Program required by the permit. Documentation for the various eligibility criteria are as follows:

- USFWS Criterion A: A copy of the IPaC generated preliminary determination letter indicating that no listed species or critical habitat is present within your action area. You shall also include a statement on how you determined that no listed species or critical habitat are in proximity to your stormwater system or discharges.
- USFWS Criterion B: A dated copy of the USFWS letter of concurrence on a finding of "no jeopardy" (for formal consultation) or "not likely to adversely affect" (for informal consultation) regarding the ESA section 7 consultation.
- USFWS Criterion C: A dated copy of the EPA concurrence with the operator's determination that the stormwater discharges and discharge-related activities will have "no affect" on listed species or critical habitat.

C. Submittal of Notice of Intent

Once the ESA eligibility requirements of Part C of this Appendix have been metyoumay submit the Notice of Intent indicating which Criterion you have met to be eligible for permit coverage. Signature and submittal of the NOI constitutes your certification, under penalty of law, of eligibility for permit coverage under 40 CFR 122.21.

D. Duty to Implement Terms and Conditions upon which Eligibility was Determined

You must comply with any terms and conditions imposed under the ESA eligibility requirements to ensure that your stormwater discharges and discharge related activities do not pose adverse effects or jeopardy to listed species and/or critical habitat. You must incorporate such terms and conditions into your Storm Water Management Program as required by this permit. If the ESA eligibility requirements of this permit cannot be met, then you may not receive coverage under this permit and must apply for an individual permit.

E. Services Information

United States Fish and Wildlife Service Office

National websites for Endangered Species Information:
Endangered Species home page: http://endangered.fws.gov
ESA Section 7 Consultations: http://endangered.fws.gov/consultation/index.html
Information, Planning, and Conservation System (IPAC): http://ecos.fws.gov/ipac/

U.S. FWS – Region 5
Supervisor

New England Field Office
U.S. Fish and Wildlife Services
70 Commercial Street, Suite 300
Concord, NH 03301

Natural Heritage Network

The Natural Heritage Network comprises 75 independent heritage program organizations located in all 50 states, 10 Canadian provinces, and 12 countries and territories located throughout Latin America and the Caribbean. These programs gather, manage, and distribute detailed information about the biological diversity found within their jurisdictions. Developers, businesses, and public agencies use natural heritage information to comply with environmental laws and to improve the environmental sensitivity of economic development projects. Local governments use the information to aid in land use planning.

The Natural Heritage Network is overseen by NatureServe, the Network's parent organization, and is accessible on-line at: http://www.natureserve.org/nhp/us_programs.htm, which provides websites and other access to a large number of specific biodiversity centers.

U.S. Fish and Wildlife IPaC system instructions

Use the following protocol to determine if any federally listed species or designated critical habitats under USFWS jurisdiction exist in your action area:

Enter your project specific information into the "Initial Project Scoping" feature of the Information, Planning, and Conservation (IPaC) system mapping tool, which can be found at the following location:

http://ecos.fws.gov/ipac/

a. Indicate the action area[1] for the MS4 by either:
    a. Drawing the boundary on the map or by uploading a shapefile.
    Select "Continue"

c. Click on the "SEE RESOURCE LIST" button and on the next screen you can export a trust resources list.This will provided a list of natural resources of concern, which will include an Endangered Species Act Species list. You may also request an official species list under "REGULATORY DOCUMENTS" Save copies and retain for your records

[1] The action area is defined by regulation as all areas to be affected directly or indirectly by the action and not merely the immediate area involved in the action (50 CFR §402.02). This analysis is not limited to the "footprint" of the action nor is it limited by the Federal agency's authority. Rather, it is a biological determination of the reach of the proposed action on listed species. Subsequent analyses of the environmental baseline, effects of the action, and levels of incidental take are based upon the action area.

The documentation used by a Federal action agency to initiate consultation should contain a description of the action area as defined in the Services' regulations and explained in the Services' consultation handbook. If the Services determine that the action area as defined by the action agency is incorrect, the Services should discuss their rationale with the agency or applicant, as appropriate. Reaching agreement on the description of the action area is desirable but ultimately the Services can only consult when an action area is defined properly under the regulations.

For storm water discharges or discharge related activities, the action area should encompass the following:

- The immediate vicinity of, or nearby, the point of discharge into receiving waters.
- The path or immediate area through which or over which storm water flows from the municipality to the point of discharge into the receiving water. This includes areas in the receiving water downstream from the point of discharge.
- Areas that may be impacted by construction or repair activities. This extends as far as effects related to noise (from construction equipment, power tools, etc.) and light (if work is performed at night) may reach.

The action area will vary with the size and location of the outfall pipe, the nature and quantity of the storm water discharges, and the type of receiving waters, among other factors.

ATTACHMENT B: Manchester-By-The-Sea IPAC Report

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
http://www.fws.gov/newengland

In Reply Refer To:
Consultation Code: 05E1NE00-2019-SLI-1636
Event Code: 05E1NE00-2019-E-03971
Project Name: Manchester-by-the-Sea Stormwater

May 07, 2019

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
(603) 223-2541

Project Summary

Consultation Code: 05E1NE00-2019-SLI-1636

Event Code: 05E1NE00-2019-E-03971

Project Name: Manchester-by-the-Sea Stormwater

Project Type: Regulation Promulgation

Project Description: This is part of development of a Stormwater Management Plan, Manchester-by-the-Sea will be looking at several different projects Town-wide to improve stormwater management.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/42.579403130867846N70.76111981523619W

Counties: Essex, MA

Endangered Species Act Species

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. 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.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Flowering Plants

NAME	STATUS
Small Whorled Pogonia *Isotria medeoloides* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1890	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

ATTACHMENT C: Federally Listed Endangered and Threatened Species in Massachusetts

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN MASSACHUSETTS

COUNTY	SPECIES	FEDERAL STATUS	GENERAL LOCATION/HABITAT	TOWNS
Barnstable	Piping Plover	Threatened	Coastal Beaches	All Towns
	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	All Towns
	Northeastern beach tiger beetle	Threatened	Coastal Beaches	Chatham
	Sandplain gerardia	Endangered	Open areas with sandy soils.	Sandwich and Falmouth.
	Northern Red-bellied Cooter	Endangered	Inland Ponds and Rivers	Bourne (north of the Cape Cod Canal)
	Red Knot[1]	Threatened	Coastal Beaches and Rocky Shores, sand and mud flats	Coastal Towns
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Berkshire	Bog Turtle	Threatened	Wetlands	Egremont and Sheffield
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Bristol	Piping Plover	Threatened	Coastal Beaches	Fairhaven, Dartmouth, Westport
	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	Fairhaven, New Bedford, Dartmouth, Westport
	Northern Red-bellied Cooter	Endangered	Inland Ponds and Rivers	Taunton
	Red Knot[1]	Threatened	Coastal Beaches and Rocky Shores, sand and mud flats	Coastal Towns
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Dukes	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	All Towns
	Piping Plover	Threatened	Coastal Beaches	All Towns
	Northeastern beach tiger beetle	Threatened	Coastal Beaches	Aquinnah and Chilmark
	Sandplain gerardia	Endangered	Open areas with sandy soils.	West Tisbury
	Red Knot[1]	Threatened	Coastal Beaches and Rocky Shores, sand and mud flats	Coastal Towns
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide

Updated 02/05/2016

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN MASSACHUSETTS

COUNTY	SPECIES	FEDERAL STATUS	GENERAL LOCATION/HABITAT	TOWNS
Essex	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Gloucester, Essex and Manchester
	Piping Plover	Threatened	Coastal Beaches	Gloucester, Essex, Ipswich, Rowley, Revere, Newbury, Newburyport and Salisbury
	Red Knot[1]	Threatened	Coastal Beaches and Rocky Shores, sand and mud flats	Coastal Towns
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Franklin	Northeastern bulrush	Endangered	Wetlands	Montague, Warwick
	Dwarf wedgemussel	Endangered	Mill River	Whately
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Hampshire	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Hadley
	Puritan tiger beetle	Threatened	Sandy beaches along the Connecticut River	Northampton and Hadley
	Dwarf wedgemussel	Endangered	Rivers and Streams.	Hatfield, Amherst and Northampton
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Hampden	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Southwick
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Middlesex	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Groton
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Nantucket	Piping Plover	Threatened	Coastal Beaches	Nantucket
	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	Nantucket
	American burying beetle	Endangered	Upland grassy meadows	Nantucket
	Red Knot[1]	Threatened	Coastal Beaches and Rocky Shores, sand and mud flats	Coastal Towns
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide

Updated 02/05/2016

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN MASSACHUSETTS

COUNTY	SPECIES	FEDERAL STATUS	GENERAL LOCATION/HABITAT	TOWNS
Plymouth	Piping Plover	Threatened	Coastal Beaches	Scituate, Marshfield, Duxbury, Plymouth, Wareham and Mattapoisett
	Northern Red-bellied Cooter	Endangered	Inland Ponds and Rivers	Kingston, Middleborough, Carver, Plymouth, Bourne, Wareham, Halifax, and Pembroke
	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	Plymouth, Marion, Wareham, and Mattapoisett.
	Red Knot[1]	Threatened	Coastal Beaches and Rocky Shores, sand and mud flats	Coastal Towns
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Suffolk	Piping Plover	Threatened	Coastal Beaches	Revere, Winthrop
	Red Knot[1]	Threatened	Coastal Beaches and Rocky Shores, sand and mud flats	Coastal Towns
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Worcester	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Leominster
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide

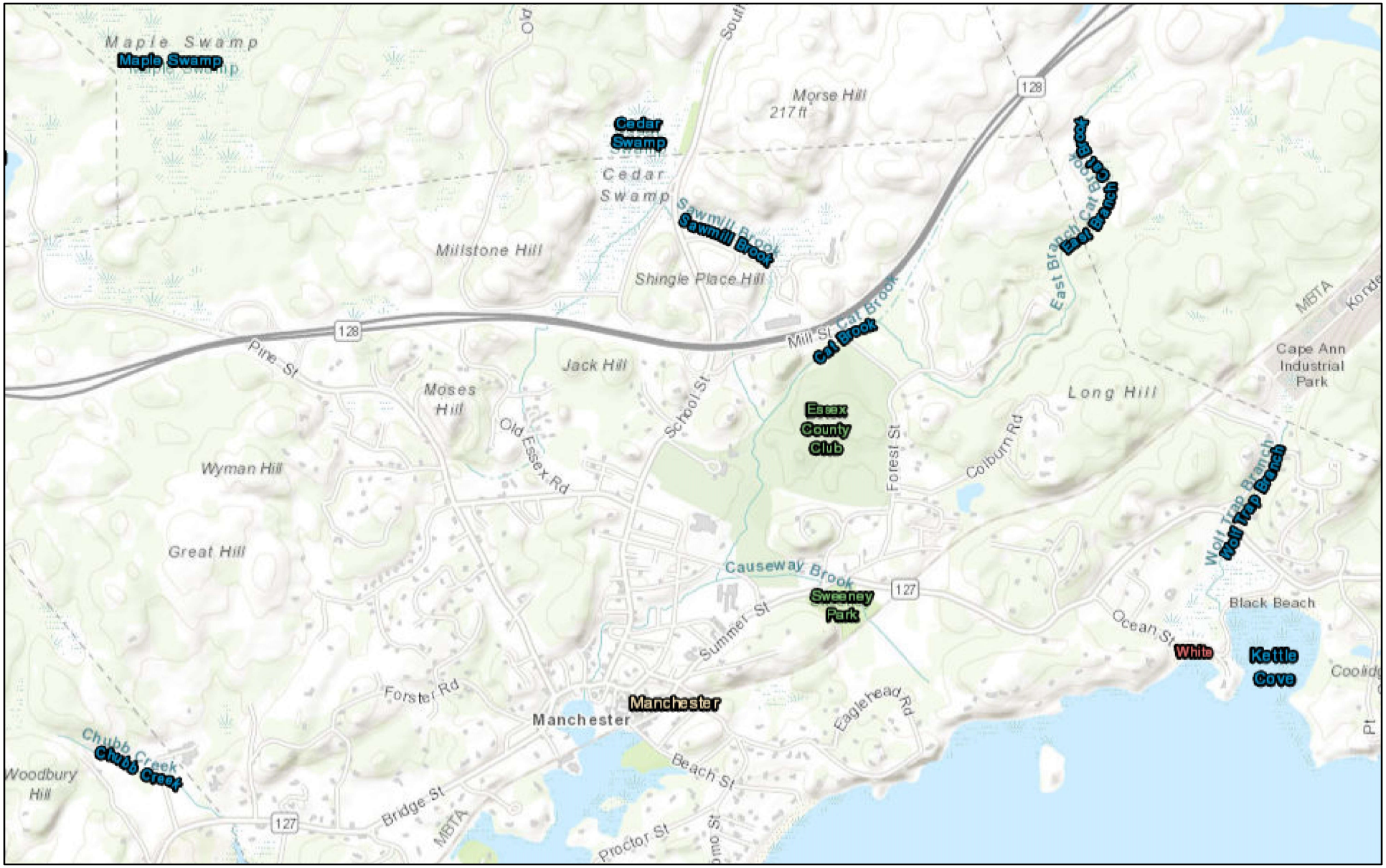
[1]Migratory only, scattered along the coast in small numbers

-Eastern cougar and gray wolf are considered extirpated in Massachusetts.
-Endangered gray wolves are not known to be present in Massachusetts, but dispersing individuals from source populations in Canada may occur statewide.
-Critical habitat for the Northern Red-bellied Cooter is present in Plymouth County.

Updated 02/05/2016

ATTACHMENT D: Northern Long-Eared Bat Location Map

Northern Longeared bat Hibernacula & Maternity Roosts



May 7, 2019

1:36,112

0 0.23 0.45 0.9 mi

0 0.35 0.7 1.4 km

ATTACHMENT E: U.S. Fish and Wildlife Review Letter

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087
http://www.fws.gov/newengland

January 31, 2019

To Whom It May Concern:

This project was reviewed for the presence of federally listed or proposed, threatened or endangered species or critical habitat per instructions provided on the U.S. Fish and Wildlife Service's New England Field Office website:

http://www.fws.gov/newengland/EndangeredSpec-Consultation.htm (accessed January 2019)

Based on information currently available to us, no federally listed or proposed, threatened or endangered species or critical habitat under the jurisdiction of the U.S. Fish and Wildlife Service are known to occur in the project area(s). Preparation of a Biological Assessment or further consultation with us under section 7 of the Endangered Species Act is not required. No further Endangered Species Act coordination is necessary for a period of one year from the date of this letter, unless additional information on listed or proposed species becomes available.

Thank you for your cooperation. Please contact David Simmons of this office at 603-227-6425 if we can be of further assistance.

Sincerely yours,

Thomas R. Chapman
Supervisor
New England Field Office

Appendix C - Historic Properties Eligibility Criteria Documents

MEMORANDUM

National Historic Preservation Act Eligibility Certification

TO:	Town of Manchester-by-the-Sea Stormwater Management Program Files
FROM:	Bobrek Engineering & Construction
COPY:	Charles Dam, P.E., Department of Public Works Director
DATE:	May 15, 2019

Bobrek Engineering & Construction completed the National Historic Preservation Act Eligibility Determination screening process in accordance with Part 1.9.2 and Appendix D of U.S. EPA's National Pollutant Discharge Elimination System (NPDES) General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) in Massachusetts, effective July 1, 2018, and determined that the **Town of Manchester-by-the-Sea** meets **Criterion A**, where the discharges do not have the potential to cause effects on historic properties.

Bobrek Engineering & Construction followed the screening process included in Appendix D and has determined Manchester-by-the-Sea is an existing facility authorized by the previous permit and therefore **meets Criterion A** and is not, as part of developing and submitting a Stormwater Management Plan, undertaking any activity involving subsurface land disturbance less than an acre.

Based on this screening process, the Town of Manchester-by-the-Sea stormwater discharges, allowable non stormwater discharges, and stormwater discharge-related activities will not have an effect on a property that is listed or eligible for listing on the National Register of Historic Properties (NRHP) and no further action is necessary at this time.

Attachment B to this memorandum includes a list of the federal- and state-listed historic areas, buildings, burial grounds, objects, and structures downloaded from the Massachusetts Cultural Resource Information System (MACRIS) that is current as of May 7, 2019. If the Town undertakes construction on or around a property that is listed or eligible for listing, the Town will coordinate with the State Historic Preservation Officer (SHPO) (i.e. the Massachusetts Historical Commission) by submitting a Project Notification Form and associated documentation for the project. As applicable for each project, the Town will implement measures 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 the Town fails to document and implement such measures, those discharges are ineligible for coverage under EPA's Small MS4 General Permit.

If you have any questions or would like to discuss further, please do not hesitate to call us at 978-406-9619

Sincerely,

Bobrek Engineering & Construction, LLC

John Bobrek, P.E.
President

Enclosures: Attachment A: Appendix D of U.S. EPA's National Pollutant Discharge Elimination System (NPDES) General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) in Massachusetts

Attachment B: Massachusetts Cultural Resource Information System (MACRIS) List of federal- and state-listed historic areas, buildings, burial grounds, objects, and structures

ATTACHMENT A: Appendix D of U.S. EPA's National Pollutant Discharge Elimination System (NPDES) General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) in Massachusetts

Appendix D
National Historic Preservation Act Guidance

Background

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to take into account the effects of Federal "undertakings" on historic properties that are either listed on, or eligible for listing on, the National Register of Historic Places. The term federal "undertaking" is defined in the NHPA regulations to include a project, activity, or program of a federal agency including those carried out by or on behalf of a federal agency, those carried out with federal financial assistance, and those requiring a federal permit, license or approval. See 36 CFR 800.16(y). Historic properties are defined in the NHPA regulations to include prehistoric or historic districts, sites, buildings, structures, or objects that are included in, or are eligible for inclusion in, the National Register of Historic Places. This term includes artifacts, records, and remains that are related to and located within such properties. See 36 CFR 800.16(1).

EPA's issuance of a National Pollutant Discharge Elimination System (NPDES) General Permit is a federal undertaking within the meaning of the NHPA regulations and EPA has determined that the activities to be carried out under the general permit require review and consideration, in order to be in compliance with the federal historic preservation laws and regulations. Although individual submissions for authorization under the general permit do not constitute separate federal undertakings, the screening processes provides an appropriate site-specific means of addressing historic property issues in connection with EPA's issuance of the permit. To address any issues relating to historic properties in connection with the issuance of this permit, EPA has included a screening process for applicants to identify whether properties listed or eligible for listing on the National Register of Historic Places are within the path of their discharges or discharge-related activities (including treatment systems or any BMPs relating to the discharge or treatment process) covered by this permit.

Applicants seeking authorization under this general permit must comply with applicable, State, Tribal, and local laws concerning the protection of historic properties and places and may be required to coordinate with the State Historic Preservation Officer (SHPO) and/or Tribal Historic Preservation Officer (THPO) and others regarding effects of their discharges on historic properties.

Activities with No Potential to Have an Effect on Historic Properties

A determination that a federal undertaking has no potential to have an effect on historic properties fulfills an agency's obligations under NHPA. EPA has reason to believe that the vast majority of activities authorized under this general permit will have no potential effects on historic properties. This permit typically authorizes discharges from existing facilities and requires control of the pollutants discharged from the facility. EPA does not anticipate effects on historic properties from the pollutants in the authorized discharges. Thus, to the extent EPA's issuance of this general permit authorizes discharges of such constituents, confined to existing channels, outfalls or natural drainage areas, the permitting action does not have the potential to cause effects on historical properties.

In addition, the overwhelming majority of sources covered under this permit will be facilities that are seeking renewal of previous permit authorization. These existing dischargers should have already addressed NHPA issues in the previous general permit as they were required to certify that they were either not affecting historic properties or they had obtained written agreement from

the applicable SHPO or THPO regarding methods of mitigating potential impacts. To the extent this permit authorizes renewal of prior coverage without relevant changes in operations the discharge has no potential to have an effect on historic properties.

Activities with Potential to Have an Effect on Historic Properties

EPA believes this permit may have some potential to have an effect on historic properties the applicant undertakes the construction and/or installation of control measures that involve subsurface disturbance that involves less than 1 acre of land. (Ground disturbances of 1 acre or more require coverage under the Construction General Permit.) Where there is disturbance of land through the construction and/or installation of control measures, there is a possibility that artifacts, records, or remains associated with historic properties could be impacted. Therefore, if the applicant is establishing new or altering existing control measures to manage their discharge that will involve subsurface ground disturbance of less than 1 acre, they will need to ensure (1) that historic properties will not be impacted by their activities or (2) that they are in compliance with a written agreement with the SHPO, THPO, or other tribal representative that outlines all measures the applicant will carry out to mitigate or prevent any adverse effects on historic properties.

Examples of Control Measures Which Involve Subsurface Disturbance

The type of control measures that are presumptively expected to cause subsurface ground disturbance include:

- Dikes
- Berms
- Catch basins, drainage inlets
- Ponds, bioretention areas
- Ditches, trenches, channels, swales
- Culverts, pipes
- Land manipulation; contouring, sloping, and grading
- Perimeter Drains
- Installation of manufactured treatment devices

EPA cautions applicants that this list is non-inclusive. Other control measures that involve earth disturbing activities that are not on this list must also be examined for the potential to affect historic properties.

Certification

Upon completion of this screening process the applicant shall certify eligibility for this permit using one of the following criteria on their Notice of Intent for permit coverage:

> **Criterion A**: The discharges do not have the potential to cause effects on historic properties.

Criterion B: A historic survey was conducted. The survey concluded that no historic properties are present. Discharges do not have the potential to cause effects on historic properties.

Criterion C: The discharges and discharge related activities have the potential to have an effect on historic properties, and the applicant has obtained and is in compliance with a written agreement with the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Officer (TPHO), or other tribal representative that outlines measures the applicant will carry out to mitigate or prevent any adverse effects on historic properties.

Authorization under the general permit is available only if the applicant certifies and documents permit eligibility using one of the eligibility criteria listed above. Small MS4s that cannot meet any of the eligibility criteria in above must apply for an individual permit.

Screening Process

Applicants or their consultant need to answer the questions and follow the appropriate procedures below to assist EPA in compliance with 36 CFR 800.

Question 1*:* Is the facility an existing facility authorized by the previous permit or a new facility and the applicant is not undertaking any activity involving subsurface land disturbance less than an acre?

YES - The applicant should certify that fact in writing and file the statement with the EPA. This certification must be maintained as part of the records associated with the permit.
The applicant should certify eligibility for this permit using Criterion A on their Notice of Intent for permit coverage. The applicant does not need to contact the state Historic Commission. Based on that statement, EPA will document that the project has "no potential to cause effects" (36 CFR 800.3(a)(1)). There are no further obligations under the Section 106 regulations.

NO- Go to Question 2.

Question 2*:* Is the property listed in the National Register of Historic Places or have prior surveys or disturbances revealed the existence of a historic property or artifacts?

NO - The applicant should certify that fact in writing and file the statement with the EPA. This certification must be maintained as part of the records associated with the permit.
The applicant should certify eligibility for this permit using Criterion B on their Notice of Intent for permit coverage. The applicant does not need to contact the state Historic Commission. Based on that statement, EPA will document that the project has "no potential to cause effects" (36 CFR 800.3(a)(1)). There are no further obligations under the Section 106 regulations.

YES - The applicant or their consultant should prepare a complete information submittal to the SHPO. The submittal consists of:

- Completed Project Notification Form- forms available at http://www.sec.state.ma.us/mhc/mhcform/formidx.htm;

- USGS map section with the actual project boundaries clearly indicated; and
- Scaled project plans showing existing and proposed conditions.

(1) Please note that the SHPO does not accept email for review. Please mail a paper copy of your submittal (Certified Mail, Return Receipt Requested) or deliver a paper copy of your submittal (and obtain a receipt) to:

State Historic Preservation Officer
Massachusetts Historical Commission
220 Morrissey Blvd.
Boston MA 02125.

(2) Provide a copy of your submittal and the proof of MHC delivery showing the date MHC received your submittal to:

NPDES Permit Branch Chief
US EPA Region 1 (OEP06-1)
5 Post Office Square, Suite 100
Boston MA 02109-3912.

The SHPO will comment within thirty (30) days of receipt of complete submittals, and may ask for additional information. Consultation, as appropriate, will include EPA, the SHPO and other consulting parties (which includes the applicant). The steps in the federal regulations (36 CFR 800.2 to 800.6, etc.) will proceed as necessary to conclude the Section 106 review for the undertaking. **The applicant should certify eligibility for this permit using Criterion C on their Notice of Intent for permit coverage.**

ATTACHMENT B: Massachusetts Cultural Resource Information System (MACRIS) List of Federal- and State-Listed Historic Areas, Buildings, Burial Grounds, Objects, And Structures

Massachusetts Cultural Resource Information System

MACRIS

MACRIS Search Results

Search Criteria: Town(s): Manchester; Resource Type(s): ü, Structure, Object, Area, Burial Ground, Building;

Inv. No.	Property Name	Street	Town	Year
MAN.A	Manchester Historic District		Manchester	
MAN.B	Manchester Village Historic District		Manchester	
MAN.C	Harbor Street Area		Manchester	
MAN.913	New Hampshire, The		Manchester	
MAN.D	Coolidge Point		Manchester	
MAN.40	Leach, Annable and Company Steam Saw Mill	Ashland Ave	Manchester	c 1869
MAN.36	Sinnicks House	4 Ashland Ave	Manchester	c 1880
MAN.38		5 Ashland Ave	Manchester	r 1975
MAN.37	Marble House	6 Ashland Ave	Manchester	1851
MAN.1	Kitfield, Henry House	9 Ashland Ave	Manchester	1847
MAN.39	Richardson House	10 Ashland Ave	Manchester	c 1845
MAN.917	Manchester World War I Memorial	Beach St	Manchester	1931
MAN.114	Leach House	4 Beach St	Manchester	c 1835
MAN.2	U. S. Post Office - Manchester Main Branch	15 Beach St	Manchester	1939
MAN.55	Cheever House	Bennett St	Manchester	c 1765
MAN.57		Bennett St	Manchester	r 1985
MAN.58		Bennett St	Manchester	r 1965
MAN.59	Tappan, I. F. House	Bennett St	Manchester	1826
MAN.53	Allen Cabinet Shop	5 Bennett St	Manchester	c 1860
MAN.54	Allen House	7 Bennett St	Manchester	c 1800
MAN.56	Hassam House	9 Bennett St	Manchester	c 1730
MAN.60	Tappan House	18 Bennett St	Manchester	c 1895
MAN.61	Long - Danforth Cabinet Shop	20-22 Bennett St	Manchester	c 1840
MAN.63	Morgan House	21 Bennett St	Manchester	c 1885
MAN.62		24 Bennett St	Manchester	c 1910
MAN.65	Bennett House	25 Bennett St	Manchester	c 1675
MAN.64	Johnson Cabinet Shop	30 Bennett St	Manchester	c 1870

Inv. No.	Property Name	Street	Town	Year
MAN.69	Bennett House	33 Bennett St	Manchester	c 1900
MAN.66	Bennett House	34 Bennett St	Manchester	c 1770
MAN.70	Allen House	37 Bennett St	Manchester	c 1770
MAN.67	Bennett House	38 Bennett St	Manchester	c 1770
MAN.912	Bennett's Brook Bridge	Bridge St	Manchester	1828
MAN.41	Cider Shed	1 Bridge St	Manchester	c 1820
MAN.3	Fention, David Boat Shop	2 Bridge St	Manchester	1906
MAN.4	Smith, Ellingwood Cabinet Shop	6 Bridge St	Manchester	c 1845
MAN.42		7 Bridge St	Manchester	c 1950
MAN.43	Allen, S. P. House	8 Bridge St	Manchester	c 1850
MAN.44	Tappen Shop	9 Bridge St	Manchester	c 1845
MAN.5	Allen, J. P. House	10 Bridge St	Manchester	1828
MAN.6	Merrill, F. J. House	12 Bridge St	Manchester	1896
MAN.7	Tappan Barn - Bray House	13 Bridge St	Manchester	1828
MAN.8	Cheever, Frank House	14 Bridge St	Manchester	1897
MAN.9	Cheever, Barn and Shops	15 Bridge St	Manchester	1822
MAN.10	Cheever, Jacob House	17 Bridge St	Manchester	1822
MAN.11	Danforth - Lee House	18 Bridge St	Manchester	1845
MAN.45	Long - Danforth House	21-23 Bridge St	Manchester	c 1838
MAN.12	Boardman, Samuel House	22 Bridge St	Manchester	c 1840
MAN.13	Marble, George House	24 Bridge St	Manchester	c 1837
MAN.46	Johnson House	25 Bridge St	Manchester	c 1890
MAN.14	Tappan, Samuel F. House	26 Bridge St	Manchester	c 1837
MAN.15	Hassam, Jonathan House	27 Bridge St	Manchester	c 1800
MAN.47	Johnson House	28 Bridge St	Manchester	c 1880
MAN.48	Johnson House	29 Bridge St	Manchester	c 1845
MAN.49	Bennett House	31 Bridge St	Manchester	c 1845
MAN.50		33 Bridge St	Manchester	1987
MAN.51	Tenney Barn	34 Bridge St	Manchester	c 1895
MAN.52	Tenney House	34 Bridge St	Manchester	c 1895
MAN.213	Higginson, Henry Lee House	138 Bridge St	Manchester	1878
MAN.19	Seaside One Firehouse	Central St	Manchester	1885
MAN.20	Manchester Orthodox Congregational Church	Central St	Manchester	1809
MAN.905	Manchester Town Common	Central St	Manchester	
MAN.906	Manchester Civil War Monument	Central St	Manchester	1928
MAN.907	Manchester World War II - Korea Monument	Central St	Manchester	
MAN.908	Manchester Towne Fountain	Central St	Manchester	1895
MAN.909	Central Street Bridge	Central St	Manchester	

Inv. No.	Property Name	Street	Town	Year
MAN.910	Knight's Wharf	Central St	Manchester	c 1900
MAN.71	Lee, John Warehouse - Bingham, Delucena L. House	7 Central St	Manchester	1754
MAN.16	Rapardy, Julius Block	15 Central St	Manchester	1884
MAN.72		19 Central St	Manchester	1953
MAN.73	Allen - Slade Store	23 Central St	Manchester	c 1860
MAN.74	Knight's Store	24-28 Central St	Manchester	c 1880
MAN.77	Allen, John Perry House	27 Central St	Manchester	c 1837
MAN.78	Story, Dr. House	29 Central St	Manchester	c 1837
MAN.75	Knight's Office	30 Central St	Manchester	c 1896
MAN.79	Rust House	31 Central St	Manchester	c 1849
MAN.80	Rust Barn and Store	33 Central St	Manchester	c 1849
MAN.81	Lee, William House	35 Central St	Manchester	c 1795
MAN.76	Peele House Square	36 Central St	Manchester	
MAN.82	Story House	37 Central St	Manchester	c 1812
MAN.83	Parsons House	38 Central St	Manchester	c 1844
MAN.84	Hooper, Capt. William - Tappan, Ebenezer House	39 Central St	Manchester	1805
MAN.85	Parsons House	40 Central St	Manchester	c 1805
MAN.17	Forster, Israel House	41 Central St	Manchester	1804
MAN.86	Tappan House	44 Central St	Manchester	c 1800
MAN.87	Brown House	46 Central St	Manchester	c 1850
MAN.88	Kimbell - Tappan House	48 Central St	Manchester	c 1760
MAN.89	Rabardy Shop	50 Central St	Manchester	c 1880
MAN.18	Story, Henry House	52 Central St	Manchester	c 1770
MAN.104	Fitz Barn	Chapel Ln	Manchester	c 1850
MAN.105	Manchester Congregational Church	Chapel Ln	Manchester	c 1860
MAN.904	Chubb Creek Bridge	Chubb Creek	Manchester	1887
MAN.101	Fitz, William House	8 Church St	Manchester	c 1850
MAN.102	Kelham House	10 Church St	Manchester	c 1850
MAN.103	Kelham Barn and Garage	10R Church St	Manchester	c 1850
MAN.920	Coolidge Point Rd	Coolidge Point	Manchester	c 1880
MAN.925	Coolidge Point Shoreline Road	Coolidge Point	Manchester	c 1874
MAN.930	Coolidge Point Hiking Trail Network	Coolidge Point	Manchester	1992
MAN.204	Coolidge, Thomas Jefferson Cottage	1 Coolidge Point	Manchester	c 1874
MAN.205	Coolidge, Thomas Jefferson Barn	1 Coolidge Point	Manchester	c 1895
MAN.217	Lily Pond Cottage Car Port	1 Coolidge Point	Manchester	c 2006
MAN.218	Lily Pond Cottage Guest House	1 Coolidge Point	Manchester	r 1920
MAN.219	Lily Pond Cottage Carriage Shed	1 Coolidge Point	Manchester	r 1920

Inv. No.	Property Name	Street	Town	Year
MAN.206	Lastavica, Dr. Catherine Coolidge House	9 Coolidge Point	Manchester	1968
MAN.207	Lastavica, Dr. Catherine Coolidge Garage	9 Coolidge Point	Manchester	1968
MAN.208	Lastavica, Dr. Catherine Coolidge Shed	9 Coolidge Point	Manchester	1968
MAN.914	Lastavica, Dr. Catherine Coolidge Pond	9 Coolidge Point	Manchester	c 1950
MAN.915	Lastavica, Dr. Catherine Coolidge Pond Channel	9 Coolidge Point	Manchester	c 1980
MAN.916	Coolidge, Thomas Jefferson Coolidge Italian Garden	9 Coolidge Point	Manchester	r 1890
MAN.921	Coolidge Point Road Vehicular Bridge	9 Coolidge Point	Manchester	2007
MAN.922	Coolidge Point Wood Pedestrian Bridge	9 Coolidge Point	Manchester	2007
MAN.923	Coolidge Point Western Concrete and Stone Pedestrian Bridge	9 Coolidge Point	Manchester	2007
MAN.924	Coolidge Point Eastern Concrete and Stone Pedestrian Bridge	9 Coolidge Point	Manchester	2007
MAN.926	Coolidge Point Ocean Lawn Stonework	15 Coolidge Point	Manchester	1992
MAN.927	Marble Palace Architectural Fragment	15 Coolidge Point	Manchester	1903
MAN.928	Coolidge Point Sea Wall	15 Coolidge Point	Manchester	c 1992
MAN.929	Clarke Pond Trail Bridge	17A Coolidge Point	Manchester	2011
MAN.209	Coolidge, Thomas Jefferson Stable	21 Coolidge Point	Manchester	c 1886
MAN.210	Coolidge, Thomas Jefferson Gardner's Stable	21 Coolidge Point	Manchester	c 1900
MAN.211		21 Coolidge Point	Manchester	c 1990
MAN.220	Coolidge Point Ranger Station - Utility Shed	21 Coolidge Point	Manchester	
MAN.142	Cheever House	2 Desmond Ave	Manchester	c 1800
MAN.901	Rockport Railroad Bridge over Eaglehead Road	Eaglehead Rd	Manchester	1985
MAN.96		Elm Ct	Manchester	r 1975
MAN.97	Merrill Stable	Elm Ct	Manchester	c 1900
MAN.99		Elm Ct	Manchester	
MAN.100	Knight Stable	Elm Ct	Manchester	c 1900
MAN.98	Marshall House	2 Elm Ct	Manchester	c 1910
MAN.68	Bennett House	Forster Rd	Manchester	c 1890
MAN.150	Swett House	6 Friend St	Manchester	c 1895
MAN.151	Friend House	8 Friend St	Manchester	c 1855
MAN.152	Friend House	10 Friend St	Manchester	c 1816
MAN.153	Friend Barn	12 Friend St	Manchester	c 1816
MAN.154		14 Friend St	Manchester	c 1830
MAN.155	Gillis House	16 Friend St	Manchester	c 1820
MAN.156	Lee Shoe Shop	20 Friend St	Manchester	c 1820
MAN.157	Crafts House	22 Friend St	Manchester	r 1785
MAN.190	Masconomo - Forbes, Capt. Robert Bennet House	Harbor St	Manchester	1856

Inv. No.	Property Name	Street	Town	Year
MAN.191	Chubbs - Boardman, Benjamin G. Cow Barn	Harbor St	Manchester	c 1865
MAN.192	Leland, Lester House	Harbor St	Manchester	c 1904
MAN.193	Boardman, Benjamin G. Cottage	Harbor St	Manchester	r 1900
MAN.194	Masconomo - Forbes, Capt. Robert Bennet Barn	Harbor St	Manchester	c 1856
MAN.195	Cotting, Charles E. House	Harbor St	Manchester	1893
MAN.196	Mansfield, N. R. Cottage	Harbor St	Manchester	c 1886
MAN.197	Uplands - Higginson, Maj. Henry Lee House	Harbor St	Manchester	r 1873
MAN.198	Sunset Hill - Higginson, Maj. Henry Lee House	Harbor St	Manchester	1878
MAN.199	Grew, Henry S. House	Harbor St	Manchester	r 1850
MAN.200	Cabot, Walter C. House	Harbor St	Manchester	c 1870
MAN.201	Bartol, Dr. - Abbott, Gordon House	Harbor St	Manchester	
MAN.187	The Rocks	50 Harbor St	Manchester	1903
MAN.188	The Rocks Caretaker's Cottage	50 Harbor St	Manchester	c 1903
MAN.189	The Rocks Stable	50 Harbor St	Manchester	c 1903
MAN.903	Manchester Draw Bridge	Manchester Harbor	Manchester	1911
MAN.90	Rust Tenement	5 Morse Ct	Manchester	c 1890
MAN.91	Parsons - Morgan House	6 Morse Ct	Manchester	c 1805
MAN.92	Rust Tenement	7 Morse Ct	Manchester	c 1895
MAN.93	Parsons - Knowlton House	8 Morse Ct	Manchester	c 1805
MAN.94	Rust Shop	9 Morse Ct	Manchester	c 1895
MAN.95		12 Morse Ct	Manchester	c 1850
MAN.158	Allen House and Tavern	3 North St	Manchester	c 1714
MAN.159	Dodge - Tuck House	4 North St	Manchester	c 1718
MAN.160	Sinnicks House	5 North St	Manchester	c 1900
MAN.161	Phillips House	6 North St	Manchester	c 1885
MAN.162	Leach House	7 North St	Manchester	c 1900
MAN.163	Knight House	8 North St	Manchester	1810
MAN.164	Driver House	9 North St	Manchester	c 1770
MAN.165		12 North St	Manchester	r 1875
MAN.166	Colby House	13 North St	Manchester	c 1805
MAN.167		14 North St	Manchester	c 1900
MAN.168	Wheaton House	16 North St	Manchester	c 1870
MAN.169	Lee House	17 North St	Manchester	c 1833
MAN.170	Tappan House	18 North St	Manchester	c 1884
MAN.900	Coolidge's Arch	Old Gloucester Rd	Manchester	1896
MAN.216	Wigglesworth, Thomas House	9 Old Neck Rd	Manchester	1889
MAN.803	Rosedale Cemetery	Rosedale Ave	Manchester	1854
MAN.214	Crowell, Benjamin Franklin Memorial Chapel	4 Rosedale Ave	Manchester	1903

Inv. No.	Property Name	Street	Town	Year
MAN.911	School Street Bridge	School St	Manchester	r 1950
MAN.123	Rowe Block	2 School St	Manchester	c 1890
MAN.125	Lee House	3 School St	Manchester	c 1730
MAN.124	Bigwood Store	4 School St	Manchester	c 1845
MAN.126	Hooper's Grocery	6 School St	Manchester	c 1899
MAN.127	Hooper House	7 School St	Manchester	c 1890
MAN.128	Manchester Fire Station	10-14 School St	Manchester	1975
MAN.129	Woodberry House	11 School St	Manchester	1832
MAN.130	Leach House	13 School St	Manchester	c 1786
MAN.131	Baker, Ira House	16 School St	Manchester	c 1848
MAN.132	Baker, John House	18 School St	Manchester	c 1850
MAN.134	Dodge House	21 School St	Manchester	c 1773
MAN.133	Manchester Baptist Church	22 School St	Manchester	1843
MAN.136	Lamson House	23 School St	Manchester	c 1877
MAN.135	Cheever House	24 School St	Manchester	c 1808
MAN.137	Dodge House	26 School St	Manchester	1834
MAN.138	Babcock House	27 School St	Manchester	1823
MAN.139	Hoare House	28 School St	Manchester	c 1888
MAN.140	Little House	31 School St	Manchester	c 1850
MAN.141	Carter House	32 School St	Manchester	c 1862
MAN.143	Allen House	34 School St	Manchester	c 1838
MAN.144	Gilson House	35 School St	Manchester	c 1846
MAN.145	Cross - Giles House	37 School St	Manchester	c 1811
MAN.146	Knight House	38 School St	Manchester	c 1845
MAN.147	Hoyt House	40 School St	Manchester	c 1845
MAN.148	Knight House	44 School St	Manchester	c 1805
MAN.149	Thurston House	45 School St	Manchester	c 1812
MAN.182	Bullock House	5 Sea St	Manchester	c 1885
MAN.184	Connolly House	8 Sea St	Manchester	c 1860
MAN.183	Coughlin House	9 Sea St	Manchester	c 1890
MAN.185	Tuck - Tappan House	18 Sea St	Manchester	c 1743
MAN.902	Summer Street Bridge	Summer St	Manchester	1896
MAN.181	Carter House	31 Summer St	Manchester	c 1850
MAN.180	Godsoe House	33 Summer St	Manchester	c 1845
MAN.21	Allen, Israel House	58 Summer St	Manchester	r 1845
MAN.22	Crombie, Austin House	85 Summer St	Manchester	c 1635
MAN.23	Crombie House	87 Summer St	Manchester	1720
MAN.202	Westmere - Lodge, The	384 Summer St	Manchester	c 1880

Inv. No.	Property Name	Street	Town	Year
MAN.203	Little Orchard House	388 Summer St	Manchester	c 1700
MAN.212	Blynman Farm	601 Summer St	Manchester	c 1914
MAN.186	Hodgkins and Sons Grain House	34 Tappan St	Manchester	c 1885
MAN.215	Chowder House	17 Tucks Point Rd	Manchester	c 1885
MAN.918	Tucks Point Pavilion	17 Tucks Point Rd	Manchester	1896
MAN.919	Tucks Point Park	17 Tucks Point Rd	Manchester	1896
MAN.106	Lee Block	2 Union St	Manchester	1875
MAN.24	Hilton, Thomas House and Cabinet Shop	8 Union St	Manchester	c 1765
MAN.28	Trask House	10-14 Union St	Manchester	1823
MAN.29	Manchester Memorial Library and Grand Army Hall	15 Union St	Manchester	1887
MAN.107		17 Union St	Manchester	c 1970
MAN.25	Driver, John H. House	18 Union St	Manchester	c 1845
MAN.108	Allen's Pharmacy	20 Union St	Manchester	c 1920
MAN.26	Crowell, Samuel House	21 Union St	Manchester	1843
MAN.109		23-29 Union St	Manchester	c 1900
MAN.113	Long - Cheever House	33-35 Union St	Manchester	c 1831
MAN.110		36 Union St	Manchester	c 1970
MAN.111	Simonds House	38 Union St	Manchester	c 1820
MAN.116		39 Union St	Manchester	1987
MAN.112	Smith House	40-42 Union St	Manchester	c 1850
MAN.117	Randall - Long House	41 Union St	Manchester	1803
MAN.118	Kimball House	43 Union St	Manchester	c 1899
MAN.119		47 Union St	Manchester	r 1975
MAN.115	Smith House - Kimball Block	48-50 Union St	Manchester	1835
MAN.27	Girdler House	51 Union St	Manchester	c 1770
MAN.120	Pert House	54 Union St	Manchester	1832
MAN.121	Roberts Barn	58 Union St	Manchester	c 1890
MAN.122	Allen House	60 Union St	Manchester	c 1730
MAN.800	Forster Cemetery	Washington St	Manchester	c 1850
MAN.801	Tappan Cemetery	Washington St	Manchester	c 1850
MAN.802	1661 Cemetery	Washington St	Manchester	1661
MAN.171	Dexter House	1-3 Washington St	Manchester	1827
MAN.172	Hamilton House	5 Washington St	Manchester	c 1870
MAN.173	Norwood House	6 Washington St	Manchester	c 1770
MAN.174	Jewett House	7 Washington St	Manchester	c 1842
MAN.30	Whipple, Dr. Joseph House	8 Washington St	Manchester	c 1765
MAN.175	Holm House	9 Washington St	Manchester	c 1843

Inv. No.	Property Name	Street	Town	Year
MAN.31	Allen, Abner House	10 Washington St	Manchester	c 1825
MAN.176	Crowell House	11 Washington St	Manchester	c 1827
MAN.32	Lee, Ebenezer House	12 Washington St	Manchester	c 1770
MAN.33	Allen, Capt. John House	13 Washington St	Manchester	c 1820
MAN.177	Allen Warehouse	15 Washington St	Manchester	c 1845
MAN.34	Allen Bakehouse	16 Washington St	Manchester	c 1832
MAN.178	Allen, Abner House	17 Washington St	Manchester	c 1794
MAN.179	Allen, Luther House	19 Washington St	Manchester	c 1834
MAN.35	Tewksbury, Jacob House	20 Washington St	Manchester	c 1770

Appendix D - Summaries of Water Pollution Reporting Categories

SUMMARIES OF EPA WATER POLLUTION REPORTING CATEGORIES USED IN THE ATTAINS DATA SYSTEM

This document includes summaries of 34 general reporting categories used for EPA ATTAINS data on polluted waters. The summaries were developed for non-technical audiences to explain clearly what the category is, where the pollution comes from, how it can harm the environment or human health, and what individuals can do to help reduce the problem. These summaries of ATTAINS reporting categories also appear along with simplified common category names in ***How's My Waterway***, a local-scale search application that retrieves ATTAINS data and translates it for general audiences. Simplified names from ***How's My Waterway*** appear in parentheses after the ATTAINS name in the coming pages.

ALGAL GROWTH (EXCESS ALGAE) *can occur when too many nutrients, warm water temperatures, and reduced flow trigger the overgrowth of naturally occurring algae into thick mats on or in the water. Blooms of algae can harm aquatic life by clogging fish gills, reducing oxygen levels, and smothering stream and lake beds and submerged vegetation. Some algae blooms can produce poisons that harm human health, pets, wildlife, and livestock when swallowed.*

What you can do: People can help reduce algae blooms in their local waters by using lawn and plant fertilizer sparingly and never before storms, regularly checking and pumping septic tanks, never dumping plant or animal waste in a waterway, disposing of pet waste in the trash, pumping boat waste to an onshore facility, and planting native plants to reduce excess nutrients entering waterways. Learn more about harmful freshwater algae, and how to reduce nitrogen and phosphorus pollution that causes excess algae growth.

Summary: Ranging from microbes to large seaweeds, algae are a natural part of the plant life in fresh and salt waters. They can become a problem when high nutrients and light, warmer temperatures, and low water flow result in very rapid growth. Runoff from over-fertilized lawns and croplands, leaking septic systems, wastes from animal feedlots, pets, industry, untreated sewage overflow, removal of shoreline plants, and reduced water flow due to irrigation or drinking water withdrawal all can contribute to a bloom. Algae blooms can harm aquatic life by clogging the gills of fish and small aquatic animals, reducing oxygen in the water, or by smothering corals and submerged aquatic vegetation. Algae blooms can also discolor the water, form huge, smelly piles on beaches, or cause drinking water, fish, and shellfish to taste bad. A small percentage of algae produce poisons that can cause illness in humans, pets, fish, livestock, and birds, which could result in death. Economic concerns associated with harmful algae blooms include increased drinking water treatment costs, loss of recreational and tourism income, loss of shellfish and fisheries jobs and food products, and livestock sickness or deaths. Coastal harmful algae blooms have been estimated to result in economic impacts to the United States of at least $82 million each year. Due to the potential human health risks, freshwater algae toxins are on the EPA drinking-water contaminants list, and fish and shellfish advisories are frequently posted in coastal areas. Around 1200 waters have been reported in this pollution category nationwide as of 2015, and several thousand more waters reported as polluted by nitrogen and phosphorus (nutrient) pollution or low dissolved oxygen can also involve algal growth problems.

AMMONIA *occurs naturally in water in trace amounts, but too much ammonia from fertilizers, sewage and other wastes can be poisonous to fish, especially when water temperature and pH are high. Ammonia can also cause heavy plant growth, foul odors, and low oxygen levels that can interfere with use for fishing, swimming and water supplies.*

What you can do: People can help reduce ammonia/nitrogen pollution by applying the correct amount of fertilizer on lawns and not applying it before storms, never dumping manure in or near a stream, picking up and disposing of pet waste in the trash, regularly pumping out septic tanks, and pumping boat waste to an onshore facility. Read more about ammonia pollution effects and what you can do to help reduce ammonia pollution.

Summary: Ammonia occurs naturally and is used in small amounts by plants for growth, but too much of it becomes poisonous to aquatic life especially in higher water temperatures and pH (water that is

more basic than acidic). Ammonia is a common cause of fish kills and can harm people's health after it is converted to nitrate by bacteria in the water. High nitrates in groundwater used for drinking have been linked to potentially fatal oxygen levels in babies, known as "blue-baby syndrome." Also, excess ammonia can cause heavy growth of harmful algae, which can cause illness in humans if swallowed during recreational activities such as swimming. Too much ammonia can also cause oxygen-poor waters, since dissolved oxygen in water is used up by bacteria and other microbes in converting ammonia into their food. Common man-made sources of ammonia pollution include fertilizer production and use, manure application to farmland, septic seepage, concentrated animal feeding operations, untreated sewage overflow, and animal and industrial waste. As of 2015, around 400 waters have been reported as polluted by ammonia. However, ammonia pollution also plays a big role in nitrogen and phosphorus pollution, which is currently the third highest reported cause of water pollution in the US affecting over 7,900 waterways as of 2015.

BIOTOXINS (BIOLOGICAL POISONS) *are toxins produced by aquatic plants, animals, and microbes that can sicken or even kill fish, shellfish, pets, livestock, wildlife, and people when swallowed or contacted. The leading producers of these poisons are blue-green algae, which can bloom into thick mats when high temperatures, still water, low water levels, and high nutrient levels are found.*

What you can do: People can help reduce the occurrence of toxic algae in their local waters by using lawn and plant fertilizer sparingly and never before storms, regularly checking and pumping out septic tanks, never dumping plant or animal waste in a waterway, disposing of pet waste in the trash, pumping boat waste to an onshore facility, and planting native plants near shores to reduce nutrient runoff into waterways. Learn more about harmful algal blooms and their toxins, and ways to reduce nitrogen and phosphorus pollution that causes excess algae.

Summary: Biological poisons (biotoxins) are water pollutants produced by microbes, animals or plants that can cause illness or death in humans, pets, fish, livestock, and birds. Most of the 82 waters reported in this category nationwide as of 2015 contain toxins produced by blue-green algae. Several thousand more waters are affected by nitrogen and phosphorus (nutrient) pollution, algae growth, or low dissolved oxygen, which can be associated with a potential biotoxin problem. Blue-green algae occur naturally in smaller numbers, but can become a problem when high nutrients and light, warmer temperatures, and/or low water flow, resulting in very rapid growth that creates dense blue-green algae blooms. Runoff of fertilizers on lawns and croplands, leaking septic systems, wastes from concentrated animal feeding operations, livestock farming, pets, and industry, untreated sewage overflow, removal of shoreline plants, and altered water flow for irrigation, municipal water supplies and industry all can contribute to cause a harmful bloom. Exposure to toxins from blue-green algae may occur through swallowing tainted water or fish, inhaling water vapor near a bloom, or contacting polluted water during recreational activities such as swimming. Economic concerns associated with harmful algae blooms include increased drinking-water treatment costs, loss of recreational and tourism revenue, loss of shellfish and fisheries revenue, and livestock sickness or death. Pets and wildlife have died after drinking from waterways with blue-green algae blooms. Due to the potential human-health risks, freshwater algae toxins are on the EPA drinking-water contaminants list, and fish and shellfish advisories are frequently posted in coastal areas with toxic algae problems.

CAUSE UNKNOWN *is a reporting category used when a state has detected degraded conditions in a waterway but has reported no specific details about those conditions or the pollution that caused them.*

What you can do: Your state water program may have more recent information on pollution cause, or added information not reported to EPA about your waterway. Contact your state water program to ask, or to report anything about possible causes that you may have observed. See EPA's CADDIS website for information on scientific methods for solving unknown causes.

Summary: This reason for reporting a degraded waterway means that a state has monitored and detected degraded conditions in a waterway, but has reported no specific details about those conditions or the pollution that caused them. About 1,150 waters are in this category as of 2015. Waters can be moved to other pollution categories as more is learned about the actual causes. The degraded conditions observed by the state but not reported may have included degraded fish or invertebrate communities, degraded aquatic habitat, or possibly other effects. Due to the uncertainty about conditions, causes, and sources, it is difficult to generalize about this category's potential effects on human health and beneficial uses or environmental impacts, or provide links for additional detailed information.

CAUSE UNKNOWN - FISH KILLS *-- large numbers of dead fish in a localized area – may be due to water conditions such as low flow, high temperatures or low oxygen levels, or to fish diseases or spills of oil or toxic substances.*

What you can do: People can help by never dumping anything for any reason in a stream or lake, and reporting evidence of fish kills immediately to a state water quality or fisheries management office.

Summary: When unusual numbers of dead fish are found in one place or along a water body, the incident is referred to as a fish kill. Usually fish kills are due to low oxygen or a contaminant in the water, not enough water, or a disease. Most waters with fish kills due to a known pollutant or other cause are reported under the pollutant type. The cause of death is sometimes unknown or unreported. This category includes 64 waters reported for fish kills of unknown cause as of 2015. Fish kills may be due to an isolated event such as a toxic spill into the water, but also can happen repeatedly under recurring conditions such as low flow or depleted oxygen. Fish kills may not affect human health, but they often mean reduced or lost fishing opportunities for up to several years. Rotting fish also degrades several other waterside recreational uses. These losses of beneficial use can hurt local economies that involve recreation. A fish kill also harms the environment by reducing or removing a major part of the water body's food chain, and this may sometimes enable less desirable aquatic life to dominate.

CAUSE UNKNOWN - IMPAIRED BIOTA (DEGRADED AQUATIC LIFE) *means that the community of aquatic animals (fish, reptiles, amphibians, aquatic insects and others) normally expected in a healthy waterway is unhealthy, reduced, or absent, and the exact cause of the problem is unknown.*

What you can do: Your state water program may have more recent information or added information not reported to EPA about your waterway. Contact your state water program to ask, or to report anything about degraded aquatic life or possible causes that you may have observed. See EPA's CADDIS website for more information on harm to aquatic life from unknown causes.

Summary: This pollution category means that the biological community normally expected in a lake, stream or other waterway is unhealthy, much reduced, or absent, and the exact pollutant cause is not known. Over 4,000 waters are listed in this category as of 2015. Degraded aquatic life associated with known causes is also a widespread problem reported under several specific pollutant names. Aquatic life includes fish, reptiles and amphibians, and a large variety of aquatic insects and other invertebrates. Normally there are enough of each of these forms of life to survive, reproduce, and serve as food for other animals. When pollution reduces or removes one form of aquatic life, this change often harms others as well. For example, a pollutant that eliminates all aquatic insects in a lake may make it unable to support fish even if the fish are not harmed by the pollutant directly. As the cause for this category is not known, it is not possible to tell whether a pollutant that has affected the fish or other life in a particular waterbody may pose a risk to human health as well. On the other hand, because this type of degradation generally involves reduction or loss of either fish or their food supply, it can impact people who make a living in the fishing industry, those who rely on fish for a source of food, and those who enjoy fishing opportunities.

CHLORINE, *used as a disinfectant and bleaching agent, is poisonous to fish and other aquatic animals at low levels. Discharges from swimming pools, storm water drains, industrial and sewage treatment facilities, and marinas can be sources of chlorine in waterways.*

What you can do: People can help reduce chlorine pollution in our waters by never dumping or rinsing off chlorine-containing disinfectants where the rinse water can wash into storm sewers or directly into a stream, lake or other waterway. Private pools should be emptied onto the ground rather than into waterways or storm drains. Read more about chlorine health effects.

Summary: Chlorine is a greenish-yellow gas that dissolves easily in water. Chlorine is not a frequently reported cause of water pollution, but over 50 waters nationwide are listed in this category. Chlorine is poisonous to fish even at very low levels. One of the most important uses of chlorine is the disinfection of drinking water to kill disease-producing bacteria. Chlorine is also used as a disinfectant in wastewater treatment plants and swimming pools, a bleaching agent in textile factories and paper mills, and is an ingredient in many laundry bleaches. Chlorine gets in our waterways from sources such as wastewater and industrial discharges and spills, urban rainfall runoff into storm water drains, and marinas. Swimming pools can be a major source of chlorinated water if they are emptied into sanitary and storm water drain systems. The storm water drain system was designed to handle runoff from rain and snow only, therefore, swimming pool water directly released into storm water drains, streets, or gutters is not treated before discharge into nearby creeks and rivers. Chlorinated waters from drinking water systems might also be released to waterways from water main breaks, leaks, and overflows. These types of releases are rarely treated before entering waterways because they happen fast and are difficult to contain. Drinking water in most towns and cities is poisonous to fish because of the chlorine it contains. Because treating municipal and industrial water supplies uses a large amount of chlorine, the excess often enters waterways where it combines with decaying material, forming other chemicals that can be cancer-causing to humans and pose a health threat to other living things.

DIOXINS, *highly toxic chemicals used in some manufacturing processes, can build up in the food chain. They may settle in sediment or on aquatic plants, then eaten and concentrated by fish, other aquatic life,*

wildlife, and people. Dioxins are considered likely to increase cancer risk and may harm the immune system, hormone levels, and fetal development.

What you can do: Human exposure to dioxins largely occurs through the food we eat. To reduce your exposure to dioxins in waterways, pay attention to local fishing advisories for fish you catch and eat yourself. See more EPA information on dioxins.

Summary: Dioxins are highly toxic chemicals formed unintentionally by burning trash or leaded gasoline and as waste byproducts from manufacturing some pesticides. These chemicals can be found in fish, some waterways, and their bottom sediments. They can reach waterways through the air, by rainfall runoff and soil erosion from contaminated sites, from pulp and paper mills, and from other industrial discharges. Dioxin levels in the environment have been declining since the early seventies but are still a concern at some sites because they are long-lasting in the environment, and some dioxins are still released at low levels. As of 2015 approximately 560 waters are reported as dioxin-polluted, mainly in the more industrialized states. Dioxins are considered likely to increase the risk of cancer in people and wildlife. At low doses, dioxins are linked to non-cancer effects on fetal development, immune systems, hormone levels and reproduction. Dioxins in water are found in sediments or on plants where they can be eaten and become concentrated in fish and other aquatic life. These chemicals may build up to harmful levels in fish and in the human body.

FISH CONSUMPTION ADVISORY (FISH UNSAFE TO EAT) *means that eating fish or shellfish caught from the waterway has been limited or banned, usually for certain species of fish/shellfish and for one or more chemicals, microbes or other conditions. In rivers and lakes, fish consumption advisories are usually issued because contaminants such as mercury or PCBs exceed safe limits in fish flesh; in coastal waters, shellfish harvesting may be banned due to unsafe levels of bacteria.*

What you can do: Pay attention to warnings, they are meant to protect your health. Note that most pollutants can't be seen or smelled in fish, and even if the catch appears normal the warnings still apply. EPA's website on fish advisories contains much more information than How's My Waterway on specific waters with this problem.

Summary: This reporting category means that a state has issued a warning to protect people from health risks of eating contaminated fish and shellfish caught in local waters. This advisory warning may recommend limiting or avoiding eating certain kinds of fish, fish from specific waters or from specific water types (such as "all lakes statewide"). Sometimes there are stricter advisories for pregnant women, nursing mothers, and children, all of which are more easily harmed. States also issue other guidelines to let people know that fish from some waters are safe to eat. Just 98 specific water bodies are currently listed in 2015 for having contaminated fish under the polluted waters reporting process. The low number is because other affected waters have been reported under the pollutant name instead. Other state and local procedures for reporting this problem account for far more waters. The 2010 total of 4,598 advisories covered 42% of the Nation's total lake acreage and 36% of the nation's total river miles. A variety of pollutants may be responsible for warnings about eating fish, and all such warnings address risk to human health. Bans on shellfish harvest in coastal waters are often due to unsafe levels of bacteria, which may come from sources such as sewage leaks or discharges, failing septic systems, or manure runoff. Fish advisories are also often due to unsafe levels of mercury, PCBs and other chemical pollutants that can build up in fish flesh.

FLOW ALTERATION (ABNORMAL FLOW) *refers to changes in river or stream volume caused by removing water for irrigation, water supply, and industry, and by dams, which hold and release water on a man-made cycle. Reduced flow can lower oxygen levels, raise water temperatures, cause build-up of sediment and pollutants, destroy aquatic wildlife habitat, and degrade swimming, boating, and fishing.*

What you can do: People can use less water wherever possible during droughts or when using water from waterways that already have low flow problems. See EPA websites for more information on flow alteration.

Summary: Major changes in stream or river flow are a form of pollution because they can reduce or eliminate fish survival, degrade a variety of beneficial human uses and indirectly make other pollutants more harmful. Although removing surface water for use is essential and widespread throughout the US, reporting of flow alteration as a direct cause of degradation is limited to approximately 200 waters mostly in the eastern and central states as of 2015. Common causes of altered flow include water removal for irrigation, municipal water supplies and industry. These uses of water are important, but in extreme cases they can reduce or eliminate other uses such as navigation, fishing or recreation. Some waterways with reduced flow dry up entirely as a result of withdrawals. Reduced water flow also indirectly affects many pollutants by providing less water to dilute contaminants. Lower water volumes can contribute to stagnant, warm water, buildup of mucky sediments, low oxygen and loss of fish and other aquatic life.

HABITAT ALTERATION (DEGRADED AQUATIC HABITAT) *occurs when stream channels are changed or diverted through man-made channels, artificial shorelines and stream banks replace natural ones, or native vegetation is removed from shores and banks. These actions reduce the habitat that fish and other animals need to reproduce, feed, and find shelter, and can also affect the appearance and value of waterfront property.*

What you can do: Waterfront property owners or users can reduce habitat degradation by not removing streamside vegetation or channelizing streams, not filling stream pools, wetlands or other waters, keeping natural shorelines intact, and leaving some rocks, logs or native aquatic plants as cover for fish. These actions can maintain recreational uses and appearance while avoiding unnecessary maintenance chores and costs. Read more about degraded habitat causes and effects.

Summary: Degraded habitats are areas where the conditions needed for fish and other aquatic life to feed, reproduce, find shelter, and survive have been reduced or lost. About 860 waters throughout the US were identified in this pollution category as of 2015. Because damages to habitat by water flow changes or specific pollutants (such as sediment) are reported separately, this habitat degradation category mainly refers to structural changes, such as loss of pools or deep channels where fish can gather, removal of plants, logs and rocks that provide cover, or changes that make areas unsuitable for spawning. Stream straightening, channelization, filling stream pools, lining streambeds with concrete, and replacing natural shorelines with artificial walls are common forms of man-made habitat degradation. These types of changes can harm aquatic life but do not directly pose risks to human health. However, degraded habitats often make fishing and other forms of water-based recreation undesirable, and can impact the appearance and value of waterfront property.

MERCURY *is found in many rocks, including coal. Released into the air by coal-fired power plants, it settles on land and is washed into waterways. Spills and improper treatment and disposal of mercury-containing products or wastes are among other top sources of mercury in water. Mercury can build up in fish, which then poses health risks to people and animals that eat fish.*

What you can do: People can help reduce mercury in the air and water by purchasing mercury-free products and correctly disposing of products that contain mercury. Fish consumption warnings for specific waters concerning mercury are also compiled by EPA. Read more about mercury sources, risks and health effects.

Summary: Mercury, a metal that is found in air, water and soil, is known to most people for its use in products like thermometers, switches, and some light bulbs. Mercury ranks among the top ten national causes of water pollution, with over 4,500 waters reported as of 2015. Many of these reported waters are in northern states where special studies have detected large numbers of mercury-polluted lakes, including many in remote areas. As a water pollutant, mercury can build up in fish tissue, be dissolved in the water, or be deposited in bottom sediments. Mercury is found in many rocks, including coal. When coal is burned, mercury is released into the environment. Coal-burning power plants account for over half of all US man-made mercury emissions, but mercury in the air also involves worldwide sources. Burning hazardous wastes, producing chlorine, breaking mercury products, and spilling mercury, as well as improper treatment and disposal, can also release it into the environment. Mercury in the air eventually settles into water or onto land where it can be washed into water. Once deposited, certain microbes can change it into a highly toxic form that builds up in fish, shellfish and animals that eat fish. The most common way people can be exposed to mercury is by eating fish or shellfish that are contaminated with mercury. Eating fish from mercury-polluted waters should be avoided, especially by children and nursing or pregnant women. Eating mercury-contaminated fish or shellfish can affect the human nervous system and harm the brain, heart, kidneys, lungs, and immune system.

METALS OTHER THAN MERCURY *enter waterways from factories, mining, and runoff from urban areas, as well as from natural processes such as erosion of soil and rocks. At high levels, all metals such as arsenic, cadmium, chromium, copper, lead, selenium, and zinc can be toxic to aquatic animals and humans.*

What you can do: People can help by following proper disposal of metal-containing appliances and products. Read more about metals in waterways.

Summary: Metals occur in nature, although the amount occurring naturally varies according to local geology. The common metals occurring in water are arsenic, cadmium, chromium, copper, lead, nickel, selenium, zinc, and mercury, but EPA tracks mercury separately. Excess metals are the third most frequent reported cause of waterbody pollution, affecting over 5,900 waters nationwide as of 2015. Metals in waterways can come from human activities (industrial processes, mining, and rainwater runoff from urban areas) and natural processes (mainly erosion of soil and rocks) resulting in the release of metals into air, water, and soil. Metals at toxic levels in water are rarely due to natural causes alone. Metals on land and in soils can also infiltrate into groundwater. Disturbed soils in metals-enriched areas can wash into streams during storms. Metals in the air from industrial emissions can be deposited onto waters or land surfaces. All metals can be toxic to aquatic animals and humans at sufficiently high exposure levels. Human health problems from high exposure, such as drinking contaminated water over a prolonged period, can include damage to organs. Excess metals at toxic concentrations can affect the survival, reproduction, and behavior of aquatic animals and can result in fish kills. Additionally, toxic

levels of metals can decrease a waterway's suitability for industrial and household water uses. Metals can be removed from water destined for human use, but treatment can be expensive.

NOXIOUS AQUATIC PLANTS (EXCESS AQUATIC WEEDS) *choke waterways, degrade healthy aquatic habitats, and interfere with recreational uses such as swimming, fishing, and boating. Fertilizers, leaking septic tanks, pet and livestock wastes, sewage overflows and water withdrawals can contribute to the growth of excess aquatic weeds.*

What you can do: People can help control aquatic plants in their local waters by using lawn and plant fertilizer sparingly and never before storms, regularly checking and pumping out septic tanks, never dumping plant or animal waste in a waterway, disposing of pet waste in the trash, pumping boat waste to an onshore facility, and planting native plants to prevent nutrient runoff into waterways. Read more about ways to reduce nutrient pollution that causes the harmful overgrowth of aquatic plants.

Summary: Aquatic plants include native (naturally occurs in the waterway) and non-native (brought from somewhere else), non-invasive (not harmful) and invasive (harmful) plants. Normally, most aquatic plants play important and beneficial roles in waterways. However, under certain water conditions such as warmer temperatures, too much nitrogen and phosphorus pollution, and low flow, 'noxious' growth of native or non- native plants can choke off waterways and interfere with human uses and other aquatic life. Around 70 waters have been reported in this category nationwide as of 2015, and several thousand more waters are polluted by nitrogen and phosphorus (nutrient) pollution and organic enrichment, which can cause undesirable aquatic plants to become noxious. Overgrowth of both native and non-native plants can interfere with oxygen levels in the water, threaten survival of fish and other animals, make waterways unattractive, reduce property value, and degrade or prevent recreational uses including swimming, fishing, and boating. The use of fertilizers on lawns and croplands, leaky septic tanks, wastes from livestock farming, pets, untreated sewage overflow, removal of shoreline plants, and excess water withdrawal all can create favorable conditions for harmful overgrowth of aquatic plants.

NUISANCE EXOTIC SPECIES (NUISANCE PLANTS OR ANIMALS, FOREIGN), *often called invasive species, are plants, animals, fish, or microbes that are not native to the region and cause harm to native species, to recreation and other uses of the waterway, and/or to human health. In general, invasive species spread vigorously and enter waterways by many means such as accidental or intentional releases and attachment to boats and other recreational equipment.*

What you can do: People can help prevent the spread of aquatic invasive species by never dumping aquarium fish, plants or water into local waters, inspecting and thoroughly cleaning boats, trailers, and recreational equipment before use and after use, allowing watercraft to dry completely before launching into another body of water, and never releasing live baitfish or other bait. Learn more about waterways degraded by non-native, invasive species and how to help. EXIT Disclaimer

Summary: Nuisance species (also called invasive species) are non-native plants, animals, or microbes whose introduction to a waterway can be harmful to the environment, economy, or human health. Invasive species are one of the largest threats to marine and fresh waters. They can take over

waterways from desirable native plants and animals, degrade water quality and fish habitat, and reduce water availability. In turn, they can cause economic losses by reducing recreational and commercial activities such as sport and commercial fishing, boating, shipping, swimming, and shellfish consumption. Invasive species also can decrease aesthetics and property value, and clog industrial and municipal water pipes. The costs to control and eradicate these species in the U.S. alone amount to more than $137 billion annually. Common sources of aquatic invasive species introduction include ballast water from ships, boat hull fouling, aquaculture escapes, and other accidental and/or intentional releases. Even though invasive species affect many waterways, only 119 waters are currently listed under this specific pollution reporting category in 2015. The reason is that many waters polluted by nuisance species are listed in categories such as excess sediment or low oxygen where an aquatic invasive species is the source of the problem.

