

Town of Southampton Catchment Investigation Procedures

To: Town of Southampton Stormwater Management Program Files

DATE: December 2019

Background

Part 2.3.4.8 of the 2016 Small MS4 General Permit requires the Town of Southampton 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 conditions¹. 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" in the 2016 Small MS4 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 2016 Small MS4 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.

The Town of Southampton developed a preliminary procedure to develop the Catchment Investigations procedure described in the Illicit Discharge Detection and Elimination (IDDE) Plan included in the Stormwater Management Program (SWMP) completed in June of 2019. This memorandum is intended to update and expand upon the catchment investigations section of the IDDE Plan as required by the 2016 Small MS4 General Permit.

Identification of System Vulnerability Factors

Per part 2.3.4.8.c.i of the 2016 Small MS4 General Permit, the presence or absence of specific System Vulnerability Factors (SVFs) in Southampton must be documented. SVFs required to be assessed include:

- History of sanitary sewer overflows (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 resulting in regular surcharging, customer back-ups, or frequent customer complaints
- Areas formerly served by combined sewer systems

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.

- 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.

EPA additionally recommends assessment of the presence or absence of the following SVFs:

- 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)

The Town of Southampton does not have a public sewer system and therefore the SVFs that are required to be assessed are not applicable. A desktop screening inventory was completed with input from Town staff to identify the presence or absence of SVFs in outfall catchments. The inventory assessed the presence or absence of both the required and recommended SVFs, as summarized in the table below.

SVF	Present?	Source
History of SSOs	N/A	No Town sewer
Common or twin-invert manholes serving storm and sanitary sewer	N/A	No Town sewer
Common trench construction serving both storm and sanitary sewer	N/A	No Town sewer
Sewer crossings where the sanitary sewer is above the storm drain	N/A	No Town sewer
Sanitary sewer alignments known or suspected to have been constructed with an underdrain system	N/A	No Town sewer
Inadequate sanitary sewer level of service	N/A	No Town sewer
Areas formerly served by combined sewer systems	N/A	No Town sewer
Sanitary sewer infrastructure defects	N/A	No Town sewer
SSO potential in the event of system failures	N/A	No Town sewer
Sanitary and storm drain infrastructure > 40 years old	No	No Town sewer, storm drain infrastructure is < 40 years old based on record drawings
Widespread code-required septic system upgrades indicative of poor soils or water table separation	Yes	Town staff, 2013 Town of Southampton Master Plan, Board of Health records
History of Board of Health (BOH) actions addressing widespread septic system failures	Yes	Town staff, 2013 Town of Southampton Master Plan, Board of Health records

Where one or more of these SVFs are present, the Town must sample and inspect the catchment area 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 flow to the MS4.

Manhole Inspection Methodology

Identification of Key Junction Manholes

The Town shall systematically and progressively observe, sample, and evaluate all key junction manholes to locate evidence of illicit discharges. A **junction manhole** is defined as a manhole or manhole structure with two or more inlets accepting flow from two or more MS4 alignments. **Key junction manholes** are defined as junction manholes that can represent one or more junction manholes without compromising adequate implementation of the illicit discharge program.

The following methodology will be used to identify Southampton's key junction manholes for each catchment using the Town's existing stormwater GIS mapping:

1. Identify junction manhole(s)
 - a. Manholes that have at least two inlets
 - b. Do not include inlets from catch basins unless the catch basins are in line
2. Identify key junction manhole(s)
 - a. Based on upstream catchment areas, amount of drainage represented by a junction manhole, and implementation of the IDDE Program
 - b. Assign primary and secondary key junction manholes if applicable – depending on the size of the catchment, there could be multiple junction and key junction manholes

