TOWN OF OXFORD

Illicit Discharge Detection and Elimination (IDDE) Plan

Revised October 1, 2020

TOWN OF OXFORD
DPW
DEPARTMENT OF PUBLIC WORKS

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Central Massachusetts Regional Stormwater Coalition

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1 Introduction

1.1 MS4 Program

This Illicit Discharge Detection and Elimination (IDDE) Plan has been developed by the Town of Oxford to address the requirements of the United States Environmental Protection Agency's (USEPA's) 2016 National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) in Massachusetts, hereafter referred to as the "MS4 Permit". The IDDE Plan template developed by Fuss & O'Neill under contract with the Central Massachusetts Regional Stormwater Coalition was utilized in drafting this document.

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

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

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

1.2 Illicit Discharges

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

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

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

connected to the storm drain system may be used inappropriately, such as for the disposal of floor washwater or old household products, in many cases due to a lack of understanding on the part of the homeowner.

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

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

1.3 Allowable Non-Stormwater Discharges

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

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

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

1.4 Receiving Waters and Impairments

Table 1-1 lists the "impaired waters" within the boundaries of Town of Oxford regulated area based on the 2016 Massachusetts Integrated List of Waters produced by MassDEP every two years, *http://www.mass.gov/eea/agencies/massdep/water/watersheds/total-maximum-daily-loads-tmdls.html.*

Impaired waters are water bodies that do not meet water quality standards for one or more designated use(s) such as recreation or aquatic habitat.

Table 1-1. Impaired Waters within Regulated Area
Town of Oxford, Massachusetts

Water Body Name	Segment ID	Category	Impairment(s)	Associated Approved TMDL
Lowes Pond	MA42034	4a	Phosphorus	2366
McKinstry Pond	MA42035	4a	Phosphorus	2367
Buffum Pond	MA42004	4c	Non-Native Aquatic Plants	
Carbuncle Pond	MA42008	5	Harmful Algae Bloom	
French River	MA42-03	5	Mercury in Fish Tissue	
French River	MA42-04	5	Mercury in Fish Tissue	
Wellington Brook	MA42-11	5	Escherichia coli	

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

1.5 IDDE Program Goals, Framework, and Timeline

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

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

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

Figure 1-1. IDDE Investigation Procedure Framework

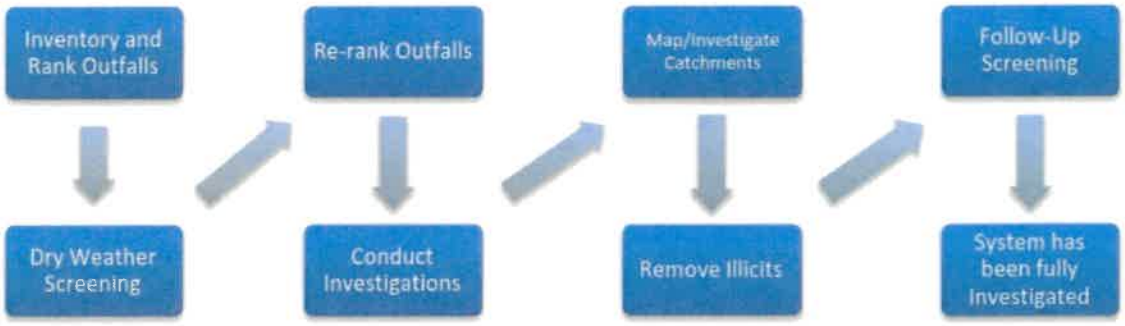

Table 1-2. IDDE Program Implementation Timeline

IDDE Program Requirement	Completion Date from Effective Date of Permit					
	1 Year 6/30/19	1.5 Years 12/31/19	2 Years 6/30/20	3 Years 6/30/21	7 Years 6/30/25	10 Years 6/30/28
Written IDDE Program Plan	X					
SSO Inventory	X					
Written Catchment Investigation Procedure		X				
Phase I Mapping			X			
Phase II Mapping						X
IDDE Regulatory Mechanism or By-law (if not already in place)				X		
Dry Weather Outfall Screening				X		
Follow-up Ranking of Outfalls and Interconnections				X		
Catchment Investigations – Problem Outfalls					X	
Catchment Investigations – all Problem, High and Low Priority Outfalls						X

1.6 Work Completed to Date

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

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

- Developed a map of outfalls and receiving waters,
- Adopted an IDDE bylaw on 1/14/2005: Chapter 65, Discharges to the Municipal Storm Drain System,
- Developed procedures for locating illicit discharges.
- Developed procedures for locating the source of the discharge.
- Developed procedures for removal of the source of an illicit discharge.
- Developed procedures for documenting actions and evaluating impacts on the storm sewer system subsequent to removal.

In addition to the 2003 MS4 Permit requirements, the Town of Oxford has mapped other storm system components including the locations of catch basins, manholes and pipe connectivity.

2 Authority and Statement of IDDE Responsibilities

2.1 Legal Authority

The Town of Oxford adopted an IDDE bylaw on 1/14/2005: Chapter 65, Discharges to the Municipal Storm Drain System. The bylaw can be viewed at : https://www.town.oxford.ma.us/storm-water-management/pages/local-stormwater-management-bylaws. The Discharges to the Municipal Storm Drain System bylaw provides the Town of Oxford with adequate legal authority to:

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

The Town of Oxford will review the Discharges to the Municipal Storm Drain System bylaw and related land use regulations and policies for consistency with the 2016 MS4 Permit.

2.2 Statement of Responsibilities

The following Municipal Departments and personnel are responsible for various aspects of the Town of Oxford's IDDE program.

Department of Public Works

The Department of Public Works is the lead municipal department responsible for implementing the IDDE program pursuant to the provisions of the Discharges to the Municipal Storm Drain System bylaw. More specifically, the Department of Public Works responsibilities include:

Department of Public Works Director

- Ensures compliance with the NPDES MS4 Stormwater Permit
- Documents suspected illicit discharges and provides appropriate investigation
- Ensures staff receives training in illicit discharge detention and elimination
- Responds to complaints, investigates potential violations and takes appropriate action
- Reviews and inspects construction projects in accordance with local and state regulations
- Enforces the local IDDE bylaw
- Administers connection permits to the MS4 and conducts inspections in accordance with the local bylaw.
- Provides effective management and financing of the municipality's stormwater system

Conservation Agent

- Coordinates compliance with the NPDES MS4 Stormwater Permit
- Responds to complaints, investigates potential violations and takes appropriate action
- Maintains the storm drain system map and update as necessary
- Reviews and inspects construction projects in accordance with local and state regulations

Land Management Department

The Land Management Department consist of the Planning Board, Building Department and Board of Health. Specific responsibilities within the Land Management Department consist of the following:

Building Commissioner

- Reviews and inspects all building construction projects in accordance with local, state and federal codes
- Ensures public health, safety and welfare is secured
- Enforces codes adopted by the Town of Oxford
- Performs on-site inspection and field investigation to verify that building codes are met
- Issues stop work orders to perpetrators who are conducting unauthorized work
- Reviews proposed construction plans or submissions and coordinates utility connections

Planning Assistant

- Reviews proposed development and construction plans for compliance with state and local regulations, including Site Plan Review
- Coordinates inspection of development and construction projects

Plumbing Inspector

- Reviews and inspects plumbing systems in all building construction projects in accordance with local, state and federal codes

- Investigates complaints of possible code violations and initiates appropriate remedial action to ensure compliance

Health Agent

- Investigates and reports on all health hazards, complaints and nuisances
- Issues cease and desist orders for violation of sanitation codes
- Conducts health inspections of public places
- Reviews septic plans and conducts compliance inspections

3 Stormwater System Mapping

The Town of Oxford originally developed mapping of its stormwater system to meet the mapping requirements of the 2003 MS4 Permit. The storm system map can be viewed at : https://www.town.oxford.ma.us/sites/oxfordma/files/uploads/oxford_stormwater_map.pdf.

The 2016 MS4 Permit requires a more detailed storm system map than was required by the 2003 MS4 Permit. The revised mapping is intended to facilitate the identification of key infrastructure, factors influencing proper system operation, and the potential for illicit discharges.

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

3.1 Phase I Mapping

Phase I mapping must be completed within two (2) years of the effective date of the permit (July 1, 2020) and include the following information:

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

3.2 Phase II Mapping

Phase II mapping must be completed within ten (10) years of the effective date of the permit (July 1, 2028) and include the following information:

- Outfall spatial location (latitude and longitude with a minimum accuracy of +/-30 feet)
- Pipes
- Manholes
- Catch basins
- Refined catchment delineations. Catchment delineations must be updated to reflect information collected during catchment investigations.
- Municipal Sanitary Sewer system

3.3 Additional Recommended Mapping Elements

Although not a requirement of the 2016 MS4 Permit, the Town of Oxford will include the following recommended elements in its storm system mapping when data becomes available.

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

4 Sanitary Sewer Overflows (SSOs)

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

There have been no known SSOs to Oxford's MS4 in the past five years Upon detection of an SSO, the Town of Oxford will eliminate it as expeditiously as possible and take interim measures to minimize the discharge of pollutants to and from its MS4 until the SSO is eliminated. Upon becoming aware of an SSO to the MS4, the Town of Oxford will provide oral notice to EPA within 24 hours and written notice to EPA and MassDEP within five (5) days of becoming aware of the SSO occurrence.

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

Table 4-1. SSO Inventory

Town of Oxford, Massachusetts
Revision Date: _____

SSO Location[1]	Discharge Statement[2]	Date[3]	Time Start[3]	Time End[3]	Estimated Volume[4]	Description[5]	Mitigation Completed[6]	Mitigation Planned[7]
NONE								

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

5 Assessment and Priority Ranking of Outfalls

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

5.1 Outfall Catchment Delineations

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

5.2 Outfall and Interconnection Inventory and Initial Ranking

The Department of Public Works will complete an initial outfall and interconnection inventory and priority ranking to assess illicit discharge potential based on existing information. The initial inventory and ranking has been completed and is listed in Table 5-1. An updated inventory and ranking will be provided in each annual report thereafter. The inventory will be updated annually to include data collected in connection with dry weather screening and other relevant inspections.

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

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

1. **Problem Outfalls**: Outfalls/interconnections with known or suspected contributions of illicit discharges based on existing information shall be designated as Problem Outfalls. This shall include any outfalls/interconnections where previous screening indicates likely sewer input. Likely sewer input indicators are any of the following:

    - Olfactory or visual evidence of sewage,

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

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

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

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

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

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

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

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

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

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

- **Past discharge complaints and reports.**

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

- **Density of generating sites** – Generating sites are those places, including institutional, municipal, commercial, or industrial sites, with a potential to generate pollutants that could contribute to illicit discharges. Examples of these sites include, but are not limited to, car dealers; car washes; gas stations; garden centers; and industrial manufacturing areas.

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

- **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. There are no historic combined sewer systems in the Town of Oxford.

- **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.

The Outfall Inventory and Priority Ranking Matrix is listed in Table 5-1. This table and outfall ranking shall be revised as additional data is collected.

Table 5-1. Outfall Inventory and Priority Ranking Matrix

Town of Oxford, Massachusetts
Revision Date: August 26, 2019

Sub Basin ID	SWID Outfall ID	Receiving Water	Zone II/ IWP	Recreational Area	Previous Screening Results Indicate Likely Sewer Input[1]	Frequency of Past Discharge Complaints	Receiving Water Quality[2]	Density of Generating Sites[3]	Age of Industrial Development/ Infrastructure [4]	Aging Residential Septic >30 years old	Culverted Streams[5]	Score	Priority Ranking[6]
		Scoring Criteria	3=Yes 0=No	3=Yes 0=No	3=Yes (Problem Outfall) 0=No	3=Frequent 2=Occasional 0=None	3=Poor 2=Fair 0=Good	3=High 2=medium 1=Low	3=High 2=Medium 1=Low	3=Yes 0=No	3=Yes 0=No		
FR-6	OF3-139	Unnamed Trib to Little River along Old Webster Rd	3	0	0	2	0	3	3	0	3	14	High
FR-13	OF3-128	French River area	3	0	0	0	0	3	3	3	0	12	High
FR-7	OF2-2	McKinstry Pond	3	3	0	0	3	0	0	3	0	12	High
FR-7	OF2-3	McKinstry Pond	3	3	0	0	3	0	0	3	0	12	High
FR-5	OF1-262	Trib to Wellington Brook	3	3	0	0	2	0	0	3	0	11	High
FR-7	OF2-8	Barbers Hollow Brook	3	0	0	2	0	0	0	3	3	11	High
FR-1	OF2-73	Unnamed Trib to Rochdale Pond	0	0	0	0	0	3	3	3	0	9	High
FR-11	OF4-142	Lowes Pond -500 feet away.	3	0	0	0	3	0	0	3	0	9	High
FR-11	OF4-201	Lowes Pond	3	0	0	0	3	0	0	3	0	9	High
FR-11	OF4-202	Lowes Pond	3	0	0	0	3	0	0	3	0	9	High
FR-2	OF2-75	French River	0	0	0	0	0	3	3	3	0	9	High
FR-2	OF2-76	French River	0	0	0	0	0	3	3	3	0	9	High
FR-2	OF2-77	French River	0	0	0	0	0	3	3	3	0	9	High
FR-6	OF3-141	Little River	3	0	0	0	0	3	3	0	0	9	High
FR-7	OF1-134	Wetland area north of Lowes Brook	3	0	0	0	3	0	0	3	0	9	High
FR-7	OF2-278	McKinstry Pond	3	3	0	0	3	0	0	0	0	9	High
FR-4	OF2-287	Carbuncle Pond	0	3	0	0	2	0	0	3	0	8	High
FR-5	OF1-250	Wellington Brook	3	0	0	0	2	0	0	3	0	8	High
FR-5	OF1-251	Wellington Brook	3	0	0	0	2	0	0	3	0	8	High
FR-5	OF1-281	Wellington Brook	3	0	0	0	2	0	0	3	0	8	High
FR-5	OF1-282	Wellington Brook	3	0	0	0	2	0	0	3	0	8	High
FR-10	OF3-104	French River	3	0	0	0	0	0	0	3	0	6	High
FR-10	OF3-138	Unnamed Trib to French crossing Old Web & Dudley	3	0	0	0	0	0	0	3	0	6	High
FR-10	OF3-147	French River	3	0	0	0	0	0	0	3	0	6	High
FR-10	OF3-148	French River	3	0	0	0	0	0	0	3	0	6	High
FR-10	OF3-155	French River	3	0	0	0	0	0	0	3	0	6	High

