Illicit Discharge Detection & Elimination

PROGRAM MANUAL

Town of Medfield, MA
June 24, 2019

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1. INTRODUCTION

1.1 PROGRAM OVERVIEW

The municipal separate storm sewer system (MS4) permit issued by the Environmental Protection Agency (EPA) to the Town of Medfield (hereafter "the Town") requires the implementation of an Illicit Discharge Detection and Elimination (IDDE) Program to systematically find and eliminate non-stormwater discharges to the MS4 and to prevent the introduction of new illicit connections and discharges.

This document describes the Town's IDDE Program in detail and constitutes the "Written IDDE Program Document" required by the permit. This document was prepared in part based on a model provided by the Neponset Stormwater Partnership (NSP) and partially funded through a Community Innovation Challenge Grant. The procedures outlined here were adapted from guidance documents by the Central Massachusetts Regional Stormwater Coalition, the Center for Watershed Protection, New England Interstate Water Pollution Control Commission, Massachusetts Department of Environmental Protection, U.S. Environmental Protection Agency (EPA), the Boston Water and Sewer Commission, the New Hampshire Estuaries Project, and the Neponset River Watershed Association (NRWA) water quality monitoring program.

This document will be reviewed and updated on a periodic basis to reflect changes to the Town's IDDE Program. The Town is required to submit an annual report each year of the permit term.

1.2 LEGAL AUTHORITY

1.2.1 Clean Water Act and NPDES

The EPA established the National Pollutant Discharge Elimination System (NPDES) program as part of the Clean Water Act (CWA) to regulate discharges to surface water. In Massachusetts, the EPA and the Massachusetts Department of Environmental Protection (MassDEP) as co-permitting authorities, regulate stormwater runoff that enters local water bodies through MS4s in "Urbanized Areas."

The MS4 NPDES General Permit (the "MS4 Permit") authorizes the Town to discharge stormwater per its Stormwater Management Program ("SWMP"). In accordance with the Small MS4 General Permit, the SWMP shall consists of six components called minimum control measures which, when implemented, should result in a reduction in pollutants discharging into receiving waters. The minimum control measures are:

1. Public Education and Outreach;
2. Public Involvement and Participation;
3. Illicit Discharge Detection and Elimination;
4. Construction Site Stormwater Runoff Control;
5. Post-Construction Stormwater Management; and

6. Good Housekeeping and Pollution Prevention.

The IDDE Program described herein will satisfy the requirements of the third minimum control measure. The Medfield Department of Public Works (DPW) has established this IDDE Program Manual ("IDDE Manual") to outline procedures, goals, standard operating procedures (SOPs), and workflow processes in accordance with requirements of the MS4 Permit. This IDDE Manual is a "working" document and revised as necessary.

1.2.2 Medfield Notice of Intent and Ordinance

In 2003, the Town of Medfield, Massachusetts (the "Town") filed a Notice of Intent (NOI) for coverage under a five-year NPDES General Permit for stormwater discharges. The General Permit was issued by the EPA and MassDEP, and was set to expire on March 31, but remained enforce until new five-year NPDES requirements were issued in 2018. On September 28, 2018, the Town filed a second NOI for covered under the new NPDES General Permit. The NOI was accepted on April 12, 2019 and is set to expire on June 30, 2023.

The Town amended its Stormwater Management Regulations (Municipal Code Chapter 235) by Town Meeting vote on April 24, 2017 (Article 37). The Illicit Discharge Ordinance adopted and amended under the authority granted by the Home Rule Amendment of the Massachusetts Constitution, the Home Rule Procedures Act, and the Clean Water Act Regulations 40 CFR 122.34, and can be found in Section 270-18 through 270-24 of the Medfield Municipal Code. Medfield's Illicit Discharge and Connection Ordinance is provided in Appendix A.

Medfield's regulations and ordinances grant authority to the DPW Director. The Director shall administer, implement and enforce Chapter 235. Any powers granted to or duties imposed upon the Director may be delegated in writing by the Director to employees or agents.

The local rules expressly prohibit illicit discharges to the Town's stormwater drainage system. The regulation The DPW administers, implements, and enforces this Ordinance. Nothing in the Ordinance intends to abrogate any enforcement authorities of the Medfield Health Department pursuant to the Massachusetts State Sanitary Code, 105 CMR 400 et seq. or any other public health law. Any powers granted to or duties imposed upon these Departments may be delegated in writing to employees or agents of the Department. Through its Stormwater Bylaws, the Town of Medfield has established the legal authority to:

- prohibit illicit discharges and Sanitary Sewer Overflows (SSOs) into the MS4 system
- investigate suspected illicit discharges
- eliminate illicit discharges, including discharges from properties not owned by or controlled by the town that discharge into the MS4 system, and
- implement appropriate enforcement procedures and actions

The NPDES Phase II Stormwater Program Designated MS4 Areas are shown on Figure 1-1. The IDDE Program applies Town-wide.

1.3 STATEMENT OF IDDE RESPONSIBILITIES

The Medfield Non-Stormwater Discharge Ordinance (Sections 270-18 through 270-24) empowers the DPW Director, or their designee, to enforce the IDDE provisions of the Bylaw.

The DPW Director has delegated day to day management, operation and reporting to the Town's Highway Superintendent. There is also coordination required with other departments to make the program successful.

The DPW Director is responsible for coordinating the efforts of other departments when needed, ensuring that necessary interdepartmental communication occurs in a timely manner, and following up with other departments as needed regarding the status of their efforts.

Responsible parties for implementing IDDE program are listed in Table 1 – Responsible Parties for Implementing IDDE Program.

Table 1 - Responsible Parties for Implementing IDDE Program

Primary Responsible Party	Responsibilities
DPW Director, Maurice Goulet Highway Superintendent, Robert Kennedy Department Employees: General Foreman (Highway); Working Foreman, Special Heavy MEO, Special Heavy MEO, Heavy MEO II, Heavy MEO I, Laborer/ MEO, Laborer, Pipelayer/Bracer, Head Pump Station Operator, Pump Station Operator, Mason, Senior Engineer, Jr. Civil Engineer	✓ Field inspections and initial investigations
DPW Director, Maurice Goulet Highway Superintendent, Robert Kennedy	✓ Outfall/Interconnection Inspections Data Review and Follow Up
DPW Director, Maurice Goulet Highway Superintendent, Robert Kennedy	✓ Investigation ✓ Corrective Action ✓ Enforcement ✓ Annual Data Summary
Town Administrator, Kristine Trierweiler Public Works Director, Maurice Goulet Inspectional Services Commissioner, Gary Pelletier Board of Health Administrative Agent, Nancy Bennotti	✓ Enforcement ✓ Annual Reporting

The DPW based its IDDE Program on current regulatory requirements and by requirements outlined in the 2018 MS4 Permit. The Program includes and/or references legal authority, statement of responsibilities, assessment and priority ranking of investigation areas, stormwater discharge outfall screening and sampling, confirmation and removal of illicit connections, follow-up screening, prevention procedures, and training.

The DPW manages the IDDE Program with primary support from the Medfield Board of Selectmen Health Department and the Medfield Town Administrator, although other municipal departments play an important role in the program.

1.4 MEDFIELD-SPECIFIC REQUIREMENTS

Operators covered by the new 2018 MS4 Permit will remain covered until EPA authorizes their MS4 discharges under a new permit or otherwise revokes permit authorization. The conditions and reporting requirements of the 2018 MS4 Permit remain fully effective and enforceable until the reissuance of the general permit. Until authorized under a reissued permit, operators authorized under the 2018 MS4 Permit are required to submit annual reports by May 1 each year pursuant to Parts II.F, III.F, IV.F or V.F of the permit. Annual reports must include a self-assessment of MS4 Permit compliance, summary of newly collected information, and discussion of planned activities for the next reporting period.

Under the current MS4 Permit, the Department is responsible for developing, implementing, and enforcing a program to detect and eliminate illicit discharges. The permit obligates the Department to develop a written program plan that includes the following:

- A regularly updated storm sewer system map showing all municipally-owned outfalls;
- A regulatory mechanism to prohibit illicit discharges with enforcement provisions;
- A regularly updated IDDE plan which shall include:
    - Procedures to identify priority areas;
    - Procedures for locating and removing illicit discharges; and
    - Procedures for documenting actions and evaluating impacts on the storm sewer system subsequent to the removal.
- Public outreach and employee training about the program; and
- An evaluation of permitted non-stormwater discharges to determine if said permitted non-stormwater discharges significantly contribute to pollution.

1.4.1 Impaired Waterways

The MS4 Permit includes additional requirements for MS4 discharges to any impaired waterway with an approved Total Maximum Daily Load (TMDL). TMDLs, established by the EPA, provide guidance on the total "load" and/or concentration of pollutants allowed to enter into impaired waterways.

Medfield is located on a rugged upland area of both the Charles River and Neponset River watersheds. Much of the Town is located northeast of the confluence of the Charles River and the Stop River (Figure 1). About seventy-five percent of the Town drains westerly to the Charles River through a number of brooks, including the Stop River. The largest watershed to the Neponset River is located at the southeastern corner of the Town and conveys a majority of runoff to Neponset River in Walpole through the Mine Brook. The Division of Water Pollution Control has rated the Charles River in Medfield, as a Class B water body with warm water restrictions on dissolved oxygen, temperature, pH, Fecal Coliform Bacteria, solids, color and turbidity, oil and grease, taste and odor. The upstream, non-tidal portion of the Neponset River (beyond mile marker 29.5) is also a Class B and a High Quality Water Body with the same warm water restrictions.

The Division of Watershed Management submitted their Section 303(d) list, strategy and implementation schedule to EPA in 1999, and updates the list every two years, most recently in 2014 (approved February 23, 2016). A review of the Year 2014 Integrated List indicates the following concerns in Medfield:

Neponset River Watershed

- Category 3 (No Uses Assessed)
    - Flynn's Pond (7 acres)
- Category 4c (Impairment Not Caused by a Pollutant – TMDL Not Required)
    - Jewell's Pond (4 acres), Privately Owned – Non-native Aquatic Plants
- Category 5 (Waters Requiring a TMDL)
    - Mill Brook[(1)] (headwaters north of Hartford Street to inlet of Jewells Pond over 2.3 miles) for low flow alteration, Aquatic Macroinvertebrate Bioassessments, Dissolved Oxygen – No TMDL developed
    - Mine Brook (Outlet of Jewells Pond to Walpole town line over 3 miles) for Fecal Coliform and Dissolved Oxygen – TMDL Number 2592.

Charles River Watershed

- Category 5 (Waters Requiring a TMDL)

- Stop River[(2)] (Norfolk-Walpole MCI in Norfolk to the confluence with the Charles River over 4.2 miles) for E-coli – TMDL Number 32372
- Stop River[(2)] (Norfolk-Walpole MCI in Norfolk to the confluence with the Charles River over 4.2 miles) for Organic Enrichment (Sewage) Biological Indicators and Phosphorous – TMDL Number 40317.

Notes:

(1) The Town undertook a fecal bacteria study of Mill Brook (MA73-09) and the wetlands behind Bayberry Road as part of its 1998 Wastewater Management Planning. The laboratory data indicated fecal coliform (FC) levels ranged from non-detect to 40/100 mls and Fecal streptococci (FS) ranged from 340 to 990/100 mls. The FC/FS ratios were all well below 1.0 and indicate that fecal contamination of Mill Brook and the wetlands behind Bayberry Road is probably due to animal, rather than human wastes from on-site waste disposal system failures).

(2) The University of Massachusetts Boston and Charles River Watershed Association conducted biological monitoring along Stop River (MA72-10) in Medfield in 2012 and 2013. The ICI results from 2012 show this site as impacted in comparison to the other sites sampled with very poor performance in certain metrics including Scraper: Filterer, EPT Index, EPT: Chironomidae, and Reference Affinity.

The Town of Medfield Impaired Waterways are shown on Figure 1-2. The Neponset River has a completed TMDL for fecal coliform and enterococcus bacteria, and the Charles River has a completed TMDL for nutrients, phosphorous and pathogens.

While implementation of this program in the Town of Medfield will reduce pollution of the impaired waterways, extensive efforts will be required by all public and private dischargers into these waterways for impairments to be remedied. The impaired waterways receive polluted discharges from numerous communities beyond the scope of this Town program.

The Notice of Intent accepted by the EPA on April 12, 2019, requires the Town to follow the MS4 permit requirements in Part II of Appendix H for both the Neponset River and Charles River waterbodies, including the testing for phosphorus. In addition, for any impaired waterbody that has a TMDL, the applicable part in Appendix F will be followed for the testing of outfalls instead of the Appendix H requirements. In this IDDE, the Department must take additional steps to meet the TMDL requirements for the known outfalls that discharge directly to the Neponset River and Charles River. TMDLs are expressed in terms of waste load allocations (WLAs) for point sources and load allocations (LAs) for non-point sources and natural background levels. WLAs and LAs are the maximum allowable concentrations of fecal coliform bacteria that can be safely discharged in order to attain the Neponset River's water quality standards.

1.4.1.1 Neponset River TMDL

The Neponset River TMDL is associated with fecal coliform and bacteria. Table 2 summarizes the applicable WLAs and LAs for the Class B portions of the Neponset River and as described in the Neponset River TMDL:

Table 2 - Neponset River TMDLs

Fecal Coliform Waste Load Allocations (WLAs) and Load Allocations (LAs) for the Neponset River and Identified Tributary Streams			
Surface Water Classification	**Bacteria Source Category**	**WLA**	**LA**
		(organisms per 100 ml)	
B	Illicit Discharges to Storm Drains	0	N/A
B	Leaking Sanitary Sewers	0	0
B	Failing Septic Systems	N/A	0
B	Storm Water Runoff	GM < 200 90% < 400	GM < 200 90% < 400
B	Sanitary Sewer Overflows	0	0

1.4.1.2 Charles River TMDL

The upper and middle Charles River has completed TMDLs for nutrients and pathogens, and the broader Charles River has a TMDL for phosphorous. Table 3 summarizes the fecal coliform and phosphorous-related WLAs and LAs for the Class B portions of the Charles River, as described in the Charles River TMDLs:

Table 3 - Charles River TMDLs

Waste Load Allocations (WLAs) and Load Allocations (LAs) for the Upper to Middle Charles River and Identified Tributary Streams			
Surface Water Classification	**Bacteria Source Category**	**WLA**	**LA**
Fecal Coliform (organisms per 100 ml)			
B	Illicit Discharges to Storm Drains	0	N/A
B	Leaking Sanitary Sewers	0	N/A
B	Failing Septic Systems	N/A	0
B	Storm Water Runoff – Phase I and II	GM < 200 90% < 400	GM < 200 90% < 400
B	Sanitary Sewer Overflows	GM < 200 90% < 400	GM < 200 90% < 400
B	Nonpoint Source Stormwater Runoff	N/A	GM < 200 90% < 400
B	NPDES - WWTP Discharge	GM < 200 90% < 400	GM < 200 90% < 400
Dissolved Oxygen, Phosphorous and Chlorophyll-*a*			
B	Minimum daily dissolved oxygen	>5 mg/L	>5 mg/L
B	Maximum daily dissolved oxygen saturation	< 125%	< 125%
B	Mean daily total phosphorus in flowing waters	<0.1 mg/L	<0.1 mg/L
B	Mean daily total phosphorus on entering (including WWTP)	<0.05 mg/L	<0.05 mg/L
B	Mean daily total phosphorus in impounded reaches	<0.025 mg/L	<0.025 mg/L
B	Mean daily chlorophyll-a	< 10 µg/L	< 10 µg/L

1.5 PROGRAM ELEMENTS AND SCHEDULE

This IDDE Manual establishes a strategic, written plan to address illicit discharges to the MS4 or waters of the United States within the Town of Medfield. The following key components of the program are included in this Manual:

- SSO Inventory and Reporting (Section 2.2.2);
- System Mapping (Section 3);
- Outfall and Interconnection Screening (Section 4);
- Catchment Investigations (Section 5);
- Illicit discharge elimination (Section 6); and
- Training, Education and Reporting (section 7).

This IDDE Manual provides guidance to Department staff for implementation of the IDDE Program. The Manual will assist the Department with operations and capital budgeting each year and as a training tool for staff. It is noted that reissuance of a new MS4 Permit may necessitate modifications to this Manual to maintain compliance with applicable requirements.

The MS4 permit defines the required timeline for major tasks in implementing the Town's IDDE program as summarized in Table 4 below.

Table 4 - Required IDDE Program Schedule

IDDE Task	Permit Schedule
General	
Establish Adequate Legal Authority Over MS4	Due May 1, 2002
Written IDDE Program	Year 1 (June 30, 2019)
Eliminate Illicit Discharges or Make an Expeditious Plan for Elimination	Within 60 days of discovery
Training for all IDDE Staff	Annually
Tracking and Reporting IDDE Progress	Annually
SSO Inventory and Reporting	
Inventory of all SSO's that Occurred the Previous 5 years	Year 1 (June 30, 2019) & updated annually
Oral Notification to EPA and DEP of an SSO	24 hours from discovery
Written Notification to EPA and DEP of an SSO	5 days from discovery
System Mapping	
Phase 1 of System Mapping	Year 2 (June 30, 2020)
Phase 2 of System Mapping	Year 10 (June 30, 2028)
Outfall and Interconnection Screening	
Written Outfall & Interconnection Screening Procedure	Year 1 (June 30, 2019)
Initial Outfall & Interconnection Inventory and Ranking	Year 1 (June 30, 2019) & updated annually
Updated Outfall and Interconnection Ranking	Year 3 (June 30, 2021)
All Outfalls (High & Low Priority) Inspected In Dry Weather	Year 3 (June 30, 2021)
Revisit Outfalls w/Evidence of Illicit Discharge & No Flow	Within 1 week of initial inspection
Confirmatory Outfall and Interconnection Screening	Within 1 year of Illicit Discharge Removal
Catchment Investigations	
Written Catchment Investigation Procedure	18 Months (December 31, 2019)
Begin Investigations for Catchments With Problem Outfalls	Year 2 (June 30, 2020)
Complete Investigations of All Catchments Related to Problem Outfalls	Year 7 (June 30, 2025)
Complete All Catchment Investigations	Year 10 (June 30, 2028)

2. ACRONYMS AND DEFINITIONS

2.1 ACRONYMS

This IDDE Plan makes reference to the following acronyms:

CRWA – Charles River Watershed Association

CSO – Combined Sewer Overflow

DPW – Medfield Department of Public Works

EPA – U.S. Environmental Protection Agency.

GIS – Geographic Information System

IDDE – Illicit Discharge Detection and Elimination.

MAPC – Metropolitan Area Planning Council

MassDEP – Massachusetts Department of Environmental Protection.

MS4 – The Municipal Separate Storm Sewer System owned and operated by the Town.

MS4 Permit – The 2016 NPDES Phase II Municipal Separate Storm Sewer System Permit which took effect in July 1 2018 as issued by EPA to the Town.

NPDES – National Pollutant Discharge Elimination System: A permit to discharge pollutants to a waterbody under the federal Clean Water Act.

NRWA – Neponset River Watershed Association

NSP – The Neponset Stormwater Partnership. A regional collaboration of cities and towns who are cooperating on MS4 implementation activities.

SOP – Standard Operating Procedure

SSO – Sanitary Sewer Overflow: An overflow of untreated sanitary wastewater from a municipal sanitary sewer to a waterbody, a storm drain collection system, roadway or inside a building.

SWMP – Stormwater Management Program: A written document describing the Town's program to comply with the MS4 Permit requirements.

TMDL – Total Maximum Daily Load: A cleanup plan for a specific pollutant that is causing a violation of water quality standards in a particular waterbody.

2.2 KEY DEFINITIONS

2.2.1 Illicit Discharges

An illicit discharge is a direct or indirect discharge to the MS4 that is not composed entirely of storm water, except as exempted by EPA regulations. The term does not include a discharge in compliance with an NPDES Storm Water Discharge Permit or a Surface Water Discharge Permit, or resulting from fire-fighting or other public safety activities exempted pursuant to Section 13.10.080 of the Town of Medfield stormwater ordinance.

The EPA defines an illicit discharge as "any discharge to an MS4 that is not composed entirely of stormwater;" exceptions to the definition include those discharges regulated by a separate NPDES permit and allowable non-stormwater discharges that do not significantly contribute pollutants to the MS4. Examples of non-stormwater discharges considered allowable by the MS4 Permit include:

- Water line flushing,
- Landscape irrigation,
- Diverted stream flows,
- Rising ground waters,
- Uncontaminated groundwater 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 vehicle washing,
- Flows from riparian habitats and wetlands,
- Dechlorinated swimming pool discharges,
- Street wash water, and
- Residential building wash waters, without detergents.

Illicit discharges can enter the drainage system via direct connections or indirect discharges.

- A direct connection is any non-stormwater pipe connected to the storm drain system, such as pipe from a washing machine or floor drain, septic system overflow pipe, or an incorrectly connected sewer service from a house. Often, these types of discharges are continuous. Continuous discharges occur most or all of the time, are easier to detect, and typically produce the greatest pollutant load.

- An indirect discharge includes non-stormwater pollution from a wide variety of sources, such as sanitary sewer overflows (SSOs) or infiltration into the drainage system from failed sanitary sewer lines, hazardous waste spills collected by catch basins, illegal dumping of grass clippings, leaf litter, pet waste, or other solid material into the storm drain system. These discharges are commonly called intermittent or transitory. Intermittent discharges occur over shorter periods of time (a few hours a day or days per year) and because they are intermittent are harder to detect, but can still represent a serious water quality problem depending upon flow type. Transitory discharges occur rarely, usually in response to a single event such as an industrial spill, ruptured tank, sewer break or dumping incident, and are extremely hard to detect with routine monitoring, but under some conditions can result in severe water quality problems on downstream receiving waters.

Prohibited illicit discharges, under the MS4 Permit and local regulations, can result in violations and fines for MS4 operators and/or private owners of illicit connections. Additionally, illicit discharges can contribute to elevated levels of pollutants to surface water bodies, create unsafe swimming conditions, and potentially contaminate groundwater. When these pollutants enter water bodies, they hinder recreational activities, and harm wildlife habitats.

2.2.2 Sanitary Sewer Overflows

Action will be taken to eliminate all dry weather and wet weather Sanitary Sewer Overflows (SSOs) immediately upon discovery. If the SSO cannot be eliminated immediately, interim mitigation measures to minimize the discharge of pollutants to the MS4 and/or the environment will be taken, and elimination will be completed as soon as possible. [An Example SSO Emergency Response Plan is referenced in NSP Table 10. This BWSC document also contains example field manual emergency response plans and corrective measures. Table 10 also includes EPA resources such as the Wastewater Collection System Toolbox and the EPA Preventative Maintenance and Sewer Response Plan Template]

EPA and MassDEP will be notified of all SSOs by telephone or in writing as soon as possible once the Town becomes aware that an SSO has occurred and, at a minimum, within 24 hours of discovery. In addition, immediate notification may be needed to the local Board of Health, to any affected downstream water supply or swimming/recreation area operators, or via the MassDEP 24 hour hotline when hazardous waste or oil may be involved.

MassDEP 24 hour Hotline: 1-888-304-1133

Written notice of all SSOs will be provided to EPA and MassDEP within 5 days of discovery using the required MassDEP reporting form [a copy of which is referenced in NSP Table 10 in the SSO Reporting Forms Category]. Copies of the written report will be forwarded to other relevant parties as indicated on the MassDEP form. Copies of written reports are maintained on file.

The Town also maintains an inventory of all dry weather and wet weather SSOs as a part of this program. An inventory of all SSOs that occurred within 5 years prior to the effective date of the permit will be prepared within the first year of the MS4 Permit and will be updated at least annually as part of the annual report. The inventory is maintained in the Town's [insert location of SSO inventory, i.e. GIS, excel spreadsheet, town website, computer database, etc.]. The following information is collected and logged:

- Location (approximate address or intersection and receiving waterbody, if any);
- Clear statement of whether the discharge entered a surface water or storm drain;
- Start and end dates and times of SSO;
- Estimated approximate volume of the overflow;
- Description including known or suspected cause;
- Mitigation and corrective measures planned with implementation schedules;
- Date and description of mitigation and corrective actions taken;
- Current status of mitigation and corrective measures; and
- Copy of completed 5 day written report and documentation (if any) of 24 hour report (where available for older incidents).

A copy of the Town's SSO inventory template is referenced in NSP Table 10.

2.2.3 Other Definitions

The terms listed below are defined for the purposes of this Program. Additional definitions are provided in the Town's Non-Stormwater Discharge Ordinance (Section 13.10 of the Town Code of Ordinances); where conflict occurs, the more stringent definition shall apply.

Best Management Practice (BMP): An activity, procedure, restraint, or structural improvement that helps to reduce the quantity or improve the quality of stormwater runoff.

Catch Basin: A chamber or well, usually built to the curb line of a street, which admits surface water for discharge into a stormwater drain.

Catchment: A catchment is the area of land that drains to an individual outfall or interconnection. Each catchment has only one outfall, and each outfall has only one catchment.

Clean Water Act: The Federal Water Pollution Control Act (33 U.S.C. § 1251 et seq.) as hereafter amended.

Director: The Director of Public Works of the Town of Medfield or his/her authorized deputy, agent or representative.

Department of Public Works: The branch of government as defined in Chapter 2.36 of Town of Medfield Code of Ordinances authorized to manage and enforce the provisions of this program manual.

Discharge of Pollutants: The addition from any source of any pollutant or combination of pollutants into the municipal storm drain system or into the waters of the Commonwealth or the United States from any source.

DPW Director: The Medfield Department Public Works Director or their designee.

Flow: Stormwater or Groundwater.

Groundwater: Water beneath the surface of the ground.

Illicit Connection: An illicit connection is any connection to the MS4 that is not authorized and is causing or contributing to an illicit discharge.

Interconnection: Any point in the Town's MS4 system that discharges to another MS4 or other stormwater system not owned and operated by the Town, or where a drainage collection system owned by an entity other than the Town connects to the Town's MS4 infrastructure. Interconnections where an outside system discharges to the Town system may be referred to as incoming interconnections, and where the Town system discharges to an outside system it is referred to as outgoing interconnections.

Manhole: Sewer system structure typically made out of brick, concrete block, or monolithic concrete sections. Manholes have solid covers that do not accept runoff like a catch basin. Manholes within a storm sewer system are installed typically at bends in pipe runs, every 300 feet to 400 feet within a storm sewer pipe run, intersections of two or more pipe runs, and at the ends of pipe runs. Manholes allow for the cleaning and inspection of storm sewer systems. Manholes are typically 'fed' stormwater by catch basins and upstream storm sewer pipes.

Junction Manhole: Under the MS4 General Permit, 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.

Municipal Separate Storm Sewer System (MS4): 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 Medfield.

National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit: A permit issued by United States Environmental Protection Agency or jointly with the Massachusetts Department of Environmental Protection that authorizes the discharge of pollutants to waters of the United States.

Non-Stormwater Discharge: Discharge to the municipal storm drain system not composed entirely of stormwater.

Outfall: A point source at the point where a municipal separate storm sewer discharges to waters of the United States. Point source means a discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, (also bridge drains); this term does not include return flows from irrigated agriculture or agricultural stormwater runoff. An outfall is considered to be an end point of a storm drain collection system (pipe network, ditch, paved waterway, erosion channel, etc.) where stormwater is discharged to a waterway or wetland (i.e. waters of the U.S.). A point at which a closed pipe discharges to an open MS4 conveyance or an open structural BMP (i.e. closed pipe enters a detention basin or closed pipe enters a surface ditch) is not considered an outfall. In such cases the outfall is the point where the detention basin or ditch, or any closed piping downstream of them discharges to the environment. Similarly, the inlet and outlet of simple road culverts that convey a waterway under a road are not considered outfalls, though in many cases there are outfalls that discharge to waters of the US inside road crossing culverts. Throughout this document, the term "outfall" is used interchangeably to mean "outfall or outgoing interconnection." Furthermore, it should be noted that there are several Non-MS4 outfalls located within the Town of Medfield, which are not required to adhere to this Plan; the following instances are considered "Non-MS4 Outfalls":

- Outfalls discharging to isolated wetlands, which are not considered waters of the United States; and
- Outfall discharges that become non-point source (non-channelized) flow prior to reaching a jurisdictional water.

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

Stormwater: Stormwater runoff, snow melt runoff, and surface water runoff and drainage.

Stormwater Best Management Practice (BMP): A structural or nonstructural technique for managing stormwater to prevent or reduce nonpoint source pollutants from entering surface waters or ground waters. A structural stormwater best management practice includes a basin, discharge outlet, swale, rain garden, biofilter, or other stormwater treatment practice or measure either alone or in combination including without limitation any discharge pipe, overflow pipe, conduit, weir control structure that: (a) is not naturally occurring; (b) is not designed as a wetland replication area; and (c) has been designed, constructed, and installed for the purpose of

conveying, collecting, storing, discharging, recharging, or treating stormwater. Nonstructural stormwater best management practices include source control and pollution prevention measures.

Stormwater Management: The use of structural or non-structural practices that are designed to reduce stormwater runoff pollutant loads, discharge volumes, and/or peak flow discharge rates.

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

Waters of the Commonwealth: All waters within the jurisdiction of the Commonwealth, including, without limitation, rivers, streams, lakes, ponds, springs, impoundments, estuaries, wetlands, coastal waters, and groundwater.

Waters of the United States: All waters within the jurisdiction of the United States, including without limitations, river, streams, lakes, ponds, springs, impoundments, estuaries, wetlands, coastal waters and groundwater.

Wastewater: Any sanitary waste, sludge, or septic tank or cesspool overflow, and water that during manufacturing, cleaning or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct or waste product.

3. MUNCIPAL SEPARATE STORM SEWER SYSTEM MAP

The DPW has built a preliminary map of the Town's MS4 using available Geographic Information System (GIS) data and data collected during field investigations including both point infrastructure (outfalls, catch basins, interconnection, and manholes) and pipe connectivity. Catchments (i.e. areas draining to a MS4 outfall) have been delineated using the NSP model for the primary MS4 outfalls based on existing contour information and drainage pipe and flow patterns. Each catchment has a unique identification number and delineated for IDDE planning purposes only. These boundaries should not be used for hydrologic evaluation, or other catchment runoff modeling. This preliminary plan does not include small catchments comprised of only a few catch basins.

In addition to MS4 infrastructure, the Department's GIS database also includes point features and pipe connectivity of the separate sanitary sewer systems, which prioritizes areas for investigation. The Town of Medfield stormwater collection system, including outfalls, is provided as Figure 3-1.

3.1 CATCHMENT PRIORITIZATION

The Department and NSP conducted a priority ranking of the catchments tributary to Medfield MS4 outfalls, allowing resources to be focused in areas with the most significant potential for illicit discharges. Catchments have been prioritized and classified as one of the following: High, Medium, and Low Priority Catchments. This prioritization deviates slightly from the EPA recommended prioritization contained in the 2018 MS4 General Permit. The MAPC's Subcatchment Prioritization Procedures are provided in Appendix B.

