Westford MS4 Catchment Investigation Procedures

TO: Town of Westford Stormwater Management Program Files

DATE: December 2019

Part 2.3.4.8 of the 2016 Small MS4 General Permit requires the Town of Westford to develop a systematic procedure to investigate each catchment associated with an outfall or interconnection within the Town's MS4. *All* catchments must be investigated during dry weather conditions[1]. Only catchments that have a higher potential for illicit discharges based on maps, historic plans and records, and other sources of data (termed "System Vulnerability Factors" (SVF) in the General Permit) must undergo a wet weather investigation process. The source of any illicit discharge identified during dry or wet weather must be isolated, confirmed, and removed.

The procedures presented in this memorandum were developed to address the General Permit requirements and describe dry and wet weather catchment investigation methodologies to isolate and confirm sources of illicit discharges. These procedures can be modified as needed by the Town to reflect local needs, staffing, and/or changes to the catchment investigation program going forward.

1 Dry Weather Catchment Investigations

All catchments must be investigated during dry weather conditions, even when no evidence of an illicit discharge is observed at the outfall. The following describes a systematic and progressive method to observe, sample, and evaluate drainage manholes during dry weather to determine the approximate location of a suspected illicit discharge or sanitary sewer overflow (SSO).

1.1 Identification of Key Junction Manholes

EPA requires dry weather investigations be completed at *all key junction manholes*[2] within a catchment. Appendix A of the General Permit provides the following definitions for junction manhole and key junction manhole:

> **Junction Manhole**: 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.
>
> **Key Junction Manhole**: Junction manholes that can represent one or more junction manholes without compromising adequate implementation of the illicit discharge program.

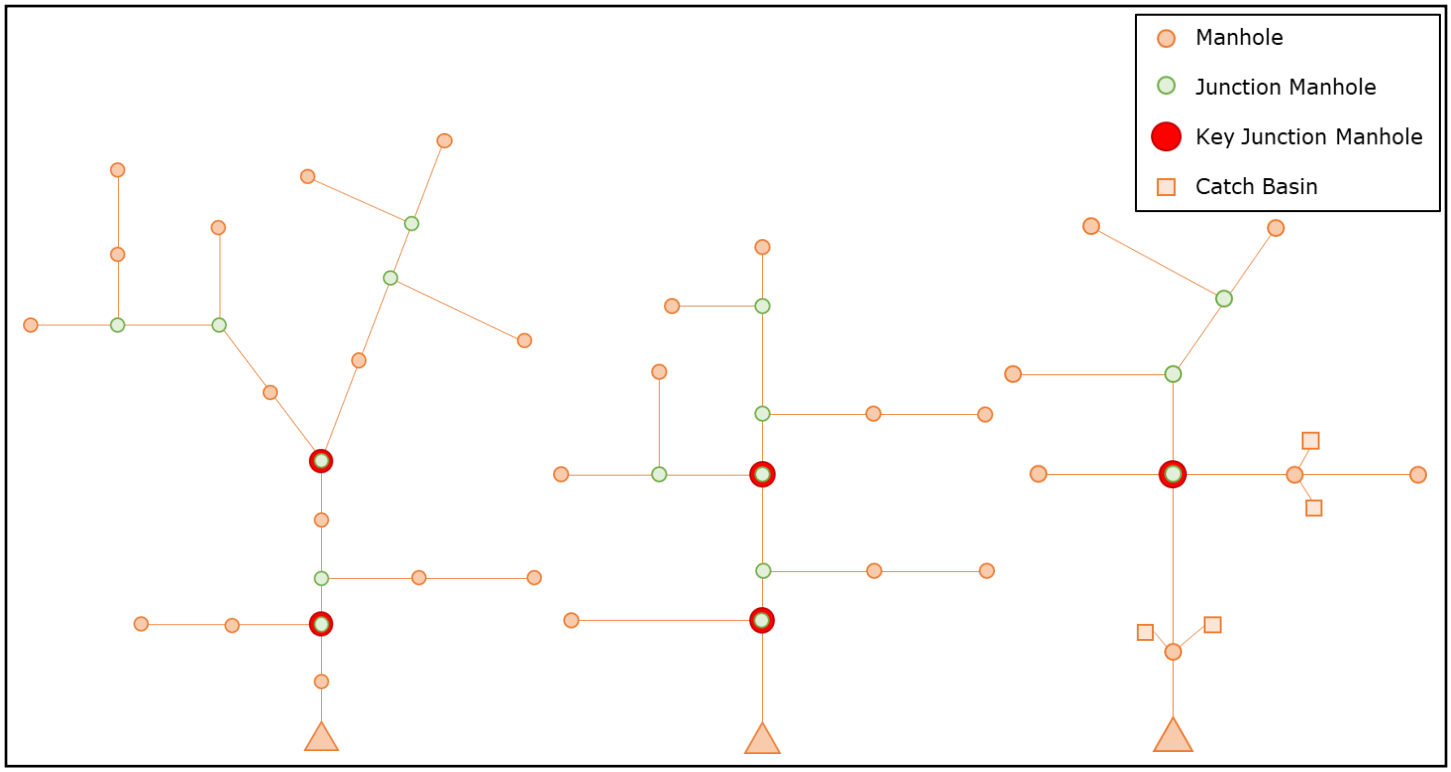
[1] Dry weather screening and sampling shall proceed only when no more than 0.1 inches of rainfall has occurred in the previous 24-hour period and no significant snow melt is occurring.