NUISANCE NATIVE SPECIES (NUISANCE PLANTS OR ANIMALS, NATIVE) *includes aquatic plants and animals that are native to the region (not brought in from elsewhere) but have become too crowded in the waterway due to other pollution. Overgrowth can interfere with oxygen levels in the water, threaten survival of fish and other animals, make waterways unattractive, reduce property value, and degrade or prevent recreational uses including swimming, fishing, and boating.*

What you can do: People can help control aquatic plants in their local waters by using lawn and plant fertilizer sparingly and never before storms, regularly checking and pumping out septic tanks, never dumping plant or animal waste in a waterway, disposing of pet waste in the trash, pumping boat waste to an onshore facility, and planting native plants to prevent nutrient runoff into waterways. Read more about ways to reduce nutrient pollution that causes the harmful overgrowth of aquatic plants.

Summary: Very few waters have been reported in this category nationwide, although other reporting categories exist with higher numbers for nuisance non-native plants and algae overgrowth. Normally, most species of native aquatic plants play important and beneficial roles in waterways. However, under certain water conditions such as warmer temperatures, too much nitrogen and phosphorus pollution, and low flow, abnormal growth of a few types of native plants can choke off waterways and interfere with human uses and other aquatic life. Under these same conditions, non-native plants can become a problem as well. Overgrowth of both native and non-native plants can interfere with oxygen levels in the water, threaten survival of fish and other animals, make waterways unattractive, reduce property value, and degrade or prevent recreational uses including swimming, fishing, and boating. The use of fertilizers on lawns and croplands, septic tank failure, wastes from livestock farming and pets, untreated sewage overflow, removal of shoreline plants, and excess water withdrawal all can create favorable conditions for harmful overgrowth.

NUTRIENTS (NITROGEN AND PHOSPHORUS) *in excessive amounts can cause aquatic plants to grow too fast, choking waterways, causing potentially harmful algae blooms, and creating low oxygen conditions that can harm fish and other aquatic life.*

What you can do: People can help reduce nitrogen and phosphorus pollution in their local waters by using lawn and plant fertilizer sparingly and never before storms, regularly checking and pumping our septic tanks, never dumping plant or animal waste in a waterway, disposing of pet waste in the trash, pumping boat waste to an onshore facility, and planting native plants to prevent nutrient runoff into

waterways. Read more about nitrogen and phosphorus pollution and learn more about what you can do to help reduce it. Technical details on nitrogen and phosphorus pollution can be found here.

Summary: Nitrogen and phosphorus (also called nutrients) are natural elements in the environment that are essential for plant and animal growth in normal amounts but are harmful in excess – too much of a good thing. These are among the top water pollutants nationally, degrading over 100,000 river and stream miles and over 3.5 million acres of lakes, reservoirs and ponds. About 7,900 nutrient-polluted waterbodies have been reported throughout the US as of 2015. Most nutrient pollution comes from runoff or discharges from fertilizing lawns and croplands, municipal waste treatment systems, and animal wastes from livestock farming. Excess nitrogen or phosphorus can cause too much aquatic plant growth and algae blooms, sometimes choking off waterways and causing toxic or oxygen-poor conditions that can kill fish and other aquatic life. Nitrogen and phosphorus pollution can be harmful to human health if the affected waterway is used for swimming or drinking water. Nitrates in drinking water wells have been linked to the fatal "blue baby syndrome." These pollutants can also harm local economies through increased drinking water treatment costs, poor fish and shellfish harvests, less income from reduced recreational tourism, and potentially reduced property values on polluted waterways.

OIL AND GREASE *includes fuel oil, gasoline, vegetable oil, and animal fats. Oils generally enter waterways through spills, leaks, and improper disposal, and can be toxic to plants and animals even in small amounts.*

What you can do: People can help reduce oil and grease pollution by always disposing of car oil and paints properly and never in storm sewers and drains, cleaning up spilled oil and grease with absorbent towels instead of hosing them into the street where they can eventually reach local waterways, and fixing oil leaks from vehicles right away. Read more about things you can do to prevent urban runoff leading to oil and grease pollution.

Summary: Oil and grease pollutants (oils) include petroleum (fuel oil, diesel oil, and gasoline) and non petroleum (vegetable oil and animal fats) oils. Oils are almost everywhere in small amounts, but they are a reported cause of water pollution in about 190 waters nationwide as of 2015. This pollutant tends to enter waterways as a result of leaks and spills occurring on land and on the water. Although large, major spills tend to be highly publicized and can do significant damage to waterways, small unreported spills also damage local waters and are more common. Oil and grease pollution affecting inland waters is often the sum total effect of many car/truck oil leaks, small unreported spills, or improper disposal of used oil that makes its way into storm drains. Other sources of spills and leaks can include oil production onshore and offshore, industrial food production facilities, fueling stations (marine and land), boats, and jet skis. Although heavier oils may sink and build up around rocks and sediments, most oils tend to float and spread on the water surface, creating a slick. Wind, water currents, and warmer waters can cause slicks to spread. Without much water movement, oils tend to collect in one spot and remain for long periods of time. Even in small amounts, oil can be toxic to plants and animals that live on or around the water surface and those that live under water, resulting in smothering or toxic effects. Spilled oil can also damage parts of the food web, contaminating fish and plants that we eat and water used for drinking.

ORGANIC ENRICHMENT/OXYGEN DEPLETION (LOW OXYGEN) *levels in water can occur naturally for short periods, but when they are extreme or long-lasting, they can sicken and even kill fish and other aquatic animals. Sewage wastewater, leaking septic tanks, farm and feedlot runoff, and runoff from city streets contain organic materials that decompose and use up oxygen in water; higher water temperature also lowers oxygen levels.*

What you can do: People can help avoid low dissolved oxygen problems in their local waters by never dumping plant or animal waste in a waterway, applying the correct amount of fertilizer on lawns and never before storms, disposing of pet waste in the trash, pumping out septic tanks regularly, and pumping boat waste to an onshore facility. Read more about dissolved oxygen pollution and what you can do to reduce nutrient pollution that results in organic enrichment and low dissolved oxygen.

Summary: Dissolved oxygen in the water is essential for healthy waterways. Aquatic plants consume oxygen at night even in healthy waters, so oxygen levels in the water can change naturally. Severe depletion of oxygen, however, is usually due to human activities that increase the amount of plant parts, chemicals or animal and human waste in the water. Prolonged periods of low dissolved oxygen are harmful to most aquatic life and can cause fish kills and large dead zones (areas that can't support aquatic life). Low dissolved oxygen and decay can cause foul smells and make waterfront properties and recreation unattractive. When excess organic matter enters the water and decays, it depletes the oxygen below levels that fish and other aquatic life forms need to survive. Some types of chemical pollutants also decrease oxygen in water and have similar effects. Runoff of chemical and manure-based fertilizer applied to lawns and croplands, septic or untreated sewage overflow, animal wastes from livestock farming and pets, and industrial waste such as discharges from pulp and paper mills can cause low oxygen. Reservoirs and activities that involve straightening streams can also cause oxygen-poor waters because they mix the air and water less than normal streamflow and decrease aeration. Prolonged high temperatures can also decrease oxygen since warm water cannot hold as much oxygen as cold water. Around 6,700 waters have been reported in this category nationwide as of 2015, making this the fourth most common reporting category, and several thousand more waters with nitrogen and phosphorus pollution or high temperature also affect dissolved oxygen in waters.

OTHER CAUSE *is a 'miscellaneous' reporting category used for dissolved gases, floating debris and foam, leachate, stormwater pollutants, and many other uncommon causes lumped together.*

What you can do: Your state water program may have more detailed information not reported to EPA about pollution causes. Contact your state water program with questions or to report what you have observed that may involve pollution causes.

Summary: This reporting category is not commonly used, and includes about 450 waters nationwide from recent reporting as of 2015. Waters in this 'miscellaneous' category represent a wide variety of types of problems. Some examples include dissolved gases, floating debris and foam, leachate, stormwater pollutants, and many other causes. Due to the variety of causes and sources, it is difficult to generalize about this category's potential effects on human health and beneficial uses or environmental impacts, or provide links for additional detailed information.

PATHOGENS (BACTERIA AND OTHER MICROBES) *are potentially disease-causing organisms from human or animal wastes that enter waters through septic tank leaks or sewage discharges, farm and feedlot manure runoff after rain, boat discharges, and pet and wildlife waste. People can become ill by eating contaminated fish or shellfish or swimming in waters with high levels of these microbes.*

What you can do: People can help reduce pathogen contamination by never dumping animal or boat waste in a waterway, fixing leaky septic tanks, picking up pet waste, and avoiding manure application close to shorelines or drainage ditches. Read more about pathogens in waterways and drinking water and health risks from pathogens.

Summary: Disease-causing bacteria and other microbes (viruses and protozoa) are called pathogens, and they usually come from human or animal waste. They are the most commonly reported cause of water pollution nationwide, with over 10,600 waters identified as of 2015. These microbes enter US waterways from both man-made and natural sources, and can affect human and animal health as well as several beneficial uses. They reach the water directly in urban and suburban areas from wastewater treatment plants, sewer overflows, failing sewer lines, slaughterhouses and meat processing facilities; tanning, textile, and pulp and paper factories; fish and shellfish processing facilities; sewage dumped overboard from recreational boats; and pet waste, litter and garbage. Rural sources include livestock manure from barnyards, pastures, rangelands, feedlots, unfenced farm animals in streams, improper manure or sewage land application, poorly maintained manure storage, and wildlife sources such as geese, beaver and deer. The amount of bacteria and other microbes present, and thus the health risks they represent, can change rapidly due to factors such as rainfall and runoff from the sources mentioned above. Serious but rarely life-threatening illnesses are caused mainly by swallowing pathogen-contaminated water during swimming or other recreation, but can also come from skin contact with the water or eating contaminated fish or shellfish. Livestock, pet, and wildlife illnesses can also occur. Besides causing illnesses, pathogens in waterways can cause significant economic losses due to beach closures, swimming and boating bans, and closures of shellfish harvest beds. When present in raw drinking water sources, they can be treated but require advanced and expensive methods to disinfect and filter the water supply.

PESTICIDES *such as herbicides and insecticides include a variety of toxic chemicals used to kill unwanted pests or weeds. In water, pesticides can affect the health of aquatic insects, fish, plants, and animals who are exposed through feeding or contact.*

What you can do: People can reduce pesticide pollution in waterways by always using insecticides and herbicides in proper doses, well away from waters or drainage ditches, only on still days, and disposing of waste properly. See more information on pesticide human health effects, insecticide effects on waterways, or herbicide effects on waterways.

Summary: Pesticides (including insecticides, fungicides and herbicides) are a broad variety of chemicals used to kill unwanted pests or plant life. About 1,800 waters throughout the US are currently reported as polluted by pesticides in 2015. Although pesticides are mainly used around homes, forestry, and agriculture, they can easily enter waters through direct application, drift from airborne applications, stormwater or irrigation runoff, discharge from industries, or wastewater treatment plants. Timing and amount of pesticide used, rainfall and wind after use, and how fast the pesticide degrades all affect how much of it may reach the water. The potential human health effects of pesticides depend on the type of

pesticide and amount of exposure, but can include nerve damage, hormonal effects, skin or eye irritation, or cancer-causing or reproductive effects. However, in many cases the amount of pesticide to which people are likely to be exposed is too small to pose a risk. Insecticide and herbicide effects on waters can be significant. Aquatic insects may be especially susceptible to insecticides, affecting a main food supply for fish. Fish themselves also can be killed or affected by slowed growth, less disease resistance, and poor reproduction. Death of aquatic plants from herbicides can remove food sources and cover for aquatic life, reduce oxygen and water quality, and degrade fish habitat.

PH/ACIDITY/CAUSTIC CONDITIONS (ACIDITY) *outside a certain range can sicken or kill fish and other aquatic life. Highly acidic or alkaline water can also release pollutants from sediments that can further harm aquatic life. Acidity in waterways is influenced by rock and soils, as well as human sources such as industrial and car emissions, mining, and agricultural runoff.*

What you can do: People can help reduce pH problems by applying the correct amount of fertilizer on lawns (and never before storms), properly disposing of chemicals such as household cleaners, and never dumping any of the above into ditches, waterways and storm drains. Read more about pH, and what you can do to help reduce acid rain.

Summary: The health and survival of aquatic plants and animals depends heavily on pH, which is a measurement of how acidic or basic the water is. Think of acid and base as two extremes, with neutral in the middle; a pH toward either extreme is generally harder for aquatic life to survive. Most aquatic plants and animals under those extreme conditions have reduced ability to grow, reproduce, and survive. Low pH (acidic) can cause toxic metals such as aluminum and copper to dissolve into the water from bottom sediments. High pH (basic or alkaline conditions) can increase the toxic form of ammonia, which can further harm fish and other aquatic life. Natural sources that influence acidity in waterways are the surrounding rock and soils, and processes such as decay of plants. Human activities that can result in acidity include agriculture (animal feedlots), urbanization and industry (emissions from vehicles and coal-fired power plants leading to acid rain and ocean acidification), and mining (acid mine drainage). Although human activities commonly result in more acidic conditions, high alkaline conditions can occur by means of stormwater runoff from sources associated with agriculture (lime-rich fertilizers) and urbanization (asphalt roads), wastewater discharges and leakage from sources associated with industry (e.g., soap manufacturing plants), and mining (oil and gas brine mining wastes). Around 4,300 waters have been reported as polluted by pH problems as of 2015, making this the 8th most common reporting category.

POLYCHLORINATED BIPHENYLS (PCBs) *are a toxic mixture of industrial chemicals which, although banned since the 1970s, are long-lasting in fish tissue and in the bottom sediments of rivers and lakes. PCBs in fish that are eaten by humans and wildlife can build up and may have cancer-causing and other health effects. PCB contamination has caused many fishing bans and warnings.*

What you can do: Your state water program may have more information about PCBs not reported to EPA. Contact your state water program with questions. See EPA websites for basic PCB information and PCB health effects.

Summary: PCBs, or polychlorinated biphenyls, are a toxic mixture of chlorinated chemicals that were banned in the late 1970s but are still a common pollutant because they build up in fish flesh and are long-lasting in the bottom sediments of rivers and lakes. Over 6,100 water bodies are listed in the PCB-polluted category as of 2015, making this the sixth-highest water pollution cause. PCBs have reached waterways worldwide by direct dumping, leakage from landfills not designed to handle hazardous waste, and through the air after burning PCB-containing waste. Originally PCBs were widely used in industry, particularly as coolants and lubricants in transformers and other electrical equipment. PCBs have been shown to cause cancer in animals. Studies have also provided evidence of potential cancer-causing effects in humans. Non-cancer health effects on the immune system, reproductive system, and nervous system in animals have been documented. PCBs are also related to deformities in birds and heart effects in young fish. PCB risks to human health occur when PCBs build up through eating PCB-contaminated fish and other sources. Other negative effects on people include recreational and commercial fishing bans at numerous PCB-contaminated lakes and rivers and the related economic impacts over the past 30 years.

RADIATION *can enter waterways through eroding or dissolving underground deposits of radioactive metals such as uranium, from the air due to accidental or intentional release, in seepage from improper disposal sites, in mining runoff or dumped mine tailings, or from industrial activities. It can become a health concern when radioactive materials become concentrated in waterways.*

What you can do: Read more about radiation and US waterways.

Summary: Although quantities that pose a health risk are uncommon and localized, radiation can be a water pollutant in some US waterways. 52 polluted waters currently occupy this reporting category as of 2015. Radioactive atoms, known as "radionuclides," are a water pollutant that comes originally from underground deposits of radium, uranium and other radioactive metals. Radioactive materials can enter water by being deposited in surface water from the air, by entering ground water or surface water from the ground through erosion, seepage, or human activities such as mining, farming, storm water, and industrial activities, or by dissolving from underground mineral deposits as water flows through them. Health becomes a concern when radionuclides become concentrated in bodies of water due to natural occurrences, accidental releases of radioactivity, or improper disposal practices. The primary environmental and human health risks from radiation involve cancer, but the degree of risk varies with how much radiation is involved over how long a time period.

SALINITY/TOTAL DISSOLVED SOLIDS/CHLORIDES/SULFATES (SALTS) *are minerals that dissolve in water; they can be toxic to freshwater plants and animals and make water unusable for drinking, irrigation, and livestock. Water withdrawals, road de-icing, human and industrial wastewater, fertilizer applications, mining and oil or gas drilling, and repeated use of irrigation water contribute to high levels of salts*.

What you can do: People can help by minimizing the use of de-icing salts where they may be washed off into waterways, storm drains and ditches. Please see more information on the sources and effects of salts on our waterways.

Summary: Salts are minerals that dissolve in water. Common table salt is a familiar example that consists of sodium and chloride, but salts can also consist of other minerals such as calcium magnesium, sulfate, bicarbonate, and potassium. Dissolved salts are essential to life in our waters when in small quantities, but too much is harmful to freshwater aquatic life and many human uses. More than 1,900 normally fresh water bodies across the country have been listed as polluted in 2015 because they contain too much salt. Most freshwater plants and animals tolerate only very low amounts of salts, and can sicken or die when these ranges are exceeded. Although salts occur naturally, human activities can increase salts to beyond the range tolerated by freshwater aquatic life. At higher salt levels, water becomes unusable for drinking, crop irrigation, livestock watering, and manufacturing. Some of the sources and activities that increase the salts in streams, lakes, groundwater and other waters include disposal of human and industrial wastewater, fertilizer and lime application, irrigation, mining and oil production, weathering of cement in urban areas, salt-water intrusion into drinking water supplies in arid areas and along the coasts, and de-icing treatment of roads and other surfaces during the winter. Once in a waterway, excess salt is very difficult to remove. Preventing salt from entering water in the first place is the best management strategy.

***SEDIMENT** is a problem when rain washes soil into waterways from fields, construction sites, yards, logging areas, city streets and other disturbed areas. Sediment can make water murky, hurt the health and habitats of fish and other aquatic animals, interfere with uses like fishing and swimming, and carry other pollutants sometimes including toxic chemicals.*

What you can do: People can help reduce sediment pollution by limiting soil erosion in any way possible, including not removing native plants from stream edges, not disturbing soil near ditches or waterways, and routing rainwater to areas where it can soak in rather than directly dump into a lake, stream or sewer system. Read more about sediment effects on waterways and ways to help control sediment problems.

Summary: Sediment is material eroded from rocks or soil and then transported and deposited in water. Sediment in the proper quantity is a natural part of the banks and bottom of lakes, streams and other waterways, but it becomes a problem when too much fine sediment enters the water or when it is contaminated by other pollutants. Excess fine sediment is one of the most common forms of pollution, reported as of 2015 in over 6,400 water bodies from all parts of the US. These waters most often suffer from excessive suspended sediment in the water or too much deposited fine sediment on the bottom. Too little sediment below dams sometimes causes streams to scour their channels and destroy fish habitat. Sediment problems happen when rain washes silt and other soil particles off of plowed fields, construction sites, logging sites, urban areas, and strip-mined lands into waterbodies. The sediment may clog and damage fish gills or suffocate eggs and aquatic insects on the bottom. Suspended silt may interfere with recreational activities like boating, fishing or swimming and degrade the beauty of waterways by reducing water clarity. Although sediment itself is generally harmless to human health or safety, indirect environmental or health risks can happen when nitrogen and phosphorus pollution and a variety of toxic chemicals attach to sediment particles on land and ride the particles into surface waters.

TASTE, COLOR AND ODOR *problems may indicate that pollutants are present; however, these problems are of concern mainly because they affect uses of waterways, such as swimming, drinking water supply, or aesthetic enjoyment.*

What you can do: Never dispose of any kind of waste into or close to any waterway. Learn more about taste, color and odor in drinking water.

Summary: This category of waterways may imply that water pollutants are present, but it is based mainly on the undesirable sensations they cause rather than for actual harm to human or environmental health. Although an unpleasant taste, color or odor may not be harmful to people or the environment, it can have a powerful effect on whether a waterway is acceptable by a community for many beneficial uses. Odor and taste, which can be caused by a wide variety of dissolved substances, are useful indicators of water quality even though odor-free water is not necessarily safe to drink. Color may be indicative of dissolved plant material or the presence of dissolved metals. Over 100 waters nationwide are listed for taste, color or odor problems in 2015, but only a small minority of states uses this reporting category. Most state water quality standards say generally that lakes, streams and other waters must be free from objectionable odors, tastes or colors, regardless of their use. But when the waterway is also a drinking water source, these characteristics become much more important because unpleasant levels can cause a community to reject the source as drinking water or require additional, expensive drinking water treatment to remove tastes, colors or odors. Further, unpleasant colors or odors in recreational waterways can lead people to reduce or stop their recreational uses of these areas, leading to local economic losses.

TEMPERATURE: *Many fish and other aquatic animals are sensitive to changes in water temperature and require a certain temperature range to survive. If water temperature goes outside that range for too long, they can sicken or die.*

What you can do: People can help avoid water temperature problems by not removing shade trees and shrubs from streambanks, using less water during droughts, and directing rainwater on pavement to soak into the ground instead of running into streams, lakes, or sewer systems. See more information on water temperature.

Summary: Abnormally high water temperature impacts aquatic life in many streams, lakes and other waters nationwide. As of 2015 about 3,100 waters have been reported as degraded by high temperature, mostly in the Northwest and the Northeast, due to concerns over salmon and trout survival. Waters can become too warm for fish and other life due to rain running off hot pavement, warmer water discharges from industry or agriculture, increased sunlight from streambank vegetation removal, and major water withdrawals in summer, leaving less water that heats more rapidly in the sun. High water temperatures can harm or kill fish and other life mainly by reducing the oxygen in the water or by raising temperatures above their survival limits. Warmer waters can also increase toxicity of pollutants, cause faster growth of undesirable algae blooms, and increase the spread of diseases in fish. Although high water temperature does not directly affect human health, it can speed up the growth of waterborne bacteria or toxic algae that can harm people or their pets if swallowed or contacted. Elevated temperature also directly degrades valuable uses such as recreational fishing, boating, and commercial salmon fishing.

TOTAL TOXICS *include a large number of harmful, man-made substances such as solvents, pesticides, fungicides, dioxins, PCBs, and furans. They enter waterways through improper application and disposal, runoff, spills, auto exhaust, and burning of chemical wastes. These chemicals are toxic to animals and people.*

What you can do: People can help eliminate toxics in waterways by never rinsing out contaminated containers or dumping directly into waterways or storm sewers. Also never flush down the toilet anything known to be poisonous, such as paints, paint strippers, other solvents, cleansers and disinfectants, prescription drugs, and automotive products. Read more about toxic chemical effects in waters and what you can do to help reduce toxic chemicals in our waterways.

Summary: Total toxics is a term used when a mix of harmful chemical pollutants occurs in a waterway. Roughly 500 waters nationwide are in this reporting category as of 2015, which is used when the exact types of chemicals in the water are not specified. Toxics in water or contaminated sediment may have come from industrial activities, wastewater treatment plants, landfills or hazardous waste sites. The potential for toxics to harm living things is dependent on the type and amount of the chemicals and how long a living thing has been exposed to them. Toxic chemicals in water can harm aquatic plants and animals by decreasing reproduction, increasing disease, and in some cases causing death. Toxic chemicals in higher amounts and over time generally can harm people's immune, reproductive, and nervous systems, and in some instances are cancer-causing.

TOXIC INORGANICS *refers to a wide range of pollutants including metals, fire retardants, cyanide, and perchlorate (used in rocket fuel) that are poisonous to aquatic life and people. Industrial or wastewater discharges, mining, landfills, and air deposition of car exhaust and coal-fired power plant emissions can contribute to high levels of toxic inorganic chemicals in waterways.*

What you can do: People can help eliminate toxics in waterways by never rinsing out contaminated containers or dumping directly into waterways or storm sewers. Also never flush down the toilet anything known to be poisonous, such as paints, paint strippers, other solvents, cleansers and disinfectants, prescription drugs, and automotive products. Read more about toxic chemical effects in waters and what you can do to help reduce toxic chemicals in our waterways.

Summary: Toxic inorganics are human-made or naturally occurring chemicals that can harm the health of aquatic life and people if exposed at high enough levels. Toxic inorganic pollutants include a wide range of chemicals from a wide array of sources. The most common toxic inorganic water pollutants as of 2015 are reported separately in their own categories, including mercury (over 4,000 waters reported), and other metals (around 6,000 waters reported). Around 370 other waters have been reported under the category of toxic inorganics, including antimony (used as a fire retardant in textiles and plastics), fluoride (added to drinking water to promote dental health), ozone (used to treat water to kill bacteria and viruses), cyanide (used in metal treatment), and perchlorate (used in rocket fuel). Human activities are usually responsible for introducing toxic concentrations of inorganic chemicals to waterways, including direct discharges from industrial or wastewater treatment plants, rain runoff and leakage from agricultural fields, mining operations, landfills, and rocket fuel manufacturing sites, and air deposition from car exhaust and coal-fired power plants.

TOXIC ORGANICS *are harmful, man-made chemicals that all contain carbon. They can build up in animal and fish tissues and sediments or get into drinking water supplies, posing potential long-term health risks.*

What you can do: People can help eliminate toxics in waterways by never rinsing out contaminated containers or dumping directly into waterways or storm sewers. Also never flush down the toilet anything known to be poisonous, such as paints, paint strippers, other solvents, cleansers and disinfectants, prescription drugs, and automotive products. Read more about toxic chemical effects in waters and what you can do to help reduce toxic chemicals in our waterways.

Summary: Toxic organic chemicals are harmful, man-made chemicals containing carbon. These often remain in the environment for long periods and can accumulate in animal and fish tissues and sediments. They also can get into drinking water supplies, posing potential long-term health risks to humans. Toxic organic chemicals are the reported cause of water pollution in over 450 waters nationwide as of 2015. These pollutants include a large number of chemicals such as solvents, pesticides, dioxins, PCBs, furans, and other nitrogen compounds. Common sources include wood preservatives, antifreeze, dry cleaning chemicals, cleansers, and a variety of other chemical products. Two important sources of toxic organic chemicals in water are improper disposal of industrial and household wastes and runoff of pesticides. Excessive application of insecticides, herbicides, fungicides, and rodenticides, or application of any of these shortly before a storm, can result in toxic chemicals being carried by stormwater runoff from agricultural lands, construction sites, parks, golf courses, and residential lawns to receiving waters. Other organic pollutants come from auto exhaust and from burning municipal and chemical wastes. Organic pollutants can build up in aquatic animals and increase in concentration. These substances can be toxic to all forms of life, and are known to cause cancer in animals. For humans, some of them are suspected to cause cancer and are also known to be harmful to immune, reproductive, nervous, and hormone systems.

TRASH *consists of litter, debris, and other types of discarded solid waste. Trash can be contaminated with toxins or bacteria, and it harms fish and wildlife that eat it or become entangled in it. In areas where people swim or wade, it also poses a human health and safety threat.*

What you can do: Never use waterways or their sloping banks as a place to dump garbage or litter of any amount. People can help by properly disposing of trash, not littering in or near waterways, preventing trash from being blown away, and picking up visible trash in and near waterways.

Summary: Trash consists of litter, debris, rubbish, refuse and other types of solid waste discarded by people. Trash in waterways is common and unsightly, but not usually enough to be the main cause for reporting a waterway as polluted. In fact, trash is the main reporting category for 70 polluted waters nationwide as of 2015. Litter left on sidewalks, streets, yards or other open areas may be carried by rainwater to storm drains that discharge into waterways. Trash can also be carried to waters from nearby areas by wind or rainwater runoff. Also of concern are trash "hotspots" where it piles up from illegal dumping and littering, such as on steep streambanks below a roadside pull-off. What happens to trash in waterways depends on trash size, ability to float, and rate of deterioration. Marine trash or debris, which degrades ocean beaches, comes from ocean dumping and beach litter. Once trash enters a waterway, it can float (used plastic food containers, wrappers and cans), sink (glass containers, cigarettes), or become suspended underwater (plastic grocery bags), and degrade the habitat and health

of aquatic plants and animals. Floating litter in water may be contaminated with toxic chemicals and bacteria, is unattractive to look at, and can harm aquatic animals and birds if they eat trash or become entangled. Trash that sinks can contribute to sediment contamination, and large trash items such as discarded appliances can result in stream erosion or contamination. Trash in waters can threaten the health or safety of people who use them for wading or swimming. Of particular concern are the bacteria and viruses associated with diapers, medical waste such as needles, and human or pet waste. Some trash items such as containers or tires can hold still water that grows mosquitos. Litter degrades the appearance and quality of waterways that provide recreation, drinking water, and numerous other benefits to society.

TURBIDITY (MURKY WATER) *refers to water that is cloudy, muddy or opaque (turbid) because of suspended soil particles, algae, microbes, or organic matter. These tiny particles can absorb heat and raise water temperatures, reduce oxygen for aquatic animals, reduce native aquatic plant growth, clog fish gills and smother fish eggs and aquatic insects.*

What you can do: Waterfront property owners or users can reduce turbidity by not removing streamside vegetation or channelizing streams, not filling wetlands or other waters, keeping natural shorelines intact, leaving some rocks, logs or native aquatic plants as cover for fish, and routing rainwater runoff to areas where it can soak in rather than directly dump into a lake, stream or sewer system. See also EPA information on reducing and controlling turbidity in drinking water.

Summary: Turbidity, a measure of how 'murky' the water is, has been reported as a pollution cause for over 2,900 waters nationwide as of 2015. Tiny particles of suspended matter or impurities can make water cloudy, muddy or opaque (turbid). Materials that cause water to be turbid may include clay, silt, fine organic matter, and microscopic life such as algae. The primary source of turbidity is rainwater runoff from disturbed or eroding land. Additional sources may include urban waste discharges, as well as particles from the decay of plant materials. High turbidity can reduce light penetration and degrade or eliminate aquatic plants in lakes and estuaries, leaving poorer shelter, nurseries, and food for fish and other aquatic animals. Loss of aquatic plants then allows wind and waves to stir up more cloudiness, which can make waters unattractive for recreational use. Suspended particles also increase temperature, reduce oxygen in water, clog fish gills and reduce survival of fish eggs. Although turbidity is not a direct cause of human health risk, other pollutants such as metals and bacteria may attach to suspended particles. If not controlled, turbidity can promote growth of bacteria, leading to waterborne diseases such as intestinal illnesses after swimming. Numerous studies show a strong relationship between reduction of turbidity and reduction of some disease-related microbes.

Appendix E - Pollutants of Concern

Pollutant Impacts on Water Quality	
Sediment	Sediment is a common component of stormwater, and can be a pollutant. Sediment can be detrimental to aquatic life (primary producers, benthic invertebrates, and fish) by interfering with photosynthesis, respiration, growth, reproduction, and oxygen exchange in water bodies. Sediment can transport other pollutants that are attached to it including nutrients, trace metals, and hydrocarbons. Sediment is the primary component of total suspended solids (TSS), a common water quality analytical parameter.
Nutrients	Nutrients including nitrogen and phosphorous are the major plant nutrients used for fertilizing landscapes, and are often found in stormwater. These nutrients can result in excessive or accelerated growth of vegetation, such as algae, resulting in impaired use of water in lakes and other sources of water supply. For example, nutrients have led to a loss of water clarity in Lake Tahoe. In addition, un-ionized ammonia (one of the nitrogen forms) can be toxic to fish.
Bacteria and Viruses	Bacteria and viruses are common contaminates of stormwater. For separate storm drain systems, sources of these contaminants include animal excrement and sanitary sewer overflow. High levels of indicator bacteria in stormwater have led to the closure of beaches, lakes, and rivers to contact recreation such as swimming.
Oil and Grease	Oil and grease includes a wide array of hydrocarbon compounds, some of which are toxic to aquatic organisms at low concentrations. Sources of oil and grease include leakage, spills, cleaning and sloughing associated with vehicle and equipment engines and suspensions, leaking and breaks in hydraulic systems, restaurants, and waste oil disposal.
Metals	Metals including lead, zinc, cadmium, copper, chromium, and nickel are commonly found in stormwater. Many of the artificial surfaces of the urban environment (e.g., galvanized metal, paint, automobiles, or preserved wood) contain metals, which enter stormwater as the surfaces corrode, flake, dissolve, decay, or leach. Over half the trace metal load carried in stormwater is associated with sediments. Metals are of concern because they are toxic to aquatic organisms, can bioaccumulate (accumulate to toxic levels in aquatic animals such as fish), and have the potential to contaminate drinking water supplies.
Organics	Organics may be found in stormwater at low concentrations. Often synthetic organic compounds (adhesives, cleaners, sealants, solvents, etc.) are widely applied and may be improperly stored and disposed. In addition, deliberate dumping of these chemicals into storm drains and inlets causes environmental harm to waterways.
Pesticides	Pesticides (including herbicides, fungicides, rodenticides, and insecticides) have been repeatedly detected in stormwater at toxic levels, even when pesticides have been applied in accordance with label instructions. As pesticide use has increased, so too have concerns about the adverse effects of pesticides on the environment and human health. Accumulation of these compounds in simple aquatic organisms, such as plankton, provides an avenue for biomagnification through the food web, potentially resulting in elevated levels of toxins in organisms that feed on them, such as fish and birds.
Gross Pollutants	Gross Pollutants (trash, debris and floatables) may include heavy metals, pesticides, and bacteria in stormwater. Typically resulting from an urban environment, industrial sites and construction sites, trash and floatables may create an aesthetic “eye sore” in waterways. Gross pollutants also include plant debris (such as leaves and lawn-clippings from landscape maintenance), animal excrement, street litter, and other organic matter. Such substances may harbor bacteria, viruses, vectors, and depress the dissolved oxygen levels in streams, lakes and estuaries sometimes causing fish kills.
Vector Production	Vector production (e.g., mosquitoes, flies, and rodents) is frequently associated with sheltered habitats and standing water. Unless designed and maintained properly, standing water may occur in treatment control BMP’s for 72 hours or more, thus providing a source for vector habitat and reproduction (Metzger, 2002).

Source: California Stormwater Quality Association, Stormwater BMP Handbook, 2003.

Potential pollutants likely associated with specific *municipal facilities*

Municipality Facility Activity	Potential Pollutants								
	Sediment	Nutrients	Trash	Metals	Bacteria	Oil & Grease	Organics	Pesticides	Oxygen Demanding Substances
Building and Grounds Maintenance and Repair	X	X	X	X	X	X	X	X	X
Parking/Storage Area Maintenance	X	X	X	X	X	X	X		X
Waste Handling and Disposal	X	X	X	X	X	X	X	X	X
Vehicle and Equipment Fueling			X	X		X	X		
Vehicle and Equipment Maintenance and Repair				X		X	X		
Vehicle and Equipment Washing and Steam Cleaning	X	X	X	X		X	X		
Outdoor Loading and Unloading of Materials	X	X	X	X		X	X	X	X
Outdoor Container Storage of Liquids		X		X		X	X	X	X
Outdoor Storage of Raw Materials	X	X	X			X	X	X	X
Outdoor Process Equipment	X		X	X		X	X		
Overwater Activities			X	X	X	X	X	X	X
Landscape Maintenance	X	X	X		X			X	X
Source: California Stormwater BMP Handbook (http://www.cabmphandbooks.com/)(slightly modified)									

Potential pollutants likely associated with *municipal activities*

Municipal Program	Activities	Potential Pollutants								
		Sediment	Nutrients	Trash	Metals	Bacteria	Oil & Grease	Organics	Pesticides	Oxygen Demanding Substances
Roads, Streets, and Highways Operation and Maintenance	Sweeping and Cleaning	X		X	X		X			X
	Street Repair, Maintenance, and Striping/Painting	X		X	X		X	X		
	Bridge and Structure Maintenance	X		X	X		X	X		
Plaza, Sidewalk, and Parking Lot Maintenance and Cleaning	Surface Cleaning	X	X			X	X			X
	Graffiti Cleaning	X	X		X			X		
	Sidewalk Repair	X		X						
	Controlling Litter	X		X		X	X			X
Fountains, Pools, Lakes, and Lagoons Maintenance	Fountain and Pool Draining		X					X		
	Lake and Lagoon Maintenance	X	X	X		X			X	X
Landscape Maintenance	Mowing/Trimming/Planting	X	X	X		X			X	X
	Fertilizer & Pesticide Management	X	X						X	
	Managing Landscape Wastes			X					X	X
	Erosion Control	X	X							
Drainage System Operation and Maintenance	Inspection and Cleaning of Stormwater Conveyance Structures	X	X	X		X		X		X
	Controlling Illicit Connections and Discharges	X	X	X	X	X	X	X	X	X
	Controlling Illegal Dumping	X	X	X	X	X	X	X	X	X
	Maintenance of Inlet and Outlet Structures	X		X	X		X			X
Waste Handling and Disposal	Solid Waste Collection		X	X	X	X	X	X		X
	Waste Reduction and Recycling			X	X					X
	Household Hazardous Waste Collection			X	X		X	X	X	
	Controlling Litter			X	X	X		X		X
	Controlling Illegal Dumping	X		X		X	X		X	X
Water and Sewer Utility Operation and Maintenance	Water Line Maintenance	X				X	X			
	Sanitary Sewer Maintenance	X				X	X			X
	Spill/Leak/Overflow Control, Response, and Containment	X	X			X		X		X
Source: California Stormwater BMP Handbook (http://www.cabmphandbooks.com/)										

Appendix F - Plan Amendment Log

Client: Town of Manchester, MA
Project: Manchester-by-the- Sea SWMP
Date: 06/30/2023

Bobrek Engineering & Construction
100 Conifer Hill Rd, Suite 204
Danvers, MA 01923

Revision Log

Revision No.	Revision Date	Section of SWMP	Revision(s) Made/Reasoning	Signature
00	10/26/2018	--	--	See Original Certification Page
01	6/30/2020	1.2.1	Note added to address how the approved 2016 Massachusetts List of Integrated Waters will be incorporated into this SWMP	
		1.2.2	Revised language to reflect that receiving waterbodies are listed in the Town's MS4 General Permit NOI submission to the EPA	
		1.4	Added language to reflect that changes to the information submitted in the Town's NOI shall be addressed in the Annual Report and SWMP updates	
		1.5	Revised Responsible Parties table to reflect personnel changes	
		2.1.4	Revised language to reflect that receiving waterbodies are listed in the Town's MS4 General Permit NOI submission to the EPA	
		2.2.1	Revised language to reflect that a Land Development Program Manual has been completed	
		2.2.4	NEW SECTION: Added language to reflect that the Town will develop a Green Infrastructure Report in PY4	
		2.2.5	NEW SECTION: Added language to reflect that the Town will develop a Retrofit Properties Inventory in PY4	
		2.3.1	NEW SECTION: Added language to reflect that the Town has developed a Clean Water Best Practices Manual	
		2.3.2	Revised language to reflect that a Municipal Facility Inventory has been completed	
		2.3.3	Revised language to reflect that O&M SOPs have been completed	
		2.3.4	NEW SECTION: Added Language to reflect that the Town has developed SWPPPs for its Department of Public Works and Transfer Station Facilities	
		Appendix A		
02	6/25/2021	1.1, 2.1.1,2.2.1, 2.2.2, 2.3.1, 2.3.2	Changed Water and Sewer Commission to Department of Public Works	
		1.2	Update the 2014 Intergrated list of waters to 2016	
		1.2	Add Enterococcus to Salem Harbor Impairement list	
		1.2	Change Category of Salem Harbor from Cat 4/5 to just Category 5	
		1.5	change chart to have Department of Public Works at the top	
		1.5	change role of DPW to "CM 1, 2, 3, 5, 6 with below additions"	
		1.5	Change role of Water and Sewer Commission to "CM 1 and 3"	
03	6/30/2022	1.3	Updated Summary of 2013 General Permit to a summary of 2016 General Permit; updated definition of urbanized areas based on the Census' 2020 definition	
		1.3.1	Revised language to reflect current public education and outreach practices	
		1.3.4	Revised language to clarify Stormwater Management and Erosion Control Bylaw; Added language to reflect addition of Street/Parking Design Assessment, Green Infrastructure Feasibility Assessment, and Permittee-owned Property Retrofit Plan	
		2.2.1	Changed Integrated List of Waters to 2018/2020 Integrated List; changed Salem Sound and Marblehead Harbor to Category 5	
		Appendix D	Updated Summaries of Water Pollution Reporting Categories from 2012 to 2016 list	
		Appendix G	Added definitions for Low Impact Development and Green Infrastructure	
		Appendix I	Updated IDDE Plan-Table and Map of Impaired Waters, IDDE Program schedule; Stormwater System Overview Map; Catchment Prioritization Map	
		Appendix J	Updated Operation and Maintenance Plan- Winter Road Maintenance	
		Appendix K	Updated SWPPPs with Inspection Reports	
		Appendix L	Added Street and Parking Design Report	
		Appendix L	Added Green Infrastructure Feasibility Report	
04	6/30/2023	Appendix M	Added Permittee Owned Property Report	
		Appendix I	Updated IDDE Plan- Stormwater Overview Map; SSO Inventory; Water Quality Analysis Instructions/User Manuals; IDDE Employee Training Record	
		Appendix K	Updated SWPPPs with Inspection Reports and Training Sign-in Sheet	
		Appendix M	Added DPW Yard to Permittee-own property inventory	

Appendix G - Definitions, Abbreviations, and Acronyms

Appendix VII: Definitions, Abbreviations and Acronyms Definitions

Best Management Practices (BMPs) - Schedules of activities, practices (and prohibitions of practices), structures, vegetation, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Common Plan of Development - A "larger common plan of development or sale" is a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one plan. For example, if a developer buys a 20-acre lot and builds roads, installs pipes, and runs electricity with the intention of constructing homes or other structures sometime in the future, this would be considered a larger common plan of development or sale. If the land is parceled off or sold, and construction occurs on plots that are less than one acre by separate, independent builders, this activity still would be subject to stormwater permitting requirements if the smaller plots were included on the original site plan.

Control Measure - Refers to any BMP or other method (including effluent limitations) used to prevent or reduce the discharge of pollutants to waters of the United States. Discharge - When used without qualification, means the "discharge of a pollutant."

Discharge of a Pollutant - Any addition of any “pollutant” or combination of pollutants to “waters of the United States” from any “point source”. This includes additions of pollutants into waters of the United States from surface runoff which is collected or channeled by man; or discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works.

Discharge-related Activities - Activities which cause, contribute to, or result in stormwater and allowable non-stormwater point source discharges, and measures such as the siting, construction and operation of BMPs to control, reduce, or prevent pollution in the discharges.

Disturbance - Action to alter the existing vegetation and/or underlying soil of a site, such as clearing, grading, site preparation (e.g., excavating, cutting, and filling), soil compaction, and movement and stockpiling of top soils.

Existing Discharger - An operator applying for coverage under this permit for discharges covered previously under an NPDES general or individual permit.

Facility or Activity - Any NPDES “point source” or any other facility or activity (including land or appurtenances thereto) that is subject to regulation under the NPDES program.

Green Infrastructure – The range of measures that use plant or soil systems, permeable pavement or other permeable surfaces or substrates, stormwater harvest and reuse, or landscaping to storm, infiltrate, or evapotranspirate stormwater and reduce flows to sewer systems or to surface waters, according to the Water Infrastructure Improvement Act.

Illicit Discharge - Any discharge to a municipal separate storm sewer that is not composed entirely of stormwater except discharges pursuant to a NPDES permit (other than the NPDES permit for discharges from the municipal separate storm sewer) and discharges resulting from firefighting activities.

Impaired Water - A water is impaired if it does not meet one or more of its designated use(s). In this context, "impaired" refers to categories 4 and 5 of the five-part categorization approach used for classifying the water quality standards attainment status for water segments under the TMDL program. Impaired waters compilations are also sometimes referred to as "303(d) lists." Category 5 waters are impaired because at least one designated use is not being supported or is threatened and a TMDL is needed. Category 4 waters indicate that at least one designated use is not being supported but a TMDL is not needed (4a indicates that a TMDL has been approved or established by EPA; 4b indicates other required control measures are expected in result in the attainment of water quality standards in a reasonable period of time; and 4c indicates that the non-attainment of the water quality standard is the result of pollution (e.g. habitat) and is not caused by a pollutant). See USEPA's 2006 Integrated Report Guidance, July 29, 2005 for more detail on the five part categorization of waters [under EPA National TMDL Guidance http://www.epa.gov/owow/tmdl/policy.html]).

Impervious Surface - Any surface that prevents or significantly impedes the infiltration of water into the underlying soil. This can include but is not limited to: roads, driveways, parking areas and other areas created using non porous material; buildings, rooftops, structures, artificial turf and compacted gravel or soil.

Industrial Activity - The ten categories of industrial activities included in the definition of "stormwater discharges associated with industrial activity," as defined in 40 CFR 122.26(b)(14)(i)-(ix) and (xi).

Industrial Stormwater - Stormwater runoff associated with the definition of "stormwater discharges associated with industrial activity."

Interconnection - 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 eventually conveyed to a water of the United States. Interconnections shall be treated similarly to outfalls throughout the permit. In Lexington, locations where stream channels discharge to adjacent communities have also been mapped as Interconnections.

Junction Manhole - For the purposes of this plan, a 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 Manhole - For the purposes of this plan, 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.

Low Impact Development (LID) – refers to systems and practices that use or mimic natural processes that result in the infiltration, evapotranspiration or use of stormwater in order to protect water quality and associate aquatic habitat. LID is an approach to land development (or re-development) that works with nature to manage stormwater as close to the source as possible. LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage to treat stormwater as a resource rather than a waste product.

Municipal Separate Storm Sewer - A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man- made channels, or storm drains): (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States; (ii) Designed or used for collecting or conveying stormwater; 3 (iii) Which is not a combined sewer; and (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

Municipal Separate Storm Sewer System (MS4) - Means all separate storm sewers that are defined as "large" or "medium" or "small" municipal storm sewer systems pursuant to paragraphs 40 CFR 122.26 (b)(4) and (b)(7), or designated under paragraph 40 126.26(a) (1)(v). For the purposes of this permit "MS4" may also refer to the permittee with jurisdiction over the sewer system.

New Development - Any construction activities or land alteration resulting in total earth disturbances greater than 1 acre (or activities that are part of a larger common plan of development disturbing greater than 1 acre) on an area that has not previously been developed to include impervious cover. (see part 2.3.6. of the permit)

Outfall Catchment - The land area draining to a single outfall or interconnection. The extent of an outfall's catchment is determined not only by localized topography and impervious cover but also by the location of drainage structures and the connectivity of MS4 pipes.

Owner or Operator - The owner or operator of any "facility or activity" subject to regulation under the NPDES program.

Point Source - Any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural stormwater runoff.

Pollutant - Dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal and agricultural waste discharged into water.

Pollutant of Concern - A pollutant which causes or contributes to a violation of a water quality standard, including a pollutant which is identified as causing an impairment in a State's 303(d) list. Redevelopment- For the purposes of this plan, any construction, land alteration, or improvement of impervious surfaces resulting in total earth disturbances greater than 1-acre (or activities that are part of a larger common plan of development disturbing greater than 1 acre) that does not meet the definition of new development (see above).

Site - For the purposes of this plan, the area extent of construction activities, including but not limited to the creation of new impervious cover and improvement of existing impervious cover. Stormwater - Stormwater runoff, snow melt runoff, and surface runoff and drainage.

Stormwater Discharges Associated with Construction Activity - A discharge of pollutants in stormwater runoff from areas where soil disturbing activities (e.g., clearing, grading, or excavating), construction materials, or equipment storage or maintenance (e.g., fill piles, borrow areas, concrete truck washout, fueling), or other industrial stormwater directly related to the construction process (e.g., concrete or asphalt batch plants) are located. (See 40 CFR 122.26(b)(14)(x) and 40 CFR 122.26(b)(15). 4

Total Maximum Daily Loads (TMDLs) - A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL includes waste load allocations (WLAs) for point source discharges, load allocations (LAs) for nonpoint sources and/or natural background and must include a margin of safety (MOS) and account for seasonal variations. (See section 303(d) of the Clean Water Act and 40 CFR 130.2 and 130.7).

Urbanized Area - US Census designated area comprised of a densely settled core of census tracts and/or census blocks that meet minimum population density requirements, along with adjacent territory containing non-residential urban land uses as well as territory with low population density included to link outlying densely settled territory with the densely settled core. For the purposes of this permit, Urbanized Areas as defined by any Census since 2000 remain subject to stormwater regulation even if there is a change in the reach of the Urbanized Area because of a change in more recent Census data.

Water Quality Limited Water - for the purposes of this permit, a water quality limited water is any waterbody that does not meet applicable water quality standards, including but not limited to waters listed in categories 5 or 4b on the Massachusetts Integrated Report of waters listed pursuant to Clean Water Act section 303(d) and 305(b).

Water Quality Standards - A water quality standard defines the water quality goals of a water body, or portion thereof, by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses. States and EPA adopt WQS to protect public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act (See CWA sections 101(a)2 and 303(c)).

Abbreviations and Acronyms

BMP – Best Management Practice
CGP – Construction General Permit
CWA – Clean Water Act (or the Federal Water Pollution Control Act, 33 U.S.C. §1251 et seq)
DCIA – Directly Connected Impervious Area
EPA – U. S. Environmental Protection Agency
ESA – Endangered Species Act
USFWS – U. S. Fish and Wildlife Service

GI- Green Infrastructure
IA – Impervious Area
IDDE – Illicit Discharge Detection and Elimination
LA – Load Allocations
LID- Low Impact Development
NOI – Notice of Intent
NPDES – National Pollutant Discharge Elimination System
NRHP – National Register of Historic Places
PCP – Phosphorus Control Plan (pertaining to Charles River Watershed phosphorus
POTW – Publicly Owned Treatment Works
SHPO – State Historic Preservation Officer
MOS – Margin of Safety
MS4 – Municipal Separate Storm Sewer System
MSGP – Multi-Sector General Permit
NHPA – National Historic Preservation Act
NMFS – U. S. National Marine Fisheries Service
SPCC – Spill Prevention, Control, and Countermeasure
SWMP – Stormwater Management Program
SWPPP – Stormwater Pollution Prevention Plan
TMDL – Total Maximum Daily Load
USGS – United States Geological Survey
WLA – Wasteload Allocation
WQS – Water Quality Standard

Appendix H - Public Education, Outreach, and Involvement Plan

GREENSCAPES NORTH SHORE COALITION

MCM 1: Public Education and Outreach - NOI FORM

* All literature and media will be available online at www.greenscapes.org and can be shared with member communities at any time.

** Community can decide how to address Greenscapes' involvement. They may choose to list GS as an external contractor, or can list whomever in their town GS communicated with for each BMP, respectively.

BMP Media/ Category	BMP Description*	Targeted Audience	Responsible Parties/ Depts**	Measurable Goal	Implementation Year
Brochure/ Pamphlets	Brochure will consist of a 'how-to-guide' for residents on how rain gardens work and how to install them at their home.	**Residents**	Greenscapes North Shore Coalition	- Number distributed - Resident testimonials	**2018 (Fall)**
Brochure/ Pamphlets	An updated version of comprehensive literature, discussing the importance of "greenscaping", small-scale stormwater management practices, sewer/septic system maintenance and other ways to avoid illicit discharge.	**Residents**	Greenscapes North Shore Coalition	- Number distributed - Resident testimonials	**2019 (Spring)**
Workshop/ Info Sheet	Workshop and associated literature will cover LID options for reducing runoff and promoting on-site infiltration. Pricing, maintenance and ordinances will also be discussed.	**Developers (Construction)**	Greenscapes North Shore Coalition and *municipal entity*	- Number of attendees - Increase in LID use	**2019 (Winter)**
Displays/ Posters/ Kiosks	Informational poster will be placed in area with heavy dog/walker traffic. Poster will describe proper pet waste management and disposal.	**Residents**	Greenscapes North Shore Coalition	- Pilot surveys may be conducted before and after message posting	**2019 (Spring)**
Brochure/ Pamphlets	Pet Waste literature is available in two forms (one page info sheet or rack card) and can be redistributed as necessary.	**Residents**	Greenscapes North Shore Coalition	- Number distributed - Resident testimonials	**2018**
Social Media Post	Greenscapes will provide content for a social media "blast" on town Facebooks etc. Ex. Autumnal facebook post describing proper disposal of leaf collection, and springtime post about proper lawn/fertilizer maintenance.	**Residents**	Greenscapes North Shore Coalition and *municipal entity*	- Number of views/ likes/ comments - Resident testimonials before and after posting	**2018**
School Curriculae/ Programs	*Elementary School Name* will host Greenscapes "Keeping Water Clean" Program.	**Residents**	Greenscapes North Shore Coalition	- Number of students/ teachers/ volunteers in attendance - Subset of students evaluated before and after program	**2018**
Brochure/ Pamphlets	Brochure will include general info on LIDs that can assist in stormwater management and pollution prevention. Content will be targeted to "environmental contacts" at industrial facilities, or property managers where applicable.	**Industrial Facilities**	Greenscapes North Shore Coalition	- Number distributed - Phone call followup	**FY2020**
Workshop	Stormwater presentation will discuss specific BMPs for parking lots; how to reduce impervious surfaces, and maintain the space more sustainably.	**Businesses/ Institutions and Commercial Facilities**	Greenscapes North Shore Coalition and *municipal entity*	- Number of attendees - Number of presentations re-distributed to commercial representatives.	**FY2020**
Displays/ Posters/ Kiosks	An updated version of informational display, discussing the importance of "greenscaping", small-scale stormwater management practices, sewer/septic system maintenance and other ways to avoid illicit discharge.	**Residents**	Greenscapes North Shore Coalition	- Number distributed - Resident testimonials	**FY2020**
Brochure/ Pamphlets	Pet Waste literature is available in two forms (one page info sheet or rack card) and can be redistributed as necessary.	**Residents**	Greenscapes North Shore Coalition	- Number distributed - Resident testimonials	**FY2020**
Social Media Post	Greenscapes will provide content for a social media "blast" on town Facebooks etc. Ex. Autumnal facebook post describing proper disposal of leaf collection, and springtime post about proper lawn/fertilizer maintenance.	**Residents**	Greenscapes North Shore Coalition and *municipal entity*	- Number of views/ likes/ comments - Resident testimonials before and after posting	**FY2020**
School Curriculae/ Programs	*Elementary School Name* will host Greenscapes "Keeping Water Clean" Presentation.	**Residents**	Greenscapes North Shore Coalition	- Number of students/ teachers/ volunteers in attendance - Subset of students evaluated before and after program	**FY2020**

Workshop	Workshop and literature will go into greater detail, following the workshop regarding low impact development held in year one. City ordinances and associated incentives will be outlined.	**Developers (Construction)**	Greenscapes North Shore Coalition and *municipal entity*	- Number of attendees	**FY2021**
Web Page	Story Map will outline and describe different examples of existing low-impact-developments in the North Shore Community.	**Residents**	Greenscapes North Shore Coalition	- Number of map views - Resident testimonials on LID awareness	**FY2021**
Brochure/ Pamphlets	Pet Waste literature is available in two forms (one page info sheet or rack card) and can be redistributed as necessary.	**Residents**	Greenscapes North Shore Coalition	- Number distributed - Resident testimonials	**FY2021**
Social Media Post	Greenscapes will provide content for a social media "blast" on town Facebooks etc. Ex. Autumnal facebook post describing proper disposal of leaf collection, and springtime post about proper lawn/fertilizer maintenance.	**Residents**	Greenscapes North Shore Coalition and *municipal entity*	- Number of views/ likes/ comments - Resident testimonials before and after posting	**FY2021**
School Curriculae/ Programs	*Elementary School Name* will host Greenscapes "Keeping Water Clean" Program.	**Residents**	Greenscapes North Shore Coalition	- Number of students/ teachers/ volunteers in attendance - Subset of students evaluated before and after program	**FY2021**
Meeting/ Presentation	Presentation will discuss proper "greenscaping" practices on a business/commercial level. Content will be targeted ro property managers and will include sand/salt storage and landscape management.	**Businesses/ Institutions and Commercial Facilities**	Greenscapes North Shore Coalition and *municipal entity*	- Number of attendees	**FY2022**
Meeting/ Presentation	Presentation will discuss proper "greenscaping" practices on an industrial level. Content will be targeted ro property managers and will include sand/salt storage and landscape management.	**Industrial Facilities**	Greenscapes North Shore Coalition and *municipal entity*	- Number of attendees	**FY2022**
Brochure/ Pamphlets	"What not to Flush" rack card will raise resident awareness of the damages of flushing things like wipes and grease in their toilets/sinks.	**Residents**	Greenscapes North Shore Coalition	- Number distributed - Resident testimonials	**FY2022**
Brochure/ Pamphlets	Pet Waste literature is available in two forms (one page info sheet or rack card) and can be redistributed as necessary.	**Residents**	Greenscapes North Shore Coalition	- Number distributed - Resident testimonials	**FY2022**
Social Media Post	Greenscapes will provide content for a social media "blast" on town Facebooks etc. Ex. Autumnal facebook post describing proper disposal of leaf collection, and springtime post about proper lawn/fertilizer maintenance.	**Residents**	Greenscapes North Shore Coalition and *municipal entity*	- Number of views/ likes/ comments - Resident testimonials before and after posting	**FY2022**
School Curriculae/ Programs	*Elementary School Name* will host Greenscapes "Keeping Water Clean" Program.	**Residents**	Greenscapes North Shore Coalition	- Number of students/ teachers/ volunteers in attendance - Subset of students evaluated before and after program	**FY2022**
Meeting/ Presentation	Greenscapes NS will conduct a "Greenscapes 101" presentation for residents at site of community's choosing. Presentation will discuss the importance of clean and plentiful water.	**Residents**	Greenscapes North Shore Coalition	- Number of attendees - Resident testimonials	**FY2023**
Special Events/ Festivals/ Fairs	Greenscapes representatives will attend a trade show expo, with the intent of sharing "Greenscaping" practices and the importance of LIDs with Landscapers and Developers.	**Developers (Construction)**	Greenscapes North Shore Coalition	- Number of materials distributed - Number of contacts made - Developer testimonials	**FY2023**
Brochure/ Pamphlets	Pet Waste literature is available in two forms (one page info sheet or rack card) and can be redistributed as necessary.	**Residents**	Greenscapes North Shore Coalition	- Number distributed - Resident testimonials	**FY2023**
Social Media Post	Greenscapes will provide content for a social media "blast" on town Facebooks etc. Ex. Autumnal facebook post describing proper disposal of leaf collection, and springtime post about proper lawn/fertilizer maintenance.	**Residents**	Greenscapes North Shore Coalition and *municipal entity*	- Number of views/ likes/ comments - Resident testimonials before and after posting	**FY2023**
School Curriculae/ Programs	*Elementary School Name* will host Greenscapes "Keeping Water Clean" Program.	**Residents**	Greenscapes North Shore Coalition	- Number of students/ teachers/ volunteers in attendance - Subset of students evaluated before and after program	**FY2023**

Appendix I - Illicit Discharge Detection and Elimination Plan

Illicit Discharge Detection and Elimination Plan

Manchester-by-the-Sea, MA

Updated
August 2023

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Table of Contents

Illicit Discharge Detection and Elimination Plan

Tables

Figures

Appendices

1 Introduction

1.1 MS4 Program

This Illicit Discharge Detection and Elimination (IDDE) Plan has been prepared by Bobrek Engineering and Construction for the Town of Manchester-by-the-Sea, Massachusetts (the Town) to address the requirements of the United States Environmental Protection Agency's (EPA) 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 (6) Minimum Control Measures (MCMs). These measures include the following:

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination Program (IDDE)
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 MCM 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. This IDDE Plan has been prepared to address the EPA's requirements.

1.2 Illicit Discharges

An "illicit discharge" is any discharge to a drainage system that is not composed entirely of stormwater, except for 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 and 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 wash water 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.

1.3 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).

1.4 Receiving Waters and Impairments

Table 1 lists the "impaired waters" within the boundaries of the Town's regulated area based on the 2018/2020 Massachusetts Integrated List of Waters produced by MassDEP every two years. Impaired waters are defined as water bodies that do not meet water quality standards for one or more designated use(s) such as recreation or aquatic habitat.

Table 1. 2018/2020 Impaired Waters of Manchester-by-the-Sea

Category 5 Water: waters requiring a TMDL			
Indicator contributing to impairment:	Cat Brook (MA93-29)		
Temperature	X		
pH, Low	X		
Category 4a Waters TMDL is completed			
Indicator contributing to impairment:	Manchester Harbor (MA93-19)	Salem Sound (MA93-55)	Causeway Brook (MA93-47)
Escherichia coli			X
Fecal Coliform	X	X	X
Enterococcus	X		
Category 3 Waters: No uses Assessed			
Clark Pond			
Sawmill Brook			
Millets Swamp to Sawmill Brook			
Bennetts Brook to Manchester Harbor			
Unnamed Stream to Swamps and Sawmill Brook			
Wolftrap Brook			

Under the requirements of the 2010 Draft NC Permit Part 2.2.1: Discharge to Impaired Waters with an Approved (Total Maximum Daily Load) TMDL, 'Approved TMDLs' are those that have been approved by EPA as of the effective date of the Permit. In 2012 MassDEP issued a Total Maximum Daily Load (TMDL) Report for the North Coastal Watershed to address fecal coliform bacterial impairment, as required by section 303(d) of the Clean Water Act. It has been documented that fecal coliform bacteria are generated from the intestinal tract of warm-blooded animals. The presence of fecal coliform within surface waters indicates fecal contamination. The Surface Water Quality Standards for the Commonwealth of Massachusetts are described in 314 CMR 4.00. Under 314 CMR 4.00, all waters within the Town are either designated as Class SB (Manchester Harbor and Salem Sound), or undesignated. For Class SB waters, the water quality standards in place in 2012 required that fecal coliform bacteria shall not exceed a median or geometric mean, MPN, of 88 organisms per 100 mL nor shall 10% of the samples be greater than 260 organisms per 100 mL. By implementing and enforcing this IDDE Plan to meet these levels, the Town meets the requirements of the North Coastal TMDL, and the NPDES MS4 Permit. The sections of the Permit relating to TMDL Requirements for the Town are as follows: 2.2.1 (c),(e),(g) - Discharge to Waters with an Approved TMDL 2.3 - Increased Discharges, New Discharges, Antidegradation 2.4.2. – Public Education and Outreach –specific forms

of messages required 2.4.7.1(a)(ii) – Municipal Good-Housekeeping - specific requirements for targeting pet-waste disposal and waterfowl feeding.

1.5 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 occurring 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
- Follow-up screening
- Employee training.

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

Figure 1. IDDE Investigation Procedure Framework

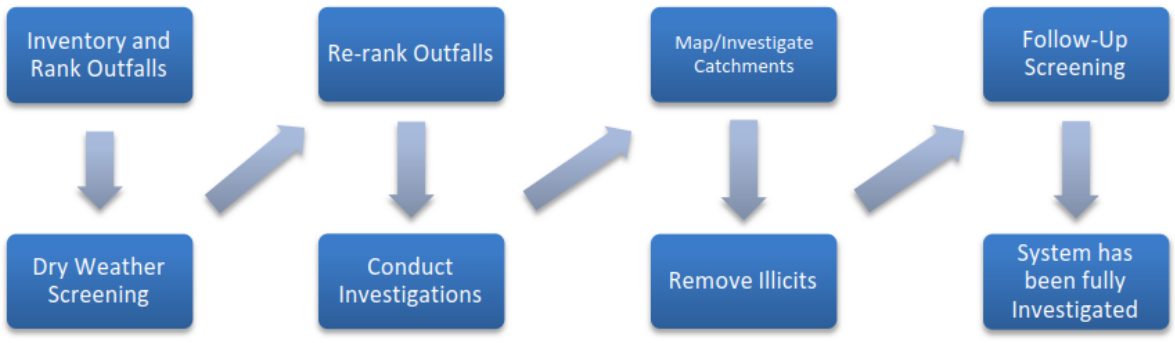


Table 2. IDDE Program Implementation Timeline

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

1.6 Work Completed to Date

The 2016 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 has completed the following IDDE program activities consistent with the 2016 MS4 Permit requirements:

- Over 100 outfalls identified and inspected
- Pipe Network updates
- Preliminary storm system mapping, including the locations of catch basins, manholes and pipe connectivity
- Catchment investigations of Problem Catchments and High Priority Catchments

2 Authority and Statement of IDDE Responsibilities

2.1 Legal Authority

The Town will adopt a bylaw, ordinance, or other regulatory mechanism to provide the Town 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 bylaw, ordinance, or other regulatory mechanism will meet the requirements of the MS4 Permit and will be in place within 3 years of the permit effective date.

2.2 Statement of Responsibilities

The Department of Public Works is the lead municipal agency or department responsible for implementing the IDDE program pursuant to the provisions of the IDDE Bylaw.

3 Stormwater System Mapping

The Town has started to develop 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 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.

3.1 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 will continue to update its stormwater mapping by year 1 of the permit to include the remaining Phase I information.

3.2 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 has completed the following updates to its stormwater mapping to meet the Phase II requirements:

- Pipes
- Manholes
- Catch basins
- Municipal Sanitary Sewer system
- Catchment Delineations

The Town will update its stormwater mapping by year 10 to include the remaining following Phase II information.

3.3 Additional Recommended Mapping Elements

Although not a requirement of the 2016 MS4 Permit, the Town will attempt to 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
- 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.

4 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.

The Town will complete an inventory of SSOs that have discharged to the MS4 within the five (5) years prior to the effective date of the 2016 MS4 Permit, based on review of available documentation pertaining to SSOs (Table 3). The inventory includes all SSOs that occurred during wet or dry weather resulting from inadequate conveyance capacities or where interconnectivity of the storm and sanitary sewer infrastructure allows for transfer of flow between systems.

Upon detection of an SSO, The Town 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 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 3 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 3. SSO Inventory for Manchester-by-the-Sea

Revision Date: as of September 2023, the Town has one (1) recorded SSO event.

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]
43 Lincoln Street	The discharge entered the MS4.	7/8/2021	-	-	1000 gallons	Called in two septic hauling trucks to pump down upstream manhole and had on-site contractor on site to make the necessary repair to the sewer main.	Yes	No

[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

5 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.

5.1 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. The Town will refer to the MAPC Catchment delineation Methodology attached in Appendix F. Initial catchment areas were done in June 2020 but will be refined as the pipe network is investigated and corrected within GIS.

5.2 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] **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.

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 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.

- 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.

- 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 4 provides a sample format for an outfall inventory and priority ranking matrix. This will be completed within year 1 of the permit.

Table 4. Outfall Inventory and Priority Ranking Matrix for Manchester-by-the-Sea

Revision Date:

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	Land Use Info, Visual Observation	Town Staff, GIS Maps	Land Use, Town Staff	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		

Priority Ranking Matrix

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.

6 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.

6.1 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 Beverly Municipal Airport Weather Station. If Beverly Municipal Airport Weather Station is not available or not reporting current weather data, then Boston, Logan International Airport will be used as a back-up.

6.2 Dry Weather Screening/Sampling Procedure

6.2.1 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 5** 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.

6.2.2 Field Equipment

Table 5 lists field equipment commonly used for dry weather outfall screening and sampling.

Table 5. 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

6.2.3 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. 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)
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 a Massachusetts Department of Environmental Protection Certified Laboratory
9. Dispose of used test strips and test kit ampules properly
10. Decontaminate all testing personnel and equipment

If 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 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. 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. Samples for laboratory analysis must also be stored and preserved in accordance with procedures found in 40 CFR § 136. **Table 7** lists analytical methods, detection limits, hold times, and preservatives for laboratory analysis of dry weather sampling parameters.

Table 7. 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

[4] 40 CFR § 136

6.3 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 8** 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 8. 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

6.4 Follow-up Ranking of Outfalls and Interconnections

Manchester-by-the-Sea 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.

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.

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

7 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.

7.1 System Vulnerability Factors

The Town 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 9), retained as part of this IDDE Plan, and included in the annual report.

Table 9. Outfall Catchment System Vulnerability Factor (SVF) Inventory Example Manchester-by-the-Sea, Massachusetts

Revision Date:

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 Under drains	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

Outfall Catchment System Vulnerability Factor (SVF) Inventory Example

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)

7.2 Dry Weather Manhole Inspections

The Town 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.

7.3 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.

7.4 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 a variety of communication methods for single family homes, businesses and building lobbies for multi-family dwellings.

7.4.1 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.

7.4.2 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.

7.4.3 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.

7.4.4 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.

7.4.5 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.

7.4.6 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.

7.5 Illicit Discharge Removal

When the specific source of an illicit discharge is identified, the Town 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.

7.5.1 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.

7.6 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.

8 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.

9 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)

ARTICLE XXII STORAGE OF COMMERCIAL MATERIALS AND VEHICLES

The Building Inspector shall allow the following, provide that they are not visible from the public way and do not create a nuisance:

- The commercial storage of building and landscaping materials and equipment, excluding that from retail establishments;
- Commercial landscaping equipment, materials, supplies;
- Unless garaged on the premises, the overnight parking of commercial vehicles owned or operated by a resident of the premises limited to one commercial vehicle less than 10,000 pounds of gross vehicle weight
- Storage of recreational vehicles, boats, and trailers within five (5) feet from the property line.