The following are EPA definitions for prioritization categories:

- *Excluded Catchments*: Catchments 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. It is anticipated that only MS4 catchments within the Medfield State Hospital region of Medfield will be excluded under the definition stated here.
- *Problem Catchments*: Catchments with known or suspected contributions of illicit discharges based on existing information. These catchments do not require additional outfall screening and must be scheduled for further investigation as described in Section 5.1.
- *High Priority Catchments*: Catchments that are discharging to an area of concern to public health due to proximity of public swimming areas, recreational areas, drinking

water supplies; or catchments determined by the permittee as high priority based on outfall screening or with catchment characteristics as follows:

- 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;
- Historically combined sewer systems that were converted to separate sanitary sewer and stormwater systems;
- Sanitary sewer and storm drain infrastructure greater than 40 years old in medium and densely developed areas;
- Size of catchment area – Larger catchments carry greater volumes of runoff and have increased likelihood of contributing significant pollution to water bodies. Additionally, larger catchments, in combination with development density, are more likely to contain illicit discharges;
- Likelihood of primary or secondary contact recreation near outfall discharge locations – Human contact with contaminated discharges increases the risk of waterborne illnesses; and
- Stormwater outfalls discharging directly to impaired water bodies with an approved TMDL.

- *Low Priority Catchments*: Catchments determined by the permittee as low priority based on outfall/interconnection screening and catchment characteristics assessment.

For the 2019 IDDE Program Manual, drainage areas (i.e. catchments) discharging to "primary" MS4 outfalls were delineated for prioritization. Primary MS4 outfalls are outfalls servicing larger drainage areas with defined pipe network and at least several catchbasins. In future updates to this manual, outfall catchments will be refined and added to Town GIS as identified. Catchments have a unique ID consistent with the MS4 outfall ID. Each catchment was evaluated using the following available data to identify potential drain system vulnerability to cross contamination of illicit connections and the potential impact to impaired waters or public water supply areas:

- Drainage Area Size
- Drainage Area Land Use
- Parcel Density
- Sanitary Sewer Density
- Sanitary Sewer Crossings of Storm Drain
- Building Age

- Discharges to the Neponset River
- Discharges to the Charles River
- Discharges to Public Water Supply areas managed by the Town of Medfield

Additionally, recent locations of SSOs have been included for reference and will be considered for "Problem Catchment" category (as defined by EPA) in 2019 along with additional outfall/interconnection monitoring data. Each of the factors above was utilized for planning-level prioritization of the 167 "primary" MS4 discharges.

3.2 ASSESSMENT AND INITIAL RANKING OF OUTFALLS AND INTERCONNECTIONS

The Town of Medfield has mapped its MS4 outfalls and interconnections (incoming and outgoing) to other stormwater systems and has defined the preliminary boundaries of the catchment for each outfall or outgoing interconnection. Preliminary catchment delineations were developed using the MAPC Catchment Delineation Procedure. The outfalls locations are provided in Figure 3-1 and are shown in conjunction with the subcatchment map as Figure 3-2.

By the close of Permit Year 1, the NSP IDDE Prioritization Tool will be used to synthesize the GIS data provided by MAPC along with ambient water quality data and impaired waters data provided by the NRWA, MassDEP, along with local knowledge provided by the Town as detailed in the NSP IDDE Prioritization Tool.

Each of the outfalls and outgoing interconnections will be placed into one of the following categories based on available data and the weighting system built into the NSP IDDE Prioritization Tool:

Not Owned by Town – Outfalls or incoming interconnections which are not owned by the Town, but which have been mapped to validate the completeness of the outfall inventory and facilitate clear communication of responsibility and effective response in the event of any future discharges. These outfalls do not need to undergo outfall screening nor catchment investigation.

Not Waters of the U.S. – Outfalls which are owned by the Town, but which do not discharge to waters of the U.S., are not subject to the requirements of the MS4 Permit. These outfalls will be tracked in the Town's outfall inventory for consistency, but do not need to undergo outfall screening, or catchment investigation.

Excluded – Excluded outfalls and outgoing interconnections are those that have no potential for illicit discharges. They are located in undeveloped areas with no dwellings and no sanitary sewers; or serve drainage for athletic fields, parks, or undeveloped green space or associated parking without services; or are cross-country drainage alignments (that neither cross nor are in proximity to sanitary sewer alignments) through undeveloped land.

Problem – Problem outfalls and outgoing interconnections are those with known or suspected illicit discharges due to past credible complaints, departmental knowledge or previous screening. Problem outfalls may bypass the screening process and proceed directly to catchment investigation.

High Priority – High priority outfalls and outgoing interconnections are those that discharge to areas of concern to public health such as beaches, recreational areas, drinking water supplies or shellfish beds. They also include outfalls with catchments determined to have a high potential for sewage input based on outfall/interconnection screening results and catchment characteristics.

Low Priority – Low priority outfalls and outgoing interconnections include those that have been determined to have a low potential for sewage input based on outfall/interconnection screening results and catchment characteristics.

The Town's ranking process, as captured by the NSP IDDE Prioritization Tool, considers the following factors when ranking outfalls into and within the categories of problem, high priority and low priority, as required by the MS4 permit:

- Past discharge complaints and reports.
- Poor receiving water quality – the following guidelines are recommended to identify waters as having a high illicit discharge potential: exceeding water quality standards for bacteria; ammonia levels above 0.5 mg/l; surfactants levels greater than or equal to 0.25 mg/l.
- Density of generating sites – Generating sites are those places, including institutional, municipal, commercial, or industrial sites, with a potential to generate pollutants that could contribute to illicit discharges. Examples of these sites include, but are not limited to, car dealers; car washes; gas stations; garden centers; and industrial manufacturing areas.
- Age of development and infrastructure – Industrial areas greater than 40 years old and areas where the sanitary sewer system is more than 40 years old will probably have a high illicit discharge potential. Developments 20 years or younger will probably have a low illicit discharge potential.
- Sewer conversion – contributing catchment areas that were once serviced by septic systems, but have been converted to sewer connections may have a high illicit discharge potential.
- Historic combined sewer systems – contributing areas that were once serviced by a combined sewer system, but have been separated may have a high illicit discharge potential.

- Surrounding density of aging septic systems – Septic systems thirty years or older in residential land use areas are prone to have failures and may have a high illicit discharge potential.
- Culverted streams – any river or stream that is culverted for distances greater than a simple roadway crossing may have a high illicit discharge potential.
- Water quality limited waterbodies that receive a discharge from the MS4 or waters with approved TMDLs applicable to the permittee, where illicit discharges have the potential to contain the pollutant identified as the cause of the water quality impairment.

In order to conduct outfall screening in an efficient manner, the Town may choose to dry weather screen all outfalls along a given stream segment as a group. This will allow personnel to move quickly down the length of a single stream, and to collect a group of outfall screening samples that need to be tested for the same parameters based on stream impairments.

If so, in order to determine which stream segments will have their outfalls screened first, all outfalls (except excluded, not waters of the U.S. and not owned by town) are initially ranked individually as problem, high, and low using the NSP IDDE Prioritization Tool. The outfalls are then sorted by MassDEP stream segment (assessment unit). Streams with the highest number of outfalls rated as "high priority" will be screened first as detailed in the NSP IDDE Prioritization Tool.

The outfall inventory and ranking will be updated on an ongoing basis and at least annually as work on the IDDE program proceeds. The updated inventory and ranking will be included with each year's annual report.

4. ILLICIT DISCHARGE MONITORING PLAN

The following Monitoring Plan is based on prior efforts in the Department and considers potential new requirements as outlined in the 2018 MS4 Permit (issued for Massachusetts). This Plan primarily focuses on the detection of direct illicit connections in the Town's MS4, but also outlines procedures to address indirect illicit discharge connections when encountered.

This Plan outlines formalized procedures for opportunistic inspections, as well as targeted outfall screening and sampling. The Department will utilize the following illicit discharge detection strategies:

1. Utilize Town catch basin and drainage infrastructure cleaning process to conduct opportunistic inspections for illicit discharges. The Department currently performs a phased catch basin cleaning program that cleans all Town catch basins each year. Opportunistic inspections for illicit discharges conducted during infrastructure cleaning and maintenance will follow the protocol outlined in Section 4.1.2 and the SOP in provided in Appendix C.
2. Track SSOs discharging to the MS4, spills and intermittent discharges reported to the Department using the Town of Medfield Illicit Discharge Detection and Elimination Reporting Form in Appendix D.
3. Continue to rely on the Medfield Inspectional Services and Zoning Enforcement Officer to conduct private property investigations and maintain compliance with Massachusetts Plumbing Code.
4. Utilize right of entry granted to Department employees when violation of the Sewer or Illicit Discharge Ordinance (Section 4.1.3) are suspected.
5. Outfall screening and sampling assessment procedures described in Section 4.2 will be utilized to conduct wet-weather and dry-weather sampling and/or verify that illicit discharges identified during opportunistic inspections have been eliminated. The Town's Outfall Inspection form is provided in Appendix E.
6. Prioritization of catchment areas will use the factors outlined in Section 4.3. Catchment areas will be reassessed periodically, to update catchment boundaries and to refine prioritization based on inspection and sampling results from additional interconnection and outfall mapping refinements. After IDDE Program implementation, classification of all catchment areas will be reevaluated based on new field information to identify appropriate next steps and updates to this Manual.

4.1 DRAINAGE SYSTEM INSPECTION

The Town operates and maintains a municipal storm drainage system through its DPW, particularly for its 75 miles of paved roads and the three public facilities now covered under Phase II NPDES industrial permitting (the Transfer Station, Highway Garage and Wastewater Treatment Plant). The paved roads include former Massachusetts Highway Department (MHD)

roads that are now being maintained and permitted by the Town. These roads include Route 27 and Route 109.

To better understand its local watersheds, the Town has been developing a new Geographic Information System (GIS) map, based on a flyover of the Town conducted on April 15, 2001 and field reconnaissance of drainage structures. The mapping indicates that there are 2,331 catch basins, 167 (436) drainage outfall locations and numerous detention basins. In addition, there are 301,266 miles of drainage pipe in the Town.

4.1.1 Illicit Potential

The Town's wastewater needs are serviced by a separate sanitary sewer collection system that flows to the Medfield Waste Water Treatment Facility (WWTF) located off West Street in Medfield. There are several known septic systems within the Town boundary; however, there may be a small number of additional unidentified septic systems in the Town. While septic system discharges into the storm drain are negligible, the IDDE Program (in addition to other Town Sanitary Sewer programs) will help to identify and eliminate improperly functioning individual wastewater disposal systems over time.

The Town operates and maintains a sewer collection and treatment system through its Department of Public Works (DPW). The Town has an estimated 45 miles of sewer pipe. All sewage flows to the Charles River Interceptor that conveys wastewater to the Medfield Wastewater Treatment Plant located in the western portion of Town off Bridge Street. The plant was constructed in 1975 and is currently being upgraded. The current NPDES Permit for effluent discharges from the Wastewater Treatment Plant to the Charles River includes Biological Oxygen Demand (15 mg/l), Total Suspended Solids (15 mg/l), pH (6.5 to 8.3), Fecal Coliform (200 per 100 ml), Total Phosphorous (0.2 mg/l), Nitrates (10 mg/l), Total Ammonia (7.6 mg/l) and Dissolved Oxygen (not less than 6.0 mg/l).

The Department last completed a full Sewer System Evaluation Survey (SSES) in 2012 and has an on-going Infiltration and Inflow (I/I) reduction program. The Department's I/I program is designed to reduce sanitary sewer inflow through pipe and point repairs but has the ancillary benefit of reducing potential for exfiltration under surcharged sanitary sewer conditions. In compliance with the requirements of 314 CMR 12.04 - Item (2)(c)1 the Town of Medfield submitted the Medfield Annual Infiltration and Inflow (I/I) Reduction Report for Fiscal Year 2017 in December 2017.

4.1.2 Opportunistic Inspections

The Department's ongoing drainage-system maintenance activities (e.g. catch basin cleaning and maintenance, pipe flushing, etc.) provide the best screening opportunity to identify potential illicit discharges on an ongoing basis. The Department currently performs (through Public Works staff and contractors) catch basin inspection and cleaning throughout the year. Catch basin inspection and cleaning allows trained Department staff to visually inspect hundreds of

drainage structures for illicit connections each year. Additionally, the Department conducts periodic storm drain repair, flushing/jetting, and CCTV allowing other opportunities for opportunistic inspection.

Department staff will utilize the SOP for Illicit Discharge Opportunistic Inspections in Appendix C and conduct olfactory (odor) and visual inspections (color, turbidity, floatables, staining, and pipe benthic growth) consistent with Chapter 11 of the Center for Watershed Protection's Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments (2004). Digital catchbasin inspection forms contain fields indicating potential illicit discharge. Training is provided on illicit discharge detection procedures and is further described in Section 7.

4.1.3 Private Property Investigations

The Department's IDDE Program also relies on private property inspections to detect and eliminate potential illicit discharges into the MS4. The Medfield Inspectional Services and Zoning Enforcement Officer is the primary regulatory authority for building and plumbing code compliance. Additionally, the Town of Medfield Sewer and Drain Ordinances (Chapter 13.08, and 13.10 respectively) provides the Town with the ability to enforce private sewer lateral improvements to address Sanitary Sewer Overflows or indirect illicit connection issues.

4.2 OUTFALL AND INTERCONNECTION MONITORING

4.2.1 Priority MS4 Outfalls

The Department's primary method for detecting illicit discharges, not immediately identified via opportunistic or private property inspection, is through outfall monitoring, which includes both screening and sampling. For the purposes of this Plan, the term outfall may also refer to locations that may discharge into or from neighboring communities or adjacent MS4s (e.g. Massachusetts Department of Transportation [MA DOT], Department of Conservation and Recreation (DCR) and the Massachusetts Bay Transportation Authority (MBTA)) and are called interconnections.

In 2019, the Town identified priority MS4 outfalls for monitoring. The Department will target its monitoring (and mapping) activities at the MS4 outfalls listed in Table 5 – Summary of Priority MS4 Outfalls.

TABLE 5
Town of Medfield Priority Outfalls

													Field Screening					Test Kits or Lab Testing				Laboratory Testing			
No.	of_id	label	xy_loc_x_coord	xy_loc_y_coord	elev	map_date	qualifierl	property	recwatbod	priority	watershed	pH	Temp.	Spec. Cond.	D.O.	Turbidity	Ammonia	Chlorine	Salinity	Surfactants	Total Phos.	TSS	Fecal Col.	E-Coli
1	OF-1	ciP-2-O	717493.2	2901560.6	228.00	10-Dec-02	Near #64 Hartford Street (under driveway)	Private	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
2	OF-2	cB-2-O	708576.8	2893612	168.00	08-Oct-02	Small Bridge- North St. by StrawHat Bldg. (Bayer Co.)	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
3	OF-3	cP-2-O	715925.5	2895648.7	170.41	08-Oct-02	Northerly of Millbrook Road (#38 & #41)	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
4	OF-4	cP-104-O	706052.6	2892114.2	120.50	04-Dec-02	Near # 658 Main Street	Private	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
5	OF-5	cmP-5-O	704330	2898142	130.03	15-Oct-02	Harding Street near # 58	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
6	OF-6	cP-99-O	710128.7	2883268.3	151.00	04-Dec-02	Near #290 South Street & #3 Noonhill Road	Town	Stop River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
7	OF-7	cP-120-O	708334.9	2893368.3	165.00	11-Dec-02	Frairy Street (into Pond)	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
8	OF-8	cP-78-O	706137.7	2903545.1	199.00	07-Nov-02	Near #9 & #11 Donnelly Drive (in woods by Dover Line)	Private	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
9	OF-9	cP-86-O	710065.4	2900033.4	217.00	07-Nov-02	Near #100 Pine Street	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
10	OF-10	cP-94-O	718460.4	2901518.8	212.00	08-Nov-02	Near #97 Hartford Street	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
11	OF-11	cP-59-O	702375.9	2900280.1	156.00	04-Nov-02	#29 Hospital Rd.	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
12	OF-12	cP-67-O	707074.4	2897323.9	175.50	04-Nov-02	Corner of Winter & North, from 1st DMH to #29 Outlet	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
13	OF-13	cP-100-O	711887.5	2880510.3	119.50	04-Dec-02	Near #11 & #12 Lakewood Drive	Town	Stop River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
14	OF-14	cP-119-O	708461.4	2893481.6	165.00	11-Dec-02	Frairy Street (into Pond)	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
15	OF-15	cmP-11-O	716677.2	2896967.7	186.00		Main St. and Wood End Lane	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
16	OF-16	cP-73-O	711326.2	2890089.1	137.50	05-Nov-02	Near #140 & #142 South Street	Unknown	Nantasket Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
17	OF-17	cP-81-O	709201.6	2900503.6	208.50	07-Nov-02	Near #80 Pine Street	Private	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
18	OF-18	cP-38-O	713938.6	2896445.1	222.00	24-Oct-02	Near #215 Main Street	Town	Unknown	TBD	TBD	x	x	x	x	x	x	x	x	x	TBD	x	TBD	TBD
19	OF-19	cP-65-O	705522.1	2897449.6	137.00		At driveway to #50 Harding Street	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
20	OF-20	cP-46-O	712882.4	2902138.2	246.00	28-Oct-02	Near #11 Quail Run	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
21	OF-21	cB-17-O	706801.4	2901826.2	154.00	28-Oct-02	Near Guardrails and #8 Farm St.	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
22	OF-22	cP-60-O	702373	2900282.3	158.50	04-Nov-02	#29 Hospital Rd.	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
23	OF-23	cP-17-O	717182.8	2897617.4	199.00	15-Oct-02	Main Street near # 22 & #70	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
24	OF-24	cB-25-O	707372.2	2899524.3	176.00		Near wood fence of #251 North Street	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
25	OF-25	cP-52-O	703920.7	2895076.3	139.00	28-Oct-02	Near Guardrails at N. Meadows Rd. and West St.	Town	Turtle Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
26	OF-26	cP-25-O	716030	2898638.5	213.00	24-Oct-02	Hartford Street near # 28	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
27	OF-27	cP-31-O	715688.2	2897769.6	207.00		Hartford Steet across from #14	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
28	OF-28	cB-12-O	709115.7	2880027.8	113.00	15-Oct-02	South Street near Indian Hill Road	Town	Stop River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
29	OF-29	cB-20-O	708660.3	2902754.4	191.00	05-Nov-02	Under driveway for #325 North Street	Private	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
30	OF-30	cP-20-O	709423.9	2893946.4	180.72	15-Oct-02	Bayer Co. Property- Brook Street side	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
31	OF-31	cB-7-O	715130.4	2891821.2	157.00	15-Oct-02	Philip Street	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
32	OF-32	cP-7-O	715483.2	2884577.8	174.76	04-Dec-02	High Street/Rte. 27	Town	Flynns Pond	2	Neponset	x	x	x	x	x	x	x	x	x		x	x	
33	OF-33	cP-101-O	711880.5	2880495.6	119.50	04-Dec-02	Near #11 & #12 Lakewood Road	Town	Stop River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
34	OF-34	cB-3-O	706533.2	2890438.3	120.00	10-Dec-02	Between #28 & #53 Causeway Street (West side)	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
35	OF-35	pIP-7-O	701442.3	2900596.6	160.00	19-Dec-02	Across street from State Hospital	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
36	OF-36	cP-3-O	715921.5	2895647.7	170.49	08-Oct-02	Northerly of Millbrook Road (#38 & #41)	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
37	OF-37	cP-108-O	710125.1	2894485	174.00	10-Dec-02	Near #1100 Wilkins Glen Road & Boiler Room	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
38	OF-38	cP-116-O	708499.4	2893500.7	163.00	11-Dec-02	Frairy Street (going into pond)	Town	Unknown	TBD	TBD	x	x	x	x	x	x	x	x	x	TBD	x	TBD	TBD
39	OF-39	cmP-27-O	707456.9	2902834.2	170.00		Near #310 & #314 North Street	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
40	OF-40	cP-124-O	710944.1	2887594.1	132.00	08-Oct-02	Near #195 South Street at Route 27	Town	Nantasket Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
41	OF-41	cmP-7-O	704602.3	2883265.6	166.00	10-Dec-02	Near #20 Causeway Street (at Harris Residence)	Private	Holt Pond	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
42	OF-42	cmP-2-O	707176	2893323.4	140.00		Easterly Side of Route 27 (North Meadow)	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
43	OF-43	cP-88-O	707383.5	2897101.1	178.00	08-Nov-02	In woods behind #9 Winter Street	Private	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
44	OF-44	cP-69-O	710580	2888742.9	118.00	05-Nov-02	Near #153 Spring Street	Town	Nantasket Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
45	OF-45	cP-75-O	711595.4	2887376.8	136.00	05-Nov-02	Near #2 Homestead Drive	Town	Great Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
46	OF-46	cP-83-O	706742.3	2900434.1	153.00	07-Nov-02	Lot #65-001	Private	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
47	OF-47	cP-91-O	708042.3	2896259.4	175.50	08-Nov-02	Near #12 and #19 Pine Street	Unknown	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
48	OF-48	cP-56-O	704533.2	2900820.7	132.50	04-Nov-02	#11 & #15 Marilyn Road (in Drain Easement)	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
49	OF-49	cP-48-O	706797.8	2901829	158.00	28-Oct-02	Near #8 Farm St. & box culvert	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
50	OF-50	cP-54-O	704366.9	2895602.9	144.00		Near #55 West St.	Town	Turtle Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
51	OF-51	cP-62-O	702351.3	2899545.3	139.00	04-Nov-02	Near Warren Field	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
52	OF-52	cP-27-O	715911.9	2898381.4	211.00	24-Oct-02	Hartford Street near #22	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
53	OF-53	cP-19-O	705115.8	2885185.2	142.00	31-Oct-02	Noon Hill Street near Reservation	Town	Saw Mill Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x	TBD	TBD
54	OF-54	cP-43-O	714045.4	2903425.2	245.00		Near # 3 Steeplechase Drive	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
55	OF-55	cP-70-O	710837	2888020.1	120.50	05-Nov-02	Near Spring & South St. intersection	Town	Great Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
56	OF-56	cB-19-O	705760.7	2897632.1	142.00	04-Nov-02	Near #3 Wight Street	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
57	OF-57	cB-27-O	716585.4	2902451.9	247.00	10-Dec-02	Near #64 Hartford Street & Rocky Woods Reservation	Town	Chickering Lake	3	Neponset	x	x	x	x	x	x	x	x	x		x	x	
58	OF-58	cP-41-O	707372	2899527.6	176.00	11-Dec-02	Across street from #251 North Street	Town	Winter Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
59	OF-59	cB-14-O	709618.6	2882869.5	110.00	15-Oct-02	South Street to Noon Hill Street	Town	Stop River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
60	OF-60	cP-14-O	716862.9	2883266.7	170.00	15-Oct-02	High Street near #144	Town	Flynns Pond	2	Neponset	x	x	x	x	x	x	x	x	x		x	x	
61	OF-61	cP-105-O	708185.1	2896308	178.00	03-Dec-02	Near #13 Pine Street	Private	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
62	OF-62	cP-22-O	716208.5	2899040.5	215.00	24-Oct-02	Hartford Street near # 36, under driveway	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
63	OF-63	cB-22-O	706532.3	2892672.1	132.00	11-Dec-02	Cemetery	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x

TABLE 5
Town of Medfield Priority Outfalls

													Field Screening					Test Kits or Lab Testing				Laboratory Testing			
No.	of_id	label	xy_loc_x_coord	xy_loc_y_coord	elev	map_date	qualifierl	property	recwatbod	priority	watershed	pH	Temp.	Spec. Cond.	D.O.	Turbidity	Ammonia	Chlorine	Salinity	Surfactants	Total Phos.	TSS	Fecal Col.	E-Coli
64	OF-64	cB-8-O	715098.8	2892879.9	165.50	15-Oct-02	Nebo Street	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
65	OF-65	cP-8-O	708842.1	2893762.1	169.39	15-Oct-02	Bayer Co. Prop. - between Brook St & North St (under Bld)	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
66	OF-66	cP-113-O	708247.5	2893207.1	166.00		Near #18 Frairy Street (at inlet of cmP-1)	Town	Unknown	TBD	TBD	x	x	x	x	x	x	x	x	x	TBD	x	TBD	TBD
67	OF-67	cP-121-O	704315.2	2893057.4	131.00	19-Dec-02	Yard between #32 & #36 Bridge Street	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
68	OF-68	cmP-12-O	716675.3	2896969.3	186.00		Main St. and Wood End Lane	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
69	OF-69	cP-128-O	714014.3	2903428.5	243.00	19-Dec-02	#3 Steeplechase Drive	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
70	OF-70	cmP-9-O	703646.4	2897259.3	125.00	15-Oct-02	West Mill Street @ Adams Street	Town	Turtle Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
71	OF-71	cmP-4-O	706310	2892398.3	125.00		Main Street/Rte. 109	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
72	OF-72	cP-98-O	711299.7	2897948.2	213.50	08-Nov-02	Near #31 Partridge Street	Private	Parkers Pond	3	TBD	x	x	x	x	x	x	x	x	x	TBD	x		x
73	OF-73	cP-102-O	708752.9	2879909.3	116.00	04-Dec-02	Near #1 Indian Hill Road	Town	Stop River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
74	OF-74	cP-79-O	706137.6	2903545	199.00	07-Nov-02	Near #9 & #11 Donnelly Drive (in woods by Dover Line)	Private	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
75	OF-75	cP-110-O	709058.2	2894996.5	174.00	10-Dec-02	Near #46A Green Street	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
76	OF-76	pvcP-2-O	708185.4	2896309.8	179.00	03-Dec-02	Near #13	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
77	OF-77	cP-77-O	712955.3	2886420.1	179.00	05-Nov-02	Near #9 Wild Holly Lane	Town	Great Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
78	OF-78	cP-93-O	718459.4	2901518.6	212.00	08-Nov-02	Near #97 Hartford Street	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
79	OF-79	cP-58-O	704536.2	2901036.2	139.50		#2 Fox Lane	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
80	OF-80	cP-85-O	710064.7	2900030.8	217.00	07-Nov-02	Near #103 Pine Street and Pole #48	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
81	OF-81	cP-109-O	710182.4	2894429.7	175.00	10-Dec-02	Near #1100 Wilkins Glen Road & Boiler Room	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
82	OF-82	cP-64-O	707069.1	2897324.1	175.50	04-Nov-02	Corner of Winter & North- near #5	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
83	OF-83	cP-29-O	715766	2898058.5	209.50	24-Oct-02	Hartford Street near #16	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
84	OF-84	cP-72-O	710835.3	2888027.3	122.00	05-Nov-02	Near Spring & South St. intersection	Unknown	Great Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
85	OF-85	cP-37-O	714669	2895616.4	188.00	24-Oct-02	Near #5 & #7 Ledgetree Road	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
86	OF-86	cP-80-O	711026.3	2901174.9	225.00	07-Nov-02	In front of #138 Pine Street	Private	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
87	OF-87	cP-45-O	712877.7	2902148.1	246.00	29-Oct-02	Near #11 Quail Run	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
88	OF-88	cP-117-O	708548.1	2893579.7	173.00	11-Dec-02	Near #30 North Street & Meeting Pond (to inlet of cmP-3)	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
89	OF-89	cmP-28-O	708042.4	2896263.2	175.50	08-Nov-02	Near #12 & #19 Pine Street	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
90	OF-90	cB-16-O	714028.8	2903427	244.00	28-Oct-02	Near # 3 Steeplechase Drive	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
91	OF-91	cP-51-O	703805.6	2895144.8	132.00	28-Oct-02	Rick's Auto Body & West St/N. Meadows intersection	Town	Turtle Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
92	OF-92	cB-24-O	707450.2	2899330.6	178.00	11-Dec-02	At driveway to #251 North Street	Private	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
93	OF-93	cP-32-O	715588.3	2897558.7	207.00		Hartford Steet near #8	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
94	OF-94	cP-125-O	710918.8	2887700.7	131.00	19-Dec-02	Near #195 South Street	Town	Nantasket Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
95	OF-95	cP-24-O	716093.9	2898783.3	213.00	24-Oct-02	Hartford Street near #30	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
96	OF-96	cP-16-O	715676.8	2897328.5	205.50	15-Oct-02	Main Street near #112	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
97	OF-97	cB-9-O	702470	2882123.5	147.00	15-Oct-02	Causeway Street and Orchard Street	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
98	OF-98	cP-30-O	715655.8	2897814.4	207.50	24-Oct-02	Hartford Street near #14	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
99	OF-99	cB-11-O	705723.4	2887925.3	110.00	15-Oct-02	Causeway Street	Town	Stop River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
100	OF-100	cP-11-O	703556.9	2896927.2	131.08		West Mill Street	Town	Turtle Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
101	OF-101	cB-4-O	707979.3	2893102.1	158.00	15-Oct-02	Westerly Side of Railroad (North Street area)	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
102	OF-102	cP-4-O	716192.1	2896349.7	171.68	08-Oct-02	Easterly of Millbrook Road @ Wood End Lane	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
103	OF-103	ciP-1-O	710836	2888024.3	122.50	05-Nov-01	Near Spring & South St. intersection	Unknown	Great Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
104	OF-104	pIP-6-O	709463.7	2893963.4	172.00	10-Dec-02	Near #15 Brook Street	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
105	OF-105	cP-106-O	706364.9	2892515.6	129.00	04-Dec-02	Near #643 Main Street	Unknown	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
106	OF-106	cP-114-O	708184.1	2893177.3	166.00	10-Dec-02	Near #18 Frairy Street (at outlet of cmP-1)	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
107	OF-107	cmP-6-O	717175	2901347.5	225.00	10-Dec-02	Near #64 Hartford Street & Rocky Woods Reservation	Town	Chickering Lake	3	Neponset	x	x	x	x	x	x	x	x	x		x	x	
108	OF-108	cmP-25-O	712408	2884572.9	194.00		Near #42 Granite Street	Town	Great Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
109	OF-109	cP-122-O	703894	2893282.8	132.00	19-Dec-02	Yard between #42 & #44 Bridge Street	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
110	OF-110	cP-87-O	707426	2900034	193.00	07-Nov-02	Near corner of Deerfield and North Streets	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
111	OF-111	cP-68-O	710576.6	2888750	118.00	05-Nov-02	Near #153 Spring Street	Town	Nantasket Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
112	OF-112	cP-129-O	701391.1	2900589.7	158.00		Across street from State Hospital	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
113	OF-113	cP-66-O	707070.4	2897281.6	176.50	04-Nov-02	Corner of Winter & North- near #5 (by cP-64-O)	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
114	OF-114	cP-74-O	713387	2890136.4	156.00	05-Nov-02	Near #13 Grace Dr.	Private	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
115	OF-115	cP-39-O	713698.1	2896321	220.00	24-Oct-02	Near Sunoco Station and Shopping Center	Town	Unknown	TBD	TBD	x	x	x	x	x	x	x	x	x	TBD	x	TBD	TBD
116	OF-116	cP-90-O	708042.5	2896267	175.50	08-Nov-02	Near #19 Pine Street	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
117	OF-117	cP-82-O	709201.5	2900509.5	208.50	07-Nov-02	Near #80 Pine Street	Private	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
118	OF-118	cP-47-O	712886.9	2902128.8	246.00	28-Oct-02	Near #11 Quail Run	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
119	OF-119	cP-55-O	705812.6	2894251.3	165.00	28-Oct-02	#55 North Meadows Rd. (Town of Medfield Garage)	Town	Turtle Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
120	OF-120	cB-18-O	706831.9	2897567.9	173.50	04-Nov-02	In the woods of Hse. #208 North Street	Private	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
121	OF-121	cP-18-O	717188.4	2897616.4	200.00		Main Street near # 22 & #70	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
122	OF-122	cP-53-O	704059.4	2894976.7	142.00		Corner of N. Meadows Rd/West St., across from Vet Clinic	Town	Turtle Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
123	OF-123	cP-26-O	715963.6	2898498.7	211.00	24-Oct-02	Hartford Street near #24	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
124	OF-124	cB-26-O	716540.5	2902946.3	307.00	10-Dec-02	Near #64 Hartford Street & Rocky Woods Reservation	Town	Chickering Lake	3	Neponset	x	x	x	x	x	x	x	x	x		x	x	
125	OF-125	cP-61-O	702378.4	2900278.1	158.50	04-Nov-02	#29 Hospital Rd.	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
126	OF-126	cP-40-O	706407.5	2903307.3	190.00	28-Oct-02	Near #10 Donnelly Drive (in front yard)	Private	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x