Sub Basin ID	SWID Outfall ID	Receiving Water	Zone II/ IWP	Recreational Area	Previous Screening Results Indicate Likely Sewer Input[1]	Frequency of Past Discharge Complaints	Receiving Water Quality[2]	Density of Generating Sites[3]	Age of Industrial Development/ Infrastructure [4]	Aging Residential Septic >30 years old	Culverted Streams[5]	Score	Priority Ranking[6]
		Scoring Criteria	3=Yes 0=No	3=Yes 0=No	3=Yes (Problem Outfall) 0=No	3=Frequent 2=Occassional 0=None	3=Poor 2=Fair 0=Good	3=High 2=medium 1=Low	3=High 2=Medium 1=Low	3=Yes 0=No	3=Yes 0=No		
FR-10	OF3-97	Wetland & Unnamed Trib to French west of Wayne	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF3-102	Lowes Brook	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF3-103	Lowes Brook	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF3-105	Lowes Brook	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF3-106	Lowes Brook	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF3-107	Lowes Brook	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF3-108	Lowes Brook	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF3-121	Lowes Brook	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF3-122	Lowes Brook	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF3-123	Lowes Brook	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF3-124	Lowes Brook	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF3-125	Unnamed Trib to Lowes Brook crossing Harwood St	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF3-152	Unnamed Trib to Lowes Brook crossing Harwood St	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF3-99	Lowes Brook area	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF4-157	Lowes Brook	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF4-166	Unnamed Trib to Lowes Brook crossing Westview	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF4-175	Unnamed Trib to Lowes Brook	3	0	0	0	0	0	0	3	0	6	High
FR-11	OF4-227	Unnamed Trib to Lowes Brook crossing Westview	3	0	0	0	0	0	0	3	0	6	High
FR-13	OF3-126	French River area	3	0	0	0	0	0	0	3	0	6	High
FR-13	OF3-153	French River	3	0	0	0	0	0	0	3	0	6	High
FR-13	OF3-154	French River	3	0	0	0	0	0	0	3	0	6	High
FR-2	OF2-279	French River	0	0	0	0	0	3	3	0	0	6	High
FR-2	OF2-43	French River	0	0	0	0	0	0	3	3	0	6	High
FR-2	OF2-88	French River	0	0	0	0	0	3	3	0	0	6	High
FR-4	OF2-0	Unnamed pond between Fremont and Rawson Ave	3	0	0	0	0	0	0	3	0	6	High
FR-4	OF2-156	French River	3	0	0	0	0	0	0	3	0	6	High
FR-4	OF2-17	French River	3	0	0	0	0	0	0	3	0	6	High
FR-4	OF2-19	French River	3	0	0	0	0	0	0	3	0	6	High
FR-4	OF2-20	French River	3	0	0	0	0	0	0	3	0	6	High
FR-4	OF2-21	French River	3	0	0	0	0	0	0	3	0	6	High

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		Scoring Criteria	3=Yes 0=No	3=Yes 0=No	3=Yes (Problem Outfall) 0=No	3=Frequent 2=Occassional 0=None	3=Poor 2=Fair 0=Good	3=High 2=medium 1=Low	3=High 2=Medium 1=Low	3=Yes 0=No	3=Yes 0=No		
FR-4	OF2-22	French River (Augutleback Pond)	3	0	0	0	0	0	0	3	0	6	High
FR-4	OF2-23	French River (Augutleback Pond)	3	0	0	0	0	0	0	3	0	6	High
FR-4	OF2-24	French River (Augutleback Pond)	3	0	0	0	0	0	0	3	0	6	High
FR-4	OF2-25	French River (Augutleback Pond)	3	0	0	0	0	0	0	3	0	6	High
FR-4	OF2-26	French River	3	0	0	0	0	0	0	3	0	6	High
FR-4	OF2-28	French River	3	0	0	0	0	0	0	3	0	6	High
FR-4	OF2-285	Unnamed pond between Fremont and Rawson Ave	3	0	0	0	0	0	0	3	0	6	High
FR-4	OF2-30	French River	3	0	0	0	0	0	0	3	0	6	High
FR-4	OF2-31	French River	3	0	0	0	0	0	0	3	0	6	High
FR-4	OF2-86	French River (Augutleback Pond)	3	0	0	0	0	0	0	3	0	6	High
FR-4	OF2-98	French River	3	0	0	0	0	0	0	3	0	6	High
FR-4	OF3-40	French River	3	0	0	0	0	0	0	3	0	6	High
FR-6	OF3-140	Unnamed Trib to Little River along Old Webster Rd	3	0	0	0	0	0	0	3	0	6	High
FR-6	OF3-34	Unnamed Trib to Little River crossing Charlton St	3	0	0	0	0	0	0	3	0	6	High
FR-6	OF3-36	Little River	3	0	0	0	0	0	0	3	0	6	High
FR-6	OF3-39	Unnamed Trib to Little River crossing Charlton St	3	0	0	0	0	0	0	3	0	6	High
FR-6	OF3-92	Little River	3	0	0	0	0	0	0	3	0	6	High
FR-7	OF1-135	Barbers Hollow Brook	3	0	0	0	0	0	0	3	0	6	High
FR-7	OF1-217	Wetland area north of Lowes Brook	3	0	0	0	3	0	0	0	0	6	High
FR-7	OF1-229	Barbers Hollow Brook	3	0	0	0	0	0	0	3	0	6	High
FR-7	OF1-230	Barbers Hollow Brook	3	0	0	0	0	0	0	3	0	6	High
FR-7	OF1-234	Barbers Hollow Brook	3	0	0	0	0	0	0	3	0	6	High
FR-7	OF1-241	Barbers Hollow Brook	3	0	0	0	0	0	0	3	0	6	High
FR-7	OF2-264	Barbers Hollow Brook	3	0	0	0	0	0	0	3	0	6	High
FR-7	OF2-274	Unnamed Trib to McKinstry Pond west of Forest St	3	0	0	0	0	0	0	3	0	6	High
FR-7	OF2-284	Unnamed Trib to McKinstry Pond north of Church St	3	0	0	0	0	0	0	3	0	6	High
FR-7	OF2-4	Barbers Hollow Brook	3	0	0	0	0	0	0	3	0	6	High
FR-7	OF2-5	Barbers Hollow Brook	3	0	0	0	0	0	0	3	0	6	High
FR-7	OF2-6	Barbers Hollow Brook	3	0	0	0	0	0	0	3	0	6	High
FR-7	OF2-7	Barbers Hollow Brook	3	0	0	0	0	0	0	3	0	6	High

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		Scoring Criteria	3=Yes 0=No	3=Yes 0=No	3=Yes (Problem Outfall) 0=No	3=Frequent 2=Occassional 0=None	3=Poor 2=Fair 0=Good	3=High 2=medium 1=Low	3=High 2=Medium 1=Low	3=Yes 0=No	3=Yes 0=No		
FR-10	OF3-100	Wetland & Unnamed Trib to French west of Wayne	3	0	0	0	0	0	0	0	0	3	High
FR-10	OF3-101	Wetland & Unnamed Trib to French west of Wayne	3	0	0	0	0	0	0	0	0	3	High
FR-10	OF3-109	French River	3	0	0	0	0	0	0	0	0	3	High
FR-10	OF3-110	French River	3	0	0	0	0	0	0	0	0	3	High
FR-10	OF3-111	French River	3	0	0	0	0	0	0	0	0	3	High
FR-10	OF3-113	Wetland & Unnamed Trib to French west of Wayne	3	0	0	0	0	0	0	0	0	3	High
FR-10	OF3-114	Wetland & Unnamed Trib to French west of Wayne	3	0	0	0	0	0	0	0	0	3	High
FR-10	OF3-115	Wetland & Unnamed Trib to French west of Wayne	3	0	0	0	0	0	0	0	0	3	High
FR-10	OF3-116	Wetland & Unnamed Trib to French west of Wayne	3	0	0	0	0	0	0	0	0	3	High
FR-10	OF3-117	Wetland & Unnamed Trib to French west of Wayne	3	0	0	0	0	0	0	0	0	3	High
FR-10	OF3-118	Wetland & Unnamed Trib to French west of Wayne	3	0	0	0	0	0	0	0	0	3	High
FR-10	OF3-119	Wetland & Unnamed Trib to French west of Wayne	3	0	0	0	0	0	0	0	0	3	High
FR-10	OF3-120	Wetland & Unnamed Trib to French west of Wayne	3	0	0	0	0	0	0	0	0	3	High
FR-10	OF3-129	Grassy Pond	3	0	0	0	0	0	0	0	0	3	High
FR-10	OF3-130	Grassy Pond	3	0	0	0	0	0	0	0	0	3	High
FR-11	OF3-112	Lowes Brook	3	0	0	0	0	0	0	0	0	3	High
FR-11	OF3-290	Lowes Brook	3	0	0	0	0	0	0	0	0	3	High
FR-13	OF3-127	French River	3	0	0	0	0	0	0	0	0	3	High
FR-6	OF2-18	Unnamed Trib to Little River crossing Charlton St	3	0	0	0	0	0	0	0	0	3	High
FR-6	OF2-261	Unnamed Trib to Little River crossing Charlton St	3	0	0	0	0	0	0	0	0	3	High
FR-6	OF3-35	Little River	3	0	0	0	0	0	0	0	0	3	High
FR-6	OF3-93	Unnamed Trib to Little River along Old Webster Rd	3	0	0	0	0	0	0	0	0	3	High
FR-6	OF3-95	Little River	3	0	0	0	0	0	0	0	0	3	High
FR-6	OF3-96	Little River	3	0	0	0	0	0	0	0	0	3	High
FR-7	OF2-1	Barbers Hollow Brook	3	0	0	0	0	0	0	0	0	3	High
FR-7	OF2-10	Unnamed Trib to McKinstry Pond west of Forest St	3	0	0	0	0	0	0	0	0	3	High
FR-7	OF2-11	Unnamed Trib to McKinstry Pond west of Forest St	3	0	0	0	0	0	0	0	0	3	High
FR-7	OF2-12	Barbers Hollow Brook	3	0	0	0	0	0	0	0	0	3	High
FR-7	OF2-13	Unnamed Trib to McKinstry Pond west of Forest St	3	0	0	0	0	0	0	0	0	3	High
FR-7	OF2-9	Unnamed Trib to McKinstry Pond west of Forest St	3	0	0	0	0	0	0	0	0	3	High

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		Scoring Criteria	3=Yes 0=No	3=Yes 0=No	3=Yes (Problem Outfall) 0=No	3=Frequent 2=Occassional 0=None	3=Poor 2=Fair 0=Good	3=High 2=medium 1=Low	3=High 2=Medium 1=Low	3=Yes 0=No	3=Yes 0=No		
FR-7	OF4-213	Wetland area north of Lowes Brook	3	0	0	0	0	0	0	0	0	3	High
FR-1	OF2-72	Unnamed Trib to Rochdale Pond	0	0	0	0	0	1	1	3	0	5	Low
FR-5	OF1-243	Wellington Brook	0	0	0	0	2	0	0	3	0	5	Low
FR-5	OF1-252	Unnamed Trib to Wellington Brook crosisng I-395	0	0	0	0	2	0	0	3	0	5	Low
FR-5	OF1-253	Unnamed Trib to Wellington Brook crossing I-395	0	0	0	0	2	0	0	3	0	5	Low
FR-5	OF1-256	Unnamed Trib to Wellington Brook crossing I-395	0	0	0	0	2	0	0	3	0	5	Low
FR-1	OF2-159	Unnamed Trib to Rochdale Pond	0	0	0	0	0	0	0	0	0	0	Low
FR-1	OF2-62	Unnamed Trib to Rochdale Pond	0	0	0	0	0	0	0	0	0	0	Low
FR-1	OF2-63	Unnamed Trib to Rochdale Pond	0	0	0	0	0	0	0	0	0	0	Low
FR-10	OF3-132	Grassy Pond	0	0	0	0	0	0	0	3	0	3	Low
FR-10	OF3-133	Grassy Pond	0	0	0	0	0	0	0	3	0	3	Low
FR-10	OF3-143	Unnamed Trib to French crossing Old Web & Dudley	0	0	0	0	0	0	0	3	0	3	Low
FR-10	OF3-144	Unnamed Trib to French crossing Old Web & Dudley	0	0	0	0	0	0	0	3	0	3	Low
FR-10	OF3-149	Unnamed Trib to French crossing Old Web & Dudley	0	0	0	0	0	0	0	3	0	3	Low
FR-10	OF3-150	Unnamed Trib to Grassy Pond	0	0	0	0	0	0	0	3	0	3	Low
FR-10	OF3-151	Unnamed Trib to Grassy Pond	0	0	0	0	0	0	0	3	0	3	Low
FR-10	OF3-199	Unnamed Trib to French crossing Old Web & Dudley	0	0	0	0	0	0	0	3	0	3	Low
FR-10	OF3-200	Unnamed Trib to French crossing Old Web & Dudley	0	0	0	0	0	0	0	3	0	3	Low
FR-10	OF3-145	Unnamed Trib to French crossing Old Web & Dudley	0	0	0	0	0	0	0	0	0	0	Low
FR-11	OF4-176	Unnamed Trib to Lowes Brook	0	0	0	0	0	0	0	3	0	3	Low
FR-11	OF4-168	Unnamed Trib to Lowes Brook crossing Westview	0	0	0	0	0	0	0	0	0	0	Low
FR-11	OF4-169	Unnamed Trib to Lowes Brook crossing Westview	0	0	0	0	0	0	0	0	0	0	Low
FR-11	OF4-170	Unnamed Trib to Lowes Brook crossing Westview	0	0	0	0	0	0	0	0	0	0	Low
FR-12	OF4-171	Unnamed Trib to Lowes north of Huguenot/under 395	0	0	0	0	0	0	0	0	0	0	Low
FR-12	OF4-177	Unnamed Trib to Lowes north of Huguenot/under 395	0	0	0	0	0	0	0	0	0	0	Low
FR-12	OF4-178	Unnamed Trib to Lowes north of Huguenot/under 395	0	0	0	0	0	0	0	0	0	0	Low
FR-12	OF4-179	Unnamed Trib to Lowes north of Huguenot/under 395	0	0	0	0	0	0	0	0	0	0	Low
FR-2	OF1-266	Unnamed Trib to Batty Brook	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF1-267	Batty Brook	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-268	French River	0	0	0	0	0	0	0	3	0	3	Low

