

**TOWN OF NEWBURY**  
**ILLICIT DISCHARGE DETECTION AND ELIMINATION PROGRAM**

**US ENVIRONMENTAL PROTECTION AGENCY**  
**GENERAL PERMIT FOR STORMWATER DISCHARGE**  
**FROM SMALL MUNICIPAL**  
**SEPARATE STORM SEWER (MS4) SYSTEMS**

June 30, 2019

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## REVISION HISTORY

Rev #PageDate

### Description

Approved

[illegible]

## INTRODUCTION

The Town of Newbury, Massachusetts is required by the US Environmental Protection Agency to obtain a permit to discharge stormwater into the “waters of the United States which essentially include any river, stream, marsh, swamp or other wetland. The permit was issued effective July 1, 2018, and will be in effect for five years.

The permit prohibits any discharge that is not any unadulterated stormwater, with nineteen exceptions that are enumerated in section 2.4 of the Permit. All other discharges are considered to be illicit.

The permit allows the following non-storm water discharge categories, unless identified as a significant contributor to pollutants to the MS4 and would therefore be deemed an “illicit discharge”.

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

There are several aspects to the permit. This document deals only with Illicit Discharge Detection and Elimination (IDDE). Other permit requirements are discussed in the document entitled “Town of Newbury Stormwater Management Program”, to which all readers of this program are referred.

This permit requires that the Town perform certain tasks in the interest of improving the quality of the stormwater that it discharges into our wetlands and rivers (the so-called “waters of the United States”).

These tasks involve, among other things, public education, good housekeeping, and appropriate town regulations for the post construction stormwater management and construction site runoff.

This program the identification of sources that would result in pollution of stormwater that discharges to the Town’s MS4 area (“illicit discharges”) and procedures to prevent such discharges. If identified, the illicit discharge must be eliminated

This program involves the following broad categories:

1. System Mapping

This involves development and revisions to a map that depicts the municipal separate storm sewer system.

2. Inspection

This involves observation of the stormwater system (pipes, catch basins and manholes) to look for signs of an illicit discharge (for example, toilet paper), as well as any damage to the system.

3. Sampling and Testing

This involves tests for the following contaminants:

- Ammonia
- Chlorine
- Conductivity
- Detergents
- E-Coli bacteria/or Enterococcus
- Fecal Coliform bacteria
- Salinity
- Temperature

4. Enforcement

This involves assuring that the source of contamination is removed.

The geographic area covered by the Permit is shown as green on the following map. This area is referred to as the “MS4 area”.

## **LEGAL BASIS**

A Town of Newbury By-law, Chapter 87, "Stormwater Management and Illicit Discharge and Erosion Control" was passed at Town Meeting on May 26, 2009, and subsequently revised on several occasions. This by-law prohibited illicit discharges, and provided for enforcement.

"Rules and Regulations, Town of Newbury Stormwater Management Illicit Discharge and Erosion Control" was originally promulgated in 2010, and subsequently revised. The Newbury Conservation Commission is responsible for enforcement.

Both of the above documents are available on the Town of Newbury website.

## **SANITARY SEWER OVERFLOWS**

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

No sanitary sewer overflows have occurred in Newbury within the five (5) years prior to the effective of the permit, based on review of available documentation. Except for a few houses in the immediate vicinity of the Newburyport city line the only sanitary sewer in Newbury is on Plum Island, which is a pressure system that also services the Newburyport (north) end of Plum Island, as well as the Plum Island Turnpike in Newbury. The City of Newburyport, by inter-municipal agreement, is responsible for the operation and maintenance of the Plum Island system.

While there have been leakages of the sewer system on Plum Island in the past none were in Newbury nor was there any credible way for the discharge to find its way to the Newbury storm drain system.

Upon detection of an SSO, Newbury will work with the City of Newburyport to eliminate it as expeditiously as possible and take interim measures to minimize the discharges of pollutants to and from its MS4 area until the SSO is eliminated. Upon becoming aware of an SSO to the MS4, Newbury will provide oral notice to the EPA within 24 hours and written notice to the EPA and Massachusetts Department of Environmental Protection (MASS DEP) within five (5) days of becoming aware of the SSO occurrence.

## **SYSTEM MAPPING**

A paper map of outfall locations was prepared under the 2003 Permit. This map also shows manholes and catch basins.

An electronic map of the storm sewer system is being prepared as part of the current (2018) permit. It is a part of the stormwater inspector database which will be used for maintenance inspections and water quality sampling.

The revised map will show substantially more detail of Newbury's storm water collection system. The pertinent requirements are itemized in Section 2.3.4.5 of the Permit.



### **IDDE RESPONSIBILITIES**

The Board of Selectmen have delegated overall responsibility of the IDDE program to the Town Administrator. The Town Administrator in turn, has delegated operational responsibility and day to day supervision to the Director of Public Works. The following table enumerates the responsibilities of the various Town departments.

IDDE Enforcement Authority  
Under the Stormwater By-Law

Conservation Commission

General supervision of the IDDE  
Program

Tracy Blais  
Town Administrator

Day to day supervision of the IDDE  
program and reporting

James Sarette  
DPW Director

Enforcement Authority for SSOs

James Sarette  
DPW Director

(working through the Director of the Newburyport Department of Public Services)

Enforcement Authority for septic  
systems

Board of Health

Enforcement Actions

Town Counsel

### **ASSESSMENT AND PRIORITY RANKING OF OUTFALLS**

All of Newbury's receiving waters are impaired, according to the 2016 303 list, with fecal coliform. These include the Merrimack, Plum Island, Parker and Little Rivers. Consequently all of Newbury's outfalls must be treated as high priority or problem outfalls, per section 2.3.4.7 of the Permit.

The following outfalls shall be treated as problem outfalls. The designators show the street on which the outfalls is located, the sequential number designating the outfall, and the water body into which the outfall discharges. For example, Outfall #B5L01L designates the first outfall in Bittersweet lane, discharging into Little River.

These outfalls were chosen based upon septic system failure issues and population density as well as local knowledge of soils and depth to ground water.

It should be noted that virtually all of Newbury, except the Plum Island and Plum Island Turnpike areas, are presently served by septic systems.

All other outfalls, as shown on the system map, with the exception of the following 29 problem outfalls, are considered high priority outfalls due to their discharge to impaired waters.

Other than distinguishing between "problem" and "high priority" outfalls, there are no criteria that make one outfall more important than another within the two designations.

<b>PRIORITY OUTFALL</b>	<b>COMMENTS</b>	<b># OUTFALLS</b>
1. BSL-01-L Bittersweet Lane	Tight soil, high groundwater	1
2. FD-01-P Through FD-13-P Fatherland Drive	Marginal soil, history of septic system problems	13
3. FO-01-P Through FO-02-P Forest Drive	High groundwater table	2
4. GR-01-P Grove St.	High groundwater table	1
5. HAN-03-L Hanover St.	Tight soil, high groundwater table	1
6. KH-01-P, 07-P Knob Hill	Tight soil	2
7. MN-01-P, 02-P Main St.	High groundwater table	2
8. MOR-01-L Morgan Ave.	Tight soil, high groundwater table	1
9. OAK-01-M Discharges to Newburyport system	Small lots, old neighborhood	1
10. O-01-PI Old Point Rd.	Small lots, history of septic system problems	1
11. PAR-01-L, 02-L Parker St.	Tight soil	2
12. SOPO-01-L, 02-L South Pond St.	Small lots, old neighborhood	2

## **SCREENING AND SAMPLING**

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

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 the National Weather Service Station at Lawrence, MA, municipal airport website will be used as back-up.