[2] Catch basins can also serve as key junction/junction "manholes".

Tighe & Bond identified Westford's key junction manholes for each catchment using the Town's existing stormwater GIS mapping and the following approach:

1. Junction manholes were identified as manholes that have at least two inlets and do not include inlets from catch basins unless the catch basins are in-line (i.e., acting as a manhole)
2. Key junction manholes were identified based on upstream catchment areas, amount of drainage represented by a junction manhole, and implementation of the IDDE Program. In some catchments, due to size, multiple key junction manholes were assigned. The most downstream key junction manhole (nearest to the outfall) was identified as a key junction manhole for all catchments.

The figures below demonstrate examples of identifying junction and key junction manholes for different drainage alignments.



Identifying Junction and Key Junction Manholes

(sketches above adapted from the Center for Watershed Protection's IDDE Guidance Manual, Chapter 13: Tracking Discharges to a Source)

Note that this analysis was completed using Westford's *current* stormwater GIS mapping and the *initial* catchment delineations. For catchments that have insufficient connectivity or inaccurate mapping or flow direction, identification of key junction manholes cannot occur until after the mapping is refined as part of Phase I and Phase II mapping improvements and before completing catchment investigations. Town staff and/or the Town's stormwater consultant should use the best professional judgement during investigations to determine whether additional key junction manholes should be identified and screened in the field and/or to update the Town's GIS mapping to reflect actual conditions.

Westford's key junction manholes are shown on the enclosed map in **Attachment 1: Catchment Investigations Map**. Some catchments do not have a junction manhole because they only have inlets from catch basins, the catchment consists of one catch basin and an outfall, or mapping is not complete. Based on the *initial* analysis completed by Tighe & Bond and the *current* GIS mapping, the Town of Westford has 144 key junction manholes/catch basins. This number will change as mapping and catchment delineations are refined.

1.2 Manhole Inspection Methodology

During dry weather, key junction manholes must be opened and inspected for visual and olfactory evidence of illicit connections. Some catchments may not include a junction manhole (i.e., the catchment may be small and only contain a number of catch basins), and therefore the dry weather screening completed at the catchment's outfall fulfills the intent of the manhole inspection requirement. If the results of the dry weather screening at the outfall indicated the potential presence of an illicit discharge, the catchment shall be further investigated until the source is identified. If the results of the dry weather screening at the outfall indicated there was no flow and no evidence of illicit discharges, and if there is no SVF for the catchment, the catchment is considered complete. Additional information about SVFs is included in Section 2.1 of this memorandum.

Enclosed is **Attachment 2: Dry Weather Manhole Inspection and Sampling Methodology** Standard Operating Practice (SOP) for Westford. To summarize the SOP, the catchment investigation will begin at the most downstream key junction manhole (nearest to the outfall) and work upstream. Key junction manholes will be opened and inspected for visual and olfactory evidence of illicit connections. If any flow is observed, a sample will be collected and field kits will be used to analyze the sample for concentrations of ammonia, chlorine, and surfactants. Where water quality screening and/or visual and olfactory observations indicate a potential illicit discharge, manhole investigations will proceed until the location of the suspected illicit discharge or SSO can be isolated to a pipe segment between two manholes. If field conditions prohibit continued investigations, the upstream area will be flagged for additional investigation and/or isolation and confirmation of sources. If there is no evidence of an illicit discharge, catchment investigations will be considered complete upon completion of inspection and sampling of all key junction manholes in the catchment.

2 Wet Weather Catchment Investigations

Only catchments with one or more SVF must be investigated based on outfall sampling completed during wet weather conditions. The following describes the process to identify SVFs and complete the wet weather outfall screening, and alternatives for catchment investigations to determine the approximate location of a suspected illicit discharge or SSOs due to wet weather conditions.

