Illicit Discharge Detection and Elimination (IDDE) Program

Town of Merrimac, Massachusetts

July 9, 2019

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1 Introduction

1.1 MS4 Program

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

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

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination (IDDE) 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 stormwater system and implement procedures to prevent such discharges. The IDDE program must also be recorded in a written document. This IDDE program 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 stormwater system through direct or indirect connections. Direct connections may be relatively obvious, such as cross-connections of sewer services to the stormwater 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 stormwater 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 stormwater system.

Sump pumps legally connected to the stormwater 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 (DEP) 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 Program (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

Impaired Eaters 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** lists the "Impaired Waters" within the boundaries of Merrimac's regulated area based on the 2014 Massachusetts Integrated List of Waters Online Map Viewer produced by DEP.

Table 1-1. Impaired Waters

Merrimac, Massachusetts

Water Body Name	Segment ID	Category	Impairment(s)	Associated Approved TMDL
Cobbler Brook	MA84A-22	4C	Debris/Floatables/Trash	0
Merrimack River	MA84A-05	5	Enterococcus, PCB in Fish Tissue	0
Lake Attitash	MA84002	5	Mercury in Fish Tissue	0
East Meadow River	MA84A-39	5	Escherichia Coli	0

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 this 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;
- Stormwater system mapping;
- Inventory and ranking of outfalls;
- Dry weather outfall screening;
- Catchment investigations;
- Identification/confirmation of illicit sources;
- Illicit discharge removal;
- Followup screening; and
- Employee training.

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

Figure 1-1. IDDE Investigation Procedure Framework

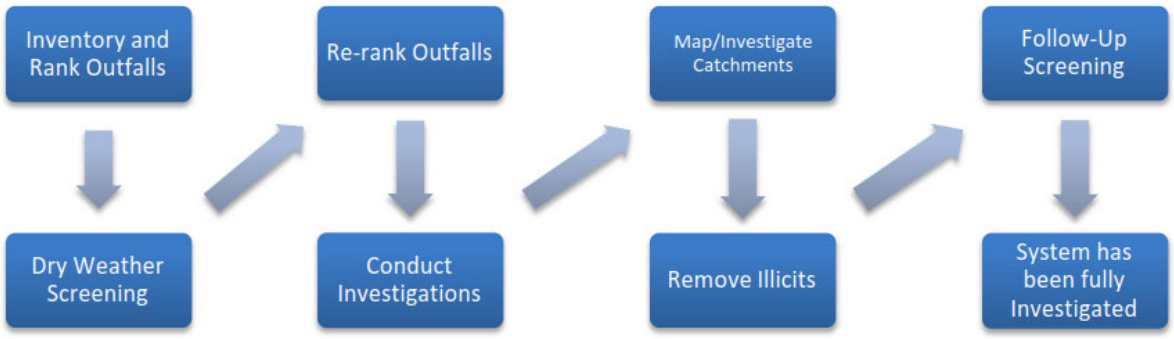

Table 1-2. IDDE Program Implementation Timeline

IDDE Program Requirement	Completion Date from Effective Date of Permit					
	1 Year	1.5 Years	2 Years	3 Years	7 Years	10 Years
Written IDDE Program	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 stormwater system mapping, adopting a regulatory mechanism to prohibit illicit discharges and enforcing this prohibition, and identifying tools and methods to investigate suspected illicit discharges. Each MS4 community was also required to define how confirmed discharges would be eliminated and how the removal would be documented.

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

- Developed a map of outfalls and receiving waters;
- Adopted an IDDE Bylaw (adopted April 27, 2015);
- Developed procedures for locating the source of illicit discharges; and
- Developed procedures for removal of the source of an illicit discharge.

2 Authority and Statement of IDDE Responsibilities

2.1 Legal Authority

The Town adopted an Illicit Discharge Detection and Elimination Bylaw on April 27, 2015. A copy of the IDDE Bylaw is provided in **Appendix A**. The goal of the Bylaw is to eliminate illicit discharges, including discharges from properties not owned by or controlled by the MS4 that discharge into the MS4 system. The Bylaw provides the Town with adequate legal authority to:

- Prevent pollutants from entering the MS4 system;
- Prohibit illicit connections and discharges; and
- Implement appropriate enforcement procedures and actions.

The Town will review its current IDDE Bylaw and related land use regulations and policies for consistency with the 2016 MS4 Permit.

2.2 Statement of Responsibilities

The Merrimac Board of Selectmen, its employees or designated agents are the authorized enforcement agency responsible for implementing and enforcing the IDDE program pursuant to the provisions of the IDDE Bylaw. Other agencies or departments with responsibility for aspects of the program include:

- Department of Public Works – Stormwater System Mapping, Dry Weather Outfall Screening and Sampling, Catchment Investigations, IDDE response,
- Fire Department – Hazardous Material Release Response.
- Board of Selectmen – IDDE Bylaw enforcement.
- Zoning Enforcement Officer – IDDE Bylaw enforcement.

3 Stormwater System Mapping

The Town has developed a map of its MS4 outfalls and receiving waters to meet the requirements of the 2003 MS4 Permit. The 2016 MS4 Permit requires a more detailed stormwater system map than was required by the 2003 MS4 Permit. The revised mapping is intended to facilitate the identification of key infrastructure and the potential for illicit discharges.

The 2016 MS4 Permit requires the stormwater 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 has created an online GIS database of the stormwater system and outfalls. All new mapping requirements will be added to the GIS database. The Town has begun GPS locating stormwater system infrastructure and will report on the progress towards completion of the stormwater system map in each annual report. Updates to the stormwater mapping are included in **Appendix B**.

3.1 Phase I Mapping

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

- Outfalls and receiving waters (completed by the Town in accordance with the 2003 MS4 Permit);
- Open channel conveyances (swales, ditches, etc.);
- Interconnections with other MS4s and other stormwater systems (the Town does not have interconnections with other MS4s or other stormwater systems at this time);
- Municipally owned stormwater treatment structures (the Town does not own any stormwater treatment structures at this time);
- Water bodies identified by name and indication of all use impairments as identified on the most recent USEPA approved Massachusetts Integrated List of Waters report; and
- Initial catchment delineations. Topographic contours and stormwater system information may be used to produce initial catchment delineations.

The Town will update its stormwater system mapping by July 1, 2020 to include the remaining Phase I information.

3.2 Phase II Mapping

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

- Outfall spatial location (latitude and longitude with a minimum accuracy of +/-30 feet);
- Stormwater system pipes;
- Stormwater system manholes;
- Catch basins;
- Outfall catchment investigations;

- Refined catchment delineations. Catchment delineations must be updated to reflect information collected during catchment investigations; and
- Municipal Sanitary Sewer system including pipes and manholes.

The Town has not completed any of the Phase 2 Mapping requirements, but the following updates are in progress:

- Outfall spatial locations;
- Spatial location of all catch basins and manholes; and
- Spatial location of the Town's sanitary sewer system.

The Town will update its stormwater mapping by July 1, 2028 to include the remaining Phase II information.

3.3 Additional Recommended Mapping Elements

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

- Stormwater system pipe material, size (pipe diameter), age;
- Sanitary sewer system pipe material, size (pipe diameter), age;
- Properties known or suspected to be served by a septic system within the limits of the sanitary sewer system, especially in high density urban areas;
- Topography; and
- Orthophotography.

4 Sanitary Sewer Overflows (SSOs)

The 2016 MS4 Permit requires municipalities to prohibit illicit discharges, including sanitary sewer overflows (SSOs), to the separate stormwater 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 at pump stations, improper sewer design, and vandalism.