(Special Town Meeting 11.14.2022 Article 5. Attorney General approval pending)

ARTICLE XXIII STORMWATER MANAGEMENT SPECIAL PERMIT

SECTION 1 PURPOSE AND INTENT

A. Regulation of discharges to the municipal separate storm sewer system (MS4) is necessary for the protection of the Town of Manchester-by-the-Sea's water bodies and groundwater, and to safeguard the public health, safety, welfare and the environment. Increased and contaminated stormwater runoff associated with developed land uses and the accompanying increase in impervious surface are major causes of impairment of water quality and flow and contamination of drinking water supplies, erosion of stream channels, alteration or destruction of aquatic and wildlife habitat, and flooding.
B. This By-law establishes stormwater management standards for the final conditions that result from development and redevelopment projects, as well as construction activities, to minimize adverse impacts offsite and downstream which would be borne by abutters to development projects and the general public.
C. The goals and objectives of this By-law are:
    1. To require practices to control the flow of stormwater from new and redeveloped sites into the Town storm drainage system in order to prevent flooding and erosion;
    2. To protect groundwater and surface water from degradation;
    3. To promote groundwater recharge;
    4. To prevent pollutants from entering the Town's municipal separate storm sewer system (MS4) and to minimize discharge of pollutants from the MS4;
    5. To ensure adequate long-term operation and maintenance of structural stormwater best management practices so that they work as designed;
    6. To comply with state and federal statutes and regulations relating to stormwater discharges; and
    7. To establish the Town's legal authority to ensure compliance with the provisions of this By-law through inspection, monitoring, and enforcement.

SECTION 2 DEFINITIONS

Alteration of drainage characteristics: Any activity on an area of land that changes the water quality, force, direction, timing or location of runoff flowing from the area. Such changes include: change from distributed runoff to confined, discrete discharge; change in the volume of

runoff from the area; change in the peak rate of runoff from the area; and change in the recharge to groundwater on the area.
Best management practice (BMP): An activity, procedure, restraint, or structural improvement that helps to reduce the quantity or improve the quality of stormwater runoff.
Clearing: Any activity that removes the vegetative surface cover.
Development: The modification of land to accommodate a new use or expansion of use, usually involving construction.
Disturbance of land: Any action that causes a change in the position, location, or arrangement of soil, sand, rock, gravel or similar earth materials.
Grading: Changing the level or shape of the ground surface.
Grubbing: The act of clearing land surface by digging up roots and stumps.
Impervious surface: Any material or structure on or above the ground that prevents water infiltrating the underlying soil. Impervious surface includes (without limitation) roads, paved parking lots, sidewalks, and rooftops.
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 G.L. c. 131, § 40 and Massachusetts Clean Waters Act G.L. c. 21, s. 23-56. The Policy addresses stormwater 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 stormwater, 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 Manchester-by-the-Sea.
Operation and Maintenance Plan: A plan setting up the functional, financial and organizational mechanisms for the ongoing operation and maintenance of a stormwater management system to ensure that it continues to function as designed.
Outfall: The point at which stormwater flows out from a point source that is a discernible, confined and discrete conveyance into waters of the Commonwealth.
Outstanding resource waters (ORWs): Waters designated by Massachusetts Department of Environmental Protection as ORWs. These waters have exceptional sociologic, recreational, ecological and/or aesthetic values and are subject to more stringent requirements under both the Massachusetts Water Quality Standards (314 CMR 4.00) and the Massachusetts Stormwater Management Standards. ORWs include vernal pools certified by the Natural Heritage Program of the Massachusetts Department of Fisheries and Wildlife and Environmental Law Enforcement, all Class A designated public water supplies with their bordering vegetated wetlands, and other waters specifically designated.
Owner: A person with a legal or equitable interest in property
Person: An individual, partnership, association, firm, company, trust, corporation, agency, authority, department or political subdivision of the Commonwealth or the federal government, to the extent permitted by law, and any officer, employee, or agent of such person.

Point source: Any discernible, confined, and discrete stormwater conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, or container from which pollutants are or may be discharged.
Redevelopment: Development, rehabilitation, expansion, demolition or phased projects that disturb the ground surface or increase the impervious area on previously developed sites.
Runoff: Rainfall, snowmelt, or irrigation water flowing over the ground surface.
Stormwater management plan: A plan required as part of the application for a Stormwater Management Permit. See Section 7.
Stormwater: Storm water runoff, snow melt runoff, and surface water runoff and drainage.
TSS: Total suspended solids.

SECTION 3 AUTHORITY

This By-law 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.

SECTION 4 APPLICABILITY

A. No person may undertake a construction activity including clearing, grading, and excavation that result in a land disturbance that will disturb equal to or greater than one acre of land or will disturb less than one acre of land but is part of a larger common plan of development that will ultimately disturb equal to or greater than one acre of land draining to the Town's municipal separate storm sewer system without a special permit from the Planning Board.
B. Activities or land uses that otherwise require a special permit from the Planning Board shall not be required to obtain an independent special permit under this Article provided that the applicable terms, conditions, and requirements of this Article are imposed within the special permit issued by the Planning Board.
C. Exemptions:
    1. Normal maintenance and improvement of land in agricultural use as defined by the Wetlands Protection Act regulation 310 CMR 10.04;
    2. Maintenance of existing landscaping, gardens or lawn areas associated with a single-family dwelling;
    3. The construction of fencing that will not substantially alter existing terrain or drainage patterns;
    4. Construction and installation of utilities other than drainage (gas, water, electric, telephone, etc.) which will not alter terrain or drainage patterns;
    5. Large-Scale Ground-Mounted Solar Photovoltaic Installations.
    6. As authorized in the Phase II Small MS4 General Permit for Massachusetts, storm water discharges resulting from the activities identified in this Section that are wholly subject to jurisdiction under the Wetlands Protection Act and demonstrate compliance with the Massachusetts Storm Water Management Policy as reflected in an Order of Conditions issued by the Conservation Commission are exempt from compliance with this Section.

SECTION 5 ADMINISTRATION

A. The Planning Board shall administer, implement and enforce this By-law pursuant to G.L. c. 40A s.9 and the special permit regulations of the Zoning By-laws.

SECTION 6 PERMITS AND PROCEDURE

A. Filing Application. The site owner or his agent shall file a completed application package for a Stormwater Management Special Permit (SMSP) as follows: one copy (with the filing fee) with

the Town Clerk and ten (10) additional copies with the Planning Board (by delivery with the above copy to the Town Clerk). Permit issuance is required prior to any site altering activity. While the applicant can be a representative, the permittee must be the owner of the site. Each copy of the SMSP Application package shall include:

1. a completed Application Form with original signatures of all owners;
2. a list of abutters, certified by the Assessor's Office;
3. the Stormwater Management Plan and project description as specified in Section 7 of this By-law;
4. the Operation and Maintenance Plan as required by Section 8 of this By-law;

B. Entry. Filing an application for a special permit grants the Planning Board, or its agent, permission to enter the site to verify the information in the application and to inspect for compliance with the resulting special permit

C. Other Boards. The applicant for a Stormwater Management Special Permit shall deliver a copy of the application package, within three (3) business days of filing the application with the Planning Board, to each of the Board of Health, Conservation Commission and Department of Public Works, and shall file a certificate of such delivery with the Planning Board.

D. Fee Structure. The Planning Board is authorized to establish an application form and filing fees, and to retain, at the applicant's expense, Registered Professional Engineers, or other professional consultants, to review and advise the Board on any or all aspects of these plans.

E. Public Hearing. The Planning Board shall hold a public hearing in accordance with G.L. c. 40A, ss. 9 and 11.

F. Actions. The Planning Board's action, rendered in writing, shall consist of either:

1. Approval of the Stormwater Management Special Permit Application based upon determination that the proposed plan meets the Standards in this By-law Section 7 and Section 12.5 of the Zoning By-laws and will adequately protect the water resources of the Town and is in compliance with the requirements set forth in this this Article XXIII.
2. Approval of the Stormwater Management Special Permit Application; subject to any conditions, modifications, or restrictions required by the Planning Board which will ensure that the project meets the Standards in this By-law Section 6 and Section 12.5 of the Zoning By-law and adequately protects water resources.
3. Disapproval of the Stormwater Management Special Permit Application based upon a determination that the proposed plan, as submitted, does not meet the Standards in this By-Law and Section 6.3 and Section 12.5 of the Zoning By-Laws or adequately protect water resources, as required herein.
4. Project Completion. At completion of the project, the permittee shall submit as-built record drawings of all structural stormwater controls and best management treatment practices required for the site. The as-built drawing shall show deviations from the approved plans, if any, and be certified by a Registered Professional Engineer.

SECTION 7 STORMWATER MANAGEMENT PLAN

A. The Stormwater Management Plan shall contain sufficient information for the Planning Board to evaluate the environmental impact, effectiveness, and acceptability of the measures proposed by the applicant for reducing adverse impacts from stormwater. The Plan shall be designed to meet the Massachusetts Stormwater Management Standards as set forth in Part B of this section and DEP Stormwater Management Handbook Volumes I and II. The Stormwater Management Plan shall fully describe the project in drawings, and narrative.

B. The Plan shall include:
    1. A locus map;
    2. The existing zoning and land use at the site;
    3. The proposed land use;
    4. The location(s) of existing and proposed easements;
    5. The location of existing and proposed utilities;
    6. The site's existing and proposed topography with contours at 2-foot intervals;
    7. The existing site hydrology;
    8. A description and delineation of existing stormwater conveyances, impoundments, and wetlands on or adjacent to the site or into which stormwater flows;
    9. A delineation of 100-year flood plains, if applicable;
    10. Estimated seasonal high groundwater elevation (November to April) in areas to be used for stormwater retention, detention, or infiltration;
    11. The existing and proposed vegetation and ground surfaces with runoff coefficient for each;
    12. A drainage area map showing pre-construction and post-construction watershed boundaries, drainage area, and stormwater flow paths;
    13. A description and drawings of all components of the proposed drainage system including:
        a. locations, cross sections, and profiles of all brooks, streams, drainage swales, and their method of stabilization;
        b. all measures for the detention, retention, or infiltration of water;
        c. all measures for the protection of water quality;
        d. the structural details for all components of the proposed drainage systems and stormwater management facilities;
        e. notes on drawings specifying materials to be used and construction specifications; and
        f. expected hydrology with supporting calculations.
    14. Proposed improvements including location of buildings or other structures, impervious surfaces, and drainage facilities, if applicable;
    15. Timing, schedules, and sequence of development including clearing, stripping, rough grading, construction, final grading, and vegetative stabilization;
    16. A maintenance schedule for the period of construction; and
    17. Any other information requested by the Planning Board.

C. Standards

Projects shall meet the Standards of the Massachusetts Stormwater Management Policy, which are as follows:

1. No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.
2. Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.
3. Loss of annual recharge to groundwater shall be eliminated or minimized with infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. The

annual recharge from the post-development site should approximate the annual recharge rate from the pre-development or existing site conditions based on soil types. 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.

4. Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). It is presumed that this standard is met when:
    a. Suitable practices for source control and pollution prevention are in a long-term pollution prevention plan and are thereafter implemented and maintained;
    b. Structural stormwater management best management practices (BMPs) are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and
    c. Pre-treatment is provided in accordance with the Massachusetts Stormwater Handbook.
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 determined by the Department to be suitable for such uses 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, G.L. c. 21, ss. 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.
6. Stormwater discharges to critical areas 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 areas 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, considering 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 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 a public water supply. Critical areas also include swimming beaches and cold-water fisheries.
7. Redevelopment of previously-developed sites must meet the Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the

Stormwater Management Standards and stormwater management systems must be designed to improve existing conditions.

8. A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.
9. All stormwater management systems must have a long-term Operation and Maintenance Plan to ensure that systems function as designed.
10. All illicit discharges to the stormwater management system are prohibited.

When one or more of the Standards cannot be met, an applicant may demonstrate that an equivalent level of environmental protection will be provided.

D. Reporting Requirements

The applicant shall prepare and submit semi-annual reports to the Planning Board for the first two (2) years after issuance of the Certificate of Completion, and annual reports thereafter demonstrating compliance with the terms and conditions of the special permit received from the Planning Board.

SECTION 8 OPERATION AND MAINTENANCE PLANS

A. An Operation and Maintenance Plan (O&M Plan) is required at the time of application for all projects. The O&M Plan shall be designed to ensure that compliance with the Permit, this By-Law and the Massachusetts Surface Water Quality Standards, 314 CMR 4.00 are met in all seasons and throughout the life of the system. The Planning Board shall make the final decision of what maintenance option is appropriate in each situation. The Planning Board will consider natural features, proximity of site to water bodies and wetlands, extent of impervious surfaces, size of the site, the types of stormwater management structures, and potential need for ongoing maintenance activities when making this decision. The O&M Plan shall remain on file with the Planning Board and shall be an ongoing requirement. The O&M Plan shall include:
    1. The name(s) of the owner(s) for all components of the system;
    2. Maintenance agreements that specify:
        a. The names and addresses of the person(s) responsible for operation and maintenance;
        b. The person(s) responsible for financing maintenance and emergency repairs;
        c. A Maintenance Schedule for all drainage structures including swales and ponds;
        d. A list of easements with the purpose and location of each; and
        e. The signature(s) of the owner(s).
    3. Stormwater Management Easement(s):
        a. Stormwater management easements shall be provided by the property owner(s) as necessary for:
            i. access for facility inspections and maintenance;
            ii. preservation of stormwater runoff conveyance, infiltration, and detention areas and facilities, including flood routes for the 100- year storm event; and
            iii. direct maintenance access by heavy equipment to structures requiring regular cleanout.
        b. The purpose of each easement shall be specified in the maintenance agreement signed by the property owner(s);
        c. Stormwater management easements are required for all areas used for off-site stormwater control unless a waiver is granted by the Planning Board;

d. Easements shall be recorded with the Essex County South Registry of Deeds prior to issuance of a Certificate of Completion by the Planning Board;

4. Changes to Operation and Maintenance Plans;
    e. The owner(s) of the stormwater management system must notify the Planning Board of changes in ownership or assignment of financial responsibility.
    f. The maintenance schedule in the Maintenance Agreement may be amended to achieve the purposes of this By-law by mutual agreement of the Planning Board and the Responsible Parties. Amendments must be in writing and signed by all Responsible Parties. Responsible Parties shall include owner(s), persons with financial responsibility, and persons with operational responsibility.

SECTION 9 SURETY

A. The Planning Board may require the permittee to post a surety bond, irrevocable letter of credit, cash, or other acceptable security before the start of land disturbance or construction activity. The bond 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 bond as each phase is completed in compliance with the permit, but the bond may not be fully released until the Board has received the final inspection report as required below and has issued a Certificate of Completion. Where the applicant is simultaneously seeking approval from the Planning Board pursuant to the Subdivision Control Law, the performance bond provisions of G.L. c. 41, s. 81-U shall supersede the requirements of this By-law provided that, in the opinion of the Planning Board, the performance bond so executed includes sufficient protections to the Town for work to be completed .

SECTION 10 INSPECTIONS

The Planning Board's representative shall inspect the site at the following stages:

1. Initial Site Inspection:
    a. prior to approval of any plan.
2. Erosion Control Inspection:
    a. to ensure erosion control practices are in accord with the filed plan.
3. Bury Inspection:
    a. prior to backfilling of any underground drainage or stormwater conveyance structures.
4. Final Inspection:
    a. After the stormwater management system has been constructed and before the surety has been released, the applicant must submit a record plan detailing the actual stormwater management system as installed. The Planning Board's representative shall inspect the system to confirm its "as-built" features. This inspection shall also evaluate the effectiveness of the system in an actual storm. If the inspection finds the system to be adequate, the Planning Board shall issue a Certificate of Completion.
    b. If the system is found to be inadequate by virtue of physical evidence or operational failure, even though it was built in accordance with the Stormwater Management Plan, it shall be corrected by the permittee before the performance guarantee is released. If the permittee fails to act, the Town may use the surety bond to complete the work.

SECTION 11 CERTIFICATE OF COMPLETION

The Planning Board will issue a letter certifying completion upon receipt and approval of the final inspection reports and/or upon otherwise determining that all work of the special permit has been satisfactorily completed in conformance with the special permit and this By-law.

SECTION 12 SEVERABILITY

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

(Special Town Meeting 11.14.2022 Article 5. Attorney General Approval pending)

AN ACT REQUIRING THAT CERTAIN MEASURES IN THE TOWN OF MANCHESTER-BY-THE-SEA BE APPROVED AT A TOWN ELECTION

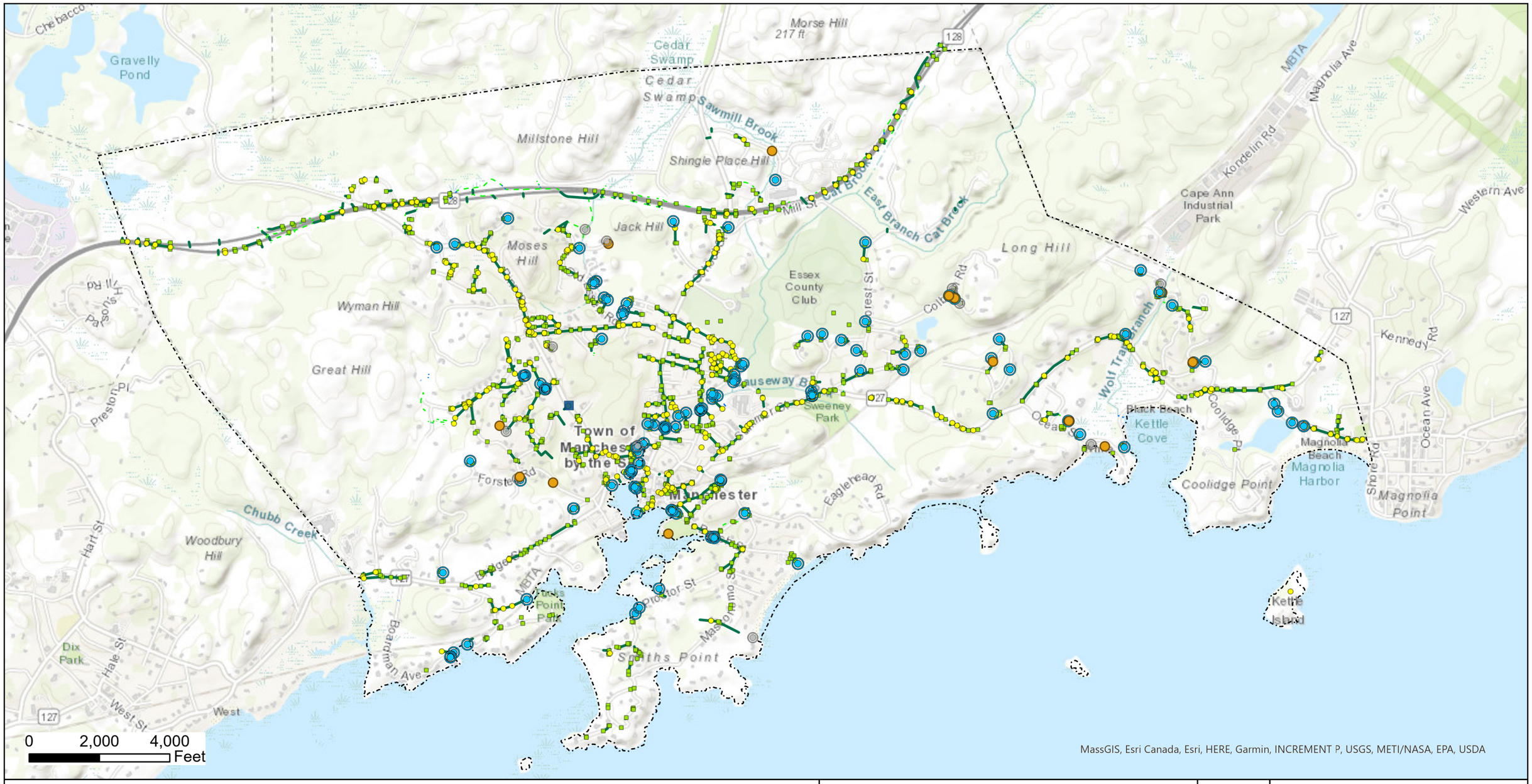
SECTION 1 Notwithstanding any general or special law to the contrary, in the Town of Manchester-by-the-Sea, no incurrence of indebtedness or other action that the Town's general by-law, as from time to time in effect, provides should be authorized pursuant to this Act, and no other action that a town meeting determines should be so authorized, shall be valid unless (i) with respect to such indebtedness or other action specified in the general by-law, the town meeting determines by majority vote that the incurrence of the indebtedness or the other action shall be submitted to the voters as a ballot question at a town election, and (ii) the ballot question as to such incurrence or as to the other action that is specified in the general by-law or that a town meeting has determined should be authorized pursuant to this Act is approved by a quantum of vote sufficient to authorize it at a town meeting. The election at which voters act on the question by ballot may be the annual election or a special election which the Select Board Member shall promptly call, held in either case not less than thirty and not more than sixty days after the dissolution of the meeting.

The question submitted to voters as a ballot question shall appear on the ballot in the following form: "Do you approve of the measure summarized below?" A fair, concise summary of the measure, as determined by the town counsel, shall follow. The polls at such election shall be open as required by section sixty-four of the General Laws for the election of town officers, and all other provisions of the General Laws pertaining to town elections shall apply. No quorum shall be required in voting on any ballot questions under this act.

SECTION 2 This act shall take effect upon its passage. [Enacted 1991]

Appendix B

Storm System Mapping



Stormwater System

- Drain Pipes
- Surface Drainage
- Culverts

Outfalls

- Pipe
- Swale
- Doghouse Catchbasin
- Other

- Drain Manholes
- Catch Basins

- Town Boundary

Stormwater Drain System Overview Map

August 2023
Manchester-by-the-Sea, MA
Department of Public Works

N

Engineering & Construction
BOBREK
100 CONIFER HILL DRIVE, SUITE 204
DANVERS, MASSACHUSETTS 01923
WWW.GOBOBREK.COM

Appendix C

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

OUTFALL RECONNAISSANCE INVENTORY/ SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

Subwatershed:		Outfall ID:	
Today's date:		Time (Military):	
Investigators:		Form completed by:	
Temperature (°F):	Rainfall (in.): Last 24 hours: Last 48 hours:		
Latitutde:	Longitude:	GPS Unit:	GPS LMK #:
Camera:		Photo #s:	

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

☐ Industrial ☐ Open Space

☐ Ultra-Urban Residential ☐ Institutional

☐ Suburban Residential Other: _____

☐ Commercial Known Industries: _____

Notes (e.g.., origin of outfall, if known):

Section 2: Outfall Description

LOCATION	MATERIAL	SHAPE		DIMENSIONS (IN.)	SUBMERGED
☐ **Closed Pipe**	☐ RCP ☐ CMP ☐ PVC ☐ HDPE ☐ Steel ☐ Other: _____	☐ Circular ☐ Eliptical ☐ Box ☐ Other: _____	☐ Single ☐ Double ☐ Triple ☐ Other: _____	Diameter/Dimensions: _____	In Water: ☐ No ☐ Partially ☐ Fully With Sediment: ☐ No ☐ Partially ☐ Fully
☐ **Open drainage**	☐ Concrete ☐ Earthen ☐ rip-rap ☐ Other: _____	☐ Trapezoid ☐ Parabolic ☐ Other: _____		Depth: _____ Top Width: _____ Bottom Width: _____	
☐ **In-Stream**	**(applicable when collecting samples)**				
Flow Present?	☐ Yes ☐ No	***If No, Skip to Section 5***			
Flow Description (If present)	☐ Trickle ☐ Moderate ☐ Substantial				

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS				
PARAMETER		**RESULT**	**UNIT**	**EQUIPMENT**
☐Flow #1	Volume		Liter	Bottle
	Time to fill		Sec	
☐Flow #2	Flow depth		In	Tape measure
	Flow width	_____' _____"	Ft, In	Tape measure
	Measured length	_____' _____"	Ft, In	Tape measure
	Time of travel		S	Stop watch
Temperature			°F	Thermometer
pH			pH Units	Test strip/Probe
Ammonia			mg/L	Test strip

Outfall Reconnaissance Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only

Are Any Physical Indicators Present in the flow? ☐ Yes ☐ No *(If No, Skip to Section 5)*

INDICATOR	CHECK if Present	DESCRIPTION	RELATIVE SEVERITY INDEX (1-3)		
Odor	☐	☐ Sewage ☐ Rancid/sour ☐ Petroleum/gas ☐ Sulfide ☐ Other:	☐ 1 – Faint	☐ 2 – Easily detected	☐ 3 – Noticeable from a distance
Color	☐	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:	☐ 1 – Faint colors in sample bottle	☐ 2 – Clearly visible in sample bottle	☐ 3 – Clearly visible in outfall flow
Turbidity	☐	See severity	☐ 1 – Slight cloudiness	☐ 2 – Cloudy	☐ 3 – Opaque
Floatables -Does Not Include Trash!!	☐	☐ Sewage (Toilet Paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other:	☐ 1 – Few/slight; origin not obvious	☐ 2 – Some; indications of origin (e.g., possible suds or oil sheen)	☐ 3 - Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are physical indicators that are not related to flow present? ☐ Yes ☐ No *(If No, Skip to Section 6)*

INDICATOR	CHECK if Present	DESCRIPTION	COMMENTS
Outfall Damage	☐	☐ Spalling, Cracking or Chipping ☐ Peeling Paint ☐ Corrosion	
Deposits/Stains	☐	☐ Oily ☐ Flow Line ☐ Paint ☐ Other:	
Abnormal Vegetation	☐	☐ Excessive ☐ Inhibited	
Poor pool quality	☐	☐ Odors ☐ Colors ☐ Floatables ☐ Oil Sheen ☐ Suds ☐ Excessive Algae ☐ Other:	
Pipe benthic growth	☐	☐ Brown ☐ Orange ☐ Green ☐ Other:	

Section 6: Overall Outfall Characterization

☐ Unlikely ☐ Potential (presence of two or more indicators) ☐ Suspect (one or more indicators with a severity of 3) ☐ Obvious

Section 7: Data Collection

1. Sample for the lab?	☐ Yes	☐ No	
2. If yes, collected from:	☐ Flow	☐ Pool	
3. Intermittent flow trap set?	☐ Yes	☐ No	If Yes, type: ☐ OBM ☐ Caulk dam

Section 8: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?

Engineering & Construction
BOBREK

Appendix D

Water Quality Analysis Instructions, User's Manuals and Standard Operating Procedures

Detergents CHEMets Kit

K-9400/R-9400: 0 - 3 ppm

Test Procedure

1. Rinse the reaction tube with the sample to be tested, and then fill it to the 5 mL mark with the sample.
2. While holding the double-tipped ampoule in a vertical position, snap the upper tip using the tip breaking tool (fig. 1).
3. Invert the ampoule and position the open end over the reaction tube. Snap the upper tip and allow the contents to drain into the reaction tube (fig. 1).
4. Cap the reaction tube and shake it vigorously for **30 seconds**. Allow the tube to stand undisturbed for **1 minute**.
5. Make sure that the flexible tubing is firmly attached to the CHEMet ampoule tip.
6. Insert the CHEMet assembly (tubing first) into the reaction tube making sure that the end of the flexible tubing is at the bottom of the tube. Break the tip of the CHEMet ampoule by gently pressing it against the side of the reaction tube (fig. 2). The ampoule should draw in fluid only from the organic phase (bottom layer).
7. When filling is complete, remove the CHEMet assembly from the reaction tube.

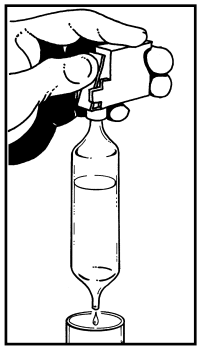


Figure 1

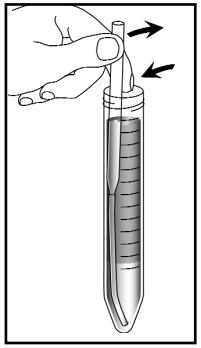


Figure 2

8. Remove the flexible tubing from the CHEMet ampoule and wipe all liquid from the exterior of the ampoule. Place an ampoule cap firmly onto the tip of the CHEMet ampoule. Invert the ampoule several times, allowing the bubble to travel from end to end.
9. Obtain a test result by placing the ampoule, flat end first, into the comparator. Hold the comparator up toward a source of light and view from the bottom. Rotate the comparator until the best color match is found (fig. 3).

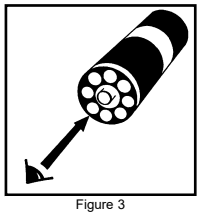


Figure 3

Tip Breaker

The tip breaker opens for easy disposal of the glass tips (pull lever away from body of tip breaker or pull open the side wall). The tip breaker will work most effectively if the tips are emptied out frequently.

Test Method

The Detergents CHEMets®[1] test kit employs the methylene blue extraction method[2,3,4]. Anionic detergents react with methylene blue to form a blue complex that is extracted into an immiscible organic solvent. The intensity of the blue color is directly related to the concentration of "methylene blue active substances (MBAS)" in the sample. Anionic detergents are one of the most prominent methylene blue active substances. Test results are expressed in ppm (mg/Liter) linear alkylbenzene sulfonate (equivalent weight 325).

1. CHEMets is a registered trademark of CHEMetrics, LLC U.S. Patent No. 3,634,038
2. APHA Standard Methods, 22nd ed., Method 5540 C - 2000
3. EPA Methods for Chemical Analysis of Water and Wastes, Method 425.1 (1983)
4. ASTM D 2330-02, Methylene Blue Active Substances

Safety Information

Read SDS (available at www.chemetrics.com) before performing this test procedure. Wear safety glasses and protective gloves.

www.chemetrics.com
4295 Catlett Road, Midland, VA 22728 U.S.A.
Phone: (800) 356-3072; Fax: (540) 788-4856
E-Mail: orders@chemetrics.com

May 23, Rev. 11

QUICK START GUIDE: YSI Pro DSS Water Quality Meter

This guide serves as a quick reference for operating a YSI Pro DSS. It is for your convenience & not intended to replace the full-length manual where additional information may be found.

This unit was calibrated on the day we sent it to you. (See Calibration Certificate)

1. Attach the cable to the YSI meter.
2. Remove calibration cup & attach flow cell over probes if required.
   a. Where probe guard is used, carefully & slowly lower the probe end of the cable to required height in the well.
   b. If using the flow cell, attach to pump & begin to pump sample through the flow cell. Please ensure that the Flow Cell is kept up right by using our Van Walt base plate located in the Peli case, will cause inaccurate readings if left horizontal.
3. Green button to turn on/off meter.
4. Press: PROBE -> DISPLAY to show desired sensor reading on screen.

Logging

- Press Enter to start logging and add details
- Select: Log interval -> Enter Value
- Select: Site -> Add New -> Enter details and save
- Select: Data ID -> Add New -> Enter details
- Select: Start now! to begin logging
- Press Enter to stop logging

QUICK START GUIDE: YSI Pro DSS Water Quality Meter

Calibrating your YSI Pro DSS

Please contact Van Walt if you wish to calibrate your YSI.

Spot Checking

We would recommend a quality spot check to ensure the best results. Used solutions will be charged for. Do not return any opened bottles of solution. Please call us for help or guidance.

Problems

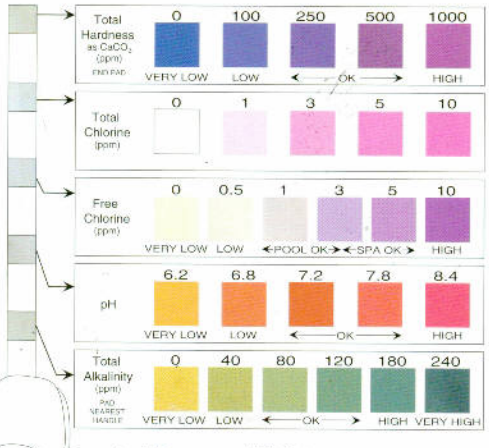
Please contact Van Walt if you have any problems.

When not in use

1. Please store your YSI in a warm dry place. Please do not keep the YSI in the peli-case if inside of the peli-case is very wet.
2. When finished with unit, please rinse probes & fill the calibration cup to the mark (approx. 1 cm) with tap water (deionised water should never be used for storage!). Fit calibration cup by sliding it over the probes & screwing right until hand tight.
3. In order to charge the unit with the wall charger it must be switched on before plugging into the mains. If the battery has run out then it will not switch on. If this happens plug it in a usb port on a laptop or pc for 15 mins and then transfer to the wall charger once switched on, this will charge quicker.

Scan to download the video

An introduction to the YSI Pro DSS



Important: Keep cap on tight between uses. Store at room temperature.

EASY SINGLE DIP INSTRUCTIONS FOR USE:

For illustrated, step-by-step directions, refer to Dr. H. Tueau's Complete Guide to Pool and Spa Care.

Remove an AquaChek Test Strip from the bottle and replace cap tightly. Dip the test strip into your pool or spa and remove immediately. Hold strip level for 15 seconds (do not shake excess water from strip). Compare Total Hardness, Total Chlorine, Free Chlorine, pH and Total Alkalinity pads (in that order) to the color chart on the front of this comparator. Record the results in the Test Log section of the Guide to Pool and Spa Care.

Once the tests have been conducted and the results logged, refer to the treatment charts in the Guide to Pool and Spa Care to correct any imbalances.

Environmental Test Systems, Inc.
P.O. Box 4659, Elkhart, IN 46514 U.S.A.
1-888-AquaChek (1-888-278-2243)
www.AquaChek.com

1604CC Rev99

Appendix E

IDDE Employee Training Record

ILLICIT DISCHARGE DETECTION AND ELIMINATION

EMPLOYEE TRAINING RECORD

YEAR 5

Town of Manchester-by-the-Sea, MA

Date of Training: 6/12/2023

Training by: Kayla Repucci, Bobrek Engineering

PLEASE PRINT CLEARLY

Name	Department
Charles Dam	DPW
Nate Desrosiers	DPW
Shawn Johnson	DPW

MS4 IDDE Annual Training

Manchester-by-the-Sea, MA

Permit Year 5

Kayla Repucci, Environmental Planner

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1

Today's Agenda

- MS4 Review
- Illicit Discharge Detection and Elimination
  - What is an Illicit Discharge?
  - Indicators of Illicit Discharges
  - Screening Protocol
- Preventing Town Pollution
- General field safety

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2

MS4

Municipal **Separate** **Storm** **Sewer** **System**

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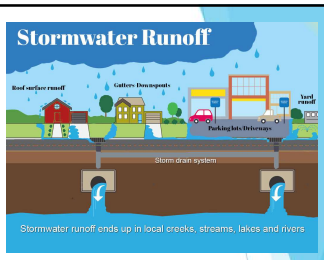
3

6 Minimum Control Measures

- Public Education & Outreach
- Public Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Discharge Controls
- Post-Construction Controls - New Development
- Good Housekeeping & Pollution Prevention



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IDDE

Illicit Discharge Detection and Elimination

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5

ILLICIT DISCHARGES

Anything not entirely made of stormwater that enters the storm sewer system

There are exceptions- not all illicit discharges are illegal.

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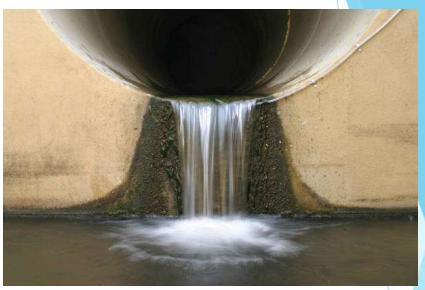
6

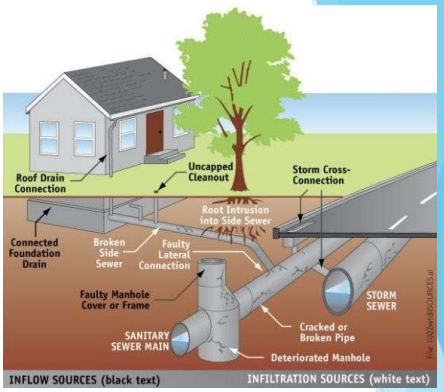
Types of Illicit Discharges by Frequency



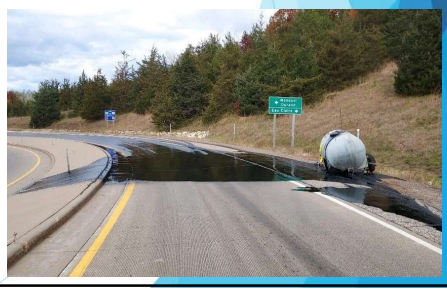
- **Continuous:** such as a cross-connection
  - Occurs continuously or nearly continuously
  - Easiest to Detect
  - Typically greatest pollutant load
- **Intermittent:** such as a sump-pump
  - Occurs over a shorter period of time (a Few hours per day)
  - Harder to detect
- **Transitory**
  - Occurs in response to singular event (spill, sewer break, transport accident, illegal dumping)
  - Hardest to identify during routine screening

7

Types of Illicit Discharges by Mode of Entry



- **Direct Connection**
  - Enter via a piped connection
  - Usually continuous or intermittent
  - sewer cross connections
- **Indirect Connection:** such as a sump-pump
  - Enter via storm drain inlets or by infiltration
  - Usually intermittent or transitory
  - Groundwater seepage, spills, outdoor washing, non-target irrigation



8

Stormwater Pollutants

Activity	Pollutant
Vehicle washing/maintenance	Heavy metals, oil/grease, surfactants, solvents
Pet Waste	Bacteria
Lawn Maintenance/landscaping	Fertilizers, pesticides, nutrients
Failing septic systems/sewer cross-connections/SSOs	Bacteria
Illegal Dumping/Spills from vehicular accidents	Oil and grease, toxics, nutrients from lawn waste dumping
Swimming pool draining	Chlorine
Construction sites	Sediment

9

Receiving Waters and Impairments

Category 5 Water: waters requiring a TMDL[1]			
Indicator contributing to impairment:	Cat Brook (MA93-29)		
Temperature	X		
pH, Low	X		
Category 4a Waters TMDL is completed			
Indicator contributing to impairment:	Manchester Harbor (MA93-19)	Salem Sound (MA93-55)	Causeway Brook (MA93-47)
Fecal Coliform	X	X	X
Enterococcus	X		
Escherichia Coli			X
Category 3 Waters: No uses Assessed			
Clark Pond			
Sawmill Brook			
Millets Swamp to Sawmill Brook			
Bennetts Brook to Manchester Harbor			
Unnamed Stream to Swamps and Sawmill Brook			
Wolftrap Brook			

Impaired waters don't meet water quality standards

If receiving water is impaired, then there are additional requirements when completing the MS4 permit.

10

ILLICIT DISCHARGES EXEMPTIONS

- Only allowable if the discharge is not identified as a significant contributor of pollutants to the MS4

Water line flushing	• Ideally check Chlorine levels before flushing and observe levels in nearby outfalls
Landscape irrigation runoff	• Unless evidence of high nitrogen and phosphorus
Diverted stream flows	• Prior approval from Con Com
Foundation drains	• French Drains • Sump Pumps • Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20)

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11

ILLICIT DISCHARGES EXEMPTIONS

Residential building wash waters (without detergents)	• Encourage residents to use power washers over detergents for cleaning purposes
Individual resident car washing	• Encourage washing in pervious areas and using biodegradable products
Dechlorinated swimming pool discharges	• 10 days sitting in the sun will naturally dechlorinate • <0.1mg/L is acceptable at low flow speed

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12

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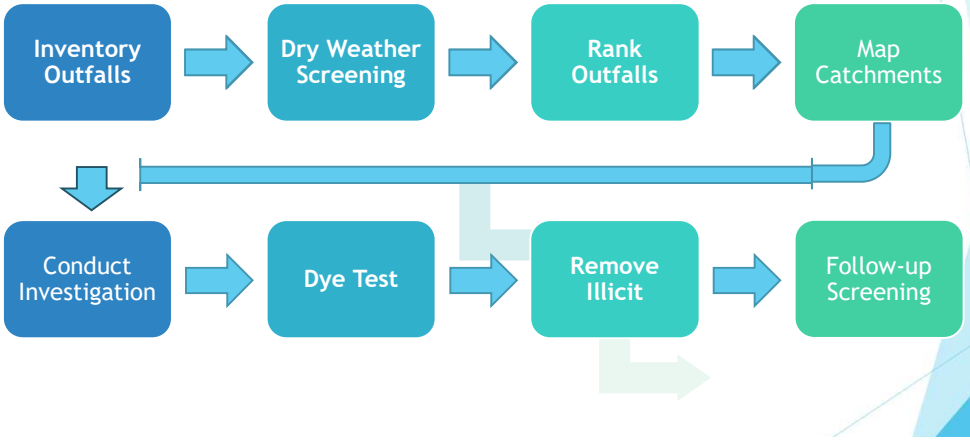

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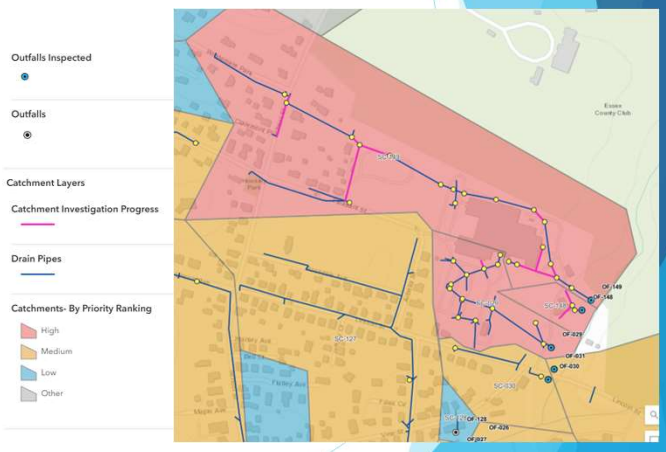
13

Stormwater System Mapping

- Outfalls, manholes, catch basins, pipes, interconnections, and refined catchment delineations by Year 5
- Much of this info has already been done to complete catchment delineations and investigations
- Catchment delineations help you to find illicit discharges



14

HOW TO FIND ILLICIT DISCHARGES?

DRY WEATHER SCREENING

- Less than 0.1" of rainfall has occurred in the previous 48-hr period
- Looking for direct illicit connections which would likely contribute flow
- Sewage, washing machines

WET WEATHER SCREENING

- Within 48 hours of a rainfall event that produces runoff greater than 0.1"
- Looking for illicit discharges only occurring or triggered during rainfall event
- Sanitary sewer Overflows. Septic backups

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15

SAMPLING PROCEDURES

- NOTABLE SMELLS
- VISUAL OBSERVATIONS
- FIELD TESTS
- LABORATORY SAMPLES

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16

Indicators of an Illicit Discharge

- Unusual flow
- Pungent odors
- Excessive or dead vegetation
- Excessive sediment
- Discoloration or stains
- Foam or Sheen
- Residual evidence (i.e. toilet paper)

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17

CHEMICAL

NATURAL

Sheen

Foam

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18

Orange Deposits

- Orange slime, fluff or crust
- Oily sheen that breaks apart when poked with a stick
- Usually caused by bacteria that feeds on iron and release a clear, jelly like substance that turns orange when exposed to air
- Could potentially be a result of an illicit discharge- investigate local causes
  - Land excavation
  - Runoff from landfill

19

Odors

- Rotten egg smell
  - May occur naturally from decomposing material in wetlands which release sulfide and methane gases
  - May be discharge from a failed septic system or damaged sewer line
- Chlorine
  - Familiar smell associated with swimming pools and bleach
  - Improper disposal of greywater or swimming pool discharges
  - No natural causes
- Sharp, pungent odors
  - Can irritate the nose, eyes and throat.
  - Natural causes are skunks, mink, muskrats, and foxes- don't produce stinging sensation
  - Human causes include volatile chemicals- pesticides and fertilizers, may cause stinging

20

SAFETY AND SAMPLING GUIDELINES

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21

FIELD SAMPLING

MBAS TEST KIT
FOR SURFACTANTS

TEST STRIPS

WATER QUALITY
MULTIMETER

22

LABORATORY SAMPLES

- e. Coli
- Enterococcus
- Fecal Coliform

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23

SAMPLING PROTOCOL

- DO NOT DO THE FOLLOWING WHILE SAMPLING:
  - Eat, drink or smoke
  - Collect near a running vehicle or park vehicle near the sample area
  - Collect sample with bare hands, wear clean gloves
  - Touch the inside of the sample container
  - Overfill sample container
  - Disturb the sediment when collecting the sample

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24

PREVENTING TOWN POLLUTION

SALT
- Enclose piles
- Maintain area by sweeping and keeping salt away from catch basins

SOLID WASTE
- Keep significant sources of pollution secure and kept in a contained area
- Inspect waste dumpsters for signs of leaks and detoriation

SNOW DUMP
- Locations should be on a pervious surface upland away from resources areas

DETERGENTS
- Never dump soaps or detergents into the storm drains
- When possible wash vehicles in enclosure with drains to sewer system

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25

WATER SAFETY

Employees/Volunteers must be provided with and use United States Coast Guard (USCG) approved Life Jackets

Before and after each use, inspect the Personal Flotation Devices for defects.

Provide ring buoys with at least 90 feet of line if working from a boat or skiff.

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26

GENERAL SAFETY PRECAUTIONS

Heat stress	Slips/trip/falls	Drowning	Caught in mud
Confined space entry	Insects	Ticks	Noxious plants

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27

SUMMARY

- MS4 requires us to have an Illicit Detection and Elimination Program
- Look for indicators of illicit discharges
- We can help prevent pollution by maintaining facilities
- Follow general safety guidelines when in the field

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28

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Appendix F

Source Isolation and Confirmation Methods: Instructions, Manuals, and SOPs

SOP 1: DRY WEATHER OUTFALL INSPECTIONS

Table of Contents

1. Introduction

Outfalls from an engineered storm drain system can be in the form of pipes or ditches. Under current and pending regulations, it is important to inspect and document water quality from these outfalls under both dry weather and wet weather conditions. SOP 2, "Wet Weather Outfall Inspection", covers the objectives of that type of inspection. This SOP discusses the dry weather inspection objectives, and how they differ from wet weather inspection objectives.

During a dry weather period, it is anticipated that minimal flow from stormwater outfalls will be observed. Therefore, dry weather inspections aim to characterize any/all flow observed during a dry weather period and identify potential source(s) of an illicit discharge through qualitative testing; further described in SOP 13, "Water Quality Screening in the Field".

2. Objectives of Dry Weather Inspections

A dry weather period is a time interval during which less than 0.1 inch of rain is observed across a minimum of 72 hours. Unlike wet weather sampling, dry weather inspections are not intended to capture a "first flush" of stormwater discharge, rather they are intended to identify any/all discharges from a stormwater outfall during a period without recorded rainfall. The objective of inspections during a dry weather period is to characterize observed discharges and facilitate detection of illicit discharges.

3. Visual Condition Assessment

The attached Dry Weather Outfall Inspection Survey is a tool to assist in documenting observations related to the both quantitative and qualitative characteristics of any/all flows conveyed by the structure during a dry period.

For any visual observation discharge from a stormwater outfall, an investigation into the pollution source should occur, but the following are often true:

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): indicators of illicit discharge.
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 or naturally occurring sheens are usually silver or relatively dull in color and will break up into a number of small patches of sheen. The cause may be presence of iron, decomposition of organic material or presence of certain bacteria. Bacterial sheen is not a pollutant but should be noted.

Many of these observations are indicators of an illicit discharge. Examples of illicit discharges include: 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). Additional guidelines for illicit discharge investigations are included in SOP 10, "Locating Illicit Discharges". If dry weather flow is present at the outfall, and the flow does not appear to be an obvious illicit discharge (e.g. flow is clear, odorless, etc.) attempt to identify the source of flow (e.g. intermittent stream, wetlands drainage, etc.) and document the discharge for future comparison.

Although many of the observations are indicators of illicit discharge it should be noted that several of these indicators may also occur naturally. Orange staining may be the result of naturally occurring iron, and thus unrelated to pollution. Foam can be formed when the physical characteristics of water are altered by the presence of organic materials. Foam is typically found in waters with high organic content such as bog lakes, streams that originate from bog lakes, productive lakes, wetlands, or woody areas. To determine the difference between natural foam and foam cause by pollution, consider the following:

1. Wind direction or turbulence: natural foam occurrences on the beach coincide with onshore winds. Often, foam can be found along a shoreline and/or on open waters during windy days. Natural occurrences in rivers can be found downstream of a turbulent site.
2. Proximity to a potential pollution source: some entities including the textile industry, paper production facilities, oil industries, and fire fighting activities work with materials that cause foaming in water. If these materials are released to a water body in large quantities, they can cause foaming. Also, the presence of silt in water, such as from a construction site can cause foam.
3. Feeling: natural foam is typically persistent, light, not slimy to the touch.
4. Presence of decomposing plants or organic material in the water.

Optical enhancers, fluorescent dyes added to laundry detergent, are typically detected through the use of clean, white cotton pads placed within the discharge for several days, dried then viewed under a UV light. If the cotton pad displays fluorescent patches, optical enhancers are present. Optical enhancers are

occasionally visible as a bluish-purple haze on the water surface; however the testing method should be used to confirm the presence of optical enhancers.

The Dry Weather Outfall Inspection Survey includes fields where these and other specific observations can be noted. The inspector shall indicate the presence of a specific water quality indicator or parameter by marking "Yes". If "Yes" is marked, provide additional details in the comments section. If the indictor in question is not present, mark "No".

Within the comments section, provide additional information with regard to recorded precipitation totals, or more detailed descriptions of observations made during the inspection and corrective actions taken.

4. Measuring Water Quality

Based on the results of the Visual Condition Assessment, it may be necessary to collect additional data about water quality. Water quality samples can be in the form of screening using field test kits and instrumentation, or by discrete analytical samples processed by a laboratory.

Information on selecting and using field test kits and instrumentation is included in SOP 13, "Water Quality Screening in the Field." The Inspection Survey also provides values for what can be considered an appropriate benchmark for a variety of parameters that can be evaluated in the field.

If the results of screening using field test kits indicate that the outfall's water quality exceeds the benchmarks provided, collection of discrete analytical samples should be considered.

5. Analytical Sample Collection

Sample collection methods may vary based on specific outfall limitations but shall follow test procedures outlined in 40 CFR 136. A discrete manual or grab sample can classify water at a distinct point in time. These samples are easily collected and used primarily when the water quality of the discharge is expected to be homogeneous, or unchanging, in nature. A flow-weighted composite sample will classify water quality over a measured period of time. These samples are used when the water quality of the discharge is expected to be heterogeneous, or fluctuating, in nature. Grab samples are more common for dry weather outfall inspections due to the time-sensitive nature of the process.

Protocols for collecting a grab sample shall include the following:

1. Do not eat, drink or smoke during sample collection and processing.
2. Do not collect or process samples near a running vehicle.
3. Do not park vehicles in the immediate sample collection area, including both running and non-running vehicles.
4. Always wear clean, powder-free nitrile gloves when handling sample containers and lids.

5. Never touch the inside surface of a sample container or lid, even with gloved hands.
6. Never allow the inner surface of a sample container or lid to be contacted by any material other than the sample water.
7. Collect samples while facing upstream and so as not to disturb water or sediments in the outfall pipe or ditch.
8. Do not overfill sample containers, and do not dump out any liquid in them. Liquids are often added to sample containers intentionally by the analytical laboratory as a preservative or for pH adjustment.
9. Slowly lower the bottle into the water to avoid bottom disturbance and stirring up sediment.
10. Do not allow any object or material to fall into or contact the collected water sample.
11. Do not allow rainwater to drip from rain gear or other surfaces into sample containers.
12. Replace and tighten sample container lids immediately after sample collection.
13. Accurately label the sample with the time and location.
14. Document on the Wet Weather Outfall Inspection Survey that analytical samples were collected, specify parameters, and note the sample time on the Inspection Survey. This creates a reference point for samples.

6. Analytical Sample Quality Control and Assurance

Upon completion of successful sample collection, the samples must be sent or delivered to a MassDEP-approved laboratory for analytical testing. Quality control and assurance are important to ensuring accurate analytical test results.

Sample preservation is required to prevent contaminate degradation between sampling and analysis, and should be completed in accordance with 40 CFR 136.3.

Maximum acceptable holding times are also specified for each analytical method in 40 CFR 136.3. Holding time is defined as the period of time between sample collection and extraction for analysis of the sample at the laboratory. Holding time is important because prompt laboratory analysis allows the laboratory to review the data and if analytical problems are found, re-analyze the affected samples within the holding times.

Chain of custody forms are designed to provide sample submittal information and document transfers of sample custody. The forms are typically provided by the laboratory and must be completed by the field sampling personnel for each sample submitted to the lab for analysis. The document must be signed by both the person releasing the sample and the person receiving the sample every time the sample changes hands. The sampling personnel shall keep one copy of the form and send the remaining copies to the laboratory with the samples. Custody seals, which are dated, signed and affixed to the sample container, may be used if the samples are shipped in a cooler via courier or commercial overnight shipping.

7. Attachments

1. Dry Weather Outfall Inspection Survey

8. Related Standard Operating Procedures

1. SOP 2, Wet Weather Outfall Inspection
2. SOP 10, Locating Illicit Discharges
3. SOP 13, Water Quality Screening in the Field

SOP 2: WET WEATHER OUTFALL INSPECTIONS

Table of Contents

1. Introduction

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2. Definition of Wet Weather

A storm is considered a representative wet weather event if greater than 0.1 inch of rain falls and occurs at least 72 hours after the previously measurable (greater than 0.1 inch of rainfall) storm event. In some watersheds, based on the amount of impervious surface present, increased discharge from an outfall may not result from 0.1 inch of rain. An understanding of how outfalls respond to different events will develop as the inspection process proceeds over several months, allowing the inspectors to refine an approach for inspections.

Ideally, the evaluation and any samples collected should occur within the first 30 minutes of discharge to reflect the first flush or maximum pollutant load.

Typical practice is to prepare for a wet weather inspection event when weather forecasts show a 40% chance of rain or greater. If the inspector intends to collect analytical samples, coordination with the laboratory for bottle ware and for sample drop-off needs to occur in advance.

3. Visual Condition Assessment

The attached Wet Weather Outfall Inspection Survey should be used to document observations related to the quality of stormwater conveyed by the structure. Observations such as the following can indicate sources of pollution within the storm drain system:

- Oil sheen
- Discoloration
- Trash and debris

For any visual observation of pollution in a stormwater outfall discharge, an investigation into the pollution source should occur, but the following are often true:

- Foam: indicator of upstream vehicle washing activities, or an illicit discharge.

- Oil sheen: result of a leak or spill.
- Cloudiness: indicator of suspended solids such as dust, ash, powdered chemicals and ground up materials.
- Color or odor: Indicator of raw materials, chemicals, or sewage.
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Wind direction or turbulence: natural foam occurrences on the beach coincide with onshore winds. Often, foam can be found along a shoreline and/or on open waters during windy days. Natural occurrences in rivers can be found downstream of a turbulent site.

Proximity to a potential pollution source: some entities including the textile industry, paper production facilities, oil industries, and fire fighting activities work with materials that cause foaming in water. If these materials are released to a water body in large quantities, they can cause foaming. Also, the presence of silt in water, such as from a construction site can cause foam.

Feeling: natural foam is typically persistent, light, not slimy to the touch.

Presence of decomposing plants or organic material in the water.

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Based on the results of the Visual Condition Assessment, it may be necessary to collect additional data about water quality. Water quality samples can be in the form of screening using field test kits or by discrete analytical samples processed by a laboratory.

Information on how to use field test kits is included in SOP 13, "Water Quality Screening with Field Test Kits", and the Wet Weather Outfall Inspection Survey includes fields to document the results of such screening. The Inspection Survey also provides values for what can be considered an appropriate benchmark for a variety of parameters that can be evaluated with field test kits.

If the results of screening using field test kits indicate that the outfall's water quality exceeds the benchmarks provided, collection of discrete analytical samples should be considered.

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- Do not eat, drink or smoke during sample collection and processing.
- Do not collect or process samples near a running vehicle.

- Do not park vehicles in the immediate sample collection area, including both running and non-running vehicles.
- Always wear clean, powder-free nitrile gloves when handling sample containers and lids.
- Never touch the inside surface of a sample container or lid, even with gloved hands.
- Never allow the inner surface of a sample container or lid to be contacted by any material other than the sample water.
- Collect samples while facing upstream and so as not to disturb water or sediments in the outfall pipe or ditch.
- Do not overfill sample containers, and do not dump out any liquid in them. Liquids are often added to sample containers intentionally by the analytical laboratory as a preservative or for pH adjustment.
- Slowly lower the bottle into the water to avoid bottom disturbance and stirring up sediment.
- Do not allow any object or material to fall into or contact the collected water sample.
- Do not allow rainwater to drip from rain gear or other surfaces into sample containers.
- Replace and tighten sample container lids immediately after sample collection.
- Accurately label the sample with the time and location.

Document on the Wet Weather Outfall Inspection Survey that analytical samples were collected, specify parameters, and note the sample time on the Inspection Survey. This creates a reference point for samples.

6. Analytical Sample Quality Control and Assurance

Upon completion of successful sample collection, the samples must be sent or delivered to a MassDEP-approved laboratory for analytical testing. Quality control and assurance are important to ensuring accurate analytical test results.

Sample preservation is required to prevent contaminant degradation between sampling and analysis and should be completed in accordance with 40 CFR 136.3.

Maximum acceptable holding times are also specified for each analytical method in 40 CFR 136.3. Holding time is defined as the period of time between sample collection and extraction for analysis of the sample at the laboratory. Holding time is important because prompt laboratory analysis allows the laboratory to review the data and if analytical problems are found, re-analyze the affected samples within the holding times.

Chain of custody forms are designed to provide sample submittal information and document transfers of sample custody. The forms are typically provided by the laboratory and must be completed by the field sampling personnel for each sample submitted to the lab for analysis. The document must be signed by both the person releasing the sample and the person receiving the sample every time the sample changes hands. The sampling personnel shall keep one copy of the form and send the remaining copies to the

laboratory with the samples. Custody seals, which are dated, signed and affixed to the sample container, may be used if the samples are shipped in a cooler via courier or commercial overnight shipping.

7. Attachments

Wet Weather Outfall Inspection Survey

8. Related Standard Operating Procedures

SOP 1, Dry Weather Outfall Inspection

SOP 10, Locating Illicit Discharges

SOP 13, Water Quality Screening in the Field

SOP 10: LOCATING ILLICIT DISCHARGES

Contents

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

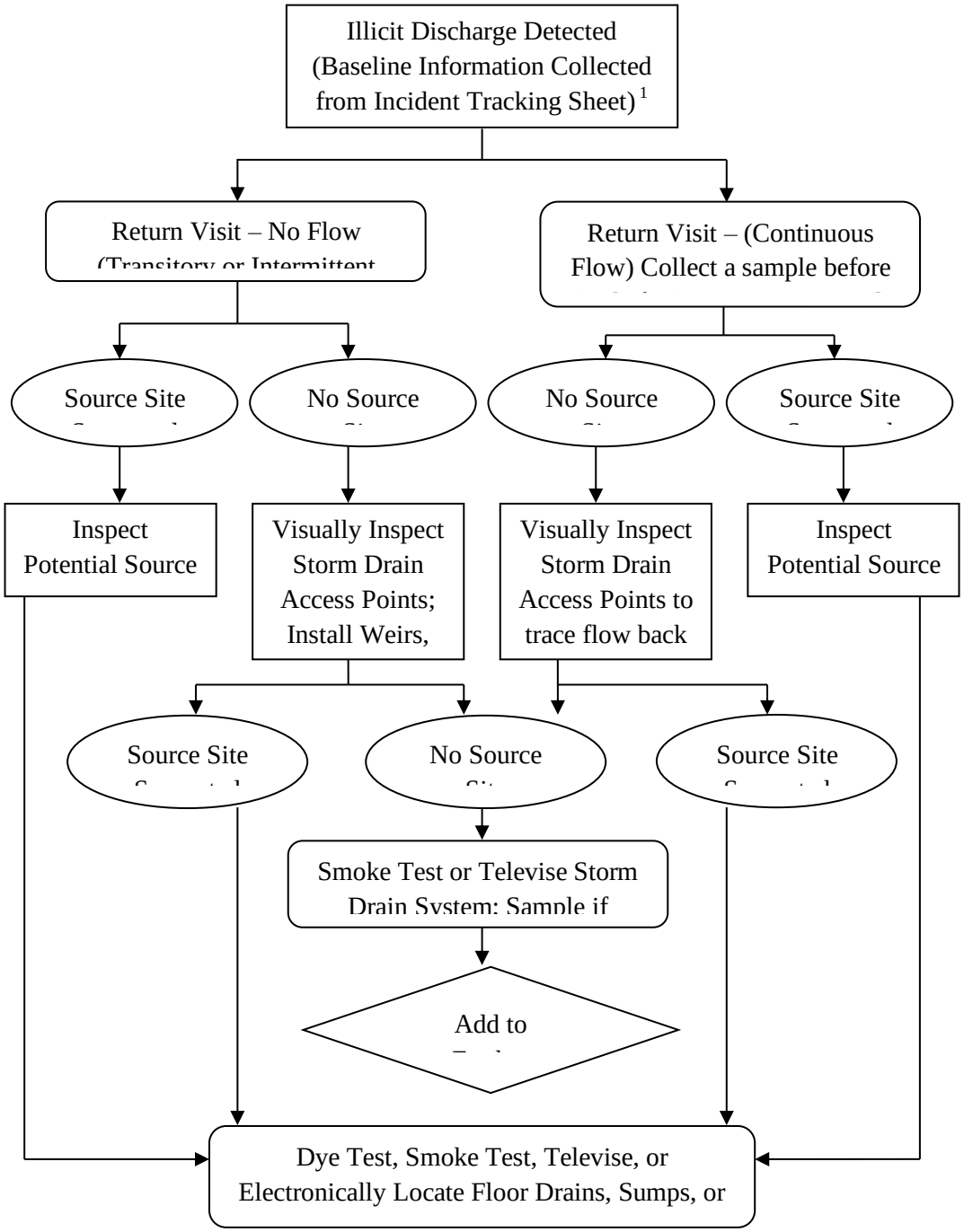
Related Standard Operating Procedures

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
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



[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.

Neponset Outfall Catchment Analysis

The federal Clean Water Act, passed in 1972, established regulation of pollutant discharges into "waters of the United States." [1] This law requires municipalities to qualify for a permit under the National Pollutant Discharge Elimination System (NPEDS) program in order to lawfully discharge stormwater into rivers, streams, and lakes. In Massachusetts, the 2003 Region 1 Final General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) is in effect, although it expired in 2008.[2] To qualify for a permit, MS4 municipalities must, for example, provide a plan for Best Management Practices (BMPs) designed to "collectively control the discharge of the pollutant(s) of concern," when the stormwater discharge contributes to Impaired Waters (303(d) waters).[3] The draft of the new Massachusetts MS4 requirement has been released for a period of public comment, and if adopted, MS4 municipalities will be required to adopt stronger measures for minimizing the impact of their stormwater on the cleanliness of the receiving waters and on the habitats of any endangered species in the area.[4]

In 2013, the Neponset River Watershed Association (NepRWA) and MAPC secured a Community Innovation Challenge (CIC) grant from the state of Massachusetts to assist the Neponset Valley Watershed municipalities in collaborating to adopt a new approach to meet the new MS4 requirements. The CIC grant program promotes municipal efficiency through regional collaboration. In this case, the goal was to provide policy templates, recommendations, and technical tools that Neponset Valley municipalities could use to meet the new requirements of the MS4 permit. Representatives from conservation commissions and departments of public works who are both involved in the permitting or in operation and management of stormwater came together to create the Neponset Valley Regional Stormwater Collaborative. The collaborative includes representatives from Canton, Dedham, Foxborough, Medfield, Milton, Norwood, Randolph, Sharon, Stoughton, Walpole, Westwood, and the Boston Water and Sewer Commission, with Boston participating as a technical advisor.

In order for Massachusetts MS4 municipalities to meet the terms of the new permit, they will likely need to meet more stringent illicit discharge detection and elimination (IDDE) requirements. "Illicit Discharges" are any discharges to the stormwater system that contains substances other than stormwater, such as chemicals, oils, gasoline, or waste.[5] Such discharges are associated with auto

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[1] United States Environmental Protection Agency. "Summary of the Clean Water Act." http://www2.epa.gov/laws-regulations/summary-clean-water-act Last modified November 12, 2014

[2] Environmental Protection Agency. 2003. *National Pollutant Discharge Elimination System (NPEDS) General Permit for Stormwater Discharges from Small Separate Storm Sewer System.* http://www.epa.gov/region1/npdes/permits/permit_final_ms4.pdf

[3] United States Environmental Protection Agency 2003: 5.

[4] United States Environmental Protection Agency. 2014. *National Pollutant Discharge Elimination System (NPEDS) General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts.* http://www.epa.gov/region1/npdes/stormwater/ma/2014DraftMASmallMS4GeneralPermit.pdf

[5] With some exceptions. United States Environmental Protection Agency. "Illicit Discharges." http://water.epa.gov/polwaste/nps/discharges.cfm Last modified November 28, 2012.

or other industrial activities, older residences, and failing septic systems. According to the draft MS4 permit, Massachusetts MS4 municipalities will be required to a) delineate catchment areas draining to each outfall, b) identify the receiving waters associated with those outfalls, and c) rate the potential for illicit discharge of the outfall catchment areas as High, Medium, or Low. This rating can be used as a tool to focus outreach, infrastructure, and enforcement campaigns to property owners or neighborhoods. Meeting this standard requires technical analysis of hydrology, topography, land use, and stormwater infrastructure.

Several public agencies have previously tackled the task of automatically delineating catchments using topographic data, such as San Francisco, Portland, and Tampa.[6] If these methods could be adapted to the Massachusetts context, then municipalities might be able to meet the standard more cost-effectively. However, any attempt at standardization must contend with the highly varied quality and completeness of municipal stormwater infrastructure data and the often limited technical capacity available at the local level. To reduce redundancy of effort and account for the varied resources available in different cities and towns, MAPC developed a regionally applicable method to conduct this analysis requiring a bare minimum of local stormwater infrastructure data in a standardized format. The product is a catalog of data and a set of ArcGIS tools that can be applied for any municipality in Massachusetts. This document describes the method and provides municipalities with instructions for implementing it using ArcGIS and CommunityViz, an ArcGIS add-in.

To develop a widely applicable process, we first began with a pilot analysis in the Town of Milton. A review of the infrastructure datasets from each Neponset Watershed municipality indicated that Milton's data was both representative of the kinds of data available from the Neponset municipalities, and was relatively complete. In keeping with the regional spirit of the CIC grants, we wanted to maximize the number of communities that would be able to apply this tool, so we used the most commonly available infrastructure datasets provided by Milton, combined with publicly available digital elevation model (DEM), to delineate each catchment area contributing to each outfall. For the ranking process, we used datasets on potential illicit discharge generating sites, such as older homes and car washes, present within the catchment areas to rank the catchments as low, medium, or high priority for inspection. These factors can be weighted based on their importance and combined to create a composite score, providing a measure for the low, medium, and high risk delineation.

NepRWA collected the municipal stormwater infrastructure data from the participating municipalities and guided parts of the analysis, and MAPC conducted the analysis. We have produced maps and digital data of the catchment areas in Milton, along with an ArcGIS toolbox (MAPC Catchment Delineation Toolbox) and the following detailed methodology to help the other

[6] "Urban Catchment Delineation Tool." https://code.google.com/p/besasm-toys/wiki/urbanCatchmentDelineationTool Last modified June 13, 2012; Nick Birth and Greg Braswell. 2011. "The 'Urban Drainage' Model: SF DPW uses Lidar DEM and Custom Algorithm for Delineating Drainage Catchments and Hydrologic Modelling." *Bay Area Automated Mapping Association Journal* 5: 5-6.*http://www.baama.org/Resources/Documents/BAAMA_Journal_V5I1_LoRes.pdf*.

municipalities delineate their own outfall catchment areas.[7] Additionally, we created a minimum set of data standards for municipal stormwater infrastructure data in order for this method to be the most effective, and provided an assessment of missing or incomplete data in each Neponset Watershed municipality based on data that they provided. Finally, we created an Outfalls and Impaired Waters database, which contains a report on each receiving water by municipality, along with a list of outfalls that contribute to that water body.

Delineating Outfall Catchments

The basic process for delineating the catchment areas for each outfall was to download, assemble, and enhance the Digital Elevation Model, then use it to define small catchments for each catch basin, and finally aggregate those smaller catchments into larger outfall catchment areas. In order to streamline the process for municipalities across Massachusetts, we created three custom ArcGIS tools: the Lidar Mosaic tool, the Create Burn Raster tool, and the Complete Watershed tool, packaged as the MAPC Catchment Delineation Toolbox. The tools are publicly available for download on the ArcGIS Online website.[8] The method requires the following input datasets:

Input Datasets for Delineating Outfall Catchments

1. Digital Elevation Model (DEM): for this analysis, we used the high resolution (1m) digital elevation models[9] These models were created from point data captured by Lidar sensors in flights from 2002 to 2012, and processed by USGS.
2. Public Rights of Way: From the MassGIS Level 3 Parcels and MAPC Massachusetts Land Parcel Database.[10]
3. Water features: MassDEP Hydrography[11]
4. Road center lines: MassDOT Road Inventory[12]
5. Catch Basins: Point feature class provided by the municipality[13]
6. Stormwater Pipes: Line feature class provided by the municipality
7. Outfalls: Point feature class provided by the municipality

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[7] The catchment delineation process requires ArcGIS 10.2 and the Spatial Analyst extension. The ranking process requires CommunityViz.