TABLE 5
Town of Medfield Priority Outfalls

												Field Screening					Test Kits or Lab Testing				Laboratory Testing			
No.	of_id	label	xy_loc_x_coord	xy_loc_y_coord	elev	map_date	qualifierl	property	recwatbod	priority	watershed	pH	Temp.	Spec. Cond.	D.O.	Turbidity	Ammonia	Chlorine	Salinity	Surfactants	Total Phos.	TSS	Fecal Col.	E-Coli
127	OF-127	cB-13-O	715123	2892737.2	163.00	15-Oct-02	Foundry Street and Nebo Street	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
128	OF-128	cP-13-O	717008.6	2883175	166.00	15-Oct-02	Jorie Lane & High Street	Town	Flynns Pond	2	Neponset	x	x	x	x	x	x	x	x	x		x	x	
129	OF-129	cB-21-O	716841.9	2883439.9	165.00	04-Dec-02	Near entrance to Starmont Farm	Town	Flynns Pond	2	Neponset	x	x	x	x	x	x	x	x	x		x	x	
130	OF-130	cP-21-O	708956.5	2893789.5	169.00	15-Oct-02	Janes Ave. @ Entrance to Bayer Parking Lot	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
131	OF-131	cP-103-O	708759.2	2879905.6	116.00	04-Dec-02	Near #1 Indian Hill Road	Town	Stop River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
132	OF-132	cP-111-O	709477.6	2893951.9	169.50	10-Dec-02	Near #15 Brook Street	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
133	OF-133	cB-5-O	715143.2	2889540.8	152.82	15-Oct-02	Southerly Side of Elm Street	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
134	OF-134	cB-1-O	708746.9	2893749.4	168.50	11-Dec-02	Bldg. #1 of Bayer Co.	Private	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
135	OF-135	pIP-3-O	707292.4	2900498.5	186.00	07-Nov-02	Across from #277 & #279	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
136	OF-136	cIP-1-O	703583.1	2897021.7	128.70	15-Oct-02	Adams Street	Town	Turtle Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
137	OF-137	cmP-10-O	715530.3	2897438.2	207.00		Near #8 Hartford Street	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
138	OF-138	cP-1-O	715929.3	2895649	170.42	08-Oct-02	Northerly of Millbrook Road (#38 & #41)	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
139	OF-139	cP-118-O	708543.3	2893586.9	173.00	11-Dec-02	Near #30 North St & Meeting Pond (NE side of North St)	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
140	OF-140	cmP-29-O	711884.8	2880504.7	118.50	04-Dec-02	Near #11 & #12 Lakewood Drive	Town	Stop River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
141	OF-141	pIP-1-O	702738.3	2900093.9	169.00	04-Nov-02	Directly across from #29 Hospital Road	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
142	OF-142	cP-126-O	710180.1	2889844.7	132.00	19-Dec-02	Church (across the street)	Town	Nantasket Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
143	OF-143	cmP-8-O	715670.9	2897325.6	205.00	15-Oct-02	Main Street near # 112	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
144	OF-144	cmP-3-O	708502.5	2893500.2	160.00	11-Nov-02	30 North Street & Meeting Pond (into pond)	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
145	OF-145	cP-89-O	704354.4	2893108.4	135.50	08-Nov-02	In CB in front yard of #33 Bridge Street	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
146	OF-146	cP-76-O	711601	2887381.6	141.00	05-Nov-02	Near #2 Homestead Drive	Town	Great Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
147	OF-147	cP-49-O	706803.6	2901824.5	155.00	28-Oct-02	Near #8 Farm St. & box culvert	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
148	OF-148	cP-57-O	704537.2	2900822.8	132.50	04-Nov-02	#11 & #15 Marlyn Road	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
149	OF-149	cP-92-O	711186.4	2897137.5	203.50	08-Nov-02	Near #11 Morse Drive	Town	Parkers Pond	3	TBD	x	x	x	x	x	x	x	x	x	TBD	x	TBD	TBD
150	OF-150	cP-63-O	707009.5	2897458.1	173.50	04-Nov-02	Intersection of North & Winter- near #212	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
151	OF-151	cP-28-O	715835.4	2898226.9	209.50	24-Oct-02	Hartford Street near #18	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
152	OF-152	cP-71-O	710838.3	2888014.5	122.00	05-Nov-02	Near Spring & South St. intersection	Unknown	Great Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
153	OF-153	cP-44-O	712873.5	2902156.8	246.00	28-Oct-02	Near #11 Quail Run	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
154	OF-154	cB-28-O	717226	2897702.9	207.00		Near #22 & #70 Main Street	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
155	OF-155	cP-36-O	714981.2	2895730.3	191.00	24-Oct-02	Near #15 Nebo Street	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
156	OF-156	cP-107-O	706336.3	2892521.4	135.00	04-Dec-02	Near #1 Tannery Lane	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
157	OF-157	cP-42-O	706646.9	2903262.9	177.00	25-Oct-02	Across Donnelly Drive, between #9/#11 & #10/#12	Town	North Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
158	OF-158	cP-50-O	705466.2	2902594.9	178.50	28-Oct-02	Between #2 & #6 Hickory Drive	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
159	OF-159	cB-23-O	707223	2899688	172.00	11-Dec-02	In field across the street from #251 North Street	Private	Winter Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
160	OF-160	cB-15-O	706944.3	2892956.9	140.00	15-Oct-02	Cemetery	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
161	OF-161	cP-15-O	716863.4	2883265.9	170.00	15-Oct-02	High Street near #144	Town	Flynns Pond	2	Neponset	x	x	x	x	x	x	x	x	x		x	x	
162	OF-162	cmP-26-O	713192.5	2883506.5	191.00		Near #70 Granite Street	Town	Brook I	TBD	TBD	x	x	x	x	x	x	x	x	x	TBD	x	TBD	TBD
163	OF-163	cP-23-O	716143.8	2898901.6	215.00	24-Oct-02	Hartford Street near #34	Town	Mill Brook	1	Neponset	x	x	x	x	x	x	x	x	x		x	x	
164	OF-164	cP-115-O	706828.4	2893042.3	140.00	11-Dec-02	In Cemetery (going into pond)	Town	Vine Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x
165	OF-165	cP-123-O	703740.4	2893537.9	139.00	19-Dec-02	Yard between #48 & #52 Bridge Street	Town	Charles River	1	Charles	x	x	x	x	x	x	x	x	x	x	x		x
166	OF-166	cB-10-O	703628.5	2897335.7	123.00	15-Oct-02	West Mill Street	Town	Turtle Brook	3	Charles	x	x	x	x	x	x	x	x	x	x	x		x

4.2.2 Outfall and Interconnection Inspections

Outfall and interconnection inspections consist of screening and sampling. Screening includes a rapid visual and olfactory inspection consistent with Chapter 11 of the Center for Watershed Protection's *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments* (2004). Inspections are documented on an Outfall Inspection Form; see example form in Appendix E.

Both dry-weather and wet-weather screening may be necessary to effectively monitor outfalls and interconnections for illicit discharges. For the purposes of this Plan, dry-weather conditions consist of no more than 0.1 inches of rainfall in the previous 48-hour period and no significant snowmelt. Wet-weather conditions should consist of at least 0.25 inches of rainfall within the preceding 24-hour period and conducted in the spring (March through June); however, precipitation events sufficient to produce any flow in outfalls will also be acceptable for this Plan.

Base flow in storm drain systems is common and can be present at any time of year due to shallow groundwater infiltration. Since cleaner groundwater flows may dilute sewage and mask its presence, it is recommended, in general, that dry weather outfall and interconnection screening investigations are conducted during periods when groundwater infiltration will be minimized. Coordination with the Medfield Water, Sewer and Drain Division staff will be necessary to confirm that dry weather flows present are not the result of hydrant flushing.

If flow is observed during screening, two samples are collected from the outfall (or if the outfall is inaccessible, the nearest accessible upstream drainage structure) in accordance with EPA's Draft Bacterial Source Tracking Protocol (2012), which is included for reference in Appendix F. One sample is analyzed in the field for ammonia, chlorine, and surfactants; the other sample is submitted to a MA-certified laboratory to be analyzed for Enterococcus bacteria. Benchmark concentrations, instrumentation, and analytical methods used for stormwater sampling are included in Table 4-2 – Sampling Guidelines for Water Quality Indicator Parameters. If flow is not observed during screening, the non-flowing condition is noted on the Outfall Inspection Form and no sample is collected.

4.3 DRY WEATHER OUTFALL AND INTERCONNECTION SCREENING AND SAMPLING

Dry weather screening/sampling will be conducted at each of the Town's outfalls and at any outgoing interconnections with other stormwater systems, except for problem, excluded, [not waters of the US, and not Town owned] outfalls. The dry weather screening consists of a series of qualitative field observations along with field and/or lab analysis of selected water quality parameters where outfalls are discharging during dry weather. As described above, in the interest of efficiency, dry weather screening will be completed for an entire waterbody or stream segment at once in the order established during the initial outfall ranking described above. Dry

weather outfall screening will be completed by the end of permit year three, and copies of all screening data collected through the program will be included with each annual report.

Field screening will initially focus on discharges to Category 5 Section 303.d waters with TMDLs and located within the Town's aquifer protection area. For the Town of Medfield these include:

- Neponset River Watershed: Mine Brook (Outlet of Jewells Pond to Walpole town line over 3 miles) for Fecal Coliform, Dissolved Oxygen – TMDL Number 2592
    - Testing of the outlet of Mine Brook itself per General Permit Part II Appendix H criteria for phosphorous.
- Charles River Watershed: Stop River (Norfolk-Walpole MCI in Norfolk to the confluence with the Charles River over 4.2 miles) for E-coli – TMDL Number 32372.
- Charles River Watershed: Stop River (Norfolk-Walpole MCI in Norfolk to the confluence with the Charles River over 4.2 miles) for Organic Enrichment (Sewage) Biological Indicators and Phosphorous – TMDL Number 40317.

Thereafter, the field screening and analytical testing will include the non-TMDL Category 5 Section 303.d waters inside the aquifer protection area. This includes:

- Neponset Watershed: Mill Brook (headwaters north of Hartford Street to inlet of Jewells Pond over 2.3 miles) for low flow alteration, Aquatic Macroinvertebrate Bioassessments, Dissolved Oxygen – No TMDL developed.
    - Testing of the outlet of Mill Brook itself per General Permit Part II Appendix H criteria for phosphorous.

Then followed by the Category 3 (No Uses Assessed) waterbody:

- Neponset River Watershed: Flynn's Pond (7 acres)

It is noted that •Jewell's Pond (4 acres) is privately owned and has been flagged as a Category 4c water for non-native aquatic plants.

4.3.1 Weather and Scheduling

Dry weather outfall / interconnection screening will take place only when less than 0.1 inches of rainfall has occurred in the previous 24-hr period and no snow melt is occurring. However, where possible, dry weather screening will occur after 48-72 hours with no precipitation or runoff. Weather conditions will be monitored using data available from the Blue Hills or Norwood Airport weather station or a combination of both.

Scheduling will also be based on the availability of laboratory services. In particular E.coli samples must be delivered to the lab within six hours, and the lab analysis must be completed by reading the samples 24 hours after testing has begun. Thus, in most cases sampling will take place in the morning so that samples can be processed by the lab in the afternoon, and sampling will take place Monday through Thursday unless the selected lab is open on Saturday.

Where feasible, dry weather screening will be completed in the spring and early summer (March through June) to help ensure that smaller illicit discharges that might not reach the outfall during drought periods are also identified.

4.3.2 Field Data Collection

When performing dry weather screening in the field, the Town's outfall screening procedure is followed and a paper or digital outfall inspection form is filled out in the field. See Table 10 for references to these documents. The following data is captured at a minimum for each outfall and interconnection:

- Unique Identifier Outfall ID;
- Receiving water;
- Date of most recent inspection;
- Dimensions;
- Shape;
- Material;
- Spatial location (GPS coordinates);
- Physical condition; and
- Indicators of potential non-stormwater discharges, including presence or evidence of suspect flow and sensory observations such as odor, color, turbidity, floatables, or oil sheen. Photographs will be collected if deemed applicable.

If flow is observed at the outfall or interconnection manhole during dry weather screening, a sample is taken for analysis as further described under "Outfall / Interconnection Sample Analysis" below. Submerged or inaccessible outfalls will be sampled from the first accessible upstream manhole or access structure and the actual location of sampling will be noted.

If no flow is observed, but there is evidence of illicit dry weather flow such as toilet paper, soap bubbles, fine gray residue, excessive algae on the outfall or odors of sewage or soap, the outfall will be visited again during dry weather within one week of the initial investigation (weather permitting) and sampled if found to be flowing. If the outfall continues to be suspected of containing illicit discharges in spite of a lack of flow during dry weather visits, alternative testing

procedures such as multi-day optical brightener collection may be deployed, or the outfall will be ranked in the high priority category for catchment investigation.

If in the course of conducting dry weather screening additional Town-owned outfalls are encountered, such as non-piped discrete conveyances, paved waterways and stormwater erosion channels, the Town's mapping and outfall inventory will be updated to include these outfalls and they will be screened.

While not required to do so by the MS4 permit, the Town may elect to inspect privately owned outfalls which it encounters during the dry weather screening process, and if found to be flowing during dry weather, may elect to sample such private outfalls for some or all of the water quality indicators as described below. To the extent that a discharge from a non-Town outfall may be causing or contributing to a violation of water quality standards, it will reduce the Town's overall MS4 compliance burden to have that discharge eliminated. Any such non-Town outfalls that appear to be affected by illicit discharges will be referred to the appropriate authorities for resolution.

4.3.3 Outfall / Interconnection Sample Analysis

All samples taken during outfall/interconnection screening are analyzed for the basic screening indicators of temperature, conductivity, salinity, ammonia, chlorine, surfactants, and bacteria. Temperature is measured directly in the field. Conductivity and salinity are [choose one: measured using a meter OR sent to a lab for analysis.] Ammonia, chlorine and surfactants are [choose one: measured in-house using a portable photometer and appropriate reagents OR sent to a lab]. Bacteria samples are [choose one: tested in-house using the Colilert (freshwater) and/or Enterolert (salt water) system OR are sent to a lab for analysis.]. Specific instruments, hold times, and preservation methods used for the basic screening samples are described in Table 6 below.

All samples, not measured or analyzed directly in the field, will be immediately preserved in ice following sample collection and labeling. All screening samples are securely packed in a cooler with plenty of ice with sufficient cooler space and ice coverage. Sample bottle care, such as firmly sealing bottles and/or placing foam sleeves between bottles, will be maintained during transport of the sample bottles.

In addition, when performing screening on a waterway which is impaired for one or more pollutants other than the basic screening parameters or which has is subject to a final TMDL, additional samples are collected as indicated in Appendix G of the MS4 permit. The impairment causes and associated additional required testing parameters that may apply to the Town are summarized in Table 7 below. Table 7 also lists impairment causes that may apply to the Town but for which no additional testing is required. Table 7 has been adapted from Appendix G of the MS4 Permit.

Note that in many areas, the Town may have outfalls that discharge to a wetland or waterway that is not identified as a stream segment or assessment unit by MassDEP. These are often smaller tributaries to the stream segment that is identified by MassDEP. Impaired waters samples are *only* collected from outfalls that are discharging directly to a MassDEP mapped stream segment, they are not collected from unmapped segments upstream of an impaired segment.

If the Town has information from a source other than the MassDEP Integrated List of Waters that indicates that a waterway is impaired for a particular pollutant, even if that waterway is not mapped as a segment by MassDEP, then the additional impaired waters samples will be tested.

These additional impaired waters samples and the standard bacteria sample are analyzed using the more rigorous procedures outlined in Appendix G of the MS4 Permit as dictated by 40 CFR §136. Table 8 summarizes the required testing methods for the additional testing parameters, as well as sample container, preservation, hold times, and the instruments or laboratories used to test each sample.

When conducting outfall screening, to the extent possible, grab samples are collected and analyzed later at our offices or a lab rather than being processed in the field. In addition, where possible, a single larger sample bottle will be used as a source for multiple test parameters. This ensures efficient use of staff time and prevents the accidental release of potentially hazardous reagents to the environment. For these same safety reasons, the Town may not fully chemically preserve samples in the field (i.e. adding acid to nutrient samples) but rather will deliver them to the lab, on ice, promptly where they will be fully preserved as needed.

Further details on using field test kits for water quality analysis can be found in Table 8 under the Outfall Screening Procedures Category including copies of equipment manuals and any field, office or lab standard operating procedures.

4.3.3.1 Field Screening

In FY2020, FY2021 and FY2022, it is anticipated that the Town will inspect all 426 outfalls (142/year). It is anticipates that the Town will collect field screening data from about 150 of the Town's estimated 426 outfall pipes during dry (summer) seasons. The sampling locations will be developed from the Town's GIS mapping of outfall pipe locations, and the locations and sample designation will be shown on plan to be developed by the Town.

Field samples will be tested for the following using EPA approved methods:

1. pH;
2. Temperature (SM-2550);
3. Specific Conductance;

4. Dissolved Oxygen (EPA 360.1, 360.2); and

5. Turbidity (EPA 180.1).

Field notes shall be summarized in bound field books and data will be compiled into Excel spreadsheets.

4.3.3.2 Analytical Testing

The Town anticipates that it may be deemed necessary from the field screening, to conduct 40 analytical tests to identify the pollutant of concern and assist in the location of pollutant sources. Under this task, a limited number of water samples, will be sent to a laboratory or analyzed from field test kits for some or all of the following constituents:

Test kits or laboratory testing:

1. Ammonia;

2. Chlorine;

3. Salinity, and

4. Surfactants.

Laboratory Testing:

1. Total Phosphorous (EPA 365.1, 365.2, 365.3), in Charles outfalls and in the Neponset waterways per General Permit Part II Appendix H,

2. Total Suspended Solids (EPA 160.2),

3. Fecal Coliform (EPA 1680, 1681), and/or

4. Escherichia coli (EPA 1160.1, 1600) or Enterococci (EPA 12.22).

If needed in the Charles River Watershed, the following may only be sampled to address very specific historic concerns, if indicators are present:

- Chlorodane;

- Dichlorodiphenyltrichloroethane (DDT); and

- Mercury.

The field notes shall be summarized in bound field books and data shall be compiled onto Excel spreadsheets.

Table 6 - Parameters, Instruments, Field Test Kits, and Laboratories for Basic Screening

Standard Screening Parameter	Target Detection Limit	Container Type & Volume	Pres.	Hold Time	OK to Combine?	Instrument, Portable Meter, or Lab Name
Ammonia	0.05 mg/L	125-250ml plastic	Ice	Process same day	Yes	• *Chemetrics V-2000 or V-3000 Multi-Analyte Photometer, with reagents • Hach™ Ammonia Test Strips • Hach Pocket Colorimeter II Ammonia, single parameter meter with reagents • [Insert Lab Name Here]
Chlorine	0.02 mg/l	125-250ml plastic	Ice	Process same day	Yes	• *Chemetrics V-2000 or V-3000 Multi-Analyte Photometer with reagents • Hach Pocket Colorimeter II Chlorine, single parameter meter with reagents • Chemetrics I-2001 single Analyte Photometer, with reagents • Hach CN-66 color wheel with reagents • [Insert Lab Name Here]
Conductivity	0.2 mS/cm	500ml plastic	Ice	Process same day	Yes	• *YSI Pro 30 (temp/ conductivity/ salinity meter) • YSI pH/EC1030A (temp/ conductivity/ salinity/ pH meter) • Chemetrics I-1200 (single purpose meter) • YSI Pro Plus (temp/ conductivity/ salinity/ DO/ pH meter) • [Insert Lab Name Here]
E. coli or Enterococcus	<=4 cfu or mpn	Sterile 125-250ml plastic	Ice	Deliver to lab in 6 hr (process in 8 hours)	No must be sterile	• [Insert Lab Name Here] • Idexx Colilert (freshwater) and/or Enterolert (salt water) System by permittee
Salinity		500ml plastic	Ice	Process same day	Yes	• *YSI Pro 30 (temp/ conductivity/ salinity meter) • YSI pH/EC1030A (temp/ conductivity/ salinity/ pH meter) • Oakton Waterproof SaltTestr (single purpose meter) • YSI Pro plus (temp/ conductivity/ salinity/ DO/ pH meter) • [Insert Lab Name Here]
Surfactants	0.1 mg/L	125-250ml plastic	Ice	Process same day	Yes	• *CHEMetrics™ I-2017, single parameter meter with reagents. • CHEMetrics™ K-9400, visual with reagents

Standard Screening Parameter	Target Detection Limit	Container Type & Volume	Pres.	Hold Time	OK to Combine?	Instrument, Portable Meter, or Lab Name
						• Hach™ DE-2 • [Insert Lab Name Here]
Temperature	0 to 40 °C	Measure in field	None	Measure in field	n/a measure in field	• *YSI Pro 30 (temp/ conductivity/ salinity meter) • Non-mercury field thermometer • YSI pH/EC1030A (temp/ conductivity/ salinity/ pH meter) • YSI Pro Plus (temp/ conductivity/ salinity/ DO/ pH meter)

Table 7 - Additional Tests Required for Screening Impaired Waters

"Pollutant" Causing Impairment	Test For
Enterococcus	Enterococcus
Escherichia coli	E. coli
Excess Algal Growth	Total Phosphorus (freshwater)
	Total Nitrogen (marine waters)
Fecal Coliform	Fecal Coliform
Nutrient/Eutrophication Biological Indicators	Total Phosphorus (freshwater)
	Total Nitrogen (marine waters)
Organic Enrichment (Sewage) Biological Indicators	E. coli (freshwater)
	Enterococcus (marine waters)
Oxygen, Dissolved or Dissolved Oxygen Saturation	Dissolved Oxygen
	Temperature
	BOD5
	Total Phosphorus (freshwater)
	Total Nitrogen (marine waters)
pH, High/Low	pH
Phosphorus (Total)	Total Phosphorus
Sedimentation/Siltation	Total Suspended Solids
Total Suspended Solids (TSS)	Total Suspended Solids
Turbidity	Total Suspended Solids
	Turbidity
Aquatic Macroinvertebrate Bioassessments	none required[1]
Aquatic Plants (Macrophytes)	none required
Chlordane	none required
Color	none required
Combined Biota/Habitat Bioassessments	none required[1]
DDT	none required
Debris/Floatables/Trash	none required
Dioxin (including 2,3,7,8-TCDD)	none required
Eurasian Water Milfoil, Myriophyllum spicatum	none required
Fishes Bioassessments	none required[1]
Fish-Passage Barrier	none required
Foam/Flocs/Scum/Oil Slicks	none required[1]
Low flow alterations	none required
Mercury in Fish Tissue	none required
Non-Native Aquatic Plants	none required

Other flow regime alterations	none required
PCB in Fish Tissue	none required
Pentachlorophenol (PCP)	none required
Physical substrate habitat alterations	none required
Polychlorinated biphenyls	none required
Taste and Odor	none required
Temperature, water	none required
[1] Awaiting confirmation from MassDEP as to whether sampling is required	

Table 8 - Test Methods for Additional Impaired Waters Testing

Impaired Waters Additional Test Parameter	Required Test Method Options[1]	Target Detection Limit	Container Type / Sample Volume[2]	Preservative	Hold Time[2]	OK to combine tests larger bottle?[2]	Instrument or Lab Name
Enterococcus	1106.1; 1600; Enterolert®	<=4 cfu or mpn	125-250ml sterile plastic with headspace	Ice	Deliver to lab within 6 hr	bacteria samples only	[Colilert / Enterolert system by Permittee OR enter lab name here]
E. coli	1103.1; 1603; Colilert®, Colilert-18®; mColiBlue-24®	<=4 cfu or mpn	125-250ml sterile plastic with headspace	Ice	Deliver to lab within 6 hr	bacteria samples only	[Colilert / Enterolert system by Permittee OR enter lab name here]
Phosphorus (Total)	365.1; 365.2; 365.3; SM 4500-P	<=10 ug/l	125-250ml plastic	Ice	Deliver to lab same day for preservation with acid[3]	Yes	[Enter lab name here]
Nitrogen (Total)	351.1 or 351.2; and 353.2	<=0.2mg/l	125-250ml plastic	Ice	Deliver to lab same day for preservation with acid[3]	Yes	[Enter lab name here]
Fecal Coliform	1680; 1681	1 CFU	125-250ml sterile plastic with headspace	Ice	Deliver to lab within 6 hr	bacteria samples only	[Enter lab name here]
Dissolved Oxygen	365.1; 365.2; 365.3 [SM4500-O]	0.5 mg/l	n/a, measure in field	n/a	measure immediately	n/a	[>*YSI EcoSense 200A (DO/ temp meter) >YSI Pro Plus (temp/ conductivity/ salinity/ DO/ pH meter)]
Temperature	351.1/351.2 + 353.2 [SM2550]	0 to 40 °C	n/a, measure in field	n/a	measure immediately	n/a	[> *YSI Pro 30 (temp/ conductivity/ salinity meter) > Non-mercury field thermometer > YSI pH/EC1030A (temp/ conductivity/ salinity/ pH meter) >YSI Pro Plus (temp/ conductivity/ salinity/ DO/ pH meter)]
BOD5	360.1; 360.2 [SM5210]	2 mg/l	1L plastic, no headspace or air	Ice	Deliver to lab same day	only those with no headspace	[Enter lab name here]
pH	150.2	4-10 SU	measure in field or 250ml plastic with no headspace/air	Ice	measure immediately or same day as soon as possible	only those with no headspace	[>*Extech ExStik pH Meter >YSI EcoSense pH/EC1030A (temp/ conductivity/ salinity/ pH meter) >YSI Pro Plus (temp/ conductivity/ salinity/ DO/ pH meter)]
Total Suspended Solids	160.2 [SM2540]	<=5 mg/l	1L plastic	Ice	deliver to lab same day	yes	[Enter lab name here]
Turbidity	180.1	<=.06 NTU	500ml plastic	Ice	deliver to lab same day	yes	[> Laboratory Name Here > Lamotte 2020we > Hach 2100Q Portable Turbidity Meter]

[1]Information taken from MS4 Permit Appendix G. Note that there appear to be some errors in Appendix G of the permit. We expect that the information listed 40 CFR §136 prevails, and will confirm this with EPA and update this table when the government reopens. Methods indicated in red are clearly incorrect. Those in brackets seem to have been inadvertently omitted..

[2]These are typical recommended values, if using a lab please update these columns with information provided by your lab.

[3]For the safety of personnel and the environment we do not recommend preserving samples with acid in the field.

4.4 FOLLOW-UP RANKING OF OUTFALLS AND INTERCONNECTIONS

The purpose of follow-up ranking is to use the information gathered during the ongoing outfall screening process to determine the order in which associated catchments will be investigated.

Outfalls and interconnections may be reprioritized continuously as dry weather screening takes place. The NSP IDDE Prioritization Tool provides a framework for updating outfall rankings on a continuous basis. At a minimum, a follow up outfall and interconnection ranking will be completed by the end of year 3 of the permit (6/30/21) when dry weather outfall screening is complete.

All screening data for a given year will be included with that year's annual report, and any previously unknown outfalls or interconnections discovered during screening will be added to the outfall inventory and initial ranking, which is also submitted with the annual report.

Any outfalls that are found during screening to contain one or more of the following signs of sewage contamination will automatically be re-prioritized to the top of the high priority outfalls for catchment investigation:

- Olfactory or visual evidence of sewage;
- Ammonia $\geq$ 0.5 mg/L, surfactants $\geq$ 0.25 mg/L, and bacteria levels greater than the applicable water quality criteria for receiving water (235 CFU or MPN for E. coli or 61 CFU or MPN for Enterococcus); or
- Ammonia $\geq$ 0.5 mg/L, surfactants $\geq$ 0.25 mg/L and detectable levels of chlorine.

Referring to the NSP IDDE Prioritization Tool, which details the Town's ranking process which considers numerous factors, in general, outfalls with known illicit discharges or SSO history are categorized as "problem outfalls" and placed at the top of the ranking. Outfalls with any of the indicator combinations described above are placed at the top of the "high priority" list. Outfalls with high bacteria but low or absent ammonia and surfactants are placed next in the overall ranking, followed by those with ammonia and/or surfactants but no other indicators. Where outfall screening discovers no contamination indicators, outfalls will be added to the "low priority" category. Outfalls without indicators but where available ambient stream water quality data indicates elevated levels of bacteria, will be moved to the high end of the low priority category. Rankings may also be adjusted in light of any known or suspected system vulnerability factors. Finally, higher priority will be given to catchments whose outfalls discharge to beaches, shell fishing areas or other public health priority areas.

At all times, the team leader will use their best judgment to schedule catchment investigations in the order that they believe is likely to lead to the most rapid identification and elimination of problem discharges to the MS4 and/or local waterways, and the team leader retains the discretion to adjust the prioritization as needed to accomplish that goal.