The Town has completed a review of all reported SSOs that have discharged to the MS4. It should be noted that as of July 1, 2019, the Town has not had any SSOs within the last five years.

Upon detection of an SSO, the Town will eliminate it as expeditiously as possible and take interim measures to minimize the discharge of pollutants to and from its MS4 until the SSO is eliminated. Upon becoming aware of an SSO to the MS4, the Town will provide oral notice to USEPA within 24 hours and written notice to USEPA and DEP 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

Merrimac, 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]

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

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

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

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

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

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

include any outfalls/interconnections where previous screening indicates likely sewer input. Likely sewer input indicators as described by USEPA and Massachusetts DEP are any of the following:

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

Dry weather screening and sampling, as described in **Section 6** of this IDDE Program 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, or
   - 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.

- **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 by the USEPA and Massachusetts DEP to identify waters as having a high illicit discharge potential:
  - Exceeding water quality standards for bacteria
  - Ammonia levels above 0.5 mg/l
  - Surfactants levels greater than or equal to 0.25 mg/l

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

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

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

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

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

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

- **Water quality limited waterbodies** – 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.

Additional relevant characteristics, including location-specific characteristics, may be considered but must be documented in this IDDE Program. A copy of the Initial Outfall Inventory and Priority Ranking is provided in IDDE **Appendix C.**

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 Public Works Department 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 section 5.

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 Precision Weather Forecasting, Inc. If Precision Weather Forecasting, Inc. is not available or not reporting current weather data, then precipitation data recorded at the Wastewater Treatment Plant will be used as a back-up.

6.2 Dry Weather Screening/Sampling

6.2.1 General Procedure

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

1. Identify outfalls 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 **Appendix D** for paper form prepared by the Central Massachusetts Regional Stormwater Coalition.
    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 2003 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 MS4 permit.

6.2.2 Field Equipment

Table 6-1 lists field equipment commonly used for dry weather outfall screening and sampling. It should be noted that not all of this equipment is required to complete 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

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

6.2.3 Sample Collection and Analysis

If flow is present during a dry weather outfall inspection, a sample will be collected and analyzed for the required permit parameters[3] listed in **Table 6-2**. 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 D** for the Water Quality Screening Field Sheet prepared by the Central Massachusetts Regional Stormwater Coalition.
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 for laboratory samples.
8. Deliver samples to approved testing facility.
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. Outfall

[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).

sampling shall be completed in accordance with analytic procedures and user manuals for field test kits and field instrumentation.

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 USEPA 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 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 2016 MS4 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.

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

7 Catchment Investigations

Once stormwater outfalls with evidence of illicit discharges have been identified, various methods can be used to trace the source of the potential discharge within the outfall catchment area. Catchment investigation techniques include but are not limited to:

- Review of maps, historic plans, and records;
- Manhole observation;
- Dry and wet weather sampling;
- Video inspection;
- Smoke testing; and
- Dye testing.

This section outlines a systematic procedure to investigate outfall catchments to trace the source of potential illicit discharges. All data collected as part of the catchment investigations will be recorded and reported in each annual report.

7.1 System Vulnerability Factors

The Public Works Department 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 system network;
- Prior work on storm drains or sewer lines;
- Board of Health or other municipal data on septic systems;
- Complaint records related to SSOs; and
- 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 stormwater system and sanitary sewer alignments where the sanitary system is shallower than the stormwater 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 stormwater system 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 stormwater system 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); and
- 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 blank copy of the SVF inventory is provided in IDDE **Appendix E.**

7.2 Dry Weather Manhole Inspections

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

The Public Works Department will be responsible for implementing the dry weather manhole inspection program and making updates as necessary. Infrastructure information will be incorporated into the stormwater 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 2016 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 stormwater system. However, the decision to move up or down the system depends on the nature of the stormwater system and the surrounding land use and the availability of information on the catchment and stormwater system. Moving up the system can begin immediately when an illicit discharge is detected at an outfall, and only a map of the stormwater system is required. Moving down the system requires more advance preparation and reliable stormwater system information on the upstream segments of the stormwater 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 and catch basins will be opened and inspected for visual and olfactory evidence of illicit connections. Sample field inspection forms prepared by the Central Massachusetts Regional Stormwater Coalition are provided in **Appendix D**.

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

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

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

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

7.3 Wet Weather Outfall Sampling

Where a minimum of one (1) System Vulnerability Factor (SVF) is identified based on previous information or the catchment investigation, a wet weather investigation must also be conducted at the associated outfall. The Public Works Department 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. See **Appendix D** the Wet Weather Outfall Inspection form prepared by the Central Massachusetts Regional Stormwater Coalition.

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

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

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

7.4 Source Isolation and Confirmation

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

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

These methods are described in the sections below. Instructions and Standard Operating Procedures (SOPs) prepared by the Central Massachusetts Regional Stormwater Coalition for these are provided in **Appendix F**.

Public notification is an important aspect of a detailed source investigation program. Prior to smoke testing, dye testing, or TV inspections, the Public Works Department will notify property owners in the affected area.

7.4.1 Sandbagging

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

7.4.2 Smoke Testing

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

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

7.4.3 Dye Testing

Dye testing involves flushing non-toxic dye into plumbing fixtures such as toilets, showers, and sinks and observing nearby stormwater system structures and sewer manholes as well as stormwater

system 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 stormwater system structure 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 stormwater system and sanitary sewer, recording the presence or absence of the dye.

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

7.4.4 CCTV/Video Inspection

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

7.4.5 Optical Brightener Monitoring

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

7.4.6 IDDE Canines

Dogs specifically trained to smell human related sewage are becoming a cost-effective way to isolate and identify sources of illicit discharges. While not widespread at the moment, the use of IDDE canines is growing as is their accuracy. The use of IDDE canines is not recommended as a

standalone practice for source identification; rather it is recommended as a tool to supplement other conventional methods, such as dye testing, in order to fully verify sources of illicit discharges.

7.5 Illicit Discharge Removal

When the specific source of an illicit discharge is identified, the Town will exercise its authority as necessary to require its removal. The annual report will include the status of the Town's 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; and
- Estimate of the volume of flow removed.

7.5.1 Confirmatory Outfall Screening

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

7.6 Ongoing Screening

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

8 Training

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

9 Progress Reporting

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

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

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

Appendix A

Legal Authority (IDDE Bylaw)

ARTICLE XXXI
ILLICIT DISCHARGE DETECTION AND ELIMINATION

Section I: Purpose:

Regulations of illicit connections and discharges to the municipal drain system is necessary for the protection of the Town of Merrimac water bodies and groundwater, and to safeguard the public health, safety, welfare and the environment.
The objectives of this by-law are:

1. to prevent pollutants from entering the Town of Merrimac'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. 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: Authority

This by-law is adopted under the authority granted by the Home Rule Amendment of the Massachusetts Constitution and the Home Rule Procedures Act, and pursuant to the regulations of the Federal Clean Water Act found at 40 CFR 122.34

Section 3: Definitions:

Authorized Enforcement Agency: The Merrimac Board of Selectmen (hereafter the Board), its employees or agents designated to enforce this by-law.

Board: The Merrimac Board of Selectmen

Best Management Practices: 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 (33 A.S. C. Sec 1251 *et seq.*) as hereafter 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, 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 Article XXXI Section 9. The term does not include a discharge in compliance with an NPDES Storm Water Discharge Permit or a surface Water Discharge Permit, or resulting from fire fighting activities exempt pursuant for Article XXXI Section 9(14) of this by-law.

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

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 Merrimac.