<https://www.wunderground.com/history/airport/KLWM/2017/01/13/dailyhistory.html>

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

1. Identify outfall(s) to be screened/sampled based on initial outfall inventory and priority ranking
2. Acquire the necessary staff, mapping, and field equipment (**see Appendix A – Standard Operating Procedures**)
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)
  - 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) (**See SOP #015, Appendix A**). 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 **SOPs in Appendix A**.
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 (**see SOP #011**). 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 Permit only if the previous screening and sampling was substantially equivalent to that required by this Permit, including the list of analytes outlined in Section 2.3.4.7.b.iii.4 of the Permit.

Screening and sampling procedures are included in the **Appendix A:**

**Outfall Monitoring**

**Standard Operating Procedures for Stormwater Sampling**

**Testing and Quality Control**

**Quality Assurance Project Plan.**

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. **See Standard Operating Procedure #007 and 014.**

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

**Table I. Benchmark Field Measurements for Select Parameters**

Analyte or Parameter	Benchmark
Ammonia	>0.5 mg/L
Conductivity	>2,000 $\mu$ S/cm
Surfactants	>0.25 mg/L
Chlorine	>0.02 mg/L (detectable levels per the 2016 MS4 Permit)
Indicator Bacteria <sup>1</sup> :	
<i>E.coli</i>	<i>E.coli</i> : 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
<i>Enterococcus</i>	<i>Enterococcus</i> : 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
Fecal Coliform	Fecal coliform: The geometric mean of MPN shall not exceed 14 organisms per 100ml, nor shall 10% of samples exceed an MPN of 28 organisms per 100ml.

<sup>1</sup> Massachusetts Water Quality Standards: <http://www.mass.gov/eea/docs/dep/service/regulations/314cmr04.pdf>

## **CATCHMENT INVESTIGATION PROCEDURES**

These procedures will be published by December 31, 2019, as Appendix B of this program.

### **ILLICIT DISCHARGE REMOVAL**

When the specific source of an illicit discharge is identified, the Town of Newbury will require its removal. The annual report will include the status of IDDE investigation and removal activities including the following information for each confirmed source:

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

#### *Confirmatory Outfall Screening*

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



### **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 this program. Ongoing wet weather screening and sampling will also be conducted at outfalls where wet weather screening was required due to System Vulnerability Factors. All sampling results will be reported in the annual report.

**SCHEDULE OF IDDE ACTIVITIES REQUIRED BY THE PERMIT**

1. Notice of Intent	September 30, 2018
2. System Map Update (annual updates thereafter)	June 30, 2020
3. Outfall/Interconnection Inventory (annual updates thereafter and Screening of problem outfalls is planned)	June 30, 2019
4. Inspect outfalls for the presence of of dry weather flow	June 30, 2021
5. Develop an outfall and interconnection screening and sampling procedure (included in this IDDE program as Appendix A)	June 30, 2019
6. Priority Ranking Update	June 30, 2021
7. Catchment Investigation Procedure (included within this IDDE program within Appendix A - screening and sampling procedure)	December 31, 2019
8. Confirmatory outfall screening of outfalls with identified and removed illicit discharge	One year after removal of identified illicit discharges
9. Ongoing Screening	Every five years
10. Complete problem catchment investigations	50% - June 30, 2021 100% - June 30, 2023

**TOWN OF NEWBURY**

**MUNICIPAL SEPARATE STORM SEWER SYSTEMS  
ILLCIT DISCHARGE DETECTION AND ELIMINATION**

**OUTFALL MONITORING**

**STANDARD OPERATING PROCEDURES FOR  
STORMWATER SAMPLING, TESTING & QUALITY CONTROL  
AND  
QUALITY ASSURANCE PROJECT PLAN**

**APPENDIX A**

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1. Revision History
2. Introduction
3. Organization
4. Definitions
5. Training
6. Safety
7. Quality Control
8. Sampling and Tracking: General Procedure
9. Standard Operating Procedures for Sampling

SOP #001 Ammonia  
SOP #002 Chlorine  
SOP #003 Conductivity, PH, Salinity and Temperature  
SOP #004 Detergents  
SOP #005 E Coli, Enterococci, Fecal Coliform  
SOP #006 Grab Sampling  
SOP #007 Sampling Pole  
SOP #008 Caulk/Sandbag Dams  
SOP #009 Sample Dilution Procedure  
SOP #010 Data Recording Procedure  
SOP #011 Manual Flow Rate Determination  
SOP #012 Records Management  
SOP #013 Key Junction Manhole Inspection Procedure  
SOP #014 Visual/Olfactory Determination  
SOP #015 Lab Housekeeping

10. References

## REVISION HISTORY

<u>Rev #</u>	<u>Page</u>	<u>Date</u>	<u>Description</u>	<u>Approved</u>
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## **INTRODUCTION**

This standard operating procedure is for the guidance of personnel who are performing collection and testing of stormwater samples in compliance with the terms of the US EPA General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) for the Town of Newbury. These personnel are primarily employees of the Department of Public Works.

The purpose of the testing is to detect illicit discharges of pollutants from storm sewer outfall pipes into our waterways so that such discharge may be eliminated. Consequently, it is essential that the testing results be accurate. Inaccurate reporting defeats the purpose of the stormwater monitoring program.

Hence, this document has been prepared to serve as a procedural guide for personnel involved in sampling and testing. As such, it forms a part of the Town's Illicit Discharge Detection and Elimination Program.

## **ORGANIZATION**

The Board of Selectmen is, of course, responsible for all activities performed in compliance with the terms of the MS4 permit. These responsibilities have been delegated to the Town Administrator, who has further delegated various components of the program as follows:

**DIRECTOR OF PUBLIC WORKS** – The maintenance and repair of the Town of Newbury stormwater collection and discharge system, and the administration of the MS4 program.

**CONSERVATION COMMISSION** – The promulgation of revisions to the Stormwater Management and Illicit Discharge and Erosion Control By-Law, and the Rules and Regulations for Stormwater Management, Illicit Discharge, and Erosion Control and enforcement activities for the above.

**MONITORING COORDINATOR** – Responsible for stormwater sampling, testing and quality control under the EPA MS4 program. The Monitoring Coordinator reports to the Director of Public Works.

**BOARD OF HEALTH** – Enforcement of all rules and regulations, including Title V, pertaining to septic systems.

## **DEFINITIONS**

Lab – The Town of Newbury MS4 stormwater laboratory located in the Newbury Department of Public Works Building, 197 High Road, Newbury

WWTF – The City of Newburyport Wastewater Treatment Facility Laboratory, 157 Water St., Newburyport

SOP – Standard Operating Procedure for sampling, testing and quality control

SDS Sheets – Safety Data Sheets issued by the manufacture of testing equipment, which are available in the lab.

Database – The electronic locations of Town of Newbury outfalls, manholes, catch basins, and conveyances, including descriptions, maintained by the Merrimack Valley Planning Commission. As sampling and testing progress, the database will also include results of tests.

Monitoring Kit – The “tool-box” of instruments and supplies required to perform MS4 field tests and to obtain samples to be tested in the lab or WWTF. It is carried into the field by the samplers.