2.1 Identification of System Vulnerability Factors

Part 2.3.4.8.c.i of the General Permit includes specific SVFs to identify catchments with higher potential for illicit connections. The presence or absence of each SVF must be identified throughout Westford's MS4 to determine where wet weather sampling will be conducted. A desktop screening exercise will be completed in GIS and input will be compiled from Town staff to identify SVFs present in Town. The enclosed table in **Attachment 3: System Vulnerability Factor (SVF) Evaluation Summary** will include a summary of the SVF evaluation once completed. The location of the catchments in Westford with SVFs will be shown on the map in Attachment 1, if applicable.

2.2 Wet Weather Outfall Sampling Investigation Procedures

When one or more of the SVFs listed in Attachment 3 are present in a drainage catchment area, the Town must sample and inspect the associated outfall during wet weather conditions to determine whether wet weather-induced high flows in sanitary sewers or high groundwater in areas served by septic systems result in the discharge of sanitary sewer flow to the MS4.

Enclosed is **Attachment 4: Wet Weather Outfall Sampling Methodology** SOP for Westford.

2.3 Wet Weather Catchment Investigation Procedures

EPA's General Permit does not specify wet weather catchment investigation procedures as it does for dry weather catchment investigations; however, it does require all illicit discharges to be isolated, confirmed, and removed. Investigations of catchments to identify discharges of wastewater to the MS4 can be tailored to the specific catchment, and may consist of:

- Additional visual and olfactory field observations
- Additional review of documents and reports to complete a more detailed evaluation of SVFs for the catchment (e.g., records related to infiltration/inflow programs, field inspection reports, sewer and drainage design or construction plans, institutional knowledge of historic sanitary issues, etc.)
- Additional wet weather sampling at the outfall
- Wet weather manhole inspections and sampling
- Catchment-wide investigation using CCTV/video inspection, smoke testing, and/or flooded dye testing
- Investigation of sewer collection system for evidence of surcharging or SSOs

3 Isolate and Confirm Sources of Illicit Discharges

Once an illicit discharge or connection has been isolated to a section of drain pipe between two manholes as part of the catchment investigations, the Town must complete additional investigation to isolate and confirm the source. Both municipal and private drainage system or plumbing components may need to be inspected to clarify the source of a discharge or connection. Traditional investigations can include sand bagging, dye testing, smoke testing, and/or video inspections of pipes or structures. In addition, regional stormwater groups have provided information on optical brighteners and IDDE canines which, while rare to use, are an option. EPA also has tested for pharmaceuticals and personal care products, which could help determine if an illicit discharge is from human sources.

If an illicit discharge is found in a catchment and investigations to isolate and confirm the source begin, catchment investigations occurring downstream should be stopped. Once the source is confirmed and removed, downstream catchment investigations can be resumed as needed.

Section 6.3, *Establish a Systematic Procedure for Locating and Removing Illicit Connections*, and Appendix F, *Protocol for IDDE Program Responsibilities*, of the Town's IDDE Plan includes processes that can be used for addressing and removing illicit discharges once they have been isolated and confirmed, as well as confirmatory screening once they have been removed.

4 Schedule

Catchment investigations must be completed in accordance with the schedule in the Permit, as summarized below:

- Investigations of catchments associated with Problem Outfalls shall begin in Permit Year 2 (i.e., prior to June 30, 2020) and be completed by the end of Permit Year 7 (i.e., June 30, 2025).
- Investigations of catchments associated with High and Low Priority Outfalls shall follow the completion of dry weather screening and re-ranking of outfalls and be completed by the end of Permit Year 10 (i.e., June 30, 2028).
- Where information gathered on an outfall/interconnection during dry weather screening identifies a likely sewer input, investigations of the associated catchment shall be completed by the end of Permit Year 7 (i.e., June 30, 2025).

Enclosures

Attachment 1: Catchment Investigations Map

Attachment 2a: Dry Weather Manhole Inspection and Sampling Methodology
Attachment 2b: Dry Weather Manhole Sample Collection Field Sheet

Attachment 3: System Vulnerability Factor (SVF) Evaluation Summary

Attachment 4a: Wet Weather Outfall Sampling Procedure
Attachment 4b: Wet Weather Outfall Sample Collection Field Sheet

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Attachment 1

Catchment Investigations Map

The Catchment Investigations Map will be inserted once the SVF analysis is completed.