[8] Go to http://www.arcgis.com/home/item.html?id=2c01d185375c4e1ea85195b7c9b96150 to download the toolbox.

[9] United States Geological Survey. "USGS Color Ortho Imagery." April 2013, April 2014. MassGIS. http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/

[10] Metropolitan Area Planning Council. "MAPC Massachusetts Land Parcel Database." 2012. MAPC.

[11] Massachusetts Department of Environmental Protection. "MassDEP Hydrography (1:25,000)." March 2010. MassGIS. http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/hd.html

[12] Massachusetts Department of Transportation. ""MassDOT Roads." June 2014. MassGIS. http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/eotroads.html

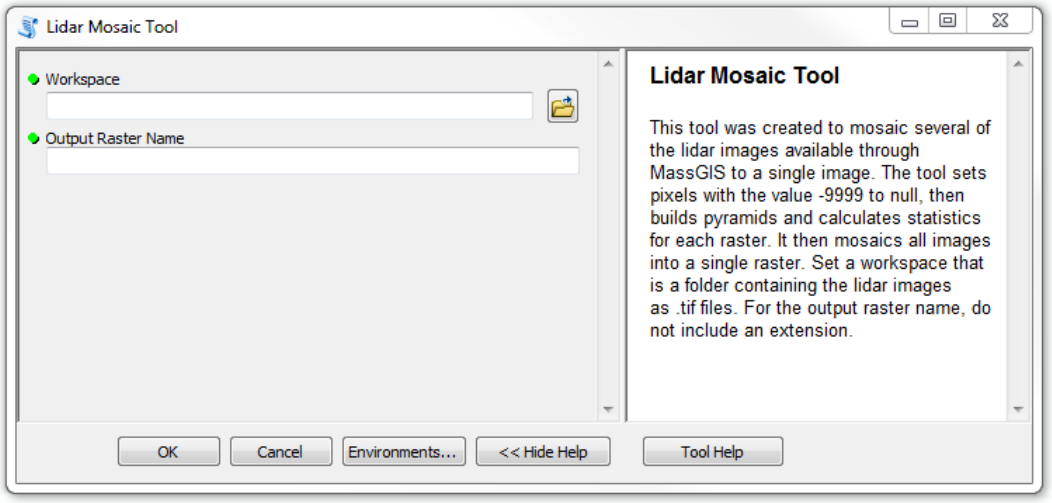
[13] The original Milton catch basin and outfall ID fields were not populated consistently, so we gave them a CB_ID and an OF_ID field, respectively. We also gave each interconnected system of stormwater pipes a unique identifier called "Pipesys_ID", described below.

Preprocessing the DEM

First, we downloaded the relevant Lidar images from MassGIS and mosaicked them into a single DEM. We performed the following steps in ArcGIS to create a DEM that covered the entire Town of Milton:

1. Set Null value to -9999
2. Built Pyramids and Calculated Statistics
3. Mosaicked to New Raster

We built this process into an ArcGIS script tool called the Lidar Mosaic Tool (these tools require the Spatial Analyst extension). To use this tool, download the relevant Lidar images from MassGIS. Then, unzip all the files and save them in a single folder. Finally, run the tool inputting the folder in the "workspace" box and the desired name of the output raster (without an extension) in the "output raster" box.



Enhancing the DEM

Although the lidar elevation model has a very high spatial resolution, it is still not precise enough to capture the relief and drainage patterns created by gutters, curbs, road crowns, or other features that are small but greatly impact stormwater runoff patterns. In order to take these important stormwater control features into account, we had to enhance the DEM to simulate these features by "burning" or etching them into the DEM. This process ensures that within an urban area, water is modeled as flowing off of properties and into roadways, where it cannot leave a gutter once it enters one, and does not cross the crown of the road. In addition to modeling features of the urban landscape more faithfully, we burned in the streambeds and other bodies of water because the DEM did not accurately capture the known streambed for smaller streams that lay in flat floodplains. The image on the lower left shows a hillshade of the Lidar DEM before features were burned into it. The flat area in the southeast actually contains a streambed with a

flat floodplain, which does not appear on the DEM, which means that the watershed tool will not accurately map the flow accumulation in this area. The roads also appear completely flat, as the slight curve of the road crown is not represented in the DEM. The lower right image shows the area after gutters, road crowns, and water bodies have been burned into it, which corrects these flat areas by etching known features into the elevation model, making it more representative of the hydrologic conditions in the area.

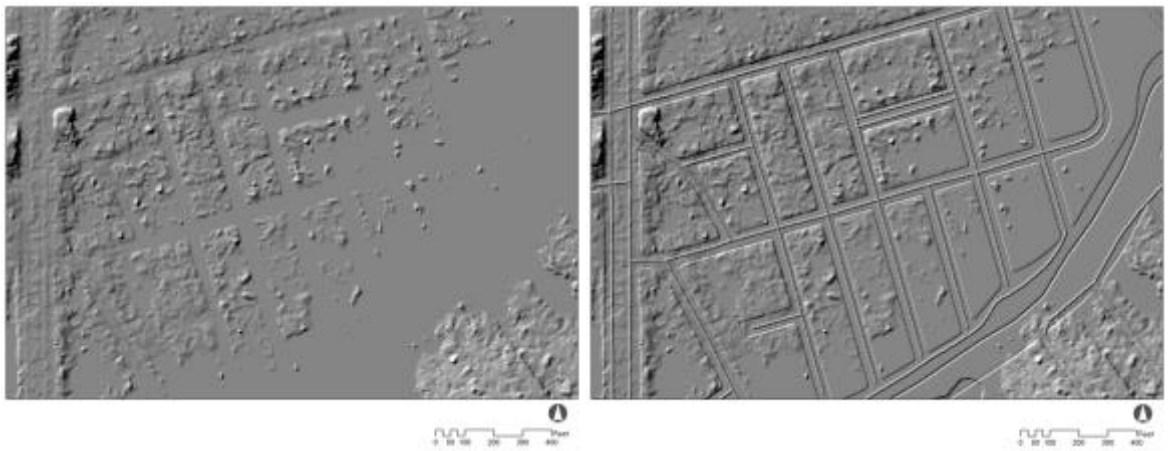


Figure 1. Hillshades before and after enhancement.

We created several "burn" rasters, which are raster representations of features such as streams or gutters. The cells representing the feature are set to the "burn value," or the value that will be added to the original DEM, and all other cells are set to 0. We created a tool for use in ArcGIS to create these rasters more easily. See the table below for the burn values that we used to enhance the DEM.

Table 1. Features and burn values.

Feature	**Data Source**	**Burn value**
Gutters	MAPC Statewide Parcel dataset, ROWs converted to polylines	-0.25m
Road Crowns	MassDOT Road centerlines	0.50m
Water Features	MassDEP	-0.25m

Set Environments

In order to create the raster images that allowed us to subtract, point, line, or polygon features from the input lidar image, the new rasters must line up so that each cell of the original raster has the same extent as each cell of the subtraction raster. To accomplish this, we set the environments (Geoprocessing > Environments) as follows:

1. Processing Extent > Snap Raster: select lidar mosaic
2. Processing Extent > Extent: same as lidar mosaic
3. Raster Analysis > Cell size: same as lidar mosaic

Once these settings are adopted, the burn rasters can be created using the "Create Burn Raster" model tool developed by MAPC.

Create Burn Raster Tool:

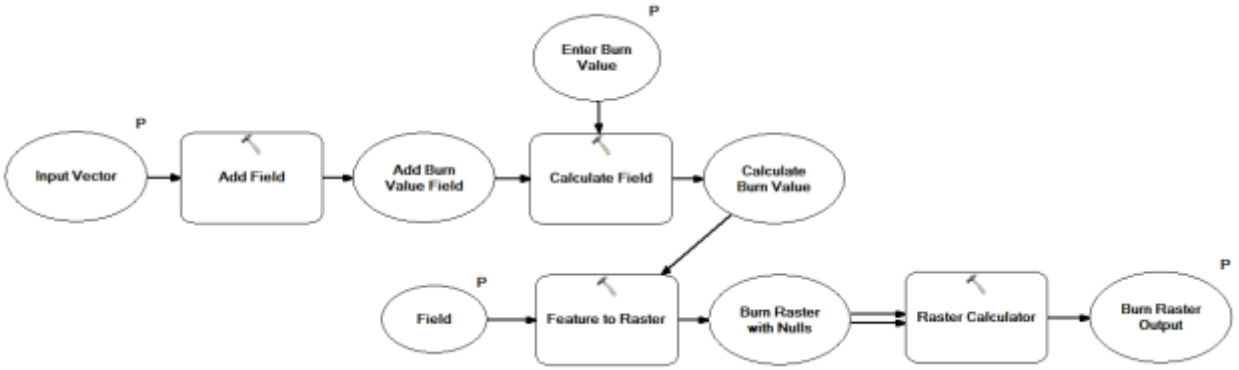


Figure 2. Burn Raster Model Tool.

For example, to create a burn raster for the road crown, a user inputs the road center line shapefile or feature class into the "Input Vector" field, then enter .5 into the "Enter Burn Value" field, select "Burn_Val" for the "Field" variable, and finally, name the output raster. The user should repeat this process with any other variable. For gutters, stream channels, or other features that will be subtracted from the DEM rather than added, users can enter a negative number.

This tool creates a raster with the same extent as the mosaicked lidar DEM with the cells of each raster lined up with cells of the entered value coinciding with the location of the input feature class, and a value of zero everywhere else. After creating the set of burn rasters, the user should add the burn rasters to the DEM using the Raster Calculator.

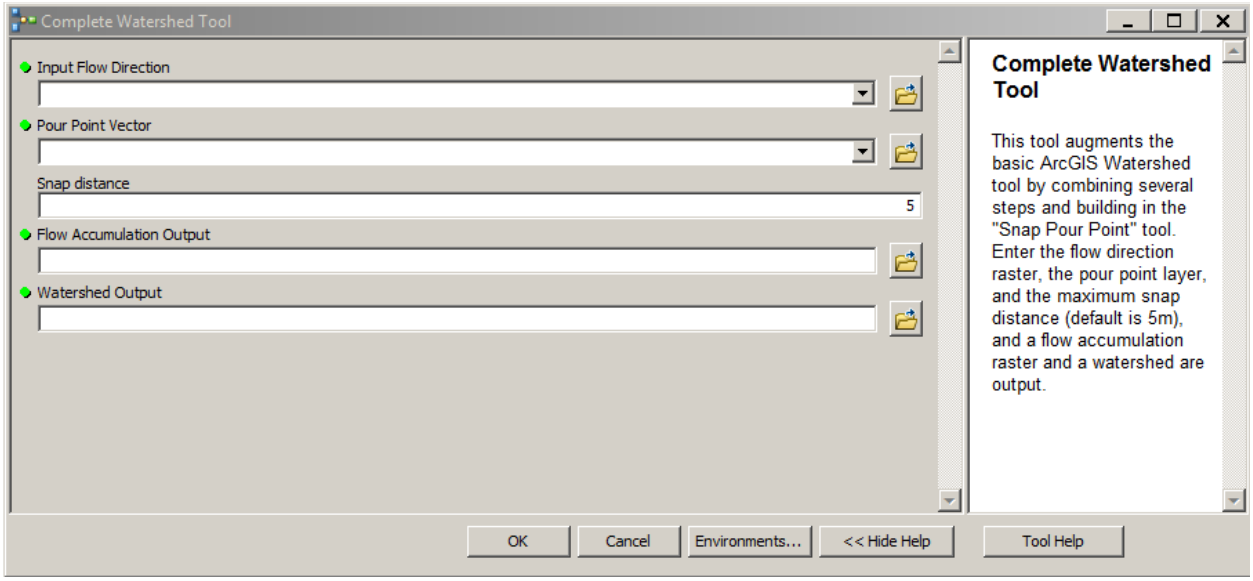
The final step in creating the most hydrologically correct model possible was to fill in any sinks in the DEM. A sink is a single pixel that has a lower elevation than all of the 8 surrounding pixels, which means that a hydrological model will show that all the water drains to that one point and does not continue further. These sinks must be automatically filled for a more accurate watershed to be created. They are also far more likely to occur in DEMs that have been heavily modified using the above burning process, so filling sinks is particularly important to this method. Sinks can be filled easily using the "Fill" tool in the ArcGIS hydrology tool set. This tool has a single input, which is the modified raster DEM. The output will be a new, enhanced DEM free of sinks. Consider creating a hillshade of this enhanced DEM to more easily see if any other features may need to be burned in using a vector dataset. Highway overpasses or bridges, for example, may be modeled as dams in the lidar image, since lidar records only the surface elevation. If such features may affect the quality of the catchments.

Creating Catch Basin Catchments

Next, we used the enhanced DEM to create small watersheds for each mapped catch basin. Using the hydrology toolset, we: :

1. Created a flow direction raster from processed DEM
2. Created a flow accumulation raster using flow direction raster
3. Snapped the pour points (catch basins) to pixels with high accumulated flow
4. Created watersheds using the flow direction raster and snapped pour points as inputs

Snapping the pour points (step 3 above) is a particularly important step, since catch basins may not coincide with the pixels where the gutters have been burned into the DEM. For this step, the input is the point feature class representing the catch basins, and a maximum snap distance. The tool will shift the location of the catch basins to coincide with pixels of highest flow accumulation in the flow accumulation raster. If this step is skipped, water will be modeled as flowing past the catch basins. We evaluated a range of radii and arrived at a maximum snap distance of 10 meters, the width of an average roadway, by visually assessing the distance between the catch basin points and the areas of high flow accumulation. The output of that process is a set of very small watersheds—one for each catch basin.



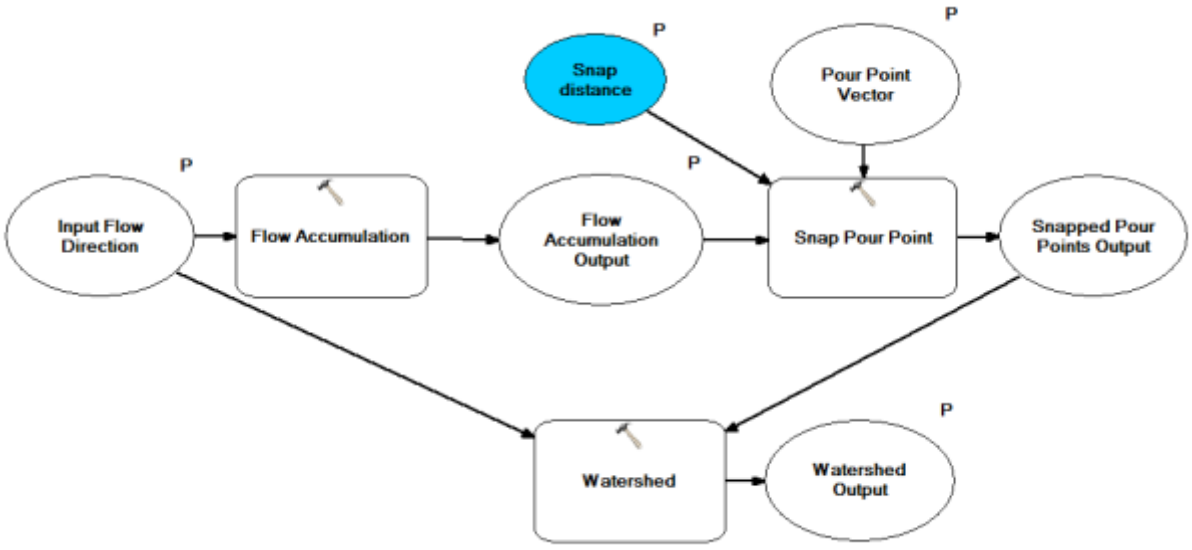


Figure 4. Complete Watershed Tool and Model.

To facilitate the four steps outlined above, we created a model tool in ArcGIS called the "Complete Watershed Tool." that allows you to combines steps 2 through 4. The user must first run the "Flow Direction" tool in ArcGIS, using the enhanced DEM as the input raster, then use the "Complete Watershed Tool" from the MAPC Toolbox. Inputs to this tool are the Flow Direction raster, the catch basins, a maximum snap distance (described below), and output names for both the flow accumulation raster and the watershed raster.

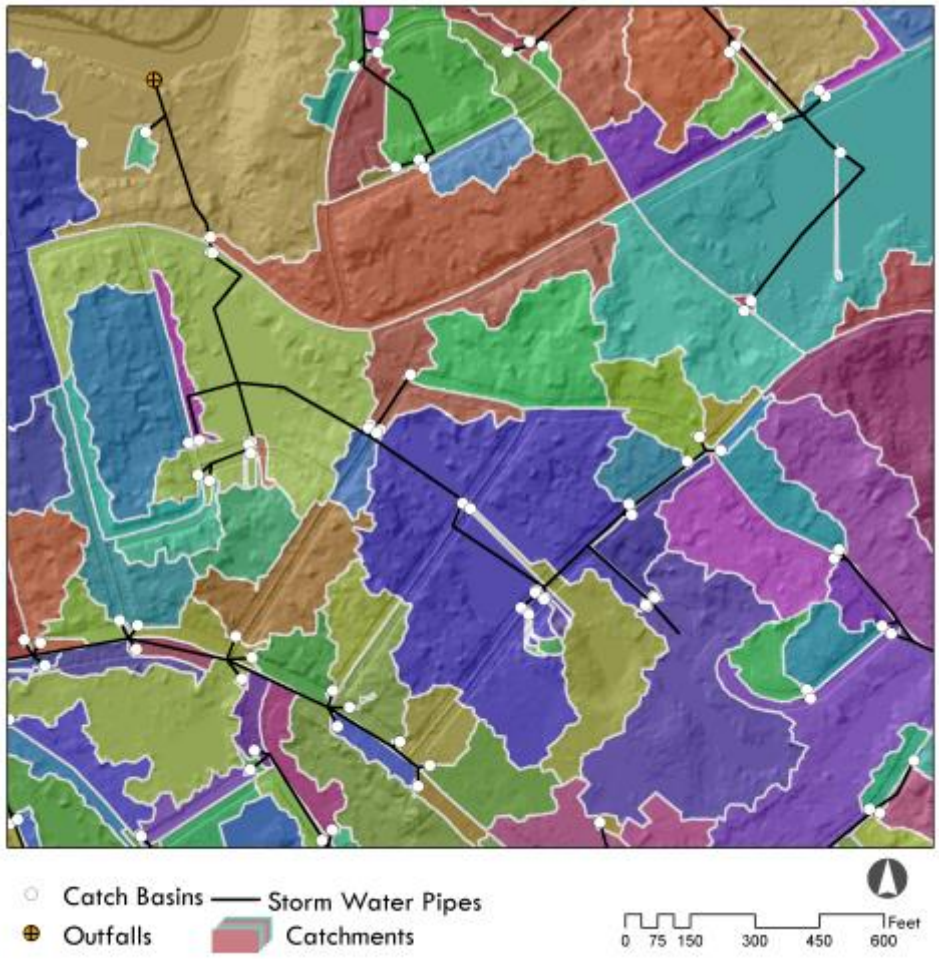


Figure 3. Catchments for each catch basin. The "streaky" catchments are in very flat areas with very low flow accumulation. Aggregating the catchments by outfall corrects for most of these issues.

Creating Outfall Catchments

The MS4 permit draft requires municipalities to delineate land areas that contribute rain water runoff to particular outfalls, so the small catch basin catchment areas must be "dissolved" into larger units based on their outfall. Neponset Municipalities did not design their GIS infrastructure datasets with this requirement in mind, so none of the catch basin datasets have an "Outfall" attribute. Furthermore, most municipalities do not have infrastructure datasets that indicate flow direction or network connectivity, which would make it easier to assign an outfall to each catch basin. MAPC developed the following method to allow municipalities to link catch basins and their outfalls using a common ID, given point feature classes for catch basins and outfalls, and a line feature class representing stormwater pipes. This method will not produce a perfect result, but will likely save municipal officials time by providing a preliminary result. The MS4 permit may be adopted soon, so at this point it is important for municipalities to come into compliance with the new requirements as quickly as possible. Using the methods outlined here, municipalities will not need perfectly clean, accurate, and precise datasets in order to begin tracing evidence of illicit

discharge discovered at an outfall back to the land area that contributed rain water to that outfall.

Creating "pipe system" IDs

To connect catch basins to their outfalls, we:

1. Buffered the pipe line features out according to the pipe diameter, then dissolve.
2. Created a "Pipesys_ID" field in the attribute table of the new pipe polygon feature class.
3. Populated the "Pipesys_ID" field with the OID number using the field calculator.
4. Performed a spatial join to link the original pipe line network to the pipe polygon feature class.
5. Performed additional spatial joins to link the pipe polygon feature class to both the catch basins and the outfalls.

At this point, all interconnected pipes shared a Pipesys_ID, and all associated outfalls and catch basins shared that ID. When selecting the buffer distance, we visually inspected the spatial relationship between a sample of the catch basins and outfalls and the pipe lines. Although in some cases the point features were not snapped to the line network precisely, in most cases they still intersected with the buffered pipe systems, so the imprecision did not affect the results. Another way to address snapping errors in the data would be to set a search distance when performing the spatial join.

Checking the data

After applying the automated method above to Milton's data, we noticed several inconsistencies in the infrastructure data. Common errors include pipe systems without associated outfalls, catch basins with no associated pipe networks, interconnected pipe networks, and outfalls with no associated pipe network or "uphill" outfalls. We met with officials from Milton's Department of Public Works to correct some of these areas based on their local knowledge. The local DPW staff informed us of some of the most common sources for these errors. The Milton DPW has a very complete dataset recording the location of every catch basin in the municipality. Because those features are easily visible from the surface, and their locations are relatively predictable, they were able to perform a survey recording each catch basin location in the town with a GPS. The underground components of the infrastructure were much more difficult for them to survey, because the pipe networks may be very old in some parts of town, or are not owned or operated by the municipality, and they do not have access to the plans for those segments of pipes and their associated outfalls.

Table 2. Common problems with municipal stormwater data.

Data Problem	**Common Causes**	**Solution**

Pipe Systems with no associated outfall	The outfall may belong to DCR, MassDOT, or a private system, or the system may be so old that no plans exist	Outfall imputed based on local knowledge, owner recorded in a separate "owner" field
Catch basins with no associated pipe networks	Most catch basins were recorded in a survey of the entire town, so even though the catch basin was visible to the surveyor, the town may not own the catch basin, or the catch basin may be in a development that has not submitted their stormwater infrastructure plans to the town.	Catch basins are assigned a new pipe system ID, and an outfall is imputed based on local knowledge. If the catch basins are not owned by the town, the owner is recorded in the "owner" field.
Interconnected Pipe networks	Pipe networks may be interconnected, but for this method, each catch basin may be assigned to only one outfall, so the Town DPW stormwater experts were able to assess which outfall was most likely associated with each catch basin.	Pipe networks split by assigning certain segments distinct pipe system IDs based on local knowledge. Catch basin and outfall IDs changed to match associated pipes.
Outfalls with no associated pipe network or outfalls that appear in unlikely positions, such as on hilltops	Could be a pipe end erroneously recorded as an outfall	Do not assign catch basins to these outfalls. No additional solution needed

In order to resolve these issues enough to aggregate the catchments by outfall, made manual adjustments to the network based on their extensive experience and personal knowledge of the stormwater system. In instances where a pipe network may be interconnected and could outfall to more than one place, for example, we adjusted the data based on information from the DPW staff.

We initially identified instances where more than one outfall was associated with an interconnected pipe network by using the "find identical" tool, then joining the output table back to the outfall table. In the image below, for example, the automated method assigned a single ID to outfalls 1, 2, and 3, because they are associated with a single interconnected pipe network. In order to assign only one outfall to each catch basin, we assigned new unique IDs to each outfall and manually assigned them to appropriate pipes and catch basins.

Catch basin 4 in the image below is an example of a catch basin that was missed by the automated method of ID assignment, since the small joining pipe segment is missing from the dataset. Such catch basins were assigned manually whenever possible.

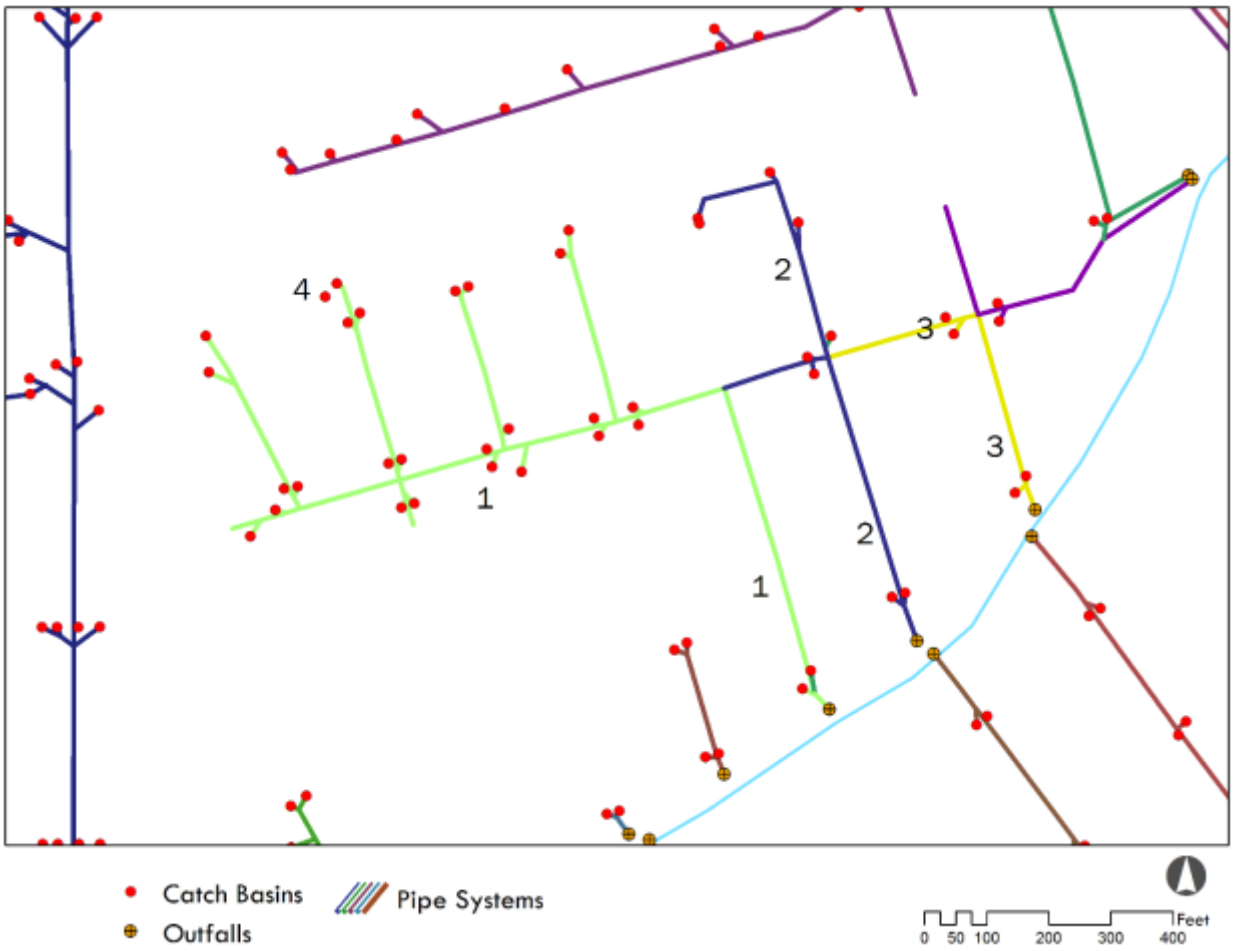


Figure 5. Splitting pipe systems by outfall.

We also added an "owner" field to account for interconnections in the infrastructure. According to the permit, municipalities must monitor not only their own outfalls, but also interconnections with other systems. For the purposes of the new MS4 permit, an interconnection is "the point 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."[14] The town of Milton is responsible for monitoring the stormwater at the point of the interconnection, not at the outfall belonging to another municipality or public agency.[15] Additionally, some areas that do not have much potential for illicit discharge, such as "roadway drainage in undeveloped areas with no dwellings and no sanitary sewers, drainage for athletic fields, parks, and associated parking without services, cross country drainage alignments," may be excluded from regulation by the permit. [16] There is a cemetery in Milton, for example, that is on a private stormwater pipe system, and may also be excluded since it would be considered an undeveloped area with no dwellings under the terms of the permit. Drainage along roadways in the Blue Hills would also be excluded for the same reason.

[14] United States Environmental Protection Agency. 2014: 27
[15] United States Environmental Protection Agency. 2014: 32
[16] United States Environmental Protection Agency. 2014: 29

After each catch basin was assigned to a pipe system, which was in turn associated with a single outfall, we merged the smaller catch basin catchments into larger catchments based on outfall and owner. Merging on owner as well as outfall allows municipalities to distinguish between MS4 regulated areas and areas that would be exempt because of a private system or another exemption. See the image below for the resulting output:

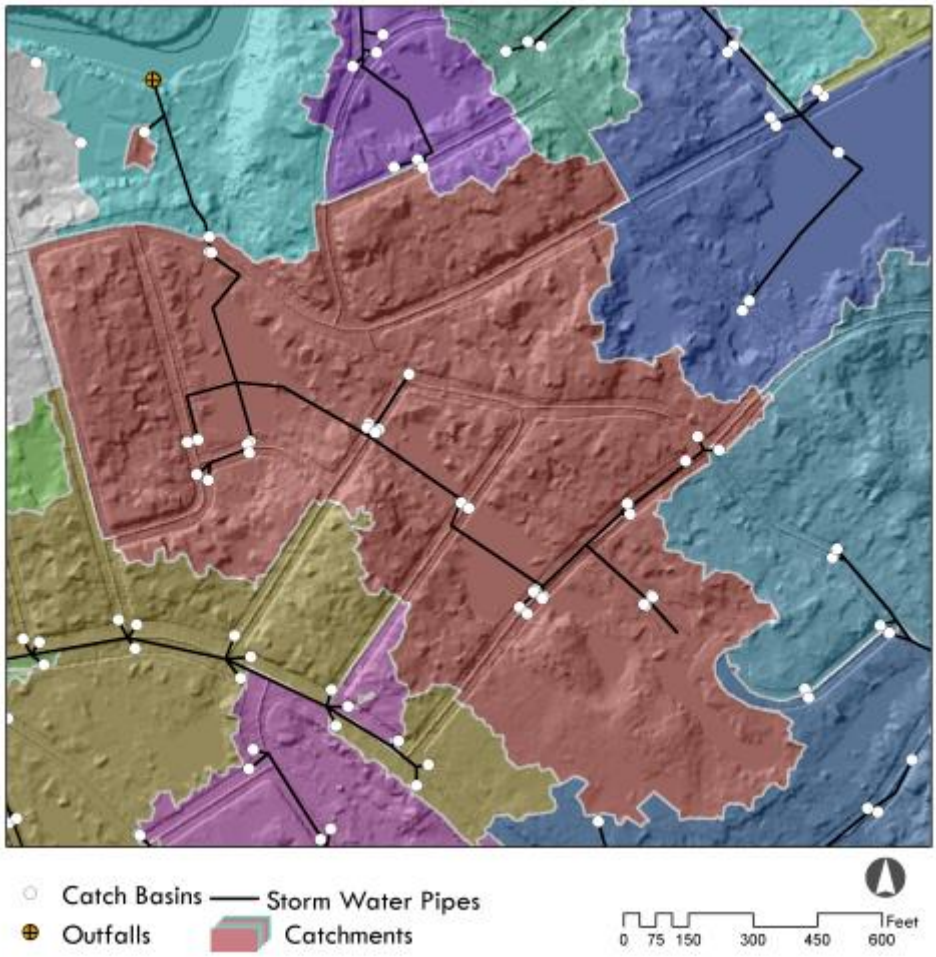


Figure 6. Outfall Catchments.

Assigning Outfalls to Receiving Waters

Once catchment areas were defined for each outfall, we assigned those outfalls to receiving waters, so that the quality of the water can be considered when the catchment areas are ranked by inspection priority. We associated each outfall in the Neponset Watershed with a body of water from the MassDEP Impaired Waters dataset, or the 303(d) waters, named for section

303(d) of the Federal Clean Water Act. [17] Section 303(d) requires each state to monitor the quality of its bodies of water. This dataset includes both a line and polygon feature class representing the bodies of water that MassDEP monitors according to the requirements of section 303(d).[18] Each stream segment or lake has a unique identifier, or "AU ID", which allows the user to link the spatial data to either of the two data tables, described below. The new MS4 permit will most likely require municipalities to be able to identify which properties will produce runoff that will feed into a catch basin, which will ultimately outfall to each body of water in the 303(d) dataset. Our methodology so far has made the connection between an area of land, or catchment, through the stormwater drainage system to the outfall. The next section describes the connection between the outfalls and the receiving waters that they feed.

The first step of this process was to associate each outfall with a body of water from the 303(d) Integrated List of Waters (IL Waters) dataset, maintained by MassDEP and available through MassGIS. Because the 303(d) dataset does not include smaller streams, it was often difficult to tell which was the receiving water. To deal with this challenge with the Milton dataset, since we had already downloaded, processed, and mosaicked a high-resolution DEM, we created a custom stream network using the hydrology toolset and the pre-processed DEM to identify the much smaller streams and brooks including intermittent drainage that connect outfalls to larger bodies of water.

Using a flow accumulation raster created using a raw DEM we used the Con tool to create a raster with a value of 1 for pixels with a flow accumulation value above 20,000. Then, we converted this raster dataset into a vector using the Stream to Feature tool. Using this custom stream network, we were able to assign each outfall to a downstream body of water with an impairment classification.

For the other municipalities, for which we had not downloaded and mosaicked lidar DEMs, we used pre-existing datasets to determine which 303(d) water a particular outfall discharges to. The general process was straight-forward, and done manually, by visually assessing which 303(d) water body an outfall was associated with, and assigning the corresponding AU ID to the outfall. Because each city and town records its stormwater data differently, we added several fields to each outfall layer to aid in standardizing the outfall datasets. Many municipalities did not have unique identifiers for their outfalls, or were inconsistent in filling in a value for that field, so we added an "OF_ID" field as a unique identifier. The unique identifier we assigned has the prefix of the municipal ID number, a value from 1 to 351 assigned by the Massachusetts Department of Revenue, followed by a hyphen and an integer starting with 1. We also added the latitude and longitude in decimal degrees, so that the outfalls could be mapped from the exported table if

[17] Visit http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/wbs2012.html for details and metadata.
[18] Massachusetts Department of Environmental Protection. "MassDEP 2012 Integrated List of Waters (305(b)/303(d))." May 2013. MassGIS. http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/wbs2012.html

necessary. Finally, we added an "AU_ID" (Assessment Unit ID) field that would contain the ID of the associated impaired body of water from the Impaired Waters dataset, described below.

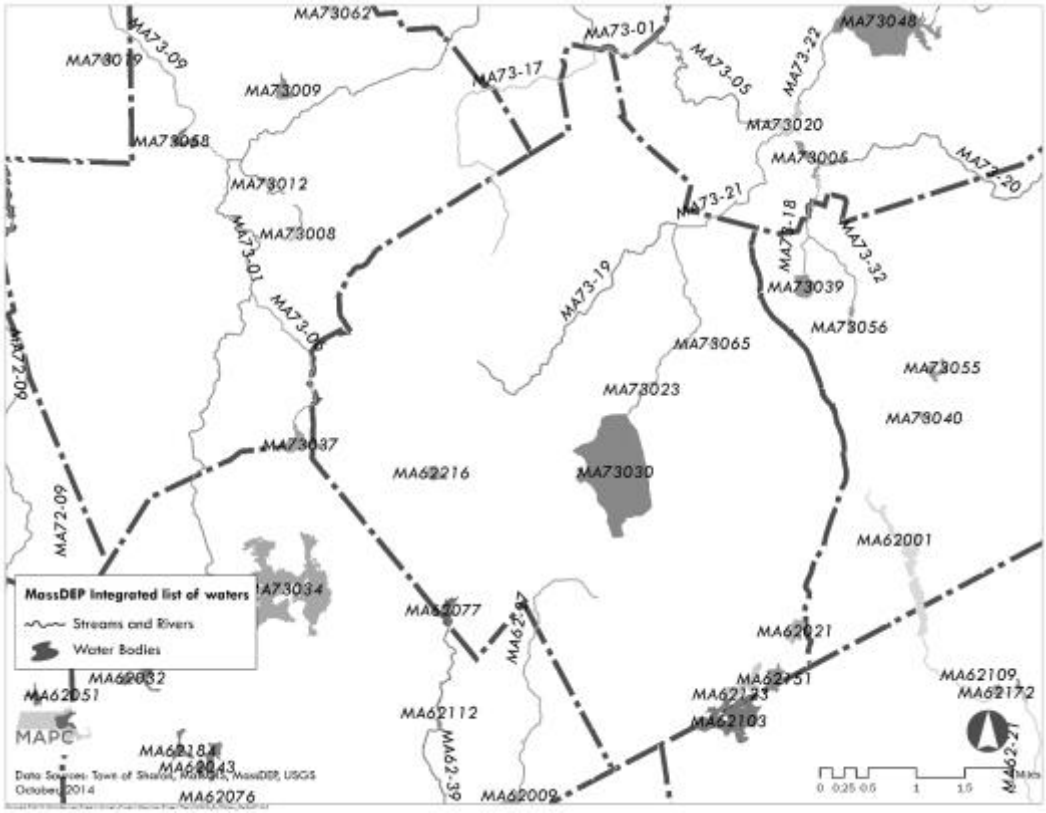


Fig 1. Mass DEP Impaired Waters dataset, available through MassGIS. Labels are AU_IDs

Our general strategy was to select outfalls within 100 m of a particular feature, and then use the field calculator to assign the appropriate AU ID. Figure 2 illustrates how few outfalls can be assigned AU IDs based only on the Impaired Waters dataset. Fortunately, many finer-grained datasets are available to supplement this dataset.

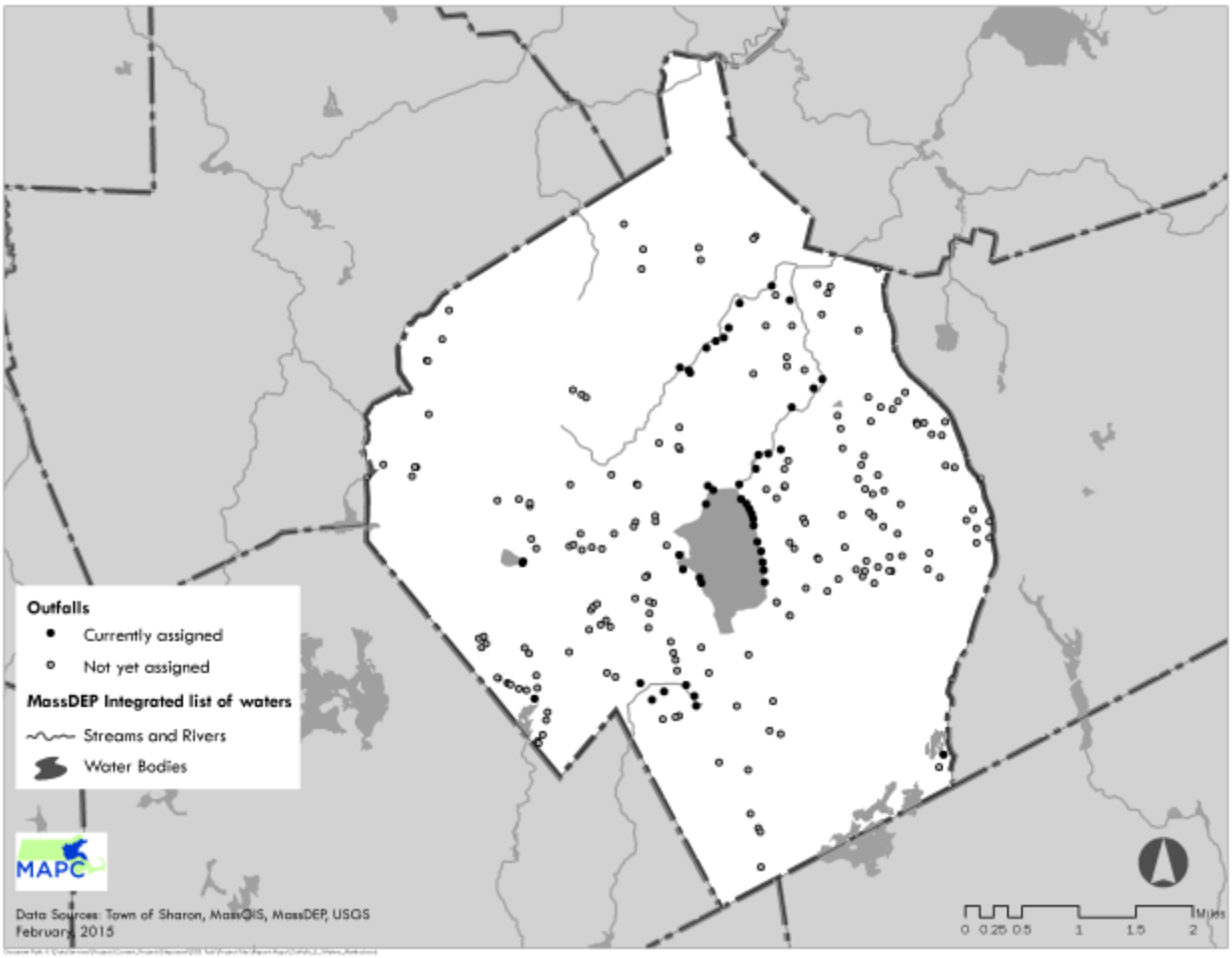


Figure 2. The Impaired Waters (Integrated list of waters) dataset. Red outfalls outfall directly to an impaired water. Gray outfalls cannot be assigned based on this dataset alone.

Adding the USGS Hydrography layer allows us to assign more outfalls to impaired waters.[19] Using this dataset, we selected outfalls within around 100 m of the streams and bodies of water from this dataset, and assigned them the AU ID of the impaired water that these smaller streams feed into (See Figure 3). Although this allowed us to assign many more outfalls to impaired waters, it was no means exhaustive, so we repeated the process with the Mass DEP wetlands layer.

[19] United States Geological Survey. "Hydrography (1:100,000)". February 2013. MassGIS. http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/hd100.html

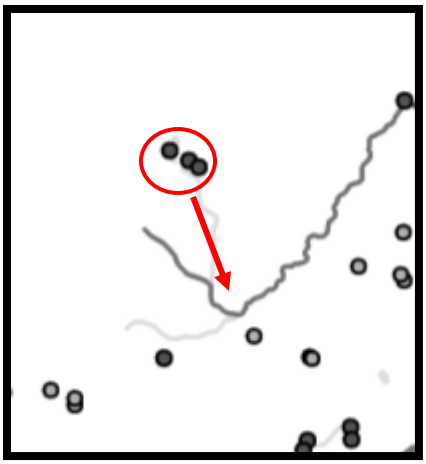


Figure 3. Using the USGS Hydrography dataset to associate the outfall to the Impaired Water.

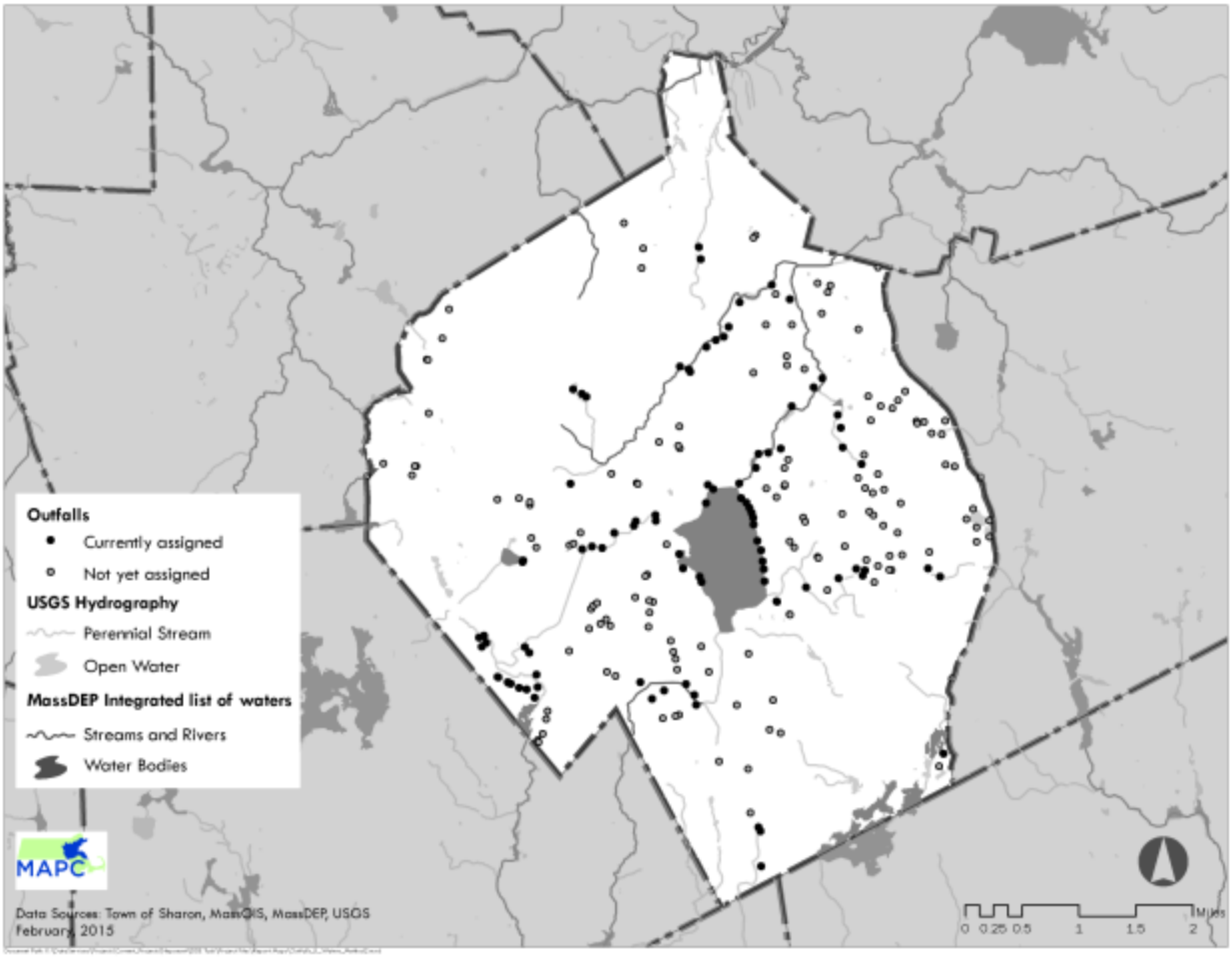


Figure 4. Using the USGS Hydrography dataset to assign an AU ID to additional outfalls.

Many drainage systems in the Neponset watershed outfall to the wetland areas that surround streams, rivers, ponds, and lakes. Using the MassDEP wetlands dataset, we assigned AU IDs to outfalls based on which impaired waters were associated with those outfalls.[20]

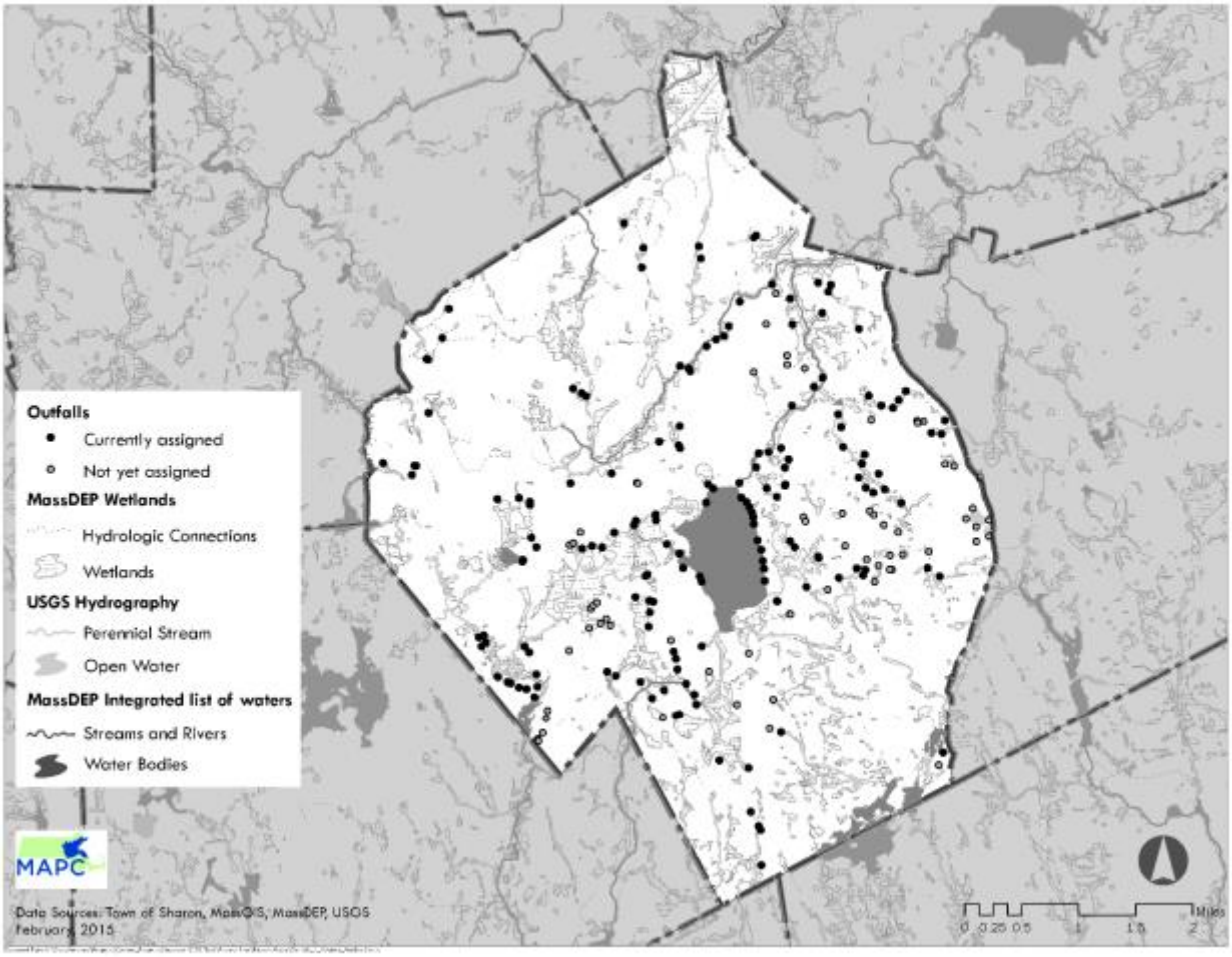


Figure 5. Using the MassDEP wetlands dataset to assign more outfalls to AU IDs.

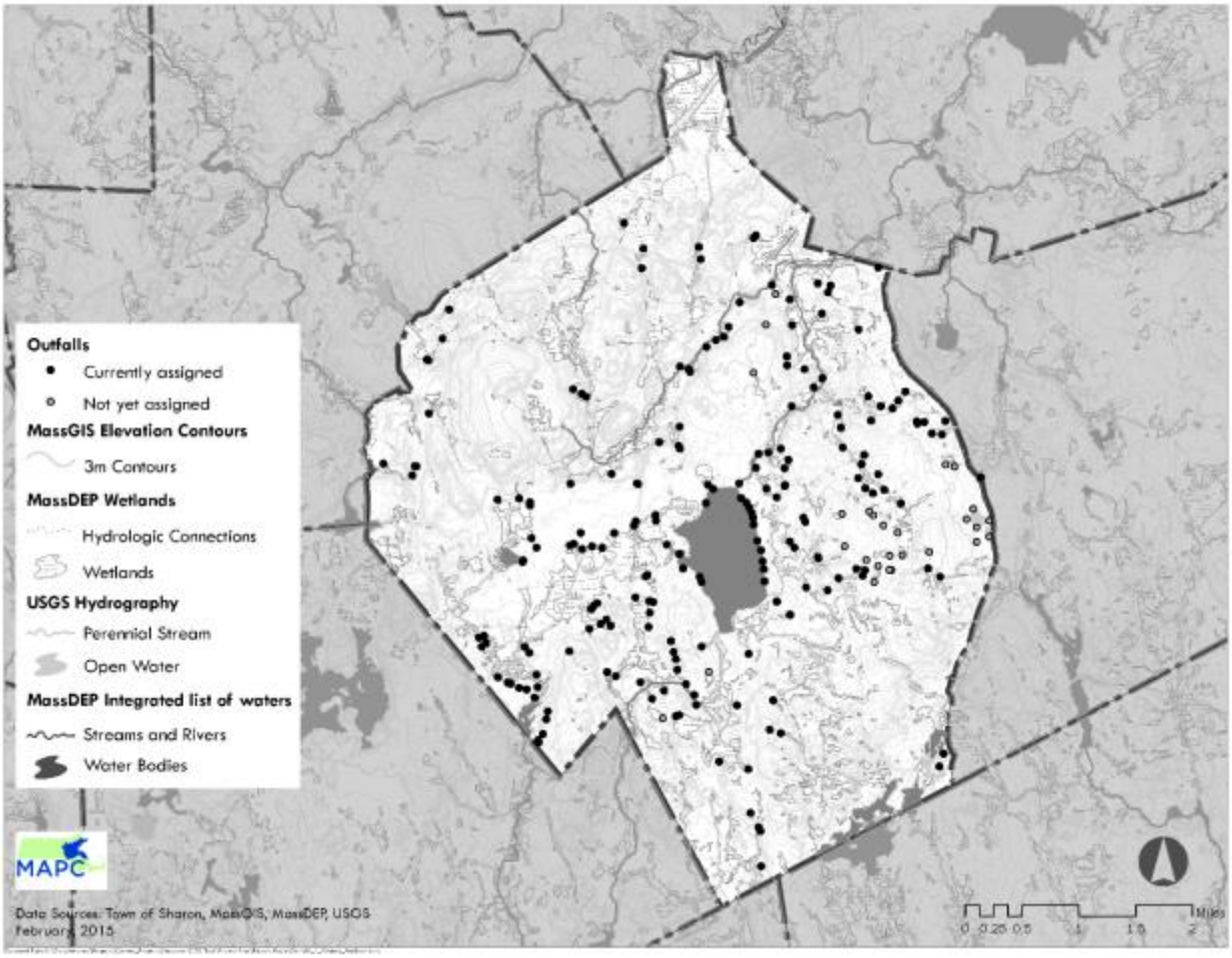
In some cases, an outfall may be situated on a rivulet that is too small to be depicted in any of the three hydrological datasets described above. In those cases, the topographic contours can help assign these outfalls AU IDs (Figure 6).[21] The contours show areas where higher hills and ridges separate riverbeds into distinct basins.

[20] Massachusetts Department of Environmental Protection. "MassDEP Wetlands (1:12,000)." January 2009. MassGIS. http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/depwetlands112000.html

[21] Massachusetts Geographic Information Systems. "Elevation Contours (1:5,000)." June 2003. MassGIS. http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/hp.html

Finally, the last few ambiguous outfalls can be assigned using the MassGIS drainage sub-basins layer.[22]

Figure 6. Using topographic contours to associate outfalls with Impaired Waters



[22] Massachusetts Geographic Information Systems. "Drainage Sub-basins." December 2007. MassGIS. http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/subbas.html

Figure 7. Topographic Contours in Sharon.

Figure 8. Drainage Sub-basins.

Ranking Catchments

Once we delineated outfall catchments for Milton and linked outfalls with Impaired Waters in Milton and all other Neponset Watershed Municipalities, we ranked Milton's outfall catchments according to how likely they were to contribute illicit discharges to the receiving waters. We used CommunityViz, a GIS-based assessment tool for planning, to prioritize outfalls and catchments using the program's suitability wizard. This suitability analysis evaluates sites based on a set of specified quantitative criteria. In this case, the presence of older homes, industrial uses, septic systems, and other physical features were summarized into a composite score from 0 to 100. Catchments with a median score or below were considered low priority, catchments within the third quartile were considered medium, and those within the top quartile were considered high priority, or most likely to contribute illicit discharges to impaired waters.

Land use codes were designated as medium or high potential for illicit discharges using information found in the 2004 manual from Center for Watershed Protection, titled "Illicit

Discharge Detection and Elimination: a guidance manual for program development and technical assessments".[23] The guidance manual provided illicit discharge pollution potential for a variety of land uses and included their SIC codes in Attachment A, which were compared to and converted to NAICS codes during this process.

We used the following criteria for the analysis:

Generating sites, Businesses

We used two data sources to capture information on businesses that are at high or medium risk for illicit discharge into the stormwater system, and used these two datasets to create lists of high and medium risk businesses, which we then combined to create an index of generating businesses. One dataset is the Massachusetts Land Parcel Database, which summarizes the assessor's records associated with each parcel. This dataset contains a land use code assigned by the assessor. These codes can be very specific—gas stations are distinguished from automobile repair shops, for example. The other dataset is establishment listings published by InfoGroup. Each business in this dataset has an associated classification code as well. These codes, called North American Industry Classification System (NAICS) codes are the standardized codes used by the US Census Bureau and other federal agencies for collecting economic data. These codes are even more specific than those from the parcel dataset. See the tables below for descriptions of the business types that we classified into high and medium risk businesses. See the appendix for the list of Assessor's and NAICS codes included in each category.

High Potential businesses:	
• Heavy Construction equipment rental and leasing • Building and heavy construction (for land disturbing activities) • Buildings for manufacturing operations • Apparel and other fabrics • Auto recyclers and scrap yards • Boat building and repair • Chemical products • Food processing • Garbage truck washout activities • Leather tanners • Metal production, plating, and engraving operations • Facilities providing building materials, hardware, and farm equipment,	• Paper and wood products • Petroleum storage and refining/ gas production plants • Tanks holding fuel and oil for retail distribution • Natural or manufactured gas storage • Textile mills • Transportation equipment • Landfills and hazardous waste material disposal • Maintenance depots • Streets and highways construction • Ports • Railroads • Petroleum bulk stations or terminals

[23] Environmental Protection Agency. "Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments." http://cfpub2.epa.gov/npdes/docs.cfm?program_id=6&view=allprog&sort=name#iddemanual Last Updated on October 1, 2004.

heating, hardware, plumbing, lumber supplies and equipment	• Research and development facilities

Medium Potential businesses:	
• Auto repair facilities/ automotive vehicles or supplies sales and service • Automobile parking lots or garages • Bus transportation facilities and related properties • Campgrounds/RV parks • Car dealers • Car washes • Food stores and wholesale beverage/ supermarkets • Small retail and services stores • Eating and drinking establishments	• Gasoline stations/ fuel service areas • Marinas • Nurseries and garden centers • Oil change shops • Restaurants • Chemical products • Food processing • Rubber and plastics • Colleges and universities • Airports • Rental car lots • US postal service • Trucking companies and distribution centers

Figure 7. Lists of commercial potential illicit discharge generating sites.

To create the Business Generator Index, we multiplied the count of medium risk businesses from both datasets within each catchment by five, and added the result to the count of high risk businesses multiplied by ten (medium risk businesses * 5 + high risk businesses * 10). Next, we divided this index by the acreage of the catchment to produce a density index. We used the generating site index density value as a criterion for the suitability analysis.

Generating sites, Residential

For residential properties, the age of the house contributes to its risk for contributing illicit discharge to the stormwater system. The draft Massachusetts MS4 permit states that one of the ranking factors that MS4 municipalities are to consider is "Age of surrounding 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."[24] We created a residential index similar to that of the business index. In this case, we used the same parcel database, this time using the "last built date." We used this category based on the assumption that new construction or drastic rebuilding would be required to follow the building codes in effect at the date of construction.

[24] United States Environmental Protection Agency. 2014. *National Pollutant Discharge Elimination System (NPEDS) General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts.* http://www.epa.gov/region1/npdes/stormwater/ma/2014DraftMASmallMS4GeneralPermit.pdf, pg. 31.

Again, we created two categories of residential risk: high, for the count of houses in a catchment built more than 40 years ago, and medium, for the count of houses in the catchment built 20 to 40 years ago. We created an index using the same formula as that for the business index (count of medium risk *5 + count of high risk *10), and divided the result by the acreage of the catchment. We used this housing index per acre value as a criterion for the suitability model.

Sewer and Septic

We also created criteria reflecting the density of sewer lines and the concentration of septic systems within each catchment. Based on the line shapefiles we got from the GIS Analyst at Milton's DPW sent us, we calculated the length of sewer pipe within each catchment divided by the total area of that catchment. Milton also provided us with a shapefile representing each parcel that has a septic system. For the "septic" criterion, we simply divided the number of septic systems in each catchment by the acreage of that catchment.

Quality of Receiving Waters

As described above, each catchment was associated with a single receiving water in the Integrated List of Waters created and maintained by MassDEP and published by MassGIS. We used the category of the associated receiving waters as a criterion within the suitability analysis. Categories of Impaired waters range from 1 to 5, with 5 being the most impaired, and 1 being unimpaired. Category 2 and 3 waters may be unimpaired for some uses and not assessed for others, or there may not be enough information available to make an assessment. Within Milton, all waters were rated a category 5, but elsewhere in the Neponset Watershed, some of the waters rank in a lower category, so we included the receiving water criterion even though it makes no difference in the rankings of the catchments for Milton.

The suitability analysis

After defining the five criteria described above, we ran a suitability analysis that ranked each catchment from 0 (least problematic) to 100 (most problematic) for each catchment. To create this ranking, each criterion was assigned a weight, based on how much that criterion should impact the resulting ranking (Table 3). The weights can be changed easily within CommunityViz, and should be decided upon based on the data specific to that town. If the entire town is on septic systems rather than town sewer lines, for example, it will not make sense to use the density of sewer lines as a criterion, since all catchments would have a value of 0, so this criterion would not change the overall score. Based on the weights above, the results for Milton are summarized in the map below:

Table 3. Ranking criteria and weights

Criterion	Description		Dataset	Weight

Business Generating Site Index Density	Count of businesses of specified types divided by catchment area (in acres)		MAPC Massachusetts Land Parcel Database, InfoGroup	8
House Age Index Density	Summary index, weighted count of houses older than 40 and 20 years.		MAPC Massachusetts Land Parcel Database	6
Density of sewer pipes	Length of sewer pipes per acre		municipal infrastructure data	2
Density of septic systems	Number of septic systems per acre		municipal data	7
Quality of receiving waters	Category of water, 3, 4, or 5		303(d) Integrated List of Waters dataset from MassDEP, available through MassGIS	2

Figure 8. Catchment Ranking, low risk (hatched), medium (cross hatched), and high risk (solid).

Areas in dark gray represent high priority catchments, or catchments with the highest chance of contributing pollution to the stormwater system. Cross hatching represents catchments with a moderate chance, and hatching is the lowest chance. Much of the hatched area, for example, is in the Blue Hills conservation area.

Table 4. Milton Outfall Catchment Ranking Results. 3 = High, 2 = Medium.

PIPESYS_ID	OWNER	AU_ID	ACRES	SUITABILITY	PRIORITY LEVEL
104	Town of Milton	MA73-26	0.8	94.32	3
248	Town of Milton	MA73-29	1.9	89.51	3
253	Town of Milton	MA73-29	4.9	83.09	3
160	Town of Milton	MA73-03	0.9	76.50	3
188	Town of Milton	MA73-03	0.7	67.32	3
23	Town of Milton	MA73-02	2.2	67.32	3
217	Town of Milton	MA73-29	0.8	66.40	3
7	Town of Milton	MA73-29	4.0	64.76	3
178	Town of Milton	MA73-26	0.6	62.40	3
178	Town of Milton	MA73-26	0.5	62.22	3
103	Town of Milton	MA73-26	1.5	58.42	3
25	Town of Milton	MA73-02	4.1	57.72	3
134	Town of Milton	MA73-26	0.4	56.28	3
231	Town of Milton	MA73-29	0.6	56.27	3
76	Town of Milton	MA73-29	2.7	54.32	3
207	Town of Milton	MA73-03	1.5	52.80	3
154	Town of Milton	MA73-26	0.6	52.65	3
170	Town of Milton	MA73-26	0.4	52.23	3

82	Town of Milton	MA73-26	1.5	52.14	3
158	Town of Milton	MA73-03	4.4	51.33	3
0	Town of Milton	MA74-09	1.0	51.23	3
186	Town of Milton	MA73-04	2.1	51.10	3
193	Town of Milton	MA73-04	2.0	50.58	3
110	Town of Milton	MA73-26	0.4	50.46	3
205	Town of Milton	MA73-03	0.4	50.39	3
0	Town of Milton	MA73-26	4.8	49.96	3
146	Town of Milton	MA73-29	1.5	49.78	3
190	Town of Milton	MA73-03	0.7	49.55	3
226	Town of Milton	MA73-04	2.1	49.41	3
207	Town of Milton	MA73-03	2.8	49.25	3
129	Town of Milton	MA74-09	2.3	48.50	3
198	Town of Milton	MA73-03	2.9	48.43	3
27	Town of Milton	MA73-29	19.1	47.41	3
183	Town of Milton	MA73-03	2.9	47.06	3
83	Town of Milton	MA73-26	0.9	46.73	3
209	Town of Milton	MA73-03	4.5	46.54	3
15	Town of Milton	MA73-29	8.7	45.71	3
27	Town of Milton	MA73-29	10.4	45.13	3
230	Town of Milton	MA73-29	3.3	44.38	3
199	Town of Milton	MA73-04	2.0	44.35	3
111	Town of Milton	MA73-29	2.9	44.16	3
242	Town of Milton	MA73-04	0.9	44.02	3

236	Town of Milton	MA73-29	4.0	43.92	3
228	Town of Milton	MA73-04	2.5	43.59	3
7	Town of Milton	MA73-29	12.9	43.47	3
39	Town of Milton	MA73003	2.0	43.38	3
84	Town of Milton	MA73-26	1.1	43.24	3
231	Town of Milton	MA73-29	3.7	43.16	3
93	Town of Milton	MA73-29	0.5	42.97	3
134	Town of Milton	MA73-26	0.8	42.59	3
100	Town of Milton	MA73-29	2.4	42.01	3
113	Town of Milton	MA73-29	8.1	41.79	3
191	Town of Milton	MA73-04	4.9	41.58	3
174	Town of Milton	MA73-03	2.8	41.29	3
239	Town of Milton	MA73-26	1.2	41.23	3
230	Town of Milton	MA73-29	10.6	41.17	3
251	Town of Milton	MA73-29	0.4	41.11	3
133	Town of Milton	MA73-29	15.0	41.09	3
121	Town of Milton	MA73-29	4.1	41.06	3
177	Town of Milton	MA73-26	0.4	40.95	3
99	Town of Milton	MA73-29	0.9	40.70	3
193	Town of Milton	MA73-04	2.9	40.64	3
147	Town of Milton	MA73-26	3.7	40.01	3
79	Town of Milton	MA73-29	0.8	39.63	3
94	Town of Milton	MA73-29	2.7	39.61	3
241	Town of Milton	MA73-26	2.2	39.60	3

173	Town of Milton	MA73-04	2.7	39.46	3
129	Town of Milton	MA74-09	1.6	39.16	2
243	Town of Milton	MA73-02	4.0	38.92	2
106	Town of Milton	MA73-29	2.4	38.78	2
215	Town of Milton	MA73-03	2.9	38.71	2
188	Town of Milton	MA73-03	20.6	38.57	2
178	Town of Milton	MA73-26	5.5	38.57	2
163	Town of Milton	MA73-03	9.6	38.54	2
148	Town of Milton	MA73-29	33.0	38.46	2
234	Town of Milton	MA73-29	40.9	37.83	2
117	Town of Milton	MA73-26	1.9	37.53	2
122	Town of Milton	MA73-29	12.8	37.23	2
92	Town of Milton	MA73-29	2.0	37.02	2
125	Town of Milton	MA73-26	13.6	36.95	2
87	Town of Milton	MA73-26	2.9	36.91	2
123	Town of Milton	MA73-26	2.5	36.91	2
81	Town of Milton	MA73-29	3.4	36.83	2
0	Town of Milton	MA74-10	2.4	36.78	2
152	Town of Milton	MA73-29	2.4	36.76	2
200	Town of Milton	MA73-03	3.6	36.64	2
86	Town of Milton	MA73-29	2.3	36.48	2
0	Town of Milton	MA73-03	2.1	36.31	2
173	Town of Milton	MA73-04	2.1	36.29	2
214	Town of Milton	MA73-29	4.2	36.22	2

41	Town of Milton	MA73003	2.2	36.04	2
159	Town of Milton	MA73-26	42.2	35.78	2
183	Town of Milton	MA73-03	13.9	35.43	2
169	Town of Milton	MA73-26	12.4	35.41	2
155	Town of Milton	MA73-03	8.9	35.22	2
85	Town of Milton	MA73-26	13.3	35.01	2
179	Town of Milton	MA73-04	3.4	34.98	2
203	Town of Milton	MA73-29	1.4	34.96	2
43	Town of Milton	MA73-02	10.0	34.81	2
218	Town of Milton	MA73-29	7.1	33.89	2
0	Town of Milton	MA74-10	0.4	33.77	2
219	Town of Milton	MA73-04	6.9	33.56	2
93	Town of Milton	MA73-29	8.5	33.53	2
181	Town of Milton	MA73-04	3.2	33.52	2
150	Town of Milton	MA73-26	1.4	33.50	2
131	Town of Milton	MA73-29	22.4	33.46	2
187	Town of Milton	MA73-04	2.8	33.45	2
104	Town of Milton	MA73-26	2.0	33.35	2
119	Town of Milton	MA73-26	6.9	33.33	2
138	Town of Milton	MA73-29	15.1	33.11	2
202	Town of Milton	MA73-03	5.4	32.99	2
87	Town of Milton	MA73-26	4.1	32.88	2
123	Town of Milton	MA73-26	2.5	32.85	2
178	Town of Milton	MA73-26	120.5	32.83	2

165	Town of Milton	MA73-26	16.9	32.30	2
45	Town of Milton	MA73-29	27.7	32.19	2
188	Town of Milton	MA73-03	2.0	32.03	2
64	Town of Milton	MA73-29	0.7	32.03	2
259	Town of Milton	MA73-04	13.3	31.69	2
104	Town of Milton	MA73-26	7.4	31.64	2
84	Town of Milton	MA73-26	19.7	31.16	2
52	Town of Milton	MA73-02	8.5	31.11	2
89	Town of Milton	MA73-26	6.4	31.02	2
159	Town of Milton	MA73-26	5.8	30.87	2
185	Town of Milton	MA73-03	35.1	30.85	2
195	Town of Milton	MA73-03	17.0	30.72	2
39	Town of Milton	MA73003	0.6	30.70	2
120	Town of Milton	MA73-29	13.8	30.64	2
88	Town of Milton	MA73-29	24.0	30.33	2
210	Town of Milton	MA73-29	11.4	30.31	2
104	Town of Milton	MA73-26	90.3	30.29	2
151	Town of Milton	MA73-03	10.8	30.14	2
136	Town of Milton	MA73-29	44.8	30.05	2
42	Town of Milton	MA73003	6.0	30.01	2
208	Town of Milton	MA73-29	14.3	29.93	2
31	Town of Milton	MA73-29	68.4	29.78	2
24	Town of Milton	MA73-29	8.2	29.71	2
256	Town of Milton	MA73059	47.4	29.07	2

180	Town of Milton	MA73-04	0.9	29.05	2
197	Town of Milton	MA73-29	36.8	29.04	2

Products

Methodology

This document consists of one of the products of the IDDE task of the CIC grant. We created the methodology with the intention of making it accessible to most MS4 municipalities in Massachusetts, so we believe it will aid municipalities across the state in meeting the requirements of the new MS4 permit.