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		Scoring Criteria	3=Yes 0=No	3=Yes 0=No	3=Yes (Problem Outfall) 0=No	3=Frequent 2=Occassional 0=None	3=Poor 2=Fair 0=Good	3=High 2=medium 1=Low	3=High 2=Medium 1=Low	3=Yes 0=No	3=Yes 0=No		
FR-2	OF2-269	French River	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-270	French River	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-272	French River	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-273	French River	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-41	Batty Brook	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-42	French River	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-53	Unnamed Trib to French River south of Ennis Rd	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-54	Unnamed Trib to French River south of Ennis Rd	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-55	Unnamed Trib to French River south of Ennis Rd	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-59	Unnamed Trib to French River south of Merriam Dist	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-60	Unnamed Trib to French River south of Merriam Dist	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-61	Unnamed Trib to French River south of Merriam Dist	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-64	Unnamed Trib to French River south of Merriam Dist	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-68	French River	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-69	French River	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-71	French River	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-74	French River	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-85	French River	0	0	0	0	0	0	0	3	0	3	Low
FR-2	OF2-271	Unnamed Trib to French crossing 56 north of 90	0	0	0	0	0	0	0	0	0	0	Low
FR-2	OF2-56	French River	0	0	0	0	0	0	0	0	0	0	Low
FR-2	OF2-70	Unnamed Trib to French crossing 56 north of 90	0	0	0	0	0	0	0	0	0	0	Low
FR-2	OF2-87	Unnamed Trib to French River crossing Comins Rd	0	0	0	0	0	0	0	0	0	0	Low
FR-4	OF2-14	Trib to French River west of Carbuncle Pond	0	0	0	0	0	0	0	3	0	3	Low
FR-4	OF2-27	French River	0	0	0	0	0	0	0	3	0	3	Low
FR-4	OF2-276	Wetland draining to French west of Woodland/Church	0	0	0	0	0	0	0	3	0	3	Low
FR-4	OF2-277	Wetland draining to French west of Woodland/Church	0	0	0	0	0	0	0	3	0	3	Low
FR-4	OF2-289	Wetland draining to French west of Woodland/Church	0	0	0	0	0	0	0	3	0	3	Low
FR-4	OF2-15	Unnamed pond between Fremont and Rawson Ave	0	0	0	0	0	0	0	0	0	0	Low
FR-4	OF2-16	French River	0	0	0	0	0	0	0	0	0	0	Low
FR-6	OF2-29	Unnamed Trib to Little River crossing Charlton St	0	0	0	0	0	0	0	3	0	3	Low

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		Scoring Criteria	3=Yes 0=No	3=Yes 0=No	3=Yes (Problem Outfall) 0=No	3=Frequent 2=Occassional 0=None	3=Poor 2=Fair 0=Good	3=High 2=medium 1=Low	3=High 2=Medium 1=Low	3=Yes 0=No	3=Yes 0=No		
FR-6	OF3-286	Buffum Pond	0	0	0	0	0	0	0	3	0	3	Low
FR-6	OF3-38	Little River	0	0	0	0	0	0	0	3	0	3	Low
FR-6	OF3-89	Buffum Pond	0	0	0	0	0	0	0	3	0	3	Low
FR-6	OF3-90	Buffum Pond	0	0	0	0	0	0	0	3	0	3	Low
FR-6	OF3-91	Little River	0	0	0	0	0	0	0	3	0	3	Low
FR-6	OF2-265	Unnamed tributary to Buffum Pond along Oakwood Ter	0	0	0	0	0	0	0	0	0	0	Low
FR-6	OF3-94	Unnamed Trib to Little River along Old Webster Rd	0	0	0	0	0	0	0	0	0	0	Low
FR-7	OF1-216	Wetland area north of Lowes Brook	0	0	0	0	3	0	0	0	0	3	Low
FR-7	OF2-275	Unnamed Trib to McKinstry Pond west of Forest St	0	0	0	0	0	0	0	3	0	3	Low
FR-7	OF2-288	Unnamed Trib to McKinstry Pond north of Church St	0	0	0	0	0	0	0	3	0	3	Low
FR-9	OF3-146	Unnamed Trib to Buffumville Pond	0	0	0	0	0	0	0	0	0	0	Low

Scoring Criteria:

[1] Previous screening results indicate likely sewer input if any of the following are true:
Olfactory or visual evidence of sewage,
Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or
Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine

[2] Receiving water quality based on latest version of MassDEP Integrated List of Waters.
Poor = Waters with approved TMDLs (Category 4a Waters) where illicit discharges have the potential to contain the pollutant identified as the cause of the impairment
Fair = Water quality limited waterbodies that receive a discharge from the MS4 (Category 5 Waters)
Good = No water quality impairments

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

[4] Age of development and infrastructure:
High = Industrial areas greater than 40 years old and areas where the sanitary sewer system is more than 40 years old
Medium = Developments 20-40 years old
Low = Developments less than 20 years old

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

[6] Priority Rank:
High : Score 6 or higher, or within Zone II/IWP
Low : Score 0 -5

6 Dry Weather Outfall Screening and Sampling

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

6.1 Weather Conditions

Dry weather outfall screening and sampling may occur when no more than 0.1 inches of rainfall has occurred in the previous 24-hour period and no significant snow melt is occurring. For purposes of determining dry weather conditions, program staff will use precipitation data from Buffumville West Station, KMACHARL4:
https://www.wunderground.com/dashboard/pws/KMACHARL4?cm_ven=localwx_pwsdash

or Worcester Regional Airport Station, KORH:
https://w1.weather.gov/data/obhistory/KORH.html.

6.2 Dry Weather Screening/Sampling Procedure

6.2.1 General Procedure

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

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

6. Input results from screening and sampling into spreadsheet/database. Include pertinent information in the outfall/interconnection inventory and priority ranking.
7. Include all screening data in the annual report.

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

6.2.2 Field Equipment

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

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

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

Equipment	Use/Notes
Zip Ties/Duct Tape	For making field repairs
Rubber Boots/Waders	For accessing shallow streams/areas
Sampling Pole/Dipper/Sampling Cage	For accessing hard to reach outfalls and manholes

6.2.3 Sample Collection and Analysis

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

1. Fill out all sample information on sample bottles and field sheets (see **Appendix C** for Sample Labels and Field Sheets)
2. Put on protective gloves (nitrile/latex/other) before sampling
3. Collect sample with dipper or directly in sample containers. If possible, collect water from the flow directly in the sample bottle. Be careful not to disturb sediments.
4. If using a dipper or other device, triple rinse the device with distilled water and then in water to be sampled (not for bacteria sampling)
5. Use test strips, test kits, and field meters (rinse similar to dipper) for most parameters (see **Table 6-2**)
6. Place laboratory samples on ice for analysis of bacteria and pollutants of concern
7. Fill out chain-of-custody form (**Appendix C**) for laboratory samples
8. Deliver samples to Premier Laboratory, Inc., (860) 774-6814
9. Dispose of used test strips and test kit ampules properly
10. Decontaminate all testing personnel and equipment

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

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

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

Table 6-2. Sampling Parameters and Analysis Methods

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

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

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

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

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

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

SM = Standard Methods

6.3 Interpreting Outfall Sampling Results

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

Table 6-4. Benchmark Field Measurements for Select Parameters

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

6.4 Follow-up Ranking of Outfalls and Interconnections

The Town of Oxford will update and re-prioritize the initial outfall and interconnection rankings based on information gathered during dry weather screening. The rankings will be updated periodically as dry weather screening information becomes available, but will be completed within three (3) years of the effective date of the permit (July 1, 2021).

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

7 Identifying Illicit Discharges

Illicit discharges can be located by several methods, including routine dry weather outfall inspections outlined in the previous section, routine catch basin inspections, as well as from citizen reports. The following are often indicators of an illicit discharge from stormwater outfall:

1. Foam: indicator of upstream vehicle washing activities, or an illicit discharge.
2. Oil sheen: result of a leak or spill.
3. Cloudiness: indicator of suspended solids such as dust, ash, powdered chemicals and ground up materials.

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

4. Color or odor: Indicator of raw materials, chemicals, or sewage.
5. Excessive sediment: indicator of disturbed earth of other unpaved areas lacking adequate erosion control measures.
6. Sanitary waste and optical enhancers (fluorescent dyes added to laundry detergent): indicator of the cross-connection of a sewer service.
7. Orange staining: indicator of high mineral concentrations.

Both bacteria and petroleum can create a sheen on the water surface. The source of the sheen can be differentiated by disturbing it, such as with a pole. A sheen caused by oil will remain intact and move in a swirl pattern; a sheen caused by bacteria will separate and appear "blocky". Bacterial sheen is not a pollutant but should be noted.

7.1 Citizen Call in Reports

Reports by residents and other users of a water body can be effective tools in identifying the presence of illicit discharges. When a call is received about a suspected illicit discharge, an IDDE Incident Tracking Sheet shall be used to document appropriate information (see form in **Appendix C**).

Potential illicit discharges reported by citizens should be reviewed on an annual basis to locate patterns of illicit discharges, identify high-priority catchments, and evaluate the call-in inspection program.

7.2 Tracing Illicit Discharges

Whenever an illicit discharge is suspected, regardless of how it was identified, an IDDE Incident Tracking Sheet shall be provided to the Department of Public Works which shall investigate the reported incident.

If the presence of an illicit discharge is confirmed by the Department of Public Works, but its source is unidentified, a catchment investigation shall be conducted in accordance with the following section.

8 Catchment Investigations

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

8.1 System Vulnerability Factors

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

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

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

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

A SVF inventory will be documented for each catchment (see **Table 8-1**), retained as part of this IDDE Plan, and included in the annual report.

Table 8-1. Outfall Catchment System Vulnerability Factor (SVF) Inventory

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

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

Presence/Absence Evaluation Criteria:

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

8.2 Dry Weather Manhole Inspections

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

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

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

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

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

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

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

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

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

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

Inspection of key junction manholes will proceed as follows:

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

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

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

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

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

8.3 Wet Weather Outfall Sampling

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

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

Wet weather outfall sampling will proceed as follows:

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

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

3. If wet weather outfall sampling indicates a potential illicit discharge, then additional wet weather source sampling will be performed, as warranted, or source isolation and confirmation procedures will be followed as described in **Section 8.4**.

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

8.4 Source Isolation and Confirmation

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

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

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

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

8.4.1 Sandbagging

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

8.4.2 Smoke Testing

Smoke testing involves injecting non-toxic smoke into drain lines and noting the emergence of smoke from sanitary sewer vents in illegally connected buildings or from cracks and leaks in the system itself.

Typically a smoke bomb or smoke generator is used to inject the smoke into the system at a catch basin or manhole and air is then forced through the system. Test personnel are placed in areas where there are suspected illegal connections or cracks/leaks, noting any escape of smoke (indicating an illicit connection or damaged storm drain infrastructure). It is important when using this technique to make proper notifications to area residents and business owners as well as local police and fire departments.

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

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

8.4.3 Dye Testing

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

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

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

8.4.4 CCTV/Video Inspection

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

8.4.5 Optical Brightener Monitoring

Optical brighteners are fluorescent dyes that are used in detergents and paper products to enhance their appearance. The presence of optical brighteners in surface waters or dry weather discharges suggests

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

8.4.6 IDDE Canines

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

8.5 Illicit Discharge Removal

When the specific source of an illicit discharge is identified, the Town of Oxford will exercise its authority as necessary to require its removal. Section 10 of the Town of Oxford General Bylaw Chapter Sixty-Five, Discharges to the Municipal Storm Drain System lists enforcement actions that the Department of Public Works will take to remove the illicit discharge. The annual report will include the status of IDDE investigation and removal activities including the following information for each confirmed source:

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

8.5.1 Confirmatory Outfall Screening

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

8.6 Ongoing Screening

Upon completion of all catchment investigations and illicit discharge removal and confirmation (if necessary), each outfall or interconnection will be re-prioritized for screening and scheduled for ongoing screening once every five (5) years. Ongoing screening will consist of dry weather screening and sampling consistent with the procedures described in **Section 6** of this plan. Ongoing wet weather screening and sampling will also be conducted at outfalls where wet weather screening was required due to System Vulnerability Factors and will be conducted in accordance with the procedures described in **Section 8.3**. All sampling results will be reported in the annual report.

9 Training

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

10 Progress Reporting

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

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

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

Appendix A

Legal Authority (IDDE Bylaw or Ordinance)

The Town of Oxford adopted an IDDE Bylaw on 1/14/2005, Chapter Sixty-Five, Discharges to the Municipal Storm Drain System. A copy of the Bylaw is on the following pages.

2. be owned by an eligible person, as that term is defined in G.L. c.21E, §2; and

3. be zoned for commercial or industrial use under the current zoning by-laws adopted by the Town;

Section 3. Abatement Agreements

1. The Town Manager is hereby authorized to negotiate and execute real estate tax abatement agreements on behalf of the Town with eligible persons. All such real estate tax abatement agreements are subject to approval by the Board of Selectmen.

2. Real estate tax abatement agreements may allow for abatement of outstanding real estate taxes, interest and/or penalties as the Town Manager shall deem appropriate to facilitate the remediation and/or redevelopment of the subject property.

3. All real estate tax abatement agreements shall incorporate terms including, but not limited to,

a. the amount of taxes, interest and penalties outstanding;
b. the percent of interest to accrue if determined applicable by the parties;
c. a description of quantifiable monthly payments to be made pursuant to the agreement;
d. the inception date of such payments;
e. the date of final payment;
f. penalties to be imposed in the event payments are not made in a timely manner; and
g. any and all other contractual terms negotiated and stipulated by the Town Manager and the property owner or other eligible person.

4. All real estate tax abatement agreements shall be executed by the Board of Selectmen on behalf of the Town, and by the eligible person, whose signatures shall be notarized and attested to by the Town Clerk.