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

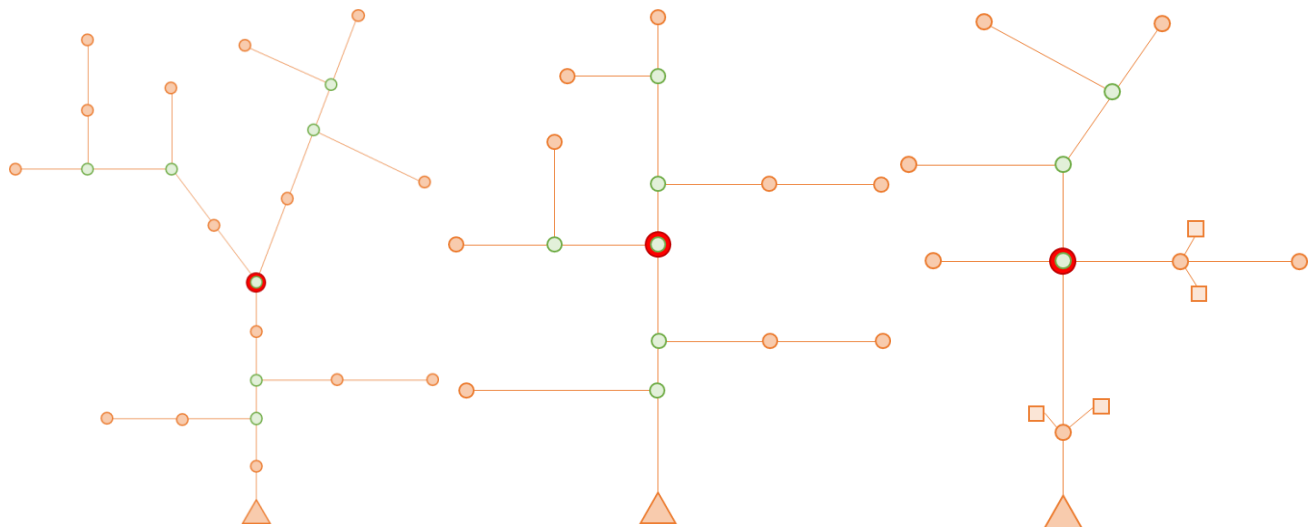


Figure 1. Examples of identification of junction and key junction manholes (adapted from the Center for Watershed Protection's *IDDE Guidance Manual*, Chapter 13: Tracking Discharges to a Source).

This analysis will be completed using Southampton'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.

If a catchment does not include a junction manhole, the dry weather screening completed at the catchment's outfall shall meet 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 indicated there was no flow and no evidence of illicit discharges at the outfall, and if there is no SVF for the catchment, the catchment is considered complete.

Dry Weather 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.

During dry weather, key junction manholes shall be opened and inspected for visual and olfactory evidence of illicit connections. The Town shall investigate each key junction manhole within the MS4, even if no evidence of an illicit discharge is present at the outfall. If a catchment does not include a key junction manhole, investigations shall take place at a junction manhole.

The Town will begin at the most downstream key junction manhole (nearest to the outfall) and work upstream. The Town shall open key junction manholes and inspect them for visual and olfactory evidence of illicit connections.

Inspection of key junction manholes will proceed as follows:

1. Manholes will be opened and inspected for visual and olfactory evidence of illicit connections. A sample field inspection form is attached.
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. Additional indicator sampling may assist in determining potential sources (e.g., bacteria for sanitary flows).
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.