4.5 SYSTEM VULNERABILITY FACTORS AND WET WEATHER OUTFALL SCREENING

If an outfall or interconnection's catchment contains one or more of the system vulnerability factors listed below, wet weather screening and sampling is required in addition to dry weather screening. The Town will document the presence or absence of system vulnerability factors in each catchment in the outfall inventory and ranking tool, an updated copy of which is included with each annual report.

System vulnerability factors may be known in advance of catchment investigation, or may be discovered during the course of the catchment historic records review or field investigation (see discussion below). If system vulnerability factors are known in advance, it is preferable but not required to conduct wet weather screening prior to catchment investigation so that the results can better inform the strategy employed during the investigation of each catchment.

If one or more system vulnerability factors is discovered during the course of catchment investigation, the wet weather screening will be completed concurrent with catchment investigation, and the associated catchment investigation may not be marked complete until wet weather screening is completed.

The NSP IDDE Prioritization Tool provides a framework for tracking which outfalls require wet weather screening and progress toward completion. The presence of one or more of the following required factors shall trigger wet weather screening.

Required System Vulnerability Factors

- 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.

Recommended but Not Required System Vulnerability Factors

- 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);

4.5.1 Wet Weather Outfall / Interconnection Screening and Sampling Field Procedures

Wet weather outfall screening will primarily occur March to June when groundwater levels are relatively high per EPA's strong recommendation. Wet weather screening only occurs when there is a rainfall event sufficient to produce a stormwater discharge. In general, a minimum of 0.25 inches of rain in the previous 24 hour period is preferred prior to wet weather screening and the drain system must be actively flowing at the time of sampling. Sampling during periods of medium to high intensity rainfall / storm drain discharge is preferred if possible.

The initial surface runoff from a rainstorm, called the "first flush," should not be sampled, if possible. The objective of the wet weather screening is to identify SSOs and wet weather cross connections, rather than street runoff.

In addition to collecting samples, an outfall inspection form will be completed at the time of sampling to note any visual or olfactory indicators of illicit discharge. See Table 10 under the Outfall Screening Procedures category for applicable procedures and forms.

Because of the need to coordinate personnel, equipment and laboratory resources in advance, it is usually preferable to plan for wet weather sampling when the forecast likelihood of rainfall is 60% or higher. It is also generally preferable to plan wet weather sampling in anticipation of frontal weather systems rather than thunderstorms or other scattered weather systems.

In the event that an outfall or interconnection is submerged, the screening and sampling is completed at the first accessible upstream manhole that is not submerged and this location is noted on the inspection form.

The parameters to be sampled on a given waterbody and sampling methods, test kits, laboratory arrangements and QA/QC procedures are the same as for dry weather screening on that waterbody.

4.5.2 Outfall Screening Quality Assurance and Quality Control

In order to ensure the integrity of the data, grab samples collected in the field for later analysis will be properly preserved and processed within the allowable hold time for each parameter as summarized in Table 5 above. In the interest of employee and environmental safety, standard preservation methods that involve hazardous materials (i.e. sulfuric acid) may be avoided in the field. Certain parameters must be measured directly in the field using field meters or other instruments as indicated in Tables 4.2 and 4.4.

All measurements are taken or analysis completed in accordance with manufacturer's and / or laboratory's instructions or a town specific SOP adapted from the manufacturer's and or laboratory's instructions, as to calibration and testing. See Table 10 under the Outfall Screening Procedures Category for relevant supporting documents.

In addition, to help further validate the reliability of testing measures being performed, when resources allow, the following additional quality assurance and quality control (QA/QC) measures may be implemented. These additional steps are not required by the MS4 permit:

- For field meters, post-calibration (pre-sampling) and post-sampling meter readings relative to a known calibration standard will be recorded.
- One lab blank, one lab positive or spike, and one lab split will be analyzed for each parameter on each mission (i.e. sampling day).
- Periodically, one field duplicate will be collected and analyzed for bacteria per mission.
- Where they are available, the results of QA/QC samples will be periodically evaluated and corrective measures including supplemental field team training will be undertaken as needed.

4.6 RECORD KEEPING

All records from collection system inspections, outfall and interconnection investigations, and catchment prioritization modifications needs to be well documented in email, screening summary spreadsheets, Department catch basin inspection forms, and/or other documentation. Summaries of monitoring and investigation activities will be included in each MS4 Annual Report submitted by every May 1st. Records should include:

- Laboratory data and field screening results;
- Dates and times screening and sampling events were conducted;

- Weather conditions both during each sample event, and in the 24 hours (for wet-weather) or 48 hours (for dry-weather) prior to, each sampling event;
- Investigations recommended;
- An updated priority ranking of all catchment areas based on new field information (if applicable); and
- An updated map showing boundaries of all MS4 catchment areas (if applicable).

5. ILLICIT DISCHARGE INVESTIGATION PLAN

The following Investigation Plan outlines procedures for tracking and isolating the source(s) of illicit discharges into the Town's MS4. Investigation procedures will vary depending on the nature of the illicit discharge. When a direct connection, spill or environmental hazard is conclusively verified during opportunistic inspection, several investigation steps will be bypassed to quickly eliminate the discharge.

This Plan also addresses the additional field investigations the DPW will complete in Permit Year 1 to improve overall understanding of the MS4 system, including identification of any additional MS4 interconnections (Section 4.2).

5.1 CATCHMENT INVESTIGATION PROCEDURES

Each catchment associated with an outfall or interconnection within the MS4 (with the exception of not waters of the US and not owned by Town outfalls) will be investigated for indicators of illicit discharges, whether or not such indicators were found during outfall screening. Problem outfalls may bypass the dry weather outfall screening process and proceed directly to catchment investigation. High and low priority outfalls catchment investigations will begin once dry weather screening is complete.

Catchments are investigated one by one in order of priority without regard to geographic proximity. "problem" catchments are investigated first, followed by high priority and then low priority catchments. Within each prioritization category, the catchments are investigated in the order they are ranked. The NSP IDDE Prioritization Tool provides a framework for ranking individual outfalls for catchment investigation purposes and tracking the progress of the program.

Investigation of catchments associated with problem outfalls will begin within two years of the permit effective date (i.e. by 6/30/20) and will be completed by year seven (6/30/25). Work may be ongoing in multiple catchments simultaneously to expedite the process. All catchments (except those which are categorized as excluded, [not waters of the US, or not Town owned] must be investigated within ten years of the permit effective date (i.e. by 6/20/28).

5.1.1 Review of Records and Preparation of Investigation Strategy for Each Catchment

Completed system mapping is critical to an effective catchment investigation. If the Phase 1, and Phase 2 mapping data described above under the section on system mapping has not been previously completed, this information will be gathered and updated concurrent with the investigation of each catchment. Where resources allow, the recommended mapping elements will also be collected at the same time.

Prior to beginning the investigation of a particular catchment, available mapping, as well as relevant, historic plans and records, and other sources of existing data for the catchment will be reviewed by the field team leader. For the Town, these data sources will include plans related to

the construction of the storm drain and of sanitary sewers, prior work performed on the storm drains or sanitary sewers, board of health or other municipal data on septic system failures or required upgrades, and complaint records related to SSOs, sanitary sewer surcharges, and septic system breakouts.

The locations of storm drains, sanitary sewers, and any combined sewer pipes and manholes are noted, as well as the outfall or interconnection location and receiving water. Information pertaining to any of the system vulnerability factors defined above, as well as the results of the outfall screening, will be considered during catchment investigation planning.

Any system vulnerability factors discovered during the records review or catchment field investigation process will be added to the system vulnerability inventory which is part of the outfall inventory ranking tool. The associated outfall will be scheduled for wet weather screening if one or more system vulnerability factors are identified, and the outfall/catchment rankings will be updated accordingly. The investigation of a catchment will not be considered complete until wet weather outfall screening is complete, if applicable.

The team will also note any system blockages or cleaning needs, and schedule appropriate maintenance activities as required, prior to field investigations if feasible.

Based on a review of the above information, an investigation strategy for the catchment will be developed. Specific manholes to be inspected will be defined for each catchment prior to beginning the field investigation of a catchment.

Junction manholes are those that receive flow from two or more drain segments. Key junction manholes receive the accumulated flow from two or more junction manholes or a junction manhole and an additional drain segment. Depending on its size and complexity, each catchment may have multiple junction and/or key junction manholes. Simple catchments may not have any junction or key junction manholes. Junction and key junction manholes are illustrated in Figure 5-1.

The resulting catchment investigation plan will include at a minimum, opening and inspection/testing of all key junction manholes—or, if no key junction manholes are present, junction manholes.

If no key junction or junction manholes are present, the dry and (if required) wet weather outfall inspections shall suffice for meeting the manhole inspection requirement, so long as the dry weather and (if required) wet weather outfall inspection reveal no indications of dry weather flow, illicit discharge or SSO activity. Where illicit discharge or SSO evidence is discovered, further manhole inspections or other investigations shall be conducted to isolate the affected pipe segment between two manholes as described further below.

5.1.2 Dry Weather Manhole Inspection Methodology

At the discretion of the field team leader, manhole inspections may be performed starting from the outfall or interconnection and working upstream, or starting from the upper parts of the catchment and working downstream, or a combination of both practices.

Key junction manholes are inspected in each catchment where they exist. If no key junction manholes are present in the system, inspections will include junction manholes. If no junction manholes exist, then the results of the outfall screening/testing will serve as the catchment investigation provided that no flow, illicit discharge, or SSO indicators were found at the outfall.

During the investigation of a catchment, storm drain manholes are opened and inspected during dry weather (less than 0.1 inches of rain in the preceding 24 hours and no snowmelt, with 72 hours dry preferred) to look for evidence of illicit discharges.

A manhole inspection form is completed and any visual or olfactory evidence of illicit discharges is noted. Visual evidence may include toilet paper, sanitary products, visible sewage, soap, food, gray filamentous bacterial growth, excrement, or other indications of anything other than stormwater entering the MS4. Olfactory evidence may include sewage, soap, laundry, bleach, food, or other odors not typical of stormwater.

If flow is observed in a storm drain manhole during dry weather, the team will use a field kit or laboratory grab sample to test the flow at a minimum for the presence of ammonia, chlorine, and surfactants using the procedures described above. In most cases these tests will be performed immediately on-site rather than being sent off to a lab so that they can be used to guide further investigations in real time. In the field team leader's discretion, samples may also be collected for E. coli and sent to the lab for analysis, especially where outfall inspection indicates potential presence of an illicit sewage discharge and/or flow is present but surfactant and ammonia tests are negative or inconclusive. E. coli sampling is recommended but not required by EPA.

In manholes where flow is present but at a level too low / shallow to be sampled, or where no flow is present but where visual or olfactory evidence of illicit discharge is found in the manhole, these indicators will be noted on the manhole inspection form and the team will in its discretion, either:

A) Re-inspect the manhole within one week and if flow is found on re-inspection, it will be sampled;

B) Dam the manhole with a sandbag or caulk dam, recheck after 48 hours of additional dry weather, and sample any discharge which has accumulated behind the dam (this process requires dry weather before, during and after placement of the dam); or

C) Proceed to investigate the collection area upstream of the manhole immediately in an effort to isolate the source of the flow or visual / olfactory indicators, and then if no upstream indicators are found, return to the original problem manhole to implement option A or B.

Sampling results will be evaluated using the criteria described above in the section titled "Follow-up ranking of outfalls and interconnections." If the observed flow is obviously an illicit discharge based on visual or olfactory evidence, the field team may note this and skip the testing.

Manhole investigations will continue upstream of the problem manhole, beginning with upstream key junction or junction manholes (if any) in an effort to identify a specific section of pipe between two manholes where the source of the discharge originates, at which point the process moves on to isolation and confirmation procedures as described further below.

If positive indicators of illicit discharge are found in a manhole, investigations further downstream of that problem manhole will be put on hold until the source of the discharge upstream has been isolated, confirmed and corrected, although investigations may continue on other key junction or junction manholes in the catchment that are unaffected by the problem manhole, if any.

To the extent that a catchment investigation reveals a discharge that does not meet the definition of an illicit discharge (see definitions and acronyms above) but is nonetheless undesirable, such as single home car washing or runoff from irrigation systems, the Town may refer the issue to the NSP or CRWA for targeted follow up education in the immediate neighborhood. If the Town determines that such discharges represent a significant source of pollutants to the MS4, more formal measures will be implemented to control these sources so they are no longer significant contributors of pollutants, and/or they are eliminated entirely.

5.1.3 Wet Weather Manhole Inspection / Catchment Investigation

When an outfall or catchment is known or found to contain one or more system vulnerability factors as described above, the Town is required to conduct wet weather outfall or catchment investigations "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."

At a minimum, this investigation will include the wet weather outfall screening procedure described in the section above titled "Wet Weather Outfall / Interconnection Screening and Sampling Field Procedures." If necessary, investigations may also include additional inspections and testing in the catchment upstream of the outfall including but not limited to wet weather manhole inspection and sampling of the MS4 infrastructure, or in some cases inspection of associated sewer or septic infrastructure that may interact with the MS4 infrastructure during wet weather conditions.

The investigation of a catchment with one or more system vulnerability factors cannot be marked complete until the wet weather outfall screening and related wet weather catchment investigations (if any) are finalized.

5.1.4 Procedures to Isolate and Confirm Sources of Illicit Discharges

Discharges of concern may include direct cross connections, indirect connections (i.e. exfiltration from a leaking sewer lateral, sewer line or septic system that infiltrates the drain), intermittent discharges of solid or liquid waste (i.e. catch basin dumping), input from features such as sewer underdrains, or SSOs. The nature of the specific investigation techniques used will vary depending on the nature of the suspected problem.

Once a section of pipe between two manholes has been isolated as the approximate location of a dry weather or wet weather discharge, further testing will be undertaken to isolate and confirm the source. Dye testing of buildings and sanitary sewer pipes, smoke testing, internal video inspection of drains, sewers or laterals, and targeted internal plumbing investigations are used to confirm the source of the illicit discharge.

During the process of attempting to isolate and confirm the source of illicit discharges in an upstream area of a catchment, similar investigations in downstream areas of the same catchment will be placed on hold. Once the source of the illicit discharge has been identified and the removal of the illicit discharge has been confirmed, downstream work in the same catchment can be resumed.

The process of locating the illicit discharge is described in further detail in the Towns illicit discharge isolation procedures which are found in Table 10 under the Outfall Screening Procedure Category.

5.1.5 Marking the Catchment Investigation Complete

If all key junction manholes have been inspected (or, if no key junction manholes are present, junction manholes, or, if no junction manholes are present, the outfall) and found to be free of dry weather flow or illicit discharge indicators, and any required wet weather outfall screening and catchment investigation has been completed, the investigation of that catchment is marked complete.

If sources of illicit discharge or SSO are found in a catchment, the investigation may be marked complete once the sources of the discharge have been isolated and confirmed as described above. In such cases the catchment may be marked “inspection complete, awaiting repair.” Once repairs are finished, further catchment investigation will be scheduled to confirm that all sources of discharge have been eliminated.

If all required manhole inspections are clean but the outfall inspection still shows evidence of illicit discharge, the catchment may be marked “inspection complete, results inconclusive” and the Town will schedule further catchment investigation and/or outfall screening until such time as the source of illicit discharge has been identified, or the catchment has been confirmed to be free of illicit discharges. In these situations, the Town may elect to collect additional outfall or manhole samples and have them analyzed for more sophisticated sewage indicators such as

pharmaceuticals (using EPA 1694 LC/MS/MS methods with EPA specified MDLs) to help determine the nature of the discharge.

5.1.6 Catchment Investigation Summary Report and Recordkeeping

In order to document the process followed and results of wet and dry investigations in each catchment, the team leader will prepare a Subcatchment Investigation Summary Report. This form briefly describes the dates of the investigation, what investigation strategy was used, any system vulnerability factors discovered, any updates to mapping needed or completed, overview of sampling results, and the conclusions of the investigation. Where an illicit discharge is encountered, the report will also briefly outline measures taken to isolate the source, and any needed or completed repairs.

As catchment investigations proceed, the outfall inventory and ranking tool will be updated to reflect the status of each outfall's catchment investigation.

The summary report, updated outfall inventory and ranking as well as all catchment investigation field data will be included with the annual report each year to document the progress of the program.

6. ILLICIT DISCHARGE ELIMINATION PLAN

Upon confirmation of a verified illicit discharge, the Department Director will send a notification to the Public Works Director, Health Department (in the case of SSOs), and Inspectional Services and Zoning Enforcement Officer (in the case of illegal dumping) indicating that the Town has verified an illicit discharge and that the 60-day window for remediation has been triggered. The Department Director will initiate the elimination workflow process/

Connections from private properties are common sources of direct illicit discharges, and therefore this Elimination Plan focuses on the procedures to follow if the Department finds that the property owner is the responsible party. If the Department is responsible for removal of the illicit discharge, such as in cases of exfiltration from broken or surcharged sewer mains, the Department will follow a 60-day corrective action timeline. The Department will prioritize its elimination activities based on flow volume, impacts to human health, etc. Where elimination of an illicit discharge within 60 days of its identification is not possible, the Department Director shall establish an expeditious schedule for its elimination and report the dates of identification and schedules for removal in the IDDE summary spreadsheet to be documented with the MS4 annual report. The Department will immediately commence actions necessary for elimination and will take all reasonable and prudent measures to minimize the discharge of pollutants to and from its MS4.

6.1 ILLICIT DISCHARGE REMOVAL AND CONFIRMATION

Once the source of an illicit discharge has been identified, the Town will immediately notify all responsible parties for any such discharge and require immediate cessation of improper disposal practices in accordance with its legal authorities. Elimination will be pursued diligently and in the interim, the Town will implement or require implementation of all reasonable and prudent measures to minimize the discharge of pollutants to and from its MS4.

Illicit discharges will be corrected within 60 days as required by the MS4 permit. For illicit discharges that cannot be corrected in 60 days, an expeditious schedule for elimination will be created within 60 days.

When the source of an illicit discharge is identified, the Town will document the removal process using the procedures and forms under the Illicit Discharge Isolation and Confirmation Procedures Category. At a minimum, the following information is collected from each illicit discharge that is removed and this information is included in each annual report to EPA:

- Location of the discharge and source(s);
- A description of the discharge, method of discovery, date of discovery;
- Dates of discovery, elimination, mitigation and/or enforcement action; and

- An estimate of the volume of flow removed.

The volume of flow removed will be estimated using an assumed volume of sewage from a typical house of 240 gallons per day. If only one fixture in a building is illicitly connected, or if the building is not a single family home, or if the illicit discharge is not a sewage cross connection, the estimated amount of sewage will be proportionately reduced or increased as appropriate.

Following the removal of an illicit discharge, confirmation outfall screening will be performed as soon as reasonably possible and, at a minimum, within 1 year. The confirmatory screening shall be conducted in dry weather unless one or more system vulnerability factors have been identified in the catchment area where the discharge was found, in which case both dry weather and wet weather confirmatory screening shall be conducted. If confirmatory screening indicates evidence of additional illicit discharges, the catchment shall be scheduled for additional investigation.

6.1.1 Voluntary Compliance

The preferred approach to address illicit discharge problems is to pursue voluntary compliance from the property owner or responsible party. Often, business operators and property owners are unaware of the existence of illicit connections or activities on their properties that may constitute an illicit discharge. In these cases, providing the responsible party with information about the connection, the environmental consequences, and suggestions on how to remedy the problem may be enough to secure voluntary compliance.

6.1.2 Operational Problems

Property owners shall be responsible for correcting operational problems that result in illicit discharges to the storm drain system. This could include sewer lateral maintenance, locating an appropriate discharge location for liquid wastes, or other operational modifications. Through an outreach handout, the Department will provide recommendations to aid property owners in identifying and addressing operational problems.

6.1.3 Structural Problems

Many illicit direct connection problems will require a structural modification to correct the problem. Structural repairs are used to address failing sanitary sewer pipes/laterals or to redirect discharges from sewer laterals to an approved sanitary wastewater collection system. Correcting structural problems is the responsibility of the property owner or the Town depending on the nature of the illicit discharge. The Department may provide general guidance for private landowners through an outreach handout.

6.1.4 Enforcement Actions

When voluntary compliance cannot be obtained or does not produce the desired result, the Department will pursue follow-up enforcement action authorized under its regulatory authority. Enforcement actions will be the responsibility of the Public Works Director (or their assigns). Violations that are more serious or continued non-compliance may warrant a more aggressive enforcement approach, such as suspending access to the storm drain, if an "imminent and substantial danger" exists.

6.1.5 Enforcement Timeline

The timeline for corrective action procedures from the "date of verification" of an illicit direct connection is 60 days. For the purposes of this Plan, the "date of verification" refers to the date on which an illicit discharge is associated with a physical address or confirmed interconnection with the sanitary sewer. Any deviation from the 60-day corrective action timeline will be documented in a schedule for elimination documented in a memorandum to file and reported in the MS4 annual report.

If property owners are not addressing problems in a timely manner (i.e. within 60 days of verification), the Department may perform the repairs necessary to remove an illicit connection, eliminate an illicit discharge, and/or clean-up a dumping incident. Property owners will also be responsible for reimbursing the Department for costs incurred in correcting illicit discharge problems in accordance with procedure outlined in the Illicit Discharge Ordinance.

6.2 ILLICIT DISCHARGE PREVENTION PROCEDURES

The Town has the following procedures in place to prevent illicit discharges to the MS4:

- Spill Response Procedure
- Spill Reporting Procedure
- Spill Identification Procedure
- Spill Containment Procedure
- Public Awareness
- Spill/IDDE Reporting Hotline
- Training of Public Employees – required annually for employees]

A summary of the Town's illicit discharge enforcement procedures can be found Table 9.

Table 9 - Summary of Enforcement Procedures

Illicit Discharge Elimination Step	Details
Step 1 – Initial Actions (0 to 60 Days)	- Provide landowner education. - Encourage voluntary compliance. - Set compliance date (determined on individual incident basis). - Public Works Director to notify landowner in writing within 30 days of verification of illicit discharge. - Provide staff support and/or technical assistance. - Request evidence of corrected problem. - Conduct site visit to verify compliance and completion of work.
Step 2 – Follow-up Actions (60 to 90 Days)	- Send "written order*, as specified in the Enforcement section of the Ordinance, indicating that elimination of flow or remediation of contamination is required, the order shall set forth a deadline by which such elimination or remediation must be completed. Said order shall further advise that, should the violator or property owner fail to elimination or perform remediation within the specified deadline, the Department may, at its option, undertake such work after advising owner of the cost associated with the remediation, and expenses thereof shall be charged to the violator. - Request evidence of corrected problem. - Conduct site visit to verify compliance and completion of work.
Step 3 – Final Actions (90+ Days)	- Send second "notice of violation" letter*. - Department shall undertake work and charge property owner in accordance with the Ordinance.

*Document copies of all letters

6.3 FOLLOW-UP SCREENING

Within 60 days of the illicit discharge elimination, dry-weather confirmatory sampling should be conducted just "downstream" in nearest manholes to the eliminated illicit discharge to confirm removal. Field sample collection includes ammonia, chlorine, and surfactants; following similar procedures for "bracket" sampling as described in Section 5.1.

Once all catchment investigations and (if applicable) illicit discharge removal and confirmation have been completed, each outfall or outgoing interconnection will be reprioritized and rescreened every 5 years.

On-going screening consists of outfall / interconnection screening during dry weather and also during wet weather for catchments with one or more system vulnerability factors present. On-going screening is performed with the same methodology described above.

If follow-up screening indicates the presence of illicit discharges in the catchment, the catchment investigation procedure is once again implemented to locate and remove all sources of illicit discharges.

6.4 RECORD KEEPING AND DATA MANAGEMENT

The Town's IDDE program involves a significant level of recordkeeping, data management and reporting which is the responsibility of the DPW Director.

The Town has documented its IDDE program procedures in a series of key reference documents and standard operating procedures. These documents are relatively static in nature, and many of them are attached directly to the IDDE SWMP for documentation purposes. Table 10 provides an overview of these key reference documents and where they can be found. Note that forms in Table 10 may be used as either paper forms, or electronic equivalents.

The Town is required to submit an annual report each year of the permit term, including tracking and evaluating IDDE program success and the overall effectiveness of the IDDE program. At a minimum the Town will report the following as metrics of IDDE program progress in each annual report:

- The number of SSOs and illicit discharges identified and removed,
- The number and percent of total outfall catchments served by the MS4 evaluated using the catchment investigation procedure,
- All dry weather and wet weather screening and sampling results,
- The estimated volume of sewage removed, and
- The estimated annual phosphorous load reduction resulting from IDDE activities

The Town also maintains an extensive collection of program data which document the completed and ongoing field work and reporting on that field work. This information is constantly changing as work is completed or new events occur. The active copies of these data are maintained on one or more computer systems including spreadsheets, databases and/or the Town GIS system among other formats. Copies of most of these data, or summaries of them, are included in the annual reports as required. Because of their dynamic nature, most of these data are not included directly in the SWMP, but are available upon request or through the Town's annual reports.

Table 11 lists the program data that are maintained by the Town, where they can be found, and whether they are included in the annual report or available upon request.

6.5 ANNUAL REPORTS

In accordance with 40 CFR 122,34(g)(3), the Town of Medfield will submit annual reports to EPA and DEP, to the addresses provided in the attached General Permit. The reporting period will be a one year period commencing on the permit effective date, and subsequent anniversaries thereof, except that the first annual report under this permit shall also cover the period from May 1, [year of final permit effective date] to the permit effective date. The annual report is due ninety days from the close of each reporting period.
The 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 permit 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.

Reports shall be submitted to EPA at the following address:

United State Environmental Protection Agency
Stormwater and Construction Permits Section (OEP06-1)
Five Post Office Square, Suite 100
Boston, MA 02109

Massachusetts Department of Environmental Protection
One Winter Street – 5th Floor
Boston, MA 02108

Table 10 - Summary of Key Protocols, SOPs and Forms

Category	Included Documents	Document Location
Bylaw	Town Bylaw or other authority prohibiting illicit discharges	"See link" or "See attachments"
SSO Inventory Spreadsheet	NSP Template for Inventory of SSO's in the Five Years Prior to Permit Effective Date (Link)	"See link" or "See attachments"
SSO preventive Maintenance and Response	BWSC SSO Emergency Response Plan (Link)	"See link" or "See attachments"
	Excerpt: BWSC SSO Example Field Manual Emergency Response Plan Appendix A (Link)	"See link" or "See attachments"
	Excerpt: BWSC SSO Preventative and Corrective Measures (Link)	"See link" or "See attachments"
	EPA Preventative Maintenance and Sewer Response Plan Template (Link)	"See link" or "See attachments"
	EPA Wastewater Collection System Toolbox (Link)	"See link" or "See attachments"
SSO Reporting	Blank MassDEP SSO Reporting Form (Link)	"See link" or "See attachments"
	MassDEP SSO Reporting Form Instructions (Link)	"See link" or "See attachments"
Catchment Delineation	MAPC Stormwater Catchment Delineation Procedure documentation (Link) [or other documentation if using something different]	"See link" or "See attachments"
Catchment Prioritization	NSP IDDE Prioritization Tool Documentation and Instructions (Link) [or other documentation if using something different]	"See link" or "See attachments"
General IDDE Materials	Central MA SOP 10- Locating Illicit Discharges SOP (Link)	"See link" or "See attachments"
	Central MA SOP 10- Locating Illicit Discharges Form (Link)	"See link" or "See attachments"
Dry Weather Outfall Screening	Central MA SOP 1- Dry Outfall Inspection SOP (Link) BWSC Dry Weather Outfall Inspection Procedure (Link)	"See link" or "See attachments"
	Central MA SOP 1- Dry Outfall Inspection Form (Link) Center for Watershed Protect Outfall Recon, Inventory & Sample Field Sheet (Link) BWSC Dry Weather Outfall Inspection Form (Link)	"See link" or "See attachments"
Wet Weather Outfall Screening	Central MA SOP 2- Wet Weather Outfall Inspection SOP (Link) BWSC Wet Weather Outfall Inspection Procedure (Link)	"See link" or "See attachments"

	Central MA SOP 2- Wet Weather Outfall Inspection Form (Link) BWSC Wet Weather Outfall Inspection Form (Link)	"See link" or "See attachments"

Water Quality Analysis	Central MA SOP 13- WQ Screening with Field Kits SOP (Link)	"See link" or "See attachments"
	Central MA SOP 13- WQ Screening with Field Kits Form (Link)	"See link" or "See attachments"
	Laboratory SOPs for parameters tested at a lab	"See link" or "See attachments"
	Manufacturer's instruction manuals for instruments used to make measurements in the field or equipment used to perform testing in-house	"See link" or "See attachments"
	Town specific testing SOP's (if any)	"See link" or "See attachments"
Manhole Inspection	BWSC Manhole Inspection Procedure (Link)	"See link" or "See attachments"
	BWSC Manhole Inspection Forms (Link)	"See link" or "See attachments"
Catchment Investigation Report	NSP Catchment Investigation Summary Report Form (Link)	"See link" or "See attachments"
Illicit Discharge Isolation	BWSC Dye Testing Procedure (Link)	"See link" or "See attachments"
	BWSC Dye Testing Record Log (Link)	"See link" or "See attachments"
	Other	"See link" or "See Attachments"
Illicit Discharge Repair Report	NSP Illicit Discharge Removal Tracking Form (Link)	"See link" or "See attachments"
Illicit Discharge Prevention	Central MA SOP 4- Spill Response and Cleanup Procedures (Link)	"See link" or "See attachments"
	Spill Reporting Procedure	"See link" or "See attachments"
	Spill Identification Procedure	"See link" or "See attachments"
	Spill Containment Procedure	"See link" or "See attachments"
	Public Awareness	"See link" or "See attachments"
	Spill/IDDE Reporting Hotline	"See link" or "See attachments"
	Training of Public Employees	"See link" or "See attachments"

Table 11 - Summary of Key Program Data and Annual Reporting Requirements

Data Type	Storage Location
SSO inventory covering period 7/1/2013 to present	DPW hard drive. Included in annual report.
Copies of completed MassDEP SSO reporting forms	DPW hard drive. Copies available upon request
System mapping	Town GIS system. Copies available upon request subject to data format constraints. Brief update on status of mapping included in each annual report.
NSP Outfall Inventory, Prioritization and Tracking Tool [or other tracking system for inventory, ranking, system vulnerability factors, dry and wet screening status, and catchment investigation status]	DPW hard drive. Included in annual report.
Completed dry weather, wet weather, confirmatory, and follow up outfall screening field data collection sheets	Town GIS system. Included in annual report.
Dry weather, wet weather, confirmatory, and follow up outfall screening field, laboratory, and/or office water quality analysis reports	DPW hard drive. Included in annual report.
Completed manhole inspection forms (noting any system vulnerability factors present)	DPW hard drive. Included in annual report.
Manhole inspection field or lab data reports (if not included on inspection forms)	DPW hard drive. Included in annual report.
Brief summary report on each catchment investigation and its results	DPW hard drive. Included in annual report.
Documentation and data on illicit / SSO isolation and confirmation including dye testing reports, video inspection files and similar data.	DPW hard drive. Included in annual report.
For each illicit discharge identified, a brief report describing its removal or if not yet removed, the plan to remove it as expeditiously as possible.	DPW hard drive. Included in annual report.