5. A copy of each real estate tax abatement agreement executed pursuant to this by-law shall be provided to the Department of Environmental Protection, the Federal Environmental Protection Agency, the Commissioner of the Department of Revenue, the Board of Selectmen, and the owners of the real property to which the agreement relates.

1/14/05

CHAPTER SIXTY-FIVE
DISCHARGES TO THE MUNICIPAL STORM DRAIN SYSTEM

Section 1. Purpose

1.01 Increased and contaminated stormwater runoff are major causes of impairment of water quality and flow in lakes, ponds, streams, rivers, wetlands, and groundwater; contamination of drinking water supplies; alteration or destruction of aquatic and wildlife habitat; and flooding. Regulation of illicit connections and discharges to

the municipal storm drain system is necessary for the protection of the town's water bodies and groundwater, and to safeguard the public health, safety, welfare and the environment.

1.02 The purpose of this By-Law is:

1. To prevent pollutants from entering the town's municipal separate storm sewer system (MS4);
2. To prohibit illicit connections and unauthorized discharges to the MS4;
3. To require the removal of all such illicit connections;
4. To comply with state and federal statutes and regulations relating to stormwater discharges; and
5. To establish the legal authority to ensure compliance with the provisions of this By-Law through inspection, monitoring, and enforcement.

Section 2. Definitions

AUTHORIZED ENFORCEMENT AGENCY: The Oxford Department of Public Works (hereafter the DPW) its Director or his designee.

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

CLEAN WATER ACT: The Federal Water Pollution control Act (33USC §1251 *et seq.*) as amended.

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 United States or Commonwealth from any source.

GROUNDWATER: Water beneath the surface of the ground.

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

ILLICIT DISCHARGE: Direct or indirect discharge to the municipal storm drain system that is not composed entirely of stormwater, except as exempted in Section 6. The term does not include a discharge in compliance with an NPDES Storm Water Discharge Permit or resulting from fire fighting activities exempted pursuant to Section 6 of this By-Law.

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

MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OR MUNICIPAL STORM DRAIN SYSTEM: The system of conveyances designed or used for collecting or conveying stormwater, including any road with a drainage system, street, gutter, curb, inlet, piped storm drain, pumping facility, retention or detention basin, natural or man-made or altered drainage channel, reservoir, and other drainage

structure that together comprise the storm drainage system owned or operated by the Town of Oxford.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORM WATER DISCHARGE PERMIT: A permit issued by the United States Environmental Protection Agency or jointly with the State 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.

OWNER: A person with a legal or equitable interest in property.

PERSON: An individual, partnership, association, firm, company, trust, corporation, or any agency, authority, department or political subdivision of the Commonwealth or the federal government, to the extent permitted by law, and any officer, employee, or agent of such person.

POLLUTANT: Any element or property of sewage, agricultural, industrial or commercial waste, runoff, leachate, heated effluent, or other matter whether originating at a point or nonpoint source, that is or may be introduced into any sewage treatment works or waters of the Commonwealth. Pollutants shall include, without limitation:

1. paints, varnishes, and solvents;
2. oil and other automotive fluids;
3. non-hazardous liquid and solid wastes and yard wastes;
4. refuse, rubbish, garbage, litter, or other discarded or abandoned objects, ordinances, accumulation and floatables;
5. pesticides, herbicides, and fertilizers;
6. hazardous materials and wastes, sewage, fecal coliform and pathogens;
7. dissolved and particulate metals;
8. animal wastes;
9. rock, sand, salt, soils;
10. construction wastes and residues; and
11. noxious or offensive matter of any kind.

PROCESS WASTEWATER: Water that, during manufacturing or processing, comes into direct contact with or results from the production or use of any material, intermediate product, finished product, or waste product.

RECHARGE: The process by which groundwater is replenished by precipitation through the percolation of runoff and surface water through the soil.

STORMWATER: Runoff from precipitation or snow melt.

TOXIC OR HAZARDOUS MATERIAL or WASTE: Any material, which because of its quantity, concentration, chemical, corrosive, flammable, reactive, toxic, infectious or radioactive characteristics, either separately or in combination with any substance or substances, constitutes a present or potential threat to human health, safety, welfare, or to the environment. Toxic or hazardous materials include any synthetic organic chemical, petroleum product, heavy metal, radioactive or infectious waste, acid and alkali, and any substance defined as Toxic or Hazardous under MGL c.21C and c.21E,

and the regulations at 310 CMR 30.00 and 310 CMR 40.00.

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.

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.

Section 3. Authority

This By-Law 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.

Section 4. Applicability

This By-Law shall apply to any and all flows entering the municipally owned storm drainage system.

Section 5. Responsibility for Administration

The Department of Public Works (DPW), acting through its Director shall administer, implement, and enforce this By-Law.

Section 6. Regulations

The DPW may promulgate rules and regulations to effectuate the purposes of the By-Law. Failure by the DPW to promulgate such rules and regulations shall not have the effect of suspending or invalidating this By-Law.

Section 7. Prohibited Activities

7.01 Illicit Discharges

No person shall dump, discharge, cause or allow to be discharged any pollutant or non-stormwater discharge into the municipal separate storm sewer system (MS4), into a watercourse, or into the waters of the Commonwealth.

7.02 Illicit Connections

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

7.03 Obstruction of Municipal Storm Drain System

No person shall obstruct or interfere with the normal flow of stormwater into or out of the municipal storm drain system without prior approval from the DPW.

7.04 Exemptions

1. Discharge of flow resulting from fire fighting activities;
2. Waterline flushing provided that prior notice is made to the DPW and the discharged water is not a significant contributor of a pollutant;
3. Natural non-storm related flows from springs, riparian habitats and wetlands, stream flow diverted by wildlife or natural causes, groundwater from roadway sub-drains, uncontaminated groundwater infiltration;
4. Water from exterior foundation drains, and footing drains (not including active groundwater dewatering systems) as allowed and conditioned by a DPW Road Opening Permit;
5. Sump pump discharges as conditioned and permitted by a DPW Road Opening Permit provided the permit is subject to immediate revocation if testing uncovers contaminated discharges;
6. Over driveway flow from residential car washing;
7. Discharge of overspray from landscape irrigation or lawn watering provided no chemical additives are in the water;
8. Discharge from dechlorinated swimming pool water (less that one ppm chlorine) provided the water is allowed to stand for one week prior to draining and the pool is drained in such a way as not to cause a nuisance, provided that prior notice is given to the DPW;
9. Discharge from street sweeping;
10. Dye testing, provided prior notice is provided to the DPW;
11. Non-stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order administered under the authority of the United States Environmental Protection Agency, provided that the discharge is in full compliance with the requirements of the permit, waiver, or order and applicable laws and regulations; and
12. Discharges for which advanced written approval is received from the DPW as necessary to protect public health, safety, welfare or the environment.

Section 8. Emergency Suspension of Storm Drainage System Access

The DPW may suspend municipal storm system access to any person or property without prior written notice when such suspension is necessary to stop an actual or threatened discharge of pollutants that presents imminent risk of harm to the public health, safety, welfare or the environment. In the event any person fails to comply with an emergency suspension order, the DPW may take all reasonable steps to prevent or minimize harm to the public health, safety, welfare or the environment.

Section 9. Notification of Spills

Notwithstanding other requirements of local, state or federal law, as soon as a person responsible for a facility or operation, or responsible for emergency response for a facility or operation has information of or suspects a release of materials at the facility or operation resulting in or which may result in discharge of pollutants to the municipal drainage system or waters of the Commonwealth, that person shall immediately notify the

Oxford Fire Department, the Oxford Police Department and the Oxford Board of Health. In the event of a release of non-hazardous material, the reporting person shall notify the DPW no later that the next business day. The reporting person shall provide to the DPW written confirmation of all telephone, facsimile or in-person notifications within three business days thereafter. If the discharge of prohibited materials is from a commercial or industrial facility, the facility owner or operator of the facility shall retain on-site a written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least three years.

Section 10. Enforcement

10.01 The DPW acting through its Director shall enforce this By-Law, regulations, orders, violation notices, and enforcement orders, and may pursue all civil and criminal remedies for such violations.

10.02 If a person violates the provisions of this By-Law, regulations, permit, notice, or order issued thereunder, the DPW may seek injunctive relief in a court of competent jurisdiction restraining that person from activities which would create further violations or compelling that person to perform abatement or remediation of the violation.

10.03 The DPW may issue a written order to enforce the provision of this By-Law or the regulations promulgated thereunder, which may include: orders to eliminate illicit connections or discharges to the MS4; orders to perform monitoring, analyses, and reporting; orders that unlawful discharges, practices, or operations shall cease and desist; and orders requiring remediation of contamination in connection therewith. Said order shall be sent certified mail, return receipt requested to the violator and owner. If the DPW determines that abatement or remediation of contamination is required, the order shall set forth a deadline by which such abatement or remediation must be completed. Said order shall further advise that, should the violator or property owner fail to abate or perform remediation within the specified deadline, the Town may, at its option, undertake such work, and expenses thereof shall be charged to the violator or property owner.

10.04 If the DPW takes action upon failure of the violator or owner to abate or remediate, notice shall be given to the violator and owner of the costs, including administrative costs, incurred by the Town. Said notice shall be sent within thirty (30) days of completion of all measures necessary to abate the violation or to perform remediation. The violator or owner shall also be notified that they may, within thirty (30) days of receipt of said notice, file an appeal in writing to the Board of Selectmen objecting to either the amount or basis of the costs incurred. If the amount due is not received by the expiration of the time in which to file an appeal or within (30) days following a decision by the Board of Selectmen 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 by MGL c.59 §57 after the thirty-first day at which the cost first become due.

10.05 Any person who violates any provision of this By-Law, regulation, order or permit issued thereunder, shall be punished by a fine of $250.00 per violation. Each day or part thereof that such violation occurs or continues shall constitute a separate offense.

10.06 As an alternative to criminal prosecution or civil action, the DPW may, at the discretion of the Director, enforce this By-Law by non-criminal disposition in accordance with MGL c.40 §21D.

10.07 To the extent permitted by state law, or if authorized by the owner or other party in control of the property, the DPW, its agents, employees, and duly authorized contractors may enter upon privately owned property for the purpose of performing their duties under this By-Law and regulations and may make or cause to be made such examinations, surveys or sampling as reasonably necessary.

10.08 The remedies listed in this By-Law are not exclusive of any other remedies available under any applicable federal, state or local law.

Section 11. Severability

The provisions of the By-Law are hereby declared to be severable. If any provision, paragraph, sentence, or clause, of this by-Law of the application thereof to any person, establishment, or circumstances shall be held invalid, such invalidity shall not affect the other provisions or application of this By-Law.

Section 12. Transitional Provisions

Residential property owners shall have 180 days from the effective date of this By-Law to comply with its provisions provided good cause is shown for the failure to comply with the By-Law during that period.

1/14/05

CHAPTER SIXTY-SIX
STORMWATER MANAGEMENT AND LAND DISTURBANCE

Section 1. Purpose

1.01 Soil erosion and sedimentation can result in harmful impacts including: impairment of water quality and flow in lakes, ponds, streams, rivers, wetlands, and groundwater; contamination of drinking water supplies; alteration or destruction of aquatic and wildlife habitat; flooding; and overloading or clogging of municipal catch basins and storm drainage systems.

1.02 The purpose of this By-Law is:

1. To protect water resources;
2. To require practices that eliminate soil erosion and sedimentation and control the volume and rate of stormwater runoff resulting from land disturbance activities;
3. To promote infiltration and the recharge of groundwater;

Appendix B

Storm System Mapping

The Town of Oxford Stormwater Inventory Map is shown on the following pages.

The Inventory Map is also located on line at:
https://www.town.oxford.ma.us/sites/oxfordma/files/uploads/oxford_stormwater_map.pdf

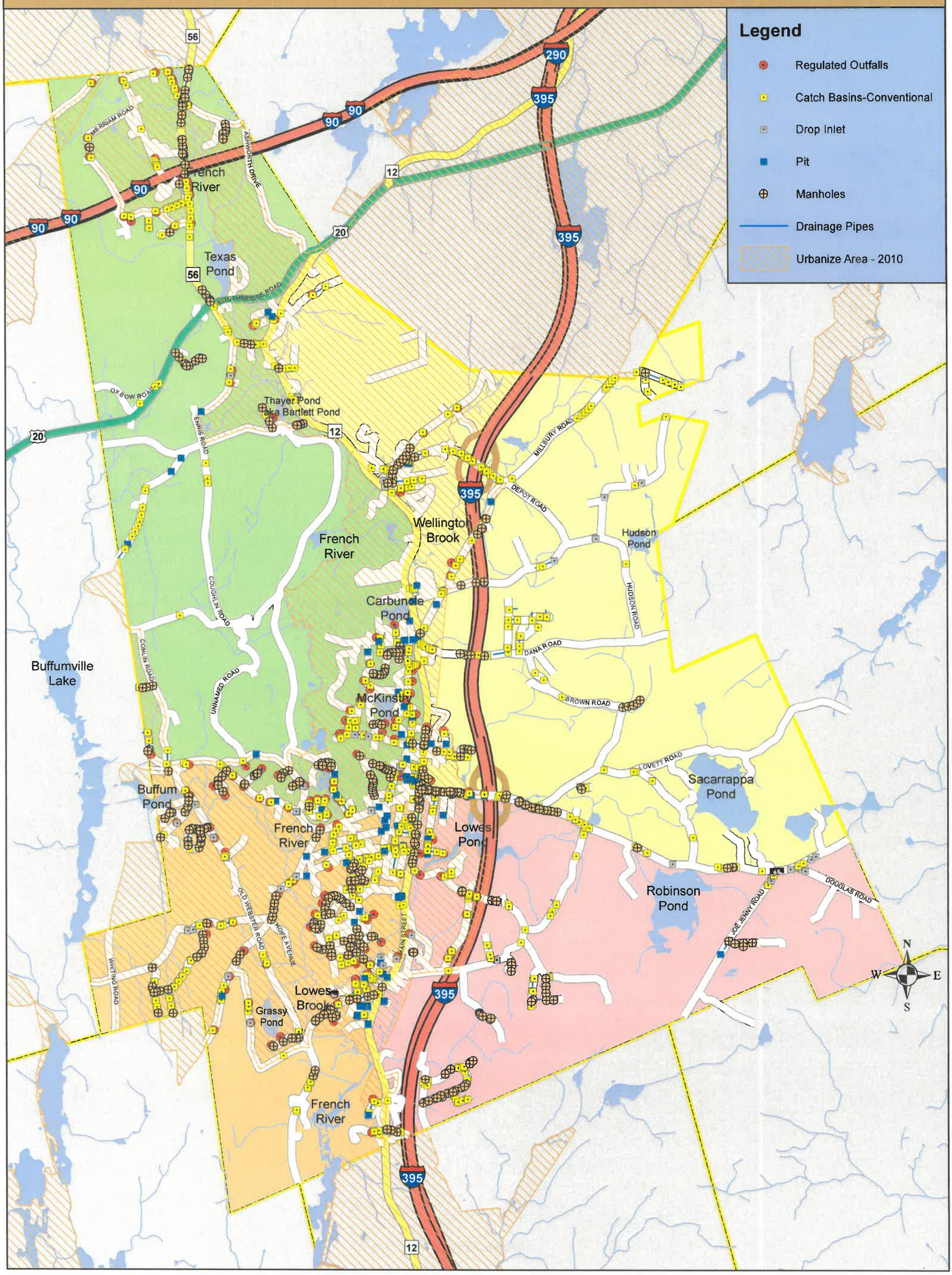
Phase I Mapping Requirements:
- Outfalls and receiving waters (previously required by the 2003 MA-MS4 permit)
- Open channel conveyances (swales, ditches, etc.)
- Interconnections with other MS4s and other storm sewer systems
- Municipally owned stormwater treatment structures
- Water bodies identified by name and indication of all use impairments as identified on the most recent EPA approved Massachusetts Integrated List of Waters report