MAPC Catchment Delineation Toolbox

In order to streamline the methodology for the municipalities, we created a set of ArcGIS script and ModelBuilder tools—the Lidar Processing Tool, the Create Burn Raster Tool, and the Complete Watershed Tool. These tools are available for download on ESRI's ArcGIS Online website as the MAPC Catchment Delineation Toolbox. Data Assessments

We also provided each Neponset Watershed municipality with a concise assessment of their stormwater infrastructure data. These assessments highlight potential challenges that the municipalities may encounter when applying the methodology outlined in this document.

The Outfalls and Impaired Waters Database

Data on the 303(d) water bodies is found within two tables, IL_SEGDEF_2012, and IL_ADB_2012. The former is a summary table that contains attributes such as Assessment Unit (AU) size. The latter contains detailed data about uses the water body was assessed for, as well as the "attainment", or status of the water body for that use, and the cause of the impairment. For example, Massapoag Lake, located in the center of Sharon, pictured above, has six records in the IL_ADB_2012 table (Figure 9). When assessed for Fish, other Aquatic Life and Wildlife, it was rated "Not Supporting," because of "Non-Native Aquatic Plants," the source of which is "Introduction of Non-native Organisms (Accidental or Intentional)". The other five records in this table contain other information on various uses, causes, and sources of pollution for Massapoag Lake. Because this table has a many-to-one relationship with the AUs, we created a Microsoft Access database to create a report on each Neponset Watershed town.[25]

[25] Two relationship classes are also available through MassGIS to help create the many-to-one relate between the ADB table and the line and polygon feature classes within ArcGIS.

Each municipality's report contains a list of impaired waters that its outfalls drain to, along with all associated data from the summary table (IL_SEGDEF_2012). The data on each impaired water is followed by the list of assessed uses and associated data (IL_ADB_2012). A list of outfalls accompanies each impaired water as well. The outfall table included in the database includes not only the few fields added by MAPC, but also all of the original data sent to us by the municipality. This way the municipality will be able to bring the data into its own data management system using its own unique identifiers. For Milton, we have also included the rank of each outfall catchment, as defined using the above methodology. Once every municipality has defined and ranked outfall catchments, they will be able to include that information in the Outfalls and Impaired Waters database as well.

AU_ID	WATERSHED	WATERBODY	LOCATION1	WATERCODE	WATERTYPE	AU_SIZE	SIZE_UNIT	CLASS	QUALIFIER	CATEGORY	TMDL_COUNT
MA73030	Boston Harbor: Neponset	Massapoag Lake	Sharon	73030	FRESHWATER LAKE	389	ACRES	B	<Null>	4A	1

Assessed Uses

ID	WATERCODE	CLASS	QUALIFIER	CATEGORY	USE	ATTAINMENT	CAUSE
1699	73030	B	<Null>	4A	Aesthetic	Not Assessed	<Null>
1700	73030	B	<Null>	4A	Fish Consumption	Not Supporting	Mercury in Fis
1701	73030	B	<Null>	4A	Fish Consumption	Not Supporting	Mercury in Fis
1702	73030	B	<Null>	4A	Fish, other Aquatic Life and Wildlife	Not Supporting	Non-Native Aquatic Plants
1703	73030	B	<Null>	4A	Primary Contact Recreation	Not Assessed	<Null>
1704	73030	B	<Null>	4A	Secondary Contact Recreation	Not Assessed	<Null>

Associated Outfalls

OF_ID	Latitude	Longitude	NUMBER	STREET_NAM	CONDITION	NOTES	AU_ID
266-2	42.110574	-71.179543	2	Beach	No flow		MA73030
266-3	42.111106	-71.180458	3	Beach	No flow		MA73030
266-13	42.107292	-71.189442	13	East Foxboro/Garden	No flow		MA73030
266-14	42.106572	-71.189407	14	East Foxboro/Lake Ave	No flow		MA73030
266-15	42.103498	-71.187563	15	East Foxboro	No flow		MA73030
266-16	42.102322	-71.185418	16	East Foxboro	No flow		MA73030
266-17	42.100475	-71.184764	17	Sturges	No flow		MA73030

Figure 9. Excerpt from Sharon's Outfall and Impaired Waters Report.

Discussion

The increasingly stringent requirements of federal stormwater permits combined with the lack of dedicated funding streams for stormwater infrastructure maintenance present substantial challenges to local jurisdictions. Given these circumstances, municipalities will greatly benefit from tools that allow them to cost-effectively satisfy analytical permit requirements so that resources and attention can be focused on infrastructure, outreach, and enforcement. This document describes one such tool recently prepared by MAPC and now available to any city or town in Massachusetts.

The methodology and data resources described here will help many municipalities meet the "catchment delineation" requirement in the system mapping section of the new MS4 permit, provided the Outfall/ Interconnection Inventory is relatively complete, and gaps in knowledge can be filled by DPW staff.[26] Cities and towns do not need to collect or developed detailed stormwater infrastructure information, and MAPC has also provided highly detailed information on land uses and establishments that pose a higher risk for water pollution, eliminating the need for cities and towns to acquire or compile such data. Furthermore, the tool is structured to provide the specific types of data and designations required by the NPDES permit. For example, the permit requires municipalities to classify catchments into four groups—excluded, high priority, low priority, and problem. These products should help municipalities with the first three categories. If municipalities assign an "owner" to each catch basin, they will be able to distinguish between excluded and included catchments. The step-by-step instructions provided in this document, combined with the published data catalog and ArcGIS tool published online, will enable jurisdictions or consultants with relatively modest technical capabilities to use this method.

The delineation methodology and ranking process has some limitations that could be addressed through additional data collection. For example, it would have been useful to include the age of the sewer pipes as a criterion. Most municipalities in the Neponset Watershed do not have this data available, however. The catchment ranking described here does not distinguish between problem catchments and other catchments. For the purposes of the MS4 permit, a "problem catchment" is one that has had an outfall that tested as contaminated, or that direct observation indicates that there is some kind of illicit discharge connected to that outfall.[27] Such a catchment would be considered a problem catchment regardless of its ranking in this suitability analysis, and must be investigated. In the future, the ranking could include historical data on whether a catchment has ever been designated a problem catchment, so that former problem catchments will rank higher than those that have had no observed contamination. If data are available, such analysis could be easily incorporated into a future version of the tool.

[26] United States Environmental Protection Agency. 2014. 26-28
[27] United States Environmental Protection Agency. 2014. 30

Appendix J - Operation and Maintenance Plan

Municipal Stormwater Infrastructure

Operation and Maintenance Plan

Manchester-by-the-Sea, MA

Bobrek Engineering & Construction
141 Pine Street
Danvers, MA 01923
www.gobobrek.com
978.406.9619

June 2020

Contents

1. Introduction

This Municipal Stormwater Infrastructure Operation and Maintenance (O&M) Plan has been prepared by Bobrek Engineering and Construction for the town of Manchester-by-the-Sea, MA. to fulfill the stormwater infrastructure O&M requirements within the USEPA's 2016 NPDES General Permit [1]for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4).

The following plan satisfies the Minimal Control Measure 6: "Good Housekeeping and Pollution Prevention for Permittee Owned Operations." The O&M Plan outlines inspection and maintenance procedures for catch basins, municipally owned streets and parking lots, and structural stormwater Best Management Practices (BMPs).

The department of Public Works is responsible for inspection and maintenance of the stormwater infrastructure. A map of the existing stormwater infrastructure in the town is provided in Appendix A.

2. Catch Basin Cleaning and Inspections

The Department of Public Works hires a third-party to inspect and clean all the town-owned catch basins. The Town will implement the following catch basin inspection and cleaning procedures to reduce the discharge of pollutants from the MS4.

2.1 Routine inspection and cleaning of catch basins. Catch basins should be cleaned such that they are no more than 50 percent full[2] at any time. The Town currently hires a third party to inspect/clean all catch basins twice each permit year to evaluate sediment or debris accumulation. The standard operating procedure (SOP) can be found in Appendix B.

2.2 If a catch basin sump is more than 50 percent full during two consecutive routine inspections or cleaning events, the finding will be documented, the contributing drainage area will be investigated for sources of excessive sediment loading, and to the

[1] United States Environmental Protection Agency's 2016 National pollutant Discharge Elimination System General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) for the state of Massachusetts

[2] 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

extent practicable, contributing sources will be addressed. If no contributing sources are found, the inspection and cleaning frequency will be increased.

2.3 Catch basins located near construction activities (roadway construction, residential, commercial, or industrial development or redevelopment) shall be inspected and cleaned on a regular basis to prevent catch basins becoming more than 50 percent full. Priority will also be given to catch basins that discharge to impaired waters.

2.4 All the information gathered from the activities above as well as the following list will be recorded in the 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.

3. Streets and Parking Lots Sweeping

Streets and town-owned parking lots are swept often to reduce the discharge of pollutants from the MS4. Arterial roadways which includes those near beaches and within the downtown, are swept throughout the summer season (May 1 -Sept 1). Rural uncurbed roads with no catch basins will be swept and/or cleaned a minimum of once per year in the spring (following winter activities such as sanding). More frequent sweeping will be considered for targeted areas based on pollutant load reduction potential, inspections, pollutant loads, catch basin cleaning or inspection results, land use, impaired waters, or other factors. More frequent sweeping is required for Town-owned streets and parking lots in areas that discharge to certain nutrient-impaired waters. Sweeping must be performed in these areas a minimum of two times per year, once in the spring (following winter activities such as sanding) and at least once in the fall (Sept 1 – Dec 1; following leaf fall). Prior to disposal or reuse, catch basin cleanings and street sweepings will be stored indoors or outside using proper controls to ensure that they do not discharge to receiving waters[3].

[3] Proper controls include barriers such a mulch socks around the area or enclosed and covered storage facilities

- The number of miles cleaned, or the volume or mass of material removed will be recorded in the annual report.

4. Winter Road Maintenance

The Town performs a variety of maintenance activities to ensure safe winter driving conditions on its roads and parking lots. The Town stores a 50/50 salt and sand mixture, and the mixture is stored in a covered barn.

The Town will implement the following winter maintenance procedures to reduce the discharge of pollutants from the MS4:

- Minimize the use and optimize the application of sodium chloride and other salt[4] (while maintaining public safety) and consider opportunities for use of alternative materials.

- Optimize sand and/or chemical application rates through the use, where practicable, of automated application equipment (e.g., zero velocity spreaders), anti-icing and pre-wetting techniques, implementation of pavement management systems, and alternate chemicals. Maintain records of the application of sand, anti-icing and/or de-icing chemicals to document the reduction of chemicals to meet established goals.

- Prevent exposure of deicing product (salt, sand, or alternative products) storage piles to precipitation by enclosing or covering the storage piles. Implement good housekeeping, diversions, containment or other measures to minimize exposure resulting from adding to or removing materials from the pile. Store piles in such a manner as not to impact surface water resources, groundwater resources, recharge areas, and wells.

- The MS4 Permit prohibits snow disposal into waters of the United States. Snow disposal activities, including selection of appropriate snow disposal sites, will adhere to the Massachusetts Department of Environmental Protection Snow Disposal Guidance, Guideline No. BWR G2015-01 (Effective Date: December 21, 2015), located at: http://www.mass.gov/eea/agencies/massdep/water/regulations/snow-disposal-guidance.html

[4] For purposes of the MS4 Permit, salt means any chloride-containing material used to treat paved surfaces for deicing, including sodium chloride, calcium chloride, magnesium chloride, and brine solutions.

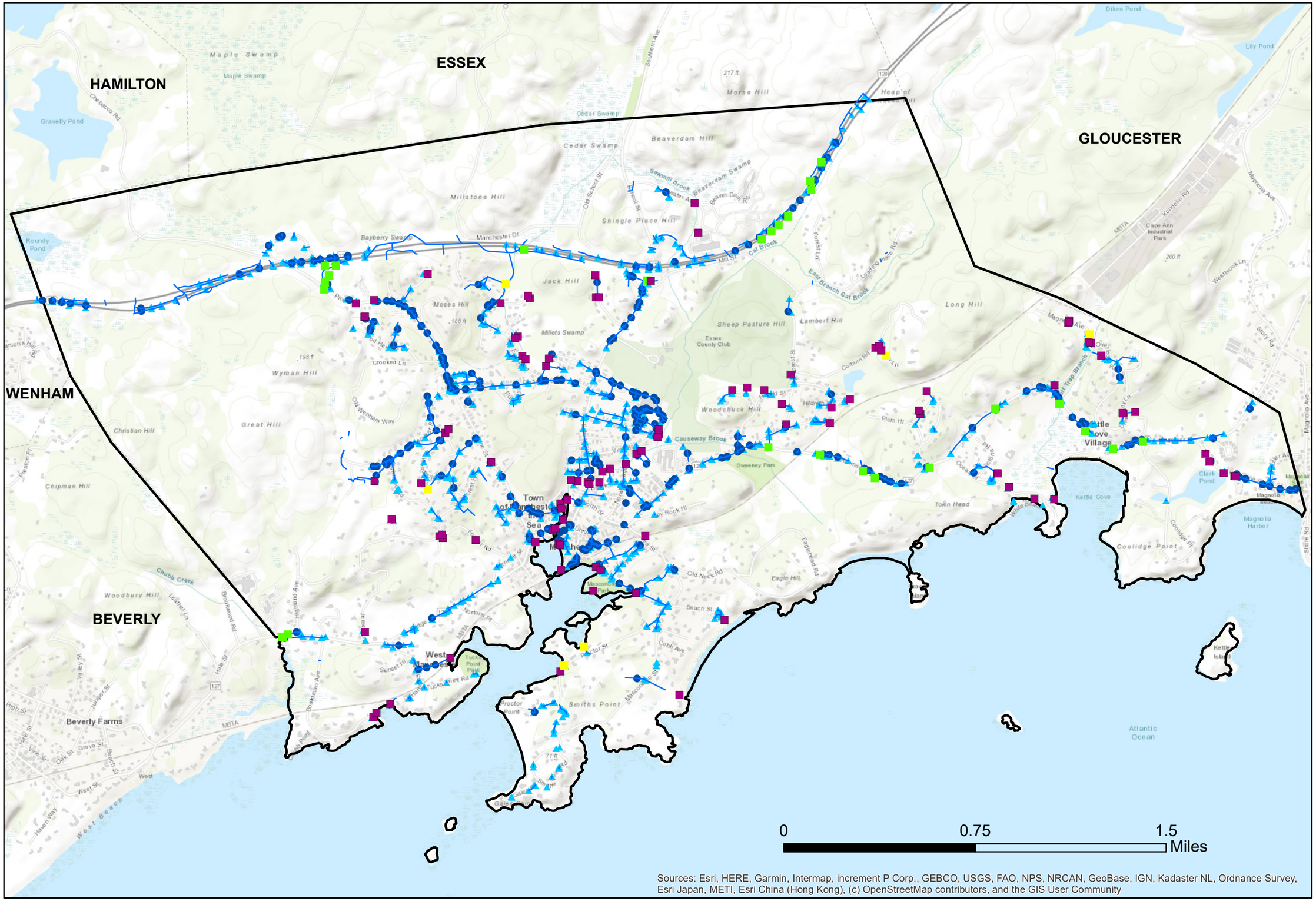
- Provide training for municipal employees on winter roadway maintenance procedures.

5. Structural Stormwater BMPs

The Town does own any structural stormwater BMPs.

APPENDIX A

EXISTING STORMWATER INFRASTRUCTURE



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MANCHESTER DPW
10 CENTRAL ST
MANCHESTER, MA
01944

STORMWATER COLLECTION SYSTEM

LEGEND

- MISC STORM STRUCTURE
- TOWN OWNED OUTFALLS
- MASSDOT OWNED OUTFALLS
- STORM DRAINS
- DRAIN MANHOLES
- CATCH BASINS
- TOWN BOUNDARY

2020 STORMWATER COLLECTION SYSTEM MAP

DR BY:	JRM
CHK BY:	JPB
PROJECT NO:	18-014
DATE:	SEPT 2020
	1 in = 1,847 ft

APPENDIX B

SOP 3 CATCH BASIN INSPECTIONS AND CLEANING

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. Catch basin cleaning reduces foul odors, prevents clogs in the storm drain system, and reduces the loading of suspended solids, nutrients, and bacteria to receiving waters.

During regular cleaning and inspection procedures, data can be gathered related to the condition of the physical basin structure and its frame and grate and the quality of stormwater conveyed by the structure. Observations such as the following can indicate sources of pollution within the storm drain system:

- Oil sheen
- Discoloration
- Trash and debris

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 a 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.

Observations such as the following 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

Each catch basin should be cleaned and inspected at least annually. Catch basins in high-use areas may require more frequent cleaning. Performing street sweeping 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 structures need to be cleaned.

Cleaning Procedure

Catch basin inspection cleaning procedures should address both the grate opening and the basin's sump. Document any and all observations about the condition of the catch basin structure and water quality on the Catch Basin Inspection Form below:

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 :**	**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): ____	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:**		**Circle those present:**
	Color:		Foam / Oil Sheen
	Odor:		Sanitary Waste / Bacterial Sheen
Weather Conditions :	Dry > 24 hours ☐	Wet ☐	Orange Staining / Floatables
Sample of Screenings Collected for Analysis? Yes ☐ No ☐			Excessive sediment / Pet Waste
Comments:			Other: _____ / Optical Enhancers

Catch basin inspection and cleaning procedures include the following:

1. Work upstream to downstream.
2. Clean sediment and trash off grate.
3. Visually inspect the outside of the grate.
4. Visually inspect the inside of the catch basin to determine cleaning needs.
5. Inspect catch basin for structural integrity.
6. Determine the most appropriate equipment and method for cleaning each catch basin.
    a. Manually use a shovel to remove accumulated sediments, or
    b. Use a bucket loader to remove accumulated sediments, or

   c. Use a high pressure washer to clean any remaining material out of catch basin while capturing the slurry with a vacuum.
   d. If necessary, after the catch basin is clean, use the rodder of the vacuum truck to clean downstream pipe and pull back sediment that might have entered downstream pipe.
7. If contamination is suspected, chemical analysis will be required to determine if the materials comply with the Massachusetts DEP Hazardous Waste Regulations, 310 CMR 30.000 (http://www.mass.gov/dep/service/regulations/310cmr30.pdf). 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.
8. Properly dispose of collected sediments. See following section for guidance.
9. If fluids collected during catch basin cleaning are not being handled and disposed of by a third party, dispose of these fluids to a sanitary sewer system, with permission of the system operator.
10. If illicit discharges are observed or suspected, notify the appropriate Department (see "SOP 10: Addressing Illicit Discharges").
11. At the end of each day, document location and number of catch basins cleaned, amount of waste collected, and disposal method for all screenings.
12. Report additional maintenance or repair needs to the appropriate Department.

Disposal of Screenings

Catch basin cleanings from storm water-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 to prevent pollution.

Related Standard Operating Procedures

1. SOP 10, Addressing Illicit Discharges

2. SOP 13, Water Quality Screening in the Field

Appendix K - Stormwater Pollution Prevention Plans

Department of Public Works Yard
Stormwater Pollution Prevention Plan

Manchester-by-the-Sea, MA

Updated August 2023

Bobrek Engineering & Construction, LLC
100 Conifer Hill Drive, Suite 204
Danvers, MA 01923
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978.406.9619

Contents

SECTION 1 – Introduction

This Stormwater Pollution Prevention Plan (SWPPP) has been developed by the Town of Manchester 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 minimize or prevent exposure, good housekeeping, preventative maintenance, spill prevention and response, erosion and sediment control, management of runoff, management of salt storage piles or piles containing salt, employee training, and maintenance of control measures.*
> 5. *Site inspections*

This SWPPP accomplishes these requirements by:

- Providing an inventory of the materials and equipment at a facility that have the potential to cause stormwater pollution, and identifying locations where these materials are stored;
- Describing how stormwater is managed at a facility, including: engineered storm drain system conveyance; on-site pretreatment, treatment and infiltration systems; and discharges to surface water directly from the site;
- Reviewing activities that occur at the facility that represent a potential for stormwater pollution;
- Describing the Best Management Practices (BMPs) that will be implemented at the facility to reduce, eliminate, and prevent the discharge of pollutants to stormwater;
- Identifying the employees responsible for developing, implementing, maintaining, and revising, as necessary, this SWPPP;
- Establishing a schedule and description of site inspections to be conducted at the facility to determine if the SWPPP is effective in preventing the discharge of pollutants;
- Serving as a tool for the facility employees, including a place to maintain recordkeeping associated with these requirements.

SECTION 2 – Detailed Facility Assessment

2.1 Facility Summary

The Department of Public Works Highway Division yard is located at 85 Rear Pleasant Street Manchester-by-the-Sea, MA 01944 and is owned and operated by the Town of Manchester-by-the-Sea (the Town). The Locus Map in Figure 2-1 shows the location of the facility within the Town of Manchester-by-the-Sea

The Department of Public Works (DPW) is primarily responsible for activities at, and maintenance of, the facility.

2.2 Site Inspection

The site inspection associated with the development of this SWPPP was completed on May 26, 2022. The inspection was conducted by John Bobrek, P.E. and Kayla Repucci from Bobrek Engineering and Construction and Shawn Johnson from the Town.

During the site inspection, information related to activities at the site, vehicles stored at the site, fueling operations, material storage, transport of oil and other materials, and spill history was gathered.

2.3 Pollution Prevention Team

A Pollution Prevention Team for DPW Yard has been prepared and designated the task of developing, implementing, maintaining, and revising, as necessary, the SWPPP for this facility. Listed below are Pollution Prevention Team members and their respective responsibilities.

Responsibilities assigned to one or more members of the Pollution Prevention Team include:

- Implementing, administering and revising the SWPPP
- Regularly inspecting stormwater control structures
- Conducting stormwater training
- Recordkeeping

Leader: Chuck Dam **Office Phone:** 978 526-1242
Title: DPW Director

Responsibilities: Considers all stages of plan development, inspections, and implementation; coordinates employee training programs; maintains all records and ensures that reports are submitted; oversees sampling program. Responsible for certifying the completeness and accuracy of the SWPPP.

Leader: Nathan Desrosiers **Office Phone:** 978-525-6445
Title: Town Engineer and Facilities Manager

Responsibilities: Implements the preventative maintenance program; oversees good housekeeping activities; serves as spill response coordinator; conducts inspections; assists with employee training programs; conducts sampling/visual monitoring.

Member: Shawn Johnson **Office Phone:** 978-526-1242
Title: Foreman

Responsibilities: Assists in all components of the stormwater program, as needed. Maintains spill kits at transfer station.

See Figure 2-1. Site Map on next page

2.4 Facility Description

The primary purpose of the yard is to store vehicles and equipment of the Department of Public Works. Activities at the site are described in SECTION 2.7

The facility covers approximately 1.96 acres and contains the structures and other features shown on the Site Map in Figure 2-1. Components shown on the site map include:

- Location of the engineered drainage system, including catch basins, ditches, drain manholes, and treatment BMPs
- Direction of surface water flow
- Location of floor drains
- Vehicle washing areas
- Aboveground storage tanks (indoors and outdoors)
- Underground storage tanks
- Chemical storage areas
- Salt storage areas
- Materials stockpiles
- Waste disposal areas

2.5 Facility Structures

The DPW Yard has three structures, the main building which is the first one you see when approaching the property, the Honey Wagon Barn which is behind the main building and the Salt Barn which is located at the rear of the property. The DPW Yard does not have a vehicle wash bay, active fueling area or a recycling system.

The Main Building

The main building at the DPW Yard is used to provide Manchester personnel with heated, covered areas in which to complete minor maintenance and preparation of vehicles, and equipment and tools for use at locations around Manchester. This building contains 5 floor drains, which discharge to an underground storage tank located outside the building. That tank is cleaned twice a year by Clean Harbors. The DPW Yard Administrative offices are located at the front portion of the property. This building includes offices for the Foreman of the highway Division and the Foreman of the Water Department, as well as break space for DPW workers. Manchester utilizes a number of salt spreaders and snowplows on its vehicles to adequately maintain roads. These vehicles are stored inside the main building only during the winter season. At all other times, they are stored outside on the east side of the property.

The Honey Wagon Barn

Small equipment, signage, and tools are stored in the Honey Wagon Barn. This building contains no floor drains and is fully enclosed. Latex paint, spray paint, and similar products are stored here. These products are properly stored in flammable material storage cabinets.

The Salt Barn

A 50/50 salt/sand mixture pile at the DPW Yard is stored in Barn. This pile is completely enclosed within the barn and the materials are fully contained within the building. The good housekeeping measure used to minimize the exposure resulting for adding to or removing stored materials include sweeping the loading area regularly or when salt has accumulated on the paved surface.

2.5.1 Additional Site Features

Aboveground Storage Tanks

Aboveground storage tanks (ASTs) at the DPW Yard are used for storage of diesel fuel and waste oil. An inventory of significant materials is included in SECTION 2.12. There are

two ASTs behind the Honey Wagon Barn that are decommissioned diesel fuel stations. These are decommissioned and will be removed. The third AST is a waste oil storage tank located in the Salt Barn. There are currently plans to move this AST outside once a proper cover is built. This tank is periodically cleaned out by Clean Harbors.

Emergency Generators

An emergency generator located at the between the Honey Barn and the Main Building, the generator provides backup power to the main building during outages. The generator, Genarac 16KW gaurdian series is exposed but has 110% containment of its fuel source. The fuel is piped natural gas and the generator is located on an impervious surface.

Solid Waste Management

The Town maintains one dumpster behind the Main Building. This dumpster is kept closed when not in use. No inappropriate materials were observed during the facility inspection.

Parking Areas

There are two designated parking areas at the DPW Yard, each of which is a pervious surface. These parking lots are used primarily for visitors to the yard, Manchester-owned cars for daily use by DPW employees, and employees' personal vehicles.

2.6 Site Drainage

Stormwater from adjacent properties has the potential of impacting the DPW Yard property as it is in a low spot. The adjacent properties are residential and forested areas.

Sheet Flow

Drainage from the impervious surfaces at the yard is directed into the pervious surfaces. There are no stormwater structures on the property.

Engineered Drainage

There is one manhole on the property that allows the underground storage tank to be cleaned out. There are no other stormwater structures on the property.

2.6.1 Receiving Waters

The final point of discharge for stormwater from this site is the Sawmill Brook, which has not been identified as impaired. The good housekeeping practices, preventative maintenance and Best Management Practices implemented at the facility are appropriate and adequate controls.

2.7 Site Activities

The following activities occur at the facility:

- Facility or Building Maintenance
- Chemical unloading, handling, and storage (including paint, flammables)
- Painting
- Sand storage
- Salt storage
- Tool storage
- Vehicle and equipment storage
- Vehicle and equipment maintenance/repair (including oil changes)
- Vehicle and equipment washing
- Waste oil storage.

Below is a discussion of site activities and the potential pollutant sources associated with each, as well as measures taken to minimize pollution. Locations of each activity are shown on the Site Plan (Figure 2-1).

The DPW Yard does not store hazardous materials other than those noted previously, and no obsolete vehicles or other potential sources of pollutants are kept in any structure at the yard.

No solvent-based parts washers were observed in any structure at the DPW Yard. Any hazardous materials are either collected by a third-party vendor contracted by the Town on an annual basis, or collected at the annual Household Hazardous Waste Day (HHHD) that is hosted by the Board of Health for the benefit of Manchester residents. Waste materials from DPW Yard operations that may be collected at the annual HHHW Day include used motor vehicle fluids that cannot be stored in the waste oil tank, such as used antifreeze and brake fluid. Any oil that may be contaminated with antifreeze, brake fluid, paint, or other additive is not accepted by the Town and a third-party vendor is called to collect it. These materials are properly labeled and stored using appropriate Best Management Practices between the time of generation and disposal.

The DPW does not apply or utilize fertilizers, herbicides, or pesticides at any facility owned or managed by the Town. As such, no fertilizers, herbicides, or pesticides are stored at the DPW Yard.

2.7.2 Stockpiles and Sand Storage

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. When the resulting eroded material enters the stormwater system, the sediment can quickly fill the sumps of catch basin structures, rendering them ineffective.

Mixing sand and salt for use in deicing activities poses an additional element of stormwater pollution, particularly if the mixing area is not fully enclosed and protected from the elements.

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. If the weather becomes dry and windy, regular light watering of the stockpile and surrounding area will provide effective dust control. Please refer to SOP 6, “Erosion and Sedimentation Control,” included in Appendix A, for more information.

Sand that has been mixed with salt for use during winter plowing and deicing activities should always be stored in an enclosed and covered salt shed. Salt sheds should be constructed on level ground with an impervious base on which to store the salt/sand mixture. Under no circumstances should loose salt/sand mix be stored outside and unprotected. All mixing of salt and sand should take place within the salt shed or other covered, enclosed area.

Ensuring that the storage area is regularly swept and kept clean is an important good housekeeping practice.

2.7.3 Salt Storage

Potential Sources of Stormwater Pollution

Salt stored in piles for use during winter plowing and deicing operations represents a potential major contributor to stormwater pollution. When stored unprotected outdoors, salt is exposed to precipitation, causing leachate with high chloride that can be discharged to the receiving water. Salt delivery and loading activities can contribute pollutants to stormwater if the material is not handled with care, and if spills from handling operations are not promptly cleaned up.

Pollution Prevention

To prevent stormwater pollution, all salt piles should be enclosed and covered in sheds to prevent exposure to precipitation. Salt sheds should be constructed on level ground with an impervious base on which to store the salt. The shed should prevent disturbance or migration of the salt by wind.

During delivery and loading activities, salt should be transferred to and from vehicles within the salt shed, whenever possible. Any spills during unloading and loading events should be tended to without delay. Ensuring that the salt storage area is regularly swept and kept clean is an important good housekeeping practice.

If it is not feasible to fully enclose the salt pile, the salt should be stored on an impervious base and covered with an impermeable membrane material. Under no circumstances should loose salt be stored outside and exposed to precipitation.

The area should not be hosed down to a storm drain as a cleaning method. To further limit stormwater pollution, an independent runoff collection system may be installed in the area of the salt storage to collect and convey runoff either directly to a treatment best management practice or to a sanitary sewer system, with approval from the operator of the sanitary sewer system.

2.7.5 Snow Dump

Potential Sources of Stormwater Pollution

Snow collected from plowing and road clearing activities and managed in snow dumps can contaminate engineered storm drain systems and receiving waters if 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.

When snow, including sand and debris contained within it, is stored directly on top of catch basins, when combined with sand and debris, discharge to the engineered drainage system can be blocked, causing localized flooding.

Pollution Prevention

To avoid contamination of stormwater and drinking water supplies by snow dumps, storage sites should be selected and prepared before the snow season begins. The snow dump 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. Snow should not be dumped within a Zone II or Interim Wellhead Protection Area of a public water supply, or within 75 feet of a private well. Sanitary landfills are not appropriate locations for snow dumps because the infiltration of meltwater will result in greater amounts of contaminated leachate. High groundwater levels also make gravel pits poor sites for snow storage.

Proper preparation and maintenance of snow disposal sites will also prevent stormwater pollution. Before winter begins, a silt fence or sediment barrier should be placed on the down-gradient side of the snow dump to collect any sediment in snow meltwater. If the site is located near a body of water, a 50-foot vegetated buffer strip (at minimum) should be maintained during the growth season to filter pollutants out of meltwater. 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, no later than May 15 of each year.

Except under the most extraordinary of circumstances, when all land-based snow disposal options have been exhausted, snow should not be dumped into any body of water. When this option is necessary, requirements of “Snow Disposal Guidance” (BRPG01-01) issued by MassDEP on March 8, 2001, shall be followed.

2.7.7 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 material 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", included in Appendix A) 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 catch basins, channels leading to outfalls, or the engineered storm drain system. If vehicles and equipment are stored outdoors, catch basins or engineered drainage system structures should include devices intended to remove oils and sediments prior to entering the system. These treatment devices should be inspected and replaced at the frequency recommended by the manufacturer.

2.7.8 Vehicle and Equipment Maintenance/Repair

Potential Sources of Stormwater Pollution

Vehicle and equipment maintenance and repair often require 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", included in Appendix A) to remove oils and gasoline.

Maintenance and repairs shall not take place in areas prone to stormwater runoff or where pollutants could enter catch basins, channels leading to outfalls, or an engineered storm drain system. All catch basins or engineered drainage systems on site that could be affected by accidental spills should include devices intended to remove oils and sediments prior to entering the system. These treatment devices should be inspected and replaced at the frequency recommended by the manufacturer.

2.7.9 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. Impervious 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 or vehicle dirtied from salting shall not be washed

outdoors. All adjacent catch basins shall have a sump and be cleaned periodically, (refer to SOP 3, "Catch Basin Inspection and Cleaning", included in Appendix A). All debris and particulate accumulation shall be removed and swept clean in all outdoor washing areas.

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", included in Appendix A). All drains that discharge directly to a water body of 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 in Appendix A for more information.

Washing of all facility vehicles is completed in the main building or on the pervious surface in the parking area. Wastewater from vehicle washing operations is discharged into a UST that is maintained by the DPW.

Salt and sand spreaders stored at the Main Building during the winter season are occasionally pressure washed inside the Main Building.

2.7.10 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. Petroleum Products
4. 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.

Solid Waste

1. Designate a waste collection area on the site that does not receive a substantial amount of runoff from upland areas and does not drain directly to a receiving water.
2. Ensure that containers have lids so they can be covered before periods of rain, and keep containers in a covered area whenever possible.
3. Schedule waste collection to prevent the containers from overfilling.
4. Clean up spills immediately and in accordance with SOP 4, "Spill Response and Cleanup Procedures" included in Appendix A.

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.

2.7.11 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" in Appendix A. 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" found in Appendix A.

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" in Appendix A for further information.

When possible, steps should be taken to recycle waste oil or reduce the amount generated.

2.8 Vehicle and Equipment Inventory

Vehicles and major equipment stored and maintained at the facility are shown in Table 2-2.

Table 2-2. Vehicle Inventory

Vehicle Type	Number on Site
Pickup Truck	6
Town Salt Spreaders	5
Town Sanders	5
Town Snowplows	15

2.9 Location of Leak and Spill Cleanup Materials

Leak and spill cleanup materials are stored at the DPW Yard to facilitate rapid response. Locations and types of leak and spill cleanup materials are identified in Table 2-3.

Table 2-3. Leak and Spill Cleanup Materials

Building or Area	Location	Materials Available
Main Building	Back right of main garage area	Oil Dri Premium absorbents – 2 32QT Bags
Salt Barn	Front left areas	Wipes, Oil Dri Premium Absorbents 1 32 QT Bag

2.10 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:

- Air conditioning condensation
- Flows from riparian habitats and wetlands
- Street wash waters

It has been determined that the above non-stormwater discharges at yard do not represent a significant contribution of pollution to the MS4 or the waters of the United States. Therefore, these are authorized under the current MS4 permit.

2.11 Existing Stormwater Monitoring Data

Stormwater monitoring is not occurring at the DPW Yard as there are no stormwater structures.

2.12 Significant Material Inventory

Materials stored include those specified in SECTION 2.7, "Site Activities". An inventory of these materials are included in Table 2-5, which also reviews the likelihood for each identified material to come in contact with stormwater. 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 Site Plan in Figure 2-1.

Table 2-5. Significant Material Inventory
DPW Yard

Material	Storage Location	Quantity	Potential Pollutant	Covered (C) or Enclosed (E)	Likelihood of Contact with Stormwater
Petroleum-Based Compounds					
Diesel fuel	Honey Barn	20 Gal	Petroleum hydrocarbons	E	0%
Gasoline	Honey Barn	30 Gal	Petroleum hydrocarbons	E	0%
Hydraulic Fluid	Main Building	55 Gal	Petroleum hydrocarbons	E	0%
Motor Oil	Main Building	55 Gal	Petroleum hydrocarbons	E	Not likely
Lubricants	Main Building	4 - 12 oz	Petroleum hydrocarbons	E	Not likely
Transmission Fluid	Main Building	55 Gal	Petroleum hydrocarbons	E	Not likely
Waste Oil	Salt Barn	750 Gal	Petroleum hydrocarbons	E	Not likely
Other:					
Total Volume of Oil At Facility = 915.4 Gal					
Non-Petroleum Significant Materials					
Antifreeze	Main Building	12 oz	Ethylene glycol; potential source of BOD	E	Not likely
Asphalt	Outside, behind Salt Barn	1 Ton	Sediments		Likely
Batteries, Used Lead Acid	Main Building	2 packages	Lead, sulfuric acid; possible particulate matter and residual oil	E	Not likely
Brake Fluid	Main Building	12 oz	Volatile organic compounds; non-petroleum based oil	E	Not likely
Deicer- Road Salt	Salt Barn	2 Tons	Chlorides	E	Not likely
Detergents	Main Building	30 Gal	Surfactants	E	Not likely

Material	Storage Location	Quantity	Potential Pollutant	Covered (C) or Enclosed (E)	Likelihood of Contact with Stormwater
Paint, Latex	Honey Wagon Barn	5 Gal	Petroleum constituents, including volatile and semivolatile organic compounds	E	Not likely
Paint, Spray	Honey Wagon Barn	18 Cans	Petroleum constituents, including volatile and semivolatile organic compounds	E	Not likely
Sand/Salt	Salt Barn	1 Ton	Sediments/Chlorides	E	Not likely
Solid Waste, for Disposal	Outside	1 3 CY Dumpster	Particulate matter, solids, metals		Likely
Spill response material (Speedi Dri or similar)	Main building and Salt Barn	3 32 QT Bags	Particulate matter, solids, residual oil.	E	Not likely

2.13 Applicability of Spill Prevention, Control and Countermeasure (SPCC) Requirements

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 containers with a capacity of 55 gallons or more. The DPW Yard does not have aboveground oil storage capacity that exceeds 1,320 gallons.

2.14 Description of Significant Material Storage Areas

Many activities at the DPW Yard which involve the materials included in Table 2-5 occur within contained garages or bays. These activities may include minor equipment/vehicle repair, oil changes, repainting, lubrication, and parts replacement.

Fueling of all Manchester vehicles does not happen on any Town-owned property.

The DPW Yard emergency generator is fueled with natural gas consistently through the gas pipes that also fuel the buildings.

Waste oil and other used motor fluids are stored in the Salt Barn. Waste oil is stored in 750 Gal AST which has internal containment or are located on appropriate containment pallets.

All delivery of waste oil to the facility occurs within the Salt Barn and is monitored by a DPW employee.

Within the Salt Barn, deicing materials including road salt and a sand salt mix are stored. Delivery of deicing materials to the Salt Barn is monitored by a DPW employee.

2.15 List of Significant Leaks or Spills

No significant spills or leaks have occurred on the site in the last three years. Forms included in Appendix B will be used to document any spill or leak that occurs at the facility in the future.

2.16 Structural BMPs

There are no structural BMPs including onsite constructed systems that provide pretreatment or treatment of stormwater flows. All floor drains in the Main Building connect to an UST located outside the main building and accessible by a manhole.

2.17 Sediment and Erosion Control

Site topography at the DPW prevents drainage of stormwater and any associated sedimentation from entering the Town's storm drain system or discharging directly to a water body.

SECTION 3 – Non-Structural Controls

3.1 Good Housekeeping

Good housekeeping practices are activities, often conducted daily, that help maintain a clean facility and prevent stormwater pollution problems. The following is a list of good housekeeping measures that are practiced at the facility:

- All washing of vehicles is performed within the designated vehicle wash bay.
- All fluid products and wastes are kept indoors.
- Fueling of small equipment is completed indoors.
- All floor drains present within garage bays drain to an UST that is cleaned out annually
- 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.
- Materials are stored indoors or in covered areas to minimize exposure to stormwater.
- No fertilizers, herbicides, or pesticides are stored or used at the facility.
- Lead-acid batteries are stored indoors and within secondary containment.
- Hazardous materials storage lockers with spill containment are used. Storage areas are located away from vehicle and equipment paths to reduce the potential of accident related leaks and spills.
- Storage drums and containers are not located close to storm drain inlets.
- All hazardous material storage areas and containers have proper signage, labels, restricted access, locks, inventory control, overhead coverage, and secondary containment.
- All materials, waste oil storage containers, and gas cans are properly labeled.
- Speedi Dri (or similar absorbent) is readily available and used for appropriate spills.
- Tools and materials are returned to designated storage areas after use.
- Waste materials are properly collected and disposed of.
- Different types of wastes are separated as appropriate.
- Regular waste disposal is arranged.
- Work areas are clean and organized.
- Work areas are regularly swept or vacuumed to collect metal, wood, and other particulates and materials.
- Obtain only the amount of materials required to complete a job.
- Materials are recycled when possible.
- 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.

- Bollards, berms, and containment features are WILL BE around areas and structures where fluids are stored.
- Drip pans are used for maintenance operations involving fluids and under leaking vehicles and equipment waiting repair.

The facility maintains a supply of spill cleanup materials at many buildings on site, and will maintain this inventory. An inventory of spill containment, control, and cleanup materials and spill kits maintained at the DPW Yard was shown in Table 2-3.

3.2 Preventative Maintenance

Preventative Maintenance can minimize the occurrence of stormwater pollution by addressing issues before they become problems. Vehicles and equipment should be regularly inspected to prevent leaks of fuel, oil, and other liquids. Structural stormwater controls should be regularly maintained to prevent inadequate performance during storm events.

The following is a list of preventative maintenance procedures practiced at the facility

- 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.
- Hydraulic equipment is kept in good repair to prevent leaks.
- Vehicle storage areas are inspected frequently for evidence of leaking oil.
- Material storage tanks and containers are regularly inspected for leaks.
- All material and bulk deliveries are monitored by facility employees.
- All waste oil is fully contained and the containers are inspected regularly.

3.3 Best Management Practices

In a SWPPP, existing and planned BMPs are identified that will prevent or reduce the discharge of pollutants in stormwater runoff for each area of concern listed in SECTION 2.

To prevent or reduce the potential of stormwater contamination from petroleum products, the following BMPs shall continue to be followed:

1. Follow Standard Operating Procedures (s) during delivery of waste oil to the equipment/waste oil storage bay. These SOPs are included in Appendix A.
2. Follow Standard Operating Procedures during delivery of bulk oil to the emergency generator and bulk fuel to the Fuel Island. These SOPs are included in Appendix A.

3. Minimize the volume of gasoline stored within the buildings and on the site.
4. Clean up any oil spills observed in the parking lot, garages, or other surfaces in a timely manner.
5. Monitor all material deliveries.
6. Inspect all storage tanks prior to filling activities for spills, leaks and corrosion.

3.4 Spill Prevention and Response

The following procedures apply to the 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. Additional materials or oil-absorbent socks will be utilized to protect adjacent catch basins.

SECTION 4 – Plan Implementation

4.1 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.

The DPW is responsible for stormwater management training for DPW employees. This position coordinates training related to stormwater management on at least an annual basis to review specific responsibilities for implementing this SWPPP, what and how to accomplish those responsibilities, including BMP implementation.

Additionally, general awareness training is provided regularly (preferably annually) to all employees whose actives may impact stormwater discharges. The purpose of this training is to educate workers on activities that can impact stormwater discharges and to help implement BMPs.

All employees responsible for the fueling or lubrication of vehicles or equipment stored at the facility will be trained regularly (preferably annually). The topics below will be covered at employee training sessions.

1. Spill prevention and response.
2. Good housekeeping.
3. Materials management practices.

Pollution Prevention Team members will meet at least twice a year to discuss the effectiveness of and improvement to the SWPPP. Appendix C contains copies of training documentation from these training activities including attendance sheets, instructor name and affiliation, date, time, and location of the training.

4.2 Site Inspection Requirements

It is required that the entire DPW Yard 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 director of the DPW or qualified third party is 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. 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 form for these inspections, and copies of completed inspection forms, are included in Appendix D.

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 Compliance Evaluation report. The permittee must 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, the permittee shall have back-up measures in place. The Compliance Evaluation report must be kept with the SWPPP and must state the problem, the solution, and when the solution was implemented.

4.3 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 Main Building and shall be updated if any of the conditions in SECTION 2.21 occur. 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.

Inspections of the DPW Yard should be performed at least quarterly (at least one during stormwater discharge) and described in the Annual Report, including any corrective actions taken, to demonstrate that operation of the DPW Yard is in compliance with the 2016 Massachusetts MS4 Permit.

4.4 Triggers for SWPPP Revisions

The Town 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.

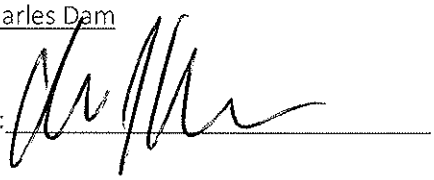
The amended SWPPP will describe the new activities that could contribute to increased pollution, as well as control measures that have been implemented to minimize the potential for pollution.

This SWPPP will be amended if a state or federal inspector determines that it is not effective in controlling stormwater pollutants discharged to waterways.

SECTION 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.

Name: Charles Dam Title: DPW Director

Signature:  Date: 9/23/2021

APPENDIX A

SOP 3 Catch Basin Inspection and Cleaning
SOP 4 Spill Response
SOP 6 Erosion Control
SOP 7 Fuel Handling
SOP 11 Oil/Water Separator
SOP 14 Vehicle Washing

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. Catch basin cleaning reduces foul odors, prevents clogs in the storm drain system, and reduces the loading of suspended solids, nutrients, and bacteria to receiving waters.

During regular cleaning and inspection procedures, data can be gathered related to the condition of the physical basin structure and its frame and grate and the quality of stormwater conveyed by the structure. Observations such as the following can indicate sources of pollution within the storm drain system:

- Oil sheen
- Discoloration
- Trash and debris

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 a 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.

Observations such as the following 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

Each catch basin should be cleaned and inspected at least annually. Catch basins in high-use areas may require more frequent cleaning. Performing street sweeping 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 structures need to be cleaned.

Cleaning Procedure

Catch basin inspection cleaning procedures should address both the grate opening and the basin's sump. Document any and all observations about the condition of the catch basin structure and water quality on the Catch Basin Inspection Form below:

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 :**	**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): ____	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:**		**Circle those present:**
	Color:		Foam / Oil Sheen
	Odor:		Sanitary Waste / Bacterial Sheen
Weather Conditions :	Dry > 24 hours ☐	Wet ☐	Orange Staining / Floatables
Sample of Screenings Collected for Analysis? Yes ☐ No ☐			Excessive sediment / Pet Waste
Comments:			Other: _____ / Optical Enhancers

Catch basin inspection and cleaning procedures include the following:

1. Work upstream to downstream.
2. Clean sediment and trash off grate.
3. Visually inspect the outside of the grate.
4. Visually inspect the inside of the catch basin to determine cleaning needs.
5. Inspect catch basin for structural integrity.
6. Determine the most appropriate equipment and method for cleaning each catch basin.
    a. Manually use a shovel to remove accumulated sediments, or
    b. Use a bucket loader to remove accumulated sediments, or

   c. Use a high pressure washer to clean any remaining material out of catch basin while capturing the slurry with a vacuum.
   d. If necessary, after the catch basin is clean, use the rodder of the vacuum truck to clean downstream pipe and pull back sediment that might have entered downstream pipe.
7. If contamination is suspected, chemical analysis will be required to determine if the materials comply with the Massachusetts DEP Hazardous Waste Regulations, 310 CMR 30.000 (http://www.mass.gov/dep/service/regulations/310cmr30.pdf). 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.
8. Properly dispose of collected sediments. See following section for guidance.
9. If fluids collected during catch basin cleaning are not being handled and disposed of by a third party, dispose of these fluids to a sanitary sewer system, with permission of the system operator.
10. If illicit discharges are observed or suspected, notify the appropriate Department (see "SOP 10: Addressing Illicit Discharges").
11. At the end of each day, document location and number of catch basins cleaned, amount of waste collected, and disposal method for all screenings.
12. Report additional maintenance or repair needs to the appropriate Department.

Disposal of Screenings

Catch basin cleanings from storm water-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 to prevent pollution.

Related Standard Operating Procedures

1. SOP 10, Addressing Illicit Discharges

2. SOP 13, Water Quality Screening in the Field

SOP 4: SPILL RESPONSE AND CLEANUP PROCEDURES

Municipalities are responsible for any contaminant spill or release that occurs on property they own or operate. Particular areas of concern include any facilities that use or store chemicals, fuel oil or hazardous waste, including schools, garages, DPW yards, and landfills. Implementation of proper spill response and cleanup procedures can help to mitigate the effects of a contaminant release.

Responding to a Spill

In the event of a spill, follow these spill response and cleanup procedures:

1. Notify a member of the facility's Pollution Prevention Team, the facility supervisor, and/or the facility safety officer.
2. Assess the contaminant release site for potential safety issues and for direction of flow.
3. With proper training and personal protective equipment, complete the following:
    a. Stop the contaminant release;
    b. Contain the contaminant release through the use of spill containment berms or absorbents;
    c. Protect all drains and/or catch basins with the use of absorbents, booms, berms or drain covers;
    d. Clean up the spill;
    e. Dispose of all contaminated products in accordance with applicable federal, state and local regulations.
        i. Products contaminated with petroleum shall be handled and disposed of as described in MassDEP policy WCS-94-400, Interim Remediation Waste Management Policy for Petroleum Contaminated Soils, http://www.mass.gov/dep/cleanup/laws/94-400.pdf.
        ii.
        iii. 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.
        iv. Waste oil contaminated products:
            1. Perform the "one drop" test to ensure absorbents do not contain enough oil to be considered hazardous. Wring absorbents through a paint filter. If doing so does not generate one drop of oil, the materials are not hazardous.
            2. 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.

3. If absorbents do not pass the "one drop" test they should be placed in separate metal containers with tight fittings lids, labeled "Oily Waste Absorbents Only."

4. 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, however **in the case of an emergency call 911**;

Contact the MassDEP 24-hour spill reporting notification line, toll-free at **(888)-3104-1133**;

a. The following scenarios **are exempt** from MassDEP reporting requirements:
   i. Spills of less than 10 gallons of petroleum and do not impact a water body;
   ii. Spills of less than one pound of hazardous chemicals and do not present an imminent health or safety hazard;
   iii. Spills from passenger vehicle accidents;
   iv. Spills within a vault or building with a watertight floor and walls that completely contain all released chemicals.

Procedures for Reporting Spill Response

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

Where was the release sent/what was contaminated, addressing:

a. Pavement;
b. Soil;
c. Drains;
d. Catch Basins;
e. Water Bodies;
f. Public Street; and
g. Public Sidewalk.

4. The concentration of the released contaminant.
5. What/who caused the release.
6. Is the release being contained and/or cleaned up, or is the response complete.
7. Type and amount of petroleum stored on site, if any.

8. 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:

1. 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;
2. Provide yearly maintenance and inspection at all municipal facilities, paying particular attention to underground storage tanks. Maintain maintenance and inspection records on site;
3. 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;
    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, 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.
4. 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;
5. Maintain a oil and grease spill response kit with the following materials, at a minimum, at each facility:

    a. 6.5 gallon bucket with screw top lid and handle
    b. 10 gallons of sand
    c. 200 pounds of Speedi Dry absorbent
    d. Drain covers
    e. Spill containment berms
    f. (4) 3’ absorbent socks
    g. (16) 16” x 18” absorbent pads
    h. Goggles
    i. Nitrile gloves
    j. Disposable bags to dispose of used materials

k. Laminated contacts list shall include the following names and numbers:
    i. Safety Officer;
    ii. Facility Supervisor;
    iii. Local Fire Department;
    iv. MassDEP spill report notification line;
    v. MassDEP Regional Office;
    vi. Hazardous Waste Compliance Assistance Line;
    vii. Household Hazardous Products Hotline;
    viii. Massachusetts Department of Fire Services;
    ix. Licensed Site Professionals Information.

Related Standard Operating Procedures

1. SOP 7, Fuel and Oil Handling Procedures

SOP 6: EROSION AND SEDIMENTATION 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

SOP 7: FUEL AND OIL HANDLING PROCEDURES

Spills, leaks, and overfilling can occur during handling of fuels and petroleum-based materials, even in small volumes, representing a potential source of stormwater pollution. This Standard Operating Procedure addresses 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".

For all manners of fuel and oil handling described below, a member of the facility's Pollution Prevention Team (or another knowledgeable person familiar with the facility) shall be present during handling procedures. This person shall ensure that the following are observed:

1. There is no smoking while fuel handling is in process or underway.
2. 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.
3. The delivery vehicle's hand brake is set and wheels are chocked while the activity is being completed.
4. Catch basins and drain manholes are adequately protected.
5. No tools are to be used that could damage fuel or oil containers or the delivery vehicle.
6. No flammable liquid shall 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.
7. Local traffic does not interfere with fuel transfer operations.
8. The attending persons should watch for any leaks or spills
    a. Any small leaks or spills should be immediately stopped, and spilled materials absorbed and disposed of properly. Refer to SOP 4, "Spill Response and Cleanup Procedures", for examples of spill cleanup and response materials.
    b. In the event of a large spill or one that discharges to surface waters or an engineered storm drain system, the facility representative shall activate the facility's Stormwater Pollution Prevention Plan (SWPPP) and report the incident as specified within.

Delivery by Bulk (Tanker) Truck

Procedures for the delivery of bulk fuel shall include the following:

1. The truck driver shall check in with the facility upon arrival.
2. The facility representative shall 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 Procedures", for examples of spill cleanup and response materials.
3. The facility representative shall check to ensure that the amount of delivery does not exceed the available capacity of the tank.
    a. 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.

4. The truck driver and the facility representative shall both remain with the vehicle during the delivery process.
5. The truck driver and the facility representative shall inspect all visible lines, connections, and valves for leaks.
6. When delivery is complete and the hoses are removed, buckets should be placed underneath connection points to catch drippings.
7. The delivery vehicle shall be inspected prior to departure to ensure that the hose is disconnected from the tank.
8. The facility representative shall 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.
9. The facility representative shall 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 shall include the following:

1. The truck driver shall check in with the facility upon arrival.
2. The facility representative shall 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 Procedures", for examples of spill cleanup and response materials.
3. The facility representative shall closely examine the shipment for damaged drums.
    a. If damaged drums are found, they shall be closely inspected for leaks or punctures.
    b. Breached drums should be removed to a dry, well-ventilated area and the contents transferred to other suitable containers.
    c. Drums shall be disposed of in accordance with all applicable regulations.
4. Drummed materials shall not be unloaded outdoors during wet weather events.
5. The truck driver and the facility representative shall both remain with the vehicle during the delivery process.
6. Drums shall be handled and unloaded carefully to prevent damage.
7. Upon completion of unloading, the facility representative shall 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.
8. The facility representative shall check to ensure that the proper amount of fuel 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 for the draining of bulk oil tanks shall include the

following:

1. The disposal truck driver shall check in with the facility upon arrival.
2. The facility representative shall 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 Procedures", for examples of spill cleanup and response materials.
3. The facility representative shall verify that the volume of waste oil in the tank does not exceed the available capacity of the disposal hauler's vehicle.
4. The truck driver and the facility representative shall both remain with the vehicle during the tank draining process.
5. When draining is complete and the hoses are removed, buckets should be placed underneath connection points to catch drippings.
6. The disposal hauler vehicle shall be inspected prior to departure to ensure that the hose is disconnected from the tank.
7. The facility representative shall 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.
8. The facility representative shall collect a receipt from the truck driver.

Attachments

1. Fuel Delivery Checklist

Related Standard Operating Procedures

1. SOP 4, Spill Response and Cleanup Procedures

Fuel Delivery Checklist

FUEL DELIVERY FORM

TOWN OF _____

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** ☐

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

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.

	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	

Measurements	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.

SOP 14: MUNICIPAL VEHICLE WASHING PROCEDURES

Vehicle washing activities can result in the discharge of nutrients, sediment, petroleum products, and other contaminants to a surface water body or to an engineered drainage system.

Consistent with the 2003 USEPA NPDES Phase II Small Municipal Separate Storm Sewer System (MS4) Permit, municipal vehicle washing activities should not discharge pollutants to the MS4 system.

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 alternate wash system is available, and full containment of wash water cannot be achieved, the following procedures shall be followed:

1. Avoid discharge of any wash water directly to a surface water (e.g., stream, pond, drainage swale, etc.)
2. Minimize use of water to the extent practical.
3. Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. Use of a biodegradable, phosphate-free detergent is preferred.
4. Do not use solvents except in dedicated solvent parts washer systems or in areas not connected to a sanitary sewer.
5. Do not power wash, steam clean or perform engine cleaning or undercarriage cleaning.
6. 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 shall not be used within wellhead protection areas or within other protected resources.
7. Impervious surfaces discharging to engineered storm drain systems shall not discharge directly to a surface water unless treatment is provided. Treatment can include a compost-filled sock designed specifically for removal of petroleum and nutrients, such as the FiltrexxTM FilterSoxx product, or equal. The treatment device shall be positioned such that all drainage must flow through the device, preventing bypassing or short-circuiting.
8. All adjacent engineered storm drain system catch basins shall have a sump. These structures shall be cleaned periodically (refer to SOP 3, “Catch Basin Inspection and Cleaning”).
9. Solids and particulate accumulation from the washing area shall be completed through periodic sweeping and/or cleaning.
10. Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Clean up any spills using the procedures described in SOP 4, “Spill Response and Cleanup Procedures”.

Heavily soiled vehicles or vehicles dirtied from salting or snow removal efforts shall not be washed outside, without exception.

Indoor Vehicle Washing Procedures

Indoor vehicle washing procedures shall include the following:

1. Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. Use of a biodegradable, phosphate-free detergent is preferred.
2. Detergents shall not be used in areas where oil/water separators provide pre-treatment of drainage (refer to SOP 11, "Oil/Water Separator Maintenance", for more information).
3. Floor drains shall be connected to a sanitary sewer or tight tank. Floor drains discharging to adjacent surface water bodies or engineered storm drain systems shall be permanently plugged or otherwise abandoned before any vehicle wash activities are completed.
4. Designate separate areas for routine maintenance and vehicle cleaning. This helps prevent contamination of wash water by motor oils, hydraulic lubricants, greases, etc.
5. Dry clean-up methods, such as sweeping and vacuuming, are recommended within garage facilities. Do not wash down floors and work areas with water.
6. Bring smaller vehicles to commercial washing stations.
7. Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Clean up any spills using the procedures described in SOP 4, "Spill Response and Cleanup Procedures".

Heavy Equipment Washing Procedures

Heavy equipment washing procedures shall include the following:

1. Mud and heavy debris removal shall occur on impervious pavement or within a retention area.
2. Maintain these areas with frequent mechanical removal and proper disposal of spoils.
3. All adjacent engineered storm drain system components shall have a sump. These structures shall be cleaned periodically (refer to SOP 3, "Catch Basin Inspection and Cleaning").
4. Impervious surfaces with engineered storm drain systems shall not discharge directly to a surface water.
5. Floor drains shall be connected to a sanitary sewer or tight tank. Floor drains discharging to adjacent surface water bodies or engineered storm drain systems shall be permanently plugged or otherwise abandoned before any vehicle wash activities are completed.
6. Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. Use of a biodegradable, phosphate-free detergent is preferred.
7. Detergents shall not be used in areas where oil/water separators provide pre-treatment of drainage (refer to SOP 11, "Oil/Water Separator Maintenance", for more information).
8. Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Clean up any spills using the procedures described in SOP 4, "Spill Response and Cleanup Procedures".

Engine Washing and Steam Washing Procedures

Engine and steam washing procedures shall include the following:

1. Do not wash parts outdoors.
2. 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. Clean up any spills using the procedures described in SOP 4, "Spill Response and Cleanup Procedures".
3. Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. Use of a biodegradable, phosphate-free detergent is preferred.
4. Avoid cleaning with solvents except in dedicated solvent parts washer systems. Make use of pressure washing and steam cleaning.
5. Recycle clean solutions and rinse water to the extent practicable.
6. Wash water shall discharge to a tight tank or a sanitary sewer via an oil/water separator. Detergents shall not be used in areas where oil/water separators provide pre-treatment of drainage (refer to SOP 11, "Oil/Water Separator Maintenance", for more information).

Related Standard Operating Procedures

1. SOP 3, Catch Basin Inspection and Cleaning
2. SOP 4, Spill Response and Cleanup Procedures
3. SOP 11, Oil/Water Separator Maintenance

APPENDIX B SPILL REPORTS

Significant Spills, Leaks or Other Releases

SPILL 1

Date of incident:	
Location of incident:	
Description of incident:	
Circumstances leading to release:	
Actions taken in response to release:	
Measures taken to prevent recurrence:	

SPILL 2

Date of incident:	
Location of incident:	
Description of incident:	
Circumstances leading to release:	

Actions taken in response to release:	
Measures taken to prevent recurrence:	

SPILL 3

Date of incident:	
Location of incident:	
Description of incident:	
Circumstances leading to release:	
Actions taken in response to release:	
Measures taken to prevent recurrence:	

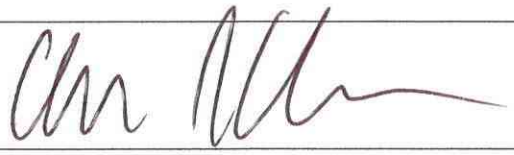
Appendix C Town Employee Training

Town Employee Training Tracking Sheet

Training Date: May 20, 2020 9 AM	
Training Description (including duration and subjects covered): 45 Minute presentation overview of stormwater pollutants and best practices to prevent pollution at Town-owned properties	
Trainer: Julia Miller , Bobrek Engineering & Construction	
Employee(s) trained	**Employee signature (due to COVID 19 all trainings are done online.)**
Charles Dam	
Nate Desrosiers	
Shawn Johnson	

Engineering & Construction
BOBREK

Town Employee Training Tracking Sheet - 2021

Training Date: June 9, 2021 9 AM-10 AM	
Training Description (including duration and subjects covered): 1 hour presentation overview of stormwater pollutants and best practices to prevent pollution at Town-owned properties with a concentration on foam and sheen identification	
Trainer: Julia Miller , Bobrek Engineering & Construction	
Employee(s) trained	**Employee signature**
Charles Dam	
Nate Desrosiers	
Shawn Johnson	

ILLICIT DISCHARGE DETECTION AND ELIMINATION

EMPLOYEE TRAINING RECORD

YEAR 4

Town of Manchester-by-the-Sea, MA

Date of Training: 6/10/2022

Training by: Kayla Repucci, Bobrek Engineering

PLEASE PRINT CLEARLY

Name	Department
Charles Dam	DPW
Nate Desrosiers	DPW
Shawn Johnson	DPW
Matt Bergeron	DPW

ILLICIT DISCHARGE DETECTION AND ELIMINATION

EMPLOYEE TRAINING RECORD

YEAR 5

Town of Manchester-by-the-Sea, MA

Date of Training: 6/12/2023

Training by: Kayla Repucci, Bobrek Engineering

PLEASE PRINT CLEARLY

Name	Department
Charles Dam	DPW
Nate Desrosiers	DPW
Shawn Johnson	DPW

APPENDIX D Stormwater Site Inspection Report

Stormwater Site Inspection Report

General Information			
Facility Name	Manchester DPW Yard		
Date of Inspection	June 10, 2020	**Start/End Time**	10:30 – 11:30
Inspector's Name(s)	John Bobrek, P.E.		
Inspector's Title(s)	President of Bobrek Engineering & Construction		
Inspector's Contact Information	john@gobobrek.com		
Inspector's Qualifications	Professional Engineer		

Weather Information
Weather at time of this inspection? ✓ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snow ❑ High Winds ❑ Other: Temperature: 78 degrees
Have any previously unidentified discharges of pollutants occurred since the last inspection? ❑Yes ✓ **No** **If yes, describe:**
Are there any discharges occurring at the time of inspection? ❑Yes ✓ **No** **If yes, 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	Floor Drains to UST	✓**Yes** ❑ No	❑ Maintenance ❑ Repair ❑ Replacement	

Areas of Materials or Activities exposed to stormwater

	Area/Activity	**Inspected?**	**Controls Adequate (appropriate, effective, and operating)?**	**Corrective Action Needed and Notes**
1	**Material loading/unloading and storage areas**	✓ **Yes** ❑ No ❑ N/A	✓ Yes ❑No	
2	**Equipment operations and maintenance areas**	✓ **Yes** ❑No ❑ N/A	✓Yes ❑No	
3	**Fueling areas**	✓ **Yes** ❑No ❑ N/A	❑Yes ✓ No	All fueling areas should be covered and have bollards or protections from vehicles
4	**Outdoor vehicle and equipment washing areas**	✓ Yes ❑No **N/A**	✓Yes ❑No	

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
5	**Waste handling and disposal areas**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
6	**Erodible areas/construction**	❑Yes ❑No ✓ **N/A**		
7	**Non-stormwater/ illicit connections**	❑Yes ❑No ✓ **N/A**		
8	**Salt storage piles or pile containing salt**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
9	**Dust generation and vehicle tracking**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
10	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
11	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
12	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance observed and not described above:

The site needs more protection of the fueling areas and all fuel barrels must be covered to prevent stormwater runoff. Note that the fueling area on site is not used and will be removed in the future.

Additional Control Measures

Describe any additional control measures or changes to the SWPPP needed to comply with the permit requirements:
Waste Oil storage should be moved outside under a covered roof.

Notes

Use this space for any additional notes or observations from the inspection:

- The site does not have stormwater structures
- Small amounts of impervious sheet flow flows onto pervious surfaces.

Print inspector name and title: John Bobrek, P.E 6/10/20

Stormwater Site Inspection Report

General Information			
Facility Name	Manchester DPW Yard		
Date of Inspection	**April 30, 2021**	**Start/End Time**	10:15
Inspector's Name(s)	John Bobrek, P.E.		
Inspector's Title(s)	President of Bobrek Engineering & Construction		
Inspector's Contact Information	john@gobobrek.com		
Inspector's Qualifications	Professional Engineer		

Weather Information
Weather at time of this inspection? Clear ✓ Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snow ❑ High Winds ❑ Other: Sprinkle Temperature: 60 degrees
Have any previously unidentified discharges of pollutants occurred since the last inspection? ❑Yes ✓ **No** **If yes, describe:**
Are there any discharges occurring at the time of inspection? ❑Yes ✓ **No** **If yes, 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	Floor Drains to UST	✓**Yes** ❑ No	❑ Maintenance ❑ Repair ❑ Replacement	

Areas of Materials or Activities exposed to stormwater

	Area/Activity	**Inspected?**	**Controls Adequate (appropriate, effective, and operating)?**	**Corrective Action Needed and Notes**
1	**Material loading/unloading and storage areas**	✓ **Yes** ❑ No ❑ N/A	✓ Yes ❑No	
2	**Equipment operations and maintenance areas**	✓ **Yes** ❑No ❑ N/A	✓Yes ❑No	
3	**Fueling areas**	✓ **Yes** ❑No ❑ N/A	❑Yes ✓ No	All fueling areas should be covered and have bollards or protections from vehicles. - Protection made w/ concrete blocks

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
4	**Outdoor vehicle and equipment washing areas**	✓ Yes ❑No **N/A**	✓Yes ❑No	Dispose of empty waste oil container. Remove Salt away from oil.
5	**Waste handling and disposal areas**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
6	**Erodible areas/construction**	❑Yes ❑No ✓ **N/A**		
7	**Non-stormwater/ illicit connections**	❑Yes ❑No ✓ **N/A**		
8	**Salt storage piles or pile containing salt**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
9	**Dust generation and vehicle tracking**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
10	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
11	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
12	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance observed and not described above:

Note that the fueling area on site is not used and will be removed in the future.