Monitors – Employees of the Newbury Department of Public Works who have been trained in proper sampling techniques within the past year.

Town – Town of Newbury, Massachusetts



## **TRAINING**

All personnel performing tests or otherwise assisting in the IDDE program will attend a training session on an annual basis. This training session will be held just prior to the spring (March – June) testing season. The training will be done by a consultant employed by the Town, and will consist of the following

1. MS4 program, its nature and purpose
2. The EPA requirements for the IDDE program
3. Status of testing to date, and plans for the upcoming season
4. Recognition of illicit discharge indicators
5. Sampling and Testing Procedures
6. Quality Control Procedures
7. Chain-of-Custody and Transportation Procedures
8. Hazardous Waste Handling and Storage Procedures
9. Safety Procedures, traffic and personal
10. Each person involved in the IDDE program shall perform at least one round of tests, accompanied by the consultant, prior to being allowed to test on their own
11. An up-to-date copy of this document will be given to each person involved in the IDDE program. Each participant will sign for attendance at training sessions and receipt of this document.

## **SAFETY**

1. On the morning of every day that testing will occur, the Newbury Police Department shall be notified (978-462-4440), and be advised of the planned locations.
2. No sampling will be done at catch basins or manholes without the assistance of the Newbury Department of Public Works. Only DPW personnel are allowed to remove manhole covers and catch basin grates.
3. No sampling will be done without wearing an orange or yellow vest, short or coat.
4. Sampling shall always be done by a team of at least two personnel.
5. No monitor may enter private property without the permission of the landowner.
6. Monitors shall wear nitrile gloves and safety glasses while sampling or testing
7. All wash/rinse water and field testing residues shall be returned to the lab for proper storage and ultimate disposal in accordance with legal requirements
8. It should be noted that there are additional safety precautions required when testing for:
  - Ammonia
  - Chlorine
  - Detergents

See the SOP's involved for this information.

9. Only personnel certified for confined space entry may enter manholes.
10. Safety Data Sheets are on hand at the lab, and at the Inspectional Services office in the Newbury Town Hall.

## **QUALITY CONTROL**

1. Obtaining correct test results from the stormwater monitoring program is of the utmost importance. If evidence of an illicit discharge is missed, it defeats the purpose of the monitoring program, and calls the legitimacy of all of our testing into question. If, on the other hand, a test indicates a discharge that is not there, this can generate extra expense, embarrassment, and hard feelings.
2. The procedures contained in this document must be followed to the letter. No deviations will be allowed unless they are approved by the DPW Director, who will record such approved deviation in the logbook.
3. For each day's testing, a field blank of deionized water and a duplicate for each parameter.

## Measurement Quality Goals

Taken together, precision, accuracy, representativeness, completeness, and comparability comprise the major data quality indicators used to assess the quality of the program's data. Town of Newbury shall report measurement quality based on analysis of overall precision, accuracy, and completeness of their data. The data quality objective for each monitored parameter is given below.

- ***Precision*** is the degree of agreement among repeated field measurements of the same indicator and gives information about the consistency of your methods. It is typically defined as relative percent difference, or RPD.
- ***Accuracy*** is a measure of confidence that describes how close a measurement is to its "true" or expected value.
- ***Representativeness*** is the extent to which measurements actually represent the true environmental condition. Parameters, site selection (including location of sampling point within the water column), time, and frequency of sample collection can all play a role in determining how representative a sample is.
- ***Comparability*** is the extent to which data can be compared between sample locations or periods of time within a project, or between different projects.
- ***Completeness*** is the comparison between the amount of valid or usable data the program originally intended to collect versus how much was actually collected. Data is usually considered useful in some way. A report detailing the number of anticipated samples, number of valid results, and percent completion (number of valid samples/number of anticipated samples) for each parameter is typically produced.

## **SAMPLING AND TRACKING**

### **GENERAL PROCEDURE**

1. Sampling shall be in conformance with SOP's #006, #007 and #008.
2. Samples of E-coli, fecal coliform, and enterococcus shall be immediately placed inside the iced cooler and taken to the WWTF laboratory within two (2) hours of sampling. WWTF personnel shall perform the required tests within six (6) hours of sampling. Signatures on chain of custody sheets will be obtained.
3. Samples of ammonia and chlorine shall be immediately stabilized with sulfuric acid and transported in an iced container to the lab for testing.
4. On the morning of testing, the testing personnel will report to the lab at 7:00 AM to receive their outfall assignment and pick up the monitoring kit and perform required instrument calibration.

**SOP 001**

**AMMONIA** [0-4 ppm (mg/L) N, 0-80 ppm (mg/L) N]

**Equipment/Supplies:**

Newbury, MA Stormwater Monitoring Kit

HACH Ammonia (Nitrogen) Teststrips, (0.00-6.0 mg/L), catalog #2755325

Extension pole for sampling with whirl-pak's or sampling bottles

**Procedure:**

The outfall flow is tested using the HACH Ammonia (Nitrogen) test strips (0.00-6.0 mg/l), Catalogue #2755325. These strips are immersed directly in the outfall effluent, and then read and recorded in the field, using procedure shown on the test strip container.

## **SOP 002**

**CHLORINE** [0.02 – 0.20 PPM (mg/L)]

### Equipment and Supplies:

Monitoring Kit  
Colorimetric assay field kit:  
    CHEMetrics Detergents CHEMets Kit K-9400  
Chlorine standard solution, Orbeco standard of 1.5 ppm chlorine, Fisher Scientific  
    #15-398-553, or NSI standard of 0.1 ppm chlorine, NSI Lab Solutions as part #QC1-118  
HACH 5-in-1 Water Quality Strips, catalog #2755250  
Extension pole for sampling whirl-pak's or sampling bottles

### Procedure:

The flow from the outfall shall be tested directly with the HACH 5-in-1 water quality test strips. If a reading is found, this shall be entered into the database, and the test for chlorine shall be considered complete.

If no reading on the test strip is found, a sample is taken and analyzed with the CHEMetrics Chlorine CHEMets Kits K-2511/R-2511, in conformance with the manufacturer's instructions.

For the analysis with the CHEMets Kit, the sample must be taken with a glass container, since any free chlorine will react with the plastic and result in a false reading. The container used for chlorine sampling shall be soaked for an hour in a light bleach solution at the beginning of the spring and fall sampling seasons and rinsed three times with deionized water. It shall be rinsed once with deionized water at the beginning of each sampling day thereafter.

### Field Analysis:

The sample shall be field tested within 15 minutes from collection.

### Quality Control:

For quality control in the field, or in the monitoring lab, the first sample analyzed is analyzed in parallel with a field blank of deionized water and with a known chlorine standard solution provided in the Monitoring Kit. For every 10 samples measured in the field a measurement on a duplicate sample is taken.

### Safety:

The reaction contains hazardous materials. Nitrile gloves and safety glasses are to be used. All assayed samples and used reagents are to be emptied into the marked chlorine waste amber glass container supplied with the Monitoring Kit. The waste container is returned to the lab and is properly stored at the DPW barn for later hazardous waste disposal.

Safety Data Sheets (SDS) for CHEMetric Chlorine Kit and for the chlorine standards are kept on file with the DPW Director and with Newbury Inspectional Services. A paper copy of SDS for the CHEMetric Chlorine Kit and chlorine standard is kept in a designated notebook in the Monitoring Kit.