Phase II Mapping Requirements:
- Outfall spatial location (latitude and longitude with a minimum accuracy of +/- 30 feet.)
- Pipes
- Manholes
- Catch Basins
- Refined catchment delineations. Catchment delineations shall be updated to reflect information collected during catchment investigations
- Municipal Sanitary Sewer system (if available)
- Municipal combined sewer system (if applicable)

Town of Oxford

Stormwater Inventory Map

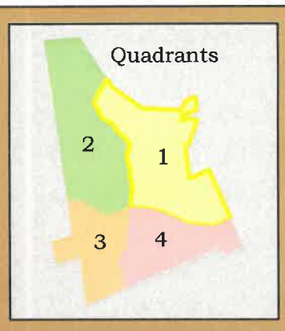
July 1, 2019

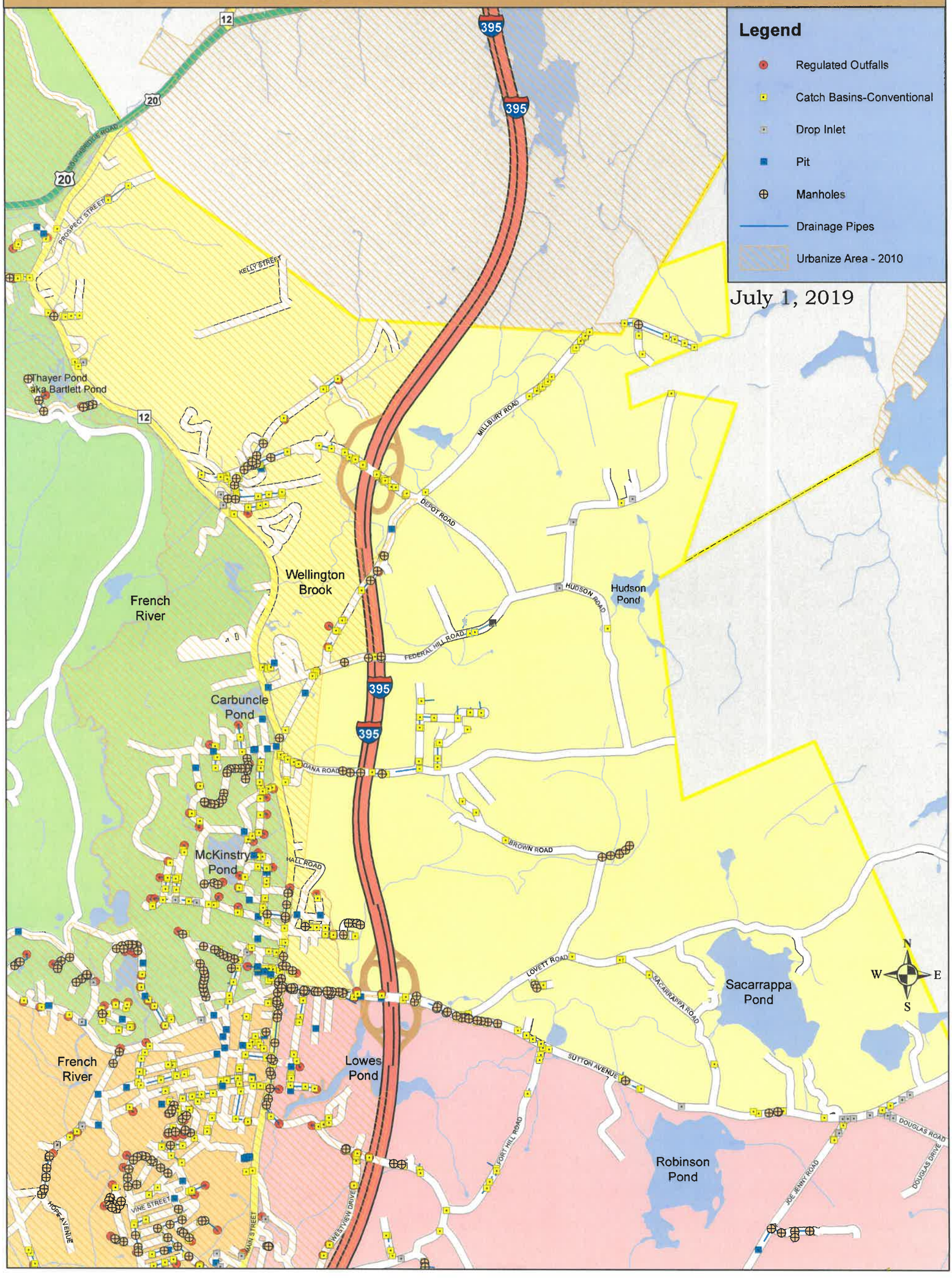


Town of Oxford

Stormwater Inventory Map

QUAD 1

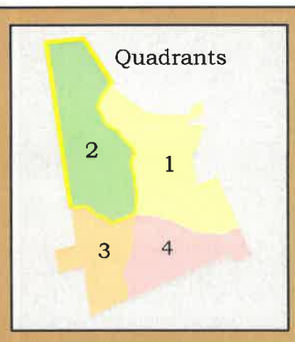


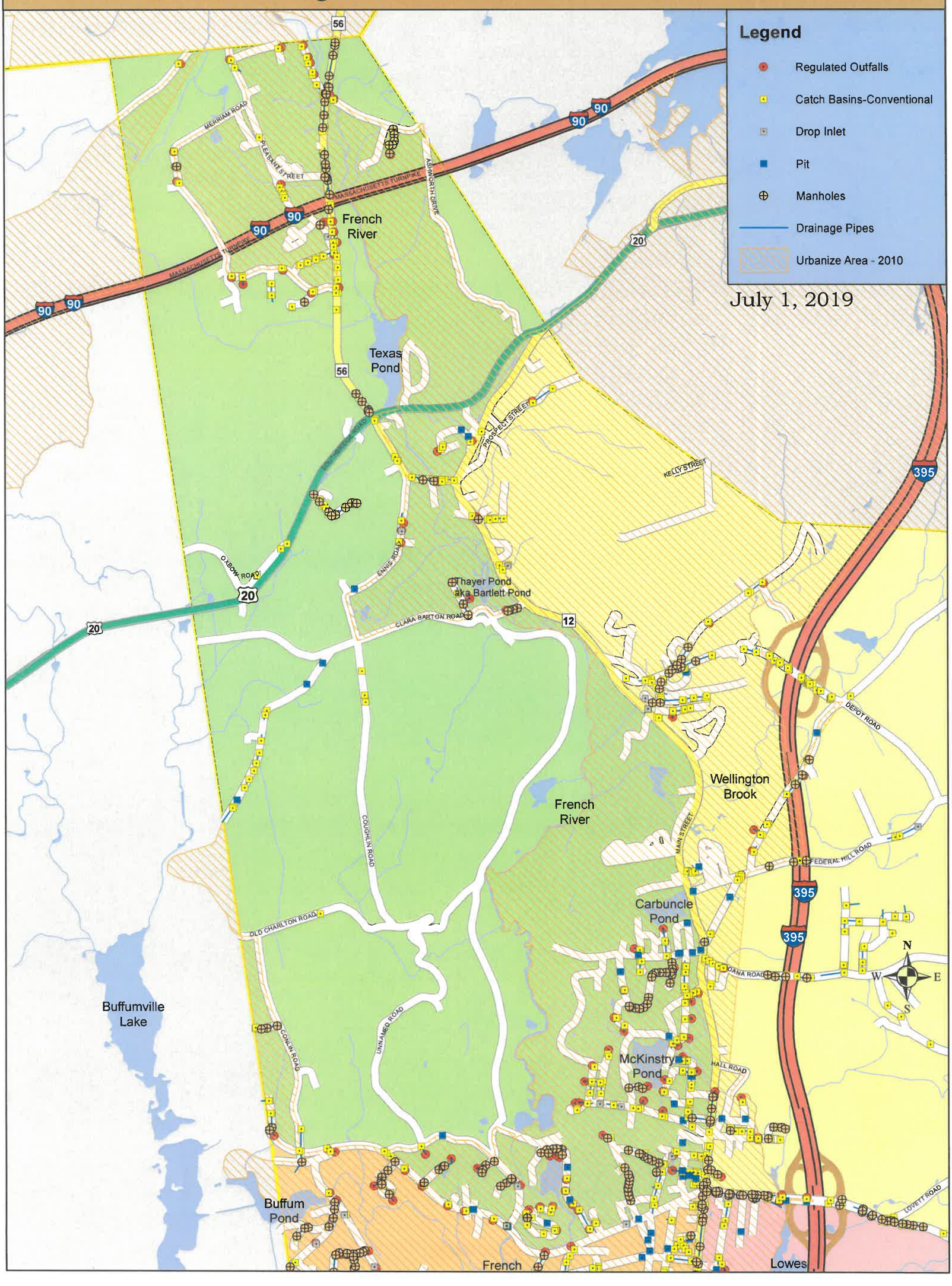


Town of Oxford

Stormwater Inventory Map

QUAD 2

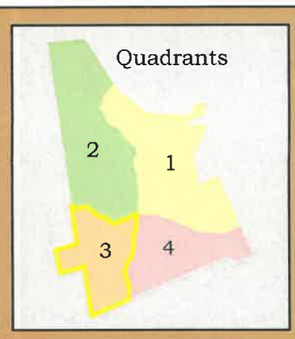


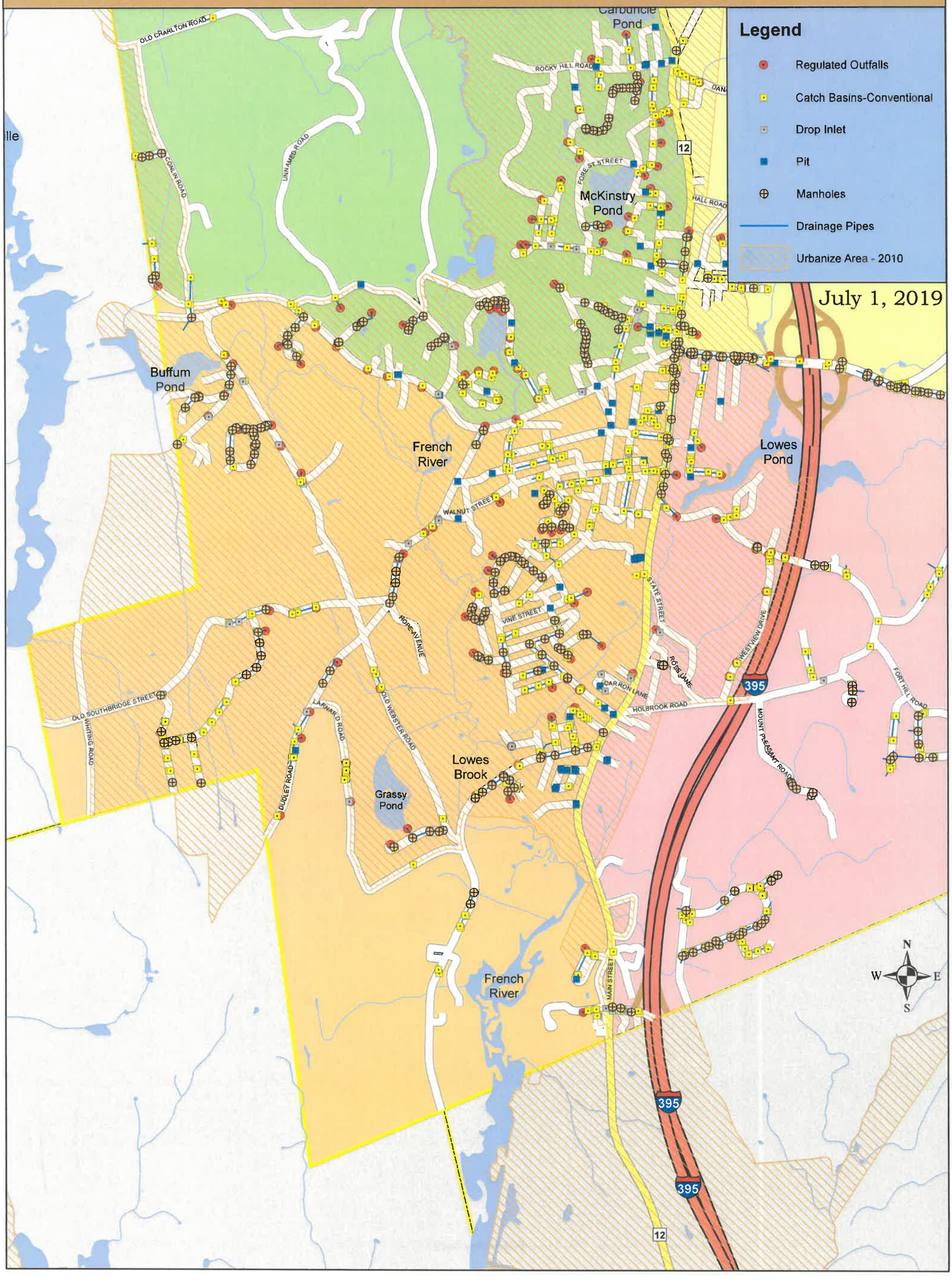


Town of Oxford

Stormwater Inventory Map

QUAD 3

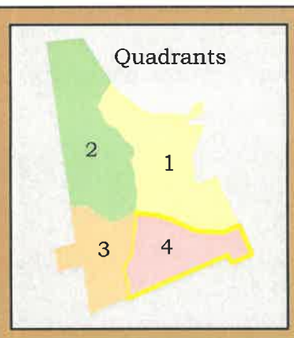


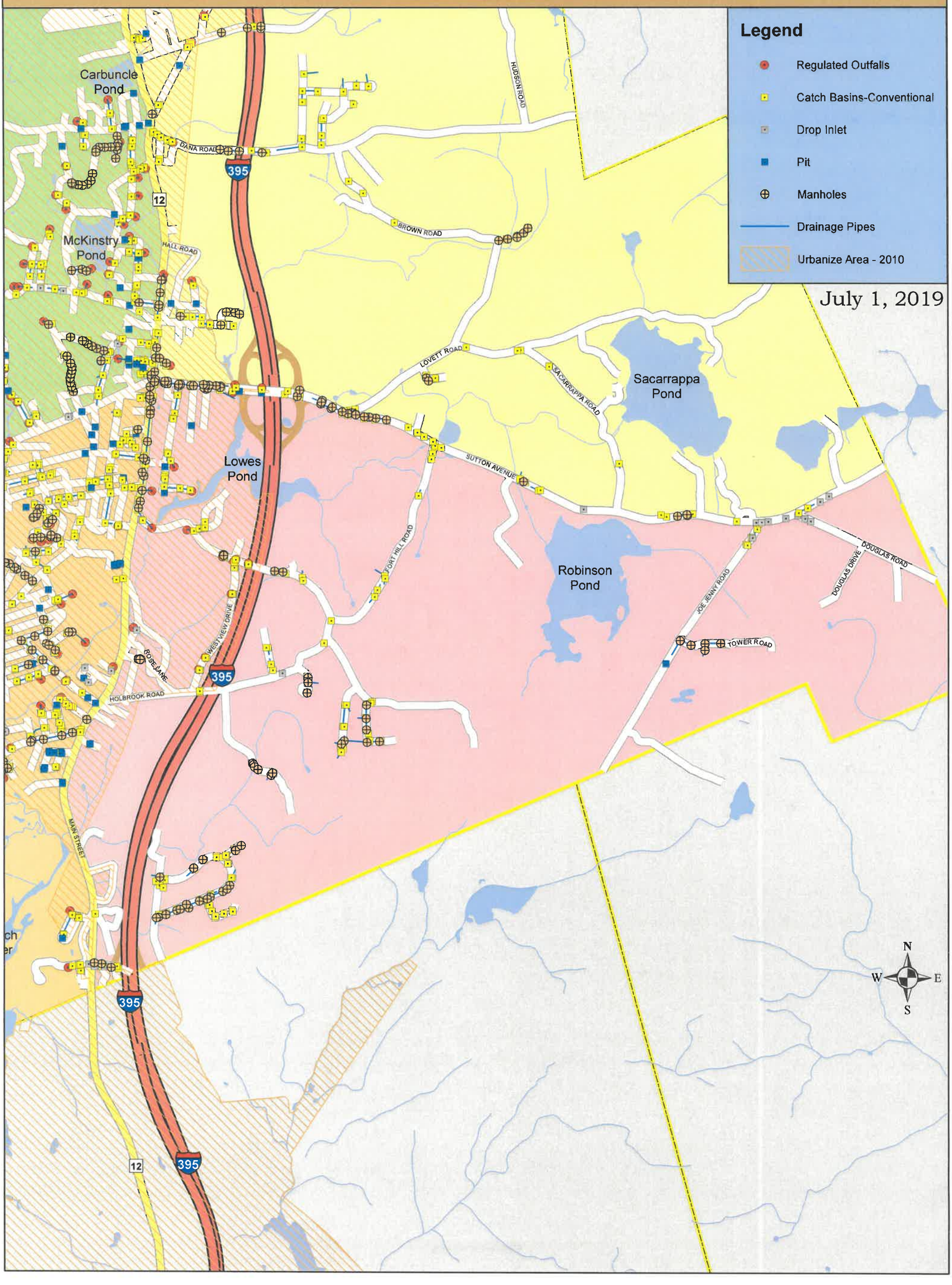


Town of Oxford

Stormwater Inventory Map

QUAD 4





Appendix C

Field, Tracking and Chain of Custody Forms

The following forms are included in this appendix:

- Illicit Discharge Incident Tracking Sheet
- Dry Weather Outfall Inspection Survey Form
- Wet Weather Outfall Inspection Survey Form
- Chain of Custody Form

Illicit Discharge Incident Tracking Sheet

Incident ID:			
Responder Information (for Citizen-Reported issues)			
Call Taken By:		Call Date:	
Call Time:		Precipitation (inches) in past 24-48 hours:	
Observer Information			
Date and Time of Observation:		Observed During Regular Maintenance or Inspections? ☐ Yes ☐ No	
Caller Contact Information (optional) or Municipal Employee Information:			
Observation Location: (complete one or more below)			
Latitude and Longitude:			
Stream Address or Outfall #:			
Closest Street Address:			
Nearby Landmark:			
Primary Location Description	**Secondary Location Description:**		
☐Stream Corridor (In or adjacent to stream)	☐Outfall	☐In-stream Flow	☐Along Banks
☐Upland Area (Land not adjacent to stream)	☐Near Storm Drain	☐Near other water source (stormwater pond, wetland, ect.):	
Narrative description of location:			
Upland Problem Indicator Description			
☐Dumping	☐Oil/Solvents/Chemicals	☐Sewage	
☐Detergent, suds, etc.	☐Other:_____		
Stream Corridor Problem Indicator Description			
Odor	☐None	☐Sewage	☐Rancid/Sour ☐Petroleum (gas)
	☐Sulfide (rotten eggs); natural gas	☐Other: Describe in "Narrative" section	
Appearance	☐"Normal"	☐Oil Sheen	☐Cloudy ☐Foam
	☐Optical enhancers ☐Discolored		
	☐Other: Describe in "Narrative" section		
Floatables	☐None	☐Sewage (toilet paper, etc)	☐Algae ☐Trash or debris
	☐Other: Describe in "Narrative" section		
Narrative description of problem indicators:			
Suspected Source (name, personal or vehicle description, license plate #, address, etc.):			

CMRSWC

Outfall ID: _____ **Town:** _____

Inspector: _____ **Date:** _____

Street Name _____

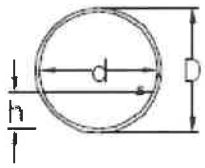
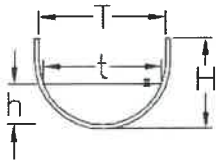
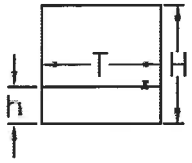
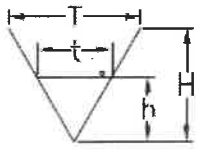
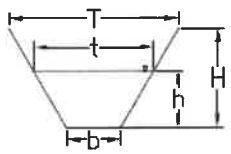
Last rainfall event _____

DRY WEATHER OUTFALL INSPECTION SURVEY

Type of Outfall (check one):		**Pipe Outfall** ☐	**Open Swale Outfall** ☐
Outfall Label:	**Stencil** ☐	**Ground Inset** ☐ **Sign** ☐	**None** ☐ **Other**_____

Pipe Material:	Concrete ☐ Corrugated metal ☐ Clay Tile ☐ Plastic ☐ Other: _____ ☐	**Pipe Condition:**	Good ☐ Poor ☐ Fair ☐ Crumbling ☐
Swale Material:	Paved (asphalt) ☐ Concrete ☐ Earthen ☐ Stone ☐ Other: _____ ☐	**Swale Condition:**	Good ☐ Poor ☐ Fair ☐ Crumbling ☐

Shape of Pipe/Swale (check one)

 ☐  ☐	 ☐	 ☐	 ☐
Rounded Pipe/Swale	**Rectangular Pipe/Swale**	**Triangular Swale**	**Trapezoidal Swale**

Pipe Measurements:	**Swale Measurements:**	**Is there a headwall?**	**Location Sketch**
Inner Dia. (in): d= _____	Swale Width (in): T= _____	Yes ☐ No ☐	
Outer Dia. (in): D= _____	Flow Width (in): t = _____	**Condition:**	
Pipe Width (in): T= _____	Swale Height (in): H= _____	Good ☐ Poor ☐ Fair ☐ Crumbling ☐	
Pipe Height (in): H= _____	Flow Height (in): h= _____*		
Flow Width (in): h= _____*	Bottom Width (in): b=_____		

Description of Flow: Heavy ☐ Moderate ☐ Trickling ☐ Dry ☐

If the outlet is submerged check yes and indicate approximate height of water above the outlet invert. h above invert (in):	**Circle All Materials Present:**