- Significant water on site behind storage piles & brook that flows perimeter of property behind salt shed.

Additional Control Measures

Describe any additional control measures or changes to the SWPPP needed to comply with the permit requirements:
Waste Oil storage should be moved outside under a covered roof. – Still applies

Notes

Use this space for any additional notes or observations from the inspection:

- The site does not have stormwater structures
- Small amounts of impervious sheet flow flows onto pervious surfaces.

Print inspector name and title: John Bobrek, P.E 4/30/21

Stormwater Site Inspection Report

General Information			
Facility Name	Manchester DPW Yard		
Date of Inspection	**May 26, 2022**	**Start/End Time**	**8:00-8:30**
Inspector's Name(s)	John Bobrek, P.E.		
Inspector's Title(s)	President of Bobrek Engineering & Construction		
Inspector's Contact Information	john@gobobrek.com		
Inspector's Qualifications	Professional Engineer		
Weather Information			
Weather at time of this inspection? Clear ✓ Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snow ❑ High Winds ❑ Other: Sprinkle Temperature: 60 degrees			
Have any previously unidentified discharges of pollutants occurred since the last inspection? ❑Yes ✓ **No** **If yes, describe:**			
Are there any discharges occurring at the time of inspection? ❑Yes ✓ **No** **If yes, 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	Floor Drains to UST	✓**Yes** ❑ No	❑ Maintenance ❑ Repair ❑ Replacement	

Areas of Materials or Activities exposed to stormwater

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
1	**Material loading/unloading and storage areas**	✓ **Yes** ❑ No ❑ N/A	✓ Yes ❑No	
2	**Equipment operations and maintenance areas**	✓ **Yes** ❑No ❑ N/A	✓Yes ❑No	
3	**Fueling areas**	✓ **Yes** ❑No ❑ N/A	✓Yes ❑ No	Fueling areas are covered with protections from vehicles made from concrete blocks.
4	**Outdoor vehicle and equipment washing areas**	✓ Yes ❑No **N/A**	✓Yes ❑No	
5	**Waste handling and disposal areas**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
6	**Erodible areas/construction**	✓ Yes ❑No ❑**N/A**	✓ **Yes** ❑No	Town staff is maintaining swale around salt barn. It has been dug out and needs seeding.
7	**Non-stormwater/ illicit connections**	❑Yes ❑No ✓ **N/A**		
8	**Salt storage piles or pile containing salt**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
9	**Dust generation and vehicle tracking**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
10	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
11	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
12	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance observed and not described above:

- Fueling area on site is not used and will be removed in the future.

- The swale around the storage piles and salt barn has been recently excavated to protect the brook that flows around the perimeter of the property.

Additional Control Measures

Describe any additional control measures or changes to the SWPPP needed to comply with the permit requirements:

Notes

Use this space for any additional notes or observations from the inspection: - The site does not have stormwater structures - Small amounts of impervious sheet flow flows onto pervious surfaces.

Print inspector name and title: John Bobrek, P.E 5/26/2022

1. **Salt Barn**

2. **Shed**

3. **Swale Around Salt Barn**

4. **Waste Oil in Garage**

Stormwater Site Inspection Report

General Information			
Facility Name	Manchester DPW Yard		
Date of Inspection	**6/8/2023**	**Start/End Time**	
Inspector's Name(s)	John Bobrek, P.E.		
Inspector's Title(s)	President of Bobrek Engineering & Construction		
Inspector's Contact Information	john@gobobrek.com		
Inspector's Qualifications	Professional Engineer		
Weather Information			
Weather at time of this inspection? Clear ✓ Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snow ❑ High Winds ❑ Other: Sprinkle Temperature:			
Have any previously unidentified discharges of pollutants occurred since the last inspection? ❑Yes ✓ **No** **If yes, describe:**			
Are there any discharges occurring at the time of inspection? ❑Yes ✓ **No** **If yes, 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	Floor Drains to UST	✓**Yes** ❑ No	❑ Maintenance ❑ Repair ❑ Replacement	

Areas of Materials or Activities exposed to stormwater

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
1	**Material loading/unloading and storage areas**	✓ **Yes** ❑ No ❑ N/A	✓ Yes ❑No	
2	**Equipment operations and maintenance areas**	✓ **Yes** ❑No ❑ N/A	✓Yes ❑No	
3	**Fueling areas**	✓ **Yes** ❑No ❑ N/A	✓Yes ❑ No	Fueling areas are covered with protections from vehicles made from concrete blocks.
4	**Outdoor vehicle and equipment washing areas**	✓ Yes ❑No **N/A**	✓Yes ❑No	
5	**Waste handling and disposal areas**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
6	**Erodible areas/construction**	✓ Yes ❑No ❑**N/A**	✓ **Yes** ❑No	Town staff is maintaining swale around salt barn. It has been dug out and needs seeding.
7	**Non-stormwater/ illicit connections**	❑Yes ❑No ✓ **N/A**		
8	**Salt storage piles or pile containing salt**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	Salt shed has some leaks but there is no discharge
9	**Dust generation and vehicle tracking**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
10	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
11	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
12	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance observed and not described above:

- Fueling area on site is not used and will be removed in the future.

- The swale around the storage piles and salt barn has been recently excavated to protect the brook that flows around the perimeter of the property.

Additional Control Measures

Describe any additional control measures or changes to the SWPPP needed to comply with the permit requirements:

Notes

Use this space for any additional notes or observations from the inspection: - The site does not have stormwater structures - Small amounts of impervious sheet flow flows onto pervious surfaces.

Print inspector name and title: John Bobrek, P.E 6/8/2023

1. Salt Barn

2. Fuel Storage

3. Drainage Ditch

Quarterly Visual Assessment Reports – additional form when stormwater discharge is occurring

Quarterly Visual Assessment Form– additional form when stormwater discharge is occurring

(Complete a separate form for each outfall you assess)

Name of Facility: DPW Yard

Outfall Name: "Substantially Identical Outfall"? ☐ Yes (identify substantially identical outfalls): ☒ No

Person(s)/Title(s) collecting sample: Shawn Johnson, Foreman

Person(s)/Title(s) examining sample: Shawn Johnson, Foreman

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
8/22/22, 12:00 pm	8/22/22, 1:30 pm	8/22/22, 1:35 pm

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).

A. Name: Shawn Johnson

B. Title: DPW Foreman

C. Signature:

D. Date Signed: 8/22/22

Quarterly Visual Assessment Form– additional form when stormwater discharge is occurring

(Complete a separate form for each outfall you assess)

Name of Facility: DPW Yard

Outfall Name: "Substantially Identical Outfall"? ☐ Yes (identify substantially identical outfalls): ☒ No

Person(s)/Title(s) collecting sample: Shawn Johnson, Foreman

Person(s)/Title(s) examining sample: Shawn Johnson, Foreman

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
10/26/22, 9:00 am	10/26/22, 10:30am	10/26/22, 10:35 am

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).

A. Name: Shawn Johnson

B. Title: DPW Foreman

C. Signature:

D. Date Signed: 10/26/22

Quarterly Visual Assessment Form– additional form when stormwater discharge is occurring

(Complete a separate form for each outfall you assess)

Name of Facility: DPW Yard

Outfall Name: Name "Substantially Identical Outfall"? ☒ Yes (identify substantially identical outfalls): ☐ No

Person(s)/Title(s) collecting sample: Shawn Johnson, Foreman

Person(s)/Title(s) examining sample: Shawn Johnson, Foreman

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
3/14/23, 12:00 am	3/14/23, 11:30 am	3/14/23, 11:35 am

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).

A. Name: Shawn Johnson

B. Title: DPW Foreman

C. Signature:

D. Date Signed: 3/14/23

Compost Site
Stormwater Pollution Protection Plan

Manchester-by-the-Sea, MA

Updated August 2023

Bobrek Engineering & Construction, LLC
100 Conifer Hill Drive, Suite 204
Danvers, MA 01923
www.gobobrek.com
978.406.9619

Contents

SECTION 1 – Introduction

This Stormwater Pollution Prevention Plan (SWPPP) has been developed by Manchester-by-the-Sea 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: minimize or prevent exposure, good housekeeping, preventative maintenance, spill prevention and response, erosion and sediment control, management of runoff, management of salt storage piles or piles containing salt, employee training, and maintenance of control measures.*
> 5. *Site inspections*

This SWPPP accomplishes these requirements by:

- Providing an inventory of the materials and equipment at a facility that have the potential to cause stormwater pollution, and identifying locations where these materials are stored;
- Describing how stormwater is managed at a facility, including: engineered storm drain system conveyance; on-site pretreatment, treatment and infiltration systems; and discharges to surface water directly from the site;
- Reviewing activities that occur at the facility that represent a potential for stormwater pollution;
- Describing the Best Management Practices (BMPs) that will be implemented at the facility to reduce, eliminate and prevent the discharge of pollutants to stormwater;
- Identifying the employees responsible for developing, implementing, maintaining, and revising, as necessary, this SWPPP;
- Establishing a schedule and description of site inspections to be conducted at the facility to determine if the SWPPP is effective in preventing the discharge of pollutants;
- Serving as a tool for the facility employees, including a place to maintain recordkeeping associated with these requirements.

SECTION 2 – Detailed Facility Assessment

2.1 Facility Summary

The compost site is located at 197 School St and is owned by Town of Manchester-by-the-Sea (the Town) and operated by Black Earth Compost. The Locus Map in **Figure 2-1** shows the location of the facility within the Town.

Black Earth Compost is primarily responsible for activities at, and maintenance of, the facility.

2.2 Site Inspection

The site inspection associated with the development of this SWPPP was completed on May 26, 2022. The inspection was conducted by John Bobrek, P.E. and Kayla Repucci from Bobrek Engineering and Construction and Shawn Johnson from the Town.

Inspections are conducted annually and during the site inspection, information related to activities at the site, vehicles stored at the site, fueling operations, material storage, transport of oil and other materials, and spill history are gathered.

2.3 Pollution Prevention Team

A Pollution Prevention Team for DPW Yard has been prepared and designated the task of developing, implementing, maintaining, and revising, as necessary, the SWPPP for this facility. Listed below are Pollution Prevention Team members and their respective responsibilities.

Responsibilities assigned to one or more members of the Pollution Prevention Team include:

- Implementing, administering, and revising the SWPPP
- Regularly inspecting stormwater control structures
- Conducting stormwater training
- Recordkeeping

Leader: Chuck Dam
Title: DPW Director
Office Phone: 978 526-1242
Cell Phone: 617-791-1550

Responsibilities: Considers all stages of plan development, inspections, and implementation; coordinates employee training programs; maintains all records and

ensures that reports are submitted; oversees sampling program. Responsible for certifying the completeness and accuracy of the SWPPP.

Leader: Andrew Brousseau **Email: andrew@blackearthcompost.com**
Title: Black Earth Compost Partner & Compost Manager

Responsibilities: Implements the preventative maintenance program; oversees good housekeeping activities; serves as spill response coordinator; conducts inspections; assists with employee training programs; conducts sampling/visual monitoring.

2.4 Facility Description

The primary purpose of the Compost site is to produce high-quality compost using the food scraps collected curbside each week, as well as brush and yard debris dropped off at the compost site at 197 School Street. Finished compost is be available to the town's residents in the spring. Activities at the site are described in **SECTION 2.7**

The facility covers approximately 7.7 acres and contains the structures and other features shown on the Site Map in **Figure 2-1** and described in detail in the following sections. Components shown on the site map include:

- Direction of surface water flow
- Structural stormwater pollution control measures
- Aboveground storage tanks
- Chemical storage areas
- Materials stockpiles
- Waste disposal area

See Figure 2.1 on the next page.

2.5 Facility Structures

The Compost Site has two structures, the office trailer and the Barn structure made with two storage containers. The Compost Site does not have a vehicle wash bay, bulk fueling island or a waste fuel burner.

Vehicle Storage and Maintenance

Vehicles are stored on the south side of the hill as shown in figure 2-1. No maintenance on vehicles is done at the facility.

Maintenance and Storage Buildings

Carpentry, electrical, and minor maintenance activities are completed in the barn structure. This building contains no floor drains and is partially enclosed.

Latex paint, spray paint, small equipment, signage, and tools are stored in the storage containers apart of the barn structure. This building contains no floor drains and is fully enclosed. These products are properly stored in flammable materials storage cabinets.

Administrative Buildings

The Black Earth Compost Administrative offices are located in the trailer on the south side of the facility. This trailer includes administrative/office space and storage.

2.5.1 Additional Site Features

Aboveground Storage Tanks

Aboveground storage tanks (ASTs) at the Compost Site are used for storage of diesel fuel and hydraulic fluid. An inventory of significant materials is included in SECTION 2.12.

One AST is located at the behind the storage containers on the south portion of the property for storage of diesel fuel. The other AST is located on the south portion of the office trailer for storage of hydraulic fluid. The diesel fuel is covered by a small roof and the hydraulic fluid is not covered.

Emergency Generators

An emergency generator located on the side of the barn provides all the power to the facility. The generator, a Generac, is exposed and lacks 110% containment of its gasoline tank. The generator is located on a pervious surface. Non-structural controls applicable to this equipment are addressed in SECTION 3 of this SWPPP.

Solid Waste Management

Black Earth Compost maintains a waste dumpster and a recycling dumpster located outside the office trailer. These dumpsters are kept closed when not in use. No inappropriate materials were observed during the facility inspection.

Parking Areas

The site has one designated parking areas at the Compost Site which is located on a pervious surface. This parking area used primarily for visitors and employees' personal vehicles; Black Earth trucks and heavy equipment are kept on the furthest south edge of the yard.

2.6 Site Drainage

No stormwater from adjacent properties impacts the Compost Site property.

Sheet Flow

There are no impervious surfaces on the Compost Site, however sheet flow from the compost piles flows to the North side of property where Black Earth has installed mulch filled socks to mitigate the stormwater going down the side of the hill.

Engineered Drainage

There is no engineered drainage on the Compost Site.

2.6.1 Receiving Waters

The final point of discharge for stormwater from this site is the Sawmill Brook, which has not been identified as impaired. The good housekeeping practices, preventative maintenance and Best Management Practices implemented at the facility are appropriate and adequate controls.

2.7 Site Activities

The following activities occur at the facility:

- Compost Production or Storage
- Tool storage
- Vehicle and equipment storage
- Vehicle and equipment maintenance/repair (including oil changes)

- Waste Handling and Disposal

Below is a discussion of site activities and the potential pollutant sources associated with each, as well as measures taken to minimize pollution. Locations of each activity are shown on the Site Plan (**Figure 2-1**).

The Compost Site does not store hazardous materials other than those noted previously, and no obsolete vehicles or other potential sources of pollutants are kept in any structure at the Compost Site.

No solvent-based parts washers were observed in any structure at the Compost Site. Any hazardous materials are either collected by a third-party vendor contracted by the Town on an annual basis, or collected at the annual Household Hazardous Waste Day (HHHD) that is hosted by the Board of Health for the benefit of Manchester residents. Waste materials from DPW yard operations that may be collected at the annual HHHW Day include used motor vehicle fluids that cannot be stored in the waste oil tank, such as used antifreeze and brake fluid. Any oil that may be contaminated with antifreeze, brake fluid, paint, or other additive is not accepted by the Town and a third-party vendor is called to collect it. These materials are properly labeled and stored using appropriate Best Management Practices between the time of generation and disposal.

The Town does not apply or utilize fertilizers, herbicides, or pesticides at any facility owned or managed by the Manchester. As such, no fertilizers, herbicides, or pesticides are stored at the Compost Site.

2.7.1 Compost Production or Storage

Potential Sources of Stormwater Pollution

Compost production and storage locations present the threat to contaminate stormwater with pathogens, including bacteria and viruses, nutrients, including phosphorus and nitrogen and sediments.

Pollution Prevention

Compost storage areas shall be located and properly labeled within a designated stockpile area that is covered and contained to prevent exposure to precipitation. If the storage area is unable to be covered it should be contained within an area contained by silt fence or concrete barriers and located in an area that does not receive a substantial amount of runoff from upland areas and does not drain directly to a waterbody. The compost shall be kept in neat, separate piles from all other materials.

2.7.7 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 material or fuel the machinery may contain. In addition, vehicles or machinery may pick up pollutants during 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", included in Appendix A) 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 catch basins, channels leading to outfalls, or the engineered storm drain system. If vehicles and equipment are stored outdoors, catch basins or engineered drainage system structures should include devices intended to remove oils and sediments prior to entering the system. These treatment devices should be inspected and replaced at the frequency recommended by the manufacturer.

2.7.8 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", included in Appendix A) to remove oils and gasoline.

Maintenance and repairs shall not take place in areas prone to stormwater runoff or where pollutants could enter catch basins, channels leading to outfalls, or an engineered storm drain system. All catch basins or engineered drainage systems on site that could be affected by accidental spills should include devices intended to remove oils and sediments prior to entering the system. These treatment devices should be inspected and replaced at the frequency recommended by the manufacturer.

2.7.10 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.

Solid Waste

1. Designate a waste collection area on the site that does not receive a substantial amount of runoff from upland areas and does not drain directly to a receiving water.
2. Ensure that containers have lids so they can be covered before periods of rain, and keep containers in a covered area whenever possible.
3. Schedule waste collection to prevent the containers from overfilling.
4. Clean up spills immediately and in accordance with SOP 4, "Spill Response and Cleanup Procedures" included in Appendix A.

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

2.8 Vehicle and Equipment Inventory

Vehicles and major equipment stored and maintained at the facility are shown in Table 2-2.

Table 2-2. Vehicle Inventory

Vehicle Type	Number on Site
Loader	2
Screener	2
Excavator	1
Skid Steer	1
Aluminum Cab Over Trucks	10

2.9 Location of Leak and Spill Cleanup Materials

Leak and spill cleanup materials are stored at the Compost Site in order to facilitate rapid response. Locations and types of leak and spill cleanup materials are identified in Table 2-3.

Table 2-3. Leak and Spill Cleanup Materials

Building or Area	Location	Materials Available
Left Container of Barn structure	Outside in a container	Speedi Dri

2.10 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. The Compost Site does not have running water so non-stormwater discharges are rare.

It has been determined that rare non-stormwater discharges at 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.

2.11 Existing Stormwater Monitoring Data

Historical stormwater monitoring data does not exist for the Compost Site

2.12 Significant Material Inventory

Materials stored include those specified in SECTION 2.7, "Site Activities". An inventory of these materials at Compost Site is included in Table 2-5, which also reviews the likelihood for each identified material to come in contact with stormwater. 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 Site Plan in Figure 2-2.

Table 2-5. Significant Material Inventory
Compost Site

Material	Storage Location	Quantity	Potential Pollutant	Covered (C) or Enclosed (E)	Likelihood of Contact with Stormwater
Petroleum-Based Compounds					
Diesel fuel	Outside storage container	2 - 250 Gal Barrels	Petroleum hydrocarbons	One C and one not	Likely
Hydraulic Fluid	In front of trailer	1 - 250 Gal	Petroleum hydrocarbons	No	Likely
Lubricants	Inside storage containers	1 - 50 Gal	Petroleum hydrocarbons	E	Not likely
Transmission Fluid	Inside storage containers	25 Gal	Petroleum hydrocarbons	E	Not likely
Total Volume of Oil At Facility = 575 Gal					
Non-Petroleum Significant Materials					
Antifreeze	Inside storage containers	10 Gal	Ethylene glycol; potential source of BOD		Not likely
Adhesives and sealants	Inside storage containers	10 - 25 oz Tubes	Volatile and semivolatile organic compounds	E	Not likely
Brake Fluid	Inside storage containers	2 12 oz bottles	Volatile organic compounds; non-petroleum based oil	E	Not likely
Paint, Latex	Inside storage containers	2 Gal	Petroleum constituents, including volatile and semivolatile organic compounds	E	Not likely
Paint, Oil-Based	Inside storage containers	2 Gal	Petroleum constituents, including volatile and semivolatile	E	Not likely

Material	Storage Location	Quantity	Potential Pollutant	Covered (C) or Enclosed (E)	Likelihood of Contact with Stormwater
			organic compounds		
Paint, Spray	Inside storage containers	6 bottles	Petroleum constituents, including volatile and semivolatile organic compounds	E	Not likely
Solid Waste, Recyclable	Dumpster	1	Miscellaneous debris/solids, particulate matter, metals		Likely
Solid Waste, for Disposal	Dumpster	1	Particulate matter, solids, metals		Likely
Spill response material (Speedi Dri or similar)	Outside Container	1Bag	Particulate matter, solids, residual oil.		Likely

2.13 Applicability of Spill Prevention, Control and Countermeasure (SPCC) Requirements

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 containers with a capacity of 55 gallons or more. The Compost Site does not have aboveground oil storage capacity that exceeds 1,320 gallons.

2.14 Description of Significant Material Storage Areas

Many activities at the Compost Site which involve the materials included in Table 2-5 occur within contained garages or bays. These activities may include minor equipment/vehicle repair, oil changes, repainting, lubrication, and parts replacement.

The Compost Site emergency generator is fueled with gasoline approximately once a week. The gasoline is delivered to the storage tank which is located within the Barn. All bulk delivery of fuel to the emergency generator is monitored by Black Earth Compost employee.

2.15 List of Significant Leaks or Spills

There have been no significant leaks or spills at the Compost Site in the last three years.

Forms included in Appendix B will be used to document any spill or leak that occurs at the facility in the future.

2.16 Structural BMPs

Structural BMPs include onsite constructed systems that provide pretreatment or treatment of stormwater flows. The following structural BMPs are presently used at the Compost Site to maintain water quality.

2.16.1 Pretreatment Structural BMPs

- Vegetated Filter strip
- Infiltration trench

2.16.2 Treatment Structural BMPs

- Pervious (Porous) pavement
- Vegetated swale
- Infiltration berm & retentive grading

2.16.3 Other Structural BMPs

- Landscape restoration

2.17 Sediment and Erosion Control

Site topography at the Compost Site sends the drainage of stormwater and any associated sedimentation down the side of the hill however with BMPs such as hay bails and mulch filled socks, the drainage infiltrates the hillside before entering the Manchester storm drain system or discharging directly to a water body.

SECTION 3 – Non-Structural Controls

3.1 Good Housekeeping

Good housekeeping practices are activities, often conducted daily, that help maintain a clean facility and prevent stormwater pollution problems. The following is a list of good housekeeping measures that are practiced at the facility:

- All fluid products and wastes are kept indoors.
- Fueling of small equipment is completed indoors.
- Spill materials and cleanup kits are maintained at all locations where oil materials are used, stored, or may be present, including at Fuel Islands.
- Used spill cleanup materials are disposed of properly.
- Materials are stored indoors or in covered areas to minimize exposure to stormwater.
- No fertilizers, herbicides, or pesticides are stored or used at the facility.
- Lead-acid batteries are stored indoors and within secondary containment.
- Hazardous materials storage lockers with spill containment are used. Storage areas are located away from vehicle and equipment paths to reduce the potential of accident related leaks and spills.
- All hazardous material storage areas and containers have proper signage, labels, restricted access, locks, inventory control, overhead coverage, and secondary containment.
- All materials, waste oil storage containers, and gas cans are properly labeled.
- Speedi Dri (or similar absorbent) is readily available and used for appropriate spills.
- Spill kits are located in areas where fluids are stored or where activities may result in a spill.
- Tools and materials are returned to designated storage areas after use.
- Waste materials are properly collected and disposed of.
- Different types of wastes are separated as appropriate.
- Regular waste disposal is arranged.
- Work areas are clean and organized.
- Work areas are regularly swept or vacuumed to collect metal, wood, and other particulates and materials.
- Obtain only the amount of materials required to complete a job.
- Materials are recycled when possible.
- 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.
- Bollards, berms, and containment features WILL BE placed around areas and structures where fluids are stored.

The facility maintains a supply of spill cleanup materials at many buildings on site, and will maintain this inventory. An inventory of spill containment, control, and cleanup materials and spill kits maintained at the Compost Site was shown in Table 2-3.

3.2 Preventative Maintenance

Preventative Maintenance can minimize the occurrence of stormwater pollution by addressing issues before they become problems. Vehicles and equipment should be regularly inspected to prevent leaks of fuel, oil, and other liquids. Structural stormwater controls should be regularly maintained to prevent inadequate performance during storm events.

The following is a list of preventative maintenance procedures practiced at the facility

- All staff members are aware of spill prevention and response procedures.
- All equipment fueling procedures are completed by qualified personnel trained in spill response procedures.
- Hydraulic equipment is kept in good repair to prevent leaks.
- Vehicle storage areas are inspected frequently for evidence of leaking oil.
- Material storage tanks and containers are regularly inspected for leaks.
- All material and bulk deliveries are monitored by facility employees.
- All waste oil is fully contained, and the containers are inspected regularly.

3.3 Best Management Practices

In a SWPPP, existing and planned BMPs are identified that will prevent or reduce the discharge of pollutants in stormwater runoff for each area of concern listed in SECTION 2.

To prevent or reduce the potential of stormwater contamination from petroleum products, the following BMPs shall continue to be followed:

1. Follow Standard Operating Procedures (s) during delivery of waste oil to the equipment/waste oil storage bay. These SOPs are included in Appendix A.
2. Follow Standard Operating Procedures during delivery of bulk oil to the emergency generator and bulk fuel to the Fuel Island. These SOPs are included in Appendix A.
3. Minimize the volume of gasoline stored within the buildings and on the site.
4. Clean up any oil spills observed in the parking lot, garages, or other surfaces in a timely manner.
5. Monitor all material deliveries.
6. Inspect all storage tanks prior to filling activities for spills, leaks and corrosion.

3.4 Spill Prevention and Response

The following procedures apply to the 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. Additional materials or oil-absorbent socks will be utilized to protect adjacent catch basins.

SECTION 4 – Plan Implementation

4.1 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.

Black Earth Compost is responsible for stormwater management training for Compost Site employees. This position coordinates training related to stormwater management on at least an annual basis to review specific responsibilities for implementing this SWPPP, what and how to accomplish those responsibilities, including BMP implementation.

Additionally, general awareness training is provided regularly (preferably annually) to all employees whose actives may impact stormwater discharges. The purpose of this training is to educate workers on activities that can impact stormwater discharges and to help implement BMPs.

All employees responsible for the fueling or lubrication of vehicles or equipment stored at the facility will be trained regularly (preferably annually). The topics below will be covered at employee training sessions.

1. Spill prevention and response.
2. Good housekeeping.
3. Materials management practices.

Pollution Prevention Team members will meet at least twice a year to discuss the effectiveness of and improvement to the SWPPP. Appendix C contains copies of training documentation from these training activities including attendance sheets, instructor name and affiliation, date, time, and location of the training.

4.2 Site Inspection Requirements

It is required that the entire Compost Site 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 Department of Public Works is 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. 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 form for these inspections, and copies of completed inspection forms, are included in Appendix D.

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 Compliance Evaluation report. The permittee must 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, the permittee shall have back-up measures in place. The Compliance Evaluation report must be kept with the SWPPP and must state the problem, the solution, and when the solution was implemented.

4.3 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 Compost Site in the office trailer and shall be updated if any of the conditions in SECTION 2.21 occur. 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.

Inspections of the Compost Site should be performed at least quarterly (at least one during stormwater discharge) and described in the Annual Report, including any corrective actions taken, to demonstrate that operation of the Compost Site is in compliance with the 2016 Massachusetts MS4 Permit.

4.4 Triggers for SWPPP Revisions

The Town 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.

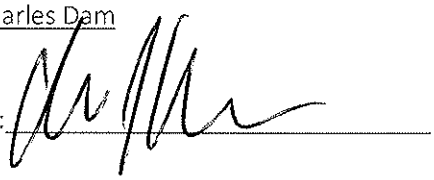
The amended SWPPP will describe the new activities that could contribute to increased pollution, as well as control measures that have been implemented to minimize the potential for pollution.

This SWPPP will be amended if a state or federal inspector determines that it is not effective in controlling stormwater pollutants discharged to waterways.

SECTION 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.

Name: Charles Dam Title: DPW Director

Signature:  Date: 9/23/2021

APPENDIX A

SOP 3 Catch Basin Inspection and Cleaning
SOP 4 Spill Response
SOP 6 Erosion Control
SOP 7 Fuel Handling
SOP 11 Oil/Water Separator
SOP 14 Vehicle Washing

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. Catch basin cleaning reduces foul odors, prevents clogs in the storm drain system, and reduces the loading of suspended solids, nutrients, and bacteria to receiving waters.

During regular cleaning and inspection procedures, data can be gathered related to the condition of the physical basin structure and its frame and grate and the quality of stormwater conveyed by the structure. Observations such as the following can indicate sources of pollution within the storm drain system:

- Oil sheen
- Discoloration
- Trash and debris

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 a 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.

Observations such as the following 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

Each catch basin should be cleaned and inspected at least annually. Catch basins in high-use areas may require more frequent cleaning. Performing street sweeping 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 structures need to be cleaned.

Cleaning Procedure

Catch basin inspection cleaning procedures should address both the grate opening and the basin's sump. Document any and all observations about the condition of the catch basin structure and water quality on the Catch Basin Inspection Form below:

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 :**	**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): ____	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:**		**Circle those present:**
	Color:		Foam / Oil Sheen
	Odor:		Sanitary Waste / Bacterial Sheen
Weather Conditions :	Dry > 24 hours ☐	Wet ☐	Orange Staining / Floatables
Sample of Screenings Collected for Analysis? Yes ☐ No ☐			Excessive sediment / Pet Waste
Comments:			Other: _____ / Optical Enhancers

Catch basin inspection and cleaning procedures include the following:

1. Work upstream to downstream.
2. Clean sediment and trash off grate.
3. Visually inspect the outside of the grate.
4. Visually inspect the inside of the catch basin to determine cleaning needs.
5. Inspect catch basin for structural integrity.
6. Determine the most appropriate equipment and method for cleaning each catch basin.
    a. Manually use a shovel to remove accumulated sediments, or
    b. Use a bucket loader to remove accumulated sediments, or

c. Use a high pressure washer to clean any remaining material out of catch basin while capturing the slurry with a vacuum.
d. If necessary, after the catch basin is clean, use the rodder of the vacuum truck to clean downstream pipe and pull back sediment that might have entered downstream pipe.

7. If contamination is suspected, chemical analysis will be required to determine if the materials comply with the Massachusetts DEP Hazardous Waste Regulations, 310 CMR 30.000 (http://www.mass.gov/dep/service/regulations/310cmr30.pdf). 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.
8. Properly dispose of collected sediments. See following section for guidance.
9. If fluids collected during catch basin cleaning are not being handled and disposed of by a third party, dispose of these fluids to a sanitary sewer system, with permission of the system operator.
10. If illicit discharges are observed or suspected, notify the appropriate Department (see "SOP 10: Addressing Illicit Discharges").
11. At the end of each day, document location and number of catch basins cleaned, amount of waste collected, and disposal method for all screenings.
12. Report additional maintenance or repair needs to the appropriate Department.

Disposal of Screenings

Catch basin cleanings from storm water-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 to prevent pollution.

Related Standard Operating Procedures

1. SOP 10, Addressing Illicit Discharges

2. SOP 13, Water Quality Screening in the Field

SOP 4: SPILL RESPONSE AND CLEANUP PROCEDURES

Municipalities are responsible for any contaminant spill or release that occurs on property they own or operate. Particular areas of concern include any facilities that use or store chemicals, fuel oil or hazardous waste, including schools, garages, DPW yards, and landfills. Implementation of proper spill response and cleanup procedures can help to mitigate the effects of a contaminant release.

Responding to a Spill

In the event of a spill, follow these spill response and cleanup procedures:

1. Notify a member of the facility's Pollution Prevention Team, the facility supervisor, and/or the facility safety officer.
2. Assess the contaminant release site for potential safety issues and for direction of flow.
3. With proper training and personal protective equipment, complete the following:
    a. Stop the contaminant release;
    b. Contain the contaminant release through the use of spill containment berms or absorbents;
    c. Protect all drains and/or catch basins with the use of absorbents, booms, berms or drain covers;
    d. Clean up the spill;
    e. Dispose of all contaminated products in accordance with applicable federal, state and local regulations.
        i. Products contaminated with petroleum shall be handled and disposed of as described in MassDEP policy WCS-94-400, Interim Remediation Waste Management Policy for Petroleum Contaminated Soils, http://www.mass.gov/dep/cleanup/laws/94-400.pdf.
        ii.
        iii. 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.
        iv. Waste oil contaminated products:
            1. Perform the "one drop" test to ensure absorbents do not contain enough oil to be considered hazardous. Wring absorbents through a paint filter. If doing so does not generate one drop of oil, the materials are not hazardous.
            2. 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.

3. If absorbents do not pass the "one drop" test they should be placed in separate metal containers with tight fittings lids, labeled "Oily Waste Absorbents Only."

4. 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, however **in the case of an emergency call 911**;

Contact the MassDEP 24-hour spill reporting notification line, toll-free at **(888)-3104-1133**;

a. The following scenarios **are exempt** from MassDEP reporting requirements:
   i. Spills of less than 10 gallons of petroleum and do not impact a water body;
   ii. Spills of less than one pound of hazardous chemicals and do not present an imminent health or safety hazard;
   iii. Spills from passenger vehicle accidents;
   iv. Spills within a vault or building with a watertight floor and walls that completely contain all released chemicals.

Procedures for Reporting Spill Response

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

Where was the release sent/what was contaminated, addressing:

a. Pavement;
b. Soil;
c. Drains;
d. Catch Basins;
e. Water Bodies;
f. Public Street; and
g. Public Sidewalk.

4. The concentration of the released contaminant.
5. What/who caused the release.
6. Is the release being contained and/or cleaned up, or is the response complete.
7. Type and amount of petroleum stored on site, if any.

8. 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:

1. 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;
2. Provide yearly maintenance and inspection at all municipal facilities, paying particular attention to underground storage tanks. Maintain maintenance and inspection records on site;
3. 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;
   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, 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.
4. 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;
5. Maintain a oil and grease spill response kit with the following materials, at a minimum, at each facility:

   a. 6.5 gallon bucket with screw top lid and handle
   b. 10 gallons of sand
   c. 200 pounds of Speedi Dry absorbent
   d. Drain covers
   e. Spill containment berms
   f. (4) 3’ absorbent socks
   g. (16) 16” x 18” absorbent pads
   h. Goggles
   i. Nitrile gloves
   j. Disposable bags to dispose of used materials

k. Laminated contacts list shall include the following names and numbers:
    i. Safety Officer;
    ii. Facility Supervisor;
    iii. Local Fire Department;
    iv. MassDEP spill report notification line;
    v. MassDEP Regional Office;
    vi. Hazardous Waste Compliance Assistance Line;
    vii. Household Hazardous Products Hotline;
    viii. Massachusetts Department of Fire Services;
    ix. Licensed Site Professionals Information.

Related Standard Operating Procedures

1. SOP 7, Fuel and Oil Handling Procedures

SOP 6: EROSION AND SEDIMENTATION 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

SOP 7: FUEL AND OIL HANDLING PROCEDURES

Spills, leaks, and overfilling can occur during handling of fuels and petroleum-based materials, even in small volumes, representing a potential source of stormwater pollution. This Standard Operating Procedure addresses 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".

For all manners of fuel and oil handling described below, a member of the facility's Pollution Prevention Team (or another knowledgeable person familiar with the facility) shall be present during handling procedures. This person shall ensure that the following are observed:

1. There is no smoking while fuel handling is in process or underway.
2. 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.
3. The delivery vehicle's hand brake is set and wheels are chocked while the activity is being completed.
4. Catch basins and drain manholes are adequately protected.
5. No tools are to be used that could damage fuel or oil containers or the delivery vehicle.
6. No flammable liquid shall 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.
7. Local traffic does not interfere with fuel transfer operations.
8. The attending persons should watch for any leaks or spills
    a. Any small leaks or spills should be immediately stopped, and spilled materials absorbed and disposed of properly. Refer to SOP 4, "Spill Response and Cleanup Procedures", for examples of spill cleanup and response materials.
    b. In the event of a large spill or one that discharges to surface waters or an engineered storm drain system, the facility representative shall activate the facility's Stormwater Pollution Prevention Plan (SWPPP) and report the incident as specified within.

Delivery by Bulk (Tanker) Truck

Procedures for the delivery of bulk fuel shall include the following:

1. The truck driver shall check in with the facility upon arrival.
2. The facility representative shall 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 Procedures", for examples of spill cleanup and response materials.
3. The facility representative shall check to ensure that the amount of delivery does not exceed the available capacity of the tank.
    a. 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.

4. The truck driver and the facility representative shall both remain with the vehicle during the delivery process.
5. The truck driver and the facility representative shall inspect all visible lines, connections, and valves for leaks.
6. When delivery is complete and the hoses are removed, buckets should be placed underneath connection points to catch drippings.
7. The delivery vehicle shall be inspected prior to departure to ensure that the hose is disconnected from the tank.
8. The facility representative shall 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.
9. The facility representative shall 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 shall include the following:

1. The truck driver shall check in with the facility upon arrival.
2. The facility representative shall 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 Procedures", for examples of spill cleanup and response materials.
3. The facility representative shall closely examine the shipment for damaged drums.
    a. If damaged drums are found, they shall be closely inspected for leaks or punctures.
    b. Breached drums should be removed to a dry, well-ventilated area and the contents transferred to other suitable containers.
    c. Drums shall be disposed of in accordance with all applicable regulations.
4. Drummed materials shall not be unloaded outdoors during wet weather events.
5. The truck driver and the facility representative shall both remain with the vehicle during the delivery process.
6. Drums shall be handled and unloaded carefully to prevent damage.
7. Upon completion of unloading, the facility representative shall 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.
8. The facility representative shall check to ensure that the proper amount of fuel 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 for the draining of bulk oil tanks shall include the

following:

1. The disposal truck driver shall check in with the facility upon arrival.
2. The facility representative shall 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 Procedures", for examples of spill cleanup and response materials.
3. The facility representative shall verify that the volume of waste oil in the tank does not exceed the available capacity of the disposal hauler's vehicle.
4. The truck driver and the facility representative shall both remain with the vehicle during the tank draining process.
5. When draining is complete and the hoses are removed, buckets should be placed underneath connection points to catch drippings.
6. The disposal hauler vehicle shall be inspected prior to departure to ensure that the hose is disconnected from the tank.
7. The facility representative shall 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.
8. The facility representative shall collect a receipt from the truck driver.

Attachments

1. Fuel Delivery Checklist

Related Standard Operating Procedures

1. SOP 4, Spill Response and Cleanup Procedures

Fuel Delivery Checklist

FUEL DELIVERY FORM

TOWN OF _____

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** ☐

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

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.

	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	

Measurements	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.

SOP 14: MUNICIPAL VEHICLE WASHING PROCEDURES

Vehicle washing activities can result in the discharge of nutrients, sediment, petroleum products, and other contaminants to a surface water body or to an engineered drainage system.

Consistent with the 2003 USEPA NPDES Phase II Small Municipal Separate Storm Sewer System (MS4) Permit, municipal vehicle washing activities should not discharge pollutants to the MS4 system.

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 alternate wash system is available, and full containment of wash water cannot be achieved, the following procedures shall be followed:

1. Avoid discharge of any wash water directly to a surface water (e.g., stream, pond, drainage swale, etc.)
2. Minimize use of water to the extent practical.
3. Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. Use of a biodegradable, phosphate-free detergent is preferred.
4. Do not use solvents except in dedicated solvent parts washer systems or in areas not connected to a sanitary sewer.
5. Do not power wash, steam clean or perform engine cleaning or undercarriage cleaning.
6. 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 shall not be used within wellhead protection areas or within other protected resources.
7. Impervious surfaces discharging to engineered storm drain systems shall not discharge directly to a surface water unless treatment is provided. Treatment can include a compost-filled sock designed specifically for removal of petroleum and nutrients, such as the FiltrexxTM FilterSoxx product, or equal. The treatment device shall be positioned such that all drainage must flow through the device, preventing bypassing or short-circuiting.
8. All adjacent engineered storm drain system catch basins shall have a sump. These structures shall be cleaned periodically (refer to SOP 3, “Catch Basin Inspection and Cleaning”).
9. Solids and particulate accumulation from the washing area shall be completed through periodic sweeping and/or cleaning.
10. Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Clean up any spills using the procedures described in SOP 4, “Spill Response and Cleanup Procedures”.

Heavily soiled vehicles or vehicles dirtied from salting or snow removal efforts shall not be washed outside, without exception.

Indoor Vehicle Washing Procedures

Indoor vehicle washing procedures shall include the following:

1. Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. Use of a biodegradable, phosphate-free detergent is preferred.
2. Detergents shall not be used in areas where oil/water separators provide pre-treatment of drainage (refer to SOP 11, "Oil/Water Separator Maintenance", for more information).
3. Floor drains shall be connected to a sanitary sewer or tight tank. Floor drains discharging to adjacent surface water bodies or engineered storm drain systems shall be permanently plugged or otherwise abandoned before any vehicle wash activities are completed.
4. Designate separate areas for routine maintenance and vehicle cleaning. This helps prevent contamination of wash water by motor oils, hydraulic lubricants, greases, etc.
5. Dry clean-up methods, such as sweeping and vacuuming, are recommended within garage facilities. Do not wash down floors and work areas with water.
6. Bring smaller vehicles to commercial washing stations.
7. Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Clean up any spills using the procedures described in SOP 4, "Spill Response and Cleanup Procedures".

Heavy Equipment Washing Procedures

Heavy equipment washing procedures shall include the following:

1. Mud and heavy debris removal shall occur on impervious pavement or within a retention area.
2. Maintain these areas with frequent mechanical removal and proper disposal of spoils.
3. All adjacent engineered storm drain system components shall have a sump. These structures shall be cleaned periodically (refer to SOP 3, "Catch Basin Inspection and Cleaning").
4. Impervious surfaces with engineered storm drain systems shall not discharge directly to a surface water.
5. Floor drains shall be connected to a sanitary sewer or tight tank. Floor drains discharging to adjacent surface water bodies or engineered storm drain systems shall be permanently plugged or otherwise abandoned before any vehicle wash activities are completed.
6. Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. Use of a biodegradable, phosphate-free detergent is preferred.
7. Detergents shall not be used in areas where oil/water separators provide pre-treatment of drainage (refer to SOP 11, "Oil/Water Separator Maintenance", for more information).
8. Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Clean up any spills using the procedures described in SOP 4, "Spill Response and Cleanup Procedures".

Engine Washing and Steam Washing Procedures

Engine and steam washing procedures shall include the following:

1. Do not wash parts outdoors.
2. 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. Clean up any spills using the procedures described in SOP 4, "Spill Response and Cleanup Procedures".
3. Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. Use of a biodegradable, phosphate-free detergent is preferred.
4. Avoid cleaning with solvents except in dedicated solvent parts washer systems. Make use of pressure washing and steam cleaning.
5. Recycle clean solutions and rinse water to the extent practicable.
6. Wash water shall discharge to a tight tank or a sanitary sewer via an oil/water separator. Detergents shall not be used in areas where oil/water separators provide pre-treatment of drainage (refer to SOP 11, "Oil/Water Separator Maintenance", for more information).

Related Standard Operating Procedures

1. SOP 3, Catch Basin Inspection and Cleaning
2. SOP 4, Spill Response and Cleanup Procedures
3. SOP 11, Oil/Water Separator Maintenance

APPENDIX B SPILL REPORTS

Significant Spills, Leaks or Other Releases

SPILL 1

Date of incident:	
Location of incident:	
Description of incident:	
Circumstances leading to release:	
Actions taken in response to release:	
Measures taken to prevent recurrence:	

SPILL 2

Date of incident:	
Location of incident:	
Description of incident:	
Circumstances leading to release:	

Actions taken in response to release:	
Measures taken to prevent recurrence:	

SPILL 3

Date of incident:	
Location of incident:	
Description of incident:	
Circumstances leading to release:	
Actions taken in response to release:	
Measures taken to prevent recurrence:	

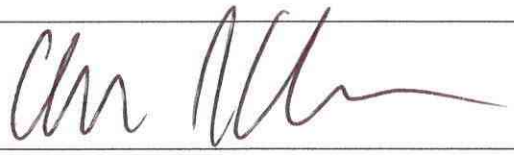
Appendix C Town Employee Training

Town Employee Training Tracking Sheet

Training Date: May 20, 2020 9 AM	
Training Description (including duration and subjects covered): 45 Minute presentation overview of stormwater pollutants and best practices to prevent pollution at Town-owned properties	
Trainer: Julia Miller , Bobrek Engineering & Construction	
Employee(s) trained	**Employee signature (due to COVID 19 all trainings are done online.)**
Charles Dam	
Nate Desrosiers	
Shawn Johnson	

Engineering & Construction
BOBREK

Town Employee Training Tracking Sheet - 2021

Training Date: June 9, 2021 9 AM-10 AM	
Training Description (including duration and subjects covered): 1 hour presentation overview of stormwater pollutants and best practices to prevent pollution at Town-owned properties with a concentration on foam and sheen identification	
Trainer: Julia Miller , Bobrek Engineering & Construction	
Employee(s) trained	**Employee signature**
Charles Dam	
Nate Desrosiers	
Shawn Johnson	

ILLICIT DISCHARGE DETECTION AND ELIMINATION

EMPLOYEE TRAINING RECORD

YEAR 4

Town of Manchester-by-the-Sea, MA

Date of Training: 6/10/2022

Training by: Kayla Repucci, Bobrek Engineering

PLEASE PRINT CLEARLY

Name	Department
Charles Dam	DPW
Nate Desrosiers	DPW
Shawn Johnson	DPW
Matt Bergeron	DPW

ILLICIT DISCHARGE DETECTION AND ELIMINATION

EMPLOYEE TRAINING RECORD

YEAR 5

Town of Manchester-by-the-Sea, MA

Date of Training: 6/12/2023

Training by: Kayla Repucci, Bobrek Engineering

PLEASE PRINT CLEARLY

Name	Department
Charles Dam	DPW
Nate Desrosiers	DPW
Shawn Johnson	DPW

APPENDIX D Stormwater Site Inspection Report

Stormwater Site Inspection Report

General Information			
Facility Name	Manchester Compost Site		
Date of Inspection	**April 30, 2021**	**Start/End Time**	10:30
Inspector's Name(s)	John Bobrek, P.E.		
Inspector's Title(s)	President of Bobrek Engineering & Construction		
Inspector's Contact Information	john@gobobrek.com		
Inspector's Qualifications	Professional Engineer		

Weather Information

Weather at time of this inspection?
❑ Clear ❑Cloudy ✓ Rain ❑ Sleet ❑ Fog ❑ Snow ❑ High Winds
❑ Other: Temperature: 55 degrees

Have any previously unidentified discharges of pollutants occurred since the last inspection? ❑Yes ✓ No
If yes, describe:

Are there any discharges occurring at the time of inspection? ✓Yes ❑ No
If yes, 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	Hay Bails	❑Yes ✓ No	✓ Maintenance ❑ Repair ❑ Replacement	Spoke with Andrew about using mulch filled socks along the perimeter of the property – add more socks around fueling area

Areas of Materials or Activities exposed to stormwater

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
1	**Material loading/unloading and storage areas**	✓ **Yes** ❑ No ❑ N/A	✓ Yes ❑No	
2	**Equipment operations and maintenance areas**	✓Yes ❑No ❑ N/A	✓Yes ❑No	Shed

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
3	**Fueling areas**	✓ **Yes** ❑No ❑ N/A	❑Yes ✓ No	All fueling areas should be covered and have bollards or protections from vehicles including DExhaust fluid. -Fuels storage area partially covered. - Rain allowing contaminated stormwater to runoff.
4	**Outdoor vehicle and equipment washing areas**	❑Yes ❑No ✓ **N/A**		
5	**Waste handling and disposal areas**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
6	**Erodible areas/construction**	✓ **Yes** ❑ No ❑ N/A	❑Yes ✓ **No**	Mulch filled socks have been installed along the perimeter of the property – additional ones are needed around the fuel area.
7	**Non-stormwater/ illicit connections**	❑Yes ❑No ✓ N/A		
8	**Salt storage piles or pile containing salt**	❑Yes ❑No ✓ N/A		
9	**Dust generation and vehicle tracking**	✓ Yes ❑No ❑ N/A	✓ Yes ❑No	
10	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
11	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
12	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance observed and not described above:
The site needs more protection of the fueling areas and all fuel barrels must be covered to prevent contamination of stormwater runoff.
Once barrel is penetrated, it must be covered.
Half barrels of waste fuel found in the back of the site were leaking; a visible sheen was detected in the water/stormwater. The fuel spill kit needs to be labeled and updated as it was insufficient.

Additional Control Measures

Describe any additional control measures or changes to the SWPPP needed to comply with the permit requirements:
Mulch filled socks were installed by Black Earth, but additional mulch filled socks are needed around the fuel area.

Notes

Use this space for any additional notes or observations from the inspection:

Print inspector name and title: John Bobrek, P.E 4/30/21


STORAGE
ENTALS

Stormwater Site Inspection Report

General Information			
Facility Name	Manchester Compost Site		
Date of Inspection	**May 26, 2022**	**Start/End Time**	**8:30-9:00 AM**
Inspector's Name(s)	John Bobrek, P.E.		
Inspector's Title(s)	President of Bobrek Engineering & Construction		
Inspector's Contact Information	john@gobobrek.com		
Inspector's Qualifications	Professional Engineer		

Weather Information

Weather at time of this inspection?
❑ Clear ✓ Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snow ❑ High Winds
❑ Other: Temperature: 60 degrees

Have any previously unidentified discharges of pollutants occurred since the last inspection? ❑Yes ✓ No
If yes, describe:

Are there any discharges occurring at the time of inspection? ❑Yes ✓ No
If yes, 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	Compost- filtered tube	❑Yes ✓ No	✓ Maintenance ❑ Repair ❑ Replacement	Erosion socks are dirty from turbidity of runoff. Need to use these tubes in addition to constructing berms around where water is pooling before the steep elevation drop

Areas of Materials or Activities exposed to stormwater

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
1	**Material loading/unloading and storage areas**	✓ **Yes** ❑ No ❑ N/A	✓Yes ❑No	
2	**Equipment operations and maintenance areas**	✓Yes ❑No ❑ N/A	✓Yes ❑No	
3	**Fueling areas**	✓ **Yes** ❑No ❑ N/A	❑Yes ✓ No	Open container of diesel exhaust fluid behind the shed.
4	**Outdoor vehicle and equipment washing areas**	✓Yes ❑No ❑ **N/A**	❑Yes ✓ No	Infiltrating stone should be put down on vehicle washing area.
5	**Waste handling and disposal areas**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
6	**Erodible areas/construction**	✓ **Yes** ❑ No ❑ N/A	❑Yes ✓ **No**	Stockpiles should have 10 ft of separation from the breaking slope to deter erosion down hillside. The material will be brought back away from the slope and a berm will be constructed around the pooling water.
7	**Non-stormwater/ illicit connections**	❑Yes ❑No ✓ N/A		
8	**Salt storage piles or pile containing salt**	❑Yes ❑No ✓ N/A		
9	**Dust generation and vehicle tracking**	✓ Yes ❑No ❑N/A	✓ Yes ❑No	
10	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
11	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
12	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance observed and not described above:

- Once a barrel is penetrated, it must be covered or capped when not in use. A diesel exhaust fluid container was found uncapped and partially full behind the shed.

Additional Control Measures

Describe any additional control measures or changes to the SWPPP needed to comply with the permit requirements:

- Stockpiles should have 10 ft of separation from the breaking slope to deter erosion down hillside. The material will be brought back away from the slope and a berm will be constructed around the pooling water.

Notes

Use this space for any additional notes or observations from the inspection:

- The site was found to be non-compliant in February 2022, but control measures have since fixed much of the erosion. Erosion socks were installed all around the property. The fuel storage area now has an adequate roof.

Print inspector name and title: John Bobrek, P.E 5/26/2022

1. **Containment shed w. roof**

2. **Stone on driveway**

3. **Garage**

4. **Dirty erosion sock from turbidity of runoff**

5. Pooled water next to steep slope

6. Uncapped diesel fluid container

Stormwater Site Inspection Report

General Information			
Facility Name	Manchester Compost Site		
Date of Inspection	**6/8/23**	**Start/End Time**	**10:30AM-11AM**
Inspector's Name(s)	John Bobrek, P.E.		
Inspector's Title(s)	President of Bobrek Engineering & Construction		
Inspector's Contact Information	john@gobobrek.com		
Inspector's Qualifications	Professional Engineer		

Weather Information
Weather at time of this inspection? ❑ Clear ✓Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snow ❑ High Winds ❑ Other: Temperature: 55 degrees
Have any previously unidentified discharges of pollutants occurred since the last inspection? ❑Yes ✓ No **If yes, describe:**
Are there any discharges occurring at the time of inspection? ✓Yes ✓ No **If yes, 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	Compost-filtered tube	❑Yes ✓ No	✓ Maintenance ❑ Repair ❑ Replacement	Erosion socks are dirty from turbidity of runoff. Need to reset these tubes in addition to constructing berms around perimeter of compost piles before the steep elevation drop.
2	Underdrain	❑Yes ✓ No	❑ Maintenance ✓ Repair ❑ Replacement	Underdrain pipe could be set deeper to improve effectiveness.

Areas of Materials or Activities exposed to stormwater

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
1	**Material loading/unloading and storage areas**	✓ **Yes** ❑ No ❑ N/A	✓ Yes ❑No	
2	**Equipment operations and maintenance areas**	✓Yes ❑No ❑ N/A	✓Yes ❑No	
3	**Fueling areas**	✓ **Yes** ❑No ❑ N/A	❑Yes ✓ No	Thirteen 5-gallon cans need to be in covered area.
4	**Outdoor vehicle and equipment washing areas**	✓Yes ❑No **❑N/A**		Truck soap should be capped when not in use.

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
5	**Waste handling and disposal areas**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
6	**Erodible areas/construction**	✓ **Yes** ❑ No ❑ N/A	❑Yes ✓ **No**	Two Washout areas need a berm or underdrain. Compost piles should get brought back from steep slope. Erosion control wattles need to be reset or replaced.
7	**Non-stormwater/ illicit connections**	❑Yes ❑No ✓ N/A		
8	**Salt storage piles or pile containing salt**	❑Yes ❑No ✓ N/A		
9	**Dust generation and vehicle tracking**	✓ Yes ❑No ❑ N/A	❑ Yes ✓No	Daily road sweeping recommended.
10	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
11	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
12	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance observed and not described above:
-Erosion control needed on slope behind storage containers near the shed- there is a pond downslope.
-Pile of coal uncovered, 5 gal containers uncapped and not in covered area.
-2 washouts areas and compost piles are too close to steep slope.
-Truck soap container uncapped.

Additional Control Measures

Describe any additional control measures or changes to the SWPPP needed to comply with the permit requirements:
- Stockpiles should have 10 feet of separation from the breaking slope to deter erosion down the hillside. The material will be brought back away from the slope and a berm will be constructed around the pooling water to prevent washout.
-Erosion control wattles will be replaced.
-One underdrain constructed in the past year- could be set deeper to improve effectiveness.
-Daily street sweeping recommended.
-Rocks that divided property (DPW) were moved causing washout on steep slope- the rocks could be replaced or a berm constructed.

Notes

Use this space for any additional notes or observations from the inspection:

Print inspector name and title: John Bobrek, P.E 6/8/23

1. Fuel Containers need to be covered

2. Covered Fuel Storage

3. Coal uncovered

4. Open truck soap container

4. Covered containers

5. Steep slope

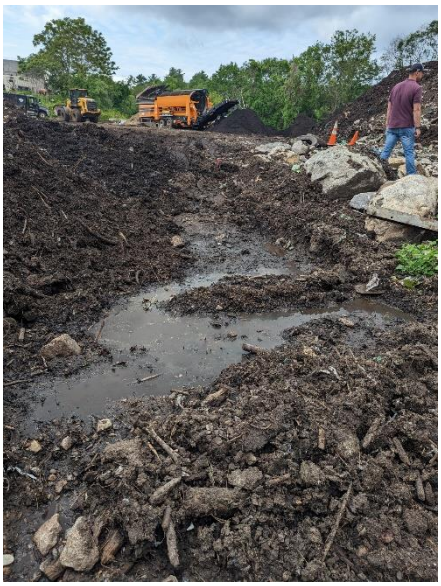
6. Erosion of slope

7. Washout

8. Washout of steep slope

9. Pooling and washout

10. Pooling next to underdrain



11. Underdrain

12. Erosion socks

13. Road requires regular sweeping

Quarterly Visual Assessment Reports – additional form when stormwater discharge is occurring

Quarterly Visual Assessment Form– additional form when stormwater discharge is occurring

(Complete a separate form for each outfall you assess)

Name of Facility: Compost Site

Outfall Name: Name "Substantially Identical Outfall"? ☒ Yes (identify substantially identical outfalls): ☐ No

Person(s)/Title(s) collecting sample: Shawn Johnson, Foreman

Person(s)/Title(s) examining sample: Shawn Johnson, Foreman

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
8/22/22, 12:00 pm	8/22/22, 1:00 pm	8/22/22, 1:15 pm

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): Runoff from compost stockpiles

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: Shawn Johnson

B. Title: DPW Foreman

C. Signature:

D. Date Signed: 8/22/22

Quarterly Visual Assessment Form– additional form when stormwater discharge is occurring

(Complete a separate form for each outfall you assess)

Name of Facility: Compost Site

Outfall Name: Name "Substantially Identical Outfall"? ☒ Yes (identify substantially identical outfalls): ☐ No

Person(s)/Title(s) collecting sample: Shawn Johnson, Foreman

Person(s)/Title(s) examining sample: Shawn Johnson, Foreman

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
10/26/22, 9:00 am	10/26/22, 10:00 am	10/26/22, 10:10 am

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): Runoff from compost stockpiles

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: Shawn Johnson

B. Title: DPW Foreman

C. Signature:

D. Date Signed: 10/26/22

Quarterly Visual Assessment Form– additional form when stormwater discharge is occurring

(Complete a separate form for each outfall you assess)

Name of Facility: Compost Site

Outfall Name: Name "Substantially Identical Outfall"? ☒ Yes (identify substantially identical outfalls): ☐ No

Person(s)/Title(s) collecting sample: Shawn Johnson, Foreman

Person(s)/Title(s) examining sample: Shawn Johnson, Foreman

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
3/14/23, 12:00 am	3/14/23, 11:00 am	3/14/23, 11:10 am

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): Runoff from compost stockpiles

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: Shawn Johnson

B. Title: DPW Foreman

C. Signature:

D. Date Signed: 3/14/23

Transfer Station
Stormwater Pollution Prevention Plan

Manchester-by-the-Sea, MA

Updated August 2023

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Contents

SECTION 1 – Introduction

This Stormwater Pollution Prevention Plan (SWPPP) has been developed by Manchester-by-the-Sea (Manchester) 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: minimize or prevent exposure, good housekeeping, preventative maintenance, spill prevention and response, erosion and sediment control, management of runoff, management of salt storage piles or piles containing salt, employee training, and maintenance of control measures.*
> 5. *Site inspections*

This SWPPP accomplishes these requirements by:

- Providing an inventory of the materials and equipment at a facility that have the potential to cause stormwater pollution, and identifying locations where these materials are stored;
- Describing how stormwater is managed at a facility, including: engineered storm drain system conveyance; on-site pretreatment, treatment and infiltration systems; and discharges to surface water directly from the site;
- Reviewing activities that occur at the facility that represent a potential for stormwater pollution;
- Describing the Best Management Practices (BMPs) that will be implemented at the facility to reduce, eliminate and prevent the discharge of pollutants to stormwater;
- Identifying the employees responsible for developing, implementing, maintaining, and revising, as necessary, this SWPPP;
- Establishing a schedule and description of site inspections to be conducted at the facility to determine if the SWPPP is effective in preventing the discharge of pollutants;
- Serving as a tool for the facility employees, including a place to maintain recordkeeping associated with these requirements.

SECTION 2 – Detailed Facility Assessment

2.1 Facility Summary

The Transfer Station is located at 201 Pine Street Manchester-by-the-Sea, MA 01944 on the closed landfill site. The Transfer Station is owned and operated by the Town of Manchester-by-the-Sea (the Town). However, the facility as a whole is managed by CMA Engineers Inc of Portsmouth, NH. The Locus Map in **Figure 2-1** shows the location of the facility within the Town.

The Department of Public Works (DPW) is primarily responsible for activities at, and maintenance of, the Transfer Station area within the facility.

2.2 Site Inspection

The site inspection associated with the development of this SWPPP was completed on May 26, 2022. The inspection was conducted by John Bobrek, P.E. and Kayla Repucci from Bobrek Engineering and Construction and Shawn Johnson from the Town.

During the site inspection, information related to activities at the site, vehicles stored at the site, fueling operations, material storage, transport of oil and other materials, and spill history was gathered.

2.3 Pollution Prevention Team

A Pollution Prevention Team for the Transfer Station has been prepared and designated the task of developing, implementing, maintaining, and revising, as necessary, the SWPPP for this facility. Listed below are Pollution Prevention Team members and their respective responsibilities.

Responsibilities assigned to one or more members of the Pollution Prevention Team include:

- Implementing, administering, and revising the SWPPP
- Regularly inspecting stormwater control structures
- Conducting stormwater training
- Recordkeeping

Leader: Chuck Dam **Office Phone:** 978 526-1242
Title: DPW Director

Responsibilities: Considers all stages of plan development, inspections, and implementation; coordinates employee training programs; maintains all records and ensures that reports are submitted; oversees sampling program. Responsible for certifying the completeness and accuracy of the SWPPP.

Leader: Nathan Desrosiers **Office Phone:** 978-525-6445
Title: Town Engineer and Facilities Manager

Responsibilities: Implements the preventative maintenance program; oversees good housekeeping activities; serves as spill response coordinator; conducts inspections; assists with employee training programs; conducts sampling/visual monitoring.

Member: Shawn Johnson **Office Phone:** 978-526-1242
Title: Foreman

Responsibilities: Assists in all components of the stormwater program, as needed. Maintains spill kits at Transfer Station.

2.4 Facility Description

The primary purpose of the Transfer Station is to collect the town's trash and recycling including larger items such as household appliances. Activities at the site are described in SECTION 2.7

The facility covers approximately 6.15 acres and contains the structures and other features shown on the Site Map in **Figure 2-1**. Components shown on the site map include:

- Direction of surface water flow
- Structural stormwater pollution control measures
- Aboveground storage tanks
- Chemical storage areas
- Waste disposal areas

See Figure 2.1 on next page.

2.5 Facility Structures

The Transfer Station has one small structure, the shed which is used to store disposed light bulbs and batteries. The Transfer Station does not have a vehicle wash bay or an active fueling area. There are no vehicle storage or maintenance areas.

2.5.1 Additional Site Features

Aboveground Storage Tanks

Aboveground storage tanks (ASTs) at the Transfer Station are used for storage of the hydraulic fluid used for the compactors on the dumpsters. An inventory of significant materials is included in SECTION 2.12.

One AST is located on top of each dumpster and is not covered.

Solid Waste Management

There are two 40-yard dumpsters at the Transfer Station. The dumpster located in the middle of the horseshoe driveway is the recycle dumpster and the dumpster located on the on the north side of the horseshoe driveway is the trash dumpster.

Parking Areas

There are no designated parking areas for long term parking at the Transfer Station, however, the site does have an impervious road which residents pull up on to dispose of their trash.

2.6 Site Drainage

No stormwater from adjacent properties impacts the Transfer Station property.

Sheet Flow

Drainage from the impervious surfaces at the Transfer Station is directed onto impervious surfaces. There are no stormwater structures on or near the property.

Engineered Drainage

There is no engineered drainage on or near the Transfer Station.

2.6.1 Receiving Waters

The final point of discharge for stormwater from this site is the Gravelly Pond, which has not been identified as impaired. The good housekeeping practices, preventative maintenance and Best Management Practices implemented at the facility are appropriate and adequate controls.

2.7 Site Activities

The following activities occur at the facility:

- Solid waste management (including scrap metal)
- Waste Handling and Disposal (including recycling)
- Snow Dump (Only snow from site)

Below is a discussion of site activities and the potential pollutant sources associated with each, as well as measures taken to minimize pollution. Locations of each activity are shown on the Site Plan (Figure 2-1).

The Transfer Station does not store hazardous materials other than those noted previously, and no obsolete vehicles or other potential sources of pollutants are kept in any structure at the Transfer Station.

No solvent-based parts washers were observed in any structure at the Transfer Station. Any hazardous materials are either collected by a third-party vendor contracted by the Town on an annual basis or collected at the annual Household Hazardous Waste Day (HHHD) that is hosted by the Board of Health for the benefit of Manchester residents. Waste materials from DPW yard operations that may be collected at the annual HHHW Day include used motor vehicle fluids that cannot be stored in the waste oil tank, such as used antifreeze and brake fluid. Any oil that may be contaminated with antifreeze, brake fluid, paint, or other additive is not accepted by the Town and a third-party vendor is called to collect it. These materials are properly labeled and stored using appropriate Best Management Practices between the time of generation and disposal.

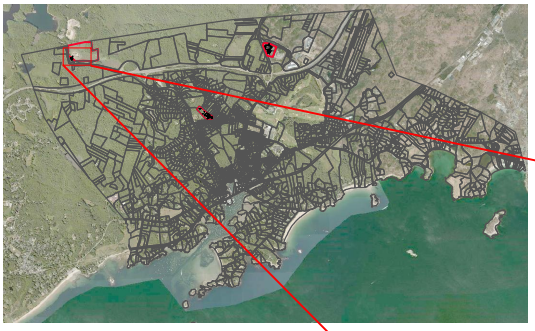
The Town does not apply or utilize fertilizers, herbicides, or pesticides at any facility owned or managed by the Manchester. As such, no fertilizers, herbicides, or pesticides are stored at the Transfer Station.

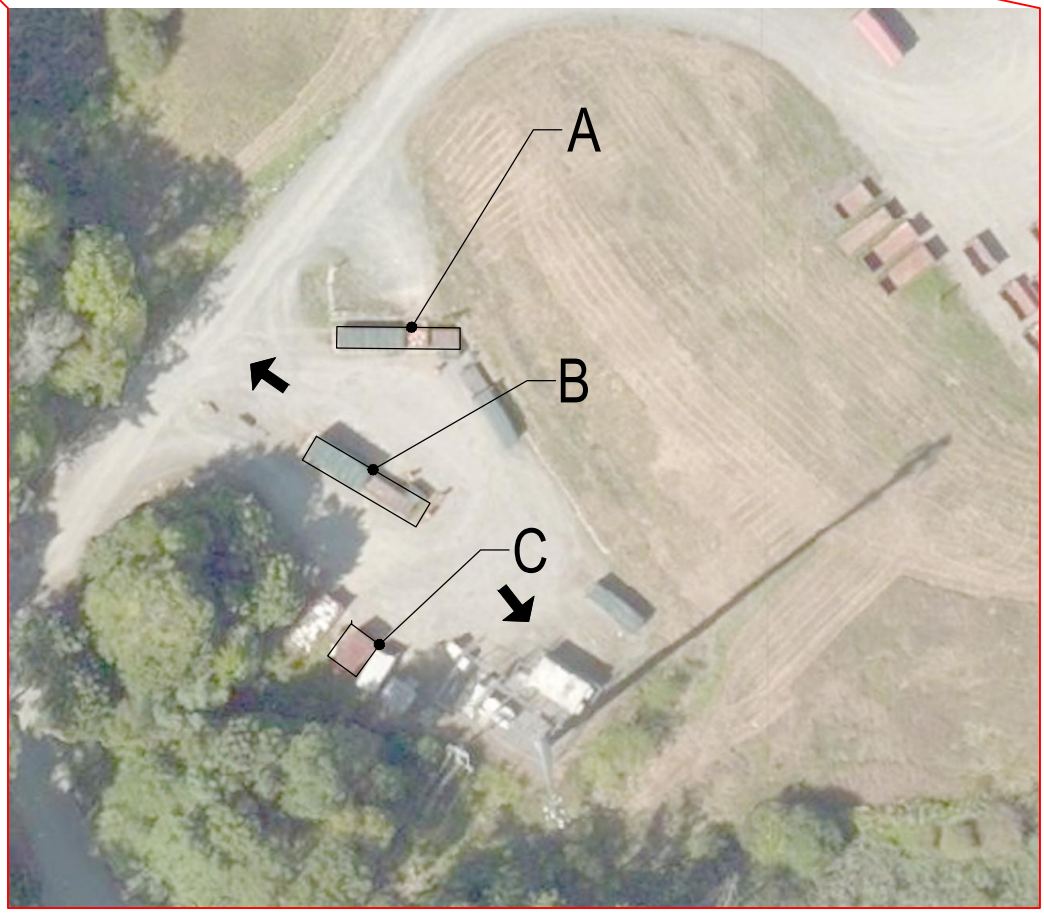
2.7.4 Solid Waste Management

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.