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

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

Person: An individual, partnership, association, firm, company, trust, corporation, agency, authority, department, o 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, garbage, litter, or other discarded or abandoned objects, ordnances, accumulations 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 which, during manufacturing or processing, comes into direct contact with or results from the production or use of any material, intermediate product, finished product, or waster product,

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

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

Surface Water Discharge Permit: A permit issued by the Department of Environmental Protection (DEP) pursuant to 314 CMR 3.00 that authorizes the discharge of pollutants to the waters of the Commonwealth of Massachusetts,

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 material 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 G. L. Ch. 12 and Ch. 21E, and the regulations at 310 CMR 30.000 and 310 CMR 40.0000.

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, costal 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 or byproduct or waste product**.**

Section 4: Applicability

This by-law shall apply to flows entering the municipally owned storm drainage system/

Section 5: Authority

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

Section 6: Responsibility for Administration

The Board shall administer, implement and enforce this bylaw. Any powers granted to or duties imposed upon the Board may be delegated in writing by the Board to employees or agents of the Board.

Section 7: Regulations

The Board may promulgate rules and regulations to effectuate the purpose of this by-law. Failure by the Board to promulgate such rules and regulations shall not have the effect if suspending or invalidating this by-law.

Section 8: Prohibited Activities

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

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

Obstruction of Municipal Storm Drain System. No person shall obstruct or interfere with the normal flow of stormwater into or out of the municipal drain system without prior written approval of the Board.

Section 9: Exemptions

Discharge or flow resulting from fire fighting activities

The following non-stormwater discharges or flows are exempt from the prohibition of non-stormwaters provided that the source is not a significant contributor of a pollutant to the municipal storm drain system.

1. Waterline flushing
2. Flow from potable water sources.
3. Springs;
4. Natural flow from riparian habitats and wetlands;
5. Diverted stream flow;
6. Rising groundwater
7. Uncontaminated groundwater infiltration as defined in 40 CFR 35.2005(20), or uncontaminated pumped groundwater;
8. Water from exterior foundation drains, footings drains (not including active groundwater dewatering systems0, crawl space pumps, or air conditioning;
9. Discharge from landscape irrigation or lawn watering;
10. Water from individual residential car washing;
11. Discharge from dechlorinated swimming pool water (less than 1 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;
12. Discharge from street sweeping;
13. Dye testing, provided verbal notification is given to the Board prior to the time of the test; Non-stormwater discharge permitted under NPDES permit or a Surface Water Discharge Permit, waiver, or waste discharge order administered under the authority of the United States Environmental Protection Agency or the Department of Environmental Protection provided that the discharge is in full compliance with the requirements of the permit, waiver, or ordered and applicable laws and regulations.

Section 10: Emergency Suspension of Storm drainage System Access

The Board may suspend municipal storm drain 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 environment. In the event any person fails to comply with an

emergency suspension order, the Authorized Enforcement Agency may take all reasonable steps to prevent or minimize harm to the public health, safety, welfare or the environment.

Section 11: Notification of Spills

Notwithstanding other requirements of local, state, 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 that facility or operation resulting in or which may result in discharge of pollutants to the municipal drainage system or waters of the Commonwealth, the person shall take all necessary steps to ensure containment, and clean up of the release. In the event of a release of oil or hazardous materials, the person shall immediately notify the municipal fire and police departments and the Merrimac Highway Department. In the event of a release of non-hazardous material, the reporting person shall notify the Authorized Enforcement Agency no later than the next business day. The reporting person shall provide to the Authorized Enforcement Agency 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 12: Enforcement

12.1 The Board or an authorized agent of the Board shall enforce this by-law, regulations, orders, violation notices and enforcement orders, and may pursue all civil remedies for such violations

12.2 If an Illicit Discharge occurs or an Illicit Connection is maintained, the Board shall give or cause to be given written notice directed to the Owner of the parcel from which the Illicit Discharge is emanating, or on which the Illicit Connection is maintained, ordering an immediate cessation of any act or condition in violation of this By-law.

12.3 The Board either with such notice or at any reasonable time thereafter may order the Owner or any other person either responsible for violating this By-law to begin and thereafter diligently prosecute to compliance, such remediation efforts as the Board in its reasonable discretion may deem appropriate.

Said order shall further advise that, should the violator or property owner fail to abate or perform remediation within the specified deadline, the Town of Merrimac may, at its option undertake such work, and expenses thereof shall be charged to the violator.

12.4 Within thirty (30) days after completing all measures to abate the violation or to perform remediation, the violator and the property owner will be notified of the costs incurred by the Town of Merrimac including administrative costs. The violator or property owner may file a written protest objecting to the amount or basis of costs with the Board within thirty (30) days of receipt of the notification of the costs incurred. If the amount due is not received by the expiration of the time in which to file a protest or within thirty (30) days following a decision of the Board affirming or reducing the costs, or from a final decision of a court of competent jurisdiction, the costs shall become a special assessment against the property owner and shall constitute a lien on the owner’s property for the amount of said costs. Interest shall begin to accrue on any unpaid costs at

the statutory rate provided in G.L. 59,-57 after the thirty-first day at which the costs first become due.

12.5 Any violation of this by-law, any regulation promulgated hereunder, will be punishable by non-criminal disposition under G.L. c. 40, Sec 21D. The Town of Merrimac, in which case, the Board of Selectmen or authorized agent shall be the enforcing person. The penalty for any person or entity which causes an illicit discharge shall be subject to a fine of $100 per day for each day that the illicit discharge continues after notice thereof is given by or at the direction of the Board. This fee may be waived by the Board to allow time for compliance.

The penalties set out herein may be assessed by the Board and are in addition to and not in substitution for any remedial action the Board may order.

Section 13: Appeals

Any person or Owner aggrieved by an action of the Board which was neither (i) the assessment of a penalty for which the provisions of M.G.L. c 40, Sec21D apply, nor (ii) an action taken by the Board at a meeting of which the aggrieved person or Owner was given notice and was afforded the opportunity to present evidence and argument with a view to causing the Board to modify its earlier action (such action being a “final action”) shall, within thirty days of such Board action, request a hearing before the Board at which the aggrieved person or Owner may present evidence and argument concerning final action by the Board. The Board shall hold such hearing within thirty (30) days following said request and within thirty days thereafter shall either confirm the Board’s previous action or order such other final action as it may determine.

Any person or Owner aggrieved by a decision of the Board of Selectmen under this by-law may appeal such decision to the appropriate court of competent jurisdiction.