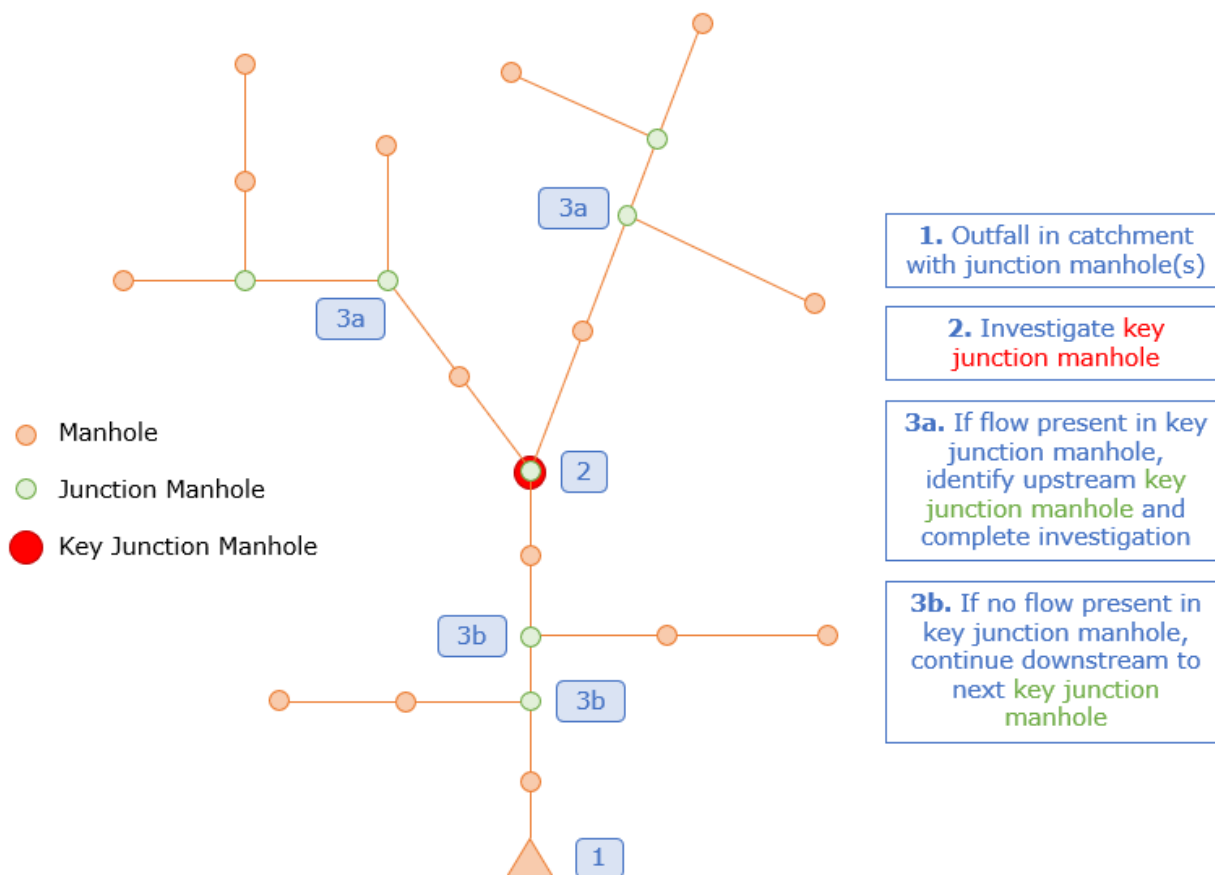


Figure 2. Example procedure for isolating illicit discharge between manholes (adapted from the Center for Watershed Protection's *IDDE Guidance Manual*, Chapter 13: Tracking Discharges to a Source).

Please refer to the attached Dry Weather Manhole Inspection and Sampling Methodology Procedure and Dry Weather Manhole Sampling Collection Field Sheet for the Town of Southampton for additional details.

Wet Weather Investigations

When one or more of the SVFs listed in Table 1 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 waste flow to the MS4.

Investigations will be conducted during wet weather for catchments where one or more SVFs have been identified, per Section 2.3.4.8.c.ii.2 of the 2016 Small MS4 General Permit. The schedule to complete catchment investigations depends on the catchment priority ranking as updated after dry weather screening; however, this sampling must be completed before the catchment investigation is marked as complete. The EPA strongly recommends sampling during the spring (March through June) when groundwater levels are relatively high.

To complete wet weather sampling, the Town will follow the attached Wet Weather Outfall Sampling Procedure. The Town shall inspect and sample under wet weather conditions to the extent necessary to determine whether wet weather-induced high groundwater in areas served by septic systems result in discharges of sanitary flows to the MS4.

The 2016 Small MS4 General Permit does not specify wet weather catchment investigation procedures; 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 (not applicable)

Where water quality screening, sampling results, and/or visual and olfactory observations indicate a potential illicit discharge, the upstream area will be flagged for additional investigation and/or isolation and confirmation of sources. Refer to the attached Wet Weather Outfall Sampling Procedure and Wet Weather Sample Collection Field Sheet for additional information. All data collected as part of the dry and wet weather investigations shall be recorded and reported in each annual report.

Procedures to Isolate and Confirm Sources of Illicit Discharges

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. 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.

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

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

Common field equipment needed for isolation and confirmation methods includes:

Maps, Documents

- Storm drain maps
- Site plan, building diagram
- Letter describing investigation
- Identification (e.g., badge or ID card)
- Pollution prevention educational materials
- Spill response agency contact information

Equipment to Find and Lift the Manhole

- Probe
- Metal detector
- Crow bar

Safety Equipment

- Hard hat
- Safety vest
- Traffic control equipment
- Gas monitor
- Eye protection
- Gloves
- Steel-toed boots
- Protective clothing

General Equipment

- Field notebook
- High powered lamps or flashlights
- Camera
- Measuring tape

As described below, each method will require additional specialized equipment, such as two-way radios, testing dye, or sandbags. The following descriptions are based on the Center for Watershed Protection's IDDE Guidance Manual, Chapter 13: Tracking Discharges to a Source.²

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 lowered on a rope through the manhole to form a dam along the bottom of the storm drain, taking care not to fully block the pipe (in case it rains before the sandbag is retrieved), as shown in Figure 3.