NOTES:

1. BLACK ARROWS REPRESENT SHEET FLOW

A	B	C
TRASH DUMPSTER ABOVEGROUND FUEL TANK	RECYCLE DUMPSTER ABOVEGROUND FUEL TANK	SHED LIGHT BULBS BATTERIES

35 0 70 140 FEET

SCALE = 1":70'

Engineering & Construction BOBREK

PO BOX 2185
DANVERS, MA 01923
WWW.GOBOBREK.COM

TRANSFER STATION
201 PINE ST
MANCHESTER, MA 01944

DATE: JUNE 2020
SCALE: 1"=70'
DR. BY: JRM
CHK. BY: BTP
PROJECT No.: 18-014

FIGURE 2.1
SITE MAP

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".

2.7.5 Snow Dump

Potential Sources of Stormwater Pollution

Snow collected from plowing and road clearing activities and managed in snow dumps can contaminate engineered storm drain systems and receiving waters if 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.

When snow, including sand and debris contained within it, is stored directly on top of catch basins, when combined with sand and debris, discharge to the engineered drainage system can be blocked, causing localized flooding.

Pollution Prevention

To avoid contamination of stormwater and drinking water supplies by snow dumps, storage sites should be selected and prepared before the snow season begins. The snow dump 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. Snow should not be dumped within a Zone II or Interim

Wellhead Protection Area of a public water supply, or within 75 feet of a private well. Sanitary landfills are not appropriate locations for snow dumps because the infiltration of meltwater will result in greater amounts of contaminated leachate. High groundwater levels also make gravel pits poor sites for snow storage.

Proper preparation and maintenance of snow disposal sites will also prevent stormwater pollution. Before winter begins, a silt fence or sediment barrier should be placed on the down-gradient side of the snow dump to collect any sediment in snow meltwater. If the site is located near a body of water, a 50-foot vegetated buffer strip (at minimum) should be maintained during the growth season to filter pollutants out of meltwater. 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, no later than May 15 of each year.

Except under the most extraordinary of circumstances, when all land-based snow disposal options have been exhausted, snow should not be dumped into any body of water. When this option is necessary, requirements of "Snow Disposal Guidance" (BRPG01-01) issued by MassDEP on March 8, 2001, shall be followed.

2.7.10 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.

Solid Waste

1. Designate a waste collection area on the site that does not receive a substantial amount of runoff from upland areas and does not drain directly to a receiving water.

2. Ensure that containers have lids so they can be covered before periods of rain, and keep containers in a covered area whenever possible.
3. Schedule waste collection to prevent the containers from overfilling.
4. Clean up spills immediately and in accordance with SOP 4, "Spill Response and Cleanup Procedures" included in Appendix A.

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.

2.8 Vehicle and Equipment Inventory

Vehicles and major equipment are not stored at the Transfer Station.

2.9 Location of Leak and Spill Cleanup Materials

There are no cleanup or spill materials at the Transfer Station.

2.11 Existing Stormwater Monitoring Data

Historical stormwater monitoring data at Transfer Station does not exist for this site

2.12 Significant Material Inventory

Materials stored include those specified in SECTION 2.7, "Site Activities". An inventory of these materials at Transfer Station is included in Table 2-5, which also reviews the likelihood for each identified material to come in contact with stormwater. 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 Site Plan in Figure 2-1.

Table 2-5. Significant Material Inventory
Transfer Station

Material	Storage Location	Quantity	Potential Pollutant	Covered (C) or Enclosed (E)	Likelihood of Contact with Stormwater
Petroleum-Based Compounds					
Hydraulic Fluid	On top of recycle and waste CRT dumpsters	2- 75 Gal	Petroleum hydrocarbons		Likely
Total Volume of Oil At Facility = 150					
Non-Petroleum Significant Materials					
Batteries, Used Lead Acid	Shed	Changes daily	Lead, sulfuric acid; possible particulate matter and residual oil	E	Not Likely
Solid Waste, Recyclable	Middle Dumpster	1 – 40 Yards	Miscellaneous debris/solids, particulate matter, metals		Likely
Solid Waste, for Disposal	Side Dumpster	1 – 40 Yards	Particulate matter, solids, metals		Likely

2.13 Applicability of Spill Prevention, Control and Countermeasure (SPCC) Requirements

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 containers with a capacity of 55 gallons or more. The Transfer Station does not have aboveground oil storage capacity that exceeds 1,320 gallons.

2.15 List of Significant Leaks or Spills

There have been no significant spills or leaks at the Transfer Station
Forms included in Appendix B will be used to document any spill or leak that occurs at the facility in the future.

2.17 Sediment and Erosion Control

Site topography at the Transfer Station prevents drainage of stormwater and any associated sedimentation from entering the Manchester storm drain system or discharging directly to a water body.

SECTION 3 – Non-Structural Controls

3.1 Good Housekeeping

Good housekeeping practices are activities, often conducted daily, that help maintain a clean facility and prevent stormwater pollution problems. The following is a list of good housekeeping measures that are practiced at the facility:

- Used spill cleanup materials are disposed of properly.
- Materials are stored indoors or in covered areas to minimize exposure to stormwater.
- No fertilizers, herbicides, or pesticides are stored or used at the facility.
- Lead-acid batteries are stored indoors and within secondary containment.
- All hazardous material storage areas and containers have proper signage, labels, restricted access, locks, inventory control, overhead coverage, and secondary containment.
- Waste materials are properly collected and disposed of.
- Different types of wastes are separated as appropriate.
- Obtain only the amount of materials required to complete a job.
- Materials are recycled when possible.
- 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.

3.2 Preventative Maintenance

Preventative Maintenance can minimize the occurrence of stormwater pollution by addressing issues before they become problems. Vehicles and equipment should be regularly inspected to prevent leaks of fuel, oil, and other liquids. Structural stormwater controls should be regularly maintained to prevent inadequate performance during storm events.

The following is a list of preventative maintenance procedures practiced at the facility

- All staff members are aware of spill prevention and response procedures.
- All staff members have received formal spill prevention and response procedure training.
- Hydraulic equipment is kept in good repair to prevent leaks.
- Material storage tanks and containers are regularly inspected for leaks.
- All material and bulk deliveries are monitored by facility employees.

3.3 Best Management Practices

In a SWPPP, existing and planned BMPs are identified that will prevent or reduce the discharge of pollutants in stormwater runoff for each area of concern listed in SECTION 2.

To prevent or reduce the potential of stormwater contamination from petroleum products, the following BMPs shall continue to be followed:

1. Follow Standard Operating Procedures (s) during delivery of waste oil to the equipment/waste oil storage bay. These SOPs are included in Appendix A.
2. Minimize the volume of gasoline stored within the buildings and on the site.
3. Clean up any oil spills observed in the parking lot, garages, or other surfaces in a timely manner.
4. Monitor all material deliveries.
5. Inspect all storage tanks prior to filling activities for spills, leaks and corrosion.

3.4 Spill Prevention and Response

The following procedures apply to the 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. Additional materials or oil-absorbent socks will be utilized to protect adjacent catch basins.

SECTION 4 – Plan Implementation

4.1 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.

The department of Public Works holds annual illicit discharge, spill response and stormwater management training for which the SWPP topics will be covered.

All employees responsible for the fueling or lubrication of vehicles or equipment stored at the facility will be trained regularly (preferably annually). The topics below will be covered at employee training sessions.

1. Spill prevention and response.
2. Good housekeeping.
3. Materials management practices.

Pollution Prevention Team members will meet at least once a year or as budget and scheduling allows to discuss the effectiveness of and improvement to the SWPPP. Appendix C contains copies of training documentation from these training activities including attendance sheets, instructor name and affiliation, date, time, and location of the training.

4.2 Site Inspection Requirements

It is required that the entire Transfer Station 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). Nathan Desrosiers is 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. 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 form for these inspections, and copies of completed inspection forms, are included in Appendix D.

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 Compliance Evaluation report. The permittee must 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, the permittee shall have back-up measures in place. The Compliance Evaluation report must be kept with the SWPPP and must state the problem, the solution, and when the solution was implemented.

4.3 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 Transfer Station and at the Department of Public Works office and shall be updated if any of the conditions in SECTION 2.21 occur. 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.

Inspections of the Transfer Station should be performed at least quarterly (at least one during stormwater discharge) or as budget allows and described in the Annual Report, including any corrective actions taken, to demonstrate that operation of the Transfer Station is in compliance with the 2016 Massachusetts MS4 Permit.

4.4 Triggers for SWPPP Revisions

Manchester 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.

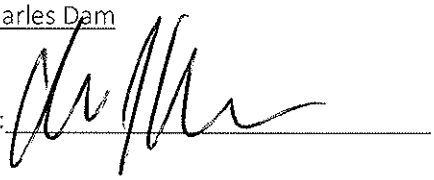
The amended SWPPP will describe the new activities that could contribute to increased pollution, as well as control measures that have been implemented to minimize the potential for pollution.

This SWPPP will be amended if a state or federal inspector determines that it is not effective in controlling stormwater pollutants discharged to waterways.

SECTION 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.

Name: Charles Dam Title: DPW Director

Signature:  Date: 9/23/2021

APPENDIX A

SOP 3 Catch Basin Inspection and Cleaning
SOP 4 Spill Response
SOP 6 Erosion Control
SOP 7 Fuel Handling
SOP 11 Oil/Water Separator
SOP 14 Vehicle Washing

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. Catch basin cleaning reduces foul odors, prevents clogs in the storm drain system, and reduces the loading of suspended solids, nutrients, and bacteria to receiving waters.

During regular cleaning and inspection procedures, data can be gathered related to the condition of the physical basin structure and its frame and grate and the quality of stormwater conveyed by the structure. Observations such as the following can indicate sources of pollution within the storm drain system:

- Oil sheen
- Discoloration
- Trash and debris

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 a 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.

Observations such as the following 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

Each catch basin should be cleaned and inspected at least annually. Catch basins in high-use areas may require more frequent cleaning. Performing street sweeping 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 structures need to be cleaned.

Cleaning Procedure

Catch basin inspection cleaning procedures should address both the grate opening and the basin's sump. Document any and all observations about the condition of the catch basin structure and water quality on the Catch Basin Inspection Form below:

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 :**	**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): ____	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:**		**Circle those present:**
	Color:		Foam / Oil Sheen
	Odor:		Sanitary Waste / Bacterial Sheen
Weather Conditions :	Dry > 24 hours ☐	Wet ☐	Orange Staining / Floatables
Sample of Screenings Collected for Analysis? Yes ☐ No ☐			Excessive sediment / Pet Waste
Comments:			Other: _____ / Optical Enhancers

Catch basin inspection and cleaning procedures include the following:

1. Work upstream to downstream.
2. Clean sediment and trash off grate.
3. Visually inspect the outside of the grate.
4. Visually inspect the inside of the catch basin to determine cleaning needs.
5. Inspect catch basin for structural integrity.
6. Determine the most appropriate equipment and method for cleaning each catch basin.
    a. Manually use a shovel to remove accumulated sediments, or
    b. Use a bucket loader to remove accumulated sediments, or

   c. Use a high pressure washer to clean any remaining material out of catch basin while capturing the slurry with a vacuum.
   d. If necessary, after the catch basin is clean, use the rodder of the vacuum truck to clean downstream pipe and pull back sediment that might have entered downstream pipe.
7. If contamination is suspected, chemical analysis will be required to determine if the materials comply with the Massachusetts DEP Hazardous Waste Regulations, 310 CMR 30.000 (http://www.mass.gov/dep/service/regulations/310cmr30.pdf). 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.
8. Properly dispose of collected sediments. See following section for guidance.
9. If fluids collected during catch basin cleaning are not being handled and disposed of by a third party, dispose of these fluids to a sanitary sewer system, with permission of the system operator.
10. If illicit discharges are observed or suspected, notify the appropriate Department (see "SOP 10: Addressing Illicit Discharges").
11. At the end of each day, document location and number of catch basins cleaned, amount of waste collected, and disposal method for all screenings.
12. Report additional maintenance or repair needs to the appropriate Department.

Disposal of Screenings

Catch basin cleanings from storm water-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 to prevent pollution.

Related Standard Operating Procedures

1. SOP 10, Addressing Illicit Discharges

2. SOP 13, Water Quality Screening in the Field

SOP 4: SPILL RESPONSE AND CLEANUP PROCEDURES

Municipalities are responsible for any contaminant spill or release that occurs on property they own or operate. Particular areas of concern include any facilities that use or store chemicals, fuel oil or hazardous waste, including schools, garages, DPW yards, and landfills. Implementation of proper spill response and cleanup procedures can help to mitigate the effects of a contaminant release.

Responding to a Spill

In the event of a spill, follow these spill response and cleanup procedures:

1. Notify a member of the facility's Pollution Prevention Team, the facility supervisor, and/or the facility safety officer.
2. Assess the contaminant release site for potential safety issues and for direction of flow.
3. With proper training and personal protective equipment, complete the following:
    a. Stop the contaminant release;
    b. Contain the contaminant release through the use of spill containment berms or absorbents;
    c. Protect all drains and/or catch basins with the use of absorbents, booms, berms or drain covers;
    d. Clean up the spill;
    e. Dispose of all contaminated products in accordance with applicable federal, state and local regulations.
        i. Products contaminated with petroleum shall be handled and disposed of as described in MassDEP policy WCS-94-400, Interim Remediation Waste Management Policy for Petroleum Contaminated Soils, http://www.mass.gov/dep/cleanup/laws/94-400.pdf.
        ii.
        iii. 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.
        iv. Waste oil contaminated products:
            1. Perform the "one drop" test to ensure absorbents do not contain enough oil to be considered hazardous. Wring absorbents through a paint filter. If doing so does not generate one drop of oil, the materials are not hazardous.
            2. 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.

3. If absorbents do not pass the "one drop" test they should be placed in separate metal containers with tight fittings lids, labeled "Oily Waste Absorbents Only."

4. 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, however **in the case of an emergency call 911**;

Contact the MassDEP 24-hour spill reporting notification line, toll-free at **(888)-3104-1133**;

a. The following scenarios **are exempt** from MassDEP reporting requirements:
   i. Spills of less than 10 gallons of petroleum and do not impact a water body;
   ii. Spills of less than one pound of hazardous chemicals and do not present an imminent health or safety hazard;
   iii. Spills from passenger vehicle accidents;
   iv. Spills within a vault or building with a watertight floor and walls that completely contain all released chemicals.

Procedures for Reporting Spill Response

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

Where was the release sent/what was contaminated, addressing:

a. Pavement;
b. Soil;
c. Drains;
d. Catch Basins;
e. Water Bodies;
f. Public Street; and
g. Public Sidewalk.

4. The concentration of the released contaminant.
5. What/who caused the release.
6. Is the release being contained and/or cleaned up, or is the response complete.
7. Type and amount of petroleum stored on site, if any.

8. 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:

1. 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;
2. Provide yearly maintenance and inspection at all municipal facilities, paying particular attention to underground storage tanks. Maintain maintenance and inspection records on site;
3. 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;
    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, 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.
4. 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;
5. Maintain a oil and grease spill response kit with the following materials, at a minimum, at each facility:

    a. 6.5 gallon bucket with screw top lid and handle
    b. 10 gallons of sand
    c. 200 pounds of Speedi Dry absorbent
    d. Drain covers
    e. Spill containment berms
    f. (4) 3’ absorbent socks
    g. (16) 16” x 18” absorbent pads
    h. Goggles
    i. Nitrile gloves
    j. Disposable bags to dispose of used materials

k. Laminated contacts list shall include the following names and numbers:
    i. Safety Officer;
    ii. Facility Supervisor;
    iii. Local Fire Department;
    iv. MassDEP spill report notification line;
    v. MassDEP Regional Office;
    vi. Hazardous Waste Compliance Assistance Line;
    vii. Household Hazardous Products Hotline;
    viii. Massachusetts Department of Fire Services;
    ix. Licensed Site Professionals Information.

Related Standard Operating Procedures

1. SOP 7, Fuel and Oil Handling Procedures

SOP 6: EROSION AND SEDIMENTATION 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

SOP 7: FUEL AND OIL HANDLING PROCEDURES

Spills, leaks, and overfilling can occur during handling of fuels and petroleum-based materials, even in small volumes, representing a potential source of stormwater pollution. This Standard Operating Procedure addresses 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".

For all manners of fuel and oil handling described below, a member of the facility's Pollution Prevention Team (or another knowledgeable person familiar with the facility) shall be present during handling procedures. This person shall ensure that the following are observed:

1. There is no smoking while fuel handling is in process or underway.
2. 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.
3. The delivery vehicle's hand brake is set and wheels are chocked while the activity is being completed.
4. Catch basins and drain manholes are adequately protected.
5. No tools are to be used that could damage fuel or oil containers or the delivery vehicle.
6. No flammable liquid shall 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.
7. Local traffic does not interfere with fuel transfer operations.
8. The attending persons should watch for any leaks or spills
    a. Any small leaks or spills should be immediately stopped, and spilled materials absorbed and disposed of properly. Refer to SOP 4, "Spill Response and Cleanup Procedures", for examples of spill cleanup and response materials.
    b. In the event of a large spill or one that discharges to surface waters or an engineered storm drain system, the facility representative shall activate the facility's Stormwater Pollution Prevention Plan (SWPPP) and report the incident as specified within.

Delivery by Bulk (Tanker) Truck

Procedures for the delivery of bulk fuel shall include the following:

1. The truck driver shall check in with the facility upon arrival.
2. The facility representative shall 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 Procedures", for examples of spill cleanup and response materials.
3. The facility representative shall check to ensure that the amount of delivery does not exceed the available capacity of the tank.
    a. 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.

4. The truck driver and the facility representative shall both remain with the vehicle during the delivery process.
5. The truck driver and the facility representative shall inspect all visible lines, connections, and valves for leaks.
6. When delivery is complete and the hoses are removed, buckets should be placed underneath connection points to catch drippings.
7. The delivery vehicle shall be inspected prior to departure to ensure that the hose is disconnected from the tank.
8. The facility representative shall 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.
9. The facility representative shall 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 shall include the following:

1. The truck driver shall check in with the facility upon arrival.
2. The facility representative shall 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 Procedures", for examples of spill cleanup and response materials.
3. The facility representative shall closely examine the shipment for damaged drums.
    a. If damaged drums are found, they shall be closely inspected for leaks or punctures.
    b. Breached drums should be removed to a dry, well-ventilated area and the contents transferred to other suitable containers.
    c. Drums shall be disposed of in accordance with all applicable regulations.
4. Drummed materials shall not be unloaded outdoors during wet weather events.
5. The truck driver and the facility representative shall both remain with the vehicle during the delivery process.
6. Drums shall be handled and unloaded carefully to prevent damage.
7. Upon completion of unloading, the facility representative shall 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.
8. The facility representative shall check to ensure that the proper amount of fuel 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 for the draining of bulk oil tanks shall include the

following:

1. The disposal truck driver shall check in with the facility upon arrival.
2. The facility representative shall 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 Procedures", for examples of spill cleanup and response materials.
3. The facility representative shall verify that the volume of waste oil in the tank does not exceed the available capacity of the disposal hauler's vehicle.
4. The truck driver and the facility representative shall both remain with the vehicle during the tank draining process.
5. When draining is complete and the hoses are removed, buckets should be placed underneath connection points to catch drippings.
6. The disposal hauler vehicle shall be inspected prior to departure to ensure that the hose is disconnected from the tank.
7. The facility representative shall 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.
8. The facility representative shall collect a receipt from the truck driver.

Attachments

1. Fuel Delivery Checklist

Related Standard Operating Procedures

1. SOP 4, Spill Response and Cleanup Procedures

Fuel Delivery Checklist

FUEL DELIVERY FORM

TOWN OF _____

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** ☐

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

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.

	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	

Measurements	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.

SOP 14: MUNICIPAL VEHICLE WASHING PROCEDURES

Vehicle washing activities can result in the discharge of nutrients, sediment, petroleum products, and other contaminants to a surface water body or to an engineered drainage system.

Consistent with the 2003 USEPA NPDES Phase II Small Municipal Separate Storm Sewer System (MS4) Permit, municipal vehicle washing activities should not discharge pollutants to the MS4 system.

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 alternate wash system is available, and full containment of wash water cannot be achieved, the following procedures shall be followed:

1. Avoid discharge of any wash water directly to a surface water (e.g., stream, pond, drainage swale, etc.)
2. Minimize use of water to the extent practical.
3. Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. Use of a biodegradable, phosphate-free detergent is preferred.
4. Do not use solvents except in dedicated solvent parts washer systems or in areas not connected to a sanitary sewer.
5. Do not power wash, steam clean or perform engine cleaning or undercarriage cleaning.
6. 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 shall not be used within wellhead protection areas or within other protected resources.
7. Impervious surfaces discharging to engineered storm drain systems shall not discharge directly to a surface water unless treatment is provided. Treatment can include a compost-filled sock designed specifically for removal of petroleum and nutrients, such as the FiltrexxTM FilterSoxx product, or equal. The treatment device shall be positioned such that all drainage must flow through the device, preventing bypassing or short-circuiting.
8. All adjacent engineered storm drain system catch basins shall have a sump. These structures shall be cleaned periodically (refer to SOP 3, “Catch Basin Inspection and Cleaning”).
9. Solids and particulate accumulation from the washing area shall be completed through periodic sweeping and/or cleaning.
10. Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Clean up any spills using the procedures described in SOP 4, “Spill Response and Cleanup Procedures”.

Heavily soiled vehicles or vehicles dirtied from salting or snow removal efforts shall not be washed outside, without exception.

Indoor Vehicle Washing Procedures

Indoor vehicle washing procedures shall include the following:

1. Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. Use of a biodegradable, phosphate-free detergent is preferred.
2. Detergents shall not be used in areas where oil/water separators provide pre-treatment of drainage (refer to SOP 11, "Oil/Water Separator Maintenance", for more information).
3. Floor drains shall be connected to a sanitary sewer or tight tank. Floor drains discharging to adjacent surface water bodies or engineered storm drain systems shall be permanently plugged or otherwise abandoned before any vehicle wash activities are completed.
4. Designate separate areas for routine maintenance and vehicle cleaning. This helps prevent contamination of wash water by motor oils, hydraulic lubricants, greases, etc.
5. Dry clean-up methods, such as sweeping and vacuuming, are recommended within garage facilities. Do not wash down floors and work areas with water.
6. Bring smaller vehicles to commercial washing stations.
7. Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Clean up any spills using the procedures described in SOP 4, "Spill Response and Cleanup Procedures".

Heavy Equipment Washing Procedures

Heavy equipment washing procedures shall include the following:

1. Mud and heavy debris removal shall occur on impervious pavement or within a retention area.
2. Maintain these areas with frequent mechanical removal and proper disposal of spoils.
3. All adjacent engineered storm drain system components shall have a sump. These structures shall be cleaned periodically (refer to SOP 3, "Catch Basin Inspection and Cleaning").
4. Impervious surfaces with engineered storm drain systems shall not discharge directly to a surface water.
5. Floor drains shall be connected to a sanitary sewer or tight tank. Floor drains discharging to adjacent surface water bodies or engineered storm drain systems shall be permanently plugged or otherwise abandoned before any vehicle wash activities are completed.
6. Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. Use of a biodegradable, phosphate-free detergent is preferred.
7. Detergents shall not be used in areas where oil/water separators provide pre-treatment of drainage (refer to SOP 11, "Oil/Water Separator Maintenance", for more information).
8. Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Clean up any spills using the procedures described in SOP 4, "Spill Response and Cleanup Procedures".

Engine Washing and Steam Washing Procedures

Engine and steam washing procedures shall include the following:

1. Do not wash parts outdoors.
2. 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. Clean up any spills using the procedures described in SOP 4, "Spill Response and Cleanup Procedures".
3. Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. Use of a biodegradable, phosphate-free detergent is preferred.
4. Avoid cleaning with solvents except in dedicated solvent parts washer systems. Make use of pressure washing and steam cleaning.
5. Recycle clean solutions and rinse water to the extent practicable.
6. Wash water shall discharge to a tight tank or a sanitary sewer via an oil/water separator. Detergents shall not be used in areas where oil/water separators provide pre-treatment of drainage (refer to SOP 11, "Oil/Water Separator Maintenance", for more information).

Related Standard Operating Procedures

1. SOP 3, Catch Basin Inspection and Cleaning
2. SOP 4, Spill Response and Cleanup Procedures
3. SOP 11, Oil/Water Separator Maintenance

APPENDIX B SPILL REPORTS

Significant Spills, Leaks or Other Releases

SPILL 1

Date of incident:	
Location of incident:	
Description of incident:	
Circumstances leading to release:	
Actions taken in response to release:	
Measures taken to prevent recurrence:	

SPILL 2

Date of incident:	
Location of incident:	
Description of incident:	
Circumstances leading to release:	

Actions taken in response to release:	
Measures taken to prevent recurrence:	

SPILL 3

Date of incident:	
Location of incident:	
Description of incident:	
Circumstances leading to release:	
Actions taken in response to release:	
Measures taken to prevent recurrence:	

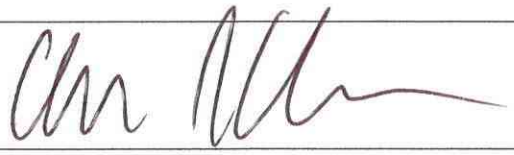
Appendix C Town Employee Training

Town Employee Training Tracking Sheet

Training Date: May 20, 2020 9 AM	
Training Description (including duration and subjects covered): 45 Minute presentation overview of stormwater pollutants and best practices to prevent pollution at Town-owned properties	
Trainer: Julia Miller , Bobrek Engineering & Construction	
Employee(s) trained	**Employee signature (due to COVID 19 all trainings are done online.)**
Charles Dam	
Nate Desrosiers	
Shawn Johnson	

Engineering & Construction
BOBREK

Town Employee Training Tracking Sheet - 2021

Training Date: June 9, 2021 9 AM-10 AM	
Training Description (including duration and subjects covered): 1 hour presentation overview of stormwater pollutants and best practices to prevent pollution at Town-owned properties with a concentration on foam and sheen identification	
Trainer: Julia Miller , Bobrek Engineering & Construction	
Employee(s) trained	**Employee signature**
Charles Dam	
Nate Desrosiers	
Shawn Johnson	

ILLICIT DISCHARGE DETECTION AND ELIMINATION

EMPLOYEE TRAINING RECORD

YEAR 4

Town of Manchester-by-the-Sea, MA

Date of Training: 6/10/2022

Training by: Kayla Repucci, Bobrek Engineering

PLEASE PRINT CLEARLY

Name	Department
Charles Dam	DPW
Nate Desrosiers	DPW
Shawn Johnson	DPW
Matt Bergeron	DPW

ILLICIT DISCHARGE DETECTION AND ELIMINATION

EMPLOYEE TRAINING RECORD

YEAR 5

Town of Manchester-by-the-Sea, MA

Date of Training: 6/12/2023

Training by: Kayla Repucci, Bobrek Engineering

PLEASE PRINT CLEARLY

Name	Department
Charles Dam	DPW
Nate Desrosiers	DPW
Shawn Johnson	DPW

APPENDIX D Stormwater Site Inspection Report

Stormwater Site Inspection Report

General Information			
Facility Name	Manchester DPW Yard		
Date of Inspection	June 10, 2020	**Start/End Time**	10:30 – 11:30
Inspector's Name(s)	John Bobrek, P.E.		
Inspector's Title(s)	President of Bobrek Engineering & Construction		
Inspector's Contact Information	john@gobobrek.com		
Inspector's Qualifications	Professional Engineer		

Weather Information
Weather at time of this inspection? ✓ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snow ❑ High Winds ❑ Other: Temperature: 78 degrees
Have any previously unidentified discharges of pollutants occurred since the last inspection? ❑Yes ✓ **No** **If yes, describe:**
Are there any discharges occurring at the time of inspection? ❑Yes ✓ **No** **If yes, 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	Floor Drains to UST	✓**Yes** ❑ No	❑ Maintenance ❑ Repair ❑ Replacement	

Areas of Materials or Activities exposed to stormwater

	Area/Activity	**Inspected?**	**Controls Adequate (appropriate, effective, and operating)?**	**Corrective Action Needed and Notes**
1	**Material loading/unloading and storage areas**	✓ **Yes** ❑ No ❑ N/A	✓ Yes ❑No	
2	**Equipment operations and maintenance areas**	✓ **Yes** ❑No ❑ N/A	✓Yes ❑No	
3	**Fueling areas**	✓ **Yes** ❑No ❑ N/A	❑Yes ✓ No	All fueling areas should be covered and have bollards or protections from vehicles
4	**Outdoor vehicle and equipment washing areas**	✓ Yes ❑No **N/A**	✓Yes ❑No	

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
5	**Waste handling and disposal areas**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
6	**Erodible areas/construction**	❑Yes ❑No ✓ **N/A**		
7	**Non-stormwater/ illicit connections**	❑Yes ❑No ✓ **N/A**		
8	**Salt storage piles or pile containing salt**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
9	**Dust generation and vehicle tracking**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
10	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
11	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
12	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance observed and not described above:

The site needs more protection of the fueling areas and all fuel barrels must be covered to prevent stormwater runoff. Note that the fueling area on site is not used and will be removed in the future.

Additional Control Measures

Describe any additional control measures or changes to the SWPPP needed to comply with the permit requirements:
Waste Oil storage should be moved outside under a covered roof.

Notes

Use this space for any additional notes or observations from the inspection:

- The site does not have stormwater structures
- Small amounts of impervious sheet flow flows onto pervious surfaces.

Print inspector name and title: John Bobrek, P.E 6/10/20

Stormwater Site Inspection Report

General Information			
Facility Name	Manchester DPW Yard		
Date of Inspection	**April 30, 2021**	**Start/End Time**	10:15
Inspector's Name(s)	John Bobrek, P.E.		
Inspector's Title(s)	President of Bobrek Engineering & Construction		
Inspector's Contact Information	john@gobobrek.com		
Inspector's Qualifications	Professional Engineer		

Weather Information
Weather at time of this inspection? Clear ✓ Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snow ❑ High Winds ❑ Other: Sprinkle Temperature: 60 degrees
Have any previously unidentified discharges of pollutants occurred since the last inspection? ❑Yes ✓ **No** **If yes, describe:**
Are there any discharges occurring at the time of inspection? ❑Yes ✓ **No** **If yes, 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	Floor Drains to UST	✓**Yes** ❑ No	❑ Maintenance ❑ Repair ❑ Replacement	

Areas of Materials or Activities exposed to stormwater

	Area/Activity	**Inspected?**	**Controls Adequate (appropriate, effective, and operating)?**	**Corrective Action Needed and Notes**
1	**Material loading/unloading and storage areas**	✓ **Yes** ❑ No ❑ N/A	✓ Yes ❑No	
2	**Equipment operations and maintenance areas**	✓ **Yes** ❑No ❑ N/A	✓Yes ❑No	
3	**Fueling areas**	✓ **Yes** ❑No ❑ N/A	❑Yes ✓ No	All fueling areas should be covered and have bollards or protections from vehicles. - Protection made w/ concrete blocks

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
4	**Outdoor vehicle and equipment washing areas**	✓ Yes ❑No **N/A**	✓Yes ❑No	Dispose of empty waste oil container. Remove Salt away from oil.
5	**Waste handling and disposal areas**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
6	**Erodible areas/construction**	❑Yes ❑No ✓ **N/A**		
7	**Non-stormwater/ illicit connections**	❑Yes ❑No ✓ **N/A**		
8	**Salt storage piles or pile containing salt**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
9	**Dust generation and vehicle tracking**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
10	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
11	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
12	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance observed and not described above:

Note that the fueling area on site is not used and will be removed in the future.

- Significant water on site behind storage piles & brook that flows perimeter of property behind salt shed.

Additional Control Measures

Describe any additional control measures or changes to the SWPPP needed to comply with the permit requirements:
Waste Oil storage should be moved outside under a covered roof. – Still applies

Notes

Use this space for any additional notes or observations from the inspection:

- The site does not have stormwater structures
- Small amounts of impervious sheet flow flows onto pervious surfaces.

Print inspector name and title: John Bobrek, P.E 4/30/21

Stormwater Site Inspection Report

General Information			
Facility Name	Manchester DPW Yard		
Date of Inspection	**May 26, 2022**	**Start/End Time**	**8:00-8:30**
Inspector's Name(s)	John Bobrek, P.E.		
Inspector's Title(s)	President of Bobrek Engineering & Construction		
Inspector's Contact Information	john@gobobrek.com		
Inspector's Qualifications	Professional Engineer		
Weather Information			
Weather at time of this inspection? Clear ✓ Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snow ❑ High Winds ❑ Other: Sprinkle Temperature: 60 degrees			
Have any previously unidentified discharges of pollutants occurred since the last inspection? ❑Yes ✓ **No** **If yes, describe:**			
Are there any discharges occurring at the time of inspection? ❑Yes ✓ **No** **If yes, 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	Floor Drains to UST	✓**Yes** ❑ No	❑ Maintenance ❑ Repair ❑ Replacement	

Areas of Materials or Activities exposed to stormwater

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
1	**Material loading/unloading and storage areas**	✓ **Yes** ❑ No ❑ N/A	✓ Yes ❑No	
2	**Equipment operations and maintenance areas**	✓ **Yes** ❑No ❑ N/A	✓Yes ❑No	
3	**Fueling areas**	✓ **Yes** ❑No ❑ N/A	✓Yes ❑ No	Fueling areas are covered with protections from vehicles made from concrete blocks.
4	**Outdoor vehicle and equipment washing areas**	✓ Yes ❑No **N/A**	✓Yes ❑No	
5	**Waste handling and disposal areas**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
6	**Erodible areas/construction**	✓ Yes ❑No ❑**N/A**	✓ **Yes** ❑No	Town staff is maintaining swale around salt barn. It has been dug out and needs seeding.
7	**Non-stormwater/ illicit connections**	❑Yes ❑No ✓ **N/A**		
8	**Salt storage piles or pile containing salt**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
9	**Dust generation and vehicle tracking**	✓ **Yes** ❑No ❑ N/A	✓ **Yes** ❑No	
10	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
11	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
12	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance observed and not described above:

- Fueling area on site is not used and will be removed in the future.

- The swale around the storage piles and salt barn has been recently excavated to protect the brook that flows around the perimeter of the property.

Additional Control Measures

Describe any additional control measures or changes to the SWPPP needed to comply with the permit requirements:

Notes

Use this space for any additional notes or observations from the inspection: - The site does not have stormwater structures - Small amounts of impervious sheet flow flows onto pervious surfaces.

Print inspector name and title: John Bobrek, P.E 5/26/2022

1. **Salt Barn**

2. **Shed**

3. **Swale Around Salt Barn**

4. **Waste Oil in Garage**

Stormwater Site Inspection Report

General Information			
Facility Name	Manchester Transfer Station		
Date of Inspection	**6/8/2023**	**Start/End Time**	
Inspector's Name(s)	John Bobrek, P.E.		
Inspector's Title(s)	President of Bobrek Engineering & Construction		
Inspector's Contact Information	john@gobobrek.com		
Inspector's Qualifications	Professional Engineer		

Weather Information
Weather at time of this inspection? Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snow ❑ High Winds ❑ Other: Temperature: degrees
Have any previously unidentified discharges of pollutants occurred since the last inspection? ❑Yes ❑ No **If yes, describe:**
Are there any discharges occurring at the time of inspection? ❑Yes ❑ No **If yes, describe:**

Control Measures

- ***NO CONTROL MEASURES AT TRANSFER STATION -***

	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		❑Yes ❑ No	❑ Maintenance ❑ Repair ❑ Replacement	

Areas of Materials or Activities exposed to stormwater

	Area/Activity	**Inspected?**	**Controls Adequate (appropriate, effective, and operating)?**	**Corrective Action Needed and Notes**
1	**Material loading/unloading and storage areas**	❑ **Yes** ❑ No ❑ N/A	❑ Yes ❑No	
2	**Equipment operations and maintenance areas**	❑Yes ❑No ❑ **N/A**	❑Yes ❑No	
3	**Fueling areas**	❑Yes ❑No ❑ **N/A**	❑Yes ❑No	
4	**Outdoor vehicle and equipment washing areas**	❑Yes ❑No ❑ **N/A**	❑Yes ❑No	
5	**Waste handling and disposal areas**	❑ **Yes** ❑No ❑ N/A	❑ **Yes** ❑No	
6	**Erodible areas/construction**	❑Yes ❑No ❑**N/A**	❑Yes ❑No	

	Area/Activity	Inspected?	Controls Adequate (appropriate, effective, and operating)?	Corrective Action Needed and Notes
7	**Non-stormwater/ illicit connections**	❑Yes ❑No ❑**N/A**	❑Yes ❑No	
8	**Salt storage piles or pile containing salt**	❑Yes ❑No ❑**N/A**	❑Yes ❑No	
9	**Dust generation and vehicle tracking**	❑Yes ❑No ❑**N/A**	❑Yes ❑No	
10	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
11	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	
12	**(Other)**	❑Yes ❑No ❑ N/A	❑Yes ❑No	

Non-Compliance

Additional Control Measures

Notes

Print inspector name and title: John Bobrek, P.E 6/8/2023

1. Battery and Lightbulb Storage Shed

Quarterly Visual Assessment Reports – additional form when stormwater discharge is occurring

Quarterly Visual Assessment Form– additional form when stormwater discharge is occurring

(Complete a separate form for each outfall you assess)

Name of Facility: Transfer Station

Outfall Name: "Substantially Identical Outfall"? ☐ Yes (identify substantially identical outfalls): ☒ No

Person(s)/Title(s) collecting sample: Shawn Johnson, Foreman

Person(s)/Title(s) examining sample: Shawn Johnson, Foreman

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
8/22/22, 12:00 pm	8/22/22, 2:00 pm	8/22/22, 2:10 pm

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).

A. Name: Shawn Johnson

B. Title: DPW Foreman

C. Signature:

D. Date Signed: 8/22/22

Quarterly Visual Assessment Form– additional form when stormwater discharge is occurring

(Complete a separate form for each outfall you assess)

Name of Facility: Transfer Station

Outfall Name: "Substantially Identical Outfall"? ☐ Yes (identify substantially identical outfalls): ☒ No

Person(s)/Title(s) collecting sample: Shawn Johnson, Foreman

Person(s)/Title(s) examining sample: Shawn Johnson, Foreman

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
10/26/22, 9:00 am	10/26/22, 11:00 am	10/26/22, 11:15 am

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).

A. Name: Shawn Johnson

B. Title: DPW Foreman

C. Signature:

D. Date Signed: 10/26/22

Quarterly Visual Assessment Form– additional form when stormwater discharge is occurring

(Complete a separate form for each outfall you assess)

Name of Facility: Transfer Station

Outfall Name: Name "Substantially Identical Outfall"? ☒ Yes (identify substantially identical outfalls): ☐ No

Person(s)/Title(s) collecting sample: Shawn Johnson, Foreman

Person(s)/Title(s) examining sample: Shawn Johnson, Foreman

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
3/14/23, 12:00 am	3/14/23, 12:00 pm	3/14/23, 12:10 am

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).

A. Name: Shawn Johnson

B. Title: DPW Foreman

C. Signature:

D. Date Signed: 3/14/23

Appendix L - Street Design and Parking Guidelines Report & Green Infrastructure Feasibility Report

Municipal Stormwater Codes: A Regional Review for Northeast Massachusetts

MassDEP MS4 Municipal Assistance Grant Report

JUNE 30, 2022

Merrimack Valley Planning Commission

MVPC

Municipal Stormwater Codes: A Regional Review for Northeast Massachusetts

Efforts funded by:
Massachusetts Department of Environmental Protection MS4 Municipal Assistance 2021-2022 Grant Program Award

In partnership with: Greenscapes North Shore Coalition (including Salem Sound Coastwatch LLC & Ipswich River Watershed Association) and the Merrimack Valley Stormwater Collaborative

Serving the Communities of: Amesbury, Andover, Beverly, Boxford, Danvers, Essex, Georgetown, Gloucester, Groveland, Hamilton, Haverhill, Ipswich, Lawrence, Lynnfield, Manchester, Marblehead, Merrimac, Methuen, Middleton, Newbury, Newburyport, North Andover, North Reading, Peabody, Rowley, Salem, Salisbury, Topsfield, Wenham, & West Newbury

Table of Contents

Introduction

The Merrimack Valley Planning Commission (MVPC) is comprised of fifteen cities and towns in northeastern Massachusetts. Created through an act of the State Legislature in 1959, MVPC's mission is to promote the orderly growth and development of the region. As such, through its Environmental Program, MVPC operates under several regional collaboratives and coalitions to ensure regional coordination surrounding environmental efforts. Two of these groups, the Merrimack Valley Stormwater Collaborative and Greenscapes North Shore Coalition, work in partnership with MVPC communities and with other entities to coordinate efforts related to stormwater and MS4 compliance. The Merrimack Valley Stormwater Collaborative, founded by MVPC in 2014, specifically convenes municipal public works departments to discuss and work together on stormwater management and regulatory compliance for communities across the valley. The Greenscapes North Shore Coalition (Greenscapes) comprised of the Merrimack Valley Planning Commission (MVPC), the Ipswich River Watershed Association (IWRA), and Salem Sound Coastwatch LLC (SSC) oversees numerous stormwater-based initiatives in over thirty cities and towns in northern Massachusetts. Founded in 2007, Greenscapes is a collaborative of municipalities and partner organizations, focusing on stormwater and watershed-related issues. Greenscapes provides outreach and education to support municipal compliance with water-related regulatory requirements, including the MS4 Stormwater and the Water Management Act permits. For this project, Greenscapes and the Merrimack Valley Stormwater Collaborative are assisting 30 Northern Massachusetts communities with compliance requirements for the 2016 Massachusetts Small Municipal Separate Storm Sewer System (MS4) Permit issued by the U.S. Environmental Protection Agency (effective July 1, 2018). This permit is intended to regulate activities in MS4 systems in compliance with the Clean Water Act and Massachusetts Clean Water Act. In Year 4 of the permit, permittees are required to meet the following requirements:

> **"**Within four (4) years of the effective date of this permit, the permittee shall develop a report assessing current street design and parking lot guidelines and other local requirements that affect the creation of impervious cover. This assessment shall be used to provide information withto allow the permittee to determine if changes to design standards for streets and parking lots can be made to support low impact design options. If the assessment indicates that changes can be made, the assessment shall include recommendations and proposed schedules to incorporate policies and standards into relevant documents and procedures to minimize impervious cover attributable to parking areas and street designs. The permittee shall implement all recommendations, in accordance with the schedules, contained in the assessment. The local planning board and local transportation board should be involved in this assessment. This assessment shall be part of the SWMP. The permittee shall report in each annual report on the status of this assessment including any planned or completed changes to local regulations and guidelines. Within four (4) years from the effective date of the permit, the permittee shall develop a report assessing existing local regulations to determine the feasibility of making, at a minimum, the following practices allowable when appropriate site conditions exist:
>
> i. Green roofs;
> ii. Infiltration practices such as rain gardens, curb extensions, planter gardens, porous

and pervious pavements, and other designs to manage stormwater using landscaping and structured or augmented soils; and
iii. Water harvesting devices such as rain barrels and cisterns, and the use of stormwater for non-potable uses.

The assessment should indicate if the practices are allowed in the MS4 jurisdiction and under what circumstances are they allowed. If the practices are not allowed, the permittee shall determine what hinders the use of these practices, what changes in local regulations may be made to make them allowable and provide a schedule for implementation of recommendations. The permittee shall implement all recommendations, in accordance with the schedules, contained in the assessment. The permittee shall report in each annual report on its findings and progress towards making the practices allowable (See Section 2.3.6.b and c of the MS4 Permit)"

Working in their capacity as Greenscapes and in collaboration with the Merrimack Valley Stormwater Collaborative, MVPC, IRWA, and SSC worked with 30 communities within the project's scope to review local codes and identify provisions where requirements impact the creation of impervious cover and the use of low impact development (LID)techniques. The following are the communities included within this scope of work as arranged by project partner:

Merrimack Valley Planning Commission

- Amesbury, Andover, Boxford, Georgetown, Groveland, Haverhill, Lawrence, Merrimac, Methuen, Newbury, Newburyport, North Andover, Rowley, Salisbury, West Newbury

Ipswich River Watershed Association

- Essex, Hamilton, Ipswich, Lynnfield, Middleton, North Reading, Topsfield, Wenham

Salem Sound Coastwatch LLC

- Beverly, Danvers, Gloucester, Manchester, Marblehead, Peabody, Salem

The Greenscapes partners reviewed all codes following the Mass Audubon Bylaw Review Tool framework and consolidated findings into community specific reports, as well as overarching regional findings. Greenscapes developed community-specific recommendations based off the optimal bylaw standards outlines in the Mass Audubon Bylaw Review Tool. These recommendations were communicated to each community, who then outlined next steps to implement these recommended changes, in many cases also identifying potential barriers to bylaw revision and working with Greenscapes to devise plans to overcome these challenges.

An additional task completed by MVPC during this project utilized Geographic Information Systems (GIS) and Esri technology to develop a mobile application for conducting construction site inspections more efficiently in the field. The goal of the app is to assist the construction site inspector in ensuring operations match the approved site plans and the Stormwater Pollution Prevention Plan (SWPPP) for the area.

Project Methodology

Liaison and Bylaw Identification

The review process for this project started with the identification of a project liaison for each community who would serve as the main point of contact for duration of the project. This task was completed leveraging Greenscapes' and the Merrimack Valley Stormwater Collaborative's already highly-developed municipal relationships to reach out to community Planners and Departments of Public Works and identify a best point of contact. In some instances, several project liaisons from an individual community were identified and involved throughout the project. Please see Appendix D for a list of identified municipal personal who served as project liaisons.

Following the identification of project liaisons, project partners worked to compile a list of relevant bylaws, ordinances, and regulations to review for each community. Overarchingly, this list consisted of:

- Zoning bylaws/ordinances
- Subdivision Rules and Regulations
- Wetland Bylaws/Ordinances
- Stormwater Bylaws/Ordinances
- Stormwater Rules and Regulations

Depending on where certain requirements resided for each community, the following documents were also reviewed:

- Planning Board Rules and Regulations
- IDDE Bylaws/Ordinances
- Board of Health Regulations

Following preliminary code identification, project partners corresponded with established community liaison(s) for each municipality to confirm the recency and relevancy of the selected codes and inquire about any missing information or documents that could not be located. After liaisons provided necessary information, a comprehensive list of each community's electronically available codes was developed (See appendix E). Please note that some codes did not exist on the internet, and in that instance a copy was received directly from the municipality.

Kickoff meeting

MVPC, with its Greenscapes partners then hosted a kickoff meeting to provide an overview of the project, its methodology, goals, and deliverables. Guest speakers from the Town of Natick and the Cape Cod Commission also presented material to provide municipal and regional insights on the bylaw review process and outcomes. This meeting received attendance from over 70 individual representatives of the participating communities. For a recording of this kickoff meeting please see attachment 1. To view this presentation, please click on the following link: https://experience.arcgis.com/experience/05c0d8f73c9f47b4b113d838f3215ad2

Bylaw Review

Project partners utilized the MassAudubon Bylaw Review Tool to conduct individual bylaw review with the intention of identifying provisions where requirements impact the creation of impervious cover and the use of low impact development techniques. This tool provides a framework to systematically evaluate various components of municipal codes and ranks them on their consistency with recommended best practices. Prior to project partners conducting the bylaw review, this tool was updated by MassAudubon and the Cape Cod Commission to include more language which is relevant to MS4 compliance. The bylaw review tool has five overarching goals: promoting natural resources and open space, promoting efficient compact development patterns, smart designs which reduce overall imperviousness, adopting green infrastructure to manage stormwater, and encouraging efficient parking. Within each goal there are multiple subgoals as well as three levels of implementation status which Greenscapes revised to read: Needs Improvement (coded orange), Improved (coded yellow), and Optimal (coded green).

For each of the goals and subgoals, the matrix has columns to be filled in with the language from each reviewed code. The reviewer then ranks this language according to Mass Audubon's criteria as "Needs Improvement", "Improved", or "Optimal." If a bylaw's contents are not applicable to a certain subgoal, then "not applicable" fills the space. The result is a color-coded matrix arranged by bylaw and subgoal which clearly delineates areas for potential improvement, as well as areas of success. To access Mass Audubon's full bylaw review template, please click the following link: https://www.massaudubon.org/our-conservation-work/policy-advocacy/shaping-climate-resilient-communities/publications-community-resources/bylaw-review.

Community Reports and Liaison Meetings

After the completion of each MassAudubon Bylaw Review matrix, Greenscapes worked to consolidate the matrix's findings into a report which highlighted the successes and areas for improvement within each community's bylaws related to low impact development implementation and impervious surface creation. Specific recommendations for improvement were provided and organized by the five main goals of the MassAudubon Bylaw Review Tool: promoting natural resources and open space, promoting efficient compact development patterns, smart designs which reduce overall imperviousness, adopting green infrastructure to manage stormwater, and encouraging efficient parking. This allowed for easy reference between the completed matrix and associated recommendations for improvement.

Following the completion of draft recommendations, project partners shared each draft report with the community liaison(s) and established a time to meet and review the findings in depth, as well as discuss priority actions and a timeline for implementation. After each community meeting, project partners revised the report as necessary and completed the "Timeline and Implementation Plan" section with priority actions and a general timeline for implementation. The final revisions were shared with community liaisons and approved for compilation into the MS4 Municipal Assistance final report.

As a concluding step, utilizing the completed set of bylaw reviews, project partners compiled best practice model language examples throughout the region and arranged them by Mass Audubon Bylaw Review Matrix goal (Appendix C) for communities to reference while revising codes based upon recommendations.

GIS Application Development

The development of the Constriction Site Inspection Application began without an existing construction site dataset. MVPC first created the baseline point feature layer that would represent the construction sites on a map and included basic identifying information for hypothetical test sites that we created to ensure functionality.

MVPC created a related table to accommodate multiple inspections at a single site. The table was based on the Central Massachusetts Regional Stormwater Collaborative's Standard Operating Procedures for Construction Site Inspections form. MVPC converted the form to Excel and imported it as the framework for our related table then related the locations to the inspections based on a unique ID that will allow for multiple inspections to be conducted at one site. Finally, MVPC published out the data on ArcGIS Online to ensure collaboration with our regional partners would be easy.

After finalizing the data development, MVPC created a web map and mobile app for inspectors using Esri's ArcGIS Online and Field Maps. MVPC utilized internal and external source data through partnerships like MassGIS to develop the web map for the project area. MVPC included relevant planning layers such as FEMA Floodplain layers, NHESP habitat information etc. to provide site context. The app leverages the web map within Field Maps to serve up a helpful map interface as well as the customized inspection form and can be accessed on any smart device to collect site and inspection information as inspections are conducted.

Following completion of mobile application development, MVPC held a virtual training through the Merrimack Valley Stormwater Collaborative to share the app's functionality and gains insights on areas of potential improvement. Please see attachment 2 for a recording of this training. In addition to the training sessions, MVPC also created a stand-alone training video that was shared following liaison meetings. A standard training video was essential as multiple municipalities communicated that they often have consultants conducting these inspections who may not have availability to attend a real-time training session. Please see attachment 3 for this training video.

Key Regional findings

Given the large geographic jurisdiction of this project, regional trends for Northern Massachusetts as they relate to MS4 compliance, LID, and impervious surface creation were able to be identified. The following key regional findings were identified:

1. The majority (24) of project municipalities have some mechanism in place through Open Space Residential Development (OSRD) or similar option, which encourages development designs that permit flexible, compact development and LID features including the preservation of open space, minimization of disturbance, and requirement for green

infrastructure. In Northern Massachusetts this form of development is typically allowed by special permit, and communities had various increments of encouragement, requirement, or optionality surrounding OSRD. Communities which required OSRD to be considered for a given parcel size or lot number and permitted OSRD in several districts were most successful at implementation.

2. Inconsistency regarding design standards/criteria was prevalent throughout all codes and communities. Often, design standards surrounding LID, stormwater management, and natural resource preservation were found within several different codes, and with varying design standards. For example, one code may require native species plantings, while others do not address it or require a counter-active standard. Language is also often shrouded in nuance, with terms like “due regard” and “whenever practicable” used in place of specific measurable design standards. Communities who had consistent and specific design standards were most successful at ensuring their implementation.
3. While almost all communities (29) had a stormwater permit in place, it often was only required for 1 or more acres. Though this is the MS4 permit’s current standard requirement, it may not be successful in encompassing all project types depending on the community’s average parcel size. Communities which lowered this standard to 20,000 square feet or developed a dual permit requirement for small and large parcels were most successful at capturing all projects.
4. While most communities tackled all MS4 requirements within their stormwater ordinance/bylaw or similar code, few communities took extra actions to develop comprehensive and measurable design standards as they relate to LID and erosion and stormwater control. Proactive stormwater control requirements which went above and beyond state legislative requirements were not often found, speaking to the necessity of proactive state requirements in ensuring municipal implementation.
5. While all communities regulated construction activities conducted by outside developers, few communities had similar standard operating procedures for activities conducted by the municipality, such as replacing sidewalks or curbing. Without regulations of this nature, municipalities are able to conduct these activities without considering proactive alternatives which reduce imperviousness and promote LID design standards.

Regional Priority Actions

Given the above regional findings and with MS4 requirements in mind, the following top priority actions were identified. These actions were chosen for either their ease of implementation, contribution to MS4 year 4 compliance, or exceptional ability to reduce stormwater runoff. Given the vast diversity of codes and community type this synthesis includes, several priority actions are listed for each item to accommodate all project members. Please see appendix C for model language for the implementation of these priority actions and appendix B for community specific reports.

1. Communities who do not currently have a functional OSRD or similar development option in place, either because the permitting process is too complex, the district in which the OSRD is permitted is too small, the OSRD is optional and not required to be considered, or OSRD is not permitted at all, should consider the following priority actions:

a. Require OSRD to be considered for parcels over a given size. For rural communities this may be 1-5 acres, while for more urbanized communities a minimum parcel size may not be necessary.
b. Streamline the permit progress for projects utilizing preferred site designs to both encourage LID and reduce time burdens on municipal staff, local boards, and developers.
c. Permit OSRD in several residential districts, or within a region of land which is likely to be developed to ensure its use.
d. Permit OSRD by-right in several applicable districts to encourage developers to choose this design standard as the preferred and easiest for permitting.
e. If OSRD is not always a feasible option, as it is not in some densely populated gateway cities with small parcel sizes and frequent redevelopment rather than new development, develop similar design standards, such as the inclusion of LID and preservation of open space, for other applicable districts or for redevelopment activities.

2. Communities who are not in compliance with the year 4 MS4 permit due to the following should immediately consider revising standards to move into compliance:
    a. Prohibiting illicit discharges.
    b. Requiring a Stormwater Management Operation and Maintenance Plan and Construction Erosion and Sedimentation Plan.
    c. Requiring a stormwater permit for lots over 1 acre or 43,560 square feet in size, or comparable based on individual community minimum lot size by zoning
    d. Requiring stormwater systems be designed to accommodate larger volume storms.
    e. Requiring specific post construction total suspended solids and total phosphorus removal standards.
3. Communities who require a stormwater permit for the standard 1 acre or 43,560 square feet of disturbance may consider revising this requirement to be more proactive in managing stormwater runoff during construction. This is especially applicable for communities who often see lots under 43,560 square feet developed. Depending on size, communities may consider:
    a. Reducing the square footage requirement to a more relevant standard which encompasses more development. Depending on the community, this may be 20,000 square feet, 10,000 square feet, or lower.
    b. Developing new permitting thresholds which include a minor permit for developments between 3,000-20,000 square feet of land disturbance (typical single family home construction), which requires administrative review and approval from a conservation agent, and a major permit for land disturbances over 20,000 square feet (multi-dwelling or large commercial project), which requires a public hearing and approval by the planning board/conservation commission. Minor and major permitting thresholds can also be revised to accommodate the community's average parcel size.
4. Communities who currently have inconsistent design requirements among codes, especially those surrounding LID and stormwater guidelines, should do the following depending on the current siting of their design standards:
    a. For communities which have a stormwater bylaw and regulations, it is recommended that either code's regulations are updated consistently to ensure they are in direct

alignment with the stormwater design standards, or preferably, that the stormwater regulations house all design requirements for LID and stormwater management, and all other design standard sections refer directly to the stormwater regulations for guidance in this realm. This will ensure requirements are consistent and will streamline future updates as they become necessary.

b. For communities without a specific stormwater bylaw and regulations, it is recommended that either all code's design standards are updated consistently to ensure they are in direct alignment with one another, or preferably, that one code is chosen to house stormwater and LID design standards, with other codes referring directly to it as necessary.

Conclusion

Given the vast diversity of municipalities reviewed through this effort, a similar assortment was found in the regulatory requirements surrounding LID implementation and impervious surface creation. Most communities have started taking proactive steps towards LID implementation and impervious surface reductions in some part of their local regulations in a manner that takes into consideration local land use, development activities, geography, and municipal capacity. The recommendations provided in this summary and within the community specific reports are intended to 1) ensure MS4 compliance, 2) present proactive recommendations and best practices for stormwater management, and 3) share out examples of best practices from fellow Northern Massachusetts communities of similar size and capacity.

This work will advance Northern Massachusetts communities towards improved stormwater management and climate resiliency by ensuring regulations are in line with best practices which minimize the alteration of natural green infrastructure, reduce impervious surfaces, and support the use of LID techniques as the preferred method for managing stormwater. Reviewing and revising regulations to encourage or require these best practices is a necessary step in guaranteeing their implementation and protecting Northern Massachusetts from stormwater related threats now and in the future. Moving forward, MVPC and its partnerships through Greenscapes North Shore Coalition and the Merrimack Valley Stormwater Collaborative will continue to work with municipalities to encourage implementation of stormwater management best practices.

Appendix A: Bylaw Review Matrices

Manchester

Factors	Needs Improvement	Improved	Optimal	Zoning Bylaw	Subdivision Regulations	Stormwater Control Bylaw (Draft shared by municipal liason)	Wetlands Protection Bylaw	Misc.
GOAL 1: PROTECT NATURAL RESOURCES AND OPEN SPACE								
Soils managed for revegetation	Not addressed	Limitations on removal from site, and/or requirements for stabilization and revegetation	Prohibit removal of topsoil from site. Require rototilling and other prep of soils compacted during construction	Not Addressed	From Appendix A Roadway Construction Specification Standards 4.0: All areas disturbed by construction and grading operations adjacent to the pavement and sidewalk, within the limits of the Right-of-Way shall be seeded. A minimum of six (6) inches of loam (depth after compaction) shall be applied and the areas shall be seeded with grass seed. Composition of seed mixture must be indicated on the Definitive Landscape Plan. A dense robust vegetated area must be established and maintained until the development is certified as complete by the Board. These areas shall be periodically mowed and watered as required to maintain a neat appearance during construction of houses in the development.	Not Applicable	Not Addressed	From Article XII Section 3 Earth Removal Proceudre: Permit Required - The removal of more than 250 cubic yards of earth from any parcel of land within the Town of Manchester, not in public use, shall, except as hereinafter provided, be allowed only in accordance with a written permit therefor issued by the Planning Board. From Article XII Section 4 General Limitations: In granting a permit hereunder, the Planning Board shall impose reasonable conditions especially designated to safeguard the neighborhood and the Town. These conditions shall be written upon and shall constitute part of the written permit, including, but not limited to:...grading of slopes and replacement of loam over the area of removal; planting of the area to suitable cover, including trees, necessary to restore the area to usable condition..."
Limit clearing, lawn size, require retention or planting of native vegetation/naturalized areas	Not addressed OR General qualitative statement not tied to other design standards	Encourage minimization of clearing/ grubbing	Require minimization of clearing/grubbing with specific standards	From Section 6.16 Topographical Land Changes and Land Clearing Special Permit: It is intended to encourage the conservation of open space, and the general topographical layout of the land, promote less land clearing, grading and excavation especially in rocky, hilly terrain, preserve existing wetlands, recharge areas, rivers, streams, marshes, historic sites, unique geological and botanical areas or features, trails, paths and open-space links, specimen trees, wildlife habitat and contiguous forested areas, and preserve natural vegetative buffer zones abutting neighboring parcels.	From Section 12 Preservation of Natural Vegetation: Every effort shall be made to preserve the existing trees or other rare or unique flora within the R.O.W. and on the lots being created. Cuts and fill for roadway construction shall be done in a manner that preserves natural vegetation whenever possible. Stock-piles of fill shall be located in areas that do not bury existing trees above the natural grade. Machine operators shall exercise due caution during construction and avoid unnecessary damage to root systems or scraping bark from trees to be preserved.	Not Applicable	From Article XVII Section 3 Regulations: The ConCom may establish in its rules and regulations design specifications, performance standards, and other measures and safeguards, including setbacks, no-disturb areas, no-build areas, maintenance of strips of continuous undisturbed vegetative cover, landscaping and other features, and other work limits for protection of Resource Area Buffer Zones [as hereinafter defined]. ...No person shall commence to alter the following areas ("Resource Areas"): 4.1.1 any freshwater or coastal wetland; salt marsh; wet meadow; bog; swamp; vernal pool; spring; bank; reservoir; lake; pond; river or stream; beach; dune; estuary; coastal bank; lands under any water body; land subject to flooding or inundation by groundwater or surface water; land subject to tidal action; coastal storm flowage or flooding; and 4.1.2 lands within 200 feet of any river or perennial stream, brook or creek ("Riverfront Area"). 4.2 Except as permitted by the ConCom pursuant to this By-Law or as otherwise allowed by this By-Law, no person shall commence to alter lands within 100 feet of any: freshwater or coastal wetland; salt marsh; wet meadow; bog; swamp; vernal	
Require native vegetation and trees	Not addressed OR General qualitative statement	Mixture of required plantings of native and nonnative	Require at least 75% native plantings	Not Addressed	Not Addressed	Not Applicable	Not Addressed	
GOAL 2: PROMOTE EFFICIENT, COMPACT DEVELOPMENT PATTERNS AND INFILL								
Lot size	Not addressed OR Required minimum lot sizes	OSRD/NRPZ preferred. Special permit with incentives to utilize	Flexible with OSRD/NRPZ by right, preferred option	From Section 5.4 Minimum Area and Dimensional Requirements: No lot shall be changed as to size or shape so as to result in the violation of the requirements set forth in the table below. See Table in Sec 5.4. From Section 6.7 Special Provision for Open Space Planning: The Planning Board may, subject to this Section 6.7, and after notice and hearing in accordance with the law, grant a Special Permit authorizing exceptions from a lot area and lot frontage requirements specified in Section 5.4. in Single Residence A, C, or E Districts	Not Addressed	Not Applicable	Not Applicable	
Setbacks	Not addressed OR Required minimum front, side, and rear setbacks	Minimize, allow flexibility	Clear standards that minimize and in some instances eliminate setbacks	From Section 5.4 Minimum Area and Dimensional Requirements: No lot shall be changed as to size or shape so as to result in the violation of the requirements set forth in the table below. See Table in Sec 5.4.	Not Addressed	Not Applicable	Not Applicable	
Frontage	Not addressed OR Required minimum frontage for each lot/unit	Minimize especially on curved streets and cul-de-sacs	No minimums in some instances, tied into other standards like OSRD design and shared driveways.	From Section 5.4 Minimum Area and Dimensional Requirements: No lot shall be changed as to size or shape so as to result in the violation of the requirements set forth in the table below. See Table in Sec 5.4.	Not Addressed	Not Applicable	Not Applicable	
Common driveways	Not addressed OR Not allowed, strict limitations	Allow for 2-3 residential units	Allow for up to 4 residential units, preferrably constructed with permeable pavers or pavement	From Section 8.5 Common Driveways: Furthermore, no common driveway shall be accepted as a public road; nor shall the Town under any circumstances be held liable for construction, reconstruction, maintenance, or snow removal on any common driveway, unless by contract duly entered into by the Town and all landowners served by the common driveway. Common driveways shall be built in accordance with the following standards: 1. Minimum driveway width: 16'(18' if over 100' in length) residential use; 24' all other uses. 2. Maximum driveway grade of 10%. 3. Maximum driveway length of 500'. 4. The common driveway, at its intersection with the street, must provide a leveling off area with a slope no greater than 1% for the first 20' and a slope no greater than 5% for the next 30'.	Not Addressed	Not Applicable	Not Applicable	
Limit impervious area – Rural Districts In high density areas, require post-development infiltration to = or > predevelopment	Not addressed (Not usually addressed in zoning and subdivision regs for rural/suburban residential)	<15%	<10%	From Section 5.4 Minimum Area and Dimensional Requirements: Maximum % coverage of lot by structures and impervious surfaces ranges from 25% - 40% From Section 6.15.7.C Stormwater Management Plan, Standards: Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. Loss of annual recharge to groundwater should be minimized through the use of infiltration measures to the maximum extent practicable. The annual recharge from the post-development site should approximate the annual recharge rate from the pre-development or existing site conditions, based on soil types.	From Setion 8.4.1 Design Requirements: There shall be no increase in the peak rate of storm water runoff leaving the site for pre- and post- development.	From Section 6.15.7 Standards (also from MA Stormwater Handbook): 3.Loss of annual recharge to groundwater shall be eliminated or minimized with infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. The annual recharge from the post-development site should approximate the annual recharge rate from the pre-development or existing site conditions based on soil types. 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.	Not Applicable	
GOAL 3: SMART DESIGNS THAT REDUCE OVERALL IMPERVIOUSNESS								

Street location	No standards addressed OR Numeric and geometric standards based primarily on vehicular travel and safety, with basic pedestrian requirements e.g. sidewalks	Flexibility in applying standards, to reduce area of impact, grading, avoid key natural features	OSRD design preferred by-right. Require locating streets to minimize grading and road length, avoid important natural features	Not Applicable	Not Addressed	Not Applicable	Not Applicable	
Road width	No categories addressed OR Major and minor categories, 24-30'	Wide, medium, narrow categories. 22-24' max, plus 2' shoulders	Wide, medium, narrow, and alley categories. 20-24' widest for 2 travel lanes, 18-20' low traffic residential neighborhood, plus 2' shoulders. Allow alleys and other low traffic or secondary emergency access and all shoulders to use alternative, permeable materials.	Not Applicable	From Section 8.3.2 Pavement Widths: 20'-34' with curbing in addition to travelled way width.	Not Applicable	Not Applicable	
Road ROW width	ROW Width not addressed OR 50-75', fully cleared and graded	40-50', some flexibility in extent of clearing	20-50'depending on road type	Not Applicable	From Section 8.3.1 Classification of Streets: Subdivision streets shall be divided into the following classifications for the purpose of establishing the applicable design and construction standards: Arterial Streets shall have a R.O.W. layout width of seventy-five (75) feet. Collector Streets shall have a R.O.W. layout width of sixty (60) feet. Minor Streets shall have a R.O.W. layout width of fifty (50) feet. Second means of access/egress required. Lanes including cul-de-sacs shall have a R.O.W. layout width of forty (40) feet. No second means of access required.	Not Applicable	Not Applicable	
Access Options	Common drives not addressed, No common drives allowed, Dead end allowed with limit on length and # of units	Allow dead end with limit on length and # of units. Allow common drives up to 2-3 units	Allow one way loop streets. Allow common drives up to 4 units, and alleys and rear-loading garages where suitable.	Not Applicable	Not Addressed	Not Applicable	Not Applicable	
Dead Ends/Cul-de-sacs	No standards addressed OR 120 ft or more minimum turnaround	Minimize end radii – 35 ft	Allow hammerhead turnaround	Not Applicable	From Section 8.3.7 Cul-De-Sacs: A circular turnaround having an outside roadway diameter of at least one hundred (100) feet, and a property line diameter of at least one hundred and twenty (120) feet unless otherwise specified by the Board. The Board may, at its option, allow an outside roadway diameter of up to two hundred (200) feet with the placement of a circular landscaped island with a minimum radius of twenty (20) feet a the center of the turnaround, if the dead-end street is not intended to connect with another street at some future point in time... Modified turnarounds such as hammerhead turnarounds may not be used.	Not Applicable	Not Applicable	
Cul-de-sacs	No standards addressed OR Full pavement standard	Encourage center landscaping with bioretention	Require center landscaping with bioretention	Not Applicable	From Section 8.3.7 Cul-De-Sacs: The unpaved area of all cul-de-sac turnarounds must be landscaped with low maintenance trees and shrubbery.	Not Applicable	Not Applicable	
Curbing	No standards addressed OR Curbing required full length both sides of road	Allow curb breaks or curb flush with pavement to enable water to flow to vegetated LID features	Open drainage with roadside swales and no curbs preferred	From Section 6.2.7 Driveway/Curb Cuts: No person shall construct a driveway or entrance from the traveled portion or from the curb of any street or way open to public use in the Town of Manchester-by-the-Sea for the purpose of passing to or from abutting property nor cut any curbing for any purpose without applying for and receiving a permit from the Planning Board, under such conditions and restrictions as the Board shall determine to be necessary to protect public safety, to prevent erosion and sedimentation, to assure proper drainage and for related purposes.	From Appendix A Roadway Construction Specification Standards 3.1: Curb or berm shall be placed along both shoulders of traveled ways.... Curbing shall be omitted along roadways segments or along entire roadways to allow stormwater runoff to flow into dry swales.	Not Applicable	Not Applicable	
Roadside Swales	Not addressed OR Allowed as an option	Preferred over closed drainage	Preferred, with criteria for proper design. Adoption of technical specifications and design templates for green infrastructure recommended	Not Applicable	Not allowed. From Section 8.4.1 Design Requirements: Swales - Wherever practical, except alongside roadways, stormwater shall be channeled via open swales to facilitate the removal of contaminants.	Not Applicable	Not Applicable	
Utilities	Off sets required contributing to wide road ROWs	Not specified - flexible	Allow under road, sidewalks or immediately adjacent to roads to enable placement of roadside swales.	Not Applicable	From Section 8.3.3 Cross Section: Except by approval of the Board, all wires for electricity, cable television, telephones or similar utility distribution systems shall be installed in conduit underground with all such distribution systems spaced not less than thirty six (36) inches (horizontally) from any water main, detector tape should be placed above the conduits.	Not Applicable	Not Applicable	
Sidewalks	Material not addressed OR Concrete or bituminous required	Some flexibility in material and design	Prefer permeable pavement or permeable pavers	Not Applicable	From Appendix A Roadway Construction Specification Standards 2.1 Location, section and dimensions of concrete sidewalks shall be as shown in Figure 2. Sidewalks shall be at least six (6) inches higher than the adjacent roadway and at least 4'-6" wide. Sidewalks shall be constructed of four (4) inches of cement concrete on a minimum eight (8) inch gravel borrow sub-base conforming to the requirements of Section 701 of the Standard Specifications.	Not Applicable	Not Applicable	
Sidewalk location	Required both sides of road	Allow on only 1 side of road especially in low density neighborhoods	Prefer siting with land contours and for best pedestrian utility (e.g. connect with common areas and shared open spaces) – not necessarily immediately parallel to road.	Not Applicable	Not Addressed	Not Applicable	Not Applicable	
Sidewalk drainage	Draining to road, closed drainage system required	Not addressed	Disconnect drainage from road system – e.g.adjacent green strips or within vegetated areas that can absorb sheet flow	Not Applicable	From Section 8.4.1 Design Requirements: Swales - Wherever practical, except alongside roadways, stormwater shall be channeled via open swales to facilitate the removal of contaminants.	Not Applicable	Not Applicable	
GOAL 4: ADOPT GREEN INFRASTRUCTURE STORMWATER MANAGEMENT PROVISIONS								
Rooftop runoff	Not addressed OR Prohibit directing clean roof runoff into closed municipal drainage systems.	Allow clean roof runoff to be directed to landscaped or naturally vegetated areas capable of absorbing without erosion, or infiltration	Require directing clean roof runoff to landscaped or naturally vegetated areas capable of absorbing, or infiltration	Not Addressed	Not Applicable	Not Applicable	Not Applicable	

Overall stormwater design; piping and surficial retention vs. LID	Conventional stormwater system design standards		LID design standard. Allow surficial ponding of retained runoff for up to 72 hours and credit for green roofs towards stormwater requirements	Not Addressed	From Section 8.4 Stormwater - Drainage: Design - Storm water drainage systems shall implement "Best Management Practices" and conform to the guidelines described in the Performance Standards and Guidelines for Storm Water Management in Massachusetts published by the Massachusetts Department of Environmental Protection. Under certain circumstances, the Planning Board may also consider, after demonstration by a registered engineer, other designs and practices common to Low Impact Development (LID) to mitigate the effects of storm water runoff when reviewing storm water drainage systems.	Not Applicable	Not Applicable	
Site Plan Requirements	LID not addressed	Encourage use of LID features in site design	Count bioretention and other vegetated LID features toward site landscaping/open space requirements.	From Section 6.5.4 Site Plan Review, Application Requirements LID Not Addressed	LID Not Addressed	Not Applicable	Not Applicable	
Allow easy siting of LID features (bioretention, swales, etc.)	Not addressed OR Require waivers from subdivision standards	Encouraged along road ROW	Allowed on lots, common open space, or road ROW, easement recorded. For commercial development, allow an increase in floor area ratio or other developmental incentives for green roofs	Not Addressed	Bioretention and Swales are addressed, but not preferred.	Not Applicable	Not Applicable	
Permeable paving	Not addressed OR Require waivers from subdivision standards	Allowed on private residential lots for parking, patios, etc.	Allowed for residential drives, parking stalls, spillover parking spaces, emergency access ways (with proper engineering support for emergency vehicles) Two track design allowed for driveways and secondary emergency access ways (where required).	Not Addressed	Not Addressed	Not Applicable	Not Applicable	
Stormwater management O&M plan	Typically only addressed if municipality has a stormwater or LID bylaw, or for areas subject to wetlands permitting	Required	Required, surficial bioretention and swales preferred. Closed/underground systems requiring specialized inspection and clean out discouraged.	From Section 6.15.8 Stormwater Management, Operation and Maintenance Plans: An Operation and Maintenance Plan (O&M Plan) is required at the time of application for all projects. The O&M Plan shall be designed to ensure that compliance with the Permit, this By-Law and the Massachusetts Surface Water Quality Standards, 314 CMR 4.00 are met in all seasons and throughout the life of the system. The Planning Board shall make the final decision of what maintenance option is appropriate in a given situation. The Planning Board will consider natural features, proximity of site to water bodies and wetlands, extent of impervious surfaces, size of the site, the types of stormwater management structures, and potential need for ongoing maintenance activities when making this decision. The O&M Plan shall remain on file with the Planning Board and shall be an ongoing requirement. The O&M Plan shall include: *see text for more details.*	From Section 8.4.1 Design Requirements: An Operation and Maintenance Plan shall be submitted to set up the functional, financial and organizational mechanisms for the ongoing operation and maintenance of the stormwater management system, based on Section 6.15.8 of the Zoning By-Law of Manchester-by-the-Sea.	From Section 6.15.7 Stormwater Management Plan: A.The Stormwater Management Plan shall contain sufficient information for the Planning Board to evaluate the environmental impact, effectiveness, and acceptability of the measures proposed by the applicant for reducing adverse impacts from stormwater. The Plan shall be designed to meet the Massachusetts Stormwater Management Standards as set forth in Part 8 of this section and DEP Stormwater Management Handbook Volumes I and II. The Stormwater Management Plan shall fully describe the project in drawings, and narrative. *See text for more detail and plan contents.* FRom 6.15.7 Standards (also from MA Stormwater Handbook): 9.All stormwater management systems must have a long term Operation and Maintenance Plan to ensure that systems function as designed.	Not Applicable	
Construction Erosion and Sedimentation Plan required	Basic general requirements	Required, contents specified	Goes beyond minimum NPDES requirements, requires minimization of site disturbance	Not Addressed	From Section 6.11 Erosion and Sediment Control Plan: In order to reduce erosion occurring from the construction of roadways, utilities, drainage structures and regrading of house lots, and to prevent siltation/ sedimentation of water bodies, water courses and wetlands resource areas, the Board shall require the submission of an Erosion/ Sediment control plan. This plan shall explain in detail the specific mitigating measures that will be implemented by the developer, and any subsequent lot owners, both for short term and long term construction of the subdivision, including house lots. *See text for contents required.*	From Section 6.15.7 Standards (also from MA Stomrwater Handbook): 8.A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.	Not Applicable	
GOAL 5: ENCOURAGE EFFICIENT PARKING								
Parking	Specific minimums set based on projected maximum use times	Encourage minimum # needed to serve routine use (e.g. 2/residential unit with any additional/visitors parking behind in driveway or on street.	Establish Maximum Parking spaces allowed. Do not require more than 2/residence. Allow tenants separate, optional lease agreements for parking.	From Section 6.2 Off-Street Parking and Driveway/Curb Cut Regulations: The following shall apply to all premises in all districts: 6.2.1 Performance Requirement: Off-street parking must be provided to service the net increase in parking demand created by new construction, additions or change of use. 6.2.2 Number of Spaces: The standards below must be met without counting any existing parking necessary for existing activities to meet these requirements. Off-street parking spaces shall be designed with minimum dimensions of 9 feet by 20 feet.	Not Applicable	Not Applicable	Not Applicable	
Commercial Parking	Specific minimums set based on projected maximum use times adding all on-site uses together.	Some flexibility to reduce minimums based on street or other available nearby parking or transit.	Allowed shared parking for uses with different peak demand times. Provide model agreements/deed restrictions. Reduce parking requirements near transit. Limit parking stall size (9ftx18ft max), with up to 30% smaller for compact cars	From Section 6.2 Off-Street Parking and Driveway/Curb Cut Regulations: The following shall apply to all premises in all districts: 6.2.1 Performance Requirement: Off-street parking must be provided to service the net increase in parking demand created by new construction, additions or change of use. 6.2.2 Number of Spaces: The standards below must be met without counting any existing parking necessary for existing activities to meet these requirements. Off-street parking spaces shall be designed with minimum dimensions of 9 feet by 20 feet.	Not Applicable	Not Applicable	Not Applicable	
LID in Parking Areas	LID not addressed OR Require waivers e.g. for planting islands to drain down rather than built up surrounded by curbs	Allow LID/bioretention within parking areas.	Require landscaping within parking areas, as LID/bioretention, at a minimum of 10% of the interior area landscaped and a minimum of 25 square feet for island planting areas.	From Sec 6.2.6 Parking Lot Plantings: Parking lots containing (5) or more parking spaces shall have at least one (1) tree per five (5) parking spaces, such trees to be located either within the lot or within (5') feet of it. Such trees shall be at least two (2") inches trunk diameter, with not less than forty (40) square feet of unpaved soil or other permeable surface area per tree. At least five (5%) percent of the interior of any parking lot having twenty (20) or more spaces shall be maintained with landscaping, including trees, in plots of at least four (4') feet in width. Trees in soil plots shall be so located as to provide visual relief and sun and wind interruption within the parking area and to assure safe patterns of internal circulation.	Not Applicable	Not Applicable	Not Applicable	

Appendix B: Community Reports

Bylaw and Regulation Review for the Town of Manchester-by-the-Sea

Overview

To ensure Manchester's compliance with year 4 MS4 permit requirements 2.3.6b: report assessing current street design and parking lot guidelines and other local requirements that affect creation of impervious surface and 2.3.6c: report assessing existing local regulations to determine the feasibility of making low impact development, infiltration practices, and water harvesting devices allowable, the following bylaws were reviewed:

- Zoning Bylaw
- Subdivision Regulations
- Stormwater Control Bylaw (current draft)
- Wetlands Protection Bylaw (current draft)
- Miscellaneous General Bylaws

During the bylaw review process, Greenscapes found that the strongest sections of Manchester's Zoning Bylaw and Subdivision Regulations, were the sections that directly referenced the MA Stormwater Handbook. Most of Greenscapes' recommendations are related to incorporating more language from the handbook into the municipal regulations and making LID the standard stormwater development practice, instead of a "allowable option" for stormwater control.