Annual IDDE self-evaluation which includes at a minimum the following EPA required annual reporting metrics: • Number of illicit discharges identified and corrected • Number of SSOs identified and removed • Number and percent of outfalls screened • Outfall/interconnection inspection data and sampling results • Volume of sewage removed • Number and identifier of catchments evaluated	DPW hard drive. Included in annual report.
Documentation of frequency and type of annual IDDE employee training	DPW hard drive. Included in annual report.
Documentation of the basis for any changes to IDDE BMPs (including why current BMP is ineffective/infeasible and expected performance of replacement BMP	DPW hard drive. Included in annual report.
Copies of any other stormwater or receiving-water monitoring performed or received by the Town.	DPW hard drive. Included in annual report.

7. TRAINING, EDUCATION AND VOLUNTARY REPORTING PLAN

7.1 ANNUAL EMPLOYEE TRAINING

Employee training is an important component of the Department's stormwater program. Department staff are trained in opportunistic inspection SOP via the NSP training module. Additionally, Town employees periodically attend conferences such as those sponsored by American Water Works Association, American Public Works Association, and New England Water Environment Association where technical seminars regarding stormwater and wastewater collection are presented.

Department staff involved with the IDDE Program are able to recognize and identify illicit discharges through standard drainage system maintenance operations.

7.2 PUBLIC EDUCATION

Under the MS4 General Permit, the Department must inform public employees, businesses, and the general public of the hazards of illicit discharges. Targeted mailings in neighborhoods with consistent indirect illicit discharges are a component of the IDDE Program. Additionally, general awareness on illicit discharges through a variety of outreach avenues will continue to be implemented and reported in the MS4 General Permit annual report.

7.3 VOLUNTARY REPORTING

7.3.1 Incidental Detection

The Department has a general complaint reporting phone line that residents, field personnel, and outside agencies can call to report illicit discharges. This service encourages residents to participate in the reporting process and helps the Department to receive timely information about problems like illegal dumping, spills, or strong odors associated with sewer system failures.

The Town also has a constituent services reporting system whereby members of the general public can report illicit discharges via the internet. Reports received through this system generate automatic work orders to specific departments and send automatic feedback to the reporting party once the work order is closed. This reporting system can be accessed at www.town.Medfield.net.

7.3.2 Contact Information

Medfield residents, other Town departments, or outside agencies reporting incidents that have occurred within the Town limits are encouraged to report the problem by calling (508) 906-3003.

8. REFERENCES

40 C.F.R § 136. https://tinyurl.com/y754r4rn

Brown, E., D. Caraco and R. Pitt. 2004. Illicit Discharge Detection and Elimination: a Guidance Manual for Program Development and Technical Assessments. Center for Watershed Protection and University of Alabama. EPA X-82907801-0.U.S. EPA Office of Wastewater Management, Washington, D.C.

Center for Watershed Protection and Robert Pitt University of Alabama, 2004. Illicit Discharge Detection and Elimination: A Guidance Document for Program Development and Technical Assessments; October.

Central Massachusetts Regional Stormwater Coalition. Standard Operating Procedures # 1, 2, 10 and 13. Retrieved July 20, 2018, from https://www.centralmastormwater.org/toolbox/pages/standard-operating-procedures

Cooke, Ian and Tedder, Newt. Email communication between Ian Cooke, Neponset River Watershed Association and Newt Tedder, Region 01 EPA. November 28 2018. Accessed online at: https://yourcleanwater.org/wp-content/uploads/2019/01/NSP-EPA-IDDE-Outfall-Clarification-Summary-Sheet.pdf

Edwards and Kelcey, November 2006. 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 Estuaries Project. Accessed online at: https://scholars.unh.edu/prep/152/

Massachusetts Department of Environmental Protection, *Total Maximum Daily Loads of Bacteria for Neponset River Basin*; 2002.

Massachusetts Department of Environmental Protection, Final Pathogen TMDL Report for the Charles River Watershed; January 2007.

Massachusetts Department of Environmental Protection, *Final Phosphorous TMDL Report for the Lower Charles River Basin*; June 2007.

Massachusetts Department of Environmental Protection, *Final TMDL for Nutrients for Upper/Middle Charles River*; 2011.

New England Interstate Water Pollution Control Commission, January 2003. Illicit Discharge Detection and Elimination Manual: A handbook for municipalities. NEIWPCC. Accessed online at: http://www.neiwpcc.org/neiwpcc_docs/iddmanual.pdf

USEPA, July 2018. General Permits For Stormwater Discharges From Small Municipal Separate Storm Sewer Systems In Massachusetts. USEPA. Accessed online at: https://www3.epa.gov/region1/npdes/stormwater/ma/2016fpd/final-2016-ma-sms4-gp.pdf

USEPA, November 2004. Lower Charles River Illicit Discharge Detection & Elimination (IDDE) Protocol Guidance for Consideration. USEPA. Accessed online at: https://www.mass.gov/files/documents/2016/08/xv/appendxa.pdf

USEPA, 2012. Draft EPA New England Bacterial Source Tracking Protocol. USEPA. Accessed online at https://www3.epa.gov/region1/npdes/stormwater/ma/2014AppendixI.pdf

USEPA, 2014. Draft *National Pollutant Discharge Elimination System (NPDES) General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts.*

FIGURES

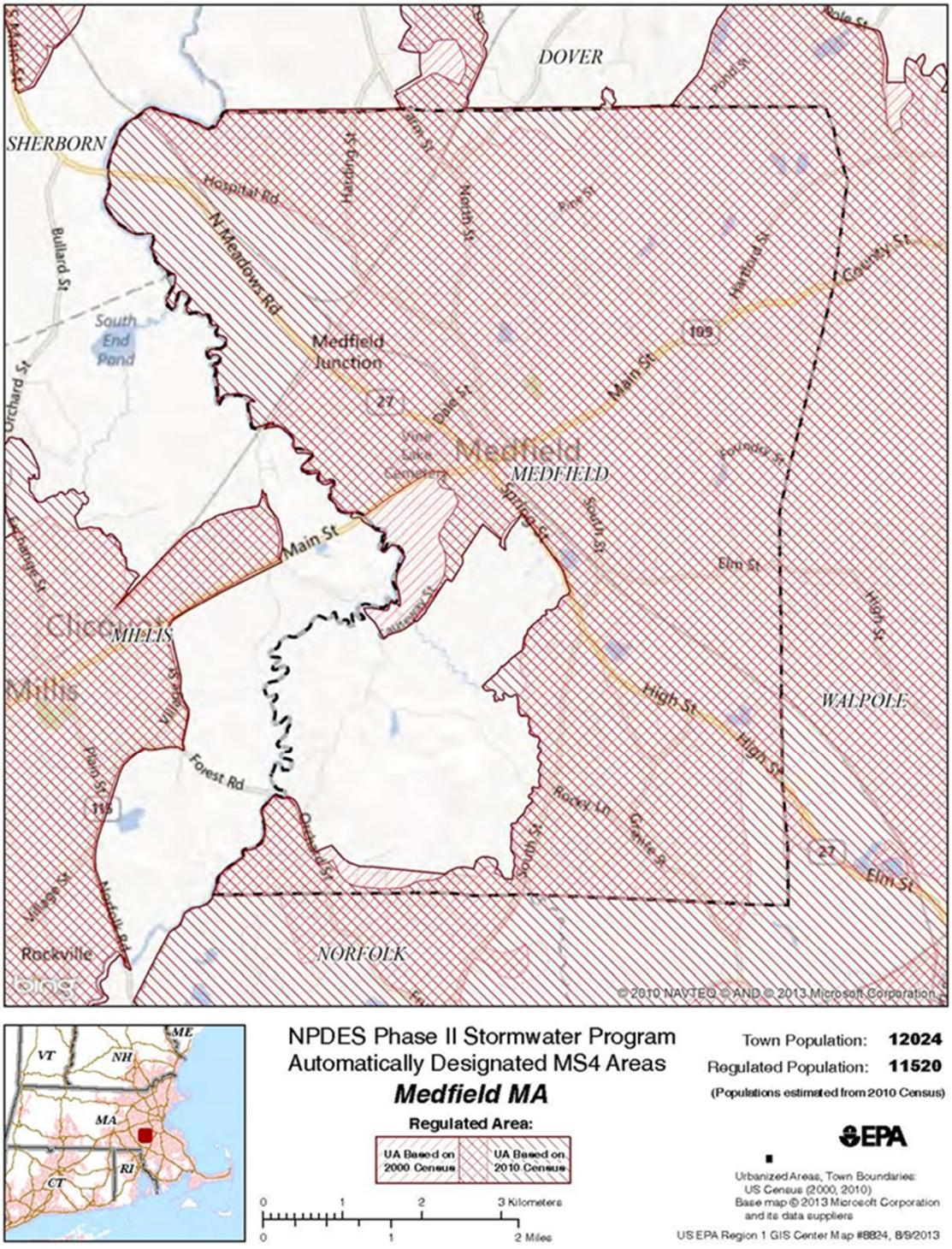
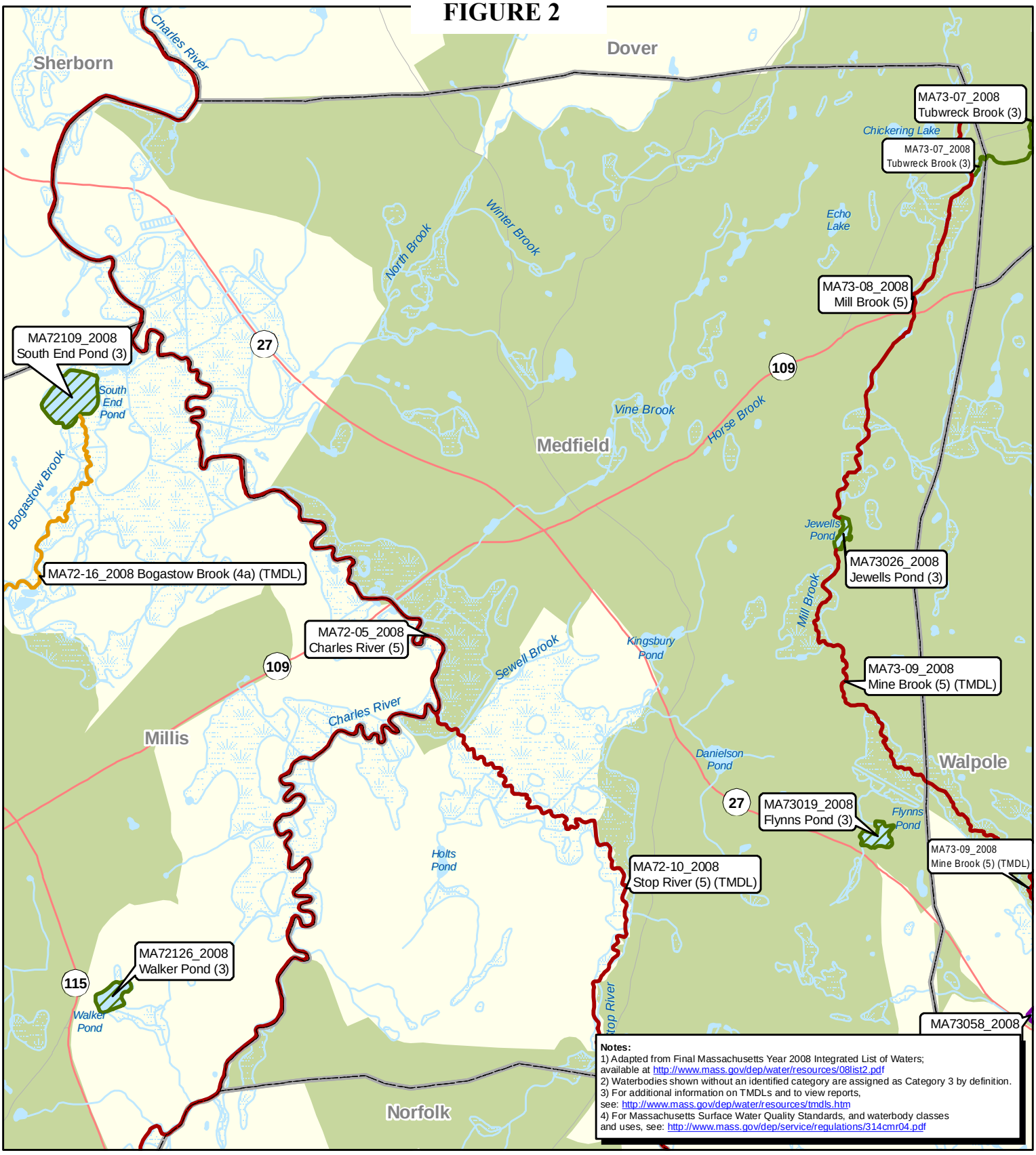


Figure 1: NPDES Phase II Stormwater Program Designated MS4 Areas

URL: http://www.epa.gov/region1/npdes/stormwater/ma/ram/Medfield.pdf

FIGURE 2



Notes:
1) Adapted from Final Massachusetts Year 2008 Integrated List of Waters; available at http://www.mass.gov/dep/water/resources/08list2.pdf
2) Waterbodies shown without an identified category are assigned as Category 3 by definition.
3) For additional information on TMDLs and to view reports, see: http://www.mass.gov/dep/water/resources/tmdls.htm
4) For Massachusetts Surface Water Quality Standards, and waterbody classes and uses, see: http://www.mass.gov/dep/service/regulations/314cmr04.pdf

Waterbody Assessment and TMDL Status
Medfield, MA

N

0 0.5 Miles

EPA

Map produced by EPA Region I GIS Center
Map Tracker ID 6678, February 25, 2010
Data Sources: TeleAtlas, Census Bureau, USGS, MassDEP

Waterbody Label

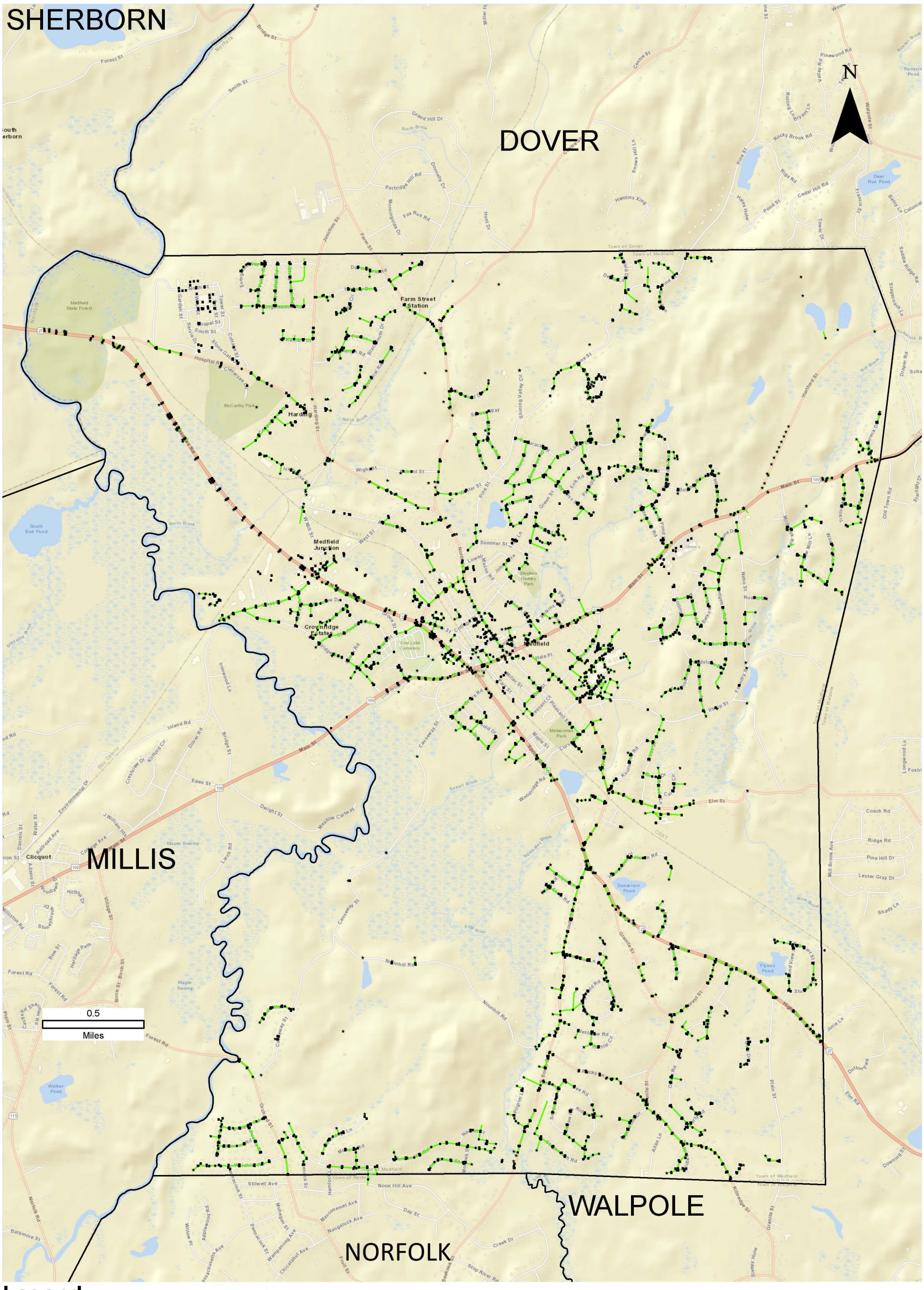
State ID,
Waterbody Name (Category)
(TMDL(s) approved for this waterbody)

See companion table for a listing of pollutants, non-pollutants, and TMDLs for each waterbody

Assessment of Waterbody Segment

- Category 2: Attaining some uses; other uses not assessed
- Category 3: Insufficient information to make assessments for any use.
- Category 4a: TMDL is completed and approved for one or more pollutants
- Category 4c: Impairment not caused by a pollutant.
- Category 5: Impaired or threatened for one or more uses and requiring a TMDL.

- Waterbodies
- Swamp/Marsh
- MS4 Urbanized Areas (2000 Census)
- Municipal Boundaries



Legend

- Outfalls
- Manholes
- Catch Basins
- Drainage Pipes and Culverts

FIGURE 3
Stormwater Collection System
Medfield, Massachusetts

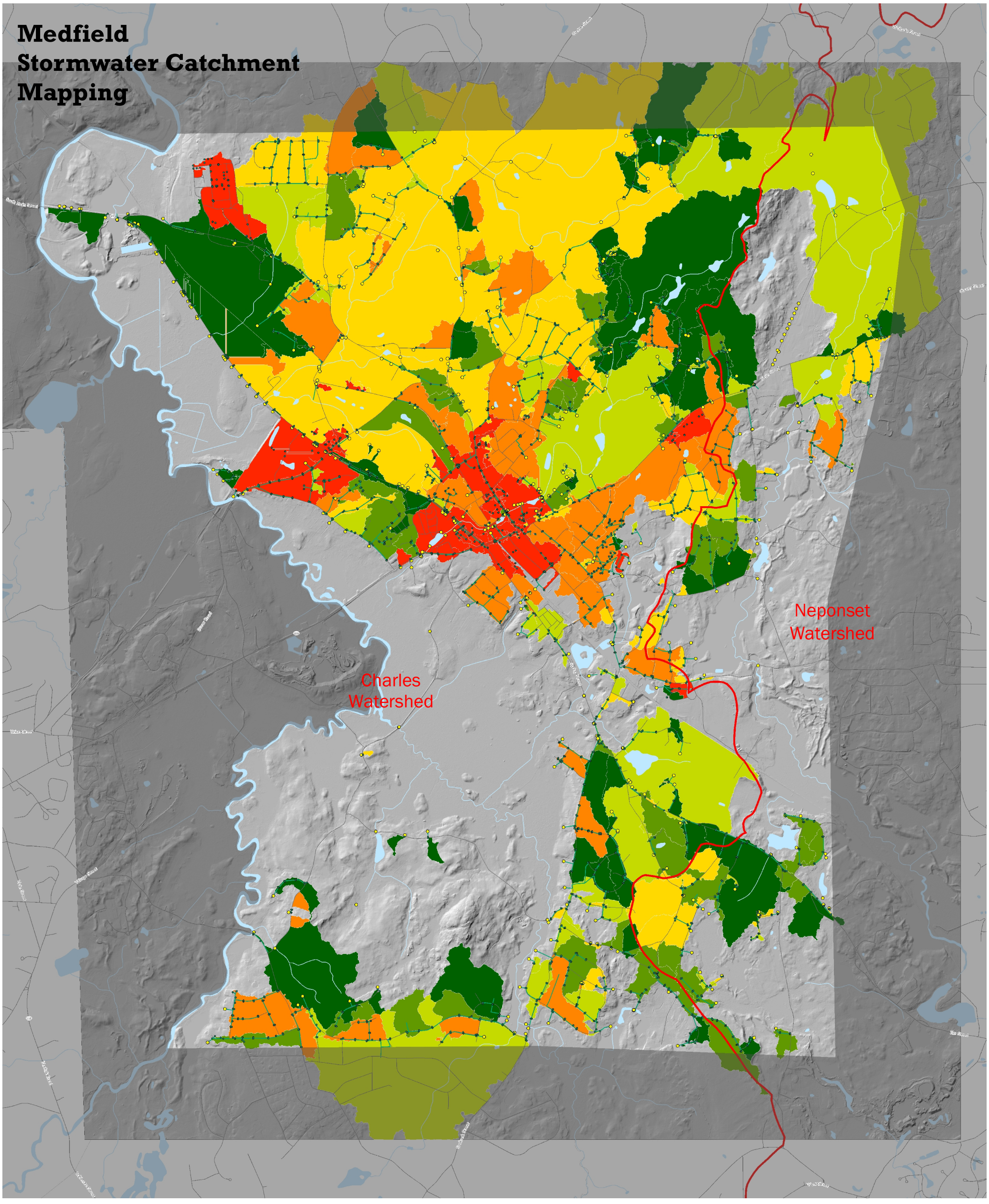


FIGURE 4
PRIORITIZED WATERSHED SUBCATCHMENT MAP

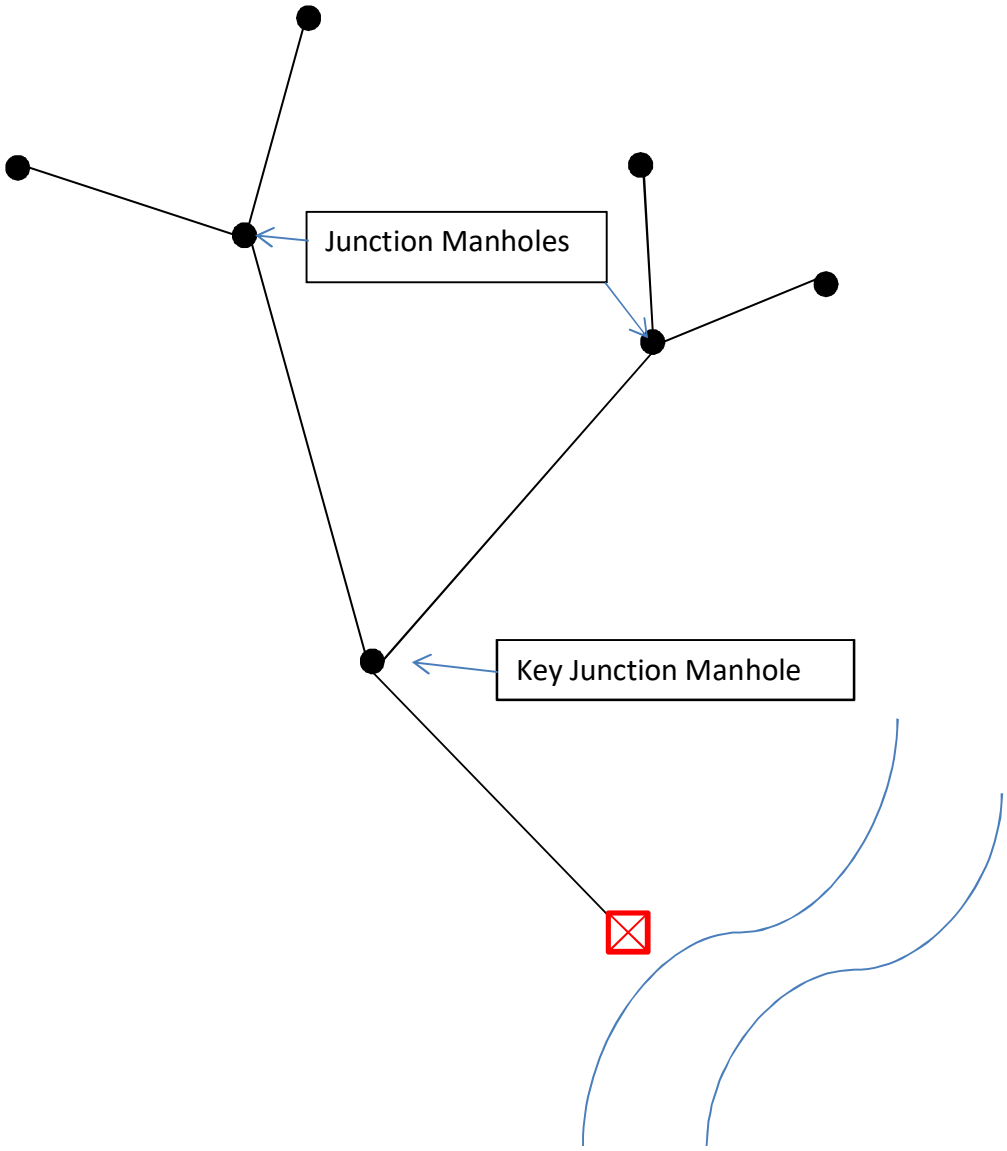


Figure 5: Junction and Key Junction Manholes Diagram

APPENDICES

APPENDIX A: ILLICIT DISCHARGE AND CONNECTION ORDINANCE

ARTICLE I
General Provisions

§ 235-1. Purpose.

The purpose of this Bylaw is to establish minimum requirements and controls to protect and safeguard the environment, natural resources, general health, safety, and welfare of the public residing in watersheds within the Town's jurisdiction from the adverse impacts of soil erosion, sedimentation, and stormwater runoff. This Section seeks to meet that purpose through the following objectives:

A. To eliminate or reduce the adverse effects of soil erosion and sedimentation;

B. To minimize stormwater runoff from any development;

C. To minimize nonpoint source pollution caused by stormwater runoff from development;

D. To provide for groundwater recharge where appropriate; and

E. To ensure controls are in place to respond to objectives in Subsections A and B and that these controls are properly operated and maintained.

§ 235-2. Definitions.

As used in this Chapter, the following terms shall have the meanings indicated:

AGRICULTURE — The normal maintenance or improvement of land in agricultural or aquacultural use as defined by the Massachusetts Wetlands Protection Act[1] and its implementing regulations.

APPLICANT — A property owner or agent of a property owner who has filed an application.

BUILDING — An independent structure having a roof supported by columns or walls, resting on its own foundations and designed for the shelter, housing or enclosure of persons, animals, chattel or property of any kind.

DETENTION — The temporary storage of stormwater runoff in a stormwater management facility with the goals of controlling peak discharge rates and providing gravity settling of pollutants.

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1. Editor's Note: See 310 CMR 10.00 et seq.

DETENTION FACILITY — A detention basin or alternative structure designed for the purpose of temporary storage of stream flow or surface runoff and gradual release of stored water at controlled rates.

DEVELOPER — A person who undertakes land disturbance activities.

DIRECTOR — The Director of Medfield Department of Public Works, or his designee.

EASEMENT — A legal right granted by a landowner to a third party grantee allowing the use of private land for stormwater management purposes.

IMPERVIOUS COVER — Those surfaces that cannot effectively infiltrate rainfall (e.g., building rooftops, pavement, sidewalks, driveways, etc.).

INFILTRATION — The flow of water from the ground surface down into the soil.

INFILTRATION FACILITY — Any structure or device designed to infiltrate retained water to the ground. These facilities may be above grade or below grade.

LAND DISTURBANCE ACTIVITY — Any activity that changes the volume or peak flow discharge rate of rainfall runoff from the land surface, including: grading, digging, cuffing, scraping, excavating of soil, placement of fill materials, paving construction, substantial removal of vegetation, any activity which bares soil or rock or involves the diversion or piping of any natural or man-made watercourse.

LANDOWNER/OWNER — The legal or beneficial owner of land, including those holding the right to purchase or lease the land, or any other person holding propriety rights in the land.

MUNICIPAL STORM DRAIN SYSTEM or MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) — 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 Medfield.

NONPOINT SOURCE POLLUTION — Pollution from any source other than from any discernible, confined, and discrete conduit or waterway, and shall include, but not be limited to, pollutants from agricultural, mining, construction, subsurface disposal and urban runoff sources.

RECHARGE — The replenishment of water to aquifers.

REDEVELOPMENT — Any construction, alteration, or improvement exceeding one acre in area where existing land use is high-density commercial, industrial, institutional or multi-family residential.

RESOURCE AREA — Any area protected under the Massachusetts Wetlands Protection Act,[2] Massachusetts Rivers Act,[3] or Medfield Conservation Commission regulations.

SOIL EROSION AND SEDIMENT CONTROL PLAN — A plan required to be submitted as part of this Bylaw as detailed in Article II, § 235-12.

START OF CONSTRUCTION — The first land-disturbing activity associated with a development, including but not limited to land preparation such as clearing, grading and filling; installation of streets and walkways; excavation for basements, footings, piers, or foundations; erection of temporary forms; and installation of accessory buildings such as garages.

STORMWATER MANAGEMENT PLAN — A plan required to be submitted as part of this Bylaw as detailed in Article III, § 235-15.

STORMWATER RUNOFF — Water resulting from precipitation that flows overland.

STORMWATER TREATMENT PRACTICES — Measures, either structural or nonstructural, that are determined to be the most effective, practical means of preventing or reducing point source or nonpoint source pollution inputs to stormwater runoff and water bodies.

WATERCOURSE — Any body of water, including, but not limited to, lakes, ponds, rivers and streams.

WATERWAY — A channel, either natural or man-made, that directs surface runoff to a watercourse or to the public storm drain.

§ 235-3. Applicability.