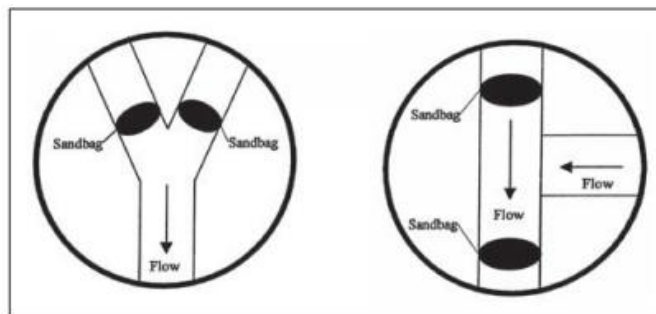


Figure 3. Example sandbag placement (from Center for Watershed Protection Center for Watershed Protection's IDDE Guidance Manual, Chapter 13: Tracking Discharges to a Source).

Sandbags should not be left in place during a heavy rainstorm. 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.

² https://www3.epa.gov/npdes/pubs/idde_chapter-13.pdf

Smoke Testing

Smoke testing involves injecting non-toxic smoke into drain lines and noting the emergence of smoke from sanitary sewer vents in illegally connected buildings or from cracks and leaks in the system itself. Basic equipment needed for smoke testing includes manhole safety equipment, a smoke source such as a smoke “bomb” or “candle” or liquid smoke, smoke blower, and sewer plugs. The two most common situations that indicate an illicit discharge are when smoke is seen rising from internal plumbing fixtures or from sewer vents.

Typically the storm drain is sealed off by plugging storm drain inlets, a smoke bomb or smoke generator is used to inject the smoke into the system at a catch basin or manhole, and air is then forced through the system. Test personnel are placed in areas where there are suspected illegal connections or cracks/leaks, noting any escape of smoke (indicating an illicit connection or damaged storm drain infrastructure). Only one manhole is tested at a time. Blowers should be set up next to the open manhole after the smoke is started.

The storm drain can be sealed off via sandbags lowered into place with a rope, beach balls with a diameter larger than the pipe can be placed in a mesh bag with a rope attached and lowered into the pipe, or expandable plugs can be inserted.

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. Residents should be notified at least two weeks prior to testing, and should be provided the date testing will occur, the reason for smoke testing, precautions they can take to prevent smoke from entering their residence, what they should do should smoke enter their residence, health concerns associated with the smoke, and a number residents can call to relay any particular concerns.

If the initial test of the storm drain system is unsuccessful then a more thorough smoke-test of the sanitary sewer lines can also be performed. Unlike storm drain smoke tests, buildings that do not emit smoke during sanitary sewer smoke tests may have problem connections and may also have sewer gas venting inside, which is hazardous. It should be noted that smoke may cause minor irritation of respiratory passages. Residents with respiratory conditions may need to be monitored or evacuated from the area of testing altogether to ensure safety during testing.

Dye Testing

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

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

In most cases, liquid dye is used, although solid dye tablets can also be placed in a mesh bag and lowered into the manhole on a rope, or dye strips, powder, wax cakes, or donuts can be used. Green and liquid dyes are the easiest to see, but test strips can be a good alternative for residential or commercial applications where potential permanent staining from the dye is a concern. Multiple colors of dye should be used when testing multiple fixtures.

Pick the closest manhole possible to make observations, typically a sewer lateral; if this is not possible, make observations at the nearest downstream manhole. The investigation is not complete until the dye is found; if the dye is missing, it is possible that the building is actually connected to a septic system instead of the sewer system, the sewer line is clogged, or there is a leak.

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.

CCTV/Video Inspections

Another method of source isolation involves the use of mobile video cameras that are guided remotely through stormwater drain lines to observe possible illicit discharges. IDDE program staff can review the videos and note any visible illicit discharges. Prior to video inspections, the field crew should review storm drain maps and, if possible, visit the site to help determine the size of camera needed and whether the storm drain has standing water.