Storage and Maintenance:

Prior to any IDDE investigation, the chlorine kit reagents and standards shall be inspected for damage and for reagent's expiration dates. CHEMetrics Chlorine Kit K-2511/R-2511 reagents when stored in the dark and at room temperature have a shelf life of 4 years. The Color comparator has a 12-month shelf life. Accessory solution has a shelf life of 2 years. Components of the kit shall be reordered as needed. The Monitoring Kit shall be inventoried for content as well as for structural damage.



### **SOP #003**

**CONDUCTIVITY** (0-500uS/cm, 0-5 mS/cm, 0-50 mS/cm, 0-200 mS/cm), **pH** (0-14 pH units), **SALINITY** (0-70 ppt), **TEMPERATURE** (-5°-55°C)

#### Equipment/Supplies:

YSI Professional Series 1030 (YSI Pro 1030) multi-parameter probe  
Easy Read general purpose thermometer  
Conductivity standards for 84uS/cm, 443 uS/cm, 1413 uS/cm, and/or 12.88 mS/cm  
pH standards for pH 4.0, pH 7.0, pH 10.0  
Newbury, MA Stormwater Monitoring Kit  
Extension pole for sampling with whirl-pak's or sampling bottles

#### Procedure:

The YSI Profession Series 1030 (YSI Pro 1030) multi-parameter probe measures specific conductance, temperature, salinity, and pH in stormwater discharge flows. Salinity is measured by using the instrument's conductivity and temperature values using algorithms found in *Standard Methods for the Examination of Water and Wastewater*.

The YSI Pro 1030 is used to directly measure the conductivity, temperature, and pH in a stormwater flow. Direct placement of the probe can be placed in the flow, in a stormwater pool either directly under the flow, or in the pool collected behind a caulk dam in the stormwater pipe. A whirl-pak bag attached to a sampling pole is to be used to collect hard-to-reach flows. The probe would measure the parameters directly from the whirl-pak contents.

#### Instrument Calibration: Lab

Prior to each day of field sampling with the YSI Pro 1030 multi-parameter probe, the conductivity sensor must be calibrated for conductivity values for at least two (2) points of calibration and the pH sensor is calibrated on each day of the field sampling for three (3) points pH calibration at the lab. The pH calibration for YSI Pro 1030 probe sensor shall be a three (3) points pH calibration using pH 7.0, pH 4.0, and pH 10.0 standards.

The suspected range for the sampling water dictates the conductivity calibration standards used. In most initial IDDE field monitoring, the calibration standards 83 uS/cm and 1413 uS/cm are used. The standard conductivity standard, 443 uS/cm is used as a field standard to determine whether or not the probe is still in calibrated conductivity range for field sampling. The pH 7.0 standard shall be used as a field standard to determine whether or not the probe is still in calibrated pH range for field sampling. pH standard calibrations shall be done on each day of the field sampling.

The Easy Read thermometer is used to measure the temperature of the calibration solution during the conductivity and pH calibration procedures. This temperature is recorded in the calibration log along with the results of the conductivity standard readings and the pH standard readings.

#### Instrument Calibration Procedure:

##### Conductivity Calibration Procedure:

Calibrate the YSI Pro 1030 for specific conductance as recommended by YSI. Use fresh, traceable calibration solution with a value better than 1000 uS/cm.<sup>3</sup> (1413 uS/cm) The YSI Pro 1030 can be calibrated for 443 uS/cm.

1. Place the probe's conductivity sensor in the solution of 1413 uS/cm standard buffer. The solution must cover the holes in the conductivity sensor that are closest to the cable. Ensure the entire conductivity sensor is submerged. Gently move the probe up and down to remove any air bubbles from the conductivity sensor.
2. Turn the probe on and allow the conductivity and temperature readings to stabilize. Press and hold the CAL key for 3 seconds. Highlight Conductivity and press enter. Next highlight Specific Conductance. And press enter.
3. Highlight the unit uS/cm and press enter.
4. Use the up or down arrow key to adjust the value on the display to match the value of the conductivity calibration solution, (with specific conductance enter the value listed for 25°C.). Press and holding either the up or down arrow key for 5 seconds will move the changing digit one place to the left. Press enter to complete the calibration.
5. "Calibration Successful" will display for a few seconds to indicate a successful calibration and then the probe will return to the RUN screen. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See troubleshooting section of the YSI Pro1030 user manual for possible solutions.<sup>3</sup>
6. Place the ISE thermometer into the calibrated 1413 uS/cm solution, allow the thermometer to stabilize, and record the temperature for the ISE thermometer in the calibration log.
7. Rinse the probe by submerging it in deionized water 3 times. Shake off any excess water.
8. Install the sensor guard to protect the sensor.

##### pH Calibration Procedure:

1. Place the sensor in pH buffer 7 and allow the temperature and pH readings to stabilize.
2. Press and hold Cal for three seconds.
3. Highlight pH and press enter.
4. Highlight 3 point and press enter.
5. If necessary, use the up and down arrow keys to adjust the pH buffer value. Note the pH mV reading should be between -50 and +50 in buffer 7.0. Record the value in into the YSI Pro1030 calibration log.
6. Press enter to continue to second point.
7. Rinse the sensor and place it in the second pH buffer 4.0. If necessary, use the up and down arrow keys to adjust the pH buffer value.
8. Wait approximately 30 to 60 seconds for the pH sensor to stabilize and for the temperature reading to stabilize. Note the pH mV reading and record the value into

the calibration log. pH mV's in buffer 4 should be +159 to 180mV from the previous buffer 7.0 mV value.

9. Rinse the sensor and place it in the third pH buffer, pH 10.0. If necessary, use the up and down arrow keys to adjust the pH buffer value.

10. Wait approximately 30 to 60 seconds for the pH sensor to stabilize. Note the pH mV reading and record into calibration log. pH mV's in buffer 10 should be -159 to 180 mV from the previous buffer 7.0 pH mV value.

11. Press enter to complete the calibration or press Cal to cancel.

12. "Calibration Successful" will display for a few seconds to indicate a successful calibration and the instrument will return to the Run screen.

13. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See troubleshooting section of the YSI Pro1030 manual for possible solutions.<sup>3</sup>

#### Calibrating Salinity:

Salinity is automatically calibrated if the YSI Pro1030 has been calibrated for specific conductance.

#### Sample Measurement: Field

1. Turn the instrument to on. With the sensor guard on the probe, Place the probe in the sample to be measured. Give the probe a quick shake to release any air bubbles.

2. Make sure the probe sensors are completely submerged into the sample. The two holes of the conductivity sensor must be covered by the sample.

3. At the end of the sampling day take the measurements for a sample containing the 443uS/cm conductivity standard and a sample containing the pH 7.0 standard as a quality control reading.

3. For all samples Wait for the readings to stabilize using the Auto Stable feature on the measurement display. Highlight save and press enter to store the reading.

4. The monitor will display the readings for conductivity, temperature, salinity, and pH.

5. Highlight the save box and press enter to save the current readings. The readings will be assigned a data set number starting with one. 50 data sets are saved in sequential order.

6. Highlight the data box to display data sets.

7. Record data sets onto the Newbury, MA IDDE monitoring datasheet or enter the information into the Newbury Stormwater Inspector database on the assigned iPad. Readings from the final quality control check on the YSI Pro 1030 are entered into the daily YSI Pro 1030 calibration data sheet.