Section 14: Severability

The provisions of this by-law are hereby declared to be severable. If any provision, paragraph, sentence, or clause, of this by-law or 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 15: Transitional Provisions

Residential property owners shall have 30 days from the effective date of the by-law to comply with its provisions provided good cause is shown for the failure to comply with the by-law during that period. (STM 10/22/07)

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Appendix B

Storm System Mapping

LEGEND

● 56 STORMWATER OUTFALL

REVISIONS:

NO.	DATE	
0	06/14/2019	ISSUED FOR IDDE PROGRAM

SGC Engineering
A Lloyd's Register Company
Lloyd's Register

ONLY VALID WITH ORIGINAL STAMP

PREPARED FOR:

MERRIMAC DEPARTMENT OF PUBLIC WORKS
4 SCHOOL STREET
MERRIMAC, MASSACHUSETTS 01860

DATE: 06/14/2019 | DESIGN: MRR | DRAWN: MRR | CHECK: MRR | PROJECT: 26027 | FILE: STORM SEWER OUTFALLS_2016

TITLE:

MERRIMAC STORMWATER OUTFALLS
MERRIMAC, MASSACHUSETTS

SCALE: 1" = 500'

500 250 0 500 1,000

SHEET:

1 OF 1

Appendix C

Initial Outfall Inventory and Priority Ranking

INITIAL OUTFALL INVENTORY AND PRIORITY RANKING

Outfall I.D.	General Street Location	Receiving Water (1)	Previous Screening Results Indicate Likely Sewer Input? (2)	Discharging to Area of Concern to Public Health? (3)	Frequency of Past Discharge Complaints (4)	Receiving Water Quality (5)	Density of Generating Sites (6)	Age of Development / Infrastructure (7)	Historic Combined Sewers or Septic? (8)	Aging Septic? (9)	Culverted Streams? (10)	Additional Characteristics	SCORE	PRIORITY RANKING (11)
Information Source:			Outfall Inspections and Sample Results	GIS Maps	Town Staff	Impaired Waters List	Land Use/GIS Maps, Aerial Photography	Land Use Information, Visual Observation	Town Staff, GIS Maps	Land Use, Town Staff	GIS and Storm System Maps	Other		
Scoring Criteria			Yes=3 (Problem Outfall) No=0	Yes=3 No=0	Fequent=3 Occasional=2 None=0	Poor=3 Fair=2 Good=0	High=3 Medium=2 Low=1	High=3 Medium=2 Low=1	Yes=3 No=0	Yes=3 No=1	Yes=3 No=2	TBD		
8249	Merrimac Road	Unknown Stream	N/A	0	0	0	1	2	0	1	2		6	Low
8254	Merrimac Road	Unknown Stream	0	0	0	0	1	2	0	1	2		6	Low
8255	Little Pond Road	Woods	0	0	0	0	1	2	0	1	2		6	Low
8272	Little Pond Road	Unknown Stream	0	0	0	0	1	2	0	1	2		6	Low
8273	Little Pond Road	Unknown Stream	0	0	0	0	1	2	0	1	2		6	Low
8275	Little Pond Road	Unknown Stream	0	0	0	0	1	2	0	1	2		6	Low
8295	Little Pond Road	Unknown Pond	0	0	0	0	1	2	0	1	2		6	Low
8299	Little Pond Road	Unknown Stream	0	0	0	0	1	2	0	1	2		6	Low
8307	Spring Hill Road	Uknown Stream	0	0	0	0	1	2	0	1	2		6	Low
8309	Spring Hill Road	Uknown Stream	0	0	0	0	1	2	0	1	2		6	Low
8310	River Road	Drop Basin	0	0	0	0	1	3	3	3	2		12	Low
8311	Little Pond Road	Unknown Stream	N/A	0	0	0	1	2	0	1	2		6	Low
8312	Spring Hill Road	Woods	0	0	0	0	1	2	0	1	2		6	Low
8313	Little Pond Road	Unknown Stream	0	0	0	0	1	2	0	1	2		6	Low
8314	Little Pond Road	Unknown Stream	N/A	0	0	0	1	2	0	1	2		6	Low
8316	River Road	Unknown Brook	N/A	0	0	0	1	3	3	3	2		12	Low
8317	River Road	Unknown Brook	0	0	0	0	1	3	3	3	2		12	Low
8321	Spring Hill Road	Woods	0	0	0	0	1	2	0	1	2		6	Low
8322	Little Pond Road	Unknown Pond	0	0	0	0	1	2	0	1	2		6	Low
8323	Spring Hill Road	Uknown Stream	0	0	0	0	1	2	0	1	2		6	Low
8336	River Road	Merrimack River (MA84A-05)	N/A	0	0	2	1	3	3	3	2		14	Low
8345	River Road	Merrimack River (MA84A-05)	0	0	0	2	1	3	3	3	2		14	Low
8349	Little Pond Road	Woods	0	0	0	0	1	2	0	1	2		6	Low
8350	River Road	Merrimack River (MA84A-05)	N/A	0	0	2	1	3	3	3	2		14	Low
8352	River Road	Merrimack River (MA84A-05)	N/A	0	0	2	1	3	3	3	2		14	Low
8358	River Road	Merrimack River (MA84A-05)	0	0	0	2	1	3	3	1	2		12	Low
8359	River Road	Merrimack River (MA84A-05)	N/A	0	0	2	1	3	3	1	2		12	Low
8360	River Road	Merrimack River (MA84A-05)	N/A	0	0	2	1	3	3	1	2		12	Low
8361	River Road	Merrimack River (MA84A-05)	N/A	0	0	2	1	3	3	1	2		12	Low
8362	Chase Cresent	Unknown Stream	0	0	0	0	1	2	0	1	2		6	Low
8363	River Road	Merrimack River (MA84A-05)	0	0	0	2	1	3	3	3	2		14	Low
8364	River Road	Merrimack River (MA84A-05)	N/A	0	0	2	1	3	3	1	2		12	Low
8365	River Road	Merrimack River (MA84A-05)	0	0	0	2	1	3	3	1	2		12	Low
8366	Locust Grove Road	Woods	N/A	0	0	0	1	2	3	3	2		11	Low
8367	Pleasant Valley Road	Merrimack River (MA84A-05)	N/A	0	0	2	1	3	3	3	2		14	Low
8368	West Parish Lane	Unknown Stream	0	0	0	0	1	2	0	1	2		6	Low
8369	Stevens Terrace	Grass Area	N/A	0	0	0	1	2	0	1	2		6	Low
8370	Pleasant Valley Road	Merrimack River (MA84A-05)	N/A	0	0	2	1	3	3	3	2		14	Low
8371	Locust Grove Road	Woods	0	0	0	0	1	2	3	3	2		11	Low
8372	Pleasant Valley Road	Merrimack River (MA84A-05)	0	0	0	2	1	3	3	3	2		14	Low
8373	Pleasant Valley Road	Merrimack River (MA84A-05)	0	0	0	2	1	3	3	3	2		14	Low
8374	Pleasant Valley Road	Merrimack River (MA84A-05)	N/A	0	0	2	1	3	3	3	2		14	Low
8375	Pleasant Valley Road	Merrimack River (MA84A-05)	0	0	0	2	1	3	3	1	2		12	Low
8376	Pleasant Valley Road	Merrimack River (MA84A-05)	0	0	0	2	1	3	3	3	2		14	Low
8377	Pleasant Valley Road	Merrimack River (MA84A-05)	0	0	0	2	1	3	3	3	2		14	Low
8378	Pleasant Valley Road	Merrimack River (MA84A-05)	N/A	0	0	2	1	3	3	1	2		12	Low
8379	River Road	Cobblers Brook (MA84A-22)	0	0	0	2	1	3	3	1	2		12	Low
8380	Pleasant Valley Road	Merrimack River (MA84A-05)	0	0	0	2	1	3	3	3	2		14	Low
8381	Pleasant Valley Road	Merrimack River (MA84A-05)	0	0	0	2	1	3	3	3	2		14	Low
8382	Pleasant Valley Road	Merrimack River (MA84A-05)	0	0	0	2	1	3	3	3	2		14	Low
8383	Locust Grove Road	Woods	0	0	0	0	1	2	0	3	2		8	Low
8384	Pleasant Valley Road	Merrimack River (MA84A-05)	0	0	0	2	1	3	3	3	2		14	Low
8385	Stevens Terrace	Unknown Stream	0	0	0	0	1	2	0	1	2		6	Low
8386	Locust Grove Road	Woods	N/A	0	0	0	1	2	0	1	2		6	Low
8387	Union Street	Woods	N/A	3	0	0	1	3	3	1	2		13	High
8388	Union Street	Woods	N/A	3	0	0	1	3	3	1	2		13	High
8389	Union Street	Woods	N/A	0	0	0	1	3	3	1	2		10	Low
8390	West Parish Lane	Detention Basin	0	0	0	0	1	2	0	1	2		6	Low
8391	Orchard Street	Woods	N/A	0	0	0	1	2	0	1	2		6	Low
8392	Middle Street	Woods	0	0	0	0	1	3	3	1	2		10	Low
8393	West Parish Lane	Unknown Stream	0	0	0	0	1	2	3	1	2		9	Low
8394	Heath Brook Lane	Unknown Stream	N/A	0	0	0	1	2	0	3	2		8	Low