Odor: Yes ☐ No ☐	Rip rap / Sheen: Bacterial
Optical enhancers suspected? Yes ☐ No ☐	Excessive sediment / Sheen: Petroleum
Has channelization occurred? Yes ☐ No ☐	Foam / Floatables
Has scouring occurred below the outlet? Yes ☐ No ☐	Sanitary Waste / Algae
Required Maintenance: Tree Work, Ditch Work, Structural Corrosion, N/A; Remove Trash/Debris, Blocked Pipe, Erosion at Structure, Other	Orange Staining / Excessive Vegetation
Comments:	

Outfall I.D.: _____ **Date:** _____

Inspector: _____

Time of Inspection: _____

Street Name _____

Last rainfall event _____

WET WEATHER OUTFALL INSPECTION SURVEY

Visual Inspection:	Yes	No	Comments (Include probable source of observed contamination):
Color	☐	☐	
Odor	☐	☐	
Turbidity	☐	☐	
Excessive Sediment	☐	☐	
Sanitary Waste	☐	☐	
Pet Waste	☐	☐	
Floatable Solids	☐	☐	
Oil Sheen	☐	☐	
Bacterial Sheen	☐	☐	
Foam	☐	☐	
Algae	☐	☐	
Orange Staining	☐	☐	
Excessive Vegetation	☐	☐	
Optical Enhancers	☐	☐	
Other _____			

Sample Parameters	Analytical Test Method	Benchmark*	Field Screening Result	Full Analytical?
Ammonia[1]	EPA 350.2/SM4500-NH3C	>50.0 mg/L		☐ Yes ☐ No
Specific Conductance[1]	SM 2510B	>2,000		☐ Yes ☐ No
Detergents & Surfactants[2]	EPA 425.1/SM5540C	> 0.25 mg/L		☐ Yes ☐ No
Fluoride[2]	EPA 300.0	>0.25 mg/L		☐ Yes ☐ No
pH[1]	EPA 150.1/SM 4500H	<5		☐ Yes ☐ No
Potassium[1]	EPA 200.7	>20 mg/L		☐ Yes ☐ No
Comments:				

[1] – *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*, Center for Watershed Protection and Robert Pitt of University of Alabama, 2004, p. 134, Table 45.

[2] – *Appendix I – Field Measurements, Benchmarks and Instrumentation*, Draft Massachusetts North Coastal Small MS4 General Permit, 2009.

PREMIER LABORATORY, INC.
A BWMi NETWORK LABORATORY

Premier Laboratory, Inc.
61 Louisa Viens Drive
Dayville, CT 06241

Chain of Custody:

www.premierlaboratory.com

page _____ of _____

Lab WO #:

Project Manager:

Copy of Report To

CUSTOMER:

ADDRESS:

DELIVERY:

E-MAIL:

PHONE: FAX:

Billing Information

BILL TO:

ADDRESS:

ATTN:

PHONE:

E-MAIL:

PURCHASE ORDER #:

Project Information

Project:

Location:

Project Mgr:

IN CASE WE HAVE ANY QUESTIONS WHEN SAMPLES ARRIVE WE SHOULD CALL:

E-MAIL:

PHONE:

FAX:

Sample Identification	Date Collected	Time Collected	Sample Matrix	Sample Type: Composite	Sample Type: Grab	Bottle Qty	Analysis					Preservatives: NON-PRES	Preservatives: HCL	Preservatives: HNO_3	Preservatives: H_2SO_4	Preservatives: OTHER

CUSTODY TRANSFER	DATE	TIME
SAMPLER:		
RECEIVED:		
RELINQUISHED:		
RECEIVED:		
RELINQUISHED:		
RECEIVED:		

TURNAROUND TIME REQUESTED (select): ***Standard*** ***RUSH*** ____ ***Day***

EXPEDITED SERVICE MAY BE SUBJECT TO SURCHARGE

Circle Delivery Method: E-MAIL HARD COPY OTHER

COMMENTS:

CONDITIONS UPON RECEIPT: (CHECK ONE)

COOLED ☐ AMBIENT ☐ °C Upon receipt at lab

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

Appendix D

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

The following are included in this appendix:

- SOP 1: Dry Weather Outfall Inspection
- SOP 2: Wet Weather Outfall Inspection
- SOP 13: Water Quality Screening in the Field
- Water Quality Screening Form

Instructions for the use of field test kits are located within each kit and in the Water Quality Sampling Kits Instruction Manuals Document, November 2013, prepared by the Central Massachusetts Regional Stormwater Coalition (CMSWC).

SOP 1: DRY WEATHER OUTFALL INSPECTION

Introduction

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

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

Objectives of Dry Weather Inspections

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

Visual Condition Assessment

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

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

1. Foam: indicator of upstream vehicle washing activities, or an illicit discharge.
2. Oil sheen: result of a leak or spill.
3. Cloudiness: indicator of suspended solids such as dust, ash, powdered chemicals and ground up materials.
4. Color or odor: Indicator of raw materials, chemicals, or sewage.
5. Excessive sediment: indicator of disturbed earth of other unpaved areas lacking adequate erosion control measures.
6. Sanitary waste and optical enhancers (fluorescent dyes added to laundry detergent): indicators of illicit discharge.
7. Orange staining: indicator of high mineral concentrations.