Attachment 2

Dry Weather Manhole Inspection and Sampling

Dry Weather Manhole Inspection and Sampling Methodology

Westford, MA

1) Field work shall proceed only under dry weather conditions (when no more than 0.1 inches of rainfall has occurred in the previous 24-hour period).
2) Notify the Town of Westford of sampling schedule prior to going into the field:
    a. Engineering Department: 978-692-5520
    b. Westford Police Department: 978-692-2161
3) Locate the catchment's most downstream key junction manhole[1] (nearest to outfall) and protect the area using traffic cones or a Town vehicle with lights.
4) Open the manhole and inspect it for visual evidence (e.g., sewage, toilet paper, gray bacterial growth, sanitary products, soap, food) and olfactory evidence (e.g., sewage, soap, laundry, bleach, food) of illicit discharge/connections.
5) If dry weather flow at a manhole is present, complete in-situ screening of flow from pipe inlet(s) using test kits.
    a. Using a sampling bottle or cup, collect the flow with care to not disturb sediment materials or collect surface debris/scum as best as possible. Use sampling pole if needed to safely reach the flow.
    b. The collected water will be poured into **surfactants** test tube, **chlorine** sample cell, and the remainder will be tested for **ammonia** with test strips. Follow the manufacturer instructions for all test kit procedures. All waste from the field test kits should be retained and disposed of according to manufacturer instructions.
6) If dry weather flow is present but there is not enough flow to sample or if dry weather flow is not present but there is visual or olfactory evidence of an illicit discharge, complete one of the following:
    a. Dam the manhole and return within 24 hours to sample the discharge that has built up behind the dam;
    b. Complete an inspection at the next upstream structure to isolate the source; or
    c. Return to and reinspect the manhole within one week and sample if flow is then present.
7) If the manhole is submerged due to downstream water levels or clogged pipes, or otherwise inaccessible, proceed to the next upstream junction manhole(s) to complete the inspection and screening. Notify the Highway Department of any maintenance issues requiring attention.
8) Threshold Levels: In-situ readings will be compared to field thresholds as follows:

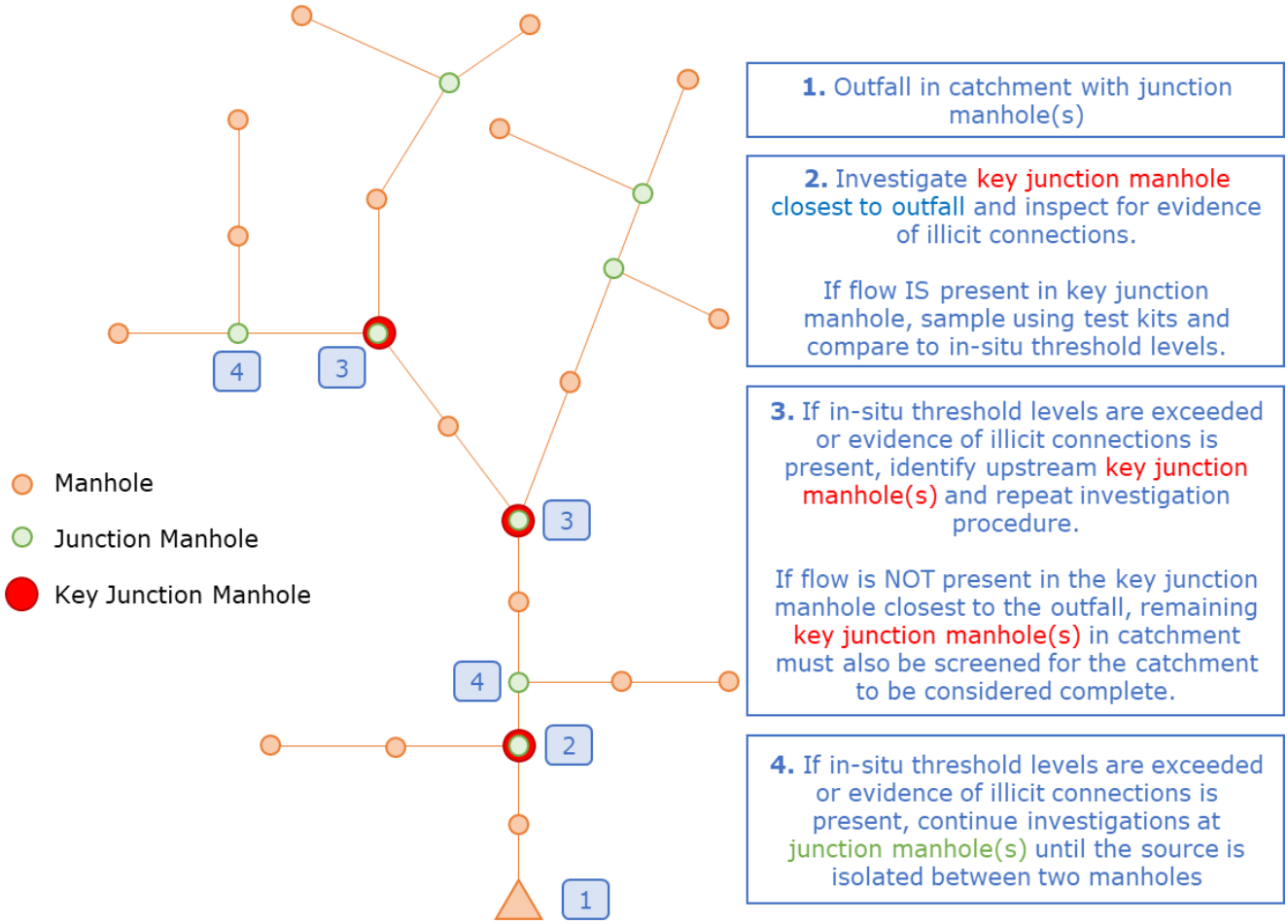
Parameter	Threshold Level	Source
Surfactants	≥ 0.25 mg/L	EPA New England Bacterial Source Tracking Protocol
Ammonia	≥ 0.5 mg/L	EPA New England Bacterial Source Tracking Protocol
Chlorine	≥ 0.02 mg/L	EPA 2016 General Permit