#### Quality Control:

For quality control in the field, or in the monitoring lab, the first sample analyzed should be analyzed in parallel with a field blank and at the end of sampling day, measurements will be taken with pH 7.0 standard and with 443uS/cm conductivity standard. A calibration log for the conductivity and pH will be kept. For every 10 samples measured in the field a measurement of a duplicate sample will be taken.

Care and Storage, short-term and long-term storage for YSI Pro 1030:

Prior to each sampling season, the probe and its sensors should be inspected for damage to the gasket and o-rings that seal the instrument from water entering the battery compartment and the sensor ports.

One week prior to sampling season (March through June),

*Gaskets and o-rings:*

1. Open battery compartment and inspect the gasket carefully for contamination, debris, grit, etc. If necessary, clean the gasket with water and mild, phosphate-free detergent. Thoroughly dry the compartment.
2. Insert C batteries to the instrument. Quickly seal the compartment.

*ISE sensor port:*

3. When replacing or installing the ISE sensor, inspect the o-rings associated with the ISE sensor connector. The o-rings should be free of dirt or debris before installing the sensor onto the cable. IT IS IMPORTANT THAT THE ENTIRE SENSOR CONNECTOR END BE DRY WHEN INSTALLING, REMOVING, OR REPLACING THE SENSOR.
4. If any moisture is present inside the port, use compressed air to completely dry the connector or let it air dry.

*Sensors:*

Check instrument and calibration log to verify the approximate working life for the pH sensor. Typical working life is approximately 12-24 months depending on storage and maintenance.

*Temperature sensor:*

Keep the temperature sensor free of build-up. If needed, a toothbrush or the brush from the maintenance kit can be use to scrub the temperature sensor.

*Conductivity Sensor:*

At the end of a sampling week, and before any short or long term storage of the sensor, use the small cleaning brush included in the Maintenance kit to clean the conductivity electrodes. Dip the brush in clean water and insert it into each hole 10 to 12 times. If a deposit has formed on the electrodes, use a mild, phosphate-free detergent with the brush. Rinse thoroughly with clean water, then check the response and accuracy of the conductivity cell with a calibration solution.

*pH Sensor:*

If deposits or contaminants appear on the glass bulb please clean. Remove the sensor from the cable if necessary. Use clean water and a soft clean cloth, lens cleaning tissue, or cotton swab to remove all foreign material from the glass bulb. Check the response and accuracy of the pH sensor with a calibration solution.

If the sensor is slow to respond, soak the sensor for 10-15 minutes in clean water containing a few drops of commercial dish washing liquid. Gently clean the glass bulb with a cotton swab soaked in the cleaning solution. Rinse the sensor in clean water, wipe with a cotton swab saturated with clean water, and then rerinse with clean water.

If additional cleaning is required consult the YSI Pro 1030 manual on sensor maintenance.

*Short-term storage: Less than 2 weeks:*

Slide the grey storage sleeve over the probe guard. The sleeve is used for short-term storage. Keep a small amount of moisture (clean tap water) on the sponge in the sleeve during storage.

*Long-term storage:*

The conductivity sensor is stored long term in a dry state while the pH sensor should be stored in solution. When storing for more than 30 days, place the pH sensor in the storage bottle that was originally included with the sensor. Fill the storage bottle with pH standard buffer 4.0 and place the pH sensor into the filled storage bottle. The conductivity sensor is stored clean and dry.

Storage temperature for the pH sensor and the conductivity sensor is between 0° to 30°C, (32° to 86°F).

## **SOP #004**

### **DETERGENT [0-3 ppm (mg/L)]**

#### Equipment and Supplies:

Monitoring Kit

Colorimetric assay field kit:

CHEMetrics Detergents CHEMets Kit K-9400

Extension pole for sampling whirl-pak's or sampling bottles

#### Procedure:

Refer to CHEMetrics Detergents CHEMets Kit K-9400 for directions for analyzing 5 ml sample of the MS4 discharge flow.<sup>6</sup>

If suspected concentration of the detergent in the sample is >3 ppm, follow the detergent sample dilution procedure on the original MS4 discharge sample.

#### Field Analysis:

A grab sample is obtained using procedures described in SOP# 006. The Detergent/Chlorine grab/composite samples are stored in the cooler for transport back to the Newbury MS4 Monitoring Lab for analysis. The grab Sample/composite sample for Detergent/Ammonia is signed into the Chain of Custody (COC) for Newbury MS4 Monitoring Lab.

#### Lab Analysis:

From the Ammonia/Detergent grab sample signed into the Lab, a 5 ml sample will be analyzed on the day of sampling for detergent.

#### Lab procedure:

1. Rinse the reaction tube provided with the CHEMets Detergent Kit, K-9400, three times, with the sample. And then fill the tube to the 5 ml mark with the sample.
2. While holding the double-tipped ampoule in a vertical position, snap the upper tip using the tip -breaking tool.
3. Invert the ampoule and position the open end over the reaction tube. Snap the upper tip and allow the contents to drain into the reaction tube.
4. Cap the reaction tube and shake it vigorously for 30 seconds. Allow the tube to stand undisturbed for 1 minute.
5. Firmly attach the flexible tubing to the CHEMet ampoule tip.
6. Insert the CHEMet assembly (tubing first) into the reaction tube making sure that the end of the flexible tubing is at the bottom of the tube. Break the tip of the CHEMet ampoule by gently pressing it against the side of the reaction tube. The ampoule should draw in fluid only from the organic phase (the bottom layer).
7. When filling is complete, remove the CHEMet assembly from the reaction tube.
8. Remove the flexible tubing from the CHEMet ampoule and wipe all liquid from the exterior of the ampoule. Place an ampule cap firmly onto the tip of the CHEMet ampoule. Invert the ampoule several times, allowing the bubble to travel from end to end.

9. Obtain the test result by placing the ampoule, flat end first, into the comparator. Hold the comparator up toward a source of light and view from the bottom. Rotate the comparator until the best color match is found.

10. Enter the results into the Newbury Stormwater Inspector database on the assigned iPad.

Safety:

The reaction contains hazardous materials. Nitrile gloves and safety glasses are to be used. All assayed samples and used reagents are to be emptied into the marked detergent waste amber glass container temporarily stored in the Lab.

Storage and Maintenance:

Prior to any IDDE investigation or MS4 monitoring, the detergent kit reagents shall be inspected for damage and for reagent's expiration dates. CHEMetric Deterent Kit, K-9400/R-9400 reagents, has a shelf-life for 5 months when stored at room temperature in the dark. The detergent color comparator has a shelf-life of 2 years when stored in the dark at room temperature. The reagents and color comparator shall be reordered as needed. CHEMetrics

## **SOP #005**

### **E.coli/ Enterococci /Fecal coliform Analysis**

(1 organism/100ml)

#### Equipment and Supplies:

Monitoring Kit

Sterile Whirl-pak Coli-test water sample bags with thiosulfate

Extension pole for sampling whirl-pak's or sampling bottles

Cooler containing "ice" packs and sample holding containers

IDEXX Enterolert Test Kit, catalog #WENT020

IDEXX Colilert-18 Test Kit, catalog #WP1001

IDEXX Quanti-Tray/2000, catalog #WQT2KC

IDEXX QC Coliform and E.coli Kit, catalog #UN3373-WQC-TCEC

#### Procedure:

Colilert treated samples are incubated at 35°C for 24 hours for E.coli, and at 44.5°C for 18 hours for fecal coliform. The treated sample wells incubated at 35 °C that have a yellow colored appearance and fluorescence, comparative to the Colilert standard color comparator well, are considered positive for E.coli. Samples analyzed for fecal coliform at 44.5°C for 24 hours are considered positive if treated sample wells have a yellow colored appearance. Numeric quantification of the yellow colored, fluorescent sample wells for E.coli or the numeric quantification of the yellow colored samples for fecal coliform are determined and recorded as MPN, Most Probable Number. One MPN for E.coli/100 ml sample is equivalent to 1cfu (bacterial colony forming unit) for E.coli/100ml sample. One MPN for fecal coliform/100ml sample is equivalent to 1 cfu (bacterial colony forming unit)for fecal coliform /100 ml sample.