Video testing requires a Closed-Circuit Television (CCTV) camera, which can be self-propelled or towed. Many commercially available camera systems are adapted to televise storm sewers or sanitary sewers. The camera should be capable of radial view and able to swivel both horizontally and vertically, should be in color, and lighting should be supplied by a lamp on the camera. If the storm drain has ponded water, the camera should be attached to a raft.

Video testing is useful when access to properties is constrained, but will not test all types of discharges. While this tool is both effective and usually definitive, it can be costly and time consuming when compared to other source isolation techniques.

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 (OBM) 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 (known as an OBM trap). The pad is retrieved at a later date and placed under UV light to determine the presence/absence of brighteners during the monitoring period. This method is most reliable for undiluted washwaters.

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.

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) – there are no Problem Outfalls currently identified in Town.
- 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).

Attachments

Attachment 1 - System Vulnerability Factors Analysis

Attachment 2A - Dry Weather Manhole Inspection and Sampling Methodology

Attachment 2B - Dry Weather Manhole Sample Collection Field Sheet

Attachment 3A - Wet Weather Outfall Sampling Procedure

Attachment 3B - Wet Weather Outfall Sample Collection Field Sheet

J:\S\S5005 Southampton\013 - MS4 Year 2 Compliance\Reports\Catchment Investigation Procedure\0 - Southampton Catchment Investigation Procedures.docx

Outfall ID	Receiving Water	History of SSOs	Common or Twin Invert Manholes	Common Trench Construction	Storm / Sanitary Sewer Crossings (Sanitary Above)	Sanitary Lines with Underdrains	Inadequate Sanitary Level of Service	Areas Formerly Served by Combined Sewers	Sanitary Infrastructure Defects	SSO Potential in the Event of System Failures	Sanitary and Storm Drain Infrastructure > 40 Years Old	Septic with Poor Soils or Water Table Separation	History of Board of Health Actions Addressing Septic Failure
1	Outside Receiving	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	Yes	Yes
2	Manhan River	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No	No
3	Sawmill Brook	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No	No
4	Outside Receiving	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No	No
5	Outside Receiving	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No	No
6	Outside Receiving	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No	No
7	Outside Receiving	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No	No
8	Outside Receiving	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No	No
9	Outside Receiving	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	Yes	Yes
10	Outside Receiving	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	Yes	Yes
11	Pequot Pond	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No	No
12	Outside Receiving	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	Yes	Yes
13	Outside Receiving	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	Yes	Yes

Dry Weather Manhole Inspection and Sampling Methodology

The following document establishes procedures for use of field kits and field data collection for dry weather sampling of manholes in the Town of Southampton, MA as part of the Catchment Investigation Procedures developed in accordance with section 2.3.4.8.b. of the EPA NPDES General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) in Massachusetts (General Permit).

- 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). Document source used to determine dry weather conditions (e.g., www.wunderground.com, www.cocorahs.org) on the attached Dry Weather Sampling Field Sheet.
- 2) Notify the Town of Southampton of sampling schedule prior to going into the field:
 - a. Randall Kemp, Southampton Highway Superintendent: (413) 527-3666, highwaydept@townofsouthampton.org
 - b. Southampton Police Department: (413) 527-1120, chief@southamptonpolice.com
- 3) Locate the catchment's key junction manhole¹ (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., waste, toilet paper, gray bacterial growth, or the presence of sanitary products) and olfactory evidence of illicit discharge/connections.
- 5) If dry weather flow is present, 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.
- 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 is otherwise inaccessible, proceed to the next upstream junction manhole to complete the inspection and screening. Notify the Highway Department of any maintenance issues requiring attention.

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

- 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

- 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, continue upstream to the next key 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 SSO 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 in a catchment must be screened in order for the catchment investigation to be considered complete.