This Bylaw shall apply to all activities that result in a land disturbance activity of one or more acres of land or that will disturb less than one acre of land but is part of a larger common plan of development or sale that will ultimately disturb equal to or greater than one acre of land. No person shall perform any activity that results in a land disturbance activity of an acre or more of land without an approved

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2. Editor's Note: See 310 CMR 10.00 et seq.

3. Editor's Note: See the Rivers Protection Act, Chapter 258 of the Acts of 1996.

soil erosion and sediment control plan and stormwater management plan. Normal maintenance and improvement of land in agricultural or aquacultural use, as defined by the Wetland Protection Act Regulation 310 CMR 10.4, are exempt. In addition, as authorized in the Phase II Small MS4 General Permit for Massachusetts, stormwater discharges resulting from the above activities that are subject to jurisdiction under the Wetlands Protection Act[4] and demonstrate compliance with the Massachusetts Stormwater Management Policy as reflected in an order of conditions issued by the Town of Medfield Conservation Commission are deemed to be in compliance with this Bylaw.

§ 235-4. Statutory authority.

Chapter 235 is adopted under the authority granted by the Home Rule Amendment of the Massachusetts Constitution, the Home Rule statutes, and the regulations of the Federal Clean Water Act found at 40 CFR 122.34.

§ 235-5. Responsibility for administration.

The Director shall administer, implement and enforce Chapter 235. Any powers granted to or duties imposed upon the Director may be delegated in writing by the Director to employees or agents.

§ 235-6. Promulgation of rules and regulations.

The Director may promulgate rules and regulations to effectuate the purpose of Chapter 235. Failure by the Director to promulgate such rules and regulations shall not have the effect of suspending or invalidating this Bylaw.

§ 235-7. Inspections; submission of final plans.

A. The Director, or designated agent, shall make inspections as hereinafter required and either shall approve that portion of the work completed or shall notify the owner or person responsible for the implementation of the plan wherein the work fails to comply with the soil erosion and sediment control plan, as described in Article II, § 235-12, or stormwater management plan, as described in Article III, § 235-15, as approved. Plans for grading, stripping, excavating, and filling work bearing civil engineer registered as a professional engineer in the Commonwealth of Massachusetts shall be maintained at the site during the progress of the work. To obtain inspections, the

4. **Editor's Note: See 310 CMR 10.00 et seq.**

permittee shall notify the Department of Public Works at least two working days before each of the following:

(1) Installation of sediment and erosion control measures.

(2) Start of construction.

(3) Completion of site clearing.

(4) Completion of rough grading.

(5) Installation of stormwater controls.

(6) Close of the construction season.

(7) Completion of final landscaping.

B. The person responsible for the implementation of the plan shall make regular inspections of all control measures in accordance with the inspection schedule outlined on the approved soil erosion and sediment control plan(s). The purpose of such inspections will be to determine the overall effectiveness of the control plan and the need for additional control measures. All inspections shall be documented in written form and submitted to the Department of Public Works at the time interval specified in the approved permit.

C. The Director, or designated agent, shall enter the property of the applicant as deemed necessary to make regular inspections to ensure the validity of the reports filed as noted above.

D. The applicant shall submit an as-built plan for the stormwater controls after the final construction is completed. The plan must show the final design and specifications of all stormwater management systems and must be prepared by a professional engineer.

§ 235-8. Project changes.

The permittee, or his or her agent, shall notify the Director in writing of any change or alteration of a land-disturbing activity authorized in either the soil erosion and sediment control plan or the stormwater management plan before any change or alteration occurs. If the Director determines that the change or alteration is significant, based on the design requirements listed in this Bylaw and accepted construction practices, the Director may require that an amended soil erosion and sediment control plan and/or stormwater management plan application be filed. If any change or deviation from these plans

occurs during a project, the Director may require the installation of interim measures before approving the change.

§ 235-9. Fees.

The appropriate application fee as established by the Director must accompany each application. Pursuant to MGL c. 44, § 53G, as amended, applicants shall pay review fees, as determined by the Director, sufficient to cover any expenses connected with any public hearing, review of the soil erosion and sediment control plan, and site inspection.

§ 235-10. Surety.

Pursuant to MGL c. 44, § 53G 1/2, as amended, the Director may require the permittee to post a surety before the start of any land disturbance or construction activity. The surety shall be in an amount deemed sufficient by the Director to protect the Town's interests and ensure that the work will be completed in accordance with the permit. If the project is phased, the Director may release part of the surety as each phase is completed in compliance with the permit but the surety may not be fully released until the Director has received the final inspection report and issued a certificate of completion.

§ 235-11. Enforcement; violations and penalties.

The Director, or an authorized employee or agent, shall enforce Chapter 235, regulations, orders, violation notices, and enforcement orders, and may pursue all civil and criminal remedies for such violations.

A. Suspension of construction or site alteration activity. In the event that the activity at a site violates the conditions as stated or shown on the approved soil erosion and sediment control plan or stormwater management plan in such a manner as the Director determines to adversely affect the environment, public welfare/ health and municipal facilities, then the Director may suspend work until the violation is corrected.

B. Civil relief. If a person violates the provisions of this Bylaw or any regulation permit, notice, or order issued thereunder, the Director may seek injunctive relief in a court of competent jurisdiction restraining the person from activities which would create further violations or compelling the person to perform abatement or remediation of the violation.

C. Orders.

(1) The Director, or an authorized employee or agent, may issue a written order to enforce the provisions of this Bylaw or the regulations thereunder, which may include:

(a) Performance of monitoring, analyses, and reporting;

(b) That unlawful discharges, practices, or operations shall cease and desist; and

(c) Remediation of contamination.

(2) If the enforcing person determines that abatement or remediation of contaminations is required, the order shall set a deadline by which the abatement or remediation must be completed. The order shall also state that, should the violator or property owner fail to abate or perform remediation within the specified deadline, the Town of Medfield may, at its option, undertake the work, and expenses shall be charged to the violator. Within 30 days after completing all measures necessary to abate the violation or to perform remediation, the violator and the property owner will be notified of the costs incurred by the Town of Medfield, including administrative costs. The violator or property owner may file a written protest objecting to the amount or basis of costs with the Director within 30 days of receipt of the notification of the costs incurred. If the amount due is not received by the expiration of the time in which to file a protest or within 30 days following a decision of the Director affirming or reducing the costs, or from a final decision of a court of competent jurisdiction, the costs shall become a special assessment against the property owner and shall constitute a lien on the owner's property for the amount of said costs. Interest shall begin to accrue on any unpaid costs at the statutory rate provided in MGL c. 59, § 57, after the 31st day at which the costs first become due.

D. Criminal penalty. Any person, who violates any provision of this Bylaw, or any regulation, order or permit issued thereunder, shall be subject to a fine of not more than $300. Each day or part thereof that such violation occurs or continues shall constitute a separate offense.

E. Noncriminal disposition. As an alternative to criminal prosecution or civil action, the Director may elect to utilize the noncriminal disposition procedure in accordance with the provisions of MGL c. 40, § 21D. The penalty for the first violation shall be $100. The penalty for the second violation shall be $200. The penalty for the

third violation shall be $300. Each day or part thereof that such violation occurs or continues shall constitute a separate offense.

F. Appeals. The decision or orders of the Director shall be final. Further relief shall be to a court of competent jurisdiction.

G. Remedies not exclusive. The remedies listed in Chapter 235 are not exclusive of any other remedies available under any applicable federal, state or local law.

APPENDIX B: 2015 PRIORITIZATION OF CATCHMENTS PROCEDURE (MAPC 2017)

Outfall Catchment Mapping and Ranking

Last updated: December 27, 2017

Background

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 permit hereafter) is in effect, although it expired in 2008, and a new permit was signed in April of 2016.[2] The permit was set to go into effect on July 1, 2017, but the US Environmental Protection Agency postponed the effective date one year, until July 1, 2018. Under the terms of the new permit, MS4 municipalities will be required to adopt stronger measures for minimizing the impact of pollutants from their stormwater on the cleanliness of the receiving waters.[3]

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 promoted 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 a representative from Boston participating as a technical advisor.

In order for Massachusetts MS4 municipalities to meet the terms of the new permit, they must meet more stringent illicit discharge detection and elimination (IDDE) requirements. "Illicit Discharges" are any substances that enter the stormwater system other than stormwater, including chemicals, oils, gasoline, or waste.[4] Such discharges are associated with auto or other industrial activities,

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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. 2016. *National Pollutant Discharge Elimination System (NPEDS) General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts.* https://www3.epa.gov/region1/npdes/stormwater/ma/2016fpd/final-2016-ma-sms4-gp.pdf

[4] With some exceptions. United States Environmental Protection Agency, 2016. pg 30.

older residences, and failing septic systems. According to the new MS4 permit, Massachusetts MS4 municipalities will be required to a) identify receiving waters associated with each outfall, b) delineate catchment areas draining to each outfall, and c) rate the potential for illicit discharge of the outfall catchment areas as High 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. This document describes the methods that MAPC has developed to meet the terms of each of these new requirements.

Several public agencies have previously tackled the task of automatically delineating catchments using topographic data in cities such as San Francisco, Portland, and Tampa.[5] By adopting these methods in Massachusetts, municipalities should be able to meet the requirements 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 built on previous examples by developing a regionally applicable method to conduct this analysis that requires a minimum of local stormwater infrastructure data in a standardized format. MAPC has published and maintains a set instructions and of ArcGIS tools that can be applied for any municipality in Massachusetts and potentially beyond. This document describes the method and provides instructions for implementing it using ArcGIS and CommunityViz, an ArcGIS add-in.

MAPC has applied this method in a number of municipalities, including the Towns of Milton, Westwood, Stoughton, and Medfield. Other consultants and GIS Analysts working throughout the state and beyond have also downloaded and applied this methodology.

Data and Software Requirements

Catchment delineation

- ArcGIS 10.2 or above
- Spatial Analyst extension

Catchment ranking

- ArcGIS 10.2 or above
- Microsoft Excel

Stormwater Infrastructure Data

- Complete inventory of catch basins within municipal boundaries, regardless of ownership

[5] "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_V511_LoRes.pdf*.

- Catch basins have an integer ID field that corresponds to outfall IDs (see "Creating Outfall Catchments" below
- Optional: "Owner" or other fields used to group catch basins into catchment areas.

Other Data Inputs

- Digital Elevation Model (DEM): for this analysis, we used the high resolution (1m) digital elevation models.[6] These models were created from point data captured by Lidar sensors in flights from 2002 to 2012, and processed by USGS.
- Vector feature classes to "etch" into the DEM, such as:
    - Water features: MassDEP Hydrography[7]
    - Road center lines: MassDOT Road Inventory[8]
    - Gutters or edges of rights of way: MAPC Massachusetts Land Parcel Database.[9]

Assigning Outfalls to Receiving Waters

The new permit requires for each municipal outfall to be associated with receiving waters both for the Notice of Intent, and for the outfall priority ranking requirement. The Notice of Intent that municipalities submit to the Department of Environmental Protection in the fall after the permit goes into effect requires municipalities to list each body of water receiving stormwater from the municipality, along with each impairment and the number of outfalls that contribute stormwater to each. Using GIS and various reference datasets such as topography and wetlands, outfalls can be assigned IDs from the MassDEP Impaired Waters dataset, or the 303(d) waters, named for section 303(d) of the Federal Clean Water Act. [10] 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).[11] Each stream segment or lake has a unique identifier, or "AU ID."

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[6] MassGIS. "LiDAR Terrain Data." http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/lidar.html

[7] 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

[8] 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

[9] Metropolitan Area Planning Council. "MAPC Massachusetts Land Parcel Database." 2017. MAPC. https://www.mapc.org/learn/data/#landparceldb

[10] 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.

[11] Massachusetts Department of Environmental Protection. "MassDEP 2014 Integrated List of Waters (305(b)/303(d))." May 2016. MassGIS. http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/wbs2014.html

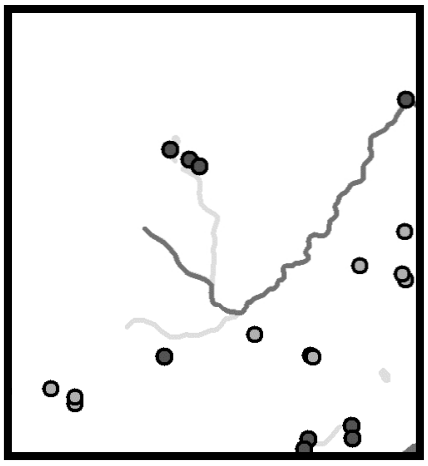

Figure 1. Using the USGS Hydrography dataset to associate the outfall to the Impaired Water.

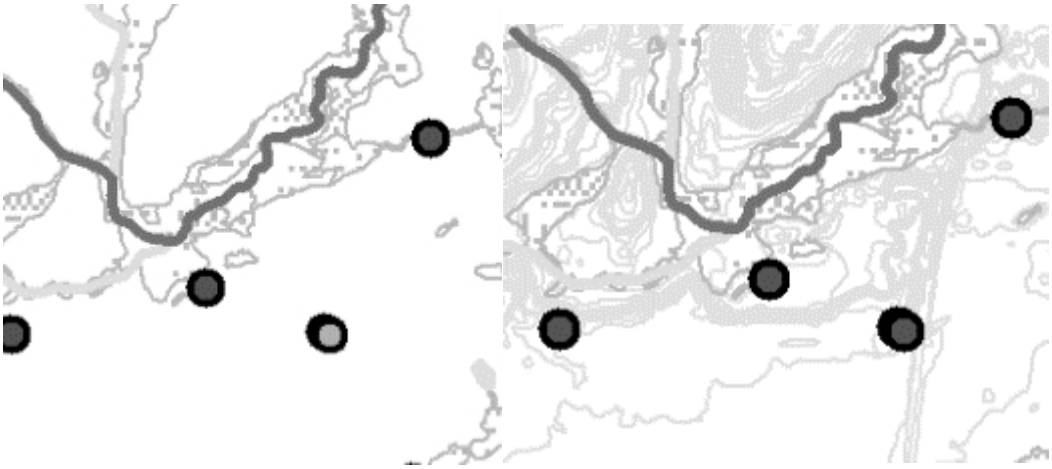

Figure 2. Using wetlands (left) and topographic contours (right) to associate outfalls with Impaired Waters

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 Github.[12]

[12] Go to https://github.com/MAPC/stormwater-toolkit https://github.com/MAPC/stormwater-toolkit to download the toolbox.

Preprocessing the DEM

First, we downloaded the relevant Lidar images from MassGIS and mosaicked them into a single DEM. We built this process into an ArcGIS script tool called the Lidar Mosaic Tool. 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.[13]

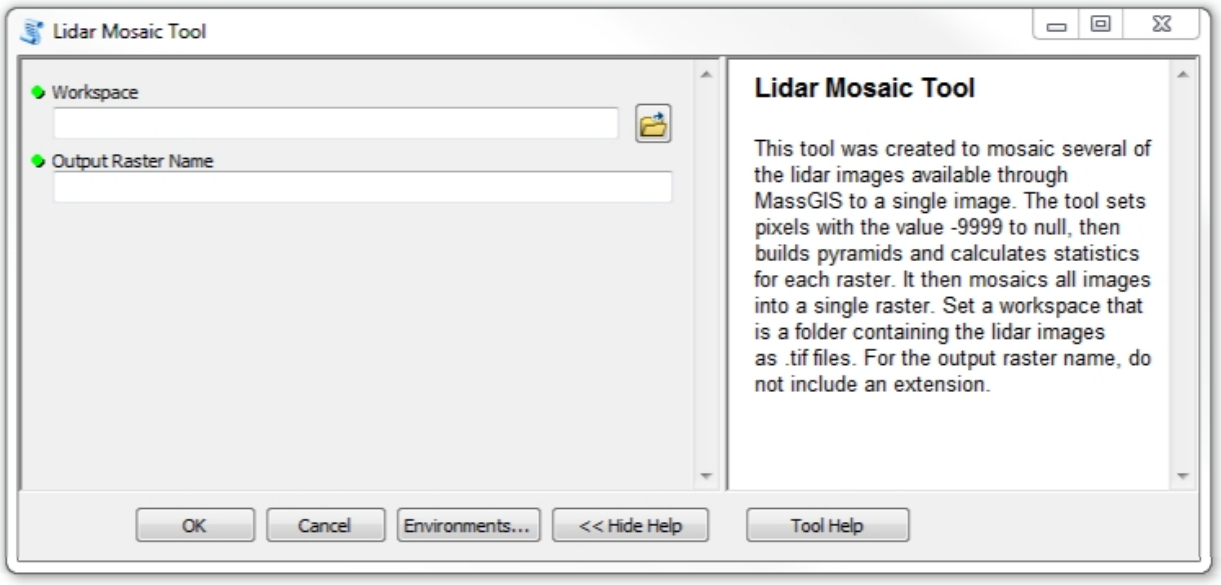

Figure 3. Lidar Mosaic script tool.

The Lidar Mosaic tool performs the following steps:

1. Sets Null value to <-400
2. Builds Pyramids and Calculates Statistics
3. Mosaics to New Raster

Enhancing the DEM

Although the digital 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 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

[13] The tool is set to mosaic using the value of the first listed raster in the case of overlapping rasters. It is also set to pull the pixel type from the first raster listed, so please use caution when mosaicking rasters from different lidar flyovers. This may require additional processing.

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.

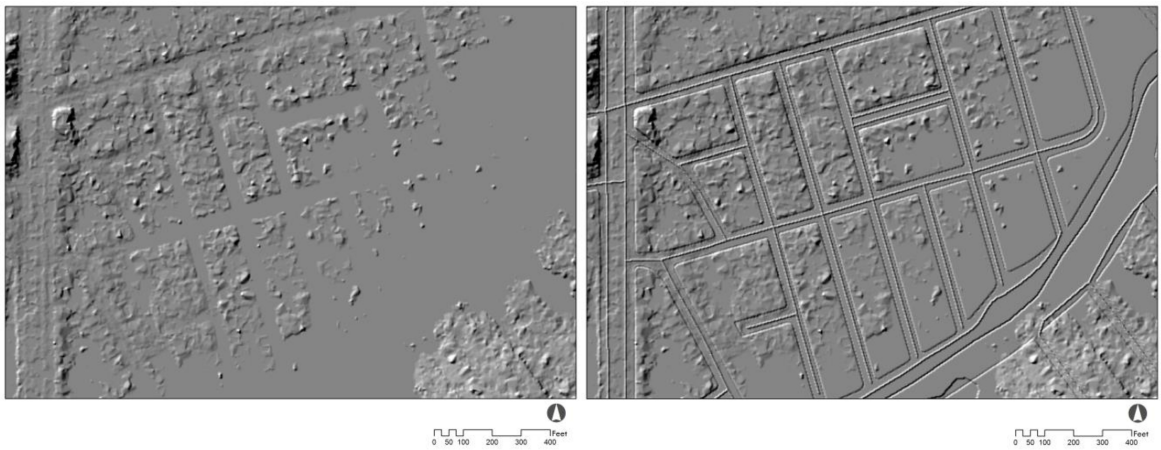

Figure 4. Hillshades before and after enhancement.

To enhance the DEM, 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, in map units, that will be added to the original DEM, and all other cells are set to zero. We created an ArcGIS script tool to create these rasters more easily (Figure 3).

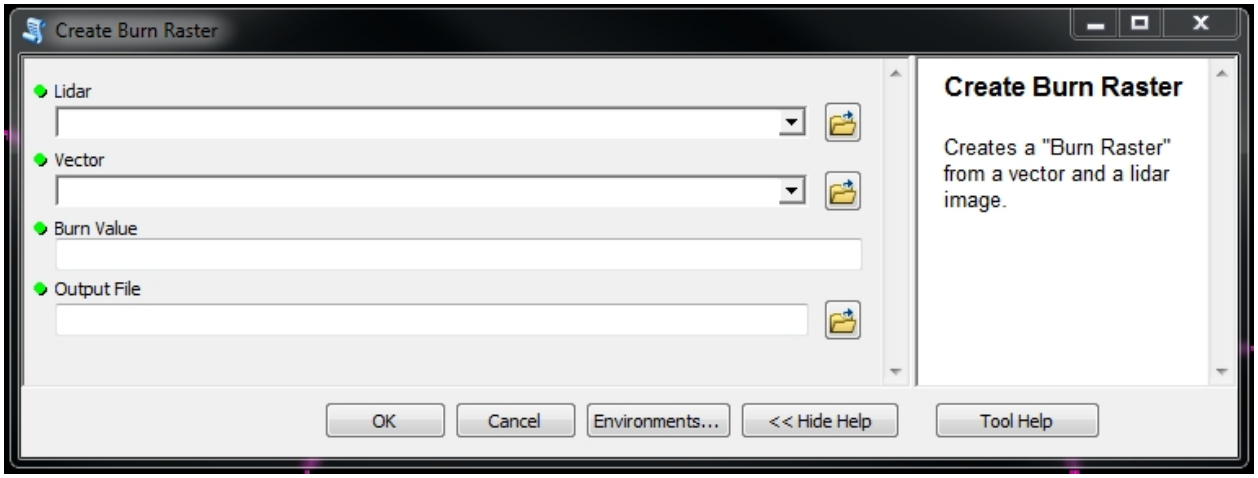

Figure 5. Create Burn Raster script tool.

This tool performs the following steps

1. Sets environments
    A. Processing Extent > Snap Raster: select lidar mosaic
    B. Processing Extent > Extent: same as lidar mosaic
    C. Raster Analysis > Cell size: same as lidar mosaic
    D. Raster Analysis > Mask: same as lidar mosaic
2. Creates an editable copy of the vector feature class
3. Adds a field to the vector's attribute table called "Burn_Val."
4. Populates the new field with the burn value.
5. Converts the vector to a raster
6. Converts nulls to zeros
7. Saves results

For example, to create a burn raster for the road crown, a user inputs the DEM that will be enhanced with the burn raster, the road center line shapefile or feature class as the "Input Vector", then enters .5 into the "Enter Burn Value" field, and finally names the output file. 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 can be run in batch mode (right click > batch) to create several burn rasters at once. See table 1 for an example of values used for the Town of Milton.

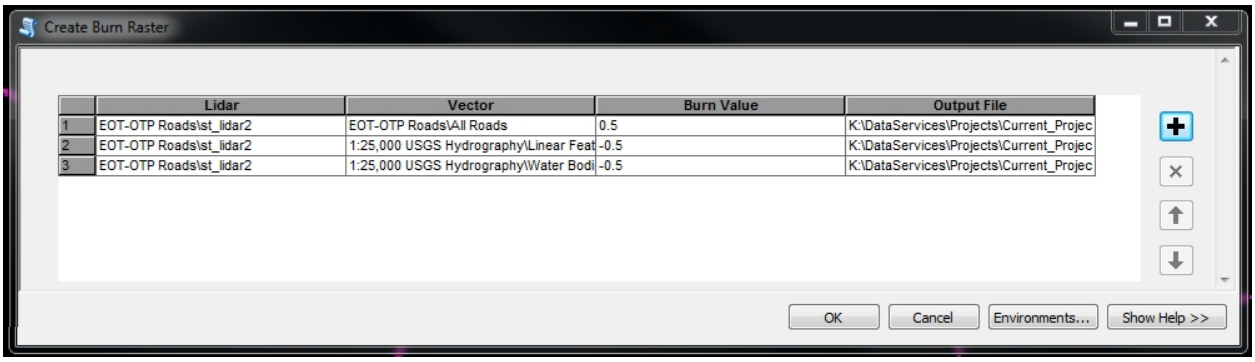

Figure 6. Create Burn Raster script tool in batch mode.

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

There is an ArcHydro tool called "DEM Reconditioning" that performs a similar function to burning streams or rivers into a DEM. This tool creates a stepped groove of a specified width along a linear feature. This tool cannot be used on polygons such as wide rivers, lakes, or ponds, however.

After creating the set of burn rasters, the user should add the burn rasters to the DEM using the Raster Calculator.

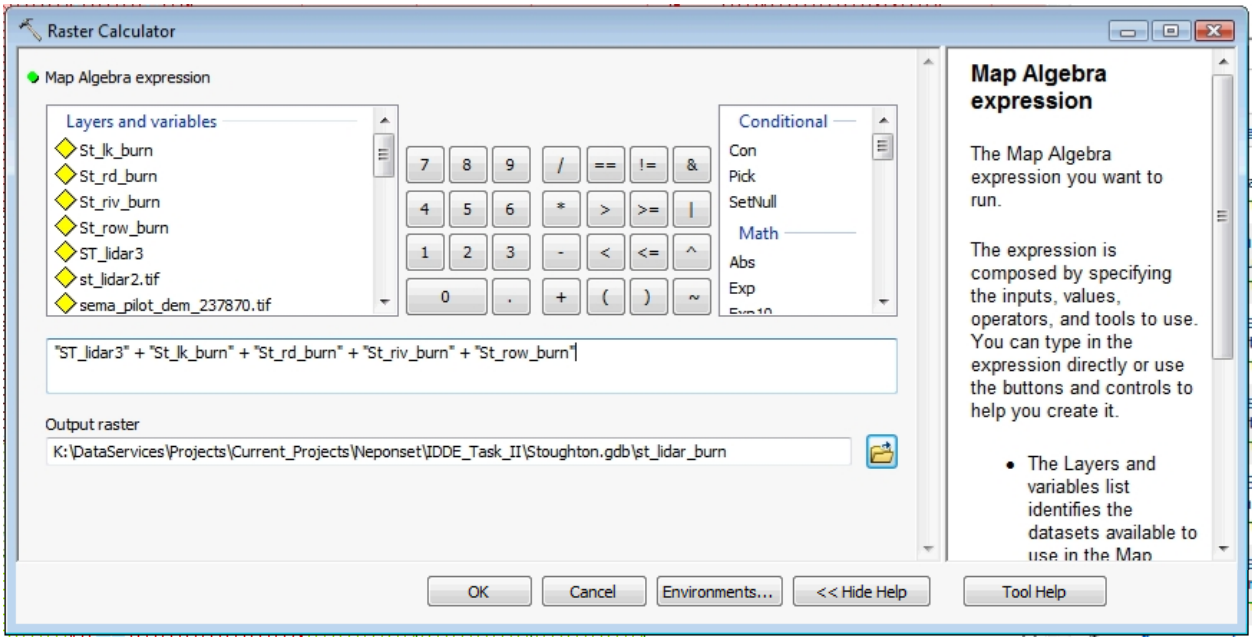

Figure 7. Using the Raster Calculator tool to enhance the DEM using the burn rasters.

Creating Catch Basin Catchments

To simplify the steps necessary to create catch basin watersheds, we created a "Complete Watershed" script tool. Tool inputs are the enhanced DEM, the pour point (catch basin) vector layer, the field to be used for catch basin IDs, the maximum snap distance, and finally a name for the output file. The inputs have the following requirements: 1) the workspace must be a geodatabase, 2) both the Lidar DEM and the catch basin file should be stored within the workspace geodatabase, 3) neither input file should be nested in a group layer in the map document, and 4) the "snap point field" should be an integer.

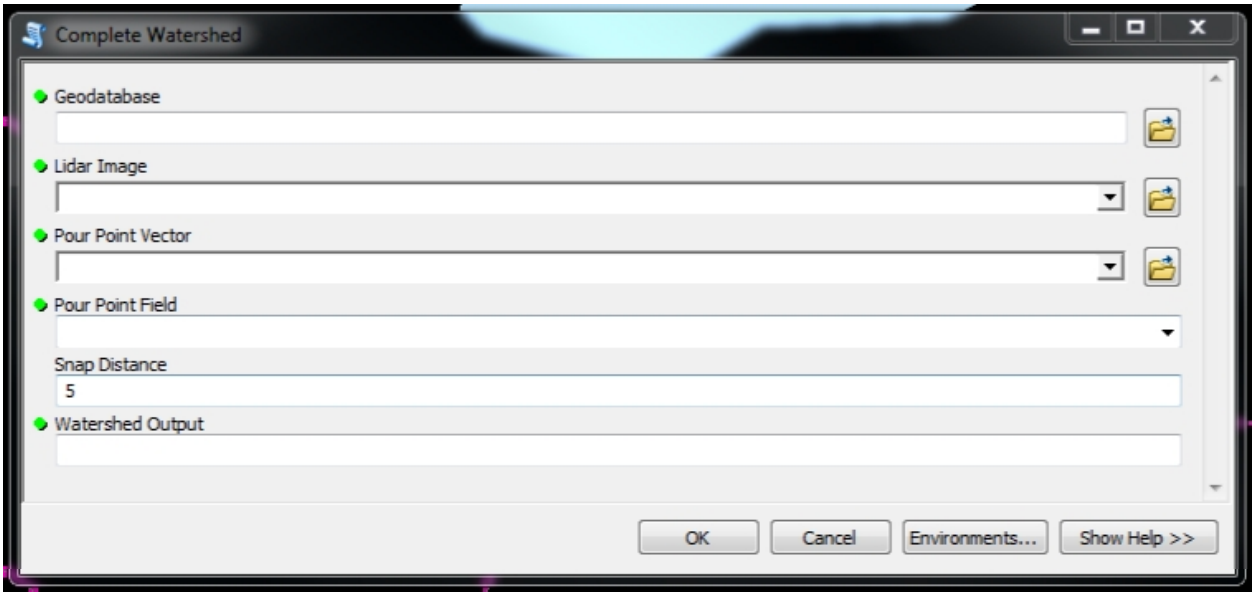

Figure 8. The Complete Watershed script tool.

The tool combines the following steps:

1. Fills any sinks in the enhanced DEM
2. Creates a flow direction raster from the filled DEM
3. Creates a flow accumulation raster using the flow direction raster
4. Snaps the pour points (catch basins) to pixels with high accumulated flow within the specified snap distance (in map units)
5. Creates watersheds using the flow direction raster and snapped pour points as inputs
6. Converts the watershed raster to a vector

Snapping the pour points (step 4 above) is particularly important, since catch basins points may not coincide with the pixels where the gutters have been burned into the DEM. For this step, the inputs are the point feature class representing the catch basins, and a maximum snap distance in map units. The tool will shift the location of the catch basins to coincide with pixels of highest flow accumulation in the flow accumulation raster within the radius specified as the "snap distance." If this step is skipped, water will be modeled as flowing past the catch basins. The default value in this field is 5 map units. For the Town of Milton, 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. If catch basin catchments look "stringy" or extremely small, try adjusting the snap distance.

The output of this tool is a set of very small watersheds—one for each catch basin. The tool will also output a set of intermediate rasters that can be used for troubleshooting or for other analyses.