[1] Key junction/junction manholes can also be catch basins. For the purpose of this Methodology, "manhole" includes both drainage structures.

9) Record Results: Fill in all form fields for sampling data, threshold exceedances, and visual/olfactory observations.

10) If the in-situ readings, visual evidence, or olfactory evidence indicate an illicit discharge, the next upstream key junction manhole shall be identified. Continue upstream to the next junction manhole and repeat the inspection and screening process. Manhole investigations will proceed at key junction and junction manholes until the location of the suspected illicit discharge or SSOs can be isolated to a pipe segment between two manholes.

11) If dry weather flow is not present and there is no visual or olfactory evidence of illicit discharge at all key junction manholes in the catchment, the catchment investigation is considered complete. All key junction manholes must be screened in order for the catchment to be considered complete.



Example of Isolating Illicit Discharge Between Manholes

(adapted from the Center for Watershed Protection's
IDDE Guidance Manual, Chapter 13: Tracking Discharges to a Source)

12) **Field Equipment Needed**

- Sampling Pole
- Carry Caddy
- Digital Camera or iPad
- Cell Phone or hand-held radio
- First aid kit
- Flashlight or head lamp
- Nitrile gloves
- Tape measure
- Surfactants, Ammonia, and Chlorine Test Kits
- 1 liter bottle
- Duct tape
- Sharpies
- Paper Towels
- Glass Container for surfactant kit liquid waste and surfactant kit glass ampules. Dispose of as hazardous waste.
- Glass container for chloride kit liquid waste. Dilute and dispose of down sink.
- Trash bag for solo cups, gloves, etc.

- **PAPERWORK**

  Signed Site Safety Plan

  Field sheets

  Center for Watershed Protection Chapter 13

  Field maps

  Key Junction Manhole Locations Map

- **PERSONAL GEAR**

  Steel-toed boots

  Safety goggles

  Reflective safety vest

  Insect repellant

  Sunscreen

  Business cards

DRY WEATHER MANHOLE SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

CATCHMENT'S OUTFALL ID:	Manhole ID:	**MANHOLE LOCATION:**
Today's date:	Time:	
INVESTIGATORS:		
TEMPERATURE (°F):	**RAINFALL (IN.):** **LAST 72 HOURS:**	**LAST 24 HOURS:**

Section 2: Manhole Description

MAINTENANCE NEEDS	☐ Pipe blockage ☐ Structure damage/corrosion ☐ Yard Waste ☐ Pet Waste ☐ Other:
INVERTS SUBMERGED	☐ No ☐ Partially ☐ Fully If yes, which pipe?
FLOW PRESENT?	☐ Yes ☐ No
FLOW DESCRIPTION (if present)	☐ Trickle ☐ Moderate ☐ Substantial
FLOW SOURCE (if present)	Description or sketch:
Intermittent flow trap (e.g., sandbag) recommended?	☐ Yes ☐ No

Section 3: Quantitative Characterization

FIELD DATA			
PARAMETER (Threshold Level)	**RESULT**	**UNIT**	**EQUIPMENT**
SURFACTANTS (≥ 0.25 mg/L)		mg/L	MBAS Test Kit (CHEMetrics K-9400)
AMMONIA (NH3) (≥ 0.5 mg/L)		mg/L	Test Strips
CHLORINE (≥ 0.02 mg/L)		mg/L	Hach Pocket Colorimeter

Section 4: Physical Indicators in the Flow

INDICATOR	CHECK if Present	DESCRIPTION
ODOR	☐	☐ Sewage ☐ Rancid/sour ☐ Petroleum/gas ☐ Soap/laundry ☐ Sulfide ☐ Other:
FLOATABLES - DOES NOT INCLUDE TRASH!	☐	☐ Sewage (toilet paper, etc.) ☐ Suds/soap ☐ Gray bacterial growth ☐ Sanitary products ☐ Food ☐ Other:

Section 5: Notes

_____

_____

_____

_____

Attachment 3

System Vulnerability Factor (SVF) Evaluation Summary

This enclosure has been included for reference and will be updated once the analysis is completed.