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Both bacteria and petroleum can create a sheen on the water surface. The source of the sheen can be differentiated by disturbing it, such as with a pole. A sheen caused by oil will remain intact and move in a swirl pattern; a sheen caused by bacteria will separate and appear "blocky". Bacterial or naturally occurring sheens are usually silver or relatively dull in color and will break up into a number of small patches of sheen. The cause may be presence of iron, decomposition of organic material or presence of certain bacteria. Bacterial sheen is not a pollutant but should be noted.

Many of these observations are indicators of an illicit discharge. Examples of illicit discharges include: cross-connections of sewer services to engineered storm drain systems; leaking septic systems; intentional discharge of pollutants to catch basins; combined sewer overflows; connected floor drains; and sump pumps connected to the system (under some circumstances). Additional guidelines for illicit discharge investigations are included in SOP 10, "Locating Illicit Discharges". If dry weather flow is present at the outfall, and the flow does not appear to be an obvious illicit discharge (e.g. flow is clear, odorless, etc.) attempt to identify the source of flow (e.g. intermittent stream, wetlands drainage, etc.) and document the discharge for future comparison.

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

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

Optical enhancers, fluorescent dyes added to laundry detergent, are typically detected through the use of clean, white cotton pads placed within the discharge for several days, dried then viewed under a UV light. If the cotton pad displays fluorescent patches, optical enhancers are present. Optical enhancers are occasionally visible as a bluish-purple haze on the water surface; however the testing method should be used to confirm the presence of optical enhancers.

The Dry Weather Outfall Inspection Survey includes fields where these and other specific observations can be noted. The inspector shall indicate the presence of a specific water quality indicator or parameter

by marking "Yes". If "Yes" is marked, provide additional details in the comments section. If the indictor in question is not present, mark "No".

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

Measuring Water Quality

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

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

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

Analytical Sample Collection

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

Protocols for collecting a grab sample shall include the following:

1. Do not eat, drink or smoke during sample collection and processing.
2. Do not collect or process samples near a running vehicle.
3. Do not park vehicles in the immediate sample collection area, including both running and non-running vehicles.
4. Always wear clean, powder-free nitrile gloves when handling sample containers and lids.
5. Never touch the inside surface of a sample container or lid, even with gloved hands.
6. Never allow the inner surface of a sample container or lid to be contacted by any material other than the sample water.
7. Collect samples while facing upstream and so as not to disturb water or sediments in the outfall pipe or ditch.
8. Do not overfill sample containers, and do not dump out any liquid in them. Liquids are often added to sample containers intentionally by the analytical laboratory as a preservative or for pH adjustment.

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9. Slowly lower the bottle into the water to avoid bottom disturbance and stirring up sediment.
10. Do not allow any object or material to fall into or contact the collected water sample.
11. Do not allow rainwater to drip from rain gear or other surfaces into sample containers.
12. Replace and tighten sample container lids immediately after sample collection.
13. Accurately label the sample with the time and location.
14. Document on the Wet Weather Outfall Inspection Survey that analytical samples were collected, specify parameters, and note the sample time on the Inspection Survey. This creates a reference point for samples.

Analytical Sample Quality Control and Assurance

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

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

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

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

Attachments

1. Dry Weather Outfall Inspection Survey

Related Standard Operating Procedures

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

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SOP 2: WET WEATHER OUTFALL INSPECTION

Introduction

Outfalls from an engineered storm drain system can be in the form of pipes or ditches. Under current and pending regulations, it is important to inspect and document water quality from these outfalls under both dry weather and wet weather conditions. SOP 1, "Dry Weather Outfall Inspection", covers the objectives of that type of inspection. This SOP discusses wet weather inspection objectives and how they differ from dry weather inspection objectives. The primary difference is that wet weather inspection aims to describe and evaluate the first flush of stormwater discharged from an outfall during a storm, representing the maximum pollutant load managed by receiving water.

Definition of Wet Weather

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

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

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

Visual Condition Assessment

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

- Oil sheen
- Discoloration
- Trash and debris

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

1. Foam: indicator of upstream vehicle washing activities, or an illicit discharge.
2. Oil sheen: result of a leak or spill.

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3. Cloudiness: indicator of suspended solids such as dust, ash, powdered chemicals and ground up materials.
4. Color or odor: Indicator of raw materials, chemicals, or sewage.
5. Excessive sediment: indicator or disturbed earth of other unpaved areas lacking adequate erosion control measures.
6. Sanitary waste and optical enhancers (fluorescent dyes added to laundry detergent): indicators of illicit discharge.
7. Orange staining: indicator of high mineral concentrations.

Many of these observations are indicators of an illicit discharge. Examples of illicit discharges include: cross-connections of sewer services to engineered storm drain systems; leaking septic systems; intentional discharge of pollutants to catch basins; combined sewer overflows; connected floor drains; and sump pumps connected to the system (under some circumstances). Additional guidelines for illicit discharge investigations are included in SOP 10, "Locating Illicit Discharges".

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

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

Both bacteria and petroleum can create a sheen on the water surface. The source of the sheen can be differentiated by disturbing it, such as with a pole. A sheen caused by oil will remain intact and move in a swirl pattern; a sheen caused by bacteria will separate and appear "blocky". Bacterial or naturally occurring sheens are usually silver or relatively dull in color and will break up into a number of small patches of sheen. The cause may be presence of iron, decomposition of organic material or presence of certain bacteria. Bacterial sheen is not a pollutant but should be noted.

Optical enhancers, fluorescent dyes added to laundry detergent, are typically detected through the use of clean, white cotton pads placed within the discharge for several days, dried then viewed under a UV light. If the cotton pad displays fluorescent patches, optical enhancers are present. Optical enhancers are occasionally visible as a bluish-purple haze on the water surface; however the testing method should be used to confirm the presence of optical enhancers.

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

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

Measuring Water Quality

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

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

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

Analytical Sample Collection

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

Protocols for collecting a grab sample shall include the following:

1. Do not eat, drink or smoke during sample collection and processing.
2. Do not collect or process samples near a running vehicle.
3. Do not park vehicles in the immediate sample collection area, including both running and non-running vehicles.
4. Always wear clean, powder-free nitrile gloves when handling sample containers and lids.
5. Never touch the inside surface of a sample container or lid, even with gloved hands.
6. Never allow the inner surface of a sample container or lid to be contacted by any material other than the sample water.
7. Collect samples while facing upstream and so as not to disturb water or sediments in the outfall pipe or ditch.

8. Do not overfill sample containers, and do not dump out any liquid in them. Liquids are often added to sample containers intentionally by the analytical laboratory as a preservative or for pH adjustment.
9. Slowly lower the bottle into the water to avoid bottom disturbance and stirring up sediment.
10. Do not allow any object or material to fall into or contact the collected water sample.
11. Do not allow rainwater to drip from rain gear or other surfaces into sample containers.
12. Replace and tighten sample container lids immediately after sample collection.
13. Accurately label the sample with the time and location.
14. Document on the Wet Weather Outfall Inspection Survey that analytical samples were collected, specify parameters, and note the sample time on the Inspection Survey. This creates a reference point for samples.

Analytical Sample Quality Control and Assurance

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

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

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

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

Attachments

1. Wet Weather Outfall Inspection Survey

Related Standard Operating Procedures

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

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SOP 13: WATER QUALITY SCREENING IN THE FIELD

Introduction

Outfalls from an engineered storm drain system can be in the form of pipes or ditches. Under current and pending regulations, it is important to inspect and document water quality within the MS4 system under both dry weather and wet weather conditions. SOP 1, "Dry Weather Outfall Inspection" and SOP 2, "Wet Weather Outfall Inspection", cover the objectives of these activities and how water quality parameters can be collected during both types of inspections. SOP 3, "Catch Basin Inspection and Cleaning", describes how this operations and maintenance activity can serve as an additional opportunity to collect water quality data.

SOP 2 included detailed information on how to collect discrete analytical samples to be processed by a laboratory. In contrast, this SOP addresses screening-level measurements than can be collected at outfalls, catch basins, receiving waters, or other water bodies. The measurements can be collected with field test kits or with portable meters.

Water quality screening data collected in this manner can feed into an illicit discharge detection and elimination investigation, like the process described in SOP 10, "Locating Illicit Discharges".

Visual Condition Assessment

SOP 1, SOP 2, and SOP 3 describe a Visual Condition Assessment to collect observations related to the quality of stormwater conveyed by an engineered storm drain system. These observations may include such visual evidence and/or potential pollutants as:

- Foaming (detergents)
- Discoloration
- Evidence of sanitary waste
- Optical enhancers (fluorescent dyes added to laundry detergent); and
- Turbidity

If a Visual Condition Assessment indicates the presence of these pollutants, it may be necessary to quantify the extent of each, and gather data on other parameters that cannot be visually observed but can be measured using field kits or meters. These parameters include:

- Ammonia
- Chloride (present in treated drinking water but not groundwater)
- Conductivity
- Fluoride
- Hardness
- pH
- Potassium

Field Kits and Sampling Methods Available

In recent drafts of new MS4 Permits, U.S. EPA Region 1 has identified several test kits that are acceptable for use in the field, and other regulatory agencies have also completed similar reviews. The following table shows field test kits and portable meters that can be used for screening parameters.

Table SOP 13-1
Field Measurements, Test Kits, and Instrumentation

Analyte or Parameter	Instrumentation (Portable meter)	Field Test Kit
Ammonia	CHEMetrics™ V-2000 Colorimeter Hach™ DR/890 Colorimeter Hach™ Pocket Colorimeter™ II	CHEMetrics™ K-1410 CHEMetrics™ K-1510 (series) Hach™ NI-SA Hach™ Ammonia Test Strips
Bacteria	Bacteria field test kits require 24-hour window	
Boron	N/A	Hanna™ HI 38074 Taylor™ K-1541
Chloride	CHEMetrics™ V-2000 Colorimeter Hach™ Pocket Colorimeter™ II LaMotte™ DC1200 Colorimeter	CHEMetrics™ K-2002 through K-2070 Hach™ CDS-DT Hach™ Chloride QuanTab® Test Strips
Color		Hach™ ColorDisc
Conductivity	CHEMetrics™ I-1200	N/A
Detergents (Surfactants)	CHEMetrics™ I-2017	CHEMetrics™ K-9400 and K-9404 Hach™ DE-2
Fluoride	CHEMetrics™ V-2000 Colorimeter Hach™ Pocket Colorimeter™ II	N/A
Hardness	N/A	CHEMetrics™ K-1705 and K-1710 CHEMetrics™ K-4502 through K-4530 Hach™ HA-DT Hach™ Hardness Test Strips
Optical enhancers	Field tests still under development	
pH	CHEMetrics™ I-1000	Hach™ 17J through 17N Hach™ pH Test Strips
Potassium	Horiba™ Cardy C-131	LaMotte™ 3138 KIW
Turbidity	CHEMetrics™ I-1300	N/A

Each field test kit will include instructions specific to that test kit, and most kits are available in configurations that detect different ranges of the parameter. For example, the CHEMetrics™ detergents kit K-9400 shown above detects concentrations of 0 to 3 milligrams per liter (mg/L) while the K-9404 kit detects concentrations of 0 to 1,400 mg/L.

The table below shows values identified by the U.S. EPA and the Center for Watershed Protection as typical screening values for select parameters. These represent the typical concentration (or value) of each parameter expected to be found in stormwater. Screening values that exceed these benchmarks may be indicative of pollution and/or illicit discharges.

Table SOP 13-2
Benchmark Field Measurements for Select Parameters

Analyte or Parameter	Benchmark
Ammonia	>50.0 mg/L
Conductivity	>2,000
Detergents (Surfactants)	> 0.25 mg/L
Fluoride	>0.25 mg/L
pH	<5
Potassium	>20 mg/L

If and when water quality screening samples, whether using field test kits or portable meters, exceed these benchmark concentrations, the inspector should consider collecting analytical samples for laboratory analysis.

Advantages and Disadvantages of Field Testing

Field test kits can be convenient for use as a screening tool, initial purchase costs are low (typically $0.50 to $5.00 for the kits included in Table SOP 13-1), and the costs are far less than full analyses at a laboratory. However, some disadvantages of this screening method include:

- Limited shelf life
- Labor cost associated with inspector's time
- Generation of wastes, including glass vials and used reagent
- Steps and processes for each kit can vary widely, resulting in errors
- Trained staff are required in order to effectively utilize kits
- Not all kits are accepted by all regulatory agencies
- Limited useful detection range

Portable instrumentation such as the colorimeters shown in Table SOP 13-1 have the benefit of providing accurate readings, measure to low detection limits, and can be purchased pre-programmed to measure concentrations of most parameters required. Disadvantages of portable instrumentation include:

- High initial purchase cost
- Requirement for ongoing calibration and maintenance
- Individual probes require periodic replacement
- Specific storage requirements to maintain calibration
- Trained staff are required in order to effectively utilize meters

Related Standard Operating Procedures

1. SOP 1, Dry Weather Outfall Inspection
2. SOP 2, Wet Weather Outfall Inspection
3. SOP 3, Catch Basin Cleaning and Inspection
4. SOP 10, Locating Illicit Discharges

WATER QUALITY SCREENING FORM

Outfall I.D.			
Outfall Location			
Inspector's Name			
Date of Inspection		Date of Last Inspection	
Start Time		End Time	
Type of Inspection: Regular ☐ Pre-Storm Event ☐ During Storm Event ☐ Post-Storm Event ☐			
Most Recent Storm Event			

FIELD WATER QUALITY SCREENING RESULTS

Sample Parameter	Field Test Kit or Portable Instrument Meter	Benchmark	Field Screening Result	Full Analytical Required?
Ammonia[1]		> 50.0 mg/L		☐ Yes ☐ No
Boron[1]		> 0.35 mg/L		☐ Yes ☐ No
Chloride[2]		230 mg/L		☐ Yes ☐ No
Color[1]		> 500 units		☐ Yes ☐ No
Specific Conductance[1]		> 2,000 µS/cm		☐ Yes ☐ No
Detergents & Surfactants[3]		> 0.25 mg/L		☐ Yes ☐ No
Fluoride[3]		> 0.25 mg/L		☐ Yes ☐ No
Hardness[1]		< 10 mg/L or > 2,000 mg/L		☐ Yes ☐ No
pH[1]		< 5		☐ Yes ☐ No
Potassium[1]		> 20 mg/L		☐ Yes ☐ No
Turbidity[1]		> 1,000 NTU		☐ Yes ☐ No

[1] – *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*, Center for Watershed Protection and Robert Pitt of University of Alabama, 2004, p. 134, Table 45.