IDEXX Enterolert Test Kit detects enterococci in water samples. This nutrient indicator fluoresces when metabolized by enterococci.

Entrolert treated samples are incubated at 41°C for 24 hours. The treated sample wells that are fluorescence are considered positive for enterococci. Numeric quantification of the fluorescence of the fluorescent sample wells are determined and recorded as MPN, Most Probable Number, for enterococci. One MPN for enterococci/100 ml sample is equivalent to 1 cfu enterococci/100 ml sample.

#### Collection Procedure:

##### *Field:*

Using the date and time stamped, and specific site named Sterile Whirl-pak Coli-test water sample bags with thiosulfate, a 120 ml grab sample or composite samples are collected from the outfall.

The sample Whirl-pak bags are immediately stored individually in the sample cup containers inside the iced cooler. The cooler is transported to the WWTF as soon as possible after sampling. All samples must be tested within 6 hours of sampling. The Chain of Custody Sheet for Bacteria Analysis for Newbury is completed, signed and dated upon arrival at the Newburyport WWTF.



*Lab Analysis:*

One week prior to any MS4 IDDE investigation or MS4 monitoring the Monitoring Coordinator shall contact the WWTF Chief Operator to assure that the WWTF is available for analyzing bacterial samples. Replenishment for any reagents or equipment needed for the bacterial analysis is determined and any supplies needed by the WWTF are provided prior to the monitoring date being scheduled.

All bacterial samples are to be delivered to the WWTF on ice in a cooler. Each whirl-pak sample shall be placed in their individual sample holding cup in the 4° C cooler. The sample site number shall be clearly marked onto the individual bags. The Bacterial Chain of Custody sheet shall be checked for each individual sample's site number and then signed and dated.

Quality Control:

Recommendations for quality control for each lot of Colilert and each lot of Enterolert are given in the procedures outlined in the Colilert Test Kit and the Enterolert Test kit.

Storage and Maintenance:

Prior to any IDDE investigation, the Colilert-18 kit, the Enterolert kit reagents, and Quanti-Tray/2000 shall be inventoried and inspected for damage and for reagent's expiration dates and equipment date expiration. The Colilert-18 test has a shelf-life up to 15 months from date of manufacture. Storage is between 2-25° C, away from light. The Enterolert test has a shelf-life of 12 months from data of manufacture. Storage for Enterolert is 2-30° C, away from light. Shelf-life for the Quanti-Tray/2000 is up to 3 years from date of manufacture.

The Monitoring Kit shall be inventoried for content as well as for structural damage.

## **SOP #006**

### **Grab Sampling**

#### **The Following Parameters:**

- **E. coli, Enterococci and fecal coliform**
- **Detergent/Ammonia**
- **YSI Pro 1030 Multi-parameter probe with sensors for conductivity, pH, temperature, and salinity**
- **Chlorine**

#### **Equipment and supplies:**

Monitoring Kit  
Gallon size zip-lock bags  
2 gallon size zip-lock bags, each a half to a third filled with sand  
1 solid, either steel or wooden 12-inch rod  
scissors  
Sterile Whirl-pak Coli-test water sample bags with thiosulfate  
Sterile Whirl-pak water sample bags without thiosulfate, (207ml)  
Glass containers for Chlorine samples  
Graduated Sampling 250 ml (or 1 liter) bottles  
Timer  
Extension pole for sampling whirl-pak's or sampling bottles  
Cooler containing "ice" packs and sample holding containers

#### **Grab Sampling Procedure:**

MS4 discharge flows are collected in Whirl-pak water sample bags.

Each sample bag contains the components that are in the MS4 flow. A grab sample is a one point in time representation of the components in the flow.

Each sample bag is marked prior to sample collection. With a permanent marker, label the front side of the bag in large lettering with the word, Newbury, and the site number where the flow is located. Label the backside of the bag with the date, time of collection, and the corresponding assay to be done on each site marked bag.

Thio-bag for Coli-Test Water Sample Bags shall be used for the collection of all E.coli and fecal coliform flow samples. Sample bags are labeled with the name of the pathogen for which the assay is to be performed.

Detergent/Ammonia grab samples, and the YSI Pro 1030 grab sample use the standard Whirl-pak bags (without thiosulfate) provided in the Monitoring Kit.

Chlorine tests require glass sampling bottles.

#### *Field procedure:*

1. Protective gloves shall be worn.
2. Confirm the site number and/or the sample name on the whirl-pak bag. 4 whirl-pak bags are required for each site; one whirl-pak bag is the Thio-bag for Coli-test Water Sample (with thiosulfate) and two whirl-pak standard bags without thiosulfate for ammonia and detergent. The whirl-pak bags with thiosulfate are for pathogen sample collection. The bags remain sealed until the sample is ready to be collected.
3. The closed tie is unzipped from the bag.

4. The unzipped bag is positioned in the center of the flow.
5. The white tabs are gently pulled apart.
6. Without touching the bottom of the pipe/pool or debris in the pipe or pool, the whirl-pak bag is scooped gently in an upward arc towards the center of the upstream flow.
7. Keep the bag sterile by NOT touching the insides of the sampling bags with gloved hands. Do not allow the bag to touch the sides of any structure or bottom of the pool or pipe.
8. Once the appropriate amount of sample is collected, the wire ends are pulled to close the bag.
9. The bag is whirled round the wire ties and the bag wired closed by twisting the wire ends around each other into a closed loop.
10. If the flow is hard to reach or is located inside a catch basin or manhole, the whirl-pak bag is opened and attached to the sampling pole with a plastic loop filament tie. See SOP # 007 for attaching whirl-pak bags to sampling pole.
11. The E.coli, Enterococci and fecal coliform water sample bags are the first collected sample. The E.coli, fecal coliform, or Enterococci bags are filled to the marked line for the Thio-bag for Coli-Test Water Sample Bag (>100ml) and are immediately placed into the sample cup containers inside the cooler for transportation to the WWTF.
12. The Detergent/Ammonia, Chlorine, and Multi-parameter water sample bags are each filled  $\frac{3}{4}$  full with the discharge sample, as is the glass containers for the chlorine sample.
13. The three (3) separate sampling containers are analyzed in the following order:
  - a. Chlorine (glass bottle)
  - b. Multi-parameter probe for conductivity, salinity, temperature, and pH
  - c. The Detergent/Ammonia is analyzed for Ammonia.
  - d. The remaining sample in the Detergent/Ammonia bag is sealed and placed back into the cooler to be tested for detergent later upon arrival at the Lab.
14. All samples must be taken and analyzed at the same sampling session. If oven space at the WWTF is limited, the fecal coliform is sampled and tested at another time, but as soon as possible.