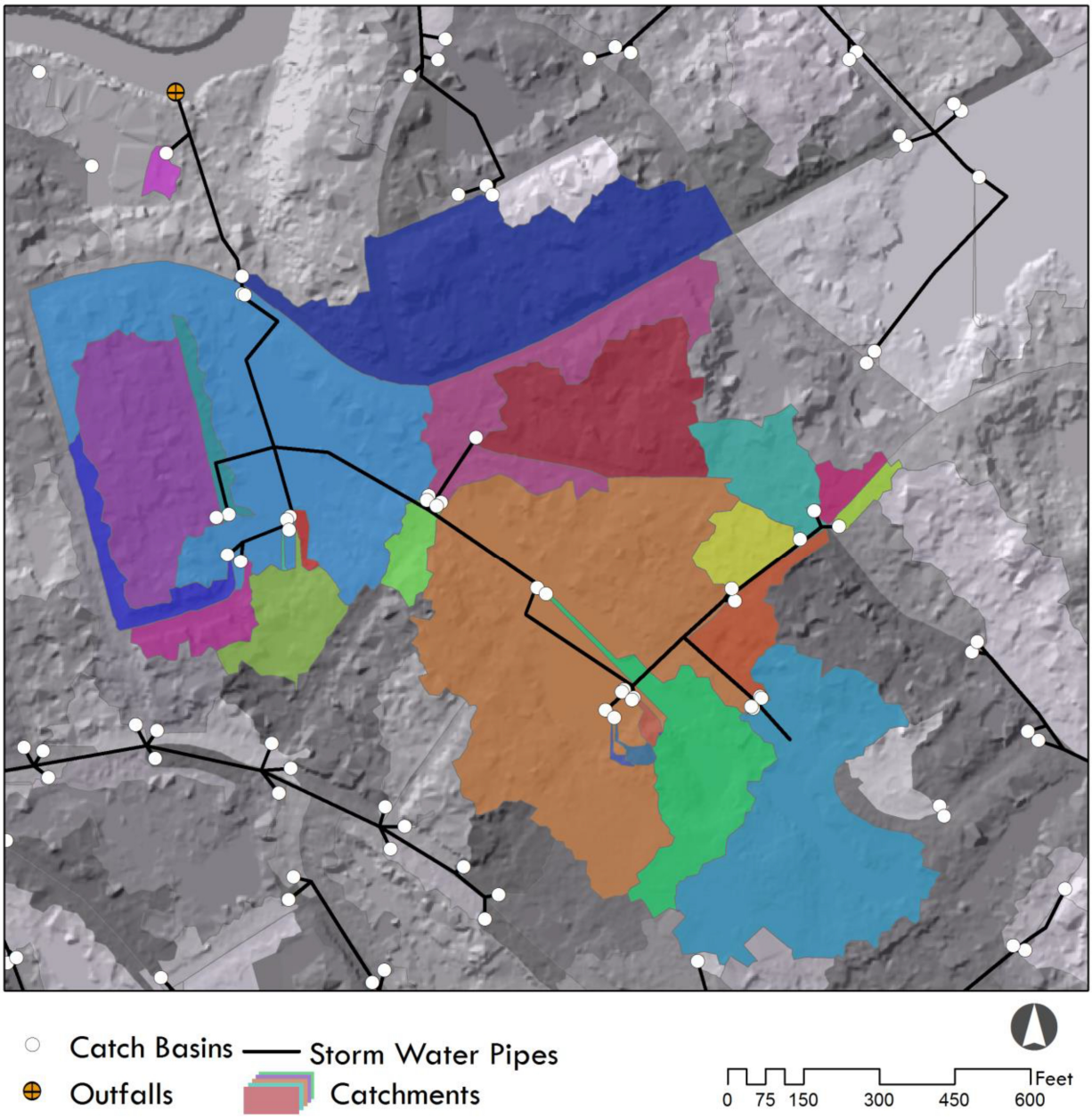

Figure 7. Catchments for each catch basin. The "streaky" catchments are in very flat areas with very low flow accumulation. Aggregating the catchments by outfall corrects for most of these issues.

The "cbid_int" field in the output raster matches the catch basin integer field, and can be used to join the original attribute table to the watershed layer.

Creating Outfall Catchments – An example from Milton, Massachusetts

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 which outfall they feed into. In order to achieve this, the catch basin feature

class should contain a field that assigns each feature to an outfall. This way, catch basins catchment areas that drain to the same outfall can be grouped.

This grouping can be done based on local knowledge of the stormwater system. MAPC has also developed a methodology for linking catch basins and their outfalls using a common ID. Inputs are 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 staff time by providing a preliminary result that can be modified manually. 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. The following sections describes how we conducted this analysis for the Town of Milton.

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 into a large multipart polygon.
2. Exploded the multipart polygon into many single part pipe polygons.
3. Created a "Pipesys_ID" field in the attribute table of the new pipe polygon feature class.
4. Populated the "Pipesys_ID" field with the OID number using the field calculator.
5. Performed a spatial join to link the original pipe line network to the pipe polygon feature class.
6. 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. Could flag for field investigation.

In order to resolve these issues enough to aggregate the catchments by outfall, we made manual adjustments to the network based on the DPW staff's 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.

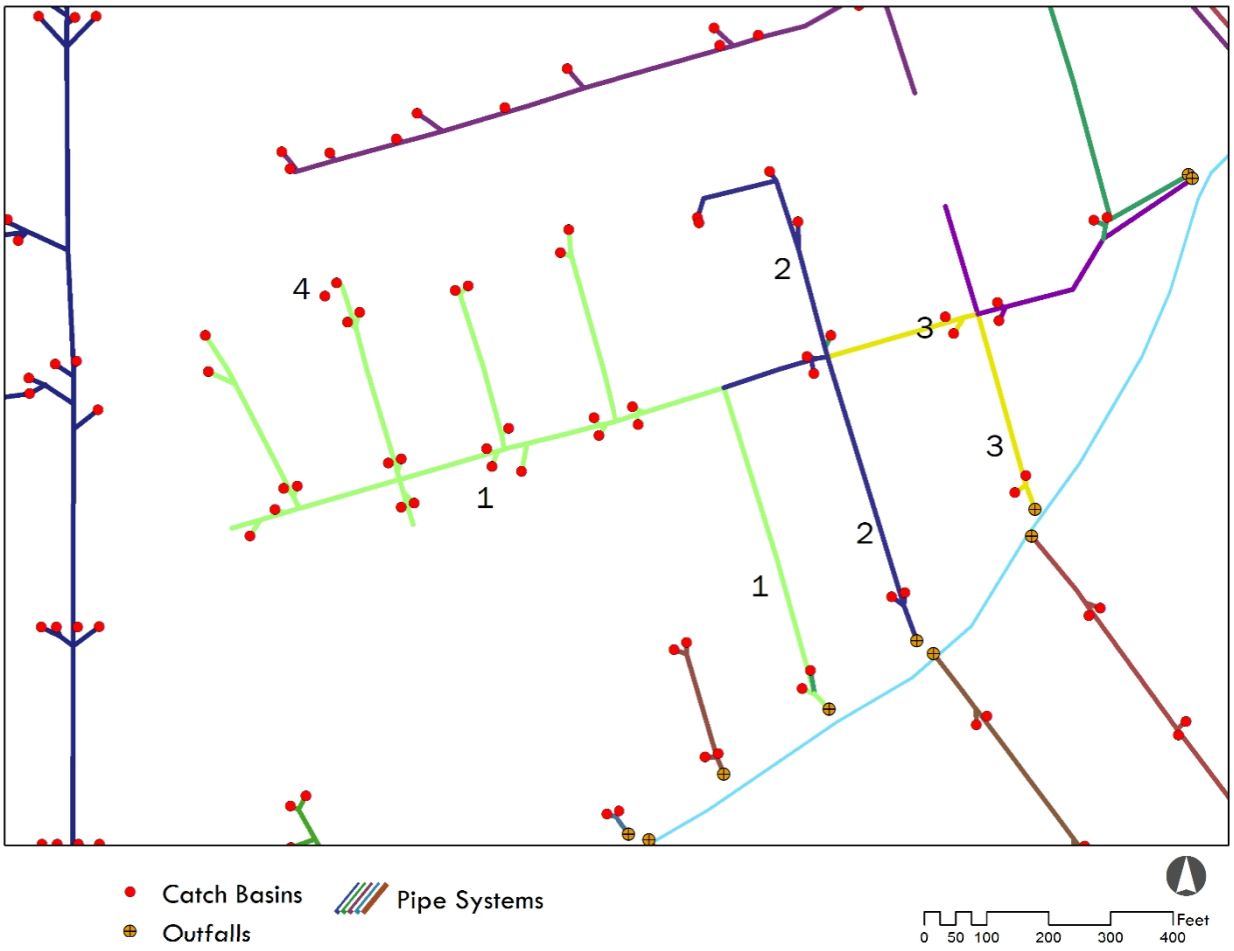

Figure 9. Splitting pipe systems by outfall.

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] 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. [15] 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.

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:

[14] United States Environmental Protection Agency. 2016: 34
[15] United States Environmental Protection Agency. 2016: 35

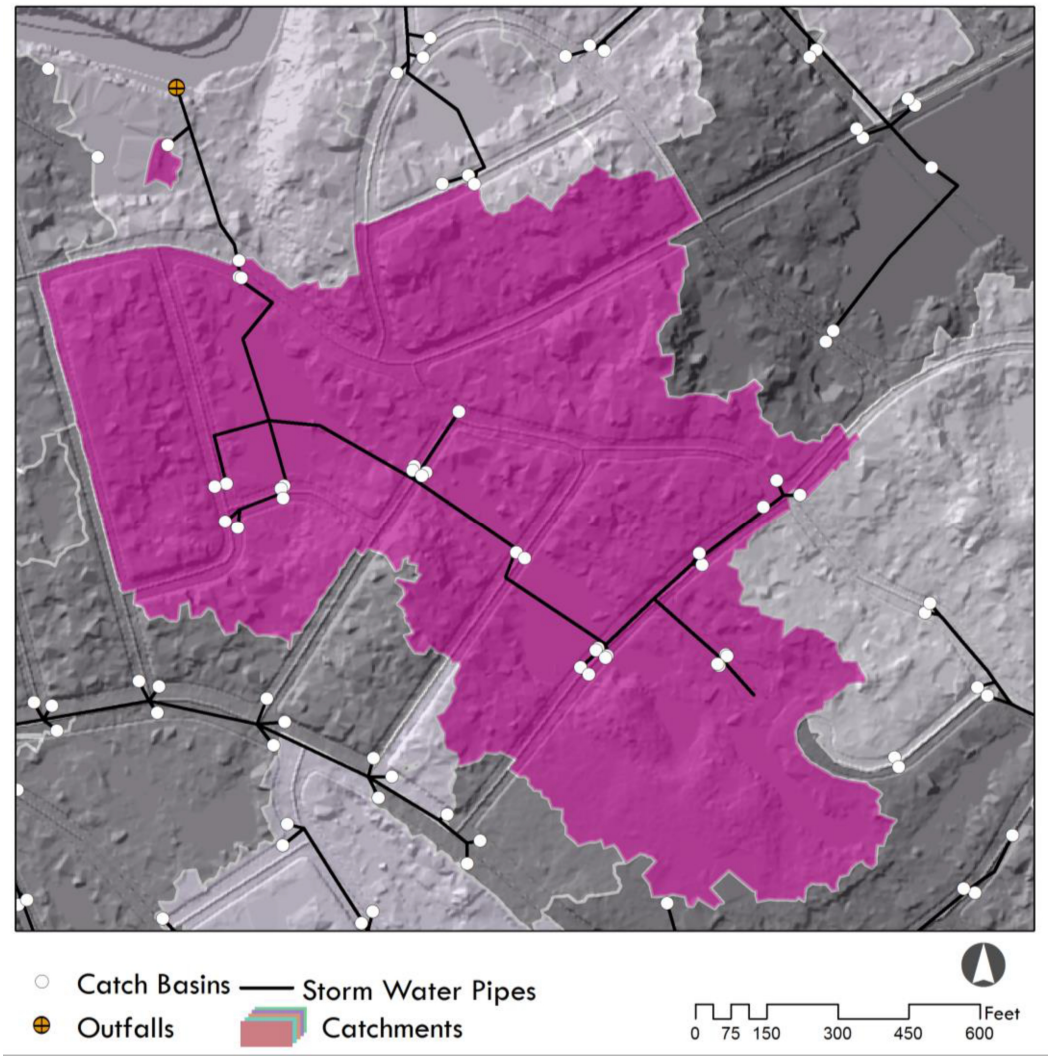

Figure 10. Outfall Catchments.

Ranking Catchments

Once we delineated outfall catchments for Milton and linked outfalls with Impaired Waters in Milton, we ranked Milton's outfall catchments according to how likely they were to contribute pollution to the receiving waters. NepRWA developed a spreadsheet-based method to prioritize outfalls and catchments based on criteria pulled directly from the language of the new permit. Some fields in the spreadsheet can be completed using GIS, and other should be completed using local knowledge of the stormwater system and municipality.

This spreadsheet analysis evaluates sites based on a set of specified quantitative criteria pulled directly from the language of the permit.

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".[16] 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.

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	• 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

[16] Environmental Protection Agency. "Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments." https://www3.epa.gov/npdes/pubs/idde_manualwithappendices.pdf Last Updated on October, 2004.

High Potential businesses:	
• Metal production, plating, and engraving operations • Facilities providing building materials, hardware, and farm equipment, heating, hardware, plumbing, lumber supplies and equipment	• Ports • Railroads • Petroleum bulk stations or terminals • 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 11. 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 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."[17] 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

[17] United States Environmental Protection Agency. 2016: 35.

or drastic rebuilding would be required to follow the building codes in effect at the date of construction.

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.

Table 3. Ranking criteria and weights

Criterion	Description	Dataset
Business Generating Site Index Density	Count of businesses of specified types divided by catchment area (in acres)	MAPC Massachusetts Land Parcel Database, InfoGroup
Density of older houses	Summary index, weighted count of houses older than 40 and 20 years.	MAPC Massachusetts Land Parcel Database
Density of sewer pipes	Length of sewer pipes per acre	municipal infrastructure data
Density of septic systems	Number of septic systems per acre	municipal data

Quality of receiving waters	Category of water, 3, 4, or 5	303(d) Integrated List of Waters dataset from MassDEP, available through MassGIS

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.[18] 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 ranking 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 outfall" 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.[19] 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

[18] United States Environmental Protection Agency. 2016: 32.
[19] United States Environmental Protection Agency. 2016: 34.

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.

APPENDIX C: OPPORTUNISTIC INSPECTION SOP

Standard Operating Procedure for:	
A.1 IDDE: Inspections During Mapping	
Purpose of SOP:	This SOP provides a basic checklist for managers and field crews conducting illicit discharge inspections during mapping.

Always:

- Characterize the outfall by recording information on the Storm Drain Characteristic Form.
- Conduct inspections during dry weather periods using the Dry Weather Outfall Inspection Form.
- Follow procedure below if an illicit discharge is encountered (such as raw sewage, paint, etc.).
- Conduct inspections with at least two staff per crew.
- Carry a list of emergency phone numbers.

Dry Weather Discharge

The CWP defines **dry weather** as a 48 hour period with no runoff-producing rainfall. NEIWPCC defines dry weather as a 48-72 hour period with less than 1/10-inch rainfall.

Whenever Possible:

- Conduct inspections during low groundwater and leaf off conditions.
- Photograph the outfall with a digital camera (use dry erase or chalk board to identify outfall).
- Identify and label the outfall with a unique identifier. For example "SWO-013".
- If dry weather flow is present at the outfall, and the flow does not appear to be an illicit discharge attempt to identify the source of the flow (intermittent stream etc.), then document the discharge for future comparison.
- Carry an authorization letter.
- Collect samples of flowing discharges before and after source removal.

Equipment list for mapping:

1. Existing paper maps
2. Field sheets
3. Camera (preferably digital) on pole
4. GPS Unit
5. Spray paint (or other marker)
6. Cell phones or hand-held radios
7. Clip boards and pencils
8. First aid kit
9. Flash light or head lamp
10. Surgical gloves
11. Tape measure
12. Temperature probe
13. Waders
14. Watch with a second hand
15. Five 1-liter sample bottles
16. Dry erase board (for photos)
17. Hand sanitizer
18. Sampling pole
19. Mirror (for light)
20. Safety vests

Never:

- Never put yourself in danger.
- Never enter private property without permission

Procedures to follow if illicit discharge is detected:

- □ Call dispatch / supervisor.
- □ Use the Dry Weather Outfall Inspection Form to document observations.
- □ Visually inspect general area for possible sources.
- □ Take photos.
- □ Estimate flow/collect samples if instructed to do so.

Dry Weather Outfall Inspection Form

Location Information

Date: _____ **Inspector:** _____

Time: _____

Outfall ID: _____

Outfall Location: _____

Receiving Waterbody: _____

Photo Taken: Yes No **Photo ID:** _____

Weather: Clear Cloudy **Approximate Temp:** _____ **Wind Present:** Yes No

Precipitation in the past 3 days: No Yes _____ inches

Pipe Flow: None Trickle Steady 1/4 pipe flow or more

Seepage Flow: None Trickle Steady 1/4 pipe flow or more

Color (if flow is present): _____

Inspection Information *Select all that are applicable*

Obvious Debris/Pollution:		**Odor:**		**Water Clarity:**	
None	0	None/Natural	0	Clear	0
Foam	3	Musty	5	Cloudy	5
Staining	5	Sewage/septic	10		
Floating Green Scum	8	Petroleum	10	Opaque	10
Oil / Film	9				
Vegetative Mat/or Gray Mat	9				
Sewage Solids	10				
TOTAL		**TOTAL**		**TOTAL**	

GRAND TOTAL SCORE = _____

Additional Information

Sediment Condition: Open 1/4 Full 1/2 Full 3/4 Full Plugged

Structure Condition: Excellent Good Fair Poor

Trash/litter present: Yes No **Yard waste observed:** Yes No

General Comments:

Potential Sources / Actions Taken:

Sample collected? Yes No

By whom? _____

Parameters:	**Results:**

Follow up required: Yes No

NOTE: Sketch site map/note on back.

NOTE: This information is to accompany the Dry Weather Outfall Inspection Form.

Odor – Most strong odors, especially gasoline, oils, and solvents are likely associated with high responses on the toxicity screening test.

Stale sanitary wastewater: sewage
Detergent, perfume: Laundromat or household laundry
Sulfur ("rotten eggs"): industries that discharge sulfide compounds or organics (meat packers, canneries, dairies)
Oil and gas: facilities associated with vehicle maintenance or petroleum product storage (gas stations) or petroleum refineries
Rancid-sour: food preparation facilities (restaurants, hotels)

Color – Important indicator of inappropriate industrial sources. Dark colors, such as brown, gray, or black are the most common.

Yellow: chemical plants, textile, and tanning plants
Brown: meat packers, printing plants, metal works, stone and concrete, fertilizers, and petroleum refining facilities [note: can be from natural organic acids if a wetland is upstream]
Green: chemical plants, textile facilities
Red: meat packers [note: can be from organic acids if a wetland is upstream]
Gray: dairies

Turbidity – The cloudy appearance of water caused by the presence of suspended or colloidal matter. In dry weather, high turbidity is often a characteristic of undiluted industrial discharges.

Cloudy: sanitary wastewater, concrete or stone operations, fertilizer facilities, automotive dealers
Opaque: food processors, lumber mills, metal operations, pigment plants

Floatable matter – a contaminated flow may contain floating solids or liquids directly related to industrial or sanitary wastewater pollution. Floatables of industrial origin may include animal fats, spoiled food, oils, solvents, sawdust, foams, packing materials, or fuel.

Oil sheen: petroleum refiners or storage facilities and vehicle service facilities. [note: there is a type of bacteria that looks like an oil sheen. If you take a stick and swirl around the sheen, it will break up into blocky pieces if it is the bacteria. A true oil sheen will quickly re-form and not look blocky.]
Toilet paper bits, fecal bits, food particles: sanitary wastewater
Soap suds: if white or a clear sheen, laundry discharge (check odor) [note: can also occur from natural surfactants; usually off-white or tan with an earthy-fishy odor.]

Deposits and Stains – Any type of coating near the outfall, usually a dark color. Deposits and stains will often contain fragments of floatable substances.

Lots of sediment: construction site erosion, sand and gravel pits, winter road applications
Oil stain: petroleum storage, vehicle service facilities, petroleum refineries
Rusty: precipitates from iron-rich water (natural or industrial) [note: if slimey and clumpy, it could be iron bacteria]
Grayish-black deposits and hair: leather tanneries
White crystalline powder: nitrogenous fertilizer waste

Vegetation – Vegetation surrounding an outfall may show the effects of industrial pollutants. Decaying organic materials coming from various food product wastes would cause an increase in plant life, while the discharge of chemical dyes and inorganic pigments from textile mills could noticeably decrease vegetation. It is important not to confuse the adverse effects on high storm water flows on vegetation with highly toxic dry-weather intermittent flows.

Excessive growth: food product facilities, fertilizer runoff (lawns, golf courses, and farms)
Inhibited growth: high storm water flows, beverage facilities, printing plants, metal product facilities, drug manufacturing, petroleum facilities, vehicle service facilities, and automobile dealers

Damage to Outfall Structures – Outfall damage can be caused by severely contaminated discharges that are very acidic or basic in nature. Primary metal industries have a strong potential to cause outfall structure damage because their batch dumps are highly acidic. Poor construction, hydraulic scour, and old age can also negatively affect the condition of al outfall structure.

Concrete or spalling (breaking off into chips or layers): industrial flows
Peeling paint: industrial flows
Metal corrosion: industrial flows

Storm Drain Outfall Characteristics Form

Location Information

Date: _____ **Inspector:** _____

Time: _____

Outfall ID: _____

Outfall Location: _____

Receiving Waterbody: _____

Photo Taken: Yes No **Photo ID:** _____

Weather Clear Cloudy **Approximate Temp:** _____ **Wind Present:** Yes No

Precipitation in the past 3 days: No Yes _____ inches _____

Dry Weather Inspection Form Used: Yes No - No Discharge No – No Dry Weather No - Other

Pipe Flow: None Trickle Steady 1/4 pipe flow or more

Seepage Flow: None Trickle Steady 1/4 pipe flow or more

Outfall Description *Select all that are applicable, fill in as necessary*

Submerged in water- no partially fully _____

Type:	RCP	CMP	Dimension (inches) _____
Open Pipe-	PVC	HDPE	Circular Box
	Steel	Other _____	Elliptical Other _____

Open Drainage-	Concrete	Trapezoidal	Depth (inches)_____
	Earthen	Parabolic	Top width (inches)_____
	Riprap	Other _____	Bottom width (inches)_____
	Other _____		

Additional Information

Sediment Condition: Open ¼ Full ½ Full ¾ Full Plugged

Structure Condition: Excellent Good Fair Poor

Trash/litter present: Yes No

Yard waste observed: Yes No

General Comments: _____

_____

Actions Taken: _____

_____

Follow-up Required: Yes No

N↑

Standard Operating Procedure for:	
A.2 IDDE: Long-Term Inspections	
Purpose of SOP:	To provide supervisor and field crew with a punch list of things to remember during regularly scheduled inspections.

Always:

- Conduct inspections during dry weather periods.
- Check the outfall's dimensions, shape, and component material using the Storm Drain Characteristic Form.
- Characterize and record observations on basic sensory and physical indicators (e.g., odor, color, oil sheen).
- If an illicit discharge is encountered (such as raw sewage, paint, etc.), follow the procedure below.

Whenever Possible:

- Perform inspections of all the outfalls at least once per permit cycle (long term).
- Photograph the outfall with a digital camera (use dry erase board to identify outfall).
- Identify and label the outfall with a unique identifier. For example "SWO-013".
- Carry a letter of authorization with you during inspections that outline who you are and what you are doing.
- 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 the flow (intermittent stream, etc.) then document the discharge for future comparison.
- Collect samples before and after source removal. Contact NHDES for technical assistance.

Never:

- Never put yourself in danger.
- Never enter private property without permission.

Procedures to follow if illicit discharge is detected:

- □ Call dispatch / supervisor.
- □ Document observations using the Dry Weather Outfall Inspection Form.
- □ Visually inspect general area for possible sources.
- □ Take photos.
- □ Estimate flow/collect samples if instructed to do so.

Standard Operating Procedure for:	
A.3 IDDE: Opportunistic Inspections	
Purpose of SOP:	This SOP provides field personnel with a quick checklist of proper procedures to follow if they observe illicit discharges while conducting their regular duties.

Always:

- Call dispatcher, supervisor, or code enforcement if you see evidence of an illicit discharge.
- Assess the general area of the illicit discharge to see if you can identify its source.

Whenever Possible:

- Use the Incident Tracking Sheet to document observations.
- Take photographs of the illicit discharge.
- Carry a Dry Weather Outfall Inspection Form.
- Use the Catch Basin Cleaning Form to document observations during cleaning.

Never:

- Never enter private property without permission.
- Never put yourself in danger.

Standard Operating Procedure for:	
A.4 IDDE: Citizen Call-in Inspections	
Purpose of SOP:	To collect appropriate information from a citizen reporting a potential illicit discharge to increase the chances of identifying and removing its source.

Always:

- Use the Incident Tracking Sheet to collect the appropriate information.
- Promptly investigate reported incidents.
- Document any further action taken.

Whenever Possible:

- Train Dispatch Personnel in the use and importance of the Incident Tracking Sheet.
- Document and review incidents reported by citizens on an annual basis to look for patterns of illicit discharges and to evaluate the call-in inspection program.

Never:

- Never enter private property without permission.
- Never put yourself in danger.

ILLICIT DISCHARGE HOTLINE INCIDENT TRACKING SHEET

Incident ID:

Responder Information	
Call taken by:	Call date:
Call time:	Precipitation (inches) in past 24-48 hrs:
Reporter Information	
Incident time:	Incident date:

Caller contact information (*optional*):

Incident Location *(complete one or more below)*

Latitude and longitude:
Or other coordinate system

Stream address or outfall #:

Closest street address:

Nearby landmark:

Primary Location Description	**Secondary Location Description:**		
☐ Stream corridor *(In or adjacent to stream)*	☐ Outfall	☐ In-stream flow	☐ Along banks
☐ Upland area *(Land not adjacent to stream)*	☐ Near storm drain	☐ Near other water source (storm water pond, wetland, etc.):	

Narrative description of location:

Upland Problem Indicator Description

☐ Dumping	☐ Oil/solvents/chemicals	☐ Sewage
☐ Wash water, suds, etc.	☐ Other: _____	

Stream Corridor Problem Indicator Description

Odor	☐ None	☐ Sewage	☐ Rancid/Sour	☐ Petroleum (gas)
	☐ Sulfide (rotten eggs); natural gas	☐ Other: Describe in "Narrative" section		
Appearance	☐ "Normal"	☐ Oil sheen	☐ Cloudy	☐ Suds
	☐ Other: Describe in "Narrative" section			
Floatables	☐ None:	☐ Sewage (toilet paper, etc)	☐ Algae	☐ Dead fish
	☐ Other: Describe in "Narrative" section			

Narrative description of problem indicators:

Suspected Violator (name, personal or vehicle description, license plate #, address, etc.):

Standard Operating Procedure for:	
A.5 IDDE: Septic System Inspections	
Purpose of SOP:	Failed septic systems can adversely impact water quality. This SOP provides a quick reference list to supervisors and field crews that are conducting an initial screening for failures in areas that are identified in the full IDDE program.

Always:

- Refer potential septic system failures to the local Health Officer for enforcement.

Whenever Possible:

- Screen high risk areas (older areas or areas near lakes or impaired waterbodies).
- Look for indicators of failures, such as wet areas or disagreeable odors near the leach field.
- Document septic system inspections in a summary report for future reference.
- Refer troublesome enforcement actions to MADEP

Never:

- Never enter private property without permission.
- Never put yourself in danger.

Standard Operating Procedure for:	
A.6 IDDE: Tracing Illicit Discharges	
Purpose of SOP:	To provide a quick reference list of items to keep in mind during tracing activities to efficiently and systematically identify the source of an illicit discharge.

Always:

- Review / consider information collected when illicit discharge was initially identified (Incident Tracking Sheet or Dry Weather Outfall Inspection Form).
- Survey the general area / surrounding properties to identify potential sources of the illicit discharge as a first step.
- Trace illicit discharges using visual inspections of upstream points as a second step.
- Document tracing results for future reference.

Whenever Possible:

- Use weirs, sandbags, dams, or optical brightener monitoring traps to collect or pool intermittent discharges during dry weather.
- Smoke test or televise the storm drain system to trace high priority, difficult to detect illicit discharges.
- Dye test individual discharge points within suspected buildings.
- If the source cannot be found, add the location to a future inspection program.
- Collect bacterial samples of flowing discharges to confirm/refute illicit discharge.

Never:

- Never enter private property without permission.
- Never put yourself in danger.

Standard Operating Procedure for:	
A.7 IDDE: Removing Illicit Discharges	
Purpose of SOP:	Proper removal of an illicit discharge will ensure it does not recur. Using legal methods for the removal will minimize the municipality's liability. This SOP provides an overview of illicit discharge removal procedures.

Always:

- Determine who is financially responsible; and follow associated procedures on Table 2-9.
- Suspend access to storm drain if threats of death or serious physical harm to humans or the environment are possible.
- If the discharge is from an exempt facility (see Table 2-9) notify the facility operator and the appropriate enforcement authority.
- Repair/correct cause of discharge if municipality is responsible.
- Collect a confirmatory sample after the removal. Seek technical assistance from MADEP, if needed.

Whenever Possible:

- Issue a Notice of Violation for violations of the municipal ordinance.

Never:

- Never repair/correct cause of discharge on private property until directed to do so by the appropriate municipal authority (storm water program manager, etc.)

TABLE 2-9:
NOTIFICATION AND REMOVAL PROCEDURES FOR ILLICIT DISCHARGES INTO THE MUNICIPAL SEPARATE STORM SEWER SYSTEM

Financially Responsible Party	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	• 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 • Massachusetts Department of Transportation (MADOT) in selected urbanized areas) AND • Industrial Facilities with selected SIC codes	Any	USEPA	• Notify exempt third party and USEPA of illicit discharge

---SAMPLE---

NOTICE OF VIOLATION

September 1, 2005

Citizen
22 Main Street
Town, NH 03210

RE: Tax Map #_____

Dear Citizen:

On August 30, 2004, _____, Planning Inspector and I responded to a report of a discharge to the storm drain system on property owned by you at _____ Street in _____, MA.

We did confirm the presence of _____. This is to confirm the conversation I had with you. You are in the process of _____ and we agreed you would have the correction completed by _____. We discussed you will _____.

This discharge is in violation of the Town of _____'s Non-Storm Water Discharge Ordinance, which is required by the Clean Water Act. Please keep me informed of how the correction is proceeding. Enclosed is a copy of the Ordinance for your review.

If I can be of further assistance please do not hesitate to contact my office. We are open Mondays from 7:00 a.m. to 5:30 p.m. and Tuesday through Friday, from 8:00 a.m. to 4:30 p.m. I can be reached at 555-5555, extension ___.