- 12) Equipment/Items Needed

Field Equipment	Paperwork	Personal Gear
☐ Sampling pole	☐ Signed Site Safety Plan	☐ Steel-toed boots
☐ Carry caddy	☐ Field sheets	☐ Safety goggles
☐ Digital camera or iPad	☐ Field maps	☐ Reflective safety vest
☐ First aid kit	☐ Key junction manhole locations map	☐ Insect repellent
☐ Surfactants test kit and glass container for liquid waste to be disposed of as hazardous waste	☐ Center for Watershed Protection, IDDE Guidance Manual, Chapter 13	☐ Sunscreen
☐ Ammonia test kit and glass container for ampules to be disposed of as hazardous waste		☐ Business cards
☐ Chlorine test kit and glass container for chloride kit liquid waste to be diluted and disposed of down sink		
☐ Flashlight or head lamp		
☐ Nitrile gloves		
☐ Tape measure		
☐ 1 liter bottle		
☐ Duct tape		
☐ Sharpies		
☐ Paper towels		
☐ Trash bags		



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 (NH ₃) (≥ 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: Data Collection

SAMPLE COLLECTED FOR LAB ANALYSIS?	☐ No ☐ Yes – E. coli
------------------------------------	--

Section 6: Notes

Wet Weather Outfall Sampling Procedure

The following document establishes procedures for wet weather outfall sampling in the Town of Southampton, MA as part of the Catchment Investigation Procedures developed in accordance with section 2.3.4.8.b. of the EPA NPDES General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) in Massachusetts (General Permit).

- 1) For all catchments with a minimum of one (1) System Vulnerability Factor identified, the Town of Southampton shall inspect and sample under wet weather conditions to the extent necessary to determine whether wet weather-induced high groundwater in areas served by septic systems result in discharges of sanitary flow to the MS4.
- 2) Definition of wet weather: A storm is considered a representative wet weather event if there is a rainfall event sufficient to produce a stormwater discharge and occurs at least 72 hours after the previously measurable (greater than 0.1 inch of rainfall) storm event.
 - Weather Underground (<https://www.wunderground.com>) or the Community Collaborative Rain, Hail, & Snow Network (<https://www.cocorahs.org>) can be used to determine the previous rainfall event time and amount.
 - 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.
 - In general, a minimum of 0.25 inches of rain in the previous 24 hour period is preferred.
 - The drain system must be actively flowing at the time of sampling.
 - Sampling during periods of medium to high intensity rainfall/storm drain discharge is preferred.
 - Avoid sampling during the "first flush," or the initial surface runoff from a rainstorm.
- 3) Review supplies of sampling bottles and test kits on a weekly basis and order as necessary for field sampling activities.
- 4) Notify the Town of Southampton of sampling schedule prior to going into the field:
 - a. Randall Kemp, Southampton Highway Superintendent: (413) 527-3666, highwaydept@townofsouthampton.org
 - b. Southampton Police Department: (413) 527-1120, chief@southamptonpolice.com
- 5) The attached Wet Weather Outfall Inspection and Sample Collection Form should be used to document observations related to the quality of stormwater conveyed by the structure.
- 6) Observations of an **oil sheen**, **discoloration**, and/or **trash and debris** can indicate sources of pollution within the storm drain system.

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

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

- Color or odor: Indicator of raw materials, chemicals, or sewage.
- Excessive sediment: indicator of disturbed earth of other unpaved areas lacking adequate erosion control measures.
- Sanitary waste and optical enhancers (fluorescent dyes added to laundry detergent): indicators of illicit discharge.
- Orange staining: indicator of high mineral concentrations.

Many of these observations are indicators of an illicit discharge, but several of these indicators may also occur naturally. Orange staining may be the result of naturally occurring iron, and thus unrelated to pollution.

Foam can be formed when the physical characteristics of water are altered by the presence of organic materials. Foam is typically found in waters with high organic content such as bog lakes, streams that originate from bog lakes, productive lakes, wetlands, or woody areas. To determine the difference between natural foam and foam caused by pollution, consider the following:

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

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

- 7) The Wet Weather Outfall Inspection and Sample Collection Form includes fields where these and other specific observations can be noted. The inspector shall indicate the presence of a specific water quality indicator or parameter by marking "Yes". If "Yes" is marked, provide additional details in the comments section. If the indicator in question is not present mark "No".
- 8) In-Situ Screening and Field Parameter Collection:
 - Sample storm drain outfalls as close to the outfall opening as possible, wearing a fresh pair of disposable gloves.
 - 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.

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

- 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.
- 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.

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

- Conductivity
- Salinity
- Temperature

11) 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
Conductivity	> 2,000 µS/cm	Center for Watershed Protection
Temperature	> 83 °F	314 CMR 4.00 for Class B Warm Water
Salinity	> 0.5 ppt Rivers	EPA Voluntary Estuary Monitoring Manual

12) 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.