Outfall I.D.	General Street Location	Receiving Water (1)	Previous Screening Results Indicate Likely Sewer Input? (2)	Discharging to Area of Concern to Public Health? (3)	Frequency of Past Discharge Complaints (4)	Receiving Water Quality (5)	Density of Generating Sites (6)	Age of Development / Infrastructure (7)	Historic Combined Sewers or Septic? (8)	Aging Septic? (9)	Culverted Streams? (10)	Additional Characteristics	SCORE	PRIORITY RANKING (11)
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Scoring Criteria			Yes=3 (Problem Outfall) No=0	Yes=3 No=0	Fequent=3 Occasional=2 None=0	Poor=3 Fair=2 Good=0	High=3 Medium=2 Low=1	High=3 Medium=2 Low=1	Yes=3 No=0	Yes=3 No=1	Yes=3 No=2	TBD		
8395	West Parish Road	Unknown Stream	0	0	0	0	1	2	3	1	2		9	Low
8396	Orchard Street	Woods	N/A	0	0	0	1	2	0	1	2		6	Low
8397	Orchard Street	Woods	0	0	0	0	1	2	0	1	2		6	Low
8398	Orchard Street	Woods	0	0	0	0	1	2	0	1	2		6	Low
8399	Orchard Street	Woods	0	0	0	0	1	2	0	1	2		6	Low
8400	Broad Street	Cobblers Brook (MA84A-22)	0	0	0	0	2	3	3	1	2		11	Low
8401	Broad Street	Cobblers Brook (MA84A-22)	0	0	0	0	2	3	3	1	2		11	Low
8402	Broad Street	Cobblers Brook (MA84A-22)	N/A	0	0	0	2	3	3	1	2		11	Low
8403	Broad Street	Cobblers Brook (MA84A-22)	0	0	0	0	2	3	3	1	2		11	Low
8404	Sunset Terrace	Woods	N/A	0	0	0	1	2	0	1	2		6	Low
8405	Champion Street	Woods	N/A	0	0	0	1	2	0	1	2		6	Low
8406	Champion Street	Woods	N/A	0	0	0	1	2	0	1	2		6	Low
8407	Broad Street	Cobblers Brook (MA84A-22)	N/A	0	0	0	1	3	3	1	2		10	Low
8408	Broad Street	Cobblers Brook (MA84A-22)	0	0	0	0	1	3	3	1	2		10	Low
8409	West Main Street	Cobblers Brook (MA84A-22)	N/A	0	0	0	3	3	3	1	2		12	Low
8410	Broad Street	Cobblers Brook (MA84A-22)	N/A	0	0	0	3	3	3	1	2		12	Low
8411	Broad Street	Cobblers Brook (MA84A-22)	N/A	0	0	0	3	3	3	1	2		12	Low
8412	Hadley Road	Woods	N/A	0	0	0	1	3	0	3	2		9	Low
8413	Broad Street	Cobblers Brook (MA84A-22)	N/A	0	0	0	3	3	3	1	2		12	Low
8414	Hadley Road	Woods	N/A	0	0	0	1	3	0	3	2		9	Low
8415	Burnside Lane	Swale/Unknown Stream	0	0	0	0	1	2	0	1	2		6	Low
8416	Liberty Street	Cobblers Brook (MA84A-22)	0	0	0	0	2	3	3	1	2		11	Low
8417	Hadley Road	Woods	0	0	0	0	1	3	0	3	2		9	Low
8418	Willowdale Drive	Cobblers Brook Tributary	0	0	0	0	1	2	0	1	2		6	Low
8419	Winter Street	Cobblers Brook Tributary	0	0	0	0	1	3	0	3	2		9	Low
8420	Willowdale Drive	Cobblers Brook Tributary	N/A	0	0	0	1	2	0	1	2		6	Low
8421	Chruch Street	Cobblers Brook Tributary	N/A	0	0	0	1	3	0	3	2		9	Low
8422	Attitash Avenue	Woods	0	0	0	0	1	3	3	1	2		10	Low
8423	Church Street	Cobblers Brook Tributary	N/A	0	0	0	1	3	0	3	2		9	Low
8424	Church Street	Cobblers Brook Tributary	0	0	0	0	1	3	0	3	2		9	Low
8425	Willowdale Drive	Cobblers Brook Tributary	N/A	0	0	0	1	2	0	1	2		6	Low
8426	Winter Street	Cobblers Brook Tributary	0	0	0	0	1	3	0	3	2		9	Low
8427	Winter Street	Cobblers Brook Tributary	0	0	0	0	1	3	0	3	2		9	Low
8428	Attitash Avenue	Wood/Wetland	0	0	0	0	1	3	3	1	2		10	Low
8429	Attitash Avenue	Wood/Wetland	N/A	0	0	0	1	3	3	1	2		10	Low
8430	Church Street	Woods/Cobblers Brook Tributary	N/A	0	0	0	1	3	3	1	2		10	Low
8431	Church Street	Wood/Wetland	0	0	0	0	1	3	3	1	2		10	Low
8432	Church Street	Cobblers Brook Tributary	0	0	0	0	1	3	3	1	2		10	Low
8433	Church Street	Cobblers Brook Tributary	0	0	0	0	1	3	3	1	2		10	Low
8434	Attitash Avenue	Lake Attitash (MA84002)	N/A	3	0	2	1	3	3	1	2		15	High
8435	Hansom Drive	Cobblers Brook (MA84A-22)	N/A	0	0	0	1	2	0	1	2		6	Low
8436	Meadow Avenue	Lake Attitash (MA84002)	N/A	3	0	2	1	3	3	1	2		15	High
8437	Bear Hill Road	Woods	0	0	0	0	1	3	0	3	2		9	Low
8438	Hansom Drive	Cobblers Brook (MA84A-22)	N/A	0	0	0	1	2	0	1	2		6	Low
8439	Highland Road	Woods	N/A	0	0	0	1	3	0	3	2		9	Low
8440	Hansom Drive	Cobblers Brook (MA84A-22)	N/A	0	0	0	1	2	0	1	2		6	Low
8441	West Shore Road	Woods (close to Lake Attitash)	N/A	0	0	0	1	1	0	1	2		5	Low
8442	Red Oak Acres	Cobblers Brook (MA84A-22)	0	0	0	0	1	2	0	1	2		6	Low
8443	West Shore Road	Lake Attitash (MA84002)	0	3	0	2	1	3	3	1	2		15	High
8444	Red Oak Acres	Cobblers Brook (MA84A-22)	0	0	0	0	1	2	0	3	2		8	Low
8445	Harriman Road	Cobblers Brook (MA84A-22)	0	0	0	0	1	3	0	3	2		9	Low
8446	Harriman Road	Cobblers Brook (MA84A-22)	0	0	0	0	1	3	0	3	2		9	Low
8447	Harriman Road	Cobblers Brook (MA84A-22)	0	0	0	0	1	3	0	1	2		7	Low
8448	Alnette Street	Lake Attitash (MA84002)	N/A	3	0	2	1	3	3	1	2		15	High
8449	Battis Road	Woods	N/A	0	0	0	1	3	0	3	2		9	Low
8450	Equestrian Way	Unknown Stream	N/A	0	0	0	1	2	0	3	2		8	Low
8451	Hadley Road	Unknown Stream	0	0	0	0	1	2	0	3	2		8	Low
8452	Equestrian Way	Unknown Stream	N/A	0	0	0	1	2	0	3	2		8	Low
8453	Ashley Lane	Grass Area	0	0	0	0	1	1	0	1	2		5	Low
8454	Brush Hill Road	Woods	N/A	0	0	0	1	2	0	3	2		8	Low
8455	Brush Hill Road	Unknown Stream	0	0	0	0	1	3	0	3	2		9	Low
8456	Brush Hill Road	Unknown Stream	N/A	0	0	0	1	3	0	3	2		9	Low
8457	Bear Hill Road	Woods	N/A	0	0	0	1	3	0	3	2		9	Low