## **SOP #007**

### **Procedure For Using A Sampling Pole To Obtain A Grab Sample From A Catch Basin, Manhole, Or Hard-To-Reach Outfall Flow**

#### Equipment/ Supplies:

Sampling pole, NASCO, catalog #B01367WA  
Plastic snapper ring, NASCO  
Sterile Whirl-pak Coli-test water sample bags with thiosulfate, NASCO  
Sterile Whirl-pak water sample bags without thiosulfate, (207ml), NASCO  
Graduated Sampling 250 ml (or 1 liter bottles)  
Glass container for Chlorine

#### Procedure:

1. Obtain the Sampling Pole. Wearing disposable nitrile gloves, rinse the sampling pole collection funnel with the distilled water spray bottle prior to placing the funnel sample end of the pole into the discharge flow. Rinse the funnel end of the sampling pole three (3) times with the discharge flow.
2. If using a whirl-pak bag for sampling, open the zip lock bag as described in SOP 006, "Grab Sampling". Under sterile conditions, secure the whirl-pak bag to the funnel end of the sampling pole with the plastic filament strip, snapper ring, by placing the opened bag onto the funnel and tightening the plastic filament.
3. Position the whirl-pak into the flow of the discharge and proceed to collect the sample as described in SOP #006.

#### Storage and Maintenance:

When not in use, the sampling pole is stored upright in the corner of the Lab. The plastic filaments for securing the sampling bags or bottles to the sampling pole, are stored in a zip-locked plastic bag inside the Newbury MS4 Monitoring Kit.

After each sampling session and prior to each sampling session, the sampling pole is inspected for cleanliness and for any damage to the funnel or swing arm of the sampling pole. The plastic filaments are inspected for any damage.

#### Safety:

Only certified personnel trained and currently qualified in Confined Space Entry can enter into any catch basin or manhole to directly collect samples. Only the sampling pole can enter the catch basin or manhole to collect samples by those not so trained and qualified.

## **SOP #008**

### **Caulk/Sandbag Dams**

#### **Equipment/Supplies:**

Plumber's putty, 2 Sand bags or similar substance  
Shovel  
Pry bar

#### **Procedure:**

The plumber's putty or sand bags are used to make a dam about 2 inches high within the bottom of the storm drain pipe in a catch basin, manhole pipe, or swale to capture any dry weather flow that occurs between field observations. Dams can also be used to partially or completely block flows from pipes in a manhole to eliminate catchments not involved in the illicit discharge flow.

Any water that has pooled behind the dam is then sampled using a grab sample procedure or composite sample procedure. A hand-pump sampler or a graduated wide-bore syringe can be used to collect the sample from the pool. The sample is then analyzed for appropriate parameters.

#### **Quality control:**

Rainfall and stormwater flow in the stormwater conveyance system that is being investigated is monitored periodically over the designated monitoring time for leaks and discharge pool levels.

#### **Storage and Maintenance:**

Plumber's putty and/or sand bags are stored at Newbury DPW Barn. Integrity of the physical structure of the putty and the sand bags are inspected prior to installation in the stormwater conveyance system. Any tears in the sand bags are repaired. Dried Plumber's putty is replaced with new pliable Plumber's putty.

Placement, replacement or removal of the dam is noted to the Coordinator and the Director of Public Works shall be advised of placement, replacement or removal of dams.

#### **Safety:**

Nitrile gloves and safety glasses are worn when sampling the pool. The MS4 discharge samples may contain hazardous materials. Protective clothing, steel toe shoes are to be worn. Safety procedures noted elsewhere are to be followed. If necessary only DPW personnel shall install or remove caulk dams.

## **SOP #009**

### **Sample Dilution Procedure**

#### **Equipment/Supplies:**

Newbury MS4 Monitoring Kit

CHEMets Sample Dilution Kit, A-0188

50 ml glass beaker

CHEMetrics sample dilution procedure chart included in CHEMets Sample Dilution Kit, A-0188<sup>14</sup>

Glass container

#### **Procedure:**

Sample dilution, prior to testing, can extend the analysis range of many CHEMetrics test kits. Samples for CHEMetrics' ammonia, detergent, chlorine test kits can be diluted to prevent interference from sample turbidity, color, or other sample components. Dilution is not appropriate when testing for determination for conductivity, salinity, or pH.

##### *Field/Lab procedure:*

1. Using the table provided with the Sample Dilution Kit, CHEMets A-0188<sup>14</sup>, select the necessary components provided in the kit to make the desired dilution.<sup>13</sup>
2. Dispense the specified volume of sample into the appropriate sample cup and dilute to the specified total volume with deionized water.
3. Perform the Test Procedure included in the parameter specific test kit as written, using this diluted sample as the sample to be tested. Be sure to use the exact volume of sample that is called for in the kit instructions.
4. Multiply the test result obtained from testing the diluted sample by appropriate multiplication factor from the table included in the Sample Dilution Kit, A-0188. The resulting value is the actual concentration value for the undiluted sample.
5. Record the resulting value onto the Newbury, MA IDDE Monitoring Datasheet or enter the information into the Newbury Stormwater Inspector database on the assigned iPad.

#### **Storage and Maintenance:**

The CHEMets Sample Dilution Kit is stored in the Newbury MS4 Monitoring Kit.

Prior to any monitoring session or IDDE investigation the contents of CHEMets Sample Dilution Kit, A-0188, is inspected for damage, for content of its components, and for the procedure dilution chart.

**SOP #010**  
**IDDE Data Recording Procedure**

**Equipment/Supplies:**

Ipad or other tablet with Newbury Stormwater Inspector software  
Timer

Weather forecast for inspection date and previous 24-hour weather history for site(s)

**Procedure:**

The Newbury Stormwater Inspector database for catch basins, manhole and/or outfalls maintain all the respective information necessary for inspection and monitoring for illicit discharges, as well as provides necessary inventory for all the stormwater sewer system in the MS4 regions in Newbury.

The data entered into the database allows the Town to evaluate the physical characteristics of the structure as well as the quality of the discharged flow from within or out of the structure.

***Field Procedure:***

Day before scheduled monitoring the tablet should be fully charged.

Monitoring day:

The tablet is turned on and the location of the MS4 structure is verified. If the structure does not appear on the screen GPS coordinates of the structure are identified by standing on or as close as possible to the structure. Select the red dotted location of the structure by pressing the red dot. If the structure is pictured on the screen, the fields are filled in by entering the appropriate information on the tablet.

**Training:**

Training for access authority to Newbury Stormwater Inspector is done with the IT Department. Data entry training and field training is done by both the IT Department and the Monitoring Coordinator.

Each year prior to the March to June sampling season, all field personnel are trained on the use of the tablet.

**SOP #011**  
**Manual Flow Rate Determination**

**Equipment/Supplies:**

Newbury MS4 Monitoring Kit  
Floatable marker-orange peel, brightly colored flat leaf  
Tape measure  
Stop-watch  
Five-foot Cone  
Narrow Board

**Procedure:**

This operation is only done when an illicit discharge has been removed, in order to determine the resulting reduction of pollutant loading.