[2] –*Env-Ws 1703.21 Water Quality Criteria for Toxic Substances*, State of New Hampshire Department Surface Water Quality Regulations.

[3] – *Appendix I – Field Measurements, Benchmarks and Instrumentation*, Draft Massachusetts North Coastal Small MS4 General Permit, 2009.

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FULL ANALYTICAL TESTING WATER QUALITY RESULTS

Sample Parameter	Analytical Test Method	Sample Collection (Time/Date)	Testing Lab	Analytical Testing Result
Ammonia	EPA 350.2/SM4500-NH3C			
Bacteria	E coli: 1103.1; 1603 Enterococcus: 1106.1; 1600			
Boron	EPA 212.3			
Chloride	EPA 9251			
Color	EPA 110.2			
Specific Conductance	SM 2510B			
Detergents & Surfactants	EPA 425.1/SM5540C			
Fluoride	EPA 300.0			
Hardness	EPA 130.1/SM 2340B			
Optical Enhancers	N/A*			
pH	EPA 150.1/SM 4500H			
Potassium	EPA 200.7			
Turbidity	SM 2130B			

*- There is presently no USEPA Standard Method for analysis of optical enhancers. Typically, sample pads are described as with "Present" or "Not Present" for fluorescing dye when exposed to UV light or a fluorometer.

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Appendix E

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

SOP 10 Locating Illicit Discharges

Additional manufacturer instructions, manuals and procedures and any in-house SOPs used to perform source isolation and confirmation for illicit discharges will be added to this appendix as obtained.

SOP 10: LOCATING ILLICIT DISCHARGES

Introduction

An "illicit discharge" is any discharge to an engineered storm drain system that is not composed entirely of stormwater unless the discharge is defined as an allowable non-stormwater discharge under the 2003 Massachusetts MS4 Permit. Illicit discharges may enter the engineered storm drain system through direct or indirect connections, such as: cross-connections of sewer services to engineered storm drain systems; leaking septic systems; intentional discharge of pollutants to catch basins; combined sewer overflows; connected floor drains; and sump pumps connected to the system (under some circumstances). Illicit discharges can contribute high levels of pollutants, such as heavy metals, toxics, oil, grease, solvents, nutrients, and pathogens to receiving streams.

Illicit discharges can be located by several methods, including routine dry weather outfall inspections and catch basin inspections, which are described in detail in SOP 1, "Dry Weather Outfall Inspection" and SOP 3, "Catch Basin Inspection and Cleaning", respectively, as well as from citizen reports.

This SOP assumes that the municipality has legal authority (i.e., a bylaw or ordinance) in place, per the requirements of the 2003 Massachusetts MS4 Permit, to prohibit the connection of non-stormwater discharges into the storm drain system. The authority or department for addressing illicit discharge reports would be clearly identified in the municipality's legal authority. In Massachusetts, this is typically a combination of the Board of Health, the Department of Public Works (or Highway Department), and the local sanitary sewer department or commission. In some communities, the Conservation Commission may also play a role. This SOP refers to "appropriate authority" generically to reflect differences in how municipalities have identified these roles.

Identifying Illicit Discharges

The following are often indicators of an illicit discharge from stormwater outfall:

1. Foam: indicator of upstream vehicle washing activities, or an illicit discharge.
2. Oil sheen: result of a leak or spill.
3. Cloudiness: indicator of suspended solids such as dust, ash, powdered chemicals and ground up materials.
4. Color or odor: Indicator of raw materials, chemicals, or sewage.
5. Excessive sediment: indicator of disturbed earth of other unpaved areas lacking adequate erosion control measures.
6. Sanitary waste and optical enhancers (fluorescent dyes added to laundry detergent): indicator of the cross-connection of a sewer service.
7. Orange staining: indicator of high mineral concentrations.

Both bacteria and petroleum can create a sheen on the water surface. The source of the sheen can be differentiated by disturbing it, such as with a pole. A sheen caused by oil will remain intact and move in a

swirl pattern; a sheen caused by bacteria will separate and appear "blocky". Bacterial sheen is not a pollutant but should be noted.

Citizen Call in Reports

Reports by residents and other users of a water body can be effective tools in identifying the presence of illicit discharges. Many communities have set up phone hotlines for this purpose, or have provided guidance to local police departments and dispatch centers to manage data reported in this manner. Municipal employees and the general public should receive education to help identify the signs of illicit discharges and should be informed how to report such incidents.

When a call is received about a suspected illicit discharge, the attached IDDE Incident Tracking Sheet shall be used to document appropriate information. Subsequent steps for taking action to trace, document, and eliminate the illicit discharge are described in the following sections.

Potential illicit discharges reported by citizens should be reviewed on an annual basis to locate patterns of illicit discharges, identify high-priority catchments, and evaluate the call-in inspection program.

Tracing Illicit Discharges

Whenever an illicit discharge is suspected, regardless of how it was identified, the attached IDDE Incident Tracking Sheet should be utilized. The Incident Tracking Sheet shall be provided to the appropriate authority (i.e., Board of Health, Department of Public Works, etc.), which shall promptly investigate the reported incident.

If the presence of an illicit discharge is confirmed by the authority, but its source is unidentified, additional procedures to determine the source of the illicit discharge should be completed.

1. Review and consider information collected when illicit discharge was initially identified, for example, the time of day and the weather conditions for the previous 72 hours. Also consider and review past reports or investigations of similar illicit discharges in the area.
2. Obtain storm drain mapping for the area of the reported illicit discharge. If possible, use a tracking system that can be linked to your system map, such as GIS.
3. Document current conditions at the location of the observed illicit discharge point, including odors, water appearance, estimated flow, presence of floatables, and other pertinent information. Photograph relevant evidence.
4. If there continues to be evidence of the illicit discharge, collect water quality data using the methods described in SOP 13, "Water Quality Screening in the Field". This may include using field test kits or instrumentation, or collecting analytical samples for full laboratory analysis.
5. Move upstream from the point of observation to identify the source of the discharge, using the system mapping to determine infrastructure, tributary pipes, and drainage areas that contribute. At each point, survey the general area and surrounding properties to identify potential sources of the illicit discharge. Document observations at each point on the IDDE Incident Tracking Sheet as well as with photographs.
6. Continue this process until the illicit discharge is no longer observed, which will define the boundaries of the likely source. For example if the illicit discharge is present in catch basin 137

but not the next upstream catch basin, 138, the source of the illicit discharge is between these two structures.

If the source of the illicit discharge could not be determined by this survey, consider using dye testing, smoke testing, or closed-circuit television inspection (CCTV) to locate the illicit discharge.

Dye Testing

Dye testing is used to confirm a suspected illicit connection to a storm drain system. Prior to testing, permission to access the site should be obtained. Dye is discharged into the suspected fixture, and nearby storm drain structures and sanitary sewer manholes observed for presence of the dye. Each fixture, such as sinks, toilets, and sump pumps, should be tested separately. A third-party contractor may be required to perform this testing activity.

Smoke Testing

Smoke testing is a useful method of locating the source of illicit discharges when there is no obvious potential source. Smoke testing is an appropriate tracing technique for short sections of pipe and for pipes with small diameters. Smoke added to the storm drain system will emerge in connected locations. A third-party contractor may be required to perform this testing activity.

Closed Circuit Television Inspection (CCTV)

Televised video inspection can be used to locate illicit connections and infiltration from sanitary sewers. In CCTV, cameras are used to record the interior of the storm drain pipes. They can be manually pushed with a stiff cable or guided remotely on treads or wheels. A third-party contractor may be required to perform this testing activity.

If the source is located, follow steps for removing the illicit discharge. Document repairs, new sanitary sewer connections, and other corrective actions required to accomplish this objective. If the source still cannot be located, add the pipe segment to a future inspection program.

This process is demonstrated visually on the last page of this SOP.

Removing Illicit Discharges

Proper removal of an illicit discharge will ensure it does not recur. Refer to Table SOP 10-1, attached for, for examples of the notification process.

In any scenario, conduct a follow up inspection to confirm that the illicit discharge has been removed. Suspend access to the storm drain system if an "imminent and substantial danger" exists or if there is a threat of serious physical harm to humans or the environment.

Attachments

1. Illicit Discharge Incident Tracking Sheet

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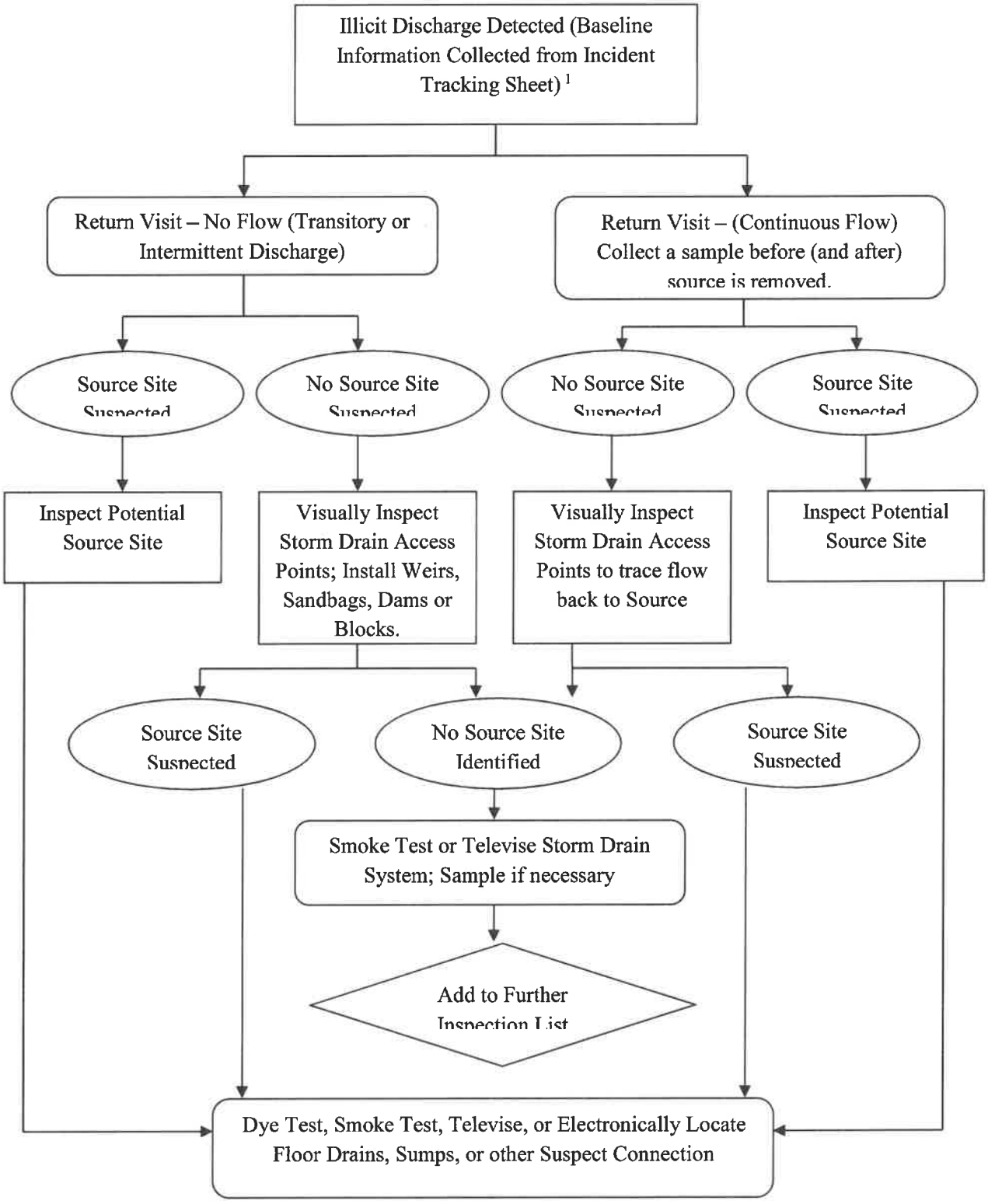
Related Standard Operating Procedures

1. SOP 1: Dry Weather Outfall Inspection
2. SOP 2: Wet Weather Outfall Inspection
3. SOP 3: Catch Basin Inspection
4. SOP 13: Using Field Test Kits For Outfall Screening
5. SOP 15: Private Drainage Connections

Table SOP 10-1

Notification and Removal Procedures for Illicit Discharges into the Municipal Separate Storm Sewer System

Financially Responsible	Source Identified	Enforcement Authority	Procedure to Follow
Private Property Owner	One-time illicit discharge (e.g. spill, dumping, etc.)	Ordinance enforcement authority (e.g. Code Enforcement Officer)	• Contact Owner • Issue Notice of Violation • Issue fine
Private Property Owner	Intermittent or continuous illicit discharge from legal connection	Ordinance enforcement authority (e.g. Code Enforcement Officer)	• Contact Owner • Issue Notice of Violation • Determine schedule for removal • Confirm removal
Private Property Owner	Intermittent or continuous illicit discharge from illegal connection or indirect (e.g. infiltration or failed septic)	Plumbing Inspector or ordinance enforcement authority	• Notify plumbing inspector
Municipal	Intermittent or continuous illicit discharge from illegal connection or indirect (e.g. failed sewer line)	Ordinance enforcement authority (e.g. Code Enforcement Officer)	• Issue work order • Schedule removal • Remove connection • Confirm removal
Exempt 3rd Party	Any	USEPA	• Notify exempt third party and USEPA of illicit discharge



[1] – *Guidelines and Standard Operating Procedures: Illicit Discharge Detection and Elimination and Pollution Prevention/Good Housekeeping for Stormwater Phase II Communities in New Hampshire,* New Hampshire Estuary Project, 2006, p. 25, Figure 2-1.

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