Table 1 includes a summary of the evaluation completed to identify the presence or absence of each SVF listed in Part 2.3.4.8.c.i of the General Permit. The General Permit also includes recommended screening criteria, which the Town has elected to not include in the consideration of SVFs for all catchments at this time.

Table 1: Identification of SVFs in Westford

SVF	Present? (Yes/No)	Source	Notes
Required SVF Screening Criteria			
History of SSOs, including, but not limited to, those resulting from wet weather, high water table, or fat/oil/grease blockages			
Common or twin-invert manholes serving storm and sanitary sewer alignments			
Common trench construction serving both storm and sanitary sewer alignments			
Crossings of storm and sanitary sewer alignments where the sanitary system is shallower than the storm drain system			
Sanitary sewer alignments known or suspected to have been constructed with an underdrain system			
Inadequate sanitary sewer level of service (LOS) resulting in regular surcharging, customer back-ups, or frequent customer complaints			
Areas formerly served by combined sewer systems			

Table 1: Identification of SVFs in Westford

SVF	Present? (Yes/No)	Source	Notes
Sanitary sewer infrastructure defects such as leaking service laterals, cracked, broken, or offset sanitary infrastructure, directly piped connections between storm drain and sanitary sewer infrastructure, or other vulnerability factors identified through Inflow/ Infiltration Analyses, Sanitary Sewer Evaluation Surveys, or other infrastructure investigations			
Recommended SVF Screening Criteria			
Sewer pump/lift stations, siphons, or known sanitary sewer restrictions where power/equipment failures or blockages could readily result in SSOs			
Any sanitary sewer and storm drain infrastructure greater than 40 years old			
Widespread code-required septic system upgrades required at property transfers (indicative of inadequate soils, water table separation, or other physical constraints of the area rather than poor owner maintenance)			
History of multiple Board of Health actions addressing widespread septic system failures (indicative of inadequate soils, water table separation, or other physical constraints of the area rather than poor owner maintenance)			

Attachment 4

Wet Weather Outfall Sampling

Wet Weather Outfall Sampling Procedure

Westford, MA

1) Review supplies of sampling bottles and test kits on a weekly basis and order as necessary for field sampling activities.
2) Prepare a Town-specific safety plan that includes procedures for emergencies and anticipated field hazards, which may include slips, trips, and falls and severe weather such as high winds or thunder and lightning.
3) Field work shall proceed only under wet weather conditions (when there is a rainfall event sufficient to produce a stormwater discharge).
    a. In general, a minimum of 0.25 inches of rain in the previous 24-hour period is preferred.
    b. The drain system must be actively flowing at the time of sampling.
    c. Sampling during periods of medium to high intensity rainfall/storm drain discharge is preferred.
    d. Avoid sampling during the "first flush," or the initial surface runoff from a rainstorm.
    e. For ease of coordination of personnel and equipment, it is preferable to plan for wet weather sampling when the forecast likelihood of rainfall is 60% or higher.
    f. Where feasible, conduct wet weather sampling during a representative storm[1] for the Northeast Coastal area (approximately eastern to central Massachusetts). The duration and depth of a representative storm (i.e., an average event plus or minus 50%) is presented in the table below. Compare the representative storm to the forecast to determine when to mobilize for field work. Storm duration and depth may also be helpful to interpret results of wet weather screening as more extreme events may induce anomalous illicit discharges.

Representative Storm Duration and Depth

	Average	+50%	-50%
Duration (hours)	11.7	17.55	5.85
Depth (inches)	0.66	0.99	0.33

4) Notify the Town of Westford of sampling schedule prior to going into the field:
    a. Engineering Department: 978-692-5520
    b. Westford Police Department: 978-692-2161
5) Take a photograph of the outfall with an iPad or camera. If the photograph is not linked to the outfall via a mobile data collection form, hold a piece of paper or a white board with the unique identifier written on it in the photograph. If using a mobile data collection form, ensure the photograph is collected with the correct outfall identifier.
6) Note any visual or olfactory evidence of illicit discharge/connections in the flow and at the outfall discharge area and record it on the data collection form.

[1] Representative storm data was compiled from Exhibit 2-8, Rain Zones of the United States, of the *NPDES Storm Water Sampling Guidance Document*, EPA, July 1992.

7) Sample storm drain outfalls as close to the outfall opening as possible, wearing a fresh pair of disposable gloves.

    a. If the outfall is submerged, sampling should be completed at the first accessible upstream structure that is not submerged. Note the location on the form.