Recommendations

Goal 1: Protect Natural Resources and Open Space

To achieve the goal of protecting natural resources and open space, Manchester's regulations require special permits for soil removal over 250 cubic yards, or for any permanent change in topography, according to Article XII of the **General Bylaws** and Section 6.16 of the **Zoning Bylaw.** These permits, when enforced by the Building Inspector would effectively conserve open space and preserve natural spaces. These regulations could be more stringent and could be improved by referencing specific standards for restabilization of disturbed soil/vegetation and by requiring native plantings in revegetation efforts.

Goal 2: Promote Efficient, Compact Development Patterns and Infill

The **Zoning Bylaw** currently contains the best language when it comes to promoting efficient compact devlopment. Though the allowable range of impervious surface coverage could be lowered to 10-15% (instead of the 25-40% as is currently allowed in Section 5.4 Minimum Area and Dimensional Requirements), the bylaw clearly states that "*Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. Loss of annual recharge to groundwater should be minimized through the use of infiltration measures to the maximum extent practicable. The annual recharge from the post-development site should approximate the annual recharge rate from the pre-development or existing site conditions, based on soil types"*. The **Subdivision Regulations** and **Stormwater Control Bylaw** contain similar language, pulled directly from the MA Stormwater Handbook.

This goal could be better achieved if regulations allowed for common drives, by right, for up to 4 residential units. The **Zoning Bylaw** currently reads "*Furthermore, no common driveway shall be accepted as a public road; nor shall the Town under any circumstances be held liable for construction, reconstruction, maintenance, or snow removal on any common driveway, unless by contract duly entered into by the Town and all landowners served by the common driveway. Common driveways shall be built in accordance with the following standards: 1. Minimum driveway width: 16'(18' if over 100' in length) residential use; 24' all other uses. 2. Maximum driveway grade of 10%. 3. Maximum driveway length of 500'. 4. The common driveway, at its intersection with the street, must provide a leveling off area with a slope no greater than 1% for the first 20' and a slope no greater than 5% for the next 30'",* without specifying the allowable usage/access for a common drive. More flexible allowances could be added immediately before or after this statement in Section 8.4 Common Driveways, in the **Zoning Bylaw** and similar language should be included or referenced in the **Subdivision Regulations.**

Greenscapes also recommends improving the flexibility of dimensional requirements for all lots. A special permit is currently required for any deviation from the dimensional requirements listed in Section 5.4 of the **Zoning Bylaw.** If the required dimensions were minimized, there would be less of a need for special permits to promote more compact development.

Goal 3: Smart Designs that Reduce Overall Imperviousness

The **Subdivision Regulations** are the only document that in any way regulates impervious surface creation in the town of Manchester. There are some highlights, such as the allowance for curb cuts, described in Appendix A Roadway Construction Specification Standards "*to allow stormwater runoff to flow into dry swales*" and the requirement for cul-de-sac centers "*to be landscaped with low maintenance trees and shrubbery".* However, later in the regulations, swales are prohibited thus negating their reference in the recommendation for curb cuts. Greenscapes recommends rectifying this disparity and allowing for swales, or grassed channels along roadways, built to standards described in Volume 2 Chapter 2 of the MA Stormwater Handbook. Greenscapes would also recommend encouraging the use of bioretention practices in the landscaped center of cul-de-sacs.

Also, in regards to cul-de-sacs and dead end streets, Greenscapes strongly recommends reducing the required roadway diameter from it's current 100'-120' to 70-'80' and make hammerhead turnarounds allowable. Road and ROW widths should also be reduced, thus minimizing impervious surface creation and resultant stormwater runoff.

Goal 4: Adopt Green Infrastructure Stormwater Management Provisions

Once again, there are some highlights in the **Zoning Bylaw** and **Subdivision Regulations** that clearly encourage the use of low-impact-development practices. It is clear that standards and related language were pulled directly from the MA Stormwater Handbook, which is an excellent resource for LID guidance.

From the **Subdivision Regulations** Section 8.4 Stormwater – Drainage: *"Storm water drainage systems shall implement "Best Management Practices" and conform to the guidelines described in the Performance Standards and Guidelines for Storm Water Management in Massachusetts published by the Massachusetts Department of Environmental Protection. Under certain circumstances, the Planning Board may also consider, after demonstration by a registered engineer, other designs and practices common to Low Impact Development (LID) to mitigate the effects of storm water runoff when reviewing*

storm water drainage systems". Here, Greenscapes would recommend prioritizing this type of stormwater management technique, instead of "only under certain circumstances". Bioretention techniques and swales are mentioned in the **Subdivision Regualtions** but are not preferred. Wherever possible, Greenscapes recommends making LID practices the development standard, instead of an allowable option.

LID and Green Infrastructure techniques could be made more accessible if they were more thoroughly described within the **Zoning Bylaw** and **Subdivision Regulations.** The descriptions could be specific references to Volume 2 Chapter 2 of the handbook, or even standards and illustrations directly in the text of the bylaw.

Goal 5: Encourage Efficient Parking

The **Zoning Bylaw** is the only regulating document that discusses parking space dimensions and requirements. Unfortunately, shared parking agreements are not discussed anywhere in the bylaw, which maximizes parking areas and impervious coverage throughout the town. Greenscapes recommends reducing required parking and establishing maximum number of spaces, depending on peak use times and other nearby shared parking opportunities.

Landscaping requirements within parking areas are breifly discussed in Section 6.2.6 of the **Zoning Bylaw** but Greenscapes would recommend encouraging more sustainable landscaping techniques such as rain gardens and bioretention within the parking areas at a minimum of 10% of the parking area (instead of the 5% area of vegetation/trees currently required).

Implementation Plan

A detailed implementation plan will be discussed and developed with input from the municipal liasons on July 1st, 2022. As noted, the Stormwater Control Bylaw and other sections of the General Bylaw are currently under review, making this the perfect time for input from the Greenscapes team.

Appendix C: Model Language for Implementation

Model Language for Implementation

Conversations with community liaisons revealed that many of them were interested in model language for implementing the recommended changes to their bylaws and regulations. Many cited a lack of resources as one of the primary barriers to implementing the recommendations that arose from this analysis. Therefore, Greenscapes created this list of examples of "optimal" bylaws and regulations within this study area for each of the five goals within the bylaw review tool. It is our hope that these references will serve as tools for communities looking to improve their bylaws and act as a means of knowledge-sharing across the North Shore region.

Goal 1. Protect Natural Resources and Open Space

- Haverhill offers a good example of zoning regulations which require that soils be managed for revegetation, limit clearing, and require the use of native species for revegetation. These standards can be found within the town's Zoning Ordinance. (https://ecode360.com/6262973)
- Newburyport offers an excellent example of bylaws which protect natural resources and open space. They have examples of language limiting the removal of topsoil, limiting clearing, and requiring native trees and vegetation across their zoning ordinance, subdivision rules and regulations, wetland ordinance, and stormwater ordinance and rules and regulations. (https://library.municode.com/ma/newburyport/codes/code_of_ordinances?nodeId=APXAZOORNE)
- Amesbury's zoning ordinance and subdivision regulations are very successful at incorporating language which protects natural resources and open space, including prohibiting the removal of earth materials, requiring permanent stabilization, and requiring the reduction of practices like cut and fill and disturbance of existing vegetation. (https://www.amesburyma.gov/DocumentCenter/View/2402/Amesbury-Zoning-Ordinance-PDF , https://www.amesburyma.gov/DocumentCenter/View/1453/Subdivision-Rules-and-Regulations-PDF?bidId=)

Goal 2. Promote Efficient, Compact Development Patterns and Infill

- Newbury offers a good example of a zoning bylaw which promotes efficient, compact development patterns, generally offering flexibility in lot size, setbacks, and frontage requirements. This example can be found within Newbury's Zoning Bylaw. (https://ecode360.com/15569988)
- Georgetown's minor and major permitting categories for the stormwater permit encapsulate all development over 3,000 square feet within the community and ensures proper erosion control standards and LID techniques are utilized. Further, Georgetown's OSRD option is highly successful at permitting flexible development. (https://ecode360.com/6484618)
- Newburyport's OSRD option is successful at permitting flexible development by requiring that OSRD be considered for parcels of land over 3 acres and providing specific design standards as they relate to natural resources, open space, and the like (https://library.municode.com/ma/newburyport/codes/code_of_ordinances?nodeId=APXAZOORNE)

- Rowley's zoning bylaw is successful at permitting flexible development both through their OSRD option, but also through encouraging flexible standards as they relate to lot size, setbacks, and frontage in development situations outside of OSRD (https://www.townofrowley.net/sites/g/files/vyhlif4956/f/uploads/zbl_all_updated_to_atm-stm_june_22-2020_1.pdf)

Goal 3. Smart Designs that Reduce Overall Imperviousness

- Gloucester offers a good example of subdivision regulations which offer optimal standards for street construction to limit impervious areas. The specifications for street construction can be found in sections 3, 4, and 6 of the subdivision rules and regulations.
- Boxford's Subdivision Regulations are successful at permitting LID techniques through their flexibility with curbing, open drainage, and sidewalk location, as well as requiring naturally vegetated cul-de-sacs (https://ecode360.com/10134935)
- Groveland's Subdivision Regulations successfully permit meandering roads which appropriately conform to topography, traffic islands with natural landscaped plantings, and sidewalk requirement reductions. (https://ecode360.com/35392357)
- Newburyport's subdivision regulations permit several activities which reduce overall imperviousness, including requiring peak flows and runoff to be the same before and after development, requiring streets be designed to conform to original topography, and having progressive road and right of way width requirements (https://www.cityofnewburyport.com/sites/g/files/vyhlif7106/f/uploads/subdivision_rules_and_regulations_adopted.pdf)

Goal 4. Adopt Green Infrastructure Stormwater Management Provisions

- Essex provides a good example of subdivision rules and regulations which require the use of green infrastructure practices for stormwater management, found in Section 7.3 in the "Rules and Regulations Relative to Subdivision Control." (https://www.essexma.org/planning-board/files/subdivision-control-rules-regulations) Of particular note is their stated preferences for open drainage which utilizes infiltration over piped conveyance.
- North Reading provides a good example of storm water management rules and regulations that enourage or mandate the use of green infrastructure, which they refer to as "Nonstructural Storm Water Management Strategies," found in the Stormwater Management Rules and Regulations, Appendix C: Stormwater Management Plan. (https://www.northreadingma.gov/sites/g/files/vyhlif3591/f/uploads/stormwater_appendices.pdf)
- Ipswich provides a good example of subdivision rules and regulations which require rainwater harvesting of rooftop runoff, found in Subdivision Rules and Regulations, Section 6.14.12 Roof Runoff. (https://ipswichma.gov/DocumentCenter/View/1014/Subdivision-Rules--Regulations)
- Methuen offers a good example of rules and regulations that promote the adoption of green infrastructure for stormwater management. The regulations do a particularly

good job of highlighting specific LID techniques that can be used. This example can be found in Methuen's Stormwater Ordinance and Rules and Regulations. (https://ecode360.com/attachment/ME3892/ME3892-S.pdf)

- Danvers' zoning regulations specific to development in Character Based Zoning Districts (which includes their entire downtown area and surrounding neighborhoods) do an excellent job providing necessary resources and descriptive standards for incorporating Low-Impact-Development techniques. Though rather lengthy, the text even describes the positive environmental impact these developments can have and justifies their prioritization. Specifically see Section 7.6.4, Stormwater Management Best Practices within the Zoning Regulations (https://www.danversma.gov/zoning-regulations/).

Goal 5. Encourage efficient Parking:

- Ipswich has an excellent example of language to allow properties to make joint use of parking spaces. This example can be found in Chapter VII of Ipswich's Zoning Bylaw, under the Subsection E. "Joint Use of Parking Areas." (https://www.ipswichma.gov/DocumentCenter/View/1015/Zoning-Bylaw)
- Ipswich also provides an example of low-impact development requirements within parking areas, located in Chapter VII of Ipswich's Zoning Bylaw, under subsection P "JSurface Draining and Curbing." (https://www.ipswichma.gov/DocumentCenter/View/1015/Zoning-Bylaw)
- Amesbury offers a good example of parking regulations which require the use of landscaping within parking areas as LID/bioretention features. These standards can be found within the community's zoning and site plan review. (https://www.amesburyma.gov/DocumentCenter/View/2402/Amesbury-Zoning-Ordinance-PDF)
- Groveland offers a good example of parking regulations which require the use of landscaping within parking areas as LID/bioretention features. These standards can be found within the town's Zoning Bylaw. (https://ecode360.com/35391189)

Other model language Resources

Coastal Stormwater Management Through Green Infrastructure: A Handbook for Municipalities: https://www.mass.gov/doc/coastal-stormwater-management-through-green-infrastructure-a-handbook-for-municipalities/download

Massachusetts Smart Growth / Smart Energy Toolkit: http://www.mass.gov/envir/smart_growth_toolkit/pages/mod-lid.html

Massachusetts Stormwater Handbook: http://www.mass.gov/eea/agencies/massdep/water/regulations/massachusetts-stormwater-handbook.html

Massachusetts Watershed Coalition, Community Guide to Growing Greener: http://commonwaters.org/resources/community-guide-to-growing-greener

Metropolitan Area Planning Council (MAPC) Low Impact Development Toolkit, Local Codes Checklist http://www.mapc.org/resources/low-impact-dev-toolkit/local-codes-lid

U.S. Environmental Protection Agency (EPA) Water Quality Scorecard: http://www2.epa.gov/smartgrowth/water-quality-scorecard-incorporating-green-infrastructure-practices-municipal

American Planning Association - Massachusetts Chapter, and the Home Builders Association of Massachusetts, Sustainable Neighborhood Road Design: A Guidebook for Massachusetts Cities and Towns http://www.apa-ma.org/apa-ma_documents/Publications/NRB_Guidebook_2011.pdf

City of Springfield, Green Infrastructure Technical Guidelines https://www.springfield-ma.gov/dpw/fileadmin/forms/Engineering/Green_InfrastructureTechnical_Guidlines_v2.pdf

Appendix D: Community Liaison List

Municipality	Contact Name(s)	Contact email(s)
Amesbury	Rob Desmarais	rob@amesburyma.gov
Andover	Jacki Byerley	jacki.byerley@andoverma.us
Boxford	Ross Povenmire, Chris Olbrot	rpovenmire@town.boxford.ma.us colbrot@town.boxford.ma.us
Georgetown	Peter Durkee	Peter Durkee pdurkee@georgetownma.gov
Groveland	Annie Schindler	aschindler@grovelandma.com
Haverhill	Jesse Middleton	jamiddleton@haverhillwater.com
Lawrence	Daniel McCarthy, Milagros Puello	mpuello@cityoflawrence.com dmccarthy@cityoflawrence.com
Merrimac	Alyssa Sexton	asexton@townofmerrimac.com
Methuen	Kathleen Caldwell, Joe Giarusso	kbcolwell@ci.methuen.ma.us JGiarrusso@ci.methuen.ma.us
Newbury	Martha Taylor, Sam Holt	planningboard@townofnewbury.org conscom@townofnewbury.org
Newburyport	Nick federico	nfederico@cityofnewburyport.com
North Andover	Amy Maxner, Andrew Shapiro	amaxner@northandoverma.gov ashapiro@northandoverma.gov
Rowley	Brent Baeslack	brent@townofrowley.org
Salisbury	Lisa Pearson	lpearson@salisburyma.gov
West Newbury	Leah Zambernardi, Wayne Amaral	lzambernardi@wnewbury.org dpwdirector@wnewbury.org
Hamilton	Patrick Reffett	preffett@hamiltonma.gov
Ipswich	Ethan Parsons	ethanp@ipswichma.gov
Middleton	Katrina O'Leary	katrina.oleary@middletonma.gov
North Reading	Danielle McKnight	dmcknight@northreadingma.gov
Topsfield	Heidi Gaffney	hgaffney@topsfield-ma.gov
Wenham	Kate Mallory	KMallory@wenhamma.gov
Lynnfield	Emilie Cademartori	ecademartori@town.lynnfield.ma.us
Essex	Brendhan Zubricki	bzubricki@essexma.org
Salem	Kate Kennedy, Amanda Chiancola, Deb Duhamel, Rebecca Dupont-Coutu	kkennedy@salem.com, achiancola@salem.com, dduhamel@salem.com, rjd@engineeringcorporation.com
Marblehead	Maggie Wheeler, Becky Curran	wheelerm@marblehead.org, rebeccac@marblehead.org
Beverly	Jenna Pirrotta, Eric Barber	jpirrotta@beverlyma.gov ebarber@beverlyma.gov
Peabody	Bill Stansfield, Lucia Del Negro, Andrew Levin	william.stansfield@peabody-ma.gov lucia.delnegro@peabody-ma.gov andrew.levin@peabody-ma.gov
Danvers	Stephen King, Sharon Clement, David Fields	sking@danversma.gov sclement@danversma.gov
Manchester	Chuck Dam, Sue Brown	damc@manchester.ma.us browns@manchester.ma.us
Gloucester	Michael Hale, Ryan Marques, Rebecca Dupont-Coutu	mhale@gloucester-ma.gov / rlopiccolo@gloucester-ma.gov rmarques@gloucester-ma.gov rjd@engineeringcorporation.com

Appendix E: List of Bylaws Reviewed

Community	Zoning		Stormwater Management		Wetland Protection		Subdivison		Other	
	Date last updated	Link	Date last updated	Link	Date last updated	Link	Date last updated	Link	Date last updated	Link
Amesbury	1/1/21	https://www.amesburyma.gov/DocumentCenter/View/2402/Amesbury-Zoning-Ordinance-PDF	8/11/20	https://ecode360.com/37175441	7/8/08	https://ecode360.com/13329110		https://www.amesburyma.gov/DocumentCenter/View/1453/Subdivision-Rules-and-Regulations-PDF?bidId=		
Andover	6/5/21	https://ecode360.com/15582155	4/20/2008, (new draft provided by municipality)	https://ecode360.com/15621021	4/28/10	https://ecode360.com/15620958		https://ecode360.com/15580713		https://ecode360.com/15617386
Boxford	5/12/09	https://ecode360.com/10134059	5/9/06	https://ecode360.com/10133701	9/12/20	https://ecode360.com/10133948	11/17/04	subdivision bylaw: https://ecode360.com/10134935		https://ecode360.com/10134278
Georgetown	6/21/21	https://ecode360.com/6484938	5/2/2016 (new draft provided by municipality)	https://ecode360.com/6484618	10/17/05	https://ecode360.com/6484873		provided by municipality		https://ecode360.com/6485427
Groveland	6/22/20	https://ecode360.com/35391189	6/22/20	https://ecode360.com/35390917	5/24/21	https://ecode360.com/36994673		https://ecode360.com/35392357		https://ecode360.com/35392022
Haverhill	10/11/20	https://ecode360.com/6262973	6/26/18	https://ecode360.com/6261944	7/23/96	https://ecode360.com/6262809		https://www.cityofhaverhill.com/departments/economic_development_and_planning/subdivision_of_land.php#revize_document_center_rz47		
Lawrence	8/15/11	https://www.cityoflawrence.com/DocumentCenter/View/1720/Zoning-Ordinances-PDF	3/17/2015 (new draft provided by municipality)	https://library.municode.com/ma/lawrence/codes/code_of_ordinances?nodeId=TIT20STMA	11/15/05	https://library.municode.com/ma/lawrence/codes/code_of_ordinances?nodeId=TIT18ENPRCO		https://library.municode.com/ma/lawrence/codes/code_of_ordinances?nodeId=TIT16SU		see word doc with updated site plan reivew
Merrimac	10/19/20	http://townofmerrimac.com/DocumentCenter/View/184/Zoning-Bylaw-PDF?bidId=	4/27//15	http://townofmerrimac.com/DocumentCenter/View/256/General-Bylaws-PDF?bidId=	4/27/15	http://townofmerrimac.com/DocumentCenter/View/256/General-Bylaws-PDF?bidId=		provided by municipality		http://townofmerrimac.com/DocumentCenter/View/184/Zoning-Bylaw-PDF?bidId=
Methuen	12/18/18	https://ecode360.com/32749441	2/8/06	https://ecode360.com/attachment/ME3892/ME3892-S.pdf		provided by municipality		https://ecode360.com/attachment/ME3892/ME3892-S.pdf		addressed in zoning bylaw
Newbury	4/23/19	https://ecode360.com/15569988	4/24/18	https://ecode360.com/15580378	11/12/19	https://ecode360.com/12472845		https://ecode360.com/12472936#12472936		https://www.townofnewbury.org/sites/g/files/vyhlif951/f/uploads/spr_submission_requirements_-_rev._2020-06-17.pdf
Newburyport	8/23/21	https://library.municode.com/ma/newburyport/codes/code_of_ordinances?nodeId=APXAZOORNE	9/24/10	https://www.cityofnewburyport.com/department-of-public-services/engineering-division/pages/local-regulations-and-ordinance	9/8/14	https://library.municode.com/ma/newburyport/codes/code_of_ordinances?nodeId=PTIICOOR_CH6.5EN_ARTIIWEPROR		https://www.cityofnewburyport.com/sites/g/files/vyhlif7106/f/uploads/subdivision_rules_and_regulations_adopted.pdf		https://library.municode.com/ma/newburyport/codes/code_of_ordinances?nodeId=APXAZOORNE_SXVSIPLRE
North Andover	na	https://ecode360.com/32682406	na	https://ecode360.com/32685529	na	https://ecode360.com/32682348		https://ecode360.com/32686798		https://ecode360.com/32683601
Rowley	6/22/20	https://www.townofrowley.net/sites/g/files/vyhlif4956/f/uploads/zbl_all_updated_to_atm-stm_june_22-2020_1.pdf	11/28/07	https://www.townofrowley.net/sites/g/files/vyhlif4956/f/uploads/concom_stormwaterbylaw2007.pdf	1/24/04	https://www.townofrowley.net/sites/g/files/vyhlif4956/f/uploads/concom_wetlandbylaw2004.pdf		https://www.townofrowley.net/sites/g/files/vyhlif4956/f/uploads/120516_planning_board_rules_reg.pdf		
Salisbury	5/20/19	https://ecode360.com/10445611		https://www.mass.gov/doc/town-of-salisbury-stormwater-bylaws/download	repealed 5/19/08	https://ecode360.com/10445555		provided by municipality		https://ecode360.com/10446395
West Newbury	4/29/19	https://www.wnewbury.org/sites/g/files/vyhlif1436/f/uploads/zoning_bylaw_as_amended_april_29_2019.pdf	4/29/19	https://www.wnewbury.org/sites/g/files/vyhlif1436/f/uploads/2019_town_bylaws_-_as_amd_04292019.pdf	4/29/19	https://www.wnewbury.org/sites/g/files/vyhlif1436/f/uploads/2019_town_bylaws_-_as_amd_04292019.pdf		https://www.wnewbury.org/sites/g/files/vyhlif1436/f/uploads/subdivision_r_r_adopted_10-3-06_revd_4_21_09revd_12_21_10_revd_09_03_19.pdf		parking regs and planning board regs provided by municipality

TOWN	REGULATION REVIEWED	LINK (if possible)
Beverly	Zoning Ordinance	https://ecode360.com/29283330
	Chapter 375 - Subdivision of Land	https://ecode360.com/29285336
	Chapter 565 - Wetlands Protection Regulations	https://ecode360.com/29286482
	Chapter 350 - OSRD Guidelines	https://ecode360.com/29321513
	Chapter 249 - Stormwater Management (Draft)	PDF shared by liason Eric Barber
	City of Beverly Master Rules & Regulations	PDF shared by liason Eric Barber
Danvers	Zoning Bylaw	https://www.danversma.gov/documents/danvers-zoning-bylaw/
	Zoning Regulations	https://storage.googleapis.com/proudcity/danversma/uploads/2021/12/Planning-Board-Zoning-Regulations-2021-12-14.pdf
	Subdivison Rules & Regulations	https://www.danversma.gov/documents/subdivision-rules-regulations/
	Stormwater Bylaw	https://www.danversma.gov/documents/idde-stormwater-bylaws-approved-oct-2020/
	Wetlands Regulations	https://www.danversma.gov/documents/wetlands-regulations/
	Wetlands Bylaw	https://www.danversma.gov/documents/wetland-bylaw-regulations/
Gloucester	Zoning Ordinance	https://library.municode.com/ma/gloucester/codes/zoning_ordinance?nodeId=THGLMA
	Subdivison Rules & Regulations	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.gloucester-ma.gov/DocumentCenter/View/340/SubdivisionRulesandRegs2008?bidId=
	OSRD (Sec 5.15 of Zoning Ordinance)	https://library.municode.com/ma/gloucester/codes/zoning_ordinance?nodeId=SVSPRE_5.15OPSPREDE
	Drainage Ordinance	PDF shared by liason Ryan Marques
Manchester	Zoning Bylaw	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.manchester.ma.us/DocumentCenter/View/4818/Zoning-bylaw-42022
	Subdivision Rules & Regulations	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://manchester.ma.us/DocumentCenter/View/546/Subdivision-Regulations-PDF
	Wetlands Bylaw (Article XVII of General Bylaw)	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://manchester.ma.us/DocumentCenter/View/2000/General-Bylaws-
	Stormwater Control Bylaw (Draft)	Word Doc shared by liason Sue Brown
	Floodplains Bylaw (Draft)	Word Doc shared by liason Sue Brown
Marblehead	Zoning Bylaw	https://ecode360.com/10438269
	Subdivision of Land Bylaw	https://ecode360.com/10439300
	Stormwater Management Bylaw	https://ecode360.com/10438138
	Wetlands Protection Bylaw	https://ecode360.com/10438079
Peabody	Zoning Ordinance	https://library.municode.com/ma/peabody/codes/zoning?nodeId=OFZOORPEMA
	Subdivision of Land Rules & Regulations	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://peabodybusiness.com/wp-content/uploads/2018/05/Rules-Regulations-Governing-the-Subdivision-of-Land.pdf
	Chapter 27 - Streets & Sidewalks	https://library.municode.com/ma/peabody/codes/code_of_ordinances?nodeId=PTIITHCOCI_CH27STSIOTPUPL
	Chapter 28 - Utilities (Article V. Stormwater)	https://library.municode.com/ma/peabody/codes/code_of_ordinances?nodeId=PTIITHCOCI_CH28UT
	Chapter 32 - Wetlands Protection	https://library.municode.com/ma/peabody/codes/code_of_ordinances?nodeId=PTIITHCOCI_CH32WERIPRRE
Salem	Zoning Ordinance	https://library.municode.com/ma/salem/codes/zoning_ordinance?nodeId=ZOOR
	Subdivision Regulations	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.salemma.gov/sites/g/files/vyhlif7986/f/uploads/subdivision_regulations.pdf
	Chapter 37 - Stormwater Management	https://library.municode.com/ma/salem/codes/code_of_ordinances?nodeId=PTIIICOOR_CH37STMA
	Chapter 50 - Wetlands Protection & Conservation	https://library.municode.com/ma/salem/codes/code_of_ordinances?nodeId=PTIIICOOR_CH50WEPRCO
	Chapter 38 - Streets & Sidewalks	https://library.municode.com/ma/salem/codes/code_of_ordinances?nodeId=PTIIICOOR_CH38STSI

Town	Bylaw/Regulation	Link
Hamilton	Zoning Bylaw	https://www.hamiltonma.gov/wp-content/uploads/2021/08/Zoning-Bylaw.Final-August-2021.pdf
Hamilton	Subdivision Regulations	https://www.hamiltonma.gov/government/planning-board/subdivision-regulations/
Hamilton	Stormwater Management Permit Rules & Regulations	https://www.hamiltonma.gov/wp-content/uploads/2016/12/Stormwater-Management-Permit-Rules-Regulations-11-16-2021.pdf
Hamilton	Stormwater Management Bylaws	https://www.hamiltonma.gov/government/board-of-selectmen/bylaws/
Hamilton	Illict Discharge Detection and Elimination By-Law	https://www.hamiltonma.gov/government/board-of-selectmen/bylaws/
Lynnfield	Zoning Bylaw	https://ecode360.com/30738580
Lynnfield	Subdivision Regulations	https://ecode360.com/28618080#28618080
Lynnfield	Conservation Commission Regulations: Stormwater Rules and F	https://ecode360.com/37964050#37964050
Lynnfield	Stormwater Management Bylaws	https://ecode360.com/28618585; https://www.town.lynnfield.ma.us/sites/g/files/vyhlif3391/f/uploads/stormwater_management.pdf
Topsfield	Zoning Bylaw	https://www.topsfield-ma.gov/zoning-board-appeals/pages/zoning-laws
Topsfield	Subdivision Regulations	https://ecode360.com/30265936#30265936
Topsfield	Stormwater Management and Erosion Control Bylaw	https://ecode360.com/30296774
Topsfield	Stormwater Management and Erosion Control Regulations	https://ecode360.com/30265630
Topsfield	Wetland Regulations	https://ecode360.com/30266437
Essex	Zoning Bylaw	https://www.essexma.org/sites/g/files/vyhlif4406/f/uploads/essex_bylaw_-_2022_v.1_0.pdf
Essex	Rules and Regulations Relative to Subdivision Control	https://www.essexma.org/planning-board/files/subdivision-control-rules-regulations
Essex	Stormwater Management and Land Disturbance Bylaw	https://www.essexma.org/sites/g/files/vyhlif4406/f/uploads/essex_bylaw_-_2022_v.1_0.pdf
Ipswich	Protective Zoning Bylaw	https://www.ipswichma.gov/DocumentCenter/View/1015/Zoning-Bylaw
Ipswich	Rules and Regulations Governing the Subdivision of Land	https://ipswichma.gov/DocumentCenter/View/1014/Subdivision-Rules--Regulations
Ipswich	Design Review Board: Steps for the Design Review Process	https://www.ipswichma.gov/DocumentCenter/View/1037/Design-Review-Board-Guidelines--Application
Ipswich	Stormwater Management Bylaws	https://ecode360.com/30685913
Ipswich	Stormwater Management Regulations	https://www.ipswichma.gov/DocumentCenter/View/13293/Draft_Ipswich_Stormwater_Regulations

Middleton	Zoning Bylaw	https://ecode360.com/10440524#10440524
Middleton	Subdivision of Land Bylaws	https://ecode360.com/30328471#30341560
Middleton	Subdivision Rules and Regulations	https://docs.google.com/document/d/1_2KthNeUoGSzKeZ_SPDgIjb5Lkx8fR_H/edit?usp=sharing&ouid=113353923203393468594&rtpof=true&sd=true
Middleton	Stormwater Management Bylaws	https://ecode360.com/30316132
Middleton	Stormwater Management Rules and Regulations	https://ecode360.com/30328471#30341560
Wenham	Zoning Bylaw	https://cms4files1.revize.com/wenhamma/Wenham%20Zoning%20Bylaw%20Revised%20Feb%202020.pdf
Wenham	Subdivision of Land Bylaws	[Draft reviewed, received via email]
Wenham	Site Plan Review Bylaw	https://ecode360.com/31434212?highlight=stormwater&searchId=8547776360581843#31434212
Wenham	Stormwater Management Bylaw	https://ecode360.com/31533561
Wenham	Planning Board Rules and Regulations	https://cms4files1.revize.com/wenhamma/Wenham%20PB%20Rules%20and%20Regulations%20Updates%206-6-19%20Final.pdf
North Reading	Zoning Bylaw	https://ecode360.com/10384134#10384134
North Reading	Subdivision of Land Bylaws	https://ecode360.com/10384134#10384134
North Reading	Site Plan Review Regulation	https://www.northreadingma.gov/sites/g/files/vyhlif3591/f/uploads/site_plan_review_regulation.pdf
North Reading	Stormwater Management Bylaw	https://www.northreadingma.gov/sites/g/files/vyhlif3591/f/uploads/stormwater_bylaw.pdf
North Reading	Stormwater Management Rules and Regulations	https://www.northreadingma.gov/sites/g/files/vyhlif3591/f/uploads/stormwater_rules_and_regs.pdf; https://www.northreadingma.gov/sites/g/files/vyhlif3591/f/uploads/stormwater_appendices.pdf

Appendix M - Permittee-Owned Property Inventory and Retrofit Plan

Permittee-owned Properties Inventory and Green Infrastructure Retrofit Plan

Manchester-by-the-Sea, MA

Updated August 2023

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Contents

Section 1 – Report Overview

1.1 Introduction

Bobrek Engineering & Construction, LLC (BEC), on behalf of the Town of Manchester-by-the-Sea, MA has prepared this municipal-owned properties inventory and green infrastructure retrofit plan as required for Year 4 as part of Minimum Control Measure (MCM) 5: Post-Construction Stormwater Management in New Development and Redevelopment. The intent of this report is to identify a minimum of five (5) Town-owned properties that could be modified or retrofitted with Stormwater Best Management Practices (BMPs) designed to reduce the frequency, volume, and pollutant loads of stormwater discharges.

The properties that are the focus of this assessment are Town-owned parking lots, because they are typically impervious land cover. Any material or structure on or above the ground that prevents water from infiltrating the underlying soil is considered an impervious surface. Pavement or compacted gravel, which are the common material of the municipal parking areas in Manchester-by-the-Sea, do not allow water to absorb into the soil, causing water to rapidly enter storm drains and streams, which may cause flooding or erosion. Pollutants, such as gas and oil, also accumulate in parking areas and get washed away down storm drains to then immediately enter natural systems without getting filtered out.

To mitigate the impacts of impervious cover on stormwater and water resources, Low Impact Development (LID) methods can be integrated into existing parking area designs. LID is an approach to community development and management of stormwater that focuses on the conservation of natural features, minimization of impermeable surfaces, and creation of green infrastructure to aid in the absorption and filtration of stormwater. Using green infrastructure, such as green roofs, bioswales or rain gardens, permeable paving, and preserving or reestablishing vegetation on a site, helps rain to be captured and absorbed by soil and plants, rather than relying solely on a conventional storm drain system. Parking areas can be modified or retrofitted with green infrastructure to reduce the impervious surface area and to better manage stormwater.

For this assessment, all municipal-owned parking lots were inventoried, and Town officials prioritized six initial properties to retrofit with green infrastructure. The Manchester-by-the-Sea Department of Public Works (DPW) staff discussed drainage issues that have been observed in each parking lot, upcoming improvement projects that have been planned or there has been interest in commencing, and other criteria that would make the parking lots feasible for retrofit projects in the next few years. The parking lots were scored on these criteria in a checklist (Appendix A) to gauge the needs of each parking lot and the feasibility of implementing a retrofit project. Five sites were then subjectively chosen, and recommendations are provided with Stormwater BMP options for improving the sites. Finally, a proposed schedule of implementation and maintenance plan are provided for each parking lot.

Section 2 – Inventory and Prioritization Process

2.1 Methods of Prioritization

Manchester-by-the-Sea DPW provided an initial list of seven (7) Town-owned parking areas. This list will be added to each year to achieve a minimum of five locations. In August 2023, the DPW Yard was added to

the list. Each of these parking lots were visited and surveyed for existing stormwater infrastructure and signs of drainage issues, such as pooling or erosion. The slope of the sites and the adjacent properties were also concerns when considering how the site drainage could be improved.

Next, Town officials from the DPW, Planning Department, and Conservation Department reviewed the information that was collected through the site visits and offered more background about known drainage issues and already planned redevelopment projects on or near these sites. To organize this information about the inventoried parking lots, a scoring system was created to aid in prioritizing the properties for future retrofit projects. Scores were given to each parking lot for the following factors which affected how they were ranked for future green infrastructure improvements: Waterbody Impairment, Site Redevelopment, and Drainage Issues.

The Waterbody Impairment score reflects the contamination of the water body or priority of the outfall to which the site drains. The highest score of two (2) is given to sites where the connected outfall has tested high with contaminants with the most recent outfall data. A score of one (1) is given to sites within a problem catchment area, such as the Riverhead catchment area. A score of zero (0) goes to a site that drains to an outfall that has no known contamination or is low or medium priority.

The Site Redevelopment score demonstrates the Town's interest or plans to redevelop a site. A score of two (2) means that plans are already in place for improving the site. If plans are already in place, it becomes more feasible to add green infrastructure concurrently. A score of one (1) goes to parking lots that Town officials are very interested in making improvements, either because of drainage issues or they see some other benefit or opportunity. A score of zero (0) goes to sites where no redevelopment projects are planned and there is no interest currently for prioritizing a project.

The Drainage Issue score indicates the observed issues with drainage at each parking area. A score of three (3) represents both flooding and erosion, two (2) represents known flooding, one (1) represents signs of erosion, and zero (0) represents no known drainage issues.

The Total Score is the cumulation of all three scores. The score is used as guidance for prioritizing the sixteen sites, where higher scores tend to have a higher prioritization. However, the final determination is a subjective decision made by Town officials. See Appendix A to see the parking lot inventory and prioritization table.

2.2 Priority Parking Areas for LID Modifications

The list of seven Town-owned parking areas were narrowed down to six that will be retrofitted with green infrastructure beginning in Year 5 of the MS4 permit. The DPW Yard was added to the list in Year 5 for a total of seven properties prioritized for LID modifications. See Appendix A to review the priority rankings for each site referenced in this section.

2.2.1 Town Hall

The Town Hall parking lot is a large, paved, public parking area near the Town Hall, American Legion, and Manchester Sewer Department buildings. It is directly adjacent to Manchester Harbor with the parking area's catch basins draining directly to the harbor via two outfalls, OF-041 and OF-052. These two outfalls

are ranked as a high priority partially due to Manchester Harbor being ranked a Category 4A Impaired Waterbody with water quality impairments such as enterococcus and fecal coliform[1].

There are 11 catch basins within the area of interest, five of which are located down slope from the police department's vehicle washing station. The five catch basins are lined up and connected, meant to serve as a pre-treatment of the vehicle washing runoff by separating pollutants out of the stormwater before it enters the harbor. However, the pre-treatment system could be improved. The other six catch basins are connected and are located throughout the parking lot, but they could be placed in better locations to drain the site. CB-035 at the center of the parking lot will surcharge and overflow during King Tides and storm surges due to the high water line at this site.

Additionally, there are several vegetated islands in the center of the parking area that are curbed, so it is unlikely that they currently aid in reducing the rate of stormwater discharge.

2.2.2 Sweeney Park

The Sweeney Park lot offers public parking for basketball courts, baseball and softball fields, and a skateboard park. It is a long, narrow gravel parking lot that slopes down and eventually discharges to Causeway Brook, a Category 4A Impaired Water[1]. There is no storm drainage system in place for the parking area, and there is occasional flooding at the furthest end of the parking lot from the street. The length of the parking lot abuts an upslope into forest. Since the site experiences flooding often, the parking area could benefit low-impact stormwater management that increases the capacity to infiltrate stormwater on site. The improvements could potentially be done in addition to upcoming work to add turf to the athletic fields.

2.2.3 Coach Field

The Coach Field parking area is utilized by visitors of the multipurpose athletics field and tennis courts. It is a gravel parking lot with a pedestrian, memorial area on the corner of Brook Street and Norwood Ave that has paved paths and a water fountain. The parking area has curbing on the side adjacent to a steep, grassy hill leading down to the athletic field and Sawmill Brook. An accumulation of sand and gravel and signs of flooding were observed in the pathway near the water found and in the sidewalk on Norwood Ave.

2.2.4 Singing Beach

The Singing Beach parking lot is a large, paved parking lot used by beach visitors. There are two catch basins on the site that drain to Outfall 015, a small pipe that drains at the top of the beach slope. Beach sand enters the parking lot from behind the concession stand building via wind and the runoff from the shower station. Sand collects in areas around the catch basins.

There are no existing curbing for stormwater management, but there is a grass strip on the perimeter of the parking area. The neighboring properties are close by on the other side of a fence on two adjacent sides. The Town has an interest in improving the Singing Beach parking lot due to its high visibility as it is a popular spot for residents and beach goers.

[1] Mass DEP 2018/2020 Integrated List of Waters

2.2.5 Masconomo Park

Masconomo Park is a public parking area for visitors to the harbor-side park, the baseball field, and community events. The parking lot includes approximately 60 spaces, and all parking along the perimeter is reserved for residents only. The lot is paved with no catch basins and an earthen swale outfall (OF-017). Manchester Harbor surround the parking area on three sides; the slope to harbor has rock armoring the protect the slope from erosion with geotextile fabric. However, the slope is eroded near the low areas of the parking lot where the stormwater flows towards the marsh and from tidal action. There are permeable pavers on the sidewalk in these low-lying areas, but the soil between the pavers is compacted and ineffective for infiltrating stormwater. Green Infrastructure could be added to this site to slow the discharge and reduce erosion of the bank leading down to the harbor.

2.2.6 Norwood Ave Parking Lot

At the corner of Norwood Avenue and Washington Street is a paved lot for public parking. The lot does not contain curbing for stormwater or parking management, and it was filled on the far side adjacent to the neighboring properties slope the lot down to the street. There are no drainage structures on the site, and there are no drain system structures near by to connect to. There is visible erosion and signs of pooling in the sidewalk next to the street due to run off from the parking area, which could cause the sidewalk to become icy during winter months which is a safety concern. The Town is interested in pursuing green infrastructure to create an infiltration system on site independent from the Town's stormwater drainage system.

2.2.7 DPW Yard

The Department of Public Works (DPW) Yard and Highway Garage are located at 85R (rear) Pleasant Street. The primary purpose of the yard is to store vehicles and equipment of the DPW. The site has three structures, the Main Building used for vehicle and equipment storage and maintenance, the Honey Wagon Barn for storage of small equipment, and the Salt Barn to store salt and cover the aboveground storage tanks containing waste oil. There are two designated parking areas, each of which is an unpaved surface but is heavily compacted. There are no stormwater structures conveying water to the MS4 system, however there is a drainage ditch maintained beside the Salt Barn to treat water before discharging to Sawmill Brook. See the Stormwater Pollution Prevention Plan (SWPPPs) for more information on stormwater management of this site. The Town is interested in incorporating green infrastructure due to the accessibility of equipment and materials on the site.

Section 3 – Low Impact Development Infrastructure (LID) Considered

The following LID stormwater management techniques are encouraged by the Environmental Protection Agency (EPA), Metropolitan Area Planning Commission (MAPC), Massachusetts Stormwater Handbook, the Greenscapes LID Toolkit, and other stormwater management experts and advocates.

3.1 Bioretention Areas

Bioretention areas are a method of stormwater management that uses soil, plants, and microbes to filter runoff before it infiltrates as groundwater or is discharged. These areas are usually depressions in the ground filled with sand or gravel and topped with mulch as a substrate for dense plantings. They are typically designed to hold 6-8 inches of ponded water, and some have an overflow outlet to prevent flooding during heavy rain. Bioretention areas are effective at removing pollutants, such as phosphorus, nitrogen, metals, organics, bacteria, and suspended solids. Not only do they improve water quality and slow

the discharge rate, bioretention areas also can be aesthetically pleasing, offering landscaping within impervious areas. A rain garden is a simplified bioretention technique that is usually smaller and shallower, using plants such as grasses and flowering perennials[2].

Bioretention areas should be inspected, cleaned of debris or dead vegetation, mulched, fertilized, and pruned on a yearly basis. They should also be mowed as needed throughout the year[3].

3.2 Porous Pavement

Porous or permeable paving can replace impermeable concrete or pavement. Permeable paving allows rainwater to percolate through and absorb into the subsoil, reducing the amount of stormwater runoff. Since the volume of water can be reduced with water infiltrating into a porous surface so can the amount of pollutants that get washed down the storm drains. Types of permeable paving include porous asphalt or concrete, paving stones, or other alternative "grass" pavers made of concrete or plastic grids that can hold soil for grass growth[4].

Porous pavement or pavers require regular maintenance and monitoring as needed to ensure it is draining properly. They should be power washed to remove clogs and vacuum swept to remove the dislodged sediment. Any joint material between pavers should also be replaced[3].

3.3 Vegetated Filter Strips

Grass filter strips can be installed next to impervious areas, such as parking lots or buildings, to slow sheet flow and provide pretreatment of runoff by removing suspended solids. They can be constructed as a low-angle, grassy slope along the length of a small- to medium- sized parking lot to filter the stormwater before reaching a bioretention area, vegetated swale, or a buffer strip. Filter strips are built as planar or convex to prevent the flow from concentrating and channeling[5].

Annually, filter strips should be inspected for sediment build-up, erosion, and overall health of vegetation, with more attention during the first year of establishment. The grass should be regularly mowed, and sediment should be removed from the toe of the slope as needed[3].

3.4 Catch Basin Filters and Hydrodynamic Separators

Stormwater filtration devices can either be inserted into existing catch basins or be installed as retrofits to remove contaminants in stormwater runoff. Catch basin inserts can be placed directly into catch basins or be retrofitted in the place of catch basins. The devices accumulate sediment and debris to be collected and disposed of. Hydrodynamic separators are a type of stormwater inlet device that can be retrofitted in the place of a catch basin, and they are cylindrical chambers that swirl the stormwater as it enters to settle out sediment. Some hydrodynamic separators also have a chamber for oil and other chemicals or objects that float.

[2] LID Toolkit Factsheets (mapc.org)
[3] MA Stormwater Handbook Volume 2 (mass.gov)
[4] Fact Sheet: Permeable Paving – MAPC
[5] Fact Sheet: Grass Filter Strips – MAPC

Catch basin inserts and hydrodynamic separators are typically used in areas with limited space for other stormwater BMPs. The sediment trapped in filters is typically removed manually and in separators with vacuum trucks[6].

3.5 Stormwater Tree Box Filters

Stormwater tree boxy filters consist of above ground plantings, such as street trees, as well as underground concrete structures that can be interconnected and are filled with mulch soil and root systems where water can be infiltrated. The filtered water then can either recharge as groundwater if its site-appropriate, or it can be discharged into another storm drainage system via an underdrain[7].

Each year, the tree should be checked for health and pruning. Twice a year, soil or mulch should be raked to make sure water can drain. If the tree needs to be replaced, the gravel, soil and mulch should also be replaced[3].

3.6 Water Quality Swales

Water quality swales, or bioswales, are graded depressions that consist of trees, vegetation, and soil which filter, absorb and slow runoff before it enters a storm drain system. The longitudinal slope of bioswales allows water to slowly move across the surface to allow pollutants to settle out. Bioswales can be incorporated into medians, cul-de-sacs, curb extensions, or vegetated islands of parking lots[8].

Vegetated swales should be inspected annually for clogging of pretreatment areas, erosion or gullies, and trash and debris. Seasonally, the grass should be mowed to maintain a height of three to four inches. As the vegetation is being established in the first year, the vegetation health should be monitored and replaced with alternative grass species as necessary. If water is ponding, the swale may be rototilled as needed. Sediment may also need to be removed if it is accumulating to greater than 25% of the original design[9].

3.7 Underground Stormwater Detention and Infiltration Systems

Underground structures may be used to temporarily store and slowly release runoff, especially in urban environments where there is limited space for above ground green infrastructure. These structures utilize vaults, chambers, and pipes to store water and have perforations or open bottoms to let water infiltrate at a slower rate[10]. A leaching catch basin is an example of an underground detention and infiltration system that is comprised of barrel and riser sections that permit the infiltration of runoff into the ground. Similarly, a leaching basin can be placed adjacent to a deep sump catch basin. This combination is preferable when it is feasible. Either method should only be used on sites with highly permeable soils[11].

Section 4 –Recommendations

4.1 Town Hall

The existing five catch basin pretreatment system should be replaced with a stormceptor system, or hydrodynamic separator, to filter the stormwater more effectively before entering the harbor. The addition

[6] NPDES: Stormwater Best Management Practices, Stormwater Inlet Controls (epa.gov)
[7] Stormwater Planter | Charles River Watershed Association (crwa.org)
[8] Bioswales | National Association of City Transportation Officials (nacto.org)
[9] NPDES: Stormwater Best Management Practice, Grassed Swales (epa.gov)
[10] Stormwater Management Solutions (conteches.com)
[11] Leaching Catch Basin/Leaching Basin | Massachusetts Clean Water Toolkit

of this oil-grit separator should be in conjunction with improving municipal car washing practices by providing a pressure washer nozzle and biodegradable, phosphate-free car wash detergent at the station. For more information on municipal car washing BMPs, the EPA has a fact sheet that includes nonstructural and structural practices[12].

BEC also recommends replacing the existing vegetated island with a bioswale or rain garden in the location of the existing catch basin in the middle of the parking lot (CB-035), if the site conditions allow for infiltration. This bio swale could increase the capacity for holding both stormwater for filtration before it is discharged via an outflow pipe and for containing the surcharged water and preventing flooding within the parking area. BEC recommends adding tide gates at Outfalls 41 and 52 to prevent the surcharge of catch basins in the parking lot during storm events.

4.2 Sweeney Park

The drainage issues could be improved in conjunction with a future improvement project planned to add turf to the fields. BEC recommends adding a vegetated swale along the length and a bioretention area at the end of the parking area that experiences frequent flooding.

4.3 Coach Field

BEC recommends add leaching catch basins by the road and before the walkway in response to the signs of pooling in those areas. Spacing may also be added between the curbing along with the addition of a bioswale on the other side of the curb to allow stormwater to slowly infiltrate rather than being directed to the sidewalk.

4.4 Singing Beach

A catch basin or bioswale may be added near the washing station to prevent sand from washing into the primary catch basin (CB-521) that drains the parking area. In addition, a leaching catch basin accompanied by a leaching structure could replace CB-521 since the parking area is sloped towards that location. Ideally, vegetated bioswales or a rain garden around the catch basin could be added to slow the rate of discharge, as well as provide shade in the large, impermeable parking lot. The space used for green infrastructure would have to be weighed with the impact of possibly losing visitor parking capacity and income from visitor fees.

Porous concrete or pavers could also be a possibility for the Singing Beach lot, especially in the perimeter parking spaces adjacent to the grassy areas, away from where sand accumulates.

4.5 Masconomo Park

BEC recommends adding a stone or vegetated filter strip with an underdrain along the edge of the paved parking lot to slow the flow of water and prevent erosion of the bank down below. The underdrains could lead to two bioswales could also be added downslope to collect and infiltrate water before it flows into the marsh and prevent bank erosion. Finally, the geotextile fabric and existing armor stone should be extended to further protect the slope.

4.6 Norwood Ave Parking Lot

On site detention of stormwater would be needed at the Norwood Ave parking area as opposed to conveyance to a drain system due the drain system being a distance away from the lot. There are several

[12] Municipal Vehicle and Equipment Washing (epa.org)

options, such as a subsurface infiltration detention tank or a leaching catch basin. By having a system that can collect and infiltrate stormwater for this parking lot, flooding and subsequent freeze/thaw and safety issues on the sidewalk may be resolved.

4.7 DPW Yard

On-site treatment of stormwater would be the most cost-efficient and feasible at the DPW Yard. There is an existing drainage ditch with vegetation that could be enhanced with plantings to create more of a bioswale. A bioretention area could also be added to the lowest lying area where the sheet flow collects at the northeast side of the property. This area would collect sediment and runoff from the maintenance garage and being tracked in from town vehicles. The unpaved parking areas could be improved with more permeable options. A treatment structure should also be added for vehicle washing, such as an oil-grit separator, in conjunction with improving municipal car washing practices by providing a pressure washer nozzle and biodegradable, phosphate-free car wash detergent at the station.

Section 5 – Schedule of Implementation

The following table shows the schedule for implementing the redevelopment plans for the parking areas of highest priority:

Tasks	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030
Sweeney Park Parking Lot Design								
Sweeney Park Parking Lot Construction								
Town Hall Parking Lot Design								
Town Hall Parking Lot Construction								

The Sweeney Park parking area will be a 4-year project that will consist of a design phase and a construction phase, with the goal of being completed by FY2026. The Town Hall parking area is the next retrofit project prioritized by the Town, which the Town aims to be started by FY2027. The Town of Manchester-by-the-Sea will assess which parking areas will be designed and retrofitted next while preparing the Capital Improvement Plan. The DPW Yard will also be considered in Year 6 as an option for green infrastructure implementation, and a schedule will be determined.

Section 6 – Conclusion

The Environmental Protection Agency (EPA) is encouraging municipal separate storm sewer system (MS4) communities to begin planning and implementing Low Impact Development (LID) practices within municipal-owned properties. These green infrastructure projects will set a precedent for the Town as well as private developers to also integrate LID stormwater management into site designs throughout the Town of Manchester-by-the-Sea. LID practices, such as bioretention areas, bioswales, and porous pavement, slow the rate and volume of stormwater while also filtering it, taking pressure off natural water resources. There are also many other community benefits such as improved aesthetics, educational opportunities, and improved air quality that make green infrastructure a great alternative to conventional stormwater

Appendix A – Site Inventory and Prioritization Checklist

Manchester-by-the-Sea Municipal Parking Lot Inventory and Assessment

Prioritized in Year 6	Prioritization Score	Parcel Number	Property Name	Property Address	Reponsible Department	Current Site Use	Waterbody Site Drains To	Waterbody Impairment Score	Waterbody Impairment	Site Redevelopment Score	Site Redevelopment Planned	Drainage Issues	Recommended BMP
*	5	11 0 17	Sweeney Park	113 Summer St	DPW	Public parking for sports fields	Causeway Brook	1	Causeway Brook has a Category 4A water quality impairment	2	Improvement project already planned for adding turf to the field	2	bioretention; bioswale
*	1	58 0 55	DPW Yard	85R Pleasant St	DPW	DPW Yard	Sawmill Brook	0	SC-136 is ranked as medium priority	1	DPW Yard may be moved in the future, but may be the most feasible to implement green infrastructure because of accessible equipment and material	0	bioretention; bioswale
	4	45 0 23; 45 0 24	Town Hall	10 Central St	DPW	Public parking in proximity to Town Hall, American Legion, and Manchester Sewer Department	Manchester Harbor	1	Two catchments (SC-041 and SC-052), both ranked high priority	1	Interest in improving the storm-ceptor system and pre-treatment for run-off from municipal car-washing	2	Replace catch basins with storm-ceptor or add catch basin filter; municipal car washing BMPs; bioswale or bioretention area
	4	47 0 4	Coach Field (Brook St)	38 Norwood Ave	DPW	Parking for sports fields/ playground	Sawmill Brook	0	SC-028 ranked as Medium priority	1	Interest in resolving erosion issues	3	Leaching catch basin; perforated curbing; bioswale
	4	17 0 4	Singing Beach	119 Beach St	DPW	Public parking for Singing Beach	Atlantic Ocean	0	Atlantic Ocean not listed as 2018/2020 impaired water body	1	Sand from beach enters parking lot and flooding occurs at one of the only catch basins on site	3	Porous concrete; leaching capacity catch basins; vegetated islands
	3	16 0 34	Masconomo Park	60 Beach St	DPW	Public Parking for Masconomo Park	Manchester Harbor	1	Catchment SC-017 ranked high priority	1	Interest in improving erosion issue next to marsh	1	Stone or vegetated filter strip; bioswales; culvert under path; armor stone
	3	51 0 41	Norwood Ave (Washington intersection)	5 Norwood Ave	DPW	Public parking near downtown	Sawmill Brook	0	SC-126 ranked as a Medium priority	1	Interest in adding drainage system on site and resolve pooling issues which are a safety concern in the winter	2	Subsurface infiltration detention tank; leaching catch basin
	1	22 0 16	Tucks Point	17 Tucks Point Rd	DPW	Parking for Tuck's Point and Manchester Yacht Club	Manchester Harbor	1	Drains to Manchester Harbor, which is a Category 4A water body	0	Little interest since parking lot is already permeable and there are existing bioretention areas	0	

0- not impaired
1- Outfall/ Catchment Ranked High Priority
2- Tested High Bacteria

2- Redevelopment planned
1- Town interest in redevelopment
0- no redevelopment planned

3- Flooding and erosion
2- Flooding/ Pooling
1- Erosion

Appendix B - Photo Log

Sweeney Park

Stormwater is flooding the far end of the parking area at Sweeney Park.

Bioswales could aid in water infiltration along the perimeter of the parking lot.

Town Hall

Parking lot catch basins drain to two outfalls that discharge directly to Manchester Harbor.

Five catch basins act as a pretreatment system for municipal vehicle washing station.

Coach Field

The parking area at Coach Field is gravel with curbing along each side.

There is a paved walkway to a memorial site where there are visible signs of pooling water.

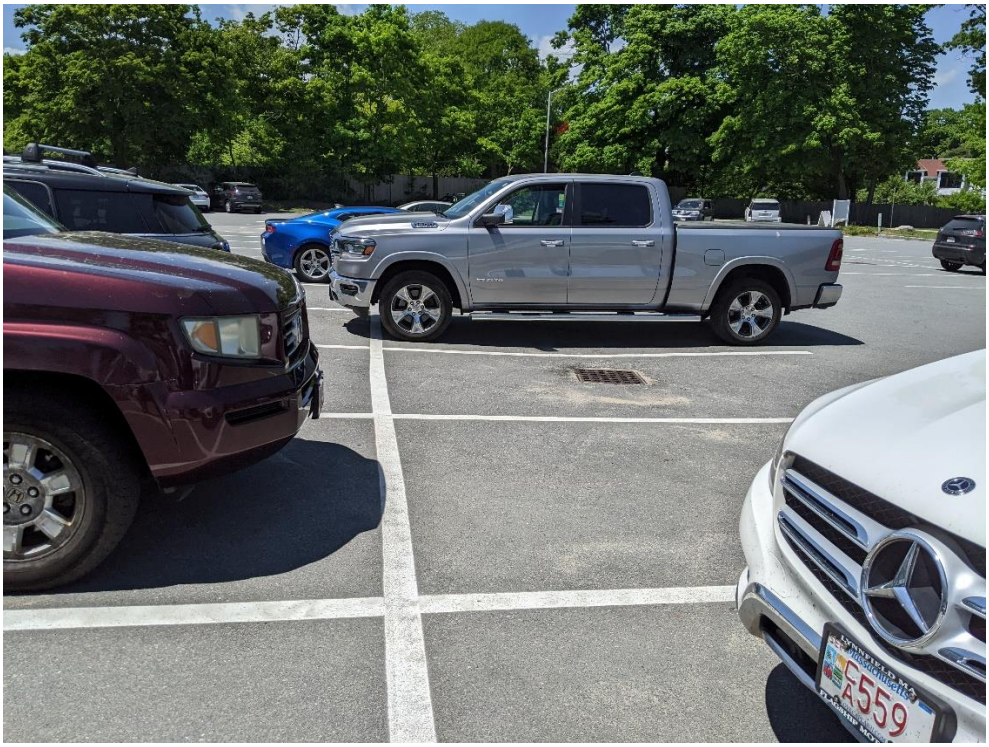
There is curbing adjacent to a grassy hill that slopes down to the athletic fields and Sawmill Brook.

The gravel and sand from the parking lot is washing out into the street and sidewalk.

Singing Beach

The Singing Beach parking lot could be retrofitted with vegetated islands and permeable paving to reduce the amount of impermeable land cover.

There is vegetation around the perimeter of the parking area.



Stormwater runoff collects at one catch basin in the middle of the parking lot where sand from the beach is also being washed away.

Masconomo Park

The paved parking lot at Masconomo Park is located adjacent to Manchester Harbor, where runoff directly discharges.

There are two low points where stormwater flows off the pavement. The permeable paving is compacted with sand and gravel.

A more effective vegetated or stone filter strip could be used to slow water flowing from the parking lot into the marsh.

Rip-rap could be extended to help prevent bank erosion.

Norwood Ave Parking Lot

There is no stormwater infrastructure at this site. It is also not in the vicinity of the stormwater drain system.

There are signs of pooling of stormwater on the sidewalk, which could potentially pose safety concerns in the winter months.