Outfall I.D.	General Street Location	Receiving Water (1)	Previous Screening Results Indicate Likely Sewer Input? (2)	Discharging to Area of Concern to Public Health? (3)	Frequency of Past Discharge Complaints (4)	Receiving Water Quality (5)	Density of Generating Sites (6)	Age of Development / Infrastructure (7)	Historic Combined Sewers or Septic? (8)	Aging Septic? (9)	Culverted Streams? (10)	Additional Characteristics	SCORE	PRIORITY RANKING (11)
Information Source:			Outfall Inspections and Sample Results	GIS Maps	Town Staff	Impaired Waters List	Land Use/GIS Maps, Aerial Photography	Land Use Information, Visual Observation	Town Staff, GIS Maps	Land Use, Town Staff	GIS and Storm System Maps	Other		
Scoring Criteria			Yes=3 (Problem Outfall) No=0	Yes=3 No=0	Fequent=3 Occasional=2 None=0	Poor=3 Fair=2 Good=0	High=3 Medium=2 Low=1	High=3 Medium=2 Low=1	Yes=3 No=0	Yes=3 No=1	Yes=3 No=2	TBD		

Scoring Criteria:

(2) 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

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

(5) 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

(6) 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.)

(7) 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

(8) Areas once served by combined sewers and but have been separated, or areas once served by septic systems but have been converted to sanitary sewers. It should be noted that Merrimac has no combined sewers.

(9) Aging septic systems are septic systems 30 years or older in residential areas.

(10) Any river or stream that is culverted for distance greater than a simple roadway crossing

SGC Assumptions:

(1) Highlighted responses were produced by SGC as either a new entry or revised from Merrimac's reporting records.

(2) "N/A" values were reports as "NO" to Dry Weather Testing within Merrimac's reporting records. All others were assumed "0" until Dry Weather Testing results can be reviewed.

(4) Assumed no previous discharge complaints.

(5) Cobblers Brook (MA84A-22) is categorized as a 4C water = 0, Lake Attitash (MA84002) is categorized as a 5 water = 2, Merrimack River (MA84A-05) is categorized as a 5 water = 2.

(6) Generating sites are institutional, municipal, commercial or industrial sites. For the purposes of this, we have assumed only municipal uses in Merrimac.

(7) Areas over 40 years old = 3, Areas of development 20-40 years old = 2, Areas of development less than 20 years old = 1.

(9) Areas where septic systems could potentially be older than 30 years.

(10) This category was difficult to determine from GIS mapping. Requires site inspeciton of additional information from Merrimac. We assumed there are no streams culverted longer than a standard road crossing.

(11) Further investigation is required to determine if some outfalls can be prioritized as "excluded".

Appendix D

Field Forms

Outfall ID: _____ **Town:** Merrimac

Inspector: _____ **Date:** _____

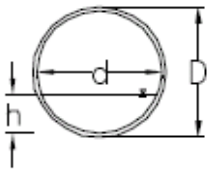
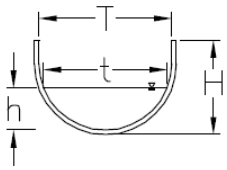
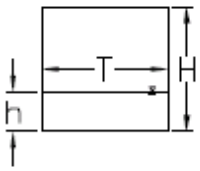
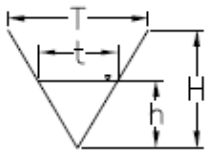
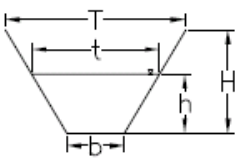
Street Name _____

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
			Orange Staining / Excessive Vegetation

Required Maintenance: Tree Work, Ditch Work, Structural Corrosion, N/A, Remove Trash/Debris, Blocked Pipe, Erosion at Structure, Other

Comments:

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.

CMRSWC

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

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.

Job No.: _____ **Town:** Merrimac

Inspector: _____ **Date:** _____

CATCH BASIN INSPECTION FORM

Catch Basin I.D.	_____	**Final Discharge from Structure?** Yes ☐ No ☐ **If Yes, Discharge to Outfall No:**_____	
Catch Basin Label:	**Stencil** ☐ **Ground Inset** ☐ **Sign** ☐ **None** ☐ **Other**_____		
Basin Material:	Concrete ☐ Corrugated metal ☐ Stone ☐ Brick ☐ Other: _____ ☐	**Catch Basin Condition:**	Good ☐ Poor ☐ Fair ☐ Crumbling ☐
Pipe Material:	Concrete ☐ HDPE ☐ PVC ☐ Clay Tile ☐ Other:_____	**Pipe Measurements:**	Inlet Dia. (in): d= ____ Outlet Dia. (in): D= ____

Required Maintenance/ Problems (check all that apply):

- ☐ Tree Work Required
- ☐ New Grate is Required
- ☐ Pipe is Blocked
- ☐ Frame Maintenance is Required
- ☐ Remove Accumulated Sediment
- ☐ Pipe Maintenance is Required
- ☐ Basin Undermined or Bypassed
- ☐ Cannot Remove Cover
- ☐ Ditch Work
- ☐ Corrosion at Structure
- ☐ Erosion Around Structure
- ☐ Remove Trash & Debris
- ☐ Need Cement Around Grate

Other: _____

Catch Basin Grate Type :	**Sediment Buildup Depth :**	**Description of Flow:**	**Street Name/ Structure Location:**
Bar: ☐ Cascade: ☐ Other:_____ Properly Aligned: Yes ☐ No ☐	0-6 (in): _____ 6-12(in): _____ 12-18 (in): _____ 18-24 (in): _____ 24 + (in): _____	Heavy ☐ Moderate ☐ Slight ☐ Trickling ☐	

***If the outlet is submerged check yes and indicate approximate height of water above the outlet invert.** h above invert (in):___ Yes ☐ No ☐

☐ **Flow**
☐ **Standing Water**
(check one or both)

Observations:

Color:
Odor:

Weather Conditions : Dry > 24 hours ☐ Wet ☐

Sample of Screenings Collected for Analysis? Yes ☐ No ☐

Comments:

Circle those present:

Foam	Oil Sheen
Sanitary Waste	Bacterial Sheen
Orange Staining	Floatables
Excessive sediment	Pet Waste
Other:_____	Optical Enhancers