Sincerely,

Joe Inspector
Code Enforcement Officer

APPENDIX D: ILLICIT DISCHARGE DETECTION AND ELIMINATION FORM

Illicit Discharge Hotline Incident Tracking Sheet

Incident ID:

Responder Information	
Call taken by:	Call date:
Call time:	Precipitation (inches) in past 24-48 hrs:
Reporter Information	
Incident time:	Incident date:

Caller contact information (*optional*):

Incident Location *(complete one or more below)*

Latitude and longitude:

Stream address or outfall #:

Closest street address:

Nearby landmark:

Primary Location Description	**Secondary Location Description:**		
☐ Stream corridor *(In or adjacent to stream)*	☐ Outfall	☐ In-stream flow	☐ Along banks
☐ Upland area *(Land not adjacent to stream)*	☐ Near storm drain	☐ Near other water source (storm water pond, wetland, etc.):	

Narrative description of location:

Upland Problem Indicator Description

☐ Dumping	☐ Oil/solvents/chemicals	☐ Sewage
☐ Wash water, suds, etc.	☐ Other: _____	

Stream Corridor Problem Indicator Description

Odor	☐ None	☐ Sewage	☐ Rancid/Sour	☐ Petroleum (gas)
	☐ Sulfide (rotten eggs); natural gas	☐ Other: Describe in "Narrative" section		
Appearance	☐ "Normal"	☐ Oil sheen	☐ Cloudy	☐ Suds
	☐ Other: Describe in "Narrative" section			
Floatables	☐ None:	☐ Sewage (toilet paper, etc)	☐ Algae	☐ Dead fish
	☐ Other: Describe in "Narrative" section			

Narrative description of problem indicators:

Suspected Violator (name, personal or vehicle description, license plate #, etc.):

Investigation Notes	
Initial investigation date:	Investigators:
☐ No investigation made	Reason:
☐ Referred to different department/agency:	Department/Agency:
☐ Investigated: No action necessary	
☐ Investigated: Requires action	Description of actions:
Hours between call and investigation:	Hours to close incident:
Date case closed:	
Notes:	

APPENDIX E: OUTFALL INSPECTION FORM

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:	
Latitude:	Longitude:	GPS Unit:	GPS LMK #:
Camera:		Photo #s:	

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

☐ Industrial
☐ Ultra-Urban Residential
☐ Suburban Residential
☐ Commercial
☐ Open Space
☐ Institutional
Other: _____
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)?

APPENDIX F: EPA'S DRAFT BACTERIAL SOURCE TRACKING PROTOCOL

EPA New England Bacterial Source Tracking Protocol
Draft – January 2012

Purpose

This document provides a common framework for EPA New England ("EPA-NE") staff to develop and implement bacterial source tracking sample events, and provides a recommended approach to watershed association, municipal, and State personnel. Adopted from Boston Water and Sewer Commission ("BWSC") (2004), Pitt (2004), and based upon fieldwork conducted and data collected by EPA-NE, the protocol relies primarily on visual observations and the use of field test kits and portable instrumentation during dry and wet weather to complete a screening-level investigation of stormwater outfall discharges or flows within the drainage system. When necessary, the addition of more conclusive chemical markers may be included. The protocol is applicable to most typical Municipal Separate Storm Sewer Systems ("MS4s") and smaller tributary streams. The smaller the upstream catchment area and/or more concentrated the flow, the greater the likelihood of identifying an upstream wastewater source.

Introduction

The protocol is structured into several phases of work that progress through investigation planning and design, laboratory coordination, sample collection, and data evaluation. The protocol involves the concurrent collection and analyses of water samples for surfactants, ammonia, total chlorine, and bacteria. When more precise confirmation regarding the presence or absence of human sanitary sewage is necessary, and laboratory capacity is available, the additional concurrent collection of samples for select Pharmaceutical and Personal Care Product ("PPCP") analysis is advised. When presented with a medium to large watershed or numerous stormwater outfalls, the recommended protocol is the screening of all outfalls using the surfactant, ammonia, total chlorine, and bacterial analyses, in addition to a thorough visual assessment. The resulting data and information should then be used to prioritize and sample a subset of outfalls for all parameters, including PPCP compounds and additional analyses as appropriate. Ideally, screening-level analyses can be conducted by state, municipal, or local watershed association personnel, and a prioritized sub-set of outfalls can be sampled through a commercial laboratory or by EPA-NE using more advanced confirmatory techniques.

Step I – Reconnaissance and Investigation Design

Each sample event should be designed to answer a specific problem statement and work to identify the source of contamination. Any relevant data or reports from State, municipal, or local watershed associations should be reviewed when selecting sample locations. Aerial photography, mapping services, or satellite imagery resources are available free to the public through the internet, and offer an ideal way to pre-select locations for either field verification or sampling.

Sample locations should be selected to segregate outfall sub-catchment areas or surface waters into meaningful sections. A common investigative approach would be the identification of a

specific reach of a surface water body that is known to be impaired for bacteria. Within this specific reach, stormwater outfalls and smaller tributary streams would be identified by desktop reconnaissance, municipal outfall mapping, and field investigation when necessary. Priority outfalls or areas to field verify the presence of outfalls should be selected based on a number of factors, including but not limited to the following: those areas with direct discharges to critical or impaired waters (e.g. water supplies, swimming beaches); areas served by common/twin-invert manholes or underdrains; areas with inadequate levels of sanitary sewer service, Sanitary Sewer Overflows ("SSOs") or the subject of numerous/chronic sanitary sewer customer complaints; formerly combined sewer areas that have been separated; culverted streams, and; outfalls in densely populated areas with older infrastructure. Pitt (2004) provides additional detailed guidance.

When investigating an area for the first time, the examination of outfalls in dry-weather is recommended to identify those with dry-weather flow, odor, and the presence of white or gray filamentous bacterial growth that is common (but not exclusively present) in outfalls contaminated with sanitary. For those outfalls with dry-weather flow and no obvious signs of contamination, one should never assume the discharge is uncontaminated. Sampling by EPA-NE staff has identified a number of outfalls with clear, odorless discharges that upon sampling and analyses were quite contaminated. Local physical and chemical conditions, in addition to the numerous causes of illicit discharges, create outfall discharges that can be quite variable in appearance. Outfalls with no dry-weather flow should be documented, and examined for staining or the presence of any obvious signs of past wastewater discharges downstream of the outfall.

As discussed in BWSC (2004), the protocol may be used to sample discreet portions of an MS4 sub-catchment area by collecting samples from selected junction manholes within the stormwater system. This protocol expands on the BWSC process and recommends the concurrent collection of bacteria, surfactant, ammonia, and chlorine samples at each location to better identify and prioritize contributing sources of illicit discharges, and the collection of PPCP compounds when more conclusive source identification is necessary.

Finally, as discussed further in Step IV, application of this sampling protocol in wet-weather is recommended for most outfalls, as wet-weather sampling data may indicate a number of illicit discharge situations that may not be identified in dry weather.

Step II – Laboratory Coordination

All sampling should be conducted in accordance with a Quality Assurance Project Plan ("QAPP"). A model QAPP is included as Attachment 1. While the QAPP details sample collection, preservation, and quality control requirements, detailed coordination with the appropriate laboratory staff will be necessary. Often sample events will need to be scheduled well in advance. In addition, the sampling team must be aware of the strict holding time requirements for bacterial samples – typically samples analysis must begin within 6 hours of sample collection. For sample analyses conducted by a commercial laboratory, appropriate coordination must occur to determine each facilities respective procedures and requirements.

The recommendations in this protocol are based on the use of a currently unpublished EPA-NE modification to *EPA Method 1694 – Pharmaceuticals and Personal Care Products in Water, Soil, Sediment, and Biosolids by HPLC/MS/MS*. Several commercial laboratories may offer Method 1694 capability. EPA-NE recommends those entities wishing to utilize a contract laboratory for PPCP analyses ensure that the laboratory will provide quantitative analyses for acetaminophen, caffeine, cotinine, carbamazepine, and 1,7-dimethylexanthine, at Reporting Limits similar to those used by EPA-NE (See Attachment 2). Currently, the EPA-NE laboratory has limited capacity for PPCP sampling, and any proposed EPA-NE PPCP sample events must be coordinated well in advance with the appropriate staff.

Step III – Sample Collection

Once a targeted set of outfalls has been selected, concurrent sampling and analyses for surfactants, ammonia, and total chlorine (which can all be done through the use of field kits), in addition to bacteria (via laboratory analysis) should be conducted. When numerous outfalls with dry-weather flow exist, sample locations should be prioritized according to the criteria mentioned above. In addition, field screening using only the field kits may occur during the field reconnaissance. However, it must be emphasized that the concurrent sampling and analyses of bacteria, surfactant, ammonia, and total chlorine parameters is the most efficient and cost-effective screening method.

When first observed, the physical attributes of each outfall or sampling location should be noted for construction materials, size, flow volume, odor, and all other characteristics listed on the data collection form (Attachment 3). In addition, GPS coordinates should be collected and a photograph of the sample location taken. Whenever possible, the sampling of storm drain outfalls should be conducted as close to the outfall opening as possible. Bacterial samples should be collected first, with care to not disturb sediment materials or collect surface debris/scum as best possible. A separate bottle is used to collect a single water sample from which aliquots will be analyzed for surfactants, ammonia, and total chlorine. A sample for PPCP analysis is recommended to be collected last, as the larger volume required and larger bottle size may cause some sediment disturbance in smaller outfalls or streams. If necessary, a second smaller, sterile and pre-cleaned sampling bottle may be used to collect the surface water which can then be poured into the larger PPCP bottle. Last, a properly calibrated temperature/specific conductance/salinity meter should be used to record all three parameters directly from the stream or outfall. When flow volume or depth is insufficient to immerse the meter probe, a clean sample bottle may be utilized to collect a sufficient volume of water to immerse the probe. In such instances, meter readings should be taken immediately.

As soon as reasonably possible, sample aliquots from the field kit bottle should be analyzed. When concurrent analyses are not possible, ammonia and chlorine samples should be processed first, followed by surfactant analysis, according to each respective Standard Operating Procedure as appropriate based on the particular brand and type of field test kit being used. All waste from the field test kits should be retained and disposed of according to manufacture instructions. Where waste disposal issues would otherwise limit the use of field kits, EPA-NE recommends

that, at a minimum, ammonia test strips with a Reporting Limit below 0.5 mg/L be utilized. Such test strips typically are inexpensive and have no liquid reagents associated with their use. Results should be recorded, samples placed in a cooler on ice, and staff should proceed to the next sample location.

Upon completion of sampling and return to the laboratory, all samples will be turned over to the appropriate sample custodian(s) and accompanied by an appropriate Chain-of-Custody ("COC") form.

Step IV – Data Evaluation

Bacterial results should be compared to the applicable water quality standards. Surfactant and ammonia concentrations should be compared to the thresholds listed in Table 1. Evaluation of the data should include a review for potential positive results due to sources other than human wastewater, and for false negative results due to chemical action or interferences. In the EPA-NE region, field sampling has indicated that the biological breakdown of organic material in historically filled tidal wetlands may cause elevated ammonia readings, as can the discharge from many landfills. In addition, salinity levels greater than 1 part per thousand may cause elevated surfactant readings, the presence of oil may likewise indicate elevated levels, and fine suspended particulate matter may cause inconclusive surfactant readings (for example, the indicator ampule may turn green instead of a shade of blue). Finally, elevated chlorine from leaking drinking water infrastructure or contained in the illicit wastewater discharge may inhibit bacterial growth and cause very low bacterial concentrations. Any detection of total chlorine above the instrument Reporting Limit should be noted.

Table 1 – Freshwater Water Quality Criteria, Threshold Levels, and Example Instrumentation [1]

Analyte/ Indicator	Threshold Levels/ Single Sample[3]	Instrumentation
E. coli [2]	235 cfu/100ml	Laboratory via approved method
Enterococci [2]	61 cfu/100ml	Laboratory via approved method
Surfactants (as MBAS)	$\geq$ 0.25 mg/l	MBAS Test Kit (e.g. CHEMetrics K-9400)
Ammonia (NH_3)	$\geq$ 0 .5 mg/l	Ammonia Test Strips (e.g. Hach brand)
Chlorine	> Reporting Limit	Field Meter (e.g. Hach Pocket Colorimeter II)
Temperature	See Respective State Regulations	Temperature/Conductivity/Salinity Meter (e.g. YSI Model 30)

[1] The mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. EPA

[2] 314 CMR 4.00 MA - Surface Water Quality Standards - Class B Waters.

[3] Levels that may be indicative of potential wastewater or washwater contamination

Once dry-weather data has been examined and compared to the appropriate threshold values, outfalls or more discreet reaches of surface water can be selected for sampling or further investigation. Wet-weather sampling is also recommended for all outfalls, in particular for those that did not have flow in dry weather or those with dry-weather flow that passed screening thresholds. Wet-weather sampling will identify a number of situations that would otherwise pass unnoticed in dry weather. These wet-weather situations include, but are not limited to the following: elevated groundwater that can now cause an exchange of wastewater between cracked or broken sanitary sewers, failed septic systems, underdrains, and storm drains; increased sewer volume that can exfiltrate through cracks in the sanitary piping; increased sewer volume that can enter the storm drain system in common manholes or directly-piped connections to storm drains; areas subject to capacity-related SSO discharges, and; illicit connections that are not carried through the storm drain system in dry-weather.

Step V – Costs

Use of field test kits and field instruments for a majority of the analytical parameters allows for a significantly reduced analytical cost. Estimated instrument costs and pro-rated costs per 100 samples are included in Table 2. The cost per 100 samples metric allows averaged costs to account for reagent refills that are typically less expensive as they do not include the instrument cost, and to average out the initial capital cost for an instrument such as a temperature/ conductivity/salinity meter. For such capital costs as the meters, the cost over time will continue to decrease.

Table 2 – Estimated Field Screening Analytical Costs [1]

Analyte/ Indicator	Instrument or Meter [2]	Instrument or Meter Cost/No. of Samples	Cost per Sample (Based on 100 Samples) [3]
Surfactants (as MBAS)	Chemetrics K-9400	$77.35/20 samples ($58.08/20 sample refill)	$3.09
Ammonia (NH_3)	Hach brand 0 – 6 mg/l	$18.59/25 samples	$0.74
Total Chlorine	Hach Pocket Colorimeter II	$389/100 samples ($21.89 per 100 sample refill)	$3.89
Temperature/ Conductivity/ Salinity	YSI	$490 (meter and cable probe)	$4.90

1 Estimated costs as of February 2011

2 The mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. EPA

3 One-time meter costs and/or refill kits will reduce sample costs over time

From Table 2, the field analytical cost is approximately $13 per outfall. Typical bacterial analyses costs can vary depending on the analyte, method, and total number of samples to be

performed by the laboratory. These bacterial analyses costs can range from $20 to $60. Therefore, the analytical cost for a single outfall, based on the cost per 100 samples, ranges from $33 to $73. As indicated above, these costs will decrease slightly over time due to one-time capitals costs for the chlorine and temperature/conductivity/salinity meters.

Step VI – Follow-Up

Once all laboratory data has been reviewed and determined final in accordance with appropriate quality assurance controls, results should be reviewed with appropriate stakeholders to determine next steps. Those outfalls or surface water segments that fail to meet the appropriate water quality standard, and meet or exceed the surfactant and ammonia threshold values, in the absence of potential interferences mentioned in Step IV, indicate a high likelihood for the presence of illicit connections upstream in the drainage system or surface water. Whereas illicit discharges are quite variable in nature, the exceedance of the applicable water quality standard and only the ammonia or surfactant threshold value may well indicate the presence of an illicit connection. When available, the concurrent collection and analyses of PPCP data can greatly assist in confirming the presence of human wastewater. However, such data will not be available in all instances, and the collective data set and information regarding the physical characteristics of each sub-catchment or surface water reach should be used to prioritize outfalls for further investigation. As warranted, data may be released to the appropriate stakeholders, and should be accompanied by an explanation of preliminary findings. Release of EPA data should be fully discussed with the case team or other appropriate EPA staff.

References Cited

Boston Water & Sewer Commission, 2004, *A systematic Methodology for the Identification and Remediation of Illegal Connections.* 2003 Stormwater Management Report, chap. 2.1.

Pitt, R. 2004 *Methods for Detection of Inappropriate Discharge to Storm Drain Systems. Internal Project Files*. Tuscaloosa, AL, *in* The Center for Watershed Protection and Pitt, R., *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*: Cooperative Agreement X82907801-0, U.S. Environmental Protection Agency, variously paged. Available at: http://www.cwp.org.

Instrumentation Cited (Manufacturer URLs)

MBAS Test Kit - CHEMetrics K-9400: http://www.chemetrics.com/Products/Deterg.htm

Portable Colorimeter – Hach Pocket Colorimeter II: http://www.hach.com/

Ammonia (Nitrogen) Test Strips: http://www.hach.com/

Portable Temperature/Conductivity/Salinity Meter: YSI Model 30: http://www.ysi.com/productsdetail.php?30-28

Disclaimer: The mention of trade names or commercial products in this protocol does not constitute endorsement or recommendation for use by the U.S. EPA.

Stormwater Monitoring Quality Assurance Project Plan
2012-2017

RFA #

Sampling Plan Acceptance

EPA OES Enforcement and Project Manager/Coordinator **Signature:**	**Date:**
EPA OEME Project Managers/Coordinator **Signature:**	**Date:**
EPA OEME QA Officer **Signature:**	**Date:**
EPA Chemistry Team Lead **Signature:**	**Date:**

1.0 Background

U.S. EPA Administrative Order 5360.1 requires that "all projects involving environmental monitoring performed by or for the U.S. EPA shall not be undertaken without an adequate Quality Assurance Project Plan (QAPP)." The purpose of this document is to describe the process used to develop, select, manage, and finalize stormwater monitoring projects. In describing this process, quality assurance goals and methods will be established, thus ensuring that the overall program and each monitoring project will meet or exceed EPA requirements for quality assurance.

The objective of these projects will be to collect data that is usable by EPA OES enforcement staff for enforcement actions and information requests. The primary focus of this project will be on urban water stormwater outfalls in the New England Region watersheds.

2.0 Sampling overview

Monitoring will be conducted on pre-scheduled days with the Laboratory. Samples will be retrieved from surface water, in stream or outfalls at suspected hotspots or areas that need further delineation. Sample sites will be located using GPS, with an accuracy goal of $\pm$ 1 meter and PDOP less than 6. Less accurate GPS reading or coordinates from maps will be accepted when site or other conditions do not allow $\pm$ 1 meter accuracy.

The primary focus of this sampling will be used to identify illegal discharges.
Results from the sampling will be used by EPA enforcement staff for enforcement purposes. For this project, sampling will be conducted according to EPA's Ambient Water Sampling SOP (Table 3). Volunteers and watershed association staff may assist in sampling. All procedures will be followed that are specified in Table 3. Parameter to be sampled will be predetermined by enforcement (OES) and OEME staff, based on data needs.

A. Locations

Site locations will be determined from field or desktop reconnaissance by project staff. Sample analyses will be predetermined based on conditions known about the sampling location prior to sampling. These may include data from previous sampling or from data collected from Mass DEP or local watershed associations. Any of the parameters listed in table 2 may be analyzed.

B. Analytical Methods and Reporting limits

Sample analyses will be conducted by EPA Laboratories.

This effort will test and compare the most appropriate analytical methods including, but not limited to; laboratory analysis, test kits and field analysis to determine the most effective and cost-efficient outfall and in-stream sampling approach.
Multiple and repeated testing will occur at each location to compare different method for identifying sewage contamination.

PPCPs, E.coli and enterococcus will be analyzed by EPA's Laboratory. Surfactants, ammonia, total chlorine will be analyzed with field test kits. Potential additional laboratory analyses include nitrogen (nitrate/nitrite), TSS, BOD, surfactants, ammonia and TPH. The Laboratory used

for each sampling event will be determined prior to sampling by the OEME Project Manager based on required analyses Laboratory availability and contract funds available.

Where available, a known concentration sample will be used to evaluate the performance of each test method. The known concentration sample will be processed in the field and Laboratory as a routine sample. The analyst or field technician will not know the concentration of the sample prior to analyzing and reporting the sample result. Sampling for PPCP testing will be done using extreme care not to contaminate the sample. No caffeine products should be consumed prior to sampling.

Table 1: Parameter specifications

Parameter (lab - equipment)	Preservation	Holding time
PH	None	Immediate
Temperature	None	Immediate
Sp Cond	None	Immediate
DO	None	Immediate
Total Phosphorus (EPA)	H_2SO_4 (pH <2) + Ice	28 days
TSS (EPA)	Ice	7 days
TSS (Alpha)	Ice	7 days
BOD (Alpha)	Ice	48 hours
Surfactants (Alpha)	Ice	48 hours
Surfactants (field kit – Chemetrics)	None	Immediate
Ammonia (alpha)	H_2SO_4 (pH <2) + Ice	28 days
Ammonia (test strips)	None	Immediate
TPH Petroleum ID (alpha)	Ice	7 Days to extraction 40 days after extraction
E. Coli (EPA)	Ice	6 hrs to lab
Enterococcus (EPA)	Ice	6 hrs to lab
PPCP	Ice (acidified in Lab)	7 day to extraction 40 days after extraction
Chlorine (Field kit – Hach)	None	Immediate

Table 2: Analytical References and Quality Control Goals

		Water Quality Criteria or Guidelines	Quality Assurance Goals		
Parameter (lab- equipment)	**Reporting Limits**	**(MA or EPA)**	**Precision**	**Accuracy**	**Completeness**
PH	4 to 10 units	6.5 - 8.3	0.02 unit	± 0.3 units	90%
Temperature	0 to +40°C	28.3°C	0.1 °C	± 0.15°C	90%
Sp Cond	0 to 100 mS/cm	NA	5 uS/cm	±10% cal std (µS/cm)	90%
DO	0.5mg/l to Sat	≥5 mg/l , ≥60% saturation	0.02mg/l	± .5 mg/l	90%
Total Phosphorus (EPA)	5.0 ug/l	NA	Field dup 30% RPD	MS 70-130%	90%
TSS (EPA)	5mg/L	NA	Field dup 30% RPD	See SOP	
TSS (Alpha)	5 mg/L	NA	Field dup 30% RPD	See SOP	90%
BOD (Alpha)	2 mg/L	NA	Field dup 30% RPD	See SOP	90%
Surfactants (field kit – Chemetrics)	0.25 mg/L[1]	0.25 mg/L	Field dup 30% RPD	TBD	90%
Ammonia (test strips)	0.25 mg/L[1]	1.0 mg/L	Field dup 30% RPD	TBD	90%
TPH Petroleum ID (alpha)	Variable	NA	Field dup 30% RPD	See SOP	
E. Coli (EPA)	4 col./ 100 ml	<=126 col./100 ml* <= 235 col./100 ml	±100 col/100ml or 30% RPD	N/A	90%
Enterococcus (EPA)	1 col/100ml	<=33 col./100 ml* <= 61 col./100 ml	±100 col/100ml or 30% RPD	See SOP	90%
PPCP	TBD	NA	Field dup 50% RPD	TBD	90%
Chlorine (Field kit – Hach)	0.02 mg/l	NA	Field dup 30% RPD	TBD	90%

Note
*Geometric mean Criteria
TBD = To be determined, Field methods and some colorimeter methods do not have accuracy criteria determined.
[1] Needs field verification to confirm

Table 3: Field and Laboratory References

Parameter	Analytical Method Reference	SOP reference
	Field References- 5/2005	
pH		
Conductivity		
Temperature		
dissolved oxygen	n/a	ECASOP-YSISondes9
Ambient water samples	n/a	ECASop-Ambient Water Sampling2
Chain of custody of samples	n/a	EIASOP-CHAINOFCUST
Sample login, tracking, disposition	n/a	EIASOP-ADMLOG14
	Lab. References- 5/ 2005	
Total Phosphorus (EPA)	EPA 365.3	EIASOP-INGTP8
TSS (EPA)	EPA 160.2	EIASOP-INGTSS-TDS-VRES5
TSS (Alpha)	EPA 160.2,SM2540D	SOP/07-29
BOD (Alpha)	EPA 405.1,SM5210B	SOP/07-13
Surfactants (field kit – Chemetrics)	Chemetrics	Draft
Ammonia (test strips)	Hach	Draft
TPH Petroleum ID (alpha)	8015B (M)	0-017
E. Coli (EPA)	SM9230	ECASOP- TC/EC Colilert2
Enterococcus (EPA)	SM9230	ECASOP-Enterolert1
PPCP	EPA 1694	TBD
Chlorine (Field kit – Hach)	Hach	TBD

*Specific conductance is the only parameter identified as non critical

Bottle list

Table 4: Bottle Sampling List

Parameter (lab - equipment)	Bottle	Preservation
Primary analyses		
E. Coli (EPA)	(2) 120ml or 250ml sterile	Ice
Enterococcus (EPA)		Ice
PPCP	1 Liter Amber	Ice (acidified in Lab)
Optional analyses		
Chlorine (Alpha)	500 ml	Ice
Total Phosphorus (EPA)	125 ml	H_2SO_4 (pH <2) + Ice
TSS (EPA)	1 liter	Ice
TSS (Alpha)	1 liter	Ice
BOD (Alpha)	1 Liter	Ice
TPH Petroleum ID (alpha)	2 -1 Liter Amber Glass tephlon lined	Ice
E. Coli (Alpha)	120 ml sterile	Ice
Enterococcus (Alpha)	120 ml sterile	Ice

C. Quality Control

Calibration:	EPA will calibrate its sondes according to the EPA sonde calibration SOP.
Field duplicate:	One duplicate sample will be collected per sampling event or approximately for every ten samples.
Trip Blank:	OEME Chemist will run appropriate QA samples for PPCP's. One blank sample will be collected for approximately every ten bacteria samples. Reported data that is less than 5 times the trip (field) blank concentration will be flagged.
QC Criteria:	Are specified in table 2, data not meeting this criteria will be reviewed by the Project Manager. Data that does not meet laboratory QA/QC criteria will be flagged by the laboratory.

D. Chain of Custody

Chain of custody procedures will follow the OEME/Investigations Office SOP (Table 3)

3.0 Data Review

EPA Microbiology data will be reviewed by the Biology QAO. Alpha generated microbiology samples will be reviewed by the OEME Project Manager. All field data and draft data reports will be reviewed by the OEME Project manager. Laboratory generated data (from Alpha and EPA) will be reviewed by the Chemistry Team Leader.

4.0 Data reports

Data reports will be reviewed by the Project Coordinator and the OEME Project Manager before a final report is release to the Enforcement Coordinator. Draft reports may be released without a complete review.

5.0 Attachments

1) Standard Operating Procedure Enterococcus (SM9230B), Multiple Tube Technique. SOP/07-01 *Alpha Analytical, Inc. May 28, 2005*

2) Standard Operating Procedure E. Coli (SM9213D). SOP/07-41 *Alpha Analytical, Inc. May 28, 2005*

3) Standard Operating Procedure MBAS, Ionic Surfactants. Draft SOP *EPA Laboratory. January 28, 2010*

4) Standard Operating Procedure Nitrogen Ammonia. Draft SOP *EPA Laboratory. February 10, 2011*

5) Standard Operating Procedure Total Chlorine. Draft SOP *EPA Laboratory. February 12, 2010*

6) Standard Operating Procedure TSS/ TVSS (SM2540 D, EPA 160.2). SOP/07-29 *Alpha Analytical, Inc. September 29, 2007*

7) Standard Operating Procedure BOD-5day, SBOD-5day, and cBOD-5day (SM 5210B, and EPA 405.1). SOP/07-13 *Alpha Analytical, Inc. September 29, 2007*

8) Standard Operating Procedure TPH 8015D – Modified 0-017 (EPA 8015D Modified) *Alpha Analytical, Inc. March 04, 2008*

9) Standard Operating Procedure determination of Trace Elements in Water and Wastes by Inductively Coupled Plasma- Mass Spectrometry (200.8). SOP/06-11 Alpha Analytical, Inc. July 13, 200

10) Standard Operating Procedure Inductively Coupled Plasma – Mass Spectrometry (6020). SOP/06-10 Alpha Analytical, Inc. October 25, 2007

Attachment 2

EPA United States Environmental Protection Agency

Target Compounds, Uses, and Reporting Limits

Target Compound	Major Use	RL (ng/L)	Daily Dose (ng)
Caffeine	Natural Stimulant	5.0	200,000,000
1,7-DMX	Metabolite of caffeine	2.5	N/A
Acetaminophen	Pain Reliever	2.5	650,000,000
Carbamazepine	Anti- depressant / bi-polar Anti-convulsant (epilepsy)	0.5	100,000,000
Primidone	Anti- epilepsy drug (AED)	5.0	100,000,000
Atenolol	Beta Blocker High Blood Pressure	2.5	50,000,000
Cotinine	Metabolite of Nicotine	0.5	3,500-7,200 (ng/mL)
Urobilin	By-product of hemoglobin breakdown (mammals)	5.0	1,300,000 ng/g in feces
Azithromycin	Antibiotic	1.6	200,000,000

Attachment 3

STORMWATER MONITORING

Field Collection Requirements (To be recorded at each site)

Sample-
Site Name _____

Time collected_____

Date collected_____

Inspection-
Take picture at site
Outfall diameter_____('na' if open stream)

Flow estimate_____('na' if open stream)

Odor_____

Color_____

Turbidity_____

Floatables_____

Other observations_____

_____

YSI Meter (calibrate in lab)-
Salinity_____

Temp_____

Conductivity (give both #'s)

_____

Location information-
Short description of where sample was collected at site_____

_____

_____

GPS_____

_____

Field Kits listed in the order they should be conducted in, include any applicable notes-

NH3 strip_____

Cl2 kit_____
Hach meter – (3 min wait)

Surfactant_____
Chemetrics K-9400 Blue box/detergent test kit

Additional Notes:

(Note any changes in weather conditions)_____

_____

_____

_____

_____

Attachment 3

STORMWATER MONITORING (PAGE 2)

Field Equipment List

Waste Containers (2 total – clearly labeled):

1 liter amber plastic for surfactants/detergents kit waste
1 liter amber plastic for Cl2 kit waste

Sample Bottles (3 total for each sample location)-
120ml sterile – E.coli/entero
1 Liter amber glass: PPCP, *EPA* (Peter Philbrook)
120ml-250ml plastic – Field Kit Bottle – to be used on site for kits listed above

***Fill out chain of custody

In Carboy Container
☐Log book
☐COC forms
☐Extra sample bottles
☐Colored tape
☐Sharpies
☐Write-On-Rain Pens
☐Paper towels
☐GPS
☐Sampling plan & GPS locations
☐Regular length Powder Free Gloves
☐Squirt bottle of DI Water
☐Coolers with Ice
☐Waders/Boots
☐YSI multi parameter Meter