8) Complete in-situ screening of flow using **test kits**:

    a. Using a sampling bottle or cup, collect the flow with care to not disturb sediment materials or collect surface debris/scum as best possible. Use sampling pole if needed to safely reach the flow.

    b. The collected water will be poured into **surfactants** test tube, **chlorine** sample cell, and the remainder will be tested for **ammonia** with test strips. Follow the manufacturer instructions for all test kit procedures. All waste from the field test kits should be retained and disposed of according to manufacturer instructions.

9) **Meters**: A properly calibrated meter should be used to record the following parameters directly from the outfall:

    a. Conductivity

    b. Salinity

    c. Temperature

    d. pH (for applicable watersheds only)

    e. Dissolved oxygen (for applicable watersheds only)

    When flow volume or depth is insufficient to immerse the meter probe, a clean sample bottle may be used to collect a sufficient volume of water to immerse the probe. In such instances, meter readings should be taken immediately.

10) **Threshold Levels**: In-situ readings will be compared to field thresholds as follows:

Parameter	Threshold Level	Source
Surfactants	≥ 0.25 mg/L	EPA New England Bacterial Source Tracking Protocol
Ammonia	≥ 0.5 mg/L	EPA New England Bacterial Source Tracking Protocol
Chlorine	≥ 0.02 mg/L	EPA 2016 General Permit
pH	< 5	Center for Watershed Protection
Conductivity	> 2,000 µS/cm	Center for Watershed Protection
Dissolved Oxygen (DO)	< 5.0 mg/L < 6.0 mg/L	314 CMR 4.00 for Class B Warm Water Reed Brook only: Class B Cold Water
Temperature	> 83 °F > 68 °F	314 CMR 4.00 for Class B Warm Water Reed Brook only: Class B Cold Water
Salinity	> 0.5 ppt Rivers	EPA Voluntary Estuary Monitoring Manual

11) **Water quality samples** will be taken for laboratory analysis according to the following table. Each bottle will be marked with time, date, and outfall identifier, and parameter to be analyzed. Once all required samples are taken for an individual outfall, the samples for that outfall should be placed in a Ziploc bag that has the outfall identifier, date and time recorded on the bag. The bag should then be placed in the cooler, on ice.

All Outfalls	Impaired Watersheds	EPA Approved Method for Analysis
E. coli samples should be collected first, in a separate sterile sample bottle. **Ammonia** **Surfactants** **Chlorine**	**Beaver Brook (MA84B-02):** *(Class B, Warm Water)* Fecal Coliform BOD_5 TSS Total Phosphorus *pH (meter)* *Temperature (meter)* *Dissolved Oxygen (meter)* **Stony Brook (MA84B-03)** *(Class B, Warm Water)* Fecal Coliform TSS Turbidity **Stony Brook (MA84B-04)** *(Class B, Warm Water)* *E. coli (already part of sampling requirements)* **Deep Brook (MA84A-21)** *(Class B, High Quality)* TSS *E. coli (already part of sampling requirements)* **Tadmuck Brook (MA84B-07)** *(Class B, High Quality)* *E. coli (already part of sampling requirements)* **Heart Pond (MA82059)** *(Class B, High Quality)* *E. coli (already part of sampling requirements)*	***E. coli:*** 1603 (preferred); 1103.1; Colilert® 12 16; Colilert-18® 12 15 16; mColiBlue-24®17 **Ammonia:** 350.1 **Surfactants:** SM 5540C (MBAS) **Fecal coliform:** 1680; 1681 **BOD_5:** SM-5210 **Total Phosphorus:** 365.1;365.2;365.3; SM 4500-P-E **TSS:** 160.2, 180.1 **Turbidity:** 160.2; 180.1 **pH:** 150.2 **Dissolved Oxygen:** 360.1; 360.2 **Chlorine, Conductivity, Salinity, Temperature:** Field test kit or meter

Note: Constituents that are in *blue ilalics* will already be analyzed as part of the 2016 General Permit sampling requirements or in-situ, and do not require additional lab analysis.

Results should be recorded, custody forms completed, and samples placed in a cooler on ice. If using an iPad, fill in all form fields for sampling data. **Make note of the first bacteria sample time for determining the hold limit until lab analysis.** Bacteria sample hold time is 6 hours. Additionally, Nashoba Analytical does NOT accept BOD_5 samples on Mondays so any locations where BOD_5 samples are to be taken should be screened on a different day.

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

Be sure to upload all data entry before leaving the site. If there is any doubt whether data was captured, duplicate information on paper forms.