Job No.: _____ **Town:** Merrimac

Inspector: _____ **Date:** _____

MANHOLE INSPECTION FORM

Manhole I.D.	_____	**Final Discharge from Structure?** Yes ☐ No ☐ **If Yes, Discharge to Outfall No:**_____	
Manhole Label:	**Stencil** ☐ **Ground Inset** ☐ **Sign** ☐ **None** ☐ **Other**_____		
Manhole Material:	Concrete ☐ Corrugated metal ☐ Stone ☐ Brick ☐ Other: _____ ☐	**Manhole Condition:**	Good ☐ Poor ☐ Fair ☐ Crumbling ☐
Pipe Material:	Concrete ☐ HDPE ☐ PVC ☐ Clay Tile ☐ Other:_____	**Pipe Measurements:**	Inlet Dia. (in): d= ____ Outlet Dia. (in): D= ____

Required Maintenance/ Problems (check all that apply):

- ☐ Tree Work Required
- ☐ New cover is Required
- ☐ Pipe is Blocked
- ☐ Frame Maintenance is Required
- ☐ Remove Accumulated Sediment
- ☐ Pipe Maintenance is Required
- ☐ Basin Undermined or Bypassed
- ☐ Cannot Remove Cover
- ☐ Ditch Work
- ☐ Corrosion at Structure
- ☐ Erosion Around Structure
- ☐ Remove Trash & Debris
- ☐ Need Cement Around Grate

Other: _____

Manhole Cover Size :	**Sediment Buildup Depth :**	**Description of Flow:**	**Street Name/ Structure Location:**
24": ☐ 30": ☐ Other:_____ Properly Aligned: Yes ☐ No ☐	0-6 (in): _____ 6-12(in): _____ 12-18 (in): _____ 18-24 (in): _____ 24 + (in): _____	Heavy ☐ Moderate ☐ Slight ☐ Trickling ☐	

***If the outlet is submerged check yes and indicate approximate height of water above the outlet invert.** h above invert (in):___ Yes ☐ No ☐

☐ **Flow**

☐ **Standing Water**

(check one or both)

Observations:

Color:

Odor:

Weather Conditions : Dry > 24 hours ☐ Wet ☐

Sample of Screenings Collected for Analysis? Yes ☐ No ☐

Comments:

Circle those present:

Foam	Oil Sheen
Sanitary Waste	Bacterial Sheen
Orange Staining	Floatables
Excessive sediment	Pet Waste
Other:_____	Optical Enhancers

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.

Appendix E

Outfall Catchment System Vulnerability Factor (SVF) Inventory

OUTFALL SYSTEM VULNERABILITY FACTOR (SVF) INVENTORY

Outfall ID	General Street Location	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
8249	Merrimac Road	Unknown Stream												
8254	Merrimac Road	Unknown Stream												
8255	Little Pond Road	Woods												
8272	Little Pond Road	Unknown Stream												
8273	Little Pond Road	Unknown Stream												
8275	Little Pond Road	Unknown Stream												
8295	Little Pond Road	Unknown Pond												
8299	Little Pond Road	Unknown Stream												
8307	Spring Hill Road	Uknown Stream												
8309	Spring Hill Road	Uknown Stream												
8310	River Road	Drop Basin												
8311	Little Pond Road	Unknown Stream												
8312	Spring Hill Road	Woods												
8313	Little Pond Road	Unknown Stream												
8314	Little Pond Road	Unknown Stream												
8316	River Road	Unknown Brook												
8317	River Road	Unknown Brook												
8321	Spring Hill Road	Woods												
8322	Little Pond Road	Unknown Pond												
8323	Spring Hill Road	Uknown Stream												
8336	River Road	Merrimack River (MA84A-05)												
8345	River Road	Merrimack River (MA84A-05)												
8349	Little Pond Road	Woods												
8350	River Road	Merrimack River (MA84A-05)												
8352	River Road	Merrimack River (MA84A-05)												
8358	River Road	Merrimack River (MA84A-05)												
8359	River Road	Merrimack River (MA84A-05)												
8360	River Road	Merrimack River (MA84A-05)												
8361	River Road	Merrimack River (MA84A-05)												
8362	Chase Cresent	Unknown Stream												
8363	River Road	Merrimack River (MA84A-05)												
8364	River Road	Merrimack River (MA84A-05)												
8365	River Road	Merrimack River (MA84A-05)												
8366	Locust Grove Road	Woods												
8367	Pleasant Valley Road	Merrimack River (MA84A-05)												
8368	West Parish Lane	Unknown Stream												
8369	Stevens Terrace	Grass Area												
8370	Pleasant Valley Road	Merrimack River (MA84A-05)												
8371	Locust Grove Road	Woods												
8372	Pleasant Valley Road	Merrimack River (MA84A-05)												
8373	Pleasant Valley Road	Merrimack River (MA84A-05)												
8374	Pleasant Valley Road	Merrimack River (MA84A-05)												
8375	Pleasant Valley Road	Merrimack River (MA84A-05)												
8376	Pleasant Valley Road	Merrimack River (MA84A-05)												
8377	Pleasant Valley Road	Merrimack River (MA84A-05)												
8378	Pleasant Valley Road	Merrimack River (MA84A-05)												
8379	River Road	Cobblers Brook (MA84A-22)												
8380	Pleasant Valley Road	Merrimack River (MA84A-05)												
8381	Pleasant Valley Road	Merrimack River (MA84A-05)												
8382	Pleasant Valley Road	Merrimack River (MA84A-05)												
8383	Locust Grove Road	Woods												
8384	Pleasant Valley Road	Merrimack River (MA84A-05)												

Outfall ID	General Street Location	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
8385	Stevens Terrace	Unknown Stream												
8386	Locust Grove Road	Woods												
8387	Union Street	Woods												
8388	Union Street	Woods												
8389	Union Street	Woods												
8390	West Parish Lane	Detention Basin												
8391	Orchard Street	Woods												
8392	Middle Street	Woods												
8393	West Parish Lane	Unknown Stream												
8394	Heath Brook Lane	Unknown Stream												
8395	West Parish Road	Unknown Stream												
8396	Orchard Street	Woods												
8397	Orchard Street	Woods												
8398	Orchard Street	Woods												
8399	Orchard Street	Woods												
8400	Broad Street	Cobblers Brook (MA84A-22)												
8401	Broad Street	Cobblers Brook (MA84A-22)												
8402	Broad Street	Cobblers Brook (MA84A-22)												
8403	Broad Street	Cobblers Brook (MA84A-22)												
8404	Sunset Terrace	Woods												
8405	Champion Street	Woods												
8406	Champion Street	Woods												
8407	Broad Street	Cobblers Brook (MA84A-22)												
8408	Broad Street	Cobblers Brook (MA84A-22)												
8409	West Main Street	Cobblers Brook (MA84A-22)												
8410	Broad Street	Cobblers Brook (MA84A-22)												
8411	Broad Street	Cobblers Brook (MA84A-22)												
8412	Hadley Road	Woods												
8413	Broad Street	Cobblers Brook (MA84A-22)												
8414	Hadley Road	Woods												
8415	Burnside Lane	Swale/Unknown Stream												
8416	Liberty Street	Cobblers Brook (MA84A-22)												
8417	Hadley Road	Woods												
8418	Willowdale Drive	Cobblers Brook Tributary												
8419	Winter Street	Cobblers Brook Tributary												
8420	Willowdale Drive	Cobblers Brook Tributary												
8421	Chruch Street	Cobblers Brook Tributary												
8422	Attitash Avenue	Woods												
8423	Church Street	Cobblers Brook Tributary												
8424	Church Street	Cobblers Brook Tributary												
8425	Willowdale Drive	Cobblers Brook Tributary												
8426	Winter Street	Cobblers Brook Tributary												
8427	Winter Street	Cobblers Brook Tributary												
8428	Attitash Avenue	Wood/Wetland												
8429	Attitash Avenue	Wood/Wetland												
8430	Church Street	Woods/Cobblers Brook Tributary												
8431	Church Street	Wood/Wetland												
8432	Church Street	Cobblers Brook Tributary												
8433	Church Street	Cobblers Brook Tributary												
8434	Attitash Avenue	Lake Attitash (MA84002)												
8435	Hansom Drive	Cobblers Brook (MA84A-22)												
8436	Meadow Avenue	Lake Attitash (MA84002)												
8437	Bear Hill Road	Woods												
8438	Hansom Drive	Cobblers Brook (MA84A-22)												