13) Analytical Sample Collection: Sample collection methods shall follow test procedures outlined in 40 CFR 136. A discrete grab sample can classify water at a distinct point in time. These samples are easily collected and used primarily when the water quality of the discharge is expected to be homogeneous, or unchanging, in nature.

14) Protocols for collecting a grab sample shall include the following:

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

- Do not overfill sample containers, and do not dump out any liquid in them. Liquids are often added to sample containers intentionally by the analytical laboratory as a preservative or for pH adjustment.
 - Do not allow any object or material to fall into or contact the collected water sample.
 - Do not allow rainwater to drip from rain gear or other surfaces into sample containers.
 - Replace and tighten sample container lids immediately after sample collection.
 - Accurately label the sample with the time and location.
- 15) Document on the Wet Weather Outfall Inspection and Sample Collection Form that analytical samples were collected, specify parameters, and note the sample time on the Form. This creates a reference point for samples.
- 16) 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.

All Outfalls	Impaired Waterbodies ¹	EPA Approved Method for Analysis
Collect <i>E. coli</i> samples first, in a separate sterile sample bottle.	<u>Manhan River (MA34-11)</u> <i>E. coli</i> ²	<i>E. coli: 1603 (preferred); 1103.1; Colilert 12® 16; Colilert-18® 12 15 16; mColiBlue-24® 17</i>
	<u>Pequot Pond (MA32055)</u> Phosphorus (Total) <i>Dissolved Oxygen</i>	Phosphorus (Total): 365.1; 365.2; 365.3; SM 4500-P-E <i>Dissolved Oxygen: 360.1/360.2</i>
	<u>All outfalls – Long Island South TMDL</u> Nitrogen (Total)	Nitrogen (Total): 351.1/351.2 + 353.2
Notes: ¹ Table is based on the most recent approved Massachusetts Integrated List of Waters (2014), and will need to be updated when new Massachusetts Integrated Lists of Waters are finalized. ² Constituents that are in <i>blue italics</i> will already be analyzed in-situ or as part of the 2016 Small MS4 General Permit sampling requirements and do not require additional lab analysis.		

- 17) 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, check parameter analysis box if a threshold was exceeded, and check outfall completed box when done. **Make note of the first bacteria sample time for determining the hold limit until lab analysis.**
- 18) 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.
- 19) 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 form.

20) Equipment/Items Needed

Field Equipment	Paperwork	Personal Gear
☐ Sample bottles and holding time and storage requirements (from lab)	☐ Signed Site Safety Plan	☐ Waders or other appropriate footwear (steel-toed boots if opening manholes)
☐ Extra sample bottles in case of contamination, cracking, or loss	☐ Sampling plan and locations	☐ Safety goggles
☐ Cooler with ice	☐ Field sheets	☐ Reflective safety vest
☐ Digital camera or iPad	☐ Field maps	☐ Insect repellent
☐ Flashlight or head lamp	☐ Chain of Custody form, filled out	☐ Sunscreen
☐ Nitrile gloves	☐ Bottle labels in Ziploc bag	☐ Business cards
☐ Tape measure	☐ Center for Watershed Protection, IDDE Guidance Manual, Chapters 11 & 13	☐ Light colored long-sleeved shirts and pants
☐ Sampling pole		
☐ First aid kit		
☐ Tape measure		
☐ Water quality meter(s)		
☐ Watch with a second hand		
☐ Carry caddy		
☐ Surfactants test kit and glass container for liquid waste to be disposed of as hazardous waste		
☐ Ammonia test kit and glass container for ampules to be disposed of as hazardous waste		
☐ Chlorine test kit and glass container for chloride kit liquid waste to be diluted and disposed of down sink		
☐ 1 liter bottle		
☐ Duct tape		
☐ Sharpies		
☐ Paper towels		
☐ Trash bags		



WET WEATHER OUTFALL SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

SUBWATERSHED:	OUTFALL ID:	LOCATION:
TODAY'S DATE:	TIME:	
INVESTIGATOR(S):		
TEMPERATURE (°F):	RAINFALL (IN.) - LAST 72 HOURS:	LAST 24 HOURS:

Section 2: Visual Inspection of Outfall/Pool

VISUAL INSPECTION	PRESENT?	DESCRIPTIONS
MAINTENANCE NEEDS	☐ Yes ☐ No	☐ Cracked ☐ Deteriorated (concrete) ☐ Yard Waste ☐ Crushed ☐ Corroded (metal) ☐ Other: ☐ Clogged with Debris ☐ Trash
SUBMERGED IN WATER	☐ Yes ☐ No	☐ Partially ☐ Fully
SUBMERGED WITH SEDIMENT	☐ Yes ☐ No	☐ Partially ☐ Fully
FLOW	☐ Yes ☐ No	☐ Trickle ☐ Moderate ☐ Substantial
DEPOSITS/STAINS	☐ Yes ☐ No	☐ None ☐ Foam ☐ Other: ☐ Grease/Oil ☐ Heavy sedimentation deposits ☐ Paper/Trash
SURROUNDING VEGETATION	☐ Yes ☐ No	☐ Little to No Distress ☐ High Distress ☐ Moderate Distress
ABNORMAL VEGETATION IN OUTFALL	☐ Yes ☐ No	☐ Excessive ☐ Inhibited
ERODIBILITY	☐ Yes ☐ No	☐ Little or No Erosion ☐ Many Eroded Areas ☐ Small Areas of Erosion
POOR POOL QUALITY	☐ Yes ☐ No	☐ Odors ☐ Suds ☐ Colors ☐ Algae ☐ Floatables ☐ Oil Sheen ☐ Other:
PIPE BENTHIC GROWTH	☐ Yes ☐ No	☐ Brown ☐ Other: ☐ Orange ☐ Green

Section 3: Visual Inspection of Outfall Flow

VISUAL INSPECTION	PRESENT?	DESCRIPTIONS	RELATIVE SEVERITY INDEX
ODOR	☐ Yes ☐ No	☐ Sewage ☐ Petroleum/gas ☐ Other: ☐ Rancid/sour ☐ Sulfide	☐ 1 – Faint ☐ 2 – Easily detected ☐ 3 – Noticeable from a distance
COLOR	☐ Yes ☐ NO	☐ Clear ☐ Gray ☐ Green ☐ Orange ☐ Brown ☐ Yellow ☐ Red ☐ Other:	☐ 1 – Faint colors in sample bottle ☐ 2 – Clearly visible in sample bottle ☐ 3 – Clearly visible in outfall flow
TURBIDITY	☐ Yes ☐ NO	See severity	☐ 1 – Slight cloudiness ☐ 2 – Cloudy ☐ 3 – Opaque
FLOATABLES (DOES NOT INCLUDE TRASH)	☐ Yes ☐ NO	☐ 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., oil sheen, suds, sanitary materials)

Section 4: Field Parameters

PARAMETER	BENCHMARK	EQUIPMENT TO USE	RESULT/NOTES
TEMPERATURE	> 83°F ^a	Water Quality Meter or Thermometer	
CONDUCTIVITY	> 2,000 uS/cm ^b	Water Quality Meter	
SALINITY (PPT)	> 0.50 River ^c	Water Quality Meter	
SURFACTANTS (MG/L)	≥ 0.25 ^d	MBAS Test Kit (CHEMetrics K-9400)	
AMMONIA (NH ₃) (MG/L)	≥ 0.50 ^d	Test Strips	
CHLORINE (MG/L)	≥ 0.02 ^e	Hach Pocket Colorimeter	

^a 314 CMR 4.00, *Massachusetts Surface Water Quality Standards*, Class B Warm Water^b Center for Watershed Protection, *Illicit Discharge Detection and Elimination Manual*^c EPA, *Voluntary Estuary Monitoring Manual*^d EPA, *New England Bacterial Source Tracking Protocol*^e EPA NPDES, *General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts***Section 5: Sample Collection for Laboratory Analysis**

SAMPLE FOR LAB	RESPONSE
SAMPLE COLLECTED FOR LABORATORY ANALYSIS	☐ <i>Escherichia Coli</i> ☐ Fecal Coliform ☐ Total Nitrogen ☐ Turbidity ☐ Total Suspended Solids ☐ No Samples Collected for Lab
SAMPLE COLLECTION LOCATION	☐ Flow ☐ Pool
INTERMITTENT FLOW TRAP RECOMMENDED?	☐ Yes ☐ NO

Section 6: Notes