12) **Field Equipment Needed**

- Sample bottles (from lab with hold-time and storage requirements)
- Extra sample bottles in case of contamination, cracking, or loss
- Sampling Pole
- Cooler with ice
- Carry Caddy
- iPad, water-proof case, and stylus
- Towel/cloth for drying equipment
- Cell Phone or hand-held radio
- First aid kit
- Flashlight or head lamp
- Nitrile gloves
- Tape measure
- Water quality meter(s) and large gallon size ziplock bag
- Surfactants, Ammonia, and Chlorine test kits– use kits listed in EPA Bacteria Source Protocol 2012 Draft
- 1 liter bottle
- Watch with a second hand
- Duct tape
- Sharpies
- Paper Towels
- Glass container for surfactant kit liquid waste and surfactant kit glass ampules. Dispose of as hazardous waste.
- Glass container for chlorine kit liquid waste. Dilute and dispose of down sink.
- Trash bag for solo cups, gloves, etc.

- **PAPERWORK**

  Signed Site Safety Plan

  Chain of Custody form filled out

  Bottle Labels in Ziploc Bag

  Field sheets

  Center for Watershed Protection Chapter 11 and Chapter 13

  Field maps

  Sampling Plan & Locations

- **PERSONAL GEAR**

  Rain gear

  Umbrella or covering

  Waders (or other appropriate footwear)

  Steel-toed boots (if opening manholes)

  Safety goggles

  Light colored long sleeve shirts and pants on-site

  Reflective safety vest

  Business cards

WET WEATHER OUTFALL SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

SUBWATERSHED:	Outfall ID:	**LOCATION:**
Today's date:	Time:	
INVESTIGATORS:		
TEMPERATURE (°F):	**RAINFALL (IN.):** **LAST 72 HOURS:**	**LAST 24 HOURS:**
Notes:		

Section 2: Outfall Description

MAINTENANCE NEEDS	☐ Cracked ☐ Clogged with Debris ☐ Crushed ☐ Deteriorated (concrete) ☐ Corroded (metal) ☐ Yard Waste ☐ Trash ☐ Other: _____	
SUBMERGED	In Water: ☐ No ☐ Partially ☐ Fully	With Sediment: ☐ No ☐ Partially ☐ Fully
FLOW DESCRIPTION	☐ Trickle ☐ Moderate ☐ Substantial	

Section 3: Quantitative Characterization

FIELD DATA			
PARAMETER (Threshold Level)	**RESULT**	**UNIT**	**EQUIPMENT**
TEMPERATURE		°F	Water Quality Meter or Thermometer
CONDUCTIVITY (>2,000 UMHOS/cm)		umhos/cm	YSI Meter
SALINITY (> 0.5 PPT)		ppt	YSI Meter
DISSOLVED OXYGEN (< 5.0 mg/L)		mg/L	YSI Meter
pH (< 5)			YSI Meter
SURFACTANTS (≥ 0.25 mg/L)		mg/L	MBAS Test Kit (CHEMetrics K-9400)
AMMONIA (NH3) (≥ 0.5 mg/L)		mg/L	Test Strips
CHLORINE (≥ 0.02 mg/L)		mg/L	Hach Pocket Colorimeter

WET WEATHER OUTFALL SAMPLE COLLECTION FIELD SHEET

Section 4: Physical Indicators in the Flow

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

Section 5: Physical Indicators at Outfall/Pool

INDICATOR	CHECK if Present	DESCRIPTION	COMMENTS
DEPOSITS/STAINS	☐	☐ None ☐ Grease/Oil ☐ Paper/Trash ☐ Foam ☐ Heavy sedimentation deposits ☐ Other _____	
SURROUNDING VEGETATION	☐	☐ Little or No Distress ☐ Moderate Distress ☐ High Distress	
ABNORMAL VEGETATION IN OUTFALL	☐	☐ Excessive ☐ Inhibited	
ERODIBILITY	☐	☐ Little or No Erosion ☐ Small Areas of Erosion ☐ Many Eroded Areas	
POOR POOL QUALITY	☐	☐ Odors ☐ Colors ☐ Floatables ☐ Oil Sheen ☐ Suds ☐ Excessive Algae ☐ Other:	
PIPE BENTHIC GROWTH	☐	☐ Brown ☐ Orange ☐ Green ☐ Other:	

Section 6: Data Collection

1. SAMPLE FOR THE LAB?	☐ Surfactants	☐ Ammonia	☐ E. Coli	☐ Fecal Coliform	☐ TSS	☐ Turbidity	☐ BOD_5	☐ Total Phosphorus	☐ No
2. If yes, collected from:	☐ Flow	☐ Pool							
3. Intermittent flow trap (e.g., sandbag) recommended?	☐ Yes	☐ No							

Section 7: Notes

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