Outfall ID	General Street Location	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
8439	Highland Road	Woods												
8440	Hansom Drive	Cobblers Brook (MA84A-22)												
8441	West Shore Road	Woods (close to Lake Attitash)												
8442	Red Oak Acres	Cobblers Brook (MA84A-22)												
8443	West Shore Road	Lake Attitash (MA84002)												
8444	Red Oak Acres	Cobblers Brook (MA84A-22)												
8445	Harriman Road	Cobblers Brook (MA84A-22)												
8446	Harriman Road	Cobblers Brook (MA84A-22)												
8447	Harriman Road	Cobblers Brook (MA84A-22)												
8448	Alnette Street	Lake Attitash (MA84002)												
8449	Battis Road	Woods												
8450	Equestrian Way	Unknown Stream												
8451	Hadley Road	Unknown Stream												
8452	Equestrian Way	Unknown Stream												
8453	Ashley Lane	Grass Area												
8454	Brush Hill Road	Woods												
8455	Brush Hill Road	Unknown Stream												
8456	Brush Hill Road	Unknown Stream												
8457	Bear Hill Road	Woods												

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)

Appendix F

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

SOP 10: LOCATING ILLICIT DISCHARGES

Introduction

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

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

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

Identifying Illicit Discharges

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

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

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

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

Citizen Call in Reports

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

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

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

Tracing Illicit Discharges

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

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

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

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

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

Dye Testing

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

Smoke Testing

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

Closed Circuit Television Inspection (CCTV)

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

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

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

Removing Illicit Discharges

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

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

Attachments

1. Illicit Discharge Incident Tracking Sheet

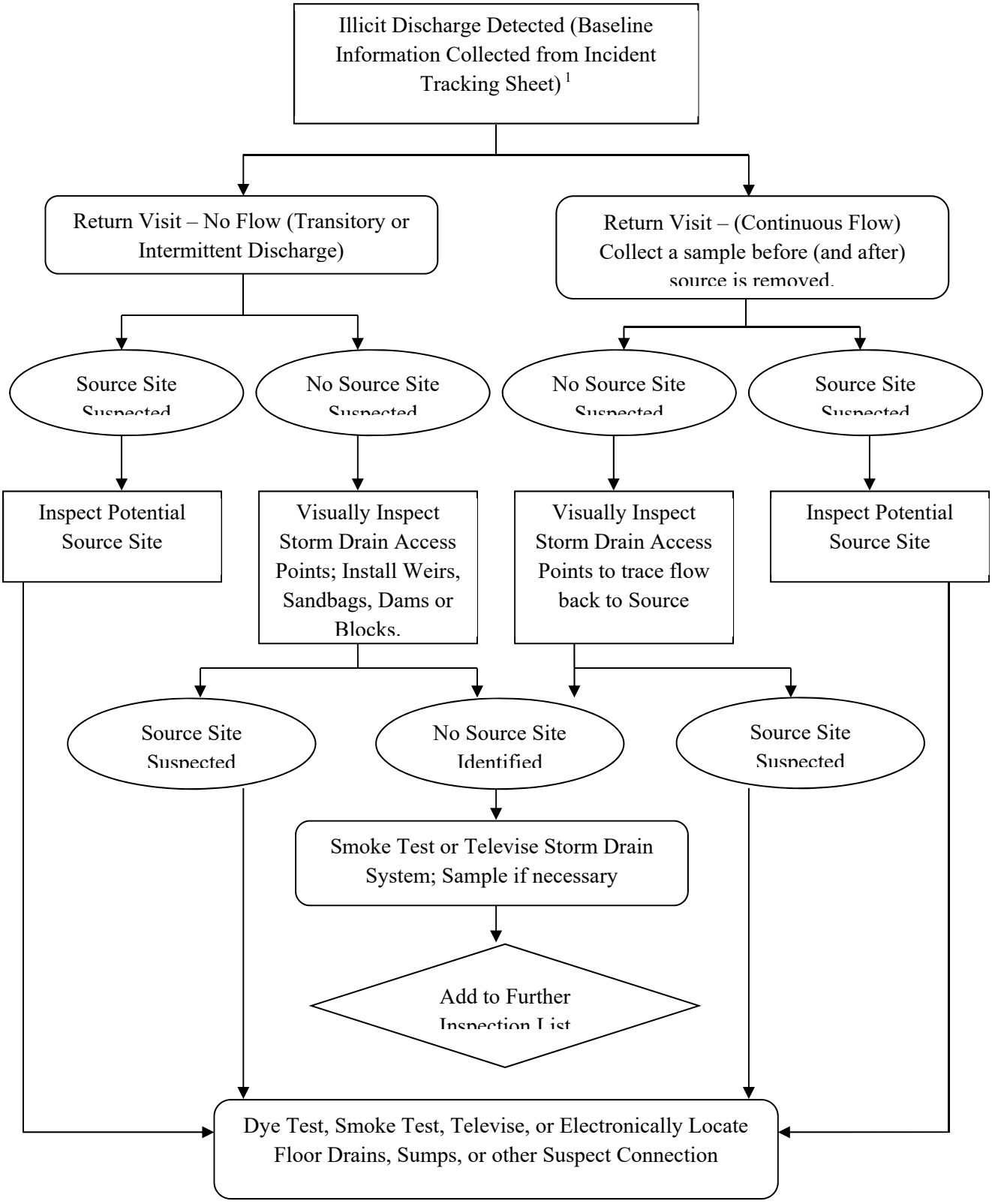
Related Standard Operating Procedures

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

Table SOP 10-1

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

Financially Responsible	Source Identified	Enforcement Authority	Procedure to Follow
Private Property Owner	One-time illicit discharge (e.g. spill, dumping, etc.)	Ordinance enforcement authority (e.g. Code Enforcement Officer)	• Contact Owner • Issue Notice of Violation • Issue fine
Private Property Owner	Intermittent or continuous illicit discharge from legal connection	Ordinance enforcement authority (e.g. Code Enforcement Officer)	• Contact Owner • Issue Notice of Violation • Determine schedule for removal • Confirm removal
Private Property Owner	Intermittent or continuous illicit discharge from illegal connection or indirect (e.g. infiltration or failed septic)	Plumbing Inspector or ordinance enforcement authority	• Notify plumbing inspector
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.

Illicit Discharge Hotline Incident Tracking Sheet

Incident ID:

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

Caller contact information (*optional*):

Incident Location *(complete one or more below)*

Latitude and longitude:

Stream address or outfall #:

Closest street address:

Nearby landmark:

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

Narrative description of location:

Upland Problem Indicator Description

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

Stream Corridor Problem Indicator Description

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

Narrative description of problem indicators:

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

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

Appendix G

IDDE Employee Training Record

Illicit Discharge Detection and Ellimination
Employee Training Record
Town of Merrimac, Massachusetts

Date:
Notes:

Name	Title	Signature