The stormwater Inspector Database has an embedded program to calculate the flow rate from the following measurements:

- The tape is held vertically at the centerline of the outfall pipe.
- The water depth and pipe diameter flow depth shall be measured and recorded in the database (to the nearest one-quarter inch), and the pipe diameter to the nearest inch.
- An orange peel wood chip or dry leaf is placed on the narrow board and the board is extended five feet into the outfall pipe. The board is rotated 180° dropping the floatable marker into the water, simultaneously with starting the stop-watch.
- The stop-watch is stopped the instant that the object exits the pipe, and travel time (to the nearest second) is recorded in the database.



**SOP #012**  
**Records Management**

**Equipment/Supplies:**  
Database Tablet

**Procedure:**

At the end of each day of monitoring, the Conservation Agent shall be notified by email. The Conservation Agent and the DPW Director shall print out the results of the monitoring, and file the printed sheets in Town Hall and the DPW Headquarters.

## **SOP #013**

### **Key Junction Manhole Inspection Procedures**

#### **Equipment/Supplies:**

Outfall Inspection Data Form  
Newbury Stormwater Inspector Database  
Pry bar and shovel  
Newbury MS4 Monitoring Kit  
Sampling pole

#### **Procedure:**

When evidence of an illicit discharge exists for each catchment, during the sampling season March through June when groundwater is at highest level, key junction manholes are inspected in dry weather for visual and olfactory evidence of illicit connections. See Newbury MS4 SOP #016 for procedure and reference chart for physical indicators of an illicit flow.

If flow is observed, the flow is sampled for ammonia, chlorine and surfactants using SOP #001-005.

If sampling results or visual or olfactory evidence as described, in SOP #14, indicates potential illicit discharges or SSOs, the area draining to the junction manhole is tagged for further catchment investigation during a time when a flow is present. Caulk dams are placed in proper pipes to allow isolating pipe flow and sampling. Resulting pools from dams are analyzed for ammonia, chlorine and detergent.

In many cases there are no manholes, with the flow towards the outfall piped directly from manhole to manhole. Where this is the case, the catch basins shall be investigated as manhole.

If analyses suggest an illicit discharge, key junction manholes and subsequent manhole investigations continue until the location of the suspected illicit discharges or SSOs can be isolated to a pipe segment between two manholes. If no evidence of an illicit discharge is found the inspection of the catchment is considered complete.

1. During dry weather conditions (0.1 inches of rainfall in last 24 hours), the manholes to be investigated shall be determined.
2. Follow safety procedures to direct traffic flow around key junction manhole
3. Pry open the manhole using pry bar, shovel, and/or cover key.
4. Visually and by olfactory evidence inspect for signs of illicit discharges. See MS4 SOP #014 for procedure.
5. Determine if any illicit connections, example, pipes are present.
6. If a flow is present, analyzed the flow for ammonia, chlorine, and detergent by using the field kits in the MS4 monitoring kit. Detergent samples are returned to MS4 monitoring lab for analysis. If flow cannot be analyzed at inspection, the manhole is designated on the database for a later analysis within 60 days.
7. All analysis data shall be entered directly into the database.
8. If no flow is present and no physical or olfactory evidence suggesting an illicit discharge is present, the manhole investigation is marked as complete in the database.

**Safety:**

Proper safety procedures for traffic safety and for personal safety for the working in the field are followed. Nobody except DPW personnel will remove catch basins or manhole covers. Only personnel who have completed the enclosed spaces training course.

**SOP #014**  
**Visual/Olfactory Determination**

**Equipment/Supplies:**

Newbury MS4 Monitoring Kit  
Sampling Pole  
Chart on visual and olfactory evidence of illicit discharges  
Database  
Data sheets  
Pen  
Mobile device photo app

**Procedure:**

Using visual and/or olfactory evidence in pipes, past MS4 discharge flows can be used to detect the potential for illicit flows. Analytical observation of the evidence under dry weather flows can identify types of pollution.

See Table 1 for chart on parameters used for determining potential illicit discharges.

Table 1. Parameter or Analysis Used For Determining Potential Illicit Discharges

Physical Appearance	Characteristics	Potential Illicit Discharge
Suds	White, lofty, soapy feel	Wash water, laundry water
Odor	Musky, rotten egg smell, rancid, detergent smell	Sanitary sewer, laundry wash water
Algae	Green, brown, reddish	Excessive nutrients, iron
Gray sediment	Gray, granular	Sanitary sewer
Staining	White, gray, green	Nutrients, sanitary sewer, laundry wash, paint
Pool color	White, gray, bright colors, oil sheen	Oil or grease, paint, sanitary sewer, laundry water
Vegetation	Excessive growth	Nutrients, sanitary sewer
Floatables	Toilet paper, excrement, sanitary products	Direct sanitary line

***Field Procedure:***

1. During dry weather conditions (0.1 inches of rainfall in last 24 hours) the outfall to be evaluated shall be identified and located.
2. Safety procedures to direct traffic flow around MS4 structure shall be followed.
3. The cover or the grate of the structure shall be removed.
4. Visually and by olfactory evidence the structure shall be inspected for signs of illicit discharge.

5. Any physical evidence or olfactory evidence found shall be compared with the chart provided in the MS4 monitoring kit.
6. All observations shall be recorded in the database.
7. If no physical evidence or no olfactory evidence (or if no dry weather flow) suggesting an illicit discharge is present, this shall be noted in the database.

## **SOP #015**

### **Lab Housekeeping**

#### **Equipment/Supplies:**

Dishpan, drying rack  
1% Liquinox solution (phosphate-free detergent solution)  
Tap water  
Deionized water  
Isopropanol solution  
Paper towels  
Floor fan

#### **Procedure:**

##### ***Lab Bench Preparation: (Prior to a monitoring event)***

1. All items shall be removed from bench top

Wash first with phosphate-free detergent, rinse with tap water

The bench shall be allowed to air-dry

The bench top shall be cleaned with isopropanol and again allowed to air-dry

2. The sink shall be cleaned

The sink shall be washed first with phosphate-free detergent, rinsed with tap water, and allowed to air-dry

3. When using detergent test kit, the outside bay overhead door shall be closed. The lab vent fan shall be turned on with the lab door open. The floor mounted fan outside the lab shall be turned on with the flow directed away from the lab.

##### ***Lab Cleanup:***

1. At the end of a monitoring event the lab vent fan shall be turned off.
2. Pour any contents remaining in detergent/chlorine/ammonia sampling bags down the sink and flush down with tap water.
3. All glassware, sampling holders, sampling bottles, and sampling pole swing-cup shall be placed into dishpan or soaking pan. 1% Liquinox shall be added to the dishpan. The articles shall be washed with phosphate-free detergent.
4. The bench top shall be cleaned as above.
5. All glassware, sampling holders, sampling bottles, and sampling pole swing-cup shall be rinsed three times with tap water. Sampling bottles shall be rinsed twice with deionized water.
6. Rinsed equipment shall be allowed to air-dry on paper towels on clean bench top or on drying rack. When dry all items shall be stored protected from dust and debris.
7. Liquid waste containers shall be stored in a kitty-litter tray and placed in a secure area in the DPW barn.

8. All test kits shall be placed in the cabinet. All monitoring probes shall be placed back in their cases.
9. Phosphate-free detergent and deionized water shall be placed under the monitoring lab sink.
10. The fan and lights shall be turned off. The lab log shall be signed by the lead person, and the lab door